THE GEOLOGY AND GEOCHEMISTRY OF THE VOLCANIC ROCKS

OF THE PONGOLA SEQUENCE

IN SOUTHERN SWAZILAND

BY

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I, MBONGENI HENRY MABUZA, hereby declare that this thesis is my own original work, that all assistance and sources of information have been duly acknowledged, and this work has not been presented to any other university for the purpose of a higher degree.

M. H. Maby

ABSTRACT

The ~ 3.0 Ga Pongola Sequence, comprising a lower dominantly volcanic Nsuze Group and an upper largely sedimentary Mozaan Group, crops out in the Mahlangatsha and Kubuta areas of southern Swaziland. The Nsuze Group consists of basaltic, andesitic, dacitic and rhyolitic rocks with intercalations of ferruginous shale and pyrophyllitic schists. The Mozaan Group comprises quartzites, ferruginous shales, basalts and minor amounts of andalusite and sericitic schists.

In the study area in southern Swaziland the Pongola Sequence is represented by a northerly striking lens of metavolcanic basaltic rocks extending southwards to the Ngwavuma River valley. These lavas comprise basalts, basaltic andesites and very minor rhyolites that are amygdaloidal and vesicular in places. Hunter (1952) tentatively correlated these metabasaltic rocks with the Nsuze Group but the geochemistry indicates that an upper Mozaan correlation is more likely.

In the study area four stages of deformation have been deduced: a cleavage development (D_1) ; low angle thrusting and bedding-parallel thrust faulting (D_2) ; normal/oblique slip faulting (D_3) and fracturing/jointing (D_4) . There has been duplication of strata by thrusting and normal faulting. Absence of marker beds prevents the determination of the degree of duplication.

It is clear from the geochemical analysis that there are two broad groups of data from the suite, one from the Sigwe Hills in the north and the other from south of the Ngwavuma River. The samples from south of the Ngwavuma River are enriched in TiO_2 , Al_2O_3 , CaO, Cr, Zr and Nb compared to the samples from Sigwe Hills. These volcanic rocks are tholeiitic in nature and indicate a within plate continental setting.

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CHAPTER 1

INTRODUCTION

1.1 LOCATION OF THE STUDY AREA

The area to be discussed is about 95 km² in area and is located in the southeastern part of Swaziland (Figure 1.1). Access is from the Hlatikulu-Hluti and the Nhlangano-Hluti-Maloma roads (in the annexure Map 1). An additional number of tracks and farm roads also provide access to the study area from the main roads.

Outcrop is generally restricted to ridges, particularly the Sigwe Hills (Map 1). The lower lying areas have been cultivated extensively so that sporadic outcrops are confined to stream beds. Map 2 in the annexure shows the sample points. The terrain in the area is gently undulating except in the Sigwe Hills where there are very steep slopes in places.

1.2 PREVIOUS WORK

The Nsuze Group was first recorded in the Piet Retief and Paulpietersburg areas as consisting of a basal thick quartzitic succession overlain predominantly by andesitic lavas with rare occurrences of the more acid and more basic varieties (Humphrey and Krige (1931) in Armstrong (1980).

No detailed studies have been carried out, except for regional geological mapping undertaken during the 1950's. The presence of the dominantly volcanic rocks in the study area was reported first by Hunter (1952). At that stage large volumes of volcanic rocks were not recognized as being associated with the Mozaan Group and Hunter assigned the rocks under consideration to the Nsuze Group. Basaltic lavas were subsequently identified in the uppermost Mozaan Group near Mooihoek by Hunter (1963), (Figure 1.1). There has been no information on the chemistry of these lavas until the present study which represents the first detailed investigation, (two of the samples analyzed K1 and K2 are from Mooihoek). There is a direct correlation between the geochemistry of the volcanic rocks from the vicinity of Mooihoek (upper Mozaan Group) and that of the volcanic rocks from the study area. In

Figure 1.1 and other subsequent figures, the study area is thus shown as being part of the Mozaan Group stratigraphy.

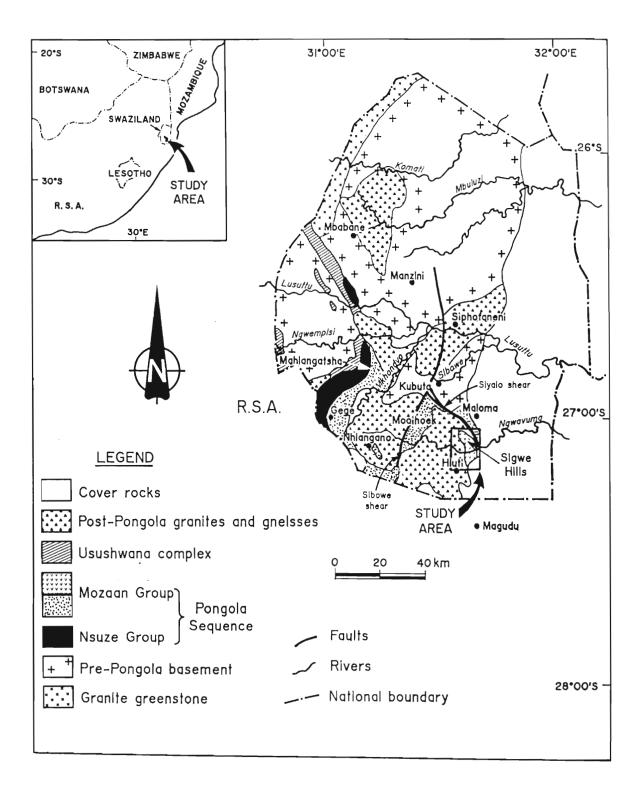


Figure 1.1: Map showing the location of the study area and the distribution of the Pongola Sequence in southern Swaziland.

Regional stratigraphical correlations within the Pongola basin have been complicated by lack of distinctive lithological sequences and the complex nature of the structure within the entire basin. In Swaziland and adjacent areas of northern KwaZulu-Natal and southeastern Transvaal, the Pongola Sequence is transected by shear zones striking north and northwest. This results in a series of fault-bound tectono-stratigraphic packages that are further disturbed by a number of granitoid intrusions.

This thesis is concerned with that part of the sequence preserved in the Sigwe Hills and extending to and beyond the Ngwavuma River (Map 1).

1.3. AIMS AND APPROACH

The present study has the following objectives

- (i) to map and record the extent and relationships of the various volcanic and sedimentary lithologies;
- (ii) to attempt to establish the environment(s) in which the volcanic rocks were extruded;
- (iii) to establish the compositions of the volcanic rocks and to compare them with those in other parts of the Pongola basin;
- (iv) to record structural data in order to attempt to unravel the deformational history and to relate this to the broader structural evolution of the Pongola basin;
- (v) to undertake a petrographic study of the lithologies to ascertain mineralogical variations and to determine the metamorphic conditions to which the rocks have been subjected;
- (vi) to establish the validity of these volcanic rocks being related to the Mozaan Group rather than the Nsuze Group in the stratigraphy.

Fieldwork involved mapping with the aid of $1 : 10\ 000$ scale orthophoto sheets and $1 : 50\ 000$ topocadastral sheets onto which data were transferred. Aerial photographs of $1 : 30\ 000$ scale were also used. The final map has been compiled at a scale of $1 : 50\ 000\ (Map\ 1)$.

A total of 47 samples of the volcanic rocks were analyzed for major and minor oxides together with trace elements Ba, Sr, Nb, Y, Rb, Zr, Sr, U, Th, Zn, Cu, Ni, Cr, V and La. Four additional samples of volcanic rocks collected from inliers of Mozaan volcanic rocks immediately south of the Swaziland border (Magudu district in northern KwaZulu-Natal), and from upper Mozaan outcrops in the vicinity of Mooihoek (Figure 1.1) were also analyzed.

CHAPTER 2

REGIONAL GEOLOGY

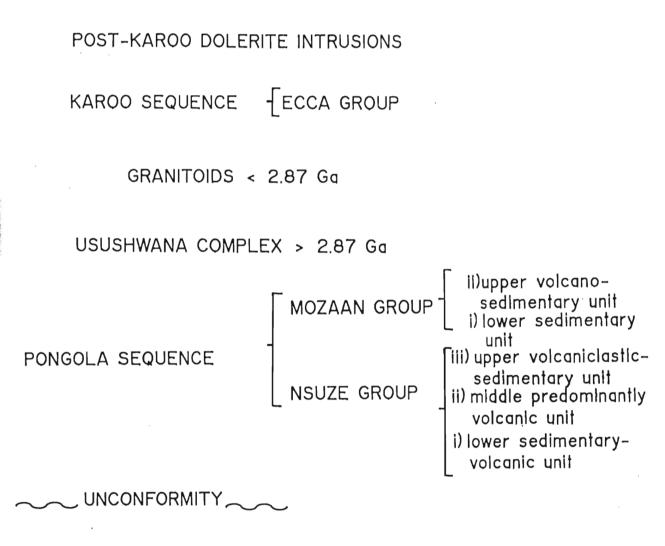
2.1 INTRODUCTION

The late Archaean Pongola Sequence (~ 2.94 Ga, Hegner *et al.*, 1984) crops out in southern Swaziland in two discrete areas, namely, Mahlangatsha-Gege and Kubuta-Sigwe Hills (Figure 1.1) where it rests unconformably on older granitic rocks, the ages of which range from about 3.64 Ga to about 3.25 Ga (Farrow *et al.*, 1990). The Nsuze Group, where it crops out to the west of Swaziland in the vicinity of Amsterdam, rests unconformably underlying Lochiel granite dated at 3.1 Ga (Barton *et al.*, 1983). This is therefore a maximum age for the Pongola Sequence.

Following the volcanism and sedimentation which produced the Pongola Sequence, the stratigraphically lowest formations in the in the Piet Retief area were intruded by magmas of dominantly mafic and ultramafic composition. These were first recognized by Hunter (1952) as a suite of gabbroic, dioritic and granophyric rocks which seemed to have their greatest development near the Usushwana river in southwestern Swaziland. Rocks of this Usushwana Complex have subsequently been identified in the area extending from east of Paulpietersburg in KwaZulu-Natal to west of Mbabane in Swaziland and also north of Amsterdam in the Transvaal (Figure 2.1). The Usushwana Complex (age ~ 2.87 Ga, Hegner *et al.*, 1984) is important in assessing the geological evolution of the region and will be described in a later section. Table 2.1 presents a stratigraphic column showing the position of the Pongola Sequence and other rock associations which are spatially related to it.

Various dominantly potassic granitoids intruded the Pongola Sequence in southern Swaziland and adjacent areas of southeastern Transvaal and northern KwaZulu-Natal. These were emplaced as gneiss domes, tabular granite batholiths (Hlatikulu granite) and a number of megacrystic discordant granitoid plutons. The most extensive is a megacrystic granodiorite building the Kwetta batholith. On its southern and western flanks are smaller intrusions of leucogranite, the Mooihoek and Mhlosheni plutons (Figure 2.2). The absolute ages of these intrusions are not known as Rb-Sr dating techniques have yielded only errochrons (D.R. Hunter pers. comm., 1991).

Table 2.1: Stratigraphic column showing the chronological sequence of geologic units in relation to the Pongola Sequence.



GRANITOID - GREENSTONE BASEMENT > 3.1 Ga

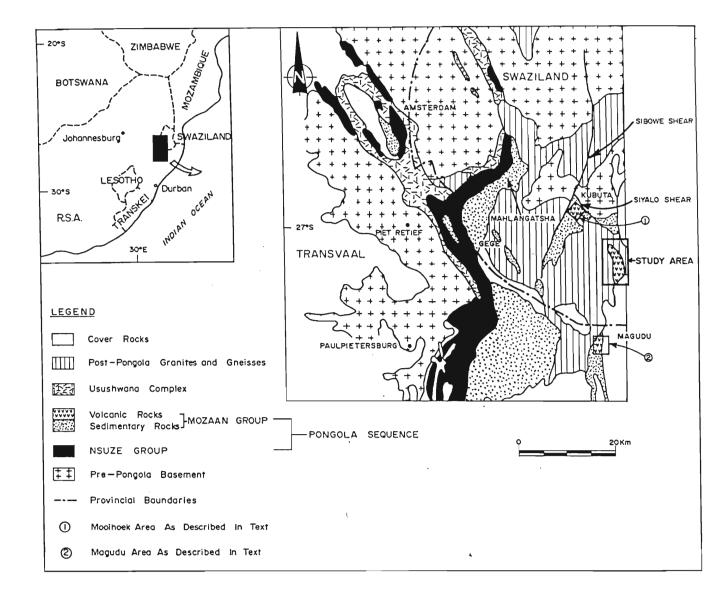


Figure 2.1: Map showing the distribution of the Archaean Pongola Sequence and associated intrusive rocks in southern Swaziland and southeastern Transvaal.

2.2 PRE-PONGOLA BASEMENT

2.2.1. Banded gneisses (Ancient Gneiss Complex)

The Pongola Sequence rests unconformably on banded gneisses in the type area of Amsterdam southeastern Transvaal (Hatfield, 1990), and the same unconformable relationship probably occurs in most areas where the Pongola rocks are developed. The dominantly tonalitic and trondhjemitic basement gneisses interlayered with amphibolites crop out north and northwest of the study area (Figure 1.1). They are medium to coarse grained, grey rocks composed of quartz, plagioclase, and biotite, with minor amounts of hornblende and potassium feldspar. Layers and lenses of amphibolite are composed of hornblende and plagioclase with minor quartz and biotite. The foliation in the tonalites results from the preferred orientation of the mafic minerals which may occur irregularly through the rock or be concentrated into thin layers varying from 1 to 10 cm in width. The strike of the subvertical foliation in these basement gneisses is generally northeasterly but, changes to northwest immediately south of the Swaziland Natal border.

Bimodal gneisses composed of alternating bands of leucotonalite and amphibolite are exposed in many parts of central and western Swaziland. The bands vary from 1 centimetre to several metres in width and are complexly folded and intruded by aplites and quartzo-feldspathic pegmatitic phases. The strike of the subvertical foliation in these gneisses is also northeasterly dips. These gneisses constitute part of the Ancient Gneiss Complex as described by Hunter (1970a).

The bimodal gneisses of the Ancient Gneiss Complex (AGC) in Swaziland have yielded ages ranging from 3.640 Ga to 3.250 Ga based on single zircon Pb-Pb studies (Compston & Kröner, 1988; Kröner *et al*, 1989, 1991). Gneisses (correlated with the AGC) forming the basement to the Pongola Sequence in the study area have not been dated but it is reasonable to assume a similar spectrum of ages for them.

2.2.2 Pre-Pongola Metavolcanic and Metasedimentary Sequences

The Archaean terrane (>2.6 Ga) in southeastern Transvaal and northern Natal contains a number of discrete metavolcanic and metasedimentary remnants which are enclosed in

granitoids that either pre- or post-date these remnants (Figure 2.2). On-going studies on this granitoid terrane are likely to provide meaningful age constrains on the start of the Pongola deposition. These remnants include the Commondale supracrustals, the De Kraalen supracrustals, the Anhalt Granitoid Suite and the Mkhondvo Metamorphic Suite (Mkhondvo being the Siswati nomenclature as opposed to Mkhondo). Each of these remnants is composed of distinct rock types and has characteristic features.

(i) Commondale Supracrustal Suite

This remnant situated south of Piet Retief (Figure 2.2) is preserved in two major synformal keels separated by a shear zone trending north-northeast (Smith, 1987). A pile of mafic and ultramafic rocks with minor intercalations of metasedimentary and calc-silicate horizons are preserved in this supracrustal suite. Ultramafic rocks are serpentinized and retrogression to talc-chlorite schists occurs in zones of high strain (Hunter and Wilson, 1988). An alternating sequence of spinifex-textured and cumulate layers is preserved in the core of one of the synforms. These layers represent individual cooling units. Thinly bedded, ferruginous quartzites, talc schists, and amphibolites occur in the fold closure at the eastern end of the layered sequence. Pillows, flow-top breccias, and other textures diagnostic of lava flows are absent.

(ii) De Kraalen Supracrustal Suite

The De Kraalen remnant, located southeast of Piet Retief (Figure 2.2), consists predominantly of banded iron-formation and metaquartzite with minor amounts of calc-silicate rocks and amphibolites. These rocks crop out over an area of about 5 km². Immediately southeast of this remnant there is a medium-grained, layered tonalitic gneiss known as the De Kraalen Gneiss (Hunter *et al.*, 1992). These gneisses have impersistent quartzo-feldspathic layers which can be traced over strike lengths of up to 15 m. The gneisses are preserved in close spatial association with the De Kraalen metavolcanic rocks and layered amphibolites although temporal relationships are not clear in the field (Hunter *et al.*, 1992).

(iii) Mkhondvo Metamorphic Suite

In the Mkhondvo (Siswati nomenclature) valley in southern Swaziland are bimodal layered gneisses labelled the Mkhondvo Metamorphic Suite (MMS in Figure 2.2; Hunter *et al.*, 1978). Banded iron-formation, cummingtonite-anthophyllite-bearing gneisses and amphibolites occur in close association with quartzites. These rocks have a minimum age of ~ 3.4 Ga (Kröner *et al.*, 1991), this age being obtained for a trondhjemite intrusive into this suite.

Some quartzites in the suite have in the past been correlated with the Mozaan Group because of their association with the banded iron-formation, which is a common feature of the Mozaan quartzites (D.R. Hunter, *pers. comm.*, 1992).

2.2.3 Pre-Pongola Tabular Batholiths

This granitoid body underlies much of the country south of Piet Retief towards Paulpietersburg and is most extensive in the southeastern Transvaal (Figure 2.2). It is not found in Swaziland. The three main subdivisions to this suite are:(i) a tabular, multiphase batholith, (ii); a hornblende granodiorite, and (iii); a cataclastic gneiss that may be tabular (Witrivier Gneiss). The tabular batholith comprises three distinct types: (i) a light coloured, coarse grained leucotonalite / trondhjemite occurring west of Piet Retief and enclosing the Commondale remnant; (ii) a granodiorite, granite and trondhjemite facies; and (iii) a unit which has discontinuous, contorted lenses of biotite, grading into a uniform coarse grained leucotonalite. This batholith is recognised as intrusive into the Commondale supracrustals owing to the common presence of supracrustal xenoliths in some of the members of the suite (Hunter *et al.*, 1992). The Anhalt Granitoid Suite is dated at ~ 3.25 Ga (Matthews *et al.*, 1989; Farrow *et al.*, 1990) and it is emplaced between the overlying supracrustal sequences and the underlying layered gneisses (Talbot *et al.*, 1987).

2.3 THE PONGOLA SEQUENCE

The Pongola Sequence comprises a lower, dominantly volcanic Nsuze Group and an upper dominantly sedimentary Mozaan Group. The former crops out in the Mahlangatsha-Gege area and represents a northern extension of the Nsuze Group occurring in the adjacent areas of the Republic of South Africa (Figure 2.1). In eastern South Africa, the Pongola Sequence consists of the lower, predominantly volcanic Nsuze Group overlain by the Mozaan Group which is mainly composed of sedimentary rocks. A "paleosaprolite" is developed in the basal sediments of the Nsuze Group which rest unconformably on the underlying Archaean granitoid basement (Mathews and Scharrer, 1968; Armstrong, 1980). These authors refer to the term paleosaprolite as a structureless, hard, medium-to coarse grained, highly micaceous cohesive rock which grades into the underlying granite basement. This clearly represents a period of intense weathering and exposure of the basement rocks prior to the deposition of the Pongola Sequence in this area.

The Nsuze Group comprises a basal sedimentary-volcanic unit overlain by a thick sequence of basalts, basaltic andesites, andesites, dacites and rhyolites, up to a maximum thickness of 8,500 m. There are minor volcaniclastic and sedimentary rocks intercalated with the lavas. The Mozaan-Nsuze boundary is locally transitional but generally marked by an andalusite slate and elsewhere it is unconformity bounded. The Mozaan Group contains fluvial, shallow marine, deltaic and shelf sediments with minor volcanic intercalations (Armstrong, 1980).

2.3.1 The Nsuze Group

Generally, east of Piet-Retief in the south eastern Transvaal, the Nsuze Group comprises a basal arenaceous sedimentary unit overlain by a succession of felsic volcanics with intercalations of tuffaceous beds commonly interbedded with clastic sedimentary layers. Overlying the felsic rocks is a thin persistent pyroclastic-volcanosedimentary unit which is in turn overlain by a sequence of intermediate volcanics, andesite being the main rock type. At the top of the succession the Nsuze Group comprises a thin sequence of amygdaloidal intermediate and mafic lavas, agglomerates, tuffs, argillites and minor arenaceous sediments, all of which are present in varying proportions (Hatfield, 1990).

The Nsuze Group has a lower basal sedimentary-volcanic unit (\pm 800 m thick) composed of sandstones with intercalated lenses of acid and intermediate lavas, volcaniclastics and volcanogenic sediments underlain mostly by non-intrusive granitoids. This unit is overlain by a middle, predominantly volcanic unit (\pm 7,500 m thick) consisting mainly of basic, intermediate and acid lavas with minor intercalated volcaniclastic-sedimentary rocks. An upper volcaniclastic-sedimentary unit (\pm 500 m thick) comprising complexly interfingering

volcaniclastic, sedimentary and volcanic assemblages overlies the middle volcanic unit (Armstrong, 1980). Towards the southwestern border of Swaziland, east of Piet Retief, (Figure 2.1), the basal sedimentary unit is highly discontinuous in outcrop because it has been disrupted by the intrusion of the Usushwana Complex. A continuation of the upper volcaniclastic-sedimentary unit into southwestern Swaziland contains a much higher proportion of the sedimentary lithologies (Hatfield, 1990). In Swaziland, there is a greater proportion of argillaceous sedimentary rock varieties, with an absence of coarse - grained pyroclastics. This means that a more lengthy period of quiescence prevailed in this part of the Pongola basin (Hatfield, 1990).

2.3.2 The Mozaan Group

The Mozaan Group consists of a succession of arenaceous and argillaceous sediments, overlying the predominantly volcanic Nsuze Group. In southern Swaziland the Mozaan Group crops out in two distinct areas (Figure 2.1). The western or Mahlangatsha-Gege locality has quartzites and conglomerates with minor intercalations of shale resting on the Nsuze Group, and the eastern or Kubuta area which is essentially argillaceous in character with subordinate quartzites (Hunter, 1963).

The Mozaan Group occurrences in the Mahlangatsha area are a continuation of those from the type area south and south-east of Piet Retief (Figure 2.1). In both the Mahlangatsha and Kubuta areas the Mozaan Group is well exposed with the quartzites building outstanding outcrops with sparse vegetation cover. In the Mahlangatsha area the Mozaan Group builds a spectacular plateau standing at a high elevation of about 1400 m above sea level.

In the southwestern border of Swaziland, the Mozaan Group has a northwesterly strike, and occurs in a faulted synclinal structure (Hunter, 1963). This strike changes at Gege (Figure 2.1) to become northeast and then gradually swinging northwards to almost due north, but the broad syncline is still well preserved. At Mahlangatsha, the basal succession of the Mozaan is a thick sandstone with conglomerate and thin shaly argillaceous beds directly resting on the felsic rocks of the Nsuze Group with a tectonic contact (Hunter and Gold, 1993). The basal quartzite which dips gently towards the southeast and east is in turn overlain by an alternating sequence of quartzites, shales and phyllites with andalusite schists making up a total thickness of about 1100 m. The andalusite schist is not found in the higher horizons

in contrast to the type area east of Piet Retief where the succession comprises a thin sandstone overlain by a thick pile of andalusite schists. At the Kubuta locality, the Nsuze Group lavas are absent and a thick basal sandstone with conglomerate beds rests unconformably on granitoid gneisses (Figure 2.1). This sandstone is overlain by a thick sequence of shales in which two prominent iron formations occur, constituting a maximum thickness of about 3000 m. A major northwest striking, dextral shear (Siyalo shear; Figure 2.1 and Figure 2.2) truncates the basal sandstone southeast of Kubuta and the Siyalo shear itself is truncated by the northerly striking Sibowe shear (Figure 2.2). West of Siyalo shear the sandstone unit dips subvertically and is disrupted by this fault. A thick sequence of ferruginous shales overlies this sandstone but iron formation horizons are absent. The eastern strike of the Mozaan is terminated by numerous normal faults of Karoo age. At this Kubuta occurrence, the Mozaan Group is preserved in a syncline (referred to here as the Mooihoek syncline) which plunges to the southeast.

This thesis is concerned with that part of the sequence preserved in the Sigwe Hills and extending southwards, to and beyond the Ngwavuma River (Map 1 and Figure 1.1). The dominantly volcanic lithologies located in the area defined by the Sigwe Hills in the north and the Ngwavuma River in the south were originally assigned to the Nsuze Group by Hunter (1952) who first recorded their existence. At that time, volcanic rocks were known to occur in the Pongola Sequence only in the Nsuze Group. Subsequently basaltic lavas were identified in the uppermost Mozaan Group in the Kubuta area (Mooihoek area) (Hunter, 1963). Basaltic lavas are preserved and represent higher stratigraphy of the Mozaan Group in the Kubuta outcrop. The preservation is facilitated by these lavas occurring in the axis of the syncline.

These lavas, described by Hunter (1952), are dense, fine grained, dark rocks commonly with amygdales of feldspar and quartz. This is one of two known occurrences in the Pongola Sequence where volcanic rocks unequivocally overlie the Mozaan sedimentary succession. The other occurrence where basaltic lava overlies Mozaan sediments is found in the core of the Tobolsk syncline in the vicinity of Magudu (Figure 2.2). Structurally and lithologically

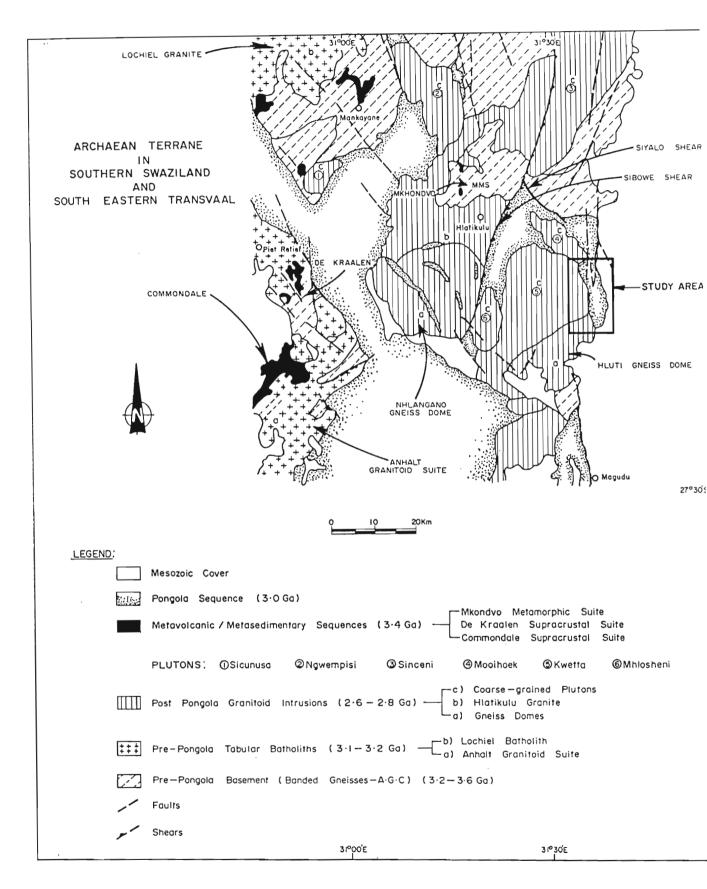


Figure 2.2: Simplified geological map of the Archaean terrain in southern Swaziland and southeastern Transvaal. International and provincial boundaries have been omitted for clarity. (After Hunter *et al.*, 1992).

these two occurrences are similar and present important evidence that volcanism was a terminating phase in the Pongola succession in this area.

The volcanic rocks investigated in this study are situated some 20 km southeast of the Mooihoek syncline. These volcanic rocks do not overlie Mozaan sediments, with the southern occurrence in contact with Mozaan quartzite, and in the north the substrate is not present because of intrusion of later granite. One of the prime questions to be addressed in this thesis is the possibility that the volcanic rocks maybe correlated with the Mozaan Group as identified in the areas close to Kubuta and Magudu.

Correlating the two basalts shows that the basal sandstones and shales of the Mozaan Group, south of Kubuta, represent a higher stratigraphic section than those situated far west in the main Pongola basin. The combined effects of faulting and intrusion of the Mooihoek pluton preclude the possibility of determining the exact stratigraphic position of the sandstone-shale-iron-formation succession east of the Siyalo shear (Figure 2.1).

Hunter and Gold (1993) concluded that deformation coupled with internal disconformities and northward overlap of the Mozaan Group militates against simplistic correlations until more detailed structural and sedimentological studies have been undertaken, particularly in the Mahlangatsha area. The eastern limit of the Mozaan Group is overlain unconformably by gently eastward dipping strata of the Mesozoic Karoo Sequence, which is also in faulted contact with the Mozaan Group.

A detailed geochemical study of the Nsuze Group volcanic rocks between the Bivane and White rivers immediately south of the Swaziland border, provided information on the nature of Nsuze volcanism (Armstrong 1980) and will be discussed on a comparative basis with the geochemical data set presented in this study.

2.3.3 THE PONGOLA BASIN AND PROBLEMS RELATING TO ITS INTERPRETATION

The Pongola Sequence is an assemblage of volcanic and sedimentary formations that were deposited about 3.0 Ga ago in the south-eastern region of the Kaapvaal Craton in southern Africa (Figure 2.3). Throughout this region the Pongola strata rest unconformably on a

granitic-greenstone basement. The Pongola Sequence is exposed in several extensive but isolated areas within a belt about 100 km wide extending southwards from southern Swaziland to northern Natal, a distance of about 270 km (Figure 2.4).

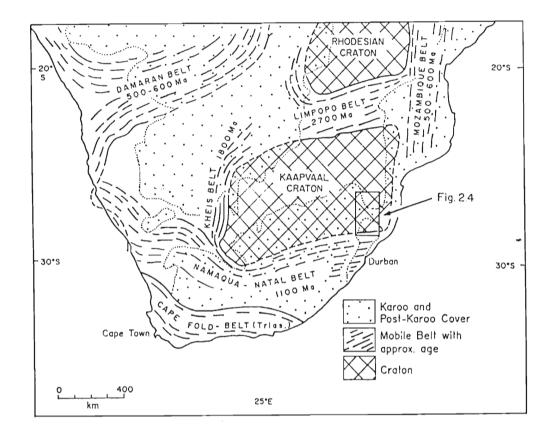


Figure 2.3: Distribution of Archaean Cratons and peripheral mobile belts in southern Africa (based on the work of Matthews, 1990).

This Late Archaean Sequence is of special geological interest because it possibly represents the oldest intracratonic sequence in the world (Matthews, 1990).

The Pongola Sequence outcrops in a semi-continuous linear belt in South Africa and Swaziland. A geologic map of the Pongola structure is presented by Figure 2.5 together with stratigraphic thicknesses for the Nsuze and Mozaan sections. The belt is marked by variations in stratigraphic thicknesses of the Pongola Sequence accompanied by a large proportion of volcanic rocks. These features have been interpreted by Burke *et al.*, (1985) to indicate deposition of the Pongola Sequence in a continental rift setting. Figure 2.6 shows the peculiar shape of the Pongola rift (after Burke *et al.*, 1985). According to Matthews (1990), regional structural features of the Pongola Sequence define three extensive but contrasting structural domains. According to Burke *et al.*, (1985), the Pongola Sequence shares many features that are typical and diagnostic of rocks deposited in continental rifts. If this interpretation is

correct, its age of between 3.0 to 3.1 Ga makes it the world's oldest, well-preserved continental rift.

Hunter (1991) argues that by the age of 3.1 Ga, because of the emplacement of tabular multiphase batholiths, a stable high standing sialic crust capable of sustaining a series of basins had formed. In these extensive basins, thick sedimentary sequences with intercalations of low MgO volcanics accumulated. One of these basins is of course the Pongola basin.

A northern domain, centred on the Pongola-Mozaan basin is situated in the Piet Retief and Vryheid districts (Figure 2.4). The western margin of this basin has not been disturbed but the eastern and northeastern margins have been deformed extensively and disrupted by the intrusion of a number of granitoid plutons. The central domain is exposed within a group of erosional inliers (Figure 2.4). It is characterised by repetitive northwest-trending outcrops of basement overlain unconformably by northeast dipping Pongola strata. This structural pattern indicates extensive block faulting. The southern domain, in contrast to the general north to northwest structural trends in the other domains, is characterised by eastwest trending folds and faults. They are associated with zones of thrust faulting related to the Natal Thrust Front at the boundary between the Kaapvaal craton and the ~ 1.0 Ga old Natal tectono-thermal Province.

2.4 THE USUSHWANA INTRUSIVE COMPLEX

Although not present in the study area this complex is important as it provides information on a suite of magmas which may be of a similar origin to those of the Pongola Sequence. Intrusive into the Pongola Sequence, the Usushwana Complex (~ 2.87 Ga; Hegner *et al.*, 1984) of southeastern Transvaal and western Swaziland (Figure 2.1) consists of gabbros, quartz gabbros, quartz diorites, granodiorites and microgranites. The Usushwana Complex in Swaziland occurs as a northwest striking dyke complex that parallels major faults in the granitic basement. This dyke complex is linked to a second northwest striking large dyke complex in southeastern Transvaal by a sheetlike mass that extends along the base of the Pongola Sequence (Hunter 1970b). This second dyke complex is also paralleled by major faults in the basement. Both the dyke complexes and the sheet contain xenoliths of Pongola rocks. At Embo in western central Swaziland, known outcrops of the Usushwana Complex exhibit a spectacular localized preservation of crude inward layering which suggests that the mafic magmas differentiated in situ. A postulated evolution of the Usushwana Complex is that magmas seem to have preferentially intruded along faults that were formed during an initial rifting episode (Hunter, 1970b).

2.5 POST - PONGOLA GRANITOIDS

There are three main groups which can be considered in this group of granitoids which are largely intrusive into the Pongola Sequence in southern Swaziland. These are (i) gneiss domes; (ii) the tabular Hlatikulu batholith; and (iii) discordant plutons. Each of these has distinguishing features, as outlined below.

(i) Gneiss domes

In southern Swaziland (south of Hlatikulu), multiple, elongate gneiss domes of the Nhlangano gneiss are aligned in a northwest direction (Figure 2.2). There are septa of the Pongola Sequence between the domes. In the Nhlangano gneiss dome these septa are Mozaan Group guartzite and banded iron- formation metamorphosed to amphibolite facies grade, implying that the Nhlangano gneiss post dates the Pongola Sequence. The northeast trending Hluti gneiss dome occurs southeast of Hlatikulu (Figure 2.2). Contacts of this gneiss with the Pongola Sequence are not exposed due to the poor nature of outcrop but in the southwestern corner of the study area (Map 1) the gneiss is in faulted contact with quartzite, presumably of the Mozaan Group. The contact is a thrust fault marked by a quartz-sericite-muscovite schist. The extent of displacement on this fault cannot be determined. The Hluti gneisses which are foliated and medium-grained have quartz, microcline, plagioclase and biotite as dominant minerals. Compositionally the gneisses range from granitic to granodioritic because of their varying amounts of K-feldspar and plagioclase. These domal gneisses have a maximum age of 2.8 Ga (Hunter et al., 1992). Xenoliths of metavolcanic material are found in the main body of the Hluti granite gneiss which suggests that the gneisses are younger than the volcanic lavas of the Pongola Sequence. A problem is brought about by the extent to which the Hluti gneiss has been deformed ("gneissified") whilst the Pongola lava rocks are weakly foliated with a lower metamorphic grade. This could suggest that the "gneissification"

in the Hluti gneiss is a result of a preferred orientation of the minerals rather than a metamorphic effect.

(ii) The tabular Hlatikulu batholith

This is a grey, medium- to coarse-grained granite that post-dates the Nhlangano gneiss domes. Porphyritic phases are developed locally. The sheet-like character of this batholith is seen on the western side of the Mkhondvo valley (Figure 2.2) where the floor to this sheet is constituted by ortho- and paragneisses of the Mkhondvo Metamorphic Suite (Hunter *et al.*, 1978). Mozaan Group quartzites define the high ground overlooking the valley. This Hlatikulu batholith is located at the interface between the underlying gneisses and the overlying sedimentary rocks. It has a maximum thickness of about 500 m.

This tabular granite is intrusive into the Mozaan Group, a relationship that is clearly demonstrated southwest of Hlatikulu. The Pongola strata in the Kubuta area are in faulted contact with this granite along the Sibowe shear zone (Hunter, 1961; Figure 2.1, 2.2). Xenoliths of Mozaan quartzite are found scattered throughout the granite mainly in the area between Hlatikulu and Nhlangano, west of this major zone.

Quartz, microcline and plagioclase are the major minerals in the granite, and biotite is a minor phase. Accessory minerals include zircon, apatite and allanite. Pegmatites occur as intersecting veinlets (\sim 50 cm) wide in the granite.

(iii) Coarse - grained plutons

Several discordant granite plutons intrude the Pongola Sequence both in southern Swaziland and adjacent areas of South Africa (labelled 1-8 in Figure 2.2). They are lithologically variable. Only those occurring in southern Swaziland will be described below.

The Kwetta granodioritic pluton, which is the most extensive, is located southeast of Hlatikulu and intrudes the upper Mozaan Group basalts in the area of Sigwe Hills. It is distinguished by the existence of randomly distributed microcline megacrysts in a coarse grained matrix of quartz, feldspar, biotite and hornblende (Hunter *et al.*, 1992). Plagioclase rims locally surround the megacrysts of microcline. In the north, the pluton makes up the high ground and in this area it is medium-grained. The Kwetta pluton has sharply defined

contacts with the Mozaan sediments east of Hlatikulu. The pelitic rocks are metamorphosed in a narrow contact aureole in which biotite and garnet are evident (Hunter *et al.*, 1992). The Mhlosheni and Mooihoek are two small plutons (Figure 2.1) characterized in the field by prominent boulders on high standing hills. They are granitic in composition, coarsegrained, and pale in colour since mafic minerals are subordinate. Quartz and feldspar are the main constituents and biotite is minor (Hunter *et al.*, 1992). Pegmatites are rare or absent. The Mooihoek pluton effectively separates the stratigraphically highest basalts of the Pongola Sequence dipping steeply eastward in the Sigwe Hills from the gently southward dipping lower Mozaan sedimentary rocks south of Sithobela (north of study area).

2.6 KAROO SUPERGROUP

2.6.1 ECCA GROUP

Ecca Group sediments are confined to the eastern flat-lying part of the study area. They consist of grey-black carbonaceous shales and sandstones with horizontal laminations. The sedimentary rocks of the Ecca Group either rest unconformably on the Pongola Sequence or are in faulted contact with this sequence.

2.6.2 KAROO DOLERITES

These dolerites occur either as dykes, which may vary in width from 1 m to greater than 50 m, or as extensive sills. They form a prominent feature of the landscape around Hlatikulu to the west and in the Hluti area immediately south of the study area. The Karoo sediments have been extensively invaded by the sheets and dykes. Dolerite sheets are common in the study area where they intrude the Pongola Sequence.

The dolerites weather into spheroidal boulders scattered over the land surface and produce a reddish-brown coloured soil. Texturally these dolerites vary from medium to coarse grained, with porphyritic varieties. They are composed of plagioclase, clinopyroxene and hornblende. Olivine may be present but is rare. Some varieties contain quartz. Magnetite is a very common accessory with ilmenite and more rarely chloritized biotite (Hunter, 1961).

2.7 CONCLUSIONS ON THE REGIONAL GEOLOGICAL SETTING

The Pongola Sequence (2.94 Ga) comprising the Nsuze and Mozaan Groups, rests unconformably on older granitic rocks in southern Swaziland, southeastern Transvaal and northern Natal. Intrusive into this late Archaean Pongola Sequence is the Usushwana Complex (gabbroic, dioritic and granophyric rocks) and various potassic granitoids.

The Karoo Supergroup (Ecca Group) rests unconformably on the Pongola Sequence rocks in southeastern Swaziland and dolerites of Karoo age are intrusive into these lithologies.

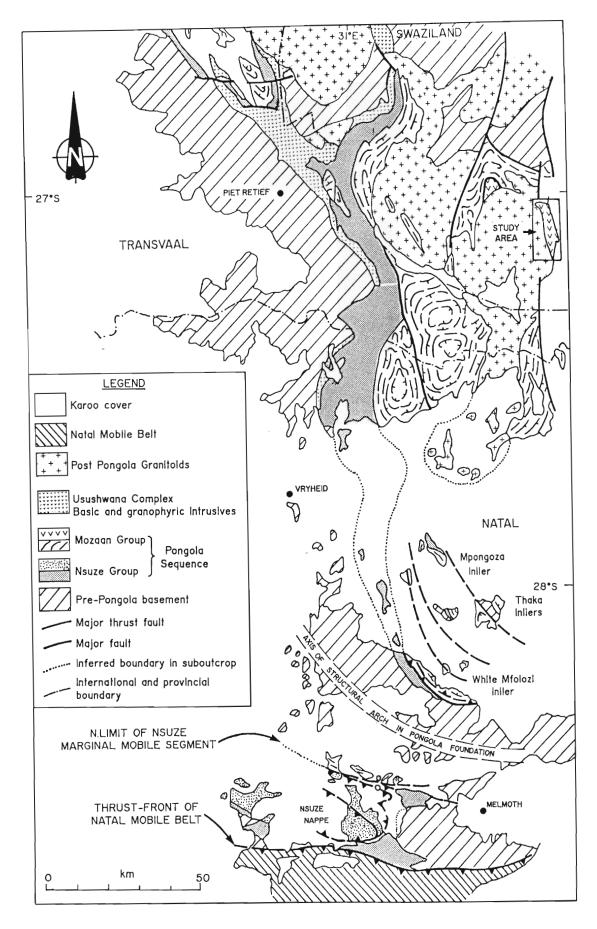


Figure 2.4: Regional distribution and geologic setting of the Late Archaean Pongola Sequence, based partly on the work of Matthews (1990).

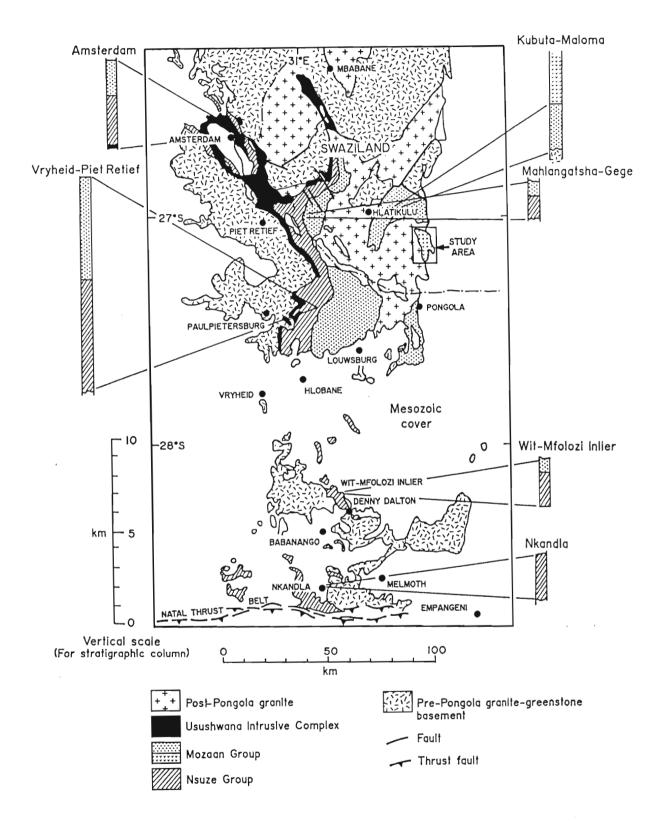


Figure 2.5: Geologic map of the Pongola structure with stratigraphic sections from various localities. The Pongola rift is bounded by thrusts in the south and splits in two around basement horsts in the north. Map based on the work of Button (1981) and Burke *et al.*, (1985).

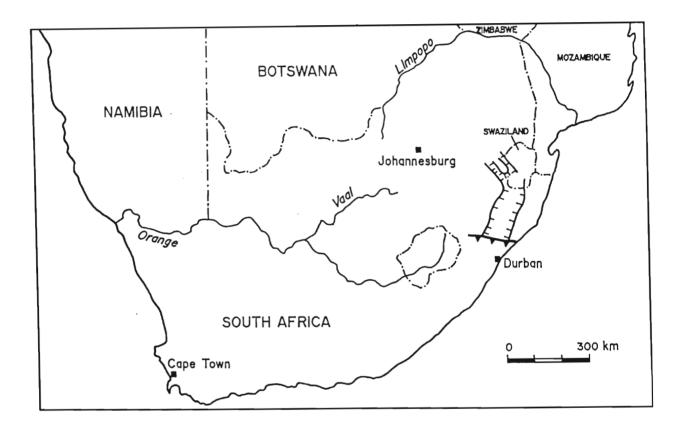


Figure 2.6: Regional map showing the shape of the Pongola Rift, suggested by Burke *et al.*, (1985).

CHAPTER 3

FIELD RELATIONS AND LITHOLOGIES

The study area is dominated by the upper Pongola Sequence into which various granitoids have intruded. Rocks of Karoo age overlie this Archaean basement in the east. Various dolerite intrusions are also found.

3.1 THE PONGOLA SEQUENCE

(i) Field relations and rock types

Basaltic metavolcanic rocks with lenses of meta-quartzite and more rarely phyllite represent the Pongola Sequence in the study area. The lavas are either dark greyish, fine- to mediumgrained or light grey greenish rocks with a similar variation in grain size. Amygdales ranging in size from less than 1 mm to 3 cm that are flattened and elongated with their longer axis oriented northsouth are common (Figure 3.1). Although common, the amygdales are not considerably developed throughout this volcanic pile (see Map 1). These rocks strike typically northsouth from south of the Ngwavuma river to the Sigwe Hills in the north. There is an obvious weak foliation in the lavas south of the Ngwavuma River which dips moderately (53°) eastward. Estimating the thickness of these Pongola volcanic rocks is hampered by the duplication of strata by thrusting as evident from the Sigwe Hills road cutting (discussed in Chapter 5). A thickness 800 m must be regarded as a maximum for these volcanic rocks. Generally these volcanic rocks are basaltic in nature with very minor local variations and geological contacts between the variations are not sharply defined. No flow contacts and flow top breccias were identified in these volcanic rocks. Where there are high concentrations of amygdales and vesicles, these units are considered to be flow tops and are planar features.

There are numerous quartz veins within the pile of metavolcanic rocks. South of the Ngwavuma valley these veins are mostly oriented in a northwest-southeast direction with a lesser number striking eastwest (Map 1). They consist of coarse-grained, dark grey, lustrous quartz with white patches of a highly siliceous and recrystallized rock. Quartz veins are typically between 2 to 10 m in width. In the Sigwe Hills, vein-like recrystallized areas are mainly oriented in the general northsouth and northwest-southeast directions, and commonly

mark the sites of faults (Map 1). Three samples that were collected from the Sigwe Hills, RM 02, RM 03, and RM 04, are anomalously rich in silica, which is also seen in their chemistry (discussed in Chapter 6). Reasons for this enrichment could not be established in the field because of the limited and poor nature of outcrop. Sample sites are shown in Map 1.

Intercalated within the volcanic rocks are metaquartzites which are lensoid or lenticular in plan and are typically parallel to the general northsouth strike. They may be up to 500 m thick over strike lengths of up to 3 km. Bedding, where observed, dips steeply (60°) eastward. There are four major quartzite lenses with minor intercalations of phyllite. One of these quartzites has been rotated from a northsouth to an eastwest strike possibly as a result of the intrusion of the Kwetta granite and/or the dolerite intrusions. In the eastwest striking quartzites, the bedding dips shallowly to the south (see Map 1). These quartzite septa outcrop in the granite as koppies.

The largest of these quartzite lenses is about 3 km long and about 0.5 km wide with a minimum thickness of about 300 m. It is in faulted contact with the granite gneiss (Hluti gneiss dome) south of the Ngwavuma River (Map 1). The contact is marked by a quartz-sericite-muscovite schist reflecting a fault contact even though the extent of displacement cannot be determined due to the lack of marker horizons. This fault however is considered to be a thrust with the downthrow to the east due to the absence of strata which may be considered lower in the Pongola Sequence.

The quartzites are hard, white to grey, highly recrystallized rocks, commonly well jointed with planar cross bedding (Figure 3.2). In some cases the rocks are friable where sericite is abundant. The flakes of sericite are wrapped around quartz grains. Trough cross bedding is common. Paleocurrent directions could not be determined as the blocks of quartzite are typically not in situ, but in two localities where the rocks are in place, the transport direction was to the south. Figure 3.3 displays some of the well exposed cross beds.

Highly recrystallized quartzite crops out north of the Sigwe Hills. Two north trending parallel faults which are also silicified pass through this outcrop. It could not be established whether the outcrop is part of the Mozaan quartzite or was vein quartz related to faulting. West of this outcrop is another sliver of quartzite in contact with the Mooihoek granite. This body is considered to be part of the Mozaan Group.

Sandy phyllites and sandstones are found interbedded in the quartzites. In one of the quartzite lenses (south of Map 1), the phyllite is a ferruginous, schistose, olive green rock that weathers to a reddish brown and is weakly magnetic. This outcrop is only about 5-10 m wide and about 100 m long.

Phyllites and/phyllitic shales occur within the metabasalts in the northern extreme of the Sigwe Hills and here they appear to be associated with small zones of faulting which are oriented north-northwest and north-northeast (Map 1). These small phyllitic horizons within the metabasalts may represent sites of localized movement during shearing along the small quartz-filled faults with which they are associated.

In a small stream south of the Ngwavuma River valley, and alusite schist is exposed (see Map 1).

(ii) Petrography

In thin section, the lavas comprise tremolite-actinolite, quartz, feldspar, epidote, chlorite, chloritoid, zoisite and opaque minerals (commonly ilmenite altering to leucoxene); (Figure 3.4).

The lavas cropping out the Sigwe Hills are considerably altered. Thin section study shows that the feldspar is extremely saussuritized. Quartz occurs as small grains in the groundmass but more usually as large grains in amygdales and also along ubiquitous veinlets (Figure 3.5). Epidote, chlorite and zoisite occur in close association in the amygdales, groundmass and in veinlets. Carbonate is observed in one thin section (RM 02) associated with chlorite, epidote and zoisite in an amygdale. In another thin section (RM 13), euhedral sphene grains were found to be prominent. (Figure 3.6).

In thin section the andalusite schist shows knots of andalusite about which micaceous foliation is wrapped (Figure 3.7).

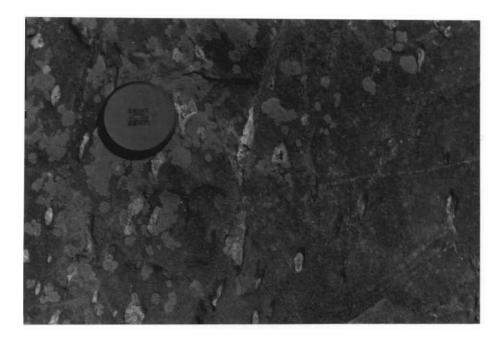


Figure 3.1: Flattened quartz amygdales in basalt from south of the Ngwavuma River. (Lens cap is 5 cm).



Figure 3.2: Jointing and planar cross bedding in quartzite from Sigwe Hills in the study area.(The hammer handle is 30 cm long).



Figure 3.3: Trough cross bedding in the quartzites in the study area (Sigwe Hills; Pencil is 14.5 cm long).

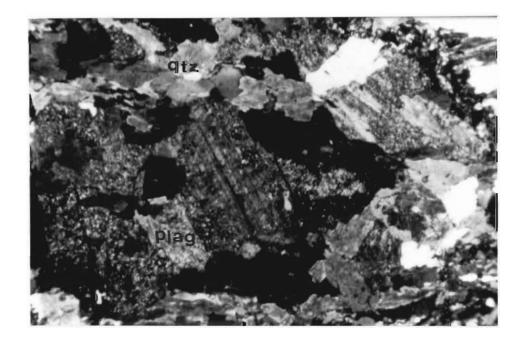


Figure 3.4: Photomicrograph showing altered basaltic lava south of Ngwavuma River area, (magnification is x 10, crossed nicols).

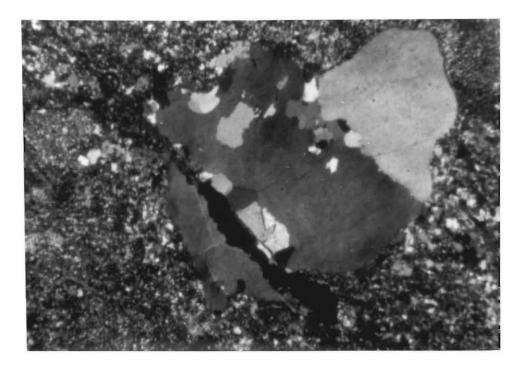


Figure 3.5: Photomicrograph of basalt from south of the Ngwavuma River showing quartz grains in groundmass, amygdale and in veinlets, (magnification is x 25, crossed nicols).

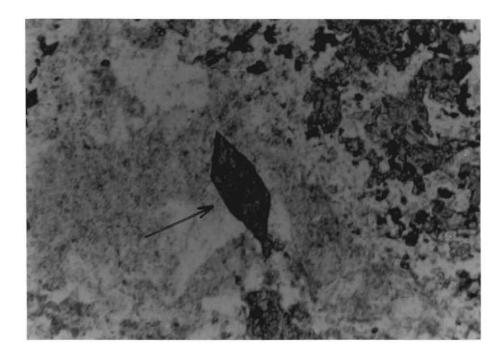


Figure 3.6: Sphene grain in basalt from south of the Ngwavuma River, magnification is x 63, crossed nicols).

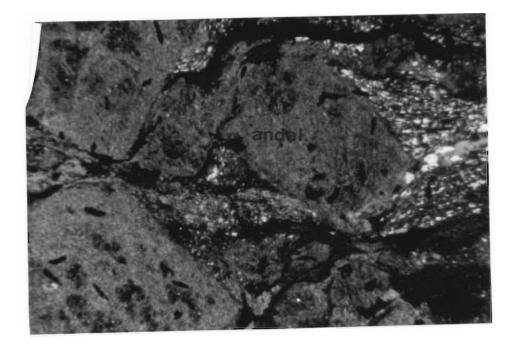


Figure 3.7: Photomicrograph of andalusite schist (south of Ngwavuma River) showing andalusite grains forming knots about which the foliation is wrapped, (magnification is x 10, crossed nicols).

3.2 POST-PONGOLA INTRUSIONS

The Pongola Sequence rocks in the study area have been intruded by a number of intrusive rock bodies that have already been described. In this section their field relations here are discussed further.

(i) Hluti Gneiss Dome

Part of this granite gneiss dome occurs in the southwest corner of the study area in faulted contact with quartzites of the Pongola Sequence (Map 1). Along the contact there is a soft schistose rock comprising quartz, muscovite and sericite. It appears that the contact is a fault with a downthrow of the Pongola rocks.

(ii) Kwetta Granite

This granite constitutes the western boundary of the study and intrudes the metavolcanic rocks in the Sigwe Hills and Ngwavuma River valley. This granite is intrusive into the Pongola lithologies because xenoliths of metaquartzites are found in this granite (Map 1). The contact of the Kwetta granite and the Pongola metabasalts is poorly exposed, but further to the west xenoliths of metavolcanic rocks are found. Scattered boulders of the Kwetta granite are found due north at two sites along the main road towards Maloma, (Map 1). This granite is also in contact with the Hluti gneiss dome just south of the Ngwavuma River towards the southwestern boundary of the study area (Map 1). The nature of this contact could not be established because of extensive cultivation in the Ngwavuma River valley.

(iii) Mooihoek Pluton

This pluton separates the stratigraphically highest basalts of the Pongola Sequence at Sigwe Hills from the known lower Mozaan sedimentary rocks. The contact between the Mooihoek granite and the Pongola strata is not exposed but it is clear that the contact is faulted between the small north-northwest trending faults. The faults are more numerous closer to the northern limit of the study area (Map 1). At Sigwe Hills the granite does crop out in two localities within the pile of volcanic rocks. In one locality, the granite body is not exposed but boulders are spread over the land surface, and in the other locality, outcrop of the intrusion is controlled by two faults (one trending north-northwest and the other northeast). In this part of the pluton, xenoliths of metabasalt are found.

3.3 KAROO SEQUENCE

3.3.1 ECCA GROUP

The Pongola Sequence is unconformably overlain by shales and sandstones of the Ecca Group to the east (Map 1). Towards the extreme north of the study area, the contact between the Pongola Sequence and the Ecca Group beds is faulted. The shales are black or grey in colour, thinly laminated and breaks unevenly into irregular fragments. Khaki (ochre) and brownish shale varieties are also present. A cross-bedded gritty sandstone with iron staining (limonite) is found with shales in an outcrop just across the Ngwavuma River along the Pongola-Maloma main road towards Maloma in the north.

3.3.2 Karoo Dolerite

The study area has been intruded by large volumes of Karoo dolerite. Sheets of this rock body form a prominent feature of the landscape particularly in the vicinity of Hluti to the southwest. South of the Ngwavuma River patches of Ecca shales are often preserved overlying or underlying the dolerite sheets.

The Karoo sedimentary rocks have been extensively invaded by dolerite sheets and dykes, while the basalts to the north of the Ngwavuma valley have been intruded by dyke swarms usually parallel to the strike of the volcanic rocks. The dolerites weather into spheroidal boulders which lie scattered over the surface.

3.4 CONCLUSION OF THE FIELD RELATIONS AND LITHOLOGIES

In the study area the late Archaean Pongola Sequence is intruded into by the Hluti granite gneiss, the Kwetta granite and the Mooihoek granite. Ecca Group shales and sandstones of the Karoo Sequence overlie unconformably the rocks of the Pongola Sequence and intrusive into all these lithologies are the Karoo dolerite sills and dykes.

CHAPTER 4

METAMORPHISM

The Pongola Sequence has been subjected to low-grade regional metamorphism with localized areas showing effects of dynamic and contact metamorphism. The mineralogy of the volcanic and sedimentary rocks is typical of low-temperature, low-pressure metamorphic conditions in which hydrated mineral assemblages are characteristic. The metamorphic mineral assemblage amphibole (tremolite-actinolite)-feldspar-chlorite-zoisite-epidote-quartz with minor amounts of calcite, sphene, leucoxene and hematite is dominant in the basalts (Figure 4.1). These minerals are indicative of greenschist to low grade amphibolite facies metamorphism.

Primary igneous minerals are rare in the basalts although relicts may be preserved in some cases. Tremolite-actinolite is the dominant amphibole, but in many cases it appears to be transitional in optical properties to hornblende. The tremolite-actinolite is light brown to pale green with localised fracturing in some grains in thin section. The greener variety (actinolite) is strongly pleochroic from pale green to a darker green. This amphibole forms columnar to fibrous aggregates (Figure 4.2). Chlorite occurs as fibrous or flake-like crystals with weak pleochroism from colourless to pale green. Under crossed nicols the chlorite shows the anomalous dark blue colour characteristic of penninite. The chlorite is probably an alteration product from the amphiboles because some of the amphiboles are zoned showing the anomalous buff blue colour of penninite in the core and the yellow-orange colours of the amphiboles in the outer rims.

Dense aggregates of chlorite are also found filling amygdales together with quartz, epidote, zoisite and calcite. Plagioclase is saussuritized and appears cloudy preventing the determination of its optical properties. However, in some remnant plagioclase crystals albite twinning can be observed and extinction angles indicate a composition of about An_{30} (oligoclase). This composition is too sodic for normal basalts and is indicative of later recrystallization under metamorphic conditions. The plagioclase grains usually retain their lath shaped form but are clouded by a dusting of small epidote grains. The epidote is in many cases zoned with a highly birefringent nucleus and outer rims of zoisite (low birefringence).

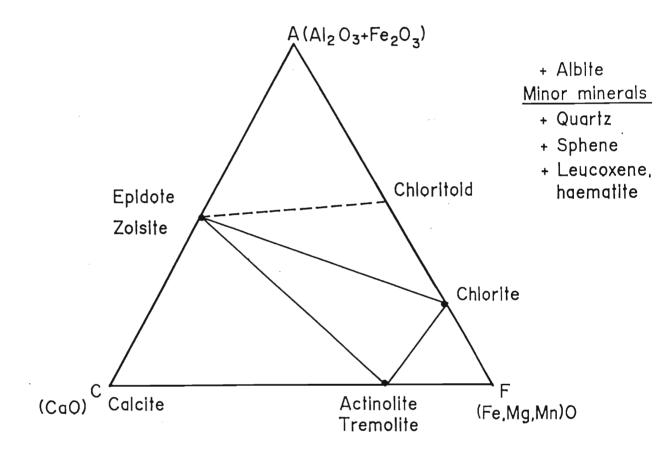


Figure 4.1: Some mafic rock characteristics of the albite-actinolite-chlorite zone of the lower temperature part of low-grade metamorphism (Winkler, 1974).

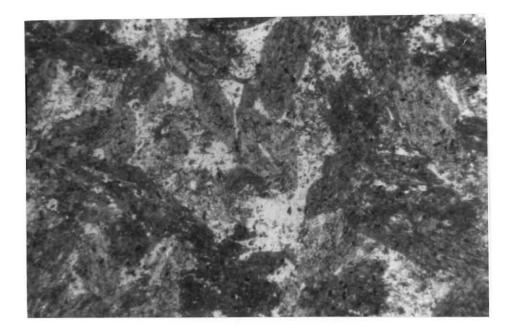


Figure 4.2: Columnar aggregates of actinolite (dark, elongate patches) with altered feldspars (lighter patches) in basalt from south of the Ngwavuma River, (magnification is x 25, crossed nicols).

Quartz forms small granular crystals in the groundmass and also builds veinlets. When present in amygdales, the quartz may be granoblastic. Carbonate, sphene, leucoxene and hematite are accessory minerals. Leucoxene locally forms alteration mantles on relict ilmenite crystals.

The arenaceous rocks consist of detrital quartz with rare muscovite flakes and opaque oxides. The quartz is detrital because it shows rounded edges due to transportation prior to deposition. These metamorphic mineral assemblages are not in themselves diagnostic but would be consistent with the low P/T part of low grade regional metamorphism (Winkler 1974).

A ferruginous schistose rock interlayered within the quartzites south of the Ngwavuma River has the assemblage: amphibole- (grunerite or cummingtonite)-epidote-quartz and minor amounts of magnetite. This assemblage of metamorphic minerals is indicative of upper greenschist-lower amphibolite facies metamorphism. There are two generations of amphibole development: a colourless, non-pleochroic amphibole (grunerite) which breaks down to a pale green/brown pleochroic amphibole with high order birefringence colours. This second generation of amphibole is elongate and aligned with a distinct fabric, whereas the earlier grunerite displays no preferred orientation. A decussate texture is observed whereby the needlelike, elongate crystals of amphibole (possibly cummingtonite), are wrapped around earlier formed quartz grains. The epidote which transgresses the foliation represents retrogression. Magnetite appears as small euhedral crystals.

Aluminous schists interbedded with quartzite consist of the mineral assemblage and alusite - chloritoid - zoisite with minor quartz. This paragenesis is also consistent with low grade amphibolite or greenschist facies metamorphism.

In conclusion, the Pongola rocks in the study area have been subjected to low-grade regional metamorphism. The observed mineral assemblages from the volcanic and sedimentary rocks are typical of low-temperature, low-pressure metamorphic conditions in which hydrous minerals are a feature. The rocks are therefore metamorphosed to low grade amphibolite facies.

CHAPTER 5

STRUCTURE

5.1 **REGIONAL OVERVIEW**

Throughout the northern Pongola basin there are two dominant structural trends, namely the northwest-southeast and the north-south (Figure 5.1). In the main outcrop area of the Pongola basin (west of Magudu in northern KwaZulu-Natal), the Piensrand and the Toboslk synclines are situated. The Tobolsk syncline trends northwest-southeast whilst the Piensrand syncline trends north-south (Figure 5.1). They are separated from each other by a broad zone of shearing known as the Delft shear which strikes northwest (Hatfield, 1990). Towards the northwest the Delft shear is presumed to link up with the Mahamba shear which was mapped by Hatfield (1990) to the east of Piet Retief, near the southwestern border of Swaziland. He interpreted the Mahamba shear as a transpressional structure in which both dextral and sinistral senses of movement are represented. To the west of the Mahamba shear is an intensely deformed, ~ 15 km wide zone which constitutes the pyroclastic volcano-sedimentary unit of the Nsuze Group (Hatfield, 1990). This zone, trending northwest with a sinistral sense of movement and transport of some 40 km, was speculated by Hatfield (1990) to have been created simultaneously with the deformational episode that gave rise to the Mahamba shear zone (his D_1 event). The southeastward extension of this zone to the Delft shear coincides with the sudden change of strike direction together, with a major thinning of the Pongola Sequence, in particular of the Nsuze Group (Hunter and Wilson, 1988). The regional northeast to north-northeast strike of the Pongola Sequence swings suddenly to the northwest in this zone in which the dips are steeper than elsewhere (D.J.C. Gold, pers. comm., 1992). The early Archaean greenstone-granitoid basement within this zone is often mylonitized affected by faulting and refolded (Hunter and Wilson 1988; Verbeek, 1991).

The Usushwana intrusive suite is believed to have intruded into pull-apart grabens that most probably formed during this deformation (Hunter and Wilson, 1988). This suite is itself deformed by the last tectonic movements which constitute the northwest and north-trending shears.

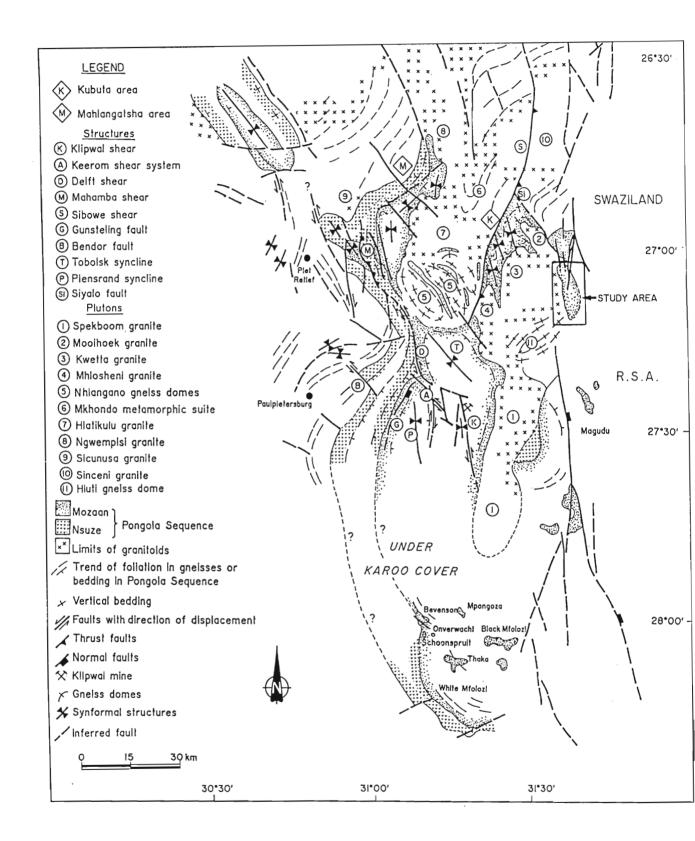


Figure 5.1: Map showing the main Pongola basin and the structures encountered within the basin. International and provincial boundaries have been omitted for clarity, (based in part on the work of Hunter and Gold, 1993).

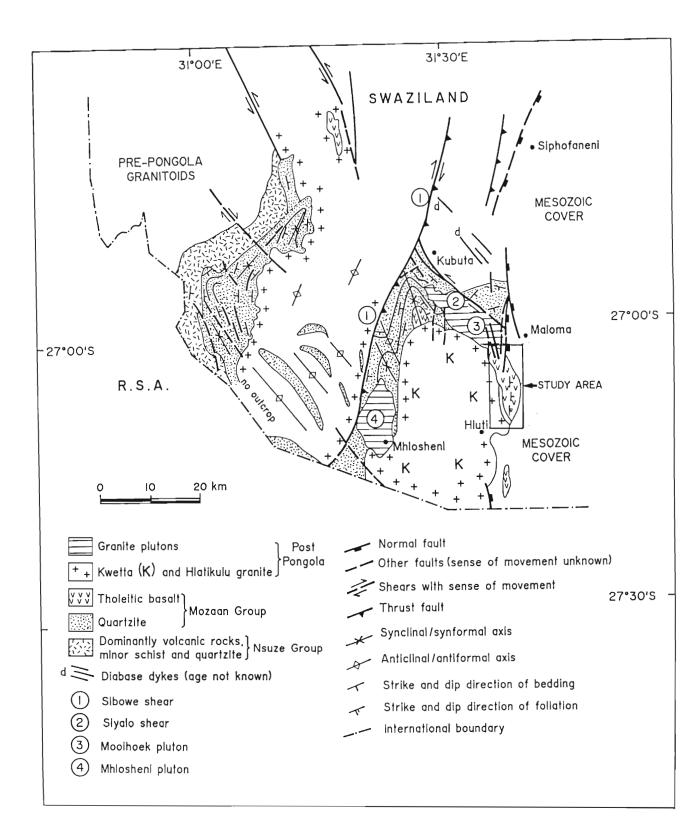


Figure 5.2: Mozaan Group rocks in southern Swaziland in a syncline between the Sibowe and the Siyalo shears, (modified after Hunter, unpub., 1992).

Northerly aligned structures are found within the broad northwestern zone of faulting affecting the Pongola Sequence (Geol. Surv. Swaziland, 1968, 1980; Hatfield, 1990) and in the pre-Pongola basement (Hunter, 1970b; Hepworth, 1973; Smith, 1987; Talbot *et al.*, 1987; Verbeek 1991). These are subparallel and they have the same sense of shear displacement.

The eastern limit of the Pongola basin is marked by a major northward trending fault (Figure 5.1 and Figure 5.2). It is not clear when this faulting event began but the last normal movement resulted in the preservation of the upper basaltic units in a series of inliers to the east of the fault. They are juxtaposed against the stratigraphically lower sedimentary divisions west of the fault (Linström, 1987).

In southern Swaziland (near Kubuta) the Mozaan Group sandstones occupy the nose of a syncline which plunges to the southeast (Hunter, 1961; Figure 5.2). The fold has been modified as a result of the intrusion of the Mooihoek pluton into its eastern limb (see Figure 5.1). Intrusion of the Mooihoek granite was accompanied by detachment faulting along incompetent horizons. Northwesterly trending structures are commonly developed in Swaziland, but in adjacent areas of the Transvaal the most intense deformation is displayed by the northerly trending shears (D.J.C. Gold, *pers. comm.*, 1992). Most of these are dextral shear zones with a steep easterly dip. The Sibowe shear is the best developed of these in Swaziland. It truncates the Mozaan Group rocks in the Kubuta area (Hunter, 1952, 1991; Hepworth, 1973, Geol. Surv., Swaziland geological map sheets, 1968, 1980; Figure 5.2). The Sibowe shear strikes north-northeast truncating the basement gneissic rocks and the Mozaan Group metasediments. The shear is a broad mylonitized zone with lineations and fold axes plunging towards the southeast (Hepworth, 1973).

The Mozaan Group is deformed by large amplitude folds to the east of the Sibowe shear, whose axes also plunge to the southeast. Hepworth (1973) suggests that the Sibowe shear was generated as a result of progressive deformation. Early lineations (L_1) plunge towards the northeast and were reoriented into a southeast direction. These lineations are consistent with a maximum compressive stress from the northeast which is supported by the presence of small scale folds as well as regional scale folds associated with this episode of deformation (Hunter 1963, 1968; Geol. Surv. Swaziland geological map sheets; 1968, 1980, 1982).

East of the Sibowe shear, Mozaan Group quartzites are preserved in a broad synclinal structure whose northeastern limb is truncated by the sinistral Siyalo shear (Hunter and Gold, 1993) which has a northeasterly strike and sub-horizontal lineations. The Siyalo shear is truncated by the Sibowe shear west of Kubuta. At this locality the Siyalo shear splits into a number of splays that give rise to a series of lenses of basal Mozaan quartzite (Figure 5.2). The Siyalo shear lies at the contact between the Mozaan Group and the Ancient Gneiss Complex southeast of Kubuta (Figure 5.2) (Hunter and Gold, 1993). Further southeast, the shear defines the contact between the gently Mozaan Group to the northeast and the Mooihoek pluton to the southwest (Figure 5.2). The Mozaan rocks east of the Siyalo shear cannot be correlated with those to the west of the shear with any confidence. The synclinal structure located between the Sibowe and Siyalo shears, has a sub-vertical northeastern limb. Hunter (1961) proposed that intrusion of a granite plug in the northeastern limb had caused thrusting and overturning of the Mozaan stratigraphy, but this assumption could not be confirmed because of the poor nature of outcrop. The intrusion of the Mooihoek pluton caused beddingparallel slip in the nearby Mozaan shales (Hunter, 1968). The southwestern contact of the Mooihoek granite pluton with the Mozaan Group is semi-conformable to the strike of bedding but swings north at one locality before resuming its regional northeasterly trend (Figure 5.2). Although no fault has been identified at this locality, a right-lateral fault offset could be inferred. This is in agreement with the displacements observed in north-striking faults elsewhere (D.J.C. Gold, pers. comm., 1992). Bedding-parallel faulting exists in the Mozaan strata east of the Siyalo shear. There is uncertainty as to whether low angle thrust faulting has duplicated the strata in this area.

The intrusion of the Mhlosheni and Mooihoek plutons seem to have been structurally controlled because, the latter has its longer axis oriented northwesterly, whereas the former has its longer axis aligned northerly (Figure 5.1 and Figure 5.2). This structural control is inferred, because as mentioned earlier, throughout the northern Pongola basin two dominant structural trends are observed and these two plutons are aligned along each of these trends. This means that these two granite bodies were intruded in zones of weakness which were aligned in the two observed directions.

5.2 STRUCTURE IN THE STUDY AREA

The study area has poor outcrop which inhibits the possibility of collecting and analyzing representative structural data for the whole area. The only significant exposure is a major east-northeast striking road cutting through Sigwe Hills (Figure 5.3).

The basaltic volcanic rocks and interbedded quartzitic and phyllitic rocks generally dip steeply to the east or southeast, although one quartzite lens north of the Ngwavuma River has an eastwest strike (Map 1-western central portion) and bedding dips moderately to the south. A weak foliation in the lavas is also aligned north-south and has a steep dip to the east.

5.3 THE SIGWE HILLS ROAD CUTTING

5.3.1 Introduction

In order to facilitate description, the Sigwe Hills road cutting has been divided into six domains separated by faults (Section X-Y, Figure 5.3). The faults numbered Fl₁-Fl₆ displace four stratigraphic horizons in a normal sense. These domains are described from right to left. Observations at the road cutting were taken looking in directions between 150° and 170°. The four lithological units comprise a phyllite (Ph_1), a quartzite (Qz), a phyllite schist (Ph_2) and a silicified metavolcanic unit (Sv). The basal phyllite is a very weathered reddish-brown, crumbly, soft, fine grained rock with an average thickness of 9 m. The overlying quartzite is hard, greyish-white and coarse-grained. It is recrystallized and bedded but bedding is poorly preserved. The unit is on average about 1.8 m thick. A phyllitic schist overlies the quartzite and is greenish grey in colour and fine-grained. It has an average thickness of about 5 m. The upper silicified metavolcanic unit is a hard, medium-to-coarse grained, greenishgrey rock with patches of whitish grey quartz vein material. It is massive or foliated. This unit has an average thickness of about 12 m. Throughout the road cutting, there are localised zones of fracturing and jointing (Figure 5.3). The most dominant fabric in the Sigwe Hills' road cutting is a penetrative foliation (s_1) . Bedding (s_0) is only readily apparent in some quartzite horizons.

5.3.2 Domain 1

In domain 1 there are three minor bedding parallel faults that are cut by the Fl_1 fault and a late fracture cutting across Fl_1 . The s_1 has been dragged slightly in a normal sense. Some of the faults post-date the Fl_1 fault because they are not deflected by it but they also do not to displace it. The fracturing and jointing postdate the foliation, bedding parallel faults and the fault Fl_1 . The dip-slip displacement along Fl_1 is about 9 m (Figure 5.3).

5.3.3 Domain 2

In this domain both bedding (s_0) and foliation (s_1) have been dragged extensively by Fl_2 . A fault bounded sliver containing Ph_2 is preserved in the fault zone. The dip-slip displacement of this fault is about 13 m. A brecciated quartz vein occurs in the Ph_2 unit above Fl_1 (Figure 5.3). The brecciation in this vein is parallel to s_1 but cuts across Fl_1 into domain 1 without apparently displacing it. A thrust fault at the base of the Qz unit cuts s_0 and s_1 in its footwall and in places interleaves the Ph_1 and Qz units.

5.3.4 Domain 3

The Sv, Ph_2 , Qz and Ph_1 units are present in domain 3. The intensity of foliation development and orientation in the silicified volcanic unit is very variable in this domain. Foliation dips vary from shallow to steep. Small scale displacements occur along minor faults, particularly in the Ph_1 towards the eastern margin of domain 3.

5.3.5 Domain 4

The Sv unit is not represented in this domain bounded by Fl_3 , Fl_4 and of Fl_5 . The Qz and Ph_2 units are duplicated by thrust faulting which may also explain thickening of the Ph_2 unit. The upper quartzite pinches out eastward. The lower quartzite is also partly duplicated by a thrust fault that rises through the unit from west to east. Drag folding associated with movement of Fl_4 caused the footwall ramp to be folded into a tight anticline and an adjacent syncline. The fold axes have a trend/plunge of 136° /74°. The fault Fl_4 can be matched with a thrust fault at a higher stratigraphic level in the footwall.

Figure 5.4 represents a possible sequential reconstruction of the thrust faulting which duplicates the strata in domain 4. The thrusts (marked by * in Figure 5.4), formed prior to

the normal faults Fl_3 and Fl_4 due to compression from the west. Thrusting developed at a high angle to the bedding planes leading to the development of small horse structures and continuous compression caused the beds to climb on top of one another causing further duplication of the stratigraphy. In stage 2, Fl_3 and Fl_4 developed and displaced the existing thrust faults (Figure 5.4). Fl_5 then developed, cutting across the upper parts of Fl_4 . Drag along the footwall of Fl_4 caused folding of the beds and the foliation in the Qz and the Ph₂ units.

5.3.6 Domain 5

The domain bounded by Fl_4 and Fl_5 contains Qz, Ph_2 , and Sv stratigraphic units. The lowermost phyllite is possibly a repetition of Ph_2 , as in domain 4. The Fl_4 fault cuts through the upper quartize in domain 4. The presence of the lower Ph_2 unit in its footwall is due to drag. Fault Fl_4 itself has been dragged by normal movement on the Fl_5 fault.

5.3.7 Domain 6

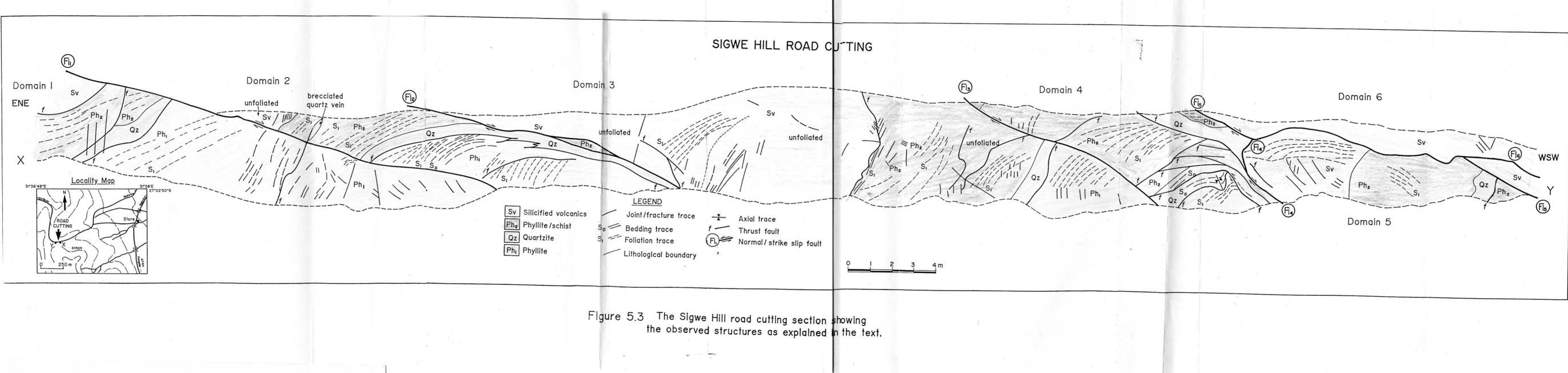
This domain lies above the Fl_5 fault. A splaying of Fl_5 occurs towards the western limit of the road cutting to produce Fl_6 . In this domain only the Sv unit is exposed. It is unfoliated and massive with a small zone of fracturing to the west.

5.4 DEFORMATIONAL HISTORY

Four deformational events, D_1 - D_4 , can be identified mainly on the evidence from the Sigwe Hills road cutting.

5.4.1 D₁ Event

The most conspicuous D_1 structure is the s_1 foliation which is a relatively intense cleavage typically dipping north-northeast. At Sigwe Hills s_0 is tilted towards the north (average strike and dip is 280°/34° NE; Figure 5.5) and has been affected by folding. The foliation at Sigwe Hills dips steeper than the bedding (average strike and dip is 288°/59° NE; Figure 5.6) which suggests that bedding has not been overturned if the foliation is axial planar (Figure 5.7).



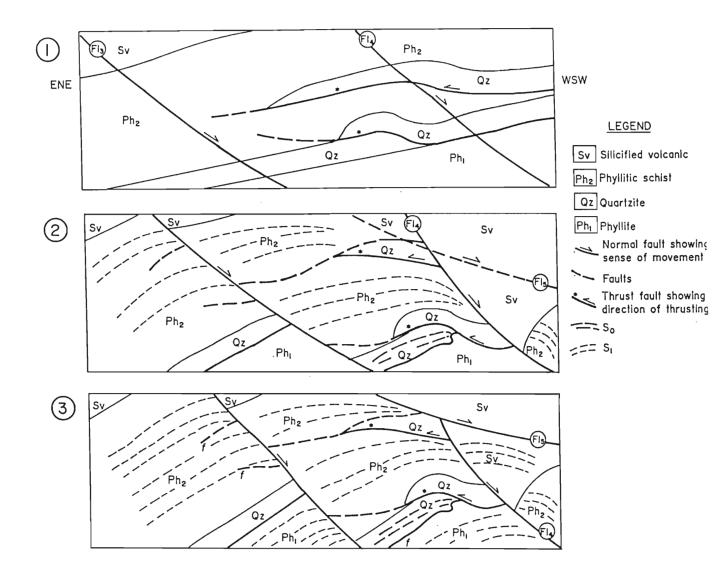


Figure 5.4: Reconstruction of part of domain 4 showing the history of the duplication of some horizons. Lateral extent shown is 10 metres with no vertical exaggeration.

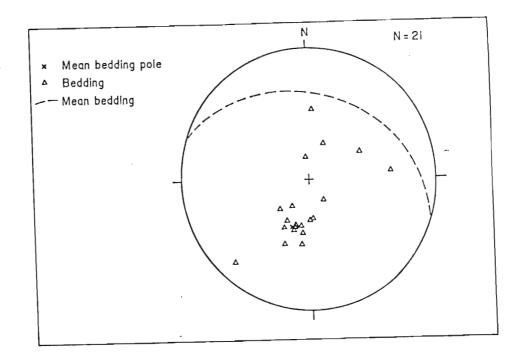


Figure 5.5: Stereographic projection showing poles to bedding for the Sigwe road cutting. Hatched line shows the average bedding plane orientation.

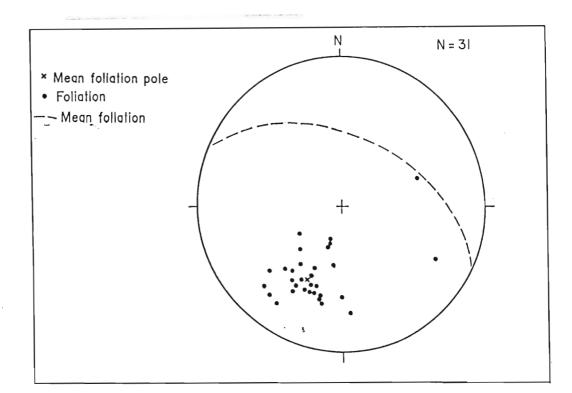


Figure 5.6: Stereographic projection showing poles to foliation surfaces at the Sigwe road cutting. Broken line gives the average foliation orientation.

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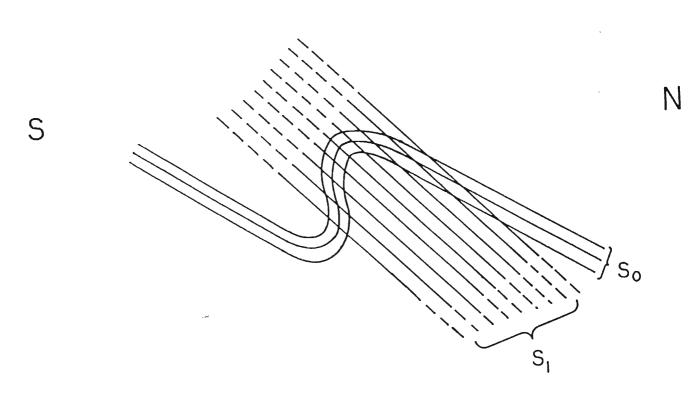


Figure 5:7: Schematic diagram showing the relationship of axial planar foliation (s_1) to bedding (s_0) at Sigwe Hills.

The mean bedding and mean foliation poles were calculated using the Eigenvector statistics method in the computer program ORIENT by M. von Veh at the University of Natal, Pietermaritzburg (M. von Veh, *pers. comm.*, 1993). Appendix 3 at the back of text shows some parameters used in the description of structural data obtained from the Sigwe Hills road cutting section.

5.4.2 D₂ Event

This event is represented by detachment and low angle thrust faulting. Mineral stretching lineations on fault planes are weakly developed and plunge down-dip (Figure 5.8). The sense of movement on these faults is difficult to identify and vergence indicators are inconsistent. The Sigwe Hills thrusts cut up-section towards the north (domain 4, looking at an oblique view to the southeast) while rotated and faulted clasts showing bookshelf sliding (Figure 5.9) point to a northerly movement direction of thrusting (Figure 5.9).

5.4.3 D₃ Event

The D_3 event is characterised by normal or oblique-slip faulting with possible inversion of some of the thrusts. Most of the normal faults in the Sigwe Hills road cutting dip towards the south and southwest (Figure 5.10). Faint lineations defined by slickenside striations are visible on fault plane and lineations indicate that movement varied from down-dip to strike parallel with a sinistral component of slip (Figure 5.10). Because of the northeast dip direction of bedding in the Sigwe road cutting, the lithological units have been repeated from east to west across the various D_3 faults at this locality. Foliation and bedding in the footwall of the faults have undergone varying degrees of drag proportional to the amount of displacement along the faults.

5.4.4 D₄ Event

Several joint and fracture assigned to a to a late brittle D_4 event. These discontinuities crosscut s₁ and the earlier formed faults and have variable orientations (Figure 5.11).

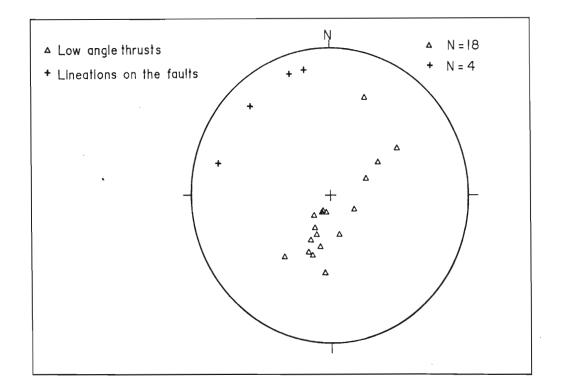


Figure 5.8 : Stereographic projection of poles to low angle thrusts (△)and lineations (+) on the thrust planes at the Sigwe road cutting.

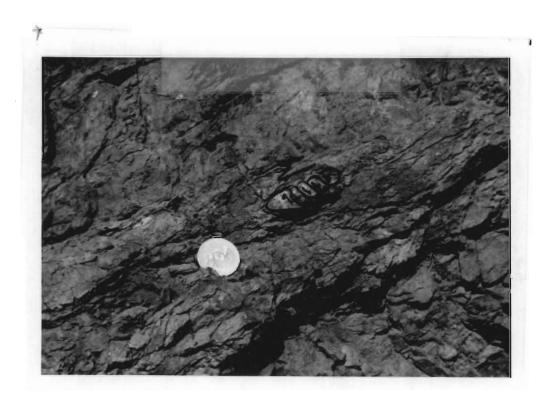


Figure 5.9: Bookshelf sliding in a clast within phyllitic horizons in the Sigwe road cut exposure. Coin = 30mm in diameter, direction of view south-southeast.

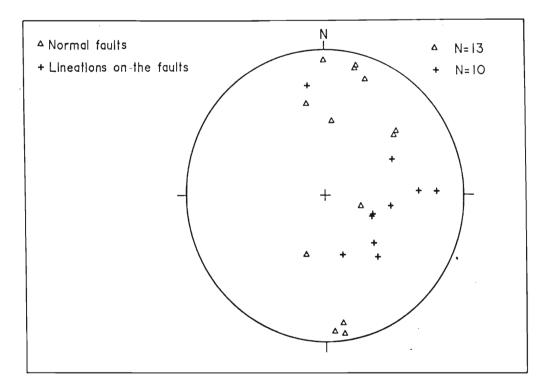
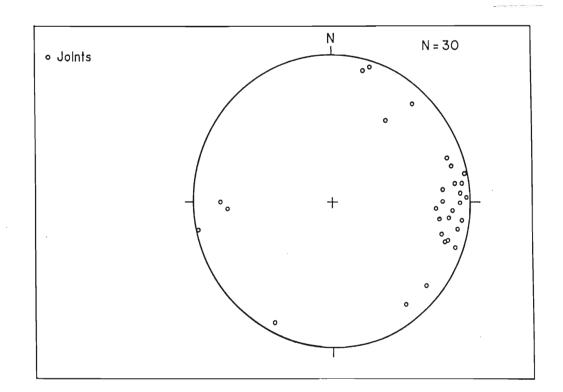


Figure 5.10: Stereographic projection of poles to normal fault surfaces and plunges of lineations on them at Sigwe Hills road cutting.





5.5 SUMMARY OF DEFORMATIONAL EVENTS

There are four distinct stages in the deformation history of the study area as deduced mainly from the Sigwe Hills road cutting. These can be summarised as follows:

- (i) Cleavage development;
- (ii) Low angle thrusting and bedding parallel thrust faulting;
- (iii) Normal/oblique slip faulting;
- (iv) Fracturing and jointing.

Outcrop did not permit extrapolation away from the road cutting.

5.6 DISCUSSION

The Pongola Sequence in the study area is intruded in the west by a granite batholith known as the Kwetta granite. The intrusion of this batholith is evident because towards its western limits, the volcanic lavas are found as xenoliths in this granite. The forceful emplacement of this body may have been responsible for the development of the s_1 cleavage, the D_1 tilting of the strata towards the east in the south and north-northeast in the north, localised folding of bedding. Outward expansion of the pluton may have caused D_2 thrusting of Pongola strata, northwards at Sigwe Hills but possibly eastward further south.

Oblique slip faulting which appears to be confined to the Sigwe hills seems to be related to the sinistral strike-slip movement which gave rise to the Siyalo shear zone (possibly Riedel shears as these faults are subparallel to each other and are oblique to the main Siyalo shear) south of which the stratigraphically highest parts of the Mozaan Group are preserved. The intrusion of both the Mhlosheni and the Mooihoek granites appears also to be related to this event and to be structurally controlled because the former pluton is aligned northerly whereas the latter is oriented northwest (Figure 5.2), reflecting the two dominant structural trends in the Archaean greenstone-granitoid basement.

The D_4 event may be correlated with the Jurassic-Cretaceous magmatism and northsouth faulting in the region.

The interpretation of the volcanic rocks in the study area as belonging to the upper Mozaan Group implies the possible presence of a major fault between the Kwetta granite and the Pongola rocks. Although the granite is clearly an intrusion as it encloses xenoliths of the country rock, major contact metamorphic effects would be expected if the intrusion occured at the present level of exposure. In this case therefore, the deformation is likely to post date the magmatic emplacement and to say that the granite caused the deformation is untenable.

The lower Pongola stratigraphy could alternatively be absent due to a basement high in the Pongola basin. The Nsuze volcanism may have been confined to the western limit of the depository, with deposition of sediments of the Mozaan Group subsequently prograding eastward.

Many of the outcrops of the volcanic rocks in the Sigwe Hills-Ngwavuma valley area create the impression that they have been only moderately deformed. However, this study clearly reveals a much more complex history of deformation for this part of the Pongola Sequence in the area involving duplication of strata by both thrusting and normal faulting. The absence of marker beds precludes determination of the degree of duplication. This faulting needs to be taken into consideration when estimating stratigraphic thicknesses, attempting regional correlations and modelling the tectonic evolution of the Pongola basin.

CHAPTER 6

GEOCHEMISTRY OF THE LAVAS

Geochemical data for the rocks from the study area have not previously been reported. The main aim of this investigation is primarily to establish the geochemical characteristics of the volcanic rocks and to compare these data with those available from other parts of the Pongola Sequence.

6.1 SAMPLING AND ANALYSIS

Forty seven volcanic rocks from the study area were analyzed for major, minor and trace elements by X-Ray fluorescence spectrometry using the Philips PW 1404 spectrometer at the University of Natal, Pietermaritzburg. Details of sample preparation and analytical techniques are given in Appendix 1. Only those rocks which appeared unweathered in the field were sampled for analysis. However, petrographic examination revealed that all the samples have undergone some alteration because of the presence of chlorite and calcite. Field locations of the samples are marked in Map 1 in the pocket at the back of the volume. Where outcrop is good, the samples were collected at closely spaced intervals providing a fair representation of the rocks within the volcanic pile from south to north. The sampling was not done on a systematic grid basis but rather on the basis of outcrop availability in the field.

In addition, four basaltic lava rocks (MAG1, MAG2, K1 and K2) from known upper Mozaan Group, (this setting established by Hunter, 1963 and Hunter, *pers. comm.*, 1992) outcrops outside the study area were also analyzed for comparison with the main data set. Two of these samples are from Magudu, south of the study area (MAG1 and 2) (Figure 1.1) and the other two are from Mooihoek, north-west of the study area (K1 and 2) (Figure 1.1).

6.2 ANALYTICAL RESULTS

The analytical results are presented in Table 6.1. Major, minor and trace element concentrations are given together with loss on ignition (L.O.I) of the original powder. All major element compositions are given anhydrous. The C.I.P.W. petronorms and other parameters arising from the analyses are given in Appendix 4. The norms are given for

comparative representation with previous data sets for Armstrong, (1980) and Preston, (1987). The petronorms were calculated using the computer program by B. Groenewald at the University of Natal, Pietermaritzburg (B. Groenewald, *pers. comm.*, 1993). Total iron is recorded as $*Fe_2O_3$ since the ratio of ferric to ferrous iron changes with oxidation state and alteration, and is therefore likely to be different in each sample reflecting variable degrees of alteration. The determination of FeO in each sample is therefore unwarranted. The allocation of Fe^{3+} is based on 10% of total Fe with the remainder being allocated as Fe^{2+} . Due to low grade metamorphism and alteration the Fe^{2+} and Fe^{3+} have been modified, therefore for consistency a constant ratio of these oxidations is used. For volcanic rocks similar to those compositions encountered in the study area on a worldwide basis, the proportion of Fe^{3+} to total Fe ranges from 0.002 to 0.2 (Le Maitre, 1976). The average for many volcanic rocks in a world wide basis is 0.1 and therefore this value has been used in this study except in calculations where the total Fe is calculated as Fe_2O_3 (shown as $*Fe_2O_3$ in variation diagrams).

6.3 GEOCHEMICAL VARIATIONS

The samples from the study area, together with the additional samples from Magudu and Mooihoek, when plotted in a total alkalis against silica diagram (Figure 6.1), reveal that they vary in composition from basalts and basaltic andesites through andesites to rhyolites. Some of the samples are depleted in alkalis causing these compositions to plot outside the designated fields in Figure 6.1. These samples are altered and their behaviour in Figure 6.1 reflect possible alkali element mobility during metamorphism and alteration.

Those samples that show depletion in alkalis do not necessarily show anomalous behaviour for other elements. Therefore the reason for this depletion should be treated with some caution. It is also possible that different elements will behave differently under various conditions of alteration and metamorphism and this may lead to general dispersion of data points on variation diagrams.

6.3.1 Major, Minor and Trace Element Variation Diagrams (range distribution of compositions)

Frequency distribution diagrams for the major and minor element oxides (Figure 6.2a) and trace elements (Figure 6.2b) summarize the chemical characteristics of the volcanic rocks. Table 6.2 shows statistical parameters required for an assessment of the distribution of all the major, minor and trace elements analyzed. In the following discussion major element contents are expressed in weight % and trace elements in ppm.

An analysis of the distribution of all data shown in Table 6.2 and plotted in Figure 6.2a and 6.2b is based on the following criteria:-

- (i) If the median value is closer to that of the 1st quartile, the distribution is skewed to the right.
- (ii) If the median value is closer to that of the 3rd quartile, the distribution is skewed to the left.
- (iii) If the median value is midway between the two quartiles, then the distribution is symmetric.

Given that all elements will respond to fractionation processes (by depletion through crystallizing phases or by enrichment in residual liquid) then deviations from symmetrical distributions may be indicative of non-magmatic processes. The most significant of these is alteration.

Figure 6.2a shows that element oxides such as Al_2O_3 , CaO and MnO have almost symmetric distributions; total alkalis, SiO₂, K₂O and P₂O₅ are skewed to the left; total Fe₂O₃ and MgO are skewed to the right. Titanium does not define a distinct pattern because of an inadequate number of samples covering the observed compositional range.

Figure 6.2b shows that most of the trace element distribution (Ni, La, Ba, Nb, U, Rb, Sr, Zr, and Th) are skewed to the left although most of the incompatible elements are close to a symmetrical distribution. For many elements two groups of population groups are observed. One controlled by the major population of mafic rock samples and a minor population

controlled by the relatively few felsic rocks. The distribution plots for TiO_2 and Y indicate three population groups and for Cr, two well defined populations are observed.

There is no consistent pattern in the statistical distribution of data except that it may be significant that Al_2O_3 and the incompatible elements Y and Zr show almost symmetrical distributions. Mobile elements and particularly the alkalis are highly asymmetric.

6.3.2 Trends in major and minor element chemistry

The plot of Al_2O_3 against SiO₂ (Figure 6.3) demonstrates that with increase in the silica content, there is a significant decrease in alumina content. The range in Al_2O_3 is from 9.2 % to 18.0% with most of the samples having 12% - 15.5%. This plot depicts three groups of samples all showing the trend of decreasing Al_2O_3 with increasing SiO₂. The three samples with SiO₂ contents between 71% - 74% weight are felsic rocks (rhyolites) which do not plot in the same field as the more mafic groups of rocks with SiO₂ contents less than 60%. These three anomalous samples are also depleted in alkali contents.

Magnesium plotted against SiO_2 (Figure 6.4a) shows considerable scatter, but the lowest magnesian samples also have the highest silica content giving a poorly defined trend. The range in MgO content is small (from 2.5 to 6.8%) with the majority at about 5.0% affecting the overall normal distribution shown in the statistical plots. No meaningful trend can be deduced from this plot. There is however a clear distinction between the samples taken from south of the Ngwavuma River and the remaining samples in the suite. The samples from the south of the Ngwavuma River form a cluster towards the left margin of the diagram.

The plot of MnO against SiO_2 (Figure 6.4b) shows some scatter but a systematic decrease with increase of SiO_2 can be observed. Most of the samples have MnO contents between 0.13 and 0.20%. Manganese is easily mobilised during hydrothermal alteration and metamorphosed samples commonly show variability in Mn concentrations (Humphris and Thompson, 1978).

Table 6.1:	Major and trace element analyses for representative samples from the volcanic
	rocks.

Sample	SiO2	Al2O3	+ _{Fe2O3}	+ _{FeO}	MnO	MgO	CaO	Na2O	K2O	TiO2	P2O5	Total	LO.L	•Fe2O3	Tư
MK001	52.36	14.94	1.26	10.23	0.19	5.82	10.12	2.9	0.22	1.4112	0.25	99. 7	0.22	12.65	
MK002	49.93	16.61	1.42	11.5	0.18	4.58	11.42	1.99	0.26	1.5108	0.28	99.68	0.98	14.22	
MK003	52.13	15.03	1.32	10.7	0.19	6.21	9.98	2.37	0.22	1.377	0.24	99.77	0.27	13.23	
MK004	50.28	15.05	1.39	11.24	0.19	6.33	10.58	2.49	0.26	1.4223	0.25	99.48	0.51	11.9	
MK005	51.91	14.47	1.35	10.96	0.18	5.74	10.69	2.11	0.31	1.4477	0.26	99.43	0.9	13.55	
MK006	52.39	14.81	1.31	10.57	0.17	5.26	10.6	2.51	0.36	1.3548	0.23	99.56	0.49	13.07	
MK007	50.81	15.38	1.41	11.46	0.18	4.49	11.76	1.88	0.27	1.428	0.28	99.35	0.67	14.17	
MK008	51.2	15.03	1.35	10.97	0.18	5.43	11.16	2.34	0.18	1.4214	0.25	99.51	0.77	13.56	
MK009	49.81	16.19	1.35	10.95	0.19	3.41	12.22	2.91	0.51	1.8175	0.42	99.78	1.3	13.54	
MK010	52.07	15.14	1.33	10.76	0.18	6	9.5	2.82	0.2	1.3723	0.24	99.61	0.45	13.31	
MK011	49.67	16.14	1.41	11.38	0.2	3.81	11.31	2.73	0.69	1.5641	0.26	99.16	1.31	14.13	
MK012	51.88	14.64	1.33	10.8	0.18	5.83	10.45	2.29	0.24	1.3849	0.25	99.27	0.52	13.35	-
MK013	55.73	13.98	1.01	8.17	0.11	2.76	11.41	0.2	4.94	1.2153	0.06	99.59	0.95	10.1	:
MK014	53.39	14.39	1.25	10.11	0.18	5.75	9.87	3.09	0.36	1.3225	0.23	99.94	0.46	12.5	÷
MK015	50.27	17.21	1.46	11.82	0.17	5.4	11.08	0.11	0.08	1.8862	0.33	99.82	3.2	14.61	t.
MK016	50.81	14.82	1.5	12.11	0.19	4.65	9.02	4.12	0.27	1.7329	0.31	99.53	0.35	14.98	
RM01	52.62	13.78	1.35	10.91	0.23	6.69	9.58	2.61	0.66	0.8135	0.16	99.41	1.2	13.49 5.16	:
RM02	72.12	12.12 11.86	0.52 0.48	4.17	0.07	0.8	3.67 4.44	1.98	3.4	0.4827	0.12	99.44 99.65	1.17	4.78	:
RM03 RM04	72_45 73.33	11.00	0.48	3.86 3.46	0.06 0.05	0.78 0.69	4.88	1.32 1.2	3.85 3.5	0.4531 0.4527	0.1 0.11	99.63 99.68	1.1 1	4.28	•
RM5	52.08	15.29	1.13	9.12	0.03	3.78	14.28	0.95	1.67	0.9141	0.11	99.66 99.55	1.3	11.28	:
RM06	50.97	17.97	1.13	8.3	0.13	2.67	17.85	0.05	0.03	0.4841	0.17	99.55	1.5	11.23	i i
RM07	55.4	14.51	1.05	8.53	0.11	4.4	10.89	2.75	0.58	0.8489	0.16	99.26	0.59	10.54	:
RM08	54.5	14.51		9.43	0.14	5.39	9.04	3.46	0.26	0.963	0.19	99.53	1.19	11.66	
RM09	55.09	13.49		8.89	0.19	5.15	8.97	4.32	1	0.9858	0.2	99.38	0.84	11	1
RM10	55.19	14.39		9.79	0.22	5.18	8.17	3.74	0.49	1.0143	0.21	99.61	1.16	12.11	4
RM11	55.33	14.29		9.43	0.18	4.88	9.49	3.1	0.4	0.9908	0.21	99.45	0.72	11.06	
RM13	57.51	12.08		8.97	0.17	3.96	13.89	0.23	0.79	0.8558	0.15	99.71	1.08	11.09	1
RM14	56.05	12.78			0.18	5.43	8.21	4.36	1.24	0.8821	0.14	100.18	1.04	12	-
RM15	63.93	9.31	1.03	8.37	0.13	4.14	10.67	0.88	0.65	0.7951	0.14	100.05	1.17	10.35	1
RM16	56.6	12.59	1.2	9.7	0.16	5.64	7.38	5.05	0.7	0.8659	0.13	100.01	1.01	12	5
RM17	57.43	13.15	1.19	9.66	0.13	4.95	8.67	2.46	1.42	0.8818	0.14	100.09	1.46	11.94	3
RM18	55.92	13.19	1.27	10.28	0.17	5.22	8.22	3.39	1.18	0.846	0.13	99.81	1.28	12.71	4
RM19	54.99	14.6	1.24	10.01	0.15	4.72	7.01	4.79	1.35	1.0415	0.18	100.08	1.27	12.38	3
RM20	59	12.69	1.17	9.48	0.15	5.06	6.65	3.78	1.11	0.8509	0.13	100.06	1.36	11.72	4
RM21	54.18	14.95			0.17	4.22	8.25	4.42	0.85	1.0915	0.18	99.79	1.1	12.64	6
RM22	55.19	13.86	1.28	10.36	0.2	5.76	8.08	3.09	0.69	1.0318	0.19	99.74	1.38	12.81	4
RM23	57.2	13.1			0.16	4.67	8.32	3.06	1.16	0.9013	0.15	99.74	1.22	12.13	5
RM24	57.23	13.14			0.17	5.15	7.09	4.05	1.57	0.8252	0.12	100.34	1.43	12.08	3
RM25	54.08	14.59			0.16	4.32	8.92	2.98	1.24	1.0632	0.18	99.44	1.27	13.1	4
RM26	58.43	13.74			0.16	4.55	6.67	4.43	0.91	0.9107	0.15	100.13	1.13	11.22	5
RM27	56.74	12.74			0.15	5.24	9.24	4.3	0.57	0.8112	0.14	99.93	0.78	11	4
RM28	55.31	13.44			0.17	5.73	8.81	3.1	1.03	0.855	0.14	99.87	1.37	12.43	- 4
RM29	56.85	13.06			0.16	5.74	8.54	3.48	0.71	0.8506	0.14	100.15	1.02	11.68	- 4
RM30 RM31	56.27 56.27	14.23			0.18	4.99	9.23	2.71	0.76	0.9287	0.16	100.26	1.24	11.91	3
		14.26			0.17	4.96	9.53	2.51	0.56	0.9223	0.16	100.1	1.09	11.83	3
RM32	55.32	14.62			0.11	3.4	8.27	5.52	0.71	1.0406	0.17	99.97	0.7	11.89	6
MAG1 MAG2	55.94 56.3	14.07 14.53			0.16	4.91 4.79	7.36 6.93	4.31	0.59	1.0226	0.19	99.68	1.7	12.23	
K1	56.76	14.53			0.14 0.16	4.79	6.93 7.07	4.09	1.14	0.9993	0.17	99.97	2.68	11.97	5.
K1 K2	56.43	13.72			0.16	4.87	7.58	4.81 4.07	0.4 0.73	0.9884 0.9879	0.19 0.19	99.75	1.28 1.33	11.66	5.
	20.40	10.77	- 1.2	3.03	0.10	7.0/	1.50	7.0/	0.73	0.30/3		99.68	1.55	11.97	
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•Fe2O3 = Fe2O3 = (FeO x 1.1113)

+ allocation of Fe^{3+} is based on 10% of total Fe.

	Sample	Zr	Sr	Nb	Y	Rь	U	Th	Zn	Cu	Ni	Cr	v	La	Ba	Sc
	MK001	167.2	231.1	8.4	37.5	5.1	0.2	1	101	86	112	204	262	27	72	34
	MK002	177	340.1	8.7	39.8	8.4	0.7	3.8	101	95	110	210	265	18	36	36
	MK003	163.2	210.9	7.3	35.7	3.7	0.5	2.5	95	112	113	196	254	20	79	31
	MK004	169.8	237.6	7.2	36.6	4.8	0.6	3.8	101	109	111	201	267	23	59	34
	MK005	171.3	254.5	9.4	38	9.2	0	0	99	102	108	182	266	22	35	32
	MK006	165.6	302.6	8	35.7	7.6	1.9	0	98	77	106	189	245	20	75	34
	MK007	166.6	262.2	8.5	37	4.2	0	0.8	96	103	105	193	254	18	50	35
	MK008	164	302.8	7.6	37.3	2.3	0	6.3	96	93	108	197	257	18	37	34
	MK009	202.2	160.7	11	43.6	11.7	0.2	3.2	114	155	111	215	285	16	99	36
	MK010	164.8	302.2	7.5	35.6	3.7	0	0	95	86	110	205	253	24	81	33
	MK011	180.9	257.1	9.3	38.2	17.8	0	0.4	93	52	120	206	273	18	280	36
	MK012	161.9	253.6	7.2	36.5	4	0	0.1	95	109	111	192	248	15	87	34
	MK013	142.9	396	6.9	17.4	50,7	0	1.2	56	62	65	134	165	8	992	24
	MK014	161	294.7	7.1	35.5	7.3	0	0	93	67	106	187	240	14	99	31
	MK015	223,7	225	10.4	47.6	2.5	0	0.8	127	65	103	248	316	27	58	34
	MK016	191.3	266.3	8.5	40.5	5.5	0	1.8	109	114	50	143	316	27	66	40
	RM01	130.6	191.9	6.2	34.6	29.5	0	2.8	113	3.5	390.4	66	212.1	25.4	145.6	31.4
	RM02	404.5	197.7	21.3	73.1	69.9	4.1	24.6	42.2	135.3	9.4	23.9	33.7	108.8	721	11.2
	RM03	365.5	303.3	19.4	69.3	84.6	2.1	18.6	35.7	103.1	9.3	15.5	43.7	95.7	734.8	9.3
	RM04	385	311.9	20.5	71.6	78.9	4.2	23.2	28.3	3.1	10.4	12.2	41.4	96.1	783.8	9.9
	RM05	149.2	804.1	7	33	47.6	2.1	3.8	88.7	25.7	92.5	53	204.5	36.5	187. 8	26.3
	RM06	70.9	742.1	3.5	18.2	1.7	0.3	0	44.9	0	61.6	43.5	236.6	6	13.5	16.7
	RM07	139.6	326	6	34.6	10.7	2.3	4.8	61.8	0	89.4	50.2	206.9	24.3	387 .9	25.5
	R.M08	153.1	352.6	5.7	33.4	26.7	0.8	3.9	1013	61.3	107.7	74.1	241.5	21.6	231.4	30.9
	RM09	158.9	201.2	5.5	33.7	29.3	0	3.4	99.9	50.8	112.4	63.2	219.9	21.7	199.4	32.9
	RM10	160.1	216.1	5.7	33	24.5	0	3.4	101.8	68.9	101.9	59.5	241.5	30.2	166.4	29.8
	RM11	158.6	186.5	6.2	33.2	167	1.2	2.9	94	74.6	99.1	56.3	232	27.9	124.9	32.1
	RM13	119	\$68.5	4.9	29.6	22.8	2.6	5.2	76	21.7	87.8	54.9	228.3	11	58.7	30.4
	RM14	138.3	197.4	6.7	33.6	32.2	0.4	4.8	104.9	32.4	124.4	66.8	221.5	14.1	269.7	34.3
1	RM15	134.7	335.8	4.7	33.4	14	0	1.7	73.3	22	111.4	228.6	218.6	18.2	95.2	31
	RM16	135.2	182.2	5.9	31.5	19.2	0	- 4	89.1	137.5	102.5	49.3	214.2	167	195.4	31.7
	RM17	136.3	280.2	6	30.6	66.5	1.9	- 4	59	63.7	120.3	68	242.5	24.6	317.6	34
	RM18	129.7	258.1	5.2	34	45,4	1.2	5.8	103.1	317	110.8	57.2	231.3	22_5	335.7	30.3
I.	RM19	151.5	209.2	7	36.5	44.2	0	5.3	195.8	70.3	88.2	40	235.1	23.1	491.1	29.7
•	RM20	129.6	158.4	5.2	30.8	36.5	1.4	3	95.3	17.9	111.3	56.2	221.4	26.6	403.5	31.3
	RM21	166.5	372.9	6.9	36.1	23.9	13	4.1	80.6	3.1	109.7	85.8	220.7	35.4	227.8	25.7
	RM22	170.3	304.4	7.4	42.5	23	1.5	47	138.1	168.4	104.8	69.3	225.3	33.3	165.5	27.7
1	RM23	143.5	316.5	6	33.2	43.6	1.6	5.9	115	101.5	106.3	58.8	227.1	30.9	348.2	31
1	RM24	160.4	391.7	7	35.3	43	0	21	90.8	0	105	69.6	208.3	29.4	340	25.1
	RM25	126.4	164	6.2	32.8	519	1.6	5.6	97.2	17.2	115.1	67	231	15.9	314.6	33
	RM26	135.2	201.2	6.1	33.1	31.8	1.8	3.6	97.1	36.5	85.9	- 44	214.2	18.1	221.1	30.2
	RM27	135.3	204	5.8	34	17	0.1	2.1	65.4	27.4	105_3	239.1	213.2	23.4	135.5	314
	RM28	140.1	208.2	6.1	35.2	45.3	0	1.5	92.5	26.3	108.8	259.1	223.8	16	339.8	32.5
	RM29	140.9	185.6	7	37.2	29.7	0.9	1.9	89.4	48.3	108.1	259.5	226.4	25.8	165.7	33.2
	RM30	129.5	313.6	5.3	31	24.6	1.2	5.6	87.3	68.5	99.6	71.5	229.9	14.2	326.2	31.9
	RM31	130.4	342.2	47	32.2	21.8	1	1.5	86.2	70.3	96.3	63.8	229.1	27.9	175.9	31.1
	RM32	159.9	356.7	6.2	32.4	. 9	2.5	· 5.7	39.3	28.7	100.2	63.6	195.6	26.8	214.4	25
	MAG1	169.7	270.4	7	40.7	14.9	0.3	3.7	93.2	48.1	118.2	84.6	222.8	20.7	230.1	31.9
	MAG2	150.4	572.9	5.9	34.6	20.4	1.2	4.6	96.4	68.1	133.7	108.3	207.3	26.7	503.1	25.4
	K1	170.8	115.1	7.2	40.2	12.6	0	29	85.7	101.4	116	146.6	200.3	10	77.8	27.1
	K2	167.7	154.9	6.9	38.9	23.2	0.7	3.1	97.3	72.4	123.4	147.7	203.1	8.2	154.5	27.1

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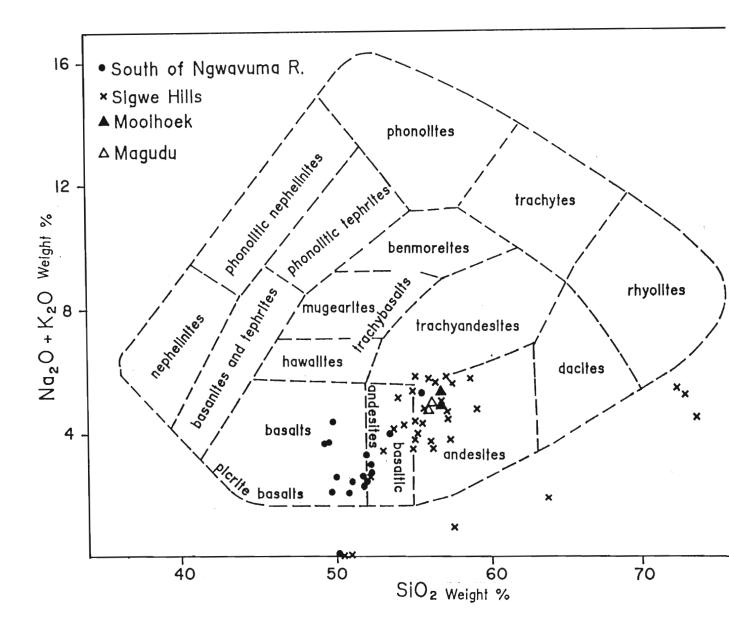


Figure 6.1 The nomenclature of normal (low-K) volcanic rocks showing the superimposed plots of the lavas. The boundary lines and fields of this diagram (Cox *et al.*, 1979) are arbitrary. The diagram serves to categorise the lavas, but is not a strict classification. Note the group of samples depleted in alkalis.

ELEMENT	MEAN	STD. DEV	1ST QUARTILE	MEDIAN	3RD QUARTILE	I.Q. RANGE
SiO ₂	55.49	5.37	52.07	55.19	56.74	4.67
Al ₂ O ₃	14.12	1.52	13.14	14.39	14.95	1.81
Fe ₂ O ₃	1.19	0.22	1.13	1.21	1.33	0.20
FeO	9.63	1.80	9.12	9.79	10.76	1.64
MnO	0.16	0.04	0.15	0.17	0.18	0.03
MgO	4.68	1.35	4.22	4.99	5.64	1.42
CaO	9.45	2.46	8.22	9.24	10.69	2.47
Na₂O	2.79	1.31	2.11	2.82	3.74	1.63
K₂O	0.95	1.01	0.31	0.69	1.16	0.85
TiO2	1.07	0.34	0.85	0.99	1.38	0.53
P ₂ O ₅	0.19	0.07	0.14	0.17	0.24	0.10
Zr	167.28	62.38	135.30	158.90	167.20	31.90
Sr	291.10	129.28	204.00	262.20	326.00	122.00
Nb	7.67	3.68	5.90	6.90	8.00	2.10
Y	36.92	10.34	33.00	35.20	37.30	4.30
Rb	25.83	21.31	7.76	22.80	43.00	35.40
U	0.90	1.08	0	0.50	1.60	1.60
Th	4.15	5.14	1.50	3.40	4.80	3.33
Zn	90.64	28.10	80.60	95.00	101.00	20.40
Cu	63.97	43.66	26.30	65.00	101.50	75.20
Ni	102.91	50.65	96.30	106.30	111.00	14.7
Cr	119.01	78.34	56.30	69.60	197.00	140.70
Va	224.24	55.95	214.20	229.90	253.00	38.80
La	26.92	20.65	18.00	23.00	27.00	9.00
Ва	234.96	213.84	79.00	175.90	326.20	247.20
Sc	29.88	6.49	29.70	31.40	34.00	4.30

Table 6.2:Parameters and values used in plotting the frequency
diagrams in Figure 6.2 determined for the forty seven samples.

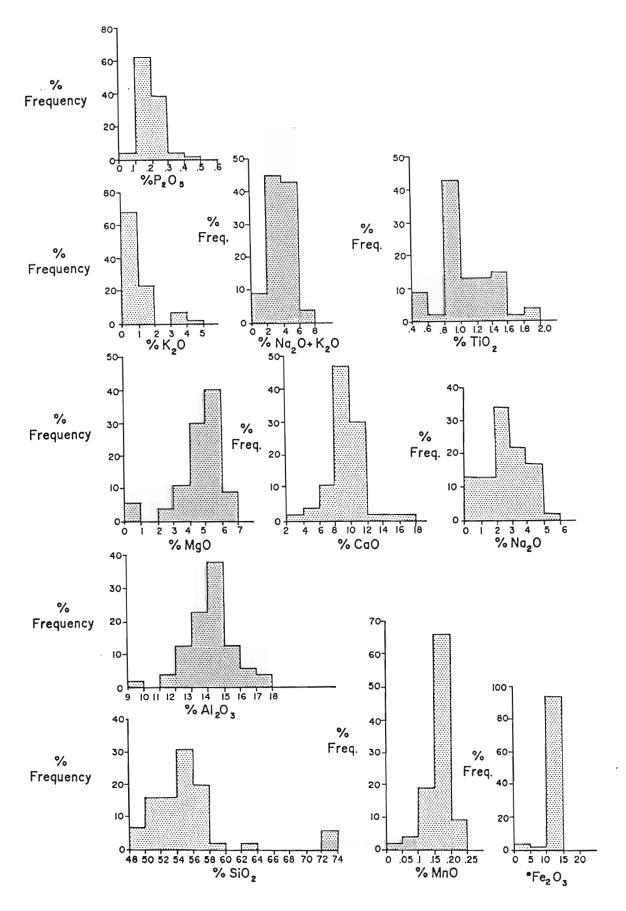


Figure 6.2a: Major element frequency distribution diagrams for the volcanic rocks.

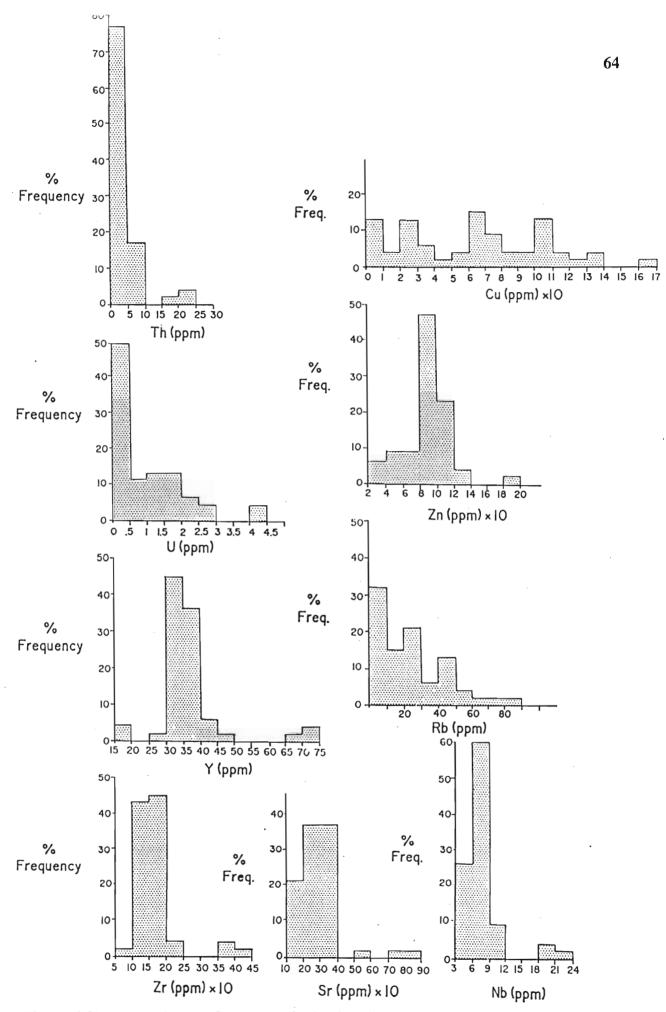


Figure 6.2b: Trace element frequency distribution diagrams for the volcanic rocks.

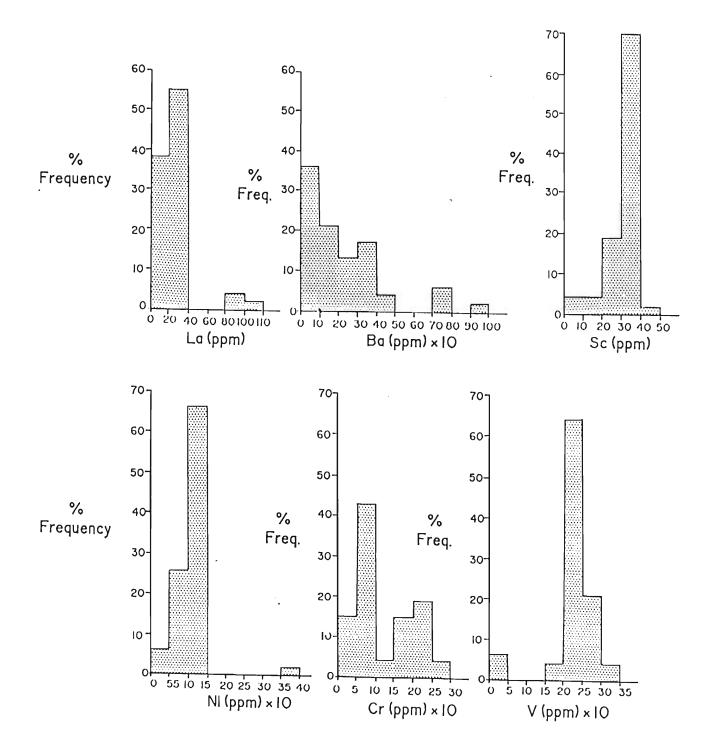
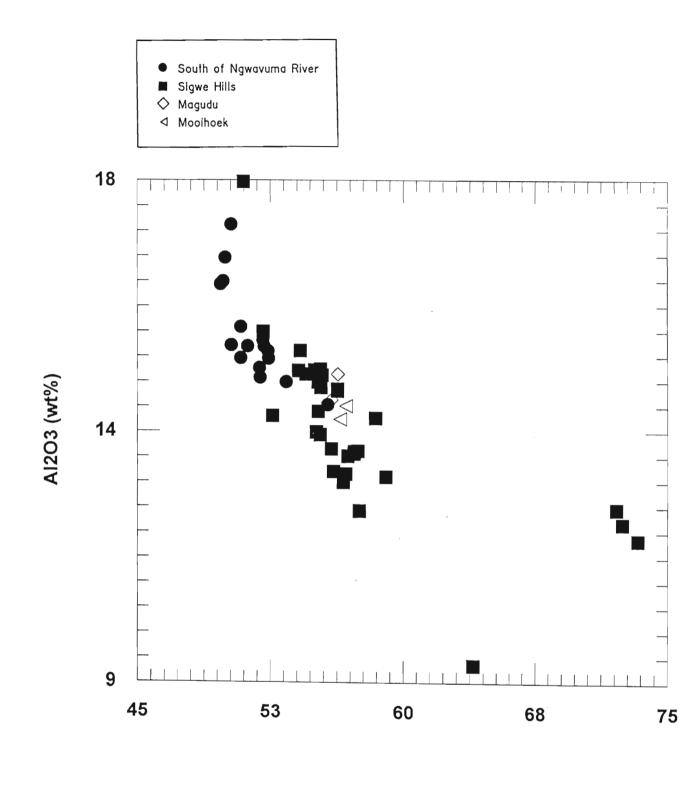


Figure 6.2b (continued).



SiO2 (wt%)

Figure 6.3: Variation diagram of Al₂O₃ vs SiO_{2.}

Calcium plot against SiO₂ (Figure 6.4c) overall displays a decrease with increasing SiO₂ concentrations. This is however not true for the three felsic samples for which there is clearly an increase in CaO with increase in SiO₂. The range in CaO content is large (from 3.8 to 18%) with a large number of the samples between 6 and 12%. Samples from south of the Ngwavuma River which are generally lower in SiO₂ have higher contents of CaO than the samples from Sigwe Hills in the north with only a few exceptions. The variation by this element may be the result of calcium mobility. During metamorphism, calcium would commonly be retained by actinolite or epidote which are present in the rocks in question. During albitization, sericitization and plagioclase recrystallization, calcium is released.

Titanium (TiO₂) shows also a general decrease with increase in SiO₂ (Figure 6.4d). Three distinct compositional fields were delineated. Samples from south of the Ngwavuma River typically have higher concentrations of this element (range between 1.2 - 1.9%) than those from Sigwe to the north (range between 0.8 - 1.15%). The third field comprises the three rhyolitic samples with the lowest TiO₂ levels of less than 0.5% weight. Sphene is present in samples which have high TiO₂ concentrations.

Total iron (as $*Fe_2O_3$) plotted against SiO₂ shows a general decrease in concentration with increase in silica (Figure 6.4e). The majority of samples have total iron concentrations between 10% and 15% weight. The three felsic samples have the lowest total iron between 4% and 6% weight.

Plots of K_2O , Na_2O and total alkalis ($K_2O + Na_2O$) versus silica all show an increase in concentration with an increase of silica (Figure 6.4 f,g,h). The range in K_2O content is small from 0 to 1.6%, with a majority of samples having about 0.5%. The lower silica samples from south of the Ngwavuma River have a lower K_2O content than the rest of the data set (Figure 6.4f).

Sodium (Na₂O) shows a wider range from 0% to 5.5%. A large number of samples lie in the range between 2% to 5%. The Na₂O concentration increases with increasing SiO₂ and (as seen in Figure 6.4g), this relationship seems to be represented by two distinct fields. The plot of total alkalis against silica (Figure 6.4h) shows an increase in the total alkalis with an increase in silica content and this relationship is also represented by two different fields. The

suite of rocks with low alkali content seems more altered and are not necessarily from the same area. This suggests that the effects of alteration could be the same irrespective of the composition of the rocks being altered.

The phosphorus (P_2O_5) versus silica plot shows a well constrained trend of decreasing P_2O_5 with increasing SiO₂ (Figure 6.4i). The range in P_2O_5 is fairly large (from 0.1 to 0.34%) with samples from south of the Ngwavuma River having higher P_2O_5 contents than those from Sigwe Hills.

Major element oxides are shown plotted ag ainst MgO (Figure 6.5). These trends are less well defined than for plots against SiO_2 . The observed scatter may reflect mobility of elements during metamorphism and/or alteration (Armstrong *et al.*, 1986). Some of these variation diagrams show two distinct groupings suggesting that the population of the samples south of the Ngwavuma River and those from Sigwe Hills are different.

Total alkalis plotted against MgO display a scatter (Figure 6.5a). Calcium (CaO) plotted against MgO shows that for samples south of the Ngwavuma River there is a decrease in the CaO content with increasing MgO content. The samples from Sigwe Hills show a scatter when plotted against MgO (Figure 6.5b). The plot of MnO versus MgO shows a positive correlation where there is an increase in the MnO content with an increase of the MgO (Figure 6.5c). Silica (SiO₂) plotted against MgO shows a scatter but there is an obvious grouping of two sets of populations with the samples from the Sigwe Hills having higher SiO₂ contents than those from south of the Ngwavuma River (Figure 6.5d).

Total iron (*Fe₂O₃) against MgO is a scatter but also shows a group of iron enriched samples from south of Ngwavuma River as a distinct group as compared to those from the Sigwe Hills (Figure 6.5e). The plot of titanium (TiO₂) against MgO (Figure 6.5f) is a scatter but shows the two distinct groups of sample populations. The samples south of the Ngwavuma River valley are enriched in TiO₂ (all above 1.2%) compared with those from the north in the Sigwe Hills with TiO₂ contents below 1.2%. Phosphorus (P₂O₅) versus MgO displays a scatter (Figure 6.5g) with the samples grouped distinctly into two scatter fields. Plotting potassium (K₂O) against MgO shows a scatter (Figure 6.5h) with a large number of samples from south of the Ngwavuma River having lower K₂O contents (< 0.5%) than those from the Sigwe Hills. Plots of Na_2O and Al_2O_3 against MgO both display wide scatter (Figure 6.5i and Figure 6.5j).

6.3.3 Trace element geochemistry

The diagrams for most of the trace elements plotted against SiO_2 are shown in Figure 6.6.

Copper shows considerable scatter when plotted against silica (Figure 6.6a). The observed Cu contents for the Pongola Sequence volcanic rocks (this study) are highly variable ranging from 0 ppm to 170 ppm. This variation in Cu is probably due to variable amounts of sulphide minerals present within the suite. Humphris and Thompson (1978) conclude that Cu is readily leached from metabasalts by hydrothermal fluids. However the Pongola Sequence volcanic rocks under investigation do not seem to show any positive evidence of leaching of Cu.

Nickel values are grouped together in the plot against SiO_2 showing no definite trend (Figure 6.6b). The range in Ni content is small, from 50 ppm to 148 ppm, with the majority of samples having about 110 ppm. A highly anomalous sample from Sigwe Hills has about 380 ppm Ni. The three highly siliceous and felsic samples have very low Ni contents.

In the plot of Cr versus SiO_2 (Figure 6.6c), there are two distinct groupings. The samples from south of the Ngwavuma River typically have high Cr contents ranging between 148 ppm and 250 ppm. Samples from the Sigwe Hills generally having lower Cr contents between 30 ppm and 90 ppm also forming their separate population. However, amongst the Sigwe Hills samples, there are four highly anomalous samples which have between 230 ppm and 260 ppm. The three felsic samples also from Sigwe Hills are depleted in Cr (< 25 ppm).

Vanadium plotted against silica shows a general decrease in the V concentration with increasing silica content (Figure 6.6d). The rock samples from south of the Ngwavuma River valley, typically lower in SiO_2 , have higher V concentration than those from Sigwe Hills which are slightly higher in SiO_2 . The range in V is small from 190 ppm to 325 ppm. The high silica felsic samples from Sigwe Hills have very low V contents.

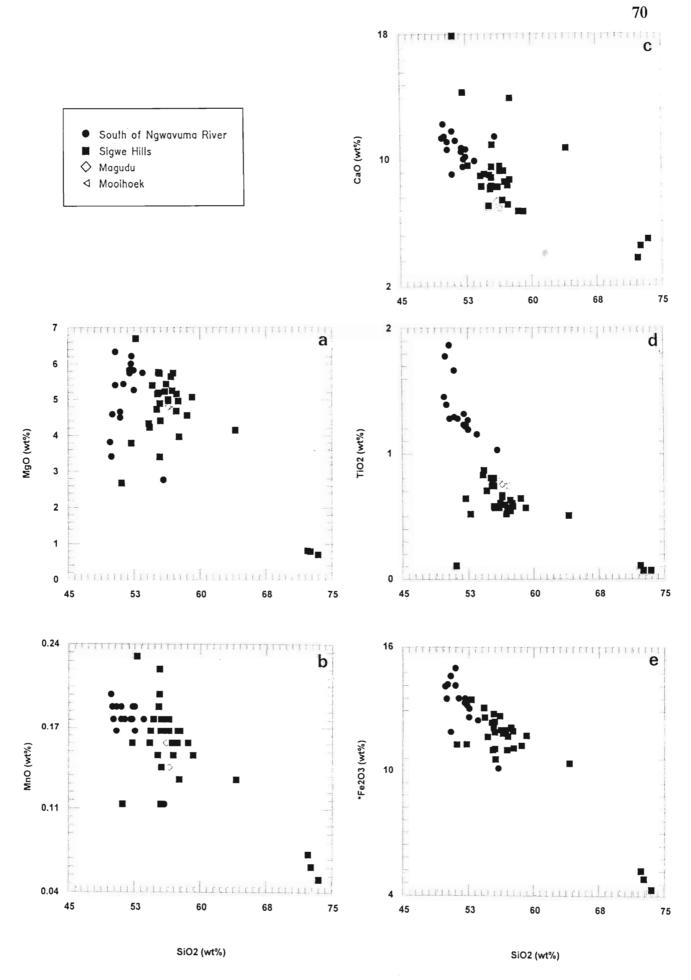
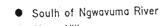


Figure 6.4: Major element oxides plotted against SiO₂.



- Sigwe Hills
- ♦ Magudu
- ⊲ Mooihoek

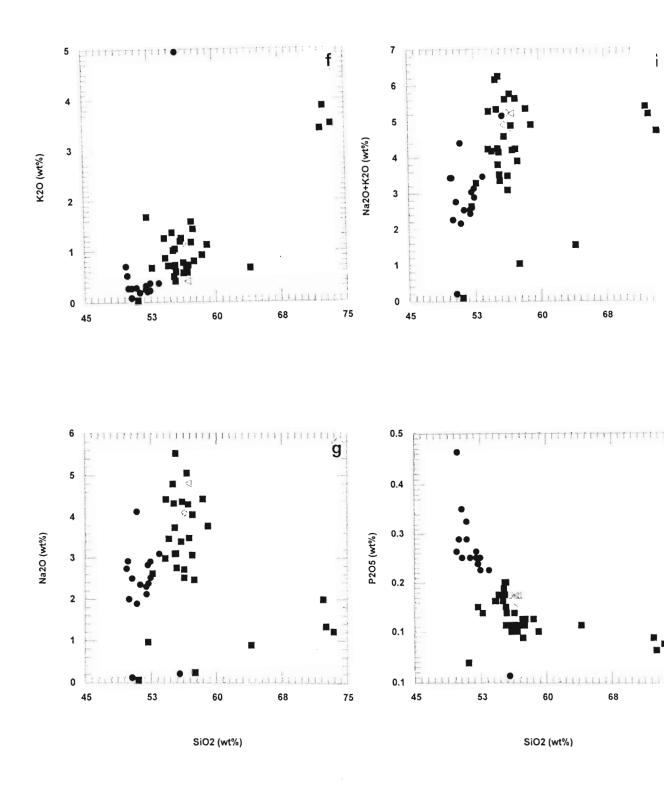


Figure 6.4: Major elements against silica (continued).

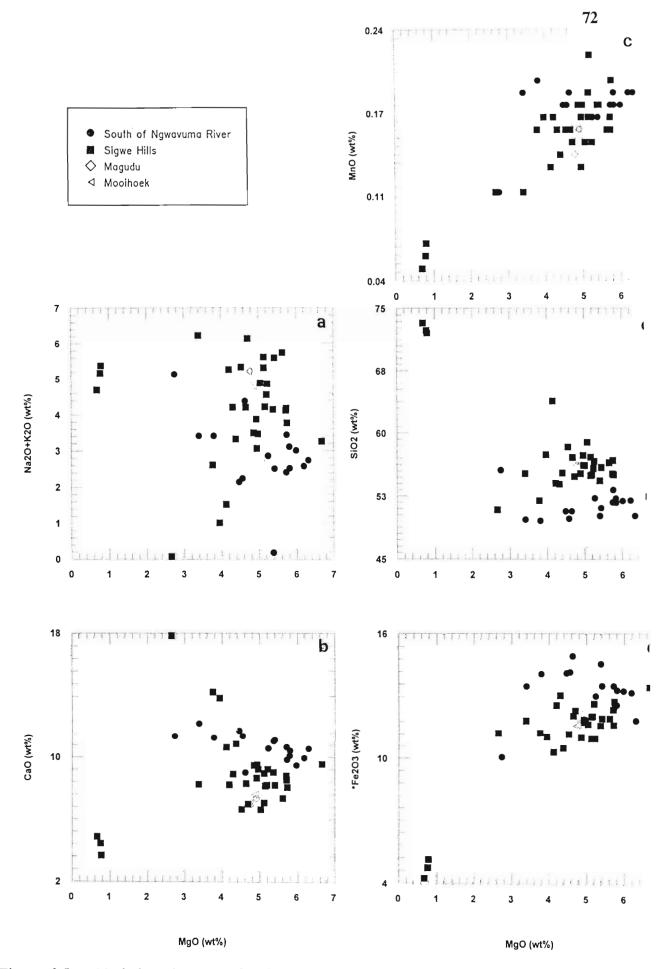


Figure 6.5: Variation diagrams of major element oxides plotted against MgO.

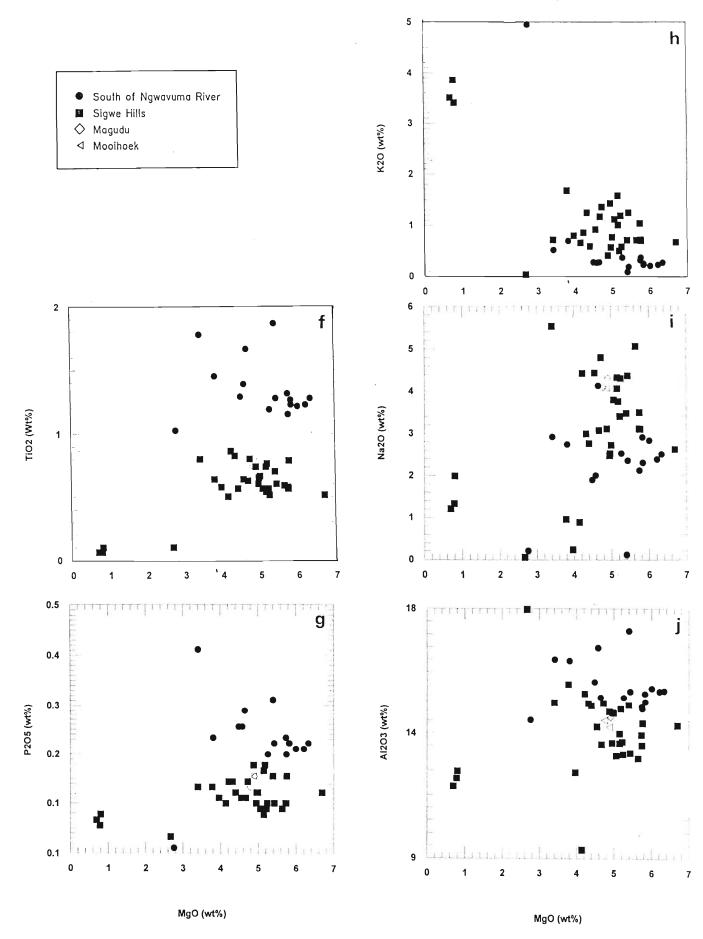


Figure 6.5: Major elements against MgO (continued).

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Lanthanum plotted against silica (Figure 6.6e) shows a tight cluster for most samples with the three highly siliceous felsic samples having much higher values. These seem to suggest that La increases on a broad scale with increasing silica concentrations.

Niobium plotted against SiO_2 shows a curvilinear relationship whereby Nb concentrations decrease with increasing SiO_2 for the majority of the samples (Figure 6.6f). Generally the samples from south of the Ngwavuma River with less silica are more enriched in Nb than those with higher silica contents from Sigwe Hills. This apparent correlation is the inverse of what is observed for most magmatic systems and will be discussed in the section on the genesis of the lavas. At high silica levels (as shown by the three felsic/silica enriched samples from Sigwe Hills) it seems that Nb becomes highly enriched.

The plot of Zr versus SiO_2 for the low silica samples displays a rough curvilinear trend whereby Zr concentration decreases with increase in the SiO_2 content (Figure 6.6g). In contrast, the higher silica samples from the Sigwe Hills are strongly enriched in Zr (> 350 ppm). The range in Zr in the former group is fairly small (from 110 ppm to 230 ppm).

Rubidium plotted against silica (Figure 6.6h) shows a scatter with a general sympathetic trend. There are two distinct population groups, the low silica, low Rb samples from south of Ngwavuma and the more Rb enriched, higher silica samples from Sigwe Hills.

Strontium versus silica shows a scatter (Figure 6.6i). The range in Sr concentration is large from 110 ppm to 800 ppm. The majority of samples are grouped between 150 ppm and 400 ppm. The large variation in Sr may be related to substitution for Ca in plagioclase and for K in K-feldspar. According to Pierce and Cann (1973), features such as albitization and Ca-depletion in low-grade metamorphism, as well as fluctuating Sr values in otherwise chemically similar rocks, are good indicators of Sr mobility.

The Zn versus SiO_2 plot (Figure 6.6j) displays a scatter within which there is a field which suggests that Zn may decrease in concentration with increasing silica contents.

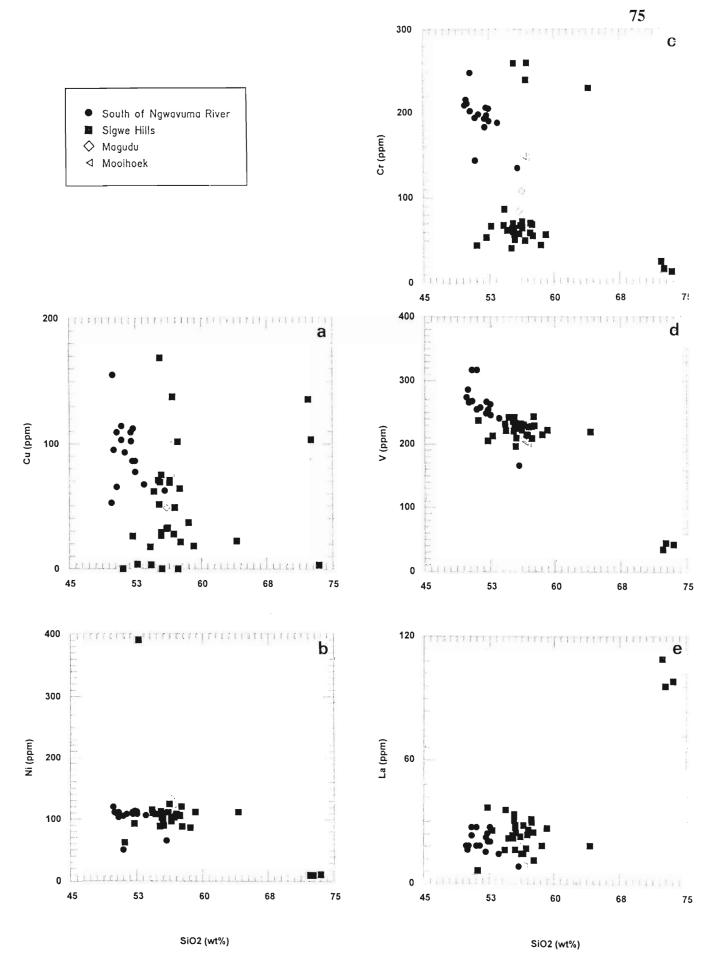


Figure 6.6: Variation plots of trace elements against SiO₂.

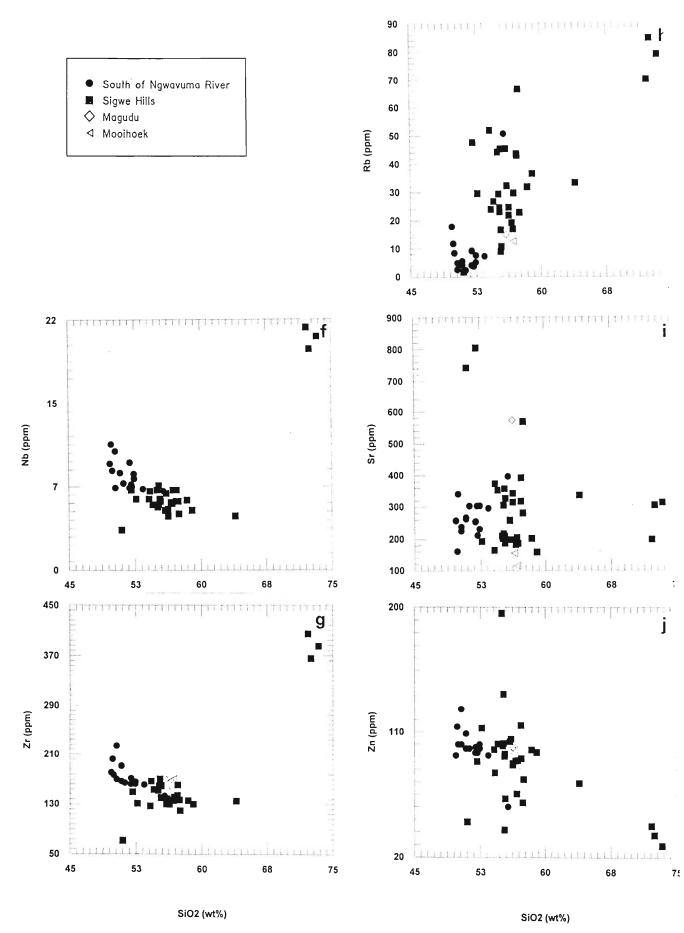


Figure 6.6: Trace elements against SiO_2 (continued).

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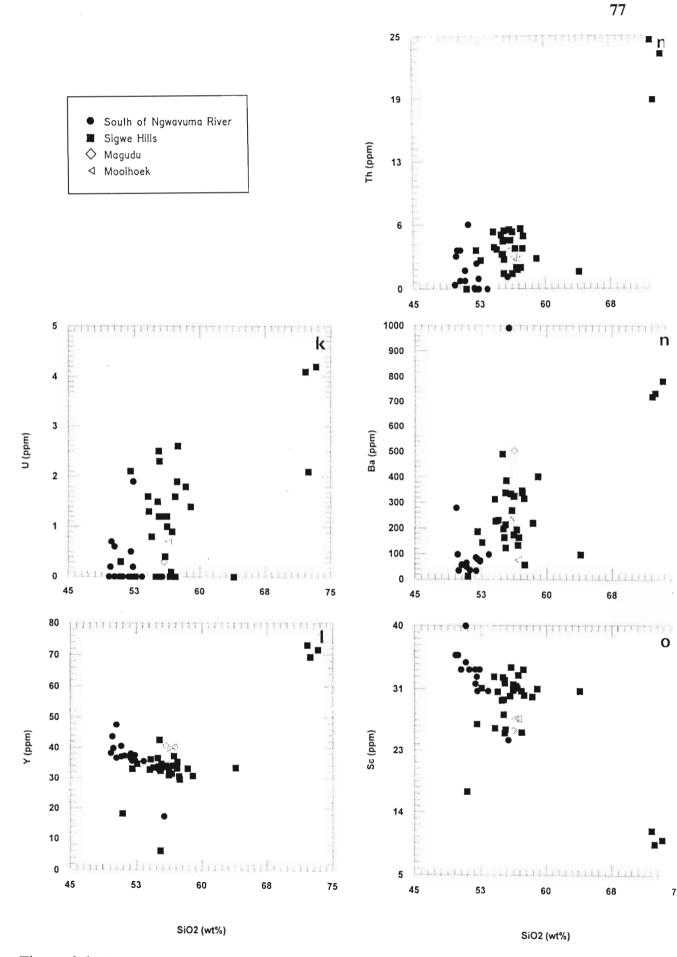


Figure 6.6: Trace elements against silica (continued).

Considerable scatter is observed when uranium is plotted against SiO_2 (Figure 6.6k). Most of the samples from south of the Ngwavuma River show absolute depletion in U. The samples from Sigwe Hills are generally slightly enriched in U. The two highly siliceous samples also have the highest U contents.

Yttrium plotted against SiO_2 shows that there are two distinct populations of indicating each rather dispersed but similar trends (Figure 6.6l). The two trends show that the concentration of Y increases with increasing SiO₂ contents. The samples from south of the Ngwavuma River are slightly enriched in Y compared with samples from Sigwe Hills in which there are a few highly anomalous cases with about 70 ppm Y. Generally the range in Y content is small (between 30 ppm and 48 ppm) with most samples having between 30 and 40 ppm.

The Th versus SiO_2 plot indicates that there is a general enrichment of Th with increasing SiO_2 (Figure 6.6m). The range in Th is small from 0 ppm to 7 ppm with the lower silica rocks from south of the Ngwavuma River having lower Th contents (< 5 ppm) compared to the bulk of rocks from the Sigwe Hills. A clear enrichment in Th with increasing SiO₂ is shown by the three felsic rocks from the Sigwe Hills.

Barium plotted against SiO_2 shows a consistent trend of increasing values with increasing silica (Figure 6.6n). The samples from south of the Ngwavuma River have low Ba contents, generally less than 100 ppm, except one highly anomalous sample with 1000 ppm Ba. Those samples from Sigwe Hills have Ba contents mostly above 100 ppm.

The Sc versus SiO₂ plot shows that with increasing silica concentrations, this element becomes depleted (Figure 6.60). The rocks lower in SiO₂ from south of the Ngwavuma River are more enriched in Sc than the samples from Sigwe Hills which have more silica. The highest silica samples from Sigwe Hills (felsic), have the lowest Sc contents (~10 ppm) whereas the majority of the rocks have between 35 to 30 ppm Sc (Fig.6.60).

The trace elements were also plotted against MgO and most of the variation diagrams obtained display considerable scatter (Figure 6.7).

Nickel plotted against MgO shows a trend of increasing values with increasing MgO (Figure 6.7a). This trend is especially true for the samples from Sigwe Hills. The range in Ni is small (from 50 to 125 ppm) with a majority of the samples at about 100 ppm. One MgO rich sample from Sigwe Hills is extremely enriched in Ni at about 380 ppm (not shown in figure). Three very low MgO samples from Sigwe (felsic) are depleted in Ni at about 10 ppm. However, considerable scatter in the data exists for this plot and a linear regression line is shown for all data for reference purposes.

Copper plotted against MgO shows considerable scatter (Figure 6.7b) with no distinct trend. The variation in the Cu content is very large ranging from 0 to 170 ppm.

Chromium plotted against MgO indicates that two clear fields of data exist (Figure 6.7c). The samples from the Sigwe Hills show a trend of increasing Cr content with increasing MgO. These samples have generally low Cr contents with a range between 10 to 80 ppm, but three anomalous samples average about 240 ppm Cr. On the other hand the rocks from south of Ngwavuma River seem to show a decrease in Cr with increase in MgO. These samples are generally high in their Cr content (averaging about 200 ppm), compared to those south of the Ngwavuma River.

Zinc plotted against MgO displays scatter but indicates an overall sympathetic trend (Figure 6.7d). The samples from Sigwe Hills are clearly depleted in Zn compared with those from south of the Ngwavuma River.

The plot of Zr versus MgO is a scatter (Figure 6.7e) with no distinct trend. The three felsic rocks from Sigwe Hills are highly enriched in Zr.

Vanadium plotted against MgO shows a scatter (Figure 6.7f) within which the samples from south of the Ngwavuma River, because of their higher V contents (> 250 ppm) are grouped together, whereas those from Sigwe Hills also form a group of their own with V contents below 250 ppm. The felsic samples, very low in MgO, are also very depleted in V (< 50 ppm).

Niobium plotted against MgO displays a scatter (Figure 6.7g) and the three low MgO felsic samples from Sigwe are highly enriched in Nb (averaging 20 ppm).

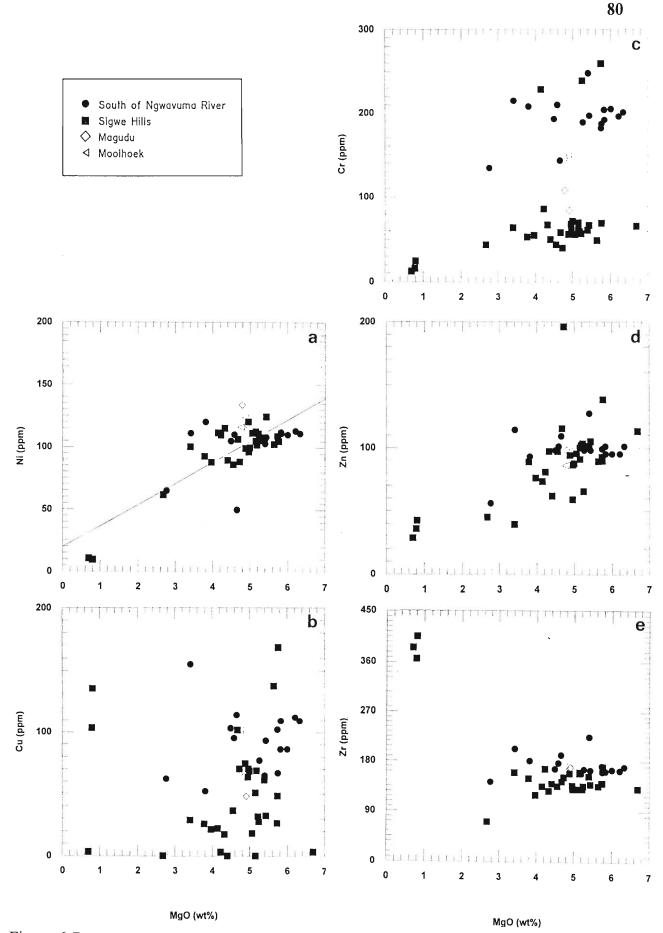


Figure 6.7: Variation diagrams of trace elements plotted against MgO for the volcanic rocks.

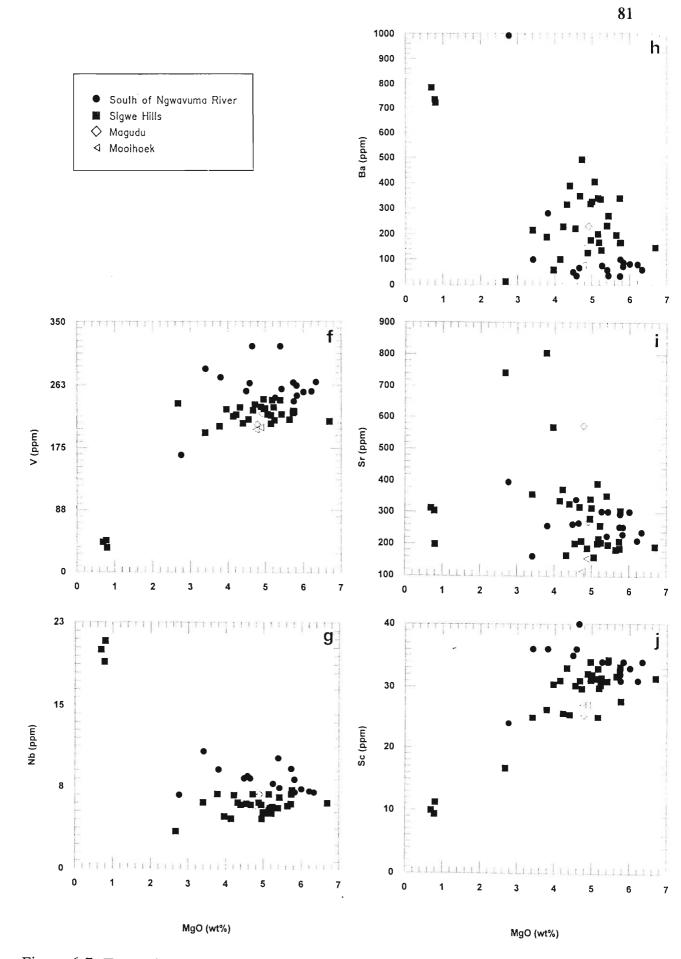


Figure 6.7: Trace elements plotted against MgO (continued.).

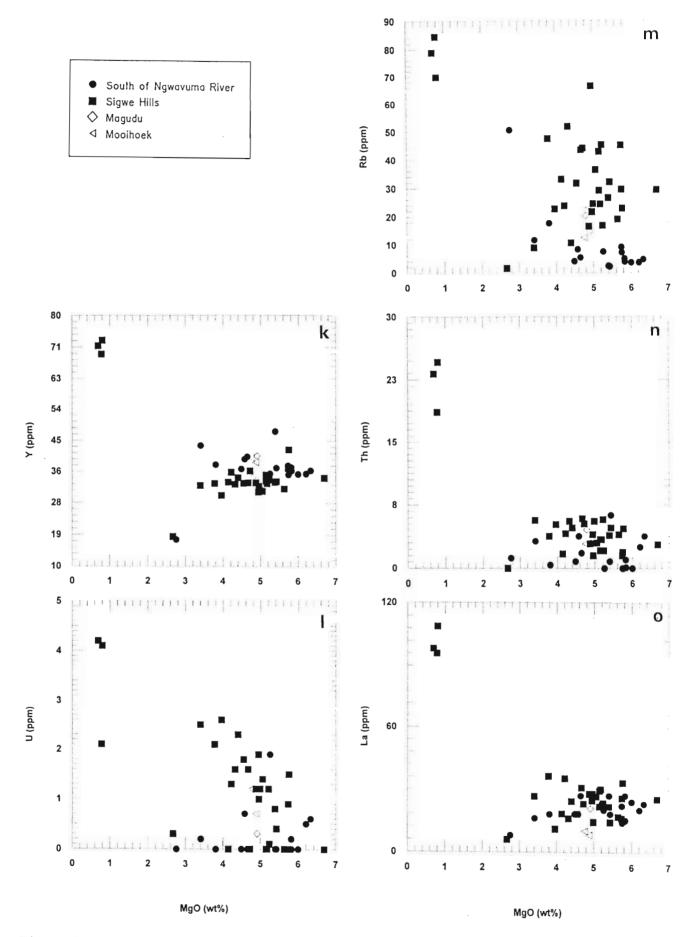


Figure 6.7: Trace elements plotted against MgO (continued.).

The plot of barium against MgO (Figure 6.7h) shows that the samples south of the Ngwavuma River are depleted in Ba (< 100 ppm) while the Sigwe Hills' samples are slightly enriched in Ba (> 100 ppm).

Strontium plotted against MgO displays considerable scatter with a very wide range of Sr contents (between 50 and 800 ppm) (Figure 6.7i). Such scatter is indicative of alteration of the samples.

A plot of Sc against MgO (Figure 6.7j) shows a scatter, but samples from Sigwe Hills display a trend of increasing Sc with increasing MgO.

Yttrium plotted against MgO (Figure 6.7k), does not show any particular trend because of the very small range in Y contents.

The plot of uranium against MgO (Figure 6.71) show a very clear trend of decreasing U against increasing MgO, a trend especially true for the higher Mg samples from Sigwe Hills. The majority of samples from south of the Ngwavuma River are depleted in U.

Rubidium plotted against MgO (Figure 6.7m) shows considerable scatter. The samples from south of the Ngwavuma River in the range 4 to 7% MgO are depleted in Rb (< 10 ppm) compared to samples from Sigwe Hills with the same amount of MgO which have Rb contents of up to 55 ppm. The felsic samples are highly enriched in Rb (in excess of 70 ppm).

The plot of Th versus MgO (Figure 6.7n) is a scatter. The felsic samples from Sigwe are slightly enriched in Th with contents between 18 ppm and 25 ppm.

Lanthanum plotted against MgO (Figure 6.70) shows a scatter with a small range in La for most of the samples (between 4 ppm and 40 ppm). The three felsic samples from Sigwe Hills which are also very low in Mg, are highly enriched in La with contents of between 98 ppm and 130 ppm.

Figure 6.8 shows the high field strength elements Nb, Zr, Sr and Y plotted against Mg number (Mg* calculated as Mg/(Mg+Fe tot)). These elements display vague increases with decreasing Mg* which is consistent with crystal fractionation (Armstrong, *et al.*, 1986). This overall trend is strongly controlled by the three felsic samples. Large ion lithophile (LIL) elements plotted against Mg* (eg. Rb) display scatter which probably reflects processes such as alteration and metamorphism imposed on a differentiation trend.

6.4 DISCUSSION

There are notable differences among the Pongola Sequence volcanic rocks with regards to enrichment and depletion of certain elements. The samples from south of the Ngwavuma River are significantly enriched in TiO_2 , Zr and Y but depleted in Ba, U, and K₂O relative to samples from Sigwe Hills. In the same way, samples from south of the Ngwavuma River valley are high in Fe₂O₃ and are depleted in SiO₂ relative to the samples from Sigwe Hills.

The plot of Al_2O_3 against SiO₂ shows three population groups pertaining to each of the geographic locations of the samples. Two of the trends are controlled by two major populations of mafic samples and one minor population controlled by the relatively fewer felsic rocks. This plot shows a decrease in Al_2O_3 with increasing SiO₂. This decrease in Al_2O_3 is indicative of feldspar fractionation for the more mafic rock series. The samples with higher SiO₂ contents (>70%), are rhyolites and do not lie on the same trend as the more mafic rock samples.

Calcium decreases with increasing concentrations of SiO_2 to give a broad trend. In the plot, however, there are a number of samples which do not conform to this overall trend. This deviation may be the result of Ca mobility. Titanium plotted against SiO_2 shows three distinct fields, all showing a trend of decreasing TiO_2 with increasing SiO_2 levels. The three fields conform to the geographic locations of the samples from south of the Ngwavuma River, Sigwe Hills and the felsic rocks from Sigwe hills. The bulk of the samples, however, form a well constrained trend which is also consistent with feldspar fractionation. The samples from south of the Ngwavuma River contain sphene. Titanium would generally be considered an immobile element (Gelinas *et al.*, 1977), however, Pierce and Cann (1973) warn that in rocks containing sphene, care must be taken as this might indicate Ti mobility.

A well constrained trend is also observed for P plotted against SiO_2 . Two distinct groupings are observed from this plot, those from south of the Ngwavuma River and those from Sigwe Hills. Total alkalis, Na₂O and K₂O plotted against SiO₂ all show a general increase with increasing SiO₂. The plot of Na₂O vs SiO₂ shows a stray group of samples which does not fall on the observed general trend and these show either depletion of Na₂O or enrichment of SiO₂ or both. These samples probably point to the easy mobility of Na.

The major element oxides plotted against MgO show trends that are not well defined but a more significant observation from these plots is the presence of two different population groups in the data set. The samples from south of the Ngwavuma River are different from those from Sigwe Hills, and within the suite of samples from Sigwe Hills are a minor population of felsic rhyolitic rock samples.

The variation diagrams for trace elements plotted against SiO_2 mostly display scattered trends. Chromium versus SiO_2 groups the data set into two major populations. In the one group of samples with higher Cr contents (south of Ngwavuma River), there is a crude trend of decreasing Cr with increasing SiO_2 . This relationship is not true for the other major group of samples from Sigwe Hills which are also depleted in Cr and for which a scatter is observed. A minor population of four samples from Sigwe Hills are highly enriched in Cr, and their position cannot be explained using the present data. The three felsic samples from Sigwe Hills show that Cr decreases with increasing SiO_2 contents.

Vanadium plotted against SiO_2 decreases as the SiO_2 increases, and the samples south of the Ngwavuma River are enriched in V relative to those from Sigwe Hills.

Plots of Nb and Zr versus SiO_2 both show similar curvilinear variations of decreasing Nb and Zr with increasing SiO_2 for most of the samples. Only the felsic samples from Sigwe Hills do not lie on this trend. Zirconium and Nb are known to be immobile during alteration and low-grade metamorphic processes (Winchester and Floyd, 1977) but these plots show that these trace elements both decrease in concentration with increasing silica values (Figure 6.6f

and g) except the three silica enriched/felsic samples which show an enrichment in Nb and Zr with increasing silica. The observed trends cannot be readily explained by fractionation processes. The general enrichment of the incompatible elements in the felsic rocks indicates clearly that these rocks are rhyolites and not highly silicified or altered basalts. However, it is also clear that these samples have undergone some degree of alteration and depletion of alkalis.

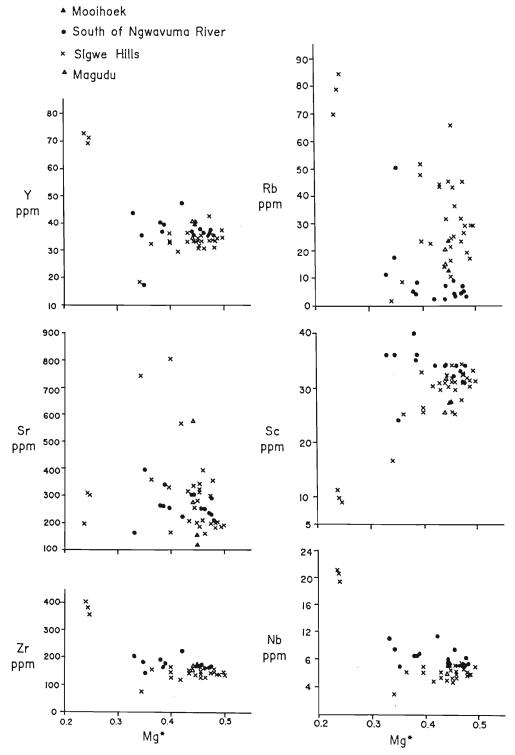


Figure 6.8: Some trace elements plotted against Mg number (Mg*).

The scatter shown by the Sr versus SiO_2 plot may be related to the substitution for Ca in plagioclase and for K in K-feldspar. According to Pierce and Cann (1973), processes such as albitization and Ca-depletion in low grade metamorphism, as well as fluctuating Sr values in otherwise chemically similar rocks, are good indicators of Sr mobility.

Barium in the plot against SiO_2 shows an overall increase with increasing SiO_2 . Ba is an incompatible element in magmatic processes. Pierce and Cann (1973) conclude that this element is particularly mobile during weathering and metamorphism. Changes in Ba content can be the result of its substitution for K in K-feldspar or mica. Chloritization can have the effect of enriching the rock in Ba. This is consistent with the observations of the Sigwe Hills-Ngwavuma River Pongola Sequence rocks because they have been highly chloritized.

The plot of scandium against SiO_2 shows that with increasing silica contents, the Sc becomes depleted. Giles (1981) argues that at high silica levels, magnetite fractionation is largely responsible for the control of *Fe₂O₃ and Sc, although mafic minerals such as clinopyroxene and amphibole influence the distribution of these elements during the first stages of differentiation.

In the plot of Y against SiO_2 the two different groups of samples stand out, with those from south of Ngwavuma River showing an enrichment in respect of Y relative to those from Sigwe Hills. Both groups display a trend of increasing Y with increasing SiO_2 . However, three samples from Sigwe Hills lie off the well established trend. Giles (1981) notes that samples that show a relative depletion in Y would normally be enriched in Sr and visa-versa. This is true also for the volcanic rocks in this study.

Trace element plots against MgO mostly show scatter trends but the general characteristics of variation diagrams are similar to those observed in the silica variation diagrams. No further conclusions can be drawn from these plots.

6.5 SUMMARY OF CONCLUSIONS ARISING FROM THE VARIATION DIAGRAMS

The significant observations arising from the plots are as follows:-

1. Most elements show a clear population separation of the samples from Sigwe Hills, and south of the Ngwavuma River e.g TiO_2 , P_2O_5 and Al_2O_3 .

2. There is a high degree of scatter in most inter-element plots in the range 50-60% SiO_2 and this points to strong mobilization of elements by secondary processes.

3. In some cases reasonably well constrained trends are observed for the entire data set as is the case for e.g TiO₂ vs SiO₂, Fe₂O₃ vs SiO₂ and P₂O₅ vs SiO₂.

4. In some cases each population group forms a distinct trend e.g V vs MgO, MnO vs MgO, Cr vs MgO and CaO vs SiO₂.

5. The felsic rocks are confired as being rhyolites rather than silicified basalts.

6. The unexpected negative correlation of some of the incompatible elements versus SiO_2 for the mafic rocks (e.g Zr, Y, TiO₂, P₂O₅) strongly suggests major disturbance of the rock system, either by contamination or by late-stage alteration, or by a combination of both these effects.

7. The significant depletion in alkalis in some of the samples (including the three felsic rocks) is suggestive of element mobility during alteration.

8. The positive correlation of Cr and MgO for the suite of samples from Sigwe Hills indicates that a primary magmatic control may be observed, but it must also be emphasized that further modifications may have taken place during alteration.

6.6 MAGMATIC AFFINITY AND MAGMA GENESIS

An AFM diagram, as defined by Irvine and Baragar (1971), has been used to determine the magmatic affinity of the Ngwavuma-Sigwe rocks. Plotted in this diagram, the geochemical data from these rocks defines a trend which lies strongly in the tholeiitic field (Figure 6.9).

The observed chemical characteristics for the volcanic rocks raise the question as to whether they had the same origin and involvement of the same processes or otherwise. One way to examine consistency of the processes is to consider ratios of incompatible elements. Table 6.3 presents some elemental ratios for the two groups of samples from the lavas south of the Ngwavuma River and Sigwe Hills. These two groups of samples clearly do not have the same ratios for all trace elements and therefore they cannot be assumed to have had a common origin.

This is particularly evident for those ratios involving Zr vs TiO_2 . The variation diagram for TiO_2 (Figure 6.10d) indicates that there are two linear trends according to the two groups of data sets. A major consideration is the extent to which later stage alteration may have affected the trace element abundances.

Figure 6.10a-e presents inter elemental plots for High Field Strength Elements on the assumption that these elements have not been significantly disturbed by later processes. The linearity displayed by the plots Y versus Zr, Nb vs Zr, Nb vs Y, Zr vs Ti₂O and Nb vs TiO₂ (Figures 6.10a-e respectively), supports the view that low silica volcanic rocks (with < 55% SiO₂ and > 4-6% MgO) from south of the Ngwavuma River had a common origin. If the volcanic rocks had been derived from various sources, the linearity observed from the plots would not be expected and indeed would be difficult to explain (Giles 1981). The second group of data from Sigwe Hills (with SiO₂ > 55% and MgO between 1-6%) conforms to the linear trends mentioned above, but these may be a result of a different part of the fractionation sequence.

In the plot of V against TiO₂ (Figure 6.10f), the data from south of the Ngwavuma River form a linear trend of increasing V with increasing TiO₂, whereas the data set from Sigwe Hills does not lie on this trend and instead forms a cluster of points. This may be further evidence that the suites of lavas had different histories. In another plot of P_2O_5 versus TiO₂ (Figure 6.10g), a common linear trend is observed for both data sets where the P_2O_5 increases with increasing TiO₂.

Additional plots of Cr vs Zr, Cr vs Ni and Ni vs Zr are shown in Figure 6.11a-c. The Cr vs Zr relationship shows some linearity for both data sets in which both Cr and Zr increase relative to each other (Figure 6.11a). The distinction between the two populations is not clear but the reason for the sympathetic variation of Cr with Zr, and the converse relationship shown by Nb and Zr with SiO_2 , cannot be explained by high level fractionation or partial melting of the mantle source rocks.

The plot of Cr vs Ni (Figure 6.11b) for all data shows a curvilinear relationship whereby both Cr and Ni levels increase initially (linear relation) to a certain level of Ni, above which only the Cr increases, thus resulting in the observed curve. Giles (1981), suggests that such Ni behaviour with Cr might be due, in some cases, to alteration or preferential partitioning of Ni into sulphide phases.

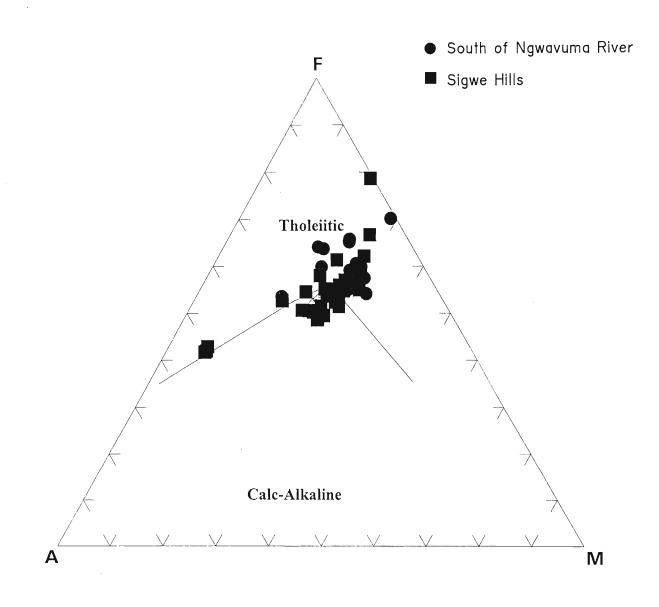


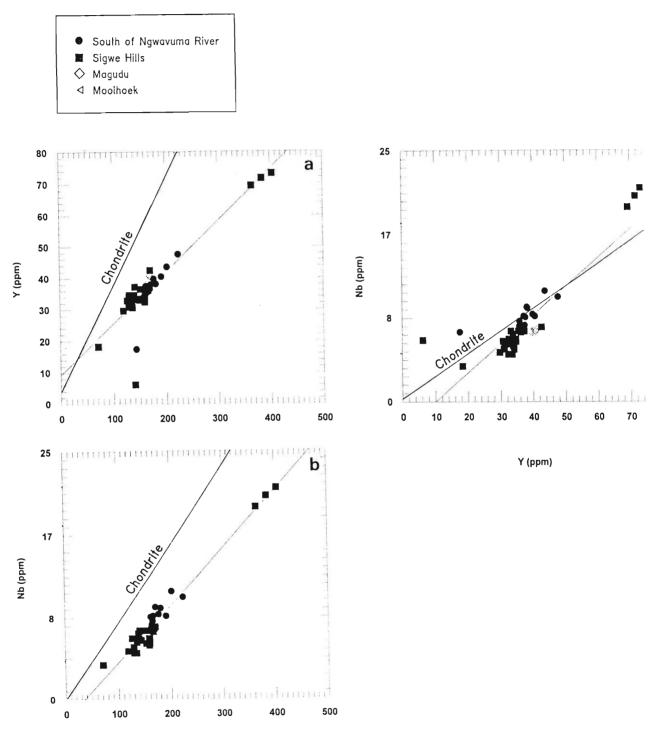
Figure 6.9: AFM diagram (Total alkalis-Total Fe-MgO) (Irvine and Baragar, 1971) showing compositional plots for the lavas. Solid line divides the tholeiitic and calc-alkaline fields.

Positive correlation between Ni and Cr, implies a primary factor such as differentiation, on the behaviour of both elements. Giles (1981) concludes that apparent sympathetic variability of MgO, Ni and Cr observed in low-silica andesites, can be satisfactorily explained in terms of differentiation from a range of primary magmas that have been produced as a result of partial melting of the uppermost mantle over a pressure interval of about 10-20 kb. The observed trend is consistent with early fractionation of clinopyroxene (rather than olivine) which would result from the strong partitioning of Cr into pyroxene. The very limited range in Ni values excludes olivine as a primary fractionating phase. Evidence for pyroxene fractionation also supports the magma type being a silica saturated tholeiite (Wilson. A.H., *pers. comm.*, 1993), and is consistent with theoretical modelling of Nsuze Group lavas by Armstrong (1980).

Nickel plotted against Zr (Figure 6.11c) shows a more constrained linear relationship for the mafic rocks but with some considerable dispersion. This relationship shows an increase in Zr with Ni. The positive relationship is best shown for the mafic samples for Sigwe Hills but in contrast to the general trend the felsic samples are highly depleted in Ni and enriched in Zr.

Table 6.3:	Elemental	ratios	for	the	volcanic	rocks	under	study.
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	South of Ngv River	vavuma	Sigwe Hills	5
RATIO	x	sd	x	sd
Y/Zr	0.21	± 0.026	0.231	± 0.023
Zr/Nb	20.91	± 1.60	23.29	± 2.88
Nb/Y	0.23	± 0.05	0.1874	± 0.037
Ti0₂/Z	8.53	± 0.23	5.95	± 1.67
Ti0₂/Y	40.90	± 7.87	21.2	<u>+</u> 6.77



Zr (ppm)

Figure 6.10: Variation diagrams of Y vs Zr, Nb vs Zr and Nb vs Y for the volcanic rocks. Chondritic lines are after Nesbitt and Sun (1976). The line for characteristic ratios is shown together with the linear regression line for the data set.

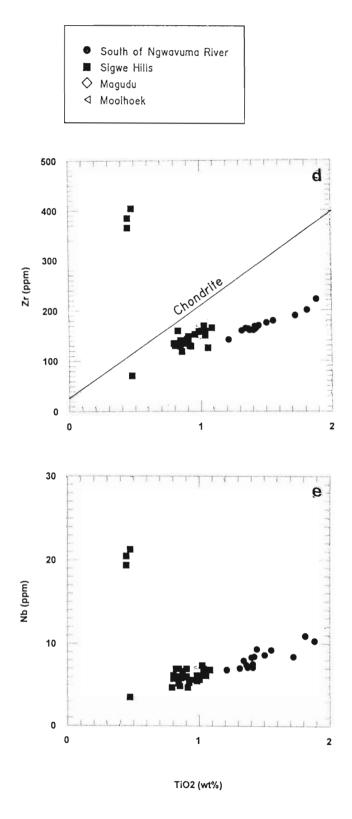
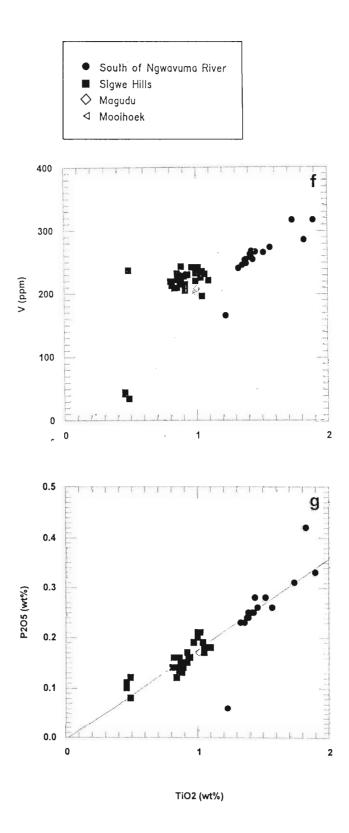


Figure 6.10 (continued): Plots of Zr vs Ti and Nb vs Ti.





Pierce and Norry (1979) conclude that within volcanic suites, increase in Zr is accompanied by decrease in Cr. This is the case for all cogenetic data sets from elsewhere which do not show any disturbance in the system. Since Cr is strongly partitioned into mafic phases (pyroxene (cpx) or amphiboles), Cr concentration in the melt should vary a little during partial melting but decrease rapidly during fractional crystallization. The unusual inverse correlations of Nb and Zr with SiO₂ (Figs. 6.6f and 6.6g), and the data distribution for Cr versus SiO₂ (Fig. 6.6c), does not represent the effect of normal fractionation which suggests that other processes were involved in the evolution of these magmas.

Hotter magmas (with higher Mg content) are more likely to assimilate country rock (or substrate) and therefore the higher magnesian, low silica magmas are more likely to have undergone contamination. This is proposed as the qualitative explanation of the observed trends with lower silica, higher magnesian compositions having high Nb and Zr contents (Wilson A.H., *pers. comm.*, 1994).

Immobile trace elements can be used to define magma series and tectonic setting. Pierce and Cann (1973),Pierce and Norry (1979) and Winchester and Floyd (1977) conclude that High Field Strength elements such as Ti, Zr, Y and Nb are immobile during alteration and metamorphism. In this light Pierce and Cann (1973) used Ti, Zr, Y, Nb and Sr to discriminate tectonic settings for recent, altered mafic volcanic rocks. The volcanic rocks under investigation were plotted in the Pierce and Cann (1973) discrimination diagram (Ti/100-Zr-Y. 3 - Figure 6.12) and all plot in calc-alkaline basalt field, except the three SiO₂ rich felsic samples; RM02, RM03 and RM04 which do not plot in any of the defined fields (and are also inappropriate for these plots).

However, the validity of the Pierce and Cann (1973) diagram must be questioned for Archaean volcanic rocks because the tectono-magmatic control may have been quite different for the Archaean compared to recent volcanics for which the diagram was constructed. This diagram also does not take into account the effects of contamination (notably Zr and Nb) which would have resulted from interaction with basement rocks.

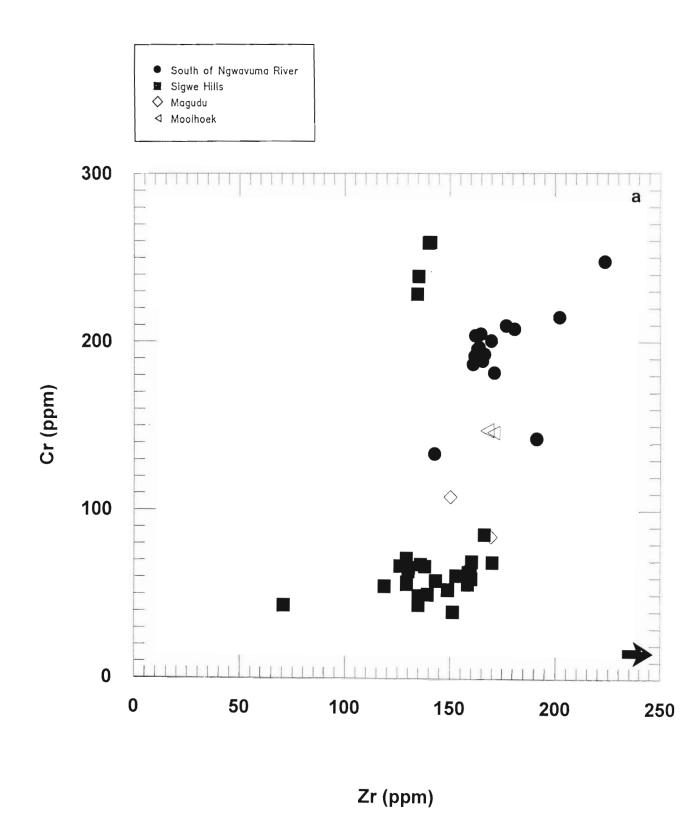


Figure 6.11: Variation diagram of Cr vs Zr. Arrow shows samples anomalously high in one of the variables plotted. These samples are not plotted because of the scale used.



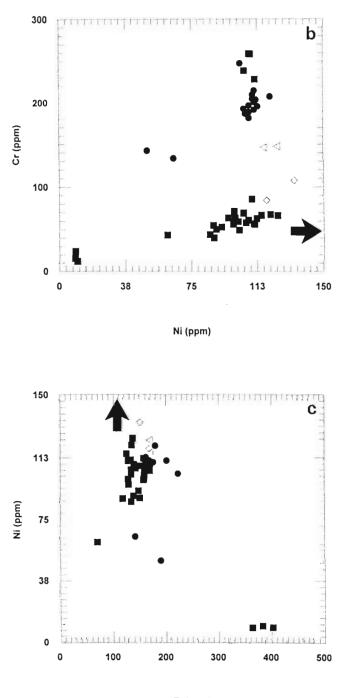




Figure 6.11 (continued):

Plot of Cr vs Ni and Ni vs Zr. Arrows show samples with extreme values in one of the variables, not plotted for scale reasons.

In addition, Winchester and Floyd (1977) caution that under conditions of extreme alteration and metamorphism, the so called immobile elements may also show differential mobility.

In the Nb-Zr-Y diagram by Meschede (1986), Nb is relied upon as a sensitive indicator for the tectonomagmatic environment for mid-ocean basalts (MORB). Mantle related enrichment or depletion processes are reflected by the Nb content. The combination of Nb with Zr and Y in the ternary plot results in the subdivision of basalts into four fields (Figure 6.13). The volcanic lava rocks under study mainly plot between normal mid-ocean ridge basalt (N-type in field D) and tholeiitic basalts from within-plate environments (WPT) in field C (Figure 6.13)

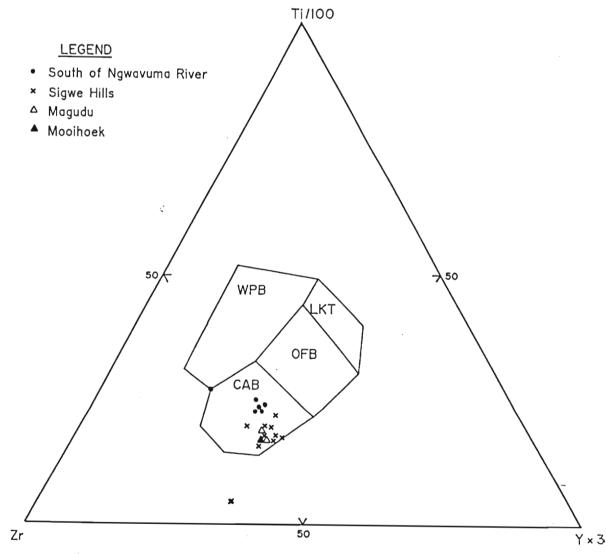


Figure 6.12: Ternary plot of Ti/100-Zr-Y x 3 for basaltic rocks of the Pongola Group from the shown localities. Field simplified after Pierce and Cann (1973). WBP, within plate basalt; LKT low K-tholeiites, OFB, ocean floor basalt; CAB, calcalkaline basalt.

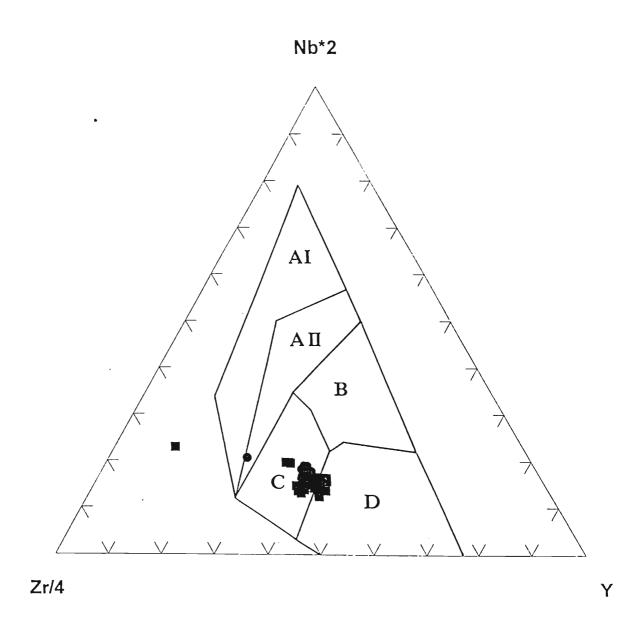


Figure 6.13: Ternary diagram of Nb-Zr-Y for mid-ocean ridge basalts (MORB) after Meschede (1986). Plotted samples are the lava rocks under study. The fields are; WPA, within plate alkaline basalts (A), P-type MORB, plume influenced basalts (B), WPT, within plate tholeiitic basalts (C) and N-type MORB, normal mid-ocean ridge basalt (D).

6.7 CRUSTAL CONTAMINATION

Crustal contamination is considered to be a major influence in the evolution the volcanic rocks of the Pongola Sequence but it is not easy to prove conclusively on the basis of major and trace elements. This is supported by the large Σ Nd value reported for the Nsuze Group lavas from Swaziland (Hegner *et al.*, 1984). The basement Ancient Gneiss Complex directly underlying the Pongola Sequence in Swaziland is a potential contaminant (Armstrong *et al.*, 1986). There is evidence from the present study that contamination has played an important role in the evolution of these lavas.

The contamination of rising basaltic magma could be accomplished initially with the emplacement of dykes under tensional conditions. The latent heat released by the crystallization from the dykes is presumed to raise temperatures in the crust (below level of free water circulation) to estimated levels by which melting of the more fusible components in the crust could take place (Patchett, 1980).

Contamination through mixing of cogenetic magmas on a local and limited scale may be responsible for or contribute to the deviation from normal standards of some of the lava rock chemical data. At Sigwe, field relations (absence of pyroclastics and tuffs, continuous lava flow units) indicate that the voluminous pile of lava was erupted rather quietly which favours this contamination process to be efficient and uniform.

The largely tholeiitic volcanics, Archaean (> 2.5 Ga) in age, are significant in that their chemistry bears no similarity to typical Archaean volcanic piles such as those found in greenstone belts. These lavas observed in the study overlie fluvial sediments and have intercalated fluvial sediments. They appear to have been extruded subaerially. Vesicles and amygdales are common but not uniform throughout the pile. Pillow lavas are absent. Tuffs and other pyroclastic rocks are also absent in these lava rocks.

Considerations of the tectonic setting of the volcanic rocks in question must be given mainly to continental environments. Modern convergent plate boundaries have explosive volcanism.

Divergent and within plate boundaries are characterized by proportions of fragmental volcanics which are missing in these lavas of the Pongola Sequence.

Continental flood basaltic volcanism in which acid rock types are very minor would seem an appropriate environment for these volcanic rocks. Contamination would have arisen by the interaction of mainly mafic magma with felsic basement crust. The acid rocks may be a result of partial melting of the felsic rocks.

6.8 COMPARISON OF COMPOSITIONS OF THE VOLCANIC ROCKS AND KNOWN NSUZE GROUP VOLCANIC LAVAS

The volcanic rocks studied have traditionally been regarded as being part of the Nsuze Group succession but this study presents the first geochemical analysis of the succession. Chemical studies have been carried out on volcanic rocks of the Nsuze Group from various parts of the Pongola basin by a number of workers (Armstrong, 1980; Preston, 1987). Armstrong (1980) investigated rocks of the Nsuze Group in northern Natal and southeastern Transvaal near Paulpietersburg (Witrivier), and Preston (1987) worked on the Mpongoza inlier also in northern Natal, east of Vryheid, which also constitute the Nsuze Group. It is appropriate to compare the geochemical characteristics obtained in this study with the data already existing for the Nsuze Group volcanics.

Figure 6.14 shows compositions of lavas from the Witrivier area (Armstrong, 1980) in Northern Natal and the Mpongoza inlier (Preston, 1987) plotted in the total alkalis versus silica diagram after Cox *et al.*, (1979). Data from the present study are shown as fields. The Nsuze rocks from the Witrivier area (Figure 6.14a) vary in composition from basalts and basaltic andesites, through andesites and dacites to rhyolites, with data showing a fairly coherent trend. The Mpongoza inlier rocks of the Nsuze Group (Figure 6.14b), largely plot outside the designated fields (therefore difficult to classify). Those samples that fall within the fields yield unrealistic classification names, apart from those within the andesitic field. The rocks from the Mpongoza inlier show extreme alteration and thus have caused serious dispersion of the data. The extreme depletion of alkalis is clearly one of the results of alteration. Samples in this study from southern Swaziland (shown as fields in Figures 6.14 and 6.1) also show significant depletion in alkalis, and therefore it must be inferred that alteration may have affected these samples. The general field of data for the Swaziland

samples conforms closely to the range of basalts and basaltic andesites from the Witrivier area with the three felsic samples from Sigwe Hills being rhyolites. Most trace element data (e.g incompatible elements) suggest these as being rhyolites but it is also clear that alkali depletion has taken place. It is noticeable that there is no evidence of a suite of dacites in the Swaziland occurrence.

The same three sets of geochemical data were also plotted on an AFM diagram to confirm magmatic affinity (Figure 6.15, Irvine and Baragar, 1971). The data for rocks from the Paulpietersburg area plot in the tholeiitic field (Armstrong, 1980). In contrast, the data from the Mpongoza inlier are widely scattered with many points plotting in the calc-alkaline field (Preston, 1987). The rock samples from southern Swaziland fall dominantly in the tholeiitic field with the exception of three samples which plot in the calc-alkaline field (Figure 6.15 and Figure 6.9). A feature of the alteration process is to impose apparent calc-alkaline characteristics on basaltic rocks. There is clear indication that this has happened in the Mpongoza inlier and also indicated in this study.

A comparison of major and trace element data between the Nsuze section studied by Armstrong (1980) and that of the present study in southern Swaziland is shown in the form of histograms in Figure 6.16a and b. Compositions for the lavas are compared for appropriate magma types (basalts and basaltic andesites). There is consistency in the two data sets both in average values and ranges, indicating broadly similar magma compositions. The incompatible trace elements (Zr, Y, Nb and Zn) show almost identical patterns. The compatible elements Ni and Cr do not show good agreement because these are highly subject to fractionation processes. Other elements such as Sr and Ba are likely to have been modified by alteration, and Cu is influenced by the presence of small amounts of sulphide.

Another comparison of the present data set with that from Witrivier area on the Pierce and Cann (1973) diagram of Ti/100-Zr-Y.3 for magma type, as related to tectonic setting (Figure 6.17), indicate a close overlap. Both data sets fall in the calc-alkaline basalts of orogenic environments. A calc-alkaline magmatic affinity is not appropriate for the volcanic setting of the Pongola Sequence and probably reflects the shortcomings of using this approach for ancient volcanic rocks. The important observation illustrated in this diagram is that the ratios of the incompatible elements in the lavas from the Nsuze Group in south eastern Transvaal

and the present data from Swaziland are effectively identical. The three felsic samples, RM02, RM03 and RM04 are not appropriate for this plot and all rhyolites have been omitted. Data from the Mpongoza inlier was not plotted onto this type of diagram because of inherent evidence of its alteration.

6.9 INCOMPATIBLE ELEMENT CONSIDERATIONS FOR THE LAVAS

When the basaltic lava rocks from the study area are normalized to primitive mantle composition (Figure 6.18) and plotted as a spidergram, it is evident that these rocks are relatively enriched in Ba, Rb, Th, U, Nb and Zr, but depleted in the Y, Cr, Ni and Zn. Normalized to continental crust (Figure 6.19) the Pongola Sequence volcanics are less depleted in respect to the crust in the Ba, Rb, Th and U trace element group. These lavas are significantly enriched in Nb, Sr and Zr. These plots give clear indication of a significant crustal component in the magmas. The trace element characteristics show an affinity to continental type settings (Norry and Fitton, 1983).

6.10 CONCLUSIONS BASED ON THE COMPARISON

There are essentially some similarities in respect of the major element compositions between the Nsuze Group lava rocks from the Witrivier area (Armstrong, 1980) and those from the present study. Significantly, the rocks from the present study are very different from the Nsuze Group volcanic rocks from the Mpongoza inlier area of Preston, 1987. This is probably due to the large extent to which the Mpongoza inlier rocks have been altered.

Considering incompatible element (Nb, Y, Zr and Ti) ratios, these are consistent and similar for the volcanic rocks from the present study and those from the Witrivier area. There are two very distinct data populations in the study area distinguished as Sigwe Hills and south of the Ngwavuma River. Element mobility is a definite feature in the Pongola Sequence volcanic rocks under study particularly considering the alkali elements. It is clear that these elements have undergone considerable depletion.

The rocks from the present study are restricted in compositional range to basalts and basaltic andesites, with a very minor population of rhyolites, than those from the Witrivier area which

have a wider array. The apparent inverse relations between some incompatible elements and compatible elements may be a result of lava disturbance of data by alteration and possible crustal contamination.

The ratios of trace elements to continental crust, indicate a clear enrichment in elements more related to the crust and depletion in mantle type elements. The combination of these relationships are indicative of both significant crustal contamination and extensive fractionation processes.

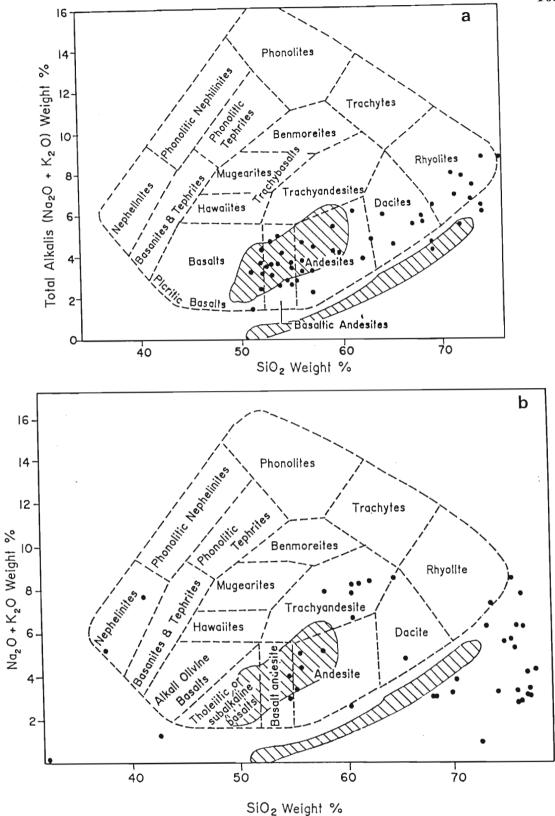


Figure 6.14: Compositional characteristics of the volcanic rocks in this study (dashed fields) compared with data from the Nsuze Group volcanic rocks. Designated fields are after Cox, *et al.*, 1979). a) Data points shown for the Nsuze Group volcanics from south eastern Transvaal (Armstrong, 1980). b) Data points shown for the Nsuze Group volcanics from the Mpongoza inlier (Preston, 1987).

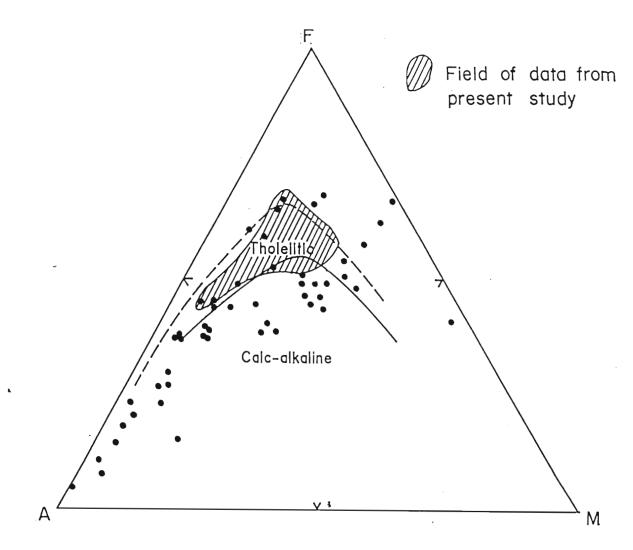


Figure 6.15: AFM diagram (Irvine and Baragar, 1971) for Nsuze Group volcanic rocks from the Mpongoza inlier and southeastern Transvaal. Solid line divides the tholeiitic and calc-alkaline fields. The hatched field is the trend for the data set obtained by Armstrong (1980) and the dots represent Mpongoza inlier rocks (Preston, 1987).

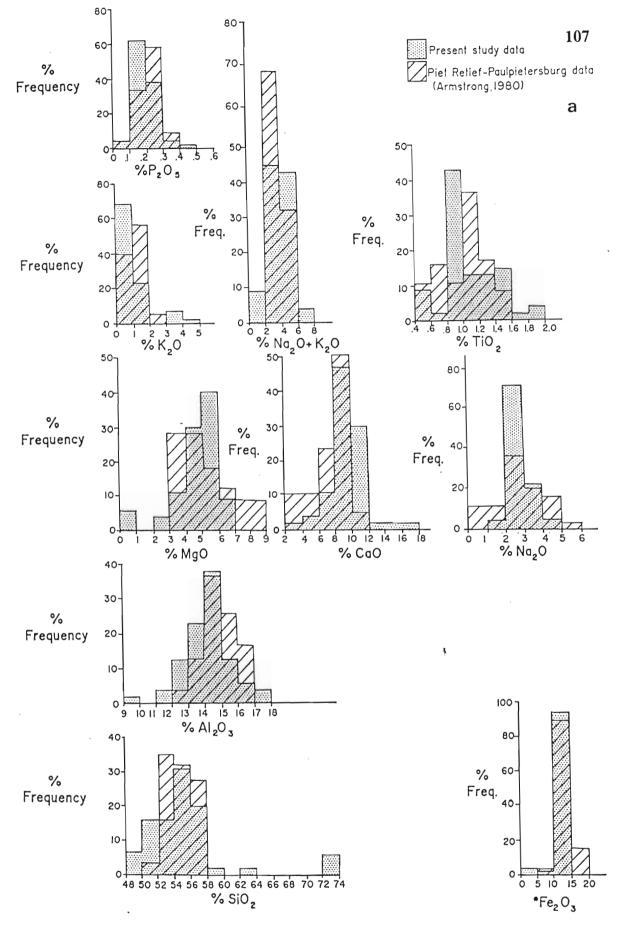


Figure 6.16: Element frequency distribution diagrams for data (basalt and basaltic andesite) from the Piet Retief-Paulpietersburg area (Armstrong 1980) and data from the present study; (a) Major elements (b) Trace elements.

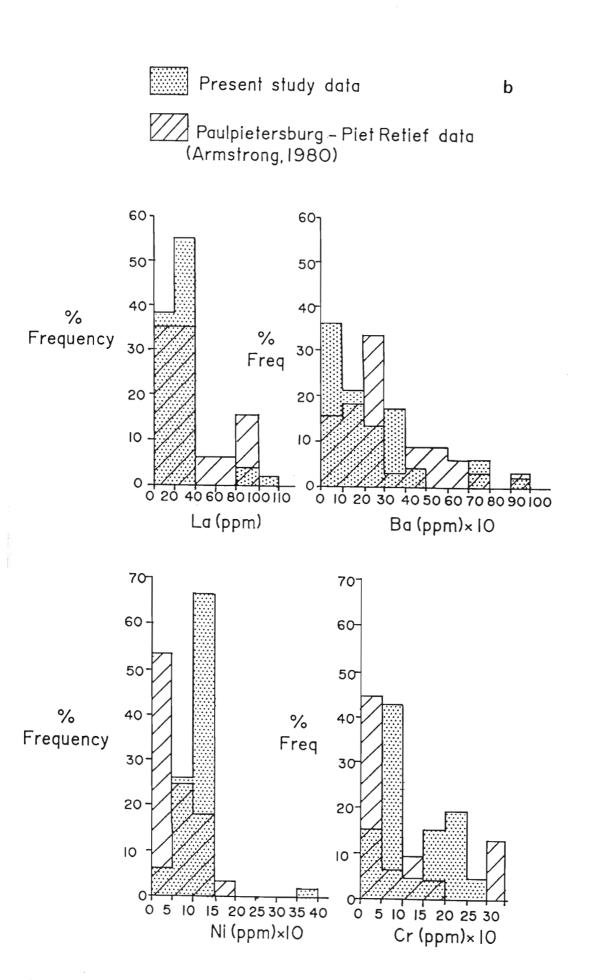
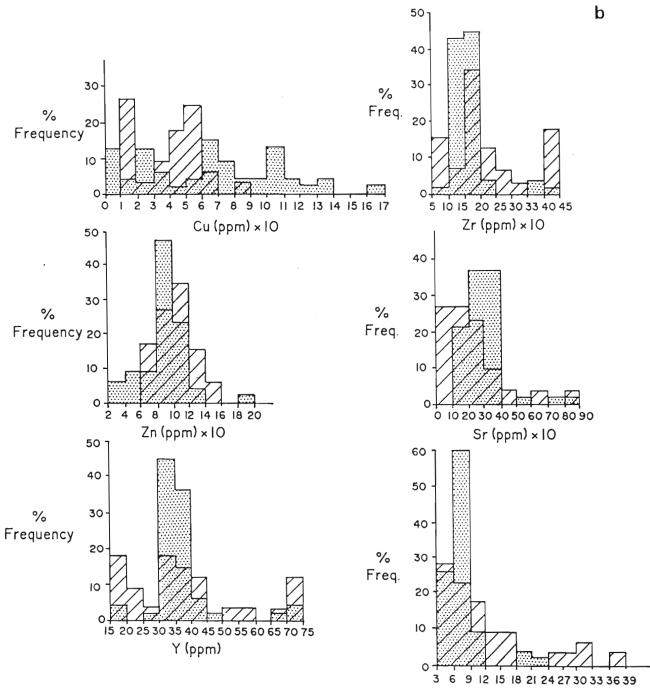


Figure 6.16 (continued).



Nb (ppm)

Figure 6.16 (continued).

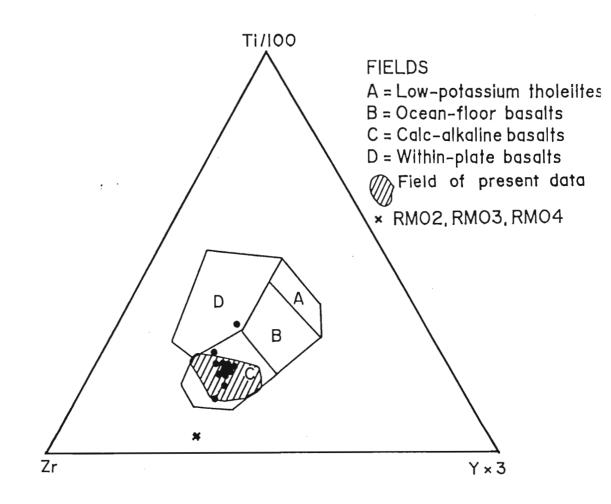


Figure 6.17: Pierce and Cann (1973) ternary plot for Nsuze Group volcanic rocks from the Witrivier area after Armstrong (1980) represented by dots. The outlined field is data for present study.

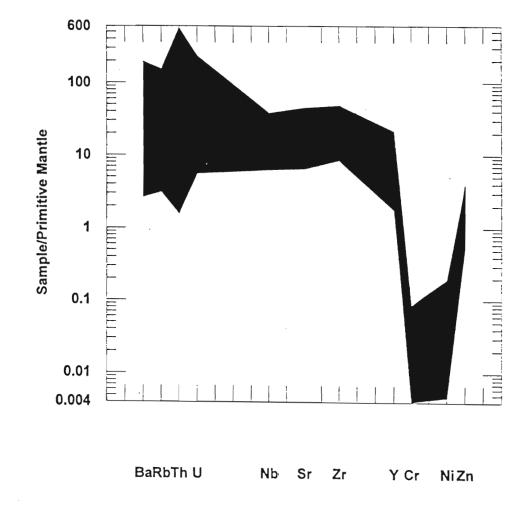


Figure 6.18: Block spider diagram showing the data of the present study normalized to primitive mantle composition.

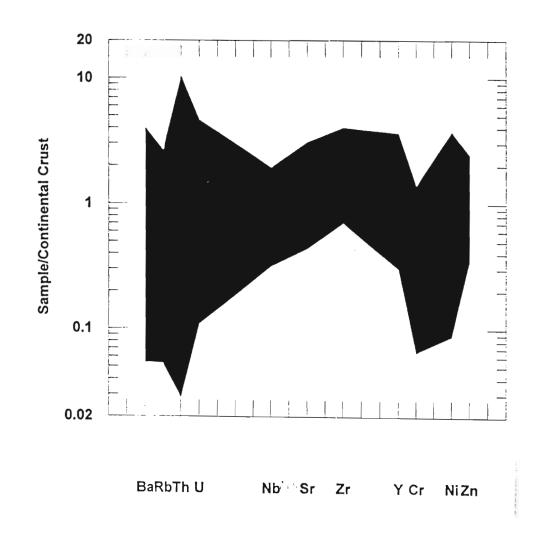


Figure 6.19: Block spider diagram showing the present study data normalized to the continental crust.

CHAPTER 7

SUMMARY AND CONCLUSIONS

7.1 CHARACTERISTICS AND CLASSIFICATION OF THE VOLCANIC ROCKS

The ~ 2.94 Ga Pongola Sequence volcanic rocks occupying the Sigwe Hills-Ngwavuma River valley consists of metavolcanic rocks interbedded with lenses of metaquartzite units and very minor phyllitic shales. The lack of marker horizons precludes the possibility of establishing the thicknesses of these lithologies. A number of granitoids and doleritic dykes intrude these Pongola Sequence rocks.

The lavas comprise mainly basalts, basaltic andesites and minor rhyolites. The intercalated sediments are mainly quartzites and arkosic sandstones which are regarded as fluvial deposits. The lava flows are amygdaloidal and vesicular in places owing to the effusive and quiet nature of their volcanism. Pillow lavas are absent and the pile is also devoid of tuffs and other pyroclastic material. The volcanism leading to these largely intermediate assemblages took place subaerially which is also supported by the vesicular nature of the flows in upper parts of the volcanic pile, the presence of intercalated fluvial sediments and lack of pillow lavas.

7.2 CORRELATIONS

The present study area is situated about 25 km southeast of Mooihoek, a locality where basaltic lava was identified and attributed to be part of the upper Mozaan stratigraphy (Hunter, 1963). This occurrence is in association with quartzite rocks of the Mozaan Group. The Mooihoek basalts occupy the core of a syncline whose axial trace trends northwest. The volcanic rocks and associated quartzites, strike north-south and are separated from the Mooihoek basalts by two granitic intrusions, the Mooihoek granite and the Kwetta granite. Xenolith metavolcanic rock bodies striking either north or northwest occur in the Kwetta batholith to the west of the study area. The Mooihoek basalts, the xenolithic bodies in the granite, and the metavolcanic rocks are considered to have originally been one large, elongate lava rock body which was fragmented by the granitic intrusions. This belt of volcanic rocks

probably extended as far south as the Magudu area, some 60km from the study area where similar volcanic rocks are designated as part of the upper Mozaan Group (Hunter, *pers. comm.*, 1992). It is on these grounds that this correlation is considered feasible.

7.3 METAMORPHISM AND STRUCTURE

The volcanic rocks have undergone alteration and metamorphism. Petrological evidence reveals that they have been subjected to low-grade regional metamorphism imposed by low temperature and low pressure conditions. These rocks have been metamorphosed to low grade, amphibolite facies.

Poor outcrop in the Sigwe-Ngwavuma valley inhibits structural evaluations in this part of the Pongola basin. Regionally, there are two dominant structural trends: a northwesterly trend and a north-south trend. In southern Swaziland, the known Mozaan Group (Mooihoek-Kubuta) is located in the nose of a syncline whose axial trace trends northwest.

7.4 CLASSIFICATION AND GEOCHEMISTRY

The Pongola Sequence lavas in the area of study represent a suite of rocks constituting a continuum in chemical composition from basalts and basaltic andesites to rhyolites. These different varieties are classified according to their silica content and total alkalies $(K_2O + Na_2O)$. Considerable scatter of the data in the variation diagrams indicate that these rocks have undergone alteration mainly as a result of metamorphism. It is also very evident from the various variation diagrams that within the suite of rocks under investigation there are two distinct groups, namely those from south of the Ngwavuma River (largely basaltic in nature), and those from the Sigwe Hills (andesitic to rhyolitic). The samples from south of the Ngwavuma River are generally enriched in TiO₂, Al₂O₃, CaO, Cr, Zr, Y and Nb but depleted in SiO₂, K₂O, Na₂O, Ba and U. This indicates that these rocks did not have a common origin even though they might have had a common source. The difference may have arisen through varying amounts of contamination and different fractionation processes. The majority of the samples from south of the Ngwavuma River have relatively low SiO₂ contents (<55%) and high MgO (4-6%) and may be less evolved than the group from Sigwe Hills (with $SiO_2 > 55\%$ and MgO between 1-6%). The former group may have resulted from a different part of the fractionation sequence coupled with crustal contamination.

Variation diagrams involving the High Field Strength elements (Zr, Nb, Ti and Y), which are regarded being effectively immobile, all show well constrained trends. These plots indicate that the volcanic rocks are a suite with a chemical composition from basalts to basaltic andesites through to very minor rhyolites.

The magma type is tholeiitic even though some samples show affinity for the calc-alkaline field. The magma series and tectonic setting for these Pongola Sequence lavas is deduced as being tholeiitic basalts from a within plate environment.

7.5 GENESIS OF THE LAVAS

The variations observed within the volcanic rocks under study are attributed to fractional crystallization from a common parental magma source. Contamination of co-genetic magmas are considered responsible for the deviation from normality for some of the lava compositions within the suite. There is no evidence to suggest that these magmas were primary partial melts from the mantle. Considering the discrimination diagram plots, there is inconsistency between the various diagrams (e.g in the Ti-Zr/100-Y.3 diagram where the data plots as calcalkaline basalts with a few samples plotting well outside the designated fields). Considering all the evidence, these volcanic lavas are seen as tholeiites which have undergone contamination and fractionation.

7.6 COMPARISON WITH NSUZE GROUP

Field descriptions of Armstrong (1980) indicated that in the southeastern Transvaal type area of the Nsuze Group there is presence of welded tuffs and air-fall tuffs which are absent in the area under investigation. In the Mpongoza inlier area, Preston (1987) described pyroclastics which are also absent in the present area of study. It seems, therefore, that the style of volcanism between these three areas is thus quite different.

Strong similarities exist between the volcanic rocks under investigation and those from the typical Nsuze Group Witrivier area. There are also similarities between the rocks under study and the four samples from known upper Mozaan Group localities (Hunter, 1963 and Hunter, *pers. comm.*, 1992) in southern Swaziland (Mooihoek), and northern KwaZulu-Natal (Magudu area). Notable differences between the present study and volcanic rocks from Mpongoza inlier

(Nsuze Group) are attributed to mainly alteration in the Mpongoza inlier rocks. Scatter of the data, as evidence of alteration (such as alkali depletion), increases from the Witrivier area (least altered) to the Mpongoza inlier (most altered) with the present study intermediate between these two. The degree of alteration of these rocks has not allowed detailed petrogenetic modelling to be carried out.

In the vicinity of Mooihoek in southern Swaziland, Hunter (1963) identified basaltic lavas located in a core of a syncline whose axial trace plunges northwest-southeast. He described these as "capping" a thick succession of Mozaan Group quartzites. These were unequivocally attributed to being the topmost exposed rocks in the Mozaan Group succession. Two samples from this area were analyzed together with the suite of rocks from the study area and it is very clear that their compositions are very similar. It is therefore logical in the present study, to correlate these volcanic lava bodies as being the stratigraphically highest parts of the Mozaan Group, as opposed to the Nsuze Group which in southern Swaziland is restricted to the far western border of the country.

The geochemical evidence indicates that the volcanic rocks in the study area are very similar to those in the Witrivier area, which is regarded as the type representative of the Nsuze Group lavas. There are also strong similarities to the four samples of volcanic rocks identified by Hunter (1963) as being part of the Mozaan Group. Field relations provide strong evidence that the volcanic rocks studied are part of the Mozaan Group and therefore it must be deduced that the magma which was emplaced in all periods of deposition of the Pongola basin was remarkably similar in composition.

In conclusion, it is clear that in the entire Pongola basin there are significant problems in terms of the structure and stratigraphy. In order for correlations to be made with more confidence, further studies need to be undertaken.

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APPENDIX 1

SAMPLE PREPARATION AND ANALYTICAL PROCEDURES

X-ray fluorescence spectrometry

Forty seven samples were analysed for major and trace elements by X-ray fluorescence spectrometry using a Philips PW 1404 X-ray spectrometer at the University of Natal, Pietermaritzburg. Major and minor elements were analysed using the lithium tetraborate fusion method of Norrish and Hutton (1969). Trace elements were analysed using pressed powder pellets.

A representative suite of rock samples for the above analyses were collected from fresh outcrops. Weathered material was removed from the sample and clean material was reduced to 5-10cm in size using a hydraulic splitter. These fragments were cleaned under running water, then in an ultrasonic cleaner and rinsed with distilled water. After being oven dried for one hour at 100° C they were then crushed in a jaw crusher with hardened steel jaws to fragments of less than 1cm in size and reduced to +/- 100g samples by cone and quartering. These were then milled in a steel mill to fine powders. The jaw crusher and mill were thoroughly cleaned using acetone after each sample had been processed.

Major elements were determined on Norrish fusion discs. The preparation of these disks involved the heating of approximately 0.5g of sample in silica crucibles (which had been previously cleaned in a dilute solution of HCl) to 100°C in order to dry the sample. The sample was then heated at 1000°C for a period of four hours, removed from the furnace and allowed to cool in a

desiccator. The flux used for the fusion (Johnson Matthey Spectroflux 105) was preheated in Pt crucibles at 1000°C and approximately 0.4g of the ashed sample was added so that the ratio of sample weight to flux was 1 : 5.4. The samples were then fused at 1000°C for two hours in Pt crucibles and the product was cast in a brass disc maintained at 250°C. The discs were annealed for approximately three hours on a heated asbestos plate and then allowed to cool gradually. Each new batch of flux was homogenised and a new set of standards made up.

Weight losses on ignition (L.O.I.) were calculated using a known amount of sample placed in silica crucible, ignited for two hours, cooled in a desiccator and then weighed. The difference in weight is the loss on ignition.

Pellets used to determine trace element concentrations were prepared in the following way. Approximately 8g of finely milled sample was mixed with 0.6ml of Mowiol binding agent using an agate pestle and mortar. The sample was then placed in a metal disc and compressed to a pellet \sim 5mm thick using \sim 8 tons of pressure. The pellets were hardened in an oven at 120°C for four hours. Ragged edges on the pellets were then trimmed, care being taken to avoid contact with the surface to be radiated. The pellets separated by cardboard discs, were stored in airtight containers.

Instrument calibration was controlled with international standards and internal synthetic standards and blanks. International standards used were DTS-1, PCC-1, GSP-1, W-1, BCR-1, G-2, AVG, NIM-G, NIM-N, NIM-P, NIM-D, NIM-S, NIM -L, BR, BHVO and DRN. Internationally accepted standard values are from Abbey (1980). Prof.A.H. Wilson of the Geology Department, University of Natal, Pietermaritzburg, compiled the computer programs for reduction of

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Analytical conditions, detection limits and accuracy are given in the Table below.

Conversions

Iron was determined as total iron (*Fe₂O₃) using the following formula:-

 $*Fe_2O_3 = [Fe_2O_3 + (FeO x 1.1113)]$

Ľ f f ed on 10% + allocation of Fe³⁺ is has

	Element	Tube	KY	Ha	Analysing Line	Analysing Crystal	Colliminator	Counter	Peak 2.	Count Time Sec.	Background 2	Count Time Sec.	Standard	-B1ants	Detection Limits	Analytical Accuracy
	s:0,	Cr	50	50	Ka	Pet	Coarse	Flow	109.165	60	106.000	30	S10: 100% NIMD 37.02%		0.004%	0.21
	A1,0,	Cr	50	50	Ka	-	•	-	145.040	60	139.160	30	NIHL 13.90:	Si0,	0.005%	0.5%
	Fei0,	Au	50	50	Ka	L1f200	Fine	-	57.525	40	Blank stan		NIML 10.28:	SiOz and 60CaO+40SiOz	0.001%	0.5%
	Hn0	Au	50	50	Ka	L1/200	-	-	62.990	40	used to ca background		NIML 0.78:	510# and 60Ca0+40510#	0.0011	0.51
01 10141	H ₃ 0	Cr	50	50	Ka	PX - 1	Coarse	•	23.300	60	25.300	30	W-1 6.55%	510,	0.011%	0.31
3	CaO	Cr	50	50	Ka	pet	Fine	-	45.240	40	Blank stan	dards	NIML 3.32:	SiOs and 40Fes0,60SiOs	0.0003\$	0.21
5	K=0	Cr	50	50	Ka	Pet	-	•	50.720	40	used to ca	librate	W-1 0.65%	Sile and 60Ca0+40Sile	0.0003\$	0.21
2	TiOr	Cr	50	50	Ka	Pet	-	-	36.720	40	background		W-1 1.05%	SiOr and 60CaO+40SiOr	0.00041	0.2%
10.10	P:0,	Cr	50	50	Ka	Ge	Coarse	-	141.040	60	133.000	30 30	BR 1.101	Sio,	0.0011	0.2%
110	NarO	Cr	50	50	Ka	PX-1	Fine	-	28,170	60	30.000	30	BR 3.12%	\$102	0.018:	2:
	Sc	Cr	50	50	Ka	L11200	-	-	97.730	60	95.850 98.555	30 30	BCR 33 ppm	SIOz and CaCOs	0.3 ppm	101
	Ba	Cr	50	50	La	L1f220	•	•	115.275	60	114.500 116.500	30 30	W-1 160 ppm	SiOa and HgO	1 ppm	<u>•</u> 20%
2	Zn	Au	50	50	Ka	L 1 f 200	-	-	41.795	60	39.65 45.70	30 30	NIMP 100 ppm	SiOz and CaCo.	0.3 ppm	<u>•</u> 101
,	Cu	Au	50	50	Ka	L1f200	-		45.040	50	39.65 46.70	30 30	W-1 110 ppm	Sill and CaCo.	0.2 pom	<u>•</u> 10%
	N Í	Au	50	50	КJ	LIF200		•	43.690	60	46.70	30 30	BR 260 ppm	SiOz and CaCo»	0.1 ppm	t 101
:	Cr	Au	50	50	Ka	Lif200	-	-	69.375	60	58.10 70.80	30 30	JBI 400 ppm	Sior	0.6 ppm	101
	Y	Au	50	50	Ka	L11220	-	-	123.220	60	117.10 123.80	30 30	W-1 260 ppm	5102	0.5 ppm	± 10%
	La	Au	50	50	Ka	L1f220	-	-	138.920	60	132.60 141.80	30 30	BR 80 ppm	SiOz	1.5 ppm	15%
	Zr	Rh	50	50	Ka .	L i f 220	-	Scint	32.045	60	29.30 34.89	30 30	AGV 230 ppm	SiOz	0.3 ppm	31
	Sr	Rh	50	50	Ka	LIFZZO		-	35.830	60	34.89 36.90	30 30	W-1 190 ppm	Si0a	0.2 ppm]1
	ND .	ጽኩ	50	50	Ka	L1f220	•	-	30.420	60	29.45 34.80	30 30	GSP 23 ppm	510#	0.1 ppm 3	31
	Y	Rh	50	50	Ka	L1/220	•	-	33.855	60	29.45 34.80	30 30	NIMG 145 ppm	\$10z	0.3 ppm 3	31
	Rb	Rh	50	50	Ka	L1/220	•	-	37.960	60	34.80 41.10	30 30	NING 320 ppm	510z	0.4 ppm	21
	U	Rh	50	50	Ka	L11220	-	-	37,300		36.90 41.10	30 30	NIHG 15 ppm	S10.	0.1 ppm 2	or
	Th	Rħ	50	50	Ka	L1f220	-	-	39.250		36.90 41.10	30 30	GSP 105 ppm	SiOz	0.5 ppm 20	01

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APPENDIX 2

THIN-SECTION DESCRIPTIONS

Brief thin section description of some of the geochemical samples used to characterise the chemistry of the Pongola Sequence volcanic rocks studied are given below :-

ROCK TYPE	SAMPLE NUMBER	MAJOR MINERALS	MINOR MINERALS	REMARKS
Basalt	RM 01	Actinolite, quartz, feldspar.	Epidote, zoisite, chlorite (penninite)op- aques	Actinolite is altering to chlorite. Feldspar is saussuritized. Quartz is in amygdales and veins with groundmass.
Rhyolite	RM 02	Amphibole, quartz, feldspar.	Calcite, zoisite, ilmenite.	Amphiboles altering to chlorite. Quartz is phenocrystic but also in groundmass with chlorite, amphibole and feldspar. Ilmenite is altering to leucoxene.
Basalt	RM 09	Plagioclase, amphibole and quartz.	Chlorite and leucoxene.	Relict plagioclase crystals display albite twinning. Plagioclase is saussuritized. Amphibole is altering to chlorite.
Basalt	RM 10	Quartz, actinolite and feldspar.	Hornblende, penninite, zoisite and epidote.	Quartz, chlorite, epidote, amphiboles and zoisite found in groundmass and in fractures and veinlets.
Basalt	RM 11	Amphiboles (tremolite- actinolite and hornblende), quartz and feldspar.	chlorite and opaque grains.	Amphiboles have been altered to epidote and zoisite. Feldspar is saussuritized.
Basalt	МК 005	Amphiboles, plagioclase and quartz.	chlorite, zoisite, epidote and leucoxene.	Quartz is in the matrix and in veins. Plagioclase is relict due to saussuritization. Epidote, zoisite and chlorite also in veins with quartz.
Basalt	МК 013	Quartz and amphiboles.	Epidote, zoisite, sphene, haematite and leucoxene	Quartz is mainly in elliptically shaped amygdales. Chlorite, epidote and zoisite are the core of the amygdales and in groundmass.
Schist	HM 02	Andalusite and actinolite.	Chloritoid, chlorite and zoisite.	Actinolite has a brownish tinge (it is prograde)
Schist	M 17	Amphibole (grunerite, cummingtonite) and epidote.	Quartz and magnetite	Amphibole elongate grains wrap around quartz crystals forming a decussate texture. Epidote grows across the general foliation direction. Grunerite is breaking down.

APPENDIX 3

Some common parameters used in the description of structural data are shown below for the Sigwe Hills road cutting data :-

	JOINTS	S _o	S ₁
N	30	21	31
Distribution type	Girdle	Girdle or cluster	Cluster
Woodcock fabric shape parameter	0.878	0.955	3.192
Strength of distribution	Weak preferential orientation	Weak preferential orientation	Weak preferential orientation
Woodcock fabric strength parameter	3.064	2.925	2.929
Lisle Hossack strength parameter	2.168	2.069	2.164
Fisher's constant (K)	-	-	10.245
Spherical variance	-	-	0.091
Raleigh uniformity parameter	0.658	-	0.909

APPENDIX 4

PETRONORMS

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PETRONORMS PROGRAM SAMPLE NUMBER MK001 OXIDES GIVEN RECALC 100% MOL PROPS CAT PROPS SiO2 52.36 52.517 0.874 0.874 14.985 0.147 0.294 Al2O3 14.94 0.016 1.264 0.008 Fe2O3 1.26 0.143 0.143 FeO 10.23 10.261 0.19 0.191 0.003 0.003 MnO 5.82 0.145 5.837 0.145 MqO 10.150 0.181 0.181 CaO 10.12 0.047 Na2O 2.90 2.909 0.094 K2O 0.22 0.221 0.002 0.005 TiO2 1.41 1.415 0.018 0.018 P205[.] 0.25 0.004 0.251 0.002 0.000 Cr203 0.00 0.000 0.000 TOTAL 99.70CIPW NORM..... q c or ab an lc ne kp wo 2.463 0.000 1.304 24.611 27.179 0.000 0.000 0.000 0.000 en fs fo fa hy ol ac mt hm 9.725 0.000 0.000 21.474 0.000 0.000 1.832 0.000 11.749 il ap cm tn pf ns ks cs ru di 2.688 0.594 0.000 0.000 0.000 0.000 0.000 0.000 0.000 17.870 CIPWNORM TOTAL = 100.015**** PARAMETERS FOR CIPW NORMATIVE MINERALS HYPERSTHENE COMPOSITION:EN 54.713 FS 45.287 FELDSPAR COMPOSITION :KFS 2.456 AB 46.354 AN 51.190 PLAGIOCLASE PERCENT ANORTHITE 52.479 QUARTZ : FELDSPAR RATIOS: QUARTZ 4.434 ORTHOCLASE 2.347 PLAGIOCLASE 93.219 QUARTZ 8.681 ORTHOCLASE 4.595 ALBITE 86.724 CHAPPELS A/CNK INDEX 0.638 MG No. IN CATIONS 47.72 AFM PARAMETERS: A = 0.15 F = 0.56 M = 0.29JENSEN CATION PLOT A = 0.37 M = 0.17 F = 0.46.....CATANORM..... q c or ab an lc ne kp wo 2.310 0.000 1.320 26.440 27.520 0.000 0.000 0.000 0.000 en fs fo fa hy ol ac mt hm 11.545 9.556 0.000 0.000 21.101 0.000 0.000 1.338 0.000 il ap cm tn pf ns ks CS ru di 1.996 0.531 0.000 0.000 0.000 0.000 0.000 0.000 0.00017.446 CATANORM TOTAL =100.000 ... MESONORM (HUCHISONS ALGORYTHM...) Q C Or Ab An Lc Ne Wo Ri Act Ed 0.42 0.00 0.00 26.44 27.52 0.00 0.00 0.00 25.23 0.00 0.00 Di Нy 01 (En Fs Fo Fa) Mt Hm HORNBLENDE 0.00 13.42 0.00 0.00 0.00 0.00 0.00 1.34 0.00 25.225 \mathbf{Tn} Ρf Ks Cs Ru BIOTITE Sp Ap Ns Cm 0.60 0.00 2.99 0.00 0.00 0.00 0.00 0.00 2.112 MESONORM TOTAL = 100.066

PETRONORMS PROGRAM SAMPLE NUMBER MK002 OXIDES GIVEN RECALC 100% MOL PROPS CAT PROPS 132 50.090 0.834 0.834 SiO2 49.93 Al2O3 16.61 16.663 0.163 0.327 0.009 0.018 Fe2O3 1.42 1.425 11.537 0.161 0.161 FeO 11.50 0.003 MnO 0.18 0.181 0.003 0.114 4.595 0.114 MgO 4.58 11.457 0.204 0.204 CaO 11.42 0.032 Na20 1.99 1.996 0.064 K2O 0.26 0.003 0.006 0.261 0.019 1.51 1.516 0.019 TiO2 0.281 0.002 P205 0.28 0.004 Cr203 0.00 0.000 0.000 0.000 TOTAL 99.68CIPW NORM..... q c or ab an lc ne kp wo 2.914 0.000 1.541 16.892 35.735 0.000 0.000 0.000 0.000 en fs fo fa hy ol ac mt hm 9.672 11.474 0.000 0.000 21.146 0.000 0.000 2.065 0.000 il ap cm tn pf ns ks cs ru di 2.879 0.665 0.000 0.000 0.000 0.000 0.000 0.000 16.180 CIPWNORM TOTAL = 100.017PARAMETERS FOR CIPW NORMATIVE MINERALS HYPERSTHENE COMPOSITION:EN 45.738 FS 54.262 FELDSPAR COMPOSITION :KFS 2.845 AB 31.184 AN 65.971 PLAGIOCLASE PERCENT ANORTHITE 67.903 QUARTZ : FELDSPAR RATIOS: QUARTZ 5.104 ORTHOCLASE 2.700 PLAGIOCLASE 92.195 QUARTZ 13.649 ORTHOCLASE 7.220 ALBITE 79.130 CHAPPELS A/CNK INDEX 0.683 MG No. IN CATIONS 38.98 AFM PARAMETERS: A = 0.11 F = 0.65 M = 0.23JENSEN CATION PLOT A = 0.39 M = 0.12 F = 0.48CATANORM........... ne kp q c or ab an lc wo 2.767 0.000 1.580 18.377 36.644 0.000 0.000 0.000 0.000 en fs fo fa hy ol ac mt hm 9.393 11.143 0.000 0.000 20.536 0.000 0.000 1.527 0.000 il ap cm tn pf ns ks cs ru di 2.165 0.602 0.000 0.000 0.000 0.000 0.000 0.000 0.00015.803 CATANORM TOTAL =100.000 ... MESONORM (HUCHISONS ALGORYTHM...) An Lc Ne Wo Ri С Or Ab Q Act Ed 1.20 0.00 0.00 18.38 36.64 0.00 0.00 0.00 21.51 0.00 0.00 Di Hy Ol (En Fs Fo Fa) Mt Hm HORNBLENDE 0.00 14.36 0.00 0.00 0.00 0.00 0.00 1.53 0.00 21.513 Ap Cm Tn Ρf Ns Ks Cs Ru BIOTITE Sp 0.68 0.00 3.25 0.00 0.00 0.00 0.00 0.00 2.528 MESONORM TOTAL = 100.075

PETRONORMS PROGRAM SAMPLE NUMBER MK003 133 OXIDES GIVEN RECALC 100% MOL PROPS CAT PROPS 0.870 SiO2 52.13 52.252 0.870 15.065 0.148 0.296 Al203 15.03 1.323 0.017 Fe2O3 1.32 0.008 0.149 0.149 FeO 10.70 10.725 MnO 0.19 0.190 0.003 0.003 0.154 0.154 6.21 6.225 MgO 9.98 0.178 0.178 CaO 10.003 0.038 0.077 Na2O 2.37 2.376 0.002 0.005 K2O 0.22 0.221 0.017 0.017 TiO2 1.38 1.380 P205 0.24 0.241 0.002 0.003 Cr203 0.00 0.000 0.000 0.000 TOTAL 99.77CIPW NORM..... q c or ab an lc ne kp wo 3,909 0.000 1.303 20.100 29.792 0.000 0.000 0.000 0.000 en fs fo fa hy ol ac mt hm 13,558 11.098 0.000 0.000 24.656 0.000 0.000 1.918 0.000 il ap cm tn pf ns ks cs ru di 2.621 0.570 0.000 0.000 0.000 0.000 0.000 0.000 0.000 15.146 CIPWNORM TOTAL = 100.015PARAMETERS FOR CIPW NORMATIVE MINERALS HYPERSTHENE COMPOSITION:EN 54.989 FS 45.011 FELDSPAR COMPOSITION :KFS 2.545 AB 39.262 AN 58.193 PLAGIOCLASE PERCENT ANORTHITE 59.713 QUARTZ : FELDSPAR RATIOS: OUARTZ 7.095 ORTHOCLASE 2.365 PLAGIOCLASE 90.541 QUARTZ 15.445 ORTHOCLASE 5.148 ALBITE 79.407 CHAPPELS A/CNK INDEX 0.675 MG No. IN CATIONS 48.22 AFM PARAMETERS: A = 0.13 F = 0.57 M = 0.30 JENSEN CATION PLOT A = 0.37 M = 0.17 F = 0.46......CATANORM..... q c or ab an lc kp ne wo 3.679 0.000 1.324 21.672 30.276 0.000 0.000 0.000 0.000 en fs fo fa hy ol ac mt hm 13.381 10.953 0.000 0.000 24.333 0.000 0.000 1.405 0.000 il ap cm tn pf ns ks cs ru di 1.954 0.511 0.000 0.000 0.000 0.000 0.000 0.000 0.00014.846 CATANORM TOTAL =100.000 ********* ... MESONORM (HUCHISONS ALGORYTHM...) Q C Or Ab An Lc Ne Wo Ri Act Ed 2.13 0.00 0.00 21.67 30.28 0.00 0.00 0.00 20.51 0.00 0.00 Ну Di Ol (En Fs Fo Fa) Mt Hm HORNBLENDE 0.00 18.45 0.00 0.00 0.00 0.00 0.00 1.41 0.00 20.511 . Ap Cm \mathbf{Tn} Ρf Ns Ks Cs Ru BIOTITE Sp 0.57 0.00 2.93 0.00 0.00 0.00 0.00 0.00 2.118 MESONORM TOTAL = 100.064

PETRONORMS PROGRAM SAMPLE NUMBER MK004 134 OXIDES GIVEN RECALC 100% MOL PROPS CAT PROPS 0.841 0.841 SiO2 50.28 50.542 Al2O3 15.05 15.128 0.148 0.297 0.017 Fe203 0.009 1.39 1.397 11.298 0.157 0.157 FeO 11.24 0.191 0.003 0.003 MnO 0.19 0.158 0.158 6.363 MgO 6.33 CaO 10.58 10.635 0.190 0.190 2.503 0.040 0.081 Na2O 2.49 0.261 K2O 0.26 0.003 0.006 1.430 0.018 0.018 TiO2 1.42 P205 0.25 0.251 0.002 0.004 0.000 Cr203 0.00 0.000 0.000 TOTAL 99.48CIPW NORM..... q c or ab an lc ne kp wo 0.131 0.000 1.544 21.178 29.271 0.000 0.000 0.000 0.000 en fs fo fa hy ol ac mt hm 13.237 11.179 0.000 0.000 24.416 0.000 0.000 2.026 0.000 il ap cm tn pf ns ks cs ru di 2.715 0.595 0.000 0.000 0.000 0.000 0.000 0.000 18.138 CIPWNORM TOTAL = 100.015***** PARAMETERS FOR CIPW NORMATIVE MINERALS HYPERSTHENE COMPOSITION:EN 54.216 FS 45.784 FELDSPAR COMPOSITION :KFS 2.970 AB 40.732 AN 56.298 PLAGIOCLASE PERCENT ANORTHITE 58.022 QUARTZ : FELDSPAR RATIOS: QUARTZ 0.252 ORTHOCLASE 2.963 PLAGIOCLASE 96.785 QUARTZ 0.575 ORTHOCLASE 6.758 ALBITE 92.668 CHAPPELS A/CNK INDEX 0.637 MG No. IN CATIONS 47.46 AFM PARAMETERS: A = 0.13 F = 0.58 M = 0.29 JENSEN CATION PLOT A = 0.36 M = 0.17 F = 0.47......CATANORM...... q c or ab an lc ne kp wo 0.123 0.000 1.567 22.807 29.711 0.000 0.000 0.000 0.000 en fs fo fa hy ol ac mt hm 13.021 10.996 0.000 0.000 24.017 0.000 0.000 1.482 0.000 di il ap cm tn pf ns ks cs ru 2.021 0.533 0.000 0.000 0.000 0.000 0.000 0.000 0.00017.738 CATANORM TOTAL =100.000 ... MESONORM (HUCHISONS ALGORYTHM...) Or Ne С Ab Q An Lc Wo Ri Act \mathbf{Ed} 0.00 0.00 0.00 20.73 29.71 0.00 0.00 0.00 19.46 0.00 6.64 . Hy Ol (En Fs Fo Di Fa) Mt Hm HORNBLENDE 0.00 15.91 0.00 0.00 0.00 0.00 0.00 1.48 0.00 26.095 Ρf Ap Cm \mathbf{Tn} Ns Ks Cs Ru BIOTITE Sp

0.60 0.00 3.03 0.00 0.00 0.00 0.00 2.507 MESONORM TOTAL = 100.067

PETRONORMS PROGRAM SAMPLE NUMBER MK005 135 OXIDES GIVEN RECALC 100% MOL PROPS CAT PROPS 0.869 0.869 SiO2 51.91 52.209 14.553 0.143 0.285 Al2O3 14.47 Fe2O3 1.35 0.009 0.017 1.358 0.153 0.153 11.023 FeO 10.96 0.003 0.003 MnO 0.18 0.181 5.74 5.773 0.143 0.143 MgO 0.192 10.752 0.192 CaO 10.69 2.11 0.034 0.068 2.122 Na2O 0.003 0.007 K20 0.31 0.312 0.018 0.018 TiO2 1.45 1.456 P205 0.26 0.261 0.002 0.004 Cr2O3 0.00 0.000 0.000 0.000 TOTAL 99.43 q c or ab an lc ne kp wo 4.835 0.000 1.842 17.956 29.263 0.000 0.000 0.000 0.000 en fs fo fa hy ol ac mt hm 11.646 10.510 0.000 0.000 22.156 0.000 0.000 1.969 0.000 il ap cm tn pf ns ks cs ru di 2.765 0.619 0.000 0.000 0.000 0.000 0.000 0.000 18.611 CIPWNORM TOTAL = 100.016PARAMETERS FOR CIPW NORMATIVE MINERALS HYPERSTHENE COMPOSITION:EN 52.564 FS 47.436 FELDSPAR COMPOSITION :KFS 3.755 AB 36.599 AN 59.646 PLAGIOCLASE PERCENT ANORTHITE 61.973 QUARTZ : FELDSPAR RATIOS: QUARTZ 8.970 ORTHOCLASE 3.418 PLAGIOCLASE 87.611 QUARTZ 19.627 ORTHOCLASE 7.479 ALBITE 72.894 CHAPPELS A/CNK INDEX 0.623 MG NO. IN CATIONS 45.66 AFM PARAMETERS: A = 0.12 F = 0.60 M = 0.28 JENSEN CATION PLOT A = 0.36 M = 0.16 F = 0.48.....CATANORM..... ne kp q c or ab an lc wo 4.574 0.000 1.881 19.461 29.893 0.000 0.000 0.000 0.000 en fs fo fa hy ol ac mt hm 11.477 10.357 0.000 0.000 21.834 0.000 0.000 1.450 0.000 il ap cm tn pf ns ks cs ru di 2.072 0.558 0.000 0.000 0.000 0.000 0.000 0.000 0.00018.277 CATANORM TOTAL =100.000 ********* ... MESONORM (HUCHISONS ALGORYTHM...) Q C Or Ab An Lc Ne Wo Ri Act \mathbf{Ed} 2.90 0.00 0.00 19.46 29.89 0.00 0.00 0.00 26.50 0.00 0.00 Ol (En Di Hy Fs Fo Fa) Mt Hm HORNBLENDE 0.00 13.12 0.00 0.00 0.00 0.00 0.00 1.45 0.00 26.501

Ap Cm Tn Pf Ns Ks Cs Ru BIOTITE Sp 0.63 0.00 3.11 0.00 0.00 0.00 0.00 0.00 3.010 MESONORM TOTAL = 100.070

PETRONORMS PROGRAM SAMPLE NUMBER MK006 136 OXIDES GIVEN RECALC 100% MOL PROPS CAT PROPS 0.876 0.876 52.619 SiO2 52.39 Al2O3 14.81 14.875 0.146 0.292 1.31 0.016 0.008 1.316 Fe203 0.148 0.148 10.616 FeO 10.57 0.002 0.171 0.002 0.17 MnO 0.131 0.131 5.283 5.26 MqO 0.190 10.646 0.190 CaO 10.60 2.521 0.041 0.081 2.51 Na2O 0.36 0.362 0.004 0.008 K20 0.017 0.017 TiO2 1.35 1.361 0.231 P205 0.23 0.002 0.003 0.000 0.000 Cr2O3 0.00 0.000 TOTAL 99.56CIPW NORM..... q c or ab an lc ne kp 4.025 0.000 2.137 21.330 28.203 0.000 0.000 0.000 0.000 en fs fo fa hy ol ac mt hm 10.251 9.769 0.000 0.000 20.020 0.000 0.000 1.908 0.000

ap cm tn pf ns ks cs ru di il 2.584 0.547 0.000 0.000 0.000 0.000 0.000 0.000 0.000 19.261 CIPWNORM TOTAL = 100.014*****

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PARAMETERS FOR CIPW NORMATIVE MINERALS HYPERSTHENE COMPOSITION:EN 51.205 FS 48.795 FELDSPAR COMPOSITION :KFS 4.135 AB 41.282 AN 54.583 PLAGIOCLASE PERCENT ANORTHITE 56.937 QUARTZ : FELDSPAR RATIOS: QUARTZ 7.227 ORTHOCLASE 3.836 PLAGIOCLASE 88.936 QUARTZ 14.641 ORTHOCLASE 7.772 ALBITE 77.587 CHAPPELS A/CNK INDEX 0.623 MG No. IN CATIONS 44.38

AFM PARAMETERS: A = 0.14 F = 0.59 M = 0.26JENSEN CATION PLOT A = 0.37 M = 0.15 F = 0.47

.....CATANORM.....

q c or ab an lc ne kp wo 3.797 0.000 2.175 23.052 28.727 0.000 0.000 0.000 0.000 fs fo fa hy ol ac mt hm en 10.036 9.564 0.000 0.000 19.599 0.000 0.000 1.401 0.000 il ap cm tn pf ns ks cs ru di 1.930 0.492 0.000 0.000 0.000 0.000 0.000 0.000 0.00018.826 CATANORM TOTAL =100.000

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... MESONORM (HUCHISONS ALGORYTHM...) An LC Ne Ri Q C Or Ab Wo Act Ed 2.27 0.00 0.00 23.05 28.73 0.00 0.00 0.00 28.06 0.00 0.00 Hy Di Ol (En Fs Fo Fa) Mt. Hm HORNBLENDE 0.00 9.63 0.00 0.00 0.00 0.00 0.00 1.40 0.00 28.059 Ap Cm \mathbf{Tn} Ρf Ns Ks Cs Ru BIOTITE Sp 0.55 0.00 2.90 0.00 0.00 0.00 0.00 0.00 3.481 MESONORM TOTAL = 100.061

PETRONORMS PROGRAM SAMPLE NUMBER MK007

OXIDES	GIVEN	RECALC 100%	MOL PROPS	CAT PROPS
SiO2	50.81	51.143	0.851	0.851
A1203	15.38	15.481	0.152	0.304
Fe203	1.41	1.419	0.009	0.018
FeO	11.46	11.535	0.161	0.161
MnO	0.18	0.181	0.003	0.003
MgO	4.49	4.519	0.112	0.112
CaO	11.76	11.837	0.211	0.211
Na2O	1.88	1.892	0.031	0.061
К2О	0.27	0.272	0.003	0.006
TiO2	1.43	1.437	0.018	0.018
P205	0.28	0.282	0.002	0.004
Cr203	0.00	0.000	0.000	0.000
TOTAL .	99.35			
		CIPW NOR	хм	

q c or ab an lc ne kp wo 4.779 0.000 1.606 16.011 32.944 0.000 0.000 0.000 0.000 en fs fo fa hy ol ac mt hm 8.624 10.478 0.000 0.000 19.101 0.000 0.000 2.058 0.000 il ap cm tn pf ns ks cs ru di 2.730 0.668 0.000 0.000 0.000 0.000 0.000 0.000 20.121 CIPWNORM TOTAL = 100.017

PARAMETERS FOR CIPW NORMATIVE MINERALS HYPERSTHENE COMPOSITION:EN 45.147 FS 54.853 FELDSPAR COMPOSITION :KFS 3.176 AB 31.667 AN 65.156 PLAGIOCLASE PERCENT ANORTHITE 67.294 QUARTZ : FELDSPAR RATIOS: QUARTZ 8.636 ORTHOCLASE 2.902 PLAGIOCLASE 88.463 QUARTZ 21.338 ORTHOCLASE 7.171 ALBITE 71.491 CHAPPELS A/CNK INDEX 0.621 MG NO. IN CATIONS 38.60

AFM PARAMETERS: A = 0.11 F = 0.66 M = 0.23 JENSEN CATION PLOT A = 0.38 M = 0.13 F = 0.50CATANORM.....

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... MESONORM (HUCHISONS ALGORYTHM...) Q C Or Ab An Lc Ne Wo Ri Act Ed 2.57 0.00 0.00 17.47 33.88 0.00 0.00 0.00 29.20 0.00 0.00 Di Hy Ol (En Fa) Fs Fo Mt Hm HORNBLENDE 0.00 9.03 0.00 0.00 0.00 0.00 0.00 1.53 0.00 29.202 Ap Pf Cm \mathbf{Tn} Ns Ks Cs Ru BIOTITE Sp 0.68 0.00 3.09 0.00 0.00 0.00 0.00 0.00 2.641 MESONORM TOTAL = 100.076

	UMBER								138
OXIDES									150
	51.20		51.45		0.85		0.856		
	15.03		15.10			18			
	1.35		1.35		0.00		0.017		
	10.97		11.02		0.1		0.153		
	0.18		0.18		0.0		0.003		
-	5.43		5.45		0.1		0.135		
	11.16		11.21		0.2		0.200		
	2.34		2.35		0.0		0.076		
	0.18		0.18		0.0		0.004		
	1.42		1.42		0.0		0.018		
	0.25		0.25		0.0		0.004		
	0.00		0.00	0	0.0	00	0.000		
TOTAL	99.51								
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CIPWNORN	I TOTAL	= 100	.015						
		****	*****	*****	******	****			
I	PARAMET	ERS FO	R CIPW	NORMA	TIVE MI	NERALS			
HYPERST	HENE CO	MPOSIT	ION:EN	51.	087 FS	48.9	13		
FELDSPAL	R COMPO	SITION	:KFS	2.0	92 AB	38.946	AN 5	8.962	
						38.946	5 AN 5	8.962	
PLAGIOCI	LASE PE	RCENT	ANORTHI			38.946	5 AN 5	8.962	
PLAGIOCI QUARTZ	LASE PE : FELDS	RCENT	ANORTHI TIOS:	ITE 6	0.222				
PLAGIOCI QUARTZ QUARTZ	LASE PE : FELDS 5.543	RCENT PAR RA ORTHO	ANORTHI TIOS: CLASE	ITE 6	0.222 PLAGI	OCLASE			
PLAGIOCI QUARTZ QUARTZ QUARTZ	LASE PE : FELDS 5.543 12.510	PAR RAS	ANORTHI TIOS: CLASE CLASE	ITE 6 1.976 1.461	0.222 PLAGI	OCLASE			
PLAGIOCI QUARTZ QUARTZ QUARTZ CHAPPEL:	LASE PE : FELDS 5.543 12.510 S A/CNK	RCENT A PAR RA ORTHO ORTHO	ANORTHI TIOS: CLASE CLASE (0.618	ITE 6 1.976 1.461	0.222 PLAGI	OCLASE			
PLAGIOCI QUARTZ QUARTZ QUARTZ	LASE PE : FELDS 5.543 12.510 S A/CNK	RCENT A PAR RA ORTHO ORTHO	ANORTHI TIOS: CLASE CLASE (0.618	ITE 6 1.976 1.461	0.222 PLAGI	OCLASE			
PLAGIOCI QUARTZ QUARTZ QUARTZ CHAPPELS MG No.	LASE PE : FELDS 5.543 12.510 S A/CNK IN CATI	RCENT 2 PAR RA ORTHO ORTHO INDEX	ANORTHI TIOS: CLASE CLASE 4 0.618 44.27	ITE 6 1.976 4.461 3	0.222 PLAGI ALBITE	OCLASE 83.029			
PLAGIOCI QUARTZ QUARTZ QUARTZ CHAPPEL MG No. AFM PAR	LASE PE : FELDS 5.543 12.510 S A/CNK IN CATI AMETERS	PAR RAY ORTHO ORTHO ORTHO INDEX ONS	ANORTHI TIOS: CLASE CLASE 4 0.618 44.27 0.13 F	TE 6 1.976 1.461 3 = 0.6	0.222 PLAGI ALBITE	OCLASE 83.029	92.481		
PLAGIOCI QUARTZ QUARTZ QUARTZ CHAPPELS MG No.	LASE PE : FELDS 5.543 12.510 S A/CNK IN CATI AMETERS	PAR RAY ORTHO ORTHO ORTHO INDEX ONS	ANORTHI TIOS: CLASE CLASE 4 0.618 44.27 0.13 F	TE 6 1.976 1.461 3 = 0.6	0.222 PLAGI ALBITE	OCLASE 83.029	92.481		
PLAGIOCI QUARTZ QUARTZ QUARTZ CHAPPEL MG NO. AFM PAR JENSEN	LASE PE : FELDS 5.543 12.510 S A/CNK IN CATI AMETERS CATION	PAR RA ORTHO ORTHO ORTHO CONS CONS CONS	ANORTHI TIOS: CLASE CLASE 0.618 44.27 0.13 F A = 0	(TE 6 1.976 1.461 3 = 0.6 .37 M	0.222 PLAGI ALBITE 1 M = (OCLASE 83.029 0.27 5 F = 0	92.481		
PLAGIOCI QUARTZ QUARTZ QUARTZ CHAPPEL MG NO. AFM PAR JENSEN	LASE PE : FELDS 5.543 12.510 S A/CNK IN CATI AMETERS CATION	PAR RAY ORTHO ORTHO ORTHO CONS CONS CONS CONS CONS	ANORTHI TIOS: CLASE CLASE (0.618 44.27 0.13 F A = 0 ATANORI	(TE 6 1.976 1.461 3 = 0.6 .37 M M	0.222 PLAGI ALBITE 1 M = 0 1 = 0.15	OCLASE 83.029 0.27 5 F = 0	92.481		
PLAGIOCI QUARTZ QUARTZ QUARTZ CHAPPEL: MG NO. AFM PAR JENSEN	LASE PE : FELDS 5.543 12.510 S A/CNK IN CATI AMETERS CATION	PAR RAY ORTHO ORTHO ORTHO CONS CONS CONS CONS CONS CONS CONS CON	ANORTHI TIOS: CLASE CLASE CLASE 44.27 0.13 F A = 0 ATANORI r	(TE 6 1.976 1.461 3 = 0.6 .37 M M	0.222 PLAGI ALBITE 1 M = (1 = 0.15 an	OCLASE 83.029 0.27 5 F = 0	92.481 .48 ne		W
PLAGIOCI QUARTZ QUARTZ QUARTZ CHAPPEL MG NO. AFM PAR JENSEN q 2.832	LASE PE : FELDS 5.543 12.510 S A/CNK IN CATI AMETERS CATION	PAR RAY ORTHO ORTHO ORTHO CINDEX CONS S: A = PLOT PLOT	ANORTHI TIOS: CLASE CLASE CLASE 44.27 0.13 F A = 0 ATANORI r 20 21.5	$\begin{array}{llllllllllllllllllllllllllllllllllll$	0.222 PLAGI ALBITE 1 M = (1 = 0.19 an 723 0	COCLASE 83.029 0.27 5 F = 0 1c .000 0	92.481 .48 0000.	kp 000	۳ 0.00
PLAGIOCI QUARTZ QUARTZ QUARTZ CHAPPEL MG No. AFM PAR JENSEN q 2.832 en	LASE PE : FELDS 5.543 12.510 S A/CNK IN CATI AMETERS CATION 	PAR RAY ORTHO ORTHO ORTHO INDEX ONS S: A = PLOT PLOT O 0 1.09 s f	ANORTHI TIOS: CLASE CLASE 44.27 0.13 F A = 0 ATANORI r 0 21.5 o	(TE 6 1.976 1.461 3 = 0.6 .37 M M ab 31 30. fa	0.222 PLAGI ALBITE 1 M = (1 = 0.15 an 723 0 hy	COCLASE 83.029 0.27 5 F = 0 1c .000 0 01	92.481 .48 ne	kp 000 mt	w 0.00 h
PLAGIOCI QUARTZ QUARTZ QUARTZ CHAPPEL MG NO. AFM PAR JENSEN q 2.832 en 10.389	LASE PE : FELDS 5.543 12.510 S A/CNK IN CATI AMETERS CATION 	RCENT 2 PAR RAY ORTHO ORTHO ORTHO INDEX CONS S: A = PLOT C C C C C C C C C	ANORTHI TIOS: CLASE CLASE 0.618 44.27 0.13 F A = 0 ATANORI r 0 21.5 0 0 0.0	$\begin{array}{llllllllllllllllllllllllllllllllllll$	0.222 PLAGI ALBITE 1 M = (1 = 0.19 an 723 0 hy .336 0	COCLASE 83.029 0.27 5 F = 0 1c .000 0 01 .000 0	92.481 .48 .000 0. ac	kp 000 mt 446	w 0.00 h 0.00
PLAGIOCI QUARTZ QUARTZ QUARTZ CHAPPEL: MG NO. AFM PAR JENSEN q 2.832 en 10.389 il	LASE PE : FELDS 5.543 12.510 S A/CNK IN CATI AMETERS CATION 	RCENT 2 PAR RAY ORTHO ORTHO ORTHO ORTHO INDEX ORTHO CONS S: A = PLOT O 1.09 f 0 1.09 s f 0 0.00 cm Cm	ANORTHI TIOS: CLASE CLASE CLASE $(4, 2, 7)$ 0.13 F A = 0 ATANORI r 0 21.5 0 0.0 tn	$\begin{array}{llllllllllllllllllllllllllllllllllll$	0.222 PLAGJ ALBITE 1 M = (0 1 = 0.15 an 723 0 hy 336 0 ns	COCLASE 83.029 0.27 5 F = 0 1c .000 0 ol .000 0 ks	92.481 .48 .000 0. ac .000 1.	kp 000 mt 446 ru	w 0.00 h 0.00 di
PLAGIOCI QUARTZ QUARTZ QUARTZ CHAPPEL MG NO. AFM PAR JENSEN q 2.832 en 10.389 il 2.029	LASE PE : FELDS 5.543 12.510 S A/CNK IN CATI AMETERS CATION 	RCENT 2 PAR RAY ORTHO ORTHO ORTHO INDEX ONS S: A = PLOT C C C C C C C C C C C C	ANORTHI TIOS: CLASE CLASE CLASE 0.618 44.27 0.13 F A = 0 ATANORI r 0 0 0 0 0 0 0	$\begin{array}{llllllllllllllllllllllllllllllllllll$	0.222 PLAGJ ALBITE 1 M = (0 1 = 0.15 an 723 0 hy 336 0 ns	COCLASE 83.029 0.27 5 F = 0 1c .000 0 ol .000 0 ks	92.481 .48 .000 0. ac .000 1. cs	kp 000 mt 446 ru	w 0.00 h 0.00 di
PLAGIOCI QUARTZ QUARTZ QUARTZ CHAPPEL MG NO. AFM PAR JENSEN q 2.832 en 10.389 il 2.029	LASE PE : FELDS 5.543 12.510 S A/CNK IN CATI AMETERS CATION 0.000 fs 9.947 ap 0.536 RM TOTA	RCENT 2 PAR RAY ORTHO ORTHO ORTHO INDEX ONS S: A = PLOT C C C C C C C C C C C	ANORTHI TIOS: CLASE CLASE CLASE 0.618 44.27 0.13 F A = 0 ATANORI r 0	TE 6 1.976 1.461 3 = 0.6 .37 M M ab 31 30. fa 00 20. pf 0.000	0.222 PLAGJ ALBITE 1 M = (0 1 = 0.15 an 723 0 hy 336 0 ns	COCLASE 83.029 0.27 5 F = 0 1c .000 0 ol .000 0 ks 0.000 0	92.481 .48 .000 0. ac .000 1. cs	kp 000 mt 446 ru	w 0.00 h 0.00 di
PLAGIOCI QUARTZ QUARTZ QUARTZ CHAPPEL MG NO. AFM PAR JENSEN q 2.832 en 10.389 il 2.029 CATANO	LASE PE : FELDS 5.543 12.510 S A/CNK IN CATI AMETERS CATION 0.000 fs 9.947 ap 0.536 RM TOTA *****	RCENT A PAR RA ORTHO ORTHO ORTHO ORTHO INDEX ONS S: A PLOT O 1.09 f 0.000 cm 0.000 cm 0.000 cm 0.000 cm	ANORTHI TIOS: CLASE CLASE CLASE 44.27 0.13 F A = 0 ATANORI r 0 21.5 0 0 0.00 tn 0.000 ******	(TE 6 1.976 1.461 3 = 0.6 .37 M M ab 31 30. fa 00 20. pf 0.000 ******	0.222 PLAGJ ALBITE 1 M = (1 = 0.19 an 723 0 hy .336 0 ns 0.000 (COCLASE 83.029 0.27 5 F = 0 1c .000 0 ol .000 0 ks 0.000 0	92.481 .48 .000 0. ac .000 1. cs	kp 000 mt 446 ru	w 0.00 h 0.00 di
PLAGIOCI QUARTZ QUARTZ QUARTZ CHAPPEL MG NO. AFM PAR JENSEN q 2.832 en 10.389 il 2.029 CATANO	LASE PE : FELDS 5.543 12.510 S A/CNK IN CATI AMETERS CATION 0.000 fs 9.947 ap 0.536 RM TOTA *****	RCENT 2 PAR RA ORTHO 0 ORTHO 0 ORTHO 0 INDEX 0 S: A PLOT 0 0 1.09 5 f 0 0.000 Cm 0.000 AL =1000 ************************************	ANORTHI TIOS: CLASE CLASE CLASE 44.27 0.13 F A = 0 ATANORI r 0 21.5 0 0 0.00 tn 0.000 .000 ****** SONS A	TE 6 1.976 1.461 3 = 0.6 .37 M M ab 31 30. fa 00 20. pf 0.000 ****** LGORYI	0.222 PLAGI ALBITE 1 M = (0 1 = 0.15 an 723 0 hy 336 0 ns 0.000 (0 ************************************	COCLASE 83.029 0.27 5 F = 0 1c .000 0 ks 0.000 0 ks	92.481 .48 .000 0. ac .000 1. cs	kp 000 mt 446 ru 00019.	w 0.00 h 0.00 di 478
PLAGIOCI QUARTZ QUARTZ QUARTZ CHAPPEL MG NO. AFM PAR JENSEN	LASE PE : FELDS 5.543 12.510 S A/CNK IN CATI AMETERS CATION 0.000 fs 9.947 ap 0.536 RM TOTA *****	RCENT 2 PAR RA ORTHO 0 ORTHO 0 ORTHO 0 INDEX 0 S: A PLOT 0 0 1.09 5 f 0 0.000 Cm 0.000 AL =1000 ************************************	ANORTHI TIOS: CLASE CLASE CLASE 44.27 0.13 F A = 0 ATANORI r 0 21.5 0 0 0.00 tn 0.000 .000 ****** SONS A	TE 6 1.976 1.461 3 = 0.6 .37 M M ab 31 30. fa 00 20. pf 0.000 ****** LGORYI	0.222 PLAGI ALBITE 1 M = (0 1 = 0.15 an 723 0 hy 336 0 ns 0.000 (0 ************************************	COCLASE 83.029 0.27 5 F = 0 1c .000 0 ks 0.000 0 ks	92.481 .48 .000 0. ac .000 1. cs .000 0.0	kp 000 mt 446 ru 00019.	w 0.00 h 0.00 di 478
PLAGIOCI QUARTZ QUARTZ QUARTZ CHAPPEL: MG NO. AFM PAR JENSEN	LASE PE : FELDS 5.543 12.510 S A/CNK IN CATI AMETERS CATION 0.000 fs 9.947 ap 0.536 RM TOTZ **** SONORM C	RCENT 2 PAR RAY ORTHO ORTHO ORTHO INDEX ONS S: A = PLOT C C C C C C C C C C C C C C	ANORTHI TIOS: CLASE CLASE CLASE CLASE ().618 44.27 0.13 F A = 0 ATANORI r 0 21.5 0 0.00 tn 0.000 .000 .000 .000 .000 .000 .000 .000 .000 .000 .000	$\begin{array}{llllllllllllllllllllllllllllllllllll$	0.222 PLAGJ ALBITE 1 M = (1 = 0.15 1 M = (1 = 0.15) 1 M	COCLASE 83.029 0.27 5 F = 0 1c .000 0 ks 0.000 0 ks 0.000 0 *****	92.481 .48 .000 0. ac .000 1. cs .000 0.0	kp 000 mt 446 ru 00019 Ri	w 0.00 h 0.00 di 478 Act
PLAGIOCI QUARTZ QUARTZ QUARTZ CHAPPEL: MG NO. AFM PAR JENSEN	LASE PE : FELDS 5.543 12.510 S A/CNK IN CATI AMETERS CATION 0.000 fs 9.947 ap 0.536 RM TOTZ **** SONORM C	RCENT 2 PAR RAY ORTHO ORTHO ORTHO INDEX ONS S: A = PLOT C C C C C C C C C C C C C C	ANORTHI TIOS: CLASE CLASE CLASE CLASE ().618 44.27 0.13 F A = 0 ATANORI r 0 21.5 0 0.00 tn 0.000 .000 .000 .000 .000 .000 .000 .000 .000 .000 .000	$\begin{array}{llllllllllllllllllllllllllllllllllll$	0.222 PLAGJ ALBITE 1 M = (1 = 0.15 1 M = (1 = 0.15) 1 M	COCLASE 83.029 0.27 5 F = 0 1c .000 0 ks 0.000 0 ks 0.000 0 *****	92.481 .48 .000 0. .000 1. .5 .000 0.0	kp 000 mt 446 ru 00019 Ri	w 0.00 h 0.00 di 478 Act
PLAGIOCI QUARTZ QUARTZ QUARTZ CHAPPELI MG NO. AFM PAR JENSEN	LASE PE : FELDS 5.543 12.510 S A/CNK IN CATI AMETERS CATION 0.000 fs 9.947 ap 0.536 RM TOTA **** SONORM C 0.000	RCENT 2 PAR RAY ORTHO ORTHO ORTHO INDEX ONS S: A = PLOT C C C C C C C C C C C C C C	ANORTHI TIOS: CLASE CLASE CLASE CLASE 44.27 0.13 F A = 0 ATANORI r 0 21.5 0 0.00 tn 0.000 ****** SONS A Ab 21.53 3	TE 6 1.976 1.461 = 0.6 .37 M M ab 31 30. fa 00 20. pf 0.000 ****** LGORYI An 30.72	0.222 PLAGI ALBITE 1 M = (1 = 0.19 an 723 0 hy 336 0 1 M = (conserved 	COCLASE 83.029 0.27 5 F = 0 1c .000 0 ol .000 0 ks 0.000 0 ***** Ne 0.00	92.481 .48 .000 0. .000 1. .000 0.0 .000 0.0	kp 000 mt 446 ru 00019 Ri 28.91	w 0.00 di 478 Act
PLAGIOCI QUARTZ QUARTZ QUARTZ CHAPPELI MG NO. AFM PAR JENSEN	LASE PE : FELDS 5.543 12.510 S A/CNK IN CATI AMETERS CATION 0.000 fs 9.947 ap 0.536 RM TOTF **** SONORM C 0.000 Hy	RCENT 2 PAR RAY ORTHO ORTHO ORTHO INDEX ONS S: A = PLOT C C C C C C C C C C C C C C	ANORTHI TIOS: CLASE CLASE CLASE CLASE 44.27 0.13 F A = 0 ATANORI r 0 21.5 0 0.00 tn 0.000 ****** SONS A Ab 21.53 3	TE 6 1.976 1.461 = 0.6 .37 M M ab 31 30. fa 00 20. pf 0.000 ****** LGORYI An 30.72	0.222 PLAGI ALBITE 1 M = (1 = 0.19 an 723 0 hy 336 0 1 M = (conserved 	COCLASE 83.029 0.27 5 F = 0 1c .000 0 ol .000 0 ks 0.000 0 ***** Ne 0.00	92.481 .48 .000 0. .000 1. .5 .000 0.0	kp 000 mt 446 ru 00019 Ri 28.91	w 0.00 di 478 Act
PLAGIOCI QUARTZ QUARTZ QUARTZ CHAPPELI MG NO. AFM PAR JENSEN q 2.832 en 10.389 il 2.029 CATANO ME Q Ed 0.54 0.00 Di HORNBLE	LASE PE : FELDS 5.543 12.510 S A/CNK IN CATI AMETERS CATION 0.000 fs 9.947 ap 0.536 RM TOTA **** SONORM C 0.000 Hy ENDE	RCENT 2 PAR RAY ORTHO ORTHO ORTHO INDEX ONS S: A = PLOT C 0 1.09 C 0	ANORTHI TIOS: CLASE CLASE CLASE CLASE 44.27 0.13 F A = 0 ATANORI r 0 21.5 0 0.00 tn 0.000 ****** Ab 21.53 3 (En	(TE 6 1.976 1.461 3 = 0.6 .37 M M ab 31 30. fa 00 20. pf 0.000 ****** LGORYD An 30.72 Fs	0.222 PLAGI ALBITE 1 M = (1 = 0.15 an 723 0 hy 336 0 1 M = (an 723 0 hy 336 0 0.000 () Lc 0.00 Fo	COCLASE 83.029 0.27 5 F = 0 1c .000 0 cl .000 0 ks 0.000 0 ***** Ne 0.00 Fa	92.481 .48 .000 0. ac .000 1. cs .000 0.0 Wo 0.00 2	kp .000 mt .446 ru .00019 Ri 28.91	w 0.00 h 0.00 di 478 Act 0.0
PLAGIOCI QUARTZ QUARTZ QUARTZ CHAPPELI MG NO. AFM PAR JENSEN q 2.832 en 10.389 il 2.029 CATANO ME Q Ed 0.54 0.00 Di HORNBLE	LASE PE : FELDS 5.543 12.510 S A/CNK IN CATI AMETERS CATION 	RCENT 2 PAR RAY ORTHO ORTHO ORTHO INDEX ONS S: A = PLOT C 0 1.09 C 0	ANORTHI TIOS: CLASE CLASE CLASE CLASE 44.27 0.13 F A = 0 ATANORI r 0 21.5 0 0.00 tn 0.000 ****** Ab 21.53 3 (En	(TE 6 1.976 1.461 3 = 0.6 .37 M M ab 31 30. fa 00 20. pf 0.000 ****** LGORYD An 30.72 Fs	0.222 PLAGI ALBITE 1 M = (1 = 0.15 an 723 0 hy 336 0 1 M = (an 723 0 hy 336 0 0.000 () Lc 0.00 Fo	COCLASE 83.029 0.27 5 F = 0 1c .000 0 cl .000 0 ks 0.000 0 ***** Ne 0.00 Fa	92.481 .48 .000 0. .000 1. .000 0.0 .000 0.0	kp .000 mt .446 ru .00019 Ri 28.91	w 0.00 h 0.00 di 478 Act 0.0
PLAGIOCI QUARTZ QUARTZ QUARTZ CHAPPELI MG NO. AFM PAR JENSEN	LASE PE : FELDS 5.543 12.510 S A/CNK IN CATI AMETERS CATION 0.000 fs 9.947 ap 0.536 RM TOTA **** SONORM C 0.000 Hy SNDE 11.52	RCENT 2 PAR RAY ORTHO ORTHO ORTHO INDEX ONS S: A = PLOT C 0	ANORTHI TIOS: CLASE CLASE CLASE CLASE ($A = 0$ ATANORI r = 0 ATANORI r = 0 ATANORI r = 0 0.13 F 0.13 F 0.000	(TE 6 1.976 1.461 = 0.6 .37 M M ab 31 30. fa 00 20. pf 0.000 ****** LGORYJ An 30.72 Fs 0.00	0.222 PLAGJ ALBITE 1 M = (1 = 0.19 723 0 hy .336 0 1 M = (0.000 () Lc 0.000 Fo 0.000	COCLASE 83.029 0.27 5 F = 0 1c .000 0 ks 0.000 0 ks 0.000 0 ***** Ne 0.00 Fa	92.481 .48 .000 0. .000 1. .000 0.0 .000 0.0 Wo 0.00 2 a) Mi 1.45	kp 000 mt 446 ru 00019 Ri 28.91 t 0.0	w 0.00 di 478 Act 0.0 Hm
PLAGIOCI QUARTZ QUARTZ QUARTZ CHAPPELI MG NO. AFM PAR JENSEN	LASE PE : FELDS 5.543 12.510 S A/CNK IN CATI AMETERS CATION 	RCENT 2 PAR RAY ORTHO ORTHO ORTHO CINDEX CINDEX	ANORTHI TIOS: CLASE CLASE CLASE CLASE CLASE (44.27 0.13 F A = 0 ATANORI r 0 21.5 0 0.00 .000 ****** Ab 21.53 3 (En 0.00 Pf	TE 6 1.976 1.461 = 0.6 .37 M M ab 31 30. fa 00 20. pf 0.000 ****** LGORYJ An 30.72 Fs 0.000 Ns	0.222 PLAGI ALBITE 1 M = (1 M = (1 = 0.15 1 M = (1 = 0.15 1 M = (1 = 0.15 1 M = (1 = 0.15 0.000 Fo 0.000 Ks	COCLASE 83.029 0.27 5 F = 0 1c .000 0 ol .000 0 ks 0.000 0 ***** Ne 0.000 Fa 0.000 Cs	92.481 .48 .000 0. ac .000 1. cs .000 0.0 Wo 0.00 2	kp 000 mt 446 ru 00019 Ri 28.91 t 0.0 DTITE	w 0.00 di 478 Act 0.0 Hm

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PETRONORMS PROGRAM SAMPLE NUMBER MK009 OXIDES GIVEN RECALC 100% MOL PROPS CAT PROPS 139 49.921 0.831 0.831 SiO2 49.81 16.226 Al2O3 16.19 0.159 0.318 Fe2O3 1.35 1.353 0.008 0.017 FeO 10.95 0.153 0.003 0.085 0.218 0.047 0.153 10.974 0.190 0.003 MnO 0.19 میں ع.41 3.418 CaO 12.22 12.247 Na2O 2 91 Mg0 3.41 0.085 0.218 0.094 0.011 0.023 2.916 Na2O 2.91 0.005 0.511 K2O 0.51 TiO2 1.82 1.822 0.003 0.006 P205 0.42 0.421 0.000 Cr203 0.00 0.000 0.000 TOTAL 99.78CIPW NORM..... q c or ab an lc ne kp wo 0.000 0.000 3.020 24.677 29.673 0.000 0.000 0.000 0.000 en fs fo fa hy ol ac mt hm 4.396 6.437 0.584 0.855 10.833 1.440 0.000 1.962 0.000 il ap cm tn pf ns ks cs ru di 3.460 0.997 0.000 0.000 0.000 0.000 0.000 0.000 0.000 23.963 CIPWNORM TOTAL = 100.024***** PARAMETERS FOR CIPW NORMATIVE MINERALS OLIVINE COMPOSITION: FORSTERITE 40.578 FAYALITE 59.422 HYPERSTHENE COMPOSITION:EN 40.578 FS 59.422 FELDSPAR COMPOSITION :KFS 5.265 AB 43.013 AN 51.722 PLAGIOCLASE PERCENT ANORTHITE 54.596 QUARTZ : FELDSPAR RATIOS: QUARTZ 0.000 ORTHOCLASE 5.265 PLAGIOCLASE 94.735 QUARTZ 0.000 ORTHOCLASE 10.905 ALBITE 89.095 CHAPPELS A/CNK INDEX 0.588 MG No. IN CATIONS 33.32 AFM PARAMETERS: A = 0.18 F = 0.64 M = 0.18JENSEN CATION PLOT A = 0.40 M = 0.10 F = 0.50q c or ab an lc ne kp wo 0.000 0.000 3.086 26.760 30.328 0.000 0.000 0.000 0.000 en fs fo fa hy ol ac mt hm 4.197 6.146 0.559 0.819 10.343 1.378 0.000 1.446 0.000 il ap cm tn pf ns ks cs ru di 2.593 0.899 0.000 0.000 0.000 0.000 0.000 0.000 0.00023.167 CATANORM TOTAL =100,000 ****** ... MESONORM (HUCHISONS ALGORYTHM...) Wo Ri Act Q C Or Ab An Lc Ne Ed 0.00 0.00 0.00 24.07 30.33 0.00 0.00 0.00 25.64 0.00 8.61 Ну Ol (En Fs Fo Fa) Mt Hm Di HORNBLENDE 0.00 0.18 0.00 0.00 0.00 0.00 0.00 1.45 0.00 34.252 Cm Tn Ap Pf Ns Ks Cs Ru BIOTITE Sp 1.01 0.00 3.89 0.00 0.00 0.00 0.00 0.00 4.937 MESONORM TOTAL = 100.112

	ORMS PRO					•
	NUMBER				DRODS	
	S GIVEN		0% MOL		PROPS 0.870	140
SiC		52.2		0.870	0.298	
	3 15.14			0.149		
	3 1.33			0.008	0.017	
	0 10.76	10.8		0.150	0.150	
	0.18			0.003	0.003	
Mg	0.6 O	6.0		0.149	0.149	
Ca	0 9.50	9.5		0.170	0.170	
Naž	2.82	2.8	31	0.046	0.091	
KZ	0.20	0.2	01	0.002	0.004	
TiC	1.37	1.3	78	0.017	0.017	
P20	0.24	0.2	41	0.002	0.003	
Cr20	0.00	0.0	000	0.000	0.000	
TOTAL	99.61					
•		CII	_	-		
	-	or			ne kp 000 0.000	
2.45		1.186 23.9				_
	en fs		fa hy		ac mt	hm
13.2	51 11.287	0.000 0.0				
	il ap		pf r		cs ru	di
			0.000 0.00	0 0.000 0.	000 0.000 14	.589
CIPWN	ORM TOTAL	= 100.015				
		*******	*********	******		
	PARAMET	ERS FOR CIP	NORMATIVE	E MINERALS		
HYPER	STHENE CO	MPOSITION:E	1 54.001	FS 45.9	99	
FELDS	PAR COMPO	SITION :KF	5 2.226	AB 44.932	AN 52.843	
PLAGI	OCLASE PE	RCENT ANORT	HITE 54.04	16		
OUART	z : FELDS	PAR RATIOS:				
OUART	z 4.400	ORTHOCLASE	2.128 PI	LAGIOCLASE	93.473	
-		ORTHOCLASE				
-		INDEX 0.6				
	. IN CATI					
AFM P	ARAMETERS	A = 0.14	F = 0.57 M	= 0.29		
JENSE	N CATION	PLOT A =	0.37 M = 0	0.17 F = 0.	47	
		CATANO	RM			
	q c	or	ab an	lc	ne kp	wo
2.3	-	1.202 25.			-	
	en fs	fo	fa hv	ol	ac mt	-
		0.000 0.	-			
		cm tn				
	-		-		.000 0.00014.	
		L = 100.000	0.000 0.00	0.000 0.	000 0.00014	241
CAIA		*******	*******	* * * * * * * * *		
		(HUCHISONS				8-4
Q	. C	Or Ab	An	Lc Ne	WO KI	Act
Ed	< 0.00	0 00 05 75				
	6 0.00	0.00 25.75	28.55 0.0	0.00	0.00 19.41	0.00
0.00						
Di	-	01 (En	Fs	Fo Fa) Mt	Hm
	LENDE					
0.0	0 18.77	0.00 0.00	0.00 0.0	0.00	1.41 0.0	0
19.41	0					
Ap	Cm	Tn Pf	Ns Ks	Cs F	Ru BIOTITE	Sp
0.5	7 0.00	2.92 0.00	0.00 0.0	0.00 0.	.00 1.923	
510						
	ORM TOTAL	= 100.06	4			
		L = 100.06	_	0000******	*****	

PETRONOR	MS PRO	GRAM							
SAMPLE N									
			ALC 10	00%	MOL	PROPS	CAT PRO	PS	141
						0.834			
							0.3		
							0.0		
							0.1		
	0.20						0.0		
	3.81						0.0		
							0.2		
	2.73						0.0		
	0.69						0.0		
	1.56			577			0.0		
	0.26			262			0.0		
Cr203	0.00			000			0.0		
TOTAL			0.	000		0.000			
			CT	PW NO	PM				
								kp	WO
								0.000	
								mt 2.062	
	-			-				ru	
				0.00	0 0.00	0.00	0.000	0.000 2	1.005
CIPWNORN	I TOTAL					*****			
_									
						E MINER			
OLIVINE									0
HYPERSTI									
FELDSPA							.579 A	N 52.25	8
PLAGIOCI	LASE PE	RCENT	ANORT	HITE	56.29	90			
QUARTZ	: FELDS	SPAR RA	TIOS:						
QUARTZ	0.000	ORTHO	CLASE	7.1	63 PI	LAGIOCL	ASE 92	.837	
QUARTZ	0.000	ORTHOC	LASE	15.00	3 ALBI	TE 84.	997		
CHAPPELS	S A/CNF	INDEX	0.6	26					
MG No.	IN CATI	ONS	34.93						
AFM PAR	AMETERS	S: A =	0.17	$\mathbf{F} = 0$.64 M	= 0.19)		
JENSEN (CATION	PLOT	A =	0.40	м = С	0.11 F	= 0.50		
•		· · · · · · c	ATANO	RM					
P	c	; o	r	ab	an	lo	e ne	kp	wo
0.000	0.000	4.19	9 25.	251 3	0.649	0.000	0.000	0.000	0.000
en						ol			hm
5.533								1.519	0.000
il	ap						s cs		
2.244	-			-				0.00020	
CATANO									
	****	******	*****	****	*****	******	*		
ME:	SONORM	(HUCHI	SONS	ALGOR	YTHM.)			
Q		Or				,	Ne W	o Ri	Act
Ed	-								nee
	0.00	0.00	23.71	30.6	5 0.0	0 0.	00 0	00 25.08	3 0 00
4.92	0.00	0.00 /	23.71	50.0	5 0.0	0.	00 0.	00 25.00	5 0.00
		~ 1	(Fn	F	-	Fo	E a V	N/L	
	Hv		(111	r 2	>	FO	raj	MC	¥¥
Di	Ну	01	`						Hm
Di HORNBLE	NDE			• •					
Di HORNBLE 0.00	NDE 3.47			0.0	0 0.0	0 0	.00 1	.52 0.	
Di HORNBLE 0.00 30.004	NDE 3.47	0.00	0.00						00
Di HORNBLE 0.00 30.004 Ap	NDE 3.47 Cm	0.00 Tn	0.00 Pf	Ns	Ks	Cs	Ru	BIOTITE	00
Di HORNBLE 0.00 30.004 Ap 0.63	NDE 3.47 Cm 0.00	0.00 Tn 3.37	0.00 Pf 0.00	Ns 0.00	Ks	Cs		BIOTITE	00
Di HORNBLE 0.00 30.004 Ap 0.63 MESONOR	NDE 3.47 Cm 0.00 M TOTAI	0.00 Tn 3.37 L = 1	0.00 Pf 0.00	Ns 0.00	Ks 0.00	Cs 0.00	Ru 0.00	BIOTITE 6.719	00
Di HORNBLE 0.00 30.004 Ap 0.63 MESONOR	NDE 3.47 Cm 0.00 M TOTAI	0.00 Tn 3.37 L = 1	0.00 Pf 0.00	Ns 0.00	Ks 0.00	Cs 0.00	Ru	BIOTITE 6.719	00

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PETRONORMS	PROGRAM				
SAMPLE NUM					142
OXIDES GI	VEN RECAL	C 100%	MOL PROPS		142
SiO2 5	1.88	52.259	0.870		
A1203 1	4.64	14.747	0.145		
Fe203	1.33	1.340	0.008		
FeO 1	0.80	10.879	0.151		
MnO	0.18	0.181	0.003		
MgO	5.83	5.873	0.146		
Ca0 1	0.45	10.526	0.188		
Na2O	2.29	2.307	0.037		
к20	0.24	0.242	0.003		
TiO2		1.395	0.017		
P205	0.25	0.252	0.002		
Cr203	0.00	0.000	0.000	0.000	
TOTAL 9	9.27				
			[• • • • • • •	
P	c or	ab	an lc		wo
				0.000 0.000	
	fs fo				
12.062 10				0.000 1.942	
il	ap cm				di
2.649 0.	596 0.000 0	.000 0.000	0.000 0.00	0.000 0.000	17.796
CIPWNORM 7	TOTAL = 100.0				
	*****	********	*******	* *	
PAP	RAMETERS FOR	CIPW NORMA	TIVE MINER	ALS	
HYPERSTHEM	E COMPOSITI	ON:EN 53.	208 FS	46.792	
FELDSPAR (COMPOSITION	:KFS 2.8	51 AB 38	.945 AN 58.2	05
PLAGIOCLAS	SE PERCENT A	NORTHITE 5	9.912		
-	FELDSPAR RAT				
QUARTZ 7	811 ORTHOC	LASE 2.628	B PLAGIOCL	ASE 89.561	
QUARTZ 16	5.856 ORTHOC	LASE 5.671	ALBITE 77.	474	
CHAPPELS A	A/CNK INDEX	0.636			
MG No. IN	CATIONS 4	6.42			

AFM PARAMETERS: A = 0.12 F = 0.59 M = 0.29 JENSEN CATION PLOT A = 0.36 M = 0.16 F = 0.47

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......CATANORM..... q c or ab an lc ne kp wo 4.007 0.000 1.455 21.101 29.723 0.000 0.000 0.000 0.000 en fs fo fa hy ol ac mt hm 11.878 10.445 0.000 0.000 22.323 0.000 0.000 1.427 0.000 il ap cm tn pf ns ks cs ru di $1.980 \ 0.536 \ 0.000 \ 0.000 \ 0.000 \ 0.000 \ 0.000 \ 0.000 \ 0.000 \ 1.448$ CATANORM TOTAL =100.000 ***** ... MESONORM (HUCHISONS ALGORYTHM...) Q C Or Ab An Lc Ne Wo Ri Act Ed 2.20 0.00 0.00 21.10 29.72 0.00 0.00 0.00 25.29 0.00 0.00 Ну Fo Di Ol (En Fs Fa) Mt Hm HORNBLENDE 0.00 14.42 0.00 0.00 0.00 0.00 0.00 1.43 0.00 25.291 Cm Tn Ρf Ks Cs Ru BIOTITE Sp Ap Ns 0.60 0.00 2.97 0.00 0.00 0.00 0.00 0.00 2.328 MESONORM TOTAL = 100.067

	IUMBER			
		RECALC 100%		
	55.73		0.931	
	13.98		0.138	
	1.01		0.006	
	8.17		0.114	
	0.11		0.002	
-	2.76		0.069	
	11.41		0.204	
	0.20		0.003	
		4.961		
		1.220		
	0.06			
	0.00 99.59	0.000	0.000	0.000
TOTAL	99.59			
•••		CIPW NO		
P		or ab		-
8.923				0.000 0.000
en		fo fa	-	
				0.000 1.471
il 2 210		cm tn p		
			0.000 0.00	0 0.000 0.000 28
CIPWNOR	M TOTAL	= 100.005		· • •
QUARTZ	14.234	ORTHOCLASE 46 ORTHOCLASE 73.4		
QUARTZ QUARTZ CHAPPEL MG No.	14.234 22.343 S A/CNK IN CATIC	ORTHOCLASE 46 ORTHOCLASE 73.4 INDEX 0.529 DNS 35.14	402 ALBITE 4	.255
QUARTZ QUARTZ CHAPPEL MG No. AFM PAR	14.234 22.343 S A/CNK IN CATIC	ORTHOCLASE 46 ORTHOCLASE 73.4 INDEX 0.529	02 ALBITE 4	• 255 ~
QUARTZ QUARTZ CHAPPEL MG No. AFM PAR JENSEN	14.234 22.343 S A/CNK IN CATIC AMETERS: CATION F	ORTHOCLASE 46 ORTHOCLASE 73.4 INDEX 0.529 DNS 35.14 A = 0.30 F = 0	02 ALBITE 4 0.53 M = 0.10 M = 0.10 F	.255 = 0.46
QUARTZ QUARTZ CHAPPEL MG No. AFM PAR JENSEN	14.234 22.343 S A/CNK IN CATIC AMETERS: CATION F	ORTHOCLASE 46 ORTHOCLASE 73.4 INDEX 0.529 DNS 35.14 A = 0.30 F = 0 PLOT A = 0.44	0.53 M = 0.10 M = 0.10 F	.255 = 0.46
QUARTZ QUARTZ CHAPPEL MG No. AFM PAR JENSEN	14.234 22.343 S A/CNK IN CATIC AMETERS: CATION F	ORTHOCLASE 46 ORTHOCLASE 73.4 INDEX 0.529 ONS 35.14 A = 0.30 F = 0 PLOT $A = 0.44$ CATANORM or ab	A02 ALBITE 4 0.53 M = 0.10 M = 0.10 F an 10	255 = 0.46 c ne kp
QUARTZ QUARTZ CHAPPELA MG No. AFM PAR JENSEN q 8.554	14.234 22.343 S A/CNK IN CATIC AMETERS: CATION F	ORTHOCLASE 46 ORTHOCLASE 73.4 INDEX 0.529 ONS 35.14 A = 0.30 F = 0 PLOT A = 0.44 CATANORM or ab 30.330 1.866 2	$\begin{array}{llllllllllllllllllllllllllllllllllll$.255 = 0.46
QUARTZ QUARTZ CHAPPEL MG No. AFM PAR JENSEN q 8.554 en	14.234 22.343 S A/CNK IN CATIC AMETERS: CATION F 	ORTHOCLASE 46 ORTHOCLASE 73.4 INDEX 0.529 DNS 35.14 A = 0.30 F = 0 PLOT A = 0.44 CATANORM or ab 30.330 1.866 fo fa	$\begin{array}{llllllllllllllllllllllllllllllllllll$.255 = 0.46 c ne kp 0 0.000 0.000
QUARTZ QUARTZ CHAPPEL MG No. AFM PAR JENSEN	14.234 22.343 S A/CNK IN CATIO AMETERS: CATION F C 0.000 fs 2.780	ORTHOCLASE 46 ORTHOCLASE 73.4 INDEX 0.529 DNS 35.14 A = 0.30 F = 0 PLOT A = 0.44 CATANORM or ab 30.330 1.866 fo fa	$\begin{array}{l} \text{A02 ALBITE 4} \\ \text{A0.53 M} = 0.10 \\ \text{M} = 0.10 \\ \text{F} \\ \text{An } 10 \\ \text{C} \\ \text$.255 = 0.46 c ne kp 0 0.000 0.000 l ac mt 0 0.000 1.097
QUARTZ QUARTZ CHAPPEL MG No. AFM PAR JENSEN	14.234 22.343 S A/CNK IN CATIO AMETERS: CATION F C 0.000 fs 2.780 ap	ORTHOCLASE 46 ORTHOCLASE 73.4 INDEX 0.529 ONS 35.14 A = 0.30 F = 0 PLOT A = 0.44 CATANORM or ab 30.330 1.866 2 fo fa 0.000 0.000 cm tn p	$\begin{array}{l} \text{AO2 ALBITE 4} \\ \text{O.53 M} = 0.10 \\ \text{M} = 0.10 \\ \text{F} \\ \text{an} \\ 10 \\ \text{C} \\ \text{A} \\ \text{C} \\ \text{A} \\ \text{A} \\ \text{B} \\ \text{O} \\ \text{O} \\ \text{O} \\ \text{ms} \end{array}$.255 = 0.46 c ne kp 0 0.000 0.000 l ac mt 0 0.000 1.097
QUARTZ QUARTZ CHAPPEL MG No. AFM PAR JENSEN q 8.554 en 2.031 i1 1.759	14.234 22.343 S A/CNK IN CATIO AMETERS: CATION F 0.000 fs 2.780 ap 0.130 C	ORTHOCLASE 46 ORTHOCLASE 73.4 INDEX 0.529 ONS 35.14 A = 0.30 F = 0 PLOT A = 0.44 CATANORM or ab 30.330 1.866 2 fo fa 0.000 0.000 cm tn p	$\begin{array}{l} \text{AO2 ALBITE 4} \\ \text{O.53 M} = 0.10 \\ \text{M} = 0.10 \\ \text{F} \\ \text{an} \\ 10 \\ \text{C} \\ \text{A} \\ \text{C} \\ \text{A} \\ \text{A} \\ \text{B} \\ \text{O} \\ \text{O} \\ \text{O} \\ \text{ms} \end{array}$.255 = 0.46 c ne kp 0 0.000 0.000 l ac mt 0 0.000 1.097 ks cs ru
QUARTZ QUARTZ CHAPPEL MG No. AFM PAR JENSEN q 8.554 en 2.031 i1 1.759	14.234 22.343 S A/CNK IN CATIC AMETERS: CATION F 0.000 fs 2.780 ap 0.130 C RM TOTAL	ORTHOCLASE 46 ORTHOCLASE 73.4 INDEX 0.529 DNS 35.14 A = 0.30 F = 0 PLOT A = 0.44 CATANORM or ab 30.330 1.866 2 fo fa 0.000 0.000 cm tn p	$\begin{array}{l} \text{A02 ALBITE 4} \\ \text{A0.53 M} = 0.10 \\ \text{M} = 0.10 \\ \text{F} \\ \text{an} \\ \text{an} \\ \text{C} \\ \text{A10 0.000} \\ \text{A10 0.000} \\ \text{A10 0.000} \\ \text{C} \\ \text{A10 0.000} \\ \text{C} \\ \text{A10 0.000} \\ \text{C} \\$	$ \begin{array}{l} 255 \\ $
QUARTZ QUARTZ CHAPPELA MG No. AFM PAR JENSEN q 8.554 en 2.031 il 1.759 CATANO	14.234 22.343 S A/CNK IN CATIO AMETERS: CATION F 0.000 fs 2.780 ap 0.130 C RM TOTAL ******	ORTHOCLASE 46 ORTHOCLASE 73.4 INDEX 0.529 ONS 35.14 A = 0.30 F = 0 PLOT A = 0.44 CATANORM or ab 30.330 1.866 2 fo fa 0.000 0.000 cm tn p 0.000 0.000 0.000 cm tn p	$\begin{array}{l} \text{AO2 ALBITE 4} \\ \text{ALBITE 4} \\ ALB$	$ \begin{array}{l} 255 \\ $
QUARTZ QUARTZ CHAPPEL MG No. AFM PAR JENSEN	14.234 22.343 S A/CNK IN CATIO AMETERS: CATION F 0.000 fs 2.780 ap 0.130 C RM TOTAL *****	ORTHOCLASE 46 ORTHOCLASE 73.4 INDEX 0.529 ONS 35.14 A = 0.30 F = 0 PLOT A = 0.44 CATANORM or ab 30.330 1.866 2 fo fa 0.000 0.000 cm tn p 0.000 0.000 0.000	$\begin{array}{l} \text{A02 ALBITE 4} \\ \text{A02 ALBITE 4} \\ \text{A03 ALBITE 4} \\ A03$	$ \begin{array}{l} 255 \\ $
QUARTZ QUARTZ CHAPPEL MG No. AFM PAR JENSEN	14.234 22.343 S A/CNK IN CATIO AMETERS: CATION F 0.000 fs 2.780 ap 0.130 C RM TOTAL *****	ORTHOCLASE 46 ORTHOCLASE 73.4 INDEX 0.529 ONS 35.14 A = 0.30 F = 0 PLOT A = 0.44 CATANORM or ab 30.330 1.866 2 fo fa 0.000 0.000 cm tn p 0.000 0.000 0.000	$\begin{array}{l} \text{A02 ALBITE 4} \\ \text{A02 ALBITE 4} \\ \text{A03 ALBITE 4} \\ A03$.255 = 0.46 c ne kp 0 0.000 0.000 l ac mt 0 0.000 1.097 ks cs ru 00 0.000 0.00027
QUARTZ QUARTZ CHAPPEL MG NO. AFM PAR JENSEN	14.234 22.343 S A/CNK IN CATIO AMETERS: CATION F 0.000 fs 2.780 ap 0.130 C RM TOTAL ***** SONORM (C	ORTHOCLASE 46 ORTHOCLASE 73.4 INDEX 0.529 DNS 35.14 $A = 0.30$ F = 0 PLOT $A = 0.44$ CATANORM or ab 30.330 1.866 fo fa 0.000 0.000 cm tn 0.000 0.000 cm tn 0.000 0.000 HUCHISONS ALGON Or Ab	A02 ALBITE 4 0.53 M = 0.10 M = 0.10 F an 16 23.552 0.000 hy 05 4.810 0.000 of ns 2 00 0.000 0.00 **********************************	.255 = 0.46 c ne kp 0 0.000 0.000 l ac mt 0 0.000 1.097 ks cs ru 00 0.000 0.00027
QUARTZ QUARTZ CHAPPEL MG NO. AFM PAR JENSEN	14.234 22.343 S A/CNK IN CATIO AMETERS: CATION F 0.000 fs 2.780 ap 0.130 C RM TOTAL ***** SONORM (C	ORTHOCLASE 46 ORTHOCLASE 73.4 INDEX 0.529 DNS 35.14 $A = 0.30$ F = 0 PLOT $A = 0.44$ CATANORM or ab 30.330 1.866 fo fa 0.000 0.000 cm tn 0.000 0.000 cm tn 0.000 0.000 HUCHISONS ALGON Or Ab	A02 ALBITE 4 0.53 M = 0.10 M = 0.10 F an 16 23.552 0.000 hy 05 4.810 0.000 of ns 2 00 0.000 0.00 **********************************	.255 = 0.46 c ne kp 0 0.000 0.000 l ac mt 0 0.000 1.097 ks cs ru 00 0.000 0.00027 ** Ne Wo Ri
QUARTZ QUARTZ CHAPPELA MG No. AFM PAR JENSEN	14.234 22.343 S A/CNK IN CATIC AMETERS: CATION F C 0.000 fs 2.780 ap 0.130 C RM TOTAL ***** SONORM (C 0.000 13	ORTHOCLASE 46 ORTHOCLASE 73.4 INDEX 0.529 ONS 35.14 A = 0.30 F = 0 PLOT A = 0.44 CATANORM or ab 30.330 1.866 2 fo fa 0.000 0.000 0.000 cm tn p 0.000 0.000 0.000 cm tn p 0.000 0.000 0.000 cm tn p 0.000 0.000 0.000 0.000 cm tn p 0.000 0.000 0.000 0.000 cm tn p 0.000 0.000 0.000 0.000 0.000 cm tn p 0.0000 0.0000 0.0000 0.	A02 ALBITE 4 0.53 M = 0.10 M = 0.10 F an 10 23.552 0.000 hy of 4.810 0.000 of ns 10 00 0.000 0.00 **********************************	.255 = 0.46 c ne kp 0 0.000 0.000 l ac mt 0 0.000 1.097 ks cs ru 00 0.000 0.00027 ** Ne Wo Ri .00 12.19 0.00
QUARTZ QUARTZ CHAPPELA MG No. AFM PAR JENSEN	14.234 22.343 S A/CNK IN CATIO AMETERS: CATION F C 0.000 fs 2.780 ap 0.130 C RM TOTAL ***** SONORM (C 0.00 13 Hy	ORTHOCLASE 46 ORTHOCLASE 73.4 INDEX 0.529 ONS 35.14 A = 0.30 F = 0 PLOT A = 0.44 CATANORM or ab 30.330 1.866 2 fo fa 0.000 0.000 0.000 cm tn p 0.000 0.000 0.000 cm tn p 0.000 0.000 0.000 cm tn p 0.000 0.000 0.000 0.000 cm tn p 0.000 0.000 0.000 0.000 cm tn p 0.000 0.000 0.000 0.000 0.000 cm tn p 0.0000 0.0000 0.0000 0.	A02 ALBITE 4 0.53 M = 0.10 M = 0.10 F an 10 23.552 0.000 hy of 4.810 0.000 of ns 10 00 0.000 0.00 **********************************	.255 = 0.46 c ne kp 0 0.000 0.000 l ac mt 0 0.000 1.097 ks cs ru 00 0.000 0.00027 ** Ne Wo Ri
QUARTZ QUARTZ CHAPPEL MG NO. AFM PAR JENSEN	14.234 22.343 S A/CNK IN CATIO AMETERS: CATION F C 0.000 fs 2.780 ap 0.130 C RM TOTAL ****** SONORM (C 0.00 1: Hy NDE	ORTHOCLASE 46 ORTHOCLASE 73.4 INDEX 0.529 DNS 35.14 A = 0.30 F = 0 PLOT A = 0.44 CATANORM or ab 30.330 1.866 2 fo fa 0.000 0.000 cm tn p 0.000 0.000 0.000 cm tn p 0.000 0.000 0.000 cm tn p 0.0000 0.000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.00	A02 ALBITE 4 0.53 M = 0.10 M = 0.10 F an 16 23.552 0.000 hy 05 4.810 0.000 of ns 5 00 0.000 0.00 **********************************	.255 = 0.46 c ne kp 0 0.000 0.000 1 ac mt 0 0.000 1.097 ks cs ru 00 0.000 0.00027 ** Ne Wo Ri .00 12.19 0.00 Fa) Mt
QUARTZ QUARTZ CHAPPEL MG NO. AFM PAR JENSEN	14.234 22.343 S A/CNK IN CATIO AMETERS: CATION F C 0.000 fs 2.780 ap 0.130 C RM TOTAL ****** SONORM (C 0.00 1: Hy NDE	ORTHOCLASE 46 ORTHOCLASE 73.4 INDEX 0.529 DNS 35.14 A = 0.30 F = 0 PLOT A = 0.44 CATANORM or ab 30.330 1.866 2 fo fa 0.000 0.000 cm tn p 0.000 0.000 0.000 cm tn p 0.000 0.000 0.000 cm tn p 0.0000 0.000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.00	A02 ALBITE 4 0.53 M = 0.10 M = 0.10 F an 16 23.552 0.000 hy 05 4.810 0.000 of ns 5 00 0.000 0.00 **********************************	.255 = 0.46 c ne kp 0 0.000 0.000 l ac mt 0 0.000 1.097 ks cs ru 00 0.000 0.00027 ** Ne Wo Ri .00 12.19 0.00
QUARTZ QUARTZ CHAPPEL MG NO. AFM PAR JENSEN	14.234 22.343 S A/CNK IN CATIC AMETERS: CATION F 0.000 fs 2.780 ap 0.130 C RM TOTAL ***** SONORM (C 0.000 12 Hy NDE 0.00 (ORTHOCLASE 46 ORTHOCLASE 73.4 INDEX 0.529 ONS 35.14 A = 0.30 F = 0 PLOT A = 0.44 CATANORM or ab 30.330 1.866 2 fo fa 0.000 0.000 0.000 cm tn p 0.000 0.000 0.000 cm tn p 0.000 0.000 0.000 cm th p 0.000 0.000 0.000 0.000 cm th p 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.000000	A02 ALBITE 4 0.53 M = 0.10 M = 0.10 F an 16 23.552 0.000 hy of 4.810 0.000 00 0.000 0.00 **********************************	.255 = 0.46 c ne kp 0 0.000 0.000 1 ac mt 0 0.000 1.097 ks cs ru 00 0.000 0.00027 ** Ne Wo Ri .00 12.19 0.00 Fa) Mt .00 1.10 0.00
QUARTZ QUARTZ QUARTZ CHAPPELA MG NO. AFM PAR JENSEN	14.234 22.343 S A/CNK IN CATIC AMETERS: CATION F C 0.000 fs 2.780 ap 0.130 C RM TOTAL ***** SONORM (C 0.00 1: Hy NDE 0.00 (Cm	ORTHOCLASE 46 ORTHOCLASE 73.4 INDEX 0.529 ONS 35.14 A = 0.30 F = 0 PLOT A = 0.44 CCATANORM or ab 30.330 1.866 2 fo fa 0.000 0.000 0.000 cm tn H 0.000 0.000 0.000 cm tn H 0.000 0.000 0.000 cm tn H 0.000 0.000 0.000 cm th H 0.000 0.000 cm th H 0.000 cm th H 0.000 cm th H 0.0000 cm th H 0.0000 cm	A02 ALBITE 4 0.53 M = 0.10 M = 0.10 F an 10 23.552 0.000 hy of 4.810 0.000 of ns 10 00 0.000 0.00 **********************************	.255 = 0.46 = 0.46 c ne kp 0 0.000 0.000 l ac mt 0 0.000 1.097 ks cs ru 00 0.000 0.00027 ** Ne Wo Ri .00 12.19 0.00 Fa) Mt .00 1.10 0.00 Ru BIOTITE
QUARTZ QUARTZ CHAPPEL MG NO. AFM PAR JENSEN	14.234 22.343 S A/CNK IN CATIO AMETERS: CATION F 	ORTHOCLASE 46 ORTHOCLASE 73.4 INDEX 0.529 ONS 35.14 A = 0.30 F = 0 PLOT A = 0.44 CCATANORM or ab 30.330 1.866 2 fo fa 0.000 0.000 0.000 cm tn H 0.000 0.000 0.000 cm tn H 0.000 0.000 0.000 cm tn H 0.000 0.000 0.000 cm th H 0.000 0.000 cm th H 0.000 cm th H 0.000 cm th H 0.0000 cm th H 0.0000 cm	A02 ALBITE 4 0.53 M = 0.10 M = 0.10 F an 10 23.552 0.000 hy of 4.810 0.000 of ns 10 00 0.000 0.00 **********************************	.255 = 0.46 c ne kp 0 0.000 0.000 1 ac mt 0 0.000 1.097 ks cs ru 00 0.000 0.00027 ** Ne Wo Ri .00 12.19 0.00 Fa) Mt .00 1.10 0.00

AVIDEC		MK014 RECALC 10	NO& N	NOT. PROPS	CAT PRO	PS	
	53.39			0.889			14
A1203				0.141			
	1.25			0.008			
		10.1		0.141			
	0.18			0.003			
	5.75		753		0.1	43	
-	9.87		376		0.1		
	3.09				0.1		
	0.36		360	0.004	0.0	08	
	1.32		323	0.017	0.0	17	
P205	0.23	0.3	230	0.002	0.0	03	
	0.00		000	0.000	0.0	00	
TOTAL	99.94						
• • • •		ci	PW NORM				
		or					
		2.129 26.					
		fo					
		0.000 0.0					
		cm tn					
		0.000 0.000	0.000	0.000 0.0	00 0.000	0.000 1	9.20
CIPWNORM	M TOTAL	= 100.014					
-		ERS FOR CIP					
		SITION :KF				1 16 25	
	R COMPO	SITION :KF	5 4.0			40. 23	
DT NOTOOT							-
		RCENT ANORT					-
QUARTZ	: FELDS	PAR RATIOS:		8.203			-
QUARTZ : QUARTZ	: FELDS 5.097	PAR RATIOS: ORTHOCLASE	3.838	8.203 PLAGIOC	CLASE 91.		-
QUARTZ : QUARTZ QUARTZ	: FELDS 5.097 9.085	PAR RATIOS: ORTHOCLASE ORTHOCLASE	3.838 6.841 A	8.203 PLAGIOC	CLASE 91.		-
QUARTZ QUARTZ QUARTZ CHAPPELS	: FELDS 5.097 9.085 S A/CNK	PAR RATIOS: ORTHOCLASE ORTHOCLASE X INDEX 0.6	3.838 6.841 A 14	8.203 PLAGIOC	CLASE 91.		-
QUARTZ QUARTZ QUARTZ CHAPPELS	: FELDS 5.097 9.085 S A/CNK	PAR RATIOS: ORTHOCLASE ORTHOCLASE	3.838 6.841 A 14	8.203 PLAGIOC	CLASE 91.		_
QUARTZ QUARTZ QUARTZ CHAPPELS MG No.	: FELDS 5.097 9.085 S A/CNK IN CATI	PAR RATIOS: ORTHOCLASE ORTHOCLASE X INDEX 0.6	3.838 6.841 A 14	8.203 PLAGIOC LBITE 84.	CLASE 91.		
QUARTZ QUARTZ QUARTZ CHAPPELS MG No. 1 AFM PARA	: FELDS 5.097 9.085 S A/CNK IN CATI	PAR RATIOS: ORTHOCLASE ORTHOCLASE (INDEX 0.6 CONS 47.71	3.838 6.841 A 14 F = 0.5	8.203 PLAGIOC LBITE 84.	CLASE 91. .074 28		-
QUARTZ QUARTZ QUARTZ CHAPPELS MG NO. J AFM PARJ JENSEN (: FELDS 5.097 9.085 S A/CNK IN CATI AMETERS CATION	PAR RATIOS: ORTHOCLASE ORTHOCLASE INDEX 0.6 ONS 47.71 S: A = 0.17 PLOT A =	3.838 6.841 A 14 F = 0.5 0.37 M	8.203 PLAGIOC LBITE 84. 5 M = 0.2 I = 0.17 F	CLASE 91. .074 28 F = 0.46		-
QUARTZ QUARTZ QUARTZ CHAPPELS MG NO. AFM PARA JENSEN (: FELDS 5.097 9.085 S A/CNK IN CATI AMETERS CATION	PAR RATIOS: ORTHOCLASE ORTHOCLASE INDEX 0.6 ONS 47.71 S: A = 0.17 PLOT A =	3.838 6.841 A 14 F = 0.5 0.37 M RM	8.203 PLAGIOC LBITE 84. 5 M = 0.2 I = 0.17 F	CLASE 91. .074 28 F = 0.46	.065	
QUARTZ QUARTZ QUARTZ CHAPPELS MG NO. AFM PARJ JENSEN (q	: FELDS 5.097 9.085 S A/CNK IN CATI AMETERS CATION	PAR RATIOS: ORTHOCLASE ORTHOCLASE INDEX 0.6 CONS 47.71 S: A = 0.17 PLOT A = CATANO c or	3.838 6.841 A 14 F = 0.5 0.37 M RM ab	8.203 PLAGIOC LBITE 84. 5 M = 0.2 1 = 0.17 F 	CLASE 91. .074 28 7 = 0.46	.065 kp	
QUARTZ QUARTZ QUARTZ CHAPPELS MG No. AFM PARA JENSEN (q 2.648	: FELDS 5.097 9.085 S A/CNK IN CATI AMETERS CATION	PAR RATIOS: ORTHOCLASE ORTHOCLASE INDEX 0.6 CONS 47.71 S: A = 0.17 PLOT A = CATANO or 0 2.152 28.	3.838 6.841 A 14 F = 0.5 0.37 M RM ab 078 24.	8.203 PLAGIOC LBITE 84. 5 M = 0.2 1 = 0.17 F an 1 627 0.00	CLASE 91. .074 28 F = 0.46 LC ne 00 0.000	.065 kp 0.000	0.0
QUARTZ QUARTZ QUARTZ CHAPPELS MG No. AFM PARA JENSEN (q 2.648 en	: FELDS 5.097 9.085 S A/CNK IN CATI AMETERS CATION 	SPAR RATIOS: ORTHOCLASEORTHOCLASEORTHOCLASEINDEXONS47.71S: $A = 0.17$ PLOTPLOTA =ORTO	3.838 6.841 A 14 F = 0.5 0.37 M RM ab 078 24. fa	8.203 PLAGIOC LBITE 84. 5 M = 0.2 1 = 0.17 F an 1 627 0.00 hy c	CLASE 91. 0.074 28 $T = 0.46$ $1c$ ne 00 0.000 01 ac	.065 kp 0.000 mt	0.0
QUARTZ QUARTZ QUARTZ CHAPPELS MG NO. AFM PARJ JENSEN (: FELDS 5.097 9.085 S A/CNK IN CATI AMETERS CATION 0.000 fs 9.132	SPAR RATIOS: ORTHOCLASE ORTHOCLASE INDEX 0.6 CONS 47.71 S: A = 0.17 PLOT A = CATANO or 0 2.152 28. fo 2 0.000 0.	3.838 6.841 A 14 F = 0.5 0.37 M RM ab 078 24. fa 000 20.	8.203 PLAGIOC LBITE 84. 5 M = 0.2 I = 0.17 F an 627 0.00 hy 091 0.00	CLASE 91. 0.074 T = 0.46 T = 0.000 0.000 0.000 0.000	.065 kp 0.000 mt 1.323	0.0
QUARTZ QUARTZ QUARTZ CHAPPELS MG NO. AFM PARJ JENSEN (q 2.648 en 10.959 il	: FELDS 5.097 9.085 S A/CNK IN CATI AMETERS CATION 0.000 fs 9.132 ap	$\begin{array}{c} \text{PAR RATIOS:} \\ \text{ORTHOCLASE} \\ \text{ORTHOCLASE \\ \text{ORTHOCLASE} \\ \text{ORTHOCLASE} \\ \text{ORTHOCLASE \\ \text{ORTHOCLASE} \\ ORTHOCLASE \\ \text{ORTHOCLASE \\ \text$	3.838 6.841 A 14 F = 0.5 0.37 M RM ab 078 24. fa 000 20. pf	8.203 PLAGIOC LBITE 84. 5 M = 0.2 1 = 0.17 F an 1 627 0.00 hy c 091 0.00 ns	CLASE 91. .074 7 = 0.46	.065 kp 0.000 mt 1.323 ru	0.0 0.0 di
QUARTZ QUARTZ QUARTZ CHAPPELS MG NO. AFM PARJ JENSEN (q 2.648 en 10.959 il 1.864	: FELDS 5.097 9.085 S A/CNK IN CATI AMETERS CATION 0.000 fs 9.132 ap 0.487	SPAR RATIOS: ORTHOCLASE ORTHOCLASE INDEX 0.6 CONS 47.71 S: A = 0.17 PLOT A = CATANO 0 2.152 28. fo 2.000 0. cm tn 0.000 0.000	3.838 6.841 A 14 F = 0.5 0.37 M RM ab 078 24. fa 000 20. pf	8.203 PLAGIOC LBITE 84. 5 M = 0.2 1 = 0.17 F an 1 627 0.00 hy c 091 0.00 ns	CLASE 91. .074 7 = 0.46	.065 kp 0.000 mt 1.323 ru	0.0 0.0 di
QUARTZ QUARTZ QUARTZ CHAPPELS MG NO. AFM PARJ JENSEN (q 2.648 en 10.959 il 1.864	: FELDS 5.097 9.085 S A/CNK IN CATI AMETERS CATION 0.000 fs 9.132 ap 0.487 RM TOTA	$\begin{array}{c} \text{PAR RATIOS:} \\ \text{ORTHOCLASE} \\ \text{ORTHOCLASE \\ \text{ORTHOCLASE} \\ \text{ORTHOCLASE} \\ \text{ORTHOCLASE \\ \text{ORTHOCLASE} \\ ORTHOCLASE \\ \text{ORTHOCLASE \\ \text$	3.838 6.841 A 14 F = 0.5 0.37 M RM ab 078 24. fa 000 20. pf 0.000	8.203 PLAGIOC LBITE 84. 5 M = 0.2 I = 0.17 F an 1 627 0.00 hy c 091 0.00 ns 0.000 0.0	CLASE 91. .074 28 7 = 0.46	.065 kp 0.000 mt 1.323 ru	0.0 0.0 di
QUARTZ QUARTZ QUARTZ CHAPPELS MG NO. AFM PARA JENSEN (2.648 en 10.959 il 1.864 CATANOI	: FELDS 5.097 9.085 S A/CNK IN CATI AMETERS CATION 0.000 fs 9.132 ap 0.487 RM TOTF *****	SPAR RATIOS: ORTHOCLASE ORTHOCLASE INDEX 0.6 CONS 47.71 S: A = 0.17 PLOT A = 0.2.152 28. fo 2.152 28. fo 0.000 0. cm tn 0.000 0.000 AL = 100.000	3.838 6.841 A 14 F = 0.5 0.37 M RM ab 078 24. fa 000 20. pf 0.000 *******	<pre>8.203 PLAGIOC LBITE 84. 5 M = 0.2 1 = 0.17 F</pre>	CLASE 91. .074 28 7 = 0.46	.065 kp 0.000 mt 1.323 ru	0.0 0.0
QUARTZ QUARTZ QUARTZ CHAPPELS MG NO. AFM PARA JENSEN (2.648 en 10.959 il 1.864 CATANOI	: FELDS 5.097 9.085 S A/CNK IN CATI AMETERS CATION 0.000 fs 9.132 ap 0.487 RM TOTA **** SONORM	SPAR RATIOS: ORTHOCLASE ORTHOCLASE INDEX 0.6 CONS 47.71 S: A = 0.17 PLOT A = CATANO	3.838 6.841 A 14 F = 0.5 0.37 M RM ab 078 24. fa 078 24. fa 000 20. pf 0.000 *******	8.203 PLAGIOC LBITE 84. 5 M = 0.2 1 = 0.17 F an 1 627 0.00 hy c 091 0.00 ns 0.000 0.0	CLASE 91. .074 28 7 = 0.46	kp 0.000 mt 1.323 ru 0.00018	0.0 0.0 di 3.729
QUARTZ QUARTZ QUARTZ CHAPPELS MG NO. AFM PARA JENSEN (2.648 en 10.959 il 1.864 CATANON MES	: FELDS 5.097 9.085 S A/CNK IN CATI AMETERS CATION 0.000 fs 9.132 ap 0.487 RM TOTA **** SONORM	PAR RATIOS: ORTHOCLASE ORTHOCLASE INDEX 0.6 ONS 47.71 S: A = 0.17 PLOT A = CATANO O 2.152 28. fo 2 0.000 0. cm tn 0.000 0.000 AL =100.000	3.838 6.841 A 14 F = 0.5 0.37 M RM ab 078 24. fa 000 20. pf 0.000 ******* ALGORYI	8.203 PLAGIOC LBITE 84. 5 M = 0.2 1 = 0.17 F an 1 627 0.00 hy c 091 0.00 ns 0.000 0.0	CLASE 91. .074 28 7 = 0.46	kp 0.000 mt 1.323 ru 0.00018	0.0 0.0 di 3.729
QUARTZ QUARTZ QUARTZ CHAPPELS MG NO. AFM PARJ JENSEN (: FELDS 5.097 9.085 S A/CNK IN CATI AMETERS CATION 0.000 fs 9.132 ap 0.487 RM TOTF **** SONORM C	PAR RATIOS: ORTHOCLASE ORTHOCLASE INDEX 0.6 ONS 47.71 S: A = 0.17 PLOT A = CATANO O 2.152 28. fo 2 0.000 0. cm tn 0.000 0.000 AL =100.000	3.838 6.841 A 14 F = 0.5 0.37 M RM ab 078 24. fa 000 20. pf 0.000 ****** ALGORYT An	8.203 PLAGIOC LBITE 84. 5 M = 0.2 1 = 0.17 F an 1 627 0.00 hy c 091 0.00 ns 0.000 0.0 HM) Lc	CLASE 91. 074 7 = 0.46 7 = 0.46 1 c ne 0 0.000 1 ac 0 0.000 ks cs 000 0.000 ks cs 000 0.000	.065 kp 0.000 mt 1.323 ru 0.00018	0.0 di 3.729 Ac
QUARTZ QUARTZ QUARTZ CHAPPELS MG NO. AFM PARJ JENSEN (: FELDS 5.097 9.085 S A/CNK IN CATI AMETERS CATION 0.000 fs 9.132 ap 0.487 RM TOTF **** SONORM C	<pre>SPAR RATIOS: ORTHOCLASE ORTHOCLASE CINDEX 0.6 CONS 47.71 S: A = 0.17 PLOT A = CATANO COT D 2.152 28. S fo 2 0.000 0. Cm tn 0.000 0.000 AL =100.000 (HUCHISONS Or Ab</pre>	3.838 6.841 A 14 F = 0.5 0.37 M RM ab 078 24. fa 000 20. pf 0.000 ****** ALGORYT An	8.203 PLAGIOC LBITE 84. 5 M = 0.2 1 = 0.17 F an 1 627 0.00 hy c 091 0.00 ns 0.000 0.0 HM) Lc	CLASE 91. 074 7 = 0.46 7 = 0.46 1 c ne 0 0.000 1 ac 0 0.000 ks cs 000 0.000 ks cs 000 0.000	.065 kp 0.000 mt 1.323 ru 0.00018	0.0 di 3.729 Ac
QUARTZ QUARTZ QUARTZ CHAPPELS MG NO. AFM PARA JENSEN (: FELDS 5.097 9.085 S A/CNK IN CATI AMETERS CATION 0.000 fs 9.132 ap 0.487 RM TOTA **** SONORM C 0.00	<pre>SPAR RATIOS: ORTHOCLASE ORTHOCLASE CINDEX 0.6 CONS 47.71 S: A = 0.17 PLOT A = CATANO COT D 2.152 28. S fo 2 0.000 0. Cm tn 0.000 0.000 AL =100.000 (HUCHISONS Or Ab</pre>	3.838 6.841 A 14 F = 0.5 0.37 M RM ab 078 24. fa 000 20. pf 0.000 ******* ALGORYI An 24.63	8.203 PLAGIOC LBITE 84. 5 M = 0.2 1 = 0.17 F an 1 627 0.00 hy c 091 0.00 ns 0.000 0.0 ********** CHM) Lc 0.00 0	CLASE 91. 074 28 7 = 0.46 10 0.000 1 ac 00 0.000 ks cs 000 0.000 ks cs 000 0.000 ks cs 000 0.000 ks cs 000 0.000	kp 0.000 mt 1.323 ru 0.00018 o Ri 00 28.13	0.0 0.0 di 3.729 Ac
QUARTZ QUARTZ QUARTZ CHAPPELS MG NO. AFM PARA JENSEN (: FELDS 5.097 9.085 S A/CNK IN CATI AMETERS CATION 0.000 fs 9.132 ap 0.487 RM TOTA ****7 SONORM C 0.000 Hy	EPAR RATIOS: ORTHOCLASE ORTHOCLASE CINDEX 0.6 CONS 47.71 S: A = 0.17 PLOT A = CATANO Or 2.152 28. fo 2 0.000 0. cm tn 0.000 0.000 AL =100.000 ********************************	3.838 6.841 A 14 F = 0.5 0.37 M RM ab 078 24. fa 000 20. pf 0.000 ******* ALGORYI An 24.63	8.203 PLAGIOC LBITE 84. 5 M = 0.2 1 = 0.17 F an 1 627 0.00 hy c 091 0.00 ns 0.000 0.0 ********** CHM) Lc 0.00 0	CLASE 91. 074 28 7 = 0.46 10 0.000 1 ac 00 0.000 ks cs 000 0.000 ks cs 000 0.000 ks cs 000 0.000 ks cs 000 0.000	kp 0.000 mt 1.323 ru 0.00018 o Ri 00 28.13	0.0 0.0 di 3.729 Ac
QUARTZ QUARTZ QUARTZ CHAPPELS MG NO. AFM PARA JENSEN (2.648 en 10.959 il 1.864 CATANOI MES Q Ed 1.13 0.00 Di HORNBLES	: FELDS 5.097 9.085 S A/CNK IN CATI AMETERS CATION 0.000 fs 9.132 ap 0.487 RM TOTF ****7 SONORM C 0.000 Hy NDE	SPAR RATIOS: ORTHOCLASE ORTHOCLASE INDEX 0.6 CONS 47.71 S: A = 0.17 PLOT A = CATANO 0 2.152 28. fo 2.152 28. fo 2.000 0. cm tn 0.000 0.000 AL = 100.000 ************************************	3.838 6.841 A 14 F = 0.5 0.37 M RM ab 078 24. fa 000 20. pf 0.000 ****** ALGORYI An 24.63 Fs	8.203 PLAGIOC LBITE 84. 5 M = 0.2 1 = 0.17 F an 1 627 0.00 hy c 091 0.00 ns 0.000 0.0 HM) Lc 0.00 0 Fo	CLASE 91. 074 28 7 = 0.46 10 0.000 1 ac 00 0.000 ks cs 00 0.000 ks cs 0.000 0.000 ks cs 0.0000 0.00000 0.0000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.000000 0.00000000	.065 kp 0.000 mt 1.323 ru 0.00018 o Ri 00 28.13 Mt	0.0 0.0 di 3.729 Ac 3 0. Hm
QUARTZ QUARTZ QUARTZ CHAPPELS MG NO. AFM PARA JENSEN (2.648 en 10.959 il 1.864 CATANOI MES Q Ed 1.13 0.00 Di HORNBLES	: FELDS 5.097 9.085 S A/CNK IN CATI AMETERS CATION 0.000 fs 9.132 ap 0.487 RM TOTF ****7 SONORM C 0.000 Hy NDE	EPAR RATIOS: ORTHOCLASE ORTHOCLASE CINDEX 0.6 CONS 47.71 S: A = 0.17 PLOT A = CATANO Or 2.152 28. fo 2 0.000 0. cm tn 0.000 0.000 AL =100.000 ********************************	3.838 6.841 A 14 F = 0.5 0.37 M RM ab 078 24. fa 000 20. pf 0.000 ****** ALGORYI An 24.63 Fs	8.203 PLAGIOC LBITE 84. 5 M = 0.2 1 = 0.17 F an 1 627 0.00 hy c 091 0.00 ns 0.000 0.0 HM) Lc 0.00 0 Fo	CLASE 91. 074 28 7 = 0.46 10 0.000 1 ac 00 0.000 ks cs 00 0.000 ks cs 0.000 0.000 ks cs 0.0000 0.00000 0.0000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.000000 0.00000000	.065 kp 0.000 mt 1.323 ru 0.00018 o Ri 00 28.13 Mt	0.0 0.0 di 3.729 Ac 3 0. Hm
QUARTZ : QUARTZ : QUARTZ CHAPPELS MG NO. AFM PARA JENSEN (: FELDS 5.097 9.085 S A/CNK IN CATI AMETERS CATION 0.000 fs 9.132 ap 0.487 RM TOTA ***** SONORM C 0.000 Hy NDE 9.99	SPAR RATIOS: ORTHOCLASE ORTHOCLASE INDEX 0.6 CONS 47.71 S: A = 0.17 PLOT A = CATANO Or 2.152 28. fo 2.000 0. cm tn 0.000 0.000 AL = 100.000 (HUCHISONS Or Ab 0.00 28.08 Ol (En 0.00 0.00	3.838 6.841 A 14 F = 0.5 0.37 M RM ab 078 24. fa 000 20. pf 0.000 ******* ALGORYI An 24.63 Fs 0.00	8.203 PLAGIOC LBITE 84. 5 M = 0.2 1 = 0.17 F an 1 627 0.00 hy c 0.91 0.00 0.000 0.0 HM) Lc 0.00 0 Fo 0.00	CLASE 91. 074 28 7 = 0.46 10 0.000 1 ac 00 0.000 ks cs 000 0.000 ks cs 000 0.000 ks cs 000 0.000 ks cs 000 0.000 ks cs 000 0.000 ks cs 000 0.000 1 ac 0 0.000 1.	kp 0.000 mt 1.323 ru 0.00018 0 Ri 00 28.13 Mt	0.0 di 3.729 Ac 3 0. Hm 00
QUARTZ : QUARTZ : QUARTZ CHAPPELS MG NO. AFM PARA JENSEN (: FELDS 5.097 9.085 S A/CNK IN CATI AMETERS CATION 0.000 fs 9.132 ap 0.487 RM TOTA **** SONORM C 0.000 Hy NDE 9.99 Cm	SPAR RATIOS: ORTHOCLASE ORTHOCLASE INDEX 0.6 CONS 47.71 S: A = 0.17 PLOT A = CATANO 0 2.152 28. fo 2.152 28. fo 2.000 0. cm tn 0.000 0.000 AL = 100.000 ************************************	3.838 6.841 A 14 F = 0.5 0.37 M RM ab 078 24. fa 000 20. pf 0.000 ******* ALGORYI An 24.63 Fs 0.000 Ns	8.203 PLAGIOC LBITE 84. 5 M = 0.2 1 = 0.17 F an 1 627 0.00 hy c 091 0.00 ns 0.000 0.0 ********* CHM) Lc 0.00 0 Fo 0.00 0 Ks Cs	CLASE 91. 074 28 7 = 0.46 10 0.000 1 ac 00 0.000 1 ac 00 0.000 1 ac 00 0.000 1 ac 0.00 0.000 *** Ne W 0.00 0.00 Fa) 0.00 1. s Ru	kp 0.000 mt 1.323 ru 0.00018 0 Ri 00 28.13 Mt .32 0. BIOTITE	0.0 di 3.729 Ac 3 0. Hm 00

	IUMBER	MK015						145
		RECALC	100%	MOL PRO	PS CAT	PROPS		145
	50.27		0.363		38	0.838		
A1203	17.21	11	7.242	0.1	.69	0.338		
Fe203	1.46		1.463	0.0	09	0.018		
Fe0	11.82	1	1.842	0.1	.65	0.165		
MnO _.	0.17	(0.170	0.0	02	0.002		
MgO	5.40	!	5.410	0.1	.34	0.134		
CaO	11.08	1	1.100	0.1	98	0.198		
Na2O	0.11	l l	0.110	0.0	002	0.004		
K20	0.08	I	0.080	0.0	001	0.002		
	1.89		1.890			0.024		
	0.33		0.331			0.005		
	0.00		0.000	0.0	000	0.000		
TOTAL	99.82							
• • •			CIPW NOR	м				
		or					_	
		0.474						-
		fo						
14.215		0.000						
	-	Cm	-					di
		0.000 0.0		0.000 (0.000 0.	.000 0.0	100 :	5.506
CIPWNOR	M TOTAL	= 100.01	.9 `*******					
		ERS FOR C				226		
HYPERST	HENE CO	MPOSITION				1 4 6		
).964 F				A
FELDSPA	R СОМРО	SITION :	KFS 0.	992 AB		1 AN 9	97.05	4
FELDSPA PLAGIOC	R COMPO LASE PE	SITION : RCENT ANO	KFS 0. RTHITE	992 AB			97.05	4
FELDSPA PLAGIOC QUARTZ	R COMPO LASE PE : FELDS	SITION : RCENT ANO PAR RATIO	KFS 0. RTHITE S:	992 AB 98.026	1.954	1 AN 9		4
FELDSPA PLAGIOC QUARTZ QUARTZ	R COMPO LASE PE : FELDS 19.892	SITION : RCENT ANO PAR RATIO ORTHOCL	KFS 0. ORTHITE OS: ASE 0.7	992 AB 98.026	1.954 GIOCLASE	1 AN 9		4
FELDSPA PLAGIOC QUARTZ QUARTZ QUARTZ	R COMPO LASE PE : FELDS 19.892 89.393	SITION : RCENT ANO PAR RATIO ORTHOCL ORTHOCLA	KFS 0. PRTHITE S: ASE 0.7 ASE 3.573	992 AB 98.026	1.954 GIOCLASE	1 AN 9		4
FELDSPA PLAGIOC QUARTZ QUARTZ QUARTZ CHAPPEL	R COMPO LASE PE : FELDS 19.892 89.393 S A/CNK	SITION : RCENT ANO PAR RATIO ORTHOCLA INDEX 0	KFS 0. PRTHITE OS: ASE 0.7 ASE 3.573 0.843	992 AB 98.026	1.954 GIOCLASE	1 AN 9		4
FELDSPA PLAGIOC QUARTZ QUARTZ QUARTZ CHAPPEL	R COMPO LASE PE : FELDS 19.892 89.393 S A/CNK	SITION : RCENT ANO PAR RATIO ORTHOCL ORTHOCLA	KFS 0. PRTHITE OS: ASE 0.7 ASE 3.573 0.843	992 AB 98.026	1.954 GIOCLASE	1 AN 9		4
FELDSPAN PLAGIOC QUARTZ QUARTZ QUARTZ CHAPPEL MG No.	R COMPO LASE PE : FELDS 19.892 89.393 S A/CNK IN CATI	SITION : RCENT ANO PAR RATIO ORTHOCLA INDEX 0	KFS 0. PRTHITE PS: ASE 0.7 ASE 3.573 0.843 29	992 AB 98.026 795 PLA 3 ALBITE	1.954 GIOCLASE 7.034	1 AN 9		4
FELDSPAN PLAGIOC QUARTZ QUARTZ QUARTZ CHAPPEL MG NO. AFM PAR	R COMPO LASE PE : FELDS 19.892 89.393 S A/CNK IN CATI AMETERS	SITION : RCENT ANO PAR RATIO ORTHOCLA ORTHOCLA INDEX 0 ONS 42.	KFS 0. PRTHITE PS: ASE 0.7 ASE 3.573 0.843 29 01 F = 0.	.992 AB 98.026 795 PLA 3 ALBITE .70 M = 0	1.954 GIOCLASE 7.034 0.29	₽ AN 9		4
FELDSPAN PLAGIOC QUARTZ QUARTZ QUARTZ CHAPPEL MG NO. AFM PAR JENSEN	R COMPO LASE PE : FELDS 19.892 89.393 S A/CNK IN CATI AMETERS CATION	SITION : RCENT ANO PAR RATIO ORTHOCLA INDEX 0 ONS 42. : A = 0.0 PLOT A	KFS 0. RTHITE S: ASE 0.7 SE 3.573 0.843 29 01 F = 0. = 0.38	992 AB 98.026 795 PLA 3 ALBITE .70 M = 0.1	1.954 GIOCLASE 7.034 0.29 4 F = 0	₽ AN 9		4
FELDSPAN PLAGIOC QUARTZ QUARTZ QUARTZ CHAPPEL MG NO. AFM PAR JENSEN	R COMPO LASE PE : FELDS 19.892 89.393 S A/CNK IN CATI AMETERS CATION	SITION : RCENT ANO PAR RATIO ORTHOCLA INDEX 0 ONS 42. : A = 0.0 PLOT A CATA	KFS 0. PRTHITE 95: ASE 0.7 ASE 3.573 0.843 29 01 F = 0. = 0.38 ANORM	992 AB 98.026 795 PLA 3 ALBITE .70 M = 0 M = 0.1	1.954 GIOCLASE 7.034 0.29 4 F = 0 	₽ AN 9 E 79.31	13	
FELDSPAN PLAGIOC QUARTZ QUARTZ QUARTZ CHAPPEL MG NO. AFM PAR JENSEN	R COMPO LASE PE : FELDS 19.892 89.393 S A/CNK IN CATI AMETERS CATION	SITION : RCENT ANO PAR RATIO ORTHOCLA INDEX O ONS 42. : A = 0.0 PLOT A CATA or	KFS 0. RTHITE S: ASE 0.7 SE 3.573 0.843 29 01 F = 0. = 0.38 NORM ab	992 AB 98.026 795 PLA 3 ALBITE .70 M = 0 M = 0.1 an	1.954 GIOCLASE 7.034 0.29 4 F = 0 1c	AN 9 E 79.31 .48 ne	13 kp	wo
FELDSPAN PLAGIOC QUARTZ QUARTZ QUARTZ CHAPPEL MG NO. AFM PAR JENSEN q 11.415	R COMPO LASE PE : FELDS 19.892 89.393 S A/CNK IN CATI AMETERS CATION C 0.000	SITION : RCENT ANO PAR RATIO ORTHOCLA ORTHOCLA INDEX 0 ONS 42. : A = 0.0 PLOT A CATA or 0.492	KFS 0. RTHITE OS: ASE 0.7 ASE 3.573 0.843 29 01 F = 0. = 0.38 NORM ab 1.029 48	992 AB 98.026 795 PLA 3 ALBITE .70 M = 0 M = 0.1 an 3.178 0	1.954 GIOCLASE 7.034 0.29 4 F = 0 1c .000 0	AN 9 E 79.31 .48 ne .000 0.	13 kp .000	wo 0.000
FELDSPAN PLAGIOC QUARTZ QUARTZ QUARTZ CHAPPEL MG NO. AFM PAR JENSEN q 11.415 en	R COMPO LASE PE : FELDS 19.892 89.393 S A/CNK IN CATI AMETERS CATION 	SITION : RCENT ANO PAR RATIO ORTHOCLA ORTHOCLA INDEX 0 ONS 42. : A = 0.0 PLOT A CATA or 0.492 i fo	KFS 0. PRTHITE OS: ASE 0.7 SE 3.573 0.843 29 01 F = 0. = 0.38 NORM ab 1.029 48 fa	992 AB 98.026 795 PLA 3 ALBITE .70 M = 0 M = 0.1 an 3.178 0 hy	1.954 GIOCLASE 7.034 0.29 $4 F = 0$ $1c$.000 0 ol	AN 9 5 79.31 .48 .000 0. ac	13 kp .000 mt	wc 0.000 hm
FELDSPAN PLAGIOC QUARTZ QUARTZ QUARTZ CHAPPEL MG NO. AFM PAR JENSEN q 11.415 en	R COMPO LASE PE : FELDS 19.892 89.393 S A/CNK IN CATI AMETERS CATION 0.000 fs 14.186	SITION : RCENT ANO PAR RATIO ORTHOCLA INDEX 0 ONS 42. : A = 0.0 PLOT A CATA or 0.492 fo 0.000	KFS 0. PRTHITE PS: ASE 0.7 SE 3.573 0.843 29 01 F = 0. = 0.38 NORM ab 1.029 48 fa 0.000 28	992 AB 98.026 795 PLA 3 ALBITE M = 0.1 M = 0.1 an 3.178 0 hy 3.351 0	1.954 GIOCLASE 7.034 0.29 4 F = 0 1c .000 0 ol .000 0	AN 9 79.31 .48 .000 0. ac .000 1.	kp .000 mt .590	wo 0.000 hm 0.000
FELDSPAN PLAGIOC QUARTZ QUARTZ QUARTZ CHAPPEL MG NO. AFM PAR JENSEN q 11.415 en 14.165 il	R COMPO LASE PE : FELDS 19.892 89.393 S A/CNK IN CATI AMETERS CATION 0.000 fs 14.186 ap	SITION : RCENT ANO PAR RATIO ORTHOCLA INDEX 0 ONS 42. : A = 0.0 PLOT A CATA or 0.492 fo 0.000 cm	KFS 0. PRTHITE PS: ASE 0.7 SE 3.573 0.843 29 01 F = 0. = 0.38 NORM ab 1.029 48 fa 0.000 28 tn pf	992 AB 98.026 795 PLA 3 ALBITE M = 0.1 M = 0.1 an 3.178 0 hy 3.351 0 f ns	1.954 GIOCLASE 7.034 0.29 4 F = 0 1c .000 0 ol .000 0 ks	AN 9 79.31 .48 .000 0. ac .000 1. cs	kp .000 mt .590 ru	wo 0.000 hm 0.000 di
FELDSPAN PLAGIOC QUARTZ QUARTZ QUARTZ CHAPPEL MG NO. AFM PAR JENSEN q 11.415 en 14.165 il 2.738	R COMPO LASE PE : FELDS 19.892 89.393 S A/CNK IN CATI AMETERS CATION 	SITION : RCENT ANO PAR RATIO ORTHOCLA ORTHOCLA INDEX 0 ONS 42. : A = 0.0 PLOT A CATA or 0.492 fo 0.000 cm 0.000 0.0	KFS 0. PRTHITE PS: ASE 0.7 ASE 3.573 0.843 29 01 F = 0. = 0.38 NORM ab 1.029 48 fa 0.000 28 tn pf 000 0.000	992 AB 98.026 795 PLA 3 ALBITE M = 0.1 M = 0.1 an 3.178 0 hy 3.351 0 f ns	1.954 GIOCLASE 7.034 0.29 4 F = 0 1c .000 0 ol .000 0 ks	AN 9 79.31 .48 .000 0. ac .000 1. cs	kp .000 mt .590 ru	wo 0.000 hm 0.000 di
FELDSPAN PLAGIOC QUARTZ QUARTZ QUARTZ CHAPPEL MG NO. AFM PAR JENSEN q 11.415 en 14.165 il 2.738	R COMPO LASE PE : FELDS 19.892 89.393 S A/CNK IN CATI AMETERS CATION 	SITION : RCENT ANO PAR RATIO ORTHOCLA INDEX 0 ONS 42. : A = 0.0 PLOT A CATA or 0.492 fo 0.000 cm	KFS 0. PRTHITE PS: ASE 0.7 ASE 3.573 0.843 29 01 F = 0. = 0.38 NORM ab 1.029 48 fa 0.000 28 tn p1 000 0.000 00	992 AB 98.026 795 PLA 3 ALBITE .70 M = 0 M = 0.1 an 3.178 0 hy 3.351 0 f ns 0 0.000	1.954 GIOCLASE 7.034 0.29 4 F = 0 1c .000 0 ol .000 0 ks 0.000 0	AN 9 79.31 .48 .000 0. ac .000 1. cs	kp .000 mt .590 ru	wo 0.000 hm 0.000 di
FELDSPAN PLAGIOC QUARTZ QUARTZ QUARTZ CHAPPEL MG NO. AFM PAR JENSEN q 11.415 en 14.165 il 2.738 CATANO	R COMPO LASE PE : FELDS 19.892 89.393 S A/CNK IN CATI AMETERS CATION 	SITION : RCENT ANO PAR RATIO ORTHOCLA ORTHOCLA INDEX 0 ONS 42. : A = 0.0 PLOT A CATA or 0.492 fo 0.000 cm 0.000 0.0 L = 100.00	KFS 0. PRTHITE PS: ASE 0.7 SE 3.573 0.843 29 01 F = 0. = 0.38 0.007 48 fa 0.000 28 tn pf 000 0.000 00	992 AB 98.026 795 PLAG ALBITE M = 0.1 M = 0.1 an 3.178 0 hy 3.351 0 f ns 0 0.000	1.954 GIOCLASE 7.034 0.29 4 F = 0 1c .000 0 ks 0.000 0 ks	AN 9 79.31 .48 .000 0. ac .000 1. cs	kp .000 mt .590 ru	wo 0.000 hm 0.000 di
FELDSPAN PLAGIOC QUARTZ QUARTZ QUARTZ CHAPPEL MG NO. AFM PAR JENSEN	R COMPO LASE PE : FELDS 19.892 89.393 S A/CNK IN CATI AMETERS CATION 	SITION : RCENT ANO PAR RATIO ORTHOCLA ORTHOCLA INDEX 0 ONS 42. : A = 0.0 PLOT A CATA or 0.492 fo 0.000 cm 0.000 0.0 L =100.00 (HUCHISON	KFS 0. PRTHITE PS: ASE 0.7 SE 3.573 0.843 29 01 F = 0. = 0.38 0.007 48 fa 0.000 28 tn pf 000 0.000 With the second	992 AB 98.026 795 PLAG ALBITE .70 M = 0 M = 0.1 an 3.178 0 hy B.351 0 f ns 0 0.000 *******	1.954 GIOCLASE 7.034 0.29 4 F = 0 1c .000 0 ks 0.000 0 ks	AN 9 79.31 .48 .000 0. ac .000 1. cs .000 0.0	kp .000 mt .590 ru 000 5	wo 0.000 hm 0.000 di .487
FELDSPAN PLAGIOC QUARTZ QUARTZ QUARTZ CHAPPEL MG NO. AFM PAR JENSEN	R COMPO LASE PE : FELDS 19.892 89.393 S A/CNK IN CATI AMETERS CATION 	SITION : RCENT ANO PAR RATIO ORTHOCLA ORTHOCLA INDEX 0 ONS 42. : A = 0.0 PLOT A CATA or 0.492 fo 0.000 cm 0.000 0.0 L = 100.00	KFS 0. PRTHITE PS: ASE 0.7 SE 3.573 0.843 29 01 F = 0. = 0.38 0.007 48 fa 0.000 28 tn pf 000 0.000 With the second	992 AB 98.026 795 PLAG ALBITE .70 M = 0 M = 0.1 an 3.178 0 hy B.351 0 f ns 0 0.000 *******	1.954 GIOCLASE 7.034 0.29 4 F = 0 1c .000 0 ks 0.000 0 ks	AN 9 79.31 .48 .000 0. ac .000 1. cs .000 0.0	kp .000 mt .590 ru 000 5	wo 0.000 hm 0.000 di .487
FELDSPAN PLAGIOC QUARTZ QUARTZ QUARTZ CHAPPEL MG NO. AFM PAR JENSEN q 11.415 en 14.165 il 2.738 CATANO ME Q Ed	R COMPO LASE PE : FELDS 19.892 89.393 S A/CNK IN CATI AMETERS CATION 0.000 fs 14.186 ap 0.719 RM TOTA ***** SONORM C	SITION : RCENT ANO PAR RATIO ORTHOCLA ORTHOCLA INDEX O ONS 42. : A = 0.0 PLOT A CATA or 0.492 fo 0.000 cm 0.000 0.0 L =100.00 (HUCHISON Or AF	KFS 0. PRTHITE 95: ASE 0.7 ASE 3.573 0.843 29 01 F = 0. = 0.38 NNORM ab 1.029 48 fa 0.000 0.000 28 tn p1 000 0.000 XS ALGORY D An	992 AB 98.026 95 PLA 3 ALBITE M = 0.1 M = 0.1 M = 0.1 3.178 0 hy 3.351 0 f ns 0 0.000 ******* YTHM) Lc	1.954 GIOCLASE 7.034 0.29 4 F = 0 1c .000 0 .000 0 ks 0.000 0 ***** Ne	AN 9 T 79.31 .48 .48 .000 0. .000 1. .cs .000 0.0	kp .000 mt .590 ru 000 5 Ri	wo 0.000 hm 0.000 di .487 Act
FELDSPAN PLAGIOC QUARTZ QUARTZ QUARTZ CHAPPEL MG NO. AFM PAR JENSEN q 11.415 en 14.165 il 2.738 CATANO ME Q Ed	R COMPO LASE PE : FELDS 19.892 89.393 S A/CNK IN CATI AMETERS CATION 	SITION : RCENT ANO PAR RATIO ORTHOCLA ORTHOCLA INDEX 0 ONS 42. : A = 0.0 PLOT A CATA or 0.492 fo 0.000 cm 0.000 0.0 L =100.00 (HUCHISON	KFS 0. PRTHITE 95: ASE 0.7 ASE 3.573 0.843 29 01 F = 0. = 0.38 NNORM ab 1.029 48 fa 0.000 0.000 28 tn p1 000 0.000 XS ALGORY D An	992 AB 98.026 95 PLA 3 ALBITE M = 0.1 M = 0.1 M = 0.1 3.178 0 hy 3.351 0 f ns 0 0.000 ******* YTHM) Lc	1.954 GIOCLASE 7.034 0.29 4 F = 0 1c .000 0 .000 0 ks 0.000 0 ***** Ne	AN 9 T 79.31 .48 .48 .000 0. .000 1. .cs .000 0.0	kp .000 mt .590 ru 000 5 Ri	wo 0.000 hm 0.000 di .487 Act
FELDSPAN PLAGIOC QUARTZ QUARTZ QUARTZ CHAPPEL MG NO. AFM PAR JENSEN	R COMPO LASE PE : FELDS 19.892 89.393 S A/CNK IN CATI AMETERS CATION 	SITION : RCENT ANO PAR RATIO ORTHOCLA ORTHOCLA INDEX O ONS 42. : A = 0.0 PLOT A CATA or 0.492 fo 0.000 cm 0.000 0.0 L =100.00 (HUCHISON Or AF	KFS 0. PRTHITE PS: ASE 0.7 ASE 3.573 0.843 29 01 F = 0. = 0.38 NNORM ab 1.029 48 fa 0.000 28 tn p1 000 0.000 XS ALGORY NO 48.18	992 AB 98.026 95 PLA 3 ALBITE M = 0.1 M = 0.10 M = 0.1 M = 0.0 M = 0.0	1.954 GIOCLASE 7.034 0.29 4 F = 0 lc .000 0 ks 0.000 0 ***** Ne 0.00	AN 9 F 79.31 A8 A8 A8 A8 A8 A8 A8 A8 A8 A8	kp .000 mt .590 ru 000 5 Ri 0.02	wo 0.000 hm 0.000 di .487 Act 0.00
FELDSPAN PLAGIOC QUARTZ QUARTZ QUARTZ CHAPPEL MG NO. AFM PAR JENSEN	R COMPO LASE PE : FELDS 19.892 89.393 S A/CNK IN CATI AMETERS CATION 0.000 fs 14.186 ap 0.719 RM TOTA ***** SONORM C 0.00 Hy	SITION : RCENT ANO PAR RATIO ORTHOCLA ORTHOCLA INDEX 0 ONS 42. : A = 0.0 PLOT A CATA or 0.492 fo 0.000 Cm 0.000 0.0 L =100.00 (HUCHISON Or AF 0.00 1.0	KFS 0. PRTHITE PS: ASE 0.7 ASE 3.573 0.843 29 01 F = 0. = 0.38 NNORM ab 1.029 48 fa 0.000 28 tn p1 000 0.000 XS ALGORY NO 48.18	992 AB 98.026 95 PLA 3 ALBITE M = 0.1 M = 0.10 M = 0.1 M = 0.0 M = 0.0	1.954 GIOCLASE 7.034 0.29 4 F = 0 lc .000 0 ks 0.000 0 ***** Ne 0.00	AN 9 F 79.31 A8 A8 A8 A8 A8 A8 A8 A8 A8 A8	kp .000 mt .590 ru 000 5 Ri 0.02	wo 0.000 hm 0.000 di .487 Act 0.00
FELDSPAN PLAGIOC QUARTZ QUARTZ QUARTZ CHAPPEL MG NO. AFM PAR JENSEN q 11.415 en 14.165 il 2.738 CATANO ME Q Ed 10.34 0.00 Di HORNBLE	R COMPO LASE PE : FELDS 19.892 89.393 S A/CNK IN CATI AMETERS CATION 0.000 fs 14.186 ap 0.719 RM TOTA ***** SONORM C 0.00 	SITION : RCENT ANO PAR RATIO ORTHOCLA ORTHOCLA INDEX 0 ONS 42. : A = 0.0 PLOT A CATA or 0.492 fo 0.000 Cm 0.000 0.0 L =100.00 (HUCHISON Or AF 0.00 1.0	KFS 0. PRTHITE 95: ASE 0.7 SSE 3.573 0.843 29 01 F 0. = 0.38 NNORMab 1.029 48 1.029 48 fa 0.000 28 fa 000 0.000 28 tn p1 900 000 0.000 900 000 0.000 900 000 48.18 900 n Fs 900	992 AB 98.026 95 PLA 3 ALBITE M = 0.1 M = 0.1 M = 0.1 3.178 0 hy 3.351 0 f ns 0 0.000 ******* YTHM) Lc 0.00 Fo	1.954 GIOCLASE 7.034 0.29 4 F = 0 1c .000 0 ks 0.000 0 ks 0.000 0 ***** Ne 0.00 Fa	AN 9 T 79.31 .48 .48 .000 0. .000 1. .000 1. .000 0.0 Wo 0.00	kp .000 mt .590 ru 000 5 Ri 0.02	wo 0.000 hm 0.000 di .487 Act 0.00 Hm
FELDSPAN PLAGIOC QUARTZ QUARTZ QUARTZ CHAPPEL MG NO. AFM PAR JENSEN q 11.415 en 14.165 il 2.738 CATANO ME Q Ed 10.34 0.00 Di HORNBLE	R COMPO LASE PE : FELDS 19.892 89.393 S A/CNK IN CATI AMETERS CATION 0.000 fs 14.186 ap 0.719 RM TOTA ***** SONORM C 0.00 	SITION : RCENT ANO PAR RATIO ORTHOCLA ORTHOCLA INDEX 0 ONS 42. : A = 0.0 PLOT A CATA or 0.492 : fo 0.000 cm 0.000 0.0 L =100.00 ********** (HUCHISON Or AF 0.00 1.0 OI (E	KFS 0. PRTHITE 95: ASE 0.7 SSE 3.573 0.843 29 01 F 0. = 0.38 NNORMab 1.029 48 1.029 48 fa 0.000 28 fa 000 0.000 28 tn p1 900 000 0.000 900 000 0.000 900 000 48.18 900 n Fs 900	992 AB 98.026 95 PLA 3 ALBITE M = 0.1 M = 0.1 M = 0.1 3.178 0 hy 3.351 0 f ns 0 0.000 ******* YTHM) Lc 0.00 Fo	1.954 GIOCLASE 7.034 0.29 4 F = 0 1c .000 0 ks 0.000 0 ks 0.000 0 ***** Ne 0.00 Fa	AN 9 T 79.31 .48 .48 .000 0. .000 1. .000 1. .000 0.0 Wo 0.00	kp .000 mt .590 ru 000 5 Ri 0.02	wo 0.000 hm 0.000 di .487 Act 0.00 Hm
FELDSPAN PLAGIOC QUARTZ QUARTZ QUARTZ CHAPPEL MG NO. AFM PAR JENSEN	R COMPO LASE PE : FELDS 19.892 89.393 S A/CNK IN CATI AMETERS CATION 	SITION : RCENT ANO PAR RATIO ORTHOCLA ORTHOCLA INDEX O ONS 42. : A = 0.0 PLOT A CATA or 0.492 fo 0.000 cm 0.000 0.0 L =100.00 OT A 0.00 1.0 OI (E 0.000 0.0	KFS 0. PRTHITE PS: ASE 0.7 ASE 3.573 0.843 29 01 F = 0. = 0.38 NNORM ab 1.029 48 fa 0.000 00 0.000 XS ALGORY D An 03 48.18 an Fs 00 0.000	992 AB 98.026 795 PLA 3 ALBITE M = 0.1 M = 0.0 M = 0.0	1.954 GIOCLASE 7.034 0.29 4 F = 0 1c .000 0 ks 0.000 0 ***** Ne 0.00 Fa 0.00	AN 9 AN 9 C 79.31 .48 .48 .000 0. .000 1. .000 0.0 WO 0.00 .000 0.0 .000 0.0	kp .000 mt .590 ru 000 5 Ri 0.02 t 0.0	wo 0.000 hm 0.000 di .487 Act 0.00 Hm
FELDSPAN PLAGIOC QUARTZ QUARTZ QUARTZ CHAPPEL MG NO. AFM PAR JENSEN	R COMPO LASE PE : FELDS 19.892 89.393 S A/CNK IN CATI AMETERS CATION 	SITION : RCENT ANO PAR RATIO ORTHOCLA ORTHOCLA INDEX 0 ONS 42. : A = 0.0 PLOT A CATA or 0.492 : fo 0.000 cm 0.000 0.0 L =100.00 ********** (HUCHISON Or AF 0.00 1.0 OI (E	KFS 0. PRTHITE 95: ASE 0.7 ASE 3.573 0.843 29 01 F = 0. 0.843 29 01 F = 0.38 NNORM ab 1.029 48 fa 0.000 0.000 0.000 000 0.000 XS ALGORY NS ALGORY 03 48.18 n Fs 00 0.000 f Ns	992 AB 98.026 95 PLA 3 ALBITE M = 0.1 M = 0.10 M = 0.1 M = 0.10 M = 0.000 M = 0.0000 M = 0.000 M = 0.000 M = 0.000 M = 0.000 M = 0.000 M = 0.0000 M = 0.00000 M = 0.00000 M = 0.0000 M = 0.00000 M = 0.00	1.954 GIOCLASE 7.034 0.29 4 F = 0 1c .000 0 ks 0.000 0 ***** Ne 0.000 Fa 0.000 Cs 1	AN 9 AN 9 C 79.31 .48 .48 .000 0. .000 1. .000 0.0 WO 0.00 NO .000 0.0 .000 0.0 .0000 0.0 .000 0.000 0	kp .000 mt .590 ru 000 5 Ri 0.02 t 0.02	wo 0.000 hm 0.000 di .487 Act 0.00 Hm

PETRONOF	MS PRO	GRAM						
SAMPLE N	IUMBER	MK016						146
OXIDES	GIVEN	RECAL	C 100%	MOL	PROPS	CAT PRO	PS	140
SiO2 .	50.81		51.048		0.850	0.8	50	
A1203	14.82		14.890		0.146	0.2	92	
Fe203	1.50		1.507		0.009	0.0	19	
FeO	12.11		12.167		0.169	0.1	.69	
MnO	0.19		0.191		0.003	0.0	03	
MgO	4.65		4.672		0.116	0.1	.16	
CaO	9.02		9.062		0.162	0.1	.62	
Na2O	4.12		4.139		0.067	0.1	.34	
к20	0.27		0.271		0.003	0.0	006	
TiO2	1.73		1.741		0.022	0.0	22	
P205	0.31		0.311		0.002	0.0	04	
Cr203	0.00		0.000		0.000	0.0	000	
TOTAL	99.53							
• • •		• • • • • • • •	.CIPW 1	NORM		• • • • • •		
P	с	or	ab	an	lc	ne	kp	wo
0.000	0.000	1.603	35.023	21.246	0.000	0.000	0.000	0.000
en	fs	fo	fa	hy	ol	ac	mt	hm
3.585	4.355	4.405	5.352	7.939	9.757	0.000	2.185	0.000
il	ap	cm	tn	pf	ns ks	CS	ru	di
3.307	0.738	0.000 0	.000 0.0	000 0.0	00 0.000	0.000	0.000	18.220

CIPWNORM TOTAL = 100.019

PARAMETERS FOR CIPW NORMATIVE MINERALS OLIVINE COMPOSITION: FORSTERITE 45.149 FAYALITE 54.851 HYPERSTHENE COMPOSITION:EN 45.149 FS 54.851 FELDSPAR COMPOSITION :KFS 2.770 AB 60.519 AN 36.712 PLAGIOCLASE PERCENT ANORTHITE 37.757 **OUARTZ : FELDSPAR RATIOS:** QUARTZ 0.000 ORTHOCLASE 2.770 PLAGIOCLASE 97.230 QUARTZ 0.000 ORTHOCLASE 4.377 ALBITE 95.623 CHAPPELS A/CNK INDEX 0.631 MG No. IN CATIONS 38.11

AFM PARAMETERS: A = 0.20 F = 0.60 M = 0.21JENSEN CATION PLOT A = 0.35 M = 0.13 F = 0.52

.....CATANORM..... q c or ab an lc ne kp wo 0.000 0.000 1.622 37.612 21.504 0.000 0.000 0.000 0.000 en fs fo fa hy ol ac mt hm 3.431 4.168 4.246 5.158 7.598 9.404 0.000 1.594 0.000 il ap cm tn pf ns ks cs di ru 2.454 0.659 0.000 0.000 0.000 0.000 0.000 0.000 0.00017.552 CATANORM TOTAL =100.000 * ***** ... MESONORM (HUCHISONS ALGORYTHM...) An Lc Q С Or Ab Ne Wo Ri Act Ed 0.00 0.00 0.00 31.40 21.50 0.00 0.00 0.00 5.07 0.00 19.88 Ну (En Fs Fo Fa) Di 01 Mt Hm HORNBLENDE 0.00 13.62 0.00 0.00 0.00 0.00 0.00 1.59 0.00 24.948 Ap Cm Pf \mathbf{Tn} Ns Ks Cs Ru BIOTITE Sp 0.74 0.00 3.68 0.00 0.00 0.00 0.00 0.00 2.595 MESONORM TOTAL = 100.082

	UMBER		a 1000	NOT	DDODC	0.800	DRODG		147
		RECAI							
					0.136				
	9.58								
	2.61								
	0.66								
	0.81								
	0.16		0.161		0.001		0.002		
	0.00		0.000		0.000		0.000		
TOTAL			0.000		0.000				
			CIPW	NORM					
q	С	or	ab	an	10	2	ne	kp	W
1.548	0.000	3.923	22.216	24.078	0.000	0.0	00 0.	.000	0.00
en	fs	fo	fa	. hy	0]	L	ac	mt	h
14.009	11.518	0.000	0.000	25.527	0.000	0.0	000 1.	969	0.00
il [.]	ap	cm	tn	pf	ns)	cs	cs	ru	di
1.554	0.381	0.000 0	.000 0.	000 0.0	00 0.00	0.0	000 0.0	000 1	8.814
CIPWNOR	M TOTAL	= 100.	011						
		****	******	******	******	***			
J	PARAMEI	ERS FOR	CIPW N	ORMATIV	E MINER	RALS			
HYPERST	HENE CO	MPOSITI	ON:EN	54.880	FS	45.12	20		
FELDSPA	R COMPC	SITION	:KFS	7.813	AB 44	1.239	DN /	47.94	R
									0
PLAGIOC	LASE PE	RCENT A	NORTHII						0
									0
QUARTZ	: FELDS	PAR RAT	IOS:	E 52.0	11				0
QUARTZ QUARTZ	: FELDS 2.990	SPAR RAT ORTHOC	IOS: LASE 7	E 52.0	11 LAGIOCI	LASE			0
PLAGIOC QUARTZ QUARTZ QUARTZ CHAPPEL:	: FELDS 2.990 5.591	ORTHOCL	IOS: LASE 7 ASE 14.	E 52.0	11 LAGIOCI	LASE			
QUARTZ QUARTZ QUARTZ	: FELDS 2.990 5.591 S A/CNK	SPAR RAT ORTHOC ORTHOCL INDEX	IOS: LASE 7 ASE 14. 0.614	E 52.0	11 LAGIOCI	LASE			
QUARTZ QUARTZ QUARTZ CHAPPELS MG No.	: FELDS 2.990 5.591 S A/CNM IN CATI	SPAR RAT ORTHOC ORTHOCL CINDEX CONS 4	IOS: LASE 7 ASE 14. 0.614 9.58	E 52.0 .579 P 170 ALB	11 LAGIOCI ITE 80	LASE .238			
QUARTZ QUARTZ QUARTZ CHAPPEL: MG No. AFM PAR	: FELDS 2.990 5.591 S A/CNK IN CATI	SPAR RAT ORTHOC ORTHOCL CINDEX CONS 4 S: A = 0	IOS: LASE 7 ASE 14. 0.614 9.58 .15 F =	E 52.0 .579 P 170 ALE	11 LAGIOCI ITE 80	LASE 238	89.430		
QUARTZ QUARTZ QUARTZ CHAPPELS	: FELDS 2.990 5.591 S A/CNK IN CATI	SPAR RAT ORTHOC ORTHOCL CINDEX CONS 4 S: A = 0	IOS: LASE 7 ASE 14. 0.614 9.58 .15 F =	E 52.0 .579 P 170 ALE	11 LAGIOCI ITE 80	LASE 238	89.430		
QUARTZ QUARTZ QUARTZ CHAPPELS MG NO. AFM PAR JENSEN	: FELDS 2.990 5.591 S A/CNK IN CATI AMETERS CATION	SPAR RAT ORTHOCL ORTHOCL CONS 4 S: A = 0 PLOT	IOS: LASE 7 ASE 14. 0.614 9.58 .15 F = A = 0.3	E 52.0 .579 P 170 ALE 0.55 M 4 M =	11 LAGIOCI MITE 80 (= 0.30 0.19 F	LASE 238	89.430		
QUARTZ QUARTZ QUARTZ CHAPPELS MG NO. AFM PAR JENSEN	: FELDS 2.990 5.591 S A/CNK IN CATI AMETERS CATION	PAR RAT ORTHOCL ORTHOCL CONS 4 CONS 4 CONS 4 CONS 4 CONS 4 CONS 4	IOS: LASE 7 ASE 14. 0.614 9.58 .15 F = A = 0.3 TANORM.	E 52.0 .579 P 170 ALE = 0.55 M 84 M =	11 LAGIOCI ITE 80 (= 0.30 0.19 F	LASE .238) = 0.4	89.430 47	ס	
QUARTZ QUARTZ QUARTZ CHAPPEL: MG NO. AFM PAR JENSEN Q	: FELDS 2.990 5.591 S A/CNK IN CATI AMETERS CATION	SPAR RAT ORTHOCL ORTHOCL CINDEX CONS 4 S: A = 0 PLOT CA	IOS: LASE 7 ASE 14. 0.614 9.58 .15 F = A = 0.3 TANORM. ab	E 52.0 .579 P 170 ALE 0.55 M 84 M = an	11 LAGIOCI ITE 80 (= 0.30 0.19 F	CASE 238 0 = 0.4	89.430 47 ne	b	W
QUARTZ QUARTZ QUARTZ CHAPPEL: MG NO. AFM PAR JENSEN q 1.451	: FELDS 2.990 5.591 S A/CNK IN CATI AMETERS CATION 	SPAR RAT ORTHOCL ORTHOCL CINDEX CONS 4 S: A = 0 PLOT CA or 0 3.968	IOS: LASE 7 ASE 14. 0.614 9.58 .15 F = A = 0.3 TANORM. at 23.851	E 52.0 .579 P 170 ALE 0.55 M 4 M = 	11 LAGIOCI ITE 80 4 = 0.30 0.19 F 	CASE 238) = 0.4	89.430 47 ne 000 0	b kp .000	ω 0.00
QUARTZ QUARTZ QUARTZ CHAPPEL: MG No. AFM PAR JENSEN q 1.451 en	: FELDS 2.990 5.591 S A/CNK IN CATI AMETERS CATION 	SPAR RAT ORTHOCL ORTHOCL CINDEX CONS 4 S: A = 0 PLOT CA or 0 3.968 5 fo	IOS: LASE 7 ASE 14. 0.614 9.58 .15 F = A = 0.3 TANORM. ak 23.851 fa	E 52.0 2.579 P 170 ALE 0.55 M 4 M = 0 an 24.364 1 hy	11 LAGIOCI ITE 80 (= 0.30 0.19 F 0.000 7 0.000	CASE 238) = 0.4	89.430 47 ne 000 0 ac	kp .000 mt	ω 0.00 h
QUARTZ QUARTZ QUARTZ CHAPPELS MG NO. AFM PAR JENSEN q 1.451 en 13.762	: FELDS 2.990 5.591 S A/CNK IN CATI AMETERS CATION 	SPAR RAT ORTHOCL ORTHOCL CINDEX CONS 4 S: A = 0 PLOT CA S: 0 3.968 S fo 5 0.000	IOS: LASE 7 ASE 14. 0.614 9.58 .15 F = A = 0.3 TANORM. 23.851 fa 0.000	E 52.0 579 P 170 ALB 0.55 M 4 M = 24.364 hy 25.077	11 LAGIOCI ITE 80 (= 0.30 0.19 F 0.000 0.000	CASE .238) = 0.4 0 0.0	89.430 47 ne 000 0 ac 000 1	kp .000 mt .436	w 0.00 h 0.00
QUARTZ QUARTZ QUARTZ CHAPPELS MG NO. AFM PAR JENSEN q 1.451 en 13.762 il	: FELDS 2.990 5.591 S A/CNK IN CATI AMETERS CATION 0.000 fs 11.315 ap	SPAR RAT ORTHOCL ORTHOCL CINDEX CONS 4 S: A = 0 PLOT CA S: A = 0 PLOT CA S: 0 .000 Cm	IOS: LASE 7 ASE 14. 0.614 9.58 .15 F = A = 0.3 TANORM. 23.851 fa 0.000 tn	E 52.0 579 P 170 ALE 0.55 M 4 M = 24.364 hy 25.077 pf	11 LAGIOCI ITE 80 (= 0.30 0.19 F 0.000 0.000 ns 1	CASE 238 = 0.4 0 0.0	89.430 47 000 0 ac 000 1 cs	kp .000 mt .436 ru	w 0.00 h 0.00 di
QUARTZ QUARTZ QUARTZ CHAPPEL: MG NO. AFM PAR JENSEN q 1.451 en 13.762 il 1.153	: FELDS 2.990 5.591 S A/CNK IN CATI AMETERS CATION 0.000 fs 11.315 ap 0.341	SPAR RAT ORTHOCL ORTHOCL INDEX ONS 4 5: A = 0 PLOT CA	IOS: LASE 7 ASE 14. 0.614 9.58 .15 F = A = 0.3 TANORM. ak 23.851 fa 0.000 tn .000 0.	E 52.0 579 P 170 ALE 0.55 M 4 M = 24.364 hy 25.077 pf	11 LAGIOCI ITE 80 (= 0.30 0.19 F 0.000 0.000 ns 1	CASE 238 = 0.4 0 0.0	89.430 47 000 0 ac 000 1 cs	kp .000 mt .436 ru	w 0.00 h 0.00 di
QUARTZ QUARTZ QUARTZ CHAPPEL: MG NO. AFM PAR JENSEN q 1.451 en 13.762 il 1.153	: FELDS 2.990 5.591 S A/CNK IN CATI AMETERS CATION 0.000 fs 11.315 ap 0.341 RM TOTA	SPAR RAT ORTHOCL ORTHOCL CINDEX CONS 4 S: A = 0 PLOT CA S: A = 0 PLOT CA S: 0 .000 Cm	IOS: LASE 7 ASE 14. 0.614 9.58 .15 F = A = 0.3 TANORM. at 23.851 fa 0.000 tn .000 0. 000	E 52.0 579 P 170 ALE 0.55 M 4 M = 24.364 1 hy 25.077 pf 000 0.0	11 LAGIOCI JITE 80 (= 0.30 0.19 F 0.000 0.000 ns 1 000 0.00	$\begin{array}{c} \text{LASE} \\ 238 \\ 0 \\ = 0.4 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ $	89.430 47 000 0 ac 000 1 cs	kp .000 mt .436 ru	w 0.00 h 0.00 di
QUARTZ QUARTZ QUARTZ CHAPPELS MG NO. AFM PARS JENSEN q 1.451 en 13.762 il 1.153 CATANO	: FELDS 2.990 5.591 S A/CNK IN CATI AMETERS CATION 0.000 fs 11.315 ap 0.341 RM TOTF *****	SPAR RAT ORTHOCL ORTHOCL ORTHOCL SINDEX ONS 4 S: A = 0 PLOT CA	IOS: LASE 7 ASE 14. 0.614 9.58 .15 F = A = 0.3 TANORM. at 23.851 fa 0.000 tn .000 0. 000	E 52.0 2.579 P 170 ALE 0.55 M 4 M = 24.364 hy 25.077 pf 000 0.0	11 LAGIOCI JITE 80 (= 0.30 0.19 F 0.000 0.000 ns 1 000 0.00	$\begin{array}{c} \text{LASE} \\ 238 \\ 0 \\ = 0.4 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ $	89.430 47 000 0 ac 000 1 cs	kp .000 mt .436 ru	w 0.00 h 0.00 di
QUARTZ QUARTZ QUARTZ CHAPPELS MG NO. AFM PAR JENSEN	: FELDS 2.990 5.591 S A/CNK IN CATI AMETERS CATION 	<pre>SPAR RAT ORTHOCL ORTHOCL</pre>	IOS: LASE 7 ASE 14. 0.614 9.58 .15 F = A = 0.3 TANORM. at 23.851 fa 0.000 tn .000 0. 000 *******	E 52.0 579 P 170 ALB 0.55 M 4 M = 24.364 hy 25.077 pf 000 0.0 Constant 	11 LAGIOCI JITE 80 (= 0.30 0.19 F 0.000 0.000 ns 1 000 0.00 *******	CASE 238) = 0.4 5 0.0 1 0 0.0 ks 00 0.0	89.430 47 47 000 0 ac 000 1 cs 000 0.0	kp .000 mt .436 ru 00018	ω 0.00 h 0.00 di .359
QUARTZ QUARTZ QUARTZ CHAPPELS MG NO. AFM PAR JENSEN	: FELDS 2.990 5.591 S A/CNK IN CATI AMETERS CATION 0.000 fs 11.315 ap 0.341 RM TOTA ***** SONORM C	EPAR RAT ORTHOCL ORTHOCL CINDEX CONS 4 CONS 4 CO	IOS: LASE 7 ASE 14. 0.614 9.58 .15 F = A = 0.3 TANORM. 23.851 fa 0.000 tn .000 0. 000 ****** ONS ALC Ab	E 52.0 579 P 170 ALE 0.55 M 4 M = 24.364 24.364 0 25.077 pf 000 0.0 ******* GORYTHM. An	11 LAGIOCI ITE 80 (= 0.30 0.19 F 0.000 10 0.000 10 0.000 10 	ASE 238 = 0.4 0 0.0 1 0 0.0 ks 00 0.0 **	89.430 47 000 0 ac 000 1 cs 000 0.0	kp .000 mt .436 ru 00018 Ri	w 0.00 h 0.00 di .359 Act
QUARTZ QUARTZ QUARTZ CHAPPELS MG NO. AFM PAR JENSEN	: FELDS 2.990 5.591 S A/CNK IN CATI AMETERS CATION 0.000 fs 11.315 ap 0.341 RM TOTA ***** SONORM C	<pre>SPAR RAT ORTHOCL ORTHOCL</pre>	IOS: LASE 7 ASE 14. 0.614 9.58 .15 F = A = 0.3 TANORM. 23.851 fa 0.000 tn .000 0. 000 ****** ONS ALC Ab	E 52.0 579 P 170 ALE 0.55 M 4 M = 24.364 24.364 0 25.077 pf 000 0.0 ******* GORYTHM. An	11 LAGIOCI ITE 80 (= 0.30 0.19 F 0.000 10 0.000 10 0.000 10 	ASE 238 = 0.4 0 0.0 1 0 0.0 ks 00 0.0 **	89.430 47 000 0 ac 000 1 cs 000 0.0	kp .000 mt .436 ru 00018 Ri	w 0.00 h 0.00 di .359 Act
QUARTZ QUARTZ QUARTZ CHAPPELS MG NO. AFM PARS JENSEN q 1.451 en 13.762 il 1.153 CATANOS ME Q Ed 1.25	: FELDS 2.990 5.591 S A/CNK IN CATI AMETERS CATION 0.000 fs 11.315 ap 0.341 RM TOTA ***** SONORM C	EPAR RAT ORTHOCL ORTHOCL CINDEX CONS 4 CONS 4 CO	IOS: LASE 7 ASE 14. 0.614 9.58 .15 F = A = 0.3 TANORM. 23.851 fa 0.000 tn .000 0. 000 ****** ONS ALC Ab	E 52.0 579 P 170 ALE 0.55 M 4 M = 24.364 24.364 0 25.077 pf 000 0.0 ******* GORYTHM. An	11 LAGIOCI ITE 80 (= 0.30 0.19 F 0.000 10 0.000 10 0.000 10 	ASE 238 = 0.4 0 0.0 1 0 0.0 ks 00 0.0 **	89.430 47 000 0 ac 000 1 cs 000 0.0	kp .000 mt .436 ru 00018 Ri	w 0.00 h 0.00 di .359 Act
QUARTZ QUARTZ QUARTZ CHAPPELS MG NO. AFM PARS JENSEN q 1.451 en 13.762 il 1.153 CATANO ME Q Ed 1.25 0.00	: FELDS 2.990 5.591 S A/CNK IN CATI AMETERS CATION 0.000 fs 11.315 ap 0.341 RM TOTF ***** SONORM C 0.00	EPAR RAT ORTHOCL ORTHOCL CINDEX CONS 4 CONS 4 CO	IOS: LASE 7 ASE 14. 0.614 9.58 .15 F = A = 0.3 TANORM. at 23.851 fa 0.000 tn .000 0. 000 ******* ONS ALC Ab	E 52.0 .579 P 170 ALE .0.55 M 4 M = .24.364 .25.077 pf 000 0.0 	11 LAGIOCI JITE 80 (= 0.30 0.19 F 0.000 LC 00 0.0	CASE 238) = 0.4 5 0.0 1 0.0 ks 0 0.0 ks 0 0.0 ks Ne .00	89.430 47 ne 000 0 ac 000 1 cs 000 0.0 Wo 0.00 1	kp .000 mt .436 ru 00018 Ri 30.10	w 0.00 di .359 Act 0.0
QUARTZ QUARTZ QUARTZ CHAPPELS MG NO. AFM PAR JENSEN	: FELDS 2.990 5.591 S A/CNK IN CATI AMETERS CATION 	<pre>GPAR RAT ORTHOCL ORTHOCL ORTHOCL ORTHOCL ORTHOCL ORTHOCL ORTHOCL ORTHOCL ORTHOCL ONS 4 G: A = 0 PLOT ORTHOCL Or O.000 0 AL = 100. ORTHOCL OR O.000 23 Ol </pre>	IOS: LASE 7 ASE 14. 0.614 9.58 .15 F = A = 0.3 TANORM. 23.851 fa 0.000 tn .000 0. 000 ******* ONS ALC Ab 3.85 24 (En	E 52.0 579 P 170 ALB 0.55 M 4 M = .24.364 b 24.364 b 25.077 pf 000 0.0 Constant Constan	11 LAGIOCI ITE 80 (= 0.30 0.19 F 0.000 0.000 ns 1 000 0.00 *******) LC 00 0. Fo	CASE .238) = 0.4 c 0.0 c 0.0	89.430 47 ne 000 0 ac 000 1 cs 000 0.0 Wo 0.00 1	kp .000 mt .436 ru 00018 Ri 30.10	w 0.00 h 0.00 di .359 Act 0.0 Hm
QUARTZ QUARTZ QUARTZ CHAPPELS MG NO. AFM PAR JENSEN	: FELDS 2.990 5.591 S A/CNK IN CATI AMETERS CATION 	SPAR RAT ORTHOCL ORTHOCL ORTHOCL SINDEX ONS 4 S: A = 0 PLOT CA	IOS: LASE 7 ASE 14. 0.614 9.58 .15 F = A = 0.3 TANORM. 23.851 fa 0.000 tn .000 0. 000 ******* ONS ALC Ab 3.85 24 (En	E 52.0 579 P 170 ALB 0.55 M 4 M = .24.364 b 24.364 b 25.077 pf 000 0.0 Constant Constan	11 LAGIOCI ITE 80 (= 0.30 0.19 F 0.000 0.000 ns 1 000 0.00 *******) LC 00 0. Fo	CASE .238) = 0.4 c 0.0 c 0.0	89.430 47 ne 000 0 ac 000 1 cs 000 0.0 Wo 0.00 1	kp .000 mt .436 ru 00018 Ri 30.10	w 0.00 h 0.00 di .359 Act 0.0 Hm
QUARTZ QUARTZ QUARTZ CHAPPELS MG NO. AFM PAR JENSEN	: FELDS 2.990 5.591 S A/CNK IN CATI AMETERS CATION 	<pre>GPAR RAT ORTHOCL ORTHOCL ORTHOCL ORTHOCL ORTHOCL ORTHOCL ORTHOCL ORTHOCL ORTHOCL ONS 4 G: A = 0 PLOT ORTHOCL Or O.000 0 AL = 100. ORTHOCL OR O.000 23 Ol </pre>	IOS: LASE 7 ASE 14. 0.614 9.58 .15 F = A = 0.3 TANORM. 23.851 fa 0.000 tn .000 0. 000 ******* ONS ALC Ab 3.85 24 (En	E 52.0 579 P 170 ALB 0.55 M 4 M = .24.364 b 24.364 b 25.077 pf 000 0.0 Constant Constan	11 LAGIOCI ITE 80 (= 0.30 0.19 F 0.000 0.000 ns 1 000 0.00 *******) LC 00 0. Fo	CASE .238) = 0.4 c 0.0 c 0.0	89.430 47 ne 000 0 ac 000 1 cs 000 0.0 Wo 0.00 1	kp .000 mt .436 ru 00018 Ri 30.10	w 0.00 h 0.00 di .359 Act 0.0 Hm
QUARTZ QUARTZ QUARTZ CHAPPELS MG NO. AFM PARS JENSEN	: FELDS 2.990 5.591 S A/CNK IN CATI AMETERS CATION 0.000 fs 11.315 ap 0.341 RM TOTA ***** SONORM C 0.000 Hy NDE 10.58	SPAR RAT ORTHOCL ORTHOCL ORTHOCL SINDEX ONS 4 S: A = 0 PLOT CA	IOS: LASE 7 ASE 14. 0.614 9.58 .15 F = A = 0.3 TANORM. at 23.851 fa 0.000 tn .000 0. 000 ******* Ab 8.85 24 (En 0.00 0	E 52.0 .579 P 170 ALE .0.55 M .4 M = .24.364 .24.364 .00 0.0 .25.077 pf .000 0.0 	11 LAGIOCI JITE 80 (= 0.30 0.19 F 0.000 LC 00 0.0 Fo 00 0 00 0	CASE 238) = 0.4 5 0.0 1 0.0 5	89.430 47 ne 000 0 ac 000 1 cs 000 0.0 Wo 0.00 1	kp .000 mt .436 ru 00018 Ri 30.10 t	w 0.00 di .359 Act 0.0 Hm
QUARTZ QUARTZ QUARTZ CHAPPELS MG NO. AFM PARI JENSEN q 1.451 en 13.762 il 1.153 CATANO ME Q Ed 1.25 0.00 Di HORNBLE 0.00 30.098 Ap	: FELDS 2.990 5.591 S A/CNK IN CATI AMETERS CATION 0.000 fs 11.315 ap 0.341 RM TOTF ***** SONORM C 0.00 Hy NDE 10.58 Cm	<pre>GPAR RAT ORTHOCL ORTHOCL ORTHOCL ORTHOCL ORTHOCL ORTHOCL ORTHOCL ORTHOCL ORTHOCL ONS 4 G: A = 0 PLOT ORTHOCL Or O.000 0 AL = 100. ORTHOCL OR O.000 23 Ol </pre>	IOS: LASE 7 ASE 14. 0.614 9.58 .15 F = A = 0.3 TANORM. at 23.851 fa 0.000 tn .000 0. 000 ******* ONS ALC Ab 3.85 24 (En 0.000 0 Pf N	E 52.0 2.579 P 170 ALE 2.0.55 M 4 M = 24.364 24.364 25.077 pf 000 0.0 25.077 pf 000 0.0 3.36 0.1 Fs .00 0. IS KS	11 LAGIOCI JITE 80 (= 0.30 0.19 F 0.000 10 0 10 0	CASE 238) = 0.4 5 0.0 1 0.0 2 0.0 1 0.0 2 0.0 0	89.430 47 ne 000 0 ac 000 1 cs 000 0.0 Wo 0.00 3 M 1.44 1.44	kp .000 mt .436 ru 00018 Ri 30.10 t 0.0	w 0.00 di .359 Act 0.0 Hm

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PETRONOR SAMPLE N	MS PROC						
CAMPLE N							
		RECALC	100%		CAT PE	OPS	148
	72.12				$\begin{array}{ccc} 3 & CRI \\ 7 & 1 \end{array}$		
		12			0 0.		
	0.52		.523		03 0.		
	4.17		.193		i8 0.		
	0.07		.070		01 0.		
	0.80		.804	0.02		020	
	3.67		.690	0.06	6 0	.066	
	1.98		.991	0.03	32 0	064	
	3.40		.419	0.03	36 O	.073	
	0.48		.485	0.00	06 0	.006	
P205	0.12	0	.121	0.00	01 0	.002	
Cr203	0.00	0	.000	0.00	0 0	.000	
TOTAL	99.45						
		c					
		or					
		20.202 16					
		fo					
		0.000 0					
	-	cm t					
		0.000 0.00		0.000 0	.000 0.00	0.000	2.835
CIPWNORN	I TOTAL	= 100.007					
		ERS FOR CI MPOSITION:					
		SITION :K					6
		RCENT ANOR			32.037	AN 27.73	0
		PAR RATIOS					
-		ORTHOCLA	-		GLOCLASE	35 275	
					GIOCHUDE	22.212	
		ORTHOCLAS	E 27.357		22 812		
				ALBITE	22.812		
	5 A/CNK	INDEX 0.	891		22.812		
	5 A/CNK		891		22.812		
MG No. 1	5 A/CNK IN CATI	INDEX 0.	891 2	ALBITE			
MG NO. 1 AFM PARA	5 A/CNK IN CATI AMETERS	INDEX 0. ONS 23.5	891 2 F = 0.4	ALBITE	.07		
MG NO. 1 AFM PARA	5 A/CNK IN CATI AMETERS	INDEX 0. ONS 23.5 : A = 0.50	891 2 F = 0.4	ALBITE	.07		
MG NO. 3 AFM PARJ JENSEN (S A/CNK IN CATI AMETERS CATION	INDEX 0. ONS 23.5 : A = 0.50	891 2 F = 0.4 0 F = 0.4	ALBITE 3 M = 0 4 = 0.04	.07 F = 0.36		
MG NO. 3 AFM PARJ JENSEN (q	S A/CNK IN CATI AMETERS CATION	INDEX 0. ONS 23.5 : A = 0.50 PLOT A = CATAN or	891 2 F = 0.4 0 F = 0.4 0 F = 0.4 NORM ab	ALBITE 3 M = 0 4 = 0.04 an	.07 F = 0.36 lc n	e kp	wo
MG NO. 3 AFM PARJ JENSEN (S A/CNK IN CATI AMETERS CATION C 0.000	INDEX 0. ONS 23.5 : A = 0.50 PLOT A = CATAN or 20.830 18	891 $F = 0.4$ $0 F = 0.4$ $0.59 M$ $NORM$ ab $8.436 14.$	ALBITE A = 0 A = 0.04 an an an	.07 F = 0.36 lc n 000 0.00	e kp 0 0.000	wo 0.000
MG NO. 3 AFM PARJ JENSEN (S A/CNK IN CATI AMETERS CATION C 0.000	INDEX 0. ONS 23.5 : A = 0.50 PLOT A = CATAN or	891 $F = 0.4$ $0 F = 0.4$ $0.59 M$ $NORM$ ab $8.436 14.$	ALBITE A = 0 A = 0.04 an an an	.07 F = 0.36 lc n 000 0.00	e kp 0 0.000	
MG NO. 3 AFM PARJ JENSEN (q 35.154 en 1.902	S A/CNK IN CATI AMETERS CATION 0.000 fs 4.767	INDEX 0. ONS 23.5 : A = 0.50 PLOT A = CATAN or 20.830 18 fo 0.000 0	891 2 F = 0.4 = 0.59 M NORM ab 8.436 14. fa 0.000 6.	ALBITE A M = 0 A = 0.04 A = 0.04	.07 F = 0.36 lc n 000 0.00 ol a 000 0.00	e kp 0 0.000 c mt 0 0.564	0.000 hm 0.000
MG NO. AFM PARJ JENSEN (9 35.154 en 1.902 il	S A/CNK IN CATI AMETERS CATION 0.000 fs 4.767 ap	INDEX 0. ONS 23.5 : A = 0.50 PLOT A = CATAN or 20.830 18 fo 0.000 0 cm t	891 2 F = 0.4 0.59 M NORM ab 3.436 14. fa 0.000 6. n pf	ALBITE A = 0.04 A = 0.04	$.07 \\ F = 0.36 \\ \\ 1c \\ n \\ 000 \\ 0.00 \\ ol \\ a \\ 000 \\ 0.00 \\ ks \\ c \\ $	e kp 0 0.000 c mt 0 0.564 s ru	0.000 hm 0.000 di
MG No. 3 AFM PARJ JENSEN (35.154 en 1.902 il 0.697	S A/CNK IN CATI AMETERS CATION 0.000 fs 4.767 ap 0.260	INDEX 0. ONS 23.5 : A = 0.50 PLOT A = CATAN or 20.830 18 fo 0.000 0 cm t 0.000 0.00	891 2 F = 0.4 0.59 M IORM ab 3.436 14. fa 0.000 6. cn pf 00 0.000	ALBITE A = 0.04 A = 0.04	$.07 \\ F = 0.36 \\ \\ 1c \\ n \\ 000 \\ 0.00 \\ ol \\ a \\ 000 \\ 0.00 \\ ks \\ c \\ $	e kp 0 0.000 c mt 0 0.564 s ru	0.000 hm 0.000 di
MG No. 3 AFM PARJ JENSEN (35.154 en 1.902 il 0.697	S A/CNK IN CATI AMETERS CATION 0.000 fs 4.767 ap 0.260 RM TOTA	INDEX 0. ONS 23.5 A = 0.50 PLOT A = CATAN or 20.830 18 fo 0.000 0 cm t 0.000 0.00 L =100.000	891 2 F = 0.4 0 F = 0.4 10RM ab 0.436 14. fa 0.000 6. cn pf 00 0.000	ALBITE A = 0.04 A = 0.04	.07 $F = 0.36$ $$ $1c n$ $000 0.00$ $o1 a$ $000 0.00$ $ks c$ $.000 0.00$	e kp 0 0.000 c mt 0 0.564 s ru	0.000 hm 0.000 di
MG NO. 3 AFM PARJ JENSEN (S A/CNK IN CATI AMETERS CATION 0.000 fs 4.767 ap 0.260 RM TOTA *****	INDEX 0. ONS 23.5 : A = 0.50 PLOT A = CATAN or 20.830 18 fo 0.000 0 cm t 0.000 0.00 L =100.000 ******	891 2 F = 0.4 0.59 M IORM ab 3.436 14. fa 0.000 6. cn pf 00 0.000	ALBITE A = 0.04 A = 0.04	.07 $F = 0.36$ $$ $1c n$ $000 0.00$ $o1 a$ $000 0.00$ $ks c$ $.000 0.00$	e kp 0 0.000 c mt 0 0.564 s ru	0.000 hm 0.000 di
MG NO. 3 AFM PARJ JENSEN (9 35.154 en 1.902 il 0.697 CATANOI	S A/CNK IN CATI AMETERS CATION 0.000 fs 4.767 ap 0.260 RM TOTA ***** SONORM	INDEX 0. ONS 23.5 : A = 0.500 PLOT A = CATAN or 20.830 18 fo 0.000 0 cm t 0.000 0.000 L =100.000 ********************************	<pre>891 2 F = 0.4 0 F = 0.4 0.59 M 00RM ab 0.436 14. fa 0.000 6. n pf 00 0.000 0 ****************************</pre>	ALBITE A M = 0 A = 0.04 A = 0.04	.07 F = 0.36 lc n 000 0.00 ol a 000 0.00 ks c .000 0.00	e kp 0 0.000 c mt 0 0.564 s ru 0 0.000 2	0.000 hm 0.000 di 2.722
MG NO. 2 AFM PARJ JENSEN (9 35.154 en 1.902 il 0.697 CATANOI MES Q	S A/CNK IN CATI AMETERS CATION 0.000 fs 4.767 ap 0.260 RM TOTA ***** SONORM	INDEX 0. ONS 23.5 : A = 0.50 PLOT A = CATAN or 20.830 18 fo 0.000 0 cm t 0.000 0.00 L =100.000 ******	<pre>891 2 F = 0.4 0 F = 0.4 0.59 M 00RM ab 0.436 14. fa 0.000 6. n pf 00 0.000 0 ****************************</pre>	ALBITE A M = 0 A = 0.04 A = 0.04	.07 F = 0.36 lc n 000 0.00 ol a 000 0.00 ks c .000 0.00	e kp 0 0.000 c mt 0 0.564 s ru 0 0.000 2	0.000 hm 0.000 di 2.722
MG NO. 2 AFM PARJ JENSEN (35.154 en 1.902 il 0.697 CATANOI MES Q Ed	S A/CNK IN CATI AMETERS CATION 0.000 fs 4.767 ap 0.260 RM TOTA ***** SONORM C	INDEX 0. ONS 23.5 : A = 0.50 PLOT A = CATAN or 20.830 18 fo 0.000 0.00 cm t 0.000 0.00 L =100.000 ********* (HUCHISONS Or Ab	<pre>891 2 F = 0.4 0 F = 0.4 10RM ab 3.436 14. fa 0.000 6. cm pf 00 0.000 0 c******** CALGORYD An</pre>	ALBITE A ALBITE A = 0.04 A = 0.0	.07 F = 0.36 lc n 000 0.00 ol a 000 0.00 ks c .000 0.00 ****	e kp 0 0.000 c mt 0 0.564 s ru 0 0.000 2 Wo Ri	0.000 hm 0.000 di 2.722 Act
MG No. 3 AFM PARJ JENSEN (9 35.154 en 1.902 il 0.697 CATANON MES Q Ed 39.17	S A/CNK IN CATI AMETERS CATION 0.000 fs 4.767 ap 0.260 RM TOTA ***** SONORM C	INDEX 0. ONS 23.5 : A = 0.500 PLOT A = CATAN or 20.830 18 fo 0.000 0 cm t 0.000 0.000 L =100.000 ********************************	<pre>891 2 F = 0.4 0 F = 0.4 10RM ab 3.436 14. fa 0.000 6. cm pf 00 0.000 0 c******** CALGORYD An</pre>	ALBITE A ALBITE A = 0.04 A = 0.0	.07 F = 0.36 lc n 000 0.00 ol a 000 0.00 ks c .000 0.00 ****	e kp 0 0.000 c mt 0 0.564 s ru 0 0.000 2 Wo Ri	0.000 hm 0.000 di 2.722 Act
MG No. 2 AFM PARJ JENSEN (9 35.154 en 1.902 il 0.697 CATANON MES Q Ed 39.17 0.00	S A/CNK IN CATI AMETERS CATION 0.000 fs 4.767 ap 0.260 RM TOTA ***** SONORM C 0.00 1	INDEX 0. ONS 23.5 A = 0.50 PLOT A = CATAN or 20.830 18 fo 0.000 0.00 L =100.000 L =100.000 Ab 13.56 18.44	<pre>891 2 F = 0.4 0 F = 0.4 0.59 M ORM ab 0.436 14. fa 0.000 6. n pf 00 0.000 0 ****************************</pre>	ALBITE A M = 0 A = 0.04 A = 0.04	.07 F = 0.36 lc n 000 0.00 ol a 000 0.00 ks c .000 0.00 **** Ne 0.00 0	e kp 0 0.000 c mt 0 0.564 s ru 0 0.000 2 Wo Ri .66 0.00	0.000 hm 0.000 di 2.722 Act 0.00
MG NO. 2 AFM PARJ JENSEN (35.154 en 1.902 il 0.697 CATANOI MES Q Ed 39.17 0.00 Di	S A/CNK IN CATI AMETERS CATION 0.000 fs 4.767 ap 0.260 RM TOTA ***** SONORM C 0.00 J Hy	INDEX 0. ONS 23.5 : A = 0.50 PLOT A = CATAN or 20.830 18 fo 0.000 0.00 cm t 0.000 0.00 L =100.000 ********* (HUCHISONS Or Ab	<pre>891 2 F = 0.4 0 F = 0.4 0.59 M ORM ab 0.436 14. fa 0.000 6. n pf 00 0.000 0 ****************************</pre>	ALBITE A M = 0 A = 0.04 A = 0.04	.07 F = 0.36 lc n 000 0.00 ol a 000 0.00 ks c .000 0.00 **** Ne 0.00 0	e kp 0 0.000 c mt 0 0.564 s ru 0 0.000 2 Wo Ri .66 0.00	0.000 hm 0.000 di 2.722 Act 0.00
MG NO. 2 AFM PARJ JENSEN (9 35.154 en 1.902 il 0.697 CATANOI MES Q Ed 39.17 0.00 Di HORNBLEJ	S A/CNK IN CATI AMETERS CATION 0.000 fs 4.767 ap 0.260 RM TOTA ***** SONORM C 0.00 1 Hy NDE	INDEX 0. ONS 23.5 : A = 0.50 PLOT A = CATAN or 20.830 18 fo 0.000 0.00 L =100.000 ********* (HUCHISONS Or Ab 13.56 18.44 Ol (En	<pre>891 2 F = 0.4 0 F = 0.4 0.59 M 00RM ab 0.436 14. fa 0.000 6. fa 0.000 6. fa 0.000 0 f******** 5 ALGORYD An 4 14.67 Fs</pre>	ALBITE A ALBITE A = 0.04 A = 0.0	.07 F = 0.36 1c n 000 0.00 ol a 000 0.00 ks c .000 0.00 **** Ne 0.00 0 Fa)	e kp 0 0.000 c mt 0 0.564 s ru 0 0.000 2 Wo Ri .66 0.00 Mt	0.000 hm 0.000 di 2.722 Act 0 0.00 Hm
MG NO. 3 AFM PARA JENSEN (35.154 en 1.902 il 0.697 CATANOI MES Q Ed 39.17 0.00 Di HORNBLEI 0.00	S A/CNK IN CATI AMETERS CATION 0.000 fs 4.767 ap 0.260 RM TOTA ***** SONORM C 0.00 1 Hy NDE	INDEX 0. ONS 23.5 A = 0.50 PLOT A = CATAN or 20.830 18 fo 0.000 0.00 L =100.000 L =100.000 Ab 13.56 18.44	<pre>891 2 F = 0.4 0 F = 0.4 0.59 M 00RM ab 0.436 14. fa 0.000 6. fa 0.000 6. fa 0.000 0 f******** 5 ALGORYD An 4 14.67 Fs</pre>	ALBITE A ALBITE A = 0.04 A = 0.0	.07 F = 0.36 1c n 000 0.00 ol a 000 0.00 ks c .000 0.00 **** Ne 0.00 0 Fa)	e kp 0 0.000 c mt 0 0.564 s ru 0 0.000 2 Wo Ri .66 0.00 Mt	0.000 hm 0.000 di 2.722 Act 0 0.00 Hm
MG NO. 2 AFM PARJ JENSEN (9 35.154 en 1.902 il 0.697 CATANON MES Q Ed 39.17 0.00 Di HORNBLEJ 0.00 0.000	S A/CNK IN CATI AMETERS CATION 0.000 fs 4.767 ap 0.260 RM TOTA ***** SONORM C 0.00 1 Hy NDE 0.00	INDEX 0. ONS 23.5 A = 0.50 PLOT A = CATAN or 20.830 18 fo 0.000 0.00 L =100.000 L =100.000 Cm t 0.000 0.00 L =100.000 Ab 3.56 18.44 Ol (En 0.000 0.00	<pre>891 2 F = 0.4 0.59 M 0.69 M 10RM ab 3.436 14. fa 0.000 6. m pf 00 0.000 7 An 4 14.67 Fs 0 0.00 </pre>	ALBITE A M = 0 A = 0.04 A = 0.04	.07 F = 0.36 1c n 000 0.00 ol a 000 0.00 ks c .000 0.00 **** Ne 0.00 0 Fa) 0.00 0	e kp 0 0.000 c mt 0 0.564 s ru 0 0.000 2 Wo Ri .66 0.00 Mt	0.000 hm 0.000 di 2.722 Act 0 0.00 Hm
MG NO. 2 AFM PARA JENSEN (9 35.154 en 1.902 il 0.697 CATANON CATANON Ed 39.17 0.00 Di HORNBLEN 0.00 0.000 Ap	S A/CNK IN CATI AMETERS CATION 0.000 fs 4.767 ap 0.260 RM TOTA ***** SONORM C 0.00 1 Hy NDE 0.00 Cm	INDEX 0. ONS 23.5 A = 0.50 PLOT A = CATAN or 20.830 18 fo 0.000 0.00 L =100.000 Ab 13.56 18.44 Ol (En 0.000 0.00 Tn Pf	<pre>891 2 F = 0.4 0.59 M IORM ab 436 14. fa 0.000 6. m pf 00 0.000 ******** ALGORYD An 14.67 Fs 0 0.000 Ns</pre>	ALBITE A M = 0 A = 0.04 A = 0.000 A = 0.000 A = 0.000 Fo 0.000 K = 0.000 K = 0.0000 K = 0.000 K = 0.0000 K = 0.00000 K = 0.00000 K = 0.00000 K = 0.00000 K = 0.00000 K = 0.00000 K = 0.000000 K = 0.000000 K = 0.0000000000000000000000000000000000	.07 F = 0.36 1c n 000 0.00 ol a 000 0.00 ks c .000 0.00 **** Ne 0.00 0 Fa) 0.00 0 CS Ru	e kp 0 0.000 c mt 0 0.564 s ru 0 0.000 2 Wo Ri .66 0.00 Mt .56 0.00 BIOTITE	0.000 hm 0.000 di 2.722 Act 0 0.00 Hm
MG NO. 2 AFM PARA JENSEN (9 35.154 en 1.902 il 0.697 CATANOI MES Q Ed 39.17 0.00 Di HORNBLES 0.00 0.000 Ap 0.29	S A/CNK IN CATI AMETERS CATION 0.000 fs 4.767 ap 0.260 RM TOTA ***** SONORM C 0.00 1 Hy NDE 0.00 Cm 0.00	INDEX 0. ONS 23.5 A = 0.50 PLOT A = CATAN or 20.830 18 fo 0.000 0.00 L =100.000 L =100.000 Ab 3.56 18.44 Ol (En 0.00 0.00 Tn Pf 1.05 0.00	<pre>891 2 F = 0.4 0.59 N IORM ab 436 14. fa 0.000 6. m pf 00 0.000 ******** ALGORYT An 14.67 Fs 0 0.00 Ns 0 0.00 </pre>	ALBITE A M = 0 A = 0.04 A = 0.000 A = 0.000 A = 0.000 Fo 0.000 K = 0.000 K = 0.0000 K = 0.000 K = 0.0000 K = 0.00000 K = 0.00000 K = 0.00000 K = 0.00000 K = 0.00000 K = 0.00000 K = 0.000000 K = 0.000000 K = 0.0000000000000000000000000000000000	.07 F = 0.36 1c n 000 0.00 ol a 000 0.00 ks c .000 0.00 **** Ne 0.00 0 Fa) 0.00 0 CS Ru	e kp 0 0.000 c mt 0 0.564 s ru 0 0.000 2 Wo Ri .66 0.00 Mt .56 0.00 BIOTITE	0.000 hm 0.000 di 2.722 Act 0 0.00 Hm
MG NO. 2 AFM PARA JENSEN (9 35.154 en 1.902 il 0.697 CATANON MES Q Ed 39.17 0.00 Di HORNBLEN 0.00 0.000 Ap 0.29 MESONORI	S A/CNK IN CATI AMETERS CATION 0.000 fs 4.767 ap 0.260 RM TOTA ***** SONORM C 0.00 1 Hy NDE 0.00 Cm 0.00 Cm 0.00 M TOTAL	INDEX 0. ONS 23.5 A = 0.50 PLOT A = CATAN or 20.830 18 fo 0.000 0.00 L =100.000 Ab 13.56 18.44 Ol (En 0.000 0.00 Tn Pf	<pre>891 2 0 F = 0.4 0 0.59 M 10RM ab 0.436 14. fa 0.000 6. 10 0.000 0 5******* 5 ALGORYD An 4 14.67 Fs 0 0.00 Ns 0 0.00 033</pre>	ALBITE A M = 0 A = 0.04 A = 0.04	.07 F = 0.36 1c n 000 0.00 ol a 000 0.00 ks c .000 0.00 **** Ne 0.00 0 Fa) 0.00 0 Cs Ru .00 0.00	e kp 0 0.000 c mt 0 0.564 s ru 0 0.000 2 Wo Ri .66 0.00 Mt .56 0.0 BIOTITE 11.638	0.000 hm 0.000 di 2.722 Act 0 0.00 Hm

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PETRONORMS PROGRAM SAMPLE NUMBER RM03 149 OXIDES GIVENRECALC 100%MOL PROPSCAT PROPSSi0272.4572.7021.2101.210 0.233 11.901 0.117 Al2O3 11.86 0.006 0.482 0.003 Fe2O3 0.48 FeO 3.86 3.873 0.054 0.054 0.001 0.001 0.06 0.060 MnO 0.019 0.019 MgO 0.78 0.783 0.079 0.079 CaO 4.44 4.455 Na2O 1.32 0.021 1.325 0.043 0.041 0.082 3.85 3.863 K20 0.006 TiO2 0.45 0.455 0.006 0.001 0.001 0.100 P205 0.10 Cr203. 0.00 0.000 0.000 0.000 TOTAL 99.65 q c or ab an lc ne kp wo 38.384 0.000 22.829 11.208 15.118 0.000 0.000 0.000 0.000 en fs fo fa hy ol ac mt hm 1.553 3.683 0.000 0.000 5.236 0.000 0.000 0.698 0.000 il ap cm tn pf ns ks cs ru di $0.864 \ 0.238 \ 0.000 \ 0.000 \ 0.000 \ 0.000 \ 0.000 \ 0.000 \ 0.000 \ 5.431$ CIPWNORM TOTAL = 100.006****** PARAMETERS FOR CIPW NORMATIVE MINERALS HYPERSTHENE COMPOSITION:EN 29.659 FS 70.341 FELDSPAR COMPOSITION :KFS 46.444 AB 22.801 AN 30.755 PLAGIOCLASE PERCENT ANORTHITE 57.427 QUARTZ : FELDSPAR RATIOS: QUARTZ 43.848 ORTHOCLASE 26.079 PLAGIOCLASE 30.073 QUARTZ 53.001 ORTHOCLASE 31.523 ALBITE 15.476 CHAPPELS A/CNK INDEX 0.823 MG No. IN CATIONS 24.47 AFM PARAMETERS: A = 0.50 F = 0.42 M = 0.08JENSEN CATION PLOT A = 0.61 M = 0.05 F = 0.35q c or ab an lc ne kp wo 36.822 0.000 23.638 12.317 15.660 0.000 0.000 0.000 0.000 en fs fo fa hy ol ac mt hm 1.460 3.464 0.000 0.000 4.924 0.000 0.000 0.522 0.000 il ap cm tn pf ns ks cs ru di 0.656 0.217 0.000 0.000 0.000 0.000 0.000 0.000 0.000 5.245 CATANORM TOTAL =100.000 ******* ... MESONORM (HUCHISONS ALGORYTHM...) Q C Or Ab An Lc Ne Wo Ri Act Ed 40.60 0.00 16.80 12.32 15.66 0.00 0.00 1.97 0.00 0.00 0.00 Di Hy Ol (En Fs Fo Fa) Mt Hm HORNBLENDE 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.52 0.00 0.000 Ap Cm Tn Ρf Ns Ks Cs Ru BIOTITE Sp 0.24 0.00 0.98 0.00 0.00 0.00 0.00 0.00 10.938 MESONORM TOTAL = 100.027

PETRONOR	RMS PROC	FRAM			
SAMPLE N	NUMBER	RM04			
OXIDES	GIVEN	RECALC 100%	MOL PROPS	CAT PROPS	
SiO2	73.33	73.571	1.225	1.225	
A1203	11.57	11.608	0.114	0.228	
Fe203	0.43	0.431	0.003	0.005	
FeO	3.46	3.471	0.048	0.048	
MnO	0.05	0.050	0.001	0.001	
MgO	0.69	0.692	0.017	0.017	
CaO	4.88	4.896	0.087	0.087	
Na2O	1.20	1.204	0.019	0.039	
К20 [.]	3.50	3.511	0.037	0.075	
TiO2	0.45	0.454	0.006	0.006	
P205	0.11	0.110	0.001	0.002	
Cr203	0.00	0.000	0.000	0.000	
TOTAL	99.67				

150

q c or ab an lc ne kp wo 41.135 0.000 20.750 10.187 15.898 0.000 0.000 0.000 0.000 en fs fo fa hy ol ac mt hm 1.101 2.605 0.000 0.000 3.707 0.000 0.000 0.626 0.000 il ap cm tn pf ns ks cs ru di 0.863 0.261 0.000 0.000 0.000 0.000 0.000 0.000 6.580 CIPWNORM TOTAL = 100.006

PARAMETERS FOR CIPW NORMATIVE MINERALS HYPERSTHENE COMPOSITION:EN 29.708 FS 70.292 FELDSPAR COMPOSITION :KFS 44.304 AB 21.750 AN 33.945 PLAGIOCLASE PERCENT ANORTHITE 60.948 QUARTZ : FELDSPAR RATIOS: QUARTZ 46.760 ORTHOCLASE 23.588 PLAGIOCLASE 29.652 QUARTZ 57.075 ORTHOCLASE 28.791 ALBITE 14.134 CHAPPELS A/CNK INDEX 0.791 MG No. IN CATIONS 24.23

AFM PARAMETERS: A = 0.51 F = 0.42 M = 0.07JENSEN CATION PLOT A = 0.62 M = 0.04 F = 0.33

.....CATANORM..... c or ab an lc ne q kp wo 39.535 0.000 21.525 11.217 16.499 0.000 0.000 0.000 0.000 en fs fo fa hy ol ac mt hm 1.038 2.455 0.000 0.000 3.493 0.000 0.000 0.468 0.000 il ap cm tn pf ns ks cs ru di 0.656 0.239 0.000 0.000 0.000 0.000 0.000 0.000 0.000 6.367 CATANORM TOTAL =100.000

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... MESONORM (HUCHISONS ALGORYTHM...)

Q C Or Ab An Lc Ne Wo Ri Act Ed 42.87 0.00 15.41 11.22 16.50 0.00 0.00 2.53 0.00 0.00 0.00 Di Hy 01 (En Fs Fo Fa) Mt Hm HORNBLENDE 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.47 0.00 0.000 Ap Cm \mathbf{Tn} Ρf Ns Ks Cs Ru BIOTITE Sp 0.27 0.00 0.98 0.00 0.00 0.00 0.00 0.00 9.778 MESONORM TOTAL = 100.030

	UMBER					151
		RECALC 100%				
	52.08				.871	
	15.29				.301	
	1.13				0.014	
	9.12	9.162			0.128	
	0.16				0.002	
_	3.78				0.094	
	14.28				.256	
		0.954			0.031	
		1.678			0.036	
		0.918			0.011	
P205	0.17		0.0		0.002	
Cr203	0.00	0.000	0.0	00 0	0.000	
TOTAL	99.54					
		CIPW	NORM			
q	с	or ab	an	lc 1	ne kp	wo
		9.913 8.075	32.672 0.	000 0.00	000.0	0.000
		fo fa				
		0.000 0.000	-			
		cm tn				di
	-	0.000 0.000 0.	-			1.388
		= 100.011				
011 ////014		********	*****	****		
	PARAMETE	ERS FOR CIPW N	ORMATIVE MI	NERALS		
		APOSITION:EN			7	
						2
		SITION :KFS		15.939	AN 04.47	2
		RCENT ANORTHIT	E 80.183			
~		PAR RATIOS:				
QUARTZ	10.313	ORTHOCLASE			72.137	
QUARTZ QUARTZ	10.313 24.462	ORTHOCLASE ORTHOCLASE 41			72.137	
QUARTZ QUARTZ	10.313 24.462	ORTHOCLASE			72.137	
QUARTZ QUARTZ CHAPPEL	10.313 24.462 S A/CNK	ORTHOCLASE ORTHOCLASE 41			72.137	
QUARTZ QUARTZ CHAPPEL MG No.	10.313 24.462 S A/CNK IN CATIO	ORTHOCLASE ORTHOCLASE 41 INDEX 0.521 DNS 39.93	.629 ALBITE	33.909	72.137	
QUARTZ QUARTZ CHAPPEL MG No. AFM PAR	10.313 24.462 S A/CNK IN CATIO AMETERS	ORTHOCLASE ORTHOCLASE 41 INDEX 0.521 DNS 39.93 : A = 0.16 F =	.629 ALBITE	33.909		
QUARTZ QUARTZ CHAPPEL MG No. AFM PAR	10.313 24.462 S A/CNK IN CATIO AMETERS	ORTHOCLASE ORTHOCLASE 41 INDEX 0.521 DNS 39.93	.629 ALBITE	33.909		
QUARTZ QUARTZ CHAPPEL MG NO. AFM PAR JENSEN	10.313 24.462 S A/CNK IN CATION AMETERS CATION	ORTHOCLASE ORTHOCLASE 41 INDEX 0.521 DNS 39.93 : A = 0.16 F =	.629 ALBITE 0.61 M = 0 3 M = 0.12	2 33.909 0.23 2 F = 0.4		
QUARTZ QUARTZ CHAPPEL MG NO. AFM PAR JENSEN	10.313 24.462 S A/CNK IN CATIO AMETERS CATION 1	ORTHOCLASE ORTHOCLASE 41 INDEX 0.521 DNS 39.93 A = 0.16 F = PLOT A = 0.4 CATANORM.	.629 ALBITE 0.61 M = 0 3 M = 0.12	2 33.909 0.23 2 F = 0.4		W
QUARTZ QUARTZ CHAPPEL MG No. AFM PAR JENSEN	10.313 24.462 S A/CNK IN CATION AMETERS CATION	ORTHOCLASE ORTHOCLASE 41 INDEX 0.521 DNS 39.93 A = 0.16 F = PLOT A = 0.4 CATANORM.	.629 ALBITE 0.61 M = 0 3 M = 0.12 an	2 33.909 0.23 2 F = 0.4 1c	5 ne kp	
QUARTZ QUARTZ CHAPPEL MG No. AFM PAR JENSEN	10.313 24.462 S A/CNK IN CATIO AMETERS CATION 1 C 0.000	ORTHOCLASE ORTHOCLASE 41 INDEX 0.521 ONS 39.93 : A = 0.16 F = PLOT A = 0.4 CATANORM. or ab 10.198 8.817	.629 ALBITE 0.61 M = 0 3 M = 0.12 an	2 33.909 0.23 2 F = 0.4 1c .000 0.0	5 ne kp	w4 0.000 hr
QUARTZ QUARTZ CHAPPEL MG NO. AFM PAR JENSEN 9 5.552 en	10.313 24.462 S A/CNK IN CATIO AMETERS CATION D C C 0.000 fs	ORTHOCLASE ORTHOCLASE 41 INDEX 0.521 ONS 39.93 : A = 0.16 F = PLOT A = 0.4 CATANORM. or ab 10.198 8.817	.629 ALBITE 0.61 M = 0 3 M = 0.12 an 33.623 0 hy	2 33.909 2 F = 0.4 1c 000 0.0 01	5 ne kp 00 0.000 ac mt	0.00 h
QUARTZ QUARTZ CHAPPEL MG NO. AFM PAR JENSEN 9 5.552 en	10.313 24.462 S A/CNK IN CATIO AMETERS CATION 1 C 0.000 fs 4.403	ORTHOCLASE ORTHOCLASE 41 INDEX 0.521 ONS 39.93 : A = 0.16 F = PLOT A = 0.4 CATANORM. or ab 10.198 8.817 fo fa	.629 ALBITE 0.61 M = 0.12 M = 0.12 an 33.623 0. hy 8.134 0.	2 33.909 $2 F = 0.4$ $1c$ $000 0.0$ 01 $000 0.0$	5 ne kp 00 0.000 ac mt 00 1.221	0.00 h
QUARTZ QUARTZ CHAPPEL MG No. AFM PAR JENSEN 9 5.552 en 3.731 il	10.313 24.462 S A/CNK IN CATIO AMETERS CATION 1 c 0.000 fs 4.403 ap	ORTHOCLASE ORTHOCLASE 41 INDEX 0.521 ONS 39.93 A = 0.16 F = PLOT A = 0.4 CATANORM. or ab 10.198 8.817 fo fa 0.000 0.000	.629 ALBITE 0.61 M = 0.12 0.61 M =	2 33.909 2 F = 0.4 1c .000 0.0 ol .000 0.0 ks	5 ne kp 00 0.000 ac mt 00 1.221 cs ru	0.00 h 0.00 di
QUARTZ QUARTZ CHAPPEL MG No. AFM PAR JENSEN q 5.552 en 3.731 il 1.316	10.313 24.462 S A/CNK IN CATION AMETERS CATION 1 C 0.000 fs 4.403 ap 0.367	ORTHOCLASE ORTHOCLASE 41 INDEX 0.521 DNS 39.93 : A = 0.16 F = PLOT A = 0.4 CATANORM. or ab 10.198 8.817 fo fa 0.000 0.000 cm tn	.629 ALBITE 0.61 M = 0.12 0.61 M =	2 33.909 2 F = 0.4 1c .000 0.0 ol .000 0.0 ks	5 ne kp 00 0.000 ac mt 00 1.221 cs ru	0.00 h 0.00 di
QUARTZ QUARTZ CHAPPEL MG No. AFM PAR JENSEN q 5.552 en 3.731 il 1.316	10.313 24.462 S A/CNK IN CATIO AMETERS CATION I C 0.000 fs 4.403 ap 0.367 RM TOTA	ORTHOCLASE ORTHOCLASE 41 INDEX 0.521 DNS 39.93 : A = 0.16 F = PLOT A = 0.4 CATANORM. or ab 10.198 8.817 fo fa 0.000 0.000 cm tn 0.000 0.000 0.	.629 ALBITE 0.61 M = 0 3 M = 0.12 an 33.623 0 hy 8.134 0 pf ns 000 0.000 0	2 33.909 0.23 2 F = 0.4 1c 000 0.0 ol 000 0.0 ks 0.000 0.0	5 ne kp 00 0.000 ac mt 00 1.221 cs ru	0.00 h 0.00 di
QUARTZ QUARTZ CHAPPEL MG NO. AFM PAR JENSEN q 5.552 en 3.731 il 1.316 CATANO	10.313 24.462 S A/CNK IN CATIO AMETERS CATION 1 c 0.000 fs 4.403 ap 0.367 RM TOTA *****	ORTHOCLASE ORTHOCLASE 41 INDEX 0.521 DNS 39.93 : A = 0.16 F = PLOT A = 0.4 CATANORM. or ab 10.198 8.817 fo fa 0.000 0.000 cm tn 0.000 0.000 0. L = 100.000	.629 ALBITE 0.61 M = 0 3 M = 0.12 an 33.623 0 hy 8.134 0 pf ns 000 0.000 0	2 33.909 0.23 2 F = 0.4 1c 000 0.0 ol 000 0.0 ks 0.000 0.0	5 ne kp 00 0.000 ac mt 00 1.221 cs ru	0.00 h 0.00 di
QUARTZ QUARTZ CHAPPEL MG NO. AFM PAR JENSEN q 5.552 en 3.731 il 1.316 CATANO	10.313 24.462 S A/CNK IN CATIO AMETERS CATION 1 C 0.000 fs 4.403 ap 0.367 C M TOTA *****	ORTHOCLASE ORTHOCLASE 41 INDEX 0.521 ONS 39.93 A = 0.16 F = PLOT A = 0.4 CATANORM. or ab 10.198 8.817 fo fa 0.000 0.000 cm tn 0.000 0.000 0. L = 100.000 ********************************	.629 ALBITE 0.61 M = 0 3 M = 0.12 an 33.623 0. hy 8.134 0. pf ns 000 0.000 0 conversion of the second secon	2 33.909 2 F = 0.4 1 c 1 c 0 0 0 0.0 0 ks 0.000 0.0 ks 0.000 0.0	5 ne kp 00 0.000 ac mt 00 1.221 cs ru	0.00 h 0.00 di .772
QUARTZ QUARTZ CHAPPEL MG NO. AFM PAR JENSEN	10.313 24.462 S A/CNK IN CATIO AMETERS CATION 1 C 0.000 fs 4.403 ap 0.367 C M TOTA *****	ORTHOCLASE ORTHOCLASE 41 INDEX 0.521 ONS 39.93 A = 0.16 F = PLOT A = 0.4 CATANORM. or ab 10.198 8.817 fo fa 0.000 0.000 cm tn 0.000 0.000 0. L =100.000	.629 ALBITE 0.61 M = 0 3 M = 0.12 an 33.623 0. hy 8.134 0. pf ns 000 0.000 0 conversion of the second secon	2 33.909 2 F = 0.4 1 c 1 c 0 0 0 0.0 0 ks 0.000 0.0 ks 0.000 0.0	5 ne kp 00 0.000 ac mt 00 1.221 cs ru 00 0.00030	0.00 h 0.00 di .772
QUARTZ QUARTZ CHAPPEL MG NO. AFM PAR JENSEN	10.313 24.462 S A/CNK IN CATIO AMETERS CATION 1 0.000 fs 4.403 ap 0.367 RM TOTA ***** SONORM C	ORTHOCLASE ORTHOCLASE 41 INDEX 0.521 DNS 39.93 A = 0.16 F = PLOT A = 0.4 CATANORM. or ab 10.198 8.817 fo fa 0.000 0.000 cm tn 0.000 0.000 cm tn 0.000 0.000 0. L =100.000 ********************************	.629 ALBITE 0.61 M = 0 3 M = 0.12 an 33.623 0. hy 8.134 0. pf ns 000 0.000 0 ORYTHM) An LC	2 33.909 2 F = 0.4 1 c 1 c 0 0 0 0.0 0 0 ks 0.000 0.0 ks 0.000 0.0	5 ne kp 00 0.000 ac mt 00 1.221 cs ru 00 0.00030 Wo Ri	0.00 h: 0.00 di .772
QUARTZ QUARTZ CHAPPEL MG NO. AFM PAR JENSEN	10.313 24.462 S A/CNK IN CATIO AMETERS CATION 1 0.000 fs 4.403 ap 0.367 RM TOTA ***** SONORM C	ORTHOCLASE ORTHOCLASE 41 INDEX 0.521 ONS 39.93 A = 0.16 F = PLOT A = 0.4 CATANORM. or ab 10.198 8.817 fo fa 0.000 0.000 cm tn 0.000 0.000 0. L =100.000	.629 ALBITE 0.61 M = 0 3 M = 0.12 an 33.623 0. hy 8.134 0. pf ns 000 0.000 0 ORYTHM) An LC	2 33.909 2 F = 0.4 1 c 1 c 0 0 0 0.0 0 0 ks 0.000 0.0 ks 0.000 0.0	5 ne kp 00 0.000 ac mt 00 1.221 cs ru 00 0.00030 Wo Ri	0.00 h: 0.00 di .772
QUARTZ QUARTZ CHAPPEL MG NO. AFM PAR JENSEN q 5.552 en 3.731 il 1.316 CATANO ME Q Ed 9.75	10.313 24.462 S A/CNK IN CATIO AMETERS CATION I C 0.000 fs 4.403 ap 0.367 RM TOTA ***** SONORM C	ORTHOCLASE ORTHOCLASE 41 INDEX 0.521 DNS 39.93 : A = 0.16 F = PLOT A = 0.4 CATANORM. or ab 10.198 8.817 fo fa 0.000 0.000 cm tn 0.000 0.000 0. L =100.000 ********************************	.629 ALBITE 0.61 M = 0 3 M = 0.12 an 33.623 0. hy 8.134 0. pf ns 000 0.000 0 An Lc .62 0.00	2 33.909 2 F = 0.4 1c 000 0.0 01 000 0.0 ks 0.000 0.0 ***** Ne 0.00	5 ne kp 00 0.000 ac mt 00 1.221 cs ru 00 0.00030 Wo Ri 9.03 18.90	0.000 hi 0.000 di .772 Act 0.0
QUARTZ QUARTZ CHAPPEL MG NO. AFM PAR JENSEN	10.313 24.462 S A/CNK IN CATIO AMETERS CATION D C 0.000 fs 4.403 ap 0.367 RM TOTA SONORM C 0.000 Hy	ORTHOCLASE ORTHOCLASE 41 INDEX 0.521 DNS 39.93 A = 0.16 F = PLOT A = 0.4 CATANORM. or ab 10.198 8.817 fo fa 0.000 0.000 cm tn 0.000 0.000 cm tn 0.000 0.000 0. L =100.000 ********************************	.629 ALBITE 0.61 M = 0 3 M = 0.12 an 33.623 0. hy 8.134 0. pf ns 000 0.000 0 An Lc .62 0.00	2 33.909 2 F = 0.4 1 c 1 c 0 0 0 0.0 0 0 ks 0.000 0.0 ks 0.000 0.0	5 ne kp 00 0.000 ac mt 00 1.221 cs ru 00 0.00030 Wo Ri 9.03 18.90	0.00 hi 0.00 di .772
QUARTZ QUARTZ CHAPPEL MG NO. AFM PAR JENSEN	10.313 24.462 S A/CNK IN CATIO AMETERS CATION I C 0.000 fs 4.403 ap 0.367 C M TOTA ***** SONORM C 0.000 Hy NDE	ORTHOCLASE ORTHOCLASE 41 INDEX 0.521 DNS 39.93 : A = 0.16 F = PLOT A = 0.4 CATANORM. or ab 10.198 8.817 fo fa 0.000 0.000 cm tn 0.000 0.000 0. L =100.000 cm tn 0.000 0.000 0. L =100.000 cm tn 0.000 8.82 33 01 (En	.629 ALBITE 0.61 M = 0 3 M = 0.12 an 33.623 0. hy 8.134 0. pf ns 000 0.000 0 *********************************	2 33.909 2 F = 0.4 1 c 1 c 1 c 0 0 0 0.0 0 0 0.0 ks 0.000 0.0 ks 0.000 0.0 Ks 0.000 0.0 Fa)	5 ne kp 00 0.000 ac mt 00 1.221 cs ru 00 0.00030 Wo Ri 9.03 18.90 Mt	0.00 hr 0.00 di .772 Act 0.0
QUARTZ QUARTZ CHAPPEL MG NO. AFM PAR JENSEN	10.313 24.462 S A/CNK IN CATIO AMETERS CATION I C 0.000 fs 4.403 ap 0.367 C M TOTA ***** SONORM C 0.000 Hy NDE	ORTHOCLASE ORTHOCLASE 41 INDEX 0.521 DNS 39.93 : A = 0.16 F = PLOT A = 0.4 CATANORM. or ab 10.198 8.817 fo fa 0.000 0.000 cm tn 0.000 0.000 0. L =100.000 cm tn 0.000 0.000 0. L =100.000 cm tn 0.000 8.82 33 01 (En	.629 ALBITE 0.61 M = 0 3 M = 0.12 an 33.623 0. hy 8.134 0. pf ns 000 0.000 0 An Lc .62 0.00	2 33.909 2 F = 0.4 1 c 1 c 1 c 0 0 0 0.0 0 0 0.0 ks 0.000 0.0 ks 0.000 0.0 Ks 0.000 0.0 Fa)	5 ne kp 00 0.000 ac mt 00 1.221 cs ru 00 0.00030 Wo Ri 9.03 18.90 Mt	0.000 hr 0.000 di .772 Act 0.0
QUARTZ QUARTZ CHAPPEL MG NO. AFM PAR JENSEN	10.313 24.462 S A/CNK IN CATIO AMETERS CATION I C 0.000 fs 4.403 ap 0.367 C RM TOTA ***** SONORM C .0.00 Hy NDE 0.00	ORTHOCLASE ORTHOCLASE 41 INDEX 0.521 DNS 39.93 A = 0.16 F = PLOT A = 0.4 CATANORM. or ab 10.198 8.817 fo fa 0.000 0.000 cm tn 0.000 0.000 0. L =100.000 .L =100.000 	.629 ALBITE 0.61 M = 0 3 M = 0.12 an 33.623 0. hy 8.134 0. pf ns 000 0.000 0 An LC .62 0.00 Fs Fo .00 0.00	2 33.909 0.23 2 F = 0.4 1c 000 0.0 0.00 ks 0.000 0.0 ks 0.000 fa) 0.00 Fa) 0.00	5 ne kp 00 0.000 ac mt 00 1.221 cs ru 00 0.00030 Wo Ri 9.03 18.90 Mt 1.22 0.4	0.00 hi 0.00 di .772 Act 0.0 Hm
QUARTZ QUARTZ QUARTZ CHAPPEL MG NO. AFM PAR JENSEN	10.313 24.462 S A/CNK IN CATIO AMETERS CATION I C 0.000 fs 4.403 ap 0.367 C RM TOTA ***** SONORM C 0.000 Hy NDE 0.00 Cm	ORTHOCLASE ORTHOCLASE 41 INDEX 0.521 DNS 39.93 : A = 0.16 F = PLOT A = 0.4 CATANORM. or ab 10.198 8.817 fo fa 0.000 0.000 0. Cm tn D.000 0.000 0. L =100.000 .L =100.000 .L =100.000 Cm tn D.000 0.000 0. L = 100.000 Cm Ab 0.00 8.82 33 Ol (En 0.00 0.00 0 Tn Pf N	.629 ALBITE 0.61 M = 0 3 M = 0.12 an 33.623 0. hy 8.134 0. pf ns 000 0.000 0 An Lc .62 0.00 Fs Fo .00 0.000 Is Ks	2 33.909 0.23 2 F = 0.4 1c 1c 000 0.0 ks 0.000 0.0 ks 0.000 0.0 Fa) 0.000 Fa) 0.000 Cs Ru	5 ne kp 00 0.000 ac mt 00 1.221 cs ru 00 0.00030 Wo Ri 9.03 18.90 Mt 1.22 0.4 BIOTITE	0.00 hi 0.00 di .772 Act 0.0 Hm
QUARTZ QUARTZ QUARTZ CHAPPEL MG NO. AFM PAR JENSEN	10.313 24.462 S A/CNK IN CATIO AMETERS CATION I C 0.000 fs 4.403 ap 0.367 C M TOTA SONORM C 0.00 Hy NDE 0.00 Cm 0.00	ORTHOCLASE ORTHOCLASE 41 INDEX 0.521 DNS 39.93 A = 0.16 F = PLOT A = 0.4 CATANORM. or ab 10.198 8.817 fo fa 0.000 0.000 cm tn 0.000 0.000 0. L =100.000 .L =100.000 	.629 ALBITE 0.61 M = 0 3 M = 0.12 an 33.623 0. hy 8.134 0. pf ns 000 0.000 0 An Lc .62 0.00 Fs Fo .00 0.000 Is Ks	2 33.909 0.23 2 F = 0.4 1c 1c 000 0.0 ks 0.000 0.0 ks 0.000 0.0 Fa) 0.000 Fa) 0.000 Cs Ru	5 ne kp 00 0.000 ac mt 00 1.221 cs ru 00 0.00030 Wo Ri 9.03 18.90 Mt 1.22 0.4 BIOTITE	0.000 hi 0.000 di .772 Act 0.0 Hm

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PETRONOR		RAM RM06			
SAMPLE N	UMBER				
OXIDES	GIVEN	RECALC 100%	MOL PROPS	CAT PROPS	1.50
SiO2	50.97	51.203	0.852	0.852	152
A1203 [.]	17.97	18.052	0.177	0.354	
Fe203	1.03	1.035	0.006	0.013	
FeO	8.30	8.338	0.116	0.116	
MnO	0.11	0.111	0.002	0.002	
MgO	2.67	2.682	0.067	0.067	
CaO	17.85	17.932	0.320	0.320	
Na2O	0.05	0.050	0.001	0.002	
K20	0.03	0.030	0.000	0.001	
TiO2	0.48	0.486	0.006	0.006	
P205	0.08	0.080	0.001	0.001	
Cr203	0.00	0.000	0.000	0.000	
TOTAL	99.54				

q c or ab an lc ne kp wo 10.821 0.000 0.178 0.425 48.942 0.000 0.000 0.000 0.000 en fs fo fa hy ol ac mt hm 1.376 2.172 0.000 0.000 3.547 0.000 0.000 1.500 0.000 il ap cm tn pf ns ks cs ru di 0.924 0.190 0.000 0.000 0.000 0.000 0.000 0.000 33.479 CIPWNORM TOTAL = 100.006

PARAMETERS FOR CIPW NORMATIVE MINERALS HYPERSTHENE COMPOSITION:EN 38.781 FS 61.219 FELDSPAR COMPOSITION :KFS 0.359 AB 0.858 AN 98.783 PLAGIOCLASE PERCENT ANORTHITE 99.139 QUARTZ : FELDSPAR RATIOS: QUARTZ 17.925 ORTHOCLASE 0.295 PLAGIOCLASE 81.780 QUARTZ 94.721 ORTHOCLASE 1.559 ALBITE 3.720 CHAPPELS A/CNK INDEX 0.552 MG NO. IN CATIONS 34.03

AFM PARAMETERS: A = 0.01 F = 0.77 M = 0.22JENSEN CATION PLOT A = 0.51 M = 0.09 F = 0.40

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 10.394
 0.000
 0.185
 0.468
 50.765
 0.000
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 ac
 mt
 hm

 1.327
 2.094
 0.000
 0.000
 3.421
 0.000
 0.000
 1.122
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 0.703
 0.174
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 0.000

... MESONORM (HUCHISONS ALGORYTHM...)

C Or An LC Ne Wo Ri Act 0 $\mathbf{A}\mathbf{b}$ Ed 8.13 0.00 0.00 0.47 50.77 0.00 0.00 7.57 30.43 0.00 0.00 Di Ну 01 (En Fs Fo Fa) Mt Hm HORNBLENDE 0.00 0.00 0.00 0.00 0.00 0.00 1.12 0.00 30.429 Ap Cm \mathbf{Tn} Ρf Ns Ks Cs Ru BIOTITE Sp 0.20 0.00 1.05 0.00 0.00 0.00 0.00 0.00 0.295 MESONORM TOTAL = 100.022

SAMPLE N	IUMBER	GRAM RM07					
		RECALC 10	0% MOL	PROPS	CAT PRO	DPS	15
	55.40			0.929			
A1203				0.143	0.2	287	
	1.05			0.007	0.0	013	
	8.53			0.120	0.1	120	
	0.14			0.002		002	
	4.40		33	0.110	0.1	110	
-	10.89			0.196	0.1	196	
	2.75		71	0.045	0.0	089	
	0.58		84	0.006	0.0	012	
TiO2	0.85	0.8	55	0.011	0.0	011	
	0.16		61	0.001	0.0	002	
	0.00		00	0.000	0.0	000	
TOTAL	99.26						
• • •		CIP	W NORM				
q					ne	_	,
7.511	0.000	3.453 23.4				0.000	0.0
en			-	y ol			
6.824		0.000 0.0					
	-	cm tn	-				
		0.000 0.000	0.000 0.0	000 0.00	0.000	0.000 2	23.04
CIPWNOR	M TOTAL	= 100.010					
FELDSPA PLAGIOC QUARTZ QUARTZ QUARTZ	R COMPO LASE PE : FELDS 12.491 21.830	MPOSITION:EN SITION :KFS RCENT ANORTH PAR RATIOS: ORTHOCLASE ORTHOCLASE	6.562 (ITE 52.3 5.742 10.036 AI	AB 44 322 Plagioc	LASE 8	N 48.88	39
FELDSPA PLAGIOC QUARTZ QUARTZ QUARTZ CHAPPEL MG No. AFM PAR	R COMPO LASE PE : FELDS 12.491 21.830 S A/CNK IN CATI AMETERS	SITION :KFS RCENT ANORTH PAR RATIOS: ORTHOCLASE ORTHOCLASE INDEX 0.58 ONS 45.29 : A = 0.19 F	6.562 TE 52.3 5.742 10.036 AI 2 T = 0.55 M	AB 44 322 PLAGIOC LBITE 68 4 = 0.26	LASE 8 3.134		39
FELDSPA PLAGIOC QUARTZ QUARTZ QUARTZ CHAPPEL MG NO. AFM PAR JENSEN	R COMPO LASE PE : FELDS 12.491 21.830 S A/CNK IN CATI AMETERS CATION	SITION :KFS RCENT ANORTH PAR RATIOS: ORTHOCLASE ORTHOCLASE INDEX 0.58 ONS 45.29 : A = 0.19 F PLOT A = 0	6.562 $TE 52.3$ 5.742 $10.036 AI$ 2 $F = 0.55 M$ $0.42 M =$	AB 44 322 PLAGIOO LBITE 68 4 = 0.26 0.15 F	LASE 8 3.134		39
FELDSPA PLAGIOC QUARTZ QUARTZ QUARTZ CHAPPEL MG NO. AFM PAR JENSEN	R COMPO LASE PE : FELDS 12.491 21.830 S A/CNK IN CATI AMETERS CATION	SITION :KFS RCENT ANORTH PAR RATIOS: ORTHOCLASE ORTHOCLASE INDEX 0.58 ONS 45.29 : A = 0.19 F PLOT A = 0 CATANOF	6.562 $ITE 52.3$ 5.742 $10.036 AI$ 2 $F = 0.55 M$ $0.42 M =$ RM	AB 44 322 PLAGIOO LBITE 68 4 = 0.26 0.15 F	LASE 8 3.134 = 0.43	1.767	
FELDSPA PLAGIOC QUARTZ QUARTZ CHAPPEL MG NO. AFM PAR JENSEN	R COMPO LASE PE : FELDS 12.491 21.830 S A/CNK IN CATI AMETERS CATION	SITION :KFS RCENT ANORTH PAR RATIOS: ORTHOCLASE ORTHOCLASE INDEX 0.58 ONS 45.29 : A = 0.19 F PLOT A = 0 CATANOR or	6.562 $IITE 52.3$ 5.742 $10.036 AI$ 2 $F = 0.55 M$ $0.42 M =$ RM	AB 44 322 PLAGIOO LBITE 68 4 = 0.26 0.15 F	LASE 8 3.134 = 0.43	1.767 kp	
FELDSPA PLAGIOC QUARTZ QUARTZ CHAPPEL MG NO. AFM PAR JENSEN 9 7.059	R COMPO LASE PE : FELDS 12.491 21.830 S A/CNK IN CATI AMETERS CATION	SITION :KFS RCENT ANORTH PAR RATIOS: ORTHOCLASE ORTHOCLASE INDEX 0.58 ONS 45.29 : A = 0.19 F PLOT A = 0 CATANOR or 3.503 25.2	6.562 $IITE 52.3$ 5.742 $10.036 AI$ 2 $F = 0.55 M$ $0.42 M =$ M $ab aI$ $241 26.103$	AB 44 322 PLAGIOO LBITE 68 0.15 F 1 10 7 0.000	LASE 8 3.134 = 0.43 c ne 0 0.000	1.767 kp 0.000	0.0
FELDSPA PLAGIOC QUARTZ QUARTZ CHAPPEL MG NO. AFM PAR JENSEN	R COMPO LASE PE : FELDS 12.491 21.830 S A/CNK IN CATI AMETERS CATION	SITION :KFS RCENT ANORTH PAR RATIOS: ORTHOCLASE ORTHOCLASE INDEX 0.58 ONS 45.29 : $A = 0.19$ F PLOT $A = 0$ CATANOR or 3.503 25.2 fo	6.562 $(ITE 52.3)$ 5.742 $10.036 AI$ 32 $F = 0.55 M$ $0.42 M =$ AM $ab aI$ $241 26.103$ $fa hy$	AB 44 322 PLAGIOO PLAGIOO 68 4 = 0.26 0.15 0.15 F	LASE 8 3.134 = 0.43 c ne 0.000 ac	1.767 kp 0.000 mt	0.0
FELDSPA PLAGIOC QUARTZ QUARTZ CHAPPEL MG NO. AFM PAR JENSEN 9 7.059 en 6.658	R COMPO LASE PE : FELDS 12.491 21.830 S A/CNK IN CATI AMETERS CATION CATION 0.000 fs 6.313	SITION :KFS RCENT ANORTH PAR RATIOS: ORTHOCLASE ORTHOCLASE INDEX 0.58 ONS 45.29 : $A = 0.19$ F PLOT $A = 0$ CATANOR or 3.503 25.2 fo 0.000 0.0	6.562 $ITE 52.3$ 5.742 $10.036 AI$ 2 $F = 0.55 M$ $0.42 M =$ RM $ab aI$ $241 26.103$ $fa hy$ $000 12.973$	AB 44 322 PLAGIOO LBITE 68 $4 = 0.26$ 0.15 F 10 $7 = 0.000$ 0 $1 = 0.000$ 0 $1 = 0.000$ 0	$\begin{array}{c} \text{LASE} 8 \\ \text{S}.134 \\ S$	kp 0.000 mt 1.122	0.0
FELDSPA PLAGIOC QUARTZ QUARTZ QUARTZ CHAPPEL MG NO. AFM PAR JENSEN 9 7.059 en 6.658 il	R COMPO LASE PE : FELDS 12.491 21.830 S A/CNK IN CATI AMETERS CATION 0.000 fs 6.313 ap	SITION :KFS RCENT ANORTH PAR RATIOS: ORTHOCLASE ORTHOCLASE INDEX 0.58 ONS 45.29 : A = 0.19 F PLOT A = 0 CATANOR or 3.503 25.2 fo 0.000 0.0 cm tn	6.562 $ITE 52.3$ 5.742 $10.036 AI$ 2 $F = 0.55 M$ $0.42 M =$ RM $ab aI$ $241 26.107$ $fa hy$ $000 12.973$ pf	AB 44 322 PLAGIOO LBITE 68 0.15 F n 10 7 0.000 y 0] 1 0.000 ns 3	$ \begin{array}{r} \text{LASE} & 8 \\ \text{S.134} \\ \text{S.134} \\ S$	kp 0.000 mt 1.122 ru	0.0 0.0 di
FELDSPA PLAGIOC QUARTZ QUARTZ CHAPPEL MG NO. AFM PAR JENSEN	R COMPO LASE PE : FELDS 12.491 21.830 S A/CNK IN CATI AMETERS CATION 	SITION : KFS RCENT ANORTH PAR RATIOS: ORTHOCLASE ORTHOCLASE INDEX 0.58 ONS 45.29 : A = 0.19 F PLOT A = 0 CATANOF or 3.503 25.2 fo 0.000 0.00 cm tn 0.000 0.000 L = 100.000	6.562 $IITE 52.3$ 5.742 $10.036 AI$ 2 $F = 0.55 M$ $0.42 M =$ M $ab aI$ $241 26.103$ $fa hy$ $000 12.973$ pf $0.000 0.0$	AB 44 322 PLAGIOO PLAGIOO 68 4 = 0.26 0.15 F 0.15 F 1 1 0.000 01 1 0.000 03 1 0.000 03 0.000 0.000	$ \begin{array}{r} \text{LASE} & 8 \\ \text{S.134} \\ \text{S.134} \\ \text{S.135} \\ S$	kp 0.000 mt 1.122 ru	0.0 0.0 di
FELDSPA PLAGIOC QUARTZ QUARTZ QUARTZ CHAPPEL MG NO. AFM PAR JENSEN	R COMPO LASE PE : FELDS 12.491 21.830 S A/CNK IN CATI AMETERS CATION 0.000 fs 6.313 ap 0.342 RM TOTA *****	SITION : KFS RCENT ANORTH PAR RATIOS: ORTHOCLASE ORTHOCLASE INDEX 0.58 ONS 45.29 : $A = 0.19$ F PLOT $A = 0$ CATANOF or 3.503 25.2 fo 0.000 0.00 cm tn 0.000 0.000 L = 100.000	6.562 $(ITE 52.3)$ 5.742 $10.036 AI$ 32 $F = 0.55 M$ $0.42 M =$ $241 26.103$ $fa hy$ $000 12.973$ pf $0.000 0.0$	AB 44 322 PLAGIOO PLAGIOO 68 $4 = 0.26$ 0.15 0.15 7 0.15 7 0.000 01 0.000 0.000 0.000 0.000 0.000 0.000	$\begin{array}{c} \text{LASE} 8\\ \text{S.134}\\ \text{S.134}$	kp 0.000 mt 1.122 ru	0.0 0.0 di
FELDSPA PLAGIOC QUARTZ QUARTZ CHAPPEL MG NO. AFM PAR JENSEN q 7.059 en 6.658 il 1.209 CATANO	R COMPO LASE PE : FELDS 12.491 21.830 S A/CNK IN CATI AMETERS CATION 0.000 fs 6.313 ap 0.342 RM TOTA *****	SITION : KFS RCENT ANORTH PAR RATIOS: ORTHOCLASE ORTHOCLASE INDEX 0.58 ONS 45.29 : A = 0.19 F PLOT A = 0 CATANOF or 3.503 25.2 fo 0.000 0.00 cm tn 0.000 0.000 L = 100.000	6.562 $ITE 52.3$ 5.742 $10.036 AI$ 2 $F = 0.55 M$ $0.42 M =$ RM $ab aI$ $241 26.103$ $fa hy$ $0.00 12.973$ pf $0.000 0.0$ $RAMMANANANANANANANANANANANANANANANANANAN$	AB 44 322 PLAGIOO LBITE 68 4 = 0.26 0.15 F 1 0.000 ns 3 000 0.00 ********	$ \begin{array}{c} 1.549 \\ 2LASE \\ 8.134 \\ \hline 8.134 \\ \hline 9.000 \\ \hline 0.000 \\ \hline 0.000 \\ cs \\ cs \\ 00 \\ 0.000 \\ cs \\ cs \\ 00 \\ 0.000 \\ cs \\ cs \\ cs \\ 0.000 \\ cs \\ cs \\ 0.000 \\ cs \\ cs \\ 0.000 \\ cs \\ c$	kp 0.000 mt 1.122 ru 0.00022	0.0 0.0 di 2.447
FELDSPA PLAGIOC QUARTZ QUARTZ CHAPPEL MG NO. AFM PAR JENSEN , q 7.059 en 6.658 il 1.209 CATANO ME Q Ed	R COMPO LASE PE : FELDS 12.491 21.830 S A/CNK IN CATI AMETERS CATION 0.000 fs 6.313 ap 0.342 RM TOTA *****	SITION :KFS RCENT ANORTH PAR RATIOS: ORTHOCLASE ORTHOCLASE INDEX 0.58 ONS 45.29 : $A = 0.19$ F PLOT $A = 0$ CATANOR or 3.503 25.2 fo 0.000 0.00 cm tn 0.000 0.000 L =100.000 ***********	6.562 (ITE 52.3) 5.742 10.036 AI (2) $F = 0.55 M$ $0.42 M =$ $241 26.107$ fa hy $000 12.977$ pf $0.000 0.0$ $441 26.107$ An	AB 44 322 PLAGIOO LBITE 68 4 = 0.26 0.15 F 1 0.000 ns 1 000 0.00 ********) LC	$ \begin{array}{c} \text{LASE} & 8 \\ \text{S.134} \\ \text{S.135} \\ \text{S.134} \\ \text{S.134} \\ \text{S.135} \\ \text{S.134} \\ \text{S.134} \\ \text{S.134} \\ \text{S.134} \\ \text{S.134} \\ \text{S.135} \\ S$	kp 0.000 mt 1.122 ru 0.00022	0.0 0.0 di 2.447 Ac
FELDSPA PLAGIOC QUARTZ QUARTZ CHAPPEL MG NO. AFM PAR JENSEN q 7.059 en 6.658 il 1.209 CATANO ME Q Ed 6.44	R COMPO LASE PE : FELDS 12.491 21.830 S A/CNK IN CATI AMETERS CATION 0.000 fs 6.313 ap 0.342 RM TOTA *****	SITION :KFS RCENT ANORTH PAR RATIOS: ORTHOCLASE ORTHOCLASE INDEX 0.58 ONS 45.29 : A = 0.19 F PLOT A = 0 CATANOR or 3.503 25.2 fo 0.000 0.00 cm tn 0.000 0.000 L =100.000 *********	6.562 (ITE 52.3) 5.742 10.036 AI (2) $F = 0.55 M$ $0.42 M =$ $241 26.107$ fa hy $000 12.977$ pf $0.000 0.0$ $441 26.107$ An	AB 44 322 PLAGIOO LBITE 68 4 = 0.26 0.15 F 1 0.000 ns 1 000 0.00 ********) LC	$ \begin{array}{c} \text{LASE} & 8 \\ \text{S.134} \\ \text{S.135} \\ \text{S.134} \\ \text{S.134} \\ \text{S.135} \\ \text{S.134} \\ \text{S.134} \\ \text{S.134} \\ \text{S.134} \\ \text{S.134} \\ \text{S.135} \\ S$	kp 0.000 mt 1.122 ru 0.00022	0.0 0.0 di 2.447 Ac
FELDSPA PLAGIOC QUARTZ QUARTZ CHAPPEL MG NO. AFM PAR JENSEN , q 7.059 en 6.658 il 1.209 CATANO ME Q Ed 6.44 0.00	R COMPO LASE PE : FELDS 12.491 21.830 S A/CNK IN CATI AMETERS CATION 	SITION : KFS RCENT ANORTH PAR RATIOS: ORTHOCLASE ORTHOCLASE INDEX 0.58 ONS 45.29 : $A = 0.19$ F PLOT $A = 0$ CATANOF OR 0.000 0.00 Cm th 0.000 0.000 L =100.000 ********************************	6.562 $IITE 52.3$ 5.742 $10.036 AI$ 2 $F = 0.55 M$ $0.42 M =$ M $ab ar$ $241 26.107$ $fa hy$ $0.00 12.977$ pf $0.000 0.0$ $ALGORYTHM$ An $26.11 0.$	AB 44 322 PLAGIOO CBITE 68 4 = 0.26 0.15 F 0.15 F 1 0.15 F 0.000 1 0.000 0.000 1 0.000 0.000 ********* 0.000 ********* 0.000 00 0.000	A.549 A CLASE 8 3.134 = 0.43 = 0.43 = 0.000 ac 0.000 cs cs 00 0.000	kp 0.000 mt 1.122 ru 0.00022 %0 Ri 53 31.80	0.0 0.0 di 2.447 Ac 0 0.
FELDSPA PLAGIOC QUARTZ QUARTZ QUARTZ CHAPPEL MG NO. AFM PAR JENSEN 9 7.059 en 6.658 il 1.209 CATANO ME Q Ed 6.44 0.00 Di	R COMPO LASE PE : FELDS 12.491 21.830 S A/CNK IN CATI AMETERS CATION 0.000 fs 6.313 ap 0.342 RM TOTA ***** SONORM C 0.000 Hy	SITION :KFS RCENT ANORTH PAR RATIOS: ORTHOCLASE ORTHOCLASE INDEX 0.58 ONS 45.29 : $A = 0.19$ F PLOT $A = 0$ CATANOR or 3.503 25.2 fo 0.000 0.00 cm tn 0.000 0.000 L =100.000 ***********	6.562 $IITE 52.3$ 5.742 $10.036 AI$ 2 $F = 0.55 M$ $0.42 M =$ M $ab ar$ $241 26.107$ $fa hy$ $0.00 12.977$ pf $0.000 0.0$ $ALGORYTHM$ An $26.11 0.$	AB 44 322 PLAGIOO CBITE 68 4 = 0.26 0.15 F 0.15 F 1 0.15 F 0.000 1 0.000 0.000 1 0.000 0.000 ********* 0.000 ********* 0.000 00 0.000	A.549 A CLASE 8 3.134 = 0.43 = 0.43 = 0.000 ac 0.000 cs cs 00 0.000 cs cs 00 0.000	kp 0.000 mt 1.122 ru 0.00022 %0 Ri 53 31.80	0.0 0.0 di 2.447 Ac 0 0.
FELDSPA PLAGIOC QUARTZ QUARTZ QUARTZ CHAPPEL MG NO. AFM PAR JENSEN	R COMPO LASE PE : FELDS 12.491 21.830 S A/CNK IN CATI AMETERS CATION 0.000 fs 6.313 ap 0.342 RM TOTA ***** CONORM C 0.000 Hy NDE	SITION : KFS RCENT ANORTH PAR RATIOS: ORTHOCLASE ORTHOCLASE INDEX 0.58 ONS 45.29 : $A = 0.19$ F PLOT $A = 0$ CATANOR or 3.503 25.2 fo 0.000 0.00 cm tn 0.000 0.000 L =100.000 *********** (HUCHISONS F Or Ab 0.00 25.24 01 (En	6.562 $ITE 52.3$ 5.742 $10.036 AI$ 2 $F = 0.55 M$ $0.42 M =$ M $ab aI$ $241 26.107$ $fa hy$ $0.000 12.973$ pf $0.000 0.0$ $ALGORYTHM$ An $26.11 0.$ Fs	AB 44 322 PLAGIOO LBITE 68 4 = 0.26 0.15 F 1 0.000 ns 1 000 0.00 ********) LC 00 0.	A.549 A CLASE 8 3.134 = 0.43 = 0.43 = 0.000 ac 0.000 cs cs 00 0.000 cs cs 00 0.0000 cs cs 00 0.000 cs cs 00 0.0000 cs cs 00000 cs cs 00000 cs cs 00000 cs cs 00000 cs cs 00000 cs cs 000000 cs cs 000000 cs cs 00000 cs cs 0000000000	kp 0.000 mt 1.122 ru 0.00022 70 Ri 53 31.80 Mt	0.0 0.0 di 2.447 Ac 0 0. Hm
FELDSPA PLAGIOC QUARTZ QUARTZ CHAPPEL MG NO. AFM PAR JENSEN 4 7.059 en 6.658 il 1.209 CATANO ME Q Ed 6.44 0.00 Di HORNBLE 0.00	R COMPO LASE PE : FELDS 12.491 21.830 S A/CNK IN CATI AMETERS CATION 0.000 fs 6.313 ap 0.342 RM TOTA ***** CONORM C 0.000 Hy NDE	SITION : KFS RCENT ANORTH PAR RATIOS: ORTHOCLASE ORTHOCLASE INDEX 0.58 ONS 45.29 : $A = 0.19$ F PLOT $A = 0$ CATANOF OR 0.000 0.00 Cm th 0.000 0.000 L =100.000 ********************************	6.562 $ITE 52.3$ 5.742 $10.036 AI$ 2 $F = 0.55 M$ $0.42 M =$ M $ab aI$ $241 26.107$ $fa hy$ $0.000 12.973$ pf $0.000 0.0$ $ALGORYTHM$ An $26.11 0.$ Fs	AB 44 322 PLAGIOO LBITE 68 4 = 0.26 0.15 F 1 0.000 ns 1 000 0.00 ********) LC 00 0.	A.549 A CLASE 8 3.134 = 0.43 = 0.43 = 0.000 ac 0.000 cs cs 00 0.000 cs cs 00 0.0000 cs cs 00 0.000 cs cs 00 0.0000 cs cs 00000 cs cs 00000 cs cs 00000 cs cs 00000 cs cs 00000 cs cs 000000 cs cs 000000 cs cs 00000 cs cs 0000000000	kp 0.000 mt 1.122 ru 0.00022 70 Ri 53 31.80 Mt	0.0 0.0 di 2.447 Ac 0 0. Hm
FELDSPA PLAGIOC QUARTZ QUARTZ CHAPPEL MG NO. AFM PAR JENSEN 4 7.059 en 6.658 il 1.209 CATANO ME Q Ed 6.44 0.00 Di HORNBLE 0.00 31.800	R COMPO LASE PE : FELDS 12.491 21.830 S A/CNK IN CATI AMETERS CATION 	SITION : KFS RCENT ANORTH PAR RATIOS: ORTHOCLASE ORTHOCLASE INDEX 0.58 ONS 45.29 : $A = 0.19$ F PLOT $A = 0$ CATANOF OR 3.503 25.22 fo 0.000 0.00 L =100.000 L =100.0000 L =100.000 L =100.0000 L =100.00000 L =100.00000 L =100.00000 L =10000000 L =100.0000000000000000000000000000000000	6.562 $IITE 52.3$ 5.742 $10.036 AI$ 2 $F = 0.55 M$ $0.42 M =$ $241 26.107$ $fa hy$ $0.00 12.977$ pf $0.000 0.0$ $C = C = C = C = C$ $A = C = C = C = C = C$ $A = C = C = C = C = C = C$ $A = C = C = C = C = C = C$ $C = C = C = C = C = C = C$ $C = C = C = C = C = C$ $C = C = C = C = C = C$ $C = C = C = C = C$ $C = C = C = C = C$ $C = C$	AB 44 322 PLAGIOO LBITE 68 4 = 0.26 0.15 F 0.0000 ********) LC 00 0. Fo .00 0	$ \begin{array}{ccccccccccccccccccccccccccccccccccc$	kp 0.000 mt 1.122 ru 0.00022 No Ri 53 31.80 Mt .12 0.	0.0 0.0 di 2.447 Ac 0 0. Hm
FELDSPA PLAGIOC QUARTZ QUARTZ CHAPPEL MG NO. AFM PAR JENSEN (7.059 en 6.658 il 1.209 CATANO (ME Q Ed 6.44 0.00 Di HORNBLE 0.00 31.800 Ap	R COMPO LASE PE : FELDS 12.491 21.830 S A/CNK IN CATI AMETERS CATION 	SITION : KFS RCENT ANORTH PAR RATIOS: ORTHOCLASE ORTHOCLASE INDEX 0.58 ONS 45.29 : $A = 0.19$ F PLOT $A = 0$ CATANOR or 3.503 25.2 fo 0.000 0.00 cm tn 0.000 0.000 L =100.000 *********** (HUCHISONS F Or Ab 0.00 25.24 01 (En	6.562 $IITE 52.3$ 5.742 $10.036 AI$ 2 $F = 0.55 M$ $0.42 M =$ $241 26.107$ $fa hy$ $0.000 12.977$ pf $0.000 0.0$ $AIGORYTHM$ An $26.11 0.$ Fs $0.00 0$ $Ns Ks$	AB 44 322 PLAGIOO CBITE 68 4 = 0.26 0.15 F 0.15 F 1 0.00 0.00 0 ********* 1 00 0.00 0 Fo 00 0 .00 0 0 500 0 0	 A.549 A CLASE 8 B.134 C ne C ne O.000 A Ne W OO 1. Fa) .00 1 Ru 	kp 0.000 mt 1.122 ru 0.00022 % Ri 53 31.80 Mt .12 0. BIOTITI	0.0 0.0 di 2.447 Ac 0 0. Hm .00 E Sp

OY THEE		RM08	a 100%	MOL	DDODC	C M	DDODG		
	GIVEN				0.911		0.911		
	54.50		54.750		0.143		0.286		
	14.53		14.597		0.143		0.015		
	1.16		9.473		0.132		0.132		
	9.43		0.181		0.003		0.003		
MnO MaQ	0.18 5.39		5.415		0.134		0.134		
-			9.082		0.162		0.162		
CaO Na2O			3.476		0.056		0.102		
	0.70		0.703		0.007		0.015		
	0.96		0.967		0.012		0.012		
	0.98				0.001		0.003		
	0.00				0.000		0.000		
TOTAL			0.000		0.000		0.000		
TOTAL	JJ.J%								
			CIPW I	NORM					
	с			an				kp	
-				22.149				.000	
	fs			hy				mt	-
				19.709					0
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	_			000 0.00					
CIPWNORN									
		*****	******	******	******	**			
PLAGIOCI QUARTZ QUARTZ QUARTZ	: FELDS	PAR RAT	IOS: LASE 7	.123 PI	LAGIOCL		88.38	4	
QUARTZ	: FELDS 4.493 7.243 S A/CNK	PAR RAT ORTHOCI ORTHOCLI INDEX	IOS: LASE 7 ASE 11. 0.635	.123 PI	LAGIOCL		88.38	4	
QUARTZ QUARTZ QUARTZ CHAPPELS MG No. 2	: FELDS 4.493 7.243 S A/CNK IN CATIO	PAR RAT: ORTHOCI ORTHOCLI INDEX ONS 4	IOS: LASE 7 ASE 11. 0.635 7.84	.123 PI 483 ALB	LAGIOCL ITE 81.	274	88.38	4	
QUARTZ QUARTZ QUARTZ CHAPPELS MG No.	: FELDS 4.493 7.243 S A/CNK IN CATIO	PAR RAT: ORTHOCI ORTHOCLI INDEX ONS 4 : A = 0	IOS: LASE 7 ASE 11. 0.635 7.84 .21 F =	.123 PJ 483 ALB 0.52 M	LAGIOCL ITE 81. = 0.27	274		4	
QUARTZ QUARTZ QUARTZ CHAPPELS MG No. 2	: FELDS 4.493 7.243 S A/CNK IN CATIO	PAR RAT: ORTHOCI ORTHOCLI INDEX ONS 4 : A = 0	IOS: LASE 7 ASE 11. 0.635 7.84 .21 F =	.123 PJ 483 ALB 0.52 M	LAGIOCL ITE 81. = 0.27	274		4	
QUARTZ QUARTZ QUARTZ CHAPPELS MG No. 1 AFM PARA JENSEN (: FELDS 4.493 7.243 S A/CNK IN CATION AMETERS CATION	PAR RAT: ORTHOCLI ORTHOCLI INDEX ONS 4 : A = 0 PLOT	IOS: LASE 7 ASE 11. 0.635 7.84 .21 F = A = 0.3	.123 PJ 483 ALB 0.52 M 9 M = 0	LAGIOCL ITE 81. = 0.27 0.17 F	274		4	
QUARTZ QUARTZ QUARTZ CHAPPELS MG No. 2 AFM PARA JENSEN O	: FELDS 4.493 7.243 S A/CNK IN CATION AMETERS CATION	PAR RAT: ORTHOCL ORTHOCL INDEX ONS 4 : A = 0 PLOT	IOS: LASE 7 ASE 11. 0.635 7.84 .21 F = A = 0.3 TANORM.	.123 PJ 483 ALB 0.52 M 9 M = 0	LAGIOCL ITE 81. = 0.27 0.17 F	= 0.	44		
QUARTZ QUARTZ QUARTZ CHAPPELS MG No. 2 AFM PARJ JENSEN G	: FELDS 4.493 7.243 S A/CNK IN CATION AMETERS CATION C	PAR RAT: ORTHOCL ORTHOCL INDEX ONS 4 : A = 0 PLOT 2 CA or	IOS: LASE 7 ASE 11. 0.635 7.84 .21 F = A = 0.3 TANORM. ab	.123 PJ 483 ALB 0.52 M 9 M = 0 an	LAGIOCL ITE 81. = 0.27 0.17 F 	= 0.	44 ne	kp	
QUARTZ QUARTZ QUARTZ CHAPPELS MG NO. AFM PARM JENSEN Q 2.444	: FELDS 4.493 7.243 (S A/CNK IN CATION AMETERS CATION (CATION (C 0.000	PAR RAT: ORTHOCH ORTHOCLI INDEX ONS 4 : A = 0 PLOT 2 CA or 4.183	IOS: LASE 7 ASE 11. 0.635 7.84 .21 F = A = 0.3 TANORM. ab 31.422	.123 PJ 483 ALB 0.52 M 9 M = (an 22.304	LAGIOCL ITE 81. = 0.27 0.17 F lc 0.000	274 = 0.	44 ne 000 0	kp .000	0
QUARTZ QUARTZ QUARTZ CHAPPELS MG NO. AFM PARM JENSEN Q 2.444 en	: FELDS 4.493 7.243 (S A/CNK IN CATION AMETERS CATION (C 0.000 fs	PAR RAT: ORTHOCH ORTHOCH INDEX ONS 4 : A = 0 PLOT 2 CA or 4.183 fo	IOS: LASE 7 ASE 11. 0.635 7.84 .21 F = A = 0.3 TANORM. ab 31.422 fa	.123 PJ 483 ALB 0.52 M 9 M = 0 an 22.304 hy	LAGIOCL ITE 81. = 0.27 0.17 F lc 0.000 ol	274 = 0.	144 ne 000 0 ac	kp .000 mt	0
QUARTZ QUARTZ QUARTZ CHAPPELS MG No. 2 AFM PARA JENSEN 0 2.444 en 10.353	: FELDS 4.493 7.243 S A/CNK IN CATIO AMETERS CATION C 0.000 fs 8.863	PAR RAT: ORTHOCI ORTHOCI INDEX ONS 4 : A = 0 PLOT 7 CA or 4.183 fo 0.000	IOS: LASE 7 ASE 11. 0.635 7.84 .21 F = A = 0.3 TANORM. ab 31.422 fa 0.000	.123 PI 483 ALB 0.52 M 9 M = $($ 22.304 hy 19.216	LAGIOCL ITE 81. = 0.27 0.17 F 1c 0.000 ol 0.000	274 = 0.	ne 000 0 ac 000 1	kp .000 mt .227	0 0
QUARTZ QUARTZ QUARTZ CHAPPELS MG No. 2 AFM PARA JENSEN (2.444 en 10.353 il	: FELDS 4.493 7.243 S A/CNK IN CATION AMETERS CATION C 0.000 fs 8.863 ap	PAR RAT: ORTHOCLO ORTHOCLI INDEX ONS 4 : A = 0 PLOT 2 CA or 4.183 fo 0.000 cm	IOS: LASE 7 ASE 11. 0.635 7.84 .21 F = A = 0.3 TANORM. ab 31.422 fa 0.000 tn	.123 PJ 483 ALB 0.52 M 9 M = 0 an 22.304 hy 19.216 pf	LAGIOCL ITE 81. = 0.27 0.17 F lc 0.000 ol 0.000 ns k	274 = 0.	ne 000 0 ac 000 1 cs	kp .000 mt .227 ru	0
QUARTZ QUARTZ QUARTZ CHAPPELS MG No. 2 AFM PARA JENSEN 0	: FELDS 4.493 7.243 (S A/CNK IN CATION AMETERS CATION (C 0.000 fs 8.863 ap 0.402	PAR RAT: ORTHOCL ORTHOCL INDEX ONS 4 : A = 0 PLOT 2 CA or 4.183 fo 0.000 cm 0.000 0	IOS: LASE 7 ASE 11. 0.635 7.84 .21 F = A = 0.3 TANORM. ab 31.422 fa 0.000 tn .000 0.	.123 PI 483 ALB 0.52 M 9 M = $($ 22.304 hy 19.216	LAGIOCL ITE 81. = 0.27 0.17 F lc 0.000 ol 0.000 ns k	274 = 0.	ne 000 0 ac 000 1 cs	kp .000 mt .227 ru	0
QUARTZ QUARTZ QUARTZ CHAPPELS MG No. 2 AFM PARA JENSEN 0	: FELDS 4.493 7.243 (S A/CNK IN CATIO AMETERS CATION (C 0.000 fs 8.863 ap 0.402 (RM TOTA)	PAR RAT: ORTHOCL ORTHOCL INDEX ONS 4 : A = 0 PLOT 2 CA or 4.183 fo 0.000 cm 0.000 0 L =100.0	IOS: LASE 7 ASE 11. 0.635 7.84 .21 F = A = 0.3 TANORM. ab 31.422 fa 0.000 tn .000 0. 000	.123 PJ 483 ALB 0.52 M 9 M = 0 an 22.304 hy 19.216 pf	LAGIOCL ITE 81. = 0.27 0.17 F lc 0.000 ol 0.000 ns k 00 0.00	274 = 0. 0.	ne 000 0 ac 000 1 cs	kp .000 mt .227 ru	0
QUARTZ QUARTZ QUARTZ CHAPPELS MG No. 2 AFM PARM JENSEN 0	: FELDS 4.493 7.243 (S A/CNK IN CATIO AMETERS CATION (0.000 fs 8.863 ap 0.402 RM TOTA *****	PAR RAT: ORTHOCI ORTHOCI INDEX ONS 4 : A = 0 PLOT 2 CA or 4.183 fo 0.000 cm 0.000 0 L =100.0	IOS: LASE 7 ASE 11. 0.635 7.84 .21 F = A = 0.3 TANORM. ab 31.422 fa 0.000 tn .000 0. 000 ********	.123 PJ 483 ALB 0.52 M 9 M = 0 an 22.304 hy 19.216 pf b 000 0.00	LAGIOCL ITE 81. = 0.27 0.17 F 0.000 ol 0.000 ns k 00 0.00	274 = 0. 0.	ne 000 0 ac 000 1 cs	kp .000 mt .227 ru	0
QUARTZ QUARTZ QUARTZ CHAPPELS MG NO. 2 AFM PARA JENSEN (2.444 en 10.353 il 1.357 CATANOI MES	: FELDS 4.493 7.243 S A/CNK IN CATIO AMETERS CATION C 0.000 fs 8.863 ap 0.402 RM TOTA ***** SONORM	PAR RAT: ORTHOCI ORTHOCI INDEX ONS 4 : A = 0 PLOT 7 CA or 4.183 fo 0.000 cm 0.000 0 L =100.0 *******	IOS: LASE 7 ASE 11. 0.635 7.84 .21 F = A = 0.3 TANORM. ab 31.422 fa 0.000 tn .000 0. 000 ********	.123 PJ 483 ALB 0.52 M 9 M = 0 an 22.304 hy 19.216 pf b 000 0.00 *******	LAGIOCL ITE 81. = 0.27 0.17 F 0.000 ol 0.000 ns k 00 0.00 *******	274 = 0. 0.	ne 000 0 ac 000 1 cs 000 0.	kp .000 mt .227 ru 00017	0
QUARTZ QUARTZ QUARTZ CHAPPELS MG NO. 2 AFM PARA JENSEN 0 q 2.444 en 10.353 il 1.357 CATANON MES Q Ed	: FELDS: 4.493 7.243 S A/CNK IN CATIO AMETERS CATION : 0.000 fs 8.863 ap 0.402 RM TOTA: ***** SONORM C	PAR RAT: ORTHOCLI INDEX ONS 4 : A = 0 PLOT 2 CA or 4.183 fo 0.000 cm 0.000 0 L =100.0 (HUCHISC Or	IOS: LASE 7 ASE 11. 0.635 7.84 .21 F = A = 0.3 TANORM. ab 31.422 fa 0.000 tn .000 0. 000 ******* ONS ALG Ab	.123 PJ 483 ALB 0.52 M 9 M = 0 an 22.304 hy 19.216 pf 000 0.00 ******* ORYTHM. An	LAGIOCL ITE 81. = 0.27 0.17 F 0.000 ol 0.000 ms k 00 0.000 *******) Lc	274 = 0. 0. 5 0 0.	44 ne 000 0 ac 000 1 cs 000 0. Wo	kp .000 mt .227 ru 00017 Ri	0
QUARTZ QUARTZ QUARTZ CHAPPELS MG NO. 2 AFM PARA JENSEN 0 q 2.444 en 10.353 il 1.357 CATANON MES Q Ed 2.43 0.00	: FELDS 4.493 7.243 (S S A/CNK IN CATION AMETERS CATION (C) 0.000 fs 8.863 ap 0.402 (C) RM TOTA ***** SONORM C 0.000	PAR RAT: ORTHOCI ORTHOCI INDEX ONS 4 : A = 0 PLOT 3 CA or 4.183 fo 0.000 cm 0.000 0 L =100.0 ******* (HUCHIS) Or 0.00 31	IOS: LASE 7 ASE 11. 0.635 7.84 .21 F = A = 0.3 TANORM. ab 31.422 fa 0.000 tn .000 0. 000 ******* ONS ALG Ab .42 22.	.123 PI 483 ALB 0.52 M 9 M = 0 an 22.304 hy 19.216 pf 1 000 0.00 ******* ORYTHM. An 30 0.0	LAGIOCL ITE 81. = 0.27 0.17 F 0.000 ol 0.000 ns k 00 0.00 *******) Lc 00 0.	274 = 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0	44 ne 000 0 ac 000 1 cs 000 0. Wo 0.00	kp .000 mt .227 ru 00017 Ri 27.62	0
QUARTZ QUARTZ QUARTZ CHAPPELS MG NO. 2 AFM PARA JENSEN O q 2.444 en 10.353 il 1.357 CATANOI MES Q Ed 2.43 0.00 Di HORNBLEJ	: FELDS: 4.493 7.243 (S) S A/CNK IN CATION AMETERS CATION (C) 0.000 fs 8.863 ap 0.402 (S) RM TOTA (C) 0.000 Hy NDE	PAR RAT: ORTHOCI ORTHOCI INDEX ONS 4 : A = 0 PLOT 2 CA or 4.183 fo 0.000 cm 0.000 0 L =100.0 ******* (HUCHISC Or 2 0.00 31 01 (IOS: LASE 7 ASE 11. 0.635 7.84 .21 F = A = 0.3 TANORM. ab 31.422 fa 0.000 tn .000 0. 000 ******** ONS ALG Ab .42 22. (En	.123 PI 483 ALB 0.52 M 9 M = 0 an 22.304 hy 19.216 pf n 000 0.00 ******* ORYTHM. An 30 0.0 Fs	LAGIOCL ITE 81. = 0.27 0.17 F 0.000 ol 0.000 ns k 00 0.00 *******) Lc 00 0. Fo	274 = 0. 0. 300. * Ne 00 Fa)	44 ne 000 0 ac 000 1 cs 000 0. Wo 0.00 Mo	kp .000 mt .227 ru 00017 Ri 27.62	0 0 .4
QUARTZ QUARTZ QUARTZ CHAPPELS MG NO. 2 AFM PARA JENSEN O q 2.444 en 10.353 il 1.357 CATANOI MES Q Ed 2.43 0.00 Di HORNBLEJ	: FELDS: 4.493 7.243 (S) S A/CNK IN CATION AMETERS CATION (C) 0.000 fs 8.863 ap 0.402 (S) RM TOTA (C) 0.000 Hy NDE	PAR RAT: ORTHOCI ORTHOCI INDEX ONS 4 : A = 0 PLOT 2 CA or 4.183 fo 0.000 cm 0.000 0 L =100.0 ******* (HUCHISC Or 2 0.00 31 01 (IOS: LASE 7 ASE 11. 0.635 7.84 .21 F = A = 0.3 TANORM. ab 31.422 fa 0.000 tn .000 0. 000 ******** ONS ALG Ab .42 22. (En	.123 PI 483 ALB 0.52 M 9 M = 0 an 22.304 hy 19.216 pf 1 000 0.00 ******* ORYTHM. An 30 0.0	LAGIOCL ITE 81. = 0.27 0.17 F 0.000 ol 0.000 ns k 00 0.00 *******) Lc 00 0. Fo	274 = 0. 0. 300. * Ne 00 Fa)	44 ne 000 0 ac 000 1 cs 000 0. Wo 0.00 Mo	kp .000 mt .227 ru 00017 Ri 27.62	0 0 .4
QUARTZ QUARTZ QUARTZ CHAPPELS MG NO. 2 AFM PARA JENSEN 0 q 2.444 en 10.353 il 1.357 CATANON MES Q Ed 2.43 0.00 Di HORNBLEJ 0.00 27.623	: FELDS: 4.493 7.243 (S S A/CNK IN CATION AMETERS CATION (C) 0.000 fs 8.863 ap 0.402 (S) RM TOTA (C) 0.000 Hy NDE 5.86	PAR RAT: ORTHOCI ORTHOCI INDEX ONS 4 : A = 0 PLOT 2 CA or 4.183 fo 0.000 Cm 0.000 0 L =100.0 ******* (HUCHIS) Or 0.00 31 01 (0.00 0	IOS: LASE 7 ASE 11. 0.635 7.84 .21 F = A = 0.3 TANORM. ab 31.422 fa 0.000 tn .000 0. 000 ******* ONS ALG Ab .42 22. (En 0.000 0	.123 PI 483 ALB 0.52 M 9 M = 0 an 22.304 hy 19.216 pf n 000 0.00 ******* ORYTHM. An 30 0.0 Fs	LAGIOCL ITE 81. = 0.27 0.17 F 0.000 01 0.000 ns k 00 0.000 *******) Lc 00 0. Fo 00 0.	274 = 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 5 0. 0. 5 0. 0. 5 0. 1. 5 0. 1. 5 0. 1. 5 0. 1. 5 0. 1. 5 0. 1. 5 0. 1. 5 0. 1. 5 0. 1. 5 0. 1. 5 0. 1. 5 0. 1. 5 0. 1. 5 0. 1. 5 0. 5 0	44 ne 000 0 ac 000 1 cs 000 0. Wo 0.00 M 1.23	kp .000 mt .227 ru 00017 Ri 27.62 It 0.	0 0 .4 Hr
QUARTZ QUARTZ QUARTZ CHAPPELS MG NO. 2 AFM PARA JENSEN 0 q 2.444 en 10.353 il 1.357 CATANON MES Q Ed 2.43 0.00 Di HORNBLES 0.00 27.623 Ap	: FELDS: 4.493 7.243 (S S A/CNK IN CATION AMETERS CATION (C) 0.000 fs 8.863 ap 0.402 (C) 8.863 ap 0.402 (C) ***** SONORM C 0.000 Hy NDE 5.86 Cm	PAR RAT: ORTHOCI ORTHOCI INDEX ONS 4 : A = 0 PLOT 2 CA or 4.183 fo 0.000 Cm 0.000 0 L =100.0 ******* (HUCHISC Or 0.00 31 01 (0.00 0 Tn 1	IOS: LASE 7 ASE 11. 0.635 7.84 .21 F = A = 0.3 TANORM. ab 31.422 fa 0.000 tn .000 0. 000 ******** ONS ALG Ab .42 22. (En 0.000 0 Pf N	.123 PI 483 ALB 0.52 M 9 M = (an 22.304 hy 19.216 pf 000 0.00 ******* An 30 0.0 Fs .00 0.0	LAGIOCL ITE 81. = 0.27 0.17 F 0.000 0.000 0.000 ns k 00 0.000 *******) LC 00 0. Fo 00 0. Cs	274 = 0. 0. 0. 0. 0. 0. 0. 0. 0. Ne 00 Fa) .000	44 ne 000 0 ac 000 1 cs 000 0. Wo 0.00 Mo 1.23 u BI	kp .000 mt .227 ru 00017 Ri 27.62 St 0. 0TITE	0 0 .4 Hr
QUARTZ QUARTZ QUARTZ CHAPPELS MG NO. 2 AFM PARA JENSEN 0 q 2.444 en 10.353 il 1.357 CATANON MES Q Ed 2.43 0.00 Di HORNBLES 0.00 27.623 Ap	: FELDS: 4.493 7.243 (S) S A/CNK IN CATION AMETERS CATION (C) 0.000 fs 8.863 ap 0.402 (S) RM TOTA (C) 0.000 Hy NDE 5.86 Cm 0.00	PAR RAT: ORTHOCI ORTHOCI INDEX ONS 4 : A = 0 PLOT 7 CA 0 0.000 Cm 0.000 0 L =100.0 ******* (HUCHISC Or 7 0.00 31 01 (0.00 0 Tn 1 2.04 0	IOS: LASE 7 ASE 11. 0.635 7.84 .21 F = A = 0.3 TANORM. ab 31.422 fa 0.000 tn .000 0. 000 ******** ONS ALG Ab .42 22. (En 0.000 0 Pf N .00 0.	.123 PI 483 ALB 0.52 M 9 M = (an 22.304 hy 19.216 pf n 000 0.0(******* ORYTHM. An 30 30 0.0 Fs .00 0.(s Ks	LAGIOCL ITE 81. = 0.27 0.17 F 0.000 0.000 0.000 ns k 00 0.000 *******) LC 00 0. Fo 00 0. Cs	274 = 0. 0. 0. 0. 0. 0. 0. 0. 0. Ne 00 Fa) .000	44 ne 000 0 ac 000 1 cs 000 0. Wo 0.00 Mo 1.23 u BI	kp .000 mt .227 ru 00017 Ri 27.62 St 0. 0TITE	0 0 .4 Hr

OXIDES	GIVEN	RECAL	C 100%	MOL	PROPS	CAT	PROP	S	155
	55.09		55.430		0.923				
	13.49		13.573		0.133		0.26	6	
	1.10		1.107		0.007		0.01	4	
	8.89		8.945		0.124		0.12	4	
MnO	0.19		0.191		0.003		0.00	3	
MgO	5.15		5.182		0.129		0.12	9	
CaO	8.97		9.025		0.161		0.16	1	
Na2O	4.32								
	1.00		1.006						
			0.992		0.012		0.01	2	
	0.20		0.201						
	0.00		0.000		0.000		0.00	0	
TOTAL	99.39								
			CIPW 1	NORM			• • •		
q	с	or	ab	an	lc	:	ne	kp	wo
								_	0.000
en	fs	fo	fa	hy	ol		ac	mt	hm
									0.000
il	ap	cm	tn	pf	ns k	s	cs	ru	di
1.884	0.477	0.000 0	.000 0.0	000 0.0	00 0.00	0 0.	000 0	0.000	23.995
CIPWNOR	M TOTAL	= 100.0	013						
		*****	******	******	*****	**			
HYPERSTI FELDSPAI PLAGIOCI QUARTZ QUARTZ QUARTZ	COMPOS HENE CO R COMPO LASE PE : FELDS 0.000 0.000	ITION: D MPOSITION SITION RCENT AN PAR RAT ORTHOC	FORSTER ON:EN :KFS NORTHIT IOS: LASE 1 ASE 13.	54.379 10.381 E 28.3 0.381	.379 F FS AB 64 52 PLAGIOC	AYAL 45.6 1.211 CLASE	21 AN	25.4	
HYPERSTI FELDSPAI PLAGIOCI QUARTZ QUARTZ QUARTZ CHAPPEL MG No.	COMPOS HENE CO R COMPO LASE PE : FELDS 0.000 0.000 0.000 S A/CNK IN CATI	ITION: D MPOSITIC SITION RCENT AI PAR RAT ORTHOCIO ORTHOCIO INDEX ONS 4	FORSTER ON:EN :KFS NORTHIT IOS: LASE 1 ASE 13. 0.551 8.16	ITE 54 54.379 10.381 E 28.3 0.381 917 ALB	.379 F FS AB 64 52 PLAGIOC ITE 86.	7AYAL 45.6 1.211 CLASE .083	21 AN	25.4	
HYPERSTI FELDSPAI PLAGIOCI QUARTZ QUARTZ QUARTZ CHAPPELS MG No.	COMPOS HENE CO R COMPO LASE PE : FELDS 0.000 0.000 S A/CNK IN CATI	ITION: D MPOSITIC SITION RCENT AN PAR RAT ORTHOCH ORTHOCH INDEX ONS 4 : A = 0	FORSTER ON:EN :KFS NORTHIT IOS: LASE 13. 0.551 8.16 .26 F =	ITE 54 54.379 10.381 E 28.3 0.381 917 ALB	.379 F FS AB 64 52 PLAGIOC ITE 86.	FAYAL 45.6 1.211 CLASE .083	21 AN : 89.	25.4	
HYPERSTI FELDSPAI PLAGIOCI QUARTZ QUARTZ CHAPPEL: MG NO.	COMPOS HENE CO R COMPO LASE PE : FELDS 0.000 0.000 S A/CNK IN CATI AMETERS CATION	ITION: D MPOSITIC SITION RCENT AN PAR RAT ORTHOCH ORTHOCH INDEX ONS 4 : A = 0	FORSTER ON:EN :KFS NORTHIT IOS: LASE 13. 0.551 8.16 .26 F = A = 0.3	ITE 54 54.379 10.381 E 28.3 0.381 917 ALB 0.49 M 9 M =	.379 F FS AB 64 52 PLAGIOC ITE 86. 1 = 0.25 0.17 F	FAYAL 45.6 1.211 CLASE .083	21 AN : 89.	25.4	
HYPERSTI FELDSPAI PLAGIOCI QUARTZ QUARTZ QUARTZ CHAPPEL: MG NO. AFM PARI JENSEN Q	COMPOS HENE CO R COMPO LASE PE : FELDS 0.000 0.000 S A/CNK IN CATI AMETERS CATION	ITION: I MPOSITION SITION RCENT AI PAR RAT: ORTHOCLO ORTHOCLO INDEX ONS 4 : A = 0 PLOT	FORSTER ON:EN :KFS NORTHIT IOS: LASE 13. 0.551 8.16 .26 F = A = 0.3 TANORM. ab	ITE 54 54.379 10.381 E 28.3 0.381 917 ALB 0.49 M 9 M = an	.379 F FS AB 64 52 PLAGIOC ITE 86 1 = 0.25 0.17 F	FAYAL 45.6 211 CLASE 083 = 0.	21 AN 89. 45 ne	25.4 .619 kp	
HYPERSTI FELDSPAI PLAGIOCI QUARTZ QUARTZ QUARTZ CHAPPEL: MG NO. AFM PARI JENSEN Q	COMPOS HENE CO R COMPO LASE PE : FELDS 0.000 0.000 S A/CNK IN CATI AMETERS CATION	ITION: I MPOSITION SITION RCENT AI PAR RAT ORTHOCL ORTHOCL INDEX ONS 4 : A = 0 PLOT	FORSTER ON:EN :KFS NORTHIT IOS: LASE 13. 0.551 8.16 .26 F = A = 0.3 TANORM. ab	ITE 54 54.379 10.381 E 28.3 0.381 917 ALB 0.49 M 9 M = an	.379 F FS AB 64 52 PLAGIOC ITE 86 1 = 0.25 0.17 F	FAYAL 45.6 211 CLASE 083 = 0.	21 AN 89. 45 ne	25.4 .619 kp	09
HYPERSTI FELDSPAI PLAGIOCI QUARTZ QUARTZ CHAPPELS MG No. AFM PAR JENSEN q 0.000 en	COMPOS HENE CO R COMPO LASE PE : FELDS 0.000 S A/CNK IN CATI AMETERS CATION C 0.000 fs	ITION: D MPOSITIC SITION RCENT AN PAR RAT ORTHOCIO ORTHOCIO INDEX ONS 4 : A = 0 PLOT 2 CA or 5.946 fo	FORSTER ON:EN :KFS NORTHIT IOS: LASE 13. 0.551 8.16 .26 F = A = 0.3 TANORM. ab 39.042 fa	ITE 54 54.379 10.381 E 28.3 0.381 917 ALB 0.49 M 9 M = an 14.561 hy	.379 F FS AB 64 52 PLAGIOC ITE 86. (= 0.25 0.17 F 0.000	FAYAL 45.6 2.211 CLASE 083 = 0.	21 AN 89. 45 ne 000 ac	25.4 .619 0.000 mt	09 0.000 μm
HYPERSTI FELDSPAI PLAGIOCI QUARTZ QUARTZ CHAPPELS MG NO. AFM PAR JENSEN Q 0.000 en 7.153	COMPOS HENE CO R COMPO LASE PE : FELDS 0.000 S A/CNK IN CATI AMETERS CATION C 0.000 fs 6.001	ITION: D MPOSITION SITION RCENT AN PAR RAT ORTHOCH ORTHOCH INDEX ONS 4 : A = 0 PLOT 4 CA or 5.946 fo 0.652	FORSTER ON:EN :KFS NORTHIT IOS: LASE 1 ASE 13. 0.551 8.16 .26 F = A = 0.3 TANORM. ab 39.042 fa 0.547	ITE 54 54.379 10.381 E 28.3 0.381 917 ALB 0.49 M 9 M = an 14.561 hy 13.153	.379 F FS AB 64 52 PLAGIOO ITE 86 ITE 86 0.17 F 0.000 0.000 0.1199	FAYAL 45.6 2.211 CLASE 083 = 0.	21 AN 89. 45 ne 000 ac 000	25.4 .619 0.000 mt 1.158	09 0.000 hm 0.000
HYPERSTI FELDSPAI PLAGIOCI QUARTZ QUARTZ CHAPPELS MG NO. AFM PAR JENSEN Q 0.000 en 7.153 il	COMPOS HENE CO R COMPO LASE PE : FELDS 0.000 S A/CNK IN CATI AMETERS CATION C 0.000 fs 6.001 ap	ITION: D MPOSITION SITION RCENT AN PAR RAT ORTHOCH ORTHOCH INDEX ONS 4 : A = 0 PLOT 4 CA or 5.946 fo 0.652 cm	FORSTER ON:EN :KFS NORTHIT IOS: LASE 1 ASE 13. 0.551 8.16 .26 F = A = 0.3 TANORM. ab 39.042 fa 0.547 tn	ITE 54 54.379 10.381 E 28.3 0.381 917 ALB 0.49 M 9 M = an 14.561 hy 13.153 pf	.379 F FS AB 64 52 PLAGIOO ITE 86 ITE 86 0.17 F 0.000 0.000 0.1199 ns	FAYAL 45.6 2.211 CLASE 083 = 0.	21 AN 89. 45 ne 000 ac 000 cs	25.4 .619 0.000 mt 1.158 ru	09 0.000 hm 0.000 di
HYPERSTI FELDSPAI PLAGIOCI QUARTZ QUARTZ QUARTZ CHAPPEL: MG NO. AFM PARI JENSEN q 0.000 en 7.153 il 1.382	COMPOS HENE CO R COMPO LASE PE : FELDS 0.000 0.000 S A/CNK IN CATI AMETERS CATION C 0.000 fs 6.001 ap 0.421	ITION: D MPOSITION SITION RCENT AI PAR RAT ORTHOCIO ORTHOCIO INDEX ONS 4 : A = 0 PLOT 2 CA or 5.946 fo 0.652 cm 0.000 0	FORSTER ON:EN :KFS NORTHIT IOS: LASE 13. 0.551 8.16 .26 F = A = 0.3 TANORM. ab 39.042 fa 0.547 tn .000 0.	ITE 54 54.379 10.381 E 28.3 0.381 917 ALB 0.49 M 9 M = an 14.561 hy 13.153 pf	.379 F FS AB 64 52 PLAGIOO ITE 86 ITE 86 0.17 F 0.000 0.000 0.1199 ns	FAYAL 45.6 2.211 CLASE 083 = 0.	21 AN 89. 45 ne 000 ac 000 cs	25.4 .619 0.000 mt 1.158 ru	09 0.000 hm 0.000 di
HYPERSTI FELDSPAI PLAGIOCI QUARTZ QUARTZ QUARTZ CHAPPEL: MG NO. AFM PARI JENSEN q 0.000 en 7.153 il 1.382	COMPOS HENE CO R COMPO LASE PE : FELDS 0.000 0.000 S A/CNK IN CATI AMETERS CATION C 0.000 fs 6.001 ap 0.421 RM TOTA	ITION: I MPOSITION SITION RCENT AI PAR RAT ORTHOCL ORTHOCL INDEX ONS 4 : A = 0 PLOT : CA fo 0.652 cm 0.000 0 L = 100.	FORSTER ON:EN :KFS NORTHIT IOS: LASE 13. 0.551 8.16 .26 F = A = 0.3 TANORM. ab 39.042 fa 0.547 tn .000 0. 000	ITE 54 54.379 10.381 E 28.3 0.381 917 ALB 0.49 M 9 M = an 14.561 hy 13.153 pf 0.00 0.0	.379 F FS AB 64 52 PLAGIOC ITE 86. (= 0.25 0.17 F 0.000 0.000 1.199 ns 3	FAYAL 45.6 1.211 CLASE 083 = 0. 5 = 0.	21 AN 89. 45 ne 000 ac 000 cs	25.4 .619 0.000 mt 1.158 ru	09 0.000 hm 0.000 di
HYPERSTI FELDSPAI PLAGIOCI QUARTZ QUARTZ CHAPPELS MG NO. 4 AFM PAR JENSEN q 0.000 en 7.153 il 1.382 CATANO	COMPOS HENE CO R COMPO LASE PE : FELDS 0.000 S A/CNK IN CATI AMETERS CATION C 0.000 fs 6.001 ap 0.421 RM TOTA *****	ITION: 1 MPOSITIC SITION RCENT AI PAR RAT ORTHOCI ORTHOCI INDEX ONS 4 : A = 0 PLOT 4 CA or 5.946 fo 0.652 cm 0.000 0 L =100.	FORSTER ON:EN :KFS NORTHIT IOS: LASE 13. 0.551 8.16 .26 F = A = 0.3 TANORM. ab 39.042 fa 0.547 tn .000 0. 000 *******	ITE 54 54.379 10.381 E 28.3 0.381 917 ALB 0.49 M 9 M = an 14.561 hy 13.153 pf 000 0.0	.379 F FS AB 64 52 PLAGIOC ITE 86. (= 0.25 0.17 F 0.000 0.1199 ns 1 000 0.00	FAYAL 45.6 1.211 CLASE 083 = 0. 5 = 0.	21 AN 89. 45 ne 000 ac 000 cs	25.4 .619 0.000 mt 1.158 ru	09 0.000 hm 0.000 di
HYPERSTI FELDSPAI PLAGIOCI QUARTZ QUARTZ CHAPPELS MG NO. AFM PAR JENSEN	COMPOS HENE CO R COMPO LASE PE : FELDS 0.000 S A/CNK IN CATI AMETERS CATION 0.000 fs 6.001 ap 0.421 RM TOTA ***** SONORM	ITION: 1 MPOSITIC SITION RCENT AI PAR RAT ORTHOCI ORTHOCI INDEX ONS 4 : A = 0 PLOT 4 : A = 0 : A = 0 PLOT 4 : A	FORSTER ON:EN :KFS NORTHIT IOS: LASE 11. 0.551 8.16 .26 F = A = 0.3 TANORM. ab 39.042 fa 0.547 tn .000 0. 000 *******	ITE 54 54.379 10.381 E 28.3 0.381 917 ALB 0.49 M 9 M = an 14.561 hy 13.153 pf 000 0.0 *******	.379 F FS AB 64 52 PLAGIOC ITE 86. (= 0.25 0.17 F 0.000 0.1199 ns 1.199 ns 1.199 ns 	FAYAL 45.6 2.211 CLASE 083 = 0. 0 0 0.	21 AN 89. 45 000 ac 000 cs 000 0	25.4 .619 0.000 mt 1.158 ru 0.0002	09 0.000 hm 0.000 di 3.137
HYPERSTI FELDSPAI PLAGIOCI QUARTZ QUARTZ CHAPPEL: MG NO AFM PARI JENSEN Q 0.000 en 7.153 il 1.382 CATANO ME Q	COMPOS HENE CO R COMPO LASE PE : FELDS 0.000 S A/CNK IN CATI AMETERS CATION 0.000 fs 6.001 ap 0.421 RM TOTA ***** SONORM	ITION: 1 MPOSITIC SITION RCENT AI PAR RAT ORTHOCI ORTHOCI INDEX ONS 4 : A = 0 PLOT 4 CA or 5.946 fo 0.652 cm 0.000 0 L =100.	FORSTER ON:EN :KFS NORTHIT IOS: LASE 11. 0.551 8.16 .26 F = A = 0.3 TANORM. ab 39.042 fa 0.547 tn .000 0. 000 *******	ITE 54 54.379 10.381 E 28.3 0.381 917 ALB 0.49 M 9 M = an 14.561 hy 13.153 pf 000 0.0 *******	.379 F FS AB 64 52 PLAGIOC ITE 86. (= 0.25 0.17 F 0.000 0.1199 ns 1.199 ns 1.199 ns 	FAYAL 45.6 2.211 CLASE 083 = 0. 0 0 0.	21 AN 89. 45 000 ac 000 cs 000 0	25.4 .619 0.000 mt 1.158 ru 0.0002	09 0.000 hm 0.000 di 3.137
HYPERSTI FELDSPAI PLAGIOCI QUARTZ QUARTZ CHAPPEL: MG NO. AFM PARI JENSEN	COMPOS HENE CO R COMPO LASE PE : FELDS 0.000 S A/CNK IN CATI AMETERS CATION C 0.000 fs 6.001 ap 0.421 RM TOTA ***** SONORM C	ITION: 1 MPOSITIC SITION RCENT AI PAR RAT ORTHOCIO ORTHOCIO INDEX ONS 4 : A = 0 PLOT CA or 5.946 fo 0.652 cm 0.000 0 L =100. ****** (HUCHIS Or	FORSTER ON:EN :KFS NORTHIT IOS: LASE 11. 0.551 8.16 .26 F = A = 0.3 TANORM. ab 39.042 fa 0.547 tn .000 0. 000 ******* ONS ALG Ab	ITE 54 54.379 10.381 E 28.3 0.381 917 ALB 0.49 M 9 M = an 14.561 hy 13.153 pf 000 0.0 ****** An	.379 F FS AB 64 52 PLAGIOC ITE 86 ITE 86 0.17 F 0.000 0.17 F 0.000 0.000 1.199 ns 000 0.000 *******	FAYAL 45.6 .211 CLASE .083 = 0.	21 AN 89. 45 000 ac 000 cs 000 0 Wo	25.4 .619 0.000 mt 1.158 ru 0.0002 Ri	09 0.000 0.000 di 3.137 i Act
HYPERSTI FELDSPAI PLAGIOCI QUARTZ QUARTZ QUARTZ CHAPPEL: MG NO. AFM PARI JENSEN	COMPOS HENE CO R COMPO LASE PE : FELDS 0.000 S A/CNK IN CATI AMETERS CATION C 0.000 fs 6.001 ap 0.421 RM TOTA ***** SONORM C	ITION: 1 MPOSITIC SITION RCENT AI PAR RAT ORTHOCIO ORTHOCIO INDEX ONS 4 : A = 0 PLOT CA or 5.946 fo 0.652 cm 0.000 0 L =100. ****** (HUCHIS Or	FORSTER ON:EN :KFS NORTHIT IOS: LASE 11. 0.551 8.16 .26 F = A = 0.3 TANORM. ab 39.042 fa 0.547 tn .000 0. 000 ******* ONS ALG Ab	ITE 54 54.379 10.381 E 28.3 0.381 917 ALB 0.49 M 9 M = an 14.561 hy 13.153 pf 000 0.0 ****** An	.379 F FS AB 64 52 PLAGIOC ITE 86 ITE 86 0.17 F 0.000 0.17 F 0.000 0.000 1.199 ns 000 0.000 *******	FAYAL 45.6 .211 CLASE .083 = 0.	21 AN 89. 45 000 ac 000 cs 000 0 Wo	25.4 .619 0.000 mt 1.158 ru 0.0002 Ri	09 0.000 hm 0.000 di 3.137
HYPERSTI FELDSPAI PLAGIOCI QUARTZ QUARTZ QUARTZ CHAPPELS MG NO AFM PARI JENSEN q 0.000 en 7.153 il 1.382 CATANO ME Q Ed 0.42 0.00	COMPOS HENE CO R COMPO LASE PE : FELDS 0.000 0.000 S A/CNK IN CATI AMETERS CATION 0.000 fs 6.001 ap 0.421 RM TOTA ***** SONORM C 0.00	ITION: 1 MPOSITIC SITION RCENT AI PAR RAT ORTHOCL ORTHOCL INDEX ONS 4 : A = 0 PLOT CA or 5.946 fo 0.652 cm 0.000 0 L =100. ****** (HUCHIS Or 0.00 39	FORSTER ON:EN :KFS NORTHIT IOS: LASE 13. 0.551 8.16 .26 F = A = 0.3 TANORM. ab 39.042 fa 0.547 tn .000 0. 000 ******* ONS ALG Ab	ITE 54 54.379 10.381 E 28.3 0.381 917 ALB 0.49 M 9 M = 14.561 hy 13.153 pf 000 0.0 ******* ORYTHM. An .56 0.0	.379 F FS AB 64 52 PLAGIOC ITE 86. (= 0.25 0.17 F 0.000 (0.000 (1.199 ns) 000 0.00 *******) Lc 00 0.	FAYAL 45.6 2211 CLASE 083 = 0. 083 = 0. 00 0. 00 0.	21 AN 89. 45 45 000 cs 000 cs 000 000 cs 000 000 000 00	25.4 ,619 0.000 mt 1.158 ru 0.0002 Ri 5 30.8	09 wo 0.000 di 3.137 Act 85 0.00
HYPERSTI FELDSPAI PLAGIOCI QUARTZ QUARTZ QUARTZ CHAPPELS MG NO. AFM PAR JENSEN	COMPOS HENE CO R COMPO LASE PE : FELDS 0.000 S A/CNK IN CATI AMETERS CATION 	ITION: 1 MPOSITIC SITION RCENT AI PAR RAT ORTHOCIO ORTHOCIO INDEX ONS 4 : A = 0 PLOT CA or 5.946 fo 0.652 cm 0.000 0 L =100. ****** (HUCHIS Or	FORSTER ON:EN :KFS NORTHIT IOS: LASE 13. 0.551 8.16 .26 F = A = 0.3 TANORM. ab 39.042 fa 0.547 tn .000 0. 000 ******* ONS ALG Ab	ITE 54 54.379 10.381 E 28.3 0.381 917 ALB 0.49 M 9 M = 14.561 hy 13.153 pf 000 0.0 ******* ORYTHM. An .56 0.0	.379 F FS AB 64 52 PLAGIOC ITE 86. (= 0.25 0.17 F 0.000 (0.000 (1.199 ns) 000 0.00 *******) Lc 00 0.	FAYAL 45.6 2211 CLASE 083 = 0. 083 = 0. 00 0. 00 0.	21 AN 89. 45 45 000 cs 000 cs 000 000 cs 000 000 000 00	25.4 ,619 0.000 mt 1.158 ru 0.0002 Ri 5 30.8	09 wo 0.000 di 3.137 Act 85 0.00
HYPERSTI FELDSPAI PLAGIOCI QUARTZ QUARTZ QUARTZ CHAPPEL: MG NO AFM PARI JENSEN Q 0.000 en 7.153 il 1.382 CATANO ME Q Ed 0.42 0.00 Di HORNBLE	COMPOS HENE CO R COMPO LASE PE : FELDS 0.000 S A/CNK IN CATI AMETERS CATION 0.000 fs 6.001 ap 0.421 RM TOTA ***** SONORM C 0.00 Hy NDE	ITION: 1 MPOSITIC SITION RCENT AI PAR RAT ORTHOCL ORTHOCL INDEX ONS 4 : A = 0 PLOT 4 : A = 0 O.000 0 L = 100. 3 : A = 0 O 0 : A = 0 : A = 0 O 0 : A = 0	FORSTER ON:EN :KFS NORTHIT IOS: LASE 1 ASE 13. 0.551 8.16 .26 F = A = 0.3 TANORM. ab 39.042 fa 0.547 tn .000 0. 000 ******* ONS ALG Ab	ITE 54 54.379 10.381 E 28.3 0.381 917 ALB 0.49 M 9 M = an 14.561 hy 13.153 pf 000 0.0 ******* An .56 0.0 Fs	.379 F FS AB 64 52 PLAGIOC ITE 86. (= 0.25 0.17 F 0.000 (1.199 ns) 000 0.00 *******) Lc 00 0. Fo	FAYAL 45.6 2211 CLASE 083 = 0. 0 0. 0 0. 0 0. 0 0. 0 0. 0 0. 0 0.	21 AN 89. 45 000 ac 000 cs 000 (Wo 1.96)	25.4 .619 0.000 mt 1.158 ru 0.0002 Ri 5 30.8 Mt	09 0.000 0.000 di 3.137 i Act 85 0.00 Hm
HYPERSTI FELDSPAI PLAGIOCI QUARTZ QUARTZ QUARTZ CHAPPEL: MG NO. AFM PARI JENSEN	COMPOS HENE CO R COMPO LASE PE : FELDS 0.000 S A/CNK IN CATI AMETERS CATION 0.000 fs 6.001 ap 0.421 RM TOTA ***** SONORM C 0.00 Hy NDE 0.00	ITION: 1 MPOSITIC SITION RCENT AI PAR RAT ORTHOCL ORTHOCL INDEX ONS 4 : A = 0 PLOT CA or 5.946 fo 0.652 cm 0.000 0 L =100. ****** (HUCHIS Or 0.00 39	FORSTER ON:EN :KFS NORTHIT IOS: LASE 1 ASE 13. 0.551 8.16 .26 F = A = 0.3 TANORM. ab 39.042 fa 0.547 tn .000 0. 000 ******* ONS ALG Ab	ITE 54 54.379 10.381 E 28.3 0.381 917 ALB 0.49 M 9 M = an 14.561 hy 13.153 pf 000 0.0 ******* An .56 0.0 Fs	.379 F FS AB 64 52 PLAGIOC ITE 86. (= 0.25 0.17 F 0.000 (1.199 ns) 000 0.00 *******) Lc 00 0. Fo	FAYAL 45.6 2211 CLASE 083 = 0. 0 0. 0 0. 0 0. 0 0. 0 0. 0 0. 0 0.	21 AN 89. 45 000 ac 000 cs 000 (Wo 1.96)	25.4 .619 0.000 mt 1.158 ru 0.0002 Ri 5 30.8 Mt	09 0.000 0.000 di 3.137 i Act 85 0.00 Hm
HYPERSTI FELDSPAI PLAGIOCI QUARTZ QUARTZ QUARTZ CHAPPEL: MG NO. AFM PARI JENSEN	COMPOS HENE CO R COMPO LASE PE : FELDS 0.000 S A/CNK IN CATI AMETERS CATION C 0.000 fs 6.001 ap 0.421 RM TOTA ***** SONORM C 0.000 Hy NDE 0.00	ITION: 1 MPOSITION SITION RCENT AL PAR RAT ORTHOCL ORTHOCL INDEX ONS 4 : A = 0 PLOT CA Or 5.946 fo 0.652 cm 0.000 0 L =100. ****** (HUCHIS Or 0.00 39 01 (0.00 (FORSTER ON:EN :KFS NORTHIT IOS: LASE 1 ASE 13. 0.551 8.16 .26 F = A = 0.3 TANORM. ab 39.042 fa 0.547 tn .000 0. 000 ******* ONS ALG Ab 0.04 14. (En 0.00 0	ITE 54 54.379 10.381 E 28.3 0.381 917 ALB 0.49 M 9 M = 14.561 hy 13.153 pf 000 0.0 ******* An .56 0.0 Fs .00 0.	.379 F FS AB 64 52 PLAGIOC ITE 86 	FAYAL 45.6 2.211 CLASE 083 = 0. 083 = 0. 0. 00 0. 00 0. 00 0. 00 0. 5 00 0. 5 00 0. 5 0000000000	21 AN 89. 45 45 000 cs 000 (Wo 1.96) 1.1	25.4 .619 0.000 mt 1.158 ru 0.0002 Ri 5 30.8 Mt 6 0	09 0.000 0.000 di 3.137 L Act 35 0.00 Hm .00
q 0.000 en 7.153 il 1.382 CATANO ME Q Ed 0.42 0.00 Di HORNBLE 0.00 30.851 Ap	COMPOS HENE CO R COMPO LASE PE : FELDS 0.000 0.000 S A/CNK IN CATI AMETERS CATION 0.000 fs 6.001 ap 0.421 RM TOTA ***** SONORM C 0.000 Hy NDE 0.00 Cm	ITION: 1 MPOSITIC SITION RCENT AI PAR RAT ORTHOCL ORTHOCL INDEX ONS 4 : A = 0 PLOT 4 : A = 0 O.000 0 L = 100. 3 : A = 0 O 0 : A = 0 : A = 0 O 0 : A = 0	FORSTER ON:EN :KFS NORTHIT IOS: LASE 13. 0.551 8.16 .26 F = A = 0.3 TANORM. ab 39.042 fa 0.547 tn .000 0. 000 ******* ONS ALG Ab 0.04 14. (En 0.00 0 Pf N	ITE 54 54.379 10.381 E 28.3 0.381 917 ALB 0.49 M 9 M = an 14.561 hy 13.153 pf 000 0.0 ******* ORYTHM. An .56 0.0 Fs .00 0.	.379 F FS AB 64 52 PLAGIOC ITE 86. (= 0.25 0.17 F (0.000 (0.1199) ns 1 000 0.00 (1.199) ns 1 000 0.00 () LC 00 0. Fo 00 0 (FAYAL 45.6 2211 CLASE 083 = 0. 0 0. 0 0. 0 0. 0 0. 0 0. 0 0. 5 0 0. 5 0 0. 5 0 0. 5 0. 5	21 AN 89. 45 45 000 cs 000 (Wo 1.96) 1.1	25.4 .619 0.000 mt 1.158 ru 0.0002 Ri 5 30.8 Mt 6 0 310TIT	09 wo 0.000 hm 0.000 di 3.137 Act 85 0.00 Hm .00 E Sp

PETRONORMS PROGRAM SAMPLE NUMBER RM10 156 OXIDES GIVEN RECALC 100% MOL PROPS CAT PROPS 0.922 0.922 SiO2 55.19 55.409 0.142 14.447 0.283 A1203 14.39 0.008 Fe2O3 1.21 1.215 0.015 9.79 0.137 9.829 0.137 FeO 0.221 0.003 0.003 MnO 0.22 0.129 5.201 0.129 MgO 5.18 0.146 CaO. 8.17 0.146 8.202 Na2O 3.74 3.755 0.061 0.121 0.49 0.492 0.005 0.010 K20 1.018 0.013 0.013 TiO2 1.01 0.001 P205 0.21 0.211 0.003 0.000 0.000 Cr203 0.00 0.000 TOTAL 99.60 q c or ab an lc ne kp wo 3.704 0.000 2.907 31.770 21.113 0.000 0.000 0.000 0.000 en fs fo fa hy ol ac mt hm 10.985 10.180 0.000 0.000 21.165 0.000 0.000 1.761 0.000 il ap cm tn pf ns ks cs ru di 1.934 0.499 0.000 0.000 0.000 0.000 0.000 0.000 15.160 CIPWNORM TOTAL = 100.014***** PARAMETERS FOR CIPW NORMATIVE MINERALS HYPERSTHENE COMPOSITION:EN 51.902 FS 48.098 FELDSPAR COMPOSITION :KFS 5.211 AB 56.946 AN 37.843 PLAGIOCLASE PERCENT ANORTHITE 39.923 QUARTZ : FELDSPAR RATIOS: QUARTZ 6.226 ORTHOCLASE 4.886 PLAGIOCLASE 88.887 QUARTZ 9.651 ORTHOCLASE 7.574 ALBITE 82.775 CHAPPELS A/CNK INDEX 0.668 MG No. IN CATIONS 45.91 AFM PARAMETERS: A = 0.21 F = 0.54 M = 0.26 JENSEN CATION PLOT A = 0.38 M = 0.16 F = 0.46 q c or ab an lc ne kp wo 3.457 0.000 2.928 33.970 21.277 0.000 0.000 0.000 0.000 en fs fo fa hy ol ac hm mt 10.661 9.879 0.000 0.000 20.540 0.000 0.000 1.280 0.000 **i**1 ap cm tn pf ns ks cs ru di 1.429 0.444 0.000 0.000 0.000 0.000 0.000 0.000 0.00014.674 CATANORM TOTAL =100.000 ****** ... MESONORM (HUCHISONS ALGORYTHM...) C Or Ab An Lc Ne Wo Ri Act 0 Ed 3.02 0.00 0.00 33.97 21.28 0.00 0.00 0.00 22.15 0.00 0.00 Ol (En Fs Fo Fa) Mt Hm Di Hy HORNBLENDE 0.00 11.02 0.00 0.00 0.00 0.00 0.00 1.28 0.00 22.153

Ap Cm Tn Pf Ns Ks Cs Ru BIOTITE Sp 0.50 0.00 2.14 0.00 0.00 0.00 0.00 0.00 4.685 MESONORM TOTAL = 100.056

	UMBER	RM11					
OXIDES	GIVEN	RECALC 10	08 MO	L PROPS	CAT PR	OPS	167
SiO2	55.33	55.6	30	0.926	0.	926	157
A1203	14.29	14.3	67	0.141	0.	282	
Fe203	1.16	1.1	66	0.007	0.	015	
Fe0	9.43	9.4	81	0.132	Ο.	132	
	0.18		81	0.003	Ο.	003	
MgO	4.88	4.9	906	0.122	Ο.	122	
CaO	9.49	9.5	541	0.170	Ο.	170	
Na20	3.10	3.1	17	0.050	Ο.	101	
К2О	0.40	0.4	102	0.004	0.	009	
TiO2	0.99	0.9	996	0.012	0.	012	
		0.2	211	0.001	Ο.	003	
Cr203	0.00	0.0	000	0.000	Ο.	000	
TOTAL	99.46						
		CII	W NORM				
α	С	or	ab a			kp	w
-		2.376 26.3				-	
en			fa h			mt	hr
		0.000 0.0		-			0.000
il	ap	cm tn	pf	ns 4	s cs	ru	di
1.892	-	0.000 0.000	-				8.276
CIPWNORN	M TOTAL	= 100.013					
		*******	******	******	***		
F	PARAMET	ERS FOR CIP	NORMATI	VE MINER	RALS		
HYPERSTR	HENE CO	MPOSITION: EN	N 51.47	6 FS	48.524		
FELDSPAR	R COMPO		- 4				
		SITION .VL	5 4.503	AB 49).972 A	N 45.52	24
PLAGIOCI QUARTZ QUARTZ	LASE PE : FELDS 11.183	RCENT ANORT PAR RATIOS: ORTHOCLAS	HITE 47. E 4.000	671 PLAGIO	CLASE 8		
PLAGIOCI QUARTZ QUARTZ QUARTZ CHAPPELS	LASE PE : FELDS 11.183 18.774 S A/CNK	RCENT ANORT PAR RATIOS:	HITE 47. E 4.000 6.715 AL	671 PLAGIO	CLASE 8		
PLAGIOCI QUARTZ QUARTZ QUARTZ CHAPPELS MG NO. 2 AFM PARA	LASE PE : FELDS 11.183 18.774 S A/CNK IN CATI AMETERS	RCENT ANORT PAR RATIOS: ORTHOCLASE ORTHOCLASE INDEX 0.6	HITE 47. E 4.000 6.715 AL 27 F = 0.56	671 PLAGIOO BITE 74. M = 0.26	CLASE 8 .511		
PLAGIOCI QUARTZ QUARTZ QUARTZ CHAPPELS MG NO. 2 AFM PARJ JENSEN (LASE PE : FELDS 11.183 18.774 S A/CNK IN CATI AMETERS CATION	RCENT ANORTH PAR RATIOS: ORTHOCLASE ORTHOCLASE INDEX 0.61 ONS 45.37	HITE 47. E 4.000 6.715 AL 27 F = 0.56 0.39 M =	671 PLAGIOO BITE 74 M = 0.26 0.15 F	CLASE 8 .511		
PLAGIOCI QUARTZ QUARTZ QUARTZ CHAPPELS MG NO. 2 AFM PARA JENSEN (LASE PE : FELDS 11.183 18.774 S A/CNK IN CATI AMETERS CATION	RCENT ANORTH PAR RATIOS: ORTHOCLASE ORTHOCLASE INDEX 0.61 ONS 45.37 : A = 0.19 PLOT A = 0	HITE 47. E 4.000 6.715 AL 27 F = 0.56 0.39 M = RM	671 PLAGIOO BITE 74 M = 0.26 0.15 F	CLASE 8 .511 5 = 0.45	4.817	
PLAGIOCI QUARTZ QUARTZ QUARTZ CHAPPELS MG NO. 2 AFM PARJ JENSEN (LASE PE : FELDS 11.183 18.774 S A/CNK IN CATI AMETERS CATION	RCENT ANORTH PAR RATIOS: ORTHOCLASE ORTHOCLASE INDEX 0.61 ONS 45.37 : A = 0.19 PLOT A = 0 CATANO	HITE 47. E 4.000 6.715 AL 27 F = 0.56 0.39 M = RM ab a	671 PLAGIOO BITE 74 M = 0.26 0.15 F 	CLASE 8 .511 = 0.45	4.817 kp	
PLAGIOCI QUARTZ QUARTZ QUARTZ CHAPPELS MG NO. 2 AFM PARM JENSEN O q 6.237	LASE PE : FELDS 11.183 18.774 S A/CNK IN CATI AMETERS CATION 	RCENT ANORT PAR RATIOS: ORTHOCLASE ORTHOCLASE INDEX 0.6 ONS 45.37 : A = 0.19 PLOT A = 0 CATANO or 2.408 28.	HITE 47. E 4.000 6.715 AL 27 F = 0.56 0.39 M = RM ab a	671 PLAGIOG BITE 74 M = 0.26 0.15 F 	CLASE 8 .511 = 0.45 = ne 0 0.000	4.817 kp 0.000	w 0.00
PLAGIOCI QUARTZ QUARTZ QUARTZ CHAPPELS MG NO. 2 AFM PARJ JENSEN (LASE PE : FELDS 11.183 18.774 S A/CNK IN CATI AMETERS CATION 	RCENT ANORT PAR RATIOS: ORTHOCLASE ORTHOCLASE INDEX 0.6 ONS 45.37 : A = 0.19 PLOT A = 0 CATANO or 2.408 28.	HITE 47. E 4.000 6.715 AL 27 F = 0.56 0.39 M = RM ab a 358 24.34 fa b	671 PLAGIOO BITE 74 M = 0.26 0.15 F n 10 9 0.000 Ny 01	CLASE 8 .511 = 0.45 = ne 0 0.000	4.817 kp 0.000 mt	wa 0.00 hi
PLAGIOCI QUARTZ QUARTZ QUARTZ CHAPPELS MG NO. 2 AFM PARA JENSEN (LASE PE : FELDS 11.183 18.774 S A/CNK IN CATI AMETERS CATION C 0.000 fs 8.627	RCENT ANORT PAR RATIOS: ORTHOCLASE ORTHOCLASE INDEX 0.6 ONS 45.37 : A = 0.19 PLOT A = CATANO or 2.408 28. fo	HITE 47. E 4.000 6.715 AL 27 F = 0.56 0.39 M = RM ab a 358 24.34 fa h 000 17.77	671 PLAGIOO BITE 74 M = 0.26 0.15 F n 10 9 0.000 N 0.000 8 0.000	CLASE 8 .511 = 0.45 = 0.000 0.000 L ac	4.817 kp 0.000 mt 1.236	wa 0.00 hi
PLAGIOCI QUARTZ QUARTZ QUARTZ CHAPPELS MG NO. 2 AFM PARJ JENSEN (, q 6.237 en 9.152 il 1.406	LASE PE : FELDS 11.183 18.774 S A/CNK IN CATI AMETERS CATION 	RCENT ANORT PAR RATIOS: ORTHOCLASE ORTHOCLASE INDEX 0.6 ONS 45.37 : A = 0.19 PLOT A = 0 CATANO or 2.408 28. fo 0.000 0.00 cm tn 0.000 0.000	HITE 47. E 4.000 6.715 AL 27 F = 0.56 0.39 M = RM ab a 358 24.34 fa h 000 17.77 pf	671 PLAGIOO BITE 74 M = 0.26 0.15 F 9 0.000 y 0] 8 0.000 ns 1	CLASE 8 .511 = 0.45 = 0.000 L ac 0.000 ks cs	kp 0.000 mt 1.236 ru	w 0.00 h 0.00 di
PLAGIOCI QUARTZ QUARTZ QUARTZ CHAPPELS MG NO. 2 AFM PARM JENSEN (, q 6.237 en 9.152 il 1.406	LASE PE : FELDS 11.183 18.774 S A/CNK IN CATI AMETERS CATION 	RCENT ANORTH PAR RATIOS: ORTHOCLASE ORTHOCLASE INDEX 0.6 ONS 45.37 : A = 0.19 PLOT A = 0 CATANO or 2.408 28.1 fo 0.000 0.000 L = 100.000	HITE $47.$ E 4.000 6.715 AL 27 F = 0.56 0.39 M = RM ab a 358 24.34 fa h 000 17.77 pf 0.000 0.	671 PLAGIOG BITE 74 M = 0.26 0.15 F an 16 9 0.000 ag 0.000 ns 1 000 0.00	CLASE 8 .511 = 0.45 = 0.000 L ac 0 0.000 ks cs 00 0.000	kp 0.000 mt 1.236 ru	w 0.00 h 0.00 di
PLAGIOCI QUARTZ QUARTZ QUARTZ CHAPPELS MG NO. 2 AFM PARJ JENSEN (q 6.237 en 9.152 il 1.406 CATANOI	LASE PE : FELDS 11.183 18.774 S A/CNK IN CATI AMETERS CATION 0.000 fs 8.627 ap 0.447 RM TOTA *****	RCENT ANORT PAR RATIOS: ORTHOCLASE ORTHOCLASE INDEX 0.6 ONS 45.37 : A = 0.19 PLOT A = 0 CATANO or 2.408 28. fo 0.000 0.000 L = 100.000	HITE 47. E 4.000 6.715 AL 27 F = 0.56 0.39 M = RM ab a 358 24.34 fa h 000 17.77 pf 0.000 0. *********	671 PLAGIOG BITE 74 M = 0.26 0.15 F 9 0.000 NS 1 000 0.00 (********	CLASE 8 .511 = 0.45 = 0.000 L ac 0 0.000 ks cs 00 0.000	kp 0.000 mt 1.236 ru	w 0.00 h 0.00 di
PLAGIOCI QUARTZ QUARTZ QUARTZ CHAPPELS MG NO. 2 AFM PARA JENSEN (LASE PE : FELDS 11.183 18.774 S A/CNK IN CATI AMETERS CATION 0.000 fs 8.627 ap 0.447 RM TOTA ***** SONORM	RCENT ANORT PAR RATIOS: ORTHOCLASE ORTHOCLASE INDEX 0.6 ONS 45.37 : A = 0.19 PLOT A = 0 CATANO or 2.408 28. fo 0.000 0.00 cm tn 0.000 0.000 L =100.000 ********************************	HITE 47. E 4.000 6.715 AL 27 F = 0.56 0.39 M = RM ab a 358 24.34 fa h 000 17.77 pf 0.000 0. *********	671 PLAGIOG BITE 74 M = 0.26 0.15 F N = 0.26 N = 0.000 N = 0.000 	CLASE 8 .511 = 0.45 = 0.45 0 0.000 ac 0 0.000 cs cs 00 0.000	kp 0.000 mt 1.236 ru 0.00017	w 0.00 h 0.00 di 7.781
PLAGIOCI QUARTZ QUARTZ QUARTZ CHAPPELS MG NO. 2 AFM PARJ JENSEN (, , 9.152 il 1.406 CATANOI MES Q	LASE PE : FELDS 11.183 18.774 S A/CNK IN CATI AMETERS CATION 0.000 fs 8.627 ap 0.447 RM TOTA ***** SONORM	RCENT ANORT PAR RATIOS: ORTHOCLASE ORTHOCLASE INDEX 0.6 ONS 45.37 : A = 0.19 PLOT A = 0 CATANO or 2.408 28. fo 0.000 0.000 L = 100.000	HITE 47. E 4.000 6.715 AL 27 F = 0.56 0.39 M = RM ab a 358 24.34 fa h 000 17.77 pf 0.000 0. *********	671 PLAGIOG BITE 74 M = 0.26 0.15 F N = 0.26 N = 0.000 N = 0.000 	CLASE 8 .511 = 0.45 = 0.45 0 0.000 ac 0 0.000 cs cs 00 0.000	kp 0.000 mt 1.236 ru	w 0.00 h 0.00 di 7.781
PLAGIOCI QUARTZ QUARTZ QUARTZ CHAPPELS MG NO. 2 AFM PARJ JENSEN (, , , , , , , , , , , , , , , , , , ,	LASE PE : FELDS 11.183 18.774 S A/CNK IN CATI AMETERS CATION 	RCENT ANORT PAR RATIOS: ORTHOCLASE ORTHOCLASE INDEX 0.6 ONS 45.37 : A = 0.19 PLOT A = 0 CATANO or 2.408 28. fo 0.000 0.000 L =100.000 ********* (HUCHISONS 20 Or Ab	HITE 47. E 4.000 6.715 AL 27 F = 0.56 0.39 M = RM ab a 358 24.34 fa h 000 17.77 pf 0.000 0. ********* ALGORYTHM An	671 PLAGIOG BITE 74 M = 0.26 0.15 F 9 0.000 NS 1 000 0.00 (********	CLASE 8 .511 = 0.45 = 0.45 0 0.000 c ac 0 0.000 c cs 00 0.000	4.817 kp 0.000 mt 1.236 ru 0.00017	w 0.00 h 0.00 di 7.781 Act
PLAGIOCI QUARTZ QUARTZ QUARTZ CHAPPELS MG NO. 2 AFM PARM JENSEN (, , , , , , , , , , , , , , , , , , ,	LASE PE : FELDS 11.183 18.774 S A/CNK IN CATI AMETERS CATION 	RCENT ANORT PAR RATIOS: ORTHOCLASE ORTHOCLASE INDEX 0.6 ONS 45.37 : A = 0.19 PLOT A = 0 CATANO or 2.408 28. fo 0.000 0.00 cm tn 0.000 0.000 L =100.000 ********************************	HITE 47. E 4.000 6.715 AL 27 F = 0.56 0.39 M = RM ab a 358 24.34 fa h 000 17.77 pf 0.000 0. ********* ALGORYTHM An	671 PLAGIOO BITE 74 M = 0.26 0.15 F 9 0.000 NS 1 000 0.00 (********	CLASE 8 .511 = 0.45 = 0.45 0 0.000 c ac 0 0.000 c cs 00 0.000	4.817 kp 0.000 mt 1.236 ru 0.00017	w 0.00 h 0.00 di 7.781 Act
PLAGIOCI QUARTZ QUARTZ QUARTZ CHAPPELS MG NO. 2 AFM PARA JENSEN (, , q 6.237 en 9.152 il 1.406 CATANON MES Q Ed 5.11 0.00	LASE PE : FELDS 11.183 18.774 S A/CNK IN CATI AMETERS CATION 0.000 fs 8.627 ap 0.447 RM TOTA ***** SONORM C	RCENT ANORT PAR RATIOS: ORTHOCLASE ORTHOCLASE INDEX 0.6 ONS 45.37 : A = 0.19 PLOT A = 0 CATANO or 2.408 28. fo 0.000 0.000 L =100.000 ********* (HUCHISONS Or Ab 0.000 28.36	HITE 47. E 4.000 6.715 AL 27 F = 0.56 0.39 M = RM ab a 358 24.34 fa h 000 17.77 pf 0.000 0. ********* ALGORYTHM An 24.35 0	671 PLAGIOG BITE 74. M = 0.26 0.15 F M = 0.26 0.15 F M = 0.26 0.15 F N = 0.26 0.15 F N = 0.26 0.15 F N = 0.26 N = 0.26 N = 0.26 	CLASE 8 .511 = 0.45 = 0.45 0 0.000 c ac 0 0.000 c cs 0 0.000	kp 0.000 mt 1.236 ru 0.00017 % Ri 00 28.07	w 0.00 h 0.00 di 7.781 Act 7 0.0
PLAGIOCI QUARTZ QUARTZ QUARTZ CHAPPELS MG NO. 2 AFM PARM JENSEN (LASE PE : FELDS 11.183 18.774 S A/CNK IN CATI AMETERS CATION 0.000 fs 8.627 ap 0.447 RM TOTA ***** SONORM C 0.000 Hy	RCENT ANORT PAR RATIOS: ORTHOCLASE ORTHOCLASE INDEX 0.6 ONS 45.37 : A = 0.19 PLOT A = 0 CATANO or 2.408 28. fo 0.000 0.000 L =100.000 ********* (HUCHISONS 20 Or Ab	HITE 47. E 4.000 6.715 AL 27 F = 0.56 0.39 M = RM ab a 358 24.34 fa h 000 17.77 pf 0.000 0. ********* ALGORYTHM An 24.35 0	671 PLAGIOG BITE 74. M = 0.26 0.15 F M = 0.26 0.15 F M = 0.26 0.15 F N = 0.26 0.15 F N = 0.26 0.15 F N = 0.26 N = 0.26 N = 0.26 	CLASE 8 .511 = 0.45 = 0.45 0 0.000 c ac 0 0.000 c cs 0 0.000	kp 0.000 mt 1.236 ru 0.00017 % Ri 00 28.07	w 0.00 h 0.00 di 7.781 Act 7 0.0
PLAGIOCI QUARTZ QUARTZ QUARTZ CHAPPELS MG NO. 2 AFM PARA JENSEN (LASE PE : FELDS 11.183 18.774 S A/CNK IN CATI AMETERS CATION 0.000 fs 8.627 ap 0.447 RM TOTA ***** SONORM C 0.000 Hy NDE	RCENT ANORT PAR RATIOS: ORTHOCLASE ORTHOCLASE INDEX 0.6 ONS 45.37 : A = 0.19 PLOT A = 0 CATANO or 2.408 28. fo 0.000 0.000 L =100.000 ********************************	HITE $47.$ E 4.000 6.715 AL 27 F = 0.56 0.39 M = RM ab a 358 24.34 fa h 000 17.77 pf 0.000 0. ********* ALGORYTHM An 24.35 0 Fs	671 PLAGIOG BITE 74. M = 0.26 0.15 F 9 0.000 18 0.000 18 0.000 18 0.000 18 0.000 18 0.000 18 0.000 18 0.000 18 0.000 18 0.000 10 0.0000 10 0.000 10 0.0000 10 0.00000 10 0.0000 10 0.0000	CLASE 8 .511 = 0.45 = 0.45 0 0.000 ac 0 0.000 cs cs 0 0.000 ** Ne Fa)	4.817 kp 0.000 mt 1.236 ru 0.00017 %0 Ri 00 28.07 Mt	w 0.00 h 0.00 di 7.781 Act 7 0.0 Hm
PLAGIOCI QUARTZ QUARTZ QUARTZ CHAPPELS MG NO. 2 AFM PARJ JENSEN (, , , , , , , , , , , , , , , , , , ,	LASE PE : FELDS 11.183 18.774 S A/CNK IN CATI AMETERS CATION 0.000 fs 8.627 ap 0.447 RM TOTA ***** SONORM C 0.000 Hy NDE	RCENT ANORT PAR RATIOS: ORTHOCLASE ORTHOCLASE INDEX 0.6 ONS 45.37 : A = 0.19 PLOT A = 0 CATANO or 2.408 28. fo 0.000 0.000 L =100.000 ********* (HUCHISONS Or Ab 0.000 28.36	HITE $47.$ E 4.000 6.715 AL 27 F = 0.56 0.39 M = RM ab a 358 24.34 fa h 000 17.77 pf 0.000 0. ********* ALGORYTHM An 24.35 0 Fs	671 PLAGIOG BITE 74. M = 0.26 0.15 F 9 0.000 18 0.000 18 0.000 18 0.000 18 0.000 18 0.000 18 0.000 18 0.000 18 0.000 18 0.000 10 0.0000 10 0.000 10 0.0000 10 0.00000 10 0.0000 10 0.0000	CLASE 8 .511 = 0.45 = 0.45 0 0.000 ac 0 0.000 cs cs 0 0.000 ** Ne Fa)	4.817 kp 0.000 mt 1.236 ru 0.00017 %0 Ri 00 28.07 Mt	w 0.00 h 0.00 di 7.781 Act 7 0.0 Hm
PLAGIOCI QUARTZ QUARTZ QUARTZ CHAPPELS MG NO. 2 AFM PARA JENSEN (, , q 6.237 en 9.152 il 1.406 CATANOI MES Q Ed 5.11 0.00 Di HORNBLEM 0.00 28.066	LASE PE : FELDS 11.183 18.774 S A/CNK IN CATI AMETERS CATION 0.000 fs 8.627 ap 0.447 RM TOTA ***** SONORM C 0.000 Hy NDE 6.48	RCENT ANORT PAR RATIOS: ORTHOCLASE ORTHOCLASE INDEX 0.65 ONS 45.37 : A = 0.19 PLOT A = 0 CATANO or 2.408 28.3 fo 0.000 0.000 L =100.000 L =100.000 ********************************	HITE $47.$ E 4.000 6.715 AL 27 F = 0.56 0.39 M = RM ab a 358 24.34 fa h 000 17.77 pf 0.000 0. ********* ALGORYTHM An 24.35 0 Fs 0.00 0	671 PLAGIOG BITE 74. M = 0.26 0.15 F M = 0.26 0.15 F M = 0.26 0.00 0.00 M = 0.26 N = 0.000 N = 0.000 N = 0.000 	CLASE 8 .511 = 0.45 = 0.45 0 0.000 ac 0 0.000 cs cs 0 0.000 ** Ne V .00 0. Fa) .00 1	4.817 kp 0.000 mt 1.236 ru 0.00017 % Ri 00 28.07 Mt .24 0.	w 0.00 h 0.00 di 7.781 Act 7 0.0 Hm 00
PLAGIOCI QUARTZ QUARTZ QUARTZ CHAPPELS MG NO. 2 AFM PARA JENSEN (, , q 6.237 en 9.152 il 1.406 CATANON MES Q Ed 5.11 0.00 Di HORNBLEN 0.00 28.066 Ap	LASE PE : FELDS 11.183 18.774 S A/CNK IN CATI AMETERS CATION 0.000 fs 8.627 ap 0.447 RM TOTA ***** SONORM C 0.000 Hy NDE 6.48 Cm	RCENT ANORT PAR RATIOS: ORTHOCLASE ORTHOCLASE INDEX 0.6 ONS 45.37 : A = 0.19 PLOT A = 0 CATANO or 2.408 28. fo 0.000 0.000 L =100.000 ********************************	HITE 47. E 4.000 6.715 AL 27 F = 0.56 0.39 M = RM ab a 358 24.34 fa h 000 17.77 pf 0.000 0. ********* ALGORYTHM An 24.35 0 Fs 0.00 0 NS K	671 PLAGIOG BITE 74. M = 0.26 0.15 F M = 0.26 0.15 F M = 0.26 0.00 N = 0.26 0.00 N = 0.26 0.00 N = 0.26 0.00 N = 0.26 0.00 N = 0.26 0.00 N = 0.26 0.00 0.	CLASE 8 .511 6 = 0.45 7 ne 0 0.000 1 ac 0 0.000 cs cs 0 0.000 cs cs 0 0.000 ** Ne V .00 0. Fa) .00 1 Ru	4.817 kp 0.000 mt 1.236 ru 0.00017 % Ri 00 28.07 Mt .24 0. BIOTITE	W 0.00 h 0.00 di 7.781 Act 7 0.0 Hm 00

PETRONOR	MS PROC	GRAM			
SAMPLE N	UMBER	RM13			
OXIDES	GIVEN	RECALC 100%	MOL PROPS	CAT PROPS	158
SiO2	57.51	57.674	0.960	0.960	138
A1203	12.08	12.114	0.119	0.238	
Fe203	1.11	1.113	0.007	0.014	
FeO	8.97	8.996	0.125	0.125	
MnO	0.17	0.170	0.002	0.002	
MgO	3.96	3.971	0.099	0.099	
CaO	13.89	13.930	0.248	0.248	
Na2O	0.23	0.231	0.004	0.007	
К2О	0.79	0.792	0.008	0.017	
TiO2	0.86	0.858	0.011	0.011	
P205	0.15	0.150	0.001	0.002	
Cr203	0.00	0.000	0.000	0.000	
TOTAL	99.72				

.....CIPW NORM.....

qcorabanlcnekpwo19.6590.0004.6821.95229.6790.0000.0000.0000.000enfsfofahyolacmthm3.8854.3340.0000.0008.2190.0000.0001.6140.000ilapcmtnpfnskscsrudi1.6300.3560.0000.0000.0000.0000.0000.00032.219CIPWNORMTOTAL=100.0100.0000.0000.0000.0000.000

AFM PARAMETERS: A = 0.07 F = 0.67 M = 0.26JENSEN CATION PLOT A = 0.38 M = 0.14 F = 0.48

.....CATANORM.....

q c or ab an lc kp ne wo 18.989 0.000 4.881 2.160 30.956 0.000 0.000 0.000 0.000 en fs fo fa hy ol ac mt hm 3.854 4.299 0.000 0.000 8.152 0.000 0.000 1.214 0.000 cm tn pf ns ks cs i 1 ap ru di 1.247 0.328 0.000 0.000 0.000 0.000 0.000 0.000 0.00032.074 CATANORM TOTAL =100.000 · *****************************

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... MESONORM (HUCHISONS ALGORYTHM...)
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Q C Or Ab An Lc Ne Wo Ri Act Ed 19.34 0.00 0.00 2.16 30.96 0.00 0.00 6.96 29.37 0.00 0.00

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 Hm

 HORNBLENDE
 0.00
 0.00
 0.00
 0.00
 1.21
 0.00

29.368 Ap Cm Tn Pf Ns Ks Cs Ru BIOTITE Sp 0.37 0.00 1.87 0.00 0.00 0.00 0.00 0.00 7.809 MESONORM TOTAL = 100.041

PETRONOR	RMS PROC	GRAM			
SAMPLE N	NUMBER	RM14			
OXIDES	GIVEN	RECALC 100%	MOL PROPS	CAT PROPS	159
SiO2	56.05	55.954	0.931	0.931	139
A1203	12.78	12.758	0.125	0.250	
Fe203	1.20	1.198	0.008	0.015	
FeO	9.70	9.683	0.135	0.135	
MnO	0.18	0.180	0.003	0.003	
MgO	5.43	5.421	0.134	0.134	
CaO	8.21	8.196	0.146	0.146	
Na20	4.36	4.353	0.070	0.140	
K20	1.24	1.238	0.013	0.026	
TiO2	0.88	0.881	0.011	0.011	
P205	0.14	0.140	0.001	0.002	
Cr203	0.00	0.000	0.000	0.000	
TOTAL	100.17				

q c or ab an lc ne kp wo 0.000 0.000 7.315 36.827 11.618 0.000 0.000 0.000 0.000 en fs fo fa hy ol ac mt hm 8.479 7.490 0.611 0.540 15.969 1.150 0.000 1.737 0.000 il ap cm tn pf ns ks cs ru di 1.672 0.331 0.000 0.000 0.000 0.000 0.000 0.000 23.389 CIPWNORM TOTAL = 100.010

PARAMETERS FOR CIPW NORMATIVE MINERALS OLIVINE COMPOSITION: FORSTERITE 53.098 FAYALITE 46.902 HYPERSTHENE COMPOSITION:EN 53.098 FS 46.902 FELDSPAR COMPOSITION :KFS 13.118 AB 66.045 AN 20.836 PLAGIOCLASE PERCENT ANORTHITE 23.982 QUARTZ : FELDSPAR RATIOS: QUARTZ 0.000 ORTHOCLASE 13.118 PLAGIOCLASE 86.882 QUARTZ 0.000 ORTHOCLASE 16.571 ALBITE 83.429 CHAPPELS A/CNK INDEX 0.545 MG No. IN CATIONS 47.31

AFM PARAMETERS: A = 0.26 F = 0.49 M = 0.25JENSEN CATION PLOT A = 0.36 M = 0.17 F = 0.47

.....CATANORM..... ne q c or ab an lc kp wo 0.000 0.000 7.324 39.139 11.638 0.000 0.000 0.000 0.000 fs fo fa hy en∙ ol ac mt hm 8.206 7.248 0.600 0.530 15.455 1.129 0.000 1.254 0.000 il ap cm tn pf ns ks cs di ru 1.229 0.293 0.000 0.000 0.000 0.000 0.000 0.000 0.00022.539 CATANORM TOTAL =100.000

... MESONORM (HUCHISONS ALGORYTHM...)

C Or Ab An Lc Ne Wo Ri 0 Act Ed 1.34 0.00 0.00 39.14 11.64 0.00 0.00 1.77 31.00 0.00 0.00 Di Hy Ol (En Fs Fo Fa) Mt Hm HORNBLENDE 0.00 0.00 0.00 0.00 0.00 0.00 1.25 0.00 31.005 Ap Cm Tn Ρf Ns Ks Cs Ru BIOTITE Sp 0.33 0.00 1.84 0.00 0.00 0.00 0.00 0.00 11.718 MESONORM TOTAL = 100.037

PETRONOR	MS PROC	GRAM			
SAMPLE N	IUMBER	RM15			
OXIDES	GIVEN	RECALC 100%	MOL PROPS	CAT PROPS	160
SiO2	63.93	63.901	1.064	1.064	160
A1203	9.31	9.306	0.091	0.183	
Fe203	1.03	1.030	0.006	0.013	
FeO	8.37	8.366	0.116	0.116	
MnO	0.13	0.130	0.002	0.002	
MgO	4.14	4.138	0.103	0.103	
CaO	10.67	10.665	0.190	0.190	
Na2O	0.88	0.880	0.014	0.028	
K20	0.65	0.650	0.007	0.014	
TiO2	0.80	0.795	0.010	0.010	
P205	0.14	0.140	0.001	0.002	
Cr203	0.00	0.000	0.000	0.000	
TOTAL	100.05				

q c or ab an lc ne kp wo 28.566 0.000 3.839 7.442 19.524 0.000 0.000 0.000 0.000 en fs fo fa hy ol ac mt hm 5.118 5.079 0.000 0.000 10.196 0.000 0.000 1.493 0.000 il ap cm tn pf ns ks cs ru di 1.509 0.331 0.000 0.000 0.000 0.000 0.000 0.000 27.107 CIPWNORM TOTAL = 100.009

PARAMETERS FOR CIPW NORMATIVE MINERALS HYPERSTHENE COMPOSITION:EN 50.191 FS 49.809 FELDSPAR COMPOSITION :KFS 12.463 AB 24.159 AN 63.378 PLAGIOCLASE PERCENT ANORTHITE 72.401 QUARTZ : FELDSPAR RATIOS: QUARTZ 48.113 ORTHOCLASE 6.466 PLAGIOCLASE 45.420 QUARTZ 71.688 ORTHOCLASE 9.635 ALBITE 18.677 CHAPPELS A/CNK INDEX 0.432 MG No. IN CATIONS 44.25

AFM PARAMETERS: A = 0.10 F = 0.62 M = 0.28JENSEN CATION PLOT A = 0.33 M = 0.17 F = 0.51

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q c or ab an lc kp ne wo 27.575 0.000 4.000 8.231 20.351 0.000 0.000 0.000 0.000 en fs fo fa hy ol mt ac hm 5.113 5.074 0.000 0.000 10.187 0.000 0.000 1.122 0.000 il cm tn pf ns ks cs ap di ru 1.154 0.305 0.000 0.000 0.000 0.000 0.000 0.000 0.00027.076

CATANORM TOTAL =100.000 ****** ... MESONORM (HUCHISONS ALGORYTHM...) C Or An Lc Ne 0 Ab Wo Ri Act Ed 27.39 0.00 0.00 8.23 20.35 0.00 0.00 4.35 30.12 0.00 0.00 Di Ну Ol (En Fs Fo Fa) Mt Hm HORNBLENDE 0.00 0.00 0.00 0.00 0.00 0.00 1.12 0.00 30.118 Ap Cm Tn Pf Ns Ks Cs Ru BIOTITE Sp 0.34 0.00 1.73 0.00 0.00 0.00 0.00 0.00 6.400 MESONORM TOTAL = 100.038

PETRONORMS PROGRAM SAMPLE NUMBER RM16

SAMPLE	NOWDER	KM10			
OXIDES	GIVEN	RECALC 100%	MOL PROPS	CAT PROPS	161
SiO2	2 56.60	56.591	0.942	0.942	161
A1203	12.59	12.588	0.123	0.247	
Fe203	3 1.20	1.200	0.008	0.015	
Fe	9.70	9.698	0.135	0.135	
MnO	0.16	0.160	0.002	0.002	
Mg(5.64	5.639	0.140	0.140	
Ca	7.38	7.379	0.132	0.132	
Na20	5.05	5.049	0.081	0.163	
K20	0.70	0.700	0.007	0.015	
TiO	2 0.87	0.866	0.011	0.011	
P20	5 0.13	0.130	0.001	0.002	
Cr20	3 0.00	0.000	0.000	0.000	
TOTAL	100.02				

q c or ab an lc ne kp wo 0.000 0.000 4.136 42.722 9.616 0.000 0.000 0.000 0.000 en fs fo fa hy ol ac mt hm 8.582 7.294 1.221 1.038 15.876 2.259 0.000 1.740 0.000 il ap cm tn pf ns ks cs ru di 1.644 0.308 0.000 0.000 0.000 0.000 0.000 0.000 21.708 CIPWNORM TOTAL = 100.009

PARAMETERS FOR CIPW NORMATIVE MINERALS OLIVINE COMPOSITION: FORSTERITE 54.058 FAYALITE 45.942 HYPERSTHENE COMPOSITION:EN 54.058 FS 45.942 FELDSPAR COMPOSITION :KFS 7.323 AB 75.649 AN 17.028 PLAGIOCLASE PERCENT ANORTHITE 18.373 QUARTZ : FELDSPAR RATIOS: QUARTZ 0.000 ORTHOCLASE 7.323 PLAGIOCLASE 92.677 QUARTZ 0.000 ORTHOCLASE 8.826 ALBITE 91.174 CHAPPELS A/CNK INDEX 0.560 MG No. IN CATIONS 48.26

AFM PARAMETERS: A = 0.26 F = 0.49 M = 0.25JENSEN CATION PLOT A = 0.35 M = 0.18 F = 0.47

.....CATANORM..... q c or ab an lc ne kp wo 0.000 0.000 4.121 45.182 9.585 0.000 0.000 0.000 0.000 en fa hy fs fo ol mt ac hm 8.287 7.043 1.197 1.018 15.329 2.215 0.000 1.250 0.000 tn pf ns ks cs ru il ap cm di 1.202 0.271 0.000 0.000 0.000 0.000 0.000 0.000 0.00020.845 CATANORM TOTAL =100.000

... MESONORM (HUCHISONS ALGORYTHM...)

C Or Ab An Lc Q Ne Wo Ri Act Ed 0.00 0.00 0.00 43.72 9.59 0.00 0.00 0.00 30.18 0.00 4.69 Di Hy 01 (En Fs Fa) Mt Hm Fo HORNBLENDE 0.00 1.91 0.00 0.00 0.00 0.00 0.00 1.25 0.00 34.869 Ap . Cm Tn Pf Ns Ks Cs Ru BIOTITE Sp 0.30 0.00 1.80 0.00 0.00 0.00 0.00 0.00 6.593 MESONORM TOTAL = 100.034

	NUMBER GIVEN		O% MO	I. PROPS	CAT PROPS	S tro
	57.43			0.955		10/
	13.15			0.129		
	1.19			0.007		
	9.66			0.134		
	0.13			0.002		
	4.95			0.123		
-				0.123		
	8.67			0.154		
	2.46			0.040		
	1.42			0.015		
			40		0.01	
	0.14					
	0.00 100.08	0.0	000	0.000	0.00	0
TOTAL	100.00					
• • •		CIP	W NORM	•••••		
-	С				ne	•
9.677	0.000	8.384 20.7	97 20.62	28 0.000	0.000	0.000 0.000
				-	ac	
9.657	9.264	0.00 0.0	00 18.92	0.000	0.000	1.724 0.000
il	-		-			
		0.000 0.000	0.000 0.	000 0.00	0 0.000 0	.000 17.873
CIPWNOR	M TOTAL	= 100.009				

		ERS FOR CIPW				
		MPOSITION:EN SITION :KFS				
~		PAR RATIOS:				
QUARTZ QUARTZ	16.267 24.903	ORTHOCLASE ORTHOCLASE	21.576 P			.638
QUARTZ QUARTZ CHAPPEL	16.267 24.903 S A/CNK	ORTHOCLASE ORTHOCLASE INDEX 0.61	21.576 P			.638
QUARTZ QUARTZ CHAPPEL MG No.	16.267 24.903 S A/CNK IN CATIO	ORTHOCLASE ORTHOCLASE INDEX 0.61 ONS 45.12	21.576 p 16	ALBITE 53	.521	.638
QUARTZ QUARTZ CHAPPEL MG No. AFM PAR	16.267 24.903 S A/CNK IN CATIO	ORTHOCLASE ORTHOCLASE INDEX 0.61 ONS 45.12 : A = 0.20 F	21.576 P 16 F = 0.55	ALBITE 53 M = 0.25	.521	.638
QUARTZ QUARTZ CHAPPEL MG No. AFM PAR	16.267 24.903 S A/CNK IN CATIO	ORTHOCLASE ORTHOCLASE INDEX 0.61 ONS 45.12	21.576 P 16 F = 0.55	ALBITE 53 M = 0.25	.521	.638
QUARTZ QUARTZ CHAPPEL MG No. AFM PAR JENSEN	16.267 24.903 S A/CNK IN CATION AMETERS CATION	ORTHOCLASE ORTHOCLASE INDEX 0.61 ONS 45.12 : A = 0.20 F PLOT A = 0	21.576 P 16 F = 0.55 D.37 M =	ALBITE 53 M = 0.25 = 0.16 F	.521	.638
QUARTZ QUARTZ CHAPPEL MG NO. AFM PAR JENSEN	16.267 24.903 S A/CNK IN CATION AMETERS CATION	ORTHOCLASE ORTHOCLASE INDEX 0.61 ONS 45.12 : A = 0.20 F PLOT A = 0 CATANOF	21.576 P 16 F = 0.55 D.37 M = RM	ALBITE 53 M = 0.25 = 0.16 F	.521 = 0.47	
QUARTZ QUARTZ CHAPPEL MG NO. AFM PAR JENSEN q	16.267 24.903 S A/CNK IN CATION AMETERS CATION	ORTHOCLASE ORTHOCLASE INDEX 0.61 ONS 45.12 : A = 0.20 H PLOT A = 0 CATANOP or	21.576 P 16 F = 0.55 D.37 M = RM ab a	M = 0.25 = 0.16 F an lc	.521 = 0.47 ne	kp wo
QUARTZ QUARTZ CHAPPEL MG NO. AFM PAR JENSEN q 9.133	16.267 24.903 S A/CNK IN CATION AMETERS CATION CATION C C 0.000	ORTHOCLASE ORTHOCLASE INDEX 0.61 ONS 45.12 : A = 0.20 F PLOT A = 0 CATANOF or 8.541 22.4	21.576 P $F = 0.55$ $0.37 M =$ RM $ab e$ $488 21.02$	M = 0.25 = 0.16 F an lc 23 0.000	.521 = 0.47 ne 0.000	kp wo 0.000 0.000
QUARTZ QUARTZ CHAPPEL MG NO. AFM PAR JENSEN q 9.133 en	16.267 24.903 S A/CNK IN CATION AMETERS CATION C 0.000 fs	ORTHOCLASE ORTHOCLASE INDEX 0.61 ONS 45.12 : A = 0.20 F PLOT A = 0 CATANOF or 8.541 22.4 fo	21.576 F 16 F = 0.55 D.37 M = RM ab a 488 21.02 fa h	M = 0.25 = 0.16 F an lc 23 0.000 ny ol	.521 = 0.47 ne 0.000 ac	kp wo 0.000 0.000 mt hm
QUARTZ QUARTZ CHAPPEL MG No. AFM PAR JENSEN 9.133 en 9.456	16.267 24.903 S A/CNK IN CATI AMETERS CATION C 0.000 fs 9.070	ORTHOCLASE ORTHOCLASE INDEX 0.61 ONS 45.12 : A = 0.20 F PLOT A = 0 CATANOF or 8.541 22.4 fo 0.000 0.0	21.576 P 16 F = 0.55 D.37 M = RM ab a 488 21.02 fa P D00 18.52	M = 0.25 = 0.16 F an lc 23 0.000 ny ol 26 0.000	.521 = 0.47 ne 0.000 ac 0.000	kp wo 0.000 0.000 mt hm 1.267 0.000
QUARTZ QUARTZ CHAPPEL MG No. AFM PAR JENSEN 9.133 en 9.456 il	16.267 24.903 S A/CNK IN CATI AMETERS CATION C 0.000 fs 9.070 ap	ORTHOCLASE ORTHOCLASE INDEX 0.61 ONS 45.12 : A = 0.20 F PLOT A = 0 CATANOF or 8.541 22.4 fo 0.000 0.0 cm tn	21.576 P 16 F = 0.55 D.37 M = RM ab z 488 21.02 fa h D00 18.52 pf	M = 0.25 = 0.16 F an lc 23 0.000 ny ol 26 0.000 ns k	.521 = 0.47 ne 0.000 ac 0.000 s cs	kp wo 0.000 0.000 mt hm 1.267 0.000 ru di
QUARTZ QUARTZ CHAPPEL MG NO. AFM PAR JENSEN 9.133 en 9.456 il 1.251	16.267 24.903 S A/CNK IN CATION AMETERS CATION C 0.000 fs 9.070 ap 0.298	ORTHOCLASE ORTHOCLASE INDEX 0.61 ONS 45.12 : A = 0.20 F PLOT A = 0 CATANOF or 8.541 22.4 fo 0.000 0.00	21.576 P 16 F = 0.55 D.37 M = RM ab z 488 21.02 fa h D00 18.52 pf	M = 0.25 = 0.16 F an lc 23 0.000 ny ol 26 0.000 ns k	.521 = 0.47 ne 0.000 ac 0.000 s cs	kp wo 0.000 0.000 mt hm 1.267 0.000 ru di
QUARTZ QUARTZ CHAPPEL MG NO. AFM PAR JENSEN 9.133 en 9.456 il 1.251	16.267 24.903 S A/CNK IN CATION AMETERS CATION C 0.000 fs 9.070 ap 0.298 RM TOTA	ORTHOCLASE ORTHOCLASE INDEX 0.61 ONS 45.12 : A = 0.20 F PLOT A = 0 CATANOF or 8.541 22.4 fo 0.000 0.00 cm tn 0.000 0.000 L =100.000	21.576 P 16 F = 0.55 D.37 M = RM ab a 488 21.02 fa h D00 18.52 pf 0.000 0.	M = 0.25 = 0.16 F An lc 23 0.000 hy ol 26 0.000 ns k .000 0.00	.521 = 0.47 ne 0.000 ac 0.000 s cs 0 0.000 0	kp wo 0.000 0.000 mt hm 1.267 0.000 ru di
QUARTZ QUARTZ CHAPPEL MG NO. AFM PAR JENSEN q 9.133 en 9.456 il 1.251 CATANO	16.267 24.903 S A/CNK IN CATION AMETERS CATION C 0.000 fs 9.070 ap 0.298 RM TOTA *****	ORTHOCLASE ORTHOCLASE INDEX 0.61 ONS 45.12 : A = 0.20 F PLOT A = 0 CATANOF or 8.541 22.4 fo 0.000 0.00 cm tn 0.000 0.000 L =100.000	21.576 P 16 F = 0.55 D.37 M = RM ab a 488 21.02 fa P 000 18.52 pf 0.000 0. ********	M = 0.25 = 0.16 F ALBITE 53 = 0.16 F ALBITE 53 ALBITE 53	.521 = 0.47 ne 0.000 ac 0.000 s cs 0 0.000 0	kp wo 0.000 0.000 mt hm 1.267 0.000 ru di
QUARTZ QUARTZ CHAPPEL MG NO. AFM PAR JENSEN 9.133 en 9.456 il 1.251 CATANO ME	16.267 24.903 S A/CNK IN CATION AMETERS CATION C 0.000 fs 9.070 ap 0.298 ORM TOTA *****	ORTHOCLASE ORTHOCLASE INDEX 0.61 ONS 45.12 : A = 0.20 F PLOT A = 0 CATANOF or 8.541 22.4 fo 0.000 0.00 cm tn 0.000 0.000 L =100.000 **********	21.576 P 16 F = 0.55 D.37 M = RM ab z 488 21.02 fa b 200 18.52 pf 0.000 0. *********	M = 0.25 = 0.16 F an lc 23 0.000 ny ol 26 0.000 ns k .000 0.00	.521 = 0.47 ne 0.000 ac 0.000 s cs 0 0.000 0	kp wo 0.000 0.000 mt hm 1.267 0.000 ru di .00017.475
QUARTZ QUARTZ CHAPPEL MG NO. AFM PAR JENSEN q 9.133 en 9.456 il 1.251 CATANO	16.267 24.903 S A/CNK IN CATION AMETERS CATION C 0.000 fs 9.070 ap 0.298 ORM TOTA *****	ORTHOCLASE ORTHOCLASE INDEX 0.61 ONS 45.12 : A = 0.20 F PLOT A = 0 CATANOF or 8.541 22.4 fo 0.000 0.00 cm tn 0.000 0.000 L =100.000	21.576 P 16 F = 0.55 D.37 M = RM ab a 488 21.02 fa P 000 18.52 pf 0.000 0. *********	M = 0.25 = 0.16 F an lc 23 0.000 ny ol 26 0.000 ns k .000 0.00	.521 = 0.47 ne 0.000 ac 0.000 s cs 0 0.000 0	kp wo 0.000 0.000 mt hm 1.267 0.000 ru di .00017.475
QUARTZ QUARTZ CHAPPEL MG NO. AFM PAR JENSEN 9.133 en 9.133 en 9.456 il 1.251 CATANO ME Q Ed	16.267 24.903 S A/CNK IN CATIO AMETERS CATION C 0.000 fs 9.070 ap 0.298 RM TOTA ***** SONORM C 0.00	ORTHOCLASE ORTHOCLASE INDEX 0.61 ONS 45.12 : A = 0.20 F PLOT A = 0 CATANOF or 8.541 22.4 fo 0.000 0.000 L =100.000 L =100.000 L =100.000 L =100.000 Cm tn 0.000 0.000 L =100.000 Cm Ab	21.576 P 16 F = 0.55 D.37 M = RM ab a 488 21.02 fa P 0.000 0. 488 21.02 fa P 0.000 0. 488 21.02 21.02 0	ALBITE 53 M = 0.25 = 0.16 F an lc 23 0.000 hy ol 26 0.000 ns k .000 0.00 ********* 4) Lc 	.521 = 0.47 ne 0.000 ac 0.000 s cs 0 0.000 0 * Ne Wo 00 0.18	kp wo 0.000 0.000 mt hm 1.267 0.000 ru di .00017.475 Ri Act 27.40 0.00
QUARTZ QUARTZ CHAPPEL MG NO. AFM PAR JENSEN	16.267 24.903 S A/CNK IN CATION AMETERS CATION C 0.000 fs 9.070 ap 0.298 RM TOTA ***** SONORM C 0.000 Hy	ORTHOCLASE ORTHOCLASE INDEX 0.61 ONS 45.12 : A = 0.20 H PLOT A = 0 CATANOF or 8.541 22.4 fo 0.000 0.00 cm tn 0.000 0.000 L =100.000 *********** (HUCHISONS A Or Ab	21.576 P 16 F = 0.55 D.37 M = RM ab a 488 21.02 fa P 0.000 0. 488 21.02 fa P 0.000 0. 488 21.02 21.02 0	ALBITE 53 M = 0.25 = 0.16 F an lc 23 0.000 hy ol 26 0.000 ns k .000 0.00 ********* 4) Lc 	.521 = 0.47 ne 0.000 ac 0.000 s cs 0 0.000 0 * Ne Wo 00 0.18	kp wo 0.000 0.000 mt hm 1.267 0.000 ru di .00017.475 Ri Act 27.40 0.00
QUARTZ QUARTZ CHAPPEL MG NO. AFM PAR JENSEN	16.267 24.903 S A/CNK IN CATION AMETERS CATION C 0.000 fs 9.070 ap 0.298 RM TOTA ***** SONORM C 0.00 Hy ENDE	ORTHOCLASE ORTHOCLASE INDEX 0.61 ONS 45.12 : A = 0.20 F PLOT A = 0 CATANOF or 8.541 22.4 fo 0.000 0.00 cm tn 0.000 0.000 L =100.000 L =100.000 ********************************	21.576 P 16 F = 0.55 D.37 M = RM ab a 488 21.02 fa b 0.000 18.52 pf 0.000 0. ********* ALGORYTHM An 21.02 0 Fs	ALBITE 53 M = 0.25 = 0.16 F an lc 23 0.000 ny ol 26 0.000 ns k .000 0.00 ********* 4) Lc 5.00 0.1 Fo	.521 = 0.47 ne 0.000 ac 0.000 s cs 0 0.000 0 * Ne Wo 00 0.18 Fa)	kp wo 0.000 0.000 mt hm 1.267 0.000 ru di .00017.475 Ri Act 27.40 0.00 Mt Hm
QUARTZ QUARTZ CHAPPEL MG NO. AFM PAR JENSEN	16.267 24.903 S A/CNK IN CATION AMETERS CATION C 0.000 fs 9.070 ap 0.298 RM TOTA ***** SONORM C 0.00 Hy ENDE	ORTHOCLASE ORTHOCLASE INDEX 0.61 ONS 45.12 : A = 0.20 F PLOT A = 0 CATANOF or 8.541 22.4 fo 0.000 0.000 L =100.000 L =100.000 L =100.000 L =100.000 Cm tn 0.000 0.000 L =100.000 Cm Ab	21.576 P 16 F = 0.55 D.37 M = RM ab a 488 21.02 fa b 0.000 18.52 pf 0.000 0. ********* ALGORYTHM An 21.02 0 Fs	ALBITE 53 M = 0.25 = 0.16 F an lc 23 0.000 ny ol 26 0.000 ns k .000 0.00 ********* 4) Lc 5.00 0.1 Fo	.521 = 0.47 ne 0.000 ac 0.000 s cs 0 0.000 0 * Ne Wo 00 0.18 Fa)	kp wo 0.000 0.000 mt hm 1.267 0.000 ru di .00017.475 Ri Act 27.40 0.00 Mt Hm
QUARTZ QUARTZ CHAPPEL MG NO. AFM PAR JENSEN	16.267 24.903 S A/CNK IN CATION AMETERS CATION C 0.000 fs 9.070 ap 0.298 RM TOTA ***** SONORM C 0.000 Hy SNDE 0.00	ORTHOCLASE ORTHOCLASE INDEX 0.61 ONS 45.12 : A = 0.20 H PLOT A = 0 CATANOF or 8.541 22.4 fo 0.000 0.00 cm tn 0.000 0.000 L =100.000 L =100.0000 L =100.000 L =100.0000 L =100.00000 L =100.00000 L =100.00000 L =100.00000 L =100.00000 L =100.0000000000 L =100.0000000000000000000000000000000000	21.576 P 16 F = 0.55 D.37 M = RM ab a 488 21.02 fa P 0.000 0. ********* ALGORYTHN An 21.02 0 Fs 0.000 C	ALBITE 53 M = 0.25 = 0.16 F an lc 23 0.000 ny ol 26 0.000 ns k .000 0.00 ********* 4) Lc 5.00 0.1 Fo 0.00 0.	.521 = 0.47 0.000 ac 0.000 s cs 0 0.000 0 * Ne Wo 00 0.18 Fa) 00 1.2	kp wo 0.000 0.000 mt hm 1.267 0.000 ru di .00017.475 Ri Act 27.40 0.00 Mt Hm 7 0.00
QUARTZ QUARTZ CHAPPEL MG NO. AFM PAR JENSEN	16.267 24.903 S A/CNK IN CATION AMETERS CATION C 0.000 fs 9.070 ap 0.298 RM TOTA ***** SONORM C 0.00 Hy SNDE 0.00 Cm	ORTHOCLASE ORTHOCLASE INDEX 0.61 ONS 45.12 : A = 0.20 F PLOT A = 0 CATANOF or 8.541 22.4 fo 0.000 0.00 cm tn 0.000 0.000 L =100.000 L =100.000 ********************************	21.576 P 16 F = 0.55 D.37 M = RMab a 488 21.02 fa H $D00 18.52pf0.000 0.3*********ALGORYTHMAn21.02 0FS0.000 CNS P$	ALBITE 53 M = 0.25 = 0.16 F an lc 23 0.000 ny ol 26 0.000 ns k .000 0.00 ********* M) Lc .00 0.1 Fo 0.00 0. Ks Cs	.521 = 0.47 ne 0.000 ac 0.000 s cs 0 0.000 0 * Ne Wo 00 0.18 Fa) 00 1.2 Ru B	kp wo 0.000 0.000 mt hm 1.267 0.000 ru di .00017.475 Ri Act 27.40 0.00 Mt Hm 7 0.00 IOTITE Sp

	MS PRO	GRAM								
SAMPLE N		RM18								
OXIDES		RECAL	LC 100	8 МО	OL P	ROPS	CAT	PROP	s	1.60
SiO2	55.92		56.02	3	0	.932		0.93	2	163
A1203	13.19		13.21	4	0	.130		0.25	9	
Fe203	1.27		1.27	2	0	.008		0.01	6	
FeO	10.28		10.29	9	0	.143		0.14	3	
	0.17		0.17	0	0	.002		0.00	2	
MgO	5.22		5.23	0	0	.130		0.13		
	8.22		8.23	5	0	.147		0.14	7	
	3.39		3.39			.055		0.11		
	1.18		1.18			.013		0.02		
	0.85		0.84			.011		0.01		
	0.13		0.13			.001		0.00		
Cr2O3 TOTAL	0.00		0.00	0	0	.000		0.00	0	
		•••••							kn	
-		6.986		b 6 17 3					kp 0.000	
									0.000 mt	
		0.000			-					
il.273		cm								
	-	0.000 0		-						
		L = 100.				2.000				
				*****	****	****	* *			
1	PARAMEI	ERS FOR	CIPW	NORMAT	IVE	MINER	ALS			
IYPERST	HENE CO	MPOSITI	ON:EN	50.5	00	FS	49.50	00		
FELDSPA	R COMPO	SITION	:KFS	13.17	0 A	B 54	.176	AN	32.65	4
		CRCENT A							_ /	
		SPAR RAT			•					
-		ORTHOC		12.261	PI	AGIOC	LASE	80.	837	
		ORTHOCL								
- CHAPPEL:						·				
MG No.	IN CATI	IONS 4	4.89							
			22 5	- 0 54		0.05				
		S: A = 0								
JENSEN	CATION	PLOT	$\mathbf{A} = 0,$	36 M	= 0.	16 F :	= 0.4	18		
		CA	TANORM	1						
		c or						ne	kp	Ţ.
		7.062								
		s fo								
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2.201		cm								di
		0.000 0								.352
il	RM TOTA	AL =100.								
il 1.194		******					*			
il 1.194 CATANO	****	/1111-0	TINIC AT	GORYTH		/				
il 1.194 CATANO	***** SONORM	(HUCHIS		n	T		Ne	Wo	Ri	Act
il 1.194 CATANO ME Q	***** SONORM	(HUCHIS Or		An	Ц					
il 1.194 CATANO ME Q Ed	***** SONORM C	Or	Ab				00	0 00) 20 07	0.0
il 1.194 CATANO ME Q Ed 5.33	***** SONORM C	•	Ab				00	0.00	29.93	0.0
il 1.194 CATANO ME Q Ed 5.33 0.00	***** SONORM C 0.00	Or 0.00 30	Ab 0.83 1	7.52	0.00	0.0				
il 1.194 CATANO Q Ed 5.33 0.00 Di	***** SONORM C 0.00 Hy	Or	Ab 0.83 1	7.52	0.00	0.0				
il 1.194 CATANO ME Q Ed 5.33 0.00 Di HORNBLE	***** SONORM C 0.00 Hy NDE	or 0.00 30 01	Ab).83 1 (En	7.52 (Fs	0.00 F	0.0 'o	Fa)		Mt	Hm
il 1.194 CATANO Ed 5.33 0.00 Di HORNBLE 0.00	***** SONORM C 0.00 Hy NDE 1.68	Or 0.00 30	Ab).83 1 (En	7.52 (Fs	0.00 F	0.0 'o	Fa)		Mt	Hm
il 1.194 CATANO Q Ed 5.33 0.00 Di HORNBLE 0.00 29.932	***** SONORM C 0.00 Hy NDE 1.68	or 0.00 30 01 0.00	Ab).83 1 (En 0.00	7.52 Fs 0.00	0.00 F 0.00	0.0 'o 0.0.	Fa) 00	1.3	Mt 5 0.	Hm 00
il 1.194 CATANO 2 Ed 5.33 0.00 Di HORNBLE 0.00 29.932 Ap	***** SONORM C 0.00 Hy NDE 1.68 Cm	or 0.00 30 01	Ab).83 1 (En 0.00 Pf	7.52 (Fs 0.00 Ns	0.00 F 0.00 Ks	0.(°o 0. Cs	Fa) 00 Ri	1.3 1 E	Mt 5 0. SIOTITE	Hm 00

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PETRONORMS PROGRAM									
SAMPLE N	IUMBER	RM19							
OXIDES	GIVEN	RECALC 100%	MOL PROPS	CAT PROPS	164				
SiO2	54.99	54.945	0.915	0.915	164				
A1203	14.60	14.588	0.143	0.286					
Fe203	1.24	1.239	0.008	0.016					
FeO	10.01	10.002	0.139	0.139					
MnO	0.15	0.150	0.002	0.002					
MqO	4.72	4.716	0.117	0.117					
CaO	7.01	7.004	0.125	0.125					
Na2O	4.79	4.786	0.077	0.154					
к20	1.35	1.349	0.014	0.029					
TiO2	1.04	1.041	0.013	0.013					
P205	0.18	0.180	0.001	0.003					
Cr203	0.00	0.000	0.000	0.000					
TOTAL	100.08								

.....CIPW NORM..... kp q c or ab an wo lc ne 0.000 0.000 7.971 40.496 14.338 0.000 0.000 0.000 0.000 en fs fo fa hy ol ac mt hm 4.558 4.696 3.781 3.895 9.254 7.676 0.000 1.796 0.000 cm tn pf ns ks cs il ap ru di 1.976 0.426 0.000 0.000 0.000 0.000 0.000 0.000 0.000 16.078 CIPWNORM TOTAL = 100.011******

PARAMETERS FOR CIPW NORMATIVE MINERALS OLIVINE COMPOSITION: FORSTERITE 49.255 FAYALITE 50.745 HYPERSTHENE COMPOSITION:EN 49.255 FS 50.745 FELDSPAR COMPOSITION :KFS 12.692 AB 64.479 AN 22.829 PLAGIOCLASE PERCENT ANORTHITE 26.148 QUARTZ : FELDSPAR RATIOS: QUARTZ 0.000 ORTHOCLASE 12.692 PLAGIOCLASE 87.308 QUARTZ 0.000 ORTHOCLASE 16.446 ALBITE 83.554 CHAPPELS A/CNK INDEX 0.661 MG No. IN CATIONS 43.06

AFM PARAMETERS: A = 0.28 F = 0.51 M = 0.21JENSEN CATION PLOT A = 0.39 M = 0.14 F = 0.47

.....CATANORM..... q c or ab an lc ne kp wo 0.000 0.000 7.964 42.946 14.331 0.000 0.000 0.000 0.000 en fs fo fa hy ol ac mt hm 4.356 4.487 3.653 3.763 8.843 7.416 0.000 1.295 0.000 il ap cm tn pf ns ks cs di ru 1.449 0.376 0.000 0.000 0.000 0.000 0.000 0.000 0.00015.380 CATANORM TOTAL =100,000 ****** ... MESONORM (HUCHISONS ALGORYTHM...) C Or Ab An Lc Ne Q Wo Ri Act Ed 0.02 0.00 0.00 42.95 14.33 0.00 0.00 0.00 23.41 0.00 0.00 Ну Di Ol (En Fs Fo Fa) Mt Hm HORNBLENDE 0.00 2.71 0.00 0.00 0.00 0.00 0.00 1.29 0.00 23.406 Ap Cm Tn Ρf Ns Ks Cs Ru BIOTITE Sp $0.42 \quad 0.00 \quad 2.17 \quad 0.00 \quad 0.00 \quad 0.00 \quad 0.00 \quad 12.742$ MESONORM TOTAL = 100.047

PETRONOF	RMS PROC	GRAM						
SAMPLE N	UMBER	RM20						
OXIDES	GIVEN	RECALC 100%	MOL PROPS	CAT PROPS	165			
SiO2	59.00	58.958	0.981	0.981	105			
A1203	12.69	12.681	0.124	0.249				
Fe203	1.17	1.169	0.007	0.015				
FeO	9.48	9.473	0.132	0.132				
MnO	0.15	0.150	0.002	0.002				
MgO	5.06	5.056	0.125	0.125				
CaO	6.65	6.645	0.118	0.118				
Na2O	3.78	3.777	0.061	0.122				
к20	1.11	1.109	0.012	0.024				
TiO2	0.85	0.850	0.011	0.011				
P205	0.13	0.130	0.001	0.002				
Cr203	0.00	0.000	0.000	0.000				
TOTAL	100.07							
CIPW NORM								

q c or ab an lc ne kp wo 8.200 0.000 6.554 31.960 14.370 0.000 0.000 0.000 0.000 fs fo fa hy ol ac mt hm en 10.664 9.861 0.000 0.000 20.525 0.000 0.000 1.695 0.000 cm tn pf ns ks cs il[.] ru di ap 1.615 0.308 0.000 0.000 0.000 0.000 0.000 0.000 0.000 14.781 CIPWNORM TOTAL = 100.009

PARAMETERS FOR CIPW NORMATIVE MINERALS HYPERSTHENE COMPOSITION:EN 51.955 FS 48.045 FELDSPAR COMPOSITION :KFS 12.394 AB 60.434 AN 27.172 PLAGIOCLASE PERCENT ANORTHITE 31.016 QUARTZ : FELDSPAR RATIOS: QUARTZ 13.423 ORTHOCLASE 10.730 PLAGIOCLASE 75.846 QUARTZ 17.553 ORTHOCLASE 14.031 ALBITE 68.416 CHAPPELS A/CNK INDEX 0.650 MG No. IN CATIONS 46.13

AFM PARAMETERS: A = 0.24 F = 0.51 M = 0.25 JENSEN CATION PLOT A = 0.36 M = 0.17 F = 0.47

......CATANORM..... q c or ab an lc kp ne wo 7.665 0.000 6.613 34.228 14.505 0.000 0.000 0.000 0.000 en fs fo fa hy ol ac mt hm 10.367 9.587 0.000 0.000 19.954 0.000 0.000 1.234 0.000 il. cm tn pf ns ks ap cs ru di 1.195 0.274 0.000 0.000 0.000 0.000 0.000 0.000 0.00014.331

CATANORM TOTAL =100.000

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... MESONORM (HUCHISONS ALGORYTHM...) Or Ab Q С An LC Ne Ri Wo Act Ed 9.54 0.00 0.00 34.23 14.51 0.00 0.00 0.00 22.39 0.00 0.00 Di Ну Ol (En Fs Fo Fa) Mt Hm HORNBLENDE 0.00 5.45 0.00 0.00 0.00 0.00 0.00 1.23 0.00 22.388 Ap Cm Tn Ρf Ns Ks Cs Ru BIOTITE Sp 0.31 0.00 1.79 0.00 0.00 0.00 0.00 0.00 10.581 MESONORM TOTAL = 100.034

PETRONO	RMS PROC	GRAM			
SAMPLE I	NUMBER	RM21			
OXIDES	GIVEN	RECALC 100%	MOL PROPS	CAT PROPS	166
SiO2	54.18	54.293	0.904	0,904	166
A1203	14.95	14.981	0.147	0.294	
Fe203	1.26	1.263	0.008	0.016	
FeO	10.22	10.241	0.143	0.143	
MnO	0.17	0.170	0.002	0.002	
MgO	4.22	4.229	0.105	0.105	
CaO	8.25	8.267	0.147	0.147	
Na2O	4.42	4.429	0.071	0.143	
к20	0.85	0.852	0.009	0.018	
TiO2	1.09	1.094	0.014	0.014	
P205	0.18	0.180	0.001	0.003	
Cr203	0.00	0.000	0.000	0.000	
TOTAL	99.79				

.....CIPW NORM.....

q' c or ab an lc ne kp wo 0.000 0.000 5.033 37.476 18.480 0.000 0.000 0.000 0.000 fo fa hy ol ac fs mt hm en 6.319 7.430 1.382 1.625 13.749 3.008 0.000 1.831 0.000 cm tn pf ns ks cs di il ap ru 2.077 0.427 0.000 0.000 0.000 0.000 0.000 0.000 0.000 17.929 CIPWNORM TOTAL = 100.012

PARAMETERS FOR CIPW NORMATIVE MINERALS OLIVINE COMPOSITION: FORSTERITE 45.961 FAYALITE 54.039 HYPERSTHENE COMPOSITION:EN 45.961 FS 54.039 FELDSPAR COMPOSITION :KFS 8.253 AB 61.447 AN 30.301 PLAGIOCLASE PERCENT ANORTHITE 33.026 QUARTZ : FELDSPAR RATIOS: QUARTZ 0.000 ORTHOCLASE 8.253 PLAGIOCLASE 91.747 QUARTZ 0.000 ORTHOCLASE 11.840 ALBITE 88.160 CHAPPELS A/CNK INDEX 0.645 MG No. IN CATIONS 39.85

AFM PARAMETERS: A = 0.25 F = 0.54 M = 0.20JENSEN CATION PLOT A = 0.40 M = 0.13 F = 0.48

......CATANORM...... q c or ab an lc ne kp wo 0.000 0.000 5.058 39.971 18.577 0.000 0.000 0.000 0.000 en fs fo fa hy ol mt ac hm 6.020 7.078 1.327 1.560 13.097 2.887 0.000 1.327 0.000 il ap cm tn pf ns ks cs ru di 1.531 0.379 0.000 0.000 0.000 0.000 0.000 0.000 0.00017.172 CATANORM TOTAL =100.000

... MESONORM (HUCHISONS ALGORYTHM...) C Or Ab An Lc Ne Wo Ri Q Act Ed 0.00 0.00 0.00 39.40 18.58 0.00 0.00 0.00 24.74 0.00 1.83 Di Ol (En Fs Fo Hy Fa) Mt Hm HORNBLENDE 3.36 0.00 0.00 0.00 0.00 0.00 0.00 1.33 0.00 26.570 Ap Cm \mathbf{Tn} Ρf Ns Ks Cs Ru BIOTITE Sp 0.43 0.00 2.30 0.00 0.00 0.00 0.00 0.00 8.092 MESONORM TOTAL = 100.047

MS PROC	GRAM							
UMBER	RM22							
GIVEN	RECALO	C 100%	MOL	PROPS	CAT P	ROPS		1(7
55.19	5	55.338		0.921	0	.921		167
13.86	:	13.897		0.136	0	.273		
1.28		1.283		0.008	0	.016		
10.36	:	10.388		0.145	0	.145		
0.20		0.201		0.003	0	.003		
5.76		5.775		0.143	0	.143		
8.08		8.102		0.144	0	.144		
3.09		3.098		0.050	0	.100		
0.69		0.692		0.007	0	.015		
1.03		1.035		0.013	0	.013		
0.19		0.191		0.001	0	.003		
0.00		0.000		0.000	0	.000		
99.73								
		.CIPW 1	NORM			•		
с	or	ab	an	10	e n	e	kp	wo
0.000	4.088	26.215	21.969	0.000	0.00	0 0	.000	0.000
fs	fo	fa	hy	0]	L a	C	mt	hm
	UMBER GIVEN 55.19 13.86 1.28 10.36 0.20 5.76 8.08 3.09 0.69 1.03 0.19 0.00 99.73	GIVEN RECALO 55.19 5 13.86 5 1.28 1 10.36 5 0.20 5.76 8.08 3.09 0.69 1.03 0.19 0.00 99.73 5 c or 0.000 4.088	UMBER RM22 GIVEN RECALC 100% 55.19 55.338 13.86 13.897 1.28 1.283 10.36 10.388 0.20 0.201 5.76 5.775 8.08 8.102 3.09 3.098 0.69 0.692 1.03 1.035 0.19 0.191 0.000 0.000 99.73 C	UMBER RM22 GIVEN RECALC 100% MOL 55.19 55.338 13.86 13.897 1.28 1.283 10.36 10.388 0.20 0.201 5.76 5.775 8.08 8.102 3.09 3.098 0.69 0.692 1.03 1.035 0.19 0.191 0.00 0.000 99.73 an	UMBER RM22 GIVEN RECALC 100% MOL PROPS 55.19 55.338 0.921 13.86 13.897 0.136 1.28 1.283 0.008 10.36 10.388 0.145 0.20 0.201 0.003 5.76 5.775 0.143 8.08 8.102 0.144 3.09 3.098 0.050 0.69 0.692 0.007 1.03 1.035 0.013 0.19 0.191 0.001 0.000 0.0000 0.000 99.73 C or ab an 1c	UMBER RM22 GIVEN RECALC 100% MOL PROPS CAT P 55.19 55.338 0.921 0 13.86 13.897 0.136 0 1.28 1.283 0.008 0 10.36 10.388 0.145 0 0.20 0.201 0.003 0 5.76 5.775 0.143 0 8.08 8.102 0.144 0 3.09 3.098 0.050 0 0.69 0.692 0.007 0 1.03 1.035 0.013 0 0.19 0.191 0.001 0 0.000 0.0000 0.000 0 99.73	TUMBER RM22 GIVEN RECALC 100% MOL PROPS CAT PROPS 55.19 55.338 0.921 0.921 13.86 13.897 0.136 0.273 1.28 1.283 0.008 0.016 10.36 10.388 0.145 0.145 0.20 0.201 0.003 0.003 5.76 5.775 0.143 0.143 8.08 8.102 0.144 0.144 3.09 3.098 0.050 0.100 0.69 0.692 0.007 0.015 1.03 1.035 0.013 0.013 0.19 0.191 0.001 0.003 0.00 0.000 0.000 0.000 99.73	TUMBER RM22 GIVEN RECALC 100% MOL PROPS CAT PROPS 55.19 55.338 0.921 0.921 13.86 13.897 0.136 0.273 1.28 1.283 0.008 0.016 10.36 10.388 0.145 0.145 0.20 0.201 0.003 0.003 5.76 5.775 0.143 0.143 8.08 8.102 0.144 0.144 3.09 3.098 0.050 0.100 0.69 0.692 0.007 0.015 1.03 1.035 0.013 0.013 0.19 0.191 0.001 0.003 0.00 0.000 0.000 0.000 99.73

12.768 11.266 0.000 0.000 24.033 0.000 0.000 1.861 0.000 il ap cm tn pf ns ks cs ru di 1.965 0.451 0.000 0.000 0.000 0.000 0.000 0.000 14.117 CIPWNORM TOTAL = 100.012

PARAMETERS FOR CIPW NORMATIVE MINERALS HYPERSTHENE COMPOSITION:EN 53.125 FS 46.875 FELDSPAR COMPOSITION :KFS 7.821 AB 50.151 AN 42.028 PLAGIOCLASE PERCENT ANORTHITE 45.594 QUARTZ : FELDSPAR RATIOS: QUARTZ 9.225 ORTHOCLASE 7.100 PLAGIOCLASE 83.675 QUARTZ 14.916 ORTHOCLASE 11.479 ALBITE 73.605 CHAPPELS A/CNK INDEX 0.675 MG No. IN CATIONS 47.14

AFM PARAMETERS: A = 0.18 F = 0.55 M = 0.27 JENSEN CATION PLOT A = 0.36 M = 0.17 F = 0.47

.....CATANORM.....

q c or ab an lc kp ne wo 4.981 0.000 4.137 28.160 22.242 0.000 0.000 0.000 0.000 en fs fo fa hy ol ac mt hm 12.489 11.020 0.000 0.000 23.509 0.000 0.000 1.358 0.000 il ap cm tn pf ns ks cs di ru 1.459 0.403 0.000 0.000 0.000 0.000 0.000 0.000 0.00013.751 CATANORM TOTAL =100.000

... MESONORM (HUCHISONS ALGORYTHM...)

С Or Ab An Lc Q Ne Wo Ri Act \mathbf{Ed} 5.38 0.00 0.00 28.16 22.24 0.00 0.00 0.00 20.31 0.00 0.00 Di Hy 01 (En Fs Fo Fa) Mt Hm HORNBLENDE

0.00 13.34 0.00 0.00 0.00 0.00 0.00 1.36 0.00 20.312

Ap Cm Tn Pf Ns Ks Cs Ru BIOTITE Sp 0.45 0.00 2.19 0.00 0.00 0.00 0.00 0.00 6.620 MESONORM TOTAL = 100.050

OXIDES	GIVEN	RECA	ALC 10)0%	MOL	PROPS	CAT	PROF	PS	
	57.20		57.3			0.955		0.95		10
	13.10		13.1			0.129		0.25		
	1.21		1.2			0.008		0.01	15	
	9.81		9.8	335		0.137		0.13	37	
MnO	0.16		0.1	160		0.002		0.00	02	
MgO	4.67		4.6	582		0.116		0.13	16	
CaO	8.32		8.3	342		0.149		0.14	19	
Na20	3.06		3.0	068		0.049		0.09	99	
	1.16		1.1	163		0.012		0.02	25	
	0.90		0.9	904		0.011		0.0	11	
	0.15		0.3	150		0.001		0.00	02	
Cr203	0.00		0.0	000		0.000		0.00	00	
TOTAL	99.74									
			cII	PW NOR	м		• • • •	• • •		
-	С								-	,
	0.000									
	fs									
	9.366									
	ap			-						
	0.356			0.000	0.00	0.00	0 0.0	000	0.000	18.19
CIPWNORM	I TOTAL									

	PARAMET									
HYPERSTR	IENE CO	MPOSIT	ION:E	N 49	. 135	FS	50.8	65		
				•••			50.0			
FELDSPAF									36.2	204
	R COMPO	SITION	:KF	s 13.	354	AB 50			36.2	204
PLAGIOCI	R COMPO LASE PE	SITION	: KF	s 13.	354	AB 50			36.2	204
PLAGIOCI QUARTZ : QUARTZ	R COMPO LASE PE FELDS 13.605	SITION RCENT PAR RA ORTH	:KF ANORT TIOS: OCLAS	S 13. HITE E 11.	354 41.73 538	AB 50 84 PLAGIO	0.442 OCLAS	AN E 7		204
PLAGIOCI QUARTZ : QUARTZ QUARTZ	COMPO LASE PE FELDS 13.605 19.797	SITION RCENT PAR RA ORTH ORTHO	:KF ANORT TIOS: OCLASE CLASE	S 13. HITE E 11. 16.78	354 41.73 538	AB 50 84 PLAGIO	0.442 OCLAS	AN E 7		204
PLAGIOCI QUARTZ QUARTZ QUARTZ CHAPPELS	R COMPO LASE PE FELDS 13.605 19.797 5 A/CNK	SITION RCENT PAR RA ORTH ORTHO INDEX	:KF ANORT TIOS: OCLAS CLASE 0.6	S 13. HITE E 11. 16.78	354 41.73 538	AB 50 84 PLAGIO	0.442 OCLAS	AN E 7		204
PLAGIOCI QUARTZ QUARTZ QUARTZ CHAPPELS	R COMPO LASE PE FELDS 13.605 19.797 5 A/CNK	SITION RCENT PAR RA ORTH ORTHO INDEX	:KF ANORT TIOS: OCLAS CLASE 0.6	S 13. HITE E 11. 16.78	354 41.73 538	AB 50 84 PLAGIO	0.442 OCLAS	AN E 7		204
PLAGIOCI QUARTZ : QUARTZ QUARTZ CHAPPELS MG No.]	R COMPO LASE PE FELDS 13.605 19.797 S A/CNK IN CATI	SITION RCENT PAR RA ORTH ORTHO INDEX ONS	:KF ANORT TIOS: OCLAS CLASE 0.6 43.30	S 13. HITE E 11. 16.78 12	354 41.73 538 9 AL	AB 50 84 PLAGIO BITE 63).442)CLAS 3.414	AN E 7		204
PLAGIOCI QUARTZ : QUARTZ QUARTZ CHAPPELS MG NO. I AFM PARA	R COMPO LASE PE FELDS 13.605 19.797 S A/CNK IN CATI	SITION RCENT PAR RA ORTH ORTHO INDEX ONS	:KF ANORT TIOS: OCLAS CLASE 0.6 43.30 0.21	S 13. HITE E 11. 16.78 12 F = 0.	354 41.7 538 9 AL	AB 50 84 PLAGIO BITE 63 = 0.24).442)CLAS 3.414	AN E 7		204
PLAGIOCI QUARTZ : QUARTZ QUARTZ CHAPPELS MG NO. I AFM PARA	R COMPO LASE PE FELDS 13.605 19.797 S A/CNK IN CATI	SITION RCENT PAR RA ORTH ORTHO INDEX ONS : A =	:KF ANORT TIOS: OCLAS CLASE 0.6 43.30 0.21	S 13. HITE E 11. 16.78 12 F = 0.	354 41.7 538 9 AL	AB 50 84 PLAGIO BITE 63 = 0.24).442)CLAS 3.414	AN E 7		204
PLAGIOCI QUARTZ : QUARTZ QUARTZ CHAPPELS MG NO. I AFM PARA JENSEN (R COMPO LASE PE FELDS 13.605 19.797 S A/CNK IN CATI AMETERS CATION	SITION RCENT PAR RA ORTHO INDEX ONS : A = PLOT	:KF ANORT TIOS: OCLASE 0.6 43.30 0.21 A = 0	S 13. HITE E 11. 16.78 12 F = 0. 0.37	354 41.78 538 9 AL 55 M M = (AB 50 84 PLAGIO BITE 63 = 0.24 0.15 F).442)CLAS 3.414	AN E 7		204
PLAGIOCI QUARTZ : QUARTZ QUARTZ CHAPPELS MG NO. I AFM PARF JENSEN (R COMPO LASE PE FELDS 13.605 19.797 A/CNK IN CATI AMETERS CATION	SITION RCENT PAR RA ORTHO INDEX ONS : A = PLOT C	:KF ANORT TIOS: OCLASE 0.6 43.30 0.21 A = 0 ATANO	S 13. HITE E 11. 16.78 12 F = 0. 0.37 RM	354 41.78 538 9 AL 55 M M = (AB 50 84 PLAGIO BITE 63 = 0.24 0.15 F).442)CLAS 3.414 = 0.	AN E 7 48	4.858	
PLAGIOCI QUARTZ QUARTZ QUARTZ CHAPPELS MG NO. I AFM PARF JENSEN C	R COMPO LASE PE FELDS 13.605 19.797 S A/CNK IN CATI AMETERS CATION	SITION RCENT PAR RA ORTH ORTHO INDEX ONS : A = PLOT C	:KF ANORT TIOS: OCLASE 0.6 43.30 0.21 A = ATANO r	S 13. HITE E 11. 16.78 12 F = 0. 0.37 RM ab	354 41.78 538 9 AL 55 M M = (an	AB 50 84 PLAGIO BITE 63 = 0.24 0.15 F).442)CLAS 3.414 = 0.	AN E 7 48 ne	4.858 kj	p
PLAGIOCI QUARTZ QUARTZ CHAPPELS MG NO. J AFM PARA JENSEN (q 7.627	COMPO CASE PE FELDS 13.605 19.797 A/CNK IN CATI AMETERS CATION	SITION RCENT PAR RA ORTHO INDEX ONS : A = PLOT C 6.98	:KF ANORT TIOS: OCLASE 0.6 43.30 0.21 A = 0 ATANO r 1 27.	S 13. HITE E 11. 16.78 12 F = 0. 0.37 RM ab 989 18	354 41.73 538 9 AL 55 M M = (an .934	AB 50 84 PLAGIO BITE 63 = 0.24 0.15 F 	0.442 0.442 3.414 = 0. 0.	AN E 7 48 ne 000	4.858 kj	p
PLAGIOCI QUARTZ QUARTZ CHAPPELS MG NO. J AFM PARA JENSEN (q 7.627 en	R COMPO LASE PE FELDS 13.605 19.797 S A/CNK IN CATI AMETERS CATION CATION CO.000 fs	SITION RCENT PAR RA ORTHO INDEX ONS : A = PLOT C 6.98 f	:KF ANORT TIOS: OCLASE 0.6 43.30 0.21 A = 1 ATANO r 1 27.0 o	S 13. HITE E 11. 16.78 12 F = 0. 0.37 RM ab 989 18 fa	354 41.73 538 9 AL 55 M M = (an .934 hy	AB 50 84 PLAGIO BITE 63 = 0.24 0.15 F 0.000 0.000	0.442 0.442 3.414 = 0.1	AN E 7 48 ne 000 ac	4.858 kj 0.000	p 0 0.0
PLAGIOCI QUARTZ QUARTZ CHAPPELS MG NO. J AFM PARA JENSEN (R COMPO LASE PE FELDS 13.605 19.797 S A/CNK IN CATI AMETERS CATION CATIO	SITION RCENT PAR RA ORTHO INDEX ONS : A = PLOT C 6.98 f 0.00	:KF ANORT TIOS: OCLASE 0.6 43.30 0.21 A = 0 ATANO r 1 27. 0 0 0.	S 13. HITE E 11. 16.78 12 F = 0. 0.37 RM ab 989 18 fa 000 17	354 41.73 538 9 AL 55 M M = (an .934 hy .885	AB 50 84 PLAGIO BITE 63 = 0.24 0.15 F 0.000 0.000	0.442 0.442 0.433 0.414 0.4414 0.4414 0.4414 0.4414 0.4414 0.4414 0.442 0.44	AN E 7 48 ne 000 ac 000	4.858 kj 0.000 m ¹ 1.28	p 0 0.0 t 9 0.0
PLAGIOCI QUARTZ QUARTZ CHAPPELS MG NO. J AFM PARF JENSEN (, , q 7.627 en 8.788 il	<pre> COMPO LASE PE FELDS 13.605 19.797 A/CNK IN CATI AMETERS CATION</pre>	SITION RCENT PAR RA ORTHO INDEX ONS : A = PLOT C 6.98 f 0.00 cm	:KF ANORT TIOS: OCLASE 0.6 43.30 0.21 A = 0 ATANO r 1 27. 0 0 0. tn	S 13. HITE E 11. 16.78 12 F = 0. 0.37 RM ab 989 18 fa 000 17 pf	354 41.78 538 9 AL 55 M M = (an 934 hy .885	AB 50 84 PLAGIO BITE 63 = 0.24 0.15 F 0.000 0.000 ns 3	0.442 0	AN E 7 48 ne 000 ac 000 cs	4.858 kj 0.000 m ⁴ 1.289 ru	p 0 0.0 t 9 0.0
PLAGIOCI QUARTZ QUARTZ CHAPPELS MG NO. J AFM PARF JENSEN C 7.627 en 8.788 il 1.279	<pre> COMPO LASE PE FELDS 13.605 19.797 A/CNK IN CATI AMETERS CATION</pre>	SITION RCENT PAR RA ORTH ORTHO INDEX ONS : A = PLOT C 6.98 f 0.00 cm 0.000	:KF ANORT TIOS: OCLASE 0.6 43.30 0.21 A = ATANO r 1 27. 0 0 0. tn 0.000	S 13. HITE E 11. 16.78 12 F = 0. 0.37 RM ab 989 18 fa 000 17 pf	354 41.78 538 9 AL 55 M M = (an 934 hy .885	AB 50 84 PLAGIO BITE 63 = 0.24 0.15 F 0.000 0.000 ns 3	0.442 0	AN E 7 48 ne 000 ac 000 cs	4.858 kj 0.000 m ⁴ 1.289 ru	p 0 0.0 t 9 0.0
PLAGIOCI QUARTZ QUARTZ CHAPPELS MG NO. J AFM PARF JENSEN (, , q 7.627 en 8.788 il	COMPO CASE PE FELDS 13.605 19.797 A S A/CNK IN CATI AMETERS CATION CATION C 9.0000 fs 9.097 ap 0.320 C CM TOTA	SITION RCENT PAR RA ORTHO INDEX ONS : A = PLOT C 6.98 f 0.00 cm 0.000 L =100	:KF ANORT TIOS: OCLASE CLASE 0.6 43.30 0.21 A = ATANO r 1 27. 0 0 0. tn 0.000 .000	<pre>S 13. HITE E 11. 16.78 12 F = 0. 0.37 RM ab 989 18 fa 000 17 pf 0.000</pre>	354 41.77 538 9 AL 55 M M = (an 	AB 50 84 PLAGIO BITE 63 = 0.24 0.15 F 0.000 0.000 ns 3 00 0.000	$\begin{array}{c} 0.442 \\ 0.442 \\ 0.442 \\ 0.4414 \\$	AN E 7 48 ne 000 ac 000 cs	4.858 kj 0.000 m ⁴ 1.289 ru	p 0 0.0 t 9 0.0
PLAGIOCI QUARTZ QUARTZ QUARTZ CHAPPELS MG NO. I AFM PARA JENSEN (, , q 7.627 en 8.788 il 1.279 CATANOF	<pre> COMPO LASE PE FELDS 13.605 19.797 A/CNK IN CATI METERS CATION</pre>	SITION RCENT PAR RA ORTHO INDEX ONS : A = PLOT C 6.98 f 0.000 cm 0.000 L = 100	:KF ANORT TIOS: OCLASE 0.6 43.30 0.21 A = 0 ATANO r 1 27. 0 0 0. tn 0.000 .000 *****	<pre>S 13. HITE E 11. 16.78 12 F = 0. 0.37 RM ab 989 18 fa 000 17 pf 0.000 ******</pre>	354 41.73 538 9 AL 55 M M = 0 an .934 hy .885 0.00	AB 50 84 PLAGIO BITE 63 = 0.24 0.15 F 0.000 0.000 0.000 ns 10 00 0.00	$\begin{array}{c} 0.442 \\ 0.442 \\ 0.442 \\ 0.4414 \\$	AN E 7 48 ne 000 ac 000 cs	4.858 kj 0.000 m ⁴ 1.289 ru	p 0 0.0 t 9 0.0
PLAGIOCI QUARTZ : QUARTZ QUARTZ CHAPPELS MG NO. J AFM PARF JENSEN C 9 7.627 en 8.788 il 1.279 CATANOF MES	R COMPO CASE PE FELDS 13.605 19.797 S A/CNK IN CATI AMETERS CATION 0.000 fs 9.097 ap 0.320 RM TOTA ***** SONORM	SITION RCENT PAR RA ORTHO INDEX ONS : A = PLOT C 6.98 f 0.00 cm 0.000 L = 100 ******	:KF ANORT TIOS: OCLASE 0.6 43.30 0.21 A = 0 ATANO r 1 27. 0 0 0. tn 0.000 .000 ***** SONS	S 13. HITE E 11. 16.78 12 F = 0. 0.37 RM ab 989 18 fa 000 17 pf 0.000 ******	354 41.77 538 9 AL 55 M M = (an 934 hy .885 0.00 ****	AB 50 84 PLAGIO BITE 63 = 0.24 0.15 F 0.000 0.000 ms 1 00 0.000 *******	0.442 0	AN E 7 48 000 ac 000 cs 000	4.858 kj 0.000 1.28 ru 0.000	p 0 0.0 t 9 0.0 17.69
PLAGIOCI QUARTZ : QUARTZ QUARTZ CHAPPELS MG NO. I AFM PARF JENSEN C q 7.627 en 8.788 il 1.279 CATANOF MES Q	R COMPO CASE PE FELDS 13.605 19.797 S A/CNK IN CATI AMETERS CATION 0.000 fs 9.097 ap 0.320 RM TOTA ***** SONORM	SITION RCENT PAR RA ORTHO INDEX ONS : A = PLOT C 6.98 f 0.00 cm 0.000 L = 100 ******	:KF ANORT TIOS: OCLASE 0.6 43.30 0.21 A = 0 ATANO r 1 27. 0 0 0. tn 0.000 .000 ***** SONS	S 13. HITE E 11. 16.78 12 F = 0. 0.37 RM ab 989 18 fa 000 17 pf 0.000 ******	354 41.73 538 9 AL 55 M M = (an 934 hy .885 0.00 ****	AB 50 84 PLAGIO BITE 63 = 0.24 0.15 F 0.000 0.000 0.000 ns 10 00 0.00	0.442 0	AN E 7 48 000 ac 000 cs 000	4.858 kj 0.000 1.28 ru 0.000	p 0 0.0 t 9 0.0 17.69
PLAGIOCI QUARTZ QUARTZ QUARTZ CHAPPELS MG NO. I AFM PARF JENSEN C 4 7.627 en 8.788 il 1.279 CATANOF MES Q Ed	<pre> COMPO LASE PE FELDS 13.605 19.797 S A/CNK IN CATI AMETERS CATION</pre>	SITION RCENT PAR RA ORTHO INDEX ONS : A = PLOT C 6.98 f 0.000 cm 0.000 L = 100 ****** (HUCHI Or	:KF ANORT TIOS: OCLASE 0.6 43.30 0.21 A = 4 ATANO r 1 27. 0 0. tn 0.000 .000 ***** SONS Ab	<pre>S 13. HITE E 11. 16.78 12 F = 0. 0.37 RM ab 989 18 fa 000 17 pf 0.000 ****** ALGORY An</pre>	354 41.73 538 9 AL 55 M M = 0 an .934 hy .885 0.00 ****	AB 50 84 PLAGIO BITE 63 = 0.24 0.15 F 0.000 0.000 ns 1 00 0.00 *******	0.442 0CLAS 3.414 = 0. 0 0. 0 0. 0 0. 0 0. 0 0.	AN E 7 48 000 ac 000 cs 000 Wo	4.858 kj 0.000 m 1.28 ru 0.000	p 0 0.0 t 9 0.0 17.69
PLAGIOCI QUARTZ QUARTZ QUARTZ CHAPPELS MG NO. I AFM PARF JENSEN C 1,627 en 8.788 il 1.279 CATANOF MES Q Ed 9.28	<pre> COMPO LASE PE FELDS 13.605 19.797 S A/CNK IN CATI AMETERS CATION</pre>	SITION RCENT PAR RA ORTHO INDEX ONS : A = PLOT C 6.98 f 0.000 cm 0.000 L = 100 ****** (HUCHI Or	:KF ANORT TIOS: OCLASE 0.6 43.30 0.21 A = 4 ATANO r 1 27. 0 0. tn 0.000 .000 ***** SONS Ab	<pre>S 13. HITE E 11. 16.78 12 F = 0. 0.37 RM ab 989 18 fa 000 17 pf 0.000 ****** ALGORY An</pre>	354 41.73 538 9 AL 55 M M = 0 an .934 hy .885 0.00 ****	AB 50 84 PLAGIO BITE 63 = 0.24 0.15 F 0.000 0.000 ms 1 00 0.000 *******	0.442 0CLAS 3.414 = 0. 0 0. 0 0. 0 0. 0 0. 0 0.	AN E 7 48 000 ac 000 cs 000 Wo	4.858 kj 0.000 m 1.28 ru 0.000	p 0 0.0 t 9 0.0 17.69
PLAGIOCI QUARTZ QUARTZ CHAPPELS MG NO. D AFM PARF JENSEN C 4 7.627 en 8.788 il 1.279 CATANOF MES Q Ed 9.28 0.00	<pre>R COMPO LASE PE FELDS 13.605 19.797 S A/CNK IN CATI AMETERS CATION 0.000 fs 9.097 ap 0.320 RM TOTA ***** SONORM C 0.000</pre>	SITION RCENT PAR RA ORTHO ORTHO INDEX ONS : A = PLOT C 6.98 f 0.000 cm 0.000 L =100 ****** (HUCHI Or 0.00 2	:KF ANORT TIOS: OCLASE 0.6 43.30 0.21 A = ATANO r 1 27. 0 0 0. tn 0.000 .000 ***** SONS Ab	<pre>S 13. HITE E 11. 16.78 12 F = 0. 0.37 RM ab 989 18 fa 000 17 pf 0.000 ****** ALGORY An 18.93</pre>	354 41.77 538 9 AL 55 M M = 0 an .934 hy .885 0.00 **** THM.	AB 50 84 PLAGIO BITE 63 = 0.24 0.15 F 0.000 0.000 0.000 10 10 	0.442 0CLAS 3.414 = 0. 0 0. 0 0. 0 0. 0 0. 0 0.	AN E 7 48 000 ac 000 cs 000 Wo 0.0	4.858 kj 0.000 1.289 ru 0.000 R 0.28.1	p 0 0.0 1 9 0.0 17.69 1 A 39 0
PLAGIOCI QUARTZ QUARTZ QUARTZ CHAPPELS MG NO. I AFM PARA JENSEN (q 7.627 en 8.788 il 1.279 CATANOF MES Q Ed 9.28 0.00 Di	<pre>R COMPO CASE PE FELDS 13.605 19.797 S A/CNK IN CATI AMETERS CATION 0.000 fs 9.097 ap 0.320 RM TOTA ***** SONORM C 0.000 Hy</pre>	SITION RCENT PAR RA ORTHO ORTHO INDEX ONS : A = PLOT C 6.98 f 0.000 cm 0.000 L =100 ****** (HUCHI Or 0.00 2	:KF ANORT TIOS: OCLASE 0.6 43.30 0.21 A = ATANO r 1 27. 0 0 0. tn 0.000 .000 ***** SONS Ab	<pre>S 13. HITE E 11. 16.78 12 F = 0. 0.37 RM ab 989 18 fa 000 17 pf 0.000 ****** ALGORY An 18.93</pre>	354 41.77 538 9 AL 55 M M = 0 an .934 hy .885 0.00 **** THM.	AB 50 84 PLAGIO BITE 63 = 0.24 0.15 F 0.000 0.000 ns 1 00 0.00 *******	0.442 0CLAS 3.414 = 0. 0 0. 0 0. 0 0. 0 0. 0 0.	AN E 7 48 000 ac 000 cs 000 Wo 0.0	4.858 kj 0.000 1.289 ru 0.000 R 0.28.1	p 0 0.0 1 9 0.0 17.69 1 A 39 0
PLAGIOCI QUARTZ QUARTZ QUARTZ CHAPPELS MG NO. I AFM PARA JENSEN (q 7.627 en 8.788 il 1.279 CATANOF MES Q Ed 9.28 0.00 Di HORNBLEN	<pre>R COMPO CASE PE FELDS 13.605 19.797 S A/CNK IN CATI AMETERS CATION 0.000 fs 9.097 0.320 RM TOTA ***** SONORM C 0.000 Hy NDE</pre>	SITION RCENT PAR RA ORTHO ORTHO INDEX ONS : A = PLOT C 6.98 : f 0.000 cm 0.000 L = 100 ****** (HUCHI Or 0.000 2 01	:KF ANORT TIOS: OCLASE 0.6 43.30 0.21 A = 0 ATANO r 1 27.0 0 0.1 tn 0.000 .000 ***** Ab 27.99 (En	S 13. HITE E 11. 16.78 12 F = 0. 0.37 RM ab 989 18 fa 000 17 pf 0.000 ****** ALGORY An 18.93 Fs	354 41.77 538 9 AL 55 M M = (an .934 hy .885 0.0 **** THM. 0.0	AB 50 84 PLAGIO BITE 63 = 0.24 0.15 F 0.000 0.000 0.000 0.000 10 0.000 0.000 0.000 0.000 	$\begin{array}{l} 0.442 \\ 0.442 \\ 0.442 \\ 0.4414 \\$	AN E 7 48 000 ac 000 cs 000 000 wo 0.0	4.858 kj 0.000 1.289 ru 0.000 R 0.28. Mt	p 0 0.0 9 0.0 17.69 i A 39 0 Hm
PLAGIOCI QUARTZ QUARTZ QUARTZ CHAPPELS MG NO. 1 AFM PARF JENSEN C q 7.627 en 8.788 il 1.279 CATANOF MES Q Ed 9.28 0.00 Di HORNBLEN 0.00	<pre> COMPO CASE PE FELDS 13.605 19.797 S A/CNK IN CATI AMETERS CATION</pre>	SITION RCENT PAR RA ORTHO ORTHO INDEX ONS : A = PLOT C 6.98 : f 0.000 cm 0.000 L = 100 ****** (HUCHI Or 0.000 2 01	:KF ANORT TIOS: OCLASE 0.6 43.30 0.21 A = 0 ATANO r 1 27.0 0 0.1 tn 0.000 .000 ***** Ab 27.99 (En	S 13. HITE E 11. 16.78 12 F = 0. 0.37 RM ab 989 18 fa 000 17 pf 0.000 ****** ALGORY An 18.93 Fs	354 41.77 538 9 AL 55 M M = (an .934 hy .885 0.0 **** THM. 0.0	AB 50 84 PLAGIO BITE 63 = 0.24 0.15 F 0.000 0.000 0.000 0.000 10 0.000 0.000 0.000 0.000 	$\begin{array}{l} 0.442 \\ 0.442 \\ 0.442 \\ 0.4414 \\$	AN E 7 48 000 ac 000 cs 000 000 wo 0.0	4.858 kj 0.000 1.289 ru 0.000 R 0.28. Mt	p 0 0.0 9 0.0 17.69 i A 39 0 Hm
PLAGIOCI QUARTZ QUARTZ QUARTZ CHAPPELS MG NO. I AFM PARF JENSEN C 4 7.627 en 8.788 il 1.279 CATANOF MES Q Ed 9.28 0.00 Di HORNBLEN 0.00 28.385	<pre> COMPO CASE PE FELDS 13.605 19.797 A/CNK IN CATI AMETERS CATION CATION CO 0.000 fs 9.097 ap 0.320 RM TOTA ***** SONORM C 0.000 Hy NDE 0.71 </pre>	SITION RCENT PAR RA ORTH ORTHO INDEX ONS : A = PLOT C 0 6.98 f 0.000 Cm 0.000 L =100 ****** (HUCHI Or 0.000 2 01 0.000	:KF: ANORT TIOS: OCLASE 0.6 43.30 0.21 A = 0 ATANO r 1 27. 0 0. 1 27. 0 0. 1 27. 0 0. 1 27. 0 0. 1 27. 0 0. 27.99 (En 0.00	S 13. HITE E 11. 16.78 12 F = 0. 0.37 RM ab 989 18 fa 000 17 pf 0.000 ****** ALGORY An 18.93 Fs 0.00	354 41.77 538 9 AL 55 M M = 6 an .934 hy .885 0.00 **** THM. 0.00	AB 50 84 PLAGIO BITE 63 = 0.24 0.15 F 0.000 0.000 0.000 *******) Lc 00 0. Fo 00 0 00 0).442 OCLAS 3.414 = 0. 0 0. 0 0. 0 0. 0 0. 0 0. 0 0. 0 0.	AN E 7 48 000 ac 000 cs 000 000 000 1.2	4.858 kj 0.000 1.28 ru 0.000 R 0.28. Mt	p 0 0.0 1 9 0.0 17.69 1 A 39 0 Hm 0.00
MG No. 1 AFM PARA JENSEN (9 7.627 en 8.788 il 1.279 CATANOF MES Q Ed 9.28 0.00 Di HORNBLEN 0.00 28.385 Ap	<pre> COMPO CASE PE FELDS 13.605 19.797 S A/CNK IN CATI AMETERS CATION</pre>	SITION RCENT PAR RA ORTHO ORTHO INDEX ONS : A = PLOT C 0.000 Cm 0.000 L =100 ****** (HUCHI Or 0.000 2 01 0.000 Tn	:KF: ANORT TIOS: OCLASE 0.6 43.30 0.21 A = 1 ATANO r 1 27. 0 0 0. tn 0.000 .000 ***** SONS Ab 27.99 (En 0.00 Pf	S 13. HITE E 11. 16.78 12 F = 0. 0.37 RM ab 989 18 fa 000 17 pf 0.000 ****** ALGORY An 18.93 Fs 0.00 Ns	354 41.77 538 9 AL 55 M M = (934 hy .885 0.00 **** THM. 0.00 (6.00 (7,00) ****	AB 50 84 PLAGIO BITE 63 = 0.24 0.15 F 0.000 0.000 0.000 *******) Lc 00 0. Fo 00 0 Cs).442)CLAS 3.414 = 0. 3.414 = 0. 0. 0. 0. 0. 0. 0. 0. 0. 0.	AN E 7 48 000 ac 000 cs 000 000 000 1.2	4.858 kj 0.000 1.28 ru 0.000 R 0.28. Mt	p 0 0.0 1 9 0.0 17.69 1 A 39 0 Hm 0.00

	GIVEN	RM24 RECALC 1	100% MOI	PROPS CAT	PROPS
SiO2	57.73			0.953	0.953 169
	13.14		032	0.128	0.256
	1.21		200	0.008	0.015
	9.77		690	0.135	0.135
MnO	0.17	0.	.169	0.002	0.002
	5.15		.108	0.127	0.127
	7.09		.032	0.125	0.125
Na2O	4.05	4.	.017	0.065	0.130
к20	1.57	1.	.557	0.017	0.033
TiO2	0.83	0.	.818	0.010	0.010
P205	0.12	0.	.119	0.001	0.002
Cr203	0.00	0	.000	0.000	0.000
TOTAL	100.83				
•••		c	IPW NORM		
-		or		n lc	ne kp wo
2.987				1 0.000 0.	
				y ol	
				в 0.000 0.	
				ns ks	
				0.000 0.000	000 0.000 17.648
IPWNOR	M TOTAL	= 100.008			
				VE MINERALS	3.1
				9 FS 48.5	
					AN 23.042
LAGIOC					
			THITE 27.	560	
UARTZ	: FELDS	PAR RATIOS	:		
UARTZ UARTZ	: FELDS 5.053	PAR RATIOS ORTHOCLAS	: E 15.568	PLAGIOCLASE	79.379
UARTZ UARTZ UARTZ	: FELDS 5.053 6.468	PAR RATIOS ORTHOCLASI ORTHOCLASE	: E 15.568 19.927 ALM		79.379
UARTZ UARTZ UARTZ HAPPEL	: FELDS 5.053 6.468 S A/CNK	PAR RATIOS ORTHOCLASS ORTHOCLASE INDEX 0.0	: E 15.568 19.927 ALM 618	PLAGIOCLASE	79.379
UARTZ UARTZ UARTZ HAPPEL	: FELDS 5.053 6.468 S A/CNK	PAR RATIOS ORTHOCLASI ORTHOCLASE	: E 15.568 19.927 ALM 618	PLAGIOCLASE	79.379
UARTZ UARTZ UARTZ HAPPEL G No.	: FELDS 5.053 6.468 S A/CNK IN CATI	PAR RATIOS ORTHOCLASI ORTHOCLASE INDEX 0.0 ONS 45.8	: E 15.568 19.927 AL 618 1	PLAGIOCLASE BITE 73.605	79.379
UARTZ UARTZ UARTZ HAPPEL G No. FM PAR	: FELDS 5.053 6.468 S A/CNK IN CATI AMETERS	PAR RATIOS ORTHOCLASS ORTHOCLASE INDEX 0.0 ONS 45.8 : A = 0.26	: E 15.568 19.927 ALM 618 1 F = 0.50 M	PLAGIOCLASE BITE 73.605 M = 0.24	
UARTZ UARTZ UARTZ HAPPEL G No. FM PAR	: FELDS 5.053 6.468 S A/CNK IN CATI AMETERS	PAR RATIOS ORTHOCLASS ORTHOCLASE INDEX 0.0 ONS 45.8 : A = 0.26	: E 15.568 19.927 ALM 618 1 F = 0.50 M	PLAGIOCLASE BITE 73.605	
UARTZ UARTZ UARTZ HAPPEL G No. FM PAR ENSEN	: FELDS 5.053 6.468 S A/CNK IN CATI AMETERS CATION	PAR RATIOS ORTHOCLASS ORTHOCLASE INDEX 0.0 ONS 45.8 : A = 0.26	: E 15.568 19.927 ALM 618 1 F = 0.50 M 0.37 M =	PLAGIOCLASE BITE 73.605 M = 0.24 0.16 F = 0.	
UARTZ UARTZ UARTZ HAPPEL G NO. FM PAR ENSEN	: FELDS 5.053 6.468 S A/CNK IN CATI AMETERS CATION	PAR RATIOS ORTHOCLASE INDEX 0.0 ONS 45.8 : A = 0.26 PLOT A =	: E 15.568 19.927 ALM 618 1 F = 0.50 M 0.37 M = ORM	PLAGIOCLASE BITE 73.605 M = 0.24 0.16 F = 0.	
UARTZ UARTZ UARTZ HAPPEL G NO. FM PAR ENSEN q	: FELDS 5.053 6.468 S A/CNK IN CATI AMETERS CATION 	PAR RATIOS ORTHOCLASE INDEX 0.0 ONS 45.8 : A = 0.26 PLOT A = CATANG Or	: E 15.568 19.927 AL 618 1 F = 0.50 M 0.37 M = ORM ab an	PLAGIOCLASE BITE 73.605 M = 0.24 0.16 F = 0. n lc	47
UARTZ UARTZ UARTZ HAPPEL G NO. FM PAR ENSEN q 2.781	: FELDS 5.053 6.468 S A/CNK IN CATI AMETERS CATION 	PAR RATIOS ORTHOCLASE INDEX 0.0 ONS 45.8 : A = 0.26 PLOT A = CATANG or 9.247 36	: E 15.568 19.927 ALM 618 1 F = 0.50 M 0.37 M = ORM ab an .254 13.000	PLAGIOCLASE BITE 73.605 M = 0.24 0.16 F = 0. n lc	47 ne kp wo 000 0.000 0.000
UARTZ UARTZ UARTZ HAPPEL G No. FM PAR ENSEN q 2.781 en	: FELDS 5.053 6.468 S A/CNK IN CATI AMETERS CATION C 0.000 fs	PAR RATIOS ORTHOCLASE INDEX 0.0 ONS 45.8 : A = 0.26 PLOT A = CATANG or 9.247 36 fo	: E 15.568 19.927 AL 618 1 F = 0.50 M 0.37 M = 0RM ab an .254 13.000 fa hy	PLAGIOCLASE BITE 73.605 M = 0.24 0.16 F = 0. n 1c 0 0.000 0.	47 ne kp wo 000 0.000 0.000 ac mt hm
UARTZ UARTZ UARTZ HAPPEL G No. FM PAR ENSEN q 2.781 en 9.794	: FELDS 5.053 6.468 S A/CNK IN CATI AMETERS CATION C 0.000 fs 9.235	PAR RATIOS ORTHOCLASE INDEX 0.0 ONS 45.8 : A = 0.26 PLOT A = CATANG or 9.247 36 fo 0.000 0	: E 15.568 19.927 AL 618 1 F = 0.50 H 0.37 M = 0RM ab an .254 13.000 fa hy .000 19.02	PLAGIOCLASE BITE 73.605 M = 0.24 0.16 F = 0. n 1c 0 0.000 0. y 01 9 0.000 0.	47 ne kp wo 000 0.000 0.000 ac mt hm
UARTZ UARTZ UARTZ HAPPEL G NO. FM PAR ENSEN q 2.781 en 9.794 il	: FELDS 5.053 6.468 S A/CNK IN CATI AMETERS CATION c 0.000 fs 9.235 ap	PAR RATIOS ORTHOCLASE INDEX 0.0 ONS 45.8 : A = 0.26 PLOT A = CATAN or 9.247 36 fo 0.000 0 cm t:	$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	PLAGIOCLASE BITE 73.605 M = 0.24 0.16 F = 0. n lc 0 0.000 0. y ol 9 0.000 0. ns ks	47 ne kp wo 000 0.000 0.000 ac mt hm 000 1.261 0.000
UARTZ UARTZ UARTZ HAPPEL G NO. FM PAR ENSEN q 2.781 en 9.794 il 1.146	: FELDS 5.053 6.468 S A/CNK IN CATI AMETERS CATION C 0.000 fs 9.235 ap 0.250	PAR RATIOS ORTHOCLASE INDEX 0.0 ONS 45.8 : A = 0.26 PLOT A = CATAN or 9.247 36 fo 0.000 0 cm t:	: E 15.568 19.927 ALM 618 1 F = 0.50 M 0.37 M = 0RM ab an .254 13.000 fa hy .000 19.022 n pf 0 0.000 0.0	PLAGIOCLASE BITE 73.605 M = 0.24 0.16 F = 0. n lc 0 0.000 0. y ol 9 0.000 0. ns ks	47 ne kp wo 000 0.000 0.000 ac mt hm 000 1.261 0.000 cs ru di
UARTZ UARTZ UARTZ HAPPEL G NO. FM PAR ENSEN q 2.781 en 9.794 il 1.146	: FELDS 5.053 6.468 S A/CNK IN CATI AMETERS CATION 0.000 fs 9.235 ap 0.250 RM TOTA	PAR RATIOS ORTHOCLASE INDEX 0.0 ONS 45.8 : A = 0.26 PLOT A = CATANG or 9.247 36 fo 0.000 0 cm t; 0.000 0.00	: E 15.568 19.927 ALM 618 1 F = 0.50 M 0.37 M = 0RM ab an .254 13.000 fa hy .000 19.020 n pf 0 0.000 0.00	PLAGIOCLASE BITE 73.605 M = 0.24 0.16 F = 0. n 1c 0 0.000 0. y 01 9 0.000 0. ns ks 000 0.000 0.	47 ne kp wo 000 0.000 0.000 ac mt hm 000 1.261 0.000 cs ru di
UARTZ UARTZ UARTZ HAPPEL G NO. FM PAR ENSEN q 2.781 en 9.794 il 1.146 CATANO	: FELDS 5.053 6.468 S A/CNK IN CATI AMETERS CATION 0.000 fs 9.235 ap 0.250 RM TOTA *****	PAR RATIOS ORTHOCLASE INDEX 0.0 ONS 45.8 : A = 0.26 PLOT A = CATANG Or 9.247 36 fo 0.000 0 cm tr 0.000 L =100.000	<pre>: 15.568 19.927 ALU 618 1 F = 0.50 M 0.37 M = 0.37 M = 0.37 M = 0.37 M = 0.00 19.024 n pf 0 0.000 0.0 ***************************</pre>	PLAGIOCLASE BITE 73.605 M = 0.24 0.16 F = 0. n lc 0 0.000 0. y ol 9 0.000 0. ns ks 000 0.000 0.	47 ne kp wo 000 0.000 0.000 ac mt hm 000 1.261 0.000 cs ru di
UARTZ UARTZ UARTZ HAPPEL G NO. FM PAR ENSEN q 2.781 en 9.794 il 1.146 CATANO ME Q	: FELDS 5.053 6.468 S A/CNK IN CATI AMETERS CATION 0.000 fs 9.235 ap 0.250 RM TOTA *****	PAR RATIOS ORTHOCLASE INDEX 0.0 ONS 45.8 : A = 0.26 PLOT A = CATANG or 9.247 36 fo 0.000 0 cm tr 0.000 0.000 L =100.000 ********************************	<pre>: E 15.568 19.927 ALU 618 1 F = 0.50 H 0.37 M = 0RM ab au .254 13.000 fa hy .000 19.02 n pf 0 0.000 0.0 ********** ALGORYTHM</pre>	PLAGIOCLASE BITE 73.605 M = 0.24 0.16 F = 0. n lc 0 0.000 0. y ol 9 0.000 0. ns ks 000 0.000 0. 	47 ne kp wo 000 0.000 0.000 ac mt hm 000 1.261 0.000 cs ru di
UARTZ UARTZ UARTZ HAPPEL G NO. FM PAR ENSEN q 2.781 en 9.794 il 1.146 CATANO ME Q Ed	: FELDS 5.053 6.468 S A/CNK IN CATI AMETERS CATION 0.000 fs 9.235 ap 0.250 RM TOTA ***** SONORM C	PAR RATIOS ORTHOCLASE INDEX 0.0 ONS 45.8 : A = 0.26 PLOT A = CATANG or 9.247 36 fo 0.000 0 cm tr 0.000 0.000 L =100.000 ********************************	: E 15.568 19.927 ALI 618 1 F = 0.50 H 0.37 M = 0RM ab an .254 13.000 fa hy .000 19.022 n pf 0 0.000 0.0 ********** ALGORYTHM An	PLAGIOCLASE BITE 73.605 M = 0.24 0.16 F = 0. n lc 0 0.000 0. y ol 9 0.000 0. ns ks 000 0.000 0. *********) Lc Ne	47 ne kp wo 000 0.000 0.000 ac mt hm 000 1.261 0.000 cs ru di 000 0.00017.032 Wo Ri Act
UARTZ UARTZ UARTZ HAPPEL G NO. FM PAR ENSEN 9.794 il 1.146 CATANO ME Q Ed 6.00	: FELDS 5.053 6.468 S A/CNK IN CATI AMETERS CATION 0.000 fs 9.235 ap 0.250 RM TOTA ***** SONORM C	PAR RATIOS ORTHOCLASE INDEX 0.0 ONS 45.8 : A = 0.26 PLOT A = CATANG or 9.247 36 fo 0.000 0 cm tr 0.000 0.000 L =100.000 ********************************	: E 15.568 19.927 ALI 618 1 F = 0.50 H 0.37 M = 0RM ab an .254 13.000 fa hy .000 19.022 n pf 0 0.000 0.0 ********** ALGORYTHM An	PLAGIOCLASE BITE 73.605 M = 0.24 0.16 F = 0. n lc 0 0.000 0. y ol 9 0.000 0. ns ks 000 0.000 0. *********) Lc Ne	47 ne kp wo 000 0.000 0.000 ac mt hm 000 1.261 0.000 cs ru di 000 0.00017.032
UARTZ UARTZ UARTZ HAPPEL G NO. FM PAR ENSEN q 2.781 en 9.794 il 1.146 CATANO ME Q Ed 6.00 .00	: FELDS 5.053 6.468 S A/CNK IN CATI AMETERS CATION 0.000 fs 9.235 ap 0.250 RM TOTA **** SONORM C 0.00	PAR RATIOS ORTHOCLASE INDEX 0.0 ONS 45.8 : A = 0.26 PLOT A = CATAN(or 9.247 36 fo 0.000 0 cm tr 0.000 0.000 L =100.000 ********* (HUCHISONS Or Ab 0.000 36.25	: E 15.568 19.927 ALM 618 1 F = 0.50 M 0.37 M = 0RM ab an .254 13.000 fa hy .000 19.020 n pf 0 0.000 0.0 ********** ALGORYTHM An 13.00 0.	PLAGIOCLASE BITE 73.605 M = 0.24 0.16 F = 0. n 1c 0 0.000 0. y 01 9 0.000 0. ns ks 000 0.000 0. ********) Lc Ne .00 0.00	47 ne kp wo 000 0.000 0.000 ac mt hm 000 1.261 0.000 cs ru di 000 0.00017.032 Wo Ri Act 0.33 26.39 0.00
UARTZ UARTZ UARTZ HAPPEL G NO. FM PAR ENSEN q 2.781 en 9.794 il 1.146 CATANO ME Q Ed 6.00 Di	: FELDS 5.053 6.468 S A/CNK IN CATI AMETERS CATION 0.000 fs 9.235 ap 0.250 RM TOTA **** SONORM C 0.000 Hy	PAR RATIOS ORTHOCLASE INDEX 0.0 ONS 45.8 : A = 0.26 PLOT A = CATAN(or 9.247 36 fo 0.000 0 cm tr 0.000 0.000 L =100.000 ********* (HUCHISONS Or Ab 0.000 36.25	: E 15.568 19.927 ALM 618 1 F = 0.50 M 0.37 M = 0RM ab an .254 13.000 fa hy .000 19.020 n pf 0 0.000 0.0 ********** ALGORYTHM An 13.00 0.	PLAGIOCLASE BITE 73.605 M = 0.24 0.16 F = 0. n lc 0 0.000 0. y ol 9 0.000 0. ns ks 000 0.000 0. *********) Lc Ne	47 ne kp wo 000 0.000 0.000 ac mt hm 000 1.261 0.000 cs ru di 000 0.00017.032 Wo Ri Act 0.33 26.39 0.00
UARTZ UARTZ UARTZ HAPPEL G NO. FM PAR ENSEN q 2.781 en 9.794 il 1.146 CATANO ME Q Ed 6.00 Di ORNBLE	: FELDS 5.053 6.468 S A/CNK IN CATI AMETERS CATION 0.000 fs 9.235 ap 0.250 RM TOTA ***** SONORM C 0.000 Hy NDE	PAR RATIOS ORTHOCLASE INDEX 0.0 ONS 45.8 : A = 0.26 PLOT A = CATANG or 9.247 36 fo 0.000 0 cm tr 0.000 0.000 L =100.000 ********************************	: E 15.568 19.927 AL 618 1 F = 0.50 M 0.37 M = 0.37 M = 0.30 0.000 0.000 0.4 M = 0.4 M = 0	PLAGIOCLASE BITE 73.605 M = 0.24 0.16 F = 0. n lc 0 0.000 0. y ol 9 0.000 0. ns ks 000 0.000 0. *********) LC Ne .00 0.00 Fo Fa	47 ne kp wo 000 0.000 0.000 ac mt hm 000 1.261 0.000 cs ru di 000 0.00017.032 Wo Ri Act 0.33 26.39 0.00) Mt Hm
UARTZ UARTZ UARTZ HAPPEL G NO. FM PAR ENSEN q 2.781 en 9.794 il 1.146 CATANO ME Q Ed 6.00 Di ORNBLE 0.00	: FELDS 5.053 6.468 S A/CNK IN CATI AMETERS CATION 0.000 fs 9.235 ap 0.250 RM TOTA **** SONORM C 0.000 Hy NDE	PAR RATIOS ORTHOCLASE INDEX 0.0 ONS 45.8 : A = 0.26 PLOT A = CATANG or 9.247 36 fo 0.000 0 cm tr 0.000 0.000 L =100.000 ********************************	: E 15.568 19.927 AL 618 1 F = 0.50 M 0.37 M = 0.37 M = 0.30 0.000 0.000 0.4 M = 0.4 M = 0	PLAGIOCLASE BITE 73.605 M = 0.24 0.16 F = 0. n lc 0 0.000 0. y ol 9 0.000 0. ns ks 000 0.000 0. *********) LC Ne .00 0.00 Fo Fa	47 ne kp wo 000 0.000 0.000 ac mt hm 000 1.261 0.000 cs ru di 000 0.00017.032 Wo Ri Act 0.33 26.39 0.00
UARTZ UARTZ UARTZ HAPPEL G NO. FM PAR ENSEN q 2.781 en 9.794 il 1.146 CATANO ME Q Ed 6.00 .00 Di ORNBLE 0.00 6.391	: FELDS 5.053 6.468 S A/CNK IN CATI AMETERS CATION 0.000 fs 9.235 ap 0.250 RM TOTA ***** SONORM C 0.00 Hy NDE 0.00	PAR RATIOS ORTHOCLASE INDEX 0.0 ONS 45.8 : A = 0.26 PLOT A = CATANG Or 9.247 36 fo 0.000 0 cm tr 0.000 0.000 L =100.000 ********** (HUCHISONS Or Ab 0.00 36.25 Ol (En 0.00 0.000	: E 15.568 19.927 AL 618 1 F = 0.50 M 0.37 M = 0RM ab an .254 13.000 fa hy .000 19.022 n pf 0 0.000 0.00 ********** ALGORYTHM An 13.00 0. Fs 0 0.00 0	PLAGIOCLASE BITE 73.605 M = 0.24 0.16 F = 0. 1c 0 0.000 0. y ol 9 0.000 0. ns ks 000 0.000 0. *********) Lc Ne 00 0.00 Fo Fa .00 0.00	47 ne kp wo 000 0.000 0.000 ac mt hm 000 1.261 0.000 cs ru di 000 0.00017.032 Wo Ri Act 0.33 26.39 0.00) Mt Hm 1.26 0.00
UARTZ UARTZ UARTZ HAPPEL G NO. FM PAR ENSEN q 2.781 en 9.794 il 1.146 CATANO ME Q Ed 6.00 .00 Di ORNBLE 0.00 6.391 Ap	: FELDS 5.053 6.468 S A/CNK IN CATI AMETERS CATION 0.000 fs 9.235 ap 0.250 RM TOTA **** SONORM C 0.00 Hy NDE 0.00 Cm	PAR RATIOS ORTHOCLASE INDEX 0.0 ONS 45.8 : A = 0.26 PLOT A = CATAN(0r 9.247 36 fo 0.000 0 cm tr 0.000 0.000 L =100.000 ********** (HUCHISONS Or Ab 0.00 36.25 Ol (En 0.00 0.00 Tn Pf	: E 15.568 19.927 ALM 618 1 F = 0.50 M 0.37 M = 0RM ab an .254 13.000 fa hy .000 19.020 n pf 0 0.000 0.00 **********************************	PLAGIOCLASE BITE 73.605 M = 0.24 0.16 F = 0. 0 0.000 0. y ol 9 0.000 0. y ol 9 0.000 0. ns ks 000 0.000 0. ********) LC Ne .00 0.00 Fo Fa .00 0.00 s Cs R	47 ne kp wo 000 0.000 0.000 ac mt hm 000 1.261 0.000 cs ru di 000 0.00017.032 Wo Ri Act 0.33 26.39 0.00) Mt Hm 1.26 0.00 u BIOTITE Sp
JARTZ JARTZ JARTZ JARTZ JARTZ HAPPEL G NO. FM PAR ENSEN q 2.781 en 9.794 il 1.146 CATANO ME Q Ed 6.00 .00 Di DRNBLE 0.00 5.391 Ap	: FELDS 5.053 6.468 S A/CNK IN CATI AMETERS CATION 0.000 fs 9.235 ap 0.250 RM TOTA **** SONORM C 0.00 Hy NDE 0.00 Cm	PAR RATIOS ORTHOCLASE INDEX 0.0 ONS 45.8 : A = 0.26 PLOT A = CATAN(0r 9.247 36 fo 0.000 0 cm tr 0.000 0.000 L =100.000 ********** (HUCHISONS Or Ab 0.00 36.25 Ol (En 0.00 0.00 Tn Pf	: E 15.568 19.927 ALM 618 1 F = 0.50 M 0.37 M = 0RM ab an .254 13.000 fa hy .000 19.020 n pf 0 0.000 0.00 **********************************	PLAGIOCLASE BITE 73.605 M = 0.24 0.16 F = 0. 0 0.000 0. y ol 9 0.000 0. y ol 9 0.000 0. ns ks 000 0.000 0. ********) LC Ne .00 0.00 Fo Fa .00 0.00 s Cs R	47 ne kp wo 000 0.000 0.000 ac mt hm 000 1.261 0.000 cs ru di 000 0.00017.032 Wo Ri Act 0.33 26.39 0.00) Mt Hm 1.26 0.00 u BIOTITE Sp
UARTZ UARTZ UARTZ HAPPEL G NO. FM PAR ENSEN	: FELDS 5.053 6.468 S A/CNK IN CATI AMETERS CATION 0.000 fs 9.235 ap 0.250 RM TOTA ***** SONORM C 0.000 Hy NDE 0.00 Cm 0.00	PAR RATIOS ORTHOCLASE INDEX 0.0 ONS 45.8 : A = 0.26 PLOT A = CATAN(0r 9.247 36 fo 0.000 0 cm tr 0.000 0.000 L =100.000 ********** (HUCHISONS Or Ab 0.00 36.25 Ol (En 0.00 0.00 Tn Pf	<pre>: E 15.568 19.927 ALU 618 1 F = 0.50 M 0.37 M = 0.37 M = 0.37 M = 0.254 13.000 fa hy .254 13.000 fa hy .000 19.020 n pf 0 0.000 0.00 **************************</pre>	PLAGIOCLASE BITE 73.605 M = 0.24 0.16 F = 0. 1c 0 0.000 0. y ol 9 0.000 0. ns ks 000 0.000 0. *********) Lc Ne 00 0.00 Fo Fa .00 0.00	47 ne kp wo 000 0.000 0.000 ac mt hm 000 1.261 0.000 cs ru di 000 0.00017.032 Wo Ri Act 0.33 26.39 0.00) Mt Hm 1.26 0.00 u BIOTITE Sp

	UMBER		100%	NOT DROP	S CAT	PROPS		
		RECALC		MOL PROP 0.90		0.905		1
			.388			0.288		
		14			-			
	1.31		.317		8	0.017		
	10.59		.650		8	0.148		
	0.16		.161		2			
-	4.32		.345		8	0.108		
	8.92		8.971		0	0.100		
	2.98		.997	0.04				
	1.24		.247	0.01		0.026		
	1.06		.069	0.01		0.013		
	0.18		0.181	0.00	_	0.003		
	0.00		0.000	0.00	10	0.000		
TOTAL	99.43							
	С			an			-	
		7.369 25						0.
	fs			hy				
8.741		0.000 (
	_	cm t	-				ru	
		0.000 0.00		0.000 0	.000 0.0	000 0.0	000 17	• • •
CIPWNORN	I TOTAL	= 100.01						

_		ERS FOR C						
		MPOSITION						
FELDSPAN	R COMPO	SITION :	KFS 13.	247 AB	45.585	AN 4	1.168	2
								,
PLAGIOCI	LASE PE	RCENT ANO	RTHITE					,
		RCENT ANO						,
QUARTZ	: FELDS	PAR RATIO	s:	47.454			38	,
QUARTZ QUARTZ	: FELDS 6.184	PAR RATIO	S: SE 12.4	47.454 128 plag:	IOCLASE	81.38	38	,
QUARTZ QUARTZ QUARTZ	: FELDS 6.184 10.075	PAR RATIO ORTHOCLA ORTHOCLA	S: SE 12.4 SE 20.24	47.454 128 plag:	IOCLASE	81.38	38	,
QUARTZ QUARTZ QUARTZ CHAPPELS	: FELDS 6.184 10.075 S A/CNK	PAR RATIO ORTHOCLAS ORTHOCLAS INDEX 0	S: SE 12.4 SE 20.24 .650	47.454 128 plag:	IOCLASE	81.38	38	,
QUARTZ QUARTZ QUARTZ CHAPPELS	: FELDS 6.184 10.075 S A/CNK	PAR RATIO ORTHOCLA ORTHOCLA	S: SE 12.4 SE 20.24 .650	47.454 128 plag:	IOCLASE	81.38	38	,
QUARTZ QUARTZ QUARTZ CHAPPELS MG No.	: FELDS 6.184 10.075 S A/CNK IN CATI	PAR RATIO ORTHOCLA ORTHOCLA INDEX 0 ONS 39.	S: 12.4 SE 12.4 SE 20.24 .650 55	47.454 128 plag: 18 albite	IOCLASE 69.677	81.38	38	J
QUARTZ QUARTZ QUARTZ CHAPPELS MG No.	: FELDS 6.184 10.075 S A/CNK IN CATI AMETERS	PAR RATION ORTHOCLAN ORTHOCLAN INDEX 0 ONS 39. A = 0.2	S: SE 12.4 SE 20.24 .650 55 1 F = 0	47.454 128 PLAG 18 ALBITE .58 M = 0	IOCLASE 69.677	81.38	38	,
QUARTZ QUARTZ QUARTZ CHAPPELS MG No.	: FELDS 6.184 10.075 S A/CNK IN CATI AMETERS	PAR RATIO ORTHOCLA ORTHOCLA INDEX 0 ONS 39.	S: SE 12.4 SE 20.24 .650 55 1 F = 0	47.454 128 PLAG 18 ALBITE .58 M = 0	IOCLASE 69.677	81.38	38	
QUARTZ QUARTZ QUARTZ CHAPPELS MG No. 2 AFM PARI JENSEN	: FELDS 6.184 10.075 S A/CNK IN CATI AMETERS CATION	PAR RATIO ORTHOCLAS ORTHOCLAS INDEX 0 ONS 39. A = 0.2 PLOT A CATA	S: SE 12.4 SE 20.24 .650 55 1 F = 0 = 0.38 NORM	47.454 128 PLAG 18 ALBITE .58 M = 0 M = 0.13	IOCLASE 69.677 .21 F = 0.	81.38 49		
QUARTZ QUARTZ QUARTZ CHAPPELS MG No. 2 AFM PARI JENSEN	: FELDS 6.184 10.075 S A/CNK IN CATI AMETERS CATION	PAR RATIO ORTHOCLAS ORTHOCLAS INDEX 0 ONS 39. : A = 0.2 PLOT A	S: SE 12.4 SE 20.24 .650 55 1 F = 0 = 0.38 NORM	47.454 128 PLAG 18 ALBITE .58 M = 0 M = 0.13	IOCLASE 69.677 .21 F = 0.	81.38 49		
QUARTZ QUARTZ QUARTZ CHAPPELS MG NO. AFM PARM JENSEN q 3.454	: FELDS 6.184 10.075 S A/CNK IN CATI AMETERS CATION 	PAR RATIO ORTHOCLA ORTHOCLA INDEX 0 ONS 39. A = 0.2 PLOT A PLOT A OR OR 7.492 2	S: SE 12.4 SE 20.24 .650 55 1 F = 0 = 0.38 NORM ab 7.366 23	47.454 128 PLAG 18 ALBITE .58 M = 0 M = 0.13 an 3.294 0.1	IOCLASE 69.677 .21 F = 0. 1c 000 0.	81.38 49 ne 000 0.		
QUARTZ QUARTZ QUARTZ CHAPPELS MG NO. AFM PARM JENSEN q 3.454	: FELDS 6.184 10.075 S A/CNK IN CATI AMETERS CATION 	PAR RATIO ORTHOCLAS ORTHOCLAS INDEX 0 ONS 39. : A = 0.2 PLOT A CATAS or	S: SE 12.4 SE 20.24 .650 55 1 F = 0 = 0.38 NORM ab 7.366 23	47.454 128 PLAG 18 ALBITE .58 M = 0 M = 0.13 an 3.294 0.1	IOCLASE 69.677 .21 F = 0. 1c 000 0.	81.38 49 ne 000 0.	kp	
QUARTZ QUARTZ QUARTZ CHAPPELS MG No. AFM PARA JENSEN q 3.454 en	: FELDS 6.184 10.075 S A/CNK IN CATI AMETERS CATION 	PAR RATIO ORTHOCLA ORTHOCLA INDEX 0 ONS 39. A = 0.2 PLOT A PLOT A OR OR 7.492 2	S: SE 12.4 SE 20.24 .650 55 1 F = 0 = 0.38 NORM ab 7.366 2: fa	47.454 128 PLAG 18 ALBITE .58 M = 0 M = 0.13 an 3.294 0.4 hy	OCLASE 69.677 F = 0. 1c 000 0. ol	81.38 49 000 0. ac	kp .000	0
QUARTZ QUARTZ QUARTZ CHAPPELS MG No. AFM PARA JENSEN q 3.454 en	: FELDS 6.184 10.075 S A/CNK IN CATI AMETERS CATION 0.000 fs 10.062	PAR RATIO ORTHOCLAS ORTHOCLAS INDEX 0 ONS 39. A = 0.2 PLOT A PLOT A Or 7.492 2 fo	S: SE 12.4 SE 20.24 .650 55 1 F = 0 = 0.38 NORM ab 7.366 23 fa 0.000 18	47.454 $128 PLAG$ $18 ALBITE$ $.58 M = 0$ $M = 0.13$ $$ an $3.294 0.4$ hy $8.478 0.4$	IOCLASE 69.677 F = 0. 1c 000 0. 01 000 0.	81.38 49 000 0. ac 000 1.	kp .000 mt .401	0
QUARTZ QUARTZ QUARTZ CHAPPELS MG No. 2 AFM PARZ JENSEN q 3.454 en 8.416 il	: FELDS 6.184 10.075 S A/CNK IN CATI AMETERS CATION 0.000 fs 10.062 ap	PAR RATION ORTHOCLAN ORTHOCLAN INDEX 0 ONS 39. A = 0.2 PLOT A PLOT A OR 7.492 2 fo 0.000	S: SE 12.4 SE 20.24 .650 55 1 F = 0 = 0.38 NORM ab 7.366 2: fa 0.000 1: tn p:	47.454 128 PLAG 18 ALBITE .58 M = 0 M = 0.13 an 3.294 0.1 hy 8.478 0.1 f ns	IOCLASE 69.677 F = 0. lc 000 0. ol 000 0. ks	81.38 49 000 0. ac 000 1. cs	kp .000 mt .401 ru	0
QUARTZ QUARTZ QUARTZ CHAPPELS MG NO. AFM PARA JENSEN 9 3.454 en 8.416 il 1.515	: FELDS 6.184 10.075 S A/CNK IN CATI AMETERS CATION 0.000 fs 10.062 ap 0.385	PAR RATIO ORTHOCLAS ORTHOCLAS INDEX 0 ONS 39. $\therefore A = 0.2$ PLOT A CATAS or 7.492 2 fo 0.000 cm	S: SE 12.4 SE 20.24 .650 55 1 F = 0 = 0.38 NORM ab 7.366 2: fa 0.000 12 tn p: 00 0.000	47.454 128 PLAG 18 ALBITE .58 M = 0 M = 0.13 an 3.294 0.1 hy 8.478 0.1 f ns	IOCLASE 69.677 F = 0. lc 000 0. ol 000 0. ks	81.38 49 000 0. ac 000 1. cs	kp .000 mt .401 ru	0
QUARTZ QUARTZ QUARTZ CHAPPELS MG NO. AFM PARA JENSEN 9 3.454 en 8.416 il 1.515	: FELDS 6.184 10.075 S A/CNK IN CATI AMETERS CATION 0.000 fs 10.062 ap 0.385 RM TOTA	PAR RATIO ORTHOCLA ORTHOCLA INDEX 0 ONS 39. : A = 0.2 PLOT A CATA or 7.492 2 fo 0.000 cm 0.000 0.0	S: SE 12.4 SE 20.24 .650 55 1 F = 0 = 0.38 NORM ab 7.366 2: fa 0.000 12 tn p: 00 0.000 0	47.454 128 PLAG 18 ALBITE .58 M = 0 M = 0.13 an 3.294 0.4 hy 8.478 0.4 f ns 0 0.000 0	IOCLASE 69.677 F = 0. lc 000 0. ks .000 0.	81.38 49 000 0. ac 000 1. cs	kp .000 mt .401 ru	0
QUARTZ QUARTZ QUARTZ CHAPPELS MG NO. AFM PAR JENSEN q 3.454 en 8.416 il 1.515 CATANO	: FELDS 6.184 10.075 S A/CNK IN CATI AMETERS CATION 0.000 fs 10.062 ap 0.385 RM TOTA *****	PAR RATIO ORTHOCLA ORTHOCLA INDEX 0 ONS 39. A = 0.2 PLOT A CATA Or 7.492 2 fo 0.000 cm 0.000 0.0 L = 100.00	S: SE 12.4 SE 20.24 .650 55 1 F = 0 = 0.38 NORM ab 7.366 2: fa 0.000 1: tn p: 00 0.000 0 *******	47.454 128 PLAG 18 ALBITE .58 M = 0 M = 0.13 an 3.294 0.4 hy 8.478 0.4 f ns 0 0.000 0	IOCLASE 69.677 F = 0. lc 000 0. ks .000 0.	81.38 49 000 0. ac 000 1. cs	kp .000 mt .401 ru	0
QUARTZ QUARTZ QUARTZ CHAPPELS MG NO. 2 AFM PAR JENSEN	: FELDS 6.184 10.075 S A/CNK IN CATI AMETERS CATION 0.000 fs 10.062 ap 0.385 RM TOTA *****	PAR RATIO ORTHOCLA ORTHOCLA INDEX 0 ONS 39. : A = 0.2 PLOT A CATA or 7.492 2 fo 0.000 cm 0.000 0.0 L = 100.00	S: SE 12.4 SE 20.24 .650 55 1 F = 0 = 0.38 NORM ab 7.366 23 fa 0.000 13 tn p2 00 0.000 s * * * * * *	47.454 128 PLAG 18 ALBITE .58 M = 0 M = 0.13 an 3.294 0.4 hy 8.478 0.4 f ns 0 0.000 0 ********	<pre>IOCLASE 69.677 .21 F = 0 lc 000 0. ks .000 0. *****</pre>	81.38 49 ne 000 0. ac 000 1. cs 000 0.0	kp .000 mt .401 ru 00016	0
QUARTZ QUARTZ QUARTZ CHAPPELS MG NO. 2 AFM PAR JENSEN	: FELDS 6.184 10.075 S A/CNK IN CATI AMETERS CATION 0.000 fs 10.062 ap 0.385 RM TOTA *****	PAR RATIO: ORTHOCLA: ORTHOCLA: INDEX 0 ONS 39. : A = 0.2 PLOT A CATA: Or 7.492 2 fo 0.000 cm 0.000 0.0 L =100.00 ********	S: SE 12.4 SE 20.24 .650 55 1 F = 0 = 0.38 NORM ab 7.366 23 fa 0.000 13 tn p2 00 0.000 s * * * * * *	47.454 128 PLAG: 18 ALBITE .58 M = 0 M = 0.13 an 3.294 0.4 hy 8.478 0.4 f ns 0 0.000 0 ********	<pre>IOCLASE 69.677 .21 F = 0 lc 000 0. ks .000 0. *****</pre>	81.38 49 ne 000 0. ac 000 1. cs 000 0.0	kp .000 mt .401 ru 00016	0
QUARTZ QUARTZ QUARTZ CHAPPELS MG NO. 2 AFM PARA JENSEN	: FELDS 6.184 10.075 S A/CNK IN CATI AMETERS CATION 0.000 fs 10.062 ap 0.385 RM TOTA ***** SONORM C	PAR RATIO: ORTHOCLA: ORTHOCLA: INDEX 0 ONS 39. : A = 0.2 PLOT A CATA: Or 7.492 2 fo 0.000 cm 0.000 0.0 L =100.00 ********	S: SE 12.4 SE 20.24 .650 55 1 F = 0 = 0.38 NORM ab 7.366 2: fa 0.000 1: tn p: 00 0.000 0 ****** S ALGOR An	47.454 128 PLAG 18 ALBITE .58 M = 0 M = 0.13 an 3.294 0.1 hy 8.478 0.1 f ns 0 0.000 0 ********* YTHM) LC	IOCLASE 69.677 .21 F = 0. lc 000 0. ks .000 0. ks .000 0. ****	81.38 49 000 0. ac 000 1. cs 000 0.0	kp .000 mt .401 ru 00016 Ri	0
QUARTZ QUARTZ QUARTZ CHAPPELS MG NO. 2 AFM PARA JENSEN	: FELDS 6.184 10.075 S A/CNK IN CATI AMETERS CATION 0.000 fs 10.062 ap 0.385 RM TOTA ***** SONORM C	PAR RATIO: ORTHOCLA: ORTHOCLA: INDEX 0 ONS 39. : A = 0.2 PLOT A CATA: or 7.492 2 fo 0.000 cm 0.000 0.0 L = 100.00 ******** (HUCHISON Or Ab	S: SE 12.4 SE 20.24 .650 55 1 F = 0 = 0.38 NORM ab 7.366 2: fa 0.000 1: tn p: 00 0.000 0 ****** S ALGOR An	47.454 128 PLAG 18 ALBITE .58 M = 0 M = 0.13 an 3.294 0.1 hy 8.478 0.1 f ns 0 0.000 0 ********* YTHM) LC	IOCLASE 69.677 .21 F = 0. lc 000 0. ks .000 0. ks .000 0. ****	81.38 49 000 0. ac 000 1. cs 000 0.0	kp .000 mt .401 ru 00016 Ri	0
QUARTZ QUARTZ QUARTZ CHAPPELS MG NO. 2 AFM PARA JENSEN 0	: FELDS 6.184 10.075 S A/CNK IN CATI AMETERS CATION 0.000 fs 10.062 ap 0.385 RM TOTA ***** SONORM C 0.00	PAR RATIO ORTHOCLAS ORTHOCLAS ORTHOCLAS INDEX 0 ONS 39. : A = 0.2 PLOT A CATA Or 0.000 0.0 L = 100.00 Cm 0.000 0.0 L = 100.00 ******** (HUCHISON Or Ab 0.00 27.3	S: SE 12.4 SE 20.24 .650 55 1 F = 0 = 0.38 NORM ab 7.366 2: fa 0.000 1: tn p: 00 0.000 ****** S ALGOR An 37 23.29	47.454 128 PLAG 18 ALBITE .58 M = 0 M = 0.13 an 3.294 0.1 hy 8.478 0.1 f ns 0 0.000 0 ******** YTHM) LC 0.00	<pre>IOCLASE 69.677 .21 F = 0 1c 000 0. ks .000 0. ks Ne 0.00</pre>	81.38 49 ne 000 0. ac 000 1. cs 000 0.0 Wo 0.00 3	kp .000 mt .401 ru 00016 Ri 25.47	0
QUARTZ QUARTZ QUARTZ CHAPPELS MG NO. 2 AFM PARA JENSEN 0	: FELDS 6.184 10.075 S A/CNK IN CATI AMETERS CATION 0.000 fs 10.062 ap 0.385 RM TOTA ***** SONORM C 0.000 Hy	PAR RATIO: ORTHOCLA: ORTHOCLA: INDEX 0 ONS 39. : A = 0.2 PLOT A CATA: or 7.492 2 fo 0.000 cm 0.000 0.0 L = 100.00 ******** (HUCHISON Or Ab	S: SE 12.4 SE 20.24 .650 55 1 F = 0 = 0.38 NORM ab 7.366 2: fa 0.000 1: tn p: 00 0.000 ****** S ALGOR An 37 23.29	47.454 128 PLAG 18 ALBITE .58 M = 0 M = 0.13 an 3.294 0.1 hy 8.478 0.1 f ns 0 0.000 0 ******** YTHM) LC 0.00	<pre>IOCLASE 69.677 .21 F = 0 1c 000 0. ks .000 0. ks Ne 0.00</pre>	81.38 49 ne 000 0. ac 000 1. cs 000 0.0 Wo 0.00 3	kp .000 mt .401 ru 00016 Ri 25.47	0
QUARTZ QUARTZ QUARTZ CHAPPELS MG NO. AFM PAR JENSEN (3.454 en 8.416 i1 1.515 CATANO (ME Q Ed 5.49 0.00 Di HORNBLE	: FELDS 6.184 10.075 S A/CNK IN CATI AMETERS CATION 0.000 fs 10.062 ap 0.385 RM TOTA ***** SONORM C 0.000 Hy NDE	PAR RATIO: ORTHOCLA: ORTHOCLA: INDEX 0 ONS 39. A = 0.2 PLOT A CATA: Or 0.000 0.0 L = 100.00 Cm 0.000 0.0 L = 100.00 X******** (HUCHISON Or Ab 0.00 27.3 Ol (Ex	S: SE 12.4 SE 20.24 .650 55 1 F = 0 = 0.38 NORM ab 7.366 2: fa 0.000 1: tn p: 00 0.000 ******* S ALGOR An 57 23.29 h Fs	47.454 128 PLAG 18 ALBITE .58 M = 0 M = 0.13 an 3.294 0.1 hy 8.478 0.1 f ns 0 0.000 0 ********* YTHM) Lc 0.00 Fo	IOCLASE 69.677 F = 0. lc 000 0. ol 000 0. ks .000 0. **** Ne 0.00 Fa	81.38 49 ne 000 0. ac 000 1. cs 000 0.0 Wo 0.00 2	kp .000 mt .401 ru 00016 Ri 25.47 t	0 0 .6
QUARTZ QUARTZ QUARTZ CHAPPELS MG NO. AFM PAR JENSEN (3.454 en 8.416 i1 1.515 CATANO ME Q Ed 5.49 0.00 Di HORNBLE 0.00	: FELDS 6.184 10.075 S A/CNK IN CATI AMETERS CATION 0.000 fs 10.062 ap 0.385 RM TOTA ***** SONORM C 0.000 Hy NDE	PAR RATIO ORTHOCLAS ORTHOCLAS ORTHOCLAS INDEX 0 ONS 39. : A = 0.2 PLOT A CATA Or 0.000 0.0 L = 100.00 Cm 0.000 0.0 L = 100.00 ******** (HUCHISON Or Ab 0.00 27.3	S: SE 12.4 SE 20.24 .650 55 1 F = 0 = 0.38 NORM ab 7.366 2: fa 0.000 1: tn p: 00 0.000 ******* S ALGOR An 57 23.29 h Fs	47.454 128 PLAG 18 ALBITE .58 M = 0 M = 0.13 an 3.294 0.1 hy 8.478 0.1 f ns 0 0.000 0 ********* YTHM) Lc 0.00 Fo	IOCLASE 69.677 F = 0. lc 000 0. ol 000 0. ks .000 0. **** Ne 0.00 Fa	81.38 49 ne 000 0. ac 000 1. cs 000 0.0 Wo 0.00 2	kp .000 mt .401 ru 00016 Ri 25.47 t	0 0 .6
QUARTZ QUARTZ QUARTZ CHAPPELS MG NO. AFM PARIJENSEN	: FELDS 6.184 10.075 S A/CNK IN CATI AMETERS CATION 0.000 fs 10.062 ap 0.385 RM TOTA ***** SONORM C 0.000 Hy NDE 2.33	PAR RATIO ORTHOCLAS ORTHOCLAS ORTHOCLAS INDEX 0 ONS 39. : A = 0.2 PLOT A :CATA Or 7.492 2 fo 0.000 0.0 Cm 0.000 0.0 L = 100.00 ******** (HUCHISON Or Ab 0.00 27.3 01 (Ex 0.00 0.0	S: SE 12.4 SE 20.24 .650 55 1 F = 0 = 0.38 NORM ab 7.366 2: fa 0.000 1: tn p: 00 0.000 0 ******* S ALGOR An 57 23.29 n Fs 00 0.00	47.454 128 PLAG 18 ALBITE .58 M = 0 M = 0.13 an 3.294 0.4 hy 8.478 0.4 f ns 0 0.000 0 ********* YTHM) Lc 0.00 Fo 0 0.00	IOCLASE 69.677 .21 F = 0. .1c 000 0. .01 000 0. ks .000 0. **** Ne 0.00 Fa 0.00	81.38 49 ne 000 0. ac 000 1. cs 000 0.0 Wo 0.00 2) M 1.40	kp .000 mt .401 ru 20016 Ri 25.47 t	0 0 .6
QUARTZ QUARTZ QUARTZ CHAPPELS MG NO. AFM PARA JENSEN	: FELDS 6.184 10.075 S A/CNK IN CATI AMETERS CATION 0.000 fs 10.062 ap 0.385 RM TOTA ***** SONORM C 0.000 Hy NDE 2.33 Cm	PAR RATIO: ORTHOCLA: ORTHOCLA: INDEX 0 ONS 39. A = 0.2 PLOT A CATA: Or 0.000 0.0 L = 100.00 Cm 0.000 0.0 L = 100.00 X******** (HUCHISON Or Ab 0.00 27.3 Ol (Ex	S: SE 12.4 SE 20.24 .650 55 1 F = 0 = 0.38 NORM ab 7.366 2: fa 0.000 1: tn p: 00 0.000 ******* S ALGOR An 57 23.29 n Fs 00 0.00 Ns	47.454 128 PLAG 18 ALBITE .58 M = 0 M = 0.13 an 3.294 0.1 hy 8.478 0.1 f ns 0 0.000 0 ********* YTHM) LC 0.00 Fo 0 0.000 Ks	IOCLASE 69.677 .21 F = 0. 1c 000 0. .01 000 0. ks .000 0. ks .000 0. ks .000 0. Fa 0.00 Fa 0.00	81.38 49 ne 000 0. ac 000 1. cs 000 0.0 Wo 0.00 2) M 1.40	kp .000 mt .401 ru 00016 Ri 25.47 t 0.0	0 0 .6

PETRONOR	MS PRO	GRAM						
SAMPLE N	UMBER							
OXIDES	GIVEN	RECAI	LC 100%	MOL	PROPS	CAT PROP	PS	171
SiO2	58.43		58.348		0.971	0.97	71	1.1.1
A1203	13.74		13.721		0.135		59	
Fe203	1.12		1.118		0.007	0.03	14	
FeO	9.07		9.057		0.126			
			0.160			0.00		
MgO	4.55		4.544		0.113	0.1	13	
CaO	6.67		6.661		0.119	0.1	19	
Na2O	4.43		4.424		0.071	0.1	43	
К2О	0.91		0.909		0.010	0.0	19	
TiO2	0.91		0.909		0.011	0.0	11	
P205	0.15		0.150		0.001	0.0	02	
Cr203	0.00		0.000		0.000	0.0	00	
TOTAL	100.14							
• • •		• • • • • • •		NORM				
-		or				ne		
5.624	0.000	5.370	37.430	14.897	0.000	0.000	0.000	0.000
en	fs	fo	fa	hy	ol	ac	mt	hm
9.448	9.214	0.000	0.000	18.663	0.000	0.000	1.622	0.000
	-			-		s cs		
1.727	0.355	0.000 0	.000 0.	000 0.00	0.00	0 0.000	0.000 1	4.323
CIPWNORN	I TOTAL	= 100.	010					
		****	******	******	******	**		
1	PARAMET	ERS FOR	CIPW N	ORMATIVE	E MINER	ALS		
HYPERSTI	HENE CO	MPOSITI	ON:EN	50.627	FS	49.373		
FELDSPA	R COMPO	SITION	:KFS	9.307	AB 64	.874 AN	25.82	0
PLAGIOC	LASE PE	RCENT A	NORTHIT	E 28.46	59			
QUARTZ	: FELDS	PAR RAT	IOS:					
QUARTZ	8.881	ORTHOC	LASE 8	.480 PI	LAGIOCL	ASE 82.	639	
QUARTZ	11.613	ORTHOC	LASE 11	.089 AL	BITE 77	.297		
CHAPPEL	S A/CNK	INDEX	0.674					
MG No.	IN CATI	ONS 4	4.59					
AFM PAR	AMETERS	: A = 0	.27 F =	0.50 M	= 0.23			
AFM PARI Jensen (
JENSEN	CATION	PLOT	A = 0.4		0.15 F			
JENSEN (CATION	PLOT	A = 0.4 TANORM.	0 M = 0	0.15 F	= 0.46	kp	wo
JENSEN (q	CATION	PLOT CA or	A = 0.4 TANORM. ab	0 M = (an	0.15 F lc	= 0.46	-	
JENSEN (q 5.230	CATION c 0.000	PLOT CA or 5.390	A = 0.4 TANORM. ab 39.882	0 M = (an	0.15 F 1c 0.000	= 0.46 ne 0.000	0.000	0.000
JENSEN , q 5,230 en	CATION c 0.000 fs	PLOT CA or 5.390 fo	A = 0.4 TANORM. ab 39.882 fa	0 M = (an 14.961 hy	0.15 F lc 0.000 ol	= 0.46 ne 0.000	0.000 mt	0.000 hm
JENSEN , q 5,230 en	CATION c 0.000 fs 8.880	PLOT CA or 5.390 fo 0.000	A = 0.4 TANORM. ab 39.882 fa 0.000	0 M = (an 14.961 hy 17.985	0.15 F lc 0.000 ol 0.000	= 0.46 ne 0.000 ac	0.000 mt 1.174	0.000 hm
JENSEN (q 5.230 en 9.105 il	CATION 0.000 fs 8.880 ap	PLOT CA or 5.390 fo 0.000 cm	A = 0.4 TANORM. 39.882 fa 0.000 tn	0 M = (an 14.961 hy 17.985 pf	0.15 F 1c 0.000 ol 0.000 ms k	= 0.46 ne 0.000 ac 0.000	0.000 mt 1.174 ru	0.000 hm 0.000 di
JENSEN q 5.230 en 9.105 il 1.272	CATION 0.000 fs 8.880 ap 0.314	PLOT CA or 5.390 fo 0.000 cm	A = 0.4 TANORM. 39.882 fa 0.000 tn .000 0.	0 M = (an 14.961 hy 17.985 pf	0.15 F 1c 0.000 ol 0.000 ms k	= 0.46 ne 0.000 ac 0.000 s cs	0.000 mt 1.174 ru	0.000 hm 0.000 di
JENSEN q 5.230 en 9.105 il 1.272	CATION 	PLOT CA or 5.390 fo 0.000 cm 0.000 0 L =100.	A = 0.4 TANORM. 39.882 fa 0.000 tn .000 0. 000	0 M = (an 14.961 hy 17.985 pf	0.15 F 0.000 ol 0.000 ns k 00 0.00	= 0.46 ne 0.000 ac 0.000 s cs 0 0.000	0.000 mt 1.174 ru	0.000 hm 0.000 di
JENSEN q 5.230 en 9.105 il 1.272 CATANO	CATION C 0.000 fs 8.880 ap 0.314 RM TOTA *****	PLOT CA or 5.390 fo 0.000 cm 0.000 0 L =100. *******	A = 0.4 TANORM. 39.882 fa 0.000 tn .000 0. 000 *******	0 M = (an 14.961 hy 17.985 pf 000 0.00	0.15 F lc 0.000 ol 0.000 ns k 00 0.00	= 0.46 ne 0.000 ac 0.000 s cs 0 0.000	0.000 mt 1.174 ru	0.000 hm 0.000 di
JENSEN q 5.230 en 9.105 il 1.272 CATANO	CATION C 0.000 fs 8.880 ap 0.314 RM TOTA ***** SONORM	PLOT CA or 5.390 fo 0.000 cm 0.000 0 L =100. ***********************************	A = 0.4 TANORM. ab 39.882 fa 0.000 tn .000 0. 000 *******	0 M = (an 14.961 hy 17.985 pf 000 0.00 *******	0.15 F 1c 0.000 ol 0.000 ms k 00 0.00 *******	= 0.46 ne 0.000 ac 0.000 s cs 0 0.000	0.000 mt 1.174 ru 0.00013	0.000 hm 0.000 di
JENSEN q 5.230 en 9.105 il 1.272 CATANO	CATION C 0.000 fs 8.880 ap 0.314 RM TOTA ***** SONORM	PLOT CA or 5.390 fo 0.000 cm 0.000 0 L =100. ***********************************	A = 0.4 TANORM. ab 39.882 fa 0.000 tn .000 0. 000 *******	0 M = (an 14.961 hy 17.985 pf 000 0.00 *******	0.15 F 1c 0.000 ol 0.000 ms k 00 0.00 *******	= 0.46 ne 0.000 ac 0.000 s cs 0 0.000	0.000 mt 1.174 ru 0.00013	0.000 hm 0.000 di .791
JENSEN q 5.230 en 9.105 il 1.272 CATANO 0 Ed	CATION C 0.000 fs 8.880 ap 0.314 RM TOTA ***** SONORM C	PLOT CA or 5.390 fo 0.000 cm 0.000 0 L =100. ******* (HUCHIS Or	A = 0.4 TANORM. ab 39.882 fa 0.000 tn .000 0. 000 ******* ONS ALG Ab	0 M = (an 14.961 hy 17.985 pf 000 0.00 ******* ORYTHM. An	D.15 F 1c 0.000 ol 0.000 ns k 00 0.00 *******) Lc	= 0.46 ne 0.000 ac 0.000 s cs 0 0.000	0.000 mt 1.174 ru 0.00013	0.000 hm 0.000 di .791 Act
JENSEN q 5.230 en 9.105 il 1.272 CATANO 0 Ed	CATION C 0.000 fs 8.880 ap 0.314 RM TOTA ***** SONORM C	PLOT CA or 5.390 fo 0.000 cm 0.000 0 L =100. ******* (HUCHIS Or	A = 0.4 TANORM. ab 39.882 fa 0.000 tn .000 0. 000 ******* ONS ALG Ab	0 M = (an 14.961 hy 17.985 pf 000 0.00 ******* ORYTHM. An	D.15 F 1c 0.000 ol 0.000 ns k 00 0.00 *******) Lc	= 0.46 ne 0.000 ac 0.000 s cs 0 0.000 * Ne Wo	0.000 mt 1.174 ru 0.00013	0.000 hm 0.000 di .791 Act
JENSEN q 5.230 en 9.105 il 1.272 CATANO CATANO Q Ed 6.42	CATION C 0.000 fs 8.880 ap 0.314 RM TOTA ***** SONORM C 0.00	PLOT CA or 5.390 fo 0.000 cm 0.000 0 L =100. ***********************************	A = 0.4 TANORM. ab 39.882 fa 0.000 tn .000 0. 000 ******* ONS ALG Ab	0 M = (an 14.961 hy 17.985 pf 000 0.00 ******* ORYTHM. An 96 0.0	D.15 F lc 0.000 ol 0.000 ms k 00 0.00 *******) Lc 00 0.1	= 0.46 ne 0.000 ac 0.000 s cs 0 0.000 * Ne Wc 00 0.0	0.000 mt 1.174 ru 0.00013 0 Ri	0.000 hm 0.000 di .791 Act 0.00
JENSEN q 5.230 en 9.105 il 1.272 CATANO CATANO Ed 6.42 0.00	CATION C 0.000 fs 8.880 ap 0.314 RM TOTA ***** SONORM C 0.00 Hy	PLOT CA or 5.390 fo 0.000 cm 0.000 0 L =100. ***********************************	A = 0.4 TANORM. ab 39.882 fa 0.000 tn .000 0. 000 ******* ONS ALG Ab	0 M = (an 14.961 hy 17.985 pf 000 0.00 ******* ORYTHM. An 96 0.0	D.15 F lc 0.000 ol 0.000 ms k 00 0.00 *******) Lc 00 0.1	= 0.46 ne 0.000 ac 0.000 s cs 0 0.000 * Ne Wo	0.000 mt 1.174 ru 0.00013 0 Ri	0.000 hm 0.000 di .791 Act 0.00
JENSEN (9 5.230 en 9.105 il 1.272 CATANO CATANO 2 Ed 6.42 0.00 Di HORNBLE	CATION 	PLOT CA or 5.390 fo 0.000 cm 0.000 0 L =100. ******* (HUCHIS Or 0.00 39 01	A = 0.4 TANORM. ab 39.882 fa 0.000 tn .000 0. 000 ******* ONS ALG Ab 9.88 14. (En	0 M = (an 14.961 hy 17.985 pf 000 0.00 ******* ORYTHM. An 296 0.0 Fs	D.15 F lc 0.000 ol 0.000 ns k 00 0.00 *******) Lc Fo	= 0.46 ne 0.000 ac 0.000 s cs 0 0.000 * Ne Wc 00 0.0 Fa)	0.000 mt 1.174 ru 0.00013 0 Ri 0 21.09 Mt	0.000 hm 0.000 di .791 Act 0.00 Hm
JENSEN (9 5.230 en 9.105 il 1.272 CATANO CATANO 2 Ed 6.42 0.00 Di HORNBLE	CATION 	PLOT CA or 5.390 fo 0.000 cm 0.000 0 L =100. ******* (HUCHIS Or 0.00 39 01	A = 0.4 TANORM. ab 39.882 fa 0.000 tn .000 0. 000 ******* ONS ALG Ab 9.88 14. (En	0 M = (an 14.961 hy 17.985 pf 000 0.00 ******* ORYTHM. An 296 0.0 Fs	D.15 F lc 0.000 ol 0.000 ns k 00 0.00 *******) Lc Fo	= 0.46 ne 0.000 ac 0.000 s cs 0 0.000 * Ne Wc 00 0.0	0.000 mt 1.174 ru 0.00013 0 Ri 0 21.09 Mt	0.000 hm 0.000 di .791 Act 0.00 Hm
JENSEN q 5.230 en 9.105 il 1.272 CATANO CATA	CATION 	PLOT CA or 5.390 fo 0.000 cm 0.000 0 L =100. ******* (HUCHIS Or 0.00 39 01 0.00 (A = 0.4 TANORM. ab 39.882 fa 0.000 tn .000 0. 000 ******* Ab 9.88 14. (En 0.00 0	0 M = (an 14.961 hy 17.985 pf 000 0.00 ******* ORYTHM. An 96 0.0 Fs .00 0.0	D.15 F 1c 0.000 ol 0.000 ns k 00 0.00 *******) Lc 00 0.1 Fo 00 0.	= 0.46 ne 0.000 ac 0.000 s cs 0 0.000 * Ne Wc 00 0.0 Fa) 00 1.1	0.000 mt 1.174 ru 0.00013 0 Ri 0 21.09 Mt 17 0.	0.000 hm 0.000 di .791 Act 0.00 Hm
JENSEN (9 5.230 en 9.105 il 1.272 CATANO CA	CATION C 0.000 fs 8.880 ap 0.314 RM TOTA ***** SONORM C 0.00 Hy NDE 5.63 Cm	PLOT CA or 5.390 fo 0.000 cm 0.000 0 L =100. ***********************************	A = 0.4 TANORM. ab 39.882 fa 0.000 tn .000 0. 000 ******* ONS ALG Ab 9.88 14. (En 0.00 0 Pf N	0 M = (an 14.961 hy 17.985 pf 000 0.00 ******* ORYTHM. An 296 0.0 Fs .00 0.0 S Ks	D.15 F lc 0.000 ol 0.000 ns k 00 0.00 *******) Lc 00 0.1 Fo 00 0. Cs	= 0.46 ne 0.000 ac 0.000 s cs 0 0.000 * Ne Wc 00 0.0 Fa) 00 1.5 Ru	0.000 mt 1.174 ru 0.00013 0 Ri 0 21.09 Mt 17 0. BIOTITE	0.000 hm 0.000 di .791 Act 0.00 Hm
JENSEN q 5.230 en 9.105 il 1.272 CATANO CATANO CATANO Di Ed 6.42 0.00 Di HORNBLE 0.00 21.089 Ap 0.35	CATION 	PLOT CA or 5.390 fo 0.000 cm 0.000 0 L =100. ******* (HUCHIS Or 0.00 39 01 0.00 (Tn 1.91 0	A = 0.4 TANORM. ab 39.882 fa 0.000 tn .000 0. 000 ******* ONS ALG Ab 9.88 14. (En 0.00 0 Pf N .00 0.	0 M = (an 14.961 hy 17.985 pf 000 0.00 ******* ORYTHM. An 296 0.0 Fs .00 0.0 S Ks	D.15 F lc 0.000 ol 0.000 ns k 00 0.00 *******) Lc 00 0.1 Fo 00 0. Cs	= 0.46 ne 0.000 ac 0.000 s cs 0 0.000 * Ne Wc 00 0.0 Fa) 00 1.1	0.000 mt 1.174 ru 0.00013 0 Ri 0 21.09 Mt 17 0. BIOTITE	0.000 hm 0.000 di .791 Act 0.00 Hm
JENSEN 0 9 5.230 en 9.105 il 1.272 CATANO CATANO Ed 6.42 0.00 Di HORNBLE 0.00 21.089 Ap 0.35 MESONOR	CATION 	PLOT CA or 5.390 fo 0.000 cm 0.000 0 L =100. ******* (HUCHIS Or 0.00 39 01 0.00 (Tn 1.91 0 = 10	A = 0.4 TANORM. ab 39.882 fa 0.000 tn .000 0. 000 ******* ONS ALG Ab 9.88 14. (En 0.00 0 Pf N .00 0. 0.039	0 M = (an 14.961 hy 17.985 pf 000 0.00 ******* ORYTHM. An 596 0.0 Fs .00 0.00 s Ks 00 0.00	D.15 F 1c 0.000 ol 0.000 ns k 00 0.00 *******) Lc 00 0.0 Fo 00 0.0 Cs 0 0.00	= 0.46 ne 0.000 ac 0.000 s cs 0 0.000 * Ne Wc 00 0.0 Fa) 00 1.5 Ru	0.000 mt 1.174 ru 0.00013 0 Ri 0 21.09 Mt 17 0. BIOTITE 8.624	0.000 hm 0.000 di .791 Act 0.00 Hm

PETRONORMS PROGRAM SAMPLE NUMBER RM27 OXIDES GIVEN RECALC 100% MOL PROPS CAT PROPS 0.945 0.945 SiO2 56.74 56.785 0.125 12.750 0.250 Al2O3 12.74 0.007 0.014 Fe2O3 1.10 1.101 0.124 0.124 FeO 8.89 8.897

0.150

MnO 0.15

0.130 0.130 MgO 5.24 5.244 0.165 CaO 9.24 9.247 0.165 0.069 4.303 0.139 Na2O 4.30 0.570 0.006 0.012 K2O 0.57 TiO2 0.81 0.812 0.010 0.010 0.001 0.002 P205 0.14 0.140 0.000 0.000 0.000 Cr203 0.00 TOTAL 99.92CIPW NORM.....

0.002

0.002

172

q c or ab an lc ne kp wo 2.528 0.000 3.371 36.411 13.788 0.000 0.000 0.000 0.000 en fs fo fa hy ol ac mt hm 7.930 6.638 0.000 0.000 14.568 0.000 0.000 1.596 0.000 il ap cm tn pf ns ks cs ru di 1.542 0.332 0.000 0.000 0.000 0.000 0.000 0.000 25.873 CIPWNORM TOTAL = 100.009

PARAMETERS FOR CIPW NORMATIVE MINERALS HYPERSTHENE COMPOSITION:EN 54.437 FS 45.563 FELDSPAR COMPOSITION :KFS 6.292 AB 67.969 AN 25.738 PLAGIOCLASE PERCENT ANORTHITE 27.467 QUARTZ : FELDSPAR RATIOS: QUARTZ 4.506 ORTHOCLASE 6.009 PLAGIOCLASE 89.485 QUARTZ 5.975 ORTHOCLASE 7.967 ALBITE 86.058 CHAPPELS A/CNK INDEX 0.520 MG NO. IN CATIONS 48.60

AFM PARAMETERS: A = 0.24 F = 0.49 M = 0.26 JENSEN CATION PLOT A = 0.37 M = 0.17 F = 0.45

... MESONORM (HUCHISONS ALGORYTHM...) Q C Or Ab An Lc Ne Wo Ri Act Ed 1.43 0.00 0.00 38.72 13.82 0.00 0.00 1.87 35.61 0.00 0.00 Hy Ol (En Fs Fo Fa) Mt Hm Di HORNBLENDE 0.00 0.00 0.00 0.00 0.00 0.00 1.15 0.00 35.605 \mathbf{Tn} Ар Cm Ρf Ns Ks Cs Ru BIOTITE Sp 0.33 0.00 1.70 0.00 0.00 0.00 0.00 0.00 5.404 MESONORM TOTAL = 100.037

PETRONOR SAMPLE N	TIMBER	RM28							
		RECALC	1008	MOL PI	POPS	CAT	PROPS		
	55.31		5.379		.922		0.922		173
	13.44		3.457		.132		0.264		
	1.24		1.242		.008		0.016		
	10.05		0.063		.140		0.140		
	0.17		0.170		.002		0.002		
	5.73		5.737		.142		0.142		
CaO	8.81		8.821		.157		0.157		
	3.10		3.104		.050		0.100		
	1.03		1.031		.011		0.022		
	0.85		0.856		.011		0.011		
	0.14				.001				
					.000		0.000		
TOTAL			0.000	0	.000		0.000		
IOIAL .	JJ.01								
			CTPW NO	RM					
		or		an				kn	wo
		6.094 2						-	0.000
		fo						mt	hr
		0.000							0.000
il		Cm							
	-	0.000 0.0	-						
		= 100.00		0 01000	0.00	0 0.0			
				*****	****	**			
PLAGIOCI	LASE PE	SITION : RCENT ANO	KFS 11 RTHITE		в 50	46.55 .411		37.89	1
PLAGIOCI QUARTZ QUARTZ QUARTZ CHAPPELS	LASE PE FELDS 6.909 10.674 5 A/CNK	RCENT ANO PAR RATIO ORTHOCLA ORTHOCLA INDEX 0	KFS 11 RTHITE S: SE 10. SE 16.8 .605	.698 A 42.910 889 PL	B 50 Agioc	.411 LASE	AN		1
PLAGIOCI QUARTZ QUARTZ QUARTZ CHAPPELS MG No. I AFM PARA	LASE PE FELDS 6.909 10.674 S A/CNK IN CATI AMETERS	RCENT ANO PAR RATIO ORTHOCLA ORTHOCLA	KFS 11 RTHITE S: SE 10. SE 16.8 .605 77 0 F = 0	.698 A 42.910 889 PL 24 ALBI	B 50 AGIOC TE 72	.411 LASE .502	AN 82.2		1
PLAGIOCI QUARTZ QUARTZ QUARTZ CHAPPELS MG No. 1 AFM PARA JENSEN (LASE PE FELDS 6.909 10.674 S A/CNK IN CATION	RCENT ANO PAR RATIO ORTHOCLA ORTHOCLA INDEX 0 ONS 47. : A = 0.2 PLOT A	KFS 11 RTHITE S: SE 10. SE 16.8 .605 77 0 F = 0 = 0.36	.698 A 42.910 889 PL 24 ALBI .53 M = M = 0.	B 50 AGIOC TE 72 0.27 17 F	.411 LASE .502	AN 82.2		1
PLAGIOCI QUARTZ QUARTZ QUARTZ CHAPPELS MG NO. I AFM PARA JENSEN (LASE PE FELDS 6.909 10.674 S A/CNK IN CATI AMETERS CATION	RCENT ANO PAR RATIO ORTHOCLA ORTHOCLA INDEX 0 ONS 47. : A = 0.2 PLOT A CATA	KFS 11 RTHITE S: SE 10. SE 16.8 .605 77 0 F = 0 = 0.36 NORM	.698 A 42.910 889 PL 24 ALBI .53 M = M = 0.	B 50 AGIOC TE 72 0.27 17 F 	.411 LASE .502 = 0.4	AN 82.2	01	
PLAGIOCI QUARTZ QUARTZ CHAPPELS MG NO. D AFM PARA JENSEN (LASE PE FELDS 6.909 10.674 S A/CNK IN CATI AMETERS CATION	RCENT ANO PAR RATIO ORTHOCLA ORTHOCLA INDEX O ONS 47. : A = 0.2 PLOT A CATA or	KFS 11 RTHITE S: SE 10. SE 16.8 .605 77 0 F = 0 = 0.36 NORM ab	.698 A 42.910 889 PL 24 ALBI .53 M = M = 0. an	B 50 AGIOC TE 72 0.27 17 F 1c	.411 LASE .502 = 0.4	AN 82.2 7 ne	01 kp	wo
PLAGIOCI QUARTZ QUARTZ CHAPPELS MG NO. D AFM PARA JENSEN (q 3.619	LASE PE FELDS 6.909 10.674 5 A/CNK IN CATI AMETERS CATION CATION CO.000	RCENT ANO PAR RATIO ORTHOCLA ORTHOCLA INDEX 0 ONS 47. : A = 0.2 PLOT A CATA or 6.157 2	KFS 11 RTHITE S: SE 10. SE 16.8 .605 77 0 F = 0 = 0.36 NORM ab 8.164 1	.698 A 42.910 889 PL 24 ALBI .53 M = M = 0. an 9.953	B 50 AGIOC TE 72 0.27 17 F 1c 0.000	.411 LASE .502 = 0.4	AN 82.2 7 ne 000 0	01 kp .000	wi 0.000
PLAGIOCI QUARTZ QUARTZ CHAPPELS MG NO. D AFM PARA JENSEN (LASE PE FELDS 6.909 10.674 5 A/CNK IN CATION AMETERS CATION CATION C 0.000 fs	RCENT ANO PAR RATIO ORTHOCLA ORTHOCLA INDEX 0 ONS 47. : A = 0.2 PLOT A CATA or 6.157 2 fo	KFS 11 RTHITE S: SE 10. SE 16.8 .605 77 0 F = 0 = 0.36 NORM ab 8.164 1 fa	.698 A 42.910 889 PL 24 ALBI M = 0. M = 0. an 9.953 hy	B 50 AGIOC TE 72 0.27 17 F lc 0.000 ol	.411 LASE .502 = 0.4	AN 82.2 7 ne 000 0 ac	01 kp .000 mt	wa 0.000 hi
PLAGIOCI QUARTZ QUARTZ CHAPPELS MG NO. I AFM PARA JENSEN (3.619 en 11.016	LASE PE FELDS 6.909 10.674 5 A/CNK IN CATION AMETERS CATION C 0.000 fs 9.595	RCENT ANO PAR RATIO ORTHOCLA ORTHOCLA INDEX 0 ONS 47. : A = 0.2 PLOT A CATA or 6.157 2 fo 0.000	KFS 11 RTHITE S: SE 10. SE 16.8 .605 77 0 F = 0 = 0.36 NORM ab 8.164 1 fa 0.000 2	$ \begin{array}{r} .698 \\ 42.910 \\ 889 \\ 24 \\ ALBI \\ M = 0. \\ \\ M = 0. \\ $	B 50 AGIOC TE 72 0.27 17 F 1c 0.000 01 0.000	.411 LASE .502 = 0.4 0.0	AN 82.2 7 ne 000 0 ac 000 1	01 kp .000 mt .312	w 0.00 h 0.00
PLAGIOCI QUARTZ QUARTZ QUARTZ CHAPPELS MG NO. I AFM PARA JENSEN (q 3.619 en 11.016 il	LASE PE FELDS 6.909 10.674 S A/CNK IN CATI AMETERS CATION C 0.000 fs 9.595 ap	RCENT ANO PAR RATIO ORTHOCLA ORTHOCLA INDEX 0 ONS 47. : A = 0.2 PLOT A CATA or 6.157 2 fo 0.000 cm	KFS 11 RTHITE S: SE 10. SE 16.8 .605 77 0 F = 0 = 0.36 NORM ab 8.164 1 fa 0.000 2 tn p	.698 A 42.910 889 PL 24 ALBI M = 0. M = 0. an 9.953 hy 0.611 of ns	B 50 AGIOC TE 72 0.27 17 F 10.000 01 0.000 k	.411 LASE .502 = 0.4 0.0 0.0	AN 82.2 7 ne 000 0 ac 000 1 cs	01 kp .000 mt .312 ru	w 0.00 h 0.00 di
PLAGIOCI QUARTZ QUARTZ CHAPPELS MG NO. 1 AFM PARA JENSEN (3.619 en 11.016 il 1.205	LASE PE FELDS 6.909 10.674 S A/CNK IN CATI AMETERS CATION C 0.000 fs 9.595 ap 0.296	RCENT ANO PAR RATIO ORTHOCLA ORTHOCLA INDEX 0 ONS 47. : A = 0.2 PLOT A CATA or 6.157 2 fo 0.000 cm 0.000 0.0	KFS 11 RTHITE S: SE 10. SE 16.8 .605 77 0 F = 0 = 0.36 NORM ab 8.164 1 fa 0.000 2 tn p 00 0.00	.698 A 42.910 889 PL 24 ALBI M = 0. M = 0. an 9.953 hy 0.611 of ns	B 50 AGIOC TE 72 0.27 17 F 10.000 01 0.000 k	.411 LASE .502 = 0.4 0.0 0.0	AN 82.2 7 ne 000 0 ac 000 1 cs	01 kp .000 mt .312 ru	w 0.00 h 0.00 di
PLAGIOCI QUARTZ QUARTZ CHAPPELS MG NO. 1 AFM PARA JENSEN (3.619 en 11.016 il 1.205	LASE PE FELDS 6.909 10.674 5 A/CNK IN CATI AMETERS CATION C 0.000 fs 9.595 ap 0.296 CM TOTA	RCENT ANO PAR RATIO ORTHOCLA ORTHOCLA INDEX 0 ONS 47. : A = 0.2 PLOT A CATA or 6.157 2 fo 0.000 cm 0.000 0.0 L =100.00	KFS 11 RTHITE S: SE 10. SE 16.8 .605 77 0 F = 0 = 0.36 NORM ab 8.164 1 fa 0.000 2 tn p 00 0.00 0	.698 A 42.910 889 PL 24 ALBI M = 0. M = 0. an 9.953 hy 0.611 f ns 0.000	B 50 AGIOC TE 72 0.27 17 F 10 0.000 01 0.000 k 0.000	.411 LASE .502 = 0.4 0.0 0.0 0.0	AN 82.2 7 ne 000 0 ac 000 1 cs	01 kp .000 mt .312 ru	w 0.00 h 0.00 di
PLAGIOCI QUARTZ QUARTZ QUARTZ CHAPPELS MG NO. D AFM PARA JENSEN (3.619 en 11.016 il 1.205 CATANOR	LASE PE FELDS 6.909 10.674 5 A/CNK IN CATI AMETERS CATION C 0.000 fs 9.595 ap 0.296 CM TOTA *****	RCENT ANO PAR RATIO ORTHOCLA ORTHOCLA INDEX 0 ONS 47. : A = 0.2 PLOT A CATA or 6.157 2 fo 0.000 cm 0.000 0.0 L =100.00 ********	KFS 11 RTHITE S: SE 10. SE 16.8 .605 77 0 F = 0 = 0.36 NORM ab 8.164 1 fa 0.000 2 tn p 00 0.00 0 *******	.698 A 42.910 889 PL 24 ALBI M = 0. an 9.953 hy 0.611 of ns 0 0.000	B 50 AGIOC TE 72 0.27 17 F 10 0.000 01 0.000 k 0.000 k 0.000	.411 LASE .502 = 0.4 0.0 0.0 0.0	AN 82.2 7 ne 000 0 ac 000 1 cs	01 kp .000 mt .312 ru	ww 0.000 hi 0.000 di
PLAGIOCI QUARTZ QUARTZ CHAPPELS MG NO. D AFM PARA JENSEN (3.619 en 11.016 il 1.205 CATANOP	LASE PE FELDS 6.909 10.674 5 A/CNK IN CATI AMETERS CATION 0.000 fs 9.595 ap 0.296 CM TOTA *****	RCENT ANO PAR RATIO ORTHOCLA ORTHOCLA INDEX 0 ONS 47. : A = 0.2 PLOT A CATA or 6.157 2 fo 0.000 cm 0.000 0.0 L =100.00 ********	KFS 11 RTHITE S: SE 10. SE 16.8 .605 77 0 F = 0 = 0.36 NORM ab 8.164 1 fa 0.000 2 tn p 00 0.00 0 *******	.698 A 42.910 889 PL 24 ALBI .24 ALBI	B 50 AGIOC TE 72 0.27 17 F 1c 0.000 01 0.000 k 0.000 k *****	.411 LASE .502 = 0.4 0.0 0.0 0.0 \$ 0.0	AN 82.2 7 ne 000 0 ac 000 1 cs 000 0.	kp .000 mt .312 ru 00018	w 0.00 h 0.00 di .682
PLAGIOCI QUARTZ QUARTZ QUARTZ CHAPPELS MG NO. 1 AFM PARA JENSEN (3.619 en 11.016 il 1.205 CATANON MES Q	LASE PE FELDS 6.909 10.674 5 A/CNK IN CATI AMETERS CATION 0.000 fs 9.595 ap 0.296 CM TOTA *****	RCENT ANO PAR RATIO ORTHOCLA ORTHOCLA INDEX 0 ONS 47. : A = 0.2 PLOT A CATA or 6.157 2 fo 0.000 cm 0.000 0.0 L =100.00 ********	KFS 11 RTHITE S: SE 10. SE 16.8 .605 77 0 F = 0 = 0.36 NORM ab 8.164 1 fa 0.000 2 tn p 00 0.00 0 *******	.698 A 42.910 889 PL 24 ALBI .24 ALBI	B 50 AGIOC TE 72 0.27 17 F 1c 0.000 01 0.000 k 0.000 k *****	.411 LASE .502 = 0.4 0.0 0.0 0.0 \$ 0.0	AN 82.2 7 ne 000 0 ac 000 1 cs 000 0.	kp .000 mt .312 ru 00018	w 0.00 h 0.00 di .682
PLAGIOCI QUARTZ QUARTZ QUARTZ CHAPPELS MG NO. 1 AFM PARA JENSEN (3.619 en 11.016 il 1.205 CATANON MES Q Ed	LASE PE FELDS 6.909 10.674 S A/CNK IN CATI AMETERS CATION C 0.000 fs 9.595 ap 0.296 C TOTA **** SONORM C	RCENT ANO PAR RATIO ORTHOCLA ORTHOCLA INDEX 0 ONS 47. : A = 0.2 PLOT A CATA or 6.157 2 fo 0.000 cm 0.000 0.0 L =100.00 ******** (HUCHISON Or Ab	KFS 11 RTHITE S: SE 10. SE 16.8 .605 77 0 F 0 F 0 F 0 F 0 F 0 F 0 F 0.00 2 tn p 00 0.000 ******** S ALGOR An		B 50 AGIOC TE 72 0.27 17 F 0.000 ol 0.000 k 0.000 k 0.000	.411 LASE .502 = 0.4 0.0 0.0 s 0 0.0 * Ne	AN 82.2 7 ne 000 0 ac 000 1 cs 000 0. Wo	01 kp .000 mt .312 ru 00018 Ri	ww 0.000 hi 0.000 di .682 Act
PLAGIOCI QUARTZ QUARTZ QUARTZ CHAPPELS MG NO. D AFM PARA JENSEN (3.619 en 11.016 il 1.205 CATANOF MES Q Ed 4.68	LASE PE FELDS 6.909 10.674 S A/CNK IN CATI AMETERS CATION C 0.000 fs 9.595 ap 0.296 C TOTA **** SONORM C	RCENT ANO PAR RATIO ORTHOCLA ORTHOCLA INDEX 0 ONS 47. : A = 0.2 PLOT A CATA or 6.157 2 fo 0.000 cm 0.000 0.0 L =100.00 ********	KFS 11 RTHITE S: SE 10. SE 16.8 .605 77 0 F 0 F 0 F 0 F 0 F 0 F 0 F 0.00 2 tn p 00 0.000 ******** S ALGOR An		B 50 AGIOC TE 72 0.27 17 F 0.000 ol 0.000 k 0.000 k 0.000	.411 LASE .502 = 0.4 0.0 0.0 s 0 0.0 * Ne	AN 82.2 7 ne 000 0 ac 000 1 cs 000 0. Wo	01 kp .000 mt .312 ru 00018 Ri	ww 0.000 hi 0.000 di .682 Act
PLAGIOCI QUARTZ QUARTZ QUARTZ CHAPPELS MG NO. D AFM PARA JENSEN (3.619 en 11.016 il 1.205 CATANON MES Q Ed 4.68 0.00	LASE PE FELDS 6.909 10.674 5 A/CNK IN CATION AMETERS CATION 0.000 fs 9.595 ap 0.296 RM TOTA ***** SONORM C 0.000	RCENT ANO PAR RATIO ORTHOCLA ORTHOCLA INDEX 0 ONS 47. : A = 0.2 PLOT A CATA or 6.157 2 fo 0.000 cm 0.000 0.0 L =100.00 ******** (HUCHISON Or Ab 0.000 28.5	KFS 11 RTHITE S: SE 10. SE 16.8 .605 77 0 F = 0 = 0.36 NORM ab 8.164 1 fa 0.000 2 tn p 00 0.00 0 ******* S ALGOR 16 19.95	.698 A 42.910 889 PL 24 ALBI .53 M = M = 0. an 9.953 hy 0.611 of ns 0.000 ******* XTHM LC 5 0.00	B 50 AGIOC TE 72 0.27 17 F 10 0.000 01 0.000 k 0.000 k 0.000 k 0.000	.411 LASE .502 = 0.4 0.0 0.0 5 0 0.0 * Ne 00	AN 82.2 7 ne 000 0 ac 000 1 cs 000 0. Wo 0.00	kp .000 mt .312 ru 00018 Ri 30.51	w 0.000 h 0.000 di .682 Act 0.0
PLAGIOCI QUARTZ QUARTZ QUARTZ CHAPPELS MG NO. D AFM PARA JENSEN (3.619 en 11.016 il 1.205 CATANON MES Q Ed 4.68 0.00 Di	LASE PE FELDS 6.909 10.674 5 A/CNK IN CATION AMETERS CATION 0.000 fs 9.595 ap 0.296 CM TOTA ***** SONORM C 0.000 Hy	RCENT ANO PAR RATIO ORTHOCLA ORTHOCLA INDEX 0 ONS 47. : A = 0.2 PLOT A CATA or 6.157 2 fo 0.000 cm 0.000 0.0 L =100.00 ******** (HUCHISON Or Ab	KFS 11 RTHITE S: SE 10. SE 16.8 .605 77 0 F = 0 = 0.36 NORM ab 8.164 1 fa 0.000 2 tn p 00 0.00 0 ******* S ALGOR 16 19.95	.698 A 42.910 889 PL 24 ALBI .53 M = M = 0. an 9.953 hy 0.611 of ns 0.000 ******* XTHM LC 5 0.00	B 50 AGIOC TE 72 0.27 17 F 10 0.000 01 0.000 k 0.000 k 0.000 k 0.000	.411 LASE .502 = 0.4 0.0 0.0 5 0 0.0 * Ne 00	AN 82.2 7 ne 000 0 ac 000 1 cs 000 0. Wo 0.00	kp .000 mt .312 ru 00018 Ri 30.51	w 0.000 h 0.000 di .682 Act 0.0
PLAGIOCI QUARTZ QUARTZ QUARTZ CHAPPELS MG NO. D AFM PARA JENSEN (3.619 en 11.016 il 1.205 CATANON MES Q Ed 4.68 0.00 Di HORNBLEN	LASE PE FELDS 6.909 10.674 5 A/CNK IN CATION AMETERS CATION 0.000 fs 9.595 ap 0.296 CM TOTA ***** SONORM C 0.000 Hy NDE	RCENT ANO PAR RATIO ORTHOCLA ORTHOCLA INDEX 0 ONS 47. : A = 0.2 PLOT A CATA or 6.157 2 fo 0.000 cm 0.000 0.0 L =100.00 ********* (HUCHISON Or Ab 0.00 28.2 Ol (E	KFS 11 RTHITE S: SE 10. SE 16.8 .605 77 0 F = 0 = 0.36 NORM ab 8.164 1 fa 0.000 2 tn p 00 0.000 0 ******* S ALGOR 16 19.95 n Fs	.698 A 42.910 889 PL 24 ALBI .24 ALBI	B 50 AGIOC TE 72 0.27 17 F 10.000 01 0.000 k 0.000 k 0.000 k 0.000	.411 LASE .502 = 0.4 0.0 0.0 5 0 0.0 * Ne 00 Fa)	AN 82.2 7 ne 000 0 ac 000 1 cs 000 0. Wo 0.00 M	kp .000 mt .312 ru 00018 Ri 30.51	ww 0.000 hn 0.000 di .682 Act 0.0 Hm
PLAGIOCI QUARTZ QUARTZ QUARTZ CHAPPELS MG NO. 1 AFM PARA JENSEN (3.619 en 11.016 i1 1.205 CATANON CATANON Ed 4.68 0.00 Di HORNBLEN 0.00	LASE PE FELDS 6.909 10.674 5 A/CNK IN CATION AMETERS CATION 0.000 fs 9.595 ap 0.296 CM TOTA ***** SONORM C 0.000 Hy NDE	RCENT ANO PAR RATIO ORTHOCLA ORTHOCLA INDEX 0 ONS 47. : A = 0.2 PLOT A CATA or 6.157 2 fo 0.000 cm 0.000 0.0 L =100.00 ******** (HUCHISON Or Ab 0.000 28.5	KFS 11 RTHITE S: SE 10. SE 16.8 .605 77 0 F = 0 = 0.36 NORM ab 8.164 1 fa 0.000 2 tn p 00 0.000 0 ******* S ALGOR 16 19.95 n Fs	.698 A 42.910 889 PL 24 ALBI .24 ALBI	B 50 AGIOC TE 72 0.27 17 F 10.000 01 0.000 k 0.000 k 0.000 k 0.000	.411 LASE .502 = 0.4 0.0 0.0 5 0 0.0 * Ne 00 Fa)	AN 82.2 7 ne 000 0 ac 000 1 cs 000 0. Wo 0.00 M	kp .000 mt .312 ru 00018 Ri 30.51	wa 0.000 hi 0.000 di .682 Act 0.0 Hm
PLAGIOCI QUARTZ QUARTZ QUARTZ CHAPPELS MG NO. D AFM PARA JENSEN (3.619 en 11.016 i1 1.205 CATANON CATANON Ed 4.68 0.00 Di HORNBLEN 0.00 30.510	LASE PE FELDS 6.909 10.674 S A/CNK IN CATI AMETERS CATION 0.000 fs 9.595 ap 0.296 RM TOTA ***** SONORM C 0.000 Hy NDE 3.43	RCENT ANO PAR RATIO ORTHOCLA ORTHOCLA INDEX O ONS 47. : A = 0.2 PLOT A CATA or 6.157 2 fo 0.000 cm 0.000 0.0 L =100.00 ******** (HUCHISON Or Ab 0.00 28.1 01 (E 0.00 0.4	KFS 11 RTHITE S: SE 10. SE 16.8 .605 77 0 F = 0 = 0.36 NORM ab 8.164 1 fa 0.000 2 tn p 00 0.00 0 ******* S ALGOR 0 An 16 19.95 n Fs 00 0.0	698 A 42.910 889 PL 24 ALBI M = 0. 9.953 hy 0.611 of ns 0.0611 of ns 0.000 ******* SYTHM 5 0.00 5 0.00	B 50 AGIOC TE 72 0.27 17 F 0.000 01 0.000 k 0 k	.411 LASE .502 = 0.4 0.0 0.0 0 0.0 * Ne 00 Fa) 00	AN 82.2 87 900 0 ac 900 1 cs 900 0. 000 0. Wo 0.00 Mo 1.31	01 kp .000 mt .312 ru 00018 Ri 30.51 It 0.	wa 0.000 hr 0.000 di .682 Act 0.0 Hm
PLAGIOCI QUARTZ QUARTZ QUARTZ CHAPPELS MG NO. D AFM PARA JENSEN (3.619 en 11.016 il 1.205 CATANON MES Q Ed 4.68 0.00 Di HORNBLEN 0.00 30.510 Ap	LASE PE FELDS 6.909 10.674 5 A/CNK IN CATI AMETERS CATION 0.000 fs 9.595 ap 0.296 CM TOTA ***** SONORM C 0.000 Hy NDE 3.43 Cm	RCENT ANO PAR RATIO ORTHOCLA ORTHOCLA INDEX 0 ONS 47. : A = 0.2 PLOT A CATA or 6.157 2 fo 0.000 cm 0.000 0.0 L = 100.00 ********* (HUCHISON Or Ab 0.000 28.5 01 (E) 0.000 0.4 Tn Pf	KFS 11 RTHITE S: SE 10. SE 16.8 .605 77 0 F 0 F 0 F 0 F 0 F 0 F 0 F 0 F 0 F 0.000 2 tn p 00 0.000 ******* S ALGOR An 16 19.95 n Fs 00 0.0 Ns	698 A 42.910 889 PL 24 ALBI 	<pre>B 50 AGIOC TE 72 0.27 17 F 0.000 k 0.000 k 0.000 k 0.000 c 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0.</pre>	.411 LASE .502 = 0.4 0.0 0.0 0 0.0 * Ne 00 Fa) 00 Ru	AN 82.2 7 ne 000 0 ac 000 1 cs 000 0. 000 0. Wo 0.00 Mo 1.31 1.31	01 kp .000 mt .312 ru 00018 Ri 30.51 It 0. 0TITE	wa 0.000 hr 0.000 di .682 Act 0.0 Hm
PLAGIOCI QUARTZ QUARTZ QUARTZ CHAPPELS MG NO. D AFM PARA JENSEN (3.619 en 11.016 il 1.205 CATANON MES Q Ed 4.68 0.00 Di HORNBLEN 0.00 30.510 Ap 0.33	LASE PE FELDS 6.909 10.674 5 A/CNK IN CATI AMETERS CATION 0.000 fs 9.595 ap 0.296 CM TOTA ***** SONORM C 0.000 Hy NDE 3.43 Cm 0.000	RCENT ANO PAR RATIO ORTHOCLA ORTHOCLA INDEX O ONS 47. : A = 0.2 PLOT A CATA or 6.157 2 fo 0.000 cm 0.000 0.0 L =100.00 ******** (HUCHISON Or Ab 0.00 28.1 01 (E 0.00 0.4	KFS 11 RTHITE S: SE 10. SE 16.8 .605 77 0 F 0 F 0 F 0 F 0 F 0 F 0 F 0 F 0 O 8.164 1 fa 0.000 0 0.000 ******* S S ALGOR n Fs 00 0.0 Ns 0 0 0.00	698 A 42.910 889 PL 24 ALBI 	<pre>B 50 AGIOC TE 72 0.27 17 F 0.000 k 0.000 k 0.000 k 0.000 c 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0.</pre>	.411 LASE .502 = 0.4 0.0 0.0 0 0.0 * Ne 00 Fa) 00 Ru	AN 82.2 7 ne 000 0 ac 000 1 cs 000 0. 000 0. Wo 0.00 Mo 1.31 1.31	01 kp .000 mt .312 ru 00018 Ri 30.51 It 0. 0TITE	wa 0.000 hi 0.000 di .682 Act 0.0 Hm

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		MS PRO UMBER									
				ALC 10) 0%	MOL	PROPS	CAT	PRO	PS	
		56.85			70		0.945		0.9		174
Al	203	13.06					0.128		0.2	56	
		1.17		1.1			0.007		0.0	15	
		9.44		9.4	27		0.131		0.1	31	
		0.16		0.1	160		0.002		0.0	02	
		5.74		5.7	732		0.142		0.1	42	
	-	8.54			528		0.152		0.1	52	
		3.48		3.4	175		0.056		0.1	12	
		0.71		0.7	709		0.008		0.0	15	
		0.85		0.8	349		0.011		0.0	11	
		0.14			140		0.001		0.0	02	
		0.00			000		0.000		0.0		
		100.14									
				cII	W NOR	м					
	q	с	0	r	ab	an	lc		ne	kŗ	o wo
5.					403 17	.892	0.000	0.0	000	0.000	0.000
	en	fs	f	0	fa	hy	ol		ac	mt	: hn
10.	947	8.892	0.00	0 0.0	000 19	.840	0.000	0.0	000	1.694	0.000
	il	ap	cm	tn	pf	1	ns k	s	cs	ru	di
1.											19.486
CIPW	NORN	TOTAL	= 100	.009							
			****	*****	*****	****	******	**			
	r	DARAMET	ERS FO	R CIP	W NORM	ATTV	E MINEF	DT.S			
PLAG QUAR	SPAF IOCI TZ :	R COMPO LASE PE : FELDS	SITION RCENT	:KF ANORT TIOS:	S 8. HITE	137 37.8		.110	AN		752
PLAG QUAR QUAR QUAR CHAP	SPAF IOCI TZ TZ TZ PELS	R COMPO LASE PE : FELDS 9.746	SITION RCENT PAR RA ORTHO ORTHO INDEX	:KF ANORT TIOS: CLASE CLASE 0.5	S 8. HITE 7.34 10.70	137 37.8 4 P	AB 57	.110 ASE	AN 82.		752
PLAG QUAR QUAR QUAR CHAP MG N	SPAF IOCI TZ TZ TZ PELS	R COMPO LASE PE FELDS 9.746 14.200 S A/CNK IN CATI	SITION RCENT PAR RA ORTHO ORTHO INDEX ONS	:KF ANORT TIOS: CLASE CLASE 0.5 49.37	S 8. HITE 7.34 10.70 93	137 37.8 4 P 1 AL	AB 57 31 LAGIOCI BITE 75	.110 ASE	AN 82.		752
PLAG QUAR QUAR QUAR CHAP MG N AFM	SPAF IOCI TZ TZ PELS O. J	COMPO LASE PE FELDS 9.746 14.200 ALCOM S A/CNK IN CATI	SITION RCENT PAR RA ORTHO ORTHO INDEX ONS : A =	:KF ANORT TIOS: CLASE CLASE 0.5 49.37	S 8. HITE 7.34 10.70 93 F = 0.	137 37.8 4 P 1 AL 51 M	AB 57 31 LAGIOCI BITE 75 = 0.28	ASE	AN 82.		752
PLAG QUAR QUAR QUAR CHAP MG N AFM	SPAF IOCI TZ TZ PELS O. J	COMPO LASE PE FELDS 9.746 14.200 ALCOM S A/CNK IN CATI	SITION RCENT PAR RA ORTHO ORTHO INDEX ONS : A =	:KF ANORT TIOS: CLASE CLASE 0.5 49.37	S 8. HITE 7.34 10.70 93 F = 0.	137 37.8 4 P 1 AL 51 M	AB 57 31 LAGIOCI BITE 75	ASE	AN 82.		752
PLAG QUAR QUAR QUAR CHAP MG N AFM	SPAF IOCI TZ TZ PELS O. J PARJ EN (R COMPO LASE PE : FELDS 9.746 14.200 5 A/CNK IN CATI AMETERS CATION	SITION RCENT PAR RA ORTHO ORTHO INDEX ONS : A = PLOT	:KF: ANORT TIOS: CLASE CLASE 0.5 49.37 0.21 A = 0	S 8. HITE 7.34 10.70 93 F = 0. 0.36	137 37.8 4 P 1 AL 51 M M = 0	AB 57 31 LAGIOCI BITE 75 = 0.28 0.18 F	ASE	AN 82.		752
PLAG QUAR QUAR QUAR CHAP MG N AFM	SPAF IOCI TZ TZ PELS O. J PARI EN (R COMPO LASE PE FELDS 9.746 14.200 S A/CNK IN CATI AMETERS CATION	SITION RCENT PAR RA ORTHO ORTHO INDEX ONS : A = PLOT C	:KF: ANORT) TIOS: CLASE CLASE 0.5 49.37 0.21 A = 0	S 8. HITE 7.34 10.70 93 F = 0. 0.36 RM	137 37.83 4 P2 1 AL3 51 M M = 0	AB 57 31 LAGIOCI BITE 75 = 0.28 0.18 F	.110 ASE .099 = 0.	AN 82. 46	909	
PLAG QUAR QUAR QUAR CHAP MG N AFM JENS	SPAF IOCI TZ TZ PELS O. J PARA EN (R COMPO LASE PE FELDS 9.746 14.200 S A/CNK IN CATI AMETERS CATION	SITION RCENT PAR RA ORTHO ORTHO INDEX ONS : A = PLOT C	:KF: ANORT TIOS: CLASE CLASE 0.5 49.37 0.21 A = 0 A = 0	S 8. HITE 7.34 10.70 93 F = 0. 0.36 RM ab	137 37.83 4 P2 1 AL3 51 M M = 0 	AB 57 31 LAGIOCI BITE 75 = 0.28 0.18 F 	.110 ASE .099 = 0.	AN 82. 46 ne	909 ki	
PLAG QUAR QUAR QUAR CHAP MG N AFM JENS	SPAF IOCI TZ TZ PELS O. J PAR EN (190	COMPO CASE PE FELDS 9.746 14.200 S A/CNK IN CATI AMETERS CATION	SITION RCENT PAR RA ORTHO ORTHO INDEX ONS : A = PLOT C o 4.22	:KF: ANORT TIOS: CLASE CLASE 0.5 49.37 0.21 A = 0 A = 0 A = 0 CATANO	S 8. HITE 7.34 10.70 93 F = 0. 0.36 RM ab 448 18	137 37.8 4 P 1 AL 51 M M = 0 an .037	AB 57 31 LAGIOCI BITE 75 = 0.28 0.18 F 10 0.000	ASE .099 = 0.	AN 82. 46 ne 000	909 kı	р wa
PLAG QUAR QUAR QUAR CHAP MG N AFM JENS	SPAF IOCI TZ TZ PELS O. J PAR EN (190 en	COMPO CASE PE FELDS 9.746 14.200 5 A/CNK IN CATI AMETERS CATION 0.000 fs	SITION RCENT PAR RA ORTHO ORTHO INDEX ONS : A = PLOT C o 4.22 f	:KF: ANORTITIOS: CLASE CLASE 0.5 49.37 0.21 A = 0 A = 0	S 8. HITE 7.34 10.70 93 F = 0. 0.36 RM ab 448 18 fa	137 37.8 4 P 1 AL 51 M M = 0 an .037 hy	AB 57 31 LAGIOCI BITE 75 = 0.28 0.18 F 0.000 0.000	.110 ASE .099 = 0.	AN 82. 46 ne 000 ac	909 kr 0.000 mt	p wa 0 0.000 t hr
PLAG QUAR QUAR QUAR CHAP MG N AFM JENS	SPAF IOCI TZ TZ TZ PELS O. J PARA EN (190 en 723	R COMPO LASE PE : FELDS 9.746 14.200 5 A/CNK IN CATI AMETERS CATION 	SITION RCENT PAR RA ORTHO ORTHO INDEX ONS : A = PLOT C o 4.22 f 0.00	:KF: ANORT TIOS: CLASE CLASE 0.5 49.37 0.21 A = 0 ATANO r 2 31. 0 0 0.0	S 8. HITE 7.34 10.70 93 F = 0. 0.36 RM ab 448 18 fa 000 19	137 37.8 4 P 1 AL 51 M M = 0 an .037 hy .433	AB 57 31 LAGIOCI BITE 75 = 0.28 0.18 F 0.000 0.000	.110 ASE .099 = 0.	AN 82. 46 ne 000 ac 000	909 kj 0.000 mt 1.233	0 wa 0 0.000 t hr 1 0.000
PLAG QUAR QUAR CHAP MG N AFM JENS 5.	SPAF IOCI TZ TZ PELS O. J PARA EN (190 en 723 il	<pre> COMPO CASE PE FELDS 9.746 14.200 S A/CNK IN CATI AMETERS CATION </pre>	SITION RCENT PAR RA ORTHO ORTHO INDEX ONS : A = PLOT C 6 4.22 f 0.00 cm	:KF: ANORT TIOS: CLASE CLASE 0.5 49.37 0.21 A = 0 A = 0 ATANO r 2 31.0 0 0.0 tn	S 8. HITE 7.34 10.70 93 F = 0. 0.36 RM ab 448 18 fa 900 19 pf	137 37.8 4 P 1 AL 51 M M = 0 an .037 hy .433	AB 57 31 LAGIOCI BITE 75 = 0.28 0.18 F 0.000 0.000 0.000	.110 ASE .099 = 0.	AN 82. 46 ne 000 ac 000 cs	909 kr 0.000 mt 1.233 ru	o wa 0 0.000 t hr 1 0.000 di
PLAG QUAR QUAR QUAR CHAP MG N AFM JENS 5. 10.	SPAF IOCI TZ TZ TZ PELS O PAR EN (190 en 723 il 193	<pre> COMPO LASE PE FELDS 9.746 14.200 A/CNK IN CATI AMETERS CATION</pre>	SITION RCENT PAR RA ORTHO ORTHO INDEX ONS : A = PLOT C o 4.22 f 0.000 cm 0.000	:KF: ANORT TIOS: CLASE CLASE 0.5 49.37 0.21 A = 0 ATANO r 2 31. 0 0 0.0 tn 0.000	S 8. HITE 7.34 10.70 93 F = 0. 0.36 RM ab 448 18 fa 900 19 pf	137 37.8 4 P 1 AL 51 M M = 0 an .037 hy .433	AB 57 31 LAGIOCI BITE 75 = 0.28 0.18 F 0.000 0.000	.110 ASE .099 = 0.	AN 82. 46 ne 000 ac 000 cs	909 kr 0.000 mt 1.233 ru	o wa 0 0.000 t hr 1 0.000 di
PLAG QUAR QUAR QUAR CHAP MG N AFM JENS 5. 10.	SPAF IOCI TZ TZ TZ PELS O PAR EN (190 en 723 il 193	R COMPO LASE PE FELDS 9.746 14.200 S A/CNK IN AMETERS CATION CATION C 0.000 fs 8.710 ap 0.295 IN	SITION RCENT PAR RA ORTHO ORTHO INDEX ONS : A = PLOT C o 4.22 f 0.000 cm 0.000 L =100	:KF: ANORT TIOS: CLASE CLASE 0.5 49.37 0.21 A = 0 A = 0 A = 0 CATANO F 2 31. 0 0 0. tn 0.000 .000	S 8. HITE 7.34 10.70 93 F = 0. 0.36 RM ab 448 18 fa 000 19 pf 0.000	137 37.8 4 P 1 AL 51 M M = an .037 hy .433 0.0	AB 57 31 LAGIOCI BITE 75 = 0.28 0.18 F 0.000 0.000 0.000 ns 3 00 0.000	.110 ASE .099 = 0.	AN 82. 46 ne 000 ac 000 cs	909 kr 0.000 mt 1.233 ru	o wa 0 0.000 t hi 1 0.000 di
PLAG QUAR QUAR QUAR CHAP MG N AFM JENS 5. 10. 1. CAT	SPAF IOCI TZ TZ PELS O. J PAR EN (190 en 723 il 193 ANOF	<pre> COMPO CASE PE FELDS 9.746 14.200 5 A/CNK IN CATI AMETERS CATION 0.000 fs 8.710 ap 0.295 RM TOTA *****</pre>	SITION RCENT PAR RA ORTHO ORTHO INDEX ONS : A = PLOT C 0.00 cm 0.000 L =100 ******	:KF: ANORT TIOS: CLASE CLASE 0.5 49.37 0.21 A = 0 A = 0 ATANO C C A = 0 C ATANO C C A = 0 C A A = 0 C A C A C A C A C A S A C A S A C A S A C A S A C A S A S	S 8. HITE 7.34 10.70 93 F = 0. 0.36 RM 448 18 fa 000 19 pf 0.000	137 37.8 4 P 1 AL 51 M M = an .037 hy .433 0.0	AB 57 31 LAGIOCI BITE 75 = 0.28 0.18 F 0.000 0.000 0.000 ns 10 0.000	.110 ASE .099 = 0.	AN 82. 46 ne 000 ac 000 cs	909 kr 0.000 mt 1.233 ru	o wa 0 0.000 t hr 1 0.000 di
PLAG QUAR QUAR QUAR CHAP MG N AFM JENS 5. 10. 1. CAT	SPAF IOCI TZ TZ PELS O. J PARA EN (PARA EN (190 en 723 il 193 ANOF	R COMPO LASE PE : FELDS 9.746 14.200 S A/CNK IN CATI AMETERS CATION	SITION RCENT PAR RA ORTHO ORTHO INDEX ONS : A = PLOT C 6 4.22 f 0.00 cm 0.000 L =100 ****** (HUCHI	:KF: ANORT TIOS: CLASE CLASE CLASE 0.5 49.37 0.21 A = 0 ATANO r 2 31. 0 0 0.0 tn 0.000 *****	S 8. HITE 7.34 10.70 93 F = 0. 0.36 RM ab 448 18 fa 000 19 pf 0.000 ******	137 37.8 4 P 1 AL 51 M M = an .037 hy .433 0.0	AB 57 31 LAGIOCI BITE 75 = 0.28 0.18 F 0.000 0.000 0.000 ns 1 00 0.000	.110 ASE .099 = 0. 0. 0.	AN 82. 46 ne 000 ac 000 cs 000	909 kr 0.000 1.233 ru 0.0003	o wa 0 0.000 t hr 1 0.000 di 18.952
PLAG QUAR QUAR QUAR CHAP MG N AFM JENS 5. 10. 1. CAT	SPAF IOCI TZ TZ PELS O. J PARA EN (190 en 723 il 193 ANOF .MES	R COMPO LASE PE : FELDS 9.746 14.200 S A/CNK IN CATI AMETERS CATION	SITION RCENT PAR RA ORTHO ORTHO INDEX ONS : A = PLOT C 0.00 cm 0.000 L =100 ******	:KF: ANORT TIOS: CLASE CLASE CLASE 0.5 49.37 0.21 A = 0 ATANO r 2 31. 0 0 0.0 tn 0.000 *****	S 8. HITE 7.34 10.70 93 F = 0. 0.36 RM ab 448 18 fa 000 19 pf 0.000 ******	137 37.8 4 P 1 AL 51 M M = an .037 hy .433 0.0	AB 57 31 LAGIOCI BITE 75 = 0.28 0.18 F 0.000 0.000 0.000 ns 1 00 0.000	.110 ASE .099 = 0. 0. 0.	AN 82. 46 ne 000 ac 000 cs 000	909 kr 0.000 1.233 ru 0.0003	o wa 0 0.000 t hr 1 0.000 di 18.952
PLAG QUAR QUAR QUAR CHAP MG N AFM JENS 5. 10. 1. CAT Q Ed	SPAF IOCI TZ TZ TZ PELS O. J PAR EN (190 en 723 il 193 ANOF .MES	<pre> COMPO CASE PE FELDS 9.746 14.200 S A/CNK IN CATI AMETERS CATION</pre>	SITION RCENT PAR RA ORTHO ORTHO INDEX ONS : A = PLOT C 6 4.22 f 0.000 cm 0.000 L =100 ***** (HUCHI Or	:KF: ANORT TIOS: CLASE CLASE CLASE 0.5 49.37 0.21 A = 0 ATANO C C A T 0.000 .000 ***** SONS Ab	S 8. HITE 7.34 10.70 93 F = 0. 0.36 RM ab 448 18 fa 000 19 pf 0.000 ***** ALGORY An	137 37.8 4 P 1 AL 51 M M = an .037 hy .433 0.0 **** THM.	AB 57 31 LAGIOCI BITE 75 = 0.28 0.18 F 0.000 0.000 0.000 0.000 0.000 LC	.110 ASE .099 = 0. 0. 0. 	AN 82. 46 ne 000 ac 000 cs 000 wc	909 kr 0.000 1.233 ru 0.0003	o wa 0 0.000 t hr 1 0.000 di 18.952 i Act
PLAG QUAR QUAR QUAR CHAP MG N AFM JENS 5. 10. 1. CAT Q Ed 5.	SPAF IOCI TZ TZ PELS O. J PAR EN (PAR EN (190 en 723 il 193 ANOF .MES	<pre> COMPO CASE PE FELDS 9.746 14.200 S A/CNK IN CATI AMETERS CATION</pre>	SITION RCENT PAR RA ORTHO ORTHO INDEX ONS : A = PLOT C 6 4.22 f 0.000 cm 0.000 L =100 ***** (HUCHI Or	:KF: ANORT TIOS: CLASE CLASE CLASE 0.5 49.37 0.21 A = 0 ATANO C C A T 0.000 .000 ***** SONS Ab	S 8. HITE 7.34 10.70 93 F = 0. 0.36 RM ab 448 18 fa 000 19 pf 0.000 ***** ALGORY An	137 37.8 4 P 1 AL 51 M M = an .037 hy .433 0.0 **** THM.	AB 57 31 LAGIOCI BITE 75 = 0.28 0.18 F 0.000 0.000 0.000 0.000 0.000 LC	.110 ASE .099 = 0. 0. 0. 	AN 82. 46 ne 000 ac 000 cs 000 wc	909 kr 0.000 1.233 ru 0.0003	o wa 0 0.000 t hr 1 0.000 di 18.952 i Act
PLAG QUAR QUAR QUAR CHAP MG N AFM JENS 5. 10. 1. CAT Q Ed 5. 0.00	SPAF IOCI TZ TZ PELS O. J PAR EN (PAR EN (190 en 723 il 193 ANOF .MES	R COMPO LASE PE FELDS 9.746 14.200 SA/CNK IN CATION AMETERS CATION CATION C 0.000 fs 8.710 C 0.295 RM TOTA XMORM C 0.000 C	SITION RCENT PAR RA ORTHO ORTHO INDEX ONS : A = PLOT C 6 4.22 f 0.000 cm 0.000 L =100 ****** (HUCHI Or 0.00 3	:KF: ANORT TIOS: CLASE CLASE 0.5 49.37 0.21 A = 0 A A CATANO C T 0.000 .000 ***** SONS Ab	S 8. HITE 7.34 10.70 93 F = 0. 0.36 RM ab 448 18 fa 000 19 pf 0.000 ****** ALGORY An 18.04	137 37.8 4 Pi 1 AL 51 M M = an .037 hy .433 0.0 **** THM.	AB 57 31 LAGIOCI BITE 75 = 0.28 0.18 F 0.000 0.000 0.000 ns 3 0.000 0.000 ns 3 0.000 0.000 b0 0.00	.110 ASE .099 = 0. 0 0. 0 0. 0 0. 0 0. 0 0.	AN 82. 46 000 ac 000 cs 000 Wc 0.0	kg 0.000 mt 1.23 ru 0.000 ru 0.000	p wa 0 0.000 t hr 1 0.000 di 18.952 i Act
PLAG QUAR QUAR QUAR CHAP MG N AFM JENS 5. 10. 1. CAT Q Ed 5. 0.000 Di	SPAF IOCI TZ TZ PELS O. J PARA EN (PARA EN (190 en 723 il 193 ANOF .MES 06	<pre>R COMPO LASE PE : FELDS 9.746 14.200 S A/CNK IN CATI AMETERS CATION 0.000 fs 8.710 ap 0.295 RM TOTA ***** SONORM C 0.00 Hy</pre>	SITION RCENT PAR RA ORTHO ORTHO INDEX ONS : A = PLOT C 6 4.22 f 0.000 cm 0.000 L =100 ****** (HUCHI Or 0.00 3	:KF: ANORT TIOS: CLASE CLASE 0.5 49.37 0.21 A = 0 A A CATANO C T 0.000 .000 ***** SONS Ab	S 8. HITE 7.34 10.70 93 F = 0. 0.36 RM ab 448 18 fa 000 19 pf 0.000 ****** ALGORY An 18.04	137 37.8 4 Pi 1 AL 51 M M = an .037 hy .433 0.0 **** THM.	AB 57 31 LAGIOCI BITE 75 = 0.28 0.18 F 0.000 0.000 0.000 0.000 0.000 LC	.110 ASE .099 = 0. 0 0. 0 0. 0 0. 0 0. 0 0.	AN 82. 46 000 ac 000 cs 000 Wc 0.0	kg 0.000 mt 1.23 ru 0.000 ru 0.000	p wa 0 0.000 t hr 1 0.000 di 18.952 i Act
PLAG QUAR QUAR QUAR CHAP MG N AFM JENS 5. 10. 1. CAT Q Ed 5. 0.00 Di HORN	SPAF IOCI TZ TZ PELS O. J PARA EN (PARA EN (190 en 723 il 193 ANOF .MES 06	<pre> COMPO CASE PE FELDS 9.746 14.200 S A/CNK IN CATI AMETERS CATION 0.000 fs 8.710 0.295 RM TOTA ***** SONORM C 0.00 Hy VDE </pre>	SITION RCENT : PAR RA' ORTHO ORTHO INDEX ONS : A = PLOT C 6 4.22 f 0.000 Cm 0.000 L =100 ****** (HUCHI Or 0.00 3 01	:KF: ANORT TIOS: CLASE CLASE CLASE 0.5 49.37 0.21 A = 0 ATANO r 2 31. 0 0 0.0 tn 0.000 ***** Ab 31.45 (En	S 8. HITE 7.34 10.70 93 F = 0. 0.36 RM ab 448 18 fa 000 19 pf 0.000 ****** ALGORY An 18.04 Fs	137 37.8 4 P 1 AL 51 M M = an .037 hy .433 0.0 **** THM.	AB 57 31 LAGIOCI BITE 75 = 0.28 0.18 F 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 Ec Fo	.110 ASE .099 = 0. 0 0. 3 0. 3 0. 3 0. 3 0. 3 0. 3 0. 3	AN 82. 46 000 ac 000 cs 000 wc 0.0	909 kr 0.000 mt 1.233 ru 0.0003 c R 0.0003	o wa 0 0.000 t hr 1 0.000 di 18.952 i Act 06 0.00 Hm
PLAG QUAR QUAR QUAR CHAP MG N AFM JENS 5. 10. 1. CAT Q Ed 5. 0.000 Di HORN 0.	SPAF IOCI TZ TZ PELS O. J PAR/ EN (190 en 723 il 193 ANOF .MES 06 BLEF 00	<pre> COMPO CASE PE FELDS 9.746 14.200 S A/CNK IN CATI AMETERS CATION 0.000 fs 8.710 0.295 RM TOTA ***** SONORM C 0.00 Hy VDE </pre>	SITION RCENT : PAR RA' ORTHO ORTHO INDEX ONS : A = PLOT C 6 4.22 f 0.000 Cm 0.000 L =100 ****** (HUCHI Or 0.00 3 01	:KF: ANORT TIOS: CLASE CLASE CLASE 0.5 49.37 0.21 A = 0 ATANO r 2 31. 0 0 0.0 tn 0.000 ***** Ab 31.45 (En	S 8. HITE 7.34 10.70 93 F = 0. 0.36 RM ab 448 18 fa 000 19 pf 0.000 ****** ALGORY An 18.04 Fs	137 37.8 4 P 1 AL 51 M M = an .037 hy .433 0.0 **** THM.	AB 57 31 LAGIOCI BITE 75 = 0.28 0.18 F 0.000 0.000 0.000 ns 3 0.000 0.000 ns 3 0.000 0.000 b0 0.00	.110 ASE .099 = 0. 0 0. 3 0. 3 0. 3 0. 3 0. 3 0. 3 0. 3	AN 82. 46 000 ac 000 cs 000 wc 0.0	909 kr 0.000 mt 1.233 ru 0.0003 c R 0.0003	o wa 0 0.000 t hr 1 0.000 di 18.952 i Act 06 0.00 Hm
PLAG QUAR QUAR QUAR CHAP MG N AFM JENS 5. 10. 1. CAT Q Ed 5. 0.000 Di HORN 0. 31.0	SPAF IOCI TZ TZ PELS O. J PAR EN (190 en 723 il 193 ANOF .MES 06 BLEF 00 62	<pre> COMPO CASE PE FELDS 9.746 14.200 S A/CNK IN CATI AMETERS CATION 0.000 fs 8.710 0.295 RM TOTA ***** SONORM C 0.000 Hy VDE 4.33 </pre>	SITION RCENT PAR RA ORTHO ORTHO INDEX ONS : A = PLOT C 6 4.22 f 0.00 cm 0.000 L =100 ****** (HUCHI Or 0.00 3 01 0.000	:KF: ANORT TIOS: CLASE CLASE 0.5 49.37 0.21 A = 0 ATANO r 2 31. 0 0.0 tn 0.000 ***** SONS Ab 31.45 (En 0.00	S 8. HITE 7.34 10.70 93 F = 0. 0.36 RM ab 448 18 fa 000 19 pf 0.000 ****** ALGORY An 18.04 Fs 0.00	137 37.8 4 P 1 AL 51 M M = an .037 hy .433 0.0 **** THM. 0.0	AB 57 31 LAGIOCI BITE 75 = 0.28 0.18 F 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 	.110 ASE .099 = 0. 0 0. 0 0. 0 0. 0 0. 5 0 0. 5 0 0. 5 0 0. 5 0 0. 5 0 0. 5 0 0. 5 5 0 0. 5 5 0 0. 5 5 0 0. 5 5 7 7 8 7 7 8 7 7 8 7 7 7 7 7 8 7 7 7 7	AN 82. 46 ne 000 ac 000 cs 000 wc 0.0	909 kg 0.000 mt 1.23 ru 0.000 ru 0.000	p wa 0 0.000 t hr 1 0.000 di 18.952 i Act 06 0.0 Hm
PLAG QUAR QUAR QUAR CHAP MG N AFM JENS 5. 10. 1. CAT Q Ed 5. 0.00 Di HORN 0. 31.0 A	SPAF IOCI TZ TZ PELS O. J PAR EN O PAR EN O 190 en 723 il 193 ANOF .MES 06 BLEF 00 62 P	<pre> COMPO CASE PE FELDS 9.746 14.200 S A/CNK IN CATI AMETERS CATION 0.000 fs 8.710 0.295 RM TOTA ***** SONORM C 0.00 Hy VDE 4.33 Cm </pre>	SITION RCENT : PAR RA ORTHO ORTHO ORTHO : INDEX ONS : A = PLOT C 0.00 Cm 0.000 L =100 ****** (HUCHI Or 0.00 3 01 0.000 Tn	:KF ANORT TIOS: CLASE CLASE CLASE 0.5 49.37 0.21 A = 0 ATANO r 2 31. 0 0.0 tn 0.000 ***** SONS Ab 31.45 (En 0.00 Pf	S 8. HITE 7.34 10.70 93 F = 0. 0.36 RM ab 448 18 fa 000 19 pf 0.000 ****** ALGORY An 18.04 Fs 0.00 Ns	137 37.8 4 P 1 AL 51 M M = an .037 hy .433 0.0 **** THM. 0.0 0.0 Ks	AB 57 31 LAGIOCI BITE 75 = 0.28 0.18 F 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 Ec Fo	ASE .099 = 0. 0 0. 0 0. 0 0. 0 0. 1 0 0. 1 0 0. 1 0 0. 1 1 0 0. 1 1 1 0 0. 1 1 1 1 1 1 1 1 1 1 1 1 1	AN 82. 46 000 ac 000 cs 000 wc 0.0 1.1	 909 kg 0.000 mt 0.0003 R. 0.0031.0 Mt 23 0 BIOTID 	p wa 0 0.000 t hr 1 0.000 di 18.952 i Act 06 0.0 Hm 0.00 CE Sp

SAMPLE N	UMBER	GRAM RM30					
OXIDES	GIVEN	RECALC 1009	MOL	PROPS	CAT PRO	PS	175
SiO2	56.27	56.114	1 (0.934	0.9	34	175
A1203	14.23	14.190)	0.139	0.2	78	
Fe203	1.19	1.187	7	0.007	0.0	15	
FeO	9.63	9.603	3	0.134	0.1	34	
MnO	0.18				0.0		
-	4.99						
CaO	9.23	9.20			0.1		
Na2O	2.71	2.70			0.0		
K20	0.76	0.75			0.0		
	0.93				0.0		
	0.16			0.001	0.0		
	0.00		0	0.000	0.0	00	
TOTAL	100.28						
		CIPW	NORM				
			b an			kp	v
-		4.478 22.86					
		fo f					
		0.000 0.00	-				
il	ap	cm tn	pf n	s ks	s cs	ru	di
	_	0.000 0.000 0	-				
CIPWNORN	M TOTAL	= 100.011					
		*******	*****	*****	* *		
1	PARAMET	ERS FOR CIPW	NORMATIVE	MINER	ALS		
PLAGIOCI QUARTZ	LASE PE : FELDS	SITION :KFS RCENT ANORTHI PAR RATIOS: ORTHOCLASE	8.663 TE 51.57	2	.232 AN	47.10 3.904	4
PLAGIOCI QUARTZ QUARTZ QUARTZ CHAPPELS	LASE PE : FELDS 13.612 22.951 S A/CNK	RCENT ANORTHI PAR RATIOS: ORTHOCLASE ORTHOCLASE 1 INDEX 0.645	8.663 TE 51.57 7.484 P 2.619 ALE	AB 44 2 PLAGIOCI	.232 AN		4
PLAGIOCI QUARTZ QUARTZ QUARTZ CHAPPELS MG No. S AFM PARA	LASE PE : FELDS 13.612 22.951 S A/CNK IN CATI AMETERS	RCENT ANORTHI PAR RATIOS: ORTHOCLASE ORTHOCLASE 1	8.663 TE 51.57 7.484 P 2.619 ALE = 0.56 M	AB 44 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	.232 AN LASE 78 .430		4
PLAGIOCI QUARTZ QUARTZ QUARTZ CHAPPELS MG No. AFM PARI JENSEN	LASE PE : FELDS 13.612 22.951 S A/CNK IN CATI AMETERS CATION	RCENT ANORTHI PAR RATIOS: ORTHOCLASE ORTHOCLASE 1 INDEX 0.645 ONS 45.39 : A = 0.18 F PLOT A = 0.	8.663 TE 51.57 7.484 P 2.619 ALE = 0.56 M 39 M = 0	AB 44 2 DLAGIOCI DITE 64 = 0.26 0.16 F =	.232 AN LASE 78 .430		4
PLAGIOCI QUARTZ QUARTZ QUARTZ CHAPPELS MG NO AFM PARI JENSEN	LASE PE : FELDS 13.612 22.951 S A/CNK IN CATI AMETERS CATION	RCENT ANORTHI PAR RATIOS: ORTHOCLASE ORTHOCLASE 1 INDEX 0.645 ONS 45.39 : A = 0.18 F PLOT A = 0. CATANORM	8.663 TE 51.57 7.484 P 2.619 ALE = 0.56 M 39 M = 0	AB 44 2 DLAGIOCI DITE 64 = 0.26 0.16 F =	.232 AN LASE 78 .430 = 0.46	3.904	
PLAGIOCI QUARTZ QUARTZ QUARTZ CHAPPELS MG NO. AFM PARI JENSEN Q	LASE PE : FELDS 13.612 22.951 S A/CNK IN CATI AMETERS CATION	RCENT ANORTHI PAR RATIOS: ORTHOCLASE ORTHOCLASE 1 INDEX 0.645 ONS 45.39 : A = 0.18 F PLOT A = 0. CATANORM or a	8.663 TE 51.57 7.484 P 2.619 ALE = 0.56 M 39 M = 0 b an	AB 44 2 LAGIOCI ITE 64 = 0.26 0.16 F = lc	.232 AN LASE 78 .430 = 0.46 ne	8.904 kp	
PLAGIOCI QUARTZ QUARTZ QUARTZ CHAPPELS MG NO. AFM PARI JENSEN Q 7.668	LASE PE : FELDS 13.612 22.951 S A/CNK IN CATI AMETERS CATION 	RCENT ANORTHI PAR RATIOS: ORTHOCLASE ORTHOCLASE 1 INDEX 0.645 ONS 45.39 : A = 0.18 F PLOT A = 0. CATANORM or a 4.550 24.66	8.663 TE 51.57 7.484 P 2.619 ALE = 0.56 M 39 M = 0 b an 1 24.752	AB 44 2 LAGIOCI 1TE 64 = 0.26 0.16 F = 1c 0.000	.232 AN LASE 78 .430 = 0.46 ne 0.000	8.904 kp 0.000	0.00
PLAGIOCI QUARTZ QUARTZ QUARTZ CHAPPELS MG NO. AFM PARI JENSEN Q 7.668 en	LASE PE : FELDS 13.612 22.951 S A/CNK IN CATI AMETERS CATION C 0.000 fs	RCENT ANORTHI PAR RATIOS: ORTHOCLASE ORTHOCLASE 1 INDEX 0.645 ONS 45.39 : $A = 0.18$ F PLOT $A = 0$. CATANORM or a 4.550 24.66 fo f	8.663 TE 51.57 7.484 P 2.619 ALE = 0.56 M 39 M = 0 b an 1 24.752 a hy	AB 44 2 DLAGIOCI DITE 64 = 0.26 0.16 F = lc 0.000 ol	.232 AN LASE 78 .430 = 0.46 ne 0.000 ac	kp 0.000 mt	0.00
PLAGIOCI QUARTZ QUARTZ QUARTZ CHAPPELS MG NO. AFM PARI JENSEN 9.736	LASE PE : FELDS 13.612 22.951 S A/CNK IN CATI AMETERS CATION C 0.000 fs 9.240	RCENT ANORTHI PAR RATIOS: ORTHOCLASE ORTHOCLASE 1 INDEX 0.645 ONS 45.39 : A = 0.18 F PLOT A = 0. CATANORM or a 4.550 24.66 fo f 0.000 0.00	8.663 TE 51.57 7.484 P 2.619 ALE = 0.56 M 39 M = 0 b an 1 24.752 a hy 0 18.976	AB 44 2 DLAGIOCI DITE 64 = 0.26 0.16 F = lc 0.000 ol 0.000	.232 AN LASE 78 .430 = 0.46 ne 0.000 ac 0.000	kp 0.000 mt 1.261	0.00
PLAGIOCI QUARTZ QUARTZ QUARTZ CHAPPELS MG No. AFM PAR JENSEN 9.736 il	LASE PE : FELDS 13.612 22.951 S A/CNK IN CATI AMETERS CATION 0.000 fs 9.240 ap	RCENT ANORTHI PAR RATIOS: ORTHOCLASE ORTHOCLASE 1 INDEX 0.645 ONS 45.39 : A = 0.18 F PLOT A = 0. CATANORM or a 4.550 24.66 fo f 0.000 0.00 cm tn	8.663 TE 51.57 7.484 P 2.619 ALE = 0.56 M 39 M = 0 b an 1 24.752 a hy 0 18.976 pf m	AB 44 2 DLAGIOCI DITE 64 = 0.26 0.16 F = 1c 0.000 ol 0.000 as k:	.232 AN LASE 78 .430 = 0.46 ne 0.000 ac 0.000 s cs	kp 0.000 mt 1.261 ru	0.00 0.00
PLAGIOCI QUARTZ QUARTZ QUARTZ CHAPPELS MG NO. AFM PAR JENSEN 9.736 il 1.311	LASE PE : FELDS 13.612 22.951 S A/CNK IN CATI AMETERS CATION 0.000 fs 9.240 ap 0.339	RCENT ANORTHI PAR RATIOS: ORTHOCLASE ORTHOCLASE 1 INDEX 0.645 ONS 45.39 : A = 0.18 F PLOT A = 0. CATANORM or a 4.550 24.66 fo f 0.000 0.00	8.663 TE 51.57 7.484 P 2.619 ALE = 0.56 M 39 M = 0 b an 1 24.752 a hy 0 18.976 pf m	AB 44 2 DLAGIOCI DITE 64 = 0.26 0.16 F = 1c 0.000 ol 0.000 as k:	.232 AN LASE 78 .430 = 0.46 ne 0.000 ac 0.000 s cs	kp 0.000 mt 1.261 ru	0.00 0.00
PLAGIOCI QUARTZ QUARTZ QUARTZ CHAPPELS MG NO. AFM PAR JENSEN 9.736 il 1.311	LASE PE : FELDS 13.612 22.951 S A/CNK IN CATI AMETERS CATION 0.000 fs 9.240 ap 0.339 RM TOTA	RCENT ANORTHI PAR RATIOS: ORTHOCLASE ORTHOCLASE 1 INDEX 0.645 ONS 45.39 : A = 0.18 F PLOT A = 0. CATANORM or a 4.550 24.66 fo f 0.000 0.000 cm tn 0.000 0.000 0	8.663 TE 51.57 7.484 P 2.619 ALP $= 0.56 M$ 39 M = 0 b an 1 24.752 a hy 0 18.976 pf m .000 0.00	AB 44 2 LAGIOCI 0ITE 64 0.16 F = 1c 0.000 ol 0.000 0.000	.232 AN LASE 78 .430 = 0.46 ne 0.000 ac 0.000 s cs 0 0.000	kp 0.000 mt 1.261 ru	0.00 0.00
PLAGIOCI QUARTZ QUARTZ QUARTZ CHAPPELS MG NO. AFM PARI JENSEN 9.736 il 1.311 CATANOS	LASE PE : FELDS 13.612 22.951 S A/CNK IN CATI AMETERS CATION 0.000 fs 9.240 ap 0.339 RM TOTA *****	RCENT ANORTHI PAR RATIOS: ORTHOCLASE ORTHOCLASE 1 INDEX 0.645 ONS 45.39 : A = 0.18 F PLOT A = 0. CATANORM or a 4.550 24.66 fo f 0.000 0.000 cm tn 0.000 0.000 0 L = 100.000	8.663 TE 51.57 7.484 P 2.619 ALE = 0.56 M 39 M = 0 b an 1 24.752 a hy 0 18.976 pf m .000 0.00	AB 44 2 LAGIOCI JITE 64 = 0.26 0.16 F = 1c 0.000 ol 0.000 ls k: 00 0.000	.232 AN LASE 78 .430 = 0.46 ne 0.000 ac 0.000 s cs 0 0.000	kp 0.000 mt 1.261 ru	0.00 10.00
PLAGIOCI QUARTZ QUARTZ QUARTZ CHAPPELS MG NO. AFM PAR JENSEN 4 7.668 en 9.736 il 1.311 CATANON Q	LASE PE : FELDS 13.612 22.951 S A/CNK IN CATI AMETERS CATION 0.000 fs 9.240 ap 0.339 RM TOTA ***** SONORM	RCENT ANORTHI PAR RATIOS: ORTHOCLASE ORTHOCLASE 1 INDEX 0.645 ONS 45.39 : A = 0.18 F PLOT A = 0. CATANORM or a 4.550 24.66 fo f 0.000 0.000 cm tn 0.000 0.000 0 L =100.000	8.663 TE 51.57 7.484 P 2.619 ALE = 0.56 M 39 M = 0 b an 1 24.752 a hy 0 18.976 pf m .000 0.00 *********	AB 44 2 DLAGIOCI DITE 64 = 0.26 0.16 F = 1c 0.000 ol 0.000 ks ks 0.000 (ks)	.232 AN LASE 78 .430 = 0.46 ne 0.000 ac 0.000 s cs 0 0.000 *	kp 0.000 mt 1.261 ru 0.00016	0.00 1 0.00 di .482
PLAGIOCI QUARTZ QUARTZ QUARTZ CHAPPELS MG NO. AFM PARI JENSEN 4 7.668 en 9.736 il 1.311 CATANOI MES Q Ed	LASE PE : FELDS 13.612 22.951 S A/CNK IN CATI AMETERS CATION 0.000 fs 9.240 ap 0.339 RM TOTA **** SONORM C	RCENT ANORTHI PAR RATIOS: ORTHOCLASE ORTHOCLASE 1 INDEX 0.645 ONS 45.39 : A = 0.18 F PLOT A = 0. CATANORM or a 4.550 24.66 fo f 0.000 0.000 cm tn 0.000 0.000 0 L =100.000 ********************************	8.663 TE 51.57 7.484 P 2.619 ALE = 0.56 M 39 M = 0 b an 1 24.752 a hy 0 18.976 pf n .000 0.00 ********* GORYTHM An I	AB 44 2 DLAGIOCI DITE 64 = 0.26 0.16 F = 1c 0.000 ol 0.000 c k: 0.000 c 1c 0.000 c 1c 0.000 c 	.232 AN LASE 78 .430 = 0.46 ne 0.000 ac 0.000 s cs 0 0.000 *	kp 0.000 mt 1.261 ru 0.00016	0.00 1 0.00 di .482 Ac
PLAGIOCI QUARTZ QUARTZ QUARTZ CHAPPELS MG NO. AFM PARI JENSEN 4 7.668 en 9.736 il 1.311 CATANOI MES Q Ed	LASE PE : FELDS 13.612 22.951 S A/CNK IN CATI AMETERS CATION 0.000 fs 9.240 ap 0.339 RM TOTA **** SONORM C	RCENT ANORTHI PAR RATIOS: ORTHOCLASE ORTHOCLASE 1 INDEX 0.645 ONS 45.39 : A = 0.18 F PLOT A = 0. CATANORM or a 4.550 24.66 fo f 0.000 0.000 cm tn 0.000 0.000 0 L =100.000 ********************************	8.663 TE 51.57 7.484 P 2.619 ALE = 0.56 M 39 M = 0 b an 1 24.752 a hy 0 18.976 pf n .000 0.00 ********* GORYTHM An I	AB 44 2 DLAGIOCI DITE 64 = 0.26 0.16 F = 1c 0.000 ol 0.000 c k: 0.000 c 1c 0.000 c 1c 0.000 c 	.232 AN LASE 78 .430 = 0.46 ne 0.000 ac 0.000 s cs 0 0.000 *	kp 0.000 mt 1.261 ru 0.00016	0.00 1 0.00 di .482 Ac
PLAGIOCI QUARTZ QUARTZ QUARTZ CHAPPELS MG NO. AFM PARI JENSEN 4 7.668 en 9.736 il 1.311 CATANOS MES Q Ed 8.01 0.00 Di	LASE PE : FELDS 13.612 22.951 S A/CNK IN CATI AMETERS CATION 0.000 fs 9.240 ap 0.339 RM TOTA ***** SONORM C 0.00 Hy	RCENT ANORTHI PAR RATIOS: ORTHOCLASE ORTHOCLASE 1 INDEX 0.645 ONS 45.39 : A = 0.18 F PLOT A = 0. CATANORM or a 4.550 24.66 fo f 0.000 0.000 cm tn 0.000 0.000 0 L =100.000 ********************************	8.663 TE 51.57 7.484 F 2.619 ALE = 0.56 M 39 M = 0 b an 1 24.752 a hy 0 18.976 pf m .000 0.00 ********* GORYTHM An I 4.75 0.0	AB 44 2 LAGIOCI 3ITE 64 = 0.26 0.16 F = 1c 0.000 cl 0.0000 cl 0.0000 cl 0.000 c	.232 AN LASE 78 .430 = 0.46 .430 = 0.46 .430 ac 0.000 ac 0.000 ac 0.000 ac 0.000 ac 0.000 x Ne Wa	kp 0.000 mt 1.261 ru 0.00016 o Ri	0.00 1 0.00 di .482 Ac
PLAGIOCI QUARTZ QUARTZ QUARTZ CHAPPELS MG NO. AFM PARI JENSEN (7.668 en 9.736 il 1.311 CATANOS MES Q Ed 8.01 0.00 Di HORNBLES	LASE PE : FELDS 13.612 22.951 S A/CNK IN CATI AMETERS CATION 0.000 fs 9.240 ap 0.339 RM TOTA ***** SONORM C 0.00 Hy NDE	RCENT ANORTHI PAR RATIOS: ORTHOCLASE ORTHOCLASE 1 INDEX 0.645 ONS 45.39 : A = 0.18 F PLOT A = 0. CATANORM or a 4.550 24.66 fo f 0.000 0.000 0 cm tn 0.000 0.000 0 L =100.000 ********************************	8.663 TE 51.57 7.484 P 2.619 ALE = 0.56 M 39 M = 0 b an 1 24.752 a hy 0 18.976 pf m .000 0.00 ********* GORYTHM An I 4.75 0.0 Fs	AB 44 2 LAGIOCI DITE 64 = 0.26 0.16 F = 1c 0.000 0.000 0.000 1c 0.000 0.000 1c 0.000 0.000 1c 1c 0.000 1c 1c 0.000 1c 1c 0.000 1c 1c 0.000 1c 1c 0.000 1c 1c 0.000 1c 1c 0.000 1c 1c 0.000 1c 1c 1c 0.000 1c 1c 1c 1c 1c 1c 1c 1c 1c 1c	.232 AN LASE 78 .430 = 0.46 ne 0.000 ac 0.000 s cs 0 0.000 * Ne Wo DO 0.0 Fa)	kp 0.000 mt 1.261 ru 0.00016 D Ri 00 25.99 Mt	0.00 1 0.00 di .482 Ac 0.1
PLAGIOCI QUARTZ QUARTZ QUARTZ CHAPPELS MG NO. AFM PARI JENSEN G 7.668 en 9.736 il 1.311 CATANOI CATANOI Ed 8.01 0.00 Di HORNBLEI 0.00	LASE PE : FELDS 13.612 22.951 S A/CNK IN CATI AMETERS CATION 0.000 fs 9.240 ap 0.339 RM TOTA ***** SONORM C 0.00 Hy NDE	RCENT ANORTHI PAR RATIOS: ORTHOCLASE ORTHOCLASE 1 INDEX 0.645 ONS 45.39 : A = 0.18 F PLOT A = 0. CATANORM or a 4.550 24.66 fo f 0.000 0.000 cm tn 0.000 0.000 L =100.000 ********************************	8.663 TE 51.57 7.484 P 2.619 ALE = 0.56 M 39 M = 0 b an 1 24.752 a hy 0 18.976 pf m .000 0.00 ********* GORYTHM An I 4.75 0.0 Fs	AB 44 2 LAGIOCI DITE 64 = 0.26 0.16 F = 1c 0.000 0.000 0.000 1c 0.000 0.000 1c 0.000 0.000 1c 1c 0.000 1c 1c 0.000 1c 1c 0.000 1c 1c 0.000 1c 1c 0.000 1c 1c 0.000 1c 1c 0.000 1c 1c 0.000 1c 1c 0.000 1c 1c 1c 0.000 1c 1c 1c 1c 1c 1c 1c 1c 1c 1c	.232 AN LASE 78 .430 = 0.46 ne 0.000 ac 0.000 s cs 0 0.000 * Ne Wo DO 0.0 Fa)	kp 0.000 mt 1.261 ru 0.00016 D Ri 00 25.99 Mt	0.00 1 0.00 di .482 Ac 0.1
PLAGIOCI QUARTZ QUARTZ QUARTZ CHAPPELS MG NO. AFM PARI JENSEN 4 7.668 en 9.736 il 1.311 CATANOI MES Q Ed 8.01 0.00 Di HORNBLEI 0.00 25.986	LASE PE : FELDS 13.612 22.951 S A/CNK IN CATI AMETERS CATION 0.000 fs 9.240 0.339 RM TOTA ***** SONORM C 0.000 Hy NDE 5.74	RCENT ANORTHI PAR RATIOS: ORTHOCLASE ORTHOCLASE 1 INDEX 0.645 ONS 45.39 : $A = 0.18$ F PLOT $A = 0.$ CATANORM or a 4.550 24.66 fo f 0.000 0.000 cm tn 0.000 0.000 0 L =100.000 ********************************	8.663 TE 51.57 7.484 P 2.619 ALE = 0.56 M 39 M = 0 b an 1 24.752 a hy 0 18.976 pf m .000 0.00 ********* GORYTHM An I 4.75 0.0 Fs 0.00 0.00	AB 44 2 LAGIOCI 0ITE 64 0ITE 64 0.16 F = 1c 0.000 01 0.000 01 0.000 01 0.000 01 0.000 01 0.000 01 0.000 01 0.000 01 0.000 01 0.000 01 0.000 01 0.000 01 0.000 01 0.0000 0.000 0.000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.00000 0.0000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.000000 0.00000000	.232 AN LASE 78 .430 = 0.46 0.000 ac 0.000 s cs 0 0.000 * Ne Wo DO 0.0 Fa) 00 1.	kp 0.000 mt 1.261 ru 0.00016 D Ri 00 25.99 Mt 26 0.0	0.00 di .482 Ac 0.1 Hm
PLAGIOCI QUARTZ QUARTZ QUARTZ CHAPPELS MG NO. AFM PARA JENSEN (7.668 en 9.736 il 1.311 CATANON CATANON Ed 8.01 0.00 Di HORNBLEN 0.00 25.986 Ap	LASE PE : FELDS 13.612 22.951 S A/CNK IN CATI AMETERS CATION 0.000 fs 9.240 0.339 RM TOTA ***** SONORM C 0.00 Hy NDE 5.74 Cm	RCENT ANORTHI PAR RATIOS: ORTHOCLASE ORTHOCLASE 1 INDEX 0.645 ONS 45.39 : A = 0.18 F PLOT A = 0. CATANORM or a 4.550 24.66 fo f 0.000 0.000 0 cm tn 0.000 0.000 0 L =100.000 ********************************	8.663 TE 51.57 7.484 F 2.619 ALE = 0.56 M 39 M = 0 b an 1 24.752 a hy 0 18.976 pf m .000 0.00 ********* GORYTHM An I 4.75 0.0 Fs 0.00 0.0 NS KS	AB 44 2 LAGIOCI 3ITE 64 = 0.26 0.16 F = 1c 0.000 cl 0.0000 cl 0.000 cl Cl Cl Cl Cl Cl Cl Cl Cl Cl C	.232 AN LASE 78 .430 = 0.46 0.000 ac 0.000 s cs 0 0.000 * Ne Wa DO 0.0 Fa) 00 1. Ru	kp 0.000 mt 1.261 ru 0.00016 D Ri 00 25.99 Mt 26 0.0 BIOTITE	0.00 10.00 di .482 Ac 0.0 Hm

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	UMDER	RM31			
OXIDES			MOL PR	OPS CAT PROPS	5
	56.27			936 0.936	
A1203	14.26	14.247	ο.	140 0.279)
Fe203	1.18	1.179	0.0	0.015 0.015	i
FeO	9.57	9.561	0.	133 0.133	5
MnO	0.17	0.170	0.	0.002	2
MqO	4.96	4.955	ы О .	123 0.123	3
-	9.53	9.521	L 0.	170 0.170)
Na2O	2.51	2.508	з О.	040 0.081	L
к20	0.56	0.559	θ.	006 0.012	2
TiO2	0.92	0.921	L 0.	012 0.012	2
	0.16	0.160	0.	001 0.002	2
	0.00	0.000	0.	000 0.000)
TOTAL					
		CIPW	NORM		
	с			lc ne	
9.522	0.000			.000 0.000 0	
	_			ol ac	
9.909	9.395	0.000 0.000	0 19.304 0	.000 0.000 1	1.709
				ks cs	
1.750	0.379	0.000 0.000 0	.000 0.000	0.000 0.000 0.	.000 16
CIPWNOR	M TOTAL	= 100.010			
		*******	*****	*****	
1	PARAMET	ERS FOR CIPW	NORMATIVE M	INERALS	
HYPERST	HENE CO	MPOSITION: EN	51.333 F	S 48.667	
FELDSPA	R COMPO	SITION :KFS	6.548 AB	42.025 AN	51.427
PLAGIOC	LASE PE	RCENT ANORTHI	TE 55.030		
		PAR RATIOS:			
QUARTZ	15.867	ORTHOCLASE	5.509 PLA	GIOCLASE 78.6	624
-		ORTHOCLASE ORTHOCLASE 9			624
QUARTZ	27.968	ORTHOCLASE 9			624
QUARTZ CHAPPEL	27.968 S A/CNK				624
QUARTZ CHAPPEL MG No.	27.968 S A/CNK IN CATI	ORTHOCLASE 9 INDEX 0.646 ONS 45.40	.711 ALBITE	62.321	624
QUARTZ CHAPPEL MG No. AFM PAR	27.968 S A/CNK IN CATI AMETERS	ORTHOCLASE 9 INDEX 0.646	.711 ALBITE = 0.57 M =	0.27	624
QUARTZ CHAPPEL MG No. AFM PAR JENSEN	27.968 S A/CNK IN CATI AMETERS CATION	ORTHOCLASE 9 INDEX 0.646 ONS 45.40 : A = 0.16 F PLOT A = 0.	.711 ALBITE = 0.57 M = 39 M = 0.1	0.27 5 F = 0.46	624
QUARTZ CHAPPEL MG No. AFM PAR JENSEN	27.968 S A/CNK IN CATI AMETERS CATION	ORTHOCLASE 9 INDEX 0.646 ONS 45.40 : A = 0.16 F PLOT A = 0. CATANORM	.711 ALBITE = 0.57 M = 39 M = 0.1	0.27 5 F = 0.46	
QUARTZ CHAPPEL MG NO. AFM PAR JENSEN Q	27.968 S A/CNK IN CATI AMETERS CATION	ORTHOCLASE 9 INDEX 0.646 ONS 45.40 : A = 0.16 F PLOT A = 0. CATANORM or a	.711 ALBITE = 0.57 M = 39 M = 0.1 b an	0.27 5 F = 0.46 lc ne	kp
QUARTZ CHAPPEL MG No. AFM PAR JENSEN Q 8.981	27.968 S A/CNK IN CATI AMETERS CATION C 0.000	ORTHOCLASE 9 INDEX 0.646 ONS 45.40 : A = 0.16 F PLOT A = 0. CATANORM or a 3.366 22.92	.711 ALBITE = 0.57 M = 39 M = 0.1 b an 7 26.444 C	$\begin{array}{c} 0.27\\ 5 F = 0.46\\\\ 1c ne\\ 0.000 0.000 \end{array}$	kp 0.000
QUARTZ CHAPPEL MG No. AFM PAR JENSEN , q 8.981 en	27.968 S A/CNK IN CATI AMETERS CATION C 0.000 fs	ORTHOCLASE 9 INDEX 0.646 ONS 45.40 : A = 0.16 F PLOT A = 0. CATANORM or a 3.366 22.92 fo f	.711 ALBITE = 0.57 M = 39 M = 0.1 b an 7 26.444 C a hy	$\begin{array}{c} 0.27\\ 5 \ F = 0.46\\ \\ 1c \ ne\\ 0.000 \ 0.000\\ 01 \ ac\\ \end{array}$	kp 0.000 mt
QUARTZ CHAPPEL MG No. AFM PAR JENSEN 9.703	27.968 S A/CNK IN CATI AMETERS CATION C 0.000 fs 9.199	ORTHOCLASE 9 INDEX 0.646 ONS 45.40 : A = 0.16 F PLOT A = 0. CATANORM or a 3.366 22.92 fo f 0.000 0.00	.711 ALBITE = 0.57 M = 39 M = 0.1 b an 7 26.444 C a hy 0 18.903 C	0.27 5 F = 0.46 1c ne 0.000 0.000 0 01 ac	kp 0.000 mt 1.255
QUARTZ CHAPPEL MG No. AFM PAR JENSEN q 8.981 en 9.703 il	27.968 S A/CNK IN CATI AMETERS CATION 0.000 fs 9.199 ap	ORTHOCLASE 9 INDEX 0.646 ONS 45.40 : A = 0.16 F PLOT A = 0. CATANORM or a 3.366 22.92 fo f 0.000 0.00 cm tn	.711 ALBITE = 0.57 M = 39 M = 0.1 b an 7 26.444 C a hy 0 18.903 C pf ns	0.27 5 F = 0.46 1c ne 0.000 0.000 ol ac 0.000 0.000 f ks cs	kp 0.000 mt 1.255 ru
QUARTZ CHAPPEL MG NO. AFM PAR JENSEN Q 8.981 en 9.703 il 1.307	27.968 S A/CNK IN CATI AMETERS CATION 0.000 fs 9.199 ap 0.340	ORTHOCLASE 9 INDEX 0.646 ONS 45.40 : A = 0.16 F PLOT A = 0. CATANORM or a 3.366 22.92 fo f 0.000 0.000 cm tn 0.000 0.000 0	.711 ALBITE = 0.57 M = 39 M = 0.1 b an 7 26.444 C a hy 0 18.903 C pf ns	0.27 5 F = 0.46 1c ne 0.000 0.000 0 01 ac	kp 0.000 mt 1.255 ru
QUARTZ CHAPPEL MG NO. AFM PAR JENSEN Q 8.981 en 9.703 il 1.307	27.968 S A/CNK IN CATI AMETERS CATION 0.000 fs 9.199 ap 0.340 RM TOTA	ORTHOCLASE 9 INDEX 0.646 ONS 45.40 : A = 0.16 F PLOT A = 0. CATANORM or a 3.366 22.92 fo f 0.000 0.00 cm tn 0.000 0.000 0 L =100.000	.711 ALBITE = 0.57 M = 39 M = 0.1 b an 7 26.444 C a hy 0 18.903 C pf ns .000 0.000	0.27 5 F = 0.46 1c ne 0.000 0.000 ol ac 0.000 0.000 ks cs 0.000 0.000 0	kp 0.000 mt 1.255 ru
QUARTZ CHAPPEL MG No. AFM PAR JENSEN q 8.981 en 9.703 il 1.307 CATANO	27.968 S A/CNK IN CATI AMETERS CATION 0.000 fs 9.199 ap 0.340 RM TOTA *****	ORTHOCLASE 9 INDEX 0.646 ONS 45.40 : A = 0.16 F PLOT A = 0. CATANORM or a 3.366 22.92 fo f 0.000 0.00 cm tn 0.000 0.000 0 L =100.000	.711 ALBITE = 0.57 M = 39 M = 0.1 b an 7 26.444 C a hy 0 18.903 C pf ns .000 0.000	0.27 5 F = 0.46 1c ne 0.000 0.000 0 01 ac 0.000 0.000 1 ks cs 0.000 0.000 0	kp 0.000 mt 1.255 ru
QUARTZ CHAPPEL MG No. AFM PAR JENSEN q 8.981 en 9.703 il 1.307 CATANO ME	27.968 S A/CNK IN CATI AMETERS CATION 0.000 fs 9.199 ap 0.340 RM TOTA ***** SONORM	ORTHOCLASE 9 INDEX 0.646 ONS 45.40 : A = 0.16 F PLOT A = 0. CATANORM or a 3.366 22.92 fo f 0.000 0.00 cm tn 0.000 0.000 L =100.000 ********************************	.711 ALBITE = 0.57 M = 39 M = 0.1 b an 7 26.444 C a hy 0 18.903 C pf ns .000 0.000 ***********	0.27 5 F = 0.46 1c ne 0.000 0.000 ol ac 0.000 0.000 ks cs 0.000 0.000 0	kp 0.000 mt 1.255 ru .00016
QUARTZ CHAPPEL MG No. AFM PAR JENSEN q 8.981 en 9.703 il 1.307 CATANO ME	27.968 S A/CNK IN CATI AMETERS CATION 0.000 fs 9.199 ap 0.340 RM TOTA ***** SONORM	ORTHOCLASE 9 INDEX 0.646 ONS 45.40 : A = 0.16 F PLOT A = 0. CATANORM or a 3.366 22.92 fo f 0.000 0.00 cm tn 0.000 0.000 L =100.000 ********************************	.711 ALBITE = 0.57 M = 39 M = 0.1 b an 7 26.444 C a hy 0 18.903 C pf ns .000 0.000 ***********	0.27 5 F = 0.46 1c ne 0.000 0.000 0 01 ac 0.000 0.000 1 ks cs 0.000 0.000 0	kp 0.000 mt 1.255 ru .00016
QUARTZ CHAPPEL MG NO. AFM PAR JENSEN	27.968 S A/CNK IN CATI AMETERS CATION 0.000 fs 9.199 ap 0.340 RM TOTA ***** SONORM C	ORTHOCLASE 9 INDEX 0.646 ONS 45.40 : A = 0.16 F PLOT A = 0. CATANORM or a 3.366 22.92 fo f 0.000 0.00 cm tn 0.000 0.000 0 L =100.000 ********************************	.711 ALBITE = 0.57 M = 39 M = 0.1 b an 7 26.444 C a hy 0 18.903 C pf ns .000 0.000 *********** GORYTHM) An LC	0.27 5 F = 0.46 1c ne 0.000 0.000 ol ac 0.000 0.000 ks cs 0.000 0.000 0	kp 0.000 mt 1.255 ru .00016 Ri
QUARTZ CHAPPEL MG NO. AFM PAR JENSEN	27.968 S A/CNK IN CATI AMETERS CATION 0.000 fs 9.199 ap 0.340 RM TOTA ***** SONORM C	ORTHOCLASE 9 INDEX 0.646 ONS 45.40 : A = 0.16 F PLOT A = 0. CATANORM or a 3.366 22.92 fo f 0.000 0.000 cm tn 0.000 0.000 0 L =100.000 ********************************	.711 ALBITE = 0.57 M = 39 M = 0.1 b an 7 26.444 C a hy 0 18.903 C pf ns .000 0.000 *********** GORYTHM) An LC	0.27 5 F = 0.46 1c ne 0.000 0.000 ol ac 0.000 0.000 ks cs 0.000 0.000 0 ******	kp 0.000 mt 1.255 ru .00016 Ri
QUARTZ CHAPPEL MG No. AFM PAR JENSEN (8.981 en 9.703 il 1.307 CATANO ME Q Ed 8.61 0.00	27.968 S A/CNK IN CATI AMETERS CATION C 0.000 fs 9.199 0.340 RM TOTA ***** SONORM C	ORTHOCLASE 9 INDEX 0.646 ONS 45.40 : A = 0.16 F PLOT A = 0. CATANORM or a 3.366 22.92 fo f 0.000 0.00 cm tn 0.000 0.000 L =100.000 ********************************	.711 ALBITE = 0.57 M = 39 M = 0.1 b an 7 26.444 C a hy 0 18.903 C pf ns .000 0.000 *********** GORYTHM) An Lc 5.44 0.00	0.27 5 F = 0.46 1c ne 0.000 0.000 ol ac 0.000 0.000 ks cs 0.000 0.000 0 ****** Ne Wo 0.00 0.00	kp 0.000 mt 1.255 ru .00016 Ri 25.99
QUARTZ CHAPPEL MG No. AFM PAR JENSEN	27.968 S A/CNK IN CATI AMETERS CATION 0.000 fs 9.199 ap 0.340 RM TOTA ***** SONORM C .0.00 Hy	ORTHOCLASE 9 INDEX 0.646 ONS 45.40 : A = 0.16 F PLOT A = 0. CATANORM or a 3.366 22.92 fo f 0.000 0.00 cm tn 0.000 0.000 L =100.000 ********************************	.711 ALBITE = 0.57 M = 39 M = 0.1 b an 7 26.444 C a hy 0 18.903 C pf ns .000 0.000 *********** GORYTHM) An Lc 5.44 0.00	0.27 5 F = 0.46 1c ne 0.000 0.000 ol ac 0.000 0.000 ks cs 0.000 0.000 0 ******	kp 0.000 mt 1.255 ru .00016 Ri 25.99
QUARTZ CHAPPEL MG NO. AFM PAR JENSEN	27.968 S A/CNK IN CATI AMETERS CATION 0.000 fs 9.199 ap 0.340 RM TOTA ***** SONORM C .0.00 Hy NDE	ORTHOCLASE 9 INDEX 0.646 ONS 45.40 : A = 0.16 F PLOT A = 0. CATANORM or a 3.366 22.92 fo f 0.000 0.00 cm tn 0.000 0.000 0 L =100.000 ********************************	.711 ALBITE = 0.57 M = 39 M = 0.1 b an 7 26.444 C a hy 0 18.903 C pf ns .000 0.000 ********** GORYTHM) An LC 5.44 0.00 Fs Fc	0.27 5 F = 0.46 1c ne 0.000 0.000 ol ac 0.000 0.000 ks cs 0.000 0.000 0 ks cs 0.000 0.000 0 ***** Ne Wo 0.00 0.000 Fa)	kp 0.000 mt 1.255 ru .00016 Ri 25.99 Mt
QUARTZ CHAPPEL MG NO. AFM PAR JENSEN	27.968 S A/CNK IN CATI AMETERS CATION 0.000 fs 9.199 ap 0.340 RM TOTA ***** SONORM C .0.00 Hy NDE	ORTHOCLASE 9 INDEX 0.646 ONS 45.40 : A = 0.16 F PLOT A = 0. CATANORM or a 3.366 22.92 fo f 0.000 0.00 cm tn 0.000 0.000 0 L =100.000 ********************************	.711 ALBITE = 0.57 M = 39 M = 0.1 b an 7 26.444 C a hy 0 18.903 C pf ns .000 0.000 ********** GORYTHM) An LC 5.44 0.00 Fs Fc	0.27 5 F = 0.46 1c ne 0.000 0.000 ol ac 0.000 0.000 ks cs 0.000 0.000 0 ****** Ne Wo 0.00 0.00	kp 0.000 mt 1.255 ru .00016 Ri 25.99 Mt
QUARTZ CHAPPEL MG NO. AFM PAR JENSEN (, q 8.981 en 9.703 il 1.307 CATANO (ME Q Ed 8.61 0.00 Di HORNBLE 0.00 25.994	27.968 S A/CNK IN CATI AMETERS CATION 0.000 fs 9.199 0.340 RM TOTA ***** SONORM C .0.00 Hy NDE 7.08	ORTHOCLASE 9 INDEX 0.646 ONS 45.40 : A = 0.16 F PLOT A = 0. CATANORM or a 3.366 22.92 fo f 0.000 0.000 cm tn 0.000 0.000 0 L =100.000 L =100.000 L =100.000 Cr Ab 0.00 22.93 26 01 (En 0.00 0.00	.711 ALBITE = 0.57 M = 39 M = 0.1 b an 7 26.444 C a hy 0 18.903 C pf ns .000 0.000 *********** GORYTHM) An Lc 5.44 0.00 Fs Fc 0.00 0.000	0.27 5 F = 0.46 1c ne 0.000 0.000 ol ac 0.000 0.000 ks cs 0.000 0.000 0 ****** Ne Wo 0.00 0.000 5 Fa) 0.00 1.26	kp 0.000 mt 1.255 ru .00016 Ri 25.99 Mt 5 0.0
QUARTZ CHAPPEL MG NO. AFM PAR JENSEN (4 8.981 en 9.703 i1 1.307 CATANO ME Q Ed 8.61 0.00 Di HORNBLE 0.00 25.994 Ap	27.968 S A/CNK IN CATI AMETERS CATION 0.000 fs 9.199 0.340 RM TOTA ***** SONORM C .0.00 Hy NDE 7.08 Cm	ORTHOCLASE 9 INDEX 0.646 ONS 45.40 : A = 0.16 F PLOT A = 0. CATANORM or a 3.366 22.92 fo f 0.000 0.000 cm tn 0.000 0.000 0 L =100.000 L =100.0000 L =100.0000 L =100.0000 L =100.0000 L =100.0000 L =100.0000 L =100.0000 L =100.00000 L =100.0000 L =100.00000 L =100.0000 L =100.00000 L =100.00000000 L =100.0000000000000000000000000000000000	.711 ALBITE = 0.57 M = 39 M = 0.1 b an 7 26.444 C a hy 0 18.903 C pf ns .000 0.000 *********** GORYTHM) An Lc 5.44 0.00 Fs Fc 0.00 0.00 NS Ks	0.27 5 F = 0.46 1c ne 0.000 0.000 ol ac 0.000 0.000 ks cs 0.000 0.000 0 ****** Ne Wo 0.00 0.000 5 Fa) 0.00 1.26 Cs Ru B	kp 0.000 mt 1.255 ru .00016 Ri 25.99 Mt 5 0.0
QUARTZ CHAPPEL MG NO. AFM PAR JENSEN	27.968 S A/CNK IN CATI AMETERS CATION 0.000 fs 9.199 ap 0.340 RM TOTA ***** SONORM C .0.00 Hy NDE 7.08 Cm 0.00	ORTHOCLASE 9 INDEX 0.646 ONS 45.40 : A = 0.16 F PLOT A = 0. CATANORM or a 3.366 22.92 fo f 0.000 0.000 cm tn 0.000 0.000 0 L =100.000 L =100.0000 L =100.0000 L =100.0000 L =100.0000 L =100.0000 L =100.0000 L =100.0000 L =100.00000 L =100.0000 L =100.00000 L =100.0000 L =100.00000 L =100.00000000 L =100.0000000000000000000000000000000000	.711 ALBITE = 0.57 M = 39 M = 0.1 b an 7 26.444 C a hy 0 18.903 C pf ns .000 0.000 *********** GORYTHM) An Lc 5.44 0.00 Fs Fc 0.00 0.00 NS Ks	0.27 5 F = 0.46 1c ne 0.000 0.000 ol ac 0.000 0.000 ks cs 0.000 0.000 0 ****** Ne Wo 0.00 0.000 5 Fa) 0.00 1.26	kp 0.000 mt 1.255 ru .00016 Ri 25.99 Mt 5 0.0

PETRONOR	RMS PROC	GRAM			
SAMPLE N	NUMBER	RM32			
OXIDES	GIVEN	RECALC 100%	MOL PROPS	CAT PROPS	177
SiO2 [.]	55.32	55.342	0.921	0.921	177
A1203	14.62	14.626	0.143	0.287	
Fe203	1.19	1.190	0.007	0.015	
FeO	9.61	9.614	0.134	0.134	
MnO	0.11	0.110	0.002	0.002	
MgO	3.40	3.401	0.084	0.084	
CaO	8.27	8.273	0.148	0.148	
Na2O	5.52	5.522	0.089	0.178	
К2О	0.71	0.710	0.008	0.015	
TiO2	1.04	1.041	0.013	0.013	
P205	0.17	0.170	0.001	0.002	
Cr203	0.00	0.000	0.000	0.000	
TOTAL	99.96				

.....CIPW NORM..... c or ab an lc ne wo kp P 0.000 0.000 4.197 46.724 13.023 0.000 0.000 0.000 0.000 fs fo fa hy ol ac mt hm en 0.300 0.409 3.620 4.928 0.709 8.548 0.000 1.726 0.000 cm tn pf ns ks cs ru di il ap 1.977 0.403 0.000 0.000 0.000 0.000 0.000 0.000 0.000 22.704 CIPWNORM TOTAL = 100.010

PARAMETERS FOR CIPW NORMATIVE MINERALS OLIVINE COMPOSITION: FORSTERITE 42.348 FAYALITE 57.652 HYPERSTHENE COMPOSITION:EN 42.348 FS 57.652 FELDSPAR COMPOSITION :KFS 6.564 AB 73.071 AN 20.366 PLAGIOCLASE PERCENT ANORTHITE 21.796 QUARTZ : FELDSPAR RATIOS: QUARTZ 0.000 ORTHOCLASE 6.564 PLAGIOCLASE 93.436 QUARTZ 0.000 ORTHOCLASE 8.242 ALBITE 91.758 CHAPPELS A/CNK INDEX 0.588 MG No. IN CATIONS 36.20

AFM PARAMETERS: A = 0.31 F = 0.53 M = 0.17JENSEN CATION PLOT A = 0.41 M = 0.11 F = 0.48

......CATANORM..... q С or ab an lc ne kp wo $0.000 \quad 0.000 \quad 4.192 \quad 49.528 \quad 13.011 \quad 0.000 \quad 0.000 \quad 0.000 \quad 0.000$ fs fo fa hy ol en ac mt hm 0.282 0.383 3.409 4.641 0.665 8.051 0.000 1.243 0.000 **i**1 ap cm tn pf ns ks cs di ru 1.449 0.355 0.000 0.000 0.000 0.000 0.000 0.000 0.00021.507 CATANORM TOTAL =100.000

... MESONORM (HUCHISONS ALGORYTHM...)

Q C Or Ab An Lc Ne Ri Wo Act \mathbf{Ed} 0.00 0.00 0.00 46.09 13.01 0.00 0.00 1.88 17.54 0.00 11.00 Di Ну 01 Fo (En Fs Fa) Mt Hm HORNBLENDE 0.00 0.00 0.00 0.00 0.00 0.00 0.00 1.24 0.00 28.544 Ap Cm \mathbf{Tn} Ρf Ns Ks Cs Ru BIOTITE Sp 0.40 0.00 2.17 0.00 0.00 0.00 0.00 0.00 6.706 MESONORM TOTAL = 100.044

OVIDEC		MAG1	LC 100%	MOT. P	POPS	CAT PRO	PS	
	55.94		56.118			0.9		178
			14.115		.138			
			1.224	-	.008		15	
			9.942			0.1		
			0.161			0.0		
	4.91		4.926		.122	0.1	.22	
	7.36		7.383	0	.132	0.1	.32	
	4.31		4.324	0	.070	0.1	40	
к20	0.59)	0.592	0	.006	0.0	13	
TiO2	1.02	2	1.026	0	.013	0.0	13	
P205	0.19)	0.191	0	.001	0.0	03	
	0.00		0.000	0	.000	0.0	000	
TOTAL .	99.68	3						
			CIPW NO					
			ab					
			36.584 1					
			fa	-				
			0.000 2					
	-		tn p					di
			.000 0.00	0.000	0.000	0.000	0.000	15.044
CIPWNOR	Μ ΤΟΤΑΙ	. = 100.0	J12 ********					
			CIPW NOR					
			ON:EN 5					
FELDSPA	P COMPC	NOT TON	.VEC C					
				.089 A		692 AN	i 30.2	19
PLAGIOC	LASE PE	RCENT AN	NORTHITE			692 AN	1 30.2	19
PLAGIOC QUARTZ	LASE PE	ERCENT AN SPAR RATI	NORTHITE IOS:	32.178				19
PLAGIOC QUARTZ QUARTZ	LASE PE FELDS 4.582	CRCENT AN SPAR RATIONS ORTHOCI	NORTHITE IOS: LASE 5.8	32.178 10 PLA	GIOCLA	SE 89.		19
PLAGIOC QUARTZ QUARTZ QUARTZ	LASE PE : FELDS 4.582 6.438	ERCENT AN SPAR RAT ORTHOCI ORTHOCLA	NORTHITE IOS: LASE 5.8 ASE 8.164	32.178 10 PLA	GIOCLA	SE 89.		19
PLAGIOC QUARTZ QUARTZ QUARTZ CHAPPEL	LASE PE FELDS 4.582 6.438 S A/CNE	ERCENT AN SPAR RATI ORTHOCI ORTHOCLA C INDEX	NORTHITE IOS: LASE 5.8 ASE 8.164 0.667	32.178 10 PLA	GIOCLA	SE 89.		19
PLAGIOC QUARTZ QUARTZ QUARTZ CHAPPEL	LASE PE FELDS 4.582 6.438 S A/CNE	ERCENT AN SPAR RAT ORTHOCI ORTHOCLA	NORTHITE IOS: LASE 5.8 ASE 8.164 0.667	32.178 10 PLA	GIOCLA	SE 89.		19
PLAGIOC QUARTZ QUARTZ QUARTZ CHAPPEL 4G No.	LASE PE FELDS 4.582 6.438 S A/CNE IN CATJ	ERCENT AN SPAR RATION ORTHOCION ORTHOCION CINDEX CONS 44	NORTHITE IOS: LASE 5.8 ASE 8.164 0.667 4.29	32.178 10 PLA ALBITE	GIOCLA	SE 89.		19
PLAGIOC QUARTZ QUARTZ QUARTZ CHAPPEL 4G No.	LASE PE FELDS 4.582 6.438 S A/CNF IN CATJ AMETERS	ERCENT AN SPAR RATE ORTHOCH ORTHOCH CONS 44 S: A = 0	NORTHITE IOS: LASE 5.8 ASE 8.164 0.667 4.29 .24 F = 0	32.178 10 PLA ALBITE	GIOCLA 85.39	SE 89. 8		19
PLAGIOC QUARTZ QUARTZ QUARTZ CHAPPEL 4G No.	LASE PE FELDS 4.582 6.438 S A/CNF IN CATJ AMETERS	ERCENT AN SPAR RATE ORTHOCH ORTHOCH CONS 44 S: A = 0	NORTHITE IOS: LASE 5.8 ASE 8.164 0.667 4.29	32.178 10 PLA ALBITE	GIOCLA 85.39	SE 89. 8		19
PLAGIOC QUARTZ QUARTZ QUARTZ CHAPPEL 4G No.	LASE PE FELDS 4.582 6.438 S A/CNE IN CATI AMETERS CATION	ERCENT AN SPAR RATION ORTHOCION ORTHOCION CONS 44 S: A = 0 PLOT A	NORTHITE IOS: LASE 5.8 ASE 8.164 0.667 4.29 .24 F = 0 A = 0.38	32.178 10 PLA ALBITE .53 M = M = 0.	GIOCLA 85.39 0.24 15 F =	SE 89. 8		19
PLAGIOC QUARTZ QUARTZ QUARTZ CHAPPEL MG NO. AFM PAR JENSEN	LASE PE FELDS 4.582 6.438 S A/CNF IN CATI AMETERS CATION	ERCENT AN SPAR RATE ORTHOCH ORTHOCH CONS 44 S: A = 0 PLOT 2 CONS 44	NORTHITE IOS: LASE 5.8 ASE 8.164 0.667 4.29 .24 F = 0 A = 0.38 FANORM	32.178 10 PLA ALBITE .53 M = M = 0.	GIOCLA 85.39 0.24 15 F =	SE 89. 8 0.47	608	
PLAGIOC QUARTZ QUARTZ QUARTZ CHAPPEL 4G NO. AFM PAR JENSEN q	LASE PE : FELDS 4.582 6.438 S A/CNH IN CATI AMETERS CATION	ERCENT AN SPAR RATE ORTHOCH ORTHOCH CONS 44 S: A = 0 PLOT A PLOT A	NORTHITE IOS: LASE 5.8 ASE 8.164 0.667 4.29 .24 F = 0 A = 0.38 TANORM ab	32.178 10 PLA ALBITE 0.53 M = M = 0. an	GIOCLA 85.39 0.24 15 F = 1c	SE 89. 8 0.47 ne	608 kp	WO
PLAGIOC QUARTZ QUARTZ QUARTZ CHAPPEL 4G NO. AFM PAR JENSEN 9 2.567	LASE PE : FELDS 4.582 6.438 S A/CNF IN CATJ AMETERS CATION 	ERCENT AN SPAR RATE ORTHOCH ORTHOCH CINDEX CONS 44 S: A = 0 PLOT 2 PLOT 2 ORTHOCH CONS 44 S: A = 0 PLOT 2 ORTHOCH CONS 44 S: A = 0 PLOT 2 ORTHOCH CONS 44 S: A = 0 PLOT 2 ORTHOCH CONS 44 S: A = 0 S: A =	NORTHITE IOS: LASE 5.8 ASE 8.164 0.667 4.29 .24 F = 0 A = 0.38 TANORM ab 39.008 1	32.178 10 PLA ALBITE 0.53 M = M = 0. an 7.444	GIOCLA 85.39 0.24 15 F = 1c 0.000	SE 89. 8 0.47 ne 0.000	608 kp 0.000	wo 0.000
PLAGIOC QUARTZ QUARTZ QUARTZ CHAPPEL MG NO. AFM PAR JENSEN q 2.567 en	LASE PE : FELDS 4.582 6.438 S A/CNF IN CATI AMETERS CATION 	CRCENT AN SPAR RATE ORTHOCH ORTHOCH CINDEX CONS 44 S: A = 0 PLOT 4 CONS 44 CONS 44	NORTHITE IOS: LASE 5.8 ASE 8.164 0.667 4.29 .24 F = 0 A = 0.38 TANORM ab 39.008 1 fa	32.178 310 PLA ALBITE 0.53 M = M = 0. an 7.444 hy	GIOCLA 85.39 0.24 15 F = 1c 0.000 ol	SE 89. 8 0.47 ne 0.000 ac	608 kp 0.000 mt	wо 0.000 hm
PLAGIOC QUARTZ QUARTZ QUARTZ CHAPPEL 4G No. AFM PAR JENSEN q 2.567 en 10.012	LASE PE : FELDS 4.582 6.438 S A/CNE IN CATI AMETERS CATION 	ERCENT AN SPAR RATE ORTHOCH ORTHOCH CINDEXORTHOCH CINDEXCINDEXCONS 44 S: A = 0PLOTPLOT03.5135fo0.000	NORTHITE IOS: LASE 5.8 ASE 8.164 0.667 4.29 .24 F = 0 A = 0.38 FANORM ab 39.008 1 fa 0.000 1	32.178 10 PLA ALBITE .53 M = M = 0. an 7.444 hy 9.854	GIOCLA 85.39 0.24 15 F = 1c 0.000 ol 0.000	SE 89. 8 0.47 ne 0.000 ac 0.000	.608 kp 0.000 mt 1.286	wo 0.000 hm 0.000
PLAGIOC QUARTZ QUARTZ QUARTZ CHAPPEL MG NO. AFM PAR JENSEN q 2.567 en 10.012 il	LASE PE : FELDS 4.582 6.438 S A/CNF IN CATI AMETERS CATION 	ERCENT AN SPAR RATE ORTHOCH ORTHOCH CONS 44 S: $A = 0$ PLOT 2 PLOT 2 ORTHOCH CONS 44 S: $A = 0$ PLOT 2 ORTHOCH CONS 44 CONS 44	NORTHITE IOS: LASE 5.8 ASE 8.164 0.667 4.29 .24 F = 0 A = 0.38 FANORM ab 39.008 1 fa 0.000 1 tn p	32.178 310 PLA ALBITE M = 0. M = 0. 310 M = 0. 310 M = 0. 310 M = 0. 310 M = 0. 310 M = 0. 310 310 M = 0. 310 310 310 M = 0. 310 310 310 310 M = 0. 310	GIOCLA 85.39 0.24 15 F = 1c 0.000 ol 0.000 ks	SE 89. 8 0.47 ne 0.000 ac 0.000 cs	.608 kp 0.000 mt 1.286 ru	wo 0.000 hm 0.000 di
PLAGIOC QUARTZ QUARTZ QUARTZ CHAPPEL IG NO. AFM PAR JENSEN q 2.567 en 10.012 il 1.436	LASE PE : FELDS 4.582 6.438 S A/CNH IN CATI AMETERS CATION 	ERCENT AN SPAR RATE ORTHOCH ORTHOCH CINDEX CONS 44S: $A = 0$ PLOT APLOT A0 3.513 5 fo0 0.000 cm 0.000 0.000	NORTHITE IOS: LASE 5.8 ASE 8.164 0.667 4.29 .24 F = 0 A = 0.38 TANORM ab 39.008 1 fa 0.000 1 tn p .000 0.00	32.178 310 PLA ALBITE M = 0. M = 0. 310 M = 0. 310 M = 0. 310 M = 0. 310 M = 0. 310 M = 0. 310 310 M = 0. 310 310 310 M = 0. 310 310 310 310 M = 0. 310	GIOCLA 85.39 0.24 15 F = 1c 0.000 ol 0.000 ks	SE 89. 8 0.47 ne 0.000 ac 0.000 cs	.608 kp 0.000 mt 1.286 ru	wo 0.000 hm 0.000 di
PLAGIOC QUARTZ QUARTZ QUARTZ CHAPPEL IG NO. AFM PAR JENSEN q 2.567 en 10.012 il 1.436	LASE PE : FELDS 4.582 6.438 S A/CNF IN CATJ AMETERS CATION 	ERCENT AN SPAR RATE ORTHOCH ORTHOCH ORTHOCH SINDEX ONS 44 S: A = 0 PLOT 0.000 Cm 0.000 0.000 0.000	NORTHITE IOS: LASE 5.8 ASE 8.164 0.667 4.29 .24 F = 0 A = 0.38 TANORM ab 39.008 1 fa 0.000 1 tn p .000 0.00	32.178 10 PLA ALBITE 0.53 M = M = 0. an 7.444 hy 9.854 f ns 0 0.000	GIOCLA 85.39 0.24 15 F = 1c 0.000 ol 0.000 ks 0.000	SE 89. 8 0.47 ne 0.000 ac 0.000 cs 0.000	.608 kp 0.000 mt 1.286 ru	wo 0.000 hm 0.000 di
PLAGIOC QUARTZ QUARTZ QUARTZ CHAPPEL 4G No. 4FM PAR JENSEN 9 2.567 en 10.012 il 1.436 CATANO	LASE PE : FELDS 4.582 6.438 S A/CNF IN CATJ AMETERS CATION 	ERCENT AN SPAR RATE ORTHOCH ORTHOCH ORTHOCH SINDEX ONS 44 S: A = 0 PLOT 4 S. A = 0 ORTHOCH S: A = 0 PLOT 4 S. S. 513 S fo 0.000 Cm 0.000 OL = 100.0	NORTHITE IOS: LASE 5.8 ASE 8.164 0.667 4.29 .24 F = 0 A = 0.38 TANORM ab 39.008 1 fa 0.000 1 tn p .000 0.00 .000	32.178 32.178 ALBITE 0.53 M = M = 0. an 7.444 hy 9.854 of ns 0 0.000 *******	GIOCLA 85.39 0.24 15 F = 1c 0.000 ol 0.000 ks 0.000	SE 89. 8 0.47 ne 0.000 ac 0.000 cs 0.000	.608 kp 0.000 mt 1.286 ru	wo 0.000 hm 0.000 di
PLAGIOC QUARTZ QUARTZ QUARTZ CHAPPEL 4G NO. AFM PAR JENSEN q 2.567 en 10.012 il 1.436 CATANO ME	LASE PE : FELDS 4.582 6.438 S A/CNF IN CATI AMETERS CATION 	ERCENT AN SPAR RATE ORTHOCH ORTHOCH ORTHOCH CINDEX ONS 44 S: A = 0 PLOT 4 ORTHOCH ORTHOCH S: A = 0 PLOT 4 ORTHOCH <	NORTHITE IOS: LASE 5.8 ASE 8.164 0.667 4.29 .24 F = 0 A = 0.38 TANORM ab 39.008 1 fa 0.000 1 tn p .000 0.00 .000 	32.178 32.178 ALBITE 3.53 M = M = 0. an 7.444 hy 9.854 of ns 0 0.000 *******	GIOCLA 85.39 0.24 15 F = 1c 0.000 ol 0.000 ks 0.000 ******	SE 89. 8 0.47 ne 0.000 ac 0.000 cs 0.000	608 kp 0.000 mt 1.286 ru 0.0001	wo 0.000 hm 0.000 di 4.492
PLAGIOC QUARTZ QUARTZ QUARTZ CHAPPEL MG NO. AFM PAR JENSEN q 2.567 en 10.012 il 1.436 CATANO ME Q	LASE PE : FELDS 4.582 6.438 S A/CNF IN CATI AMETERS CATION 	ERCENT AN SPAR RATE ORTHOCH ORTHOCH ORTHOCH CINDEX ONS 44 S: A = 0 PLOT 4 ORTHOCH ORTHOCH S: A = 0 PLOT 4 ORTHOCH <	NORTHITE IOS: LASE 5.8 ASE 8.164 0.667 4.29 .24 F = 0 A = 0.38 TANORM ab 39.008 1 fa 0.000 1 tn p .000 0.00 .000	32.178 32.178 ALBITE 3.53 M = M = 0. an 7.444 hy 9.854 of ns 0 0.000 *******	GIOCLA 85.39 0.24 15 F = 1c 0.000 ol 0.000 ks 0.000 ******	SE 89. 8 0.47 ne 0.000 ac 0.000 cs 0.000	608 kp 0.000 mt 1.286 ru 0.0001	wo 0.000 hm 0.000 di 4.492
PLAGIOC QUARTZ QUARTZ QUARTZ CHAPPEL MG NO. AFM PAR JENSEN q 2.567 en 10.012 il 1.436 CATANO ME Q Ed	LASE PE : FELDS 4.582 6.438 S A/CNH IN CATI AMETERS CATION 	ERCENT AN SPAR RATE ORTHOCH ORTHOCH ORTHOCH CONS 44 S: $A = 0$ PLOT 2 S: $A = 0$ PLOT 2 ORTHOCH CONS 44 S: $A = 0$ ORTHOCH CONS 44 S: $A = 0$ ORTHOCH CONS 44 S: $A = 0$ ORTHOCH CONS 44 CONS	NORTHITE IOS: LASE 5.8 ASE 8.164 0.667 4.29 .24 F = 0 A = 0.38 TANORM ab 39.008 1 fa 0.000 1 tn p .000 0.000 >>>>>>>>>>>>>>>>>>>>>>>>>>>>>>	32.178 10 PLA ALBITE 0.53 M = M = 0. an 7.444 hy 9.854 of ns 0 0.000 ******* YTHM	GIOCLA 85.39 0.24 15 F = 1c 0.000 ol 0.000 ks 0.000 ******	SE 89. 8 0.47 ne 0.000 ac 0.000 cs 0.000	kp 0.000 mt 1.286 ru 0.0001	wo 0.000 hm 0.000 di 4.492 Act
PLAGIOC QUARTZ QUARTZ QUARTZ CHAPPEL 4G NO. AFM PAR JENSEN q 2.567 en 10.012 il 1.436 CATANO ME Q Ed 2.50	LASE PE : FELDS 4.582 6.438 S A/CNF IN CATJ AMETERS CATION 	ERCENT AN SPAR RATE ORTHOCH ORTHOCH ORTHOCH CONS 44 S: $A = 0$ PLOT 2 S: $A = 0$ PLOT 2 ORTHOCH CONS 44 S: $A = 0$ ORTHOCH CONS 44 S: $A = 0$ ORTHOCH CONS 44 S: $A = 0$ ORTHOCH CONS 44 CONS	NORTHITE IOS: LASE 5.8 ASE 8.164 0.667 4.29 .24 F = 0 A = 0.38 TANORM ab 39.008 1 fa 0.000 1 tn p .000 0.00 .000 	32.178 10 PLA ALBITE 0.53 M = M = 0. an 7.444 hy 9.854 of ns 0 0.000 ******* YTHM	GIOCLA 85.39 0.24 15 F = 1c 0.000 ol 0.000 ks 0.000 ******	SE 89. 8 0.47 ne 0.000 ac 0.000 cs 0.000	kp 0.000 mt 1.286 ru 0.0001	wo 0.000 hm 0.000 di 4.492 Act
PLAGIOC QUARTZ QUARTZ QUARTZ CHAPPEL 4G NO. AFM PAR JENSEN 4 2.567 en 10.012 il 1.436 CATANO ME Q Ed 2.50).00	LASE PE : FELDS 4.582 6.438 S A/CNF IN CATJ AMETERS CATION 	ERCENT AN SPAR RATE ORTHOCH ORTHOCH CINDEX CONS 44 CINDEX CONS 44 CINDEX CINDEX CONS 44 CINDEX C	NORTHITE IOS: LASE 5.8 ASE 8.164 0.667 4.29 .24 F = 0 A = 0.38 TANORM ab 39.008 1 fa 0.000 1 tn p .000 0.00 000 ********** A = 0.17.44	32.178 10 PLA ALBITE 0.53 M = M = 0. M = 0. an 7.444 hy 9.854 of ns 0 0.000 ******* YTHM LC 4 0.00	GIOCLA 85.39 0.24 15 F = 1c 0.000 ol 0.000 ks 0.000 ******	SE 89. 8 0.47 0.000 ac 0.000 cs 0.000	kp 0.000 mt 1.286 ru 0.0001 Ri 0 21.7	wo 0.000 hm 0.000 di 4.492 Act 9 0.00
PLAGIOC QUARTZ QUARTZ QUARTZ CHAPPEL 4G NO. AFM PAR JENSEN 4 2.567 en 10.012 il 1.436 CATANO ME Q Ed 2.50 0.00 Di	LASE PE : FELDS 4.582 6.438 S A/CNF IN CATI AMETERS CATION 	ERCENT AN SPAR RATE ORTHOCH ORTHOCH CINDEX CONS 44 CINDEX CONS 44 CINDEX CINDEX CONS 44 CINDEX C	NORTHITE IOS: LASE 5.8 ASE 8.164 0.667 4.29 .24 F = 0 A = 0.38 TANORM ab 39.008 1 fa 0.000 1 tn p .000 0.000 >>>>>>>>>>>>>>>>>>>>>>>>>>>>>>	32.178 10 PLA ALBITE 0.53 M = M = 0. M = 0. an 7.444 hy 9.854 of ns 0 0.000 ******* YTHM LC 4 0.00	GIOCLA 85.39 0.24 15 F = 1c 0.000 ol 0.000 ks 0.000 ******	SE 89. 8 0.47 0.000 ac 0.000 cs 0.000 (cs 0.000	kp 0.000 mt 1.286 ru 0.0001 Ri 0 21.7	wo 0.000 hm 0.000 di 4.492 Act 9 0.00
PLAGIOC QUARTZ QUARTZ QUARTZ CHAPPEL 4G NO. AFM PAR JENSEN 4 2.567 en 10.012 il 1.436 CATANO ME Q Ed 2.50 0.00 Di IORNBLE	LASE PE : FELDS 4.582 6.438 S A/CNF IN CATJ AMETERS CATION 	ERCENT AN SPAR RATE ORTHOCH ORTHOCH CINDEX CONS 44 S: A = 0 PLOT 4 CONS 44 CONS 44	NORTHITE IOS: LASE 5.8 ASE 8.164 0.667 4.29 .24 $F = 0$ A = 0.38 TANORM 39.008 fa 0.000 tn p.0000 NS ALGOR Ab An .01 17.44 En Fs	32.178 10 PLA ALBITE 0.53 M = M = 0. an 7.444 hy 9.854 of ns 0 0.000 ******* UTHM 4 0.00 5 F	GIOCLA 85.39 0.24 15 F = 1c 0.000 ol 0.000 ks 0.000 ******) N 0.00	SE 89. 8 0.47 0.000 ac 0.000 cs 0.000 Ke Wa 0.000	kp 0.000 mt 1.286 ru 0.0001 Ri 0 21.7 Mt	wo 0.000 hm 0.000 di 4.492 Act 9 0.00 Hm
PLAGIOC QUARTZ QUARTZ QUARTZ CHAPPEL MG NO. AFM PAR JENSEN (2.567 en 10.012 i1 1.436 CATANO ME Q Ed 2.50 0.00 Di HORNBLE 0.00	LASE PE : FELDS 4.582 6.438 S A/CNF IN CATJ AMETERS CATION 	ERCENT AN SPAR RATE ORTHOCH ORTHOCH CINDEX CONS 44 S: A = 0 PLOT 4 CONS 44 CONS 44	NORTHITE IOS: LASE 5.8 ASE 8.164 0.667 4.29 .24 F = 0 A = 0.38 TANORM ab 39.008 1 fa 0.000 1 tn p .000 0.00 000 ********** DNS ALGOR AD An .01 17.44	32.178 10 PLA ALBITE 0.53 M = M = 0. an 7.444 hy 9.854 of ns 0 0.000 ******* UTHM 4 0.00 5 F	GIOCLA 85.39 0.24 15 F = 1c 0.000 ol 0.000 ks 0.000 ******) N 0.00	SE 89. 8 0.47 0.000 ac 0.000 cs 0.000 Ke Wa 0.000	kp 0.000 mt 1.286 ru 0.0001 Ri 0 21.7 Mt	wo 0.000 hm 0.000 di 4.492 Act 9 0.00 Hm
PLAGIOC QUARTZ QUARTZ QUARTZ CHAPPEL MG NO. AFM PAR JENSEN (2.567 en 10.012 i1 1.436 CATANO 2.50 D.00 Di HORNBLE 0.00 21.788	LASE PE : FELDS 4.582 6.438 S A/CNH IN CATJ AMETERS CATION 	ERCENT AN SPAR RATE ORTHOCH ORTHOCH ORTHOCH CINDEX CONS 44 S: A = 0. PLOT 2 CAT S: A = 0. PLOT 2 CAT C 0.000 C 0.000 C 0.000 C 0.000 C 0.000 C 1. C 0.000 C 0.000 C 1. C 0.000 C 1. C 0.000 C 1. C	NORTHITE IOS: LASE 5.8 ASE 8.164 0.667 4.29 .24 $F = 0$ A = 0.38 IANORM ab 39.008 fa 0.000 tn p .000 0.00 X******** Ab An .01 17.44 En Fs .00 0.0	32.178 10 PLA ALBITE 0.53 M = M = 0. M = 0. A 0.000 ******* M LC 0.000 From 0.000 0.000	GIOCLA 85.39 0.24 15 F = 1c 0.000 0.000 ks 0.000 ks 0.000 ks 0.000	SE 89. 8 0.47 ne 0.000 ac 0.000 cs 0.000 cs 0.000 Fa) 0.1.	kp 0.000 mt 1.286 ru 0.0001 Ri 0 21.7 Mt 29 0.	wo 0.000 hm 0.000 di 4.492 Act 9 0.00 Hm
PLAGIOC QUARTZ QUARTZ QUARTZ CHAPPEL MG NO. AFM PAR JENSEN 4 2.567 en 10.012 il 1.436 CATANO ME Q Ed 2.50 0.00 Di HORNBLEI 0.00 21.788 Ap	LASE PE : FELDS 4.582 6.438 S A/CNF IN CATJ AMETERS CATION 	ERCENT AN SPAR RATE ORTHOCH ORTHOCH CINDEX CONS 44 CINDEX CONS 44 CINDEX CINDEX CONS 44 CINDEX C	NORTHITE IOS: LASE 5.8 ASE 8.164 0.667 4.29 .24 $F = 0$ A = 0.38 TANORM 39.008 fa 0.000 tn p.0000 NS ALGOR Ab An .01 17.44 En Fs	32.178 10 PLA ALBITE 0.53 M = M = 0. M = 0. A 0.000 ******* M = 0. A 0.000 A 0.000 Ks	GIOCLA 85.39 0.24 15 F = 0.000 0.000 ****** N 0.00 0 0.000 ******	SE 89. 8 0.47 ne 0.000 ac 0.000 cs 0.000 (e Wc 0 0.0 Fa) 0 1. Ru	kp 0.000 mt 1.286 ru 0.0001 Ri 00 21.7 Mt 29 0. BIOTITI	wo 0.000 hm 0.000 di 4.492 Act 9 0.00 Hm

		MAG2					
		RECALC 1					17
	56.30		.312			937	17
	14.53		533	0.14			
	1.20		.200		8 0.		
	9.69		.692		5 0.		
	0.14		.140		2 0.		
-	4.79		.791		90.		
	6.93		.931		4 0.		
	4.09		.091		6 0.		
	1.14		.140		2 0.		
	1.00		.000	0.01	3 0.	013	
P205	0.17		.170	0.00		002	
Cr203	0.00	0	.000	0.00	0 0.	000	
TOTAL	99.98						
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-		or			lc ne	-	
		6.738 34					0.0
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10.562	10.383	0.000 0	.000 20	.945 0.0	00 0.000	1.740	0.0
il	-	cm ti	-				
1.898	0.403	0.000 0.00	0.000	0.000 0.	000 0.000	0.000 1	2.81
CIPWNORN	I TOTAL	= 100.011					
		*******	******	*******	****		
1	PARAMET	ERS FOR CI	PW NORM	ATIVE MIN	ERALS		
HYPERSTI	HENE CO	MPOSITION:	EN 50	.427 FS	49.573		
							-
FELDSPA	к сомро	SITTION :K	FS 11.3	367 AB	58.394 A	N 30.23	9
					58.394 A	LN 30.23	9
PLAGIOCI	LASE PE	RCENT ANOR	THITE :		58.394 A	IN 30.23	9
PLAGIOCI QUARTZ	LASE PE : FELDS	RCENT ANOR PAR RATIOS	THITE :	34.117			9
PLAGIOCI QUARTZ QUARTZ	LASE PE : FELDS 4.723	RCENT ANOR PAR RATIOS ORTHOCLAS	THITE : : E 10.8:	34.117 30 plagi	OCLASE 8		9
PLAGIOCI QUARTZ QUARTZ QUARTZ	LASE PE : FELDS 4.723 6.634	RCENT ANOR PAR RATIOS ORTHOCLAS ORTHOCLASE	THITE : : E 10.8: 15.213	34.117 30 plagi	OCLASE 8		9
PLAGIOCI QUARTZ QUARTZ QUARTZ CHAPPEL:	LASE PE : FELDS 4.723 6.634 S A/CNK	RCENT ANOR PAR RATIOS ORTHOCLAS ORTHOCLASE INDEX 0.	THITE : : E 10.8: 15.213 707	34.117 30 plagi	OCLASE 8		9
PLAGIOCI QUARTZ QUARTZ QUARTZ CHAPPEL:	LASE PE : FELDS 4.723 6.634 S A/CNK	RCENT ANOR PAR RATIOS ORTHOCLAS ORTHOCLASE	THITE : : E 10.8: 15.213 707	34.117 30 plagi	OCLASE 8		9
PLAGIOCI QUARTZ QUARTZ QUARTZ CHAPPELS MG No. 3	LASE PE : FELDS 4.723 6.634 S A/CNK IN CATI	RCENT ANOR PAR RATIOS ORTHOCLAS ORTHOCLASE INDEX 0. ONS 44.2	THITE : : E 10.8: 15.213 707 2	34.117 30 plagi Albite 7	OCLASE 8 8.153		9
PLAGIOCI QUARTZ QUARTZ QUARTZ CHAPPELS MG No.	LASE PE : FELDS 4.723 6.634 S A/CNK IN CATI	RCENT ANOR PAR RATIOS ORTHOCLASE ORTHOCLASE INDEX 0. ONS 44.2 : A = 0.25	THITE : E = 10.83 15.213 707 2 F = 0.5	34.117 30 plagi Albite 7 52 m = 0.	OCLASE 8 8.153 23		9
PLAGIOCI QUARTZ QUARTZ QUARTZ CHAPPELS MG No.	LASE PE : FELDS 4.723 6.634 S A/CNK IN CATI	RCENT ANOR PAR RATIOS ORTHOCLAS ORTHOCLASE INDEX 0. ONS 44.2	THITE : E = 10.83 15.213 707 2 F = 0.5	34.117 30 plagi Albite 7 52 m = 0.	OCLASE 8 8.153 23		9
PLAGIOCI QUARTZ QUARTZ QUARTZ CHAPPELS MG No. 3 AFM PARI JENSEN (LASE PE : FELDS 4.723 6.634 S A/CNK IN CATI AMETERS CATION	RCENT ANOR PAR RATIOS ORTHOCLASS ORTHOCLASS INDEX 0. ONS 44.2 : A = 0.25 PLOT A =	THITE : E = 10.83 15.213 707 2 F = 0.3 0.39	34.117 30 PLAGI ALBITE 7 52 M = 0. M = 0.15	OCLASE 8 8.153 23 F = 0.46		9
PLAGIOCI QUARTZ QUARTZ QUARTZ CHAPPELS MG NO. AFM PARI JENSEN (LASE PE : FELDS 4.723 6.634 S A/CNK IN CATI AMETERS CATION	RCENT ANOR PAR RATIOS ORTHOCLASE ORTHOCLASE INDEX 0. ONS 44.2 : A = 0.25 PLOT A =	THITE : E = 10.83 15.213 707 2 F = 0.3 0.39 1 ORM	34.117 30 PLAGI ALBITE 7 52 M = 0. M = 0.15	OCLASE 8 8.153 23 F = 0.46	4.447	
PLAGIOCI QUARTZ QUARTZ QUARTZ CHAPPELS MG NO. AFM PARI JENSEN (LASE PE : FELDS 4.723 6.634 S A/CNK IN CATI AMETERS CATION	RCENT ANOR PAR RATIOS ORTHOCLASE ORTHOCLASE INDEX 0. ONS 44.2 : A = 0.25 PLOT A = CATAN	THITE : E 10.83 15.213 707 2 F = 0.9 0.39 1 0RM ab	34.117 30 PLAGI ALBITE 7 52 M = 0. M = 0.15 an	OCLASE 8 8.153 23 F = 0.46 lc ne	4.447	
PLAGIOCI QUARTZ QUARTZ QUARTZ CHAPPELS MG No. AFM PARI JENSEN 0 q 2.735	LASE PE : FELDS 4.723 6.634 S A/CNK IN CATI AMETERS CATION 	RCENT ANOR PAR RATIOS ORTHOCLASE ORTHOCLASE INDEX 0. ONS 44.2 : A = 0.25 PLOT A = CATAN or 6.770 36	THITE : E 10.8: 15.213 707 2 F = 0.9 0.39 1 0RM ab .918 18	34.117 30 PLAGI ALBITE 7 52 M = 0. M = 0.15 an .019 0.0	23 F = 0.46 lc ne 000 0.000	94.447 e kp 0.000	0.0
PLAGIOCI QUARTZ QUARTZ QUARTZ CHAPPELS MG No. AFM PARI JENSEN 0 q 2.735 en	LASE PE : FELDS 4.723 6.634 S A/CNK IN CATI AMETERS CATION C 0.000 fs	RCENT ANOR PAR RATIOS ORTHOCLASE ORTHOCLASE INDEX 0. ONS 44.2 : A = 0.25 PLOT A = CATAN or 6.770 36 fo	THITE : E = 10.83 15.213 707 2 F = 0.3 0.39 1 0RM ab .918 18 fa	34.117 30 PLAGI ALBITE 7 52 M = 0. M = 0.15 an .019 0.0 hy	OCLASE 8 8.153 23 F = 0.46 1c ne 000 0.000 ol ac	e kp 0.000 c mt	0.0
PLAGIOCI QUARTZ QUARTZ QUARTZ CHAPPELS MG NO. AFM PARI JENSEN q 2.735 en 10.183	LASE PE : FELDS 4.723 6.634 S A/CNK IN CATI AMETERS CATION 0.000 fs 10.011	RCENT ANOR PAR RATIOS ORTHOCLASE ORTHOCLASE INDEX 0. ONS 44.2 : A = 0.25 PLOT A = CATAN or 6.770 36 fo 0.000 0	THITE : E 10.8: 15.213 707 2 F = 0.9 0.39 1 ORM ab .918 18 fa .000 20	34.117 30 PLAGI ALBITE 7 52 M = 0. M = 0.15 an .019 0.0 hy .194 0.0	23 F = 0.46 lc ne 000 0.000 ol ac 000 0.000	e kp 0 0.000 5 mt 0 1.261	0.0
PLAGIOCI QUARTZ QUARTZ QUARTZ CHAPPELS MG NO. AFM PARI JENSEN q 2.735 en 10.183 il	LASE PE : FELDS 4.723 6.634 S A/CNK IN CATI AMETERS CATION 0.000 fs 10.011 ap	RCENT ANOR PAR RATIOS ORTHOCLASE ORTHOCLASE INDEX 0. ONS 44.2 : A = 0.25 PLOT A = CATAN or 6.770 36 fo 0.000 0 cm t	THITE : E 10.8: 15.213 707 2 F = 0.9 0.39 1 0RM ab .918 18 fa .000 20 n pf	34.117 30 PLAGI ALBITE 7 52 M = 0. 52 M = 0.15 an .019 0.0 hy .194 0.0 ns	COCLASE 8 8.153 23 F = 0.46 1c ne 000 0.000 ol ac 000 0.000 ks cs	e kp 0.000 mt 0.261 s ru	0.0 0.0 di
PLAGIOCI QUARTZ QUARTZ QUARTZ CHAPPELS MG NO. 2 AFM PARI JENSEN 0 q 2.735 en 10.183 il 1.399	LASE PE : FELDS 4.723 6.634 5 A/CNK IN CATI AMETERS CATION 0.000 fs 10.011 ap 0.357	RCENT ANOR PAR RATIOS ORTHOCLASS ORTHOCLASS INDEX 0. ONS 44.2 : $A = 0.25$ PLOT $A =$ CATAN or 6.770 36 fo 0.000 0 cm t 0.000 0.00	THITE : E 10.83 15.213 707 2 F = 0.9 0.39 1 0RM ab .918 18 .000 20 n pf 0 0.000	34.117 30 PLAGI ALBITE 7 52 M = 0. 52 M = 0.15 an .019 0.0 hy .194 0.0 ns	COCLASE 8 8.153 23 F = 0.46 1c ne 000 0.000 ol ac 000 0.000 ks cs	e kp 0.000 mt 0.261 s ru	0.0 0.0
PLAGIOCI QUARTZ QUARTZ QUARTZ CHAPPELS MG NO. 2 AFM PARI JENSEN 0 q 2.735 en 10.183 il 1.399	LASE PE : FELDS 4.723 6.634 S A/CNK IN CATI AMETERS CATION 0.000 fs 10.011 ap 0.357 RM TOTA	RCENT ANOR PAR RATIOS ORTHOCLASE ORTHOCLASE INDEX 0. ONS 44.2 : $A = 0.25$ PLOT $A =$ CATAN or 6.770 36 fo 0.000 0 cm t 0.000 0.00 L =100.000	THITE : E 10.83 15.213 707 2 F = 0.9 0.39 1 0RM ab .918 18 fa .000 20 n pf 0 0.000	34.117 30 PLAGI ALBITE 7 52 M = 0. 52 M = 0.15 an .019 0.0 hy .194 0.0 ns 0.000 0.	23 F = 0.46 lc ne 000 0.000 ol ac 000 0.000 ks cs 000 0.000	e kp 0.000 mt 0.261 s ru	0.0 0.0
PLAGIOCI QUARTZ QUARTZ QUARTZ CHAPPELS MG NO. AFM PARI JENSEN 0 q 2.735 en 10.183 il 1.399 CATANON	LASE PE : FELDS 4.723 6.634 S A/CNK IN CATI AMETERS CATION 0.000 fs 10.011 ap 0.357 RM TOTA ****	RCENT ANOR PAR RATIOS ORTHOCLASE ORTHOCLASE INDEX 0. ONS 44.2 : A = 0.25 PLOT A = CATAN or 6.770 36 fo 0.000 0 cm t 0.000 0.00 L = 100.000	THITE : E 10.8: 15.213 707 2 F = 0.9 0.39 1 0RM ab .918 18 fa .000 20 n pf 0 0.000	34.117 30 PLAGI ALBITE 7 52 M = 0. 52 M = 0.15 an .019 0.0 hy .194 0.0 ns 0.000 0. ********	23 F = 0.46 lc ne 000 0.000 ol ac 000 0.000 ks cs 000 0.000	e kp 0.000 mt 0.261 s ru	0.0 0.0
PLAGIOCI QUARTZ QUARTZ QUARTZ CHAPPELS MG NO. AFM PARI JENSEN (2.735 en 10.183 il 1.399 CATANOI MES	LASE PE : FELDS 4.723 6.634 S A/CNK IN CATI AMETERS CATION 0.000 fs 10.011 ap 0.357 RM TOTA ***** SONORM	RCENT ANOR PAR RATIOS ORTHOCLASE ORTHOCLASE INDEX 0. ONS 44.2 : A = 0.25 PLOT A = CATAN or 6.770 36 fo 0.000 0 cm t 0.000 0.00 L =100.000	THITE : E 10.83 15.213 707 2 F = 0.9 0.39 1 0RM ab .918 18 fa .000 20 n pf 0 0.000 ******	34.117 30 PLAGI ALBITE 7 52 M = 0. 52 M = 0.15 an .019 0.0 hy .194 0.0 ns 0.000 0. *********	23 F = 0.46 lc ne 000 0.000 ol ac 000 0.000 ks cs 000 0.000	e kp 0 0.000 5 mt 0 1.261 5 ru 0 0.00012	0.0 0.0
PLAGIOCI QUARTZ QUARTZ QUARTZ CHAPPELS MG NO. 2 AFM PARI JENSEN 0 q 2.735 en 10.183 il 1.399 CATANOI MES Q	LASE PE : FELDS 4.723 6.634 S A/CNK IN CATI AMETERS CATION 0.000 fs 10.011 ap 0.357 RM TOTA ***** SONORM	RCENT ANOR PAR RATIOS ORTHOCLASE ORTHOCLASE INDEX 0. ONS 44.2 : A = 0.25 PLOT A = CATAN or 6.770 36 fo 0.000 0 cm t 0.000 0.00 L = 100.000	THITE : E 10.8: 15.213 707 2 F = 0.9 0.39 1 0.39 1 0RM ab .918 18 fa .000 20 n pf 0 0.000 ******* ALGORY	34.117 30 PLAGI ALBITE 7 52 M = 0. 52 M = 0.15 an .019 0.0 hy .194 0.0 ns 0.000 0. *********	23 F = 0.46 lc ne 000 0.000 ol ac 000 0.000 ks cs 000 0.000	e kp 0 0.000 5 mt 0 1.261 5 ru 0 0.00012	0.0 0.0 di .345
PLAGIOCI QUARTZ QUARTZ QUARTZ CHAPPELS MG NO. AFM PARI JENSEN (2.735 en 10.183 il 1.399 CATANOI MES Q Ed	LASE PE : FELDS 4.723 6.634 S A/CNK IN CATI AMETERS CATION 0.000 fs 10.011 ap 0.357 RM TOTA ***** SONORM C	RCENT ANOR PAR RATIOS ORTHOCLASE ORTHOCLASE INDEX 0. ONS 44.2 : $A = 0.25$ PLOT $A =$ CATAN or 6.770 36 fo 0.000 0 cm t 0.000 0.00 L =100.000 ********* (HUCHISONS Or Ab	THITE : E 10.83 15.213 707 2 F = 0.9 0.39 0 0 0 0 0 1 0 0 2 0 0 1 0 0 1 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0	34.117 30 PLAGI ALBITE 7 52 M = 0. 52 M = 0.15 an .019 0.0 hy .194 0.0 ns 0.000 0. ********* THM) Lc	OCLASE 8 8.153 F = 0.46 lc ne 000 0.000 ol ac 000 0.000 ks cs 000 0.000 **** Ne W	4.447 (4.447 0.000 mt 1.261 ru 0.00012 No Ri	0.0 0.0 di .345
PLAGIOCI QUARTZ QUARTZ QUARTZ CHAPPELS MG NO. 2 AFM PARI JENSEN 0 q 2.735 en 10.183 il 1.399 CATANOI MES Q	LASE PE : FELDS 4.723 6.634 S A/CNK IN CATI AMETERS CATION 0.000 fs 10.011 ap 0.357 RM TOTA ***** SONORM C	RCENT ANOR PAR RATIOS ORTHOCLASE ORTHOCLASE INDEX 0. ONS 44.2 : A = 0.25 PLOT A = CATAN or 6.770 36 fo 0.000 0 cm t 0.000 0.00 L =100.000	THITE : E 10.83 15.213 707 2 F = 0.9 0.39 0 0 0 0 0 1 0 0 2 0 0 1 0 0 1 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0	34.117 30 PLAGI ALBITE 7 52 M = 0. 52 M = 0.15 an .019 0.0 hy .194 0.0 ns 0.000 0. ********* THM) Lc	OCLASE 8 8.153 F = 0.46 lc ne 000 0.000 ol ac 000 0.000 ks cs 000 0.000 **** Ne W	4.447 (4.447 0.000 mt 1.261 ru 0.00012 No Ri	0.0 0.0 di .345
PLAGIOCI QUARTZ QUARTZ QUARTZ CHAPPELS MG NO. 1 AFM PARI JENSEN 0	LASE PE : FELDS 4.723 6.634 S A/CNK IN CATI AMETERS CATION 0.000 fs 10.011 ap 0.357 RM TOTA **** SONORM C 0.00	RCENT ANOR PAR RATIOS ORTHOCLASE ORTHOCLASE INDEX 0. ONS 44.2 : A = 0.25 PLOT A = CATAN or 6.770 36 fo 0.000 0 cm t 0.000 0.00 L =100.000 *************** (HUCHISONS 0.00 36.92	THITE : E 10.8: 15.213 707 2 F = 0.9 0.39 1 ORM ab .918 18 fa .000 20 n pf 0 0.000 ******* ALGORY? An 2 18.02	34.117 30 PLAGI ALBITE 7 52 M = 0. 52 M = 0.15 an .019 0.0 hy .194 0.0 ns 0.000 0. ********* THM) Lc 0.00	OCLASE 8 8.153 23 F = 0.46 1c ne 000 0.000 ol ac 000 0.000 ks cs 000 0.000 ks cs 000 0.000	 4.447 9.0.000 mt 1.261 ru 0.00012 No Ri 00 17.90 	0.0 di .345 Ac
PLAGIOCI QUARTZ QUARTZ QUARTZ CHAPPELS MG NO. 1 AFM PARI JENSEN 0	LASE PE : FELDS 4.723 6.634 S A/CNK IN CATI AMETERS CATION 0.000 fs 10.011 ap 0.357 RM TOTA **** SONORM C 0.00	RCENT ANOR PAR RATIOS ORTHOCLASE ORTHOCLASE INDEX 0. ONS 44.2 : A = 0.25 PLOT A = CATAN or 6.770 36 fo 0.000 0 cm t 0.000 0.00 L =100.000 *************** (HUCHISONS 0.00 36.92	THITE : E 10.8: 15.213 707 2 F = 0.9 0.39 1 ORM ab .918 18 fa .000 20 n pf 0 0.000 ******* ALGORY? An 2 18.02	34.117 30 PLAGI ALBITE 7 52 M = 0. 52 M = 0.15 an .019 0.0 hy .194 0.0 ns 0.000 0. ********* THM) Lc 0.00	OCLASE 8 8.153 23 F = 0.46 1c ne 000 0.000 ol ac 000 0.000 ks cs 000 0.000 ks cs 000 0.000	 4.447 9.0.000 mt 1.261 ru 0.00012 No Ri 00 17.90 	0.0 di .345 Ac
PLAGIOCI QUARTZ QUARTZ QUARTZ CHAPPELS MG NO. 1 AFM PARI JENSEN 0	LASE PE : FELDS 4.723 6.634 S A/CNK IN CATI AMETERS CATION 0.000 fs 10.011 ap 0.357 RM TOTA ***** SONORM C 0.000 Hy	RCENT ANOR PAR RATIOS ORTHOCLASE ORTHOCLASE INDEX 0. ONS 44.2 : $A = 0.25$ PLOT $A =$ CATAN or 6.770 36 fo 0.000 0 cm t 0.000 0.00 L =100.000 ********* (HUCHISONS Or Ab	THITE : E 10.8: 15.213 707 2 F = 0.9 0.39 1 ORM ab .918 18 fa .000 20 n pf 0 0.000 ******* ALGORY? An 2 18.02	34.117 30 PLAGI ALBITE 7 52 M = 0. 52 M = 0.15 an .019 0.0 hy .194 0.0 ns 0.000 0. ********* THM) Lc 0.00	OCLASE 8 8.153 23 F = 0.46 1c ne 000 0.000 ol ac 000 0.000 ks cs 000 0.000 ks cs 000 0.000	<pre>kp 0.000 mt 0.261 ru 0.00012 No Ri 0.00 17.90</pre>	0.0 di .345 Ac
PLAGIOCI QUARTZ QUARTZ QUARTZ CHAPPELS MG NO. AFM PARI JENSEN (2.735 en 10.183 i1 1.399 CATANON MES Q Ed 4.90 0.00 Di HORNBLES	LASE PE : FELDS 4.723 6.634 S A/CNK IN CATI AMETERS CATION 0.000 fs 10.011 ap 0.357 RM TOTA ***** SONORM C 0.00 Hy NDE	RCENT ANOR PAR RATIOS ORTHOCLASE ORTHOCLASE INDEX 0. ONS 44.2 : A = 0.25 PLOT A = CATAN or 6.770 36 fo 0.000 0 cm t 0.000 0.00 L =100.000 ********* (HUCHISONS Or Ab 0.00 36.92 Ol (En	THITE : E 10.8: 15.213 707 2 F = 0.9 0.39 0 0 0 0 0 0 18.18 fa .000 20 n pf 0 0.000 ******* ALGORY An 18.02 Fs	34.117 30 PLAGI ALBITE 7 52 M = 0. 52 M = 0.15 an .019 0.0 hy .194 0.0 ns 0.000 0. ********* THM) LC 0.00 Fo	OCLASE 8 8.153 F = 0.46 lc ne 000 0.000 ol ac 000 0.000 ks cs 000 0.000 ks cs 000 0.000 ks cs 000 0.000 ks cs 000 0.000 ks cs 000 0.000 ks cs 000 0.000 ks cs	 4.447 9.0.000 mt 1.261 ru 0.00012 No Ri 0.00 17.90 Mt 	0.0 0.0 di .345 Ac 0 Hm
PLAGIOCI QUARTZ QUARTZ QUARTZ CHAPPELS MG NO. AFM PARI JENSEN (2.735 en 10.183 i1 1.399 CATANON MES Q Ed 4.90 0.00 Di HORNBLES	LASE PE : FELDS 4.723 6.634 S A/CNK IN CATI AMETERS CATION 0.000 fs 10.011 ap 0.357 RM TOTA ***** SONORM C 0.00 Hy NDE	RCENT ANOR PAR RATIOS ORTHOCLASE ORTHOCLASE INDEX 0. ONS 44.2 : A = 0.25 PLOT A = CATAN or 6.770 36 fo 0.000 0 cm t 0.000 0.00 L =100.000 *************** (HUCHISONS 0.00 36.92	THITE : E 10.8: 15.213 707 2 F = 0.9 0.39 0 0 0 0 0 0 18.18 fa .000 20 n pf 0 0.000 ******* ALGORY An 18.02 Fs	34.117 30 PLAGI ALBITE 7 52 M = 0. 52 M = 0.15 an .019 0.0 hy .194 0.0 ns 0.000 0. ********* THM) LC 0.00 Fo	OCLASE 8 8.153 F = 0.46 lc ne 000 0.000 ol ac 000 0.000 ks cs 000 0.000 ks cs 000 0.000 ks cs 000 0.000 ks cs 000 0.000 ks cs 000 0.000 ks cs 000 0.000 ks cs	 4.447 9.0.000 mt 1.261 ru 0.00012 No Ri 0.00 17.90 Mt 	0.0 0.0 di .345 Ac 0 Hm
PLAGIOCI QUARTZ QUARTZ QUARTZ CHAPPELS MG NO. 2 AFM PARI JENSEN 0	LASE PE : FELDS 4.723 6.634 S A/CNK IN CATI AMETERS CATION 0.000 fs 10.011 ap 0.357 RM TOTA ***** SONORM C 0.00 Hy NDE 7.71	RCENT ANOR PAR RATIOS ORTHOCLASE ORTHOCLASE INDEX 0. ONS 44.2 : A = 0.25 PLOT A = CATAN or 6.770 36 fo 0.000 0 cm t 0.000 0.00 L =100.000 L =100.000 ********* (HUCHISONS Or Ab 0.00 36.92 01 (En 0.00 0.00	THITE : E 10.8: 15.213 707 2 F = 0.1 0.39 1 0RM ab .918 18 fa .000 20 n pf 0 0.000 ******* ALGORY: An e 18.02 Fs 0 0.00	34.117 30 PLAGI ALBITE 7 52 M = 0. 52 M = 0.15 an .019 0.0 hy .194 0.0 ns 0.000 0. ********* THM) LC 0.00 Fo 0.00	COCLASE 8 8.153 F = 0.46 1c ne 000 0.000 01 ac 000 0.000 ks cs 000 0.000 ks cs 000 0.000 **** Ne F 0.00 0. Fa) 0.00 1	4.447 kp 0.000 mt 1.261 ru 0.00012 No Ri 00 17.90 Mt .26 0.	0.0 0.0 di .345 Ac 0. Hm
PLAGIOCI QUARTZ QUARTZ QUARTZ CHAPPELS MG NO. 1 AFM PARI JENSEN 0	LASE PE : FELDS 4.723 6.634 S A/CNK IN CATI AMETERS CATION 0.000 fs 10.011 ap 0.357 RM TOTA ***** SONORM C 0.00 Hy NDE 7.71 Cm	RCENT ANOR PAR RATIOS ORTHOCLASE ORTHOCLASE INDEX 0. ONS 44.2 : A = 0.25 PLOT A = CATAN or 6.770 36 fo 0.000 0 cm t 0.000 0.00 L =100.000 ********* (HUCHISONS Or Ab 0.00 36.92 Ol (En	THITE : E 10.8: 15.213 707 2 F = 0.9 0.39 1 0RM ab .918 18 fa .000 20 n pf 0 0.000 ******* ALGORY? An 2 18.02 Fs 0 0.00 Ns	34.117 30 PLAGI ALBITE 7 52 M = 0. 52 M = 0.15 an .019 0.0 hy .194 0.0 0.00 0. ********* THM) LC 0.00 Fo 0.00 KS 0	23 F = 0.46 1c ne 00 0.000 ol ac 00 0.000 ks cs 000 0.000 ks cs 000 0.000 **** Ne k 0.00 0. Fa) 0.00 1 2s Ru	4.447 kp 0.000 mt 1.261 ru 0.00012 No Ri 00 17.90 Mt .26 0. BIOTITE	0.0 0.0 di .345 Ac 0.0 Hm 00