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Scavi e ricerche della Missione Greco-Italiana in Creta Orientale (1991-1993)

con contributi di
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POTTERY PRODUCTION AND CONSUMPTION IN THE SITIA BAY AREA DURING THE NEW PALACE PERIOD

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INTRODUCTION[1]

This section examines the variety of ceramic fabrics encountered in the Sitia Bay area of East Crete during the period from Middle Minoan III to Late Minoan I, in addition to pottery of MM II at Platyskinos. It aims to identify technological information and production centres of ceramics found at seven sites of the Neopalatial period: Achladia-Platyskinos; Achladia-Riza; Analoukas; Klimataria; Petras; Stavros and Zou. With the exception of the pottery from Platyskinos, the work described here was carried out as part of the author's doctoral dissertation which presented analyses of pottery from 15 sites of MM III-LM I date within the Eparchy of Sitia and Isthmus of Ierapetra (Day 1991).

The place of petrographic analysis of Minoan ceramics with regard to other analytical techniques is discussed briefly to present the context for this work. Next the petrographic fabrics defined from samples from these sites are presented on a regional basis: previously they were studied on a site-by-site basis (Day 1991); then a summary comparison of Protopalatial and Neopalatial pottery from Achladia Platyskinos is offered. Through the characterization of these ceramic fabrics, technological and provenance conclusions are then drawn to illuminate regional production, distribution and trade patterns.

CERAMIC ANALYSIS ON CRETE

An analytical programme on the production and distribution of ceramics on a regional basis is a logical outcome of the development of physicochemical analysis of Minoan pottery. The examination of prehistoric pottery from Crete, primarily by elemental analysis, has played an important part in the on-going application of analytical methods to ceramics throughout the Aegean; Jones (1986, 225-58) has summarised thoroughly the work carried out on the island. There were several stages in the development of such work, with most effort invested in provenance projects.

Chemical analysis

Analytical studies of Minoan pottery saw the initial characterization of major centres, such as Knossos, with the aim of discriminating these on elemental grounds from mainland sites, notably Mycenae. In this research the main technique was chemical analysis by optical emission spectroscopy (OES). In the pioneering work by the Research Laboratory in Oxford, Catling identified a number of provenance and trade problems which it was thought could be solved by analytical techniques. It was found (Catling *et al.* 1963) that some degree of discrimination was possible on elemental grounds between Cretan sites including Tylissos, Knossos, Gournia, Palaikastro and Kato Zakros, in addition to attempting to separate mainland sites such as Mycenae. This work was built upon by Catling and Millett (1965) in focussing upon Palaikastro and Zakros compositions in their

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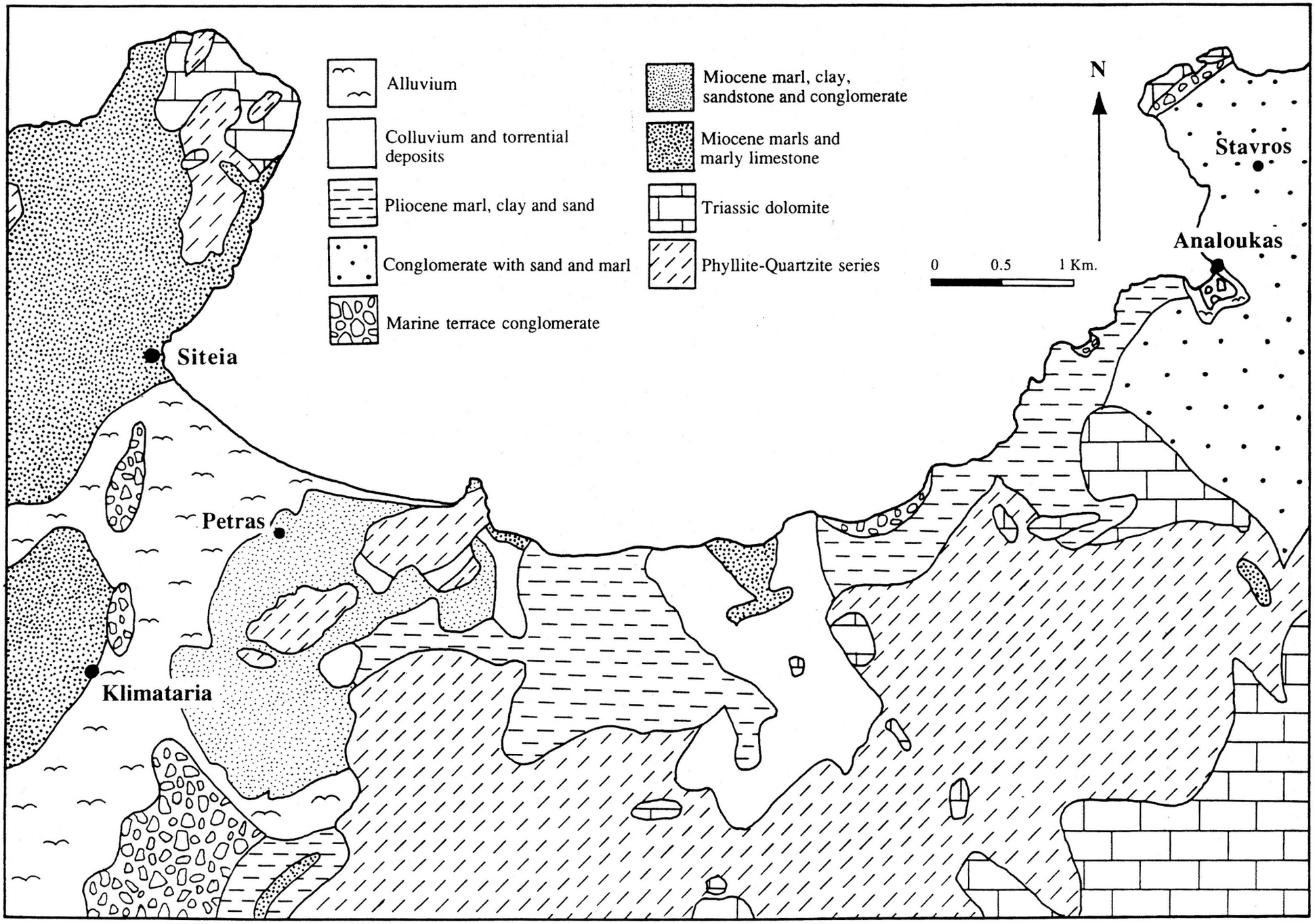


Fig. 107 - Geology and site location in the Siteia area (after Papastamatiou *et al.* 1959).

assessment of the origin of the inscribed stirrup jars found at Thebes. The work on stirrup jars was controversial from the start and its progress, up to the present, has mirrored experience gained in the analytical field and changes in thinking. Certain problems became apparent. It appeared that pottery may have been more freely traded than at first thought, and it was becoming clear that making *positive* statements on the source of pottery was difficult with the small amount of major centres for which chemical control data was available.

In order to investigate compositional overlaps, a more complete coverage of the island was attempted to produce a compositional "map": Catling and Millett's "Crete" project (see Jones 1986 for discussion and publication). Further work made progress in answering specific provenance-based questions, clarifying previous confusions and overlaps and demonstrating the potentials and limitations of the techniques of OES and atomic absorption spectrophotometry (Catling and Jones 1977; Catling *et al.* 1980; Haskell *et al.*, forthcoming). Although progress was made in discrimination between some areas, overlaps in chemical composition have persisted involving key areas such as Boeotia, the Argolid and Central Crete. The compositional map of Crete remains as three broad zones: West, Central and East Crete.

It has been argued that the introduction of a more powerful chemical technique will not produce the required results in Cretan pottery production studies unless accompanied by a change in research design (Day 1988). Recent work with neutron activation analysis has indeed shown that it is not only spatial but technological differences which are being measured in the compostion of Minoan ceramics (Tomlinson 1991; in press).

Petrographic analysis and other techniques

The first large scale application of petrographic analysis to Minoan ceramics was by Riley (1981; 1983; 1984). His research demonstrated that coarse ware pottery had been exchanged regularly in the Cretan Late Bronze Age, that petrographic analysis had the ability to identify likely sources of raw materials of pottery on a detailed scale and that the technique could also provide information on fine ware pottery. At Knossos, Riley demonstrated a change in clay beds during the Late Bronze Age and suggested the movement of jars with serpentiniferous fabrics from the nearby Tylissos/ Gonies area.

Betancourt has carried out petrographic and other studies of individual Minoan wares (Betancourt *et al.* 1979; Betancourt 1984) with some success. His studies have integrated analytical techniques in order to provide an overview of ceramic technology and the range of fabric produced at a single production centre (Myer and Betancourt 1990).

The present author's work has attempted to build on such foundations by the examination of pottery from over 30 sites on the island, demonstrating the ability of petrographic analysis to discriminate between production centres between and within regions of Crete (Day 1988a), to provide information on pottery technology (Day 1989), to illuminate regional production and distribution patterns (Day, in press), to record intra-island trade (Wilson and Day 1994) and trade with other parts of the Aegean (Haskell *et al.* forthcoming). In this way, ceramic petrographic studies have demonstrated their ability to produce an array of information concerning pottery production and consumption. The direct link between macroscopic and microscopic fabric provide a visual continuity in consideration of the pottery data both inside and outside the laboratory.

Pottery analysis in the Eparchy of Sitia

Within the study area, there have been few previous analyses of pottery. Pottery of Neopalatial date from Piskokephalo, 3 km. south of Sitia, was analysed by optical emission spectroscopy (Jones 1986, 249). The twenty samples, from a surface collection, were found to have compositions of East Cretan type, being indistinguishable from pottery from Zakros and Palaikastro. Local centres outside the area considered here have been characterised chemically (Jones 1986, 250-55) and, more recently, petrographically (Day 1991).

THE SITES STUDIED

In characterising East Cretan pottery, a major aim has been to provide as wide a geographical coverage as possible to identify the full variety of fabrics in the area. Equally, it was intended to sample pottery from as broad a spread of settlement types as possible, to examine the relationship between settlement hierarchy and pottery consumption. The nature of different settlements and possible geomorphological divisions has been investigated recently by Driessen and MacGillivray (1989) and Tsipopoulou (this volume, 11-13; Tsipopoulou and Papacostopoulou, in press).

Until relatively recently, the Sitia Bay area was considered to contain a number of villas which exercised some sort of control over the rural areas outside the immediate environs of the major towns at Palaikastro and Zakros. These included Zou, Klimataria and Achladia-Riza, all excavated by Platon (summary: Platon 1971). This was reflected in some of the economic analyses of settlement on the island (eg. Halstead and O'Shea 1982). The excavation of Petras (Tsipopoulou 1987a), recent studies of

outlying settlements in this area (Tsipopoulou and Papacostopoulou, in press) and on Crete in general (Hägg, in press) have forced a reconsideration of the roles of the variety of settlements in the area.
It now seems that in Petras, we have the major centre of the area which contains a substantial central building. Klimataria appears to be a river-side building on the opposite side of the valley from Petras; Zou and Achladia-Riza are suggested to be buildings which form parts of surrounding settlements. The status of Platyskinos is discussed in this volume and there are other Neopalatial settlements of uncertain nature in the eastern part of the bay, at Analoukas and Stavros (Tsipopoulou 1989, 12-13).
Pottery was sampled from all these sites from either excavations or surface survey collections.

PREVIOUS EVIDENCE OF POTTERY PRODUCTION IN THE AREA

The evidence for ancient pottery production in the area of the Sitia Bay can be said to be both direct and indirect. Starting with the latter, it should be said that there is at least one very distinctive macroscopic fabric which is in the majority at the site of Petras. Unlike more well known East Cretan fabrics, such as those at Palaikastro and Zakros, it is not reddish in colour, but yellowish (Tsipopoulou, this volume, 31). In addition, a number of wasters have been found at Petras and in the valley running to Asprougas to the south-east of the site (Tsipopoulou 1987a, 23; 1988). This would argue for at least one local production centre.
Direct, and especially structural evidence of pottery manufacturing locations is rare from the Neopalatial period in Crete, indeed for much of the Minoan period we have little evidence. The position may be much improved with recent discoveries at Gouves and Zominthos (Hatzi-Vallianou 1985; Sakellarakis 1988). Within the study area, the sites of Zou and Achladia have provided evidence of possible pottery production; the first of Neopalatial date. In the Achladia valley Platon excavated a horseshoe shaped potter's kiln (Platon 1952, 646, fig. 25). This type of kiln, possibly dating to the LM III period has been found at Kavousi (Gesell *et al.* 1988; Preston Day *et al.* 1989) and at Stylos Chanion (Davaras 1973a), both of which have central columns in the firing chamber which support the kiln floor. Further information is not available on the kiln at Achladia and the site was destroyed during cultivation.
In the MM III-LM IA building at Zou, Platon considered that there was evidence for pottery production, postulating two features to be connected with the production process. The first of these are the features to the east of Room Z (Z1-Z4), which open onto the pit in the corner of Room Z. The excavator points out that stokeholes of kilns usually lead of a sunken pit and that there was a 30 cm. thick layer of ash in these features. The second ceramic related feature has a more orthodox position, to the north of the main building. This oval-shaped feature was preserved in its lower part only and was identified as a pottery kiln, the floor and walls being heavily burnt. The area of the kiln was connected by a narrow corridor to a room, where Platon suggested (1956, 238) that the pottery was prepared with clay mixed in a pit. Recent re-appraisal of the site by Photou (1988) has confirmed the nature of the site as a workshop and emphasised that it represents part of a series of buildings. However the function of the features above is not clear. It seems that Z1-Z4 are not to be connected with pottery production and the function of the kiln feature is open to question.

AIMS OF THE STUDY

From this background it is clear that there exist sites of varied nature in the area and that our understanding of their inter-relationships may be increased by analytical study of the pottery. Petrographic analysis is most suited to this regional work and should be accompanied by widespread geological sampling. We might pose a number of questions which should be addressed:

- Which raw materials are available within the study area which are suitable for ceramic production?
- Which petrographic groupings can be distinguished within the pottery examined and how do these groupings relate to their type and function?
- Are there indications, from their distribution, of the likely origin of such groupings?
- Are there *petrological* indications of the origin of these groupings?

Clearly it is the relationship between the point of production and findspot which may give us information regarding production and distribution of ceramics in the Sitia Bay and the trade of ceramics from other areas of Crete.

GEOLOGICAL PROSPECTION

The various geological deposits of the area were studied and extensively sampled (see catalogue). The thin sections of rocks and experimentally fired clays were examined and compared with both ancient pottery and ceramics sampled from local traditional kilns in a parallel ethnographic study (Day 1991).

Geological outline

The coastal areas of the Sitia Bay comprise marine, coastal and terrestrial deposits of the Miocene period which occur in several stratigraphical units, the Achladia, Faneromeni, Skopi and Toplou Formations; and Pleistocene deposits of the Sitia and Vai Formations (Gradstein 1973). Inland there are extensive deposits of pre-Neogene rocks of the Permian-Triassic Phyllite-Quartzite series and of limestones of the Tripolitza series. Many works have sketched the general sequence of pre-Neogene deposits relevant to this study (Aubouin and Dercourt 1965; Baumann *et al.* 1976; Hall *et al.* 1985; Bonneau 1985). The study area is covered by two 1: 50 000 geological maps (Papastamatiou *et al.* 1954; 1959) and Gradstein (1973) produced a detailed map of the Neogene and Quaternary deposits.
Figures 107, 109-110 show the main deposits of the area. These will be discussed in order of geological stratigraphy.

Permian or Carboniferous: There are rare, small outcrops of bluish crystalline limestone with intercalations of chert, immediately west of Paraspori; north of Sitia on Cape Vamvakia and near the Trypitos peninsula, 1 km. east of Petras. These deposits are not of great importance in our study of the activity of potters.

Permian-Triassic: Rocks of this period comprise extensive outcrops of the Phyllite-Quartzite series and occur in three main bodies. The first is in the Chamaizi-Paraspori region, starting 1 km. west of the village of Achladia and running west to the Ierapetra depression (Papastamatiou *et al.* 1959a); immediately east of Petras extending to the Trypitos peninsula; and the extensive outcrop of this series in the area from Zou/Stavromenos through Palaio Mitato, Roussa Ekklisia and along the northern slopes of the Modhi range. The Phyllite-Quartzite series has been described as a *mélange* (Wachendorf *et al.* 1974), and comprises in this area mainly sericitic phyllites with varied grades of localized metamorphism. In some locations the Phyllite-Quartzite series contains eruptive bodies. Notable in this respect are the andesite outcrops around Paraspori and Achladia. Deposits of the same period in the Palaikastro area contains a greater proportion of quartzite (Papastamatiou *et al.* 1959).

Cretaceous, Jurassic and Triassic, Tripolitza Zone: The area of high relief to the south of Achladia comprises dark-grey to black limestones and dolomites of the Tripolitza zone. These are present also to the south of the Phyllite-Quartzite series in the Modhi area running south, forming much of the upland plateau which runs south towards Ziros. These deposits are thrust over the Phyllite-Quartzite series and are not in themselves of great interest as potential ceramic raw materials. They do, however, host some terra rossa soils which have been sampled in the geological survey carried out by the author.

Miocene and Pliocene: The Neogene of the area has been studied by a number of scholars, beginning with Chalkiopoulos (1903) and the Neogene of the coast has been well summarised by Mourtzas (1990). There are several types of deposit of this period in the Sitia Bay area which have been defined by Gradstein (1973). Those to the east of Aghia Photia tend to be the products of terrestrial deposition by a braided river system which reached the sea in the area of Analoukas, where submarine gravel fans were built up. This fluviatile deposition is represented on the eastern limit of the Bay of Sitia by the Toplou Formation, which crops out from Cape Mavromouri to Palaikastro. In the Palaikastro area the lateral transition between the Toplou and Kastri formations also shows no clear signs of superposition. The Kastri formation comprises the terrestrial red clays and silts in the Palaikastro area, whereas the Western parts of the Toplou formation show that they were formed by an alternating marine and fluvial environment. Such a basic difference in Neogene deposits between the Sitia Bay and Palaikastro area should enable the distinction of ceramics from these neighbouring areas.
Within the study area to the west of Aghia Photia, the Neogene deposits are dominated by the Skopi, Achladia and Faneromeni formations, of which the first two are Miocene in date and the latter Miocene in its occurrence in the Sitia area and Pliocene in the Sykia-Papagiannadhes area (Gradstein 1973, 565). The most widespread is the Faneromeni formation, which comprises organo-clastic limestones and yellowish marls. Of a different nature are the Skopi formation deposits which border the pre-Neogene rocks on either side of the Sitia valley, running south from the Trypitos peninsula through Zou to Praisos. On the western side of the valley they run from the coast at Roussa Limni through Skopi to Achladia and Aghios Georghios. This formation comprises a mixture of conglomerates, sands, silts, limestones and rarely lignite beds. Perhaps the best Neogene clays of the area occur in the Achladia formation which occurs in the valley east of Petras and the valley and stretch of coastal plain running from Asprougas to Aghia Photia. It also crops out in the Achladia valley. The Achladia formation was formed in a shallow marine environment, comprises grey to bluish marls which are locally sandy, and contains *foraminifera* and mollusca microfossils.
Gradstein comments on the occurrence of characteristic igneous greenstones in the Skopi and Achladia formations and includes a petrological study of them (Gradstein 1973, 549). The Skopi formations are much more coarse than the Achladia

formations but they are associated laterally with them. The greenstones appear to originate in the pre-Neogene Phyllite-Quartzite deposits and have been observed from the Petras, Chamaizi and Vai areas.

Quaternary: Gradstein (1973) characterises as Pleistocene, the Sitia formation which occurs immediately to the south of the town of Sitia, and near Analoukas. It contains clays, silts, sands and conglomerates with rare limestones. The site of Klimataria is positioned on these deposits. Mourtzas has recorded in detail the coastal formations of this period, notably the aeolianites at Analoukas along with beach rocks containing sand derived from limestone and phyllite which occur on the coast by Petras and Analoukas (Mourtzas 1990, 318-34). Finally the Sitia river valley contains extensive recent alluvial deposits. The deep deposits of fluviatile material abutting the Minoan riverside building at Klimataria attest to the extensive alluviation on the Sitia valley in the post Minoan period. Mourtzas (1990) has made important comments on the supposed relative lowering of sea levels in this area due to the find of features interpreted as Roman fish-tanks (Davaras 1974). He re-interprets them as aeolianite quarries and rock cuts basin of some industrial use which would have been well above the sea level at the time.

DESCRIPTION OF CERAMIC THIN SECTIONS

Pottery from each of the three sites was studied and samples taken to represent a range of the fabrics present at each site. The relative proportions of samples belonging to individual groups should not be taken as an indication of the frequency of such fabrics at the sites concerned. The samples were prepared by the author as thin sections and examined under a petrological microscope. Descriptions presented here are an adaptation of a system proposed by Whitbread (1986; 1989), using comparative charts from Bullock *et al.* (1985) and conforming to the frequency terminology proposed by Kemp (1985). The latter uses the following equivalents: over 70% predominant, 50-70% dominant, 30-50% frequent, 15-30% common, 5-15% few, 2-5% very few, 0.5-2% rare, less than 0.5% very rare.

Photomicrographs presented here aim to show the texture and nature of some of the basic fabrics. They cannot, however, show the characteristic colours of matrix and inclusions which separate many of these groups so clearly (figs. 111-113).

Ceramic groupings

(Abbreviations: PPL = Plane polarised light; XPL = Cross polarised light)

1. Fossiliferous matrix with reddish siltstone and phyllite (fig. 111:a-b)

Petras	88/5, 6, 8, 9, 10, 12, 13, 15, 16, 19, 23, 24, 26, 27, 28, 35, 36, 37, 38, 39, 41, 52, 53, 60,
Petras	61, 62, 63, 64, 65, 68, 69, 71, 72, 77, 78, 80.
Klimataria	88/2, 19, 20, 22, 26
Zou	88/3, 10, 14, 21
Achladia-Platyskinos	88/1, 4, 5
Achladia-Riza	88/8, 15, 23, 25

Microstructure:
The fabric has irregular to planar voids and the common elongated inclusions and few voids display a preferred orientation parallel to the pot wall in some cases (eg. Petras 88/35).

Groundmass:
The composition appears homogeneous throughout the section. The micromass is optically slightly active to inactive, yellowish brown in XPL (x40) and is greenish brown to reddish brown in PPL.

Inclusions:
c : f : v 10μ 25 : 65 : 10 to 35 : 55 : 10
c : f : v 125μ 20 : 70 : 10
Inclusions are very poorly sorted and 0.125 mm. is taken as a size boundary separating a coarse and fine fraction within this section. The mode of coarse fraction ca. 1 mm., up to 3 mm. Inclusions are angular to sub-angular in the fine fraction and sub-angular to rounded in the coarse fraction.

Fine fraction <0.125 mm.

Frequent	Monocrystalline quartz, angular to sub-angular <0.125 mm.
Frequent	Microcrystalline limestone/marly inclusions <0.125 mm.
Common	Muscovite mica laths.
Rare	Amphibole, probably hornblende.
Rare	Phyllite, yellow brown sericitic.
Few	Biotite mica laths.
Very Few	Feldspar displaying simple twinning.

Coarse fraction >0.125 mm.

Frequent	Red/black sub-rounded phyllites, also grey sericitic phyllite some displaying kink-banding.
Common-Frequent	Red siltstones, with quartz inclusions.
Common	Polycrystalline quartz.
Few	Fine sandstone.
	Quartzite with comb structure.

	Microcrystalline limestone, *foraminifera* <0.5 mm.
Rare	Altered igneous rock with marked chloritic development, angular.

Comment: This fabric has been distinguished as local to Petras by the excavators, such is its distinctive macroscopic appearance. This has been described above (p. 31). It forms a large proportion of the ceramic assemblage at the site of Petras, but occurs at other sites in the region. However, no occurrence outside the study area so far has been noted. It represents the product of mixing a local fossiliferous Neogene marl with material deriving from the Phyllite-Quartzite series. Phyllites and siltstones with the texture and colour of those found in this fabric have been observed in red clays from the phyllite series from near Roussa Ekklisia (cLasithi 88/33). The fossiliferous marls used in this mix probably derives from either the Achladia Formation or Faneromeni formation as described by Gradstein (1973). These occur within 1 km. of the site, with notable deposits occurring in the valley at Asprougas (fig. 148). Grain size analysis and graphical representation (Whitbread 1991) show that the division of inclusions in both size and composition indicates the use of a clay mix (Day 1991; see fig. 149). A range of vessels appears to have been produced in this fabric, but the majority are jugs, amphorae and pithoid jars of various sizes. Cooking vessels are not made from this fabric.

2. Igneous greenstones and metamorphics (figs. 111:c-d; 112:d)

Achladia-Riza	88/1, 2, 3, 5, 7, 12, 17, 18, 19, 22, 24, 27, 28
Achladia-Platyskinos	92/2, 6, 7, 8, 9, 18, 19
Klimataria	88/5, 6, 10, 13, 15, 18, 21, 24
Zou	88/6, 20, 24
Petras	88/21, 42
Analoukas	88/1

Microstructure:
The fabric has few irregular and planar voids < 1.5 mm. In some examples the inclusions and voids show a slight preferred orientation parallel to the pot wall.

Groundmass:
The composition is homogeneous throughout the section. The micromass is optically inactive to active and ranges from deep red to yellowish brown in XPL (x40) and reddish brown to light brown in PPL.

Inclusions:
c : f : v 10μ 40 : 50 : 10
c : f : v 125μ 25 : 65 : 10
Inclusions are poorly sorted, angular to sub-angular, mode of ca. 0.5 mm. but <3 mm. Within this fabric, there is a great size range.

Fine fraction <0.125 mm.

Frequent	Monocrystalline quartz, angular to sub-rounded.
Frequent to few	Biotite mica, laths and crystals.
Few	Plagioclase feldspar.
Very few to frequent	White mica laths.

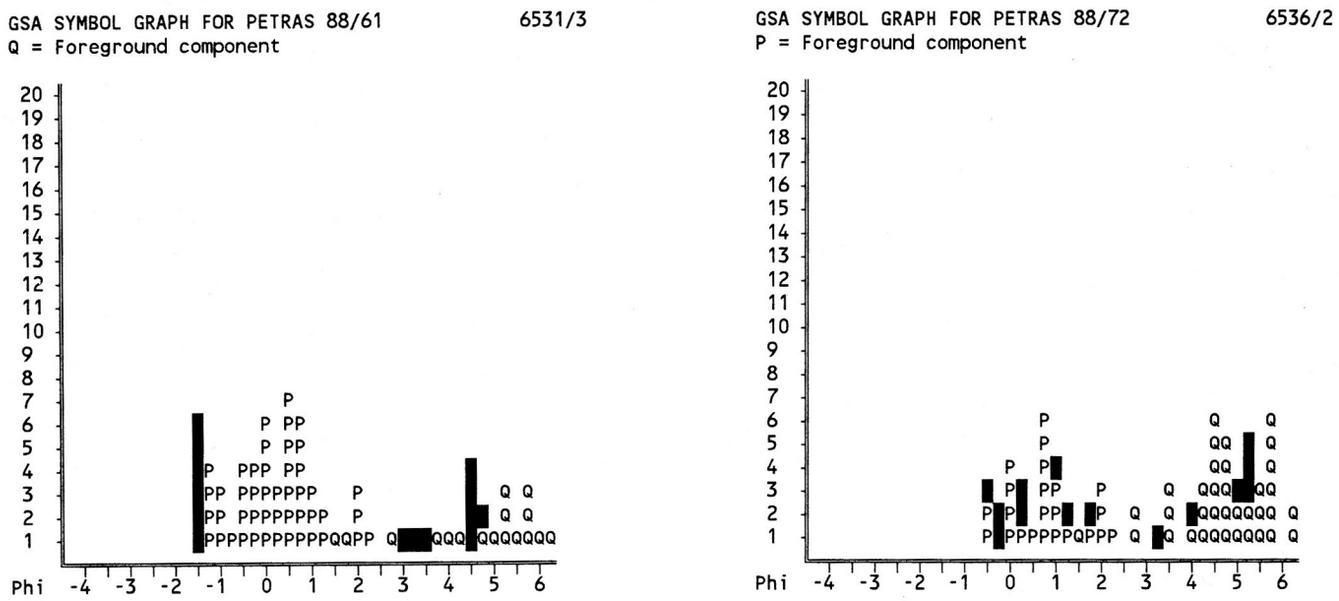


Fig. 108 - Grain size analysis graphs of Petras: 88/61, a pithos and 88/72, an amphora. Both display bimodal size distribution when plotted by phi units, the finer inclusions are mainly quartz and the larger phyllite. This indicates a body created by clay mixing. Although the same type of base clay has been used, it can be seen that 88/61, the larger vessel, has much larger phyllite non-plastics.

Coarse fraction >0.125 mm.

Dominant	The following assemblage of rocks and minerals: metamorphic rocks comprising white mica/biotite/ feldspar/quartz some with a schistose texture; yellow to grey ericitic phyllite with kink banding; sub-angular to sub-rounded K-feldspars (<0.75 mm.) and sheared quartzite with interstitial white mica.
Few to dominant	Strongly altered igneous rock with phenocrysts of altered feldspar in a fine grained matrix. There is much chlorite, a brown mineral and occasional epidote. It appears to be a chloritised intermediate igneous rock.
Few	Present in some sections are hornblende rich rocks
Few	Reddish opaques, sub-angular <0.15 mm.
Very few to few	Altered plagioclase feldspar, angular.
Rare to few	Quartz/feldspar epidote igneous rocks with less alteration.

Comment: The distribution of this fabric would suggest that it is dominant in the Achladia valley area. Mineralogically, there is evidence from these analyses to place its location of production near Achladia or Paraspori. The altered chloritised igneous rocks have been recorded as being present in Neogene deposits in the area, specifically in the Skopi, Achladia and Faneromeni formations, deriving as they do from the pre-Neogene Phyllite-Quartzite series of the area (fig. 110). Such inclusions have also been found in the present study in clay samples (near Aghios Spyridon - sample cLasithi 88/65).

Some of the members of this fabric have quantities of the altered igneous rock far in excess of what would be expected in the Neogene deposits and it is suggested that they originate in the deposits of the Phyllite series. Some of the rock fragments seem to be highly altered andesite. The Phyllite series around Paraspori and Chamaizi is characterised by frequent andesite intrusions (Papastamatiou *et al.* 1959), but these have not been sampled and it is not clear to what extent they are altered. Near these intrusions, there are large deposits of silver mica schist, a rock type which is not common in Crete. These were sampled (cLasithi 88/22) and fired experimentally. In thin section they are very similar to the schists and other metamorphic rocks described in this fabric.

This fabric suggests the existence of a production centre in the Achladia valley during the Neopalatial period. It produced a range of jars and cooking vessels. Unlike the main fabric at Petras, this fabric was suitable for both these uses, but it does not form the majority of cooking vessels. The main area of consumption of these vessels appears to have been within the Achladia area, although some did reach the more coastal sites.

3. Fine red with polycrystalline quartz (fig. 112:a)

Achladia-Riza	88/4, 9, 20, 21
Achladia-Platyskinos	92/12, 13, 14, 15
Klimataria	88/8, 11, 12
Zou	88/5, 17
Petras	88/18

Microstructure:
Rare to few irregular voids no preferred orientation of voids and non-plastics.

Groundmass:
The composition is homogeneous throughout the section. The micromass is optically active to slightly active, red in XPL (x40) and dark brown in PPL.

Inclusions:
c : f : v 10μ 15 : 80 : 5
Inclusions are moderately to well sorted, angular to sub-angular, mode of ca. 0.062 mm. but <0.75 mm.

Frequent to dominant	Monocrystalline quartz, angular <0.062 mm.
Frequent	Polycrystalline quartz, angular <0.5 mm.
Frequent to few	Altered igneous rock with phenocrysts of altered feldspar in a fine grained matrix. There is much chlorite and a brown mineral and occasional epidote, angular 0.125 - 0.75 mm.
Rare to few	Biotite mica, laths.
Rare	White mica laths.

There are few to common clay pellets in some members of this fabric. They are rounded and up to 0.5 mm. in some cases being reduced and grey in colour (Riza 88/9) and in others an oxidised red (Klimataria 88/11).

Comment: This red fabric, which occurs mainly in cups, appears to be the fine equivalent of the jar fabric group from the Achladia area which included the chloritised igneous rocks. As with the coarser fabric, their distribution backs up the mineralogical data in showing their probable point of origin as being the Achladia valley. As with the jar fabrics, in addition to the mineralogy, it has a distribution which is consistent with a provenance in the Achladia area.

The clay pellets in the matrix are consistent with those observed in thin section of modern pottery from Kentri, which used a clay mix of a Neogene clay with a *terra rossa* soil (see comment on dioritic fabrics below). Certain examples of this fabric are very similar to fine red fabrics occurring in the Palaikastro area.

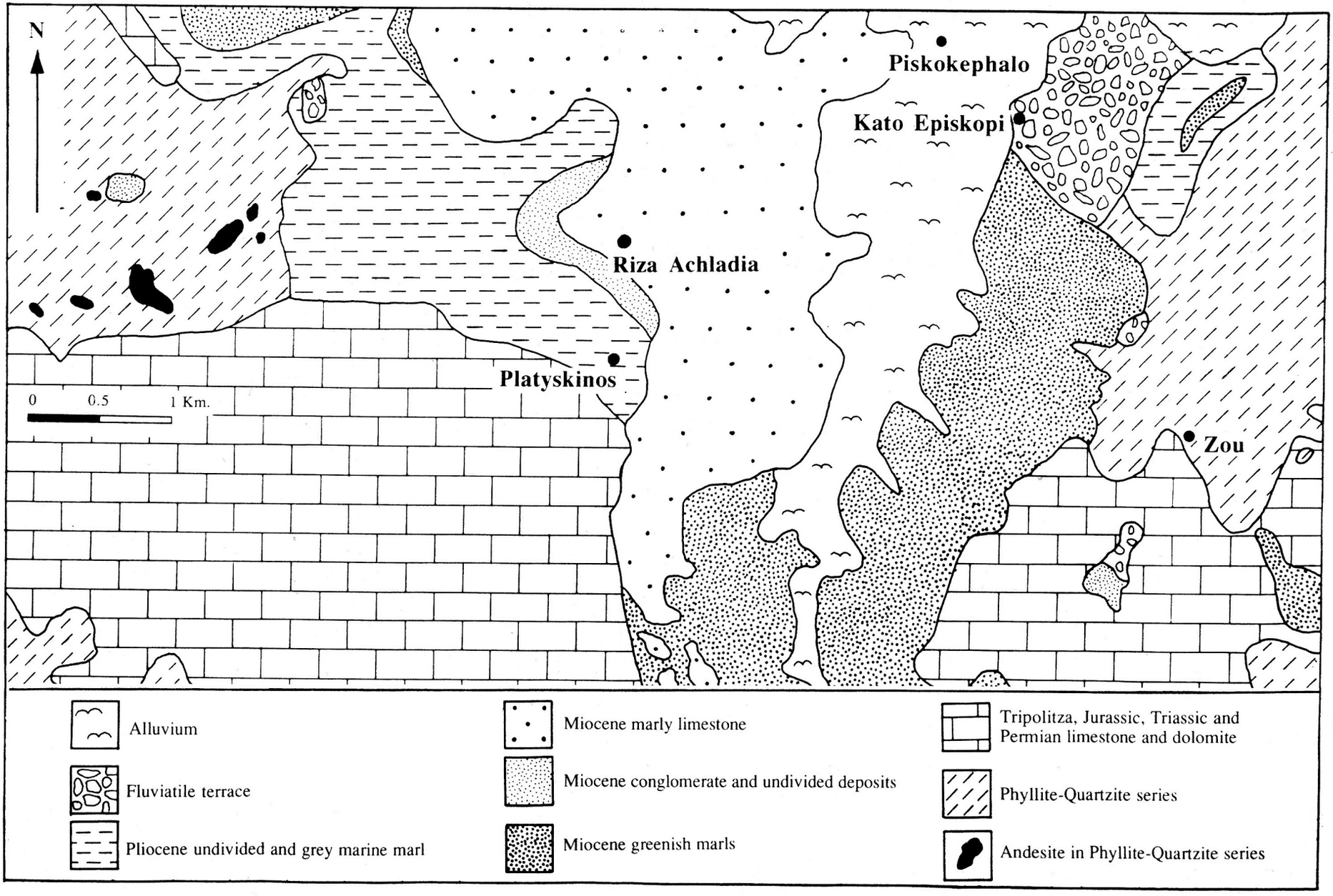


Fig. 109 - Geology and site location in the Achladia area (after Papastamatiou *et al.* 1954).

4. Coarse phyllite and quartzite (fig. 112:c)

Petras	88/2, 11, 31, 33, 46, 54, 55, 66, 79
Zou	88/7, 9, 11, 15, 23, 25
Stavros	88/5, 8, 10, 12
Analoukas	88/2, 5
Achladia-Platyskinos	92/20
Achladia-Riza	88/14

Microstructure:
Common irregular and planar voids, these and the phyllite inclusions are often orientated parallel to the pot wall.

Groundmass:
Homogeneous throughout the section. The micromass is optically active to slightly active on the oxidised interior and exterior of wall cross section. The core of most samples is reduced and optically inactive (black in XPL and PPL). The edges of the sherds are bright red to red/orange in XPL and brown in PPL.

Inclusions:
c : f : v 10μ 40 : 45 : 15
c : f : v 62μ 20 : 65 : 15
Inclusions are poorly sorted, mainly angular and have a bimodal size distribution. The larger non-plastics are dominated by phyllite (<4 mm.), compared to the frequent small quartz grounding.

Fine fraction < 0.062 mm.

Predominant	Monocrystalline and polycrystalline quartz, some of the former displaying graphitic alteration.
Rare	Biotite mica, laths.
Rare	White mica laths.

Coarse fraction >0.062 mm.

Dominant to predominant	Yellow to grey phyllite, sub-angular <4 mm. Poorly sorted.
Frequent to common	Quartzite, sub angular to angular.
Few	Monocrystalline quartz, sub-rounded to sub angular.
Few	Microcrystalline limestone, sub-rounded.

The fabric has opaques ca. 0.1 mm. and clay pellets <0.3 mm.

Comment: This fabric is present in storage jars and cooking wares which have deep red colour and a reduced core. The raw materials are clearly from the Phyllite-Quartzite series which crops out widely over the study area. Other fabrics described in this study contain phyllite, but these are either not the dominant inclusions or they are generally of another colour and composition (eg. Petras fabric). The members of this fabric are grouped together as they have predominant phyllite and quartzite, which parallels a jar and cooking vessel fabric which was produced in the Neopalatial period in the Palaikastro area (Day 1991). The latter contains material from the phyllite series in the valley to the south of the modern village of Palaikastro and some of the inclusions noted in thin sections of samples taken from the clays and silts of the Kastri formation Neogene deposits of the Palaikastro area (Gradstein 1973, 531-34). The latter are terrigenous, clastic products of braided river systems and therefore of very different character to the predominantly marine Neogene deposits of the Sitia Bay area.
Many of these samples have a markedly silty matrix and frequent quartzite. The Phyllite-Quartzite deposits to the south of Palaikastro are of the upper horizons of that series and have intercalations of quartzite which may account for the increased presence of quartz and quartzite in these samples. Some of them are definitely products of the Palaikastro area and indeed the author has identified pottery from these workshops present at both Chochlakies and Azokeramos, both of which are sites with a Neopalatial phase, located in the Zakros depression. Such a picture is a modification of one expressed recently without the benefit of full comparative material (Day, in press). It may be surprising that so many products from that origin may have reached the site at Zou. Therefore a minority of this group might have been produced elsewhere, using phyllite materials. In this case, further work on these specific fabrics would be needed to attempt to derive criteria from which to discriminate between such centres of production.

5. Orange/Red fabric with rounded schist inclusions (Mesara ?) (fig. 112:e-f)

Petras	88/70
Achladia-Riza	88/29
Klimataria	88/4

Microstructure:
The fabric has subrounded irregular and planar voids which in some sections display a preferred orientation parallel to the pot wall. The inclusions display no such orientation.

Groundmass:
Composition is homogeneous throughout the section. The micromass is optically slightly active to active, deep orange red in XPL (x40) and is reddish brown to brown in PPL.

Inclusions:
c : f : v 10μ 25 : 70 : 5 to 35 : 10 : 5
c : f : v 62μ 20 : 75 : 5

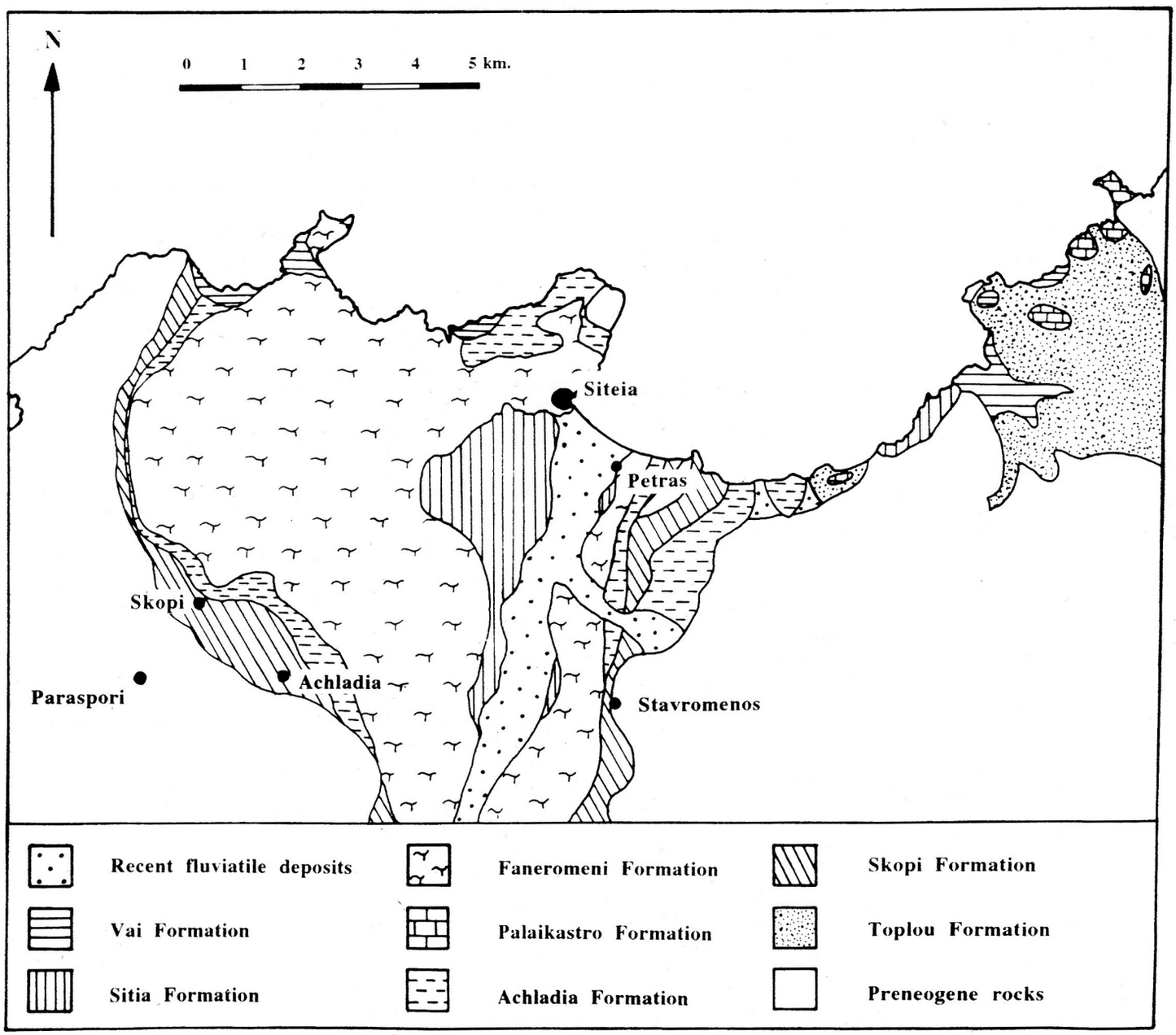


Fig. 110 - Formations of Neogene to recent deposits in the Siteia and Achladia area (after Gradstein 1973).

There is a clear bimodal distribution of grain size, with large rounded to sub-rounded sand grains in a fine matrix.

Fine fraction <0.062 mm.

Frequent	Biotite mica laths.
Frequent	Monocrystalline quartz, mode ca. 0.02 mm., angular to sub-angular.
Very Few	White mica laths.

Coarse fraction >0.062 mm. (Two descriptions are given which relate to the variation present in this fabric both in those identified within the Sitia Bay and in the fabric's source area - see comment).

a. Achladia-Riza 88/29, Klimataria 88/4.

Predominant	Biotite/hornblende/quartz/plagioclase metamorphic rocks appearing as well rounded sand grains. They range from biotite schists to amphibolites and are ca. 0.5 mm. - ca. 2.5 mm. in diameter. Some of the hornblende rich rock displays radiating hornblende crystals.
Rare	Discrete K-Feldspar, sometimes altered, sub-angular.
Rare	Rounded microcrystalline quartz.

b. Petras 88/70.

Predominant	Large (<3 mm.) rounded sand grains of a variety of rock types which will be listed.
	Schistose quartz, white mica and biotite rock.
	Sheared polycrystalline quartz.
	Very fine sandstone.
	Microcrystalline limestone with angular monocrystalline quartz inclusions.
	Rounded basalts displaying tholeiitic and sub-ophitic texture.
	Sub-angular plagioclase feldspar, altered.
	Rocks fragments with K-feldspar, biotite, quartz and plagioclase.
	Monocrystalline quartz.

Comment: This fabric matches the range of rocks and minerals found in the sand inclusions in Neopalatial pottery of the Mesara Plain of Southern Crete by the author (Day 1988a). The basaltic rock fragments may derive from the Jurassic-Cretaceous Ophiolitic complex, including the Arvi Nappe and Vatos Schists, in the Asteroussia Mountains, which occur in the area of Kouses, near Krotos and Miamou in the Asteroussia to the south and in the area of Kamares to the north of the Mesara Plain (Bonneau *et al.* 1984; Davi and Bonneau 1985). The schists, amphibolites and metamorphic rocks are likely to derive from the Asteroussia Nappe deposits. The sand inclusions in this fabric have clearly been added by the potter as temper. Myer and Betancourt (1990) have characterised fabrics from this area and have suggested that the sand was collected from beaches for adding to the clay mix. However, the preferential sorting of the mineral and rock content of various samples would suggest that they may have derived from streams draining north-south from the mountains surrounding the Mesara.

These belong to a fabric which has been noted in East Crete at a number of sites, mainly in oval-mouthed amphorae indicating a coastal trade in liquid produce to the far reaches of the island from Central Crete (Day 1991, 106; in press). The author has made a full discussion of the fabric recently in a study of Early Minoan imports to Knossos from the Mesara (Wilson and Day 1994) and noted their existence in Final Neolithic Phaestos and in LM IIIB stirrup jars from Kommos (Haskell *et al.*, forthcoming). The area around Kouses seems a likely source area for the sand temper of these fabrics; the author has noted the use of clay with the basaltic rocks found in this pottery in the lining of a modern kiln at Kouses.

A similar fabric has been recorded in the Gournia/Kavousi area, without basaltic rocks. Characterisation of this and its separation from Mesara fabrics is already underway.

6. Frequent angular granitic/dioritic fragments: "Mirabello fabric" (fig. 113:a-b)

There are two closely related fabrics, with a. Stavros 88/1 representing what has been referred to as Pseira Fabric 2; b. other samples relate to Pseira Fabric 1 (Day 1991).

Petras	88/14, 22, 43, 57, 81
Stavros	88/1, 9, 11.
Achladia-Platyskinos	92/3

Sub-group a

Microstructure:
The fabric has irregular to planar voids: there is no clear preferred orientation of the inclusions, although some voids (eg. in Petras 88/57) and amorphous red concentration features run parallel to the pot wall in some cases (eg. Petras 88/35).

Groundmass:
The composition is usually homogeneous throughout the section, but in some examples (eg. Platyskinos 92/9) the distribution of non-plastics in the matrix is inhomogeneous. The micromass is optically inactive to slightly active and bright orange-red to yellowish brown in XPL (x40); and is greenish brown to reddish brown in PPL.

Inclusions:

c : f : v 10μ	40 : 55 : 5 although in some sections there is a smaller proportion of non-plastics.
c : f : v 62μ	30 : 65 : 5

Inclusions are poorly sorted and probably bimodal in grain size distribution, range <2.5 mm. Shape ranges from angular rock fragments to well rounded clay pellets.

Fine fraction <0.062 mm.	
Frequent	Monocrystalline quartz, angular to sub-angular.
Frequent	Biotite mica laths.
Few	Plagioclase and K-feldspar, angular to sub-angular. Microcrystalline calcite, unevenly distributed throughout the matrix.
Few	Amphibole, probably hornblende.
Very rare	Muscovite mica laths.
Coarse fraction >0.062 mm.	
Dominant to predominant	Angular rock fragments and discrete constituent minerals <2.5 mm.: plagioclase feldspar (andesine); other feldspars which; hornblende; biotite, some of it altered by bleaching and chloritisation; clinopyroxene; quartz. The feldspars are frequently altered.
Common to frequent	Clay pellets, rounded with diffuse to sharp boundaries. They are usually a deeper red colour than the matrix and often display shrinkage voids on their border. They may comprise 10-15% of the field of view. Up to 2 mm.
Few	Microcrystalline limestone, sub-rounded.

Sub-group b
This is related to the fabric above, but some features distinguish it.

Microstructure:
The fabric has frequent irregular voids: there is no preferred orientation of the inclusions.

Groundmass:
The composition is homogeneous throughout the section, the micromass is optically active to slightly active and orange-red to reddish brown in XPL (x40); and is brown to reddish brown in PPL.

Inclusions:
c : f : v 10μ 40 : 50 : 10
Inclusions are poorly sorted and angular ranging from silt to <2.5 mm.

For the composition see sub-group a, but note following. The fabric does not contain the clay pellets characteristic of the sub-group a. There is more frequent sericitic alteration of the feldspars than in sub-group a. In addition, few polycrystalline quartz with sutured boundaries and chert, angular <1 mm., which did not occur in sub-group a.

Comment: This broad fabric has been found in the present study in a number of coastal sites (Day, in press) and also is present in EM IIB and EM III Knossos as an imported fabric. It reflects the type of rock and mineral suite discussed by Myer as being characteristic of the Vasiliki/Gournia area in Vasiliki Ware and White-on-Dark Ware, which he took to be compatible with a residual clay soil profile developed on a metamorphic calc-silicate rock formation (Myer 1984, 60; 1979, 5). The fabric, which is macroscopically distinctive (Haggis and Mook 1993), has been given the name Mirabello fabric due to its predominance in the Mirabello area (Day 1991, 99). Haggis and Mook caution that its period of use may be at its height in the MM period, but the appearance of the inclusions does continue into and beyond the LM III period in the area.
The bimodal grain size distribution and inclusion angularity displayed in sub-group argue for the deliberate addition of temper to the ceramic matrix as Myer argues (1984). These non-plastics are compatible with the diorite and granite intrusions which characterise the geology between Gournia and Kalo Chorio on the southern edge of the Gulf of Mirabello (Baranyi *et al.* 1975; Papastamatiou *et al.* 1959a). Their almost standardised size is due to their availability as weathered rock, even within the settlement of Gournia.
It has been suggested that the clay pellets observed in this fabric bear witness to the mixing of two clays, one of which was a *terra rossa* (Myer 1984, 61-62). Such a practice has been well demonstrated elsewhere (Myer and Betancourt 1990) and an ethnographic parallel exists at the nearby modern pottery centre of Kentri (Blitzer 1984). However, the clay pellets resulting from such a mixing process at Kentri have been examined petrographically in pottery from 3 kilns and do not seem to resemble those in the ancient pottery described here. The pellets resulting from mixing, which have been replicated in experimental briquettes, tend to be coarser than the matrix with quartz inclusions and are often locally reduced. This may be due to their non-calcareous nature, which encourages their vitrification at a lower temperature. On the other hand, experimental firing of Neogene clays from the area of Vrionisi, near Gournia, shows that the types of concentration features noted in sub-group a are present in the raw, non-mixed clays. Sub-group a is, therefore, taken to be a product of the Gournia/Kalo Chorio area and the product of tempering a Miocene fine clay with granite/diorite from the local intrusions.
Sub-group b is from the same area, but its unimodal grain size, degree of weathering and the presence of chert seems to suggest that it has as its major constituent *terra rossa* soils of the surrounding area. One experimentally fired clay sample of *terra rossa* from the Pandelimon peninsula, near Kalo Chorio, matches the ancient sample in many respects. This "red" Mirabello fabric is common in cooking vessels

Early Minoan pottery of the area (Haggis and Mook 1993).
The appearance of these fabrics in the Bay of Sitia, mainly in pithoi and pithoid jars, reflects their presence at a number of sites around the coast. This seems to bear witness to the use of jars from the Gournia area as containers for sea-borne trade, as the local workshops had their own types of storage jars.

7. Green fabric with grey siltstone inclusions - North Central Crete (fig. 112:b).

Petras	88/47, 48, 50
Zou	88/4
Klimataria	88/1

Microstructure:
The fabric has irregular voids 0.25-3 mm. which sometimes have a dark coating around the edge. There is little sign of preferred orientation of non-plastics and voids, but red-grey amorphous concentrations run parallel to the pot wall in some samples.

Groundmass:
The composition appears homogeneous throughout the section. The micromass is optically inactive, green in XPL (x40) and green to greyish green in PPL.

Inclusions:

c : f : v 10μ	30 : 60 : 10 to 30 : 50 : 20
c : f : v 200μ	5 : 75 : 20 to 25 : 55 : 20

Inclusions are poorly sorted, those below 0.2 mm. are angular to sub-angular and those above (<1 mm.) this size subangular to rounded. There is a wide range of grain size between members of this fabric. Petras 88/47; 48; 50 which have frequent coarse large sand inclusions, the remaining two samples are much finer.

Fine fraction <0.2 mm.

Dominant	Monocrystalline quartz, sub-angular to angular, undulose extinction, some evidence of alteration.
Common	Polycrystalline quartz, angular to sub-angular with sutured grain boundaries.
Few	Biotite mica, laths scattered through matrix, no preferred orientation.

Coarse fraction >0.2 mm.

Dominant	Rounded grains of the following rocks: fine greywacke sandstone with dark matrix; grey/black siltstone with orientated mica inclusions; grey/black mudstones and phyllite.
Common	Polycrystalline quartz displaying graphitic alteration.
Few	Monocrystalline quartz.
Very few	Altered plagioclase feldspar.
Very few	Microcrystalline limestone <1mm.

The fabric has lime rich concentrations, most of which appear to have been burnt out during firing, there are also red concentrations, sub-angular ca. 0.05 - 0.1 mm. Other amorphous, red/brown streaks are visible within the micromass in XPL.

Comment: This macroscopically distinctive, green fabric has been recorded at a number of East Cretan sites (Day, in press), often occurring in oval-mouthed amphorae. Its has been noted in North Central Crete and it is taken to come from there, although mineralogically its origin is not clear. These green fabrics with siltstones are highly fired calcareous clays (Day and Kilikoglou, work in progress) and have been found as early as EM III at Knossos (Momigliano 1991, 260). They become popular in LM IB, II and III at Knossos and have been noted at other sites, including Poros Katsambas (N. Dimopoulou *pers. comm.*). The fabric is never a majority local fabric in Knossos.
As with the Mesara imports, the occurrence of this fabric indicates a trade in goods from the centre of the island. It is hoped that further work in North Central Crete will clarify the centre of production of this fabric.

8. Frequent small quartz (fig. 113:c).

Stavros	88/2, 6, 7
Achladia-Riza	88/13

Microstructure:
Very few irregular voids <1 mm., mode 0.25 mm. No preferred orientation of voids or non-plastics.

Groundmass:
Homogeneous throughout the section. The micromass is optically inactive to slightly active, reddish brown in XPL (x40) and brown in PPL.

Inclusions:

c : f : v 10μ	40 : 55 : 5

Inclusions are moderately sorted, angular to subangular. They will be described together.

Frequent	Monocrystalline quartz, angular to sub-angular.
Frequent	Quartzite and chert, sub-angular, mode 0.1 mm., <2 mm.
Few	Opaques and red concentrations, mode 0.125 mm. but <1 mm.
Very Few	K-feldspar, sub-angular to sub-rounded, sericitic development.
Rare	Plagioclase feldspar, angular.
Rare	Biotite mica, laths.
Rare	Phyllite ca. 0.2 mm.
Very Rare	Rounded, large siltstone <2.5 mm.

Comment: This fabric has its origin in the Palaikastro area, where vessels of similar fabric have been found. It contains material of both sedimentary and metamorphic origin compatible with that area. They

metamorphic origin compatible with that area. They too, as in the case of this material from the Sitia Bay comprised small vessels such as cups and jugs.
In addition to the archaeological comparative material, they bear similarities to red/maroon silty clays sampled from Vouvas Kephali to the west of Palaikastro and from the Kastri formation silts and clays bordering Roussolakkos and to the south of the modern village of Palaikastro.

9. Fine buff, calcareous (fig. 113:d)

Petras	88/17, 25, 40, 67, 75
Zou	88/1, 8, 19
Achladia-Platyskinos	92/11

Microstructure:
The fabric has irregular voids with no preferred orientation of either voids or inclusions.

Groundmass:
The composition is homogeneous throughout the section. The micromass is optically active to inactive and ranges from light orange to yellowish brown in XPL (x40) and orange to yellowish brown in PPL.

Inclusions:
c : f : v 10μ 25 : 70 : 5
c : f : v 125μ 10 : 85 : 5
Inclusions are poorly sorted and the mode is below 0.062 mm. There are isolated inclusions <2 mm. The non-plastics are angular to sub-rounded with a tendency for the larger inclusions to be sub-rounded.

Fine fraction <0.125 mm.

Frequent	Monocrystalline quartz, angular to sub-angular.
Frequent to common	Microcrystalline calcite inclusions, mode 0.12 mm.
Frequent	Euhedral twinned calcite ca. 0.1 mm.
Common	Biotite mica, laths.
Few	White mica laths.

Coarse fraction >0.125 mm.

Frequent to dominant	Red siltstones and phyllites, sub-rounded to rounded, 0.5 - 2 mm.
Frequent to dominant	Micritic limestone including microfossils, *foraminifera.*
Few to rare	K-feldspar some altered, sub-angular <0.75 mm.
Rare	Altered chloritised igneous rocks <0.3 mm.

The matrix contains few red concentrations with more frequent *foraminifera* <1.5 mm.

Comment: All but one of these samples are cups. Clay samples such as cLasithi 88/16 and 88/17 (from the Achladia Formation marls near Petras and Achladia respectively) show the presence of this type of fossiliferous material in the local marls. The distribution of these vessels tends to suggest a provenance on the eastern side of the valley, but it would be difficult to make a positive ascription of provenance on the grounds of the mineralogical data. They are distinctive from those previous cups which we have suggested may be made in the Achladia area.

10. Red, optically active fine matrix (fig. 113:e)

Petras	88/30, 44, 49, 56
Zou	88/18, 22
Klimataria	88/ 3

Microstructure:
The fabric has few irregular voids which run parallel to the pot wall. The micromass displays parallel extinction in some samples whereas non-plastics have no preferred orientation.

Groundmass:
The composition appears homogeneous throughout the section. The micromass is optically active and is orange/red in both XPL and PPL.

Inclusions:
c : f : v 10μ 15 : 75 : 10
(Red concentrations not counted as inclusions). Inclusions are poorly sorted, angular to sub-rounded <2 mm. They are discussed together:

Frequent	Monocrystalline quartz, sub-angular to angular, mode ca. 0.062 mm., but <0.25 mm.
Frequent	Microcrystalline limestone mainly <0.062 mm. but also microfossils <2 mm.
Few	Translucent red concentration features <0.25 mm.
Rare	Red phyllite <1 mm.
Rare	Quartz biotite metamorphic rocks <2 mm.

Contains characteristic red pellets which are optically very active, contrast with the sometimes buff matrix and they contain less frequent lime inclusions than the matrix.

Comment: This fabric occurs in cups and jugs and appears from the optical activity of the matrix to be relatively low fired. The origin of the concentration features in this fabric is not known and similar features are not present in the raw materials sampled. The mineral content of this fabric is, however, compatible with the geology of the Miocene and Pliocene deposits of the Sitia Bay area. Its distribution may lead us to suggest that it is the product of the vicinity of Petras.

Petras 88/3 - Lamp.

Microstructure:
The fabric has common irregular voids with no preferred orientation of either voids or inclusions.

Groundmass: The composition is homogeneous throughout the section. The micromass is optically inactive and is dark reddish brown in XPL (x40) and PPL.

Inclusions:
c : f : v 10μ 35 : 45 : 20
c : f : v 62μ 25 : 55 : 20
Inclusions are poorly sorted, quartz grounding is angular to sub-angular, coarse rock fragments are well rounded.

Fine fraction <0.062 mm.

Frequent to dominant	Monocrystalline quartz, angular to sub-angular.
Few	Biotite mica.
Rare	White mica laths.

Coarse fraction >0.062 mm.

Frequent	Phyllite, brown to yellow, rounded <1.25mm.
Frequent	Quartzite.
Few	Alkali Feldspar <0.6 mm. sometimes altered. Chert.
Very Few	Altered chloritised igneous rocks.Very fine sandstone.

The matrix contains few red concentrations with more frequent *foraminifera* <1.5 mm.

Comment: This appears to be a sand tempered highly fired fabric and differs from the other fabrics described in the study. It is, however, compatible with a local origin. Its function may be linked to the different clay recipe used to form this vessel.

* * *

There now follow a number of groups and single samples which will not be formally described. A brief account is given of their petrographic nature and comment added where appropriate.

Fine buff fabric without foraminifera: - Klimataria 88/23, 25 and Achladia-Platyskinos 92/10
These vessels, all cups, are fine and have inclusions which do not exceed silt size. The matrix is orange to buff and contains quartz and/or biotite. It is likely to derive from the clays present in the Neogene deposits of the locality.

Achladia jars with foraminifera: - Zou 88/13, 16; Klimataria 88/9 and Achladia-Riza 88/6
These jars are, in terms of their major inclusions, members of the broad group of jars manufactured in the Achladia area (description no. 2). In addition, however, they also contain *foraminifera* microfossils. They have therefore been made from a mix of raw materials deriving from the phyllite series and from local Neogene marine clays, the latter of which contained microfossils.

Cooking vessels: - Riza 88/10, 26 and Achladia-Platyskinos 92/21
Frequent phyllite, muscovite schist and siltstone inclusions <3 mm. in a reddish brown optically active matrix. The groundmass comprises angular quartz <0.25 mm. The inclusions in these vessels are related to those in group 2, which have their origin in the Achladia area. These vessels also are from the Achladia valley, but their optically active micromass shows these cooking vessels have been fired to a lower temperature than the jars containing similar materials.

Cooking vessels: - Klimataria 88/7 and Petras 88/59
Optically very active red micromass with grounding of quartz. Moderately sorted range of subrounded inclusions which range in size from 0.25 - 1 mm. These include monocrystalline quartz, quartzite, chert, epidote clusters, with few phyllite and biotite quartz schist. This fabric has also been observed in a cooking vessel from Aghia Photia. In keeping with other cooking fabrics, these examples have an optically active low-fired micromass.

Cooking vessels: - Achladia-Riza 88/11 and Achladia-Platyskinos 88/16 (fig. 113:f)
Very coarse fabric - non-plastics form ca. 60% of the section area. Inclusions are dark phyllite, quartzites and clay pellets. Likely to have been made from clays from the Phyllite-Quartzite series. The micromass is optically active, indicating a low firing temperature.

Cooking vessel: - Klimataria 88/17
This sample is closely related to the altered igneous Achladia jar fabric, but the groundmass also contains common micritic limestone inclusions, some of which contains microfossils, although not *foraminifera.* The micromass is optically very active and linear voids are orientated parallel to the pot wall. The optical activity suggests a low firing temperature for this vessel.

Petras 88/4, 20
The micromass is optically inactive, dark red, mottling to greenish brown in XPL and brown in PPL. It has dominant grey/black phyllite and siltstones which are sub-angular to sub-rounded; also sub-rounded micro-crystalline limestone inclusions. Mode of the coarse fraction ca. 1 mm. in a matrix of small quartz, mode of 0.062 mm. This fabric is made from materials available in the local Phyllite-Quartzite series. The micromass shows that these jars are highly fired.

Klimataria 88/14
The optically inactive micromass is deep red in XPL and brown in PPL. It contains red/black siltstones which are not dissimilar to the host matrix, but which display their own internal orientation. The fine fraction contains few sub-angular quartz and common biotite mica laths. This vessel's fabric can be closely matched by clay sample cLasithi 88/24, which is a clay from the Phyllite series near Skordhilo south of Paraspori (see Papastamatiou *et al.* 1954).

Analoukas 88/3, 4
These coarse jars have a micromass which is optically inactive and red in XPL. There is common quartz in the grounding and has large inclusions of phyllite, polycrystalline quartz and siltstone <7 mm.

Petras 88/7, 51
The micromass is yellowish brown in XPL and brown in PPL. Common inclusions range up to 3 mm. in size and comprise phyllite, microcrystalline limestone, red/black iron-rich concentrations, metamorphic rock containing biotite, white mica, and feldspar and a sub-angular altered volcanic rock with relict trachytic texture. The phyllites and schists display a lenticular structure and characteristic quartz porphyroclasts in addition to a phacoid structure resulting from shearing which has been detailed in this area by Durkin and Lister (1983). These were also observed in similar rocks present in the main Achladia jar fabric. This fact, along with the altered igenous rock suggests that these two storage jars may have been made in the Achladia valley.

Stavros 88/3, 4
The micromass is mottled red to green and shows some degree of vitrification. It has rounded to sub-rounded monocrystalline and polycrystalline quartz. This is similar to fabric identified from Palaikastro and probably have their origin there.

Zou 88/2
Fine fabric with clay pellets and highly irregular voids which are filled with secondary calcite. There are very few non-plastics, those present are <0.050. This very fine fabric finds comparative material in clay samples taken from very fine grey clays in flysch deposits.

Zou 88/26
Fine grey phyllite inclusions in over-fired matrix.

Achladia-Riza 88/16
Coarse fabric with grey phyllite <3 mm. (ca. 50% area inclusions).

Zou 88/12
Yellowish brown in XPL and PPL, optically active micromass. Small yellow phyllite sometimes displaying a "phacoid" shape with quartz porphyroclasts. Dominant calcitic material in the matrix, including *foraminifera* microfossils. This vessel is a mix of Neogene clays and material from the Phyllite-Quartzite series.

COMPARISON OF MIDDLE MINOAN AND LATE MINOAN FABRICS AT PLATYSKINOS

Amongst the ceramics from the Middle Minoan phases at Achladia Platyskinos, samples Platyskinos 92/27 and 30 are both members of Fabric 2 described here, the Achladia jar fabric; samples Platyskinos 92/26 and 92/28 are members of Fabric 3, the Achladia cup and jug fabric. Platyskinos 92/23, 92/24, 92/25 and 92/29 all have dominant phyllite inclusions and are taken to be local products. 92/23 and 92/25 have an optically active micromass and the other two inactive matrices, which is a reflection of a lower firing temperature and less vitrification in the first two samples. They are cooking vessels and so fit into the pattern which is clear from the Neopalatial material, that cooking pots are fired at a lower temperature.
Sample 92/22, also a cooking vessel, contains large angular inclusions of fossiliferous limestone which clearly have been added as temper. The use of calcite temper, the dominant paste preparation technique during the Neolithic period, was not recorded during the Neopalatial period of East Crete. On a theoretical level, the use of calcite for such vessels is advantageous in minimising the effect of thermal stress on the vessel, as it has a coefficient of thermal expansion similar to a low-fired clay (Rice 1987, 229).
This is a small number of samples to make any general comment about diachronic change, but it is clear that there is some degree of continuity in the raw material resources exploited during the the Protopalatial and Neopalatial periods. Cooking vessel Platyskinos 92/22 demonstrates the variation in vessel fabric which occurs over time due to cultural factors. The raw material choices available to a potter in this area provide a large number of different solutions to the problem, for example, of how to make a cooking pot. It should be of interest to us as to why in any one time period a certain potter would make specific decisions concerning choice and manipulation of raw materials.

DISCUSSION

Raw Materials

Within the study area, there are a variety of raw materials available for exploitation in ceramic production. Access to such deposits is quite even in distance terms within the Sitia Bay and ethnographic work has shown that the raw material resource territories of locations such as Petras, Zou and Episkopi overlap, based on donkey transport of clay earlier this century (Day 1991). There are three main sources of clays in the area:

- Some of the Neogene marls and clays of the area, especially those of the Achladia Formation are suitable for the preparation of clay pastes. Often, however, the clays do not work well and are sticky to the feel, especially when they are highly calcareous. However, mixing the clays tends to alleviate this problem and make them more workable.

- Another major source of material in the area is the Phyllite-Quartzite series, which also has wide

distribution. The shales, phyllites and clays of these deposits are of great importance as clay mixing and non-plastic materials. Modern potters of Crete often use deposits of this sort in the formation of larger vessels.

- There are some red *terra rossa* residual soils in the area, especially developed on limestones. These are suitable for use in combination with other materials for ceramic manufacture.

Ceramic groupings

In the thin section analysis of ancient pottery, a number of fabric groupings were found. Regardless of their provenance, which we will discuss shortly, each of these groups tended to include a restricted number of shapes, demonstrating a strong link between the shape/function of a pot and the recipe of its paste. At the most basic level, the greater proportion of non-plastic material in jar fabrics was demonstrated: most of these pastes were mixed or tempered. The smaller range of vessels such as cups and jugs were more likely to display a unimodal non-plastic size range and restricted mineral assemblage, suggesting the use of single geological deposits. It is the cooking vessels which perhaps show the greatest variation between each vessel; but consistently use phyllite-based clays. Their optical activity attests to a low firing temperature, something which has been observed in other Neopalatial cooking vessels (Day, in press) and throughout the Early Minoan period (Day and Kilikoglou, work in progress). Their resultant, less vitrified structure makes them more resistant to thermal stress.
We have identified some major fabrics which will be discussed briefly here.

a. Petras coarse and fine fabrics (descriptions 1 and 9). The cup and jar fabrics of Petras, which are easily identified macroscopically have been characterised and are found to be a mix of Neogene marine clays and phyllitic materials. They are compatible with production close to Petras and have a distribution which accords with this.

b. Similarly, there appears to be coarse and fine fabrics produced in the area of the Achladia valley (descriptions 2 and 3). These contain material which derived from the Phyllite-Quartzite series which may also appear locally in Miocene deposits. The mica schist in some of these samples and the altered igneous rocks would tend to indicate the area around the modern village of Achladia and Paraspori as possible source areas of these materials. The distribution of these fabrics has a geographical bias towards the Achladia valley and the west of the study area.

c. Both cooking vessels and storage jars tend to have a wider variation in fabric, which may reflect a greater number of workshops producing these vessels or a greater natural variability in the raw materials used to form the paste of these vessels. The cooking vessels often have non-plastic inclusions which are similar to those in jar fabrics.

d. Descriptions 4 and 8, respectively coarse and fine related fabrics, are of interest. The first contains yellow phyllite fabrics which originate near Palaikastro and the second a fine fabric from the same source area. Vessels from Palaikastro are certainly present in the LM III period at Petras and they reach here already in the Neopalatial period. It would appear that Analoukas and Stavros were, thanks to their geographical proximity of Palaikastro, within the distribution area of that centre. What may be surprising is the presence of members of this group at Zou. As has been suggested above, it is possible that there is a locally produced phyllite-rich fabric which is difficult to separate analytically from those produced in the Palaikastro area, although further work would be needed to clarify the problem.

e. From our direct and indirect evidence, we had postulated the possibility of ceramic production in the Petras, Achladia and Zou area. In the case of Petras and Achladia, we have indeed demonstrated the existence of production centres. The case of Zou is less clear in that its resource zone overlaps with Petras. A workshop at Zou, therefore, might be using the same or similar clays to produce their ceramics. This should not deter further investigation of this problem, however, as two centres sharing similar clay sources may still produce different ceramic fabrics, according to their manipulation of the raw materials.

f. There are three important groups which were imported from other areas of Crete: those from the Mesara Plain (description 5), those from the Gournia/Kalo Chorio area (description 6) and oval-mouthed amphorae from North Central Crete (description 7). These have been discussed elsewhere (Day, in press), but clearly show the regular movement of goods around the island during MM III and LM I. This picture is reflected in other areas of East Crete examined. The products from Gournia comprise storage jars which may have formed containers on coastal shipments rather than being traded for their own properties. Recent analyses have also revealed the presence at Makryghialos of intrusive pithoi manufactured at a centre near to Myrtos. The imports from the Mesara are largely from oval-mouthed amphorae and these along with the amphorae from North Central Crete attest a regular trade in some liquid commodity from settlements in Central Crete.

Comment

It might be suggested that these traded coarse wares paint a picture of exchange or distribution of goods which we have been hitherto unable to trace. It raises interest in the relationship between various geographical regions of the island at this time. Equally, on a local level, it is clear that although the harbour town of Petras is the largest settlement of the area and contains a substantial central building, its pottery products are not the only ones in circulation within the Sitia Bay. There appears to be at least one other major production centre functioning within the Achladia area and that their distribution areas overlapped to some extent. With other cup, jar and cooking vessel fabrics recorded in this study, pottery from Palaikastro and imports from further afield, we have presented a picture of the large scale everyday movement of pottery. It is hopedthat this may help us to reconstruct relationships between sites at the lower end of the settlement hierarchy (Day, in press).

In methodological terms, we have left behind the *impasse* brought about by trying to force ever more detailed information out of elemental data. We have begun to exploit the great potential of fabric-based ceramics studies which exploit macroscopic and petrographic work to provide a picture of pottery production and distribution on the detailed scale needed to answer the increasing number of questions about intra-island movement of goods.

CATALOGUE OF ANCIENT POTTERY SAMPLES

1. Achladia-Platyskinos

Excavation by M. Tsipopoulou and L. Vagnetti. Sherds stored in Sitia Museum, selected by M. Tsipopoulou.

Sample	*Vessel*	*Cat. No. (this volume)*
92/1	Jug	127
92/2	Basin	220
92/3	Pithoid jar	—
92/4	Pithoid jar	73
92/5	Amphora	211
92/6	Pithoid jar	196
92/7	Tripod	122
92/8	Pithos	150
92/9	Pithos	65
92/10	Conical cup	146
92/11	Semiglobular cup	39
92/12	Straight-sided cup	—
92/13	Semiglobular cup	186
92/14	Closed vessel	51/17
92/15	Conical cup	154
92/16	Pithos	ME 21/2
92/17	Amphora	81
92/18	Tripod	79
92/19	Tripod	121
92/20	Pithoid jar	201
92/21	Tripod	123
92/22	Tripod	152
92/23	Dish	226
92/24	Jug	215
92/25	Tripod	206
92/26	Barbotine dec. sherd	53/4
92/27	Amphora	159
92/28	Jug	84
92/29	Pithoid jar	—
92/30	Pithoid jar	194

2. Achladia-Riza

Excavations of N. Platon, stored in Iraklion Museum.

Sample	*Vessel*	*Context*
88/1	Pithoid jar	Δωμάτιο Τετράγωνου Πεσσού. Επιφάνεια στρώματος 2.
88/2	Oval-mouthed amphora. Grey fabric with incision at the base of handle	Ανω δωμ. Τμήματος θήκης Γ.
88/3	Pithos with thickened rim	Θήκη Γ
88/4	Conical cup	"
88/5	Jug with imitation rivet on handle and vertical incisions at base of handle	"
88/6	Pithoid jar	Θήκη Γ. 13
88/7	Coarse ware body sherd	"
88/8	Coarse ware body sherd	"
88/9	Cup or bowl base	"
88/10	Cooking vessel	"
88/11	Tripod cooking vessel	"
88/12	Cooking vessel, rounded with out-turned rim	Δωμ. Γ Ομάς 15

Sample	*Vessel*	*Context*
88/13	Bowl or jug base	Θήκη Γ 11
88/14	Pithoid jar with vertical handle and oblique applique rope pattern	"
88/15	Pithos/basin body sherd	"
88/16	Basin with horizontal rope pattern band beneath out-turned rim	Θήκη Γ 9
88/17	Large jar rim and spout	'Οστρακα ΒΔ τμήματος 3 δωμ. Β
88/18	Oval-mouthed amphora	Σώρος 5 Θήκη Γ
88/19	Conical cup	Επιφανειακό δωμ. Β κ. Δυτ. μέρους δωμ. Α.
88/20	Conical cup	"
88/21	Conical cup	"
88/22	Jar body sherd	Κρύπτης άνω ΝΑ γωνίας Δ 3
88/23	Jug spout	Δωμ. Δ σωρός 30
88/24	Oval-mouthed amphora	Δωμ. Α σωρος 3
88/25	Oval-mouthed amphora	Δωμ. Γ. 24
88/27	Pithos with oblique applique rope pattern between handles	Δωμ. Πεσσού 2
88/28	Pithos with oblique applique rope pattern	"
88/29	Oval-mouthed amphora, white painted	? context

3. Analoukas

Surface survey by M. Tsipopoulou (1988). Stored in Sitia Museum, SM = Sitia Museum Number.

88/1	Coarse ware jar	SM 4506/25
88/2	Coarse ware jar	SM 4506/24
88/3	Coarse ware jar	SM 4506/26
88/4	Coarse ware jar	SM 4506/23
88/5	Straight-sided cup	SM 4506/21

4. Klimataria (Επαυλις Σητείας / Manares /Μέγαρον Σητείας)

Excavations of N. Platon, pottery stored in Iraklion Museum.

88/1	Cup base	Β Δωμάτιον. Πτέρυγος άνω δρόμου
88/2	Jug base	"
88/3	Conical cup	"
88/4	Amphora neck, red and black painted	'Οστρακα Ν δωματίου κίονως οδού
88/5	Pithos with rolled rim	1952
88/6	Pithos with rolled rim	1952
88/7	Tripod cooking vessel	1952
88/8	Straight sided cup	Επίχωσις άνω Β δωματίου πτέρυγος άνω δρόμου
88/9	Pithoid jar, rolled rim	"
88/10	Oval-mouthed amphora	"
88/11	Conical cup	"
88/12	Conical cup	"
88/13	Cooking vessel	"
88/14	Pithos	ΝΑ γωνία περιβόλου εξωτερικώς
88/15	Spout of large storage jar	"
88/17	Tripod cooking vessel	"
88/18	Tripod cooking vessel	"
88/19	Large jar	"
88/20	Large closed vessel, red/black painted reed decoration	"
88/21	Tripod cooking vessel	"

Sample	*Vessel*	*Context*
88/22	Jug or amphora neck	ΝΑ γωνία περιβόλου εξωτερικώς
88/23	Large cup	"
88/24	Jug or amphora, horizontal painted bands	Δωμ. ανατολικόν. Ημισυ δρόμου
88/26	Storage jar	? context

5. Petras

Surface survey by M. Tsipopoulou, stored in Sitia Museum.

88/2	Tripod leg	SM 6559/2
88/3	Lamp	SM 6559/3
88/4	Black painted pithos rim	SM 6559/4
88/5	Closed vessel with rolled rim	SM 6559/8
88/6	Oval-mouthed amphora rim and neck	SM 6521/1
88/7	Pithos base with cordon	SM 6521/5
88/8	Pithoid jar body sherd	SM 6574/6
88/9	Oval-mouthed amphora rim	SM 6574/3
88/10	Amphora handle	SM 6574/2
88/11	Tripod dish. Cooking ware	SM 6574/9
88/12	Kalathos	SM 6574/1
88/13	Lamp rim	SM 6574/4
88/14	Pithoid jar body sherd, drip painted exterior	SM 6574/10
88/15	Large closed jar	SM 6520/1
88/16	Large open slipped and painted bowl	SM 6520/6
88/17	Cup base, red painted	SM 6520/4
88/18	Cup base, black painted	SM 6520/7
88/19	?Oval-mouthed amphora handle	SM 6620/5
88/20	Pithoid jar rim	SM 6620/1
88/21	Bridge- spouted jar	SM 6617/2
88/22	Pithos rim	SM 6617/3
88/23	Basin rim with rope pattern relief decoration	SM 6611/1
88/24	Rim of jar, overfired	SM 6625/9
88/25	Conical cup	SM 6625/4
88/26	Bowl	SM 6625/8
88/27	Semi closed globular vessel rim	SM 6625/3
88/28	Bowl	SM 6625/5
88/30	Conical cup	SM 6573/7
88/31	Pithoid jar rim	SM 6582/7
88/33	Semi closed vessel rim and base	SM 6582/4
88/35	?Oval-mouthed amphora base	SM 6564/4
88/36	Pithos base	SM 6512/1
88/37	Pithoid jar base	SM 6512/4
88/38	Closed vessel, body sherd, overfired	SM 6512/6
88/39	Tray	SM 6555/2
88/40	Cup, one-handled straight sided, black wash	SM 6555/3
88/41	Conical cup	SM 6555/5
88/42	Conical cup	SM 6555/6
88/43	Jar, body sherd with black paint	SM 6555/7
88/44	Juglet	SM 6578/3
88/46	Small cooking vessel	SM 6578/5
88/47	Coarse ware body sherd	SM 6578/8
88/48	Coarse ware body sherd	SM 6578/9
88/49	Coarse ware body sherd	SM 6578/10
88/50	Coarse ware body sherd	SM 6578/11
88/51	Coarse ware body sherd with rope pattern	SM 6578/12
88/52	Coarse ware body sherd	SM 6578/13
88/53	Coarse ware body sherd	SM 6578/14
88/54	Cooking vessel tripod leg	SM 6510/1
88/55	Cooking vessel	SM 6510/3

Sample	*Vessel*	*Context*
88/56	Pipe or tube	SM 6531/1
88/57	Pithoid jar rim	SM 6531/8
88/59	Cooking vessel rim	SM 6531/6
88/60	Pithos rim	SM 6531/4
88/61	Pithos base	SM 6531/3
88/62	Coarse open vessel base	SM 6523/4
88/63	Waster body sherd	SM 6523/6
88/64	Oval-mouthed amphora rim and neck	SM 6581/1
88/65	Bowl	SM 6581/2
88/66	Large cup /bowl	SM 6581/7
88/67	Conical cup	SM 6581/4
88/68	Pithoid jar base	SM 6581/3
88/69	Amphora base	SM 6571/1
88/70	Amphora rim	SM 6571/3
88/71	Conical cup	SM 6571/5
88/72	Amphora base	SM 6536/2
88/75	Cup, black painted	SM 6536/10
88/77	Small bowl rim	SM 6538/5
88/78	?Oval-mouthed amphora neck	SM 6616/7
88/79	Pithoid jar	SM 6616/1
88/80	Cup	SM 6616/9
88/81	Closed vessel	SM 6616/8

6. Stavros

Surface survey by M. Tsipopoulou, stored in Sitia Museum.

88/1	Pithoid jar	SM 4505/23
88/2	Conical cup	SM 4505/24
88/3	Conical cup	SM 4505/8
88/4	Conical cup	SM 4505/9
88/5	Conical cup	SM 4505/32
88/6	Conical cup	SM 4505/7
88/7	Bridge spouted jar	SM 4505/20
88/8	Closed vessel	SM 4505/11
88/9	Pithoid jar	SM 4505/21
88/10	Cooking vessel	SM 4505/34
88/11	Bowl/basin handle	SM 4505/35
88/12	Tripod leg cooking vessel	SM 4505/22

7. Zou

Excavations of N. Platon, stored in Iraklion Museum.

88/1	Straight-sided cup	1956. Αποθ. β, γ
88/2	Conical cup base	"
88/3	Body sherd of large pithos with rope pattern banding	1956. Ξ
88/4	Base of amphora	Δωμ. Β δάπεδον
88/5	Cup/jug base	"
88/6	Large jar body sherd	"
88/7	Base of cooking vessel with finger-impressed rope pattern around base	1956. Δωμ. Λ
88/8	Body sherd of LM I polychrome closed vessel	"
88/9	Tripod leg of large cooking pot	"
88/10	Large bowl, basin	"
88/11	"Frying pan" type of vessel in cooking fabric	"
88/12	Semi-closed jar, decorated in red paint	"
88/13	Base and lower body of small jar	Δωμ. Ζ, Αποθέτης

Sample	*Vessel*	*Context*
88/14	Coarse pithos body sherd	Δωμ. Ζ, Αποθέτης
88/15	Neck and shoulder of jug/jar	"
88/16	Rim of basin/storage jar, with thickened rim,	Κάτω στρώμα αποθ. Ανατ. τμήμα
88/17	Cup/jug base with black wash	Ν. Περιβόλου
88/18	Conical cup	"
88/19	Conical cup rim and body	"
88/20	Body and handle of large cooking pot	1956. Δωμ. Μα
88/21	Stand with white slip	"
88/22	Jug base	"
88/23	Pithos rim and neck with vertical rolled handle	"
88/24	Rim and shoulder of small closed vessel	1955. Αποθέτης
88/25	Body sherd of storage jar with rounded shoulder	"
88/26	Upper part of overfired jug; incised lines around neck	"

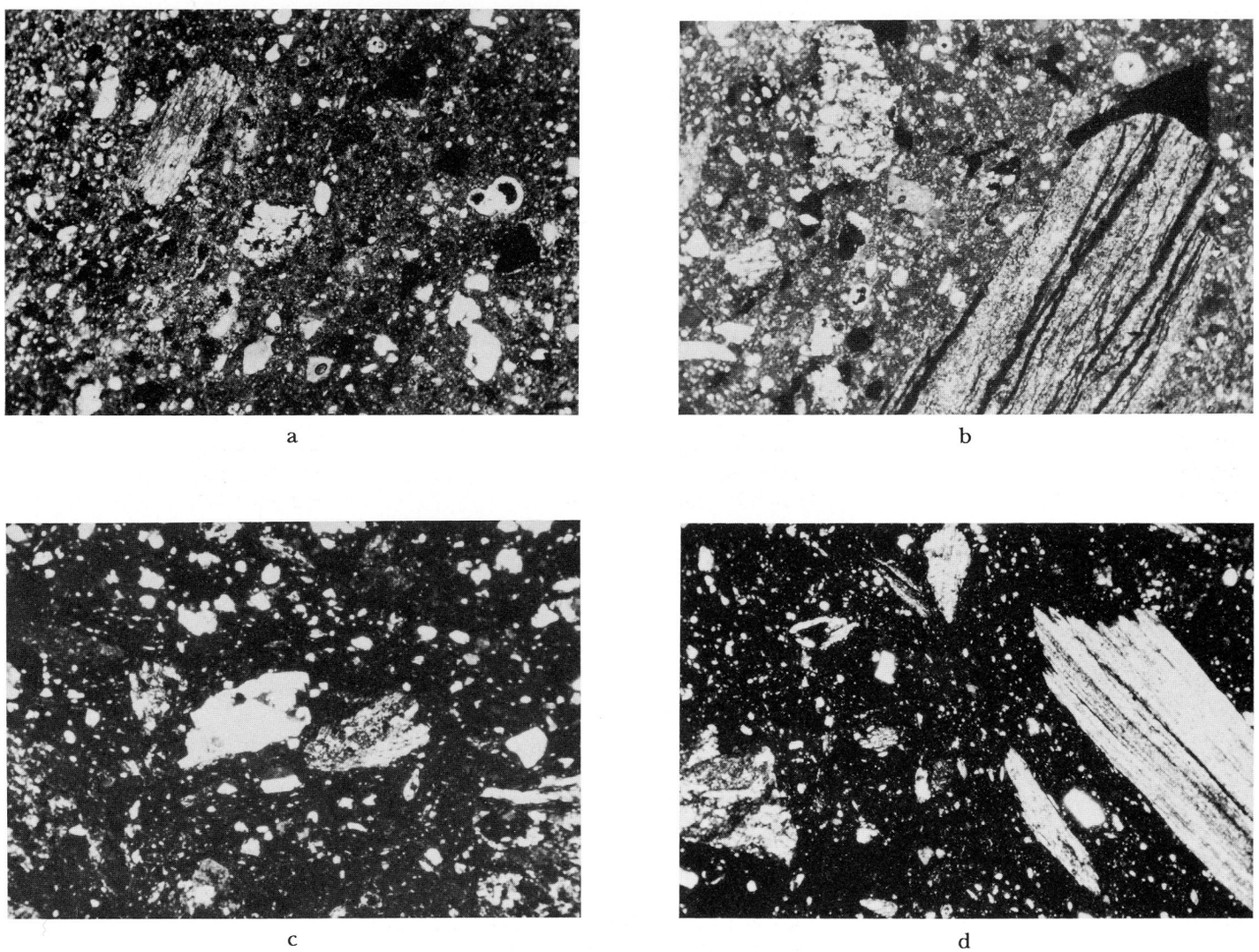
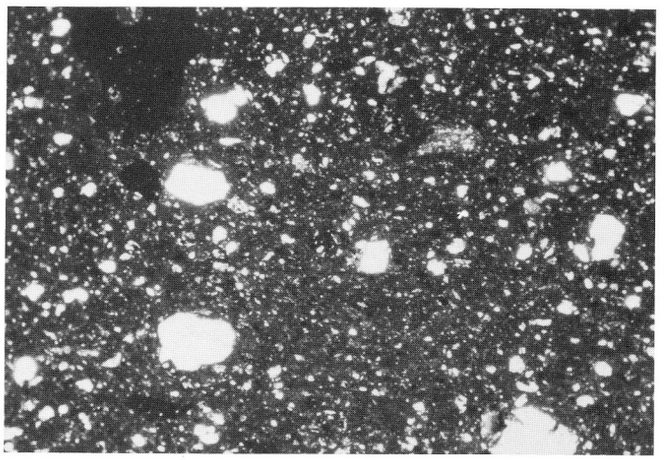


Fig. 111 - a. Petras 88/41: phyllite, quartzite and microfossils (*foraminifera*). b. Petras 88/60: large phyllite and quartzite inclusions, microfossils (*foraminifera*). c. Platyskinos 92/7: phyllite and quartzite in quartz rich matrix. d. Riza Achladia 88/24: altered igneous rock and phyllite.



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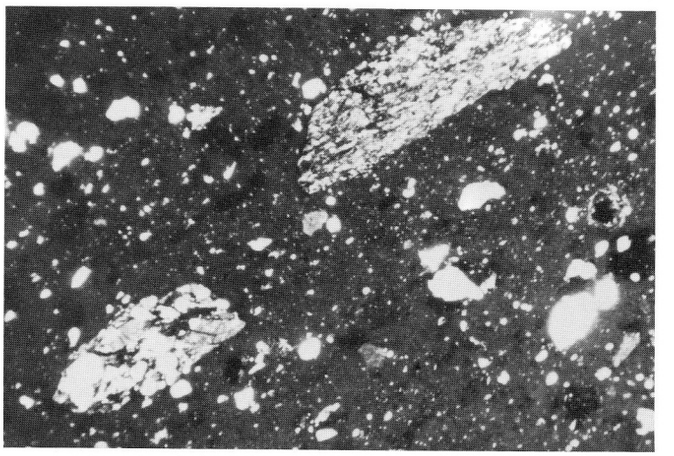

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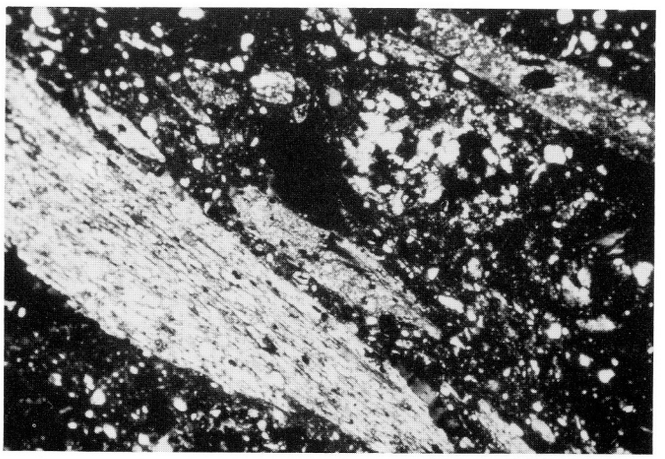

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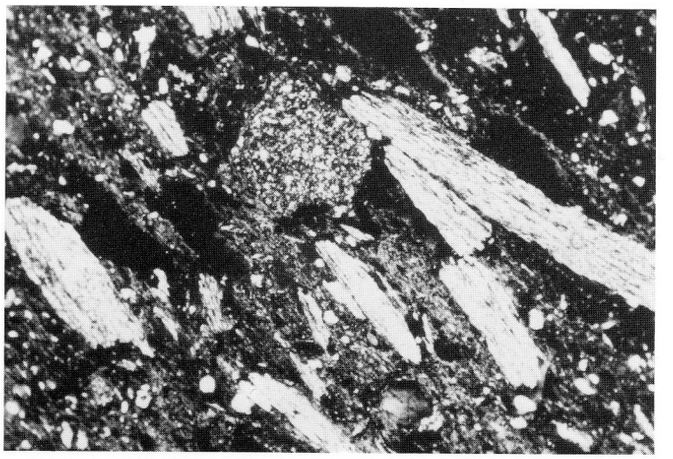

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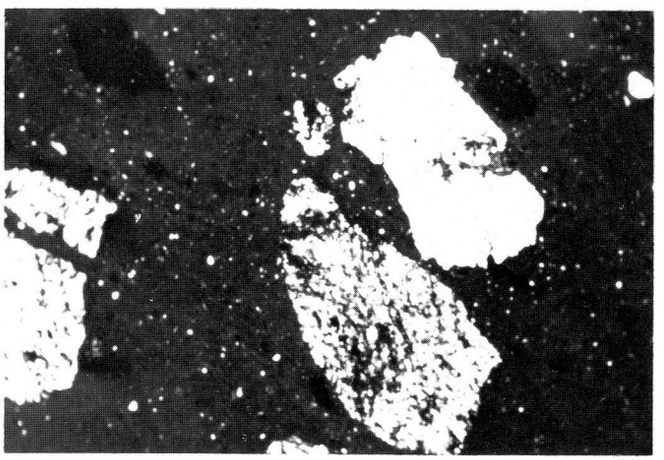

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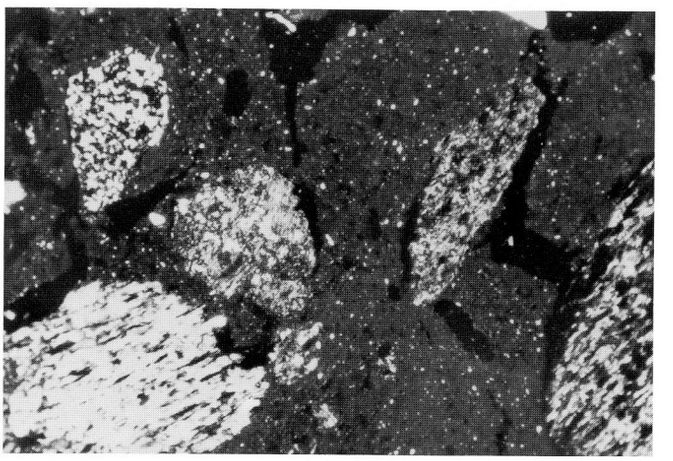

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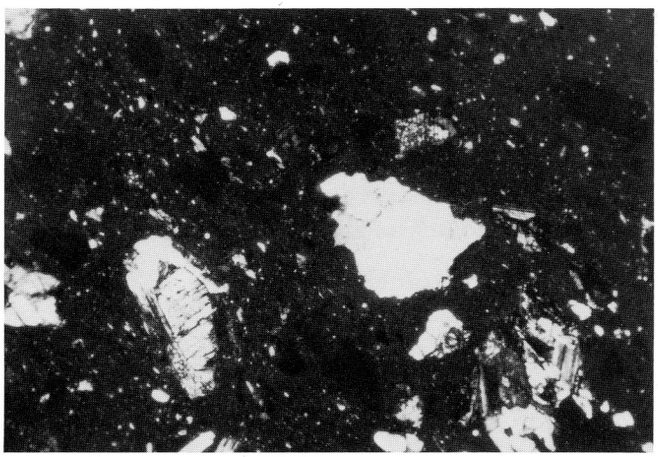
Fig. 112 - a. Zou 88/5: fine quartz rich fabric. b. Petras 88/47: rounded quartzite and siltstone. c. Petras 88/54: frequent, large, parallel orientated phyllite in cooking pot. d. Klimataria 88/18: frequent, large, parallel orientated phyllite in cooking pot. e. Klimataria 88/4: amphibole and biotite schists in a fine matrix. f. Phaestos 85/18: common local Mesara fabric identical to Klimataria 88/4.



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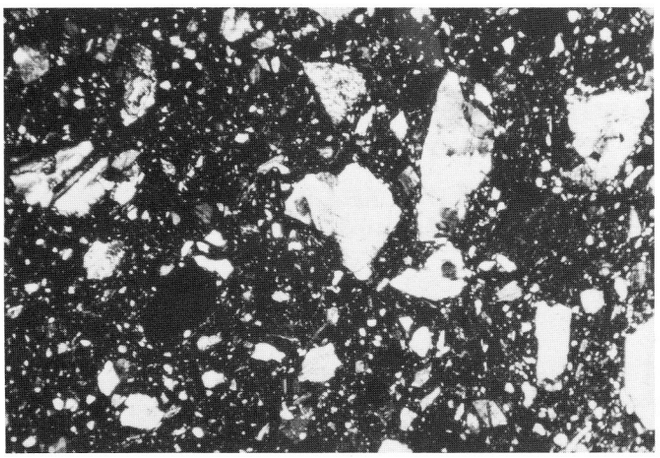

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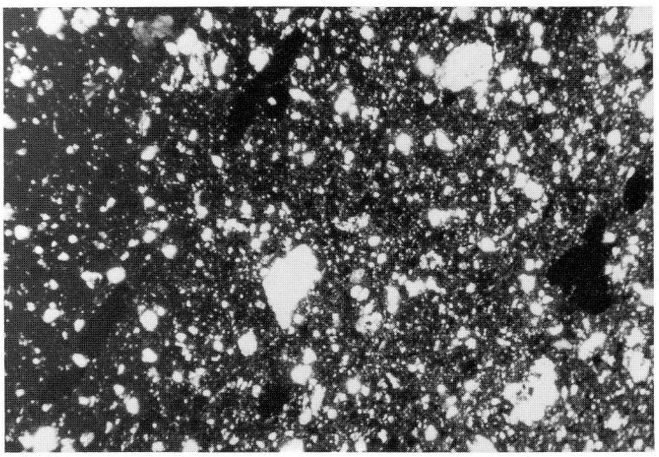

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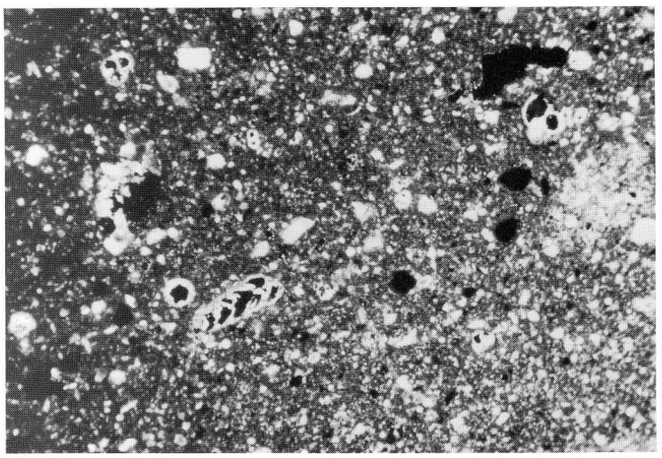

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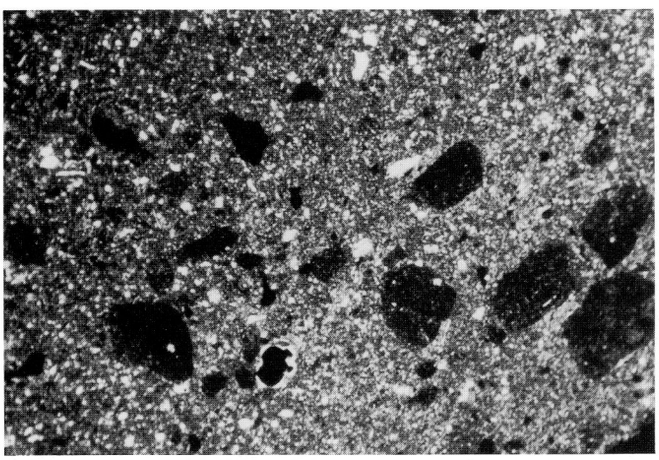

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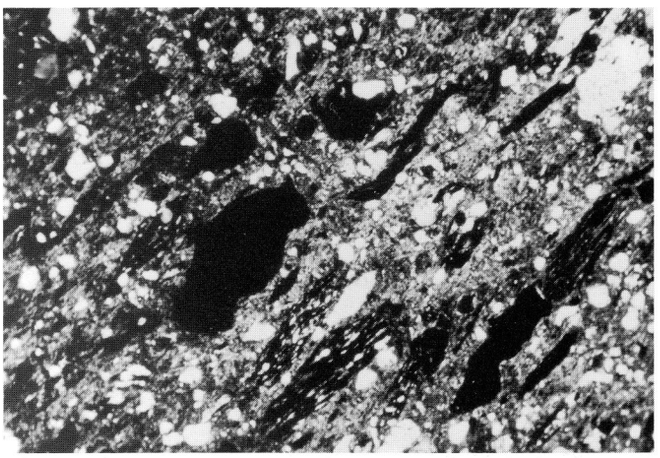

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Fig. 113 - a. Petras 88/81: igneous rock with plagioclase feldspar, quartz (description 6). b. Gournia 88/21: common local fabric from the Gulf of Mirabello, containing rock fragments of granitic/dioritic rocks, in this view dominant plagioclase feldspar. c. Stavros 88/2: finer cup fabric with quartz, chert etc. d. Petras 88/17: Calcareous cup fabric with foraminifera microfossils, cf. clay matrix of Petras 88/41 and 88/60. e. Petras 88/44: fine, optically active matrix with rounded dark concentration features. f. Riza Achladia 88/11: cooking pot showing parallel orientated dark phyllites.

CATALOGUE OF GEOLOGICAL AND MODERN POTTERY SAMPLES
Map references in the right hand column refer to the 1:50 000 map series.

cLASITHI 88/16	Asprougas, Sitia	3028 1213
Blue/white marl in clay deposits of the Achladia Formation in valley east of Petras.		
cLASITHI 88/17	Achladia-Riza	2980 1182
White marly clay of Achladia Formation at the foot of the Kephala hill by the road to Achladia.		
cLASITHI 88/18	Paraspori	2949 1182
Shales in phyllite series.		
cLASITHI 88/19	Paraspori	2943 1183
Shale/phyllite.		
cLASITHI 88/20	Paraspori	2943 1183
Phyllite.		
cLASITHI 88/21	Paraspori	2941 1180
Modern sherds - from kiln of the Thrapsano potters - Kiln 34 (Day 1991).		
cLASITHI 88/22	Paraspori	2941 1180
Mica schist by andesite outcrop - in Phyllite-Quartzite series.		
cLASITHI 88/23	Paraspori	2941 1181
Shale/Phyllite beds - referred to by the potters as *lepida.*		
cLASITHI 88/24	Skordhilo	2942 1157
White silty clay from the *Chomatolakkos* source - depth of 20 cm.		
cLASITHI 88/25	Skordhilo	2942 1157
Purple clay from from the *Chomatolakkos* source - depth of 40 cm.		
cLASITHI 88/26	Kouphota Hill, Aghia Photia, Sitia	3055 1221
Terra rossa in the cave by the sea.		
cLASITHI 88/27	Zou villa	3016 1174
White marl of Achladia Formation.		
cLASITHI 88/28	Stavromenos	3021 1175
Purple shale/phyllite from Phyllite-Quartzite series.		
cLASITHI 88/29	Stavromenos	3019 1182
Phyllite.		
cLASITHI 88/30	Stavromenos	3019 1182
Phyllite.		
cLASITHI 88/31	Kato Dris	3026 1170
Terra rossa.		
cLASITHI 88/33	Roussa Ekklisia	3046 1196
Clay in Phyllite-Quartzite series		
cLASITHI 88/34	Roussa Ekklisia	3044 1203
Phyllitic clay.		
cLASITHI 88/35	Roussa Ekklisia	3044 1203
Red clay from Phyllite-Quartzite series.		
cLASITHI 88/40	Skopi	2954 1199
Grey marl from the Achladia Formation.		

cLASITHI 88/41 Skopi 2954 1199
Grey marl from the Achladia Formation.

cLASITHI 88/46 Vouvas Kephali, Palaikastro 3122 1235
Grey lignite seam in Miocene clays.

cLASITHI 88/47 Vouvas Kephali, Palaikastro 3122 1235
Terra rossa.

cLASITHI 88/48 Vouvas Kephali, Palaikastro 3126 1232
Grey clay.

cLASITHI 88/63 Aghios Spyridon 2990 1128
Miocene clay.

cLASITHI 88/64 Aghios Spyridon 2988 1128
Miocene clay.

cLASITHI 88/65 Aghios Spyridon 2986 1129
Miocene clay.

cLASITHI 88/66 Profitis Ilias Hill, Aghios Georghios-Tourtouloi 2983 1138
White marl.

cLASITHI 88/116 Sitia 3016 1226
Fine alluvial clay from river mouth.

cLASITHI 88/117 Zou 3013 1177
Marl in valley - Achladia Formation.

cLASITHI 88/118 Zou 3013 1177
Marl in valley - Achladia Formation.

cLASITHI 88/130 Trypitos 3029 1218
Red beds on hilltop above Karavopetra.

cLASITHI 85/31-35 Trypitos 3032 1221
Modern sherds from kiln site - Kiln 45 (Day 1991).

cLASITHI 85/61 Asprougas, Sitia 3028 1213
Grey clay from Achladia Formation.

cLASITHI 85/62 Asprougas, Sitia 3028 1213
Yellow clay from Achladia Formation.

cLASITHI 85/63 Trypitos, Sitia 3031 1219
Red earth from phyllite deposits.

cLASITHI 85/64 Paraspori 2941 1181
Phyllite.