25. MINERALOGY OF CLASTIC SEDIMENTS

25.1 TEXTURE AND MINERALOGY OF SOME CLASTIC SEDIMENTS FROM SITE 133 – WESTERN SARDINIA SLOPE

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Five samples of variegated silts and shales from Site 133, 39° 12'N, 7° 20'E, were examined. The purpose was to determine if evaporite minerals occur as detrital components. Also, textural analysis may give some indication as to their depositional environments. These sediments are unfossiliferous, but it was believed that they could be correlative to the clastics of the Miocene Solfifera Formation of Sicily (Hardie and Eugster, 1971).

Sample description

13-133-4-1, 140 cm:	Sand-silt-clay, very fine grained, light green, very well indurated, recrystallized quartz cement. When heated 1 hour at 550°C changes to a rusty red.
13-133-5-1, 142 cm:	Sand-silt-clay, buff tan, friable.
13-133-6-1, 125 cm:	Silty clay, tan, friable.
13-133-7-1, 40 cm:	Clayey silt, light brown, friable.
13-133-7-1, 102 cm:	Fine sand, green, very friable.

Size Analysis

The samples were disaggragated in an ultrasonic bath and sieved down to 63μ. The fraction less than 63μ was then introduced into a silt-sedimentation cylinder recording the fraction down to 2μ. The remaining weight difference compared with the original sample was attributed to clay-size material and split into three decreasing fractions for the statistical calculations. Due to the physics of the analysis there is a slight artificial dip in the frequency curve at 5ϕ (63μ) and 9ϕ (2μ).

Results of the size analyses are summarized in Table 1 and Figure 1. Sample 133-4-1, 140 cm was too well indurated to be completely disaggregated for analysis. It can be seen from the set of curves that statistical measures are not very meaningful with such strong bi- and tri-modality. 133-7-1, 102 cm is the only sample which is moderately well sorted and is skewed positively.

Mineralogy

Summarized results of X-ray diffraction analyses and visual examination of the sand fractions are presented in Table 2. The search for evidence of evaporite formation proved fruitless. The bulk mineralogies of the samples are all quite similar. Quartz or micas are dominant

TABLE 1
Statistical Measures of Size Analysis from Site 133

	ϕ Mean	ϕ Median	Sorting	Skewness	Kurtosis
133-5-1, 142 cm	6.91	8.42	3,43	-0.20	-1.40
133-6-1, 125 cm	8.34	9.09	2.19	-0.32	-0.78
133-7-1, 40 cm	7.18	7.05	2.62	-0.15	-0.89
133-7-1, 102 cm	3.23	3.13	1.97	0.95	5.32

TABLE 2
Mineralogy of Silts, Site 133

	133-4-1, 140 cm	133-5-1, 142 cm	133-6-1, 125 cm	133-7-1, 40 cm	133-7-1, 102 cm
Quartz	Very dominant	Common	Dominant	Dominant	Dominant
Feldspars					
K-Fels	Major	Major	Major	Common	Major
Plagioclase	Very major	Minor	Major	Common	Major
Clay minerals					
Illite	Common				
Paragonite	?	Dominant	Major	Major	Major
Muscovite	Common			Trace	Trace
Kaolinite	Minor	–	Trace	Trace	Trace
Chlorite	?	–	–	–	–
Montmorillonite	Trace	–	Minor trace	–	Trace
Accessorys					
Goethite	Trace	Minor	–	–	–
Magnetite/Hematite	Trace	Trace	Trace	Trace	Trace
Apatite	Trace	Trace	Trace	Trace	Trace
Epidote	Trace	Trace	Trace	Trace	Trace
Zircon	Trace	Trace	Trace	Trace	Trace
Others	Diverse	Diverse	Diverse	Diverse	Diverse
Amorphous	–	15 glass beads	–	–	2 glass beads
Unknown	Minor D = 6.42Å			Trace d = 6.42Å	

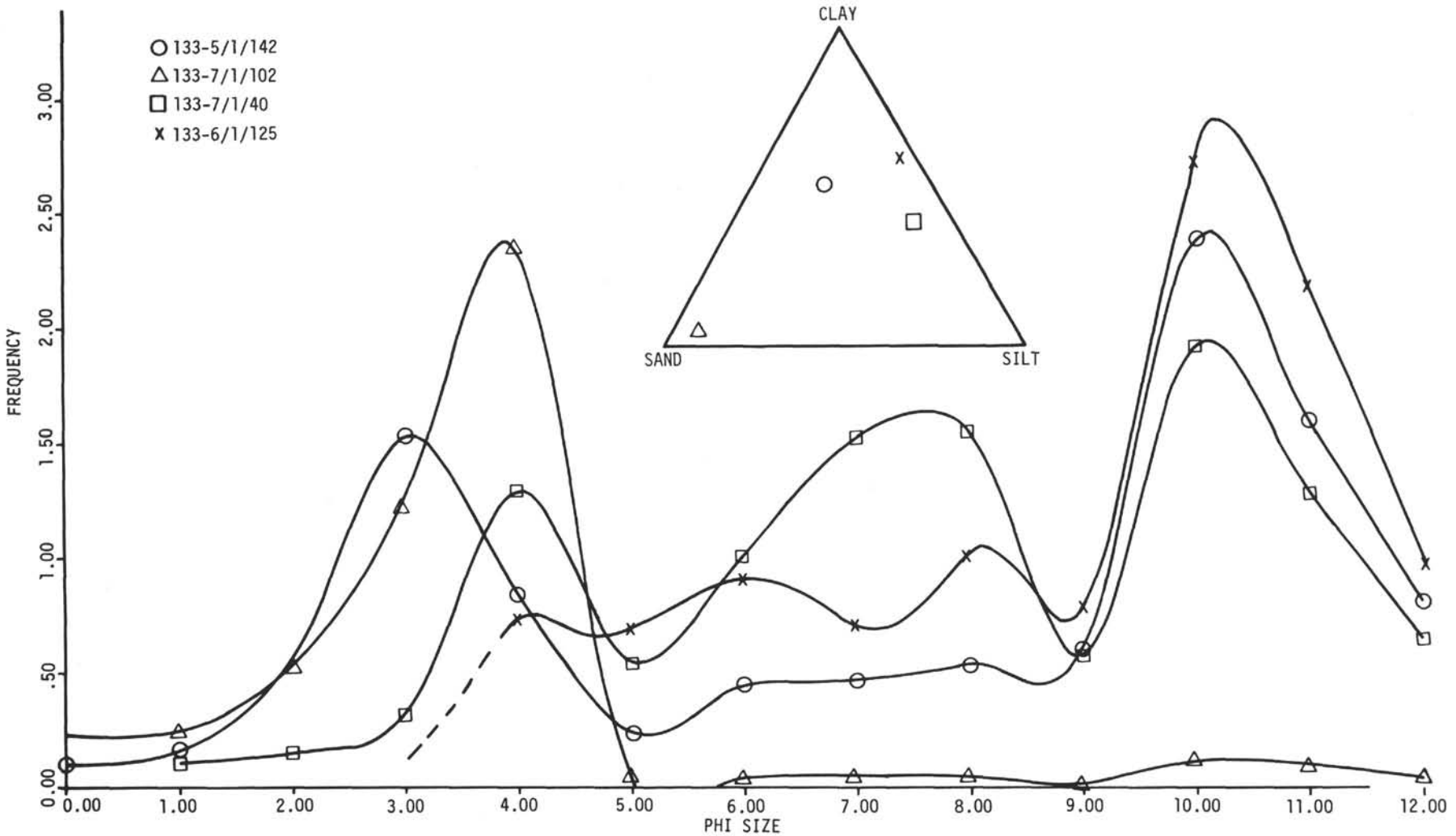

Figure 1. *Phi size-frequency plots for selected samples.*

depending on the amount of clay-size particles. Both K-feldspars and plagioclase occur in appreciable amounts in all samples. Carbonates or evaporite minerals are totally lacking. There is a large variety of diverse minor accessory minerals, including magnetite, hematite, apatite, zircon, epidote, and several unidentified opaque minerals. Goethite was found particularly enriched in Sample 133-5-1, 142 cm. In the sand fractions, feldspars and quartz grains are very fresh in appearance and poorly rounded.

The results are consistent with the postulate that the variegated beds were deposited on a flood plain. Influxes of clastic continental sediments were derived from a varied crystalline source. The absence of evaporite minerals negated the hypothesis of detrital gypsum suggested by shipboard scientists. Poor sorting excludes the possibility that the sediments represent aeolian loess.

Glass Beads

Of special interest is the occurrence of glass beads in Sample 13-5-1, 142 cm. They are light yellow to yellowish brown, transparent to translucent, and almost perfect spheres ranging from 60μ to 200μ. The surface of the balls is rough, thus suggesting shrinkage cracks. From 5 grams of initial sample, 15 individual balls could be isolated. Further analysis is under way to determine if the balls are volcanic, or extraterrestrial.

REFERENCE

Hardie, L. A. and Eugster, H. P., 1971. The depositional environment of marine evaporites: a case for shallow, clastic accumulation. *Sedimentology*. **16**, 187.

25.2. MINERALOGICAL COMPOSITION OF THE NILE CONE, MEDITERRANEAN RIDGE, AND STRABO TRENCH SANDSTONES AND CLAYS

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INTRODUCTION

It had been proposed that a former Nile subsea distributary system once extended far seaward of the present day Herodotus Abyssal Plain and that clastics of Nile origin might lie beneath surficial layers of pelagic sediment on the deformed Mediterranean Ridge (Hersey, 1965). To test the validity of this hypothesis,[1] selected samples of both coarse- and fine-grained sediments from Hole 130 on the ridge and Holes 131, 131A on the Nile Cone were analyzed for a comparative mineralogical study. Detrital layers from four piston cores (*Vema* 10-53, 10-54, 10-55, and 14-128) on the lower Nile Cone and one core (*Vema* 10-57) on the Herodotus Abyssal Plain were also investigated so as to be able to establish the mineralogical composition of contemporary sediments of known Nile origin. The northern limit of the suspected Nile sedimentary province was explored by additional sampling of interbedded clastics in cores from the Mediterranean Ridge (Piston Core RC9-178), Strabo Trench (Cores 1 and 2, Hole 129B), and the Hellenic Trough (Piston Core V10-64). The locations of the drill cores and piston cores are listed in Table 1 and are plotted in the physiographic sketch of Figure 1.

The materials investigated consist of (1) loose sand-silt-clay layers inferred to be of probable turbidity current origin, (2) dark gray to black terrigenous muds, (3) carbonate rich pelagic oozes, and (4) consolidated siltstones and sandstones.

PROCEDURES

Coarse-grained Sediment

The loosely consolidated sands and silts were initially washed and sieved into several size fractions (i.e., 62, 88, 250 and 500 microns). The heavy minerals were subsequently separated from the light minerals in the >62 μ fraction by settling in bromoform, specific gravity 2.85. The heavy minerals were mounted in Hydrax on separate glass slides for petrographic analysis.

Selected pieces of sandstones and siltstones were thin sectioned and examined under the petrographic microscope. Parts of these rock slices were disaggregated in dilute hydrochloric acid to remove the calcareous cement and then separated out and concentrated. The mineralogical data, based on counting more than 300 grains, are reported in Tables 2 and 3.

[1] Discussed in some detail in Chapter 11.