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Heavy minerals from cores in a deep-sea channel off Cape Mendocino, California

by

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Introduction

A meandering deep-sea channel, referred to as the Mendocino channel (Cacchione and others, 1995, in press), was discovered during the 1984 mapping of the Exclusive Economic Zone (EEZ) off the west coast of the conterminous United States (Chase and others, 1992; EEZ-SCAN 84 Scientific Staff, 1986, Sheet 21). This feature is located at the southern edge of the Gorda deep-sea fan about 40 km west of Cape Mendocino, California (Fig. 1). Three cores from this channel were examined for their heavy-mineral content. Two cores were taken on the channel levee and one within the channel itself. Figure 2 gives locations, water depths, and schematic lithologic diagrams of the analyzed cores.

The channel core (Bx 1 of Cacchione and others, in press) contains sandy turbidites separated by zones of olive-gray hemipelagic mud. The two cores from the channel levee (Bx 7 and 8 of Cacchione and others, in press) are composed mostly of this hemipelagic mud with thin sandy layers; the contacts between the mud and sand units are generally distinct and conformable. These cores were chosen for analysis to determine possible differences between sands deposited by normal processes versus those of turbidity currents.

Methods

The samples were processed as follows: The sand fraction (0.062-2.0 mm) was separated in tetrabromoethane (S.G.=2.96). The heavy-mineral fraction was sieved to separate the 0.062-0.125 mm fraction. Grain mounts of microsplits of this fraction were mounted in Lakeside 70 (n=1.54) and line-counted. The number of grains counted ranged from 356 to 400 grains; all but two samples had a 400-grain count. With chrome spinel regarded as an "opaque" mineral, the number of non-opaque grains ranged from 350 to 392. Regardless of the number of grains counted, the entire slide was examined to note the presence of any mineral not encountered during the point count. Results are given in Table 1.

However, the Mattole River is greatly enriched in epidote and garnet compared to the Eel (Wong and Klise, 1986). Mattole Canyon precludes much northward transport of material from this river. The dominance of epidote within the samples in this study suggests at least a secondary source within the Mattole River.

The present study examined the heavy minerals in the 0.062-0.125 mm fraction. The studies of Wong and Klise (1986) and Wong (in press) looked at the heavy minerals of the 062-0.25 mm fraction. In examining this wider range of grain sizes, minerals found in larger sizes, such as pyroxenes and amphiboles, may occur preferentially in a grain count. Differences in heavy-mineral composition among the present and previous studies could be an artifact of the differing grain-size range examined.

Conclusions

Epidote group minerals dominate the heavy-mineral suite in deep-sea cores from the Mendocino channel within the Gorda deep-sea fan. The main source for these sediments is probably the Eel River, the largest nearby river. At least moderate contributions from the Mattole River, because of its high epidote content, may also be present. The number of samples examined in this study is small, but the distinct variability of epidote percentages suggests that the turbidite layers can be distinguished based on variations in heavy-mineral content.

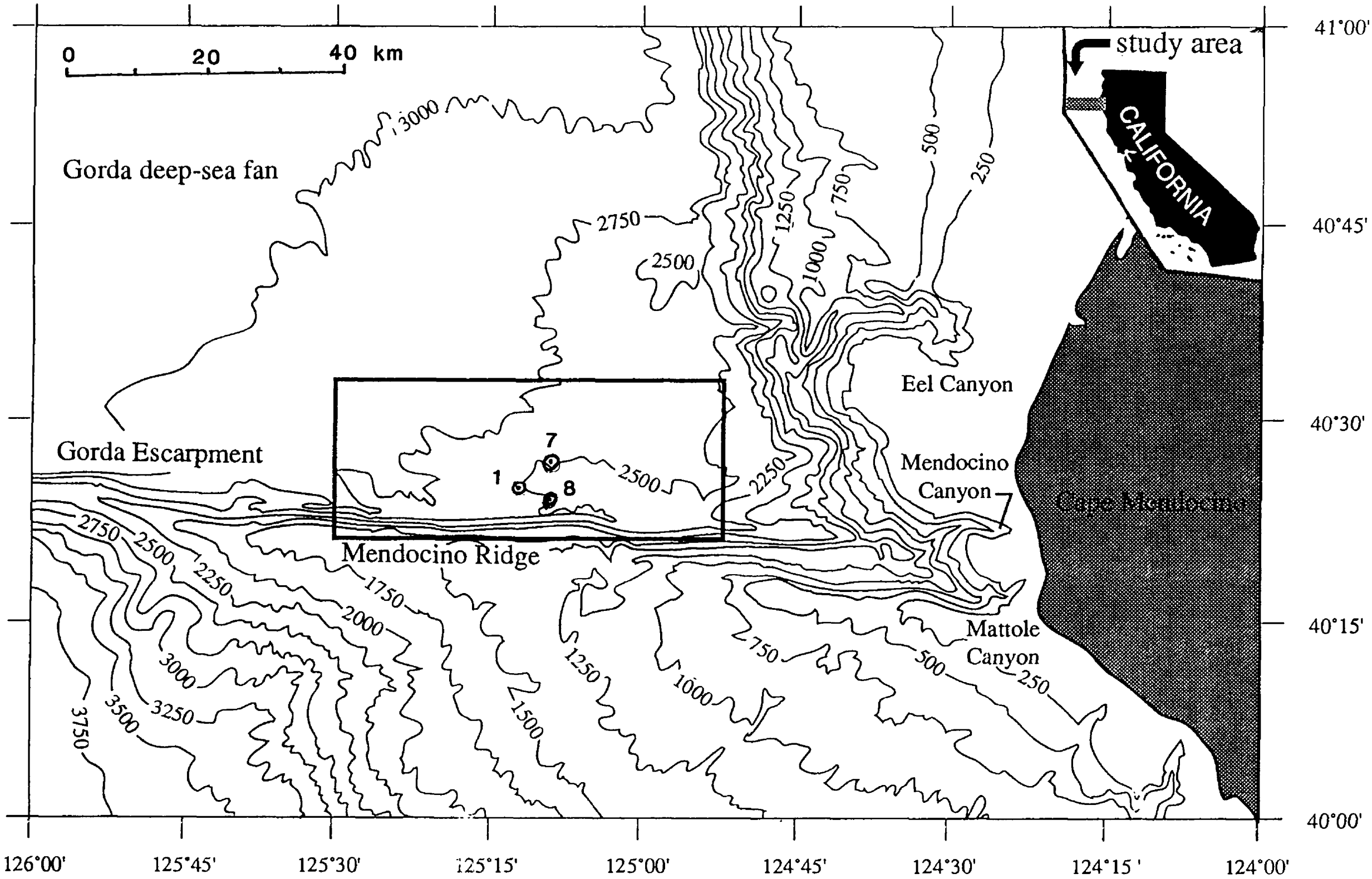

Figure 1. Index map showing sampling area on the sea floor off Cape Mendocino

Table 1. Heavy minerals identified in deep-sea cores off Cape Mendocino, California

Box Core No.	Core Interval	Chrome Spinel	Epidote group	Ortho-pyroxene	Clino-pyroxene	Hornblende	Tremolite/ Actinolite	Glaucophane
Bx 1	0-2 cm	2.0	53.2	2.5	12.2	7.8	2.8	0.5
	13-15 cm	4.2	50.0	6.0	12.8	8.8	1.2	2.5
	19-21 cm	1.7	43.0	7.3	15.4	9.6	2.5	2.2
	38-40 cm	3.0	34.5	7.3	15.0	10.8	3.5	4.3
Bx 7	12-15 cm	2.8	38.0	8.8	18.5	8.5	1.2	3.8
	18-20 cm	3.0	34.4	9.1	15.7	7.3	1.5	3.3
	40-42 cm	5.0	39.7	9.8	11.8	9.5	2.0	4.0
Bx 8	22-24 cm	4.8	36.3	8.0	12.8	9.0	2.2	3.2

Box Core No.	Core Interval	Lawsonite	Sphene	Garnet	Apatite	Tourmaline	Zircon	Rutile
Bx 1	0-2 cm		5.0	5.8	6.8	0.8	*	0.5
	13-15 cm	1.2	2.8	4.5	5.2	0.5		0.2
	19-21 cm	3.1	4.5	5.1	4.2	1.1	0.3	
	38-40 cm	1.2	7.3	6.0	6.0	1.0	*	
Bx 7	12-15 cm	1.2	6.5	4.5	4.5	0.7	0.5	0.5
	18-20 cm	1.5	6.3	10.1	5.3	1.0	1.0	0.3
	40-42 cm	0.5	5.5	7.2	3.5	0.8	0.5	0.2
Bx 8	22-24 cm	2.0	6.3	5.8	7.5	0.8	1.0	0.3

*mineral seen but not encountered during the point count