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CHANGES IN THE GRAIN SIZE OF SEDIMENTS ON THE PALOSVERDES SHELF

In the summer of 1973, the sediments from the Palos Verdes shelf were analyzed for grain-size composition. The significant findings were summarized in the Project's 1974 Annual Report and compared with the findings of Uchupi and Gaal (1962) from the period of 1954 to 1959. This comparison showed that the most significant difference between the late 1950's and 1973 was a large increase in the fine fractions (particles less than 62 microns), especially the clay fraction (less than 4 microns). The greatest increase occurred around and downcurrent (to the northwest) of the outfalls and was attributed to an interaction between the organic material originating from the outfalls and fine sediments entering the shelf. Almost all sediments enter the marine environment in the flocculated state. Because of this flocculation, the fine sediments usually settle in much the same manner as silts. However, this process is normally amplified in environments of high organic content (such as exist around outfalls) and much settling may occur quite rapidly near the source of input.

The rate at which the deposition and accumulation of clay has occurred on this shelf is not known. The fact that samples taken in 1973 to a depth of 7 cm at a distance of approximately 9 km from the outfalls contained more than 40 percent clay suggests that the accumulation of clay-sized particles had occurred over a number of years. However, the data of Uchupi and Gaal show that these sediments typically were less than 20 percent clay in the late 1950's. Thus, the large increase in clay-sized particles on this shelf has been relatively recent and may reflect the addition of new and larger submarine outfalls and a substantial increase in the volume of sewage discharged since the late 1950's.

These sediments were resampled and analyzed for grainsize composition in the summer of 1975. The distribution of clay-sized particles in the 1975 samples is compared with those found in 1973 and the late 1950's on Figure 1. The results show a rather dramatic decrease in the clay fraction between 1973 and 1975 (from more than 40 percent to just more than 20 percent clay), especially around and downcurrent from the outfalls. There was also a smaller reduction in the amount of finer silt-sized particles. As a result there was a large compensating increase in the coarser (sand) fraction in 1975 and only a small increase in the silt fraction (particles between 4 and 62 microns).

These observations suggest that the sediments had been acted on by hydrological forces of sufficient energy to stir the sediments to a depth of several centimeters, allowing a large portion of the clay fraction and a smaller portion of the finer silt fraction to be resuspended and transported away from this area. It also seems reasonable to assume that this pronounced change in sediment composition resulted from forces greater than those that normally affect the sediments of this shelf (see Page 63). Relatively rapid changes in the composition of the biota on this and the nearby Orange County shelf (see Pages 197 and 205) suggest that the factors that produced the changes in these sediments may have occurred in the late spring or early summer 1975.

REFERENCES

Uchupi, E., and R. Gaal. 1962. Sediments of the Palos Verdes shelf, Allan Hancock Foundation, Univ. of Southern California, Emergy Commemorative Volume.

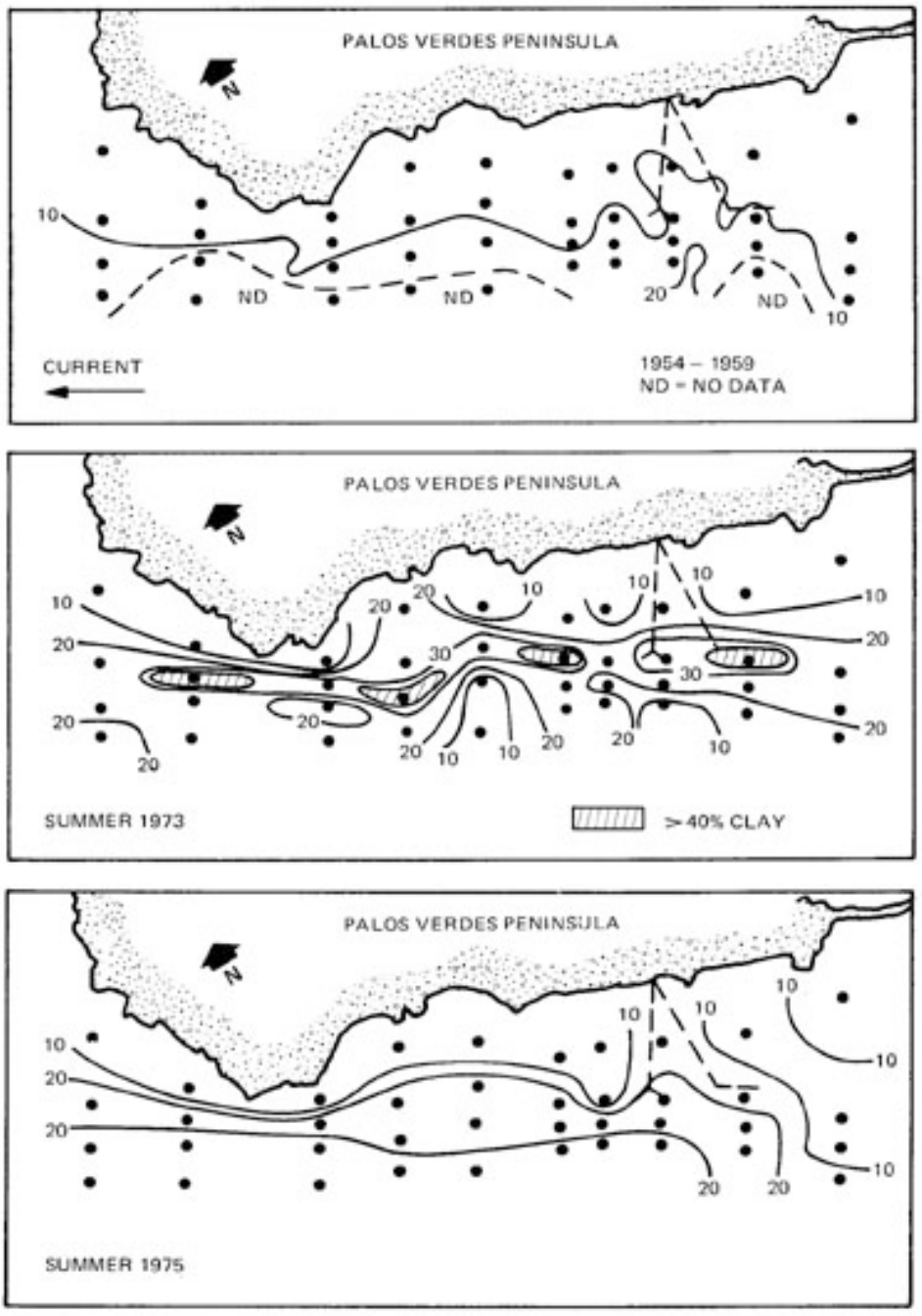

Figure 1. Distributions of clay-sized inorganic particles (percent per unit volume) in the sediments of the Palos Verdes shelf and slope for 1954 – 59 (after Uchupi & Gaal), and summer 1973 and 1975.