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Seafloor Sediment Studies in the Middle East

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LONG TERM GOAL

The distribution of sediment types on the seafloor reflects the relative strengths of biologic and terrestrial sediment sources and the effects of physical, chemical, and biologic processes on after deposition. Our long-term goal is to understand what factors are most important in controlling the composition of shallow water sediments in a variety of arid basins.

OBJECTIVES

The primary objective of this project is to determine the nature and spatial variability of sediment composition in several marine basins in the Middle East.

APPROACH

For this study we used publicly available data. We digitized locations and sediment compositions from literature sources and compiled observations from the NGDC surface sediment core data base. We also obtained archived editions of navigation charts published before 1972 by the Hydrographic Office of the British Admiralty that show seafloor sediment type as bottom annotations. These data sets were merged, and sediment types were mapped. Classifications are primarily texture based, but composition is also considered

WORK COMPLETED

In 1998, I prepared maps for the southern and northern Red Sea and for the Gulfs of Suez and Aqaba. I compiled data from NGDC and from an extended search of the published literature. Correspondents in the Naval Historical Center, National Archives, Library of Congress, Israel, Saudi Arabia, and Egypt provided assistance. Bottom annotations made on old editions of British Admiralty bathymetry charts provided the most detail. The smallest scale charts covering the region were obtained by mail from the archives of the British Admiralty Hydrographic Office and from the US Naval Hydrographic Office archives during a visit to the National Archives at College Park, MD. The data on 21 bathymetry sheets were compiled with published and NGDC data, sediment types were mapped, and the 21 sheets were submitted to Navoceano in early June. Revised maps were submitted in mid-July. Charts for the central Red Sea and the western Gulf of Oman are in preparation.

RESULTS

Shelf sediments in the southern Red Sea are mostly carbonate debris produced by coral reefs coralline algae and fine carbonate sand and mud from foraminifera. Trace components of local igneous rock

outcrops are also found. Bottom currents driven by tides and density differences are very important near the coastline, between coral reefs, and in the Straits of Bab-el-Mandeb. These currents sort and redistribute sediment, break blocks of reefal debris down into finer grains, and expose hardground layers. The shorelines of the Gulfs of Suez and Aqaba are tectonically rising producing steep exposures of soft sedimentary strata and Neogene volcanic deposits. These materials are much more common constituent of bottom sediment in these basins and current reworking is important only in the straits at the southern ends of the Gulfs. Sediments are generally finer grained than in the southern Red Sea.

IMPACT/APPLICATIONS

These maps are the first systematic data bases of sediment types in these basins. The results differ significantly with earlier efforts to compile data in the Gulf of Suez. The effects of tectonics are clearly evident in the northern end of the Red Sea, but need additional core studies to document to the south.

TRANSITIONS

The sediment types maps were compiled in cooperation with the mine warfare mapping project at NAVOCEANO (Code N5). The maps completed to date have been given to NAVOCEANO for digitizing and incorporation in their data bases.

RELATED PRODUCTS

The search for hydrographic charts with bottom annotations revealed many data collected by the British Admiralty in key regions of the Persian Gulf that were previously unknown and will be incorporated in our studies of the sedimentation in the Gulf under other ONR grants.