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GENERALIZED THICKNESS MAP OF UNCONSOLIDATED SURFICIAL SEDIMENTARY UNITS, KODIAK SHELF, WESTERN GULF OF ALASKA

by

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A generalized thickness map of unconsolidated surficial sediments on the Kodiak shelf, western Gulf of Alaska, has been constructed using high-resolution seismic reflection records (Uniboom and 90-160 kilojoule sparker), supplemented by data from bottom sediment samples. The seismic reflection records were gathered in June-July 1976 aboard the R/V SEA SOUNDER and R/V S.P. LEE. Trackline coverage is shown in Plate 1. Microfilms of the R/V SEA SOUNDER seismic reflection records are available in U.S. Geological Open-File Report 76-848 (Hampton and Bouma, 1976). The locations of sampling stations are shown in Plate 2. See Bouma and Hampton (1976, 1978) for textural descriptions of the sediments. Thickness measurements made at 15-minute intervals along the R/V SEA SOUNDER records are shown in Plate 3, and those from the R/V S.P. LEE records are shown in Plate 4. The generalized thickness map is in Plate 5.

The map is of a generalized nature because of two factors. First, the wide spacing of tracklines necessitates omission of many small basins or highs that could be detected on single lines but not correlated between lines. Second, limitations were imposed by the seismic records, due to the shallow water and generally hard seafloor of the Kodiak shelf. Sub-bottom penetration and clarity of acoustic reflectors was poor in some profiles, and seafloor multiples were so closely spaced in many sparker records as to make measurements uncertain or impossible.

Seismic reflection signatures vary across the shelf according to sediment type. Unconsolidated sediments on Albatross and Portlock Banks are sand, typcically containing coarser material but nearly devoid of fines. Shell debris and volcanic ash are common consituents of these sediments. Depths of acoustic penetration are commonly low where these sediments occur. Sub-bottom reflectors show moderate to poor stratification, and in some cases the entire section above bedrock (see below) is unstratified. These coarse sediments from wedges with internal layers that dip toward the axes, adjacent to the major troughs that traverse the shelf.

Sediment samples from the floors of Kiliuda, Chiniak, and Amatuli Troughs consist almost entirely of fine-grained volcanic ash. These surficial units on Uniboom records are thin (less than about 20 milliseconds) and well stratified, and in some areas overlie less well stratified material that can be correlated with surficial (unconsolidated) units of the adjacent banks. Clean sands were recovered from the floor of Stevenson Trough, and seismic profiles show moderately to well stratified surficial units.

Semilithified to lithified bedrock crops out at the seafloor over broad areas of the banks and over more restricted areas of the troughs. Dart cores of this material are composed of mudstone, commonly with pebbles and/or sand. These bedrock units tend to show folding and good stratification in seismic reflection records. Where covered with unconsolidated material, a marked structural discordance typically occurs, and it is the depth to this unconformity surface that is given in Plates 3, 4, and 5.

Where the depth to bedrock was clearly evident in the records, the two-way travel time in milliseconds was measured and recorded. Many times it was not possible to pick the unconformity surface however. For example, surficial units could be seen to the limit of penetration in some Uniboom records, but the corresponding sparker records might show indeterminate stratigraphy, due to closely spaced multiples or complex seismic signatures. In these instances, a minimum thickness of the surficial unit, equal to the limit of penetration on the Uniboom profile, was recorded. In other instances, Uniboom records showed no sub-bottom stratigraphy at all, and in the sparker record, bedrock would be clearly shown extending up to the bubble pulse. Therefore, maximum possible thickness, equal to the thickness of the bubble pulse, was recorded. In intermediate cases, where shallow Uniboom penetration showed only the surficial unit and the sparker record showed bedrock extending up to the bottom of the bubble pulse, limiting minimum/maximum thicknesses were measured. Lastly, some sections of trackline had indeterminate seismic stratigraphy for both the sparker and Uniboom records. No depth measurements could be made in these areas.

References listed below include those cited in the text and other related papers containing geo-environmental information about the Kodiak shelf.

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