DEPARTMENT OF THE INTERIOR
UNITED STATES GEOLOGICAL SURVEY – MINERALS MANAGEMENT SERVICE

OPEN FILE REPORT 83-104

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OPEN-FILE MAP SERIES ON THE EASTERN GULF OF ALASKA
OUTER CONTINENTAL SHELF, 1980-1983

This map is one of two on the surface and near-surface geologic environment of the Eastern Gulf of Alaska between Yakutat Bay and Dry Bay. This series was prepared because of the potential for oil and gas exploration in the area. All of the tracts sold in Oil and Gas Lease Sale 55, held in October 1980, are within the area of these maps. The maps in this series are:

Bathymetric Map of the Outer Continental Shelf Between Yakutat Bay and Dry Bay, Eastern Gulf of Alaska, by G. P. Thrasher and B. W. Turner: U.S. Geological Survey Open-File Report 80-649, scale 1:250,000, 1 sheet.

Isopach Map of Holocene Sediment on the Outer Continental Shelf Between Yakutat Bay and Dry Bay, Eastern Gulf of Alaska, by P. J. Hoose, G. P. Thrasher, and L. D. Lybeck: Minerals Management Service, U.S. Geological Survey Open-File Report 83-104, scale 1:250,000, 1 sheet.

The information presented in these two reports was interpreted mainly from 5,544 km of multisensored high-resolution geophysical data collected in 1979 by Nektan, Inc., for the U.S. Geological Survey. The acoustic systems used included a 16-kJ sparker with both stefold common-depth-point processing and analog format, a low-energy (1-3 kJ) sparker, an electro-mechanical boomer, a 3.5-kHz piezoelectric profiler, a fathometer, and side-scan sonar. The tracklines along which data were collected are shown on each map. This survey was performed under an exclusive contract with the U.S. Geological Survey; the data are available to the public as Sale 55, Data Set AK-18248 from the National Geophysical Data Center (Address: NOAA/EDIS/NGDC, Code E/GC3, 325 Broadway, Boulder, CO 80303).

ISOPACH MAP OF HOLOCENE SEDIMENT

This map shows the distribution and thickness of Holocene sediment on the Continental Shelf in the eastern Gulf of Alaska. In this report, Holocene age sediments are identified by relative stratigraphic position and not by isotopic or paleontologic dates (Molnia and Carlson, 1975). These sediments are accumulating today and occur in three types of localities: as fill in the Yakutat and Alsek sea valleys; as a wedge prograding across the shelf from the shoreline; and as deposits ponded around glacial terminal moraines that occur in water depths ranging between 110 and 180 m. If deglaciation of the shelf in this region occurred at the same time as it did in other medium-high latitude regions, the shelf here was ice free by approximately 10,000 yr B.P. (Molnia and Carlson, 1978), and the sediment unit shown on this map was deposited since that deglaciation.

The Holocene unit was identified and its thickness measured using 3.5-kHz subbottom profiler, sparker, and electromechanical profiler data. The criteria used to identify this unit were its geometry, stratigraphic position, location, and seismic characteristics. On profiler records, the Holocene sediment is clearly distinguishable by the presence of numerous parallel and subparallel internal reflectors; however, in areas where it has slumped, reflectors are jumbled and discontinuous. These criteria were used by Carlson and Molnia (1975) and Molnia and Carlson (1980) to map Holocene sediment on the Alaskan Continental Shelf west of this study area and in the northern Gulf of Alaska respectively. In areas where the Holocene unit was thin, sediment thickness was measured using the 3.5 kHz subbottom profiler. The Holocene unit readily transmits the 3.5 kHz signal, whereas sound at this frequency typically did not penetrate the underlying sedimentary unit. Wherever the Holocene sediment was too thick for the 3.5 kHz signal to penetrate, sparker and electro-mechanical profiler data were used to measure thickness. In these areas, the bottom of the Holocene sedimentary unit was identified as either an angular unconformity or as a disconformity recognized by the markedly different seismic characteristics of the upper and lower units. In a few small areas, seismic data was indistinct and the base of the Holocene was inferred.

Descriptions of 98 sediment samples provided by the U.S. Geological Survey Branch of Pacific-Arctic Marine Geology reveal that this unit is composed of homogeneous, dark gray to olive gray, poorly consolidated, clayey silt. A small component of fine sand is present as thin, discrete layers. Holocene sediment is distinguished from Quaternary glacial moraine and glacial outwash (Molnia and Carlson, 1980) by very low sand component, low degree of consolidation, characteristic homogeneity, high water content, and the absence of pebbles.

The Holocene sequence is primarily a prograding wedge of sediment which extends up to 40 km offshore on the bank between the Yakutat and Alsek sea valleys and up to 100 km to the shelf break within the Alsek and Yakutat sea valleys. These sea valleys and their relationship to the bank area are shown on the bathymetric map by Thrasher and Turner (1980). Most of the Holocene sediment accumulating today is clayey silt that originates as rock flour generated by glaciers and is transported to the shelf by meltwater rivers. A 1972 LANDSAT image of the Gulf of Alaska between Cape Suckling and Montague Island shows vast quantities of glacially derived sediment entering the Gulf of Alaska as numerous sediment plumes primarily in the vicinity of the mouth of the Copper River (Molnia and Carlson, 1978). The Alaskan Gyre transports sediment from east to west along the shelf, hence, the Alsek and Dangerous Rivers and to a lesser degree the Manby and Alder Streams are the primary sources for sediment injection in the area of this study. Yakutat Bay represents an environment which has too little energy to be a significant source of sediment to the shelf. This is indicated by the high clay-sized component in sediment samples from within the bay (up to 85 percent; Wright, 1972) because the clay-sized particles settle out of suspension rather than being flushed out onto the shelf.

Once it has entered the shelf environment, Holocene sediment accumulates under two influences. First, sediment is entrained in the long-shore current which flows towards the northwest. This current-controlled mode forms deposits that tend to accumulate in depressions such as the Alsek and the Yakutat sea valleys and adjacent to morainal ridges rather than as a uniform drape. The prevailing current causes Holocene sediment to accumulate with a pronounced asymetric thickness across the floors of the sea valleys. Near shore, this unit probably merges with the recent shoreline and undifferentiated surficial deposits mapped by Miller (1961). Second, sediment which is accumulating close to shore often becomes unstable and collapses out onto the shelf in the form of slumps and debris flows. Once further out on the shelf, these deposits are influenced by currents and may be reworked.

REFERENCES CITED

Carlson, P. R., and Molnia, B. F., 1975, Preliminary isopach map of Holocene sediments, Northern Gulf of Alaska: U.S. Geological Survey Open-File Report 75-507, scale 1:500,000.

Miller, D. J., 1961, Geology of the Yakutat district, Gulf of Alaska Tertiary province, Alaska: U.S. Geological Survey Open-File Report 209, scale 1:96,000.

Molnia, B. F., and Carlson, P. R., 1975, Surface sediment distribution map, Northeastern Gulf of Alaska: U.S. Geological Survey Open-File Report 75-505, scale 1:500,000.

-----, 1978, Surface sedimentary units of Northern Gulf of Alaska Continental Shelf: American Association of Petroleum Geologists Bulletin, v. 62, p. 633-643.

-----, 1980, Quaternary sedimentary facies on the Continental Shelf of the Northeast Gulf of Alaska, in Field, M. E., and others, eds., Quaternary depositional environment of the Pacific Coast: Pacific Coast Paleographic Symposium 4: Society of Economic Paleontologists and Mineralogists, Los Angeles, California, P. 157-168.

Thrasher, G. P., and Turner, B. W., 1980, Bathymetric map of the Outer Continental Shelf between Yakutat Bay and Dry Bay, Eastern Gulf of Alaska: U.S. Geological Survey Open-File Report 80-649, scale 1:250,000.

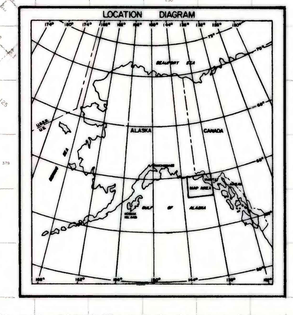
Wright, F. F., 1972, Marine geology of Yakutat Bay, Alaska: U.S. Geological Survey Professional Paper 800-B, p. B9-B15.

NO 7-1

NO 7-2

NO 7-4

LOCATION DIAGRAM



This map is not intended for navigational purposes. It has not been edited for conformity with Minerals Management Service and Geological Survey editorial standards. Any use of trade names is for descriptive purposes only, and does not constitute endorsement of these products by the Minerals Management Service.

SOURCE OF SHORELINE FROM U.S.G.S YAKUTAT QUADRANGLE (1:250,000). PUBLISHED IN 1959 WITH MINOR REVISIONS IN 1970.

SCALE 1:250,000

5 0 5 10 15 20 25 STATUTE MILES

5 0 5 10 15 20 25 KILOMETERS

5 0 5 10 15 NAUTICAL MILES

CONTOUR INTERVAL 10 METERS (INDEX C.I. 50 METERS; CONTOURS DASHED WHERE INFERRED)

MAP PROJECTION UTM, CLARKE 1866 SPHEROID, ZONE 7.

ISOPACH MAP OF HOLOCENE SEDIMENT ON THE OUTER CONTINENTAL SHELF BETWEEN YAKUTAT BAY AND DRY BAY, EASTERN GULF OF ALASKA

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1983