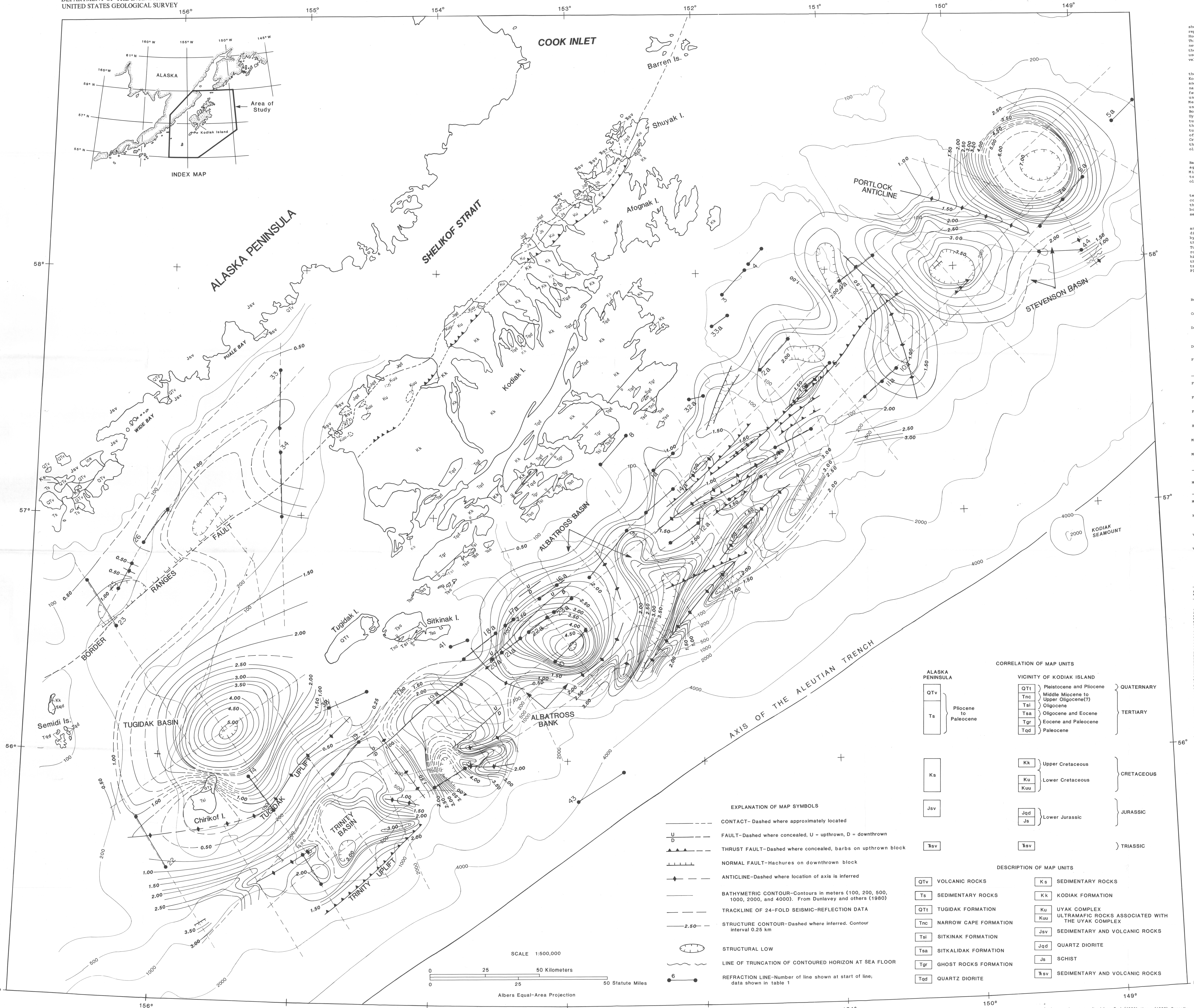
DEPARTMENT OF THE INTERIOR
UNITED STATES GEOLOGICAL SURVEY

OPEN-FILE REPORT
84-24



INDEX MAP
ALASKA
Area of Study
Kodiak Island
COOK INLET
ALASKA PENINSULA
SHELIKOF STRAIT
Barren Is.
Shuyak I.
Afognak I.
Kodiak I.
PUALE BAY
WIDE BAY
PORTLOCK ANTICLINE
STEVENSON BASIN
ALBATROSS BASIN
ALBATROSS BANK
Tugidak I.
Sitkinak I.
Semidi Is.
TUGIDAK BASIN
Chirikof I.
TUGIDAK UPLIFT
TRINITY BASIN
TRINITY UPLIFT
BORDER RANGES FAULT
AXIS OF THE ALEUTIAN TRENCH
KODIAK SEAMOUNT
SCALE 1:500,000
0 25 50 Kilometers
0 25 50 Statute Miles
Albers Equal-Area Projection
EXPLANATION OF MAP SYMBOLS
CONTACT- Dashed where approximately located
FAULT-Dashed where concealed, U = upthrown, D = downthrown
THRUST FAULT-Dashed where concealed, barbs on upthrown block
NORMAL FAULT-Hachures on downthrown block
ANTICLINE-Dashed where location of axis is inferred
BATHYMETRIC CONTOUR-Contours in meters (100, 200, 500, 1000, 2000, and 4000). From Dunlavey and others (1980)
TRACKLINE OF 24-FOLD SEISMIC-REFLECTION DATA
STRUCTURE CONTOUR-Dashed where inferred. Contour interval 0.25 km
STRUCTURAL LOW
LINE OF TRUNCATION OF CONTOURED HORIZON AT SEA FLOOR
REFRACTION LINE-Number of line shown at start of line; data shown in table 1
CORRELATION OF MAP UNITS
ALASKA PENINSULA
VICINITY OF KODIAK ISLAND
QTv
Ts
Pliocene to Paleocene
QTt Pleistocene and Pliocene
Tnc Middle Miocene to Upper Oligocene(?)
Tsi Oligocene
Tsa Oligocene and Eocene
Tgr Eocene and Paleocene
Tqd Paleocene
QUATERNARY
TERTIARY
Ks
Kk Upper Cretaceous
Ku
Kuu
Lower Cretaceous
CRETACEOUS
Jsv
Jqd
Js
Lower Jurassic
JURASSIC
T̄Rsv
TRIASSIC
DESCRIPTION OF MAP UNITS
QTv VOLCANIC ROCKS
Ts SEDIMENTARY ROCKS
QTt TUGIDAK FORMATION
Tnc NARROW CAPE FORMATION
Tsi SITKINAK FORMATION
Tsa SITKALIDAK FORMATION
Tgr GHOST ROCKS FORMATION
Tqd QUARTZ DIORITE
Ks SEDIMENTARY ROCKS
Kk KODIAK FORMATION
Ku UYAK COMPLEX
Kuu ULTRAMAFIC ROCKS ASSOCIATED WITH THE UYAK COMPLEX
Jsv SEDIMENTARY AND VOLCANIC ROCKS
Jqd QUARTZ DIORITE
Js SCHIST
T̄Rsv SEDIMENTARY AND VOLCANIC ROCKS

Planimetric base from Dunlavey and others (1980)

Onshore geology generalized from Burk (1965), Moore (1967), Connelly and Moore (1979), and Detterman and others (1979). Structure map compiled in 1981.

This map is preliminary and has not been reviewed for conformity with U.S. Geological Survey editorial standards and stratigraphic nomenclature. Any use of trade names is for descriptive purposes only and does not imply endorsement by the USGS.

DISCUSSION

The geologic structure and history of various parts of the continental shelf southeast and southwest of Kodiak Island have been described in several reports (von Huene, 1972; Fisher, 1979; Nilsen and Moore, 1979; Fisher and von Huene, 1980; Moore and Allwardt, 1980); we give only a brief summary here. This map is a compilation of the published structure maps and includes some new seismic-reflection data. Only 24-fold seismic data collected for or by the U.S. Geological Survey (Fisher, 1979; Fisher and von Huene, 1980) were used. Holmes and others (1978) showed detailed analyses of refraction velocities from sonobuoys deployed over the shelf (table 1).

The horizon contoured here is an unconformity. The age of rocks under the unconformity varies geographically because the continental shelf near Kodiak Island is divided tectonically by the Border Ranges fault (MacKevett and Plafker, 1974; Fisher, 1981). On the northwest side of this fault a narrow, northwest-striking belt of Jurassic schist and diorite separates the fault from a thick section of sedimentary rocks, on the Alaska Peninsula and under Shelikof Strait, that are as old as middle Paleozoic, but are mainly of Mesozoic age. Northwest of this fault, Tertiary rocks are thin, and rocks under the contoured unconformity are mainly Mesozoic in age. Southeast of the Border Ranges fault, the oldest known rocks are in a Cretaceous melange -- the Uyak Complex -- that is adjacent to the fault. The deformed Upper Cretaceous turbidites of the Kodiak Formation are faulted against the southeast side of the melange. Southeast of the Kodiak Formation lie deformed Tertiary turbidites of the Ghost Rocks, Sitkalidak, and Sitkinak Formations. Southwest of Kodiak Island, then, rocks under the contoured unconformity are as old as Cretaceous; and southeast of the island, rocks under the unconformity are thought to be of Paleogene age (Fisher and Holmes, 1980), and they could be as old as Late Cretaceous.

Microfossils collected from rocks above the unconformity near Albatross Bank show that these rocks are mostly late Miocene or Pliocene and younger in age, although microfossils also indicate that some rocks are as old as middle Miocene (McClellan and others, 1980a, b). Rocks above the unconformity onlap to the northwest; in the area of Shelikof Strait, these rocks are probably no older than Pliocene or Pleistocene.

The continental margin near Kodiak Island is structurally segmented by tectonic boundaries -- one boundary strikes northwest along the southwest coast of Kodiak Island; the other strikes northwest between Shuyak Island and the Barren Islands (von Huene and others, 1979; Fisher and others, 1981). The boundaries are marked by offset volcanoes, terminated structural trends, and separated zones of aftershock swarms of large-magnitude earthquakes.

Before the late Miocene or Pliocene, the shelf southeast of Kodiak Island and near Tugidak basin was exposed and eroded. Then the shelf subsided differentially, separating Albatross and Stevenson basin by an area underlain by pre-Miocene rocks at shallow depth. Later, perhaps during the Pliocene, the shelf was deformed, creating major elevated shelf structures such as Tugidak uplift, Albatross Bank, and Portlock anticline. As these structures rose, the basins continued to subside. Much of the strata that record the history near the shelf break are missing in and near Shelikof Strait. During the late Miocene or Pliocene, this area appears to have been exposed; the transgressing ocean apparently reached the strait during the Pliocene or Pleistocene.

REFERENCES

Burk, C. A., 1965, Geology of the Alaska Peninsula -- island arc and continental margin (parts 1, 2, and 3): Geological Society of America Memoir 99, 250 p.

Connelly, William, and Moore, J. C., 1979, Geologic map of the northwest side of the Kodiak Islands, Alaska: U.S. Geological Survey Miscellaneous Field Studies Map MF-1057, 2 sheets, scale 1:250,000.

Detterman, R. L., Miller, T. P., Yount, M. E., and Wilson, F. H., 1979, Generalized geologic map of the Chignik and Sutwik Island quadrangles, Alaska: U. S. Geological Survey Miscellaneous Field Studies Map MF-1253-A, 1 sheet, scale 1:250,000.

Dunlavey, J. M., Childs, J. R., von Huene, Roland, 1980, Bathymetric map of the western Gulf of Alaska: U. S. Geological Survey Open-File Report 80-1093, 13 sheets.

Fisher, M. A., 1979, Structure and tectonic setting of continental shelf southwest of Kodiak Island, Alaska: American Association of Petroleum Geologists Bulletin, v. 63, p. 301-310.

_____, 1981, Location of the Border Ranges fault southwest of Kodiak Island, Alaska: Geological Society of America Bulletin, Part 1, v. 92, p. 19-30.

Fisher, M. A., and Holmes, M. L., 1980, Large-scale structure of deep strata beneath Kodiak shelf, Alaska: Geological Society of America Bulletin, Part 1, v. 91, p. 218-224.

Fisher, M. A., and von Huene, Roland, 1980, Structure of late Cenozoic strata beneath Kodiak shelf, Alaska: American Association of Petroleum Geologists Bulletin, v. 64, p. 1014-1033.

Fisher, M. A., Bruns, T. R., and von Huene, Roland, 1981. Transverse tectonic boundaries near Kodiak Island, Alaska: Geological Society of America Bulletin, Part 1, v. 92, p. 10-18.

Holmes, M. L., Meeder, C. A., and Creager, K. C., 1978, Sonobuoy refraction data near Kodiak, Alaska: U. S. Geological Survey Open-File Report 78-368, p. 1-9.

MacKevett, E. M., Jr., and Plafker, George, 1974, The Border Ranges fault in south-central Alaska: U. S. Geological Survey Journal of Research, v. 2, no. 3, p. 323-329.

McClellan, P. H., and others, 1980a, Biostratigraphic results of dart-coring in the western Gulf of Alaska, and their tectonic implications: U. S. Geological Survey Open-File Report 80-63, 11 p.

_____, 1980b, New biostratigraphic results of dredging and dart coring in the western Gulf of Alaska and their tectonic implications: U. S. Geological Survey Open-File Report 80-1237.

Moore, G. W., 1967, Preliminary geologic map of Kodiak Island and vicinity, Alaska: U. S. Geological Survey Open-File Report 271, 1 sheet.

_____, 1969, New formations on Kodiak and adjacent islands, Alaska: U. S. Geological Survey Bulletin 1274-A, p. A27-A35.

Moore, J. C., and Allwardt, A., 1980, Progressive deformation of a Tertiary trench slope, Kodiak Islands, Alaska: Journal of Geophysical Research, v. 85, p. 4741-4756.

Nilsen, T. H., and Moore, G. W., 1979, Reconnaissance study of Upper Cretaceous to Miocene stratigraphic units and sedimantary facies, Kodiak and adjacent islands, Alaska, with a section on sedimentary petrography by G. R. Winkler: U. S. Geological Survey Professional Paper 1093, 34p.

von Huene, Roland, 1972, Structure of the continental margin and tectonism at the eastern Aleutian Trench: Geological Society of America Bulletin, v. 83, P. 3613-3626.

von Huene, Roland, Fisher, M. A., Bruns, T. R., and Shor, G. G., Jr., 1979, Continental margins of the Gulf of Alaska and late Cenozoic tectonic plate boundaries: *in* sixth Alaska Geological Society Symposium, Proceedings, Alaska Geological Society, Anchorage, Alaska, p. J1-J33.

Table 1. Results from Sonobuoys Deployed over Continental Shelf

Line Number*	Layer Velocity (km/sec)						Water depth (km)	Layer Thickness (km)				
	v_2	v_3	v_4	v_5	v_6	v_7		h_2	h_3	h_4	h_5	h_6
1a	1.95	2.18	3.84	4.15	..	..	0.09	0.42	0.27	1.56	..	..
2a	1.81	2.23	4.47	5.06	6.06	..	0.08	0.34	1.26	1.20	1.17	..
4a	2.07	2.80	4.24	4.68	4.90	..	0.12	0.53	1.10	1.27	0.85	..
5a	2.01	2.55	..	..	..	..	0.13	0.43	..	..	..	..
6a	2.02	2.33	2.78	..	..	..	0.13	0.26	0.64	..	..	..
7a	2.10	2.54	2.91	3.46	3.88	..	0.12	0.42	0.64	0.94	0.79	..
10a	1.99	2.22	..	..	..	..	0.13	0.35	..	..	..	..
11a	2.05	2.25	2.57	3.64	..	..	0.10	0.08	1.12	0.34	..	..
12a	2.00	2.21	2.48	3.65	..	..	0.09	0.48	0.51	0.53	..	..
14a	2.00	2.33	2.58	4.36	4.63	..	0.13	0.58	0.24	0.76	0.64	..
16a	1.95	2.26	2.50	..	..	..	0.09	0.32	1.17	..	..	..
17a	1.88	..	..	..	..	..	0.11	..	..	..	..	..
18a	2.17	2.64	3.49	4.78	6.30	..	0.14	0.91	0.96	0.80	2.18	..
19a	1.97	2.19	2.51	2.82	4.56	6.06	0.16	0.33	0.50	1.27	0.39	1.84
20a	2.10	2.33	2.77	..	..	..	0.08	0.19	0.48	..	..	..
21a	2.10	2.18	2.30	2.91	3.53	3.93	0.08	0.60	0.51	0.24	0.83	0.95
22a	2.06	2.57	3.26	5.01	..	..	0.10	0.61	1.32	1.29	..	..
23a	2.00	2.28	2.65	3.30	4.27	..	0.13	0.33	0.76	0.57	1.26	..
24a	2.16	2.65	2.93	3.69	4.14	5.67	0.10	0.44	0.55	0.80	1.00	1.85
32a	3.97	..	..	..	..	..	0.09	..	..	..	..	..
33a	1.83	2.15	2.35	2.90	3.45	..	0.09	0.34	0.23	0.07	0.56	..
3	2.00	2.80	3.80	..	..	..	0.07	0.81	1.15	..	..	..
4	1.73	2.33	2.97	5.20	..	..	0.07	0.21	0.31	0.94	..	..
6	1.94	2.32	3.89	..	..	..	0.06	0.27	1.08	..	..	..
7	2.25	2.68	3.30	..	..	..	0.09	0.88	0.71	..	..	..
8	1.99	4.19	5.31	..	..	..	0.10	0.26	1.39	..	..	..
9	1.97	2.46	4.28	4.85	..	..	0.14	0.67	0.44	0.93	..	..
10	1.99	2.47	3.07	3.35	..	..	0.05	0.04	0.23	1.65	..	..
12	1.71	1.79	2.66	..	..	..	0.11	0.25	0.79	..	..	..
14	2.04	2.18	2.80	5.01	..	..	0.02	0.30	0.78	1.08	..	..
16	1.80	2.40	2.56	3.18	..	..	0.33	0.29	0.39	1.27	..	..
19	1.82	2.00	3.28	4.05	..	..	0.31	0.32	0.34	0.96	..	..
22	1.69	2.02	4.72	6.23	..	..	0.20	0.11	0.62	2.52	..	..
23	1.89	2.18	5.21	..	..	..	0.21	0.12	0.58	..	..	..
25	1.93	2.15	3.11	..	..	..	0.14	0.11	0.43	..	..	..
26	2.07	2.22	2.86	..	..	..	0.24	0.25	0.40	..	..	..
33	1.60	2.16	3.22	3.79	7.09	..	0.28	0.09	0.61	1.01	2.93	..
34	1.88	2.09	4.79	..	..	..	0.27	0.06	0.20	..	..	..
38	2.37	3.00	4.29	4.86	..	..	0.11	0.36	0.78	2.37	..	..
41	3.55	4.73	..	..	..	..	0.07	0.67	..	..	..	..
43	2.16	3.15	3.98	..	..	..	4.19	0.79	1.58	..	..	..
44	1.81	2.00	2.35	2.52	2.76	..	0.09	0.08	0.21	0.24	0.52	..

*Letter "a" in line number means data were collected in 1976; other data were collected in 1977.

MAP SHOWING THE GEOLOGIC STRUCTURE OF THE CONTINENTAL SHELF SOUTHEAST AND SOUTHWEST OF KODIAK ISLAND, ALASKA, FROM 24-FOLD SEISMIC DATA

By
Michael A. Fisher and Roland von Huene

1985