DEPARTMENT OF THE INTERIOR
UNITED STATES GEOLOGICAL SURVEY

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MISCELLANEOUS FIELD STUDIES
MAP MF-1307

EXPLANATION

High / Low — Free-air gravity contour—Dashed where inferred; contour interval 10 milligals

● -92 : ● 82 — Extreme value within closed contour

955 — Ship trackline showing line number

This free-air gravity map is the fourth in a series of maps covering the continental margin of the northern Gulf of Alaska. Other maps in the series are by Burkhard and others (1980 a, b) and Bruns and others (1981; see index map). The offshore map series adjoins a large-scale Bouguer gravity map for onshore Alaska by Barnes (1977).

MARINE GRAVITY SURVEYS

Gravity data used for this map were acquired during the following U.S. Geological Survey cruises:

Ship And Line Numbers	Year	Cruise Designation	Navigation System	Gravity Meter
R/V S.P. Lee (Lines 890-891)	1977	L6-77-EG	Integrated Satellite Loran C Sonar Doppler	LaCoste & Romberg[1] with Stabilized platform, 2 axis
R/V S.P. Lee (Lines 951-959)	1978	L3-78-EG	Integrated Satellite Loran C Sonar Doppler	LaCoste & Romberg with stabilized platform, 3 axis

ACQUISITION AND COMPILATION

The gravity data were obtained with LaCoste-Romberg[1] sea gravimeters with two-axis (1977) and three-axis (1978) inertial stabilized platforms. The theory of operation and calculation methods are described in LaCoste and others (1967) and in Valiant and LaCoste (1976). Gravity values were calculated from spring tension and a correction term that included components for beam motion and "inherent" cross coupling errors (LaCoste and others, 1967). The gravity values were filtered prior to digital recording with a 4-minute averaging filter to remove the effects of ship motion and, for three-axis data, with an 84-minute notch filter to remove the Schuler period oscillations. During post-cruise processing, an "imperfect" cross coupling correction was also applied, using a crosscorrelation method described by LaCoste (1973). Observed gravity data were adjusted for meter drift by interpolation between harbor station ties, and Eotvos corrections were calculated from 1-minute dead reckoning fixes. Absolute gravity values were obtained by tying to the Alaska gravity base station network (Barnes, 1968) that has been extended to harbor stations at ports of call. The free-air gravity was calculated using the ellipsoid defined by the Geodetic Reference System, 1967 (International Association of Geodesy, 1971).

The overall accuracy of the data set is estimated by a comparison of the free-air gravity at line crossings. There are only five such crossings within the map area, of which three show differences of 2 mgals or less. This number of crossings is insufficient to adequately estimate data accuracy. However, in the adjacent map area, comparison of data from the two R/V S.P. Lee cruises plus one additional cruise (EGAL-75-XB) showed differences of 2 mgals or less at 24 of 28 crossings (Bruns and others, 1981). Thus, in the two map areas, 27 of 33 crossings show differences of 2 mgal or less and the overall accuracy of the data is therefore estimated to be ±2 mgals over the map region.

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[1]Any use of trade names is for descriptive purposes only and does not imply endorsement by the U.S. Geological Survey.

REFERENCES

Atwood, T. J., Bruns, T. R., Carlson, P. R., Molnia, B. F., and Plafker, George, 1981, Bathymetric maps of the northern Gulf of Alaska: U.S. Geological Survey Miscellaneous Field Studies Map MF-859, 1:250,000; 3 sheets.

Barnes, D. F., 1968, Alaska gravity base station network: U.S. Geological Survey Open-File Report 68-4, 21 p.

Barnes, D. F., 1977, Bouguer gravity map of Alaska: U.S. Geological Survey Geophysical Investigations Map GP-913, scale 1:2,500,000.

Bruns, T. R., Atwood, T. J., and Childs, J. R., 1981, Free-air gravity anomaly map, Cross Sound to Icy Bay, northern Gulf of Alaska: U.S. Geological Survey Miscellaneous Field Studies Map MF-1306, 1:500,000.

Burkhard, Nardia, Bruns, T. R., McHendrie, Graig, and Ruppel Byron, 1980a, Free-air gravity anomaly map, eastern Gulf of Alaska: U.S. Geological Survey Miscellaneous Field Studies Map MF-1172, 1:500,000.

Burkhard, Nardia, von Hueme, Roland, McHendrie, Graig, Ruppel, Byron, and Bruns, T. R., 1980b, Free-air gravity anomaly map, western Gulf of Alaska: U.S. Geological Survey Miscellaneous Field Studies Map MF-1173, 1:500,000.

Chase, T. E., Menard, H. W., and Mammerickx, J., 1970, Bathymetry of the north Pacific, sheet 4: Scripps Institute of Marine Resources, University of California, San Diego, Technical Reports Series TR-9.

International Association of Geodesy, 1971, Geodetic reference system, 1967: Paris Bureau Central de l'Association Internationale de Géodésie Special Publication 3, 116 p.

LaCoste, L. J. B., 1973, Crosscorrelation method for evaluating and correcting shipboard gravity data: Geophysics v. 38, no. 4, p. 701-709.

LaCoste, L. J. B., Clarkson, N., and Hamilton, G., 1967, LaCoste and Romberg stabilized platform shipboard gravity meter: Geophysics, v. 32, no. 1, p. 99-109.

Seeman, D. A., and Tiffin, D. L., 1980, Physiography of Dixon Entrance and approaches: Canadian Geological Survey Open File Report, 1:250,000.

U.S. Geological Survey, 1970, The national atlas of the United States of America: Washington, U. S. Government Printing Office, 417 p.

Valiant, H. D., and LaCoste, L. J. B., 1976, Theory and evaluation of the LaCoste and Romberg three inertial platform for marine gravimetry: Geophysics, v. 41, no. 3, p. 459-467.

Index map showing study area (stippled) and adjacent gravity publications. A, Burkhard and others, 1980b; B, Burkhard and others, 1980a; C, Bruns and others, 1981.

Base from U.S. Geological Survey computer generated grid on standard parallels of 55° N. and 65° N.; shoreline from U.S. Geological Survey 1:2,000,000 National Atlas, 1970.

Bathymetric contours from Chase and others, 1970, Seeman and Tiffin, 1980, Atwood and others, 1981, and Bruns, unpublished data, 1981. Contour interval 500 m; 200 m contour also shown.

SCALE 1:500 000

0 10 20 30 40 NAUTICAL MILES

0 10 20 30 40 50 60 KILOMETERS

ALBERS EQUAL AREA PROJECTION
Reduction Ellipsoid from 1967 Geodetic Reference System
(International Association of Geodesy, 1971)

FREE-AIR GRAVITY ANOMALY MAP, DIXON ENTRANCE TO CROSS SOUND, NORTHEASTERN GULF OF ALASKA

By
Terry R. Bruns, Jon R. Childs, and Thomas Atwood
1981

Interior—Geological Survey, Reston, Va.—1981
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