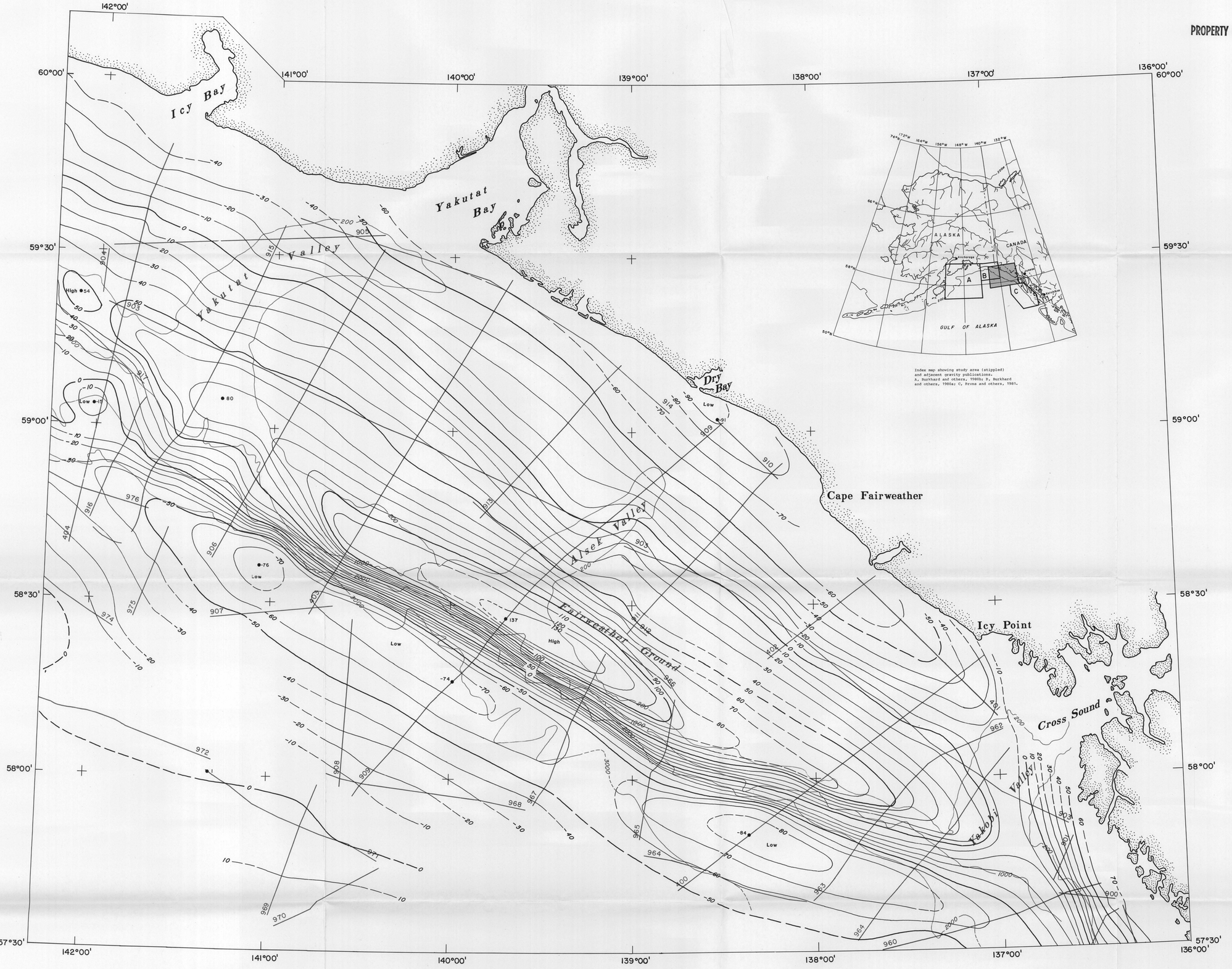
DEPARTMENT OF THE INTERIOR
UNITED STATES GEOLOGICAL SURVEY

MISCELLANEOUS FIELD STUDIES
MAP MF-1306



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 at 200, 1000, 2000, and 3000 meters from Atwood and others, 1981.

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.

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, CROSS SOUND TO ICY BAY, NORTHERN GULF OF ALASKA

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

EXPLANATION

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

●-84; ●137 — Extreme value within closed contour – Value from Burkhard and others(1980a) if not on trackline

403 — Ship trackline showing line number

This free-air gravity map is the third in a series of maps covering the continental margin of the northern Gulf of Alaska. Other maps in the series are by Bruns and others (1981) and Burkhard and others (1980 a, b; see index map). This map joins the map of Burkhard and others (1980a) at longitude 142° 15'W; contours east of 142° 15'W on the Burkhard and others (1980a) map are incorporated into this compilation, but have been altered to reflect additional data coverage. This offshore map series adjoins a large-scale Bouguer gravity map of Alaska by Barnes (1977).

MARINE GRAVITY SURVEYS

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

Ship And Line Numbers	Year	Cruise Designation	Navigation System	Gravity Meter
M/V C.H. Green (Lines 400-404)	1975	EGAL-75-KB	Integrated Satellite Loran C Sonar Doppler	LaCoste & Romberg[1] with stabilized platform, 2 axis
R/V S.P. Lee (Lines 900-916)	1977	L6-77-BG	Integrated Satellite Loran C Sonar Doppler	LaCoste & Romberg with stabilized platform, 2 axis
R/V S.P. Lee (Lines 960-976)	1978	L3-78-BG	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 (1975-1977) or 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 before 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) extended to harbor stations at ports of call.

The free-air gravity for data collected in 1977 and 1978 was calculated using the ellipsoid defined by the Geodetic Reference System, 1967 (International Association of Geodesy, 1971). Free-air gravity for data collected in 1975 was calculated using the 1930 International Gravity Formula (Cassinis, 1930). The 1930 datum differs from the 1967 datum by -6.5 mgal at 56° N. latitude, and by -7.5 mgal at 60° N. (Barnes, 1977). The data from the 1975 cruise were converted to the 1967 datum by adding a constant value of -7.0 mgal before contouring.

An analysis of differences in free-air gravity at line crossings, shown on the accompanying histogram, shows excellent agreement in gravity values, with differences at 24 of 28 line crossings of 2 mgal or less. Therefore, overall accuracy of the data is estimated to be ± 2 mgals over the map region.

ACKNOWLEDGMENTS

We thank Larry Meyer and A. K. Cooper for their helpful suggestions, and Donna Blackman and E. A. Bailey for their technical aid.

[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., Childs, J. R., and Atwood, T. J., 1981, Free-air gravity anomaly map, Dixon Entrance to Cross Sound, northeastern Gulf of Alaska: U.S. Geological Survey Miscellaneous Field Studies Map MF-1307, 1:500,000.

Burkhard, Nardia, Bruns T. R., McHendrie, Craig, 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 Huene, Roland, McHendrie, Craig, 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.

Cassinis, Gino, 1930, Sur l'adoption d'une formule internationale pour la pesanteur normale: Bulletin Géodésique, Paris, France, no. 26, p. 40-49.

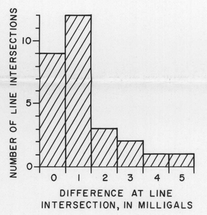
International Association of Geodesy, 1971, Geodetic reference system, 1967: Paris Bureau Central de l'Association Internationale de Géodésie Special Publication 3, 116 p.

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 stabalized platform shipboard gravity meter: Geophysics, v. 32, no.1, p. 99-109.

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.



Interior—Geological Survey, Reston, Va.—1981

For sale by Distribution Section, U.S. Geological Survey, Federal Bldg., Box 12, 101 Twelfth Avenue, Fairbanks, AK 99701, and Branch of Distribution, U.S. Geological Survey, Box 25286, Federal Center, Denver, CO 80225