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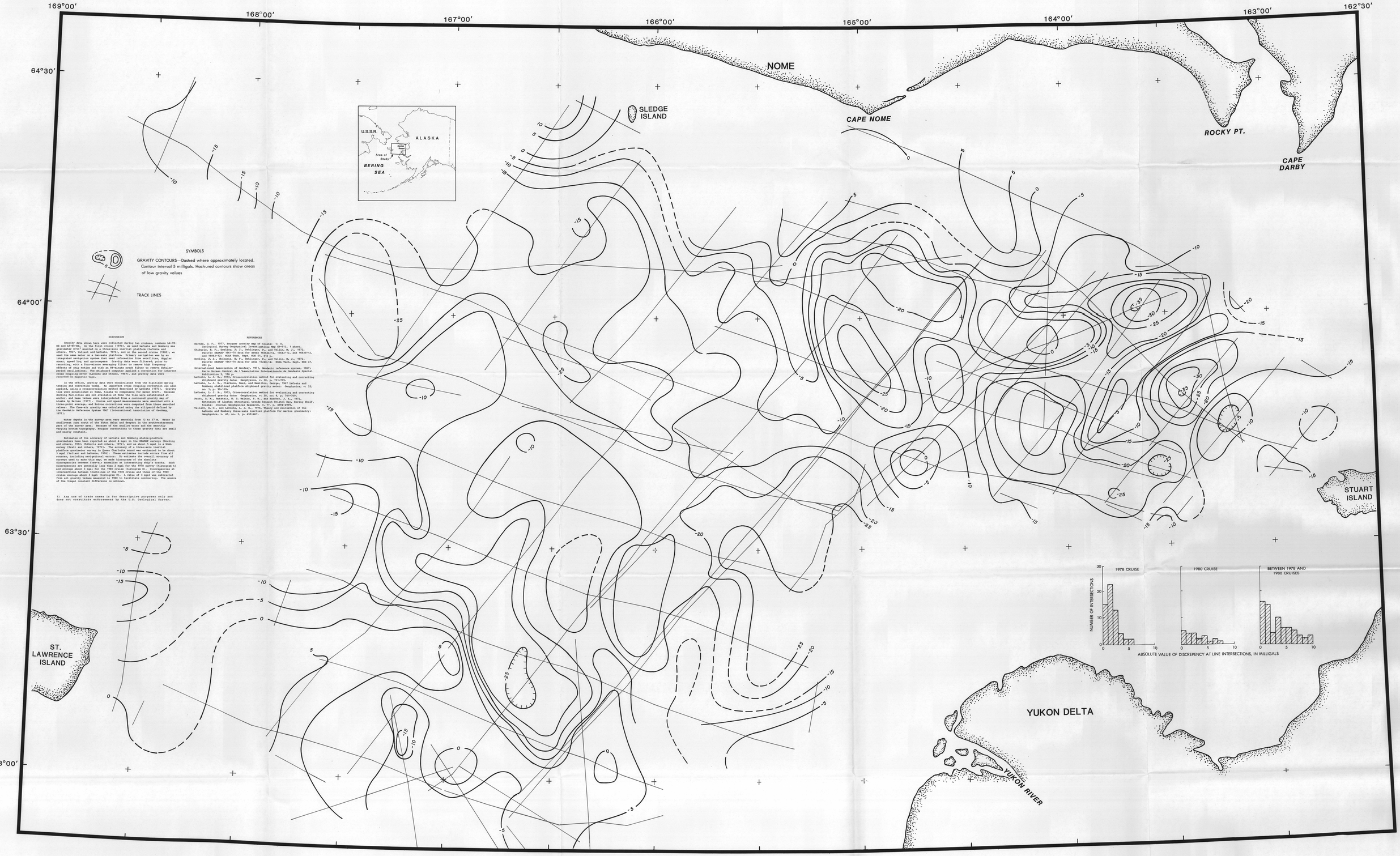
MISCELLANEOUS FIELD STUDIES
MAP MF-1460



DISCUSSION

Gravity data shown here were collected during two cruises, numbers 1d-78-BS and 1d-80-BS. On the first cruise (1978), we used LaCoste and Romberg sea gravimeter S-35[1] mounted on a three-axis inertial platform (LaCoste and others, 1967; Valliant and LaCoste, 1976); and on the second cruise (1980), we used the same gravity meter mounted on a gimbal platform with an integrated navigation system that used information from satellites, Doppler sonar, speed log, and gyrocompass. Gravity data were filtered, prior to recording, with a four-minute sweeping filter to remove high frequency effects of ship motion and with an 84-minute notch filter to remove Schuler-period oscillations. Corrections were applied to compensate for cross-coupling and spring tension (LaCoste and others, 1967); and gravity data were recorded on magnetic tape.

In the office, gravity data were revalidated from the digitized spring tension and correction terms. An imperfect cross coupling correction was also applied, using a crosscorrelation method described by LaCoste (1973). Gravity ties were established at Nome, Alaska to compensate for meter drift. Because drift was linear, ties were made only at the beginning and ending of each anchor, and base values were interpolated from a contoured gravity map of Alaska by Barnes (1977). Course and speed measurements were smoothed with a three-point average, and Eotvos corrections were computed from these smoothed values. The free-air gravity was calculated using the ellipsoid defined by the Geodetic Reference System 1967 (International Association of Geodesy, 1971).

Water depths in the survey area vary smoothly from 13 to 37 m. Water is shallowest just north of the Yukon delta and deepest in the southeastern part of the survey area. Because of the shallow water and the smoothly varying bottom topography, Bouguer corrections to these gravity data are small and nearly constant.

Estimates of the accuracy of LaCoste and Romberg stable-platform gravimeters have been reported as about 4 mgal in the GSANHP surveys (Dowling and others, 1972; Chibanis and others, 1972), and as about 5 mgal in a NOAA survey (Pratt and others, 1972). The accuracy of a three-axis inertial platform gravimeter used on a ship has been estimated to be about 2 mgal (Valliant and LaCoste, 1976). These estimates include errors from all sources, including navigational errors. To estimate the overall accuracy of surveys used to make this map, we made histograms of the absolute discrepancies between free-air anomalies at intersecting ship's tracks. Each histogram contains about 1000 points. For the 1978 cruise (histogram 1), and average about 3 mgal for the 1980 cruise (histogram 2). Discrepancies at intersections between tracklines of the 1978 cruise and those of the 1980 cruise average about 3 mgal (histogram 3). A value of 3 mgal was subtracted from all gravity values measured in 1980 to facilitate contouring. The source of the 3-mgal constant difference is unknown.

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

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FREE-AIR GRAVITY MAP, NORTON BASIN, ALASKA

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