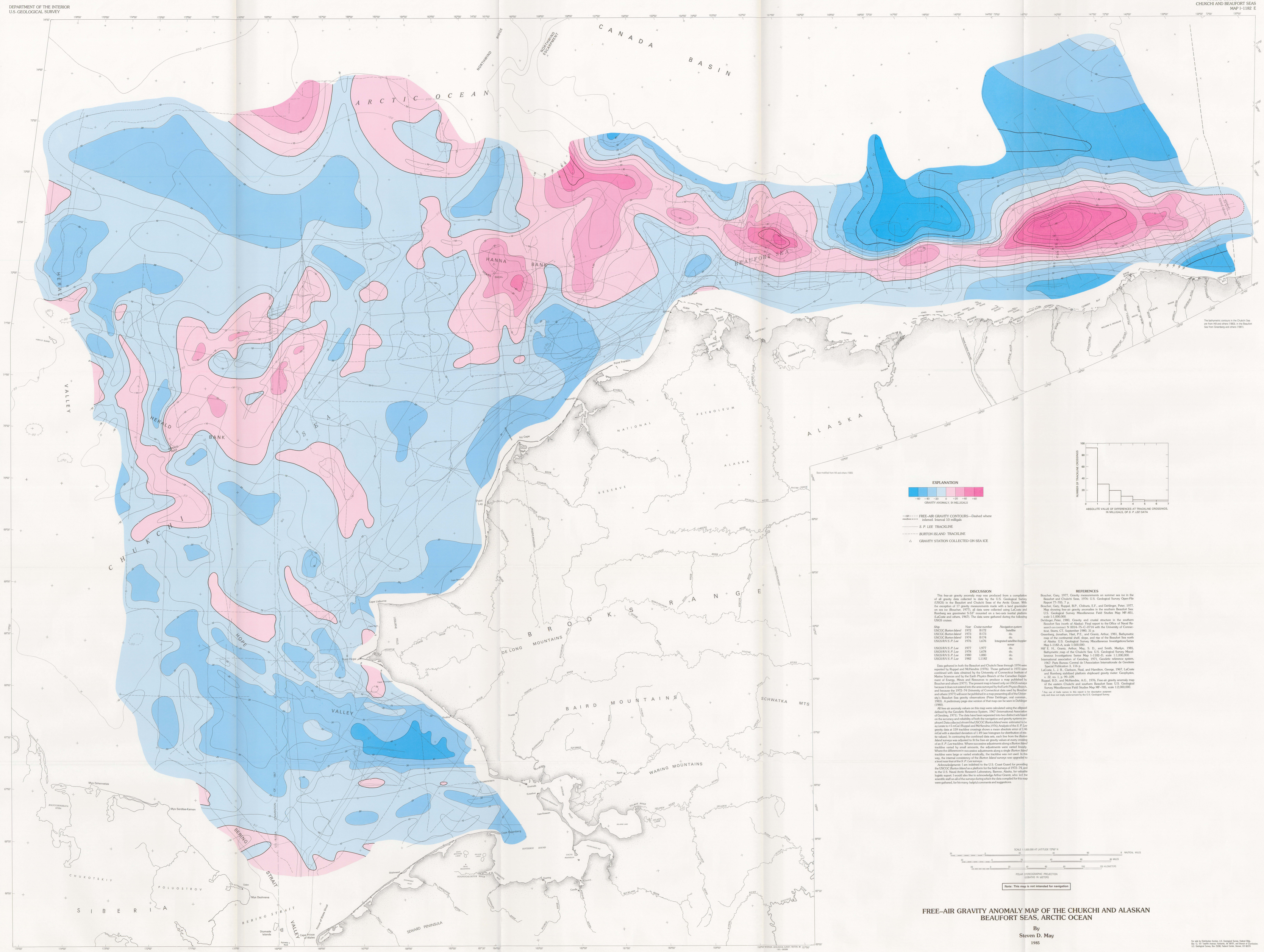

DISCUSSION

This free-air gravity anomaly map was produced from a compilation of all gravity data collected to date by the U.S. Geological Survey (USGS) in the Beaufort and Chukchi Seas of the Arctic Ocean. With the exception of 17 gravity measurements made with a land gravimeter on sea ice (Boucher, 1977), all data were collected using LaCoste and Romberg sea gravimeter S-52[1] mounted on a two-axis inertial platform (LaCoste and others, 1967). The data were gathered during the following USGS cruises:

Ship	Year	Cruise number	Navigation system
USCGC *Burton Island*	1972	B172	Satellite
USCGC *Burton Island*	1973	B173	do.
USCGC *Burton Island*	1974	B174	do.
USGS R/V *S. P. Lee*	1976	L676	Integrated satellite/doppler sonar
USGS R/V *S. P. Lee*	1977	L677	do.
USGS R/V *S. P. Lee*	1978	L678	do.
USGS R/V *S. P. Lee*	1980	L880	do.
USGS R/V *S. P. Lee*	1982	L1182	do.

Data gathered in both the Beaufort and Chukchi Seas through 1974 were reported by Ruppel and McHendrie (1976). Those gathered in 1973 were combined with data obtained by the University of Connecticut Institute of Marine Sciences and by the Earth Physics Branch of the Canadian Department of Energy, Mines and Resources to produce a map published by Boucher and others (1977). The present map is based only on USGS surveys because it does not extend into the area surveyed by the Earth Physics Branch, and because the 1972–74 University of Connecticut data used by Boucher and others (1977) will soon be published in a map presenting all of the University's Beaufort Sea gravity observations (Peter Dehlinger, oral commun., 1983). A preliminary page-size version of that map can be seen in Dehlinger (1980).

All free-air anomaly values on this map were calculated using the ellipsoid defined by the Geodetic Reference System, 1967 (International Association of Geodesy, 1971). The data have been separated into two distinct sets based on the accuracy and reliability of both the navigation and gravity systems employed. Data collected aboard the USCGC *Burton Island* were estimated to be accurate to ±5 mGal (Ruppel and McHendrie, 1976). Analysis of the *S. P. Lee* gravity data at 159 trackline crossings shows a mean absolute error of 1.46 mGal with a standard deviation of 1.49 (see histogram for distribution of misfit values). In contouring the combined data sets, each line from the *Burton Island* surveys was adjusted to fit the free-air gravity values at every crossing of an *S. P. Lee* trackline. Where successive adjustments along a *Burton Island* trackline varied by small amounts, the adjustments were varied linearly. Where the differences in successive adjustments along a single *Burton Island* trackline were large or varied erratically, the trackline was not used. In this way, the internal consistency of the *Burton Island* surveys was upgraded to a level near that of the *S. P. Lee* surveys.

Acknowledgments I am indebted to the U.S. Coast Guard for providing the USCGC *Burton Island* as a platform for the field surveys of 1972–74, and to the U.S. Naval Arctic Research Laboratory, Barrow, Alaska, for valuable logistic support. I would also like to acknowledge Arthur Grantz, who led the scientific staff on all of the surveys during which the data compiled for this map were gathered, for his many helpful comments and suggestions.

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

FREE–AIR GRAVITY ANOMALY MAP OF THE CHUKCHI AND ALASKAN BEAUFORT SEAS, ARCTIC OCEAN

By
Steven D. May

1985

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