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NATIONAL REPORT ON GRAVIMETRY IN DENMARK,
FAEROE ISLANDS, AND GREENLAND 1983 - 1986

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by

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1. Gravity networks, Denmark.

Observations in the new Danish Precision Gravity Network have been carried out from 1977 - 1984. The final adjustment and publication is planned to take place within the next year. The location of the primary stations of the network is shown in Fig. 1. The network is tied to absolute gravity measurement stations in Hamburg, Copenhagen, and Gothenburg. A large number of observations have been carried out in the network using two LCR "G" gravimeters, with preliminary standard deviation in the network adjustment of one reading at 13 μgal .

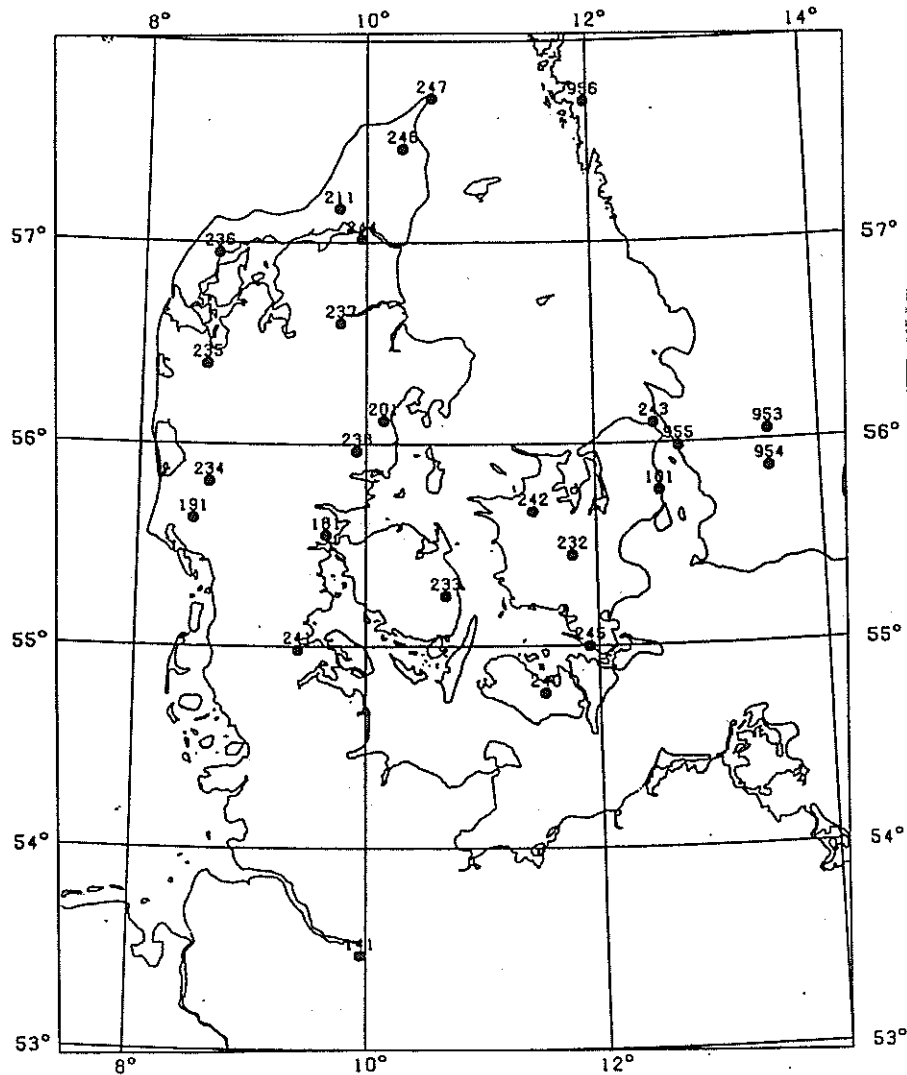


Fig. 1. Primary stations in the danish precision gravity network.

Measurements on the southernmost land uplift gravity lines have been executed, as described in Maekinen et al.(1986).

2. Gravity networks, Faeroe Islands.

A new base gravity network was established in the Faeroe Islands in June 1984, using the same principles as in the danish precise gravity network. The primary stations and ties of the network is shown in Fig. 2. The network is currently only tied to the absolute gravity station in Copenhagen. The standard deviation in the current network adjustment is 17 μ gal.

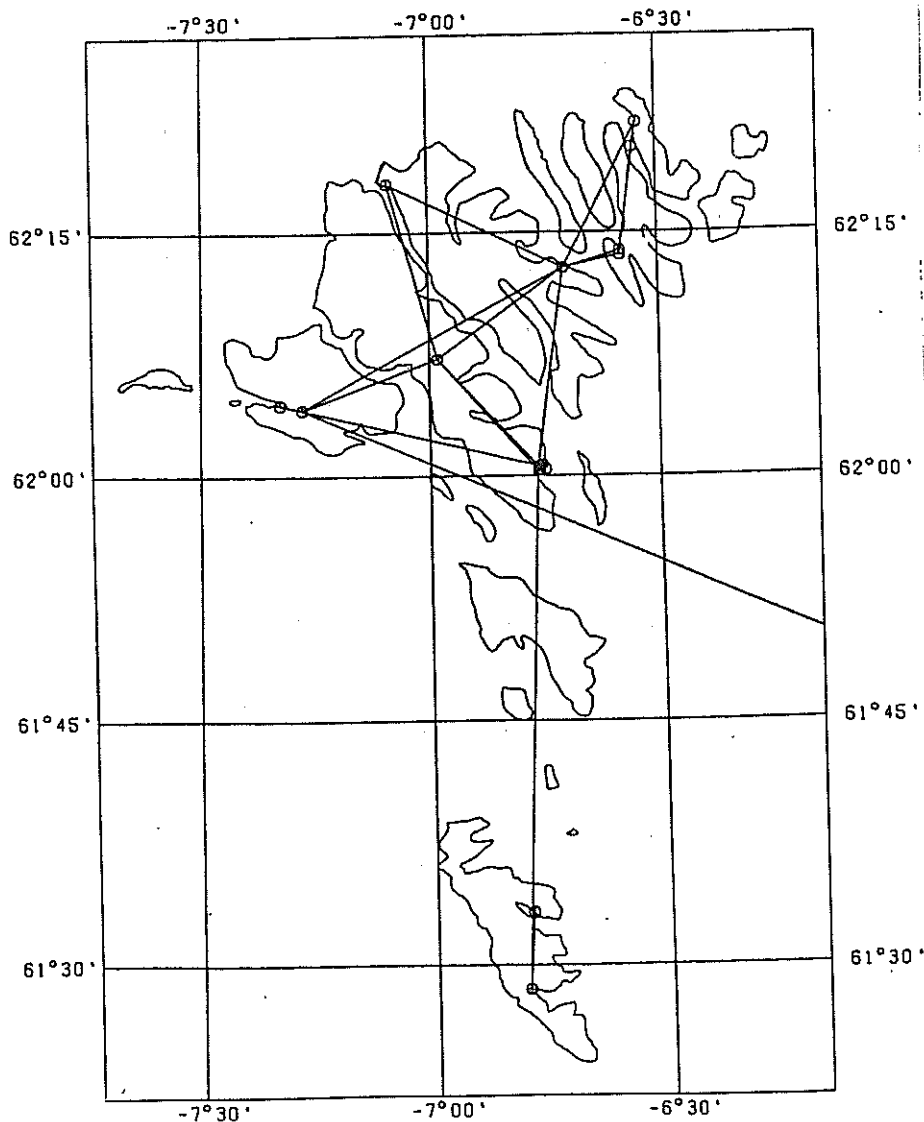


Fig. 2. New precision gravity network in the Faeroe Islands.

3. Gravity networks, Greenland.

Gravity measurements in Greenland have been carried out in northern Greenland (1978-80) (Forsberg, 1979; Weng, 1980; Forsberg, 1981), in central East Greenland (Forsberg, 1986), and in western Greenland in cooperation with Earth Physics Branch (1982). A gravity map including Greenland, with measurements up to 1984, will be part of the work of Sobczak et al. (1986).

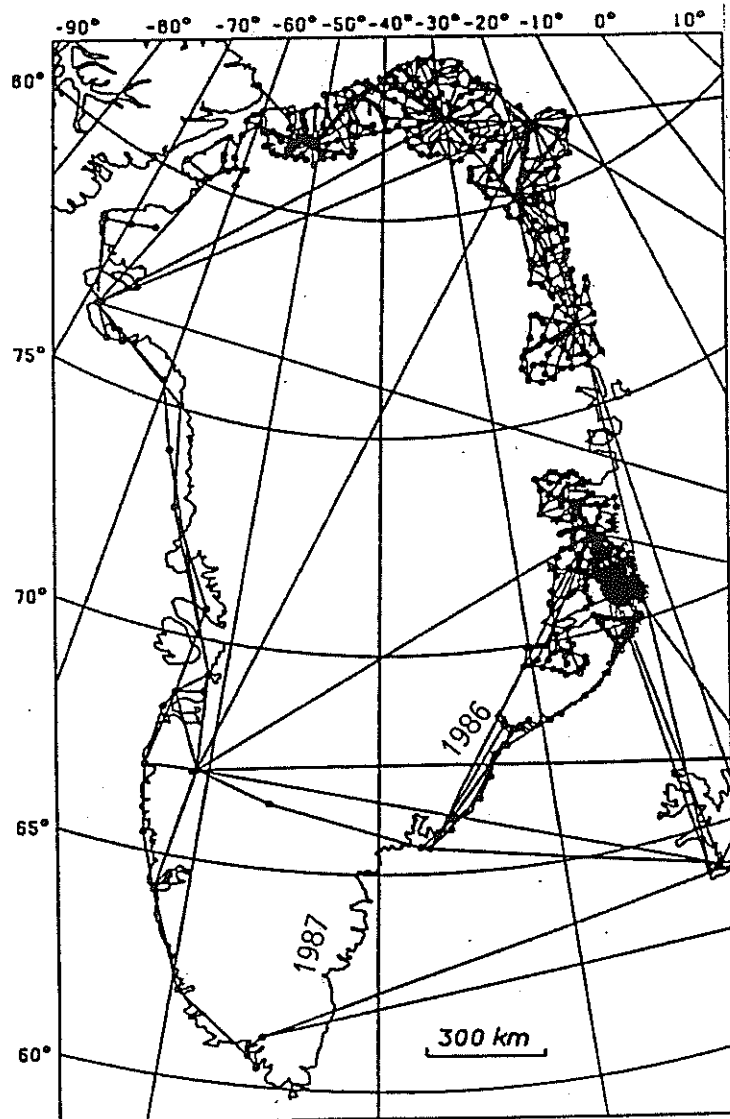


Fig. 3. Greenland LCR gravity network, showing network connections and regional surveys in northern and east Greenland, and current operation areas.

The main ties of the Greenland gravity network are shown in Fig. 3. Older measurements (pre-1976) are not shown in this plot, but are mainly concentrated on the west coast. The Greenland LCR gravity network is a combined network, aiming at both regional gravity coverage in the ice-free areas, as well as the establishment of a

reference network at airfields, ports etc. Due to the large gravity differences and the frequently rough transportation the standard deviation is relatively poorer, c. 27 μgal in the most recent reference network adjustment (1983). The network is tied to IGSN-stations in Greenland, Iceland, Canada, Norway and Denmark.

Experiments with gravity measurements on the sea-ice and ice cap have been carried out in 1986, in cooperation with Greenland Geological Survey and Defense Mapping Agency, respectively. A combination of GPS and OMEGA navigation was used in the ice cap profiles.

4. Gravity data base activities.

A gravity data base has been implemented with facilities for data selection in various types of areas, grids etc. An index sequential access method assures a fast access to individual records, because a geographically related key is used. Combined with programs for fast gridding and plotting, the data base management system has been an effective tool in gross error detection.

Copies of data sources received from DMAAC were compared to our own files. In this manner we detected numerous errors, the major part in the files received from DMAAC. The typical errors found were of the type, where, e.g., the longitude had be changed 1° , errors which otherwise are difficult to detect if the gravity field only varies little. We found that one per 1000 records contained an error. Totally 300 records were identified as having a gross error, the data being from Denmark, Norway and Sweden with surrounding waters. The BGI and DMAAC has been informed about the gross errors we found (and verified as such) for the Danish territory, while errors in other countries have not yet been verified.

The database currently contains c. 200000 values from the Nordic Area, including the North Atlantic and Greenland. A plot of the current data base holdings for the Nordic area may be found in Tscherning and Forsberg (1986).

References:

- Forsberg, R.: A gravity map of Peary Land, North Greenland. Rapp. Grønlands geol. Unders., No. 88, pp. 93-94, 1979.
- Forsberg, R.: Preliminary Bouger Anomalies of North-East Greenland. Rapp. Grøn. Geol. Unders., No. 106, pp. 105-107, 1981.
- Forsberg, R.: Establishment of a LaCoste & Romberg Gravity Network in Greenland. Bull. de Bureau Gravimetrique International, No. 46, pp. 168-179, 1981.
- Forsberg, R.: Gravity surveying and terrain corrections in Greenland. International Meeting on Potential Fields in Rugged Topography, Institute de Geophysique Lausanne, Bulletin 7, pp. 19-24, 1985.
- Forsberg, R.: Gravity measurements in Jameson Land and neighbouring parts of East Greenland. Monograph, Meddr. Grønland, no. 15, 1986, in print.
- Maekinen, J., M. Ekman, A. Mitsundstad and O. Remmer: The Fennoscandian Land Uplift Gravity Lines 1966 - 1984. Reports of the Finnish Geodetic Institute, no. 85:4, Helsinki 1986.
- Sobczak, L.W., D.B. Hearty, R. Forsberg, Y. Kristoffersen, O. Edholm and S.D. May: Gravity from 64 deg. N to the North Pole. Decade of North American Geology (DNAG), Arctic Geophysics volume, 75 pp, 1986, in print.
- Tscherning, C.C. and R. Forsberg: Geoid determination in the Nordic countries - a status report. Paper presented at the 10th Meeting of the Nordic Geodetic Commission, Helsinki, sep. 29 - oct. 3, 1986.
- Weng, W.L.: Preliminary Bouguer anomalies of western north Greenland. Rapp. Grønlands Geol. Unders., no. 99, pp. 153-154, 1980.