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Gravity measurements in Jameson Land and neighbouring parts of East Greenland

René Forsberg

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Table of contents

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RENÉ FORSBERG

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In the summer of 1982 a regional gravity survey of Jameson Land and adjacent East Greenland areas was carried out by the Danish Geodetic Institute. The purpose of this survey was primarily to contribute to the ongoing efforts to evaluate the hydrocarbon potential of the area. Together with gravity data from supplementary surveys in 1983 and 1984, a total of 379 new gravity stations has been established in the central East Greenland area. The gravity station spacing ranges from 5 to 30 km, most dense in southern and central Jameson Land, where a small area around J. P. Koch Fjeld was covered with a station spacing down to 1 km to investigate local structural disturbances in the area.

In the paper results of the surveys are given, including details of the processing of the raw gravimeter readings, barometric elevations and terrain correction computations. Additionally the results of earlier, unpublished surveys in the Scoresby Sund and Mesters Vig regions are presented. Based on available onshore and offshore gravity data, Bouguer anomaly maps are outlined for Jameson Land and for the central East Greenland region 69°N to 73°N, 30°W to 19°W.

The gravity data of the region show very large anomalies, with Bouguer anomalies varying from 90 mgal on the continental shelf to -180 mgal near the edge of the Inland Ice at the centre of the Caledonian fold belt. This variation is consistent with general isostatic principles, and probably primarily indicates changes in crustal thickness. Over the Jameson Land post-Caledonian sedimentary basin a smooth anomaly picture is found, with an E–W trending high crossing the central part of the area, and SSW–NNE trending lows and highs in the southern part, probably closely related to overall basin structure and basement geology. In the local area around J. P. Koch Fjeld a small positive anomaly seems to be associated with the structural disturbances, thus probably indicating shallow, relatively high-density rocks within the sedimentary sequence.

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East Greenland is a vast area, extending more than 2000 km in a north-south direction, with the ice-free coast area attaining its greatest widths, up to 300 km, in the central East Greenland region. Until recent years virtually no gravity data have been available for the ice-free areas, and major regions and nearly all of the ice cap await future gravity survey efforts.

In the central East Greenland region the first gravity survey dates back to 1954, when the Danish Geodetic Institute (DGI) established 15 scattered gravity stations in the Scoresby Sund fjord system. The first more extensive survey was carried out as late as 1976, when *c.* 75 stations were measured in the inner parts of the Kong Oscar Fjord/Kejser Franz Joseph Fjord area, also by DGI. Both these surveys were subsequently tied to the international gravity reference network IGSN 71 in 1977, when control measurements were carried out with DGI's newly acquired LaCoste and Romberg gravimeter G466.

In 1980 the offshore region and parts of Scoresby Sund were surveyed by the Geological Survey of Greenland (GGU), as part of a major offshore survey project, extending from the south tip of Greenland to *c.* latitude 73°N, carried out in the years 1980–82. Gravity data from this survey have been used for completing the outline Bouguer anomaly maps accompanying this paper, but will otherwise not be discussed in detail in the present context where the emphasis is on presenting the new onshore gravity measurements.

These new measurements originate from the relatively extensive 1982–84 DGI gravity survey of the central East Greenland region, covering from 69°N to 74°N, with additional coverage along the outer coast south of this area to Angmagssalik. The results and out-

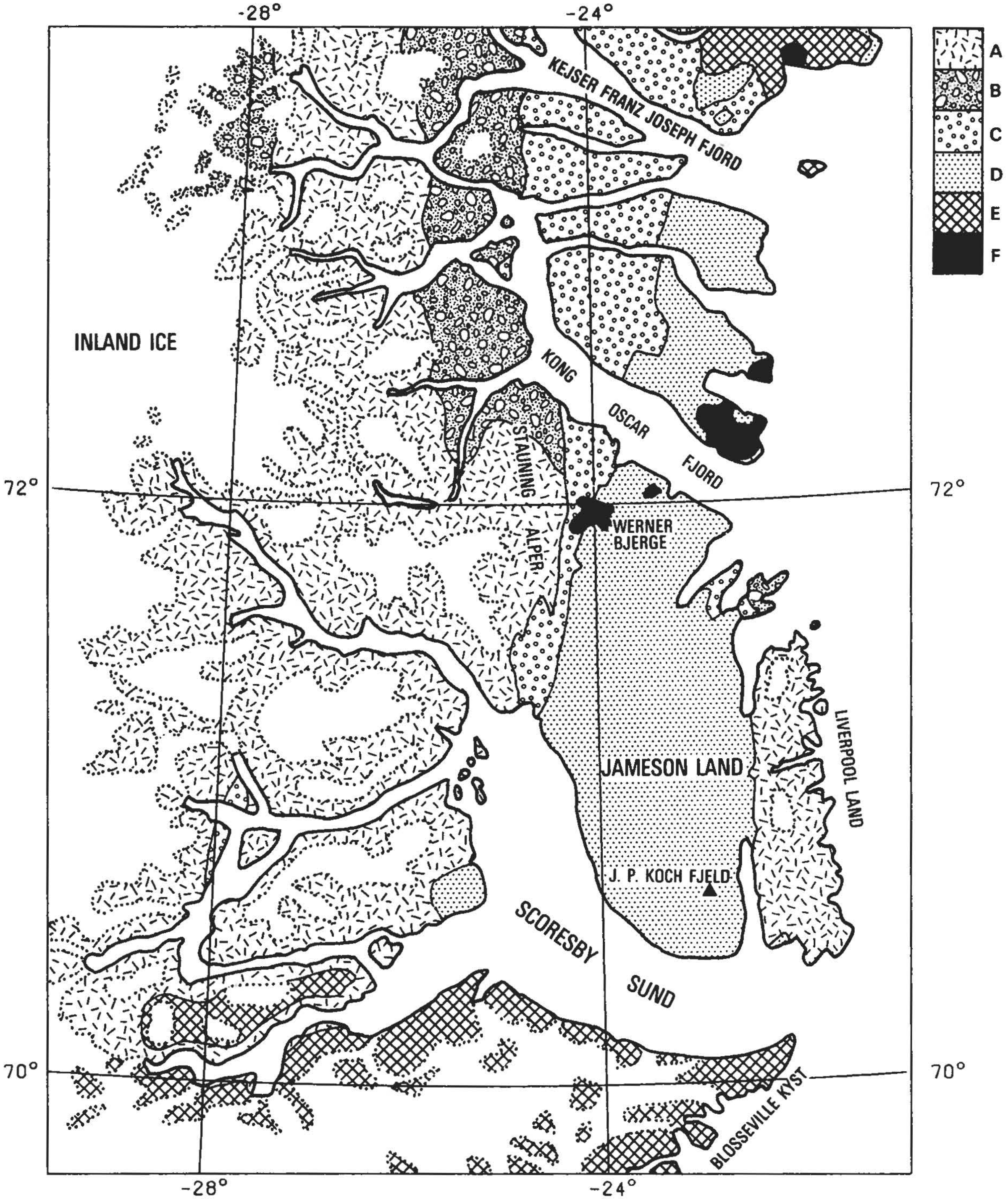

Fig. 1. Geological sketch map of central East Greenland. A: Caledonian and Precambrian crystalline rocks, B: Caledonian sediments (late Precambrian to Ordovician), C: Post-Caledonian sediments (Devonian to Permian), D: Post-Caledonian sediments (Mesozoic), E: Tertiary basalts, F: Tertiary intrusions. (After N. Henriksen, pers. comm.).

line of this survey are presented in the following, together with a recompilation of the older data. None of the results reported here have been published previously.

Apart from these surveys, the only other major gravity survey project in the ice-free parts of East Greenland covered the northern regions north of latitude 76°N. This survey was carried out in 1980 as part of the "North Greenland Project", with preliminary results presented in Forsberg (1981b). The Bouguer anomaly variations found in the northern and central East Greenland regions show somewhat similar main features, with large Bouguer anomaly gradients at the outer coast and low anomaly values near the Inland Ice margin.

The central East Greenland region

The 1982–84 regional gravity survey covers primarily Jameson Land, the central East Greenland fjord systems and the northern part of the Blosseville Kyst and inland nunatak area, roughly within an area 69° to 74°N, 30° to 19°W. The primary survey efforts have been concentrated in Jameson Land in order to provide geophysical information relating to the overall dimensions and major structures of the post-Caledonian, mainly Mesozoic sedimentary basin, comprising essentially all of Jameson Land.

A geological sketch of Jameson Land and surrounding areas is shown in Fig. 1. In Jameson Land the central East Greenland post-Caledonian sedimentary basin attains its greatest width. Mesozoic, especially Jurassic, sedimentary formations make up most of Jameson Land. The oldest sediments (Devonian) outcrop to the north, while the youngest formations (Lower Cretaceous) outcrop in a small area of southernmost Jameson Land. The sediments in the southern part of Jameson Land are intruded by numerous Tertiary dykes and sills, while major Tertiary intrusions are found intersecting the sediments at the northern end of Jameson Land (Noe-Nygaard 1976).

In the western regions central East Greenland is made up mainly of Caledonian complexes, including the spectacular granites of Stauning Alper NW of Jameson Land. The Caledonian fold belt includes a major sequence of late Precambrian–Ordovician sediments with a cumulative thickness of more than 17 km (Henriksen 1985), mainly exposed in a roughly 550 km wide belt along the central parts of the Kong Oscar/Kejser Franz Joseph Fjord system. Caledonian metamorphic complexes and intrusives are also found east of Jameson Land, where Liverpool Land represents an area probably uplifted and eroded in late geological times (Henriksen & Higgins 1976).

South of Jameson Land the East Greenland plateau basalt province is situated, with huge piles of volcanic rocks of Tertiary age. The volcanic rocks overlie Caledonian rocks in the inner part of Scoresby Sund, and are also found overlying Mesozoic sediments in areas north of Kejser Franz Josef Fjord. However, it remains an open question whether the Mesozoic sediments of Jameson Land continue south under the plateau basalts (Henderson 1976).

The general topographic features of the region are closely linked to the geology. In the late Palaeozoic-Mesozoic sedimentary area rounded landforms prevail,

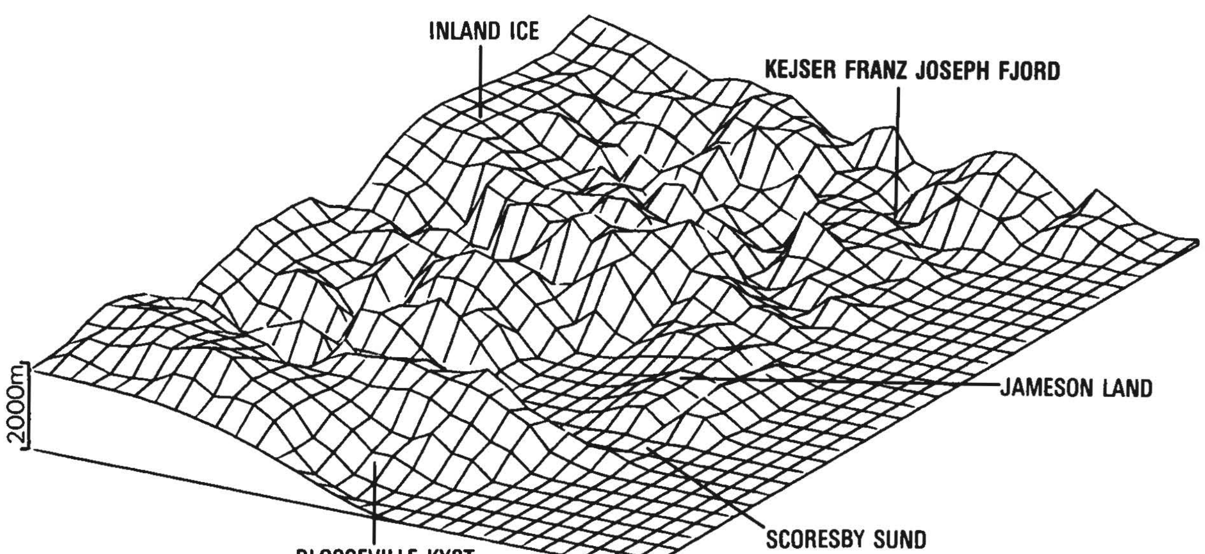

Fig. 2. Perspective view of the central East Greenland region, as seen from SE. North–south extension of the block roughly 500 km.

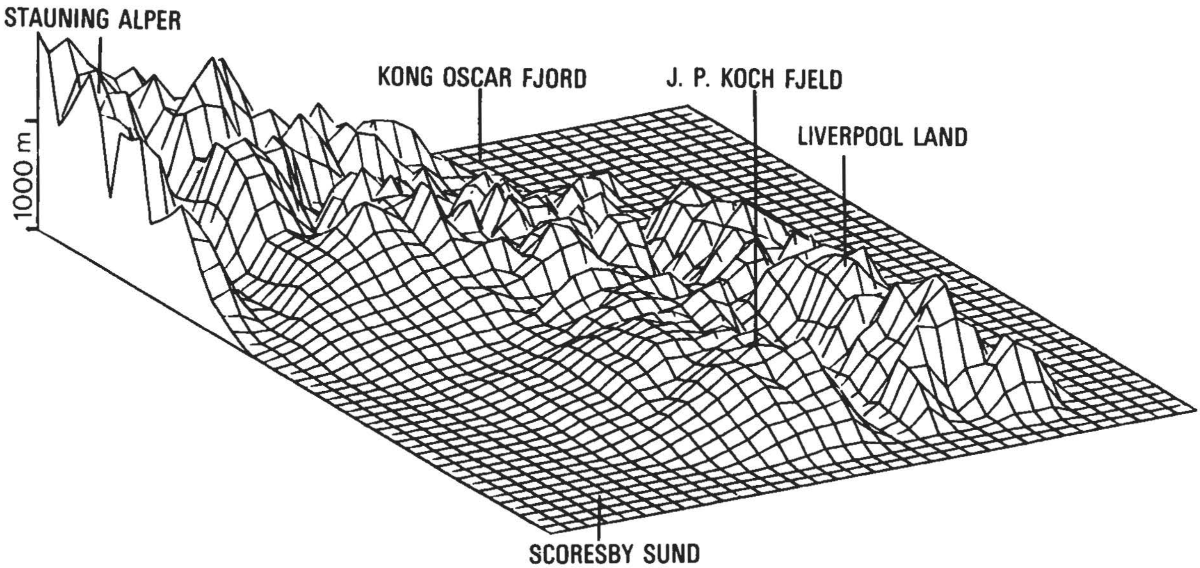

Fig. 3. Topography of Jameson Land, as seen from SW. The mean height grid illustrated is used for computing remote-zone terrain corrections.

with the topography of Jameson Land being nearly flat in a belt along the coast of Scoresby Sund. In the southern half of Jameson Land the elevation ranges up to 908 m at J. P. Koch Fjeld, while in the area to the north more rugged mountains, intersected by large valleys, are found. In the northern area most gravity stations have been located in these valleys.

In the Caledonian areas the topographic relief is dramatic, with alpine regions or plateau-like landscapes, topped with ice caps and cut by steep-sided fjords and valleys. Elevations in the alpine areas around Jameson Land range up to 2800 m in Stauning Alper to the west and 1430 m in Liverpool Land to the east. Both of these adjacent areas have, unlike Jameson Land, quite heavy valley glaciation, a factor limiting the number of good gravity station sites available.

The plateau basalt region south of Scoresby Sund attains the highest topographic elevations in Greenland and is also heavily glaciated. The southern extension of the present gravity survey covers the nunatak zone SW of Scoresby Sund, an area of average elevation up to 2000 m or more. The general topographic elevations are illustrated in the block diagrams Fig. 2 and Fig. 3 for the central East Greenland region and Jameson Land, respectively.

Field work of the 1982–84 gravity survey

The purpose of the gravity survey was, in addition to the Jameson Land geophysical data contribution, to continue the ongoing gravimetric survey of Greenland. This programme is aimed at establishing a reference network and to provide a general outline of the gravity field variations in the ice-free areas, primarily in order to provide data for the geoid computations needed for precise satellite surveying. The 1982/83 survey phase was carried out in close logistic and economic co-operation with the Geological Survey of Greenland, while the 1984 survey represents the first phase of a DGI mapping project aimed at future coverage of all of southern East Greenland.

The 1982 field survey provided the bulk coverage of Jameson Land, Liverpool Land and Stauning Alper. The season was initiated in early July when a set of base stations was established at Kulusuk/Angmagssalik in southern East Greenland. In the first part of the season emphasis was on non-gravity activities (natural airstrip reconnaissance and Doppler surveying), but a limited set of gravity stations was measured in the Kangerdlugssuaq area. In the last part of July the survey team arrived in Mesters Vig, and the survey of the Jameson Land area was carried out in the next three weeks.

Transportation in Jameson Land was provided by a Hughes 500 D helicopter. Most of the gravity stations were established by short helicopter stops at pre-selected sites marked on aerial photographs. Whenever possible these sites were chosen to coincide with known trigonometric survey points or sea-level points. Fortunately southern and central Jameson Land has a relative abundance of such points, originating from earlier geodetic mapping projects. The known heights of these points provide good control of the barometric levelling which otherwise formed the only available means for determining heights of the gravity stations.

Generally 10–20 gravity stations were measured in a "loop"-type configuration to check for instrument drift and possible tares (jumps) of the LaCoste and Romberg gravimeter, using as bases Mestersvig airport or temporary field camps. A total of *c.* 30 helicopter hours was used (including idle time during measurement stops), distributed on 8 different days. Each measurement stop had a duration of 5–6 minutes on the Jameson Land profiles (including landing and take-off), while the measurements in Stauning Alper were somewhat slower due to the often very large gravity differences encountered between successive stops. A total of approximately 155 gravity stations were established during this phase of the survey.

The 1982 survey was supplemented by surveying on foot in the area around J. P. Koch Fjeld in southern Jameson Land, and by ship-borne surveys along the south shore of Kong Oscar Fjord and the Alpefjord/Forsblad Fjord branches west of Stauning Alper. For the ship-borne surveys in 1982 (and 1983) the vessel "Molly" was kindly put at our disposal by Nordisk Mineselskab A/S.

In 1983 the field season was initiated in late July. In the first part of the season supplementary gravity stations were measured in Jameson Land, along the western and southern shores of Scoresby Sund, and on a traverse across the northern part of the Blosseville Kyst inland area. Later in the season a combined gravity and Doppler satellite survey program was undertaken in the Kong Oscar/Kejser Franz Joseph Fjord system area, using a combination of ship-borne and helicopter-borne operations. Because a Doppler observation programme usually requires that each site is visited twice (set-out and pick-up of the receivers), many gravity stations in this area were thus measured twice, yielding a relatively strong gravity network with many extra determinations improving the subsequent least-squares adjustment of the instrument readings. Additionally a number of older gravity stations of the 1976 survey were revisited. Finally, in October 1983, an additional survey trip was carried out along the coast from Scoresby Sund to Angmagssalik, taking advantage of a Greenland Air helicopter ferry flight. On this trip 10 new stations were measured at sites primarily chosen to complement GGU's offshore survey lines.

The survey of 1984 had as primary objective the establishment of a number of Doppler satellite stations in the high nunatak area behind the Blosseville Kyst south of the Scoresby Sund fjord system. Around 25 gravity stations were measured in the area as an integral part of the survey, operating again with a Hughes 500 D helicopter from a temporary base camp at Hjørnedal (70°21'N, 28°09'W) in the inner branches of the Scoresby Sund fjord system. Along with some additional gravity measurements in the inner fjord system area, to fill in some of the coverage gaps of the earlier surveys, this yielded a total of 37 new gravity stations for the season.

In total 379 new gravity stations were established during the 1982–84 survey, with more than 200 of these stations originating from the 1982 Jameson Land survey. The outline of the observed gravity network in central East Greenland is shown in Fig. 4.

Survey data processing

The computation of final gravity anomalies requires three distinct steps for conventional land based gravity surveys: adjustment of gravimeter observations to yield absolute gravity values, computation of geographical coordinates and heights of the gravity stations to allow computation of simple anomalies, and the computation of terrain corrections to eliminate the influence of topographic irregularities on the measured gravity at a specific point. In the following, processing details of each of the steps will be given.

Adjustment of gravimeter observations

During the 1982–84 survey two LaCoste and Romberg "G" meters – nos 466 and 495 – were used. This type of gravimeter has an accuracy around 0.02 mgal, a global measurement range and low instrument drift rates, thus making it ideal for the present type of gravity work. Both gravimeters were used for ties between individual areas, but only one gravimeter was used during the actual regional surveys, the other instrument being kept as a reserve. The survey was tied to the international gravity standardization network IGSN 71 (Morelli 1974) through readings in Søndre Strømfjord, Iceland and Copenhagen.

The processing of the field gravimeter readings includes as a first step calibration of instrument non-linearities using the tables provided by the manufacturer. In the second step observations are corrected for tides, using the formulae of Longman (1959), assuming an earth tide factor of 1.15. The "reduced" readings thus obtained are subsequently processed in a least-squares adjustment, where optimal estimates of various unknowns such as station gravity values, instrument scale factors, drift rates and occasional jumps in instrument bias (tares) are determined through the solution of a large set of linear equations. Due to basic non-linearities in the problem formulation several iterations are needed to obtain the final solutions. Details of the least-squares adjustment method can be found in Forsberg (1981a) and Sjøberg (1982).

The 1982–83 measurements have been adjusted together with all other Greenland LaCoste and Romberg gravity control measurements in one large adjustment, while the relatively few observations of the 1984 survey were adjusted in a small separate adjustment. The main adjustment included 1112 readings at 430 stations, measured primarily by DGI in the period 1976–83. Six different gravimeters have been used in the network,

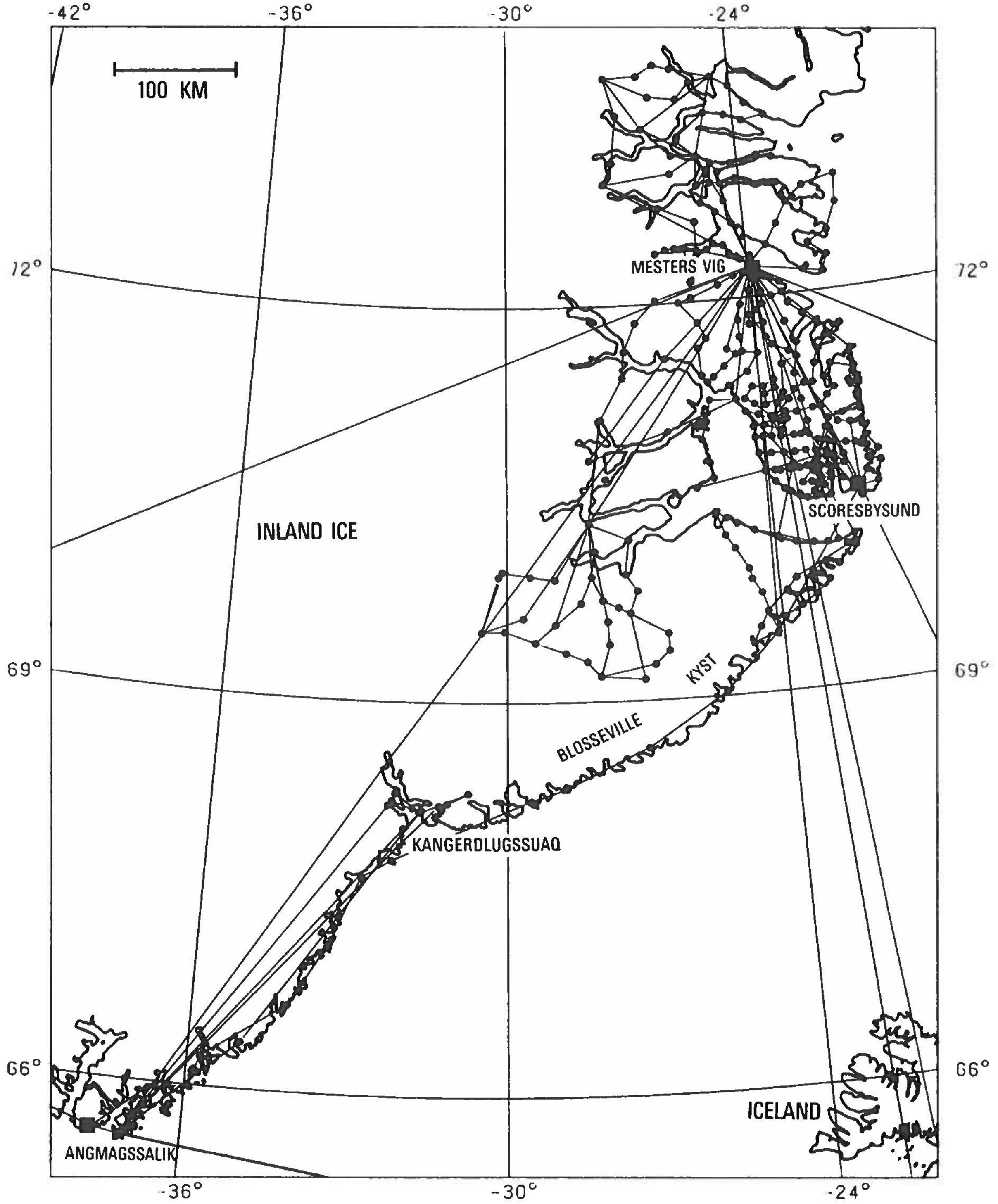

Fig. 4. East Greenland gravity network, showing stations and ties of the 1982–84 survey.

Table 1. Some East Greenland station gravity values – results of the 1976/83 gravity network adjustment. Scale factors: G466 – 1.00061; G495 – 1.00035.

41100	Mesters Vig	Doppler station	982 682.95 mgal
48203	Mesters Vig	GGU base	982 683.39 mgal
48206	Mestervig	airstrip apron	982 684.57 mgal
51261	J. P. Koch Fjeld	summit cairn	982 421.37 mgal
57704	Scoresbysund	flagpole	982 652.11 mgal
78208	Kulusuk	airstrip apron	982 333.75 mgal
78210	Angmagssalik	heliport	982 322.75 mgal
78212	Angmagssalik	Atlantic pier	982 323.38 mgal

and IGSN 71-station groups in Søndre Strømfjord, Thule, Iceland, Canada and Denmark were kept fixed in order to provide the datum and scale of the gravity network. The results relevant to the Jameson Land survey are shown in Table 1.

The gravimeter performances during the survey trips were generally excellent, with average drift levels at the order of 0.03 mgal/day. Although the stability of the instruments was good, a few instrument tares did occur, especially in connection with the ship-borne surveys in 1982 and 1983. Apparently the gravimeters were to some degree susceptible to engine vibrations. Most of the tares were of small magnitude (below 0.5 mgal), with a few exceptions (maximum detected tare 1.9 mgal). Due to the frequent repeat measurements in the ship-borne networks it was to some degree possible to locate the probable time of the instrument tares. However, in a few cases this was not possible, yielding minor network segments with significantly higher possible gravity errors than the adjustment estimate. However, considering the overall station spacing in the gravity network, these problems are of little practical importance for the computed gravity anomalies.

Height determinations of the gravity stations

Precise knowledge of the height of a gravity point is necessary for computation of gravity anomalies. A height error of 1 m will produce anomaly errors of 0.2 and 0.3 mgal for Bouguer and free-air anomalies respectively.

In the 1982–84 survey a variety of height determination methods were used: triangulation, Doppler satellite surveying, photogrammetric methods, and especially barometric levelling. A fairly large set of existing trigonometric points was available, especially in southern Jameson Land. These points have superior height accuracy compared to the needs of the regional gravity survey, and were utilized for constraining the barometric levelling to obtain the highest possible accuracies. Generally the barometric height determinations were carried out in short traverse segments ending at such points with known elevation and sea-level points. The barometers used were of type "Baromec", a high-precision altimeter with a proven accuracy of 0.1 mbar, corresponding to 80 cm in elevation. Generally three different altimeters were used on each survey flight. Except at cairned, trigonometric stations, it was generally not necessary for the barometer operator to leave the helicopter during measurement stops, a definite advantage in terms of speed and safety of the operations.

The gravity survey pattern consisted as mentioned earlier of a series of more or less irregular loops. For each such loop an average atmospheric model of the type

$$dH = -c(t + 273°)\ln(dP) \qquad (1)$$

has been used for the barometric levelling computations. Here dH is the height difference, dP the pressure difference and c a constant, the value of which depends slightly on factors such as latitude and humidity. For Jameson Land a value c = 29.2 m/°C/mbar is applicable, corresponding to a typical pressure gradient of 8.12 m/mbar at sea-level and t = 5°C. These values and the formula (1) follow from simple ideal gas physics.

From the formula (1) it is clear that a knowledge of the average temperature at the survey level is very important, an error of 1°C giving a scale error in height of 1/273 at 0°C. The state of the atmosphere (average temperature t) was to the degree possible determined indirectly through pressure measurements in high and low stations with known heights, supplemented by ordinary temperature measurements. The final barometric altitudes were estimated taking the height errors at the loop points of known elevation into account, using an adjustment programme developed by J. Olsen at DGI.

Generally the best quality of barometric levelling is expected in southern and central Jameson Land, where the topography is relatively gentle and many trigonometric stations exist. Based on some test adjustments of the altimeter measurements in this area, a height error around 2–3 m is estimated for most stations, corresponding to a Bouguer anomaly error of 0.5 mgal. In northern Jameson Land the height accuracy probably deteriorates to around 5 m for altimeter stations inland.

For the high-altitude altimeter stations in the areas of rugged topography, i.e. mainly measured stations in Stauning Alper, the Blosseville Kyst hinterland and the land in the interior of the Kong Oscar/Kejser Franz Joseph Fjord system, altitude errors or 10 m of more are possible. Although care has been taken to utilize high/low "atmosphere calibration" pressure observations, the large areas and altitude differences make barometric levelling more uncertain. However, especially in the last two regions, the number of barometric height determinations is relatively small and well controlled by satellite Doppler heights. These Doppler heights have been determined using available preliminary (broadcast ephemeris) or final (precise orbit) satellite positions, from which station heights have been computed using geoid height information primarily from a global spherical harmonic geopotential model, complete to degree and order 180 (Rapp 1981), with local improvements based on available gravity data. The accuracy of these heights is of the order of 3–5 m.

For the detailed local gravity survey around J. P. Koch Fjeld the altitudes were determined by a combination of trigonometric height determinations, barometric levelling and photogrammetric methods. The points of the survey on foot were marked in the field on 1:50 000 aerial photographs, and heights were obtained through an aerotriangulation. Only two stereomodels were necessary to cover this local area, and the quality of the derived heights is estimated to by ± 2–3 m, corresponding to 0.5 mgal in the gravity anomaly. The barometric levelling was used to supplement the photogrammetric/trigonometric heights when successive points were surveyed within reasonable time spans or when photo markings were uncertain.

Coordinates of the gravity stations

Geographical coordinates are necessary for location and plotting purposes, and for the computation of gravity anomalies. At the high northern latitudes of central East Greenland, only a modest accuracy in the latitude determination is necessary for anomaly computations, the horizontal gradient of normal gravity at 71°N having a relatively low value – around 0.5 mgal/km.

The coordinates of the gravity stations of the 1982–84 survey are known with high accuracy at trigonometric or Doppler points, and also for the local J. P. Koch Fjeld survey the photogrammetric derived coordinates have accuracies at the few metre level. For all remaining gravity stations, coordinates have been digitized from available maps or geometrically corrected Landsat mosaics.

The existing topographic maps of East Greenland are on scale 1:250 000 and of varying quality. In Jameson Land and the Scoresby Sund fjord system the maps are of recent date with adequate to good ground control, but north of 72°N the maps date from the thirties and have significant errors. Similarly south of 70°N the existing maps are old and erroneous, with no DGI maps available at all for the northern part of the Blosseville Kyst. For this area a 1:500 000 geometrically corrected Landsat mosaic map has been constructed by Hauge Andersson and Jon Olsen using the DGI orthophoto projector.

To summarize, the following maps were used to extract coordinates of the gravity stations:

1) North of 72°N: Landsat mosaics and maps at 1:500 000 and 1:250 000.
2) Between 70° and 72°N: DGI maps at 1:250 000.
3) Southern Jameson Land: DGI manuscript map at 1:200 000.
4) Blosseville Kyst area and Kangerdlussuaq: Landsat mosaic at 1:500 000; AMS map at 1:250 000 for a small area not covered by mosaic.

The positions of the gravity stations were transferred to the maps and mosaics from field markings on aerial photographs and subsequently digitized with a Calcomp digitizer. Map distortions were checked using the geodetic coordinates of existing trigonometric points. The final coordinates of the stations in the Jameson Land area are estimated to have average errors of 100–200 m, while the coordinate errors in the areas where Landsat mosaics have been used are probably up to 1 km.

The final coordinates of the gravity stations have been transformed to the new international satellite datum WGS 84 (World Geodetic System 1984), also known as NAD 83 (North American Datum 1983). The coordinates given for the gravity stations are therefore not directly transferable to the existing DGI map material of the area, which is based on the old Scoresbysund 1954 datum. The datum shifts between the two systems amount to –2″ in latitude and 34″ in longitude, corresponding to an ESE shift of 360 m, which must be subtracted from the given gravity station coordinates (cf. Appendix 1) to get positions compatible with the existing DGI and GGU maps.

Computation of simple gravity anomalies

Based on the adjusted station gravity values, geographical coordinates, and heights of the gravity stations, free-air anomalies and simple Bouguer anomalies may be computed directly. To obtain the complete Bouguer anomaly, terrain corrections are also needed, but discussion of this point will be postponed to the next section.

The free-air anomaly at a point is defined as the actual observed gravity g minus the value of normal gravity γ,

$$\Delta g_{FA} = g - \gamma \quad (2)$$

where γ is defined implicitly through the choice of geodetic reference ellipsoid and GM-value of the earth. Normal gravity is a function of both latitude and height. In gravity work the Geodetic Reference System 1967 (GRS 67) is traditionally used, and it has also been used here in spite of the existence of more recent, better reference systems (e.g. GRS 80, the system underlying WGS 84). The differences are minor and of no practical importance in the present context. For GRS 67 normal gravity, the following basic formula has been used:

$$\gamma(\varphi,h) = 978031.85\ (1 + .005278895 \sin^2\varphi + .000023462 \sin^4\varphi) + 0.30877\ (1 - .00139 \sin^2\varphi)h \quad (3)$$

where the first part of this formula corresponds to the well-known "1967 gravity formula" (International Association of Geodesy 1967).

Bouguer anomalies have subsequently been computed from the free-air anomalies by

$$\Delta g_{BA} = \Delta g_{FA} - 2\pi G\varrho h + tc \quad (4)$$

where G is the gravitational constant, ϱ the topographic density (conventional value 2.67 g/cm³) and tc the terrain correction. The Bouguer correction takes into account the gravitational attraction of the visible topography, and in (4) is subdivided into a slab correction $2\pi G\varrho h$ and the terrain correction tc, representing the gravitational effects of topographic irregularities relative to the slab. The terrain correction is always positive, very cumbersome to compute and usually rather small, and is therefore often neglected. In the central East Greenland region, however, large tc values are nearly unavoidable, and considerable effort has been put into computation of tc, as outlined in the following. Due to the varying quality of the existing topographic maps, reasonable computations have only been possible for gravity stations located between 70° and 72°N, i.e. including all Jameson Land stations.

Computation of terrain corrections

The computation of precise terrain corrections is necessary to enhance anomalies due to geological factors. The terrain correction is very sensitive to the local topography surrounding the measurement point, and thus usually requires large-scale maps. Such maps are not available for the region. However, considering the regional nature of the gravity survey, even the existing 1:200 000 and 1:250 000 maps may provide reasonably good terrain corrections when proper care is taken in the computations, and when the sites selected for the gravity measurements have a reasonably smooth topography in the immediate neighbourhood of the station. For the local survey in the J. P. Koch Fjeld area the map-derived terrain corrections were not however considered sufficiently accurate. Here a detailed digital terrain model was constructed by photogrammetric methods.

The terrain corrections for the gravimeter stations in the area were computed using a modification of the "prism method", where the individual mass elements of the topographic irregularities are represented as rectangular prisms of uniform density in a latitude/longitude grid. In the method, the basic formula for the gravity effect of a mass prism located at relative coordinates x_1 to x_2, y_1 to y_2 and z_1 to z_2 (z axis positive upward)

$$\delta g = G\varrho \left|\left|\left| x\log(y + r) + y\log(x + r) - z\arctan\frac{xy}{zr} \right|_{x_1}^{x_2} \right|_{y_1}^{y_2} \right|_{z_1}^{z_2}, \qquad (5)$$

$$r = \sqrt{x^2 + y^2 + z^2}$$

(Jung 1961) is used in an inner zone around the computation point, while faster, approximative formulae are used at larger distances from the computation point, in connection with the use of coarser mean height grids (Fig 5). In the immediate neighbourhood of the computation point the digital terrain model used is refined using a bicubical spline interpolation procedure to give more detailed height information. Details of the method are described in Forsberg & Tscherning (1981).

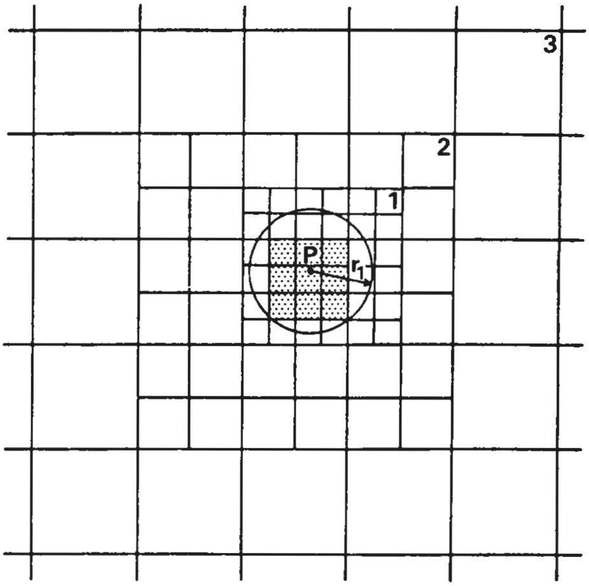

Fig. 5. Computation of terrain corrections using a sequence of mean height grids. The topographic mass excesses or deficits are in each compartment represented by rectangular prisms. Around the computation point P a bicubic spline interpolation procedure is used to obtain an improved height representation of the inner zone (dotted).

The digital terrain models forming the basis of the computations were derived from the 1:200 000 and 1:250 000 maps. To minimize the work in acquiring the height data, the DTMs were split into two groups:

1) Regional DTMs, grids of *c.* 2×2 and 6×6 km mean heights, covering all of Jameson Land and surrounding areas. These DTMs were constructed from N–S height profile scans of the available maps, with distances between scan lines varying from *c.* 2 km in southern Jameson Land and 3 km in northern Jameson Land and Stauning Alper to 5–6 km in the other areas. Examples of mean height DTMs are shown in Fig. 2 and Fig. 3.
2) Local DTMs, with 400×400 or 500×500 m point heights read relative to individual stations. To minimize the work of reading the local heights, spot height dot templates with dots in a pattern of 400/500 or 800/1000 m spacing, corresponding to 2 and 4 mm in the maps, were utilized. Depending on the ruggedness of the local topography, various template patterns were used.

At each computation point, the terrain correction computation was carried out to a maximum distance of 50 km from the point. The effects of glaciers and fjord depths were not taken into account due to lack of data.

The computed terrain corrections show that the terrain corrections are significant over most of the area. The tc values in Jameson Land range from 0–1 mgal in the flat areas along the shore of Scoresby Sund to 2–5 mgal in the more rough central and northern areas. In the surrounding alpine and mountainous areas values of 5–10 mgal are common. Of the computed corrections 54% are in the range 0–5 mgal and 85% below 10 mgal.

For some gravity stations extremely large gravity corrections were encountered. This is for example the case for the only two gravity stations (nos 51829 and 53524, cf. Appendix 1) measured in the Werner Bjerge Tertiary intrusion area in northern Jameson Land, and for some stations close to Scoresby Sund, visited primarily in order to get a high reference point for the barometric levelling. Naturally the anomalies for such stations (Table 2) should be used with caution.

For the local J. P. Koch Fjeld area, a photogrammetric digital terrain model with a resolution of 100 m was constructed by scanning 1:50 000 aerial photographs in an analytical plotter. The actual scanning work was performed by Scankort A/S. A derived 200×200 m mean height DTM of the local area is shown in Fig. 6. The computed terrain corrections for the 44 local gravity stations vary from 1–2 mgal at the lowest-lying stations to 10.3 mgal at the summit station (no. 51261, altitude 908 m), thus being of much larger magnitude than the possible local geological anomalies searched for. However, due to the detailed high-quality DTM used, the noise in the computation of the terrain corrections is estimated to be only a fraction of a mgal.

The availability of the detailed DTM of the J. P. Koch Fjeld area provided a means of testing the accuracy of the terrain correction computations based on the small-scale maps. Based on the available southern Jameson Land 1:200 000 manuscript map (with contour interval 100 m and many spot heights), a "best possible" map-derived DTM was constructed. Comparison of terrain corrections computed from the photogrammetric DTM and the map-derived DTM yielded the results indicated in Table 3. From the table it is seen that a sub-mgal terrain correction accuracy apparently is possible using the existing maps. Since the J. P. Koch Fjeld area is relatively rugged, this conclusion should be valid for most of Jameson Land, and thus for the majority of the gravity stations of the present paper.

Table 2. Examples of stations with excessive terrain corrections.

Station	Location	Height	tc
51312 Kap Stevenson	70°24'N, 25°18'W	1069 m	47.6 mgal
51317 Pythagoras Bjerg	71°23'N, 25°14'W	1376 m	33.8 mgal
51829 Werner Bjerge	71°52'N, 24°06'W	1792 m	34.3 mgal

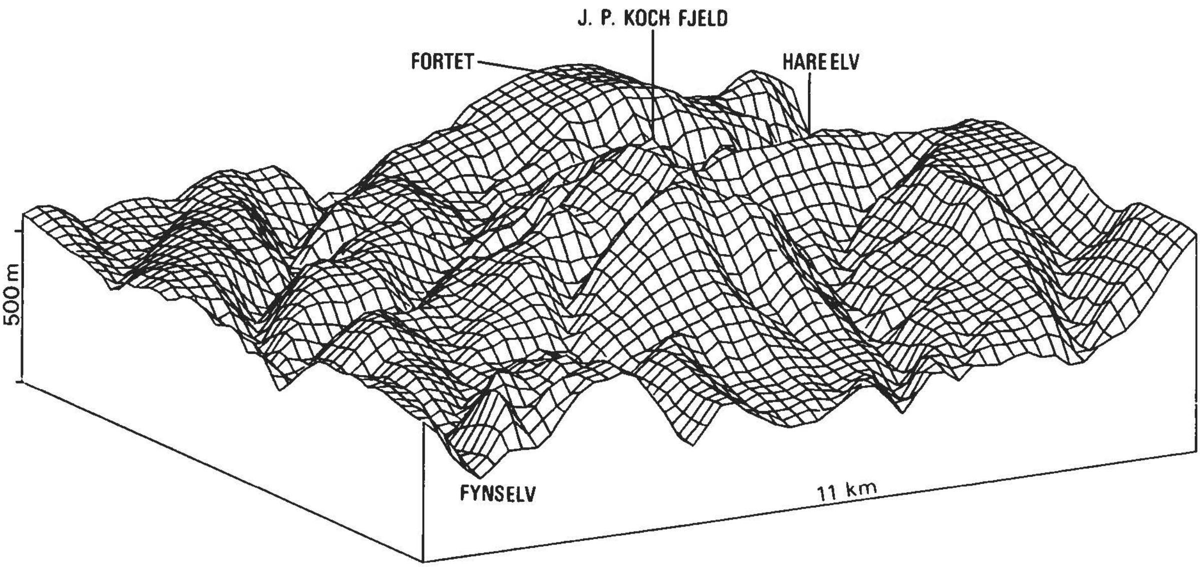

Fig. 6. Digital terrain model of the J. P. Koch Fjeld area, southern Jameson Land. The perspective view shows 200 m × 200 m mean heights seen from the SW.

Table 3. Comparison of photogrammetric and map-derived terrain corrections, J. P. Koch Fjeld area.

Standard density (2.67 g/cm³)	r.m.s. variation	maximum value	summit station (no. 51261)
Computed correction	4.9	11.3	10.3
Differences	0.6	1.4	1.0

The final gravity anomaly listings and maps

The final gravity values and gravity anomalies, processed as outlined, are presented in Appendix 1. The standard density 2.67 g/cm³ has been used throughout. The station number shown in the listings is the official DGI number. Stations south of 69°N, not shown in map form, have station numbers above 60 000. Latitude and longitude are given in North American Datum 1983 (NAD 83), gravity anomalies in datum IGSN 71/GRS 67.

The assumption of standard reduction density 2.67 g/cm³ is usually valid in areas with old sediments or metamorphic rocks. In Jameson Land, however, the predominantly Jurassic sediments making up the topography have significantly lower density. Based on experience from sediments of similar age and type in other areas of the world a density around 2.30 would be expected (Woolard 1962). This estimate is supported by a regression analysis of gravity versus height using the J. P. Koch Fjeld local gravity data (Fig. 7). The results indicate an apparent topographic density slightly below 2.30. Although such regression analysis should only be used with care, especially when topography is closely linked to geologic structure as in J. P. Koch Fjeld, a density of ϱ = 2.30 g/cm³ has been selected as the most realistic reduction density for Jameson Land in the absence of other density information. Naturally this density value applies to the terrain corrections as well as the Bouguer "slab" correction.

The outline of the Bouguer anomaly contours is shown for the whole central East Greenland region in Fig. 8 (density 2.67), for Jameson Land in Fig. 9 (density 2.30 except for the few high-altitude stations in Werner Bjerge and Liverpool Land), and for the local J. P. Koch Fjeld area in Fig. 10 (density 2.30). Contour intervals in the maps are 10, 5 and 1 mgal, respectively.

The Bouguer anomaly maps have been supplemented with results from the GGU offshore gravity survey of 1980. This survey, which was executed by a commercial contractor as part of a major seismic project, was tied to IGSN 71 in Reykjavik, Iceland. The anomalies have been transformed to free-air anomalies in system GRS 67, and to Bouguer anomalies with density 2.30, using a two-dimensional terrain correction procedure. These Bouguer anomalies are shown directly in the Jameson Land plot (Fig. 9), while they have been recomputed to reference density 2.67 without the 2-D terrain correction for the central East Greenland plot (Fig. 8). In both plots the location of the survey tracks is indicated with small dots.

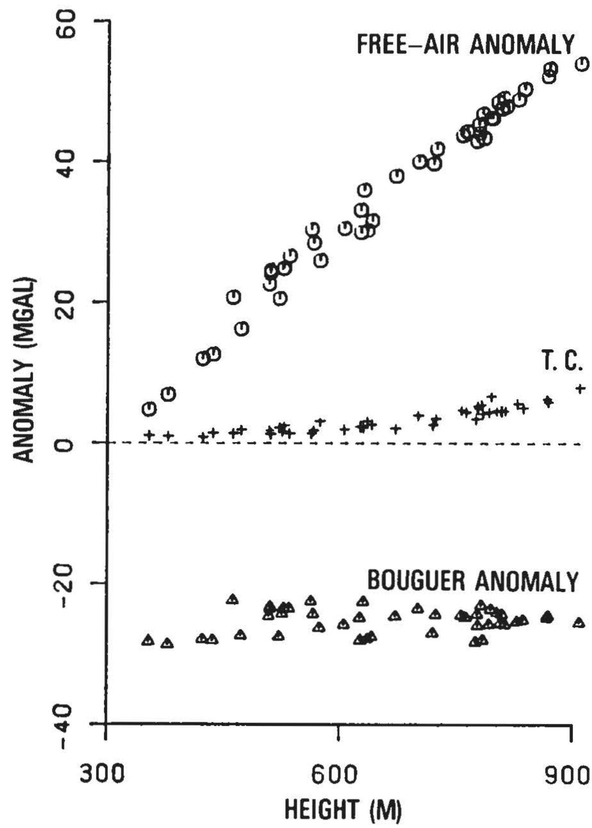

Fig. 7. Regression of free-air anomalies, terrain corrections and Bouguer anomalies (density 2.30 g/cm³) in the J. P. Koch Fjeld area. The absence of trend in the Bouguer anomalies indicates that the selected Bouguer density may be close to the average density of the Jurassic sediments of the area.

Results of earlier DGI gravity surveys in central East Greenland

Based on ties from the new gravity network, results of gravity surveys in 1954 in the Scoresby Sund fjord system and in 1976 in the Kong Oscar/Kejser Franz Joseph Fjord region have been reprocessed, and results are published here for the first time. Both surveys were ship-borne, with all stations close to sea-level. The surveys complement the recent survey to give a better regional coverage, and the results have been listed in Appendix 2 in the same manner as the 1982–84 survey listings, and have also been used for the preparation of the Bouguer anomaly maps (Figs 8 and 9). As in the recent survey, terrain corrections have been computed for stations between 70° and 72°N, i.e. for the stations from the 1954 Scoresby Sund survey.

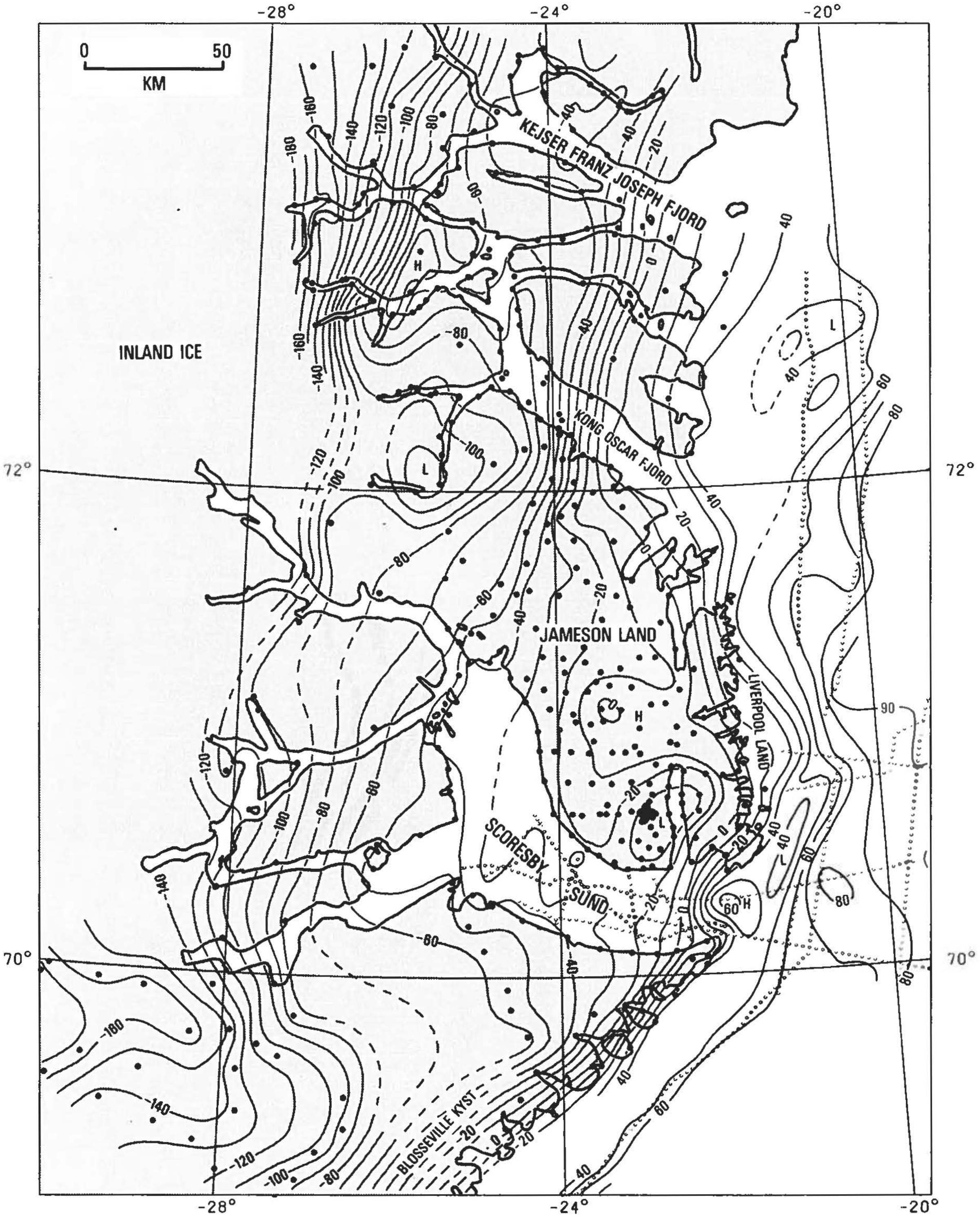

Fig. 8. Bouguer anomaly map of central East Greenland. Gravity datum IGSN 71, normal gravity GRS 67. 10 mgal contour interval. A more detailed map of Jameson Land anomalies is shown in Fig. 9.

The 1954 Scoresby Sund survey

The survey took place simultaneously with early triangulation in the area. Using a Frost Gravimeter, 78 observations were taken at 15 stations by B. Svejgaard of DGI. The Frost measurements are less accurate compared to those of modern gravimeters, and several instrument tares occurred during the survey. However, the many repeat measurements facilitated the isolation of these jumps in instrument bias. The network has been tied to the modern LaCoste and Romberg network through stations at the settlements Scoresbysund and Kap Tobin.

The readjustment of the network gave as standard deviation of a single measurement the relatively high value 0.35 mgal. The scale factor of the Frost gravimeter could not be determined through the adjustment, so a value of 1.00985 mgal/scale division was taken from values used in similar surveys with the same instrument in western Greenland (Svejgaard 1959). Due to the limited north–south extent of the network the role of a possible scale factor error is hardly significant. Coordinates of the gravity stations have been redigitized from the newer 1:250 000 maps and are precise to a few hundred metres, except for a few stations whose precise location was uncertain.

The 1976 Kong Oscar/Kejser Franz Joseph Fjord survey

This gravity survey in the fjord region north of Mesters Vig was similarly undertaken as part of a triangulation project in the region, and was carried out by K. Ekholm. The measurements were done using a Worden gravimeter (no. 142), with a total of 166 readings at the 73 different stations for the survey. The gravimeter used had a limited measuring range of 80 mgal. Due to the large gravity changes frequent resetting of the measurement range was necessary. In some cases this resetting happened accidentally, thus producing unwanted tares giving poorly determined points in the network.

In the adjustment of the gravimeter readings, gravity values at 4 stations remeasured during the 1982–84 survey were kept fixed. The scale factor of the instrument was treated as unknown and yielded a value of 1.03756 mgal/s.d. in the final solution. The standard deviation of a reading was estimated at 0.13 mgal. The coordinates of the gravity stations have been derived from a Landsat image of the region, using the existing triangulation as control.

Qualitative discussion of Bouguer anomaly results

The gravity map of central East Greenland (Fig. 8) shows a remarkable change of Bouguer anomaly, from +90 mgal on the continental shelf to −180 mgal at the innermost branch of Kejser Franz Joseph Fjord. This change in overall Bouguer anomaly values correlates closely to the overall topography, the area with the most negative anomaly values also being the area of highest topography near the centre of the East Greenland Caledonian fold belt. The decrease in gravity anomalies from the continental shelf to the Inland Ice may therefore be ascribed to a large degree to isostatic factors, in accordance with experience from other areas of the world (e.g. Scandinavia), probably reflecting primarily crustal thickening and upper mantle density anomalies. The lack of geophysical information on crustal thickness, however, prohibits separation of these two sources.

The decrease in Bouguer anomalies from the outer coast to the Inland Ice margin is not just a gradual change. Major gradients are seen along the outer coast of Liverpool Land, along the Blosseville Kyst and along the post-Devonian main fault (Skeldal fault) separating the complexes in Stauning Alper from the late Palaeozoic–Mesozoic sedimentary basin of Jameson Land. The magnitudes of these gradients (more than 3 mgal/km along the Blosseville Kyst) implies major intracrustal composition changes and/or abrupt changes in crustal thickness. The thick accumulation of late Precambrian to Devonian sediments east of the Caledonian complexes north of Mester Vig is also reflected in the pattern of the Bouguer anomalies, as the gradients are small over this area.

The Jameson Land sedimentary basin is characterized by a relatively smooth gravity anomaly picture compared to the rest of the region. The Bouguer anomaly map of Jameson Land (Fig. 9) shows the existence of major anomalies linked to basin structure and basement composition. A significant E–W trending positive anomaly is seen in the central part of Jameson Land, and, south of this high, prominent SSW–NNE trending high and low anomaly ridges are seen continuing out into Scoresby Sund. At the south tip of Liverpool Land extremely large gradients occur, with an offshore high of +50 mgal probably indicating a major intrusion.

The location of the central Jameson Land gravity high corresponds to a hinge line known from the structure of the sedimentary formations. Palinspastic sections of sediment thicknesses show much larger thicknesses of the individual sedimentary formations to the north of this line than to the south, despite the gradual outcrop of older and older sediments towards the north (Birkelund & Perch-Nielsen 1976, fig. 286). The gravity high is associated with a magnetic high of 100–200 gammas (L. Thorning, pers. comm.), and probably the explanation of the anomaly necessitates both changes in basement topography and composition.

Contrary to the central Jameson Land anomaly, the gravity high in southwestern Jameson Land and the low centred at Hurry Inlet seem to have no or even slightly negative correlation with the magnetic field, suggesting a different source of the anomalies compared to the cen-

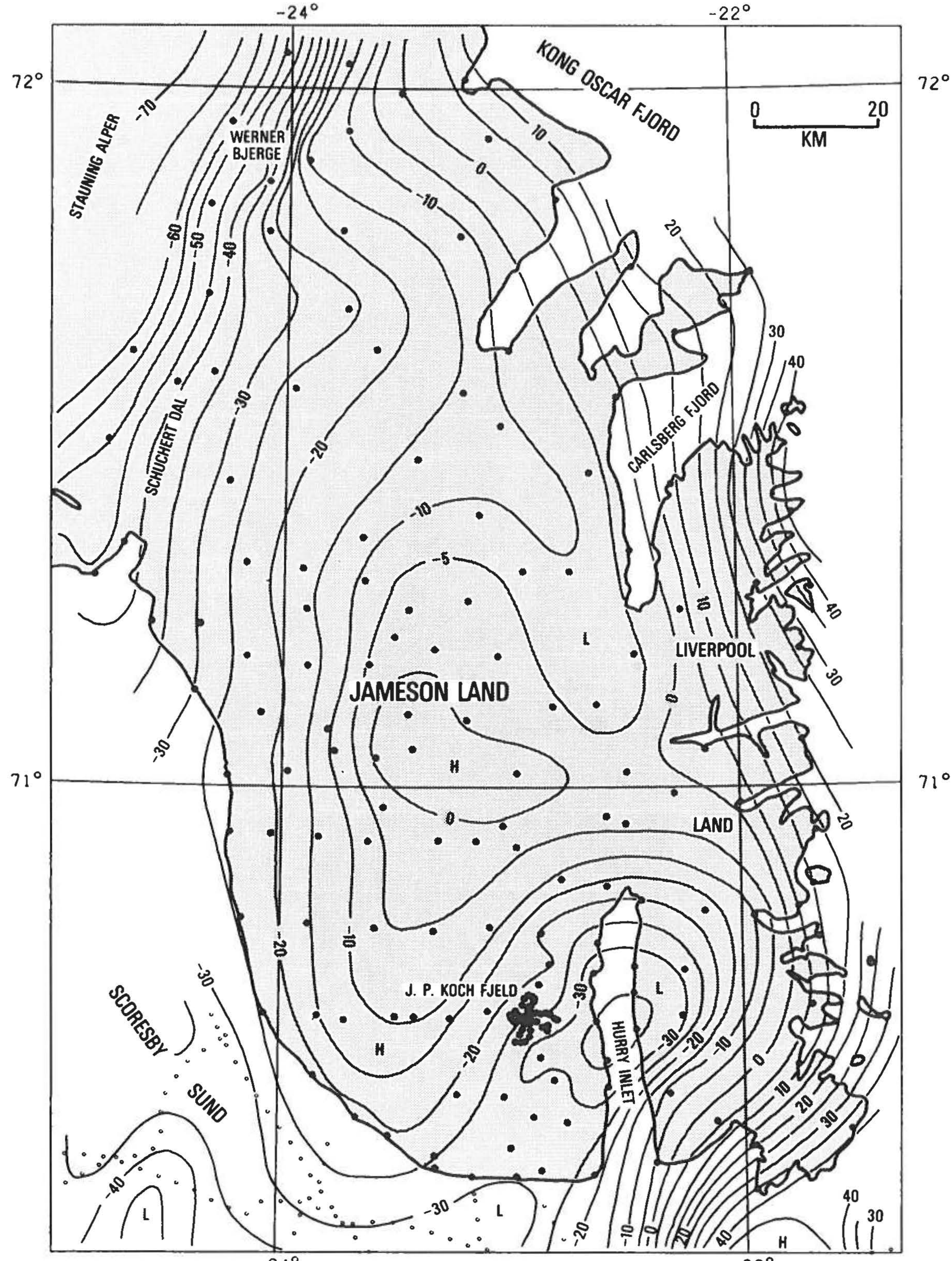

Fig. 9. Bouguer anomaly map of Jameson Land. Contour interval 5 mgal. Reduction density 2.30 g/cm³. For high-altitude stations in Stauning Alper, Werner Bjerge and Liverpool Land 2.67 g/cm³ has been used.

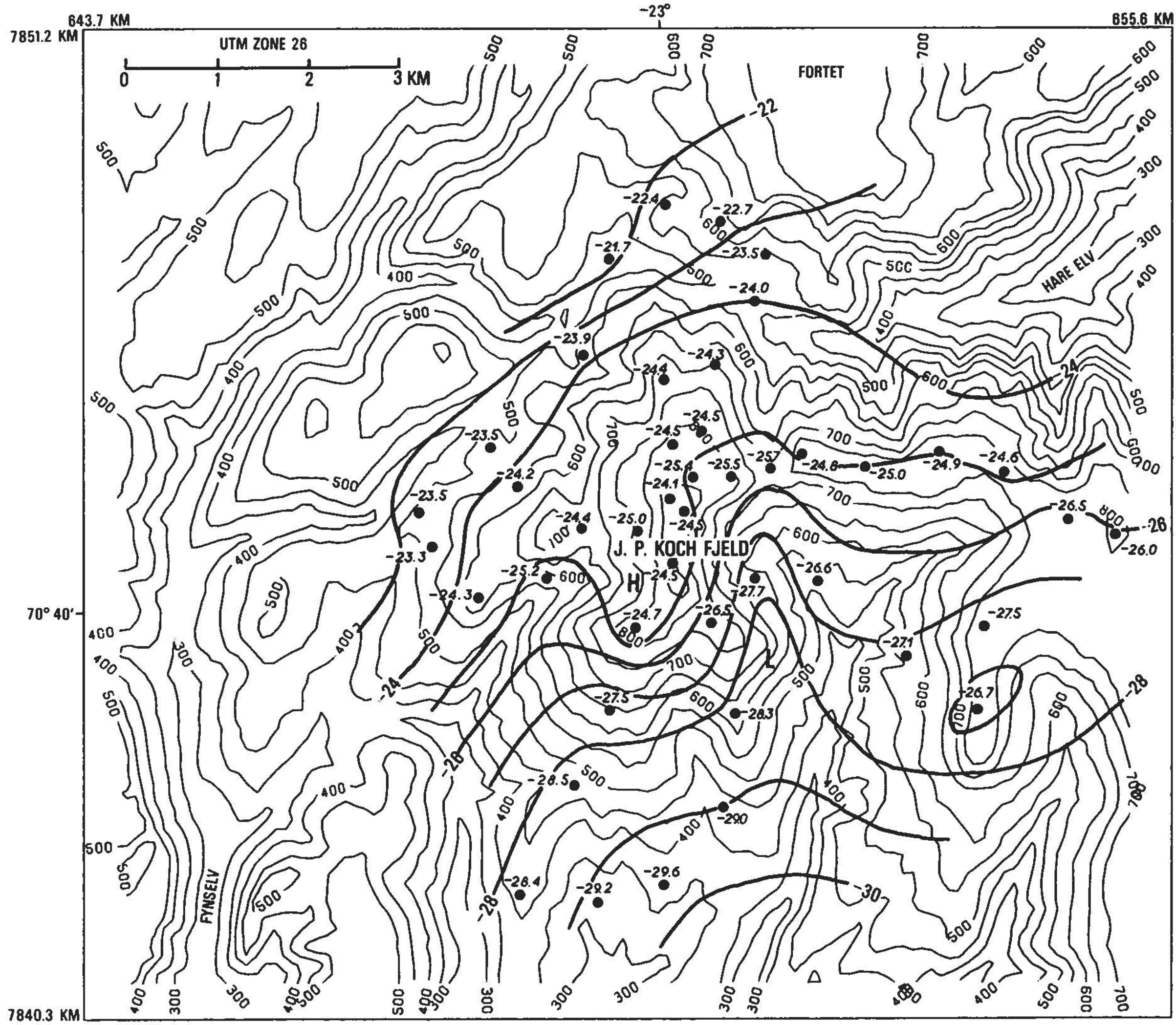

Fig. 10. Bouguer anomaly map of the J. P. Koch Fjeld area, southern Jameson Land. Density 2.30 g/cm^3, contour interval 1 mgal. Topography interpolated from the 100 m × 100 m digital terrain model contoured at 50 m intervals.

tral high. The Hurry Inlet gravity low seems to continue into the Liverpool Land area where it roughly coincides with the location of the youngest intrusive of the area, the Hurry Inlet granite body (Henriksen & Higgins 1976, fig. 213). The occurrence of this probably light granite might explain part of the anomaly. In the sediments west of Hurry Inlet the anomaly trend roughly follows the axis of a relatively broad syncline seen in the Jurassic sediments, on top of which the youngest sediments of Jameson Land, of lower Cretaceous age, rest with angular unconformity (Birkelund & Perch-Nielsen 1976, fig. 293). The anomaly might therefore in part be due to local deepening of the sedimentary basin, but to give more valid interpretations quantitative investigations utilizing independent geophysical information is needed. This is, however, not the subject of the present paper.

The Bouguer anomaly results in the J. P. Koch Fjeld area of southern Jameson Land are shown in Fig. 10 with 1 mgal contour interval, overlain on topographic contours at 50 m interval. The structural disturbance in the sediments mentioned earlier consists essentially of a dome-like structure. The sediment dips around the summit of J. P. Koch Fjeld summit have large values, up to 30–40°, directed away from the mountain, compared to the low sediment dips (few degrees) encountered farther away from the mountain (Surlyk & Birkelund 1972). The structure is terminated on the east side by a N–S trending fault, roughly at the location of the indicated residual gravity low.

The J. P. Koch Fjeld structure itself seems to be associated with a small residual gravity high of 1–2 mgal amplitude. This thus points to a (minor) intrusive plug as the possible source of the sediment disturbances, in accordance with the existence of the many Tertiary sills and dykes in the area. As mentioned earlier, however, this conclusion is tentative, as the apparent magnitude of the residual gravity anomaly is critically dependent on the density used in the Bouguer reduction. It would therefore be advantageous to undertake laboratory investigations of densities of samples from the area before more detailed interpretations are made.

Summary and concluding remarks

In the present paper new gravity data from central East Greenland and the outer coast between Scoresbysund and Angmagssalik have been presented. The emphasis in the presentation has been to outline the processing of the raw gravimeter readings into final terrain-corrected gravity anomalies, including fairly detailed discussions of barometric levelling, the sources of geographical coordinate information and computation of terrain corrections. The paper has been designed and written in a form intended to make it valuable as a reference for future gravity work in the region.

The presented survey data includes 379 gravity stations from the 1982–84 survey, and 78 additional stations from earlier, unpublished DGI gravity surveys in the region. The Bouguer anomaly variations in the region were found to be dramatic, with a general isostasy-related anomaly slope towards the Inland Ice and major anomalies related to crustal structure. In the Jameson Land sedimentary basin major gravity anomalies have been detected, anomalies which are likely to be of interest in the interpretation of the basin structure in an area currently of great interest for oil exploration.

The main part of the Jameson Land gravity survey was carried out during a three week period of 1982. The results of this relatively low-cost survey show that the gravity method may be an advantageous exploration tool even for detailed work in Greenland, without excessive costs. A prerequisite for future surveys is, however, in most areas the availability of maps of sufficient quality, or – even better – photogrammetric digital terrain models for computations of terrain correction. Although barometric levelling has provided sufficient accuracy in the height determinations of the present survey, the requirements of more precise gravity measurements may not be fulfilled. For such measurements the use of geodetic inertial survey systems would be a great advantage (Forsberg & Tscherning 1982), in spite of the significantly increased survey costs involved.

Acknowledgements

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Appendix 1: Gravity data of the 1982–84 DGI survey.

Stat. no.	Latitude ° ' ''	Longitude ° ' ''	Height (m)	Gravity	Free-air (- mgal -)	Bouguer (- mgal -)	T.c.
41021	72 23 12	-25 15 06	1	982654.76	-85.9	-86.0	
41042	73 20 07	-26 27 29	3	982664.54	-124.1	-124.4	
41043	73 05 06	-27 16 00	0	982624.80	-152.1	-152.1	
41046	73 26 37	-27 06 54	0	982640.16	-154.8	-154.8	
41100	72 13 58	-23 55 10	10	982682.95	-46.9	-48.0	
41119	73 42 06	-24 31 12	1	982756.14	-51.2	-51.3	
41142	72 14 24	-23 54 28	42	982680.05	-40.3	-45.0	
41208	72 01 25	-26 23 13	78	982614.51	-83.2	-92.0	
41349	73 02 36	-24 43 11	1	982720.99	-53.5	-53.6	
41413	73 43 48	-27 22 21	751	982504.53	-72.9	-156.9	
41414	73 44 20	-26 30 32	720	982529.42	-58.0	-138.6	
41416	73 34 36	-26 13 43	584	982575.75	-45.7	-111.0	
41417	73 32 45	-25 30 09	323	982662.48	-37.9	-74.0	
41420	72 55 23	-27 30 29	40	982585.93	-170.5	-174.9	
41423	73 49 05	-26 03 24	464	982601.32	-68.9	-120.8	
41424	73 46 47	-25 36 35	1	982701.61	-109.5	-109.6	
41445	72 58 18	-24 32 29	2	982711.14	-59.4	-59.7	
41446	72 52 53	-24 29 34	0	982704.84	-61.8	-61.8	
41447	72 54 42	-24 05 30	2	982707.87	-59.7	-59.9	
41448	72 50 58	-23 33 16	1	982712.18	-52.5	-52.6	
41449	72 50 57	-23 02 14	1	982740.75	-23.9	-24.0	
41450	73 01 47	-24 09 52	2	982715.59	-57.9	-58.2	
41451	73 02 01	-23 49 33	1	982721.51	-52.5	-52.6	
41452	73 04 22	-23 28 46	1	982724.94	-51.1	-51.2	
41453	73 02 52	-23 05 03	1	982742.16	-32.6	-32.7	
41454	73 28 46	-23 38 52	2	982757.14	-38.9	-39.2	
41455	73 25 40	-24 47 38	1	982743.56	-50.3	-50.4	
41456	73 24 01	-24 13 54	1	982747.97	-44.5	-44.6	
41457	73 20 48	-23 46 03	1	982751.49	-38.3	-38.4	
41458	72 34 25	-24 17 47	3	982680.46	-69.4	-69.7	
41459	73 37 13	-24 02 00	2	982756.64	-46.4	-46.6	
41461	73 22 21	-23 10 01	1	982744.43	-46.6	-46.7	
41462	72 44 47	-24 27 05	2	982680.56	-78.5	-78.7	
41464	72 44 39	-25 03 22	0	982689.22	-70.3	-70.3	
41465	72 36 09	-25 15 06	228	982622.00	-59.9	-85.4	
41466	72 58 59	-25 47 44	354	982661.33	-1.3	-40.9	
41467	73 07 01	-25 43 28	1	982726.90	-51.4	-51.5	
41468	73 15 33	-25 31 38	1	982713.34	-72.1	-72.2	
41469	73 40 06	-25 06 32	1	982734.86	-70.8	-70.9	
41471	73 06 11	-25 04 41	1	982712.79	-64.8	-64.9	
41472	73 13 25	-25 33 40	1	982710.31	-73.3	-73.4	
41473	72 53 37	-24 45 56	0	982713.98	-53.2	-53.2	
41474	72 52 45	-25 08 17	0	982712.62	-53.9	-53.9	
41475	72 59 35	-24 50 41	0	982717.85	-54.4	-54.4	
41501	72 10 08	-22 38 23	1	982745.22	16.0	15.9	
41502	72 08 24	-22 09 28	0	982770.58	42.6	42.6	
41503	72 15 50	-22 00 56	0	982770.66	36.1	36.1	
41504	72 22 04	-22 25 45	0	982770.23	30.2	30.2	

Stat. no.	Latitude ° ' ''	Longitude ° ' ''	Height (m)	Gravity	Free-air (- mgal -)	Bouguer (- mgal -)	T.c.
41505	72 26 53	-21 56 01	1	982784.22	40.3	40.2	
41506	72 38 58	-21 38 00	0	982791.54	36.9	36.9	
41507	72 51 58	-21 34 10	0	982793.41	27.6	27.6	
41508	72 48 32	-22 24 29	66	982763.50	21.0	13.6	
41509	72 41 34	-22 51 38	0	982759.01	2.1	2.1	
41510	72 32 14	-23 09 57	69	982737.76	10.2	2.5	
41511	72 23 13	-23 28 58	2	982721.76	-18.6	-18.8	
47601	72 15 31	-23 55 29	2	982686.18	-47.5	-47.7	
47603	72 52 45	-25 08 17	6	982711.43	-53.2	-53.9	
47607	72 15 26	-23 55 59	31	982679.40	-45.2	-48.7	
47611	72 43 26	-26 09 17	6	982710.49	-46.2	-46.8	
47613	72 40 05	-24 41 33	15	982686.08	-64.9	-66.6	
48203	72 13 45	-23 55 05	8	982683.39	-46.8	-47.7	
48204	72 00 50	-23 12 41	0	982727.78	6.5	6.5	
48205	72 03 01	-24 01 25	57	982661.29	-44.4	-50.7	
48206	72 14 05	-23 55 04	6	982684.57	-46.6	-47.2	
48207	72 13 42	-23 45 16	1	982702.71	-29.6	-29.8	
48208	72 10 08	-23 44 15	1	982702.63	-26.6	-26.7	
48209	72 07 50	-23 53 01	0	982688.03	-39.5	-39.5	
48210	72 08 48	-23 36 37	0	982711.65	-16.7	-16.7	
48211	72 07 35	-23 28 21	0	982723.33	-3.9	-3.9	
48212	72 05 46	-23 14 45	1	982737.48	12.1	12.0	
48213	71 59 51	-25 48 41	26	982599.99	-112.4	-115.3	
48214	72 01 47	-25 29 44	0	982606.64	-115.5	-115.5	
48215	72 06 46	-24 47 26	1249	982384.42	43.1	-96.7	
48216	72 10 20	-24 22 36	121	982617.37	-75.0	-88.5	
48217	72 20 51	-24 25 28	0	982658.72	-80.2	-80.2	
48218	72 24 43	-24 33 47	1	982666.35	-75.7	-75.8	
48219	72 25 47	-24 48 58	2	982658.85	-83.8	-84.0	
48220	72 23 28	-24 59 35	1	982653.45	-87.5	-87.6	
48221	72 17 04	-25 20 53	1	982638.89	-96.4	-96.5	
48222	72 13 32	-25 30 24	0	982631.27	-101.2	-101.2	
48223	72 08 57	-25 28 27	0	982620.56	-107.9	-107.9	
48224	72 24 21	-25 33 50	0	982649.12	-92.9	-92.9	
48225	72 24 49	-25 48 33	0	982652.52	-89.9	-89.9	
48226	72 24 20	-26 03 13	0	982653.19	-88.8	-88.8	
48227	72 22 54	-26 18 31	0	982653.30	-87.4	-87.4	
48228	72 17 43	-24 09 33	0	982670.36	-65.8	-65.8	
48229	72 19 00	-23 54 55	0	982685.11	-52.2	-52.2	
48230	72 10 58	-24 07 00	294	982606.57	-33.0	-65.9	
51001	71 26 16	-24 15 03	491	982555.12	16.4	-36.1	2.4
51024	71 34 46	-26 14 42	1564	982271.99	56.4	-76.2	42.4
51037	70 49 34	-28 06 22	1449	982256.25	47.0	-98.5	16.6
51205	70 25 16	-21 57 24	55	982655.91	39.8	34.1	0.5
51208	70 26 38	-22 38 53	69	982597.77	-15.3	-22.5	0.6
51220	70 29 00	-21 58 24	13	982651.37	18.7	18.4	1.2
51259	70 29 02	-21 57 14	56	982643.76	24.3	19.2	1.2
51261	70 40 20	-22 55 40	908	982421.37	54.0	-37.3	10.3

Stat. no.	Latitude ° ' "	Longitude ° ' "	Height (m)	Gravity	Free-air (- mgal -)	Bouguer	T.c.
51301	70 28 15	-23 19 53	75	982596.02	-16.8	-24.9	0.2
51303	71 08 13	-24 23 15	39	982635.02	-26.5	-30.7	0.1
51312	70 23 42	-25 18 08	1069	982319.47	17.5	-54.5	47.6
51317	71 22 59	-25 14 12	1376	982323.31	60.5	-59.6	33.8
51395	70 57 30	-22 35 07	594	982530.37	50.0	-10.8	5.7
51829	71 51 59	-24 05 32	1792	982287.88	127.1	-39.2	34.2
51845	71 13 56	-24 22 12	219	982602.36	-8.9	-32.9	0.5
51864	71 57 05	-24 16 16	667	982523.23	11.0	-57.2	6.5
51928	71 49 59	-24 21 35	145	982623.21	-43.7	-49.9	10.0
51938	71 42 18	-24 21 42	78	982636.46	-44.2	-45.6	7.3
53032	70 43 02	-22 52 49	780	982459.72	50.3	-33.5	3.5
53034	70 40 35	-22 51 04	795	982448.74	46.3	-36.4	6.3
53035	70 40 01	-22 48 04	813	982444.32	47.9	-37.9	5.1
53036	70 39 03	-22 50 43	784	982447.70	43.3	-38.2	6.3
53069	70 28 57	-23 00 12	218	982560.26	-9.1	-32.9	0.6
53095	70 33 38	-22 19 19	386	982554.89	32.9	-8.4	2.0
53145	71 01 41	-26 16 23	0	982581.19	-86.2	-64.2	22.1
53151	71 08 14	-27 48 34	34	982552.95	-110.1	-98.7	15.2
53153	71 27 05	-27 15 54	1	982566.27	-124.3	-95.6	28.8
53157	71 38 40	-27 11 45	0	982570.80	-130.6	-116.5	14.0
53201	70 47 38	-23 20 27	534	982534.30	44.7	-13.4	1.6
53202	70 56 42	-23 02 10	553	982544.79	52.5	-8.7	0.7
53203	70 55 21	-23 09 26	511	982550.79	46.8	-9.9	0.5
53257	71 21 30	-23 38 53	649	982533.72	48.1	-22.9	1.6
53272	71 05 01	-23 47 54	129	982632.00	1.2	-13.1	0.1
53278	71 12 57	-23 30 34	470	982573.77	40.8	-10.8	0.9
53279	71 15 17	-23 26 52	492	982571.95	43.6	-10.4	1.0
53280	71 16 04	-23 11 30	579	982552.96	50.8	-12.4	1.6
53287	71 03 15	-23 25 47	325	982603.06	34.4	-1.4	0.6
53307	71 11 57	-22 27 12	205	982626.49	12.7	-9.1	1.1
53319	71 10 34	-23 37 02	260	982615.15	19.6	-9.0	0.5
53351	71 59 36	-23 29 37	75	982700.53	3.5	-1.3	3.6
53352	71 47 22	-23 13 48	29	982690.16	-10.1	-11.5	1.9
53353	71 37 34	-23 00 34	0	982690.20	-10.2	-7.2	3.0
53354	71 23 27	-23 08 32	146	982646.42	3.9	-10.0	2.4
53355	71 11 19	-23 03 29	175	982633.47	11.1	-6.3	2.2
53356	71 01 14	-22 58 28	460	982572.10	46.9	-4.3	0.2
53357	70 47 26	-22 52 12	92	982610.51	-15.2	-22.3	3.3
53358	70 40 25	-22 55 54	868	982433.06	53.2	-36.7	7.2
53359	70 40 32	-22 55 28	836	982440.18	50.4	-37.6	5.6
53360	70 40 31	-22 54 48	807	982446.30	47.6	-37.4	5.3
53361	70 40 33	-22 54 05	725	982465.44	41.4	-36.5	3.3
53362	70 40 37	-22 53 30	778	982453.30	45.5	-36.1	5.5
53363	70 40 31	-22 52 25	764	982456.71	44.7	-36.1	4.6
53364	70 40 26	-22 49 57	778	982453.07	45.5	-36.0	5.6
53365	70 40 08	-22 48 53	792	982449.01	46.0	-38.1	4.5
53366	70 39 32	-22 50 30	776	982450.66	43.3	-38.9	4.6
53367	70 39 23	-22 51 54	574	982495.35	25.8	-35.7	2.7

Stat. no.	Latitude ° ' "	Longitude ° ' "	Height (m)	Gravity	Free-air (- mgal -)	Bouguer	T.c.
53368	70 39 52	-22 53 23	526	982506.63	21.9	-34.3	2.7
53369	70 39 54	-22 54 30	626	982483.80	29.8	-37.1	3.1
53370	70 39 40	-22 55 20	777	982450.96	43.8	-37.9	5.2
53371	70 40 02	-22 55 56	865	982432.35	52.0	-36.8	8.0
53373	70 40 45	-23 06 18	533	982514.95	31.5	-26.6	1.5
53374	70 40 07	-23 16 13	416	982543.42	24.5	-21.5	0.6
53375	70 40 15	-23 25 07	310	982571.49	19.8	-14.5	0.5
53376	70 40 15	-23 29 56	244	982585.16	13.1	-13.4	0.8
53377	70 39 58	-23 42 57	107	982612.51	-1.6	-13.4	0.1
53378	70 40 20	-23 49 58	85	982614.14	-7.1	-16.5	0.1
53379	70 40 29	-24 03 53	0	982622.58	-25.0	-25.0	0.0
53380	70 35 10	-23 50 49	0	982621.63	-20.9	-20.8	0.1
53381	70 31 37	-23 39 41	0	982617.81	-21.3	-21.2	0.1
53382	70 30 01	-23 31 32	2	982616.54	-20.5	-20.5	0.2
53383	70 26 29	-23 10 23	0	982604.71	-29.5	-29.3	0.2
53384	70 27 01	-22 52 15	61	982592.70	-23.2	-29.6	0.5
53385	70 34 12	-22 35 09	0	982607.10	-34.5	-32.3	2.2
53386	70 39 51	-22 38 05	0	982608.41	-38.5	-34.9	3.6
53387	70 08 01	-22 14 19	0	982631.77	15.3	17.2	2.0
53388	70 02 25	-22 14 40	0	982646.34	35.3	36.4	1.2
53389	70 03 46	-22 25 28	456	982543.40	71.6	26.5	5.9
53390	70 04 33	-22 13 58	440	982544.53	67.1	21.4	3.6
53391	69 50 50	-23 37 25	492	982477.25	29.2	-25.9	
53392	69 45 42	-23 50 32	15	982556.89	-33.2	-34.9	
53393	69 36 42	-24 18 16	0	982546.56	-39.3	-39.3	
53394	69 30 02	-24 29 31	304	982506.70	21.2	-12.8	
53395	69 22 52	-24 40 22	43	982560.73	1.9	-2.9	
53396	69 27 00	-24 07 47	0	982589.74	13.5	13.5	
53397	69 33 39	-23 56 08	0	982580.85	-2.0	-2.0	
53398	69 38 00	-23 33 12	45	982587.25	14.0	8.9	
53399	69 42 31	-23 12 35	11	982617.03	28.8	27.6	
53400	69 48 37	-22 53 50	0	982637.16	39.6	39.6	
53401	69 51 23	-23 03 05	0	982614.65	14.3	14.3	
53402	69 52 52	-23 14 51	2	982584.71	-16.4	-16.7	
53403	69 56 57	-22 55 48	0	982607.00	1.2	1.2	
53404	69 55 03	-22 38 58	0	982634.80	30.9	30.9	
53405	70 06 00	-22 36 22	0	982611.69	-2.9	0.7	3.6
53406	70 33 34	-23 14 16	265	982563.28	4.0	-25.2	0.5
53407	70 33 23	-23 01 57	347	982537.60	3.8	-34.0	1.0
53408	70 34 48	-22 48 55	601	982484.48	27.7	-36.0	3.6
53409	70 31 13	-22 07 09	16	982636.89	3.1	3.2	2.0
53410	70 30 23	-21 32 40	40	982664.52	38.9	39.5	5.1
53411	70 39 56	-21 24 54	0	982674.18	27.1	27.8	0.7
53412	70 41 07	-21 42 17	51	982636.95	4.5	6.2	7.4
53413	70 49 39	-21 45 13	0	982656.74	0.5	6.6	6.0
53414	70 48 53	-21 56 48	0	982636.56	-18.9	-8.3	10.6
53415	70 49 21	-22 09 30	215	982586.99	-2.6	-18.5	8.1
53416	70 50 16	-22 26 08	0	982635.42	-21.4	-19.8	1.5

Stat. no.	Latitude ° ′ ″	Longitude ° ′ ″	Height (m)	Gravity	Free-air (- mgal -)	Bouguer	T.c.
53417	70 44 34	-22 28 17	2	982617.17	-33.6	-32.7	1.2
53418	70 40 20	-22 15 45	41	982601.64	-33.1	-30.6	7.1
53419	70 39 11	-22 27 53	0	982609.75	-36.6	-35.4	1.2
53420	70 40 16	-22 57 30	671	982478.32	37.9	-34.5	2.7
53421	70 39 59	-22 58 11	605	982490.93	30.4	-34.3	3.0
53422	70 39 54	-22 59 25	626	982487.08	33.1	-33.6	3.4
53423	70 40 13	-23 00 10	510	982514.56	24.5	-31.0	1.5
53424	70 40 26	-23 00 22	510	982514.53	24.3	-31.4	1.4
53425	70 40 47	-22 59 02	535	982509.55	26.7	-31.5	1.6
53426	70 40 32	-22 58 36	567	982501.44	28.7	-32.7	2.1
53427	70 40 14	-22 56 31	759	982457.67	44.4	-36.3	4.2
53428	70 40 48	-22 55 16	802	982449.07	48.5	-36.3	4.9
53429	70 41 11	-22 54 57	700	982472.13	39.8	-34.7	3.8
53430	70 41 32	-22 54 10	511	982514.45	23.5	-31.6	2.1
53431	70 41 49	-22 53 55	528	982511.01	25.0	-31.3	2.8
53432	70 42 02	-22 54 41	630	982490.71	36.0	-32.2	2.3
53433	70 42 09	-22 55 37	563	982505.90	30.4	-30.9	1.7
53434	70 41 51	-22 56 41	463	982527.18	21.1	-28.7	2.0
53435	70 41 17	-22 57 16	526	982510.96	24.9	-31.8	2.2
53436	70 41 07	-22 55 52	724	982466.93	42.0	-35.1	3.8
53437	70 40 44	-22 55 47	809	982447.35	49.0	-36.5	5.0
53441	70 39 40	-22 56 40	829	982440.17	49.0	-36.5	7.2
53442	70 39 11	-22 57 13	639	982480.29	31.0	-36.9	3.6
53443	70 38 46	-22 57 56	468	982516.60	15.0	-35.6	1.7
53444	70 38 08	-22 59 02	419	982526.90	10.8	-34.6	1.5
53445	70 38 04	-22 57 39	349	982540.89	3.2	-34.5	1.3
53446	70 38 08	-22 56 28	373	982535.46	5.2	-35.3	1.3
53447	70 38 34	-22 55 20	432	982523.63	11.1	-35.6	1.6
53448	70 39 07	-22 55 01	630	982480.67	28.7	-37.5	4.3
53449	70 47 58	-23 05 43	358	982569.49	25.3	-14.1	0.7
53450	70 47 52	-23 35 14	257	982593.09	17.8	-10.6	0.3
53451	70 48 14	-23 52 49	126	982612.55	-3.5	-17.4	0.1
53452	70 48 41	-24 10 11	0	982630.31	-25.0	-24.9	0.1
53453	70 56 03	-24 13 20	7	982636.79	-23.2	-24.0	0.0
53454	70 55 57	-24 02 35	108	982618.28	-10.5	-22.5	0.1
53455	70 55 44	-23 50 00	113	982623.42	-3.6	-16.2	0.1
53456	70 55 20	-23 37 02	219	982606.91	12.9	-11.3	0.2
53457	70 55 25	-23 19 17	414	982571.33	37.4	-8.7	0.2
53458	70 54 51	-22 58 34	144	982620.16	3.5	-6.1	6.5
53459	70 52 06	-22 46 49	70	982628.23	-8.7	-13.8	2.7
53460	70 51 29	-22 35 07	7	982640.00	-15.8	-15.5	1.0
53461	70 46 35	-22 37 41	0	982623.72	-29.6	-28.2	1.4
53462	70 56 51	-22 30 07	12	982654.79	-4.4	-3.7	2.1
53463	71 01 20	-22 29 46	40	982654.82	0.0	-2.5	2.0
53464	71 03 15	-22 08 52	0	982665.53	-3.4	3.4	6.7
53465	71 04 01	-21 43 26	2	982683.81	14.8	21.2	6.6
53466	71 11 53	-21 43 37	6	982693.12	18.1	27.4	10.0
53468	71 17 28	-21 54 30	0	982698.54	16.5	26.7	10.2

Stat. no.	Latitude ° ′ ″	Longitude ° ′ ″	Height (m)	Gravity	Free-air (- mgal -)	Bouguer	T.c.
53469	71 23 34	-21 44 53	0	982730.65	43.0	46.4	3.4
53470	71 26 07	-22 17 17	0	982697.64	7.7	9.2	1.5
53471	71 20 24	-22 28 29	0	982681.08	-3.7	-2.4	1.3
53472	71 15 19	-22 15 01	101	982658.09	9.2	2.4	4.5
53473	71 07 09	-22 37 28	61	982650.31	-3.4	-8.7	1.5
53474	71 06 58	-22 48 53	275	982608.83	21.3	-8.6	0.9
53475	71 05 49	-23 11 50	244	982618.49	22.5	-4.4	0.5
53476	71 06 17	-23 26 58	129	982647.36	15.4	1.7	0.7
53477	71 03 07	-23 46 04	91	982640.19	-0.5	-10.6	0.1
53479	71 18 36	-22 56 46	754	982514.50	63.9	-16.6	3.8
53480	71 19 17	-24 10 06	283	982600.82	4.4	-26.8	0.5
53481	71 18 50	-23 54 53	372	982586.89	18.3	-22.9	0.5
53482	71 17 45	-23 38 19	484	982569.97	36.9	-16.7	0.6
53483	71 11 14	-24 09 37	88	982634.18	-15.0	-24.6	0.2
53484	71 10 27	-23 53 24	197	982616.68	1.9	-20.1	0.1
53485	71 15 21	-23 53 49	249	982610.75	7.4	-20.1	0.3
53486	71 01 20	-23 58 27	32	982641.05	-16.2	-19.7	0.1
53488	71 02 31	-23 35 11	209	982624.18	20.4	-2.7	0.2
53489	70 58 16	-23 33 13	312	982594.36	26.3	-8.1	0.5
53490	71 00 56	-24 14 17	0	982644.46	-22.3	-22.3	0.0
53491	71 11 54	-23 20 19	282	982613.67	23.7	-7.1	0.7
53492	71 18 37	-22 44 23	116	982644.75	-2.6	-10.5	5.1
53493	71 27 05	-22 39 04	16	982677.43	-8.5	-7.7	2.6
53494	71 33 35	-22 31 36	0	982694.00	-2.8	-0.7	2.1
53495	71 39 09	-22 15 27	0	982711.22	9.4	11.7	2.3
53496	71 44 07	-21 55 33	27	982722.62	24.6	24.9	3.3
53497	71 44 45	-22 27 14	0	982719.08	12.2	14.5	2.3
53498	71 50 31	-22 47 32	0	982715.18	3.1	3.9	0.8
53499	71 55 46	-23 06 05	122	982690.79	11.7	2.6	4.6
53500	71 47 43	-24 05 24	401	982594.16	8.3	-31.8	4.8
53501	71 47 47	-23 45 03	203	982642.85	-4.2	-20.7	6.2
53502	71 41 06	-23 43 28	100	982652.42	-20.3	-27.0	4.5
53503	71 37 36	-23 35 48	320	982608.08	6.3	-27.0	2.4
53504	71 33 58	-23 12 59	3	982678.71	-17.5	-14.2	3.6
53505	71 31 04	-23 02 46	11	982679.15	-12.0	-9.9	3.3
53506	71 28 12	-23 24 50	218	982625.28	0.6	-15.8	8.0
53507	71 06 23	-24 05 39	75	982632.83	-15.8	-24.1	0.1
53508	71 14 04	-24 35 04	0	982640.73	-38.2	-37.8	0.3
53509	71 20 45	-24 42 59	0	982640.69	-44.4	-43.3	1.0
53510	71 34 16	-23 57 34	242	982621.14	-1.6	-27.0	1.7
53511	71 35 36	-24 19 42	39	982649.71	-36.9	-36.8	4.4
53512	71 34 40	-24 29 37	42	982643.63	-41.2	-41.5	4.4
53513	71 37 15	-24 42 00	524	982531.50	-7.0	-59.8	5.8
53514	71 29 36	-24 47 52	251	982585.69	-30.1	-51.9	6.3
53515	71 25 14	-25 05 04	89	982608.04	-53.7	-49.1	14.5
53516	71 26 17	-25 22 33	0	982612.60	-77.5	-64.5	13.0
53517	71 38 39	-25 24 59	1350	982358.08	73.0	-70.4	7.7
53518	71 43 03	-25 11 43	1408	982349.92	78.8	-66.7	12.1

Stat. no.	Latitude ° ′ ″	Longitude ° ′ ″	Height (m)	Gravity	Free-air (- mgal -)	Bouguer	T.c.
53519	71 50 16	-25 22 42	2130	982206.31	151.3	-80.1	7.0
53522	71 56 21	-23 43 45	542	982591.23	41.1	-11.0	8.6
53523	72 02 07	-23 44 04	367	982628.51	19.3	-21.8	
53524	71 53 48	-23 54 39	1767	982324.76	154.7	-14.8	28.2
53525	71 31 59	-21 45 35	1	982733.05	38.0	40.2	2.3
53526	71 17 07	-21 40 15	1	982714.85	33.4	38.5	5.2
53527	70 58 39	-21 59 52	0	982655.10	-9.5	1.5	11.0
53528	70 59 30	-22 17 16	464	982569.72	47.4	-3.1	1.4
53529	70 44 51	-21 26 46	0	982676.11	24.4	24.7	0.2
53530	70 56 11	-21 40 16	0	982673.59	11.3	14.4	3.1
53531	70 51 34	-21 41 21	0	982662.11	4.1	10.7	6.6
53532	70 42 19	-22 28 26	1	982613.21	-35.8	-34.5	1.4
53533	70 44 17	-22 15 02	66	982603.54	-27.3	-29.1	5.6
53534	70 26 30	-22 58 44	1	982604.13	-29.8	-29.2	0.7
53535	70 31 38	-22 54 17	445	982515.53	13.6	-33.9	2.3
53536	70 31 10	-22 45 43	410	982522.96	10.7	-33.7	1.5
53537	70 36 45	-22 52 27	520	982496.81	13.1	-42.6	2.4
53538	70 44 00	-22 38 45	1	982614.88	-35.7	-33.1	2.7
53539	70 44 47	-22 50 09	724	982476.32	48.0	-28.2	4.9
53541	69 39 53	-27 19 46	1810	982115.06	84.2	-118.3	
53543	70 05 23	-22 50 41	8	982593.00	-18.5	-13.1	6.3
53544	70 05 54	-23 09 05	0	982577.64	-36.8	-25.0	11.8
53545	70 07 00	-23 32 14	2	982572.17	-42.7	-33.7	9.3
53546	70 10 03	-23 55 17	0	982568.04	-50.4	-41.3	9.2
53547	70 14 12	-24 26 56	0	982561.62	-60.8	-48.3	12.5
53548	70 17 48	-24 49 08	0	982578.87	-47.1	-38.8	8.2
53549	70 20 36	-25 03 18	0	982584.11	-44.5	-37.3	7.2
53550	70 35 16	-25 41 30	1	982598.60	-43.7	-42.5	1.3
53551	70 39 17	-25 16 11	0	982599.96	-46.5	-45.7	0.8
53552	70 46 11	-25 20 06	1	982606.88	-45.7	-44.7	1.2
53553	70 56 56	-25 29 07	0	982619.32	-43.7	-38.7	5.0
53554	71 05 05	-25 21 05	0	982632.57	-38.0	-37.0	1.0
53555	71 14 50	-25 14 06	0	982628.21	-51.4	-49.7	1.7
53556	69 45 27	-24 24 01	1690	982196.51	123.2	-65.9	
53557	69 52 04	-24 35 43	1608	982231.43	126.3	-53.6	
53558	69 56 57	-24 38 18	1443	982264.88	104.1	-57.3	
53559	70 12 47	-25 06 31	507	982470.54	5.8	-45.4	5.6
53560	69 45 01	-28 22 47	2045	982024.80	61.4	-167.4	
53563	70 06 40	-24 54 49	1753	982184.26	109.7	-58.2	28.3
53564	69 38 24	-29 39 19	2447	981939.30	106.4	-167.4	
53565	70 36 29	-22 35 25	0	982606.86	-36.9	-34.9	2.0
53566	69 35 23	-28 57 11	2545	981939.86	140.2	-144.6	
53567	69 36 20	-27 49 19	2243	982010.39	116.6	-134.4	
53569	69 32 07	-30 33 05	2513	981919.44	113.1	-168.1	
53571	70 42 31	-23 24 07	128	982610.66	0.7	-11.6	2.1
53573	70 36 01	-21 46 03	1	982648.45	5.4	9.8	4.5
53577	69 01 54	-25 20 14	0	982572.57	21.5	21.5	
53578	69 32 28	-30 03 10	2564	981911.19	120.2	-166.7	

Stat. no.	Latitude ° ′ ″	Longitude ° ′ ″	Height (m)	Gravity	Free-air (- mgal -)	Bouguer	T.c.
53580	69 42 41	-27 34 55	1860	982111.28	93.1	-115.0	
53581	69 45 59	-27 54 20	1673	982114.38	35.3	-151.9	
53582	69 55 48	-28 56 46	1074	982232.58	-40.8	-161.0	
53583	69 57 38	-27 23 43	7	982507.97	-96.3	-97.1	
53585	70 13 15	-27 17 40	0	982528.07	-93.5	-78.2	15.3
53586	70 08 22	-28 02 42	0	982483.41	-133.4	-116.1	17.3
53597	69 49 58	-27 08 52	1033	982311.40	31.0	-84.5	
53598	69 56 51	-28 07 44	431	982384.28	-88.5	-136.7	
53600	70 21 04	-28 09 00	19	982495.70	-127.5	-114.5	15.1
53604	69 57 19	-30 11 35	2049	982026.89	52.7	-176.6	
53605	69 59 38	-30 06 20	1910	982070.07	50.7	-163.0	
53606	69 57 19	-29 29 38	1987	982062.66	69.3	-153.0	
53608	69 30 06	-26 32 08	2081	982064.20	126.6	-106.2	
53610	69 22 18	-26 31 46	1940	982093.11	119.8	-97.3	
53611	69 16 24	-26 51 05	2329	981997.32	149.9	-110.7	
53612	69 09 34	-27 04 45	2043	982064.45	135.7	-92.9	
53613	69 11 27	-28 00 02	2634	981921.12	172.7	-122.0	
53614	69 18 26	-28 16 48	2579	981926.16	153.8	-134.8	
53615	69 22 27	-28 44 09	2607	981922.85	155.1	-136.6	
53616	69 25 59	-27 47 59	2481	981948.37	138.3	-139.4	
53618	69 27 24	-29 23 39	2338	981979.61	124.0	-137.6	
53622	71 51 43	-26 53 46	534	982498.12	-50.3	-84.9	25.2
53625	70 20 49	-28 09 51	39	982489.89	-126.9	-114.1	17.2
63000	68 12 28	-31 23 05	89	982438.31	-34.5	-44.5	
63001	67 47 36	-32 17 19	7	982523.59	51.6	50.8	
63050	68 38 28	-27 03 46	3	982527.16	0.9	0.6	
63051	68 20 32	-28 46 21	3	982518.20	10.4	10.1	
63053	67 39 37	-32 52 56	0	982483.18	17.5	17.5	
63054	67 08 22	-33 27 41	9	982448.77	19.4	18.4	
63055	66 39 36	-34 11 56	4	982427.15	27.7	27.2	
63056	66 13 39	-35 45 27	1	982334.26	-37.4	-37.5	
63057	68 15 06	-29 30 58	2	982531.38	29.0	28.7	
68214	68 15 04	-32 19 22	441	982365.87	-1.1	-50.5	
68215	68 13 04	-31 23 23	82	982439.83	-35.8	-45.0	
68216	68 13 56	-31 13 26	34	982439.58	-51.7	-55.5	
68217	68 18 41	-30 48 19	41	982437.80	-56.3	-60.9	
68218	66 21 19	-35 02 01	11	982349.03	-28.0	-29.3	
68221	68 11 15	-31 19 56	4	982462.94	-34.8	-35.3	
68223	68 10 08	-31 45 32	3	982507.50	10.6	10.3	
71502	65 34 46	-37 08 58	14	982337.61	13.8	12.3	
72531	65 59 27	-35 55 49	3	982344.11	-11.0	-11.3	
72532	65 56 53	-36 40 25	2	982312.70	-39.8	-40.0	
78212	65 36 51	-37 37 30	3	982323.38	-6.1	-6.5	

Appendix 2: Reprocessed gravity data of the 1954 and 1976 DGI surveys.

Stat. no.	Latitude ° ′ ″	Longitude ° ′ ″	Height (m)	Gravity	Free-air (- mgal -)	Bouguer	T.c.
41135	72 13 47	-23 46 08	105	982678.39	-22.0	-33.7	
41140	72 17 26	-23 52 48	24	982684.59	-43.9	-46.6	
41346	73 36 30	-22 28 33	5	982761.70	-39.8	-40.4	
41352	72 52 35	-25 06 38	23	982708.41	-50.8	-53.4	
41355	72 49 57	-25 33 18	50	982696.21	-52.5	-58.1	
47602	72 25 33	-25 53 35	3	982644.38	-97.7	-98.1	
47604	73 19 44	-25 16 53	1	982726.53	-62.4	-62.5	
47605	73 10 16	-25 42 29	3	982724.55	-55.8	-56.1	
47606	72 23 45	-25 37 53	1	982641.00	-100.2	-100.3	
47608	72 27 52	-24 40 21	1	982664.52	-80.2	-80.3	
47609	72 40 12	-27 11 54	3	982613.50	-141.3	-141.6	
47610	72 42 06	-26 46 56	1	982669.71	-87.3	-87.5	
47612	72 49 55	-25 33 03	1	982706.85	-56.9	-57.0	
47614	72 21 58	-24 18 49	6	982663.09	-75.0	-75.6	
47615	72 58 25	-25 04 10	1	982704.10	-66.9	-67.0	
47616	73 06 42	-25 04 42	1	982712.96	-65.0	-65.1	
47617	73 37 45	-22 19 54	2	982769.76	-33.7	-33.9	
47618	73 32 45	-22 48 07	3	982756.84	-42.2	-42.5	
47619	73 32 52	-22 51 21	3	982757.04	-42.1	-42.4	
47620	73 34 17	-22 58 03	4	982762.21	-37.8	-38.2	
47621	73 35 24	-22 56 15	2	982760.97	-40.6	-40.8	
47622	73 37 39	-23 11 30	2	982757.18	-46.2	-46.4	
47623	73 39 54	-23 23 00	1	982764.36	-41.2	-41.3	
47624	73 42 35	-23 50 02	1	982756.08	-51.6	-51.8	
47625	73 44 01	-23 50 45	1	982757.91	-51.0	-51.1	
47626	73 45 44	-24 24 01	1	982757.92	-52.4	-52.5	
47627	73 47 17	-24 23 46	2	982757.95	-53.3	-53.5	
47628	73 48 55	-24 02 47	5	982762.73	-48.9	-49.5	
47629	73 38 07	-24 03 31	2	982755.17	-48.6	-48.8	
47630	73 33 04	-24 24 13	16	982751.55	-43.7	-45.5	
47631	73 33 21	-24 43 30	3	982752.70	-46.8	-47.2	
47632	73 28 31	-25 03 17	2	982740.35	-55.5	-55.7	
47633	72 26 35	-24 07 02	2	982678.62	-64.7	-64.9	
47634	73 24 25	-25 29 41	4	982717.30	-74.6	-75.0	
47635	73 14 38	-25 53 54	5	982711.69	-71.7	-72.3	
47636	73 20 52	-26 27 41	5	982664.99	-123.6	-124.2	
47637	72 48 49	-25 55 16	4	982701.56	-60.3	-60.8	
47638	72 46 34	-26 24 52	3	982689.53	-70.7	-71.1	
47639	72 51 42	-26 47 40	1	982642.97	-122.3	-122.4	
47640	72 51 28	-26 51 03	2	982643.38	-121.4	-121.6	
47641	72 48 43	-27 15 00	2	982607.93	-154.5	-154.7	
47642	72 50 26	-27 16 12	2	982604.59	-159.3	-159.5	
47643	72 51 01	-27 21 13	10	982594.34	-167.6	-168.7	
47644	72 50 30	-26 42 44	1	982656.09	-108.2	-108.3	
47645	72 43 57	-25 53 36	2	982693.28	-65.1	-65.3	
47646	72 45 19	-25 47 57	1	982593.79	-66.0	-66.1	
47647	72 46 59	-25 42 30	1	982695.35	-65.9	-66.0	
47648	72 46 39	-24 51 56	3	982698.94	-61.4	-61.7	
47649	72 34 30	-24 41 38	2	982678.86	-71.3	-71.6	
47650	72 41 00	-24 25 49	7	982677.82	-76.4	-77.2	
47651	72 49 47	-24 31 20	2	982694.49	-68.8	-69.1	
47652	73 11 16	-23 00 34	2	982749.20	-32.3	-32.5	
47653	73 13 25	-23 32 55	2	982732.96	-50.4	-50.6	
47654	73 15 28	-24 01 28	1	982734.50	-50.8	-50.9	
47655	73 18 22	-24 44 35	1	982736.55	-51.2	-51.3	
47656	73 10 50	-26 11 06	3	982679.79	-101.0	-101.4	
47657	73 12 53	-26 35 14	3	982661.85	-120.7	-121.0	
47658	73 10 12	-26 39 21	8	982653.25	-125.5	-126.4	
47659	73 06 33	-26 54 06	3	982632.28	-145.0	-145.3	
47660	73 10 55	-27 04 47	2	982616.34	-164.9	-165.1	
47661	73 11 06	-27 15 13	2	982619.30	-162.1	-162.3	
47662	73 09 22	-27 33 22	8	982597.98	-180.1	-181.0	
47663	73 08 47	-26 30 56	2	982660.88	-118.5	-118.8	
47664	72 23 34	-25 15 02	1	982655.01	-86.0	-86.1	
47665	72 15 25	-23 55 29	17	982682.15	-46.8	-48.7	
53238	70 51 42	-25 21 30	2	982612.69	-44.8	-43.4	1.6
53239	70 26 45	-26 14 20	9	982585.62	-46.1	-45.1	2.0
53241	70 27 31	-28 06 28	7	982504.36	-128.7	-125.2	4.3
53242	70 51 59	-28 00 59	3	982534.46	-123.0	-112.5	10.8
53243	70 40 18	-27 47 50	3	982525.84	-120.6	-115.8	5.1
53244	70 52 22	-27 13 00	3	982552.32	-105.5	-97.7	8.1
53245	71 04 58	-27 44 29	3	982560.99	-108.6	-100.3	8.6
53246	71 08 14	-25 15 45	9	982631.20	-39.5	-39.2	1.4
53247	71 17 56	-24 50 39	1	982636.26	-45.9	-45.1	0.9
53248	71 17 40	-25 06 59	1	982638.30	-43.6	-39.9	3.8
53249	70 27 31	-27 26 12	2	982527.04	-107.6	-93.1	14.7
53250	70 27 40	-22 23 01	0	982630.38	-5.0	-4.5	0.5
53251	70 27 15	-23 19 47	4	982608.00	-25.7	-26.0	0.2

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