Structure

The structural pattern of the Agto map sheet is dominated by the typical Nagssugtoqidian ENE trend and is most clearly shown by the Nordre Strømfjord shear zone (Bak *et al.*, 1975).

The region south of the Nordre Strømfjord shear zone is characterised by an alternating pattern of linear belts and areas dominated by dome and basin structures with highly variable axial directions.

The rocks of the linear belts show strong planar and linear fabrics defined by preferred shape-orientation of hornblende, orthopyroxene, biotite and graphite, and preferred lattice-orientation of quartz and plagioclase, a subject presently under study.

Some of these southern linear belts may be older than the Nordre Strømfjord shear zone as they are either developed along the limbs of the dome and basin structures and die out along the strike, or they are directly folded into these structures, which are in turn deformed by the Nordre Strømfjord shear zone.

References

Bak, J., Korstgård, J. & Sørensen, K. 1975: A major shear zone within the Nagssugtoqidian of West Greenland. *Tectonophysics* **27**, 191–209.

Olesen, N. Ø. & Sørensen, K. 1976: Studies of the Precambrian basement in the Agto – Nordre Strømfjord area, central West Greenland. *Rapp. Grønlands geol. Unders.* **80**, 68–69.

Ramberg, H. 1949: On the petrogenesis of the gneiss complexes between Sukkertoppen and Christianshaab, W-Greenland. Preliminary report. *Meddr dansk geol. Foren.* **11**, 312–327.

Winter, J. 1974: The Precambrian geology of the Túngarnit nunât area, outer Nordre Strømfjord, central West Greenland. *Rapp. Grønlands geol. Unders.* **61**, 17 pp.

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Geophysical field work on selected aeromagnetic anomalies in central West Greenland

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During the airborne operations carried out in 1975 and 1976 (Thorning, 1976, 1977), limited field activity was undertaken on the ground, mainly with the purpose of obtaining measurements of magnetic susceptibility of rocks. In 1977 no airborne operations were carried out and the summer's field work was concentrated on ground surveys.

As in previous years the base camp was at Søndre Strømfjord where also a continuous analog and digital recording magnetometer was functional during the summer. Three field teams were supported by boat and helicopter (fig. 14); L. B. J. and C. M. worked in three areas from field camps north of Søndre Strømfjord, mainly with the purpose of collecting orientated samples from rocks causing magnetic anomalies; B. S. M. and S. A. P. worked from ca ps inland east of Sukkertoppen with a detailed survey of the Majorqaq anomaly; L.T. worked from the GGU cutter *Kornerup* in Nordre Strømfjord, from another boat on the east coast of Nordlandet north of Godthåb, and with helicopter south of Søndre Strømfjord and in the Holsteinsborg area studying the rocks and structures causing the magnetic anomalies and obtaining values of the magnetic parameters of these rocks.

Magnetic anomalies in the region between Arfersiorfik and Søndre Strømfjord (L.B.J. & C. M.).

The aeromagnetic survey of 1976 included part of the region between Søndre Strømfjord and Disko Bugt (Thorning, 1977). In order to provide magnetic parameters of rocks associated with some of the aeromagnetic anomalies, field work in 1977 was carried out in three areas in the inland part of the Nordre Strømfjord – Nordre Isortoq region (fig. 14). The main purpose was to collect orientated samples for laboratory determination of the natural remanent magnetisation (NRM) and to obtain field measurements of the magnetic susceptibility of the various rock types. This will enable the resultant magnetisation of the rocks to be calculated as the vector sum of the NRM and induced component of magnetisation. Core or hand samples were collected at 18 sites with at least eight samples from each site. Orientation was performed with a sun-compass and where this was not possible with a magnetic compass. Whenever possible, magnetic vertical field profiling was carried out with an astatic magnetometer (MINIMAG) to obtain an overall view of the anomaly.

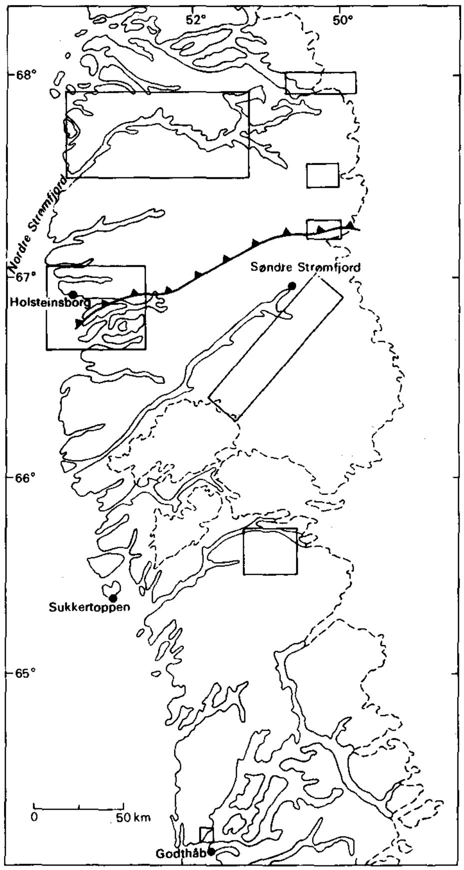

Fig. 14. Locations of the geophysical group field work in 1977.

Most of the field work was done in the central part of the quartz diorite body at the head of Arfersiorfik (68°N) (Henderson, 1969) where two areas on each side of the Tycho Brahe Sø were investigated. In the northern area measurements of magnetic susceptibility were made at many locations over the entire area to establish a reference for the interpretation of the anomalous part of the southern area at Nunatarujuk. The investigations show that this area is characterised by high susceptibilities and has a well-defined tectonically determined boundary to the south. Major parts of the diorite body in both areas are rather foliated with an east–west strike, and at several places folding and faulting are in the same general direction. In the southern part the diorite is intersected by a number of major pegmatite dykes.

Some days were spent in the Kûk area (67°30′N) where a magnetic anomaly has been identified. An attempt was made to correlate the anomaly with the boundary between hypersthene gneiss and the granodioritic gneiss. So far this has not been possible, but it is likely that some amphibolite dykes in the northern part of the granodioritic gneiss have a certain influence on the anomaly. The main geological features strike east–west.

Two magnetic profiles were made over the major thrust zone in the Manitsoq area (67°20′N) at the boundary between the Isortoq and the Ikertôq complexes of the Nagssugtoqidian mobile belt. This established a magnetic boundary that seems to correspond to the thrust zone (fig. 15). Orientated samples were here collected at two localities.

Field work on the Majorqaq magnetic anomaly (B.S.M. & S.A.P.)

A detailed ground magnetic survey was carried out on the large Majorqaq anomaly (65°40′N) identified in the previous year's aeromagnetic surveys inland from Sukkertoppen. Magnetic susceptibilities of the various rock types were measured and a small number of orientated hand samples collected.

The measurements of the total magnetic field were made with a proton magnetometer (GeoMetrics G-816) at a constant level over the ground of 2.4 m. Susceptibilities were measured with an ABEM Kappameter KT-3. Most of the work was concentrated in a north–south traverse of approximately 20 km length with measurements at 20 m intervals. A number of shorter, supplementary profiles were recorded parallel to the main profile, and over a small area the total field was measured in a rectangular grid.

The main Majorqaq anomaly appears to be associated with granulite-facies rocks. This is in good agreement with results obtained from the aeromagnetic data from other parts of West Greenland. Many of the minima near the Majorqaq anomaly seem to reflect areas with amphibolite-facies rocks. The dominant geological trend here is east–west, and some geological features with this trend are thought to influence the details of the Majorqaq anomaly. These geological features are:

(1) Igneous intrusive dykes with high susceptibilities and positive anomalies.

(2) Rusty zones with relatively high magnetic deflection, although the susceptibility values of these rocks are not particularly high. This may indicate a content of pyrrhotite with significant magnetic remanence. This must be tested during the laboratory work.

(3) Zone of inhomogeneous rocks consisting mainly of amphibolites in granitic gneisses.

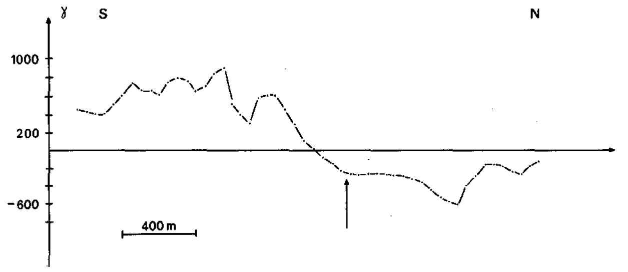

Fig. 15. Magnetic profile in the Manitsoq area. The arrow indicates the position of the thrust on the geological map.

There can be considerable variation in the magnetic susceptibility, but so far no obvious correlation with different components of the rocks have been established.

(4) A band of light coloured, homogeneous granitic rocks with a low susceptibility gives a smooth local minimum.

It is hoped that the planned work will further clarify the relationship between the metamorphic facies and the ground magnetic data, and eventually the aeromagnetic data.

General results (L.T.)

The field work has shown that some features of the aeromagnetic data are quite characteristic of most of the areas studied. One such feature is the correlation of magnetic anomalies with the local metamorphic facies. Generally, granulite-facies areas give large amplitude, high-frequency type aeromagnetic anomalies, while over amphibolite-facies terrain the aeromagnetic field is much smoother and the anomalies are of smaller amplitude. This effect can often be seen to mask the effect of differing lithologies. The results of this summer's work are consistently in agreement with these observations.

Although the analyses of the field measurements of the magnetic susceptibility of the rocks are still at an early stage it appears that the variations in magnetic susceptibilities of the surface rocks cannot alone explain all the larger magnetic anomalies. Thus it can be expected that the analyses of the aeromagnetic data may reveal some deep-seated geological structures. One important factor in this connection is the remanent magnetisation of the rocks and to evaluate this a collection of orientated samples was made and will be continued in forthcoming summers.

One purpose of the 1975 and 1976 aeromagnetic surveys was to evaluate the use of different survey parameters over different Precambrian rocks and landforms. The topography presents a number of difficulties, especially when interacting with the magnetic parameters of susceptibility and remanence. The mountains to the north of Søndre Strømfjord and those in Godthåbsfjord are of similar topographic characteristics but their effect on the pattern of the aeromagnetic field is very different. In Godthåbsfjord only minor effects can be observed, whereas at Søndre Strømfjord the topography seems to have a dominant influence. This can be understood and explained from a theoretical point of view, but it is still important to obtain as many constraints (i.e. true values of magnetic parameters) as possible for the modelling before trying to interpret data of such varying character.

Similar activities have been planned for the next couple of summers to provide a satisfactory amount of background information for the interpretation of the aeromagnetic data.

References

Henderson, G. 1969: The Precambrian rocks of the Egedesminde-Christianshåb area, West Greenland. *Rapp. Grønlands geol. Unders,* **23**, 37 pp.

Thorning, L. 1976: Aeromagnetic surveys in southern and central West Greenland between 63° and 71°N. *Rapp. Grønlands geol. Unders.* **80**, 61–65.

Thorning, L. 1977: Continuation of the aeromagnetic surveys in southern and central West Greenland between 64° and 72°N. *Rapp. Grønlands geol. Unders.* **85**, 34–37.

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Nagssugtoqidian deformation and Kangâmiut dyke intrusion in the Søndre Strømfjord area, West Greenland

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This note describes the age relationships between Kangâmiut dyke intrusion and Nagssugtoqidian deformation based on detailed mapping of dyke exposures in the summer of 1977 in the inner part of the Søndre Strømfjord area (fig. 42). Many dyke exposures were visited, six of them were studied in detail and sampled for geochemical work. Maps at 1:1000 scale were prepared of two dykes.

The Nagssugtoqidian deformation has been subdivided into two main phases: Nag. 1, lateral shear, pre-dating and in part synchronous with the intrusion of the Kangâmiut dykes, and Nag. 2, post-dyke thrusting and deformation (Bridgwater *et al.*, 1973).

The Nag. 1 deformation was thought to be largely restricted to the coastal area between Itivdleq and Holsteinsborg (fig. 42) were the Nag. 2 post-dyke thrusting has not been active. Here, undeformed Kangâmiut dykes have intruded into Nag. 1 shear zones and locally evidence was found for gross contemporaneity of Nag. 1 deformation and dyke intrusion. In the eastern (inland) area, the main Nagssugtoqidian deformation (Nag. 2) was thought to considerably overlap the southern limit of the earlier movements, so that little evidence of Nag. 1 deformation was preserved (Escher *et al.*, 1976a). However, some dykes also here were found emplaced into early Nagssugtoqidian shear zones, sometimes with very irregular margins, suggesting synkinematic emplacement.