

## Geological and geophysical investigations between 69°N and 72°N, central West Greenland

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The mapping programme initiated in 1971 (Henderson, 1972, 1973; GGU, 1973) was continued and extended to inland areas on Nûgssuaq, Disko and Svartenhuk Halvø. The sampling programme, designed for geochemical, sedimentological and palynological studies of the Nûgssuaq embayment (Schiener, 1974) was intensified, with concentration on the south coast and on parts of the north coast of Nûgssuaq. Sampling for palaeomagnetic studies on dykes and dyke swarms in the Precambrian basement and a detailed investigation of sulphide mineralisation in Tertiary intrusives on Disko was undertaken as a special project. In the spring a grid of magnetic and gravimetric stations was established on the sea-ice between Umanak Fjord and Karrats Isfjord, concentrating on the Igdlorssuit Sund area, with support from local Greenlanders.

A total of seven two-man groups were involved in the investigations during the summer season from the middle of June to early September. Logistically these parties were to some extent dependent on locally hired transport: however, the GGU ship *K. J. V. Steenstrup* with Andreas Viðstein as skipper provided the backbone of logistics and communications. Transport inland was facilitated by six 'all-terrain' motor-cycles.

### *Mapping groups*

The group led by A. K. Pedersen (Univ. of Copenhagen) operating on Disko concentrated on three main topics: (1) mapping of the coast area from Godhavn west and northward up to 70° N, in order to define the structure of the area bordering Baffin Bay; (2) investigation of the youngest volcanics on Disko; (3) investigation of sulphide and native iron mineralisation connected with intrusives related to the Maligat Formation.

In the course of the mapping in the area between Gieseckes Dal, Hammers Dal and Igdlorpait, several subvolcanic centres were discovered where basaltic eruptives were contaminated by sedimentary rocks. On the west coast the contaminated lavas provided good marker horizons which made a more detailed structural analysis possible. The volcanic sequence dips gently (3–6°) west and is cut by numerous approximately N–S trending faults of generally small displacement. The strong contamination of some of the lavas and a calculated total production of at least 200 km<sup>3</sup> of contaminated magma are assumed to have had a detrimental effect on the hydrocarbon prospects of the underlying sediments.

A party led by J. Gutzon Larsen (Univ. of Copenhagen) mapped on southern Svartenhuk Halvø. In outline, previous reconnaissance work by Pulvertaft & Clarke (1966) and Münther (1973) was substantiated. Additional detail allowed subdivision of the volcanics into three formations:

- (1) upper basalt formation
- (2) transitional formation (with a pyroclastic member forming a marker horizon near the top)
- (3) lower basalt formation

In addition to the known fault trends (NW–NNW) a major WNW-trend has been found to exist in the area. Thickness of the volcanics was estimated to be around 5–6 km in agreement with Münther's findings (1973).

The group led by G. Henderson concentrated on detailed study of the area south and south-west of Niaqornat on the north coast of Nûgssuaq. In the Sordlût valley the lowest volcanic rocks are a thick sequence of well bedded green ultrabasic hyaloclastites varying in texture from coarse breccias to fine volcanic sediments. Pillows are rare. These rocks are extensively altered. At one locality on the west bank of the river they are intruded by a tholeiitic dyke which forms a small ridge rising to a height of 10 m above the river bed and 4–5 m in width. The dyke has intruded as far as the sea floor existing at the time, cooled rapidly and become brecciated. The interstices between the blocks composing the breccia contain limestone with abundant corals.

In the Tunorssuaq valley additional evidence was found showing that this area was tectonically unstable during the earlier part of the volcanism. Repeated sagging in depressions trending NE–SW has allowed hundreds of metres of pillow breccia to accumulate in some areas. Particularly impressive is the eastern margin of a thick breccia zone in the inner part of Tunorssuaq. Close to the fault zone separating the breccia from the sediments, the breccia is well layered, the layering being shown by both textural and colour differences in the breccias. The dip of the layering is up to 70° to the west of the fault zone, but decreases westwards and upwards.

The group led by E. J. Schiener mapped a small area on the north side of the inner parts of Tunorssuaq valley (Kiggánguaq) as part of the sampling and basin-study programme. Observations by G. Henderson, above, on the pillow breccias found corroboration also in the underlying Danian sediments, which are well exposed to the east of the sudden downstep of the pillow breccias. In a zone parallel to the strike of the huge foresets of the breccias, slides of pillow breccias, sandstones and thin limestones were found in the predominating shales.

The individual slide-bodies generally dip much more steeply than the surrounding undisturbed shales and there is also some mixing of the lithologies involved. They are interpreted as gravity transported slivers of already consolidated shallow water sediments which, with eastward migration of a tectonically active zone, were tipped over the break of slope. This zone is considered to represent the eastern margin of a tectonically unstable depression, which had already developed in Danian time and culminated during the deposition of the pillow breccias.

### *Geophysical group*

A group led by G. S. Murthy (Memorial Univ., St. Johns, Newfoundland) carried out a sampling programme for a palaeomagnetic study of dykes and dyke swarms occurring in the Precambrian basement. The regions visited ranged from the inner parts of Umanak Fjord, through Karrats Isfjord to the southern parts of Svartenhuk Halvø.

J. W. Elder (Univ. of Manchester) conducted magnetic and gravimetric work on the sea-ice during April and early May. From the base at Igdlorssuit a grid of stations was established in Igdlorssuit Sund and Karrats Isfjord covering approximately 800 km<sup>2</sup>. The investigations should provide more detail on previously established magnetic and

gravity features, especially on the zone of crustal thinning to the north-east of Ubekendt Ejland. The strong linear magnetic anomalies in the area are interpreted as being caused by the remaining margins of partially ice-eroded basalt flows on the sea floor.

#### *Basin study group, Nûgssuaq embayment*

Two groups, led by J. Morten Hansen and T. Jürgensen (both Univ. of Copenhagen) operated on Nûgssuaq. They jointly sampled and measured a total of 4195 m profiles through the sedimentary section along the south coast from Qordlortoq to Ippigârssuaraq. Some profiles were also collected on the north coast from Kangilia to Iterdlaup qâqai, just east of the Itivdle valley. The results of the sedimentological observations substantiate the earlier findings of a fluvial-deltaic facies development which, as determined from palaeocurrents, progrades from south to north. Succeeding facies belts have approximately ESE-WNW strike. The occurrence of marine body fossils, together with abundant trace fossils, in the north-westernmost parts of the south coast provides evidence for the transition into the prodelta marine facies prevailing on the north coast.

E. J. Schiener studied facies development and relationships of basement and the sedimentary cover in the Kûk area on north-east Nûgssuaq. Sampling for palynological investigations and coal petrography took place concordantly. Despite great differences in the relief of the basement-sediment boundary, conglomerates are almost completely absent. Lower parts of the sedimentary column show the petrographic characteristics of 'granite-wash' with good porosities and high permeabilities.

Time was also spent in Agatdalen to investigate Danian and Cretaceous sediments, mainly for correlation purposes. The remainder of the field season was spent on south-east Disko, with sampling for geochemical and palynological investigations as the main purpose.

#### *Ore geology group*

Detailed investigation of high temperature mineralisation in subvolcanic intrusions on western Disko were carried out by F. Ulf-Møller (this report).

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