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GEOLOGICAL AND GEOPHYSICAL WORK BETWEEN 69°N AND 72°N, CENTRAL WEST GREENLAND

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In continuation of the programme of geological and geophysical work on the Cretaceous-Tertiary sedimentary and volcanic rocks initiated in 1971 (Henderson, 1972, 1973; GGU, 1973) four groups operated in the area.

Three geologists, three geophysicists, one civil engineer and three assistants formed the core of the various groups. Greenland helpers were employed for shorter periods either as boatmen or bearers. Two groups were involved in mapping and detailed sampling of the Tertiary basalts, one on Nûgssuaq, the second on Ubekendt Ejland. One group studied sedimentological problems in the Cretaceous-Tertiary rocks throughout the whole of the region. Special photogrammetric control studies were carried out by one person attached to different groups (Dueholm, this report). The geophysical party mainly investigated selected areas from south Nûgssuaq to south Svartenhuk Halvø.

The GGU ship *K. J. V. Steenstrup* with Andreas Viðstein as skipper provided logistic support.

Mapping groups

The group led by N. Hald (Univ. of Copenhagen), operating on Nûgssuaq, had three main objectives:

1. Completion of the field mapping begun in 1971 (Hald, 1973) of the upper basalt formation west of the Itivdle valley.
2. Petrological investigations of the lower lava formation, involving detailed sampling of profiles.
3. Investigation of dykes with emphasis on distribution, orientation and petrology.

Work commenced in western Nûgssuaq, where the discovery of a continuation of interbasaltic sediments from the north coast to the central Itivdle valley made possible a closer correlation. The basalts above and below this horizon were extensively sampled with a view to differentiating them on potassium content. The other two objectives were pursued by working on the north coast east of the Itivdle valley and in the Auvfarssuaq valley.

A group led by J. Gutzon Larsen (Univ. of Copenhagen) carried out detailed investigations on Ubekendt Ejland. Main objects were:

1. Detailed sampling of the lava sequence for petrogenetic and correlation purposes.
2. Investigation of the fault pattern and determination of throw on individual faults.
3. A detailed study of smaller intrusives.

Work on the structure largely confirmed the trends obtained from photogeological interpretation by Henderson (1971, unpubl.). However, although some interbasaltic sediment and tuff horizons were found, correlation of basalt units over longer distances could not be achieved.

Two main trends of dykes were established: a NE-SW system with basalt/dolerite dominating and an ENE-WSW system, which seems to be followed by most of the picrites. As a result of this year's field work a revision of the lava stratigraphy on Ubekendt Ejland is envisaged.

Sedimentological investigations carried out by the writer were firstly aimed at the margins of the sedimentary cover towards basement rock and secondly at an attempt to trace the lateral transition from the coarse clastic facies in the south-east to the predominantly shaly facies in the north. For this purpose profiles were measured wherever practical and special attention was given to palaeodirections.

Work commenced on the south coast of Nûgssuaq, from the Sarqaq valley to 15 km north of Atanikerdluk. The immediate results here were recognition of: (a) the cyclicity of sedimentation, resulting in repeated development of channel-sands already in the Cretaceous; (b) a marked and rapid decrease of the sand/shale ratio north-westward; (c) a weak anticlinal structure running approximately parallel with the coast.

During the second half of July the south coast of Disko from Agssoq to Flakerhuk was inspected, resulting in the following observations (a) the sequence is very uniformly developed as sandstones with occasional carbonaceous horizons; (b) transport directions are very consistent from the south or south-east; (c) no direct evidence for any influence of the Disko gneiss ridge on sedimentation could be detected with the probable exception of; (d) a characteristic marker assemblage of exotic components (acid subaerial volcanics, red and black cherts, pisolites and chertified limestones) which is much better developed than on southern Nûgs-suaq.

From late July until mid-August was spent in the Auvfarssuaq valley. Seven profiles were measured in detail from Tunorqo in the east to Ukádtlit in the west. As an immediate outcome the following can be mentioned: (a) the discovery of a trace-fossil assemblage (fodichnia of the type *Häntzschelinia ottoi*) in the Cretaceous sandstones, indicating shallow marine environment; (b) the discovery of a hitherto unknown patch-reef locality in Danian shales; (c) small-scale local unconformities in addition to the Danian unconformity.

The availability of 'all-terrain' motorcycles was a great asset in enabling the sections, spread over more than 30 km, to be worked in eleven days.

The remainder of August was spent in the Svartenhuk Halvø area, starting in Umíarfik, where the relations between basement and sediments were studied. Faulting appears to be subordinate, although typical basal development could not be found. The predominant facies is shaly. Subsequently, the sediments on Itsako, west Qeqertarsuaq and Upernivik Næs were inspected and some profiles measured in detail. In all areas visited the adjacent basement rocks (metagreywackes) did not contribute significantly to the composition of the cover rocks. This, together with the consistent southerly derivation must have some bearing on the palaeogeography of the embayment.

At the end of the field season a visit was paid to the newly-opened lead-zinc mine at Mårmorilik.

T. Jürgensen (Univ. of Copenhagen) collected extensively for nanno-fossils in all areas visited; in addition he again visited Marrait kitdlit (Rosenkrantz, 1970) and Kangilia (Jürgensen & Mikkelsen, in press). In the former locality an additional fossiliferous carbonate horizon was recognised. He also undertook measurements on foreset bed orientation in the basal pillow breccias.

Geophysical Group

The party led by J. W. Elder (Univ. of Manchester) undertook mainly depth-to-basement determinations. The programme was designed for seismic reflection shooting, using a technique developed during the 1972 work. Additionally the network of gravimetric, magnetic and microseismic stations was considerably extended and refined.

Three main areas were selected for seismic work, all situated on the landward margin of the sedimentary cover rocks towards basement. Work commenced in early July on south Nûgssuaq, where basement was to be traced from the south across the Sarqaq valley fault for approximately 30 km north-westwards along the coast. The second project was to investigate the Ikorfat fault on the north coast of Nûgssuaq, and the operations were concluded in the first week of August with a survey in the Itsako area of southern Svartenhuk Halvø.

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UNTRADITIONAL TOPOGRAPHIC MAPPING IN CENTRAL WEST GREENLAND

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During the geological investigations carried out in central West Greenland (see Schiener, this report) a cartographical programme was carried out to test a newly-developed method of producing topographic maps direct from aerial photographs. The programme was adapted to the working conditions of the geologists and the author was attached to different geological parties working on western and central Nûgssuaq, southern Disko, Hareøen and Ubekendt Ejland. Within the two months' season sufficient measurements were obtained to enable eventual topographic map coverage of 1700 km² with acceptable accuracy for geological mapping at the scale 1: 50 000.

Principles

The nature of the terrain and the unstable climate, coupled with logistic difficulties in many parts of Greenland, make the establishment of the complete ground control network necessary for traditional photogrammetric mapping,