
# Systematic geological mapping in 1984 in central and western North Greenland.

## General introduction to the present collection of papers

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The region between J. P. Koch Fjord (40°W) and north-eastern Washington Land (65°W) was the site of geological mapping and general geological investigations during the first of a two season systematic field mapping programme.
An expedition of 37 members, comprising 12 geological two-man parties and 13 supporting personnel including aircraft crews, worked in the region for two months during the summer. The preliminary results of the geological work are presented in 12 contributions from the individual geologists in this report (GGU report no. 126).

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The first season of the two-year field mapping programme in central and western North Greenland was carried out from mid-June to late August 1984. These investigations are a continuation of the 1978–1980 mapping programme in the Peary Land region (GGU, 1979, 1980, 1981) adjoining the present area to the east. One of the main aims of the regional studies of the present programme is completion of the 1: 500 000 geological map sheet (no. 7) covering the region between J. P. Koch Fjord (40°W) in the east and north-eastern Washington Land (65°W) in the west. The southern boundary of the map sheet is at latitude 81°N, although the Inland Ice in most of the region forms the southern margin of rock outcrop. In addition to regional mapping, general geological investigations were carried out over the whole area, and a geochemical exploration programme and source rock project were integrated with the work.

The collection of papers in this report presents the preliminary results of the 1984 geological field investigations, and in addition the first results of laboratory research. The succeeding planned field work in 1985 will continue and complete the regional mapping, and a general elaboration of the present results can be expected.

The expedition in 1984 numbered 37 participants, comprising 12 geological two-man parties and 13 supporting personnel including aircraft crews. Logistic preparations were begun in 1980, with storage of equipment used during the 1978–80 expeditions to Peary Land, and continued in the summer of 1983 when fuel, equipment and provisions were flown into the Canadian Forces Station (C.F.S.) Alert in north-east Ellesmere Island, Canada (Dawes, 1984). A tent base camp was established in south-eastern Warming Land (fig. 1) at a site pre-

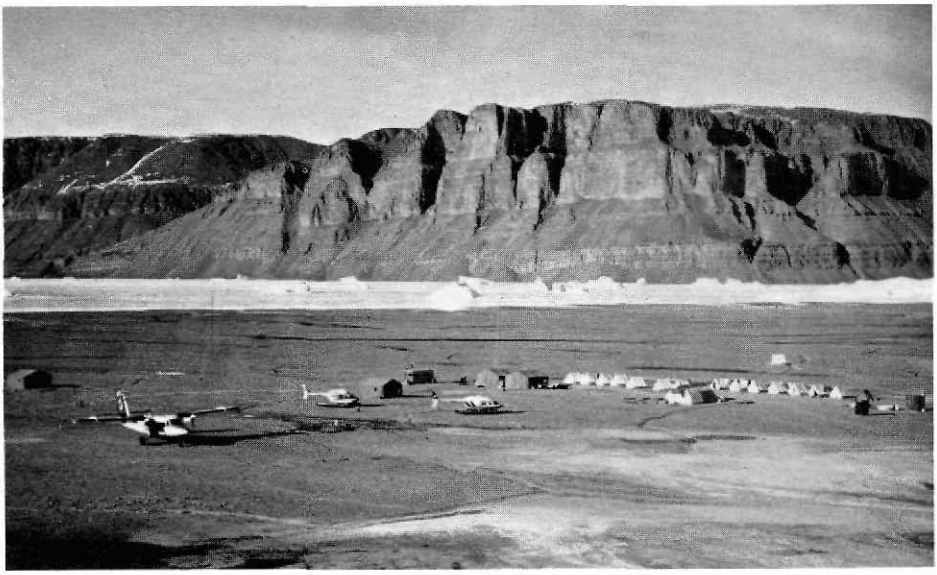

Fig. 1. Tent base camp in Warming Land.

viously used in 1979 by the Geodetic Institute during their ground surveying programme. Two chartered Jet Ranger helicopters and a Twin Otter aircraft were based here and provided transport, camp moves and helicopter reconnaissance to the geological field teams at intervals of 4–6 days throughout the season. The operation area extended about 500 km from east to west and 150–200 km from south to north.

Transport of the whole expedition to and from C.F.S. Alert was carried out with help from the Royal Danish Air Force, who airlifted personnel and material from Denmark or airports in Greenland. Permission for the expedition to use Alert for transit of equipment and personnel was given by the Department of National Defence Headquarters, Ottawa, and during the summer the Twin Otter maintained frequent connections between C.F.S. Alert and the base camp in Warming Land. In late July a fuel lift with the Danish C-130 from Thule Air Base brought in the 1985 supplies of jet fuel to Alert.

Prior to the 1984 field season topographic and photogeological maps at a scale of 1: 100 000 with 50 m contours were prepared photogrammetrically for the entire region. This work was organised and partially carried out by H. F. Jepsen assisted by O. Winding in the photogeological laboratory in GGU, using a Kern PG-2 stereoplotter instrument with a semi-automatic drawing table supported by a computer system (Dueholm, 1979). The geologists J. C. Escher and A. K. Higgins participated in the photogeological interpretations. The photogrammetric work was based on new wide-angle aerial photographs taken in 1978 at a scale of 1: 150 000, with control points established by the Geodetic Institute, Copenhagen. In all 17 base maps were constructed from within the mapping area, and covered an exposed land area of approximately 50 000 km$^2$. The photogeological interpretations were built on previous reconnaissance work from the area, and provided a geological mapping framework which proved to be a significant contribution to the general work. In addition to

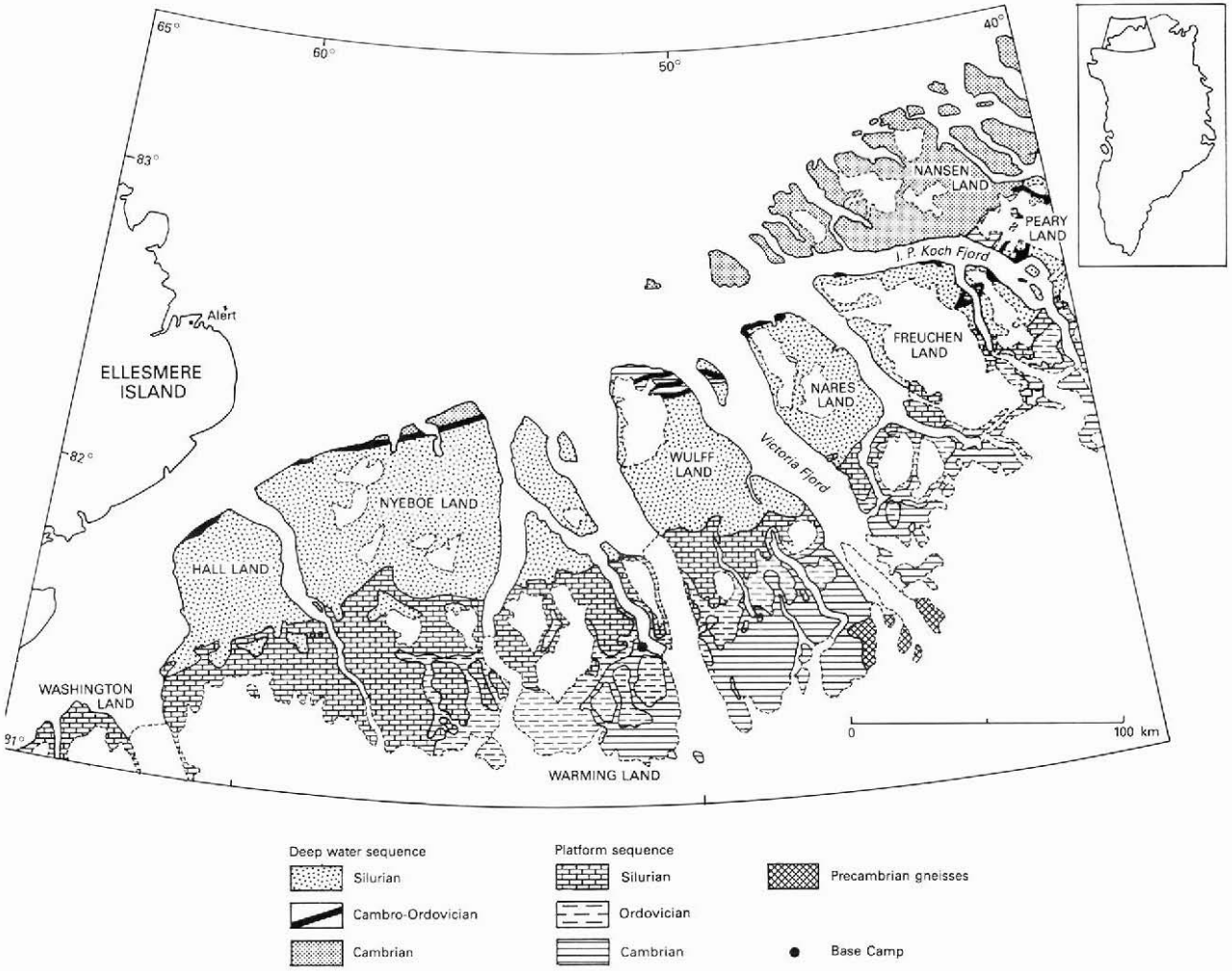


Fig. 2. Geological sketch map of central and western North Greenland showing results of mapping in 1984 and of photointerpretation.

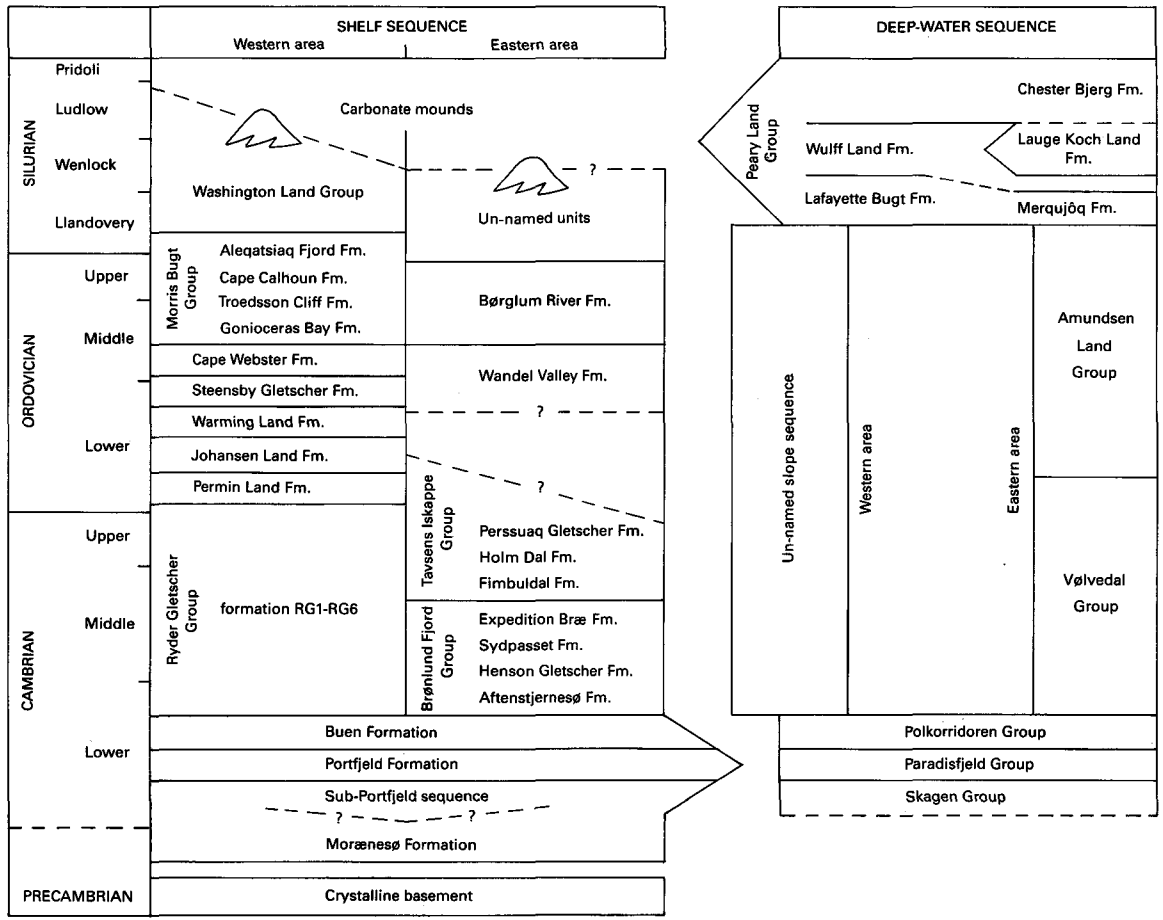


Fig. 3. Schematic summary of stratigraphic nomenclature used in this report. Due to changes in the position of the platform margin relative to the deep-water trough, the unnamed slope sequence overlies formations of the Lower Cambrian shelf sequence. Likewise expansion of the trough during the Silurian resulted in deposition of formations of the Peary Land Group above the carbonate shelf sequence.

the maps, new 1: 100 000 orthophotos from the Geodetic Institute were used as a basis for mapping.

The working area is made up of three major tectonic/stratigraphic units (figs 2 & 3). The oldest unit is the Precambrian crystalline basement which forms the northernmost exposed part of the Greenland shield; this outcrops in a small area around the head of Victoria Fjord at the rim of the Inland Ice. The second unit is a sequence of early Palaeozoic carbonate sediments, up to 3–4 km in thickness, which overlies the crystalline rocks. This sequence is exposed in a broad east–west trending belt in the southern half of the region. The third major unit is an 8–10 km thick deep-water sequence of mainly clastic sediments deposited on the slope and trough to the north of the carbonate platform. These deposits are largely Cambrian to Silurian turbiditic sediments. Northwards this deep-water sequence is increasingly involved in Upper Palaeozoic (Ellesmerian) deformation which gave rise to the North Greenland fold belt. General reviews of aspects of the geology of North Greenland include Dawes (1976), Peel (1982) and Surlyk & Hurst (1984). Many aspects of the geology have recently been summarised in a symposium volume concerning the geology and geophysics of North Greenland and Ellesmere Island around Nares Strait (Dawes & Kerr, 1982).

The distribution of the geological parties in 1984 was as follows. Reconnaissance investigations on the exposed areas of the Precambrian crystalline shield were carried out by a combination of two teams, who both had other commitments. Three parties investigated the Cambro-Ordovician carbonate shelf sequence between J. P. Koch Fjord and south-western Warming Land. One team worked in the Silurian turbidite sequence between Nyeboe Land and Victoria Fjord, and two teams mapped and investigated the folded Cambro-Ordovician deep-water sequence between Nansen Land and Nyeboe Land along the north coast. Detailed studies of the geology of Wulff Land were carried out by one team, aimed at compiling maps and profiles at a scale of 1: 100 000 using photogrammetric methods. A reconnaissance geochemical exploration programme was carried out by one team in the area between Nansen Land and Warming Land. Quaternary geological investigations were undertaken by one party, who obtained reconnaissance information from the entire working area. A special source rock project included two teams, who were partially financed by the Danish Ministry of Energy, but whose work was fully integrated in the general programme. Oblique aerial photography in both black and white and colour was undertaken from the Twin Otter along many coast and valley sections throughout the working area.

The 1984 systematic field work in the central and western parts of North Greenland was completed according to plan, and more or less detailed maps of more than half of the region have been prepared. Some activities have been completed, e.g. the Quaternary investigations, but most activities will continue in the 1985 season.

The present report contains 12 contributions from the participating individual geologists. The areas covered by the contributions are indicated on fig. 1, opposite the list of contents in this report.

*Acknowledgements.* The 1984 field work was carried out with the help of many external institutions and their personnel. The Royal Danish Air Force supplied C-130 transport. Department of National Defence Headquarters, Ottawa, gave permission to use C.F.S. Alert as a supporting base in connection with mobilisation and demobilisation, and the Polar Continental Shelf Project, Ottawa, made available hut facilities at Alert. The Danish Liaison Officer and his staff at Thule Air Base helped with the coordi-

nation and communication, and the Meteorological Institute in Copenhagen gave special weather forecasts throughout the season.

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