Dawes, P. R. 1979: Field investigations in the Precambrian terrain of the Thule district, North-West Greenland. *Rapp. Grønlands geol. Unders.* **95,** 14–22.

Goldthwait, R. P. 1960: Study of an ice cliff in Nunatarssuaq, Greenland. *Tech. Rep. Cold Reg. Res. Engng Lab.* **39,** 108 pp.

Krog, H. & Tauber, M. 1974: C-14 chronology of Late- and Postglacial marine deposits in North Jutland. *Danm. geol. Unders. Årbog* **1973,** 93–195.

Miller, G. H., Andrews, J. T. & Short, S. K. 1977: The last interglacial-glacial cycle, Clyde foreland, Baffin Island, N. W. T.: stratigraphy, biostratigraphy, and chronology. *Can. J. Earth Sci.* **14,** 2824–2857.

Weidick, A. 1978: Comments on radiocarbon dates from northern Greenland made during 1977. *Rapp. Grønlands geol. Unders.* **90,** 124–128.

Department of Environmental Sciences,
University of Lancaster,
Lancaster LA1 4YQ,
U.K.

Field work on Precambrian granites and metasediments in the Søndre Upernavik – Kuvdlorssuaq region (72°00′–74°40′N), northern West Greenland

Jan C. Escher and Ole Stecher

The 1979 field work was the last of a series of three GGU reconnaissance mapping expeditions in the Søndre Upernavik – Kuvdlorssuaq region. The investigations aimed at the production of the 1:500 000 geological map sheet of the Mârmorilik – Melville Bugt region. However, at the end of the 1979 field season it became clear that enough field data had been collected for the production of a series of six 1:100 000 geological map sheets covering the region between 72°00′ and 75°00′N. Support was again provided by the GGU motor cutter *K. J. V. Steenstrup* with Andreas Viðstein as skipper.

To consolidate the work of previous field seasons, time was spent in correlative work and re-investigation of certain areas. Special attention was given to the Prøven charnockite complex and the stratigraphy of the metasedimentary cover. A preliminary general outline of the regional geology was given by Escher & Stecher (1978).

Prøven charnockite complex

The youngest major group of rocks of the region is a large belt of hypersthene granite consisting of a variety of granite types. The contacts at the complex are concordant with the major structures of the surrounding gneisses of the basement and cover. These gneisses dip

inwards under the charnockite complex, indicating that the complex probably occupies a higher structural position than the country tocks. The Prøven charnockite complex is a late tectonic intrusion of Proterozoic age (F. Kalsbeek, personal communication, 1978) and is in granulite facies. The granites have been weakly deformed in most places, producing a weak foliation.

The following three granite types dominate the complex.

(1) A brown weathering andesine - potash feldspar-biotite-hypersthene-bearing porphyritic granite. The rock has a well developed primary texture of tabular potash feldspar phenocrysts, 4–10 cm long, tightly packed together. The granite ranges from coarse to medium grained and occurs as massive sheets within the complex.

(2) A light brown-greenish weathering feldspar-biotite-hornblende-hypersthene-bearing granite with a variable amount of garnet. The rock is generally medium grained and has in some localities a feldspar augen texture. It contains small mafic inclusions of hornblende-hypersthene-biotite gabbro. The granite occurs as massive sheets within the charnockite complex.

(3) A leucocratic quartz-feldspar-bearing granite with often a fair amount of garnet and occasionally hypersthene. The granite varies from coarse to fine grained and often occurs as irregular intrusive sheets and veins.

The contacts between these granite types vary from sharp to gradational. Where they are sharp, the age relationship is however not clear as the apparent order of intrusion is reversed from one locality to another. A close relationship in age has also been demonstrated by F. Kalsbeek who obtained a perfect Rb-Sr isochron from samples of the three granite types collected far apart from each other (F. Kalsbeek, personal communication, 1978).

Inclusions of the surrounding country rocks are common in many parts of the complex. They comprise grey biotite gneiss derived from the basement and inclusions of biotite-garnet-graphite schistose gneiss from the cover of metasediments.

Metasediments

North of the Prøven charnockite complex up to Holm Ø, from 73°00′ to 74°30′N, the metasedimentary cover makes up some 80 per cent of the exposed rocks. The metasediments are probably of early Proterozoic age (F. Kalsbeek, personal communication, 1979). The remaining 20 per cent consists of the structurally lower grey gneiss of the Archaean basement (F. Kalsbeek, personal communication, 1979). North of Holm Ø, only basement occurs with the exception of a large outcrop of very rusty weathering metasediments on Red Head, at 75°00′N.

The pronounced contrast in colour between the grey basement gneiss and the rusty weathering metasediments in amphibolite facies terrain makes the major fold patterns conspicuous in the field.

North of the Prøven charnockite complex the region continues to be in granulite facies up to 73°15′N. Further north hypersthene gradually disappears and the region changes to amphibolite facies.

Due to the intense regional deformation during Proterozoic time, the contacts between the basement and the metasediments are strongly deformed often with the formation of a

thin layer of mylonite separating the two units. Because of this intense shearing the lower part of the metasedimentary sequence is unfortunately mixed-up or incomplete. Nevertheless a reconstruction of the stratigraphy was made with the help of incomplete stratigraphic rock sections collected in the field. The thickness of the layers described below are approximate.

Stratigraphy of the metasediments

The metasedimentary cover can be divided into two major units, an upper thick monotonous unit of metagreywacke gneiss, and a lower thinner composite unit of carbonate, metapelite, quartzite and volcanic rocks.

Beginning at the base of the lower unit we have in ascending order:

(1) A layer (0.4–4 m) of metapelite consisting of rusty weathering garnet-sillimanite-muscovite-biotite-chlorite-bearing schistose gneiss. The rock is always strongly sheared and is situated directly on top of the grey basement gneiss.

(2) A layer (0.5–8 m) of metavolcanics consisting of banded amphibolite with pods of ultramafic rock. The layer is generally boudinaged or broken up into fragments.

(3) A layer (0.5–4 m) of metapelite consisting of rusty weathering garnet-sillimanite-biotite schist. Thin layers of metapelite schist occur in some localities on top of layers (4) or (5).

(4) A layer (03.–4 m) of white quartzite often with impurities of calc-silicate rock.

(5) A composite layer (1–30 m) of calc-silicate rock and marble generally rich in skarn minerals. The layers are considerably deformed and fragmented.

(6) A layer (1–15 m) of massive, sulphide-bearing, calc-silicate gneiss. The rock is black to dark rusty weathered with a high content of graphite and iron sulphide minerals.

(7) A thick layer (1.5 km or more) of very uniform banded metagreywacke gneiss interlayered with thin fine-grained metapelitic schist. The metagreywacke is typically rusty weathered and consists of a granodioritic garnet-bearing gneiss with sillimanite and graphite.

Most of the island of Atiligssuaq, situated just east of Upernavik, consists of white, calc-silicate and related rocks. This unit has an exceptional thickness of at least 1.5 km. It contains several thin layers of metapelite locally rich in garnet, sillimanite, graphite, cordierite, andalusite, biotite and muscovite, and a few thin layers of banded amphibolite and ultramafic rock. This unit is surrounded by metagreywacke gneiss and together they form the closure of a tight anticline or elongated dome structure.

The previously reported metaconglomerate structure of the metagreywacke (Escher & Stecher, 1978, p. 24) is now interpreted as boudinaged layers of quartzitic gneiss in a strongly deformed schistose matrix.

The stratigraphy of the metasediments is typical of marginal marine to open shelf sediments interrupted with minor volcanic activity. The upper unit represent flysch sediments deposited during a later transgression.

No mineral deposits of economic interest were found, but some green malachite staining occurs near the bottom of the lower unit of the metasediments.

At present GGU has no plans for further field activity in the region. Two major topics worth further investigation are: (1) detailed mapping of the internal structure of the Prøven charnockite complex and petrology of the sub-granite units, and (2) detailed study of the stratigraphy of the lower unit of the metasedimentary cover.

Reference

Escher, J. C. & Stecher, O. 1978: Precambrian geology of the Upernavik – Red Head region (72°15′–75°15′N), northern West Greenland. *Rapp. Grønlands geol. Unders.* **90,** 23–26.

O.S.,
Laboratoriet for endogen Geologi,
Geologisk Institut,
Aarhus Universitet,
Ole Worms Alle,
DK–8000 Århus C.

Mapping in the Umanak district, central West Greenland

T. C. R. Pulvertaft, Morten C. Andersen, Jeppe B. Jørgensen, J. Christian Knudsen and Lasse Schiøtte

Geological mapping in the Umanak district aimed at the production of the 1:100 000 sheet 70 V.2 Nord – Agpat continued in 1979. The background for this work was outlined by Pulvertaft (1979a). The four geologists who were in the field in 1978 were joined in 1979 by Lasse Schiøtte who mapped area III (Pulvertaft, 1979a, p. 27, fig. 9). In response to a request from Umanak Kommune, one of us (T.C.R.P.) visited the village of Niaqornat to investigate the rock falls that have damaged buildings in the village, and to assess the risk of further falls. Copies of a report on this investigation have been submitted to Umanak Kommune and GGU.

Rock types in the Umanak area

Apart from a small area of Cretaceous sediments (Pulvertaft, 1979b) overlain by Tertiary basalts which overlap onto the surrounding basement, the Umanak area is made up of Precambrian metamorphic and igneous rocks that are cut by a number of dolerite dykes of uncertain age. The Precambrian rocks are predominantly of Archaean age, the only proven Proterozoic cover rocks being the isolated occurrences of marbles and associated metasediments belonging to the Marmorilik Formation. Gneisses dominate the area. Within these there are horizons of amphibolite-dominated supracrustal rocks, paragneiss, and gneiss packed with anorthosite or leucogabbro inclusions. These were described briefly in last year's report, and the only important additional discoveries from 1979 are as follows:

(1) Good examples of relic spinifex textures are preserved in some of the larger ultrabasic bodies that occur within the amphibolite-dominated supracrustal horizons; these are described in the following article.

(2) The Akugdleq supracrustal unit, which is conspicuous for its rusty-ochre-weathering pyrrhotite-rich rocks and which was thought to be an exclusively metasedimentary unit, also contains amphibolitic rocks which are tightly folded into the metasediments.