Field work in central and northern East Greenland

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The expedition to central and northern East Greenland in 1975 had 29 participants. Ten of these took part in the programme for uranium prospecting (Steenfelt, and Secher *et al.*, this report) and 5 field teams studied the following subjects: the sedimentology of continental Trias in Scoresby Land (Clemmensen & Andreasen, this report), the stratigraphy and structure of the lower Eleonore Bay Group sediments in the Alpefjord region (Caby, this report), the geochemistry of heavy metals in the Eleonore Bay Group, the Caledonian crystalline complex in relation to older crystalline rocks (Frederichsen & Higgins, this report), and finally the Quaternary deposits around Clavering Ø.

The field parties and the prospecting work were served by a helicopter chartered from Heliswiss, Berne, and by the GGU cutter *Jytte*. The base camp for all operations was at Stordal situated in Muskusoksefjord, west of Hold with Hope. Personnel were flown from Copenhagen via Iceland, to Mesters Vig from where the 200 km journey to Stordal was carried out by a Beechcraft chartered from Flugfélag Norðurlands, Iceland.

The expedition activity is to continue in 1976.

Reconnaissance work in the crystalline complexes of northern East Greenland between 72° and 74°N

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Most crystalline rocks of northern East Greenland have until recently been regarded as representing the deep-seated mobile core zone of the Caledonian orogenic belt (Haller, 1971). However, recent regional mapping and isotopic studies in the Scoresby Sund region indicate that the main development of the crystalline complexes relate to Archaean and Proterozoic orogenesis, with a relatively superficial Caledonian overprint (Henriksen & Higgins, 1976). It was a logical step to extend field studies northwards to the crystalline rocks of the region between 72–74°N (fig. 32). These studies supplement isotopic work in progress on material from the crystalline complexes collected by D. C. Rex (Leeds) in 1974 (Rex *et al.*, this report), as well as the research being carried out on various aspects of the Eleonore Bay Group by R. Caby (Montpellier) this report and H. Stendal (Copenhagen).

As 1:250 000 geological maps of the region north of 72°N already exist (Koch & Haller, 1971), detailed mapping was carried out only in a few critical areas. Attention was given to crystalline units which might have similarities with those of the Scoresby Sund region, including the three main infracrustal complexes (Gletscherland migmatite complex, Niggli Spids migmatite dome, Hagar migmatite sheet) which have usually been regarded as deep-

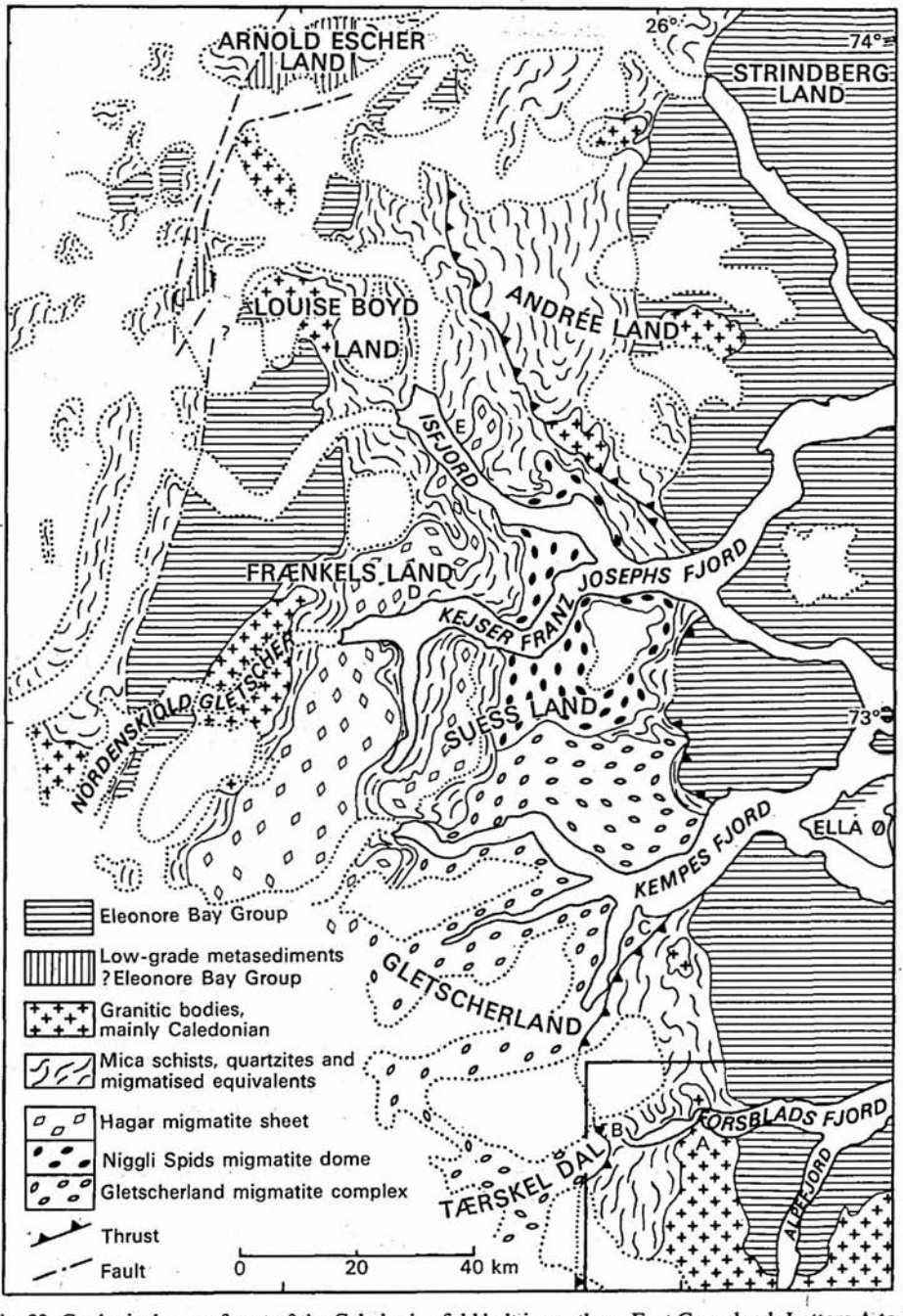

Fig. 32. Geological map of part of the Caledonian fold belt in northern East Greenland. Letters A to E indicate the localities of dated samples mentioned in Rex *et al.* (this report), and the inset in the south-eastern corner delimits the area described by Caby.

seated upwellings created by the ascent of the Caledonian migmatite front. The metasedimentary sequences surrounding the infracrustal units were extensively sampled with a view to establishing a regional metamorphic zonation, and for comparisons with early Proterozoic sedimentary sequences of the Scoresby Sund region; all sedimentary rocks have previously been assumed to represent metamorphosed equivalents of the Lower Eleonore Bay Group. The contact zone between the belts of weakly or non-metamorphosed Eleonore Bay Group sediments and the crystalline complexes was examined. Ground observations were also made in the vicinity of Nordenskiöld Gletscher, western Louise Boyd Land and Arnold Escher Land, areas normally difficult of access and rarely visited.

Infracrustal complexes

The Gletscherland migmatite complex comprises a variety of granitic gneisses, banded gneisses, amphibolites and occasional ultrabasic rocks which exhibit generally the characters of an old basement complex. Numerous bands of supposed supracrustal rocks were found to comprise mainly rusty coloured gneisses. In the Tærskeldal area swarms of dykes cross-cut the gneisses and have subsequently been folded and transformed into amphibolite, but they are not late Caledonian lamprophyres as has been suggested (Haller, 1958). It has previously been recognised that the Gletscherland migmatite complex incorporated Precambrian basement rocks although these were allegedly extensively reworked and petrogenetically rejuvenated during the Caledonian orogeny (Wegmann, 1935; Haller, 1971). The entire complex has many similarities with the Archaean Flyverfjord infracrustal complex of the Scoresby Sund region, and there is little evidence for other than superficial Caledonian orogenic activity.

The Niggli Spids migmatite dome comprises homogenous foliated granitic gneisses and augen gneisses, but contains few rock types which can be described as migmatite. Units distinguished as synorogenic Caledonian granites (Koch & Haller, 1971) appear to be no more than leucocratic phases of the main rock types. This infracrustal unit appears to form a basement to the concordantly overlying supracrustals, and while it is possible that the domal structure relates to Proterozoic or even Caledonian deformation, the degree of reactivation involved is uncertain.

The nappe-like Hagar migmatite sheet was only investigated in a few sections in Kejser Franz Josephs Fjord and Isfjord. In part it comprises banded hornblende gneiss, granitic gneiss and amphibolites which have the character of basement complexes. High grade migmatitic sedimentary units were recorded, but many of the thin bands supposedly representing migmatitic lobes or offshoots from the main sheet proved to be non-migmatitic sedimentary units differing from other parts of the sequence only by being of more massive aspect, or lighter colouration.

All three infracrustal units retain many characteristics of basement complexes, and similarities with the Scoresby Sund region suggest an original Archaean or Proterozoic development. Isotopic studies by Rex *et al.* (this report) suggest that parts of the infracrustal complexes originated or suffered major reactivation in the early Proterozoic (*c.* 1800 m.y.). Caledonian activity was evidently not as widespread or intense as traditionally supposed, although there is clear evidence of moderate Caledonian regional metamorphism.

On reconnaissance trips to the nunatak region two granitic bodies belonging to the

'Western Metamorphic Complex' (Wenk & Haller, 1953) were visited. Both have been interpreted as synorogenic Caledonian granites. One body in Arnold Escher Land is a well foliated, almost banded body while the other at Drømmetinde (upper Nordenskiöld Gletscher) exibits conspicuous augen developments. Both bodies are closely comparable to some of the Proterozoic granites in the Scoresby Sund region.

Metasedimentary sequences

The main outcrops of the Eleonore Bay Group follow the eastern border of the metamorphic complexes. These often spectacularly banded strata are deformed by a system of major N–S trending folds and are largely non-metamorphosed. Towards the contact with the metamorphic complexes there is often a gradual increase in metamorphic grade, while the contact itself is often a major fault or thrust with extensive mylonitic developments.

Below the thrust in outer Forsblads Fjord area and in the areas to the north a sequence of metasedimentary rocks superficially similar to the late Precambrian – Lower Eleonore Bay Group is found (Haller, 1958). These pass rapidly westwards into a zone of sillimanite-bearing migmatites and granites, the sedimentary rocks surviving in the migmatites as quartzitic lenses and boudins enclosed by a foliated garnet-bearing neosome component. Late kinematic granite sheets and plutons cut across the migmatitic complex. This zone of migmatites and granites is clearly the northward continuation of the major zone of identical rock types traceable through the Scoresby Sund region (70°–72°N).

A suite of middle Proterozoic isotopic ages from the northern part of the migmatite zone in the Scoresby Sund region suggests that the apparent transition between the migmatites and the Eleonore Bay Group rocks in Forsblads Fjord may involve sedimentary sequences of very different ages (cf. Caby, this report).

Somewhat similar relationships are seen in Andrée Land where a transition has been described from recognisable units of the Eleonore Bay Group downwards and westwards into metasediments invaded by sheets and bodies of granites (Haller, 1953). The general appearance of the metasedimentary sequences, which are mainly well banded quartzites and semipelitic rocks, suggests a lower grade than in the Forsblads Fjord area, and only locally are there comparable migmatitic developments. Some of the granite sheets are foliated gneissic bodies, which sometimes exhibit flatlying mesoscopic fold structures. The structural pattern is more complex than in the overlying Eleonore Bay Group sequence, and the narrowness of the transition zone may indicate a dislocation of some kind despite the apparent regional concordance.

The metasedimentary sequences surrounding and overlying the three main infracrustal complexes are in many areas notable for their alternating lithology of quartzites and mica schist bands, often deformed in conspicuous tight zig-zag folds on a minor and major scale. Superficially there is a strong resemblance between these sequences and the middle Proterozoic Krummedal supracrustal sequence of the Scoresby Sund region. Both sequences have locally marble or calc-silicate developments near the base.

On the west side of the infracrustal complexes a transition has been described between the 'Petermann Series', a zone of non-metamorphic rocks equivalent to part of the Eleonore Bay Group, and high-grade metasediments of the infracrustal complex (Wenk & Haller, 1953). New observations suggests that while there is an increase in grade towards the

Hagar migmatite sheet, the contact with the high-grade metasediments is a thrust zone.

On both sides of Nordenskiöld Gletscher a gently inclined eastward dipping fault or thrust separates the 'Petermann Series' from a group of highly sheared, often mylonitic siliceous rocks. Further west, below the thrust, low-grade micaceous quartzites and semipelitic metasediments are common, and in some places seem to rest on a gneissic basement of regularly banded granitic gneiss with thin amphibolites. There is at present no indisputable evidence of their age. The same is true for the 'Eleonore Sø Series' the various units of which were sampled in Arnold Escher Land; these low grade supracrustal rocks seem to occur beneath a thrust in a structural window.

The former assumption that all metasedimentary sequences are equivalents of the Eleonore Bay Group is now suspect. It seems probable that several lithologically similar sedimentary sequences of widely different ages may have been brought into conjuction by Precambrian as well as Caledonian orogenic events. Isotopic studies in progress (Rex *et al.*, this report) support a radically revised interpretation of the whole crystalline complex, but specific correlations of the metasedimentary units are premature without considerably more data.

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Investigations on the Lower Eleonore Bay Group in the Alpefjord region, central East Greenland

Renaud Caby

The Lower Eleonore Bay Group outcropping on the eastern flank of the 'central metamorphic complex' and in the Alpefjord region comprises a sedimentary sequence more