Proterozoic and Lower Palaeozoic strata in northern East Greenland. *Rapp. Grønlands geol. Unders.* **145** (this volume).

Henriksen, N., Friderichsen, J. D., Strachan, R. A., Soper, N. J. & Higgins, A. K. 1989: Caledonian and pre-Caledonian geology of the region between Grandjean Fjord and Bessel Fjord (75°–76°N), North-East Greenland. *Rapp. Grønlands geol. Unders.* **145** (this volume).

Koch, L. & Haller, J. 1971: Geological map of East Greenland 72°–76°N. Lat. (1:250,000). *Meddr Grønland* **183**, 26 pp.

Larsen, P.-H., Olsen, H., Rasmussen, F. O. & Wilken, U. G. 1989: Sedimentological and structural investigations of the Devonian basin, East Greenland. *Rapp. Grønlands geol. Unders.* **145** (this volume).

Marcussen, C., Larsen, P.-H., Nøhr-Hansen, H., Olsen, H., Piasecki, S. & Stemmerik, L. 1988: Studies of the onshore hydrocarbon potential in East Greenland 1986–87: field work from 73° to 76°N. *Rapp Grønlands geol. Unders.* **140**, 89–95.

Sønderholm, M., Collinson, J. D. & Tirsgaard, H. 1989: Stratigraphic and sedimentological studies of the Eleonore Bay Group (Precambrian) between 73° 30′ and 76° in East Greenland. *Rapp. Grønlands geol. Unders.* **145** (this volume).

N. H.,
Grønlands Geologiske Undersøgelse,
Øster Voldgade 10,
DK-1350 København K,
Danmark.

Caledonian and pre-Caledonian geology of the region between Grandjean Fjord and Bessel Fjord (75°–76°N), North-East Greenland

N. Henriksen, J. D. Friderichsen, R. A. Strachan, N. J. Soper and A. K. Higgins

The area between Grandjean Fjord and Bessel Fjord was the focus in 1988 of regional geological investigations and 1:500 000 mapping during the North-East Greenland project (Henriksen, 1989). The greater part of the area forms part of the East Greenland Caledonides and can be divided into three distinct rock groups: infracrustal gneisses and granites of possible Archaean or early Proterozoic origin; a metasedimentary sequence which has probably suffered both mid-Proterozoic and Caledonian migmatisation and metamorphism; and the late Proterozoic Eleonore Bay Group, a thick sedimentary sequence which has undergone amphibolite facies Caledonian metamorphism in its lower parts and is intruded by Caledonian granites. Aspects of the stratigraphy and sedimentology of the Eleonore Bay Group are described by Sønderholm *et al.* (1989); only the structures affecting the sequence are described here.

Archaean – early Proterozoic(?) crystalline complex – *(N. H.)*

The infracrustal crystalline rocks in the region studied occur in an arcuate belt running from the inner part of Grandjean Fjord northwards along the margin of the Inland Ice to inner Bessel Fjord, then curving to follow the north side of Bessel Fjord (fig. 1). The complex is bordered to the east by a thick migmatitic metasedimentary sequence (the Smallefjord sequence) or by the Eleonore Bay Group outcrop.

The previously published geological maps (Koch & Haller, 1971) were based largely on aerial photograph interpretation with only limited ground control; the field work was made during Lauge Koch's geological expeditions up to 1958. On these maps the infracrustal rocks were distinguished as syn-orogenic granite, migmatitic gneiss with amphibolite and mica schist bands, and mica schist/biotite gneiss. In accordance with the then prevailing concept of a pervasive Caledonian orogeny (Haller, 1953, 1955, 1970, 1971), virtually all rock units were considered as of Caledonian age with the mica schists viewed as metamorphic derivatives of the Eleonore Bay Group sequence. They were referred by Haller (1971) to his regional structural unit, the 'Grandjean Fjord Mountain Belt', in which a set of NNE-trending early structures was thought to reflect the main Caledonian orogenic phase (Silurian), and a later set of NW-trending folds was attributed to Lower – Middle Devonian 'late orogenic spasms' centred on Grandjean Fjord where migmatisation was rejuvenated (Haller, 1970, 1971).

In southern parts of the East Greenland Caledonides isotopic studies undertaken in association with GGU's mapping since 1968 have shown that substantial parts of the infracrustal gneiss complexes are of Archaean or early Proterozoic development (Steiger *et al.*, 1979; Higgins *et al.*, 1981; Henriksen, 1985), with only limited Caledonian reactivation. By analogy it is suspected that the infracrustal rocks of the study area (75°–76°N) also

Rapp. Grønlands geol. Unders. 145, 90–97 (1989)

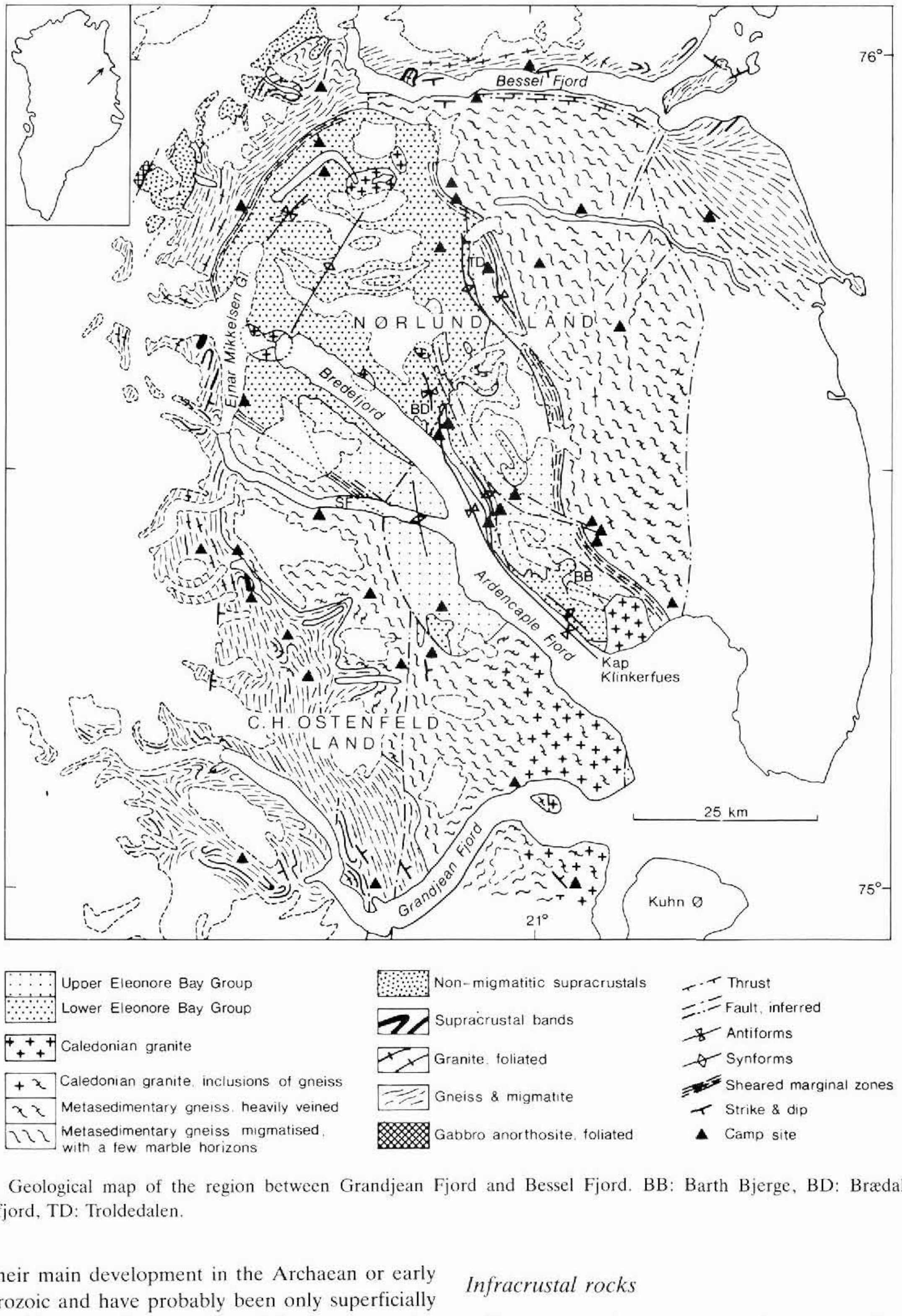

Fig. 1. Geological map of the region between Grandjean Fjord and Bessel Fjord. BB: Barth Bjerge, BD: Brædal, SF: Smallefjord, TD: Troldedalen.

had their main development in the Archaean or early Proterozoic and have probably been only superficially modified by later Proterozoic and Caledonian metamorphic overprinting. A radiometric age dating programme has been started to clarify the uncertainties.

Infracrustal rocks

The dominant lithologies are migmatitic gneisses and foliated banded granitic rocks. Throughout the area of outcrop they are interleaved with a variety of bands and lenses of supracrustal rocks, mainly rusty brown weathering mica schists, schistose gneisses and dark grey to black amphibolites (fig. 1). All rock types are folded together and their mutual boundaries are concordant. The schists and amphibolites are generally affected by migmatisation in the same way as the gneisses, but in a few cases areas of non-migmatised schists have been found.

The gneisses comprise a wide range of types and varieties, including banded, veined and agmatitic types showing different degrees of migmatisation. The main types are biotite and hornblende-biotite bearing, with garnet in some units. Most gneisses are light grey to grey in weathering colour, but some have a rusty brownish colour, similar to the weathering colour of the mica schists. The granitic rocks are foliated nearly everywhere and many are also banded and gneissic. However, the inner part of some of the larger granitic bodies or bands can preserve a non-directional fabric which has a gradual transition into foliated rocks towards the outer parts. The larger granitic bands are up to several kilometres across and many contain inclusions of other rock types in thin bands, streaks, schlieren and lenses. The main granitic lithologies are rather coarse grained biotite-hornblende granites and fine to medium grained, light coloured biotite granites. Augen granites and augen gneisses are found in places. No age relations of regional significance between the various types have been distinguished, but locally it can be shown that a finer grained 'aplite' biotite granite occurs as veins and sheets in the other units.

The interbanding of gneisses and granitic units takes place on all scales, varying from a few tens of centimetres to kilometre-wide bands. There are often gradual transitions from granitic types to gneissic units and the main impression is that a substantial part of the gneisses are derived from granitic rocks and are thus orthogneisses.

An occurrence of foliated and folded gabbro-anorthositic and anorthositic rock types is found on a peninsula about 2 km by 3 km at the rim of the Inland Ice (fig. 2). To the east it is bordered by a fault against non-migmatised mica schists. The gabbro-anorthositic sequence is strongly deformed and in many places flattened. It has, however, often preserved the characteristic textural and structural patterns between leucocratic and mafic minerals. The rocks are probably completely recrystallised and the mafic parts are sometimes developed into garnet-amphibolite bands and streaks. Gabbro-anorthositic rocks in West Greenland are generally considered as markers for Archaean units (Kalsbeek, 1982); thus the occurrence here in North-East Greenland may be of stratigraphic significance.

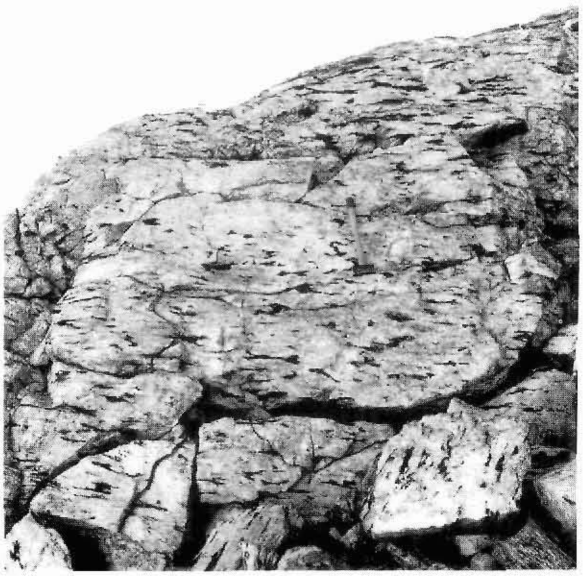

Fig. 2. Deformed and recrystallised leucogabbro from the gabbro anorthosite occurrence at the rim of the Inland Ice west of inner Bessel Fjord. Hammer indicates the scale.

Supracrustal units

Bands and schlieren of mica schists and amphibolites interleaved with the gneisses are common in the whole area. The bands vary in width from a few metres up to several hundred metres, and supracrustal rocks and gneisses are often so intensely interbanded that a unit mapped as a 'supracrustal band' may in reality be a complex sequence of schists and gneisses. Composite sequences of interbanded mica schists and amphibolites are seen in many places and the amphibolites may be associated with lenses of ultramafic rocks. Occasionally thin marble horizons are found together with the other supracrustal units, and in a few instances marble occurs as massive bands up to several hundred metres wide. The mica schists and the finely-banded schistose biotite gneisses have a characteristic rusty brown weathering colour. They often contain garnet and occasionally sillimanite. The amphibolites are also often garnet bearing.

The supracrustal units are generally migmatitic when they occur as bands in the gneisses. However, non-migmatised supracrustals have been found in two metapelitic and semipelitic bands south of Grandjean Fjord and as a sequence several kilometres thick in a belt west of Bessel Fjord. In the latter area rusty brown mica schists and greyish, finely-banded biotite-bearing psammitic gneisses dominate. Amphibolites and a variety of banded gneissic schists also form part of the sequence.

Structures

The infracrustal rocks and the interbanded schists and amphibolites are everywhere strongly deformed and fold interference patterns are encountered in many places. Contrasting styles of deformation with both steep-sided structures with vertical axial planes and flat-lying folds with almost horizontal axial planes are seen in different valley and fjord sections. The regional trends around inner Grandjean Fjord are NW–SE to NNW–SSE. Farther north, as far as Bessel Fjord, the trends are N–S to NNE–SSW, while north of Bessel Fjord the regional trend is approximately E–W.

In the south, around inner Grandjean Fjord, the interference between flat-lying and steep sided structures indicates that a set of large recumbent west-vergent folds was overprinted by a later set of open to tight folds with steep axial planes trending north-westerly. The recumbent folds have an amplitude of up to several kilometres. A 5–10 km wide zone bordering the Smallefjord supracrustal sequence is characterised by N–S trending structures all dipping to the east (45°–85°) where some units are strongly tectonised and flattened. West of this zone, belts occur with flat-lying and recumbent structures as well as belts of, often narrow, steep-sided N–S trending folds. The structural pattern in the gneiss region north of Bessel Fjord has only been observed in a zone a few kilometres wide along the fjord. Only few major folds have been observed, but the general E–W trend is conformable to the E–W trending boundary between the Smallefjord sequence and the infracrustal complexes, which follows the south side of the fjord (see below). West of innermost Bessel Fjord an area of interbanded, strongly tectonised mica schists and bands of gneisses may represent an imbrication of infracrustal and supracrustal rocks.

Middle(?) Proterozoic supracrustal rocks: the Smallefjord sequence – *(J. D. F. & R. A. S.)*

The infracrustal gneisses and granitic rocks described above are overlain by a thick metasedimentary sequence, for convenience designated here as the Smallefjord sequence. The most extensive exposures are in C. H. Ostenfeld Land and in north-east Nørlund Land; outcrops are notably good in Smallefjord (fig. 1). The sequence has tectonic contacts with the assumed younger Eleonore Bay Group. The age of the Smallefjord sequence is uncertain in the absence of isotopic age determinations, but a middle Proterozoic age of deposition is thought most likely.

Lithology

The Smallefjord sequence is a polymetamorphic series of migmatised meta-semipelites and meta-psammites, probably originally a sequence of turbiditic semipelitic and psammitic sediments, with minor amounts of quartzites and impure limestones. The metamorphic parageneses are amphibolite facies assemblages of quartz-plagioclase-biotite-muscovite, often with garnet, sillimanite, or kyanite in the meta-semipelitic lithologies. Pods and lenses of calc-silicate material are common and are inferred to represent concretions within the sequence; they display an amphibolite facies mineral assemblage of hornblende-garnet-quartz-plagioclase-pyroxene. A few large but impersistent, impure marble horizons occur near the base of the sequence.

The migmatisation is ubiquitous but variable in intensity, and the neosome occurs as concordant layers and augen of quartzo-feldspathic material (fig. 3). In spite of the migmatisation the primary lithologies of semipelite and psammite can be recognised and form

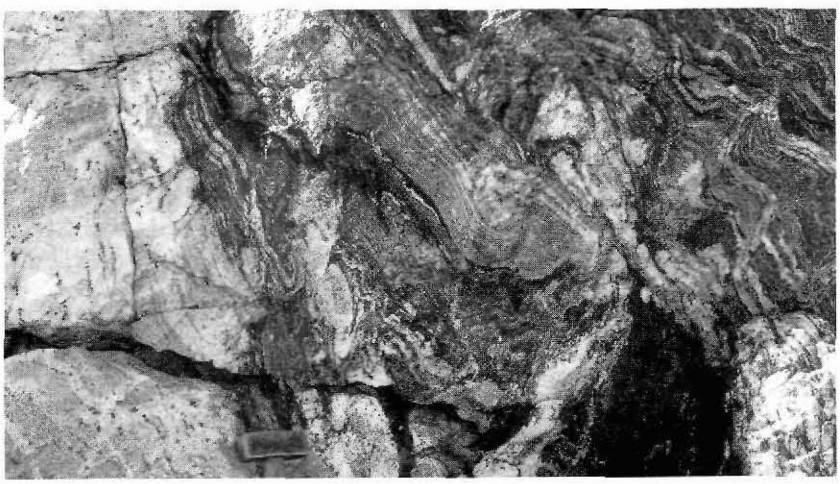

Fig. 3. Migmatised Smallefjord sequence metasediments, semipelitic at right, psammitic in centre of photograph. At left leucocratic granitic material replaces metasediments leaving nebulitic foliation traces and trails of garnets apparently in metamorphic equilibrium. Hammer head is 10 cm long.

units from a few centimetres to hundreds of metres in thickness. There are, however, rapid lateral facies variations as well as a complete absence of sedimentary structures, such that it is not possible to establish a coherent stratigraphical succession. Both the lower and the upper boundaries are tectonic and the sequence is so highly deformed on a regional scale that it is only possible to infer a minimum thickness of one kilometre on the basis of the field work.

Cross-cutting granite, aplite and pegmatite veins occur throughout the sequence in varying amounts. To the south-east the metasediments form only scattered rafts within extensive granite masses, while the veining is less intense or absent elsewhere. The overlying Eleonore Bay Group sequence is cut by some of the veins, which are therefore referred to a Caledonian magmatic event.

Orogenic history

Two sets of deformation phases can be distinguished in the Smallefjord sequence: an early composite phase and a late phase of a less deep-seated nature.

Within the early phase the first event recognised is responsible for the regional penetrative schistosity and formation of minor isoclinal and intrafolial folds. This was accompanied by regional amphibolite facies metamorphism and widespread migmatisation and by the intrusion of syn-kinematic basic dykes. The dykes are now seen as sub-concordant boudinaged sheets of foliated garnet amphibolite, often veined by neosome from the host rocks. The second deformation event within this early phase resulted in small to medium scale tight folds with a variably developed axial plane fabric concordant with the regional schistosity. A distinct E–W trending stretching and mineral lineation (micas, sillimanite) is characteristic. In the north-eastern part of the region a third deformation event led to the formation of a series of narrow, N–S trending belts of subvertical foliation, outlining very large structures. Cross-cutting sheets of amphibolite, up to 100 m thick, also belong to the early phase, although their precise chronological position is not clear.

The late phase is characterised by the formation of large amounts of acid veins and plutons. The veins are discordant, anastomosing and often anatectic in origin. Grain size varies from coarse pegmatitic to aplitic. The veins often seem to be folded, but in these cases the vein material shows no internal fabric. This indicates that the crystallisation outlasted penetrative deformation. The density of veining is extremely variable with generally the highest proportion of acid veins and plutons in the east and south-east of the study area. The presence of radiating sillimanite fibres adjacent to and within the veins suggests that their formation was accompanied by high temperatures.

Extensive high strain zones exist along the margins of the Smallefjord sequence, and a very persistent late mylonite belt, the Bessel Fjord shear zone, is traceable along the entire south coast of Bessel Fjord. It forms the boundary between the Smallefjord sequence to the south and older gneisses to the north. This shear zone dips gently to the south, deforms some of the late veins and shows indications of extensional geometry. Other highly strained zones along the structurally lower western margin of the Smallefjord sequence seem to have a more deep-seated nature and may well have been active only in the early phase of deformation.

Structure of the Eleonore Bay Group – *(N. J. S. & A. K. H.)*

The large scale structure of the Eleonore Bay Group inlier preserved in a graben-like setting centred on Ardencaple Fjord is relatively simple, as established by Sommer (1957) and described below, but the relationship of the Eleonore Bay Group to the underlying metamorphic rocks poses considerable problems. As in the more southerly outcrops of the Eleonore Bay Group (72°–74°N) there is an apparent transition in metamorphic grade between the two rock groups, and since the lowest recognisable Eleonore Bay Group rocks belong to different stratigraphical levels in different places, the true base of the Eleonore Bay Group is not seen. However, the sequence can be readily correlated with the main Eleonore Bay Group succession farther south in East Greenland (Sønderholm *et al.*, 1989). The outcrop in the north-west on both sides of Bredefjord largely equates with the lower Eleonore Bay Group, and that in the south-east equates for the most part with the upper Eleonore Bay Group (fig. 1).

Haller (1953, 1955, 1971) was of the opinion that the high grade schists underlying the Eleonore Bay Group in East Greenland represented metamorphic equivalents of that sequence and that the infracrustal gneisses and granites within the metamorphic complexes were generated during the Caledonian orogeny. Subsequent isotopic work in central East Greenland has demonstrated that many of the gneisses and granites have an Archaean to middle Proterozoic history and that many supracrustal rocks have undergone a Grenvillian metamorphic event (Hansen *et al.*, 1978; Steiger *et al.*, 1979; Rex & Gledhill, 1981). If, as is generally supposed, the sub-Eleonore Bay Group schists in the study area have been affected by a comparable Grenvillian event, then the Eleonore Bay Group sequence, which is of late Proterozoic age, must rest unconformably upon them.

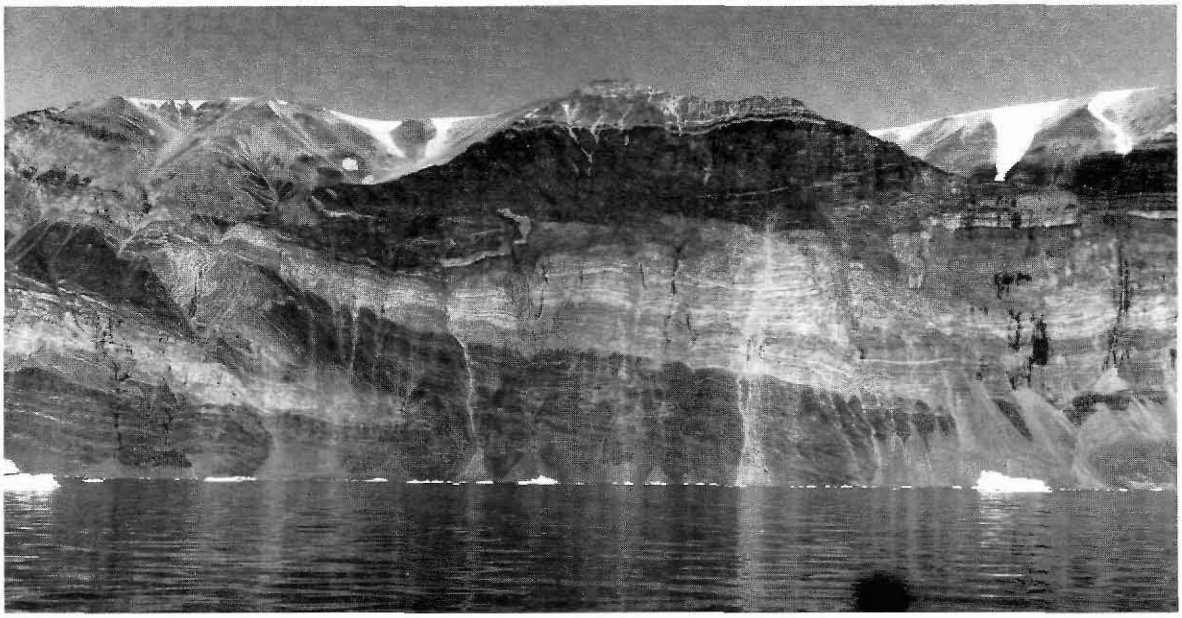

Fig. 4. North side of Ardencaple Fjord showing south-west verging folds in upper Eleonore Bay Group cut by extensional faults running almost parallel to the cliff face. Mountains are about 1200 m high.

This unconformity presumably underlies the whole area occupied by the Eleonore Bay Group at the present surface, but is nowhere exposed.

A further problem arises from the geometry of the Caledonian folds which affect the Eleonore Bay Group (described below). Along the north-east margin of their outcrop the folds verge north-east, displacing the Eleonore Bay Group upwards over the underlying rocks, apparently on a low-angle detachment. Since thrusts tend to cut up-sequence, displacing lower units over higher ones, it is necessary to infer an earlier deformation which displaced the Eleonore Bay Group downwards relative to the surrounding schists.

Caledonian folds

Over much of its outcrop in the study area the Eleonore Bay Group is gently inclined. However, there are several belts of strong folding. One belt is associated with the north-east margin of the outcrop where subhorizontal rocks turn sharply down to the north-east to form a NW–SE trending anticline or monocline, which can be traced for at least 25 km from Troldedalen towards the south-eastern Barth Bjerge (Troldedalen anticline). The steep limb of this structure is usually inverted and passes down into a zone in which the strain and metamorphic state of the Eleonore Bay Group increases towards the contact with the subjacent schists (see below). For a short distance south of Troldedalen a complimentary syncline is developed, so that the rocks immediately above the shear zone are right way up.

An approximately parallel pair of folds, the Brædal anticline and syncline, can be traced for some 36 km along the north-east coast of Ardencaple Fjord and Bredefjord. This fold pair faces the opposite direction to the Troldedalen structure, that is to the south-west, and its steep common limb forms the fjord walls from Kap Klinkerfues to Brædal, which provide good exposures of folds cut by extensional faults (fig. 4). In Brædal the steep limb is inverted, forming a panel of moderately inclined rocks which Sommer (1957), not recognising that the sequence is inverted, was unable to correlate with the normal Eleonore Bay Group succession and termed the 'Brædal Quartzite'.

West of the Brædal fold pair an open NNE-trending anticline crosses Smallefjord, and an even broader anticlinal up-warp trends northwards from the head of Bredefjord. This latter structure is flanked to the west by a syncline along Ejnar Mikkelsen Gletscher, along which the Eleonore Bay Group rocks turn up steeply against the north-west margin of their outcrop.

Basal shear zone

Except where affected by late normal faults, the exposed boundary between the Eleonore Bay Group and the underlying schists and gneisses is always marked by a zone of high shear strain which affects both rock groups. When the underlying rocks belong to the schistose Smallefjord sequence it is frequently impossible to differentiate them from sheared and metamorphosed Eleonore Bay Group, due to both tectonic and metamorphic convergence. When the underlying rocks belong to the gneissose 'basement' the problem is less acute. The gneisses undergo grain size reduction in association with the development of a strong *L–S* fabric in which original angular discordances are largely eliminated. Kinematic indicators show both thrust and lag sense, suggesting a complex displacement history. Granite and pegmatite sheets are concentrated in the shear zones, early examples carrying the *L–S* fabric. Later sheets cut the shear fabric and are strongly discordant but often deformed by folds congruous with the larger Caledonian folds.

It is usually possible to define a zone in which highly sheared Eleonore Bay Group and the underlying lithologies are interleaved. Passing out of the shear zone the *L–S* fabric becomes less intense, both foliated and unfoliated granite sheets become less frequent, and eventually sedimentary structures such as cross-bedding become recognisable in arenaceous Eleonore Bay Group lithologies. More pelitic lithologies continue to be schistose and to carry static porphyroblasts (most commonly euhedral amphibole) for several hundred metres above the shear zone.

A locality on the east side of the south branch of Ejnar Mikkelsen Gletscher provides a well-exposed section across the western margin of the Eleonore Bay Group outcrop. The shear zone is steeply inclined and deformed by Caledonian folds which also affect late Caledonian granite sheets. The underlying rocks are gneissose metasediments which are in sharp contact with Eleonore Bay Group quartzites, both rock groups being strongly deformed with an extensional sense of shear (i.e. downwards on the Eleonore Bay Group side). These observations support the two-stage tectonic sequence mentioned above:

(1) Pre- or early Caledonian downward displacement of the Eleonore Bay Group along extensional shear zones, with granite veining.

(2) Caledonian compression, deforming the shear zones and in some cases reactivating them in the thrust sense.

This structural model explains the apparent transition between the Eleonore Bay Group and underlying rocks in the Ardencaple Fjord region and with appropriate modifications is almost certainly applicable to the main Eleonore Bay Group outcrop (72°–74°N) where comparable enigmatic boundary relationships are encountered (see e.g. Higgins *et al.*, 1981).

Late extensional faulting

The whole Eleonore Bay Group outcrop is cut by normal faults whose dominant trend is NNW, with an easterly downthrow. The faults are prominent along the south-west margin of the Eleonore Bay Group outcrop, across Smallefjord, in association with the Brædal and Troldedalen folds, and in northern Kuhn Ø where a NNW-trending graben is occupied by the Eleonore Bay Group. The faults post-date the late Caledonian muscovite granite plutons and may have been developed over a long period in association with late Palaeozoic, Mesozoic and Tertiary phases of passive margin extension.

References

Haller, J. 1953: Geologie und Petrographie von West-Andrées Land und Ost-Frænkels Land (NE-Grönland). *Meddr Grønland* **113**(5), 196 pp.

Haller, J. 1955: Der 'Zentrale Metamorphe Komplex' von NE-Grönland. Teil I. Die geologische Karte von Suess Land, Gletscherland und Goodenoughs Land. *Meddr Grønland* **73**, I(3), 174 pp.

Haller, J. 1970: Tectonic map of East Greenland (1:500 000). An account of tectonism, plutonism and volcanism in East Greenland. *Meddr Grønland* **171**(5), 286 pp.

Haller, J. 1971; *Geology of the East Greenland Caledonides*, 413 pp. New York: Interscience Publishers.

Hansen, B. T., Higgins, A. K. & Bär, M.-T. 1978: Rb-Sr and U-Pb age patterns in polymetamorphic sediments from the southern part of the East Greenland Caledonides. *Bull. geol. Soc. Denmark* **27**, 55–62.

Henriksen, N. 1985: The Caledonides of central East Greenland 70°–76°N. *In* Gee, D. G. & Sturt, B. A. (edit.), *The Caledonide Orogen: Scandinavia and related areas*, 1095–1113. London: Wiley.

Henriksen, N. 1989: Regional geological investigations and 1:500 000 mapping in North-East Greenland. *Rapp. Grønlands geol. Unders.* **145** (this volume).

Higgins, A. K., Friderichsen, J. D. & Thyrsted, T. 1981: Precambrian metamorphic complexes in the East Greenland Caledonides (72°–74°N) – their relationships to the Eleonore Bay Group, and Caledonian orogenesis. *Rapp. Grønlands geol. Unders.* **104**, 46 pp.

Kalsbeek, F. 1982: The evolution of the Precambrian Shields of Greenland. *Geol. Rundschau* **71**, 38–60.

Koch, L. & Haller, J. 1971: Geological map of East Greenland 72°–76°N. Lat. (1:250 000). *Meddr Grønland* **183**, 26 pp.

Rex, D. C. & Gledhill, A. R. 1981: Isotopic studies in the East Greenland Caledonides (72°–74°N) – Precambrian and Caledonian ages. *Grønlands geol. Unders.* **104**, 47–72.

Sommer, M. 1957: Geologische Untersuchungen in den praekambrischen Sedimenten zwischen Grandjeans Fjord und Bessels Fjord in NE-Grönland. *Meddr Grønland* **160**(2), 56 pp.

Sønderholm, M., Collinson, J. D. & Tirsgaard, H. 1989: Stratigraphic and sedimentological studies of the Eleonore Bay Group (Precambrian) between 73° 30′ and 76° in East Greenland. *Rapp. Grønlands geol. Unders.* **145** (this volume).

Steiger, R. H., Hansen, B. T., Schuler, C., Bär, M. T. & Henriksen, N. 1979: Polyorogenic nature of the southern Caledonian fold belt in East Greenland. *J. Geol.* **87**, 475–495.

N. H., J. D. F. & A. K. H.,
Grønlands Geologiske Undersøgelse,
Øster Voldgade 10,
DK-1350 København K,
Danmark.

R. A. S.,
Department of Geology,
Oxford Polytechnic,
Gipsy Lane, Headington,
Oxford OX3 0BP,
U.K.

N. J. S.,
Department of Earth Sciences,
The University,
Leeds LS2 9JT,
U.K.

Stratigraphic and sedimentological studies of the Eleonore Bay Group (Precambrian) between 73° 30′ and 76°N in East Greenland

M. Sønderholm, J. D. Collinson and H. Tirsgaard

As part of the North-East Greenland Project 1988–1990, a sedimentological study of the Precambrian Eleonore Bay Group between Grandjean Fjord and Bessel Fjord (75°–76°N) (fig. 1) was planned to start in 1988 with one two-man team and to continue in 1989 with two teams. This area was last visited in 1955 when Sommer (1957) as a member of Lauge Koch's expeditions to East Greenland carried out the mapping. This work, however, only dealt with stratigraphic and tectonic problems, and sedimentological data, apart from gross lithologies, were not recorded. Unfortunately, the field work of 1988 quickly revealed that the sediments had suffered from a relatively strong metamorphic recrystallisation, and hence it was generally not possible to carry out detailed sedimentological work in this area. As a consequence the team concentrated on stratigraphic problems, and after 3 weeks the working area was moved southwards to Vibeke Sø (Hudson Land) and Brogetdal (Strindberg Land) (fig. 1) where the rest of the season was spent.

Geology

The Eleonore Bay Group is a fundamental element of the East Greenland Caledonian fold belt. It is a sequence of sediments and metasediments up to 14 km thick which crop out over an area of 450 km north to south and 200 km east to west (fig. 1), forming the greater part of the pre-Caledonian sedimentary pile. Earlier investigations were mainly made by Lauge Koch's expeditions to East Greenland from 1930–1958, but were restricted to general mapping (see reviews by Haller, 1971 and Henriksen & Higgins, 1976).

There is no general agreement on a formal subdivision of the Eleonore Bay Group although one version was unsuccesfully proposed by Katz (1961). Hence we persist with the commonly used informal subdivision of Haller (1971) (figs 1, 2) into the basal Arenaceous–Argillacous 'Series' (up to *c.* 9000 m), the Quartzite

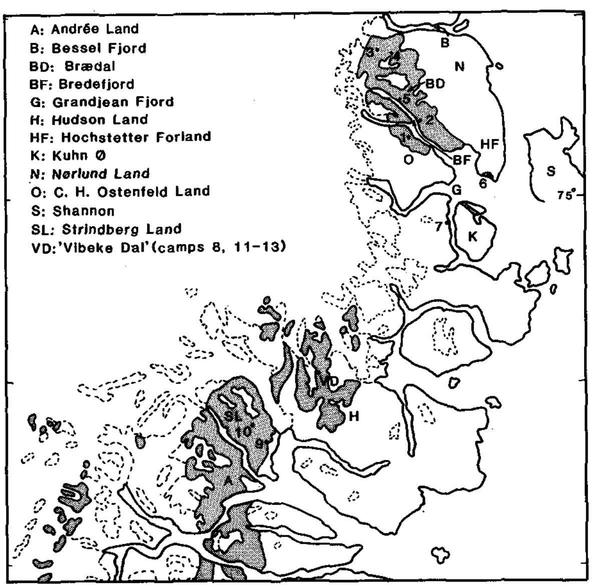

Fig. 1. Map showing distribution of Eleonore Bay Group in East Greenland and camp positions (1–13) during the 1988 field work.