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N89-22204

SIGNIFICANCE OF THE LATE ARCHAEAN GRANULITE FACIES TERRAIN BOUNDARIES, SOUTHERN WEST GREENLAND; **C. R. L. Friend**, Dept. of Geology, Oxford Polytechnic, Oxford OX3 0BP, U.K.; **A. P. Nutman**, Dept. of Earth Sciences, MUN, St. John's Newfoundland, Canada; and **V. R. McGregor**, Atammik, 3912 Sukkertoppen, Greenland, Denmark

Within a distance of c.60 km across the mouth of Godthåbsfjord (Fig. 1), three different Archaean granulite facies events are represented. First, that which affected the Amîtsoq gneisses at c.3600 Ma (1) is preserved only in relatively small areas. Second, that at c.3000 Ma affecting Nordlandet. Third, that at c.2800 Ma, which we discuss here, affecting the region south of the Qarliit nunaat thrust and south to Bjørnesund (Fig. 1).

This granulite facies event has been dated (Pb/Pb) at 2800$\pm$70 Ma (2) and at 2795$\pm$ Ma (zircons) from an intrusive ferrodiorite/rapakivi (s.l.) granite suite (3). The block comprises probable middle Archaean gneisses, supracrustal rocks dominated by amphibolites and intrusive, layered gabbro/anorthosite complexes (see 4 for further references). Early deformation episodes culminated in granulite facies conditions, the assemblages of which were extensively retrogressed to amphibolite facies, frequently obliterating the early history, during the late Archaean. Two different boundaries, both now highly modified by the later events, have been recognised:

(a) Southern boundary

The boundary occurring in and around Bjørnesund (Fig. 1) have been variably retrogressed, but toward the head of the fjord is well-preserved and is shown to originally have been prograde. The boundary comprises the grey biotite $\pm$ hornblende and amphibolite-facies gneisses traversed by a network of brownish, orthopyroxene-bearing zones and cut by felsic, orthopyroxene-bearing pegmatite sheets. Orthopyroxene growth clearly overprints the amphibolite facies structures and fabrics on many scales. Owing to the proximity of granulite and amphibolite facies assemblages and the intricacy of the network, the relationship is interpreted as prograde and to have formed by fluid-dominated processes, similar to those in southern India (e.g. 5).

(b) Northern boundary

This is demonstrated to be a tectonic feature, the Qarliit nunaat thrust (Figs. 1 and 2) which was folded and metamorphosed in the late Archaean. This deformation decreases inland and the thrust becomes more apparent. South of the thrust granulite facies rocks are brownish weathering and toward the thrust relict brown cores surrounded by greyish-white, bleached rocks occur (Fig. 2). These bleached rocks have one or a combination of two fabrics within them. At higher structural and topographic levels new amphibolite facies minerals statically overprint and mimic the steeply dipping granulite facies fabrics. At lower levels the amphibolite facies minerals form a progressively more gently southerly dipping fabric sub-parallel with the thrust (Figs. 1 and 2). Generally, deeper structural levels (at 2800 Ma) are represented in this northern part of the block with preserved conditions of c. 10 kbar and 800^{o}C (e.g. 6; our unpublished data).

DISCUSSION

Previous interpretations of the region are at variance with that presented here. The southern boundary was recognised to be prograde (7), but the patchy distribution of granulite assemblages in the Fiskenaesset region was interpreted to represent the original prograde boundaries which had been little modified by later retrogression (8). The northern boundary, despite detailed 1:20000 scale mapping, was also identified as prograde (6; 9). This misinterpretation is considered to be due to the interaction of the flat-lying foliation associated with the thrust and the steeply dipping foliation of the granulites during folding (Fig. 3). Additionally, PT data were assembled to represent PT conditions for synchronous amphibolite and granulite facies metamorphism (6) which is now known not to be the case. Recent data (10), the new data presented here and other unpublished results demonstrate that the granulite facies block evolved separately before being tectonically excavated and juxtaposed against lower grade rocks. Much of the granulite facies terrane, especially close to the thrust boundary, is dominated by the process of hydrous retrogression. Geochemical relationships in most of the northern part are thus considered to reflect *retrograde* rather than prograde processes. The use of the earlier interpretations to construct theories for the general evolution of continental crust (6, 9, 11) must be regarded with caution.

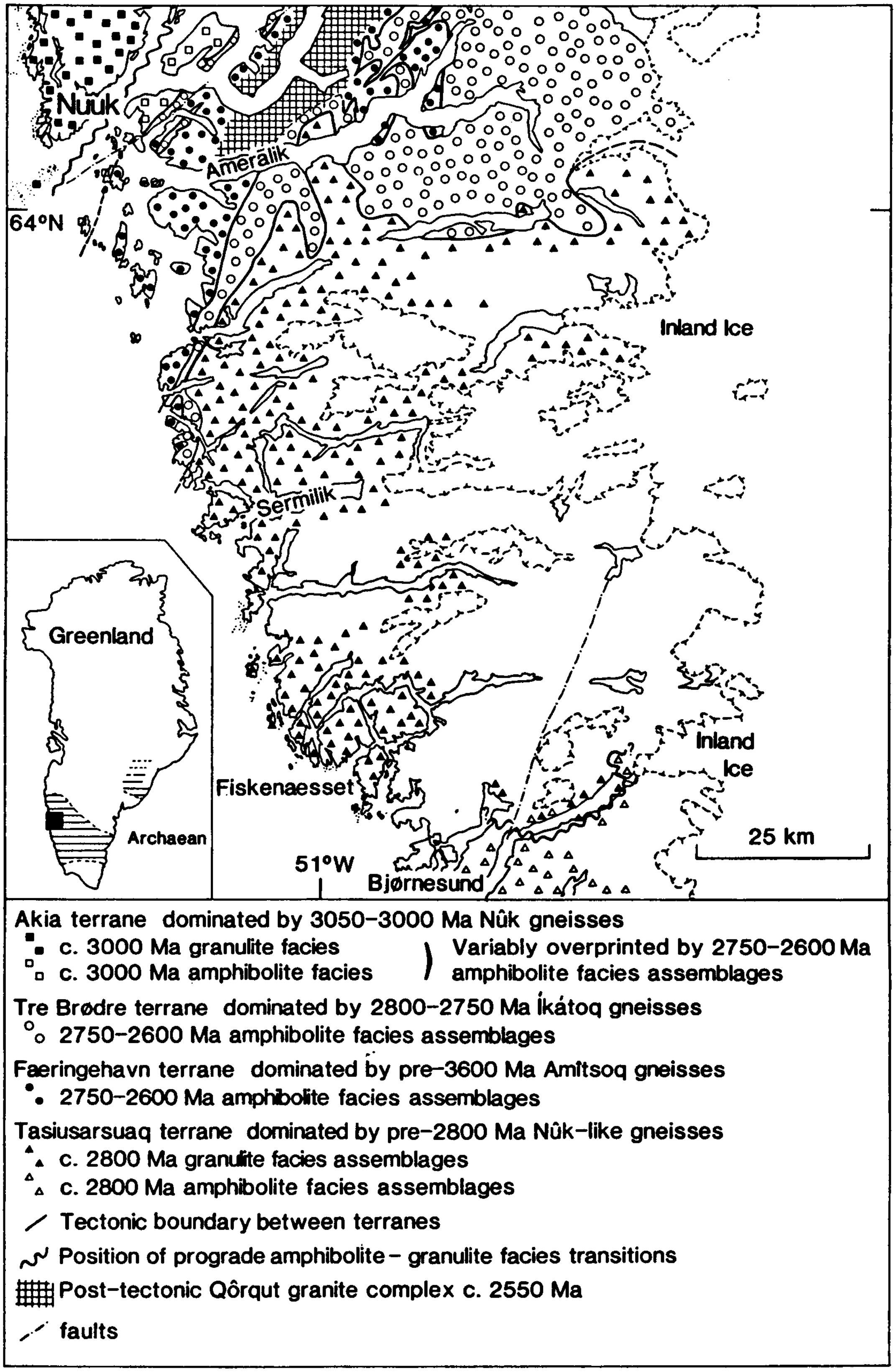

Fig. 1. Simplified sketch map of the Godthåbsfjord-Bjørnesund region showing the distribution of four distinct terranes and their boundaries as presently understood.

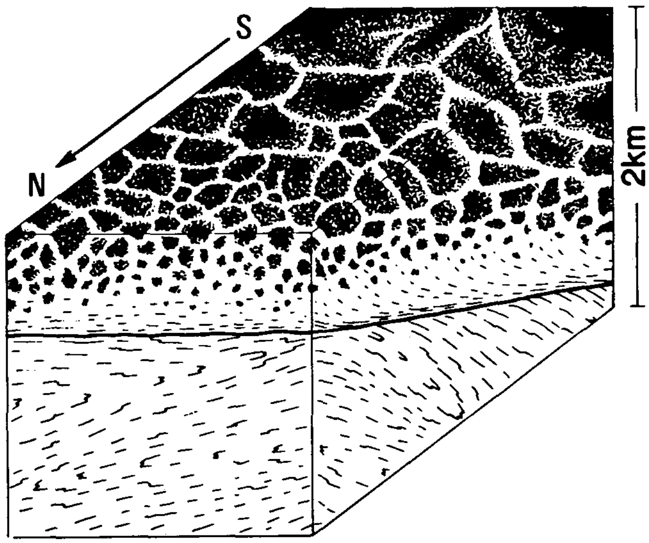

Fig. 2. Block diagram to show the topographical control over retrogression of granulite facies rocks above the Qarliit nunaat thrust. Unretrogressed (solid black) occurs at high structural levels associated with partially retrogressed rocks (heavy stipple). Statically retrogressed veins overprint the granulite fabric (white) and at lower levels a new amphibolite facies fabric is formed (white with dashes). Below the thrust amphibolite facies structures are deformed and are partially reoriented.

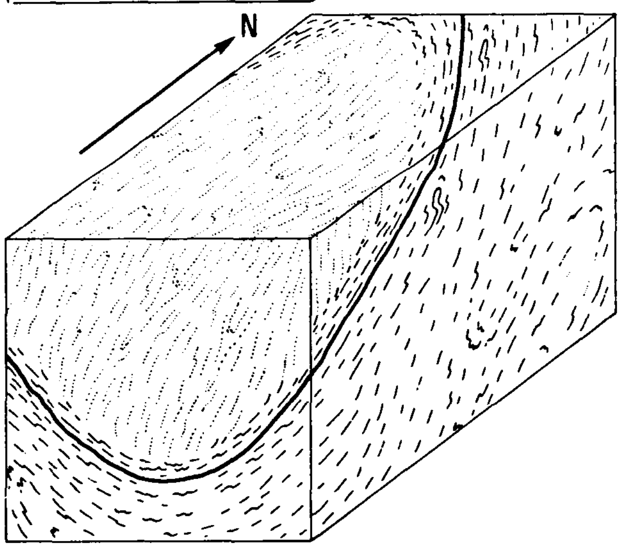

Fig. 3. Block diagram illustrating the effects of folding the thrust with its associated amphibolite facies fabric. The relatively competent granulites fold in a different manner to the flat-lying amphibolite facies fabrics.

Where there is more than one granulite facies event present, as for example now appears to be the case in southern India, it is important that each is carefully documented by a combination of associated field and laboratory studies, prior to amphibolite-granulite relations being used for crustal modelling.

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