THE STRUCTURAL CHRONOLOGY IN THE NIGERDLIKASIK AREA, FREDERIKSHÅB DISTRICT

J. R. Andrews

In basement areas of good exposure which enable continuous marker horizons to be mapped, it is possible to distinguish many events in the structural history. Thus in the Nigerdlikasik area, 45 km due east of Frederikshåb, it has been possible to trace at least five phases of deformation and associated migmatization by mapping the many fold closures in amphibolite horizons. The following chronology has been established:

f_1) The production of gneiss structures, e.g. layering, foliation, concordant pegmatites and intrafolial folds, probably incorporating more than one event.

f_2) Isoclinal folding of kilometre amplitude and 100 - 1000 m wavelength. No congruent mesoscopic folding or syn-tectonic axial surface migmatization has been seen. The folds have no well defined hinge area since the closures are approximately semicircular in profile. The foliation follows concordantly around these closures.

f_3) Tight folding on mesoscopic and macroscopic scales accompanied by syn-tectonic axial surface migmatization. Many of the ubiquitous tight small folds in the gneiss are attributed to this phase. The fold hinges are well defined by acute arrowhead-shaped closures with axial surface foliation passing through them. The folds trends and attitudes are very variable.

?) Intrusion of a dyke body, now transformed into a 20 cm thick amphibolite body but still discordant to the country rocks. It is migmatized by NW-trending acid veins belonging to the subsequent phase of deformation. A 2.5 cm thick acid margin occurs along one border of the dyke.

f_4) NW-trending open folds of kilometre amplitude and wavelength. There are congruent small folds of extremely variable intensity which have migmatite developed along axial surface shears.

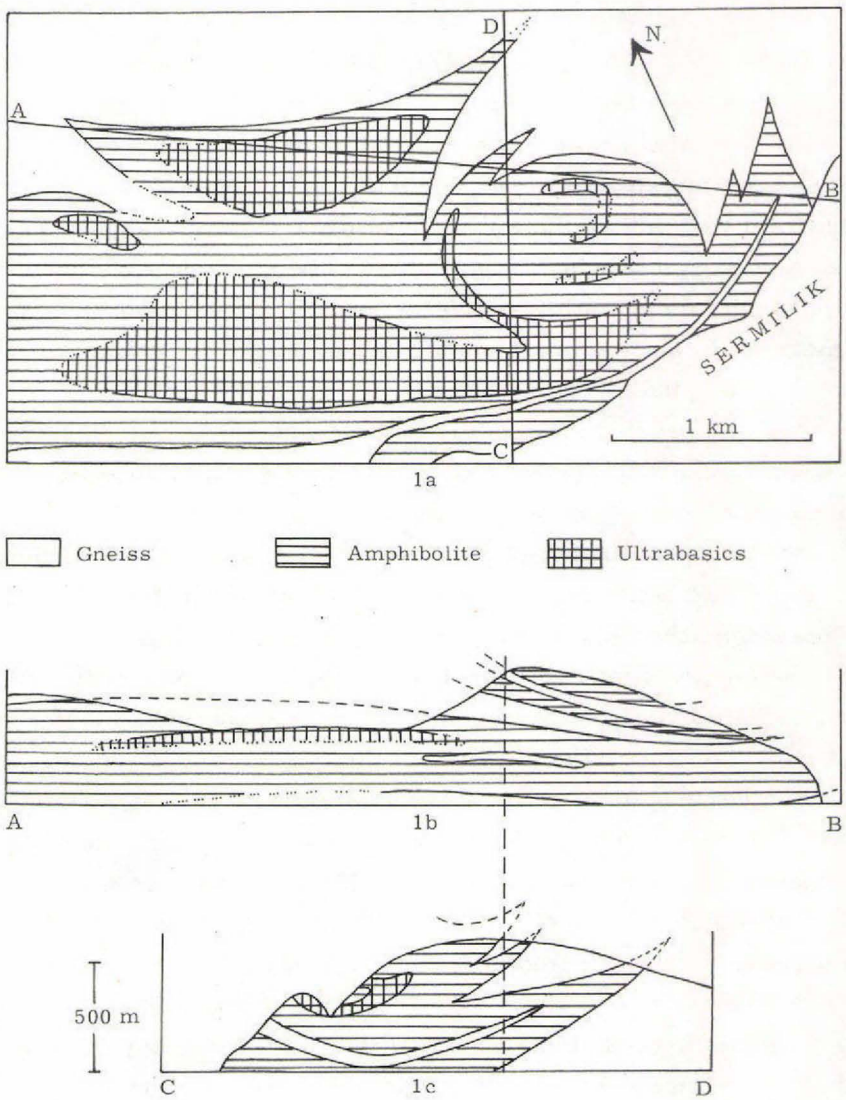

Fig. 2. Plan view (a) and schematic sections (b and c) of the fold structure north of Sermilik. Vertical scale x3 exaggeration.

Although their overall trend is NW, individual folds may trend in almost any direction as a result of later deformation.

f_5) Folds with NNE to ENE axial surfaces which have variable dips. A great range in style from isoclinal folds to weak open structures can be traced. Axial surface migmatization is especially noticable where deformation has been strongest. Only these latest structures have a reasonably constant axial surface trend and even this varies between NNE and ENE; the dip can be either to NW or to SE, although it does not vary so much within a single subarea.

Age relations between the various phases were established on observations of early folds which, together with their associated minor structures, are deformed by later folds. One major isoclinal f_2 closure is folded by an f_3 major tight fold so that one amphibolite horizon is repeated at least four times across the consistent NW strike. The repetition can be proved by observing the major tight closure in the southern wall of Nigerdlikasik fjord and the isoclinal closure immediately south of the river running from the Inland Ice to Sermilik glacier, and following the amphibolite around them. A "mushroom and crab" shaped outcrop (fig. 2a) just north of Sermilik fjord results from the superposition of the three latest fold phases. A stack of recumbent folds in the core of a tight f_3 closure have subhorizontal NW-trending axes. They have been deformed around a coaxial NW open fold with a vertical axial plane (fig. 2c). Later folding around a NE axis makes the originally subhorizontal NW axes plunge NW in the north and SE in the south (fig. 2b). The interference of the latest two phases has deformed the recumbent f_3 axial surface into a basin shape in the south.

On a mesoscopic scale only three sets of folds could be separated. Mushroom, crescent and oval outcrop patterns provide ample evidence of age relations. After considering the styles, directions and relative ages of the small folds they could usually be assigned to one of the three latest phases of deformation. Often the later phases of folding have been so intense that most of the evidence of preceding phases has been obliterated. For example at

Nigerdlikasik Bræ the latest NE folding is so intense as to have locally transposed the foliation to a NE direction. Intrafolial folds and blocks containing relic folds are not necessarily the remains of the earliest deformation since intrafolial structures of several ages have been produced, including some relic blocks which contain folds deforming still earlier folds. Because of the great range in intensity of minor folding there is no characteristic style for each age of fold and to assign a particular style to a particular phase can cause great confusion.

The tectonic complications in the area prevent one distinguishing more than two stratigraphic levels of amphibolite:

i) Amphibolite in which dunitic ultrabasic lenses are common, especially in fold closures. The thickness of this horizon may vary between 5 and 500 m along the strike. This unit is repeated many times by folding in the western part of the area and appears as a basin structure farther east.

ii) Amphibolite bordered by a thin (10 m) layer of brown-weathering quartz - feldspar - garnet - biotite gneiss and characterized by the absence of ultrabasic lenses. This horizon occurs only in the eastern part of the area.