Discussion

The K/Ar ages are believed to represent emplacement ages since the respective dykes are demonstrably post-tectonic (Andrews *et al.*, 1971; in prep.) and the regional K/Ar "cooling" ages from the country rocks are grouped between 1500 and 1600 m.y., isotopic ages which are widespread in South Greenland (see previous GGU Reports of Activities). Concordant K/Ar ages from Danells Fjord dykes support the belief that their emplacement age is close to 1100 m.y. No such definite conclusion may be drawn from the single sample age from Pâtussoq which may be older than the K/Ar age indicates, namely 1400 m.y., but its post-tectonic character would suggest that its age must lie between about 1600 m.y. and 1400 m.y. The ages given by the samples are unlikely to have been significantly affected either by argon loss (usually indicated by discordant ages from related samples) or by the presence of "excess" argon.

References

Andrews, J. R., Bridgwater, D., Gulson, B. [L.] & Watterson, J. 1971: Reconnaissance mapping of South-East Greenland between 62°30′N and 60°30′N. *Rapp. Grønlands geol. Unders.* **35,** 32–38.

Andrews, J. R., Bridgwater, D., Gormsen, K., Gulson, B. L., Keto, L. & Watterson, J. in prep: The Precambrian of South-East Greenland.

Bridgwater, D. 1965: Isotopic age determinations from South Greenland and their geological setting. *Bull. Grønlands geol. Unders.* **53** (also *Meddr Grønland* **179,** 4), 56 pp.

Larsen, O. & Møller, J. 1968: K/Ar determinations from western Greenland I. Reconnaissance programme. *Rapp. Grønlands geol. Unders.* **15,** 82–86.

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K/Ar DATES FROM THE FREDERIKSHÅB REGION, SOUTHERN WEST GREENLAND

Ole Larsen

The dating laboratory at the Institute of Petrology, University of Copenhagen, has made 8 K/Ar age determinations on 7 samples of Precambrian gneiss and granite from the area between Kvanefjord and Neria fjord. The ages reported on here (summarised in table 6) are the first half of a series of K/Ar age determinations to be made covering the region between Frederikshåbs Isblink to the north and Neria fjord to the south.

Table 6. K/Ar age determinations from southern West Greenland

GGU sample no.	Rock type	Locality	Min.	K_2O%	$^{40}Ar_R/^{40}K$	Age (m.y.)
72600	Biotite gneiss	Frederikshåb quarry	Bi	9.3	0.219	2060 ± 30
72554	Foliated granite	Coast south of Kvaneø	Bi	8.5	0.196	1930 ± 50
72594	Hom. biotite gneiss	East side Kangerdlua	Bi	9.0	0.193	1905 ± 30
72591	Two-mica gneiss	Nigerdlinguaq	Mu	7.8	0.225	2100 ± 30
			Bi	9.2	0.176	1800 ± 50
72598	Biotite gneiss	NW coast Vesterland	Bi	8.6	0.178	1810 ± 75
72595	Granite	North of inner Neria fjord	Bi	8.2	0.179	1820 ± 30
72560	Banded gneiss	West coast inner Kvanefjord	Bi	8.8	0.172	1770 ± 20

Decay constants: $\lambda_e = 5.85 \times 10^{-11}$ yr^{-1}; $\lambda_\beta = 4.72 \times 10^{-10}$ yr^{-1}; $^{40}K/K = 1.19 \times 10^{-4}$.

The ages and sample descriptions

2060 ± 30 m.y. biotite

GGU 72600. Biotite gneiss. Frederikshåb quarry, 62°00′14″ N, 49°40′25″ W.

Strained quartz, twinned plagioclase and dark green mica are the major minerals. Grain size is approximately 2 mm. Microcline occurs interstitially in small amounts. Biotite is apparently unaltered and no chlorite is seen. The rock also contains grains of epidote, in part with cores of allanite, some sphene, apatite and opaque ore. Prismatic zircons are present.

1930 ± 50 m.y. biotite

GGU 72554. Strongly foliated granite bordering a band of amphibolitic schists. Coast south of Kvaneø, 61°55′20″ N, 49°26′00″ W.

The feldspar grains are filled with mica flakes, muscovite as well as biotite, all orientated in accordance with the dominant foliation. Only grains of quartz and smaller interstitial microclines are free of micas. Larger mica flakes (0.5–1 mm) are deformed and display undulose extinction. Epidote is a common accessory. Pleochroic halos exist in the biotite.

1905 ± 30 m.y. biotite

GGU 72594. Homogeneous biotite gneiss. East side of Kangerdlua, 61°38′18″ N, 48°55′28″ W.

Quartz, microcline and plagioclase are present in approximately equal amounts. The biotite is brownish green occurring in flakes up to 2 mm in size. The larger flakes are often strongly bent and may have kink bands. Epidote is common, partly as well formed grains. Large grains of ore are surrounded by muscovite, sphene and unidentified alteration products.

1800 ± 50 m.y. biotite
2100 ± 30 m.y. muscovite

GGU 72591. Two-mica gneiss. Nigerdlinguaq, 61°53′37″ N, 49°09′45″W.

The rock is composed dominantly of plagioclase and quartz, with grain size of 2-4 mm. The quartz is strained resulting in an intense polygonisation of the larger grains. Plagioclase shows polysynthetic albite twinning. Microline perthite is present in minor amounts as smaller grains (less than 1 mm) filling the interstices between the larger grains of quartz and plagioclase. Flakes of muscovite and dark green biotite are intergrown. The micaceous aggregates contain epidote which has in part replaced the biotite. Epidote has also been nucleated on subhedral grains of allanite. Both micas have a grain size of approximately 1 mm. Apatite is a common accessory.

1810 ± 75 m.y. biotite

GGU 72598. Biotite gneiss. North-west coast of Vesterland, 61°46′11″ N, 49°27′48″ W.

Plagioclase and quartz are dominant. Interstitial microcline is prominent due to the coarse perthitic exsolution veins. Microcline displays an intense patchwork twinning; the plagioclase grains are only weakly twinned. The biotite is dark green with somewhat ragged grain boundaries showing incipient alteration to chlorite. Epidote, often with cores of allanite, and apatite are important accessories. Opaque ore is present in most biotite aggregates. The presence of secondary chlorite must be emphasised.

1820 ± 30 m.y. biotite

GGU 72595. Granite. North of inner Neria fjord, 61°40′15″ N, 48°34′30″ W.

The granite contains abundant grains of perthitic microcline. Plagioclase grains display a poikilitic texture enclosing subhedral grains of epidote and microcline. Quartz grains are strained and somewhat polygonised. Biotite is dark green and occurs in aggregates of small grains (0.1–0.3 mm) together with abundant epidote and a little muscovite. Opaque ore and red flakes of hematite are also associated with these micaceous aggregates. Apatite and zircon are accessories. Biotite grains show signs of chloritisation along cleavage planes. Green flakes of secondary chlorite are observed here and there in thin section.

1770 ± 20 m.y. biotite

GGU 72560. Banded gneiss. West coast of inner Kvanefjord, 62°03′47″ N, 49°08′02″ W.

The sampled gneiss band is composed mainly of strained quartz and grains of twinned plagioclase commonly with patches or cores of saussurite. Flakes of brown mica range in size up to 1 mm. The brown mica is full of needle-shaped crystals, probably rutile. Apatite is a common accessory. Epidote forms very small crystals, in part related to the saussurite of the plagioclase feldspars, in part intergrown with brown mica. Epidote is also seen as an overgrowth on grains of allanite.

Discussion

The ages obtained are clearly unrelated to the orogenesis which formed the major structures of this region. The rocks of the Frederikshåb region, which are of pre-Ketilidian age, have apparently been thermally affected during Ketilidian time. The

biotite ages range from 2060 m.y. at Frederikshåb to 1770 m.y. in inner Kvanefjord. A single age determination on muscovite from Nigerdlinguaq giving 2100 m.y. demonstrates that this mineral has retained argon better than biotite. A biotite separate from the same rock gives 1800 m.y. Future measurements on muscovite separates may demonstrate the difference between the two micas even more clearly, and this may lead to an estimate of the range of temperatures affecting the basement rocks of the Frederikshåb region during the Ketilidian orogenic episode.

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C^{14} DATING OF SURVEY MATERIAL PERFORMED IN 1971

General compilation by **Anker Weidick**

The systematic mapping of the Quaternary deposits by the Survey (S. Funder, M. Kelly, D. Laursen, L. Simonarson, N. W. Ten Brink and the present compiler) has produced a need for a regular dating of shell and driftwood material connected to Holocene shore-lines. It is hoped to erect a framework of dated shore-lines from Greenland coastal areas, which can be used for reference and for control in establishing the age of other Holocene events.

Only radiocarbon age determinations carried out in 1971, 38 in total, are included in the present compilation. A paper including all earlier dates on Survey material from Greenland is in preparation, and it is planned to publish all radiocarbon dates annually in the Report of Activities in the future.

Many of the samples (marked K) reported on here have been dated by Henrik Tauber, Carbon-14 Dating Laboratory, National Museum, Copenhagen; others (marked UW) have been dated in U.S.A., at the Quaternary Research Center, University of Washington, Seattle, by A. Fairhall and (those marked I) at Isotopes Inc., Westwood, New Jersey. Determinations of the wood samples have kindly been made by Jette Dahl Møller, Institute of Plant Anatomy and Cytology, University of Copenhagen. Unless otherwise stated the samples were submitted for dating by the collector.

Samples collected in Scoresby Sund region, East Greenland by S. Funder.
The reader is referred to the reports by Funder (1970, 1971a) for the general setting of the material treated here. Earlier dates from the same region have already been published (see Tauber, 1970; Funder, 1971b).