



## The metamorphic record of subduction-accretion processes in the Neoarchaean: the Nuuk region, southern West Greenland.

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The Nuuk region of southern West Greenland exposes an exceptionally well preserved section through Archaean mid- to lower continental crust, and therefore provides a natural laboratory to study the tectonic processes in the Archaean. The area mainly consists of amphibolite to granulite facies TTG gneisses, narrow supracrustal belts, and minor late-tectonic granites. It is made up of several distinct terranes, including, from NW to SE, the Færingshavn, Tre Brødre, and Tasiarsuaq terranes.

Extensive high-grade metamorphism and a clockwise PT evolution of the Færingshavn terrane in the Neoarchaean (2.72-2.71 Ga) have been interpreted as a result of crustal thickening and thrusting of the Tasiarsuaq terrane on top of the Tre Brødre and Færingshavn terranes (Nutman and Friend, 2007). Prior to final collision, the Tasiarsuaq terrane (the upper plate in a plate tectonic model) underwent a prolonged period of compressive deformation between 2.8 and 2.72 Ga (Kolb et al., 2012). The structural evolution was associated with near-isobaric cooling from medium-pressure granulite facies conditions of ca. 850°C and 7.5 kbar to amphibolite facies conditions of ca. 700°C and 6.5-7 kbar (Dziggel et al., 2012). Despite this long period of crustal convergence, there is no evidence for exhumation and/or loading, pointing to a rheologically weak and unstable Archaean crust perhaps due to low density differences and ongoing melt extraction.

Rocks of the structurally underlying Færingshavn terrane record a distinctly different metamorphic evolution. Although generally more strongly retrogressed, relict higher-pressure mineral assemblages in mafic granulites and felsic gneisses record conditions of > 8-9 kbar and >= 750°C, indicating burial to depths of at least 30 km along an apparent geothermal gradient of 20-25°C/km. The peak of metamorphism was followed by isothermal decompression at ca. 2.715 Ga (Nutman and Friend, 2007), indicating rapid exhumation of lower crustal rocks during, or shortly after, the main accretionary event.

The existence of dual thermal regimes with contrasting PT paths, as well as the good correlation between the timing of collision, high-pressure metamorphism and rapid exhumation are all consistent with plate-tectonic processes operating in the Neoarchaean. However, the crustal convergence in the Nuuk region was not associated with the extreme crustal thickening observed in many younger orogenic belts, and this likely reflects the generally higher mantle temperatures in the Neoarchaean. The prolonged period of crustal convergence prior to final collision may further indicate that the convergence rates in the Archaean were rather low.

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