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Variably deformed and metamorphosed Palaeoproterozoic mafic dykes across the Nagssugtoqidian Foreland, SE Greenland

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There are many mafic intrusions that are variably deformed and metamorphosed across the southern 'foreland' of the 1.7-1.8 Ga Nagssugtoqidian Orogen (NAO; e.g., [1]). This is recorded at five study areas (Umivik, Sarpap, Hornemann Ø, Dannebrog Ø and Isertoq), located progressively closer to the NOA suture. Across the opposite NOA foreland boundary, at Umivik, a swarm of roughly sub-vertical and tholeiitic dykes become markedly more amphibolitized.

Statistical analyses indicate a northward decrease in their dyke thicknesses and a corresponding increase in dyke densities, as one arguably approaches a swarm axis and where the other half of the swarm may be obscured by more intense deformation. Farther inside the more deformed foreland, the Sarpap Island exposes a better preserved nestled crustal block that exhibits four sets of mafic intrusions: (1) A boudinaged grey garnet bearing generation cut by (2) only marginally deformed and metamorphosed dykes and associated sills with coarse grained, pristine and typically brown weathered cores, which are nonetheless (3) cut by strongly sheared and thinner amphibolite sheets. The better preserved thick dyke-sill complex is also made up of a geochemically distinct 'boninitic norites', including harzburgitic cumulates and more differentiated varieties. Progressively deeper into the NAO foreland, the Hornemann Islands exhibits swarm of amphibolites, of both tholeiitic and boninitic affinities, which are strongly folded, yet sheared into sub-parallel bands that are significantly thinner than less deformed Umivik dykes. Dannebrog Island also appears to be strongly sheared but revealed one locality with at least three generations of cross-cutting tholeiitic and boninitic, amphibolites with different orientations. Closest to the NOA suture, Isertoq is also very deformed and exhibit a greater number of higher grade garnet amphibolites that are partly obscured by syn- to post-orogenic granites. Nevertheless, one set of older 'boninitic' and younger 'tholeiitic' amphibolites of different cross-cutting orientations could be recognised.

Our overall impression is that the degree of deformation and metamorphism increases towards the NOA suture, yet can also be locally variable. There is at least a boninitic and a tholeiitic suite that must have been derived from distinctly different mantle sources. Different cross-cutting geometries locally indicate the presence of at least three different intrusive events, which are all believed to be pre-orogenic but variably deformed due to different orientations relative to the NOA. These preliminary conclusions are supported by the identifications of early 'boninitic' and later 'tholeiitic' intrusions within a 2418 to 2375 Ma Scourie Swarm (Scotland) [2] that separated from SE Greenland during the opening of the Atlantic. Similar 'boninitic' and 'tholeiitic' giant dyke swarms also cut across the less deformed North Atlantic Craton in West Greenland, including ~2.37 Ga, as well as ~2.2 Ga, aged dykes [3] that can very well be extrapolated to the NOA foreland in SE Greenland.

- [1] Kolb, J. (2013) Gondwana Research 23: 471-492
- [2] Davies & Heaman, (2014) [1], Precambrian Research 249: 180-198
- [3] Nilsson, M.K.M., Klausen, M.B., et al (2013) Lithos 174: 255-270

