



Magmatism and Eurekan deformation in the High Arctic Large Igneous Province: Age constraints from North Greenland

C. Tegner (1), M. Storey (2), P. M. Holm (3), S. B. Thorarinsson (3), X. Zhao (4), S. Tappe (5), L. Heaman (6), and M. F. Knudsen (1)

(1) Aarhus University, Denmark, (2) Roskilde University, Denmark, (3) University of Copenhagen, Denmark, (4) University of California, Santa Cruz, USA, (5) Westfälische Wilhelms-Universität, Germany, (6) University of Alberta, Canada

Age, compositional and geological data show the High Arctic Large Igneous Province is unusual on two counts: first, magmatism was prolonged and include an initial tholeiitic phase (130-80 Ma) and a second alkaline phase (85-60 Ma); second, it was subsequently deformed during the Eurekan orogeny. New ⁴⁰Ar-³⁹Ar and U-Pb dating provides emplacement ages of 71-68 Ma for most of the Kap Washington alkaline volcanics of North Greenland, but with activity continuing down to 61 Ma (Tegner et al., 2011; Thorarinsson et al., 2011). A thermal resetting age of 49-47 Ma is also identified in ⁴⁰Ar-³⁹Ar whole-rock data for trachyte flows. Patch perthite feldspars and coeval resetting of Rb-Sr isotopes by hydrothermal fluids provide further support for thermal overprinting, interpreted as a result of Eurekan compressional tectonism.

The formation of the tholeiitic suite (130-80 Ma) appears to be associated with the opening of the Canada Basin and may have involved mantle plume action. Formation of the alkaline suite (85-60 Ma) is attributed to continental rifting in the Lincoln Sea area linked to seafloor spreading in the Labrador Sea and the Baffin Bay. The alkaline and tholeiitic suites of the High Arctic may therefore be unrelated.

It is striking that High Arctic volcanism terminates at about the same time (c. 60 Ma) as magmatism in the North Atlantic Large Igneous Province begins. We suggest this is a corollary of a change from extensional to compressional tectonism in the High Arctic. In the period when Greenland moved together with Eurasia (>60 Ma), the separation from North America resulted in rift-related alkaline magmatism in the High Arctic. When Greenland subsequently moved as a separate plate (60-35 Ma), overlapping spreading on both sides pushed it northwards and volcanism in the High Arctic stopped due to compression. Evaluation of plate kinematic models shows that the relative northwards movement of Greenland culminated in the Eocene, coinciding with thermal resetting. We conclude that compression in North Greenland peaked at 49-47 Ma and coincided with the Eurekan Orogeny in a belt across the Canadian Arctic Islands and western Svalbard.

References:

- Thorarinsson, S.B., Holm, P. M., Tappe, S., Heaman, L.M., Tegner, C., 2011. Late Cretaceous-Palaeocene continental rifting in the High Arctic: U-Pb geochronology of the Kap Washington Group volcanic sequence, North Greenland. *Journal of the Geological Society* 168, 1093-1106.
- Tegner, C., Storey, M., Holm, P. M., Thorarinsson, S.B. Zhao, X., Lo, C.H., Knudsen, M.F., 2011. Magmatism and Eurekan deformation in the High Arctic Large Igneous Province: ⁴⁰Ar-³⁹Ar age of Kap Washington Group volcanics, North Greenland. *Earth and Planetary Science Letters* 303, 203-214.