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Late Cretaceous -Early Tertiary dyke swarm of North Greenland it's age, origins and tectonic significance

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North Greenland is characterized by N-S, NW-SE and E-W trending swarms of mafic dykes which pre- and post date Kap Washington suite of bimodal lavas, ash flows and tuffs. Both rock groups are over-thrust by north vergent thrust sheets of Early Palaeozoic age rocks which record low grade Ellesmerian (Carboniferous) metamorphism and deformation. Laser ablation Ar/Ar ages of 58Ma and 62Ma obtained from thrust fault generated mylonites suggest that magmatism must have effectively ceased by then as no undeformed dykes have been found to cross the thrust planes.

High resolution PMAP aeromagnetic surveys for 1989 and 1997-98 show that linear magnetic anomalies parallel to the dense N-S trending dyke swarm of Nansen Land can be traced out onto the Lincoln Sea platform suggesting the dykes are part of the predominantly offshore failed rift magmatic domain which lies central to the southern ends of Alpha ridge, the Lomonosov Ridge, the Markarov Basin, the Amundsen Basin and the Morris-Jessup Plateau. In addition the dykes to the SW of the Mascart Inlet appear to extend undisturbed by faulting 150km onto the Lincoln Sea platform north of Ellesmere Island. The curved ca EW deep negative anomaly which truncates the dyke swarm offshore to the north of the Kap Canon Fault zone together with a similar anomaly along the Harder fjord Fault Zone and its western continuation to the Kap Ramsey Fault appear to constitute the limits of Eurekan thrust belt of North Greenland. Stress tensor analyses of all Eurekan fault plane populations show a consistent N-S to NNW-SSE pure compression pattern orthogonal to the main thrust faults and near parallel to the main dyke trend.

Rb/Sr, and Ar/Ar ages obtained from biotite separates, with U/Th ages from apatite-feldspar pairs suggest the dykes range in age from ca 103Ma to 69Ma. The peralkaline affinity of the dyke swarm is similar to that of many other rift generated basalts. Nd, Sr and a small number of Pb isotope ratios have been determined for these rocks and it appears that the dyke rocks have enriched isotopic compositions that suggest lithosphere-mantle mixing. It is evident that some partial metasomatism of the magmas has occurred with fluid assisted alteration resulting in particular with high Ti and feldspars also suggestive of an inhomogenous mantle source. Trace-REE ratio modelling indicates that dyke melts were generated largely in the Spinel Lherzolite facies with a small contribution from garnet lherzolite melt possibly originating from the garnet-spinel transition at 50-70km depth with 17kb pressures. The shallow depth melting and homogenisation of the magmas that were emplaced over a long time would seem to exclude plume interaction as a driving force for uplift and magmatism. Magmatism and tectonism in this region ceased before opening of the Eurasian basin at CHRON 24 (56Ma), before the dextral separation of the Greenland-Svalbard blocks and it is unlikely that these rocks formed part of the so-called Large Igneous Province.