



1.99 Ga mafic dykes of the Lewisian Gneiss Complex of Scotland: An upper age limit for the Palaeoproterozoic Loch Maree Group

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Mafic dyke swarms are often used as geochronological markers, as they are widespread and emplaced over short timespans. The ca. 2.4 Ga Scourie dyke swarm is one such example that has played a key role in understanding the complex tectonic and metamorphic history of the Lewisian Gneiss Complex of Scotland (LGC), part of the North Atlantic Craton (NAC). The LGC consists of Archean and Palaeoproterozoic terranes that experienced polyphase deformation prior to their assembly at ca. 1.8 Ga.

Zircons separated from a doleritic dyke from the Gairloch terrane have yielded a concordant U-Th-Pb age (1,989 ± 4.3 / -0.99 Ma) using the ID-TIMS method. The doleritic dyke is emplaced in Lewisian gneiss that experienced both granulite and amphibolite-facies metamorphism. Partial recrystallisation and amphibolitisation of the dyke demonstrate that it pre-dates the most recent (Laxfordian) amphibolite-facies metamorphic event. The age obtained from the dyke overlaps the U-Pb age of a previously dated olivine gabbro dyke from the Assynt terrane (1,992 Ma). These combined ages provide strong corroborating evidence for a ca. 2.0 Ga mafic dyke swarm event, distinct from the older ca. 2.4 Ga Scourie dyke event known from elsewhere in the LGC.

The existence of a ca. 2.0 Ga mafic dyke swarm provides an upper age limit for the Loch Maree Group (LMG), a Palaeoproterozoic succession of metasediment and metavolcanic rocks that overlie the LGC and which are not cross-cut by the Scourie dykes. This study proposes that a period of crustal extension took place in the region at ca. 2.0 Ga. Later, subduction may have resulted in the accretion of the LMG and the adjacent Ard Gneiss, which has previously been regarded as a magmatic arc. The ca. 1.9 Ga age of the earliest stage of the Laxfordian metamorphic event, which affected the LMG, could therefore mark the onset of collision. This sequence of events can be correlated with other coeval areas of the NAC, including the Nagsugtoqidian mobile belt of Greenland. Future trace element modelling will aim to establish the magma source(s) of this younger mafic dyke swarm.