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Modelling *P-T* conditions in the Cnoc an t'Sidhean supracrustal rocks of the Lewisian complex near Stoer, NW Scotland.

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The Lewisian complex of northwest Scotland is one of the most intensely studied Archaean high-grade terranes on Earth. It is composed mostly of metamorphosed felsic (TTG) to mafic gneisses. Ultramafic bodies and rare metasedimentary rocks also occur. In the central region of the mainland Lewisian complex two metamorphic events are recognized; a granulite facies (Badcallian) event at about 2.7 Ga and an amphibolite facies (Inverian) event at ca. 2.5 Ga, although debate remains regarding the number and timing of the metamorphic events. Pressure (P) – temperature (T) estimates for Badcallian metamorphism based on conventional thermobarometry vary considerably between 7–8 kbar at 750–800 °C and >11 kbar at >900 °C (see e.g. WHEELER ET AL., 2010).
In this study rocks cropping out near Stoer in NW Scotland are investigated, with particular focus on the Cnoc an t'Sidhean Supracrustal Suite. The supracrustal-suite is dominated by quartzo-feldspathic garnet-biotite-hornblende gneiss ("brown-gneiss") within which occur rare aluminous layers and lenses, a few centimetres to one metre across and extending for several tens of metres. These aluminous layers comprise a muscovite-rich (up to 90 vol.%) matrix containing porphyroblasts of corundum, kyanite, staurolite and rare garnet. Previous studies of these rocks by CARTWRIGHT & BARNICOAT (1986) suggested that corundum, kyanite, staurolite, muscovite and plagioclase all grew as part of the Badcallian peak metamorphic assemblage. Quartz- and feldspar-bearing veins (± garnet) were taken as evidence for *in situ* partial-melting, with loss of melt producing a residual corundum-bearing melanosome.
The metamorphic evolution of the Cnoc an t'Sidhean Supracrustals and their host gneisses are re-examined via phase equilibria modelling in the NCKFMASHTO and NCFMASHTO system using the software THERMO-CALC v.3.33 (POWELL & HOLLAND, 1988) and the HOLLAND & POWELL (1998) thermodynamic dataset. The brown-gneisses comprise an essentially anhydrous peak metamorphic assemblage of garnet, quartz, plagioclase and ilmenite (±rutile and K-feldspar) with biotite, hornblende and muscovite as retrograde minerals. *P–T* constraints imposed by the modelling of the brown gneisses and a mafic rock (garnet-clinopyroxene bearing) are 12–17 kbar at >850 °C. At these conditions, staurolite and muscovite are not predicted in the aluminous layers, suggesting that these are retrograde minerals interpreted to have grown during amphibolite facies Inverian metamorphism. The large proportion of mica suggests extensive fluid-influx during the Inverian event, which is also consistent with retrograde growth of hornblende and biotite in the brown gneisses.
Preliminary *in situ* U-Pb dating of zircon from the aluminous layer was undertaken to appraise the timing of metamorphism. The results of analyses from zircon rims interpreted to have grown during metamorphism give ages ranging between 2.75 and 2.5 Ga, consistent with partial to complete resetting of Badcallian ages by subsequent Inverian metamorphism.

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