Rare garnet clinopyroxenite and garnet granulite xenoliths from the Scottish Midland Valley: products of contemporaneous magmatism or an ancient buried ophiolite?

E. BADENSZKI[1,2], J.S. DALY[1,2] AND A. KRONZ[3]

[1]University College Dublin, Belfield, Dublin 4, Ireland, (* eszter.badenszki@ucd.ie)
[2]Irish Centre for Research in Applied Geosciences (icrag-centre.org)
[3] Georg-August-Universität, Göttingen, Germany

Exceptionally preserved garnet clinopyroxenite and garnet granulite xenoliths from Baidland Hill, western Midland Valley, Scotland provide insight into the evolution of the upper lithosphere of this part of the Caledonian orogen. These rocks are rare in Scotland, only known from four out of *c.* 150 deep xenolith localities [1,2], and are hosted by a diatreme cutting alkali basalts, associated with Lower Carboniferous rifting.

Clinopyroxenites (GC) contain the assemblage Cpx±Grt±Spl and garnet granulites (GG) have Grt+Cpx+Pl ±Bt±Ap, with secondary Amph in both. GG show equilibrated textures, while GC textural interpretation is often inhibited due to alteration by the host magma. However, in one spectacular example, coronas of secondary Grt around Spl as well as recrystallised exsolution lamellae of Grt in Cpx are interpreted as due to slow cooling at depth.

Grt-Cpx Fe-Mg geothermometry for the GC yields T = ~860 ºC from rims, while core compositions and exsolved Grt yield higher temperatures of 880 to 930 ºC and 860 to 1040 ºC, respectively. The GG yield similarly high temperatures of c. 970 ºC for both cores and rims and higher, c. 1030 ºC, for a Grt-Cpx inclusion pair.

These petrological features and similar T history suggest that GC and GG coexist in their source. They also share the effects of high-T metasomatism resulting in high-Ti Amph replacing mainly Cpx in the GC and all phases in the GG.

An origin associated with Carboniferous basaltic magmatism cannot as yet be distinguished from alternatives such as derivation from a subjacent ophiolite (cf. Ballantrae) stored at depth since the early Ordovician.

[1] Upton *et al.* (1984) *Trans. Roy. Soc. Edinburgh: Earth Sciences* 75, 65-70. [2] Upton *et al.* (2003) *Scot. J. Geol.* 39, 169-184.