Deep crustal xenoliths from the Scottish Midland Valley

E. BADENSZKI[1]*, J.S. DALY[1] AND M.S.A. HORSTWOOD[2]

[1]UCD School of Geological Sciences, University College Dublin, Belfield, Dublin 4, Ireland (*correspondence: eszter.badenszki@ucd.ie)
[2]NERC Isotope Geosciences Laboratory, Kingsley Dunham Centre, Keyworth, NG12 5GG, England

Published isotopic data and petrography distinguish metasedimentary and magmatic varieties within the classic deep crustal xenolith suite of the Scottish Midland Valley, which has been the focus of active research for several decades. Previous studies (e.g. [1]) yielded Sm-Nd model ages of 0.6-1.69 Ga for magmatic xenoliths and bulk fraction U-Pb zircon dating revealed the presence of Proterozoic detrital zircons [2] in a metasediment.

U-Pb and Lu-Hf zircon analyses (by laser ablation MCICPMS) from magmatic xenoliths (from East Lothian, east Midland Valley) constrain the deep crustal structure, the geochemical evolution of the lower crust and are used to test whether the xenoliths originate from Precambrian basement [3] or an Ordovician volcanic arc [4]

A single anorthosite xenolith and two quartzofeldspathic xenoliths yield indistinguishable U-Pb Concordia ages with a weighted mean of 416 ± 5 Ma, interpreted as dating their magmatic protoliths. A younger magmatic event at 398 ± 6 Ma in a quartzofeldspathic xenolith is coincident with metamorphic zircon growth (as rims and individual grains) in two similar xenoliths with an average age of 397 ± 2 Ma. Three zircon rims from quartzofeldspathic xenoliths also record a possible metamorphic event at *c*. 384 Ma.

A juvenile source is suggested by εHf(t) values of 0 - +4 in zircons from the anorthosite.

These data do not support the presence of Precambrian orthogneiss in the lower crust and only a single inherited grain from a quartzofeldspathic xenolith with a Concordia age of 440 ± 8 Ma supports the Ordovician arc model. Instead, the magmatic xenoliths represent bimodal late-Caledonian magmatism, coeval with the Scottish 'Newer Granites'.

[1] Halliday *et al*. (1993) *J. Geophys. Res*. **98**, 581-607. [2] Halliday *et al.* (1984) *Trans. Roy. Soc. Edin.: Earth Sciences*. **75**, 71-74. [3] Upton *et al*. (1976) *Nature* **260**, 517-518. [4] Bluck (1983) *Trans. Roy. Soc. Edin.: Earth Sciences*. **74**, 119-136.

Arsentyev gabbro-syenite massif: New geochemical and isotopic data

R.A. BADMATSYRENOVA

Geological Institute SD RAS (brose@gin.bscnet.ru)

The Arsentyev massif is located at the central part of the Monostoy ridge west of the Arsentyevka village. The massif outcrops over a 20 km^2 area. The Arsentyev massif is defined by intrusions of syenite-pyroxenite-gabbro with a high titanium ultramafic-mafic association [1]. These intrusions are related to rift-like structures of various ages and have the geochemical signature of alkaline basalts. Two intrusive phases, each of them being followed by formation of dike complexes, form the Arsentyev massif. The first phase consists of a stratified series pyroxenites, olivine and kersutite gabbros, gabbros, anorthosites and syenite. The second phase includes the rocks of the syenite series. The gabbro age is 279.5±2.0 Ma (SHRIMP zircon U-Pb).

The rocks of the Arsentyev intrusion are enriched in LREE relative to HREE, and exhibit the positive Sr, Ba, Nb, Ta, and Ti anomalies and negative Zr and Hf anomalies. Initial $^{87}Sr/^{86}Sr$ for second phases syenite represent high values (0.70649-0.71006). εNd values of layered series are low (-2 to -3). The Sr-Nd isotopic data suggests about the involvement of EM-II mantle source [2].

[1] Badmatsyrenova & Orsoev (2005) *Geochim Cosmochim Acta* **69**, A860. [2] Yarmolyuk & Kovalenko (2000) *Doklady of Earth Science* **375** (9), 1427-1431.