Pb-Hf-Nd isotopic decoupling in peridotite xenoliths from Mega (Ethiopia): Insights into the multistage evolution of the East African Lithosphere

G. BIANCHINI[1,2]*, J.G. BRYCE [3], J. BLICHERT-TOFT[4], L. BECCALUVA[1] AND C. NATALI[1],

[1]Università di Ferrara, Ferrara, Italy (bncglc@unife.it)
[2] CNR - Istituto di Geoscienze e Georisorse, Pisa, Italy
[3]UNH Earth Sciences, Durham NH, USA
[4]Ecole Normale Supérieure de Lyon, Lyon, France

New Hf and Pb isotopic data from clinopyroxenes from East African Rift (EAR) mantle xenoliths (Mega, Sidamo region, southern Ethiopia), coupled with recently published Nd isotope and trace element compositions, provide compelling evidence for multiple episodes of mantle depletion and metasomatic enrichment. Radiogenic values (ε_{Nd} up to +22.5 and ε_{Hf} up to +1076) suggest mantle domains currently located beneath the Main Ethiopian Rift suffered extreme melting regimes, possibly in the presence of residual (majorite?) garnet, effectively fractionating Sm/Nd, Lu/Hf and Nd-Hf systematics. Positively correlating Lu/Hf and $^{176}Hf/^{177}Hf$ provide an apparent ingrowth of 1.96 Ga, close to the CHUR model age of the most radiogenic sample (1.95 Ga, consistent with other local records of Proterozoic melting events). Pb isotopes are clearly decoupled from the Nd-Hf systematics, displaying $^{206}Pb/^{204}Pb$ up to 20.1, $^{207}Pb/^{204}Pb$ up to 15.70, and $^{208}Pb/^{204}Pb$ up to 39.8. These data suggest vigorous convection cells, possibly triggered as a far field dynamic consequence of the Afar plume impingement, preferentially occurred beneath this site, where important lithospheric discontinuities exist between the Archean/Early Proterozoic Tanzanian craton and the Late Proterozoic Panafrican mobile belt. Such deep mantle dynamics may contribute to stabilizing distinct EM1 and HIMU metasomatic components in the EAR lithospheric mantle.

Early Archean crust of the Ukrainian Shield – Evidence from detrital zircons

E. BIBIKOVA, L. SHUMLYANSKYY, C.J. HAWKESWORTH, S. CLAESSON, C. STOREY, B. DHUIME AND A. FEDOTOVA

Data on continental sediments remain the basis for many models for the generation and evolution of the crust [1]. Detrital zircons from old metasedimentary rocks can provide valuable contributions to the knowledge of the Early Earth crust. We have studied geochronologically (U-Pb, zircons, Sm-Nd) and geochemically (Hf-isotopes and REE) detrital zircons from two greenstone structures in the Azov domain, Ukrainian Shield. U-Pb isotopes of zircons from five samples of mica schists from the Soroki and Fedorof greenstone belts were analysed on ion microprobe NORDSIM at the Swedish Museum of Natural History, focusing mainly on cores identified by CL. The data include a group of ages in the range 3.5-3.6 Ga, and some zircon cores older than 3.7 Ga.

The REE patterns of metasediments and zircons are similar to those of TTG Archaean rocks [1]. Lu-Hf isotopic system was studied by La ICP-MS at University of Bristol [2] at the same spots inside zircons where the most concordant ages were obtained. In our interpretation of Hf isotope data, we follow the model proposed by [3]. The majority of granites have isotope signatures that preclude direct mantle genesis, rather we constrain the $^{176}Lu/^{177}Hf$ ratio of the crustal material that was initially extracted from the mantle to be 0.22-0.25, typical for mafic magmas. In such interpretation, the age of this crust will be about 4.2 Ga. The model age of zircons in metasediments derived from the TTG rocks with low ≤ 0.01 $^{176}Lu/^{177}Hf$ ratio, is 3.8-3.6 Ga.

Sm-Nd model ages of 3.3-3.4 Ga and εNd (T) for the analysed samples are in a good agreement with the zircon data. Our new results indicate that Eo and Paleoarchean crust in the Azov domain was widely distributed.

[1] Taylor & McLennan (1985) *The continental crust*. Oxford, Blackwell, 312 p. [2] Dhuime *et al*. (2007) *Precamb. Res* **155**, 24-46. [3] Pietranik *et al*. (2008) *Geology* **36**, 875-878.