Mantle heterogeneity evidence from South Patagonia, Argentine indicated by noble gas analysis on mantle xenoliths.

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Studying the subcontinental lithospheric mantle evolution and heterogeneity can be very complex for many reasons: in addition to the complex history of its own origin, after being formed, the subcontinental lithospheric mantle can be exposed to different processes related or not to the crust formation as: re-melting, delamination from the crust, re-fertilization with fluids from different origins as lithospheric, sub-astenospheric, subduting slabs and so on. Spinel- and/or garnet-bearing ultrabasic mantle xenoliths brought to the earth's surface by intraplate alkaline basalts provide direct information on the nature and processes involved in the modifications of the subcontinental mantle lithosphere as mantle metasomatism. The western South American plate is a natural laboratory for petrological investigations of the subcontinental lithosphere due to the complex tectonic arrangement of the Andes. We performed noble gas analysis (He, Ne, Ar, Kr and Xe) in thirty samples of mantle xenoliths hosted by Eocene to recent alkaline basalts from ten different localities widely dispersed in southern South America (36º-52ºS). Mineral separates (olivine, basically, orthopyroxene, and rarely clinopyroxene) were used for noble gas analysis. Noble gases were extracted by crushing and stepwise heating method. Except for high $^{3}He/^{4}He$ ratios observed for few samples at low temperature of stepwise heating indicating some cosmogenic ^{3}He, the majority of the samples show $^{3}He/^{4}He$ ratio around of 7.22±0.93RA. The lower $^{3}He/^{4}He$ ratio than the MORB value (8±1RA) indicates higher $(U+Th)/^{3}He$ ratio than the MORB source mantle. $^{40}Ar/^{36}Ar$ ratios obtained with crushing method vary from 326 to 1476. The rough correlation $^{3}He/^{4}He$ ratio and $^{40}Ar/^{36}Ar$ ratio of the lithospheric mantle beneath South Patagonia could argue for metassomatism by slab-derived component for some samples. However, the large variation of $^{20}Ne/^{22}Ne$ from 9.27 to 12.0 and the narrow variation of $^{21}Ne/^{22}Ne$ from 0.0279 to 0.049, in adition to the good correlation between $^{20}Ne/^{22}Ne$ vs. $^{21}Ne/^{22}Ne$ could suggest some OIB like characteristic for the metasomatic fluid.

Geochemical characterisics of the LB-07A and LB-08A cores from the Bosumtwi Impact Structure, Ghana

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Cores extracted from the central uplift (LB-08A) and deep crater moat (LB-07A) of the 1.07 Ma Bosumtwi impact structure, Ghana, consist of alternating suevite, polymict lithic breccia, and monomict breccia (in LB-07A only) that overlie fractured country rocks comprising metagreywacke and metapelitic sediments.

In both cores, the impact breccias have compositions intermediate to the identified target rocks [1] and are well-homogenized with respect to the silicate component. Interestingly, the different lithologies in LB-07A show less variation than those from LB-08A; however, a number of major and trace elements show more variation in the metagreywacke and metapelitic sediments for both cores. Impactite trace element concentrations are significantly different from other lithologies, and appear to be controlled by greywacke-phyllite and shale proportions. Hydrothermal alteration, which has been noted petrographically, has affected both the CaO and MgO contents of the rocks [2 and 3, for more detail], which correlate with LOI. In general, the chemical signatures of fallout suevites from the northern crater rim and fallback suevites from the cores are similar, but different MgO, CaO, and Na_2O contents were noted. Additionally, the Ivory Coast tektites have narrower ranges of MgO and CaO content than the fallback suevites. This may be due to varying degrees of alteration, but it must be noted that the fallback and fallout suevites differ signficantly in clast population (particularly with regards to calcite and granite content), as well as a higher proportion of melt fragments in the fallout suevites. Rare earth element compositions are similar between the impactites and basement lithologies for both cores, and are comparable between cores.

Siderophile element abundances in the suevites in the cores are not obviously higher than those seen in the country rocks and outer suevite occurrences; thus no evidence for a meteoritic component has been detected.

References

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