Geophysical Research Abstracts
Vol. 14, EGU2012-8810, 2012
EGU General Assembly 2012

A two-component mantle extending from Hyblean Plateau to Mt Etna (Eastern Sicily) as inferred by an integrated approach with noble gases, trace elements and isotope geochemistry.

A. Correale (1), M. Martelli (2), A. Paonita (2), A. Rizzo (2), and S. Rotolo (1)

(1) Dipartimento DiSTem, Università di Palermo, Italy, (2) Istituto Nazionale di Geofisica e Vulcanologia, Sezione di Palermo, Italy

We carried out a geochemical investigation of the mantle beneath Hyblean and Etnean area through ultramafic xenoliths (peridotites and pyroxenites) retained in Miocenic age Hyblean volcanics and primitive Etnean lavas and tephra, respectively. Major and trace elements and Sr-Nd isotopes (whole rock and /or minerals) were analysed together with noble gases entrapped in fluid inclusions hosted in olivines and pyroxenes phenocrysts.

The geochemical results from Hyblean xenoliths study highlighted the presence of two distinct compositional groups: the peridotites, featured by a more enriched geochemical fingerprint ($^{3}He/^{4}He$ $\sim$7 Ra, $^{143}Nd/^{144}Nd$ $\sim$0.5129 and Zr/Nb $\sim$ 4) and the pyroxenites, characterized by a more primitive character ($^{3}He/^{4}He$ up to 7.6 Ra, $^{143}Nd/^{144}Nd$ $\sim$0.5130 and Zr/Nb $\sim$30). Our interpretation is that metasomatic processes interested the Hyblean lithosphere and the pyroxenites (former primitive mantle melts) represent the metasomatizing agent. During their ascent these primitive melts permeated the peridotitic mantle at different levels, producing a variable degree of refertilization. The metasomatic processes affected distributions of both trace elements and noble gases, even though these geochemical tracers displayed very different sensitivity to the effects of metasomatic mixing between two end-members.

The investigated primitive Etnean magmas showed a variable REE enrichment respect to MORB (La_n/Yb_n =11-26) and isotopic values of Sr, Nd and He in the following ranges: $^{143}Nd/^{144}Nd$ = 0.512869-0.512896; $^{86}Sr/^{87}Sr$ = 0.70330-0.70370; $^{3}He/^{4}He$ = 7-7.6 Ra. A variable melting degree of a common mantle source together with a variable level of crystallization and crustal contamination is hypothesised to explain the variations exhibited by the above Etnean dataset. Numerical simulation performed on MELT code allowed to estimate the trace elements content of the Etnean mantle source. These results, joined to the most primitive isotopic values of He- Sr- Nd among the investigated products helped to geochemically characterize the mantle beneath the Etnean area, suggesting a strict relation with that Hyblean. Indeed, the modeled Etnean source locates on the mixing zone between the Hyblean peridotite and pyroxenite, so testifying a simultaneous contribution of two components in the genesis of the investigated lavas and supporting the hypothesis of an heterogeneous and metasomatized lithosphere common to both areas.