



Metasomatism of the SE Alps mantle lithosphere: evidence from ultramafic xenoliths of the Veneto Volcanic Province

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Mantle metasomatism of the Adriatic lithosphere of SE Alps has been inferred by geochemical and petrological investigations on peridotite xenoliths entrapped into basic lavas from the Tertiary Veneto Volcanic Province (TVVP).

In comparison to the primordial mantle, the ultramafic xenoliths (mg# >88) are slightly to strongly depleted in a basaltic component and show significant trace element and isotopic (Sr, Nd, Pb and O) heterogeneity. They show glass patches, which are not apparently related to interaction with the host basalt and recrystallized rims around clinopyroxene and spinel. These peculiarities are likely due to reactions between the TVVP xenoliths and different metasomatic agents. The nature of the metasomatic agents has been constrained by comparing the geochemical and isotopic features of these xenoliths, such as variable Ba/LREE, LILE-LREE/HFSE and LREE/HREE ratios, discordant Nb, Ta, Sr and K anomalies, high $^{207}\text{Pb}/^{204}\text{Pb}$ together with relatively low $^{206}\text{Pb}/^{204}\text{Pb}$ ratios, and significantly high Sr and oxygen isotopic compositions. Mass balance calculations support that different metasomatic components affected the TVVP subcontinental mantle:

1. an OIB-like agent related to upwelling of deep mantle material characterized by high Th/REE, Th/U, LREE/HREE, LILE/HREE ratios, $^{87}\text{Sr}/^{86}\text{Sr} \leq 0.7033$, $^{143}\text{Nd}/^{144}\text{Nd} \sim 0.5129$, $^{206}\text{Pb}/^{204}\text{Pb} > 19.5$ ratios and $\delta^{18}\text{O} \sim 6\%$;

2. silica-rich liquids, likely enriched in sedimentary material belonging to the European subducted slab. This upper crust-like component is characterized by high LFSE/HFSE, LREE/HFSE and variable Ba/LREE ratios, $^{87}\text{Sr}/^{86}\text{Sr} \geq 0.7035$, $^{143}\text{Nd}/^{144}\text{Nd} < 0.5130$, $^{206}\text{Pb}/^{204}\text{Pb} \leq 19.5$ isotope composition, and average $\delta^{18}\text{O} \geq 7\%$.

Overlapping of metasomatic processes, e.g. induced by OIB and slab components, is in agreement with both the lack of Rb troughs even in samples showing geochemical patterns comparable to HIMU-OIB, and the occurrence of Ti negative anomalies within the whole suite of xenoliths. The TVVP peridotites reflect a subcontinental mantle source that has been affected by complex enrichment processes, related to a geodynamic scenario dominated by extension-related magmatism (Cenozoic sodic-alkaline volcanism), but neighboring active collision (subduction of the European slab).