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Tertiary Mediterranean lamproites: towards a comprehensive model

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Four major lamproitic provinces with uniform geological, geochemical and petrographic characteristics are recognized in the Mediterranean area: Spain, Italy, Balkans and Turkey. Mediterranean lamproites are SiO2-rich lamproites, characterized by low CaO, Al2O3 and Na2O, and high K2O/Al2O3 and Mg-number. They are enriched in LILE relative to HFSE and in Pb, and show depletion in Ti, Nb and Ta. Two components are known to be involved in their origin: (i) a mantle source contaminated by crustal material, giving rise to crust-like trace element patterns and radiogenic isotope systematics, and (ii) an extremely depleted mantle characterized by very low whole-rock CaO and Al2O3, high-Fo olivine and Cr-rich spinel, and which isotopically resembles peridotitic massifs and European SCLM. Our new and comprehensive set of Sr, Nd, Pb and Hf data invoke involvement of a component originated from the convecting mantle. Using Hf-Nd isotopic systematics, the presence of an asthenospheric component may be confirmed, which is responsible for the shift of the Hf-Nd data from the terrestrial array and the enrichment in Nb. We interpret this shift as a mixing trend (hyperbola) between melts derived from sublithospheric mantle and lamproitic melt (or its source). The following important points about the origin of Mediterranean lamproites emerge from our data: (1) Lamproitic rocks are derived from multi-component melts, which combine depleted and enriched component(s); (2) The extremely variable radiogenic isotope composition of lamproites points to the importance of mixing relations between three contrasting geochemical components which appear in 206Pb/204Pb, 87Sr/86Sr and 143Nd/144Nd space; (3) the above ar-

guments demand a multistage preconditioning of lamproite-mantle source, involving an episode of extreme depletion, followed by the involvement of terrigenous sediments, and finally interaction with the melts ultimately originating from the convecting mantle, some of which are carbonatitic.