

GEOCHEMICAL FEATURES OF SPINEL PERIDOTITES IN THE UPPER MIOCENE VALLE GUFFARI DIATREME (HYBLEAN PLATEAU, SICILY): IMPLICATIONS ON EVOLUTION OF SOUTH-EASTERN SICILY LITHOSPHERE

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Abstract

Upper Miocene Valle Guffari diatrema (Hyblean Plateau, Sicily, southern Italy) contains large number of upper mantle xenoliths among which spinel-facies peridotites with coarse-grained texture are the dominant type. Rarely the xenoliths host fresh glass vein poorly crystallized.

The whole rock and mineral chemistry record distinct events of partial melting and metasomatism. Partial melting led to variable removing of basaltic components and produced depleted lherzolites with Fo₈₉₋₉₁, En₈₈₋₉₁, Cr-Diopside: En₄₈₋₄₉ Fs₄₋₆ Wo₄₅₋₄₈ and Cr-rich spinel with cr# = 25-39. The signature of metasomatic event(s) is revealed by bulk rock incompatible element enrichments and by the REE clinopyroxenes patterns that show three different profiles: a) LREE-enriched (Lan/Ybn = 7-17); a) spoon-shaped (Lan/Ybn = 18-20; Lan/Smn = 21-34; Smn/Ybn < 1); c) nearly flat (Lan/Ybn ~3). These patterns can be associated to more or less complete equilibration with at least two distinct metasomatic melts: an alkaline silicate melt resembling the host basalt (patterns a and b) and an hawaiitic melt (in case of a peridotite containing a fresh hawaiitic glass veinlet, pattern c). Trace element distribution shows also that the alkaline silicate melt influenced the HFSE content, and in particular caused the increase of Nb/Ta and Zr/Hf ratios.

fO₂ calculation gives a redox state above FMQ (up to +1.7 logunits) related to melt-driven metasomatism. P-T estimates on these rocks yield 0.9-1.2 GPa and 870-1050°C, suggesting that different metasomatising melts percolated the spinel-peridotite matrix near the Crust-Mantle boundary or just below it. Moreover the P-T data are in agreement with paleogeotherm reported by Nimis (1998) that is consistent with a high geothermal gradient. However, the inferred mantle potential temperatures (two hundred degrees lower than values typical for a mantle plume), indicates that the assessed thermal regime does not fit with the occurrence of an active mantle plume beneath the Hyblean area.

References

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