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Abstract title

THE MANTLE LITHOSPHERE IN THE RIO GRANDE DO NORTE STATE, NORTH-EASTERN BRAZIL

Authors

GIRARDI VICENTE A. V. [1], MAZZUCCHELLI M. [2], BERTOTTO G. W. [3], TASSINARI C. G. C. [4]

presenter's e-mail: girardi@usp.br

1 - presenter
2 - second author
3 - third author
4 - fourth author

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Abstract

The composition and variability of the mantle lithosphere in NE Brazil and the effects of the Fernando de Noronha Plume track are constrained by studying the petrology and Sr and Nd isotope characteristics of spinel-facies mantle xenoliths occurring in Cenozoic alkali basalts in five localities of the the Rio Grande do Norte State. Previous work on Pico Cabuji, showed that the litosphere was affected by an OIB-like component. This process induced isotope variation arrays between DMM and EM1. The new data on the other localities support this metasomatic scenario, but show that the EM1 component only sets out clearly at Pico Cabuji. In all the other localities the Sr and Nd isotope arrays suggest that an EM2-like component affected a depleted mantle. Bulk-rock geochemical characteristics are the result of three main processes: 1) ancient melting and basalt extraction; 2) metasomatism occurring during lithosphere erosion; 2) chromatographic enrichment processes. The first and the third processes are mainly recorded in xenoliths having equilibrium temperatures < 1000°C (Bray and Kohler, 1990, geothermometer). In this group, melting and basalt extraction processes are documented by major element geochemical variations in bulk rock and mineral phases. Bulk-rock REE profiles vary from spoon-shaped to flat and extended trace element patterns exhibit marked Rb enrichment and positive Zr,Hf spikes. 87Sr/86Sr30Ma and 143Nd/144Nd30Ma range 0.7023 - 0.7038 and 0.51329 - 0.51283, respectively. The second process is mainly documented in xenoliths having equilibrium temperature > 1000°C. Major element variation trends in bulk rock and cpx resemble those modelled for fractional melting residua of a Primitive Mantle source, but are enriched in TiO2, Al2O3 and Na2O.The bulk-rock REE patterns vary from flat to slightly LREE enriched or, rarely, depleted and steadily fractionated to HREE. REE concentration is 0.8 - 0.4 x PM. Rb is enriched and Ba depleted with respect to LREE. Zr and Hf have positive spikes. 87Sr/86Sr30Ma and 143Nd/144Nd30Ma range 0.7033 - 0.7044 and 0.51288 - 0.51264, respectively. In agreement with addition of a metasomatic component 143Nd/144Nd30Ma decreases, and 87Sr/86Sr30Ma, Mg#, Cen/Ybn and La/Nb increase, with increasing equilibrium temperature. The metasomatic component is geochemically and isotopically consistent with the host basalt composition, thus suggesting that metasomatism is chronologically related with the basalts.

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