



Petrogenesis of fertile mantle peridotites from the Monte del Estado massif (southwest Puerto Rico): a preserved section of Proto-Caribbean oceanic lithospheric mantle?

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The Monte del Estado massif is the largest and northernmost serpentinized peridotite belt in southwest Puerto Rico. It is mainly composed of spinel lherzolite and minor harzburgite with variable clinopyroxene modal abundances. Mineral and whole rock major and trace element compositions of peridotites coincide with those of fertile abyssal peridotites from mid ocean ridges. Peridotites lost 2-14 wt% of relative MgO and variable amounts of CaO by serpentinization and seafloor weathering. HREE contents in whole rock indicate that the Monte del Estado peridotites are residues after low to moderate degrees (2-15%) of fractional partial melting in the spinel stability field. However, very low LREE/HREE and MREE/HREE in clinopyroxene cannot be explained by melting models of a spinel lherzolite source and support that the Monte del Estado peridotites experienced initial low fractional melting degrees (~ 4%) in the garnet stability field. The relative enrichment of LREE in whole rock is not due to secondary processes but probably reflects the capture of percolating melt fractions along grain boundaries or as microinclusions in minerals, or the presence of exotic micro-phases in the mineral assemblage.

We propose that the Monte del Estado peridotite belt represents a section of ancient Proto-Caribbean (Atlantic) lithospheric mantle originated by seafloor spreading between North and South America in the Late Jurassic-Early Cretaceous. This portion of oceanic lithospheric mantle was subsequently trapped in the forearc region of the Greater Antilles paleo-island arc generated by the northward subduction of the Caribbean plate beneath the Proto-Caribbean ocean. Finally, the Monte del Estado peridotites belt was emplaced in the Early Cretaceous probably as result of the change in subduction polarity of the Greater Antilles paleo-island arc without having been significantly modified by subduction processes.