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Monte del Estado (Puerto Rico) and Loma Caribe (Dominican Republic) peridotites: A look at two different Mesozoic mantle sections within northern Caribbean region

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Peridotites (mantle-tectonites) crop out as isolated dismembered remnants of former ophiolites in tectonic belts along the northern margin of the Caribbean Plate. They include the Loma Caribe peridotite in Dominican Republic, and Monte del Estado peridotite in southwestern Puerto Rico. Their protolith age is probably Late Jurassic or Lower Cretaceous. The Monte del Estado peridotite massif is predominantly spinel lherzolite. Opx and Cpx usually show kink-bands and undulatory extinction. Peridotite contain brownish aluminous spinel with Cr# = 0.12-0.16 and Mg# = 0.73-0.77. Olivine composition fall in the range Fo89-90, with NiO content between 0.28 and 0.52 wt%. Opx compositions are in the ranges En85-90, with Al2O3 and Cr2O3 contents of 2.9-6.15 wt% and 0.26-0.79 wt% respectively. The Cpx Mg# ranges from 85 to 94. The Al2O2 content range from 2.5 to 6.5 wt%., Cr2O3 content from 0.33 to 1.11 wt%., and TiO2 content from 0.17 to 0.53 wt%. In a Cr# vs. Fo diagram all analysed samples plot in the abyssal peridotite field. Re-equilibration temperature of olivine-spinel couples range between 705 and 839 žC (μ=771 žC) and are very similar to the re-equilibration temperatures calculated on abyssal peridotites. Peridotites from Monte del Estado record oxygen fugacities of Dlog fo2 (FMQ) = -1.83 to -0.26 which overlap those of mid-ocean ridge peridotites. The Loma Caribe peridotite is composed of lherzolite, Cpx-rich harzburgite, harzburgite and dunite. The peridotites typically show

porphyroclastic textures with orthopyroxene phenocrysts strongly deformed. The Cr# in spinel from Loma Caribe peridotites vary from 0.30 (lherzolite) to 0.88 (dunite). Compositions of accessory spinel from dunites and harzburgites resemble suprasubuction zone mantle peridotites, while composition of spinel in lherzolites is similar to abyssal peridotites. In addition, the olivine Mg# of dunite (91-92) is slightly higher than that of harzburgite (89-91), and higher than lherzolite (89-90). Opx composition in harzburgite shows higher Mg# (91-92), and Al2O3 contents ranging from 0.89 to 1.1 wt.%. Opx from lherzolite exhibits lower Mg# (89-91) and higher Al2O3 (2.4-3.5 wt.%). The Mg# of clinopyroxene in harzbugite ranges from 94 to 95 and the Al2O3 content varies from 0.89 to 1.1 wt%, while Mg# of Cpx in lherzolite ranges from 86 to 94 and the Al2O3 content is in the range of 2.3-4.0 wt%. Re-equilibration temperature of olivine-spinel couples calculated is 637-670 žC (μ = 666 žC) for dunite, 698-764 žC (μ = 730 žC) for harzburgite, and 635-765 (μ = 700 žC) for lherzolite. The re-equilibration temperatures obtained for dunite differ from temperature calculated on abyssal peridotite, but are very similar to the re-equilibration temperatures calculated in the mantle diapirs of Mariana fore arc. On the other hand, dunite from Loma Caribe has oxygen fugacities of Dlog fo2 (FMQ) = -0.5 to -0.1, harzburgite record lowest fo2 (-2.0 to -1.87 log units), and lherzolite has fo2 of -1.86 to -0.84 log units relative to the FMQ buffer, suggesting that the peridotites record very different petrogenetic histories. Monte del Estado peridotite resemble fertile abyssal peridotites and do not seem to have been affected by a subduction component. They probably represents a mantle lithosphere relic of the Proto-Caribbean oceanic arm of the Atlantic generated by seafloor spreading between North and South America in Upper Jurasic-Lower Cretaceous times. In contrast, Loma Caribe peridotite correspond to depleted abyssal or supra-subduction zone peridotites. They represents a heterogeneous suboceanic mantle which probably including mantle underneath oceanic ridge, oceanic plateau and island arc. We interpreted Loma Caribe as a fragment of Jurassic-Cretaceous Pacific oceanic lithosphere that had been modified at a suprasubduction zone environment related to Cretaceous Greater Antilles arc, which was affected by a mantle plume (Duarte Plume). Restites for oceanic plateau basalt are peridotite contains chromian spinel with Cr# around 0.8, similar to Loma Caribe dunites. In conclusion, the present data suggest that at least two Jurassic-Cretaceous mantle sections existed within the northern Caribbean plate margin, which underwent different magmatic events: mid-oceanic accretion (Monte del Estado), and subduction-mantle plume interaction (Loma Caribe).