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# The origin for the olivine-rich troctolites from the oceanic lithosphere: remnants of a reactive MOHO

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Olivine-rich troctolites are documented since the early 1970s in the lower crust and mantle sections of the Jurassic oceanic lithosphere exposed along the Alpine-Apennine belt (Italy). These rocks were first interpreted to be cumulates formed by precipitation of olivine and accessory spinel from primitive basalts (Bezzi A. and Piccardo G.B., 1971. Mem. Soc. Geol. It.). The founding of olivine-rich troctolites bodies within the gabbroic sections of the Hess Deep (East Pacific Rise) and Atlantis Massif and Kane Megamullion (Mid Atlantic Ridge) called into question this idea, suggesting that they may represent portion of the crust-mantle transition entrapped during the growth of the lower crust (Arai and Matsukage, 1996, Lithos; Suhr et al., 2008, G-cubed). Recently, Japanese scientific cruises found olivine-rich troctolites associated with mantle harzburgites at the Godzilla Megamullion (Philippine Sea) [3] and at the Uraniwa Hills (Central Indian Ridge) (Nakamura et al., 2009, EPSL; Sanfilippo et al., 2013, J. Petrol.). We show that the olivine-rich troctolites from all these occurrences show peculiar structural and compositional features: i) highly variable forsterite, Ni and Co contents of olivine; ii) high Mg/(Mg+Fe), high $Cr_2O_3$ contents, and fractionated incompatible element compositions (i.e. Ti/REE and Zr/REE) of clinopyroxene; iii) the occurrence hydrous silicate mineral inclusions in spinels anomalously enriched in $TiO_2$. These features agree with the idea that olivine-rich troctolites formed through reactions between a pre-existing olivine-matrix and migrating melts [see also Renna and Tribuzio, 2011, J. Petrol.). In particular, we suggest that these chemical features were acquired at the crust-mantle transition, through interactions between mantle peridotites and melt stagnating at the base of the igneous crust. The occurrence of olivine-rich troctolites both at slow- to intermediate spreading ridges and at back-arc settings suggests that melt-peridotites reaction processes constrain the Moho under the totality of the oceanic plates.

Keywords: Ocean floor, Peridotite, Troctolite, Melt-Mantle reaction, Moho