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Multistage asthenospheric melt/rock reaction in the ultraslow eastern SWIR mantle

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Very small amounts of melt are produced during mantle upwelling beneath the ultraslow spreading South West Indian Ridge. Sectors of this Oceanic Ridge are characterized by nearly amagmatic spreading with rare limited eruptions of basalts spotting a mantle-derived serpentinitic crust. A large peridotite dataset was recovered during the Smoothseafloor French expedition leaded by D. Sauter and M. Cannat in 2005 (Sauter et al., 2013). Mantle-derived rocks show a significant modal variability from the sample to the dredge scale with frequent occurrences of millimetric to centimetric spinel-bearing pyroxenitic veins. Mantle residua record a multistage reactional history between small amount of transient melts and variably depleted mantle parcels. Incomplete mineral replacements are widespread showing that both pyroxenes are repeatedly dissolved and recrystallized leaving poekilitic pyroxene and spinel textures. Reacting conditions are modelled assuming an incremental open-system melting model under variable critical porosity/F ratios (Seyler et al., 2011; Brunelli et al., 2014). Incoming melts result to be generated by low degrees of melting in the garnet field then reacting with the rock under near-batch conditions, i.e. at low rates of melt extraction with respect to the actual rock porosity. As a consequence Na (and LREE) countertrends with melting indicators as mineral Cr# and concentration of the moderately incompatible elements (HREE, HFSE). This results in rotation of the REE patterns around a pivot element instead of showing progressive depletion as expected after suboceanic mantle decompression.

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