Metasomatized segregates of high-Ca boninites: Cabo Ortegal pyroxenites

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Abundant massive pyroxenites and dunites occur among harzburgites in the Herbeira massif of the Cabo Ortegal complex as part of the Variscan suture in Spain [1]. The formation and evolution of this assemblage have never been comprehensively understood due to a particularly complex tectonothermal history [2] [3]. Our new whole-rock and *in situ* geochemical data suggest that it constitutes the rare occurrence of a boninitic signature in ancient pyroxenites, recording a multi-stage metamorphic and metasomatic evolution during subduction and exhumation.

Depletion of high-field strength elements and the major-element composition of these spinel websterites and clinopyroxenites (*e.g.* high Ca, low Al and Ti) suggest that they originated from fractional crystallization and segregation of high-Ca boninites. Variations in heavy rare earth elements content and Mg-number (0.83-0.90) point to interaction of these melts with host mantle, producing dunites, dunitic flames-bearing pyroxenites and subordinate orthopyroxenites. The lithological heterogeneities produced controlled subsequent melt percolation and deformation during intrusion of these rocks into the Devonian subduction zone. Development of sheath folds overprinted high-temperature boudinage during the prograde metamorphism peaked at 16.5-20 kbar and ~800°C, which led to syn- to late-kinematic development of garnet around spinel. Spoon-shaped to strongly enriched rare earth element patterns were produced by various degrees of chromatographic re-equilibration with *in situ* partial melts produced at peak metamorphism, as evidenced by the existence of garnet-bearing mafic dykes. Abundant base-metal sulphides and euhedral to subhedral low-Ti magnesio-hornblende after diopside (and Al- to Cr-rich spinel) crystallized during retrograde metamorphism. Further fluid-mobile elements enrichment occurred during this hydration episode.

[1] Girardeau *et al.* (1989), *Nature*, **245**, 1231-1233. [2] Ábalos *et al.* (2003), *Tectonics*, **22**, 1006-1027. [3] Santos *et al.* (2002), *Journal of Petrology*, **45**, 17-43.