Fluid-rock interaction in the subduction environment: Tremolitite-veins and associated blackwalls in subducted Atg-serpentinite (Central Cuba)

L. BUTJOSA [1*], A. GARCIA-CASCO [2], J.A. PROENZA [1], I.F. BLANCO-QUINTERO [3] AND A. CAMBESES[2]

[1] Departament de Mineralogia, Petrologia i Geologia Aplicada, Universitat de Barcelona (UB), Martí i Franquès s/n, 08028 Barcelona, Spain. (*Correspondance: lbutjosa@ub.edu) (japroenza@ub.edu)

[2] Departamento de Mineralogía y Petrología, Universidad de Granada (UGR), Fuentenueva s/n, 18002 Granada, Spain. (agcasco@ugr.es/ aitorc@ugr.es)

[3] Departamento de Geociencias, Universidad de los Andes, Cra 1 No 18A – 70, M1-309, Bogotá, Colombia (if.blanco@uniandes.edu.co)

Fluid flow is recorded in vein structures of high pressure Atg-serpentinite from the Santa Clara subduction mélange (Central Cuba). Whole rock major and trace element composition of host serpentinite indicates MOR setting formation of subducted ultramafic protolith, which likely formed by seafloor spreading during the Late Jurassic-Cretaceous of the Proto-Caribbean ocean (related to the Central Atlantic). Atg-serpentinite formed during subduction and was incorporated as a tectonic blocks in the Caribbean subduction channel. Fluid infiltration took place shortly after incorporation into the subduction channel along open fractures, forming tremolite (nephrite jade) veins and metasomatic domains in host Atg-serpentinite. Pseudosection modelling of vein domains suggest that vein structure was formed c. 10 kbar and 450 ºC, during exhumation Atg-serpentinite blocks within channel mélange. Geochemical data indicates a LILE-, HFSE- and REE- enriched fluid likely derived from dehydration of subducted oceanic crust, while Sr and Nd isotopic compositions point to a mixture of depleted mantle- and metasediment-derived fluids. Mass balance modelling indicates that LILE, Th and Hf were enriched in the metasomatic zones (up to 100% for LILE and 600% for Th and Hf) relative to parent Atg-serpentinite. The mechanical and chemical processes are lower-T lower-P analogues of deeper fluid/melt transport and interaction in the mantle wedge. Further subduction of these rocks constitute potential sources for enriched fluids evolved from the slab and introduced in the parent mantle wedge region of volcanic arc magmas.