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In-situ characterization of subduction-related serpentinites: a new vision on behaviour of fluid mobile elements during the subduction factory

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Subducted oceanic serpentinites probably play a major role in the element transfer from slabs to dry mantle wedges and might therefore be partly responsible for the trace-element and isotopic characteristic of arc magmas. New acquisition of major and trace elements (microprobe and Laser HR ICP-MS) were acquired on serpentinite samples from three different high-pressure and ultrahigh-pressure terranes : Himalaya, Cuba and Dominican Republic. Despite the low concentrations in trace elements (ppm) and the small grain-size of serpentine minerals (mm), our preliminary results show a good reproductibility of concentrations in each sample, above the detection limit.

According to major element ratios (Mg/Si vs Al/Si ratios) on whole rock geochemistry, Hattori and Guillot (2007) distinguished oceanic hydrothermal serpentinization and hydration in mantle wedge. Himalayan serpentinites represent mantle peridotites hydrated within the mantle wedge by water released from the subducted margin of the Indian continent. Cuban serpentinites are abyssal peridotites hydrated by sea water on the sea floor whereas Dominican Republic serpentinites are the result of subduction of Atlantic oceanic lithosphere and present both abyssal hydrated peridotites and serpentinites from mantle wedge.

Serpentine mineral compositions based on Laser HR ICP-MS analysis also record the origin of the serpentinites. Serpentines from Himalayan samples present a strong enrichment in some mobile elements (As 4-163 ppm; Sb 0.17-20,5 ppm; B 0.11-188 ppm, U 0.0007-4.22 ppm) confirming the enrichment observed by whole rock geochemistry (Hattori et al., 2005). However, we do not observe particular enrichment in Lithium. In contrast, HP serpentinites derived from abyssal serpentinites (Cuba and Dominican Republic) are less enriched in mobile elements (As 0.0013-6.85 ppm; Sb 0.0001-0,84 ppm; B 0.02-120 ppm; U 0.0002-0.62 ppm). Note that these serpentinites have similar composition than Atlantic abyssal serpentinites (MARK, Andreani et al, pers. com.). Thus, there are no evidence of mobility of trace elements during subduction and exhumation of abyssal serpentinites. We observe a strong fractionation on Nb/Ta ratio between mantle wedge (Nb/Ta from 5,3 to 1761; Nb 0,0054-0,951 ppm) and abyssal samples (Nb/Ta from 0 to 159; Nb 0,0004-0,75 ppm); there are also no evidence of fractionation on Zr/Hf ratios. Such fluid-mobile elements seem to be preferentially incorporated in the crystal structure of antigorite, which makes it a good marker for mantle wedge metasomatism. Moreover we can explain partially the Nb anomaly in arc magmas with retention of this element in hydrated peridotites from the mantle wedge.

Hattori and Guillot, 2007, G3, **8**, n° 9, doi: 10.1029/2007GC001594.

Hattori et al., 2005, GCA, **69**, n° 23, 5585-5596.