Distribution of Ni-Fe alloys in the serpentinized harzburgites of the Jeffrey Mine, Asbestos, Québec

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Harzburgite tectonites in the Asbestos ophiolite complex were subjected to a complex, protracted serpentinization history. Earlier serpentinization is traditionally attributed to ridge-related processes [1], which developed retrograde pseudomorhs after olivine and bastite pseudomorphs after orthopyroxenes [2]. During ophiolite transport and deformation, the serpentinites were replaced by an assortment of new, prograde, mineral assemblages displaying non pseudomorphic textures. A wide variety of veins were formed, and brucite crystallized in large amounts. Abundant, finely dispersed Ni-Fe alloys are associated with the brucite and crystallized in and at the margins of fractures filled with late serpentines. This late association of Ni-Fe alloys with brucite in prograde recrystallized type 3-B serpentinites [2] is unusual. The formation of Ni-Fe alloys in serpentinites is conventionally attributed to highly reducing conditions attained during the oxydation of Fe^{2+}-bearing silicates [2]. Their environment of formation is considered to be restricted to partially serpentinized peridotites where H_2 is produced continuously and the activity of water is < 1 [3]. If earlier serpentinization of harzburgite in the Asbestos ophiolite went to completion before later replacement occurred, this would imply that incomplete serpentinization of peridotite is not automatically a prerequisite for the formation of Ni-Fe alloys [3].

[1] Laurent & Hebert (1979) *Can. Min.* **17**, 857-869.
[2] Wicks & Whittaker (1977) *Can. Min.* **15**, 459-488.
[3] Frost & Beard (2007) *J. of Petrology* **48**, 1351-1368.

Direct coupling between chemical and physical erosion rates in the West Indies

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The volcanic island of Guadeloupe, West Indies offers the unique opportunity to determine weathering rates of andesites under wet tropical climate and in a volcanic context characterized by an age gradient from 3 Ma to now. We developed a multi-tracer geochemical approach, coupled with geomorphological observations. Here we will report the weathering rates deduced from rivers spanning the whole S-N gradient of relief, precipitation and age based on river chemistry. Mechanical erosion rates were estimated using two different techniques. The first is a geochemical approach using major and trace elements in the different particulate phases transported in the rivers (from sands to suspended sediments collected during storms). Elemental mass budgets lead to a first set of physical erosion rates. A second set of mechanical erosion rates had be deduced from the volume of rocks removed from catchments of known age. Results show a good agreement between the two set of data and place West Indies among the most eroded places in the world. A dependence of erosion rates with age is observed with a decrease of mechanical rate over chemical rate ratio with increasing age. Chemical erosion rates and physical erosion rates appear to be correlated. This adds new evidence of the coupling between weathering and erosion rates along a temporal gradient of drainage basin of constant lithology. West Indies are thus of great interest for better understanding the role of age, soil formation and mechanical erosion onto weathering rates and associated CO_2 consumption.