Weathering regime recorded by boron isotopes in grain size fractions of soil and river sediments

C. ERCOLANI[12], D. LEMARCHAND*, A. VOINOT[1], C. BOSIA AND A. DOSSETO[2]

[1]LHyGeS-EOST, University of Strasbourg, Strasbourg, France, *lemarcha@unistra.fr

[2]Wollongong Isotope Geochronology Laboratory, School of Earth and Environmental Sciences, University of Wollongong, NSW, Australia

The relationships between tectonic, erosion and climate control the transport and transformation of the sediments and can be schematically summarized as the competition between erosion and weathering rates. Generally, these processes are determined by chemical, and sometimes isotopic, mass budgets from river waters, soils and/or sediments. However, the chemical heterogenity of the parent material, even at the weathering profile scale, often hampers accurate determination of the weathering rates.

In the present study, we explore whether B isotopes ($\delta^{11}B$) in soils and river sediments can record the mechanisms and forcing parameters of the weathering reactions. The key idea is based on the observation that cogenetic silicate minerals have very similar $\delta^{11}B$ signatures and that isotopic fractionation only occurs during precipitation of secondary products [1]. Thus, we anticipate that the $\delta^{11}B$ in coarse minerals reflects the source of sediments whereas the $\delta^{11}B$ in clay fractions is controlled by the weathering regime. Following this model, we compare the $\delta^{11}B$ in different grain size fractions (bulk sample, clay-sized and coarse fractions) from various geomorphological settings: forest soils, supended sediments from Himalayan rivers and paleochannel sediments from southest Australia.

In forest soils or suspended sediments from active river channels, constant $\delta^{11}B$ values in the coarse fractions indicate a petrographically unique source for the particles. By contrast, the $\delta^{11}B$ in coarse fractions of sediments from Australian paleochannels (deposition ages: 0-100 kyr) display evidence of slow but regular variations that can be interpreted either as a change of the sources supplying the sediments or post-depositional weathering. In all systems, $\delta^{11}B$ in clay fractions significantly differ from those in the coarse ones. Comparison of the $\delta^{11}B$ variations between coarse and clay fractions with major and trace data could help determining the conditions and intensity of the weathering reactions.

[1] Lemarchand, D., et al. (2012) *Geochim Cosmochim Ac* **98,** 78–93.