The pandora's box of reverse weathering reactions: clues from Li and Si isotopes in a paleo-delta

XU (YVON) ZHANG, JÉRÔME GAILLARDET, LAURIE BARRIER, AND JULIEN BOUCHEZ

Institut de Physique du Globe, 1 rue Jussieu, 75005, Paris

"Reverse weathering" was proposed more than 50 years ago as a viable process to account the required sink of oceanic dissolved substances (Mackenzie and Garrels, 1966), and has been suggested to consume cations and alkalinity. The main mechanism behind reverse weathering is the marine authigenic clay formation during the interaction between detrital clays and seawater. Field evidence supporting such a process is still sparse. Deltas are thought to be one of the possible environments allowing for the occurrence of reverse weathering (Michalopoulos and Aller, 1995). As reverse weathering processes should in principle fractionate isotopes, here we explore variations in three isotopic systems (Si, Li, and Nd) in sediments collected from a paleo-delta complex (Ainsa, Spain) of Eocene age, and compare marine and non-marine deposits of same age. Nd isotope data show little variation in the source rock material of the various studied deposits. Systematic differences in Si and Li isotopes exist between marine and non-marine sediments, with marine deposits being in general enriched in lighter isotopes. We argue that this difference is due to the formation of a Al-Fe rich authigenic phase, through which a tight coupling exists between the cycles of Si, Li, and Fe in deltaic environments.

References:

Mackenzie, F. T. & Garrels, R. M. Chemical mass balance between rivers and oceans. *Am. J. Sci.* **264**, 507-525 (1966)

Michalopoulos, P. & Aller, R. C. Rapid clay mineral formation in Amazon delta sediments: reverse weathering and oceanic elemental cycles. *Science*, 614-614 (1995)