Experimental dissolution of lithogenic material into freshwater and seawater

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Isotopic budget of macro and micro-nutrients (e.g. Si, Mg, Zn, Mo, Ni) in the ocean have revealed an imbalance between their sources and sinks [1]. Recent oceanic elemental budget has highlighted the importance of taking into account continental margins as a source of elements to oceans and as one of the key mechanisms explaining "boundary exchange" [1, 2]. For many elements, the quantification of the dissolved fraction inherited from dissolution of lithogenic material at the margins remains to be determined. To explore such process, we have investigated the fate of pure mineral and bedload sediment particles in distilled water and synthetic seawater.

Different lithologies were investigated in batch reactor through selected fractions of olivine, pyroxene and anorthosite in both static and agitated modes at lab temperature and using water/rocks ratios of 5 to 10 over the course of a month.

Results showed pure dissolution phase and re-precipitation with the formation of neo-minerals. Kinetics of dissolution are variable: some major and trace elements did not reach the saturation concentration while others depicted drastic decrease in concentration after several hours to days. Comparable minerals and water/rock ratios yielded different kinetic patterns in distilled vs. saline waters. XRD are being carried out before and after the experiment to precisely determine the minerals formed and model the dissolution/re-precipitation using PHREEQC. Stable isotope compositions of Ni and Si are currently measured over the course of the experiment to determine the direction and the magnitude of the fractionation for the dissolution and adsorption/re-precipitation processes under the different experimental conditions.

[1] Jeandel and Oelkers. (2015). *Chem. Geol.*, **395**, 50-66. [2] Tréguer & De La Rocha (2013). *Annu. Rev. Marine*, **5**, 477-501.