Porewater δ^7Li profile of IODP Expedition 339: An insight into clay dewatering

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Concentration and isotope proxy records derived from the marine sedimentary archive (viz. B/Ca, Mg/Ca, δ^{18}O, $^{87/86}$Sr, δ^7Li) are utilised to reconstruct climate of the past [1-4]. The robustness of such climate reconstruction depends on our understanding of the mass and isotope balance of the elements of interest in seawater.

Lithium isotopic composition of seawater is intricately linked to the silicate weathering and reverse weathering cycles, a key controler of climate [4]. Secular variations in δ^7Li of seawater reflects an imbalance between its supply by rivers and axial hydrothermal circulation, and its removal through formation of authigenic clay minerals and by low-temperature alteration of oceanic crust. This removal flux of Li from seawater is poorly constrained and is estimated from steady state approximation. Hence, a refined knowledge of fluxes and the isotopic composition of the source and sink is necessary to improve the potential application of Li isotopes.

Part of the authigenic clay bound Li is subsequntly released to porewaters, especially at subduction zones at depths >900m and high T >60ºC, during transformation of clay minerals [5]. To better constrain the Li budget of seawater a knowledge of the mass flux and the isotopic composition of this refluxed Li from clay mineral dewatering is necessary. Expedition 339 porewaters carry a prominent clay dewatering signature, indicated by negative corelation between δD and δ^{18}O, at depths below 550m [6]. A depth profile study of δ^7Li and [Li] for Exp. 339 porewaters will be completed to better constrain the Li flux and composition associated with clay mineral dehydration that can potentially revise the oceanic Li budget.

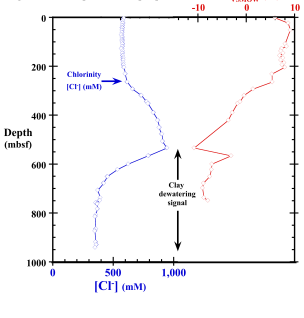

Figure: Chlorinity (blue symbols) and δD_{VSMOW} (red symbols) profiles of Site 1389 porewaters (Exp. 339 Scientists, 2013).

[1] Yu & Elderfield, *EPSL*, 2007; [2] Lear et al., *Science*, 2000; [3] Hess et al., *Science*, 1986; [4] Misra & Froelich, *Science*, 2012; [5] Kastner et al., *EPSL* 1991; [6] Epedition 339 *Scientists, Proc. IODP, Exp.* **339**, 2013.