The barium-isotopic composition of the pelagic barite flux

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The pelagic fluxes of barite and particulate organic carbon are spatially correlated, such that sedimentary barite accumulation rates have been used as a tracer of export productivity in the ocean [1]. However, pelagic barites undergo significant dynamical transformations en route to the seafloor, where their preservation can also be highly variable depending on the sedimentary environment [2]. Together, these two considerations can limit the utility of barites in paleoceanographic reconstructions [1; 2]. Stable-isotopic measurements of Ba (barium) in barites, $\delta^{138/134}Ba_{barite}$, should prove useful in addressing these concerns, as Ba-isotopic compositions will be sensitive to the dominant Ba source(s) and ambient conditions of barite precipitation in the water column, as well as the preservation efficiency of barites on the seafloor. Measurements of Ba stable-isotopic compositions in natural samples have proven extremely challenging owing to the relatively small variations expected in nature ($\leq$ 200 ppm AMU^{-1}; [3]) and the difficulties associated with isolating Ba from the other chemically-similar—and more abundant—Group II metals.

To address these issues, we developed a ^{135}Ba-^{137}Ba double spike MC-ICP-MS method to determine $\delta^{138/134}Ba_{barite}$ in natural samples that achieves an external reproducibility of ± 22 ppm AMU^{-1} (2 SD, n = 10). We have measured the first vertical profiles of pelagic $\delta^{138/134}Ba_{barite}$ for a suite of particulate samples collected from the Southern Ocean via *in situ* seawater filtration. Our pilot data indicate that, for a given locality, pelagic $\delta^{138/134}Ba_{barite}$ is essentially invariant with depth, suggesting that particle dynamics processes, such as particle (dis)aggregation, do not modify $\delta^{138/134}Ba_{barite}$ and that 'marine barite' precipitation signals are preserved during export. We will examine pelagic barites that have been recovered from diverse ecosystems so as to test the effects of plankton community composition, organic carbon fluxes, and export efficiency on marine $\delta^{138/134}Ba_{barite}$, as well as the fidelity of core-top sediments to record pelagic $\delta^{138/134}Ba_{barite}$.

[1] Paytan and Griffith (2007) *Deep-sea Res. II*, ***54*** (5-7). [2] McManus *et al* (1998) *Geochim. Cosmochim. Acta,* ***62*** (21-22). [3] Von Allmen *et al* (2010) *Chem. Geol.* **277** (1-2).