Quantifying terrestrial weathering across Oceanic Anoxic Event 2

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The terrestrial weathering response to carbon cycle perturbations during the Cretaceous is an active area of research. Lithium isotopes allow terrestrial weathering intensity, defined as the ratio of weathering to erosion, to be quantified [1]. We investigate the terrestrial weathering response to the volcanism-induced climate perturbation associated with Oceanic Anoxic Event 2 (OAE2, ~94 Ma) using lithium isotope (δ^7Li) and concentration measurements on sediments from the Western Interior Basin (Aristocrat Angus or AA core, north-central Colorado). We present carbonate δ^7Li, δ^{13}C, δ^{18}O and trace metal concentration measurements. Additionally, we measured δ^7Li of the non-carbonate residue fraction and bulk rock concentration measurements. Carbonate δ^7Li values from the AA core are lower than a majority of previously reported geologic carbonate and modern seawater values (δ^7Li_{carb} = +4.5 to +7.3 ‰), and show no negative excursion as observed in sections from the North Atlantic and Tethys [2]. We do observe elevated lithium concentrations in both the carbonate and residue fractions prior to the onset of OAE2. Residue values (δ^7Li_{res} = -1.4 to +1.9 ‰) also show no temporal trend across OAE2, and are combined with the carbonate δ^7Li measurements in a mass balance framework to estimate the solid-to-dissolved terrestrial export flux into the Western Interior Seaway across OAE2. Our results, in combination with a modified forward model coupling the oceanic lithium and carbon cycles, indicate that weathering fluxes were elevated prior to the onset of OAE2 in response to hydrologic cycle intensification, but decreased following the onset of OAE2, possibly reflecting the impact of climatic cooling related to the influence of the Plenus event in North America.

[1] Bouchez *et al*. (2013) *American Journal of Science* **313**, 267-308. [2] Pogge von Strandmann *et al*. (2013) *Nature Geoscience* **6**, 668-672.