Linking Deccan volcanism and the bolide impact with Ca isotope stratigraphy from the Late Maastrichtian of Seymour Island, Antarctica

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The Cretaceous-Paleogene (K-Pg) mass extinction marked a dramatic change in the composition of life on Earth. Both the emplacement of the Deccan Traps and the Chicxulub impact potentially perturbed the carbon cycle through CO_2 release, also driving ocean acidification (OA). However, the intensity of OA likely differed between the two evens, given differences in the rate and magnitude of CO_2 addition. On timescales shorter than the residence time of Ca in seawater, OA is hypothesized to manifest in the marine $\delta^{44/40}Ca$ record through either positive excursions reflecting changes in the carbonate fractionation factor or negative excursions indicating reduced carbonate deposition relative to terrestrial weathering inputs [1].

To test for Ca isotope signals of OA through the K-Pg, we analyzed mollusk shells from the López de Bertodano Formation on Seymour Island, Antarctica. Sampled specimens preserve primary aragonite and were recently analyzed for clumped and $\delta^{18}O$ paleotemperatures [2, 3]. The unit was deposited in an open-ocean facing shelf environment and appears to have been minimally altered after deposition [3, 4]. Water depth during deposition is estimated to be ~150 m [5, 6]. The lithology of this interval is characterized by muddy to sandy siltstones, with occasional concretionary sandstone layers, which are sometimes glauconitic [4].

Preliminary data show two brief (< 70 kyr) negative excursions near the start of the Deccan Traps eruption and just after the bolide impact. These data suggest a dynamic interplay between volcanism, impacts, and other drivers of the carbon cycle in the very latest Cretaceous.

[1] Du Vivier et al., 2015 EPSL; [2] Petersen, et al., 2016 Nat. Comm; [3] Tobin et al., 2012 PPP; [4] Witts et al., 2015 PPP [5] Huber, 1988 GSA Mem; [6] Macellari, 1988 GSA Mem