Sediment Cadmium isotopes as a proxy for nutrient dynamics during Oceanic Anoxic Event 2 (Late Cretacous)

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This study explores the use of cadmium (Cd) isotopes as a tracer for past nutrient dynamics by application to the Late Cretaceous Western Interior Seaway of North America. Widespread organic-carbon burial during the Cenomanian–Turonian Oceanic Anoxic Event 2 (OAE 2, ~94 Ma) has been associated with global climate and environmental change. One of the important mechanisms to drive and sustain unusually high rates of organic carbon burial during this event was likely the increase in oceanic nutrient inventories. However, proxies for past nutrient dynamics to test this hypothesis are not well established. Cadmium has a nutrient-like distribution in the modern ocean, and its isotope composition is influenced by biological activity, offering potential as a tracer of past nutrient conditions.

The Upper Cretaceous Boquillas (Eagle Ford) Formation, found at the southern gateway of the Cretaceous Western Interior Seaway provides an interesting case study and has been recovered by many commercial cores in the basin. Analysis of the Cd-isotope composition of marls and shales in different cores situated in close geographical proximity allows assessment of intra-basinal variation in Cd isotopes and provides insight into the processes controlling their distribution.

With an average $\delta^{114}Cd_{NIST\text{-}3108}$ of 0.16 ± 0.25 (2 SD) the Cd-isotope data show clear stratigraphic patterns that can be linked to basin- and global-scale changes in environmental conditions. Comparision with other geochemical parameters measured in the same sedimentary sucessions suggests that the Cd-isotope composition of mudrocks in the Southern Western Interior Seaway are a result of both changes in the global mass balance of Cd (e.g. Cd-sulphide and organic-matter burial, weathering inputs) and local/regional environmental conditions (e.g. redox).