Controls on the cadmium-isotope composition of modern marine sediments

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Cadmium (Cd) isotopes have provided insights into the biogeochemical cycling of Cd in the modern oceans, and may provide information about other aspects of Cd and biological cycles. Cadmium is removed from seawater into marine sediments, but the isotopic composition of this output flux, and the processes that control this isotope composition, are not understood. Such understanding is required before Cd-isotopes can be used as a tracer for past ocean cycling of this metal, and potentially as a tracer of past ocean conditions.

This study provides the first constraint on the composition of Cd in modern marine sediments accumulating under varying productivity and redox conditions, and compares these compositions with those of overlying waters. We present new data from a transect of shallow multi-cores obtained from the Black Sea and from the continental slope and shelf of the Argentine Basin.

Our results suggest a link between the redox state at the water-sediment interface and the degree of Cd-isotope fractionation of the core-top sediments relative to the overlying waters. Additionally, the most significant variability in Cd concentration and isotope composition down-core coincides with changes in redox conditions, suggesting precipitation of as a significant control on Cd isotopes in marine sediment. This down-core observation further indicates the primary role of redox cycling in controlling Cd isotopes in marine sediments.