Limited molybdenum isotope change in the oceans associated with Oceanic Anoxic Event 2

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Mo isotopes have previously been used to estimate the magnitude of global seafloor euxinia at the peak of Oceanic Anoxic Event 2. However, the true size of the global seawater isotopic shift leading into OAE 2 is unknown. New Mo isotope data are presented from a succession of organic-rich mudrocks that accumulated in euxinic conditions over a 2 million year interval prior to OAE 2 in the Cretaceous Western Interior Seaway of continental North America. These data allow the magnitude of Mo-isotope change associated with the initition of OAE 2 to be constrained to less than ~0.3 per mil, significantly less than the ~0.9 per difference between seawater at the peak of OAE 2 and the present day. The limited isotopic change of Mo in seawater is at first glance at odds with evidence for a spread in sulfidic depositional conditions at many locations worldwide during OAE 2. However the Mo-isotope and stratigraphic observations can be reconciled with a significant removal flux of isotopically light Mo into sedimentary deposits during OAE 2. The origin of this flux is proposed to be by association with the vast amounts of Fe liberated by LIP weathering and by the deoxygenation of continental shelf regions during the OAE. Sedimentary exposures of Fe-rich rocks of Cenomanian–Turonian boundary age suggest that much of this burial flux may have been concentrated in regions of the ancestral Pacific Ocean.