

Lead isotopic record of Barremian-Aptian marine sediments: Implications for large igneous provinces and the Aptian climatic crisis

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We present initial isotopic ratios of lead for Early Cretaceous (Barremian-Aptian) sections from Shatsky Rise (Pacific) and Gorgo a Cerbara (Italy). These sedimentary sections track an interval representing Oceanic Anoxic Event (OAE)-1a, which is characterized by quasi-global deposition of organic carbon-rich black shale. Pb isotopic compositions of sediments from Shatsky Rise decrease at the end of Barremian time, from radiogenic continental values to unradiogenic values, and subsequently remained less radiogenic until the end of early Aptian time. We explain the isotopic shift by a significant increase in supply rate of unradiogenic Pb, most likely due to massive volcanism. In contrast, the Pb isotopic compositions from the Italian section, which was situated at the western end of Tethys, are mostly identical to those of upper continental crust, showing no significant change in supply rate of unradiogenic Pb. The discrepancy between two sites is attributed to quiescent deep-submarine eruptions of Pacific large igneous provinces (LIPs) such as the Ontong Java Plateau (OJP), which severely limited dispersion of Pb-carrying particles out of the Pacific Ocean. Published Os isotopic data from the Italian section indicate two episodes of massive eruptions of OJP or contemporaneous Manihiki and Hikurangi plateaus starting from earliest Aptian time, slightly later than that indicated by the sedimentary Pb isotopic record from Shatsky Rise. Differences in isotopic variations between Pb and Os likely reflect differences in their chemical behaviors in the oceans, i.e., Pb isotopic compositions would have varied in response to local or regional changes in sediment provenances, whereas large-scale changes in Os inputs are required to explain variations in seawater Os isotopic compositions. Our Pb isotopic data, together with the published Os isotopic record, provide new evidence for the eruptive history of OJP together with contemporaneous Pacific plateaus and its environmental consequences, starting from end-Barremian time and extending through early Aptian time.