Molybdenum Isotopes in Modern Marine Sediments: Unique Signatures of Authigenic Processes

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We have analyzed marine sediment Mo isotope compositions in a variety of chemical environments, from reducing continental margin sediments to oxic sediments of the equatorial Pacific. At sites along the Mexico and Peru margins, we observe significant isotopic variability in the uppermost ~5 cm of several cores, presumably reflecting the impact of early diagenetic processes. With depth, however, the sediment Mo isotope values converge to an invariant isotopic signature (~1.6‰) consistent with that described previously (1), suggesting that diagenetic processes in carbon-rich reducing sediments produce a single authigenic Mo isotopic signature. In contrast, oxic equatorial Pacific sediments from Mn-rich sites have negative Mo isotopic compositions (~ -0.5‰) consistent with previous laboratory and field determinations of Mn-associated Mo isotope signatures (2,3,4). Down-core sediments from an equatorial Pacific site dominated by red clays have measured Mo isotope compositions similar to that predicted for lithogenic Mo (~0.0‰) (4). These distinct sediment Mo isotope compositions observed in various marine environments suggest that Mo isotopes record unique signatures reflecting the dominant chemical mechanism responsible for Mo sequestration.

References

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