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# Molybdenum isotope evidence for sediment recycling in hotspot-influenced MORBs: a window into ancient deep-sea redox

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Redox sensitive isotope systematics of marine sediments are valuable tools to reconstruct the evolution of Earth's surface oxygenation through time. However, the ancient deep-sea sediment archive is mostly destroyed due to continuous subduction of oceanic crust. Subduction of oceanic crust and sediments and their incorporation into the convecting mantle is considered a major cause for the large-scale chemical variability in Earth's mantle [e.g. 1]. Mo-isotopes can potentially trace the formation of this pronounced mantle heterogeneity. Significant redox-dependent Mo mobility and isotope fractionation can occur in different reservoirs before and during subduction leading to possible Mo isotope variations in the mantle due to recycling of oceanic crust and sediments. The Mo isotope composition of e.g. ocean-island basalts can therefore provide additional constraints on possibly recycled surface lithologies in their mantle source.

New Mo isotope ($\delta^{98/95}$Mo) data for South-Mid Atlantic Ridge basalts that partly interacted with the enriched Discovery and Shona mantle plumes provide evidence for surface derived material in their mantle source. A heavier Mo isotope composition is observed in the samples tapping a more enriched mantle source compared to those generated from the ambient depleted mantle. Additional correlations between $\delta^{98/95}$Mo and radiogenic isotopes, such as Sr, Nd, and Hf, suggest recycling of a Proterozoic sedimentary endmember with a primary Mo isotopic composition that was not altered before or during subduction by Mo mobility under oxidizing conditions. The combination of Mo isotope signatures with stable Se and S isotope data [2, 3] suggests the incorporation of subducted anoxic Proterozoic deep-sea sediments into the mantle source of the South-Mid Atlantic Ridge basalts. Thus the basalts from the South-Mid Atlantic Ridge reveal evidence for a complete rock cycle starting from oceanic crust being subducted, mixed into the mantle and the return of this mixture to the surface via partial melts triggered by hot spot activity.

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