Chromium isotope cycling across the Peruvian oxygen minimum zone

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Chromium isotopes ($\delta^{53}Cr$) are increasingly studied in modern sediments and ancient sedimentary rocks to reconstruct redox variations in the Earth's oceans and atmosphere. The presence of isotopically light Cr implies the functioning of reductive porcesses and the response of the chromium isotope system to open ocean anoxia has implications for the interpretation of ancient Cr isotope data. We investigate the behavior of chromium isotopes along water column profiles and a shallow sediment core transect that intersects the well-studied oxygen minimum zone (OMZ) off the coast of Peru. Local anoxia induced by upwelling provides an ideal environment to investigate the biogeochemical cycling of Cr under oxic versus anoxic conditions and how $\delta^{53}Cr$ values are preserved in the sedimentary record.

Results from bulk sediment analyses, corrected for the detrital Cr fraction, show a pronounced shift to higher $\delta^{53}Cr$ values of 0.75 ± 0.05 ‰ (2SE) and higher authigenic chromium concentrations (76%) in the permanent OMZ compared with 0.53 ± 0.06 ‰ (2SE) and 65% authigenic Cr below the OMZ. Additionally, the authigenic Cr concentrations within and below the OMZ co-vary with other redox-sensitive trace metals including U, V and Mo[1].

The lower $\delta^{53}Cr$ values below the OMZ are in agreement with previous studies[2] measuring less positively fractionated Cr compositions in an oxygenated environment, suggesting incomplete reductive removal of soluble Cr(VI) from the water column. Elevated $\delta^{53}Cr$ values as well as authigenic Cr concentrations in sediments of the permanent OMZ may be related to complete reduction of Cr in the water column or quantitative removal of Cr from reducing pore water coupled to diffusion from bottom water. We continue our study with obtaining a detailed sedimentary sample log through the depositonal environment, complementing this data with analyses of the respective anoxic and oxygenated seawater samples.

[1] Scholz *et al*, (2011), GCA, **75**, 7257-7276.

[2] Reinhard *et al*, (2014), EPSL, **407**, 9-18.