Depositional control on marine sedimentary trace metal accumulation

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Specific trace metal assemblages in marine sediments can be used to reconstruct paleoenvironmental conditions. Such application can be impaired when the sediments experienced reworking. To investigate the impact of depositional processes on trace metal enrichments in organic-rich sediments we collected samples along a transect on the Namibian Continental Margin (NCM). Upwelling induced high productivity in this area results in the vast accumulation of organic matter on the shelf and, to a lesser degree, at the slope. Due to the lateral transport of organic material from the shelf and consequently the formation of a secondary depocentre on the upper slope, the NCM is the ideal location to examine the geochemical response to sediment redeposition.

To determine the influence of the lateral redeposition on trace metal proxy signals on the NCM, we investigated the trace metal concentration (solid-phase Fe, Mo, V, Ni, Cu and Ag and pore water Fe, Mo and V) in cores from the shelf, shelf break, and upper slope. Each site revealed unique bottom water redox conditions varying from anoxic to suboxic, to fully oxic, respectively.

At each investigated site trace metals that are often used as paleoproductivity indicators mirrored the water column productivity and did not show any impact by redox conditions. In contrast, the occurrence of redox-sensitive metals corresponded to the observed bottom water redox conditions independent of the local organic carbon contents. Thus, the degree of trace metal enrichment at each sample site on the NCM may provide insight into paleoenvironments where lateral transport and redeposition have occurred and offer one explanation for the decoupling of trace metal enrichments and organic carbon contents observed in the geologic record.