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Trace element (Ag, Cd, Re) enrichment patterns in organic-rich sediments from the Benguela upwelling system.

FREDERIK GÄNG[1], JULIA WARNATZ[2], KATHARINA PAHNKE[3], VOLKER BRÜCHERT[4], NIKO LAHAJNAR[5] AND PHILIPP BÖNING[2]

[1]Institute for Chemistry and Biology of the Marine Environment, University of Oldenburg, Germany

[2]Institute for Chemistry and Biology of the Marine Environment (ICBM), University of Oldenburg, Germany

[3]ICBM, University of Oldenburg

[4]Department of Geological Sciences, Stockholm University

[5]Institute for Geology, Universität Hamburg, Germany

Presenting Author: frederik.gaeng@uni-oldenburg.de

Enrichment patterns of redox- and biosensitive trace elements (TEs) are powerful tools to reconstruct depositional conditions in marine organic-rich settings. However, for many of these TEs the authigenic sources and accumulation mechanisms – e.g., particle input versus diffusion across a redox gradient – are still insufficiently understood. We analyzed Ag, Cd, and Re (along with organic carbon, Al, P, Fe, Mn) in particles from shelf waters as well as anoxic-euxinic shelf to oxic slope sediments from the highly productive Benguela upwelling system (BUS) off Namibia. The data will fill an important gap in continental margin data sets of global relevance for the recognition of environments (i) within oxygen minimum zones (OMZs), (ii) beneath OMZs and (iii) in stagnant anoxic basins for the geological record.

Our results show that authigenic Cd enrichment is higher in water column particles from above the OMZ than in underlying anoxic-euxinic shelf sediments while authigenic Re and Ag show the opposite trend. This indicates an important particulate Cd source in the shelf water column and/or a negligible diagenetic loss of Cd in the sediment. Further, Cd is only enriched in the anoxic-euxinic shelf sediments and not the slope sediments while the Ag and Re enrichment continuously decreases with increasing water depth along the slope. There is a strong linear correlation of Re and Ag in all shelf and slope sediments suggesting a common, yet to be constrained accumulation mechanism for both elements. This is in strong contrast to studies from other marine environments globally where Re is an indicator of bottom water oxygenation and decoupled from Ag, which is commonly interpreted as an indicator of organic particle scavenging. Enrichment of Cd occurs exclusively in the anoxic-euxinic shelf sediments and indicates a productive environment *within* an OMZ, as suggested previously. Here we propose that the enrichment of Ag and Re without Cd in the slope sediments is indicative of an environment *beneath* a highly productive OMZ, which is relevant for paleo studies.