Goldschmidt 2026 Abstract
https://doi.org/10.46427/gold2026.36112

Investigating labile trace metal distributions in deep ocean waters using DGT deployments

ANJA B FRANK[1] AND SCHMIDT KATJA[2]

[1]Federal Institute for Geosciences and Natural Resources (BGR)
[2]Federal Institute for Geosciences and Natural Resources

Trace metals in seawater are important for marine life, can serve as tracers for ocean processes and be used to monitor the impact of human activity, such as seabed mining. However, seawater trace metal data is still largely lacking for the Indian Ocean, limiting our understanding of baseline trace metal distributions. We deployed diffusive gradients in thin films (DGT) passive samplers in deep waters along the hydrothermally active Central Indian Ridge (CIR) to assess the labile Fe, Mn, Ni, Cd, Co, Cu, Pb, Zn as well as rare earth elements and Yttrium (REY) concentrations of the water column below 2000m (n=35) and at the seafloor (n=3). Non-metric Multi-dimensional Scaling (NMDS) reveals that the labile trace metal composition at the seafloor is statistically different than in the water column 30m or more above the seafloor, suggesting a strong influence of the sediment-water boundary on the trace metal composition. Furthermore, the seafloor DGT deployments revealed very similar labile seawater trace metal compositions for the investigated non-vent and inactive vent sites, but vastly different labile seawater concentrations at an active vent. The determined labile Co, Fe and Mn concentrations of the water column reveal an increasing concentration trend with latitude and depth corresponding to previously reported hydrothermal plume dispersal above the CIR. Furthermore, the labile Co, Pb and Zn concentrations reveal a decreasing trend with water depth, while labile Cu increases. The labile REY compositions of the DGT deployments in the water-column deployments and the seafloor deployments at the non-vent and inactive sites revealed PAAS normalised patterns with a negative Ce anomaly and positive Y anomaly typical for seawater. On the other hand, the DGT deployment at an active vent recorded a strong positive Eu anomaly typical for high-temperature hydrothermal activity, which could not be detected at the inactive or any other site. The labile seawater trace metal concentrations obtained via DGT passive sampler deployments help identify different factors influencing their distribution in the deep Indian Ocean as well as their distribution, complexation and potential bioavailability.