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Trace metal fluxes in bottom seawater and at the sediment-water interface in the eastern CCZ, NE Pacific

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Sinking particles regulate the cycling and transport of many trace elements through the water column and determine their accumulation at the seafloor. Benthic fluxes of trace elements across the sediment water interface (SWI) are considered an important factor modulating marine elemental and isotopic budgets. We here present a combined analysis of sinking particulate and benthic diffusive trace element fluxes in an area of the NE Pacific abound with polymetallic nodules.

The fluxes have been derived from a comprehensive dataset originating from two exploration contract areas for polymetallic nodules in the eastern Clarion Clipperton Zone (CCZ) consisting of (1) surface sediment pore water, (2) sinking particles in the lower 500 meters of the water column collected with moored sediment traps, and (3) bottom seawater. The latter comprises water sampled with a CTD rosette, a bottom water sampler and *in situ* deployed diffusive gradients in thin films passive samplers addressing the labile-bound dissolved metal fraction at 0.3-200 meters above seafloor.

The calculated benthic diffusive fluxes of Fe, Mn, Co, Cu, Cd, Ni, V, and REY in the different working areas demonstrate that all studied elements are characterized by fluxes from the oxygenated sediment into the overlying bottom seawater. The pore water trace metals with the characteristic subsurface peak of elements such as Mn, Cu, Co, and V show significant local (<1 km) to regional scale (>1000 km) variability. Averaging benthic fluxes over larger areas and across several sampling years therefore allows for more robust flux estimates for the eastern CCZ. Metal oxidation and adsorption to suspended or bedded particles at the SWI and in bottom seawater will likely modulate the benthic metal fluxes, fuelling the hydrogenetic formation of polymetallic nodules and reducing the net export fluxes entering the open ocean significantly.

Both, total and trace elemental particulate fluxes in the lower water column increase with depth towards the seafloor, mainly driven by lithogenic, opal, and authigenic or resuspended Mn-oxide components. Our results contribute to the understanding of trace metal cycling and formation of polymetallic nodules in the CCZ, and furthermore serve as baseline for the assessment of deep-sea mining impacts.