Goldschmidt 2023 Abstract
https://doi.org/10.7185/gold2023.20457

Iron oxides as trace metal carriers near hydrothermal vents: a potential indicator for local oceanographic changes

LAUREN HAYGOOD[1], CHRISTOPHER K. JONES[2], AUTUMN TROXEL[1], LORI HUCK[1], CALLI M. PROVENZA[1], ALISON VERESH[1], TRACY QUAN[1], ANNA LICHTSCHLAG[3], MALE KÖSTER[4], MARTA E TORRES[5], GERHARD BOHRMANN[6] AND NATASCHA RIEDINGER[7]

[1]Oklahoma State University, Boone Pickens School of Geology
[2]University of California, Riverside
[3]National Oceanography Centre Southampton
[4]Alfred Wegener Institute Helmholtz Centre for Polar and Marine Research
[5]Oregon State University
[6]MARUM – Center for Marine Environmental Sciences and Department of Geosciences, University of Bremen
[7]Oklahoma State University

Presenting Author: Lauren.haygood@okstate.edu

Hydrothermal vents release fluids that are often enriched in reduced iron (Fe), which precipitates as Fe-oxides when mixed with oxygenated seawater. These iron oxides are known as trace metal carriers, scavenging trace metals from the water column. The transport of these Fe-oxides with the plume to nearby (~13 km) sediments could thus result in increased trace metal concentrations in marine sediments, potentially overprinting paleoenvironmental proxies, such as vanadium (V) and molybdenum (Mo). To investigate trace metal accumulations due to hydrothermally sourced Fe-phases, sediment cores were recovered along a transect at the northern segment of the East Scotia Ridge (ESR) and at a southern transect in the East Scotia Sea during *R/V Polarstern* PS119 Expedition[1]. The Scotia Sea is a tectonically active area in the Southern Ocean, with the ESR characterized by hydrothermal activity, specifically at the most northern and southern segments. To determine the reactivity of the Fe-mineral phases, sequential Fe-oxide extractions were performed and analyzed via Inductively Coupled Plasma Optical Emission Spectrometry (ICP-OES) or via ICP Mass Spectrometry (MS) for some trace metals. Our results show that the sediments near the southern segment are dominated by crystalline Fe-mineral phases, such as magnetite and hematite. In contrast, sediments at the northern segment are relatively depleted in these Fe-mineral phases, resulting in overall lower trace metal concentrations along the northern segment in comparison to the southern segment. However, trace metal concentrations increase in a west-to-east direction across the northern segment. The Antarctic Circumpolar Current moves in a west-to-east direction around Antarctica and drives the depositional pattern of vent fluid-derived precipitates in the Scotia Sea. Deep-water currents mix in the Scotia Sea, forming intermediate waters that flow towards the North Atlantic. Given the depositional pattern of vent fluid-derived particles is generally influenced by circulation patterns, the trace metals associated with Fe-phases could likely aid with the reconstruction of local or regional deep-water circulation changes.

[1]Bohrmann, G (2019). The expedition PS119 of the research vessel POLARSTERN to Eastern Scotia Sea in 2019. Reports on Polar and Marine Research. Alfred-Wegener-Institut, Helmholtz-Zentrum für Polar- und Meeresforschung, Bremerhaven, Germany. doi:10.2312/BzPM_0736_2019