

Sedimentary accumulation of critical metals nearby hydrothermal vent fields and volcanic islands

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Hydrothermal vent discharge, especially at black smoker sites, is a well-known source of rare earth elements (REE) and other critical metals. These vented metals, when mixing with the overlying, oxygen-rich water column, change their oxidation state and/or are scavenged by suspended particles. By either precipitating at the vent chimney or by being transported within the vent plume, the metals are eventually delivered to the seafloor where they can serve as potential tracers for vent fluid input [1]. Here we investigate the input of REE and other critical metals by hydrothermal fluids and potentially also by volcanogenic activity from the nearby island arc to the semi-proximal (>12 km) sediments surrounding the vent fields in the Scotia Sea. During R/V *Polarstern* research expedition PS119 to the South Scotia Sea [2], sediment cores were collected along a west to east transect off the northern East Scotia Ridge (ESR) segment as well as along an eastern transect off its southern segment. Our preliminary data indicate that sediments west of the northern ESR segment show lower REE and critical metal concentrations compared with sediments at its eastern side. This likely reflects the west-to-east prevailing Antarctic circumpolar current direction, transporting the vent particle plume towards the east. Interestingly, farther eastward, the sediment closer to the island arc show almost 2-fold lower REE contents and critical metals compared to the sites near the hydrothermal vent field. We attribute these lower REE contents to changes in material source as well as to dilution driven by higher sediment deposition at the arc. The southern transect shows overall comparable REE contents found in the northern transect, however, critical metals are far more depleted. This is likely attributed to the different chemical composition of the vent fluids at the southern segment.

[1] Cole, C.S., James, R.H., Connelly, D.P. and Hathorne, E.C. (2014). *Geochimica et Cosmochimica Acta* 140, 20-38.

[2] 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,