Noble gas composition of sediment pore water at a hydrothermal vent site

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Black smokers are deep sea hydrothermal vents, releasing hot fluids from great depths through chimney-like structures into the ocean. Noble gas (NG) analysis is a useful tool to identify the origin of sediment pore water (e.g. mantle vs crustal origin). Fluid samples from the water column above a black smoker in a recently discovered vent field in the northern trough of the Guaymas Basin, Gulf of California, show a NG signature indicating a mid-ocean ridge basalt (MORB) source [1]. Here, we present NG data from a sediment core collected from the Guaymas vent site. Even though the temperature of the sediment increases significantly with depth, a corresponding NG gradient is absent. Such vertically constant concentrations imply no significant diffusive transport of hydrothermal fluids upwards through the sediment column. However, our data identify a sediment layer of increased density composed of hydrothermal minerals towards the bottom of the core. It is accompanied by an unusually high $^{3}He/^{4}He$ ratio, which cannot be explained by the common MORB source typical for the Guaymas Basin. This suggests a phase of increased activity of the smoker, and possibly an altered fluid source during this time period, or an additional end member.

[1] Berndt et al. (2016), *Geology*, **44**, 767-77