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Isotopic concentration of sulfide sulfur and delta-34S from methane seeps on the Blake Ridge diapir and Monterey Canyon

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Isotopic Concentration of Sulfide Sulfur and δ^{34}S from Methane Seeps on the Blake Ridge Diapir and Monterey Canyon

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Marine sediments contain pore water with dissolved sulfate. Pore-water sulfate is depleted by two anaerobic chemical reactions tat involves microbes: 1) oxidation of sedimentary organic matter; and 2) anaerobic methane oxidation (AMO; $CH_4 + SO_4 \rightarrow HCO_3^- + HS^- + H_2O$). Both sulfate depletion pathways produce dissolved hydrogen sulfide ($\sum HS^-$), which is scavenged by dissolved iron to produce authigenic sulfide minerals. These minerals crystallize in pore spaces or on grain surfaces. Seafloor seeps are where methane moves upward in the sediments to escape into overlying waters. Additional methane supply should fuel AMO and result in increased amounts of sulfide mineral and a different sulfur isotopic composition (δ^{34}S) relative to diffusive sites where methane is supplied at a lower rate.

We analyzed 23 samples from 2 methane seep sites and compared their sulfide sulfur concentration and δ^{34}S to that of advective sites by converting solid sulfides to H_2S using chromium reduction. Sulfide sulfur is then collected as a precipitate in traps of zinc acetate or silver nitrate for measurement of concentration and δ^{34}S of sulfide minerals, respectively. Preliminary data shows that sulfide sulfur from sulfide minerals is at significantly higher concentration relative to sites where diffusion dominates. We predict that δ^{34}S of sulfide sulfur will be more positive (enriched in ^{34}S) relative to that of diffusive sites. If true, ancient sites where methane advection occurred may be recognized in the rock record.

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