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Variation of sulfur isotope fractionation in the Yung-An Ridge cold vent sediments offshore Southwestern Taiwan

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Biogeochemical sulfur cycle in a set of giant piston cores from the active margin offshore southwestern Taiwan is investigated by analyzing stable sulfur isotopes of AVS, pyrite S, sulfate and dissolved sulfide as well as methane and organic carbon concentrations. The area is characterized by methane gas venting with gas flare appeared on top of the ridge summit with microbial mats and bivalve patches surrounding the gas vent. Special emphasis is placed on sulfur isotopic variations under the influence of methane venting.

Anaerobic oxidation of methane is the most important process in controlling sulfur geochemistry in the study area. With methane concentrations varied at different depth and locations, spatial and vertical sulfide minerals formation and sulfur isotopic variations were found in the study area. Depth of the sulfate methane interface ranged between 1 m to 8 m, with maximum dissolved sulfide reaching 12 mM. Pore water sulfate δ34S values range from 20.5‰ to 52.9‰ with an initial seawater value of 20.3‰ at the sediment water interface. δ34S values of pyrite ranged from -19.7‰ to 9.9‰Ḣigh pyrite-S contents were found near the SMI, accompanied with heavier pyrite-S isotopic composition while lower pyrite-S concentrations always associated with negative and lighter pyrite-S isotopic signature. Contrary to the typical pyrite S isotopic composition with negative values, pyrite formation in our study region at the sulfate methane interface generated high pyrite concentrations with positive and heavier δ34S.