

Biogeochemical cycle of methanol in anoxic deep-sea sediments of the eastern Japan Sea

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Methanol is one of the most important carbon and energy sources in anoxic environments. However, the biological flux and lifetime of methanol in anoxic marine sediments are largely unknown. In this study, we report quantitative methanol removal rates in subsurface sediments for the first time. Methanol concentrations in pore water from Japan Sea sediments gradually increased with depth below the sulfate-methane transition zone. Based on anaerobic incubation experiments with radiotracers, high rates of microbial methanol consumption were detected in the sediments. Our experiments also showed that the methanol oxidation to CO₂ surpassed methanol assimilation and methanogenesis from CO₂/H₂ and methanol. Nonetheless, a significant decrease in methanol was not observed after incubation, likely because of the microbial production of methanol in parallel with its consumption. This study suggests that microbial reactions play an important role in the sources and sinks of methanol in subseafloor sediments.

Keywords: methanol, deep-sea sediment, subseafloor biosphere