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Methanogenesis in Sulfide and Nitrate Containing Sedimentary Environments

Initiative: Zwischen Europa und Orient - Mittelasien/Kaukasus im Fokus der Wissenschaft

Ausschreibung: Ausschreibung: Strukturell orientierte Maßnahmen

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Methane is produced in significant quantities in marine and lacustrine environments, and significant fractions can evade to the atmosphere contributing to global warming.It is well established that competitive effects between sulfate reducing, denitrifying and methanogenic communities, and inhibition of methanogenic Archaea by sulfide, produced during dissimilatory sulfate reduction, and nitrate and its reduction products, supress methane production. Yet, methanogenic activity in sedimentary environments observed in the presence of metabolically active sulfate-reducing and denitrifying microbial consortia suggests the existence of additional controlling mechanisms determining the fate of methanogenesis. Here, an important, yet unconstrained, role of concurrent sulfur and nitrogen cycling in modulating methane production in sediments is suggested. Combining chemical and molecular techniques with the design of state-of-the-art pilot-scale anaerobic bioreactor systems, and transferring methodological tools and insights from wastewater treatment science into the study of aquatic biogeochemistry, it is attempted to fill the knowledge gap with regards to the combined effects of sulfide and nitrate on methane production. Process interactions among S and N cycles, and methane production in mixed, methanogenic slurries under variable experimental conditions will be established to better understand the multi-faceted controls on methane production in natural environments.Hence, the current project aims at establishing a fundamental experimental basis of constrains of methane production for the calibration and extrapolation of the existing large body of data from natural anoxic environments. The project aims to shed light on a variety of fundamental, unresolved questions associated with the complex biogeochemistry of anoxic sediments that will lead to further research on spatial and temporal zonation of methanogenesis in these complex environments.

Projektbeteiligte

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Eutrophication leads to the formation of a sulfide-rich deep-water layer in Lake Sevan, Armenia

N/A

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