S03-1

Molecular and stable isotopic characterization of nitrification and denitrification in hadopelagic sediments

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海溝堆積物における窒素動態と微生物生態

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Key word : nitrogen dynamics, hadopelagic sediments, ammonia oxidizing archaea , nitrate isotopes

Great progress has been made in understanding the nitrogen cycle in oceanic waters by the recent identification of ammonia-oxidizing archaea and anaerobic ammonia oxidizer (anammox), and by the following comprehensive approaches to clarify the abundance and activity of each component in the nitrogen cycle. However, nitrogen cycle in sedimentary habitats is still uncertain. To further characterize nitrogen cycle in the deep-sea sediments, we quantified gene abundance of putative nitrifers, denitrifers and anammox, and determine nitrogen and oxygen stable isotopic compositions of nitrate in the interstitial water in the hadopelagic sediment core taken from the Ogasawara Trench (water depth of 9760 m). Abundance of potential proteobacterial denitrifers correlated with that of nitrifers through the depth, and anammox also likely co-occurred with nitrifers. Further, nitrate isotope compositions suggest the enrichment of ^{18}O by nitrification process and co-occurrence of nitrification and denitrification in nitrate reduction zone. Overall, the data suggest that aerobic and anaerobic processes of the nitrogen cycle coupled in the nitrate reduction zone in the hadopelagic sediments.

S03-2

Multiple functions of denitrifying bacterium *Azoarcus* sp. KH32C in rice paddy soil as revealed by whole genome analysis

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ゲノム解読から見えた水田土壌脱窒細菌 *Azoarcus* sp. KH32C の多彩な生態的機能

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Key word : denitrifying bacteria, whole genome analysis, rice paddy soil

Agricultural soil is a major source of nitrous oxide (N_2O), one of the greenhouse gases and ozone-depleting substances, due to the application of nitrogen fertilizers. To mitigate the N_2O emission in agricultural soil, denitrifying bacteria showing a high proportion of N_2 in their denitrification end products and capabilities of reducing exogenous N_2O to N_2 were collected from rice paddy and rice-soybean rotation fields. *Azoarcus* sp. KH32C, possessing a strong N_2O-reducing ability, successfully mitigated the N_2O emission derived from the soils. The complete genome sequence of KH32C was revealed to obtain its physiological and ecological features in soil. The genome contained the coding sequences involved in the nitrogen metabolism of denitrification pathway and gene clusters encoding nitrogen fixation. In fact, KH32C exhibited nitrogen fixing ability. In addition, KH32C harbored predicted gene to establish symbiotic association with plants. To examine the plant associating ability of KH32C, seeds of a rice plant were inoculated with KH32C and grown on an N-deficient agarose plate for two weeks. After cultivation, KH32C was detected in the rice rhizosphere, and fresh weight of KH32C-inoculated rice plants was larger than that of the control plants. These ecological functions of *Azoarcus* sp. KH32C will be of great advantage for its survival in rice paddy soil ecosystem.