

Nitrogen cycles in hadopelagic sediments

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Nitrogen cycle in deep-sea sediments is still uncertain while that in the aphotic oceanic water has intensively been investigated. A hadopelagic sediment core (1.1m in length) was taken by the ROV ABISMO from the Ogasawara Trench at a depth of 9760m. Interstitial water chemistry indicates that nitrate reduction occurred in the upper parts of the sediment core, but significant sulfate reduction did not even at the bottom of the core column. Comprehensive molecular analyses including clone analyses and quantitative PCR for SSU rRNA genes and functional genes (*amoA*, *nirK*, *hao/hzo*) present unique distribution patterns of nitrifiers, denitrifiers and anammox in the nitrate reduction zone. The maximum abundance of both aerobic nitrifiers (archaeal and proteobacterial ammonia oxidizers, and nitrite oxidizing bacteria) and proteobacterial denitrifiers occurred in a same horizon, and stable isotopic analyses for nitrate also suggest the occurrence of nitrification in the nitrate reduction zone. On the other hand, anammox population decreased with increasing depth. These results suggest that the abundance of aerobic nitrifiers is regulated by both oxygen and ammonium concentrations, and the anammox population is suppressed as a result of competition for nitrite with nitrite oxidizer and denitrifer except for surface layer in the hadopelagic sediment.

Keywords: deep-sea, sediment, nitrogen cycle, nitrification, denitrification