

Nitrate isotopes in the Bay of Bengal

*Chisato Yoshikawa¹, Akiko Makabe¹, Yohei Matsui¹, Sakae Toyoda², Makio Honda¹, Naohiko Ohkouchi¹

1. Japan Agency for Marine-Earth Science and Technology, 2. Tokyo Institute of Technology

Nitrogen isotopic composition of nitrate ($\delta^{15}\text{N}_{\text{Nitrate}}$) is widely used as a tracer of ocean-internal nitrogen cycling (consumption and regeneration) and ocean-external nitrogen inputs and losses (N_2 -fixation and denitrification). A $\delta^{15}\text{N}_{\text{Nitrate}}$ value increases, in conjunction with nitrate depletion, due to an isotopic effect during nitrate assimilation by phytoplankton. When denitrification occurs in the water column, a $\delta^{15}\text{N}_{\text{Nitrate}}$ value extremely increases due to a strong isotopic effect. N_2 -fixation produces fixed nitrogen with a $\delta^{15}\text{N}$ value of $\sim 0\text{‰}$, as nitrogen fixers take up N_2 gas with little isotopic effect. Here we determined $\delta^{15}\text{N}_{\text{Nitrate}}$ and $\delta^{18}\text{O}_{\text{Nitrate}}$ along 88°E in the Bay of Bengal during the cruise KH-18-6-leg2 of R/V *Hakuho-Marui*. The nitrate concentrations were below $1\ \mu\text{M}$ in the surface water of the whole area. Especially, the nitrate depleted water spreads out below the depth of 400 m at the station near 20°S . The $\delta^{15}\text{N}_{\text{Nitrate}}$ values were expected to increase toward the surface in conjunction with nitrate depletion unless ^{15}N depletion by N_2 -fixation and ^{15}N enrichment by denitrification are dominant. The $\delta^{15}\text{N}_{\text{Nitrate}}$ showed 5‰ in the bottom and deep waters and increased to 7‰ in the intermediate water. The horizontal maximum of the $\delta^{15}\text{N}_{\text{Nitrate}}$ in the intermediate water was found at the northern edge site where the oxygen concentration dropped below $1\ \mu\text{M}$. The ^{15}N enrichment in the intermediate water suggests the nitrate in the Indian Central Water is affected by benthic or water-column denitrification. The $\delta^{15}\text{N}_{\text{Nitrate}}$ once decreased to 6‰ in the subsurface water and then increased to the surface. The horizontal minimum of the $\delta^{15}\text{N}_{\text{Nitrate}}$ in the subsurface water was found in the nitrate depleted water near 20°S . The ^{15}N depletion in the subsurface water suggests one of the sources of surface nitrogen is the remineralized nitrogen originated from N_2 -fixation. In the presentation, we will discuss the nitrogen cycle of the Bay of Bengal in more detail by using the $\delta^{18}\text{O}_{\text{Nitrate}}$ values.

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