

## Nitrate isotope distributions in the eastern Indian Ocean

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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 ( $\text{N}_2$ -fixation; fixation of  $\text{N}_2$  gas into bioavailable nitrogen such as ammonia by diazotrophs, and denitrification; microbial respiration using nitrate as an electron acceptor). When the phytoplankton assimilates nitrate, nitrogen isotopes are fractionated. 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.  $\text{N}_2$ -fixation produces fixed nitrogen with a  $\delta^{15}\text{N}$  value of  $\sim 0\text{‰}$ , as nitrogen fixers take up  $\text{N}_2$  gas with little isotopic effect. This fixed nitrogen with low  $\delta^{15}\text{N}$  value is eventually converted into low- $\delta^{15}\text{N}_{\text{Nitrate}}$  through degradation of nitrogenous organic compounds called remineralization and subsequent nitrification. Those signatures of  $\delta^{15}\text{N}_{\text{Nitrate}}$  in the euphotic zone are conserved in nitrogenous organic compounds and transfers to the sinking particles and deep-sea sediments. Here we determined  $\delta^{15}\text{N}_{\text{Nitrate}}$  and  $\delta^{18}\text{O}_{\text{Nitrate}}$  along  $110^\circ\text{E}$  in the eastern Indian Ocean during the cruise MR15-05 of R/V *Mirai*. The nitrate concentrations were below  $0.1 \mu\text{M}$  in the surface water of the whole area. The  $\delta^{15}\text{N}_{\text{Nitrate}}$  values are expected to increase toward the surface, in conjunction with nitrate depletion. Furthermore, if nutrient uptake by phytoplankton and remineralization occur with Redfield proportions, and if external nitrogen inputs/output do not occur, then a  $\text{N}^*$  value should be  $\sim -2.9 \mu\text{M}$ . However, in this study area, the  $\delta^{15}\text{N}_{\text{Nitrate}}$  value decreased to  $4.0\text{‰}$  and the  $\text{N}^*$  value increased up to  $-1.3 \mu\text{M}$  toward the surface. These features suggest that the surface water of this study area is affected by  $\text{N}_2$ -fixation. In the presentation, we will discuss the nitrogen cycle of the eastern Indian Ocean in more detail by using the  $\delta^{18}\text{O}_{\text{Nitrate}}$  values.

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