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Poster Session Day 2

Nitrogen and oxygen isotope ratios of nitrate in the Pacific and Indian Oceans

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Nitrogen isotopic composition of nitrate ($\delta^{15}N_{Nitrate}$) 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). Oxygen isotopic composition of nitrate ($\delta^{18}O_{Nitrate}$) improves the interpretation of $\delta^{15}N_{Nitrate}$. When nitrate is assimilated by phytoplankton or nitrate is consumed by microbes with denitrification, ($\delta^{15}N_{Nitrate}$ and $\delta^{18}O_{Nitrate}$ values of residual nitrate equally rise as consumption proceeds, indicating nearly equal values for the nitrogen and oxygen isotope effects ($^{18}\varepsilon/^{15}\varepsilon \approx 1$). On the other hand, the input of nitrified nitrate from remineralization of nitrogenous organic compounds synthesized by N_2-fixation or nitrate assimilation in a part of nitrate pool causes a separately decrease in $\delta^{15}N_{Nitrate}$ compared with the typical deep-water value (~+5‰). This is because the $\delta^{15}N$ value of newly nitrified nitrate strongly depends on that of ammonia formed from the degradation of organic matter, whereas the $\delta^{18}O$ of newly nitrified nitrate is not affected by $\delta^{18}O$ of organic matter but is close to that of ambient water. Here, the distributions of nitrogen and oxygen isotope ratios of nitrate in the Sea of Okhotsk, equatorial Pacific, western North Pacific, subarctic North Pacific, subtropical South Pacific, and eastern and central Indian Ocean that we have measured [e.g., 1, 2, and 3] will be presented. Those measurements include those in waters where nitrogen fixation and denitrification are occurring. Those $\delta^{15}N_{Nitrate}$ and $\delta^{18}O_{Nitrate}$ values will be examined collectively, clarifying the nitrogen cycle in the entire Pacific and Indian Oceans.

References

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[3] Yoshikawa, C., Makabe, A., Matsui, Y., Nunoura, T., and Ohkouchi, N. (2018) Nitrate isotope distribution in the subarctic and subtropical North Pacific. Geochemistry, Geophysics, Geosystems 19, 2212-2224.