Isotopic analyses of dissovled N_2O and nitrite in the subarctic North Pacific

S. TOYODA[1]*, S. MATSUSHIMA[1], A. MAKABE[2], T. NUNOURA[2], C. YOSHIKAWA[2] AND N. YOSHIDA[1,3]

[1]Tokyo Institute of Technology, Yokohama 226-8502, Japan (*correspondence: toyoda.s.aa@m.titech.ac.jp)
[2]JAMSTEC, Yokosuka 237-0061, Japan
[3]Earth-Life Science Institute, Tokyo Institute of Technology, Tokyo 152-8551, Japan

Nitrous oxide (N_2O) is a potent greenhouse gas and the most imporant stratospheric ozone-depleting substance [1, 2]. Ocean is considered as the second largest natural source of N_2O, but estimated oceanic flux of N_2O has large uncertainty because N_2O is produced by several biological pathways and is also consumed depending on oxygen concentration *etc* [1]. Nitrite is a key compound in N_2O formation. In nitrification, N_2O is produced as byproduct during ammonia oxidation to nitrite. In denitrification, it is produced by reduction of nitrite and is further reduced to N_2 under low oxygen condition. In order to reveal the complex cycling of nitrogen species related to N_2O, we performed isotopic analyses of N_2O and nitrite in the subarctic North Pacific (47°N, 160°E-130°W).

Samples were collected during the MR14-04 cruise of R/V *Mirai* in July-August 2014. Concentration and isotopic analyses of dissolved N_2O were conducted with purge & trap-GC-IRMS [3]. Concentration of nitrite was measured on board with automated colorimetric analyzer and its isotope ratio was measured after converting it to N_2O with azide [4].

Water at 100-500 m depth was supersaturated with N_2O (100-400%) with respect to the atmosphere. The supersaturation is more pronounced in the western stations (160°E-180°E) than in the eastern stations. ^{15}N-site preference in N_2O suggested that N_2O is mainly produced by nitrification in the western region and the deep water (200-500 m) in the eastern region while nitrifier-denitrifcation is significant production pathway in the shallow water (100-200 m) in the eastern region. Nitrite concentration maximum was observed at 30-80 m depth, and vertical profiles of $\delta^{15}N_{nitrite}$ at the eastern and western edge of the studied area were distinct from those at other region, indicating different production/consumption processes of nitrite.

[1] Ciais *et al*. (2013) in *the 5th Assessment Report (WG I) of IPCC*, 465-570. [2] Ravishankara *et al*. (2009) *Science* **326**, 123-125. [3] Yamagishi *et al*. (2007) *J. Geophys. Res.* **112**, G02015. [4] McIlvin & Altabet (2005) *Anal. Chem.* **77**, 5589-5595.