1.090 Nitrogen isotope of nitrate in Arctic ice core records past anthropogenic energy shift.

Presenting Author:
Shohei Hattori, Tokyo Institute of Technology, hattori.s.ab@m.titech.ac.jp

Co-Authors:
Asuka Tsuruta, Tokyo Institute of Technology
Yoshinori Iizuka, Hokkaido University
Koji Fujita, Nagoya University
Ryu Uemura, University of the Ryukyus
Sumito Matoba, Hokkaido University
Naohiro Yoshida, Tokyo Institute of Technology

Abstract:

Nitrate is one of the major anions found in snow. Nitrate (NO_3^-) deposition results from reactions between nitrogen oxides (NO_x = NO + NO_2) and atmospheric oxidants. Global main sources of NO_x are fossil fuel, biomass burning, biogenic soil emissions, and lightning. A recent increase in NO_3^- in ice cores has been associated with increasing anthropogenic emissions of NO_x. Based on the changes in NO_3^- concentration, however, it is not easy to identify specific sources of NO_x which takes into account for the changes in NO_3^- concentrations, hindering the development of mitigation policy of anthropogenic pollution and its effect on the environment. Nitrogen and oxygen isotopic compositions of NO_3^- provide information on changes in the nitrogen source and its formation pathways, but ice core records for NO_3^- concentrations and its isotopic compositions are problematic because of post depositional loss of NO_3^- via photolysis (e. g., [1]). In this study, we analyzed isotopic compositions of NO_3^- preserved in the high-accumulation dome ice core, South East Greenland, which has a dome with high accumulation rate (about 1 m yr^{-1}) in water equivalent [2]. In this study, $d^{15}N$ value of NO_3^- was measured by the bacterial method coupled with N_2O decomposition via microwave-induced plasma (MIP) [3].

The nitrogen isotopic compositions for NO_3^- were generally lower than those reported in Summit, Greenland [4, 5], suggesting that some extent of NO_3^- deposited in Summit is removed via photolysis. Based on the trend of reconstructed $d^{15}N$ values and NO_x emission inventory, switches from coal to oil combustion mainly in North America was likely a factor changing the nitrogen cycle in the Arctic environments.