A 60-year record of isotopic compositions of nitrate preserved in the high-accumulation dome ice core, South East Greenland

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Nitrate (NO_3^-) is one of the major anions found in snow. NO_3^- deposition results from reactions between nitrogen oxides (NOx = NO + NO_2) and atmospheric oxidants. Global main sources of NOx are fossil fuel and biomass burning, biogenic soil emissions, and lightning, and a recent increase in NO_3^- in ice cores has been associated with increasing anthropogenic emissions of NOx. Based on the changes in NO_3^- concentration, however, it is difficult to identify specific sources of NOx 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.
Isotopic compositions of NO_3^- reveal 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. In this study, we analyzed isotopic compositions of NO_3^- preserved in the high-accumulation dome ice core, South East Greenland. South East Greenland has a dome whose elevation is higher than 3000 m a.s.l. with high accumulation rate (about 1 m yr^{-1}) in water equivalent. High elevation and accumulation rate gives high-time resolution reconstruction of past environment, and provides negligible effect of the post depositional loss of nitrate (NO_3^-). In fact, the nitrogen isotopic compositions for NO_3^- are generally lower than those reported in Summit, Greenland, suggesting negligible effect of post depositional loss of NO_3^- in this site. In the presentation, we present changes in NO_3^- concentration and its isotopic composition through recent 60 years, and discuss the changes in the source and formation pathways of nitrate.

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