A 60-years record of nitrogen and oxygen isotopic compositions of nitrate in high-accumulation dome ice core collected at South East Greenland

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Nitrate is one of the major anions found in snow. Nitrate (NO_3^-) deposition results from reactions between nitrogen oxides (NOx = NO + NO_2) and atmospheric oxidants. Global main sources of NOx 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 NOx. Based on the changes in NO_3^- concentration, however, it is not easy 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.

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. 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 accumulation rate gives high-time resolution reconstruction of past environment, and provides negligible effect of the post depositional loss of nitrate.

The nitrogen isotopic compositions for NO_3^- were generally lower than those reported in Summit, Greenland, suggesting negligible effect of post depositional loss of NO_3^- in this study site. Seasonal variation with higher $\delta^{15}N$ and lower $\delta^{18}O$ and $\Delta^{17}O$ in summer than winter were observed.