P-11

Poster Session Day 1

A 60-year atmospheric nitrate isotope record from the SE-Dome ice core

Zhao Wei[1], Shohei Hattori[1,2,3], Asuka Tsuruta[3], Zhuang Jiang[4], Sakiko Ishino[5], Koji Fujta[6], Sumito Matoba[7], Lei Geng[4], Alexis Lamothe[8], Ryu Uemura[6], Naohiro Yoshida[3,9], Joel Savarino[8], & Yoshinori Iizuka[7]*

[1] International Center for Isotope Effects Research (ICIER), Nanjing University, Nanjing, 210023, China
[2] Frontiers Science Center for Critical Earth Material Cycling, State Key Laboratory for Mineral Deposits Research, School of Earth Sciences and Engineering, Nanjing University, Nanjing 210023, China
[3] Department of Chemical Science and Engineering, School of Materials and Chemical Technology, Tokyo Institute of Technology, Kanagawa, Japan
[4] School of Earth and Space Sciences, University of Science and Technology of China, Hefei, Anhui, China
[5] Institute of Nature and Environmental Technology, Kanazawa University, Kakuma-machi, Kanazawa, Ishikawa 920-1192, Japan
[6] Graduate School of Environmental Studies, Nagoya University, Nagoya, Japan
[7] Institute of Low-Temperature Science, Hokkaido University, Sapporo, Japan
[8] Univ. Grenoble Alpes, CNRS, IRD, INRAE, G-INP, Institut des Géosciences de l'Environnement, Grenoble, France
[9] National Institute of Information and Communications Technology, Koganei, Tokyo 184-8795, Japan
*Presenting Author Email: hattori@nju.edu.cn

Stable isotopes of atmospheric nitrate (NO_3^-) are valuable tools for tracing nitrogen sources and processes; however, their signals in ice core records are often disrupted by post-depositional processes. The ice core from the southeastern Dome (SE-Dome) in Greenland is a potential record of variations in atmospheric chemistry that has experienced less post-depositional effects owing to a high accumulation rate (~1 m w e a^{-1}). Herein, we report 60-year (1959–2014) $\delta^{15}N(NO_3^-)$ and $\Delta^{17}O(NO_3^-)$ records from the SE-Dome ice core. $\delta^{15}N(NO_3^-)$ decreased from 1960 to 1974 and exhibited clear seasonal changes (high in summer and low in winter). $\Delta^{17}O(NO_3^-)$ did not exhibit any significant long-term trends, but did contain seasonal patterns. The mass-weighted annual average of $\delta^{15}N(NO_3^-)$ values in the SE-Dome core were about 4 ‰ lower those in the Greenland Summit ice core between 1959–2006. The Transfer of Atmospheric Nitrate Stable Isotopes to the Snow (TRANSITS) model under SE-Dome conditions showed that the NO_3^- concentration and its isotopic composition were less affected by post-depositional alteration at SE-Dome compared to Summit, with estimated changes in archived NO_3^- of only 0.4 ‰ in $\delta^{15}N(NO_3^-)$ and −0.2 ‰ in $\Delta^{17}O$ (NO_3^-) from the initial deposition. Although differences in the source of NO_3^- at the two sites cannot be entirely ruled out, the lower $\delta^{15}N(NO_3^-)$ values observed at the SE-Dome compared to Summit were likely attributed to reduced post-depositional alteration. Therefore, the SE-Dome ice core NO_3^- record offers a precise reconstruction of NOx emissions and atmospheric oxidation chemistry during transport, preserving records from both North America and Western Europe, thereby providing reliable insight into atmospheric nitrogen cycling.