

The triple isotopic composition of oxygen for sulfate and nitrate in surface snow in a latitudinal transect in East Antarctica

*服部 祥平¹、植村 立²、野呂 和嗣³、福井 幸太郎⁴、平林 幹啓⁵、竹中 規訓³、Savarino Joel⁶、川村 賢二⁵、本山 秀明⁵、吉田 尚弘¹

*Shohei Hattori¹, Ryu Uemura², Kazushi Noro³, Kotaro Fukui⁴, Motohiro Hirabayashi⁵, Norimichi Takenaka³, Joel Savarino⁶, Kenji Kawamura⁵, Hideaki Motoyama⁵, Naohiro Yoshida¹

1. 東京工業大学 物質理工学院 応用化学系、2. 琉球大学 理学部、3. 大阪府立大学、4. 立山カルデラ砂防博物館、5. 国立極地研究所、6. Univ. Grenoble Alpes, CNRS, IRD, IGE, F-38000 Grenoble, France

1. Department of Chemical Science and Engineering, School of Materials and Chemical Technology, Tokyo Institute of Technology, Japan, 2. University of the Ryukyus, Japan, 3. Osaka Prefectural University, Japan, 4. Tateyama Caldera Sabo Museum, Japan, 5. National Institute of Polar Research, Japan, 6. Univ. Grenoble Alpes, CNRS, IRD, IGE, F-38000 Grenoble, France

The isotopic compositions of sulfate (SO_4^{2-}) and nitrate (NO_3^-) reflect their sources and oxidation pathways. In particular, triple oxygen isotope compositions ($\Delta^{17}\text{O}$) are potential tool to reconstruct how the oxidants work in past and present atmosphere. Antarctica is an ideal place to investigate the past proxy, because the ice core preserves in past hundred thousands Earth's history. However, recently we found the annual mean $\Delta^{17}\text{O}$ values for atmospheric SO_4^{2-} at coastal Antarctica is not matched with the $\Delta^{17}\text{O}$ values preserved in the inland Antarctic ice core records. In addition, the lack of observation, spatial variations of $\Delta^{17}\text{O}$ values are limitedly reported.

In order to test spatial variation of isotopic compositions, especially for the difference in $\Delta^{17}\text{O}$ values between coastal site and inland site, here we present latitudinal variation of $\Delta^{17}\text{O}$ value and conventional isotopic compositions ($\delta^{34}\text{S}$, $\delta^{15}\text{N}$, and $\delta^{18}\text{O}$) of SO_4^{2-} and NO_3^- in surface snow in eastern Dronning Maud Land, East Antarctica. Snow samples were collected from the surface at low- and high-elevation sites during the 54th and 57th Japanese Antarctic Research, respectively. $\Delta^{17}\text{O}$ values of non-sea-salt (nss)- SO_4^{2-} at the East Antarctica ranges from 2.2 to 3.3‰, and the $\Delta^{17}\text{O}$ value of nss- SO_4^{2-} for coastal site was lower than those for inland site. Thus, this result suggest that oxidizing chemistry for biogenic sulfur is different among coastal and inland sites, although small sulfur isotopic variations are observed and source of sulfur is biogenic and homogeneous. For the isotopic compositions of NO_3^- , considerably increasing values of $\delta^{15}\text{N}$ of NO_3^- are observed from coastal to inland sites. The $\delta^{18}\text{O}$ and $\Delta^{17}\text{O}$ of NO_3^- values, on the other hand, decreases with increasing of $\delta^{15}\text{N}$ values, indicating the secondary formation of NO_3^- . Thus, spatial variations of isotopic compositions of NO_3^- reflect the post-depositional processes on the East Antarctic snow.

キーワード：安定同位体、三酸素同位体組成、硫酸、硝酸

Keywords: stable isotope, triple oxygen isotopes, sulfate, nitrate