

Chemical components in rime on Mt. Moriyoshi in northern Japan

Katsumi Saitoh*¹, Koichiro Sera*², Keji Yoshimura*³
Hitoshi Kodama*¹, Osamu Nagafuchi*⁴

*¹Environmental Research & Information Center of Akita Prefecture
3-1-1, Sanno, Akita 010-8572, Japan

*²Cyclotron Research Center, Iwate Medical University
348-58 Tomegamori, Takizawa 020-0173, Japan

*³Faculty of Engineering and Resource Science, Akita University
1-1 Tegata Gakuen-cho, Akita 010-8502, Japan

*⁴ Faculty of Risk and Crisis Management, Chiba Institute of Science,
3 Shiomi-cho, Choshi, Chiba 288-0025, Japan

Abstract

In order to shed light on the long-range transport of atmospheric pollutants in the Northeast Asian regions, we studied the chemical components in rime and fresh surface snow on Mt. Moriyoshi (altitude: 1454 m), located on the Sea of Japan side of northern Honshu, Japan, near Northwest China and Southwest Russia. Rime and fresh surface snow samples were collected at Juhyou-Daira (near the summit; altitude: 1200 m) in February 2004. The pH range of rime samples was 4.2 – 4.9, and the EC range was 52 – 282 $\mu\text{S}/\text{cm}$. On the other hand, the pH range of snow samples was 4.5 – 4.9, and the EC range was 17 – 77 $\mu\text{S}/\text{cm}$. The elemental compositions, ionic species and particle shapes of these samples were determined and/or observed by PIXE, ion chromatography and SEM-EDX analysis. PIXE analysis of the rime and snow samples revealed 24 elements, of which Na, Mg, Al, Si, K, Ca, Ti and Fe were found to be the major components. Comparing the determined values of rime and snow sample elements, rime samples were several times to several dozen times higher than snow samples for almost all the elements. For determined values of ionic species, rime samples were several times to several dozen times higher than snow samples. With the aid of SEM-EDX analysis, many small silicon-rich spherical particles were observed in the rime samples. Small silicon-rich spherical particles were also found in the snow samples. The existent forms of chemical components in rime will be an important factor when we consider the origin of air pollutants transported over long distances in the Northeast Asian regions.