

Spatial and temporal variations in stable isotopes and soluble ions on high mountain snow surface of Mt. Tateyama, Toyama Prefecture, Japan

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A great amount of snow accumulates during winter in mountain regions in Japan due to strong westerly of the Asian monsoon. Snow can preserve various aerosols in the atmosphere, such as sea spray, anthropogenic pollutants, mineral dust, and volcanic substances. Thus, studies of snow chemistry provide a means to understand spatial and seasonal variabilities of aerosols. Furthermore, soluble chemicals in snow affect alpine vegetations and also affect microbes growing on snow surface during snow melting season. In this study, we investigated spatial variations in water stable isotopes and major soluble ions on snow surface of high alpine area of Mt. Tateyama (2300 - 2700 m a.s.l.) from spring to summer to understand sources and transportation of aerosols affecting the surface snow chemistry. The soluble ion concentrations in the surface snow are generally higher in April, when the surface snow did not melt yet, than those in May to August, when the snow melted significantly. We found high anomaly in Cl and stable isotope in the area along a small valley, called Raicho-zawa throughout the seasons. They are likely to originate from an active volcanic fumarole, called Jigokudani, located in this area. Results show that the chemical conditions of the snow surface in this mountain area are mostly influenced by sea spray and anthropogenic pollutants supplied by westerly before melting season, and are also partially influenced by the volcanic fumarole of the mountain throughout the melting seasons.

Keywords: snow, stable isotope, soluble ion