Japan Geoscience Union Meeting 2014
(28 April - 02 May 2014 at Pacifico YOKOHAMA, Kanagawa, Japan)

ACC31-01 Room:312 Time:April 29 09:00-09:15

Chemical dynamics of snow in the Japanese Alps region

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The Japanese Alps region is one of the heaviest snowy regions in Japan. In this area, winter precipitation is observed mainly two patterns such as winter monsoon pattern and low pressure pattern. Therefore, the chemical characteristics of the snowpack are different by snowfall types. In this study we aimed to clarify chemical dynamics of snowpack in the Japanese Alps region. We conducted a snow pit studies in the Japanese Alps region. We collected snow samples at the large flat place without obstruct by trees and the impact of human activities. The samples were melted, then pH, electric conductivity and major ions (Na^+, K^+, Mg^{2+}, Ca^{2+}, Cl^-, $NO_3{}^-$ and $SO_4{}^{2-}$) were analyzed in clean room. The Na^+ concentration correlates well with Cl^- concentration. These ions are considered to be sea-salt components. On the other hand, $SO_4{}^{2-}$ concentrations included non-sea-salt components.

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Change for chemical compornent of rime ice in two decades

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Rime-ice and snow samples were collected at mountainous sites in Kyushu Island, Japan during from 1991 to 2014, and both soluble and insoluble substances in the melted rime-ice were analyzed by ion chromatography, inductively coupled plasma-mass spectrometry (ICP/MS) and analytical electron microscopy, in order to find the change of composition ratio of atmospheric pollutants cause by East Asian region. Although N/S ratio in rime-ice ranged from 0.1 to 0.3 in 1990's, recent year this ratio increased about 1.0. This phenomenon indicates that the composition of atmospheric pollutants changed during two decades in Eat Asian Continent.

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Variations in chemical composition of suface ice and meltwater on Svalbard glaciers

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Snow and ice on glaciers usually contain small amounts of various soluble substances. These chemical substances were supplied through the atmosphere, rain, and snow. Chemical substances in glacier surface ice and melting water are important to understand atmospheric circulation, material cycle and the ecology of glacial microbes. We analyzed the major soluble ions of surface ice, melt water, and fresh snow for three glaciers (Austre Broggerbreen, Midtre Lovenbreen, and Pedersenbreen) in the northwestern part of Svalbard in the melting season of 2013.

The concentrations of all of the solutes were low generally, but the compositions varied among the samples. Based on the significant correlation on the concentration of each samples, the solutes could be classified into 3 groups: Group A (Cl^-, SO_4^{2-}, Na^+),B (Mg^{2+}, Ca^{2+}), and C (NO_3^-, NH_4^+, K^+). They are likely to be derived from different sources. Group A solutes are probably sea salt origin, and Group B solutes are terrestrial dust origin, and Group C are anthropogenic or other unknown origin.

The altitudinal distribition of the concentration on Austre Broggerbreen showed that Groupe A (sea salt) solutes varied significantly although Group B (dust) solutes did not. Group A solutes were particularly higher in the higher area of the glacier. This variation can not be explained by distance from sea. It is probably due to supply from snow area remaining upper part of the glacier.

The chemical composition of the melting water was generally similar to those of the ice at the same site. However, some of the solutes (K^+ and SO_4^{2-}) were more abundant in meltwater than glacier ice at specific locations. This is probably due to supply from upper part of the glacier.

Keywords: Svalbard, glacier, chemical composition, sea salt

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Interannual variability of total SWE obtained by snow surveys in the Tuul river basin, Mongolia, from 2002 until 2013

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It is necessary for the southern limit of snow cover and the semi-arid region to be supplied with sustainable water. Mongolia is located in the southern limit and the semi-arid region. The capital, Ulaanbaatar, lies in a valley on the Tuul River. In order to investigate the actual conditions of snow water equivalent (SWE) in the upper Tuul River as water resources, the snow survey in the upper Tuul River has been carried out from 2002 to 2013. We have observed in each February when it will be the maximum amount of SWE. The snow water equivalent was estimated using a cylindrical snow sampler with 0.005-m^2 area. The total amount of SWE in the upper Tuul River basin was estimated using a global digital elevation model (DEM) with a horizontal grid spacing of 30 arc seconds (GTOP30) and a relationship between altitude and SWE. The main results obtained are shown below. The amount change of SWE in the upper Tuul River basin fluctuates over multiple years. The range of fluctuation was $0.25 \pm 0.07 km^3$. It was not necessarily fluctuating in monotone. The steep rise of the amount of SWE in the upper Tuul River basin coincides with increasing air temperature and snowfall roughly.

Keywords: snow water equivalent, snow cover, water resources, water cycle, Mongolia