Variation of stable isotope ratios of precipitation in the Japanese Alps Region

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We collected precipitation samples and observed meteorological condition every month from January 2011 to December 2016 at nine locations in the Japanese Alps Region (Nagano, Matsumoto, Suwa, Omachi, Sugadaira, Norikura, Kamikochi, Shigakogen, Nishihotaka). The collected water samples were brought back to the laboratory to stable isotope analysis to determineD,^{18}O and calculated d-excess. The ^{18}O in precipitation collected more than once times per month was weighted mean using the amount of precipitation and was taken as the mean monthly value. As a result of examining the seasonal variation of ^{18}O from 2011 to 2016, ^{18}O showed two peaks in spring and summer. In order to investigate the spatial variation, the coefficient of determination between latitude, longitude, altitude and ^{18}O was calculated, it clearly correlated with altitude from April to October. d-excess showed seasonal variation which is high in winter and low in summer. As a spatial variation, correlation with altitude is high in summer and correlation with longitude is high in winter. To investigate the factors that cause such variations, correlation coefficients between temperature, precipitation amount, lifting condensation level (LCL) and precipitation at δ^{18}O and d-excess at each site were calculated. Regarding δ^{18}O, it showed a positive correlation with the temperature at 8 points excluding Nishi Hodaka. Especially at 5 points of Matsumoto, Sugadaira, Omachi, Suwa, Nagano showed relatively high values. Regarding the relationship with precipitation, it showed a weak negative correlation at 6 sites excluding Omachi, Nagano and Nishi Hodaka. Regarding the relationship with LCL, there was a generally positive correlation, and particularly high correlation coefficients were found in Suwa and Nagano. From these results, it is considered that the temperature mainly contributes to δ^{18}O, and the correlation was high in Matsumoto, Sugadaira, Omachi, Suwa and Nagano, so there is a possibility that influence became strong in urban areas. The d-excess showed a negative correlation with temperature and precipitation, and there was no particularly significant relationship with LCL. The strong correlation was observed in relation to the temperature, the contribution to the fluctuation of d-excess was mainly considered to be the temperature.

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