

Characteristics of stable isotopes of oxygen and hydrogen in precipitation at Saku City

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Stable isotopes of oxygen and hydrogen in precipitation have several characteristics e.g., amount effect, temperature effect, altitude effect, latitude effect and longitude effect. For the altitude effect, however, there is little investigation about precipitation samples which are taken at different slopes. The objective of this study is to make clear the temporally variation and altitude effect of stable isotopes in precipitation which are sampled at different slope in Saku City, eastern part of Nagano prefecture. The precipitation samples were taken in September 21 and 22, 2011 that is before and after the typhoon No.15 for the three points in northeast slope (elevation is 800m, 1,000m and 1,200m) and at the eight points in southwest slope (elevation is 800m, 1,000m, 1,200m, 1,400m, 1,600m, 1,800m, 2,000m and 2,100m).

The stable isotopes of oxygen ($d^{18}\text{O}$) and hydrogen ($d\text{D}$) are relatively light for the precipitation samples which are taken after the typhoon had passed through. The reason of this may be estimated that the influence of the amount effect appears. The altitude effect is existed both northeast slope and southwest slope. The altitude effect for $d^{18}\text{O}$ at southwest slope is -0.25 permil/100m which is before the typhoon and -0.39 permil/100m which is after the typhoon. The altitude effect for $d\text{D}$ at southwest slope is -2.1 permil/100m which is before the typhoon and -2.6 permil/100m which is after the typhoon. The altitude effect is high for the precipitation samples which were taken after typhoon had passed through. The local meteoric water line is $d\text{D} = 7.95d^{18}\text{O} + 9.30$, it is almost the same as Craig's meteoric water line. The d-excess values in precipitation samples which were taken after the typhoon passed through are relatively higher rather than those in precipitation samples which were taken before the typhoon passed through. This cause may be considered that the difference in source of water vapor affects. In future, it will be make clear the factor of d-excess variation by performing the detailed and regularly investigation of rainfall or typhoon event.

Keywords: precipitation, typhoon, stable isotope, altitude effect, d-excess