

## Altitude effect of precipitation samples at Kusatsu area, Gunma Prefecture

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The stable isotopes of oxygen and hydrogen in precipitation are formed with complex factors, i.e. precipitation amount, elevation, altitude and air mass, and the change pattern of isotopes is different in various sites. There is a lot of study about isotopes in precipitation, but many of them target the isotopes at one-slope. Thus the investigation of the isotopes in precipitation at the mountainous area which has a complex topography is few, there are uncertain points for the mechanism of isotopes in precipitation. The isotopes in precipitation are useful tool to understand the recharge area of spring water and groundwater. In this study, the study site is Kusatsu area which is located to northwest at Gunma Prefecture and spread out the mountainous region. The objective of this study is to male clear the characteristics of isotopes in precipitation around Kusatsu area.

An annual mean air temperature is 7.4 degree and annual precipitation amount is about 1700 mm at Kusatsu area. The precipitation sampler is settled at 6 points with 3 different slopes. The monthly precipitation samples have been sampled since March 2010. The pH, EC, water quality and stable isotopes of oxygen and hydrogen were analyzed for all precipitation samples.

The stable isotopes of oxygen and hydrogen in precipitation show a similar change. The isotope values are relatively high in June and relatively low in August 2010. Thus the isotope values are relatively low with the high elevation and relatively high with the low elevation, the altitude effect is confirmed in this area. The d-excess values are high at the high elevation and low at the low elevation. And there is the obvious seasonal variation of d-excess in precipitation; that the d-excess are relatively low in summer period and relatively high in winter period. It is cause of the air mass which is source of the precipitation. The altitude effect using the data of 6 observation sites is -0.26 per mill / 100 m for  $d^{18}\text{O}$  ( $r^2=0.980$ ) and -1.9 per mill / 100 m for  $dD$  ( $r^2=0.988$ ). The altitude effect is slightly different on three slopes and also different according to the month. It is assumed that the reason of the difference of altitude effect is cause of the difference of precipitation amount and transportation process of the water vapor which is source of the precipitation. The local meteoric water line in Kusatsu is  $dD = 8.0d^{18}\text{O} + 9.6$ , which is almost same the Craig's meteoric water line. In future, the observation and sampling of the precipitation will be continued, and the characteristics of isotopes in precipitation will be clarified in detail.

Keywords: Kusatsu, precipitation, stable isotope, altitude effect