

Altitude effect of isotope ratio of oxygen and chemical constituents of precipitation collected on the Mt. Tateyama

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Observation of precipitations on the slope of mountain is one of a method to reveal the behaviors of water circulation and chemical constituents in the upper atmosphere.

Altitude profiles of oxygen isotope ratios and concentrations of chemical constituents in rain water were analyzed by using precipitation samples collect at nine stations on the Midagahara platform located at west side of Mt.Tateyama, one station at Shomyo valley and one station at Toyama city, Toyama Prefecture, Japan. Altitude of the highest sampling station (Murododaira) on the Midagahara Platform is 2450 m above sea level, and the lowest sampling station (Bijodaira) on that is 970 m above sea level.

The feature of the Midagahara Platform is that gentle slope with constant angle continues from Bijodaira as west end of the Midagahara Platform to Murododaira as east end of that. Distance between Bijodaira and Murododaira is about 13 km.

Altitude effects were observed in the precipitation amount. Precipitation amount were increased with increase in height above sea level of sampling stations. Isotope ratios of oxygen of precipitation water was decreased in linear functions with increase height above sea level of sampling stations. Decrease ratios of isotope ratio of oxygen were from -0.0013 per mill/m to -0.0025 per mill/m.

Concentrations of Na⁺ in precipitation were decreased with increase in height above sea level of sampling stations. However, concentrations of Na⁺ in precipitations became similar at sampling stations over 2000 m above sea level. Altitude effects were also observed in concentrations of NO₃⁻ and nssSO₄²⁻ in precipitations. However, decrease ratios of concentrations with increase altitude were higher in NO₃⁻ concentrations than that of nssSO₄²⁻ concentrations. Analysis of the difference of expressions of altitude effect might reveal the source of water vapor, chemical constituents in precipitation water.

Keywords: altitude effect, oxygen isotope ratio, sodium ion, nitrate ion, non sea-salt sulfate ion, Mt.Tateyama