

Temporal variations of stable isotopes in precipitation at Tsukuba, Ogawa and Utsunomiya over the past 10 years

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Stable isotopes of oxygen and hydrogen are one of the useful tracers to estimate the surface and subsurface water movement. In Japan, where the meteorological condition is relatively wet, groundwater recharge from precipitation is large. Thus, understanding the characteristics of isotopic compositions in precipitation is important.

Precipitation has been sampled at Tsukuba, Ogawa and Utsunomiya for every month since 1992. Stable isotopic compositions of oxygen and hydrogen were analyzed for all samples.

There was not obvious cyclic variation of isotopic compositions in precipitation, but isotopic compositions were relatively light in January and February and were also light in early-summer and autumn (e.g. September of 1996, June and July of 2000 and June of 2002). It is presumed that the former was affected by low air temperature in winter and the latter was affected by the intensive rainfall of baiu front or autumnal rain front. Temporal variations of isotopic composition in precipitation were similar to those of air temperature. Isotopic compositions had a good positive correlation with air temperature at Tsukuba and Ogawa, so the temperature effect existed in those sites. Stable isotopic compositions of precipitation at Tsukuba, Ogawa and Utsunomiya were relatively light on January of 2001, and those isotopic compositions were the lightest value during the observation in each site. On January of 2001, the air temperature was very low and there was a lot of snowfall. It is considered that this low air temperature affected the isotopic composition. Temporal variation of d-excess indicated clear seasonal change, as d-excess was low in summer and high in winter. These isotopic light pulse and seasonal variation of d-excess are useful to understand the hydrological cycle.