

Factors controlling seasonal variation of stable isotopes in precipitation across Japan

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This study tried to estimate factors controlling stable isotopes in precipitation across Japan by using observation and model simulation. Observation of stable isotopes in precipitation were conducted by the Isotope Mapping Working Group of Japanese Association of Hydrological Sciences (IMWG/JAHS) throughout 2013. Also, stable isotopes in precipitation and water vapor were simulated by using a regional spectral model incorporated water isotopes (IsoRSM) with a horizontal resolution of 30km. In order to validate the simulation results, simulated monthly anomaly of $\delta^{18}\text{O}$ from the annual mean values at 78 stations were averaged depend on the 7 climate regions and compared with observation. The correlation coefficients of them were over 0.70 with statistically significance.

Spatial distributions of observed $\delta^{18}\text{O}$ in precipitation across Japan show clear latitude effect in spring, fall and winter seasons, but that did not show in summer season. And, observed monthly $\delta^{18}\text{O}$ in precipitation of June were lower than those for adjacent months in 6 climate regions except Northern Japan region. As a result of the IsoRSM simulation, spatial distribution of monthly $\delta^{18}\text{O}$ in water vapor across Japan from June to September ranged from -22 to -20 permil and did not show the latitude effect. In the Baiu rainy season of 2013, precipitation amount was high in regions south of the Northern Japan region. It is suggested that monthly $\delta^{18}\text{O}$ in precipitation was depleted by the amount effect in these regions. On the other hand, monthly $\delta^{18}\text{O}$ in precipitation from June to September show the temperature effect in the Northern Japan region.

Keywords: stable isotopes in precipitation, the Baiu rainy season, precipitation amount effect