

The factor for variation of stable isotopic ratios of precipitation and atmospheric water vapor in eastern Siberia

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The isotopic composition of water ($\delta\text{-D}$, $\delta\text{-}^{18}\text{O}$) was analyzed in samples of precipitation and atmospheric water vapor that were collected from July 21, 2006 to July 30, 2006 at Yakutsk, eastern Siberia. Daily measurement of $\delta\text{-D}$ and $\delta\text{-}^{18}\text{O}$ of atmospheric water vapor was made. Diurnal variation in isotopic composition of water vapor was also measured every four hours on July 24. Water samples of two precipitation events were also collected during passage of cumulonimbus cloud.

The isotopic composition ($\delta\text{-}^{18}\text{O}$) of atmospheric water vapor in Yakutsk increased with surface temperature in the morning. This is inferred to be due to increase of transpiration from plants. In addition, the isotope ratio of atmospheric water vapor decreased in the afternoon on July 24 while collecting vapor for observation of diurnal variation. This is assumed to be due to entrainment of the atmospheric water vapor with low δ values in free atmosphere to the mixing layer with increasing thickness of the mixing layer. $\delta\text{-D}$ and $\delta\text{-}^{18}\text{O}$ values of precipitation were different for each precipitation events, and its isotope ratios were deviated from meteoric water line and on the lines of the slope of 5 in $\delta\text{-D}$ - $\delta\text{-}^{18}\text{O}$ plot. This shows the affection of evaporation and existence of several sources of atmospheric water vapor. These results indicate that variation of isotopic composition of atmospheric water vapor for short period in Yakutsk which is located far from the source of water vapor is inferred to be controlled by mixture of water vapor originated from transpiration of plants and water vapor in free atmosphere.