Depleting trend of deuterium excess in precipitation observed from 1998 to 2018 at Tiksi, Russia

*一柳 錦平[1]、朴 昊澤[2]、田上 雅浩[3]、上杉 崇之[1]
*Kimpei Ichiyanagi[1], Hotaek Park[2], Masahiro Tanoue[3], Takayuki Uesugi[1]

1. 熊本大学、2. 海洋研究開発機構、3. 国立環境研究所
1. Kumamoto University, 2. JAMSTEC, 3. National Institute for Environmental Studies

Stable isotopes in precipitation have been widely used in hydrological and meteorological studies as a natural tracer for atmospheric water cycle. From 1998 to 2018, daily precipitation samples were intermittently collected at Tiksi, northern Siberia, Russia. Totally 1,024 samples for $\delta^{2}H$ and 1,519 samples for $\delta^{18}O$ were analyzed by the Isotope Ratio Mass Spectrometry by the 2007 and by the Cavity Ring-Down Spectroscopy after 2008. Daily air temperature data was obtained from the Archive of Tiksi standard meteorological observations, Arctic and Antarctic Research Institute. Results of the quality control of isotopic compositions by using d-excess values (> -10‰) and relationships between $\delta^{18}O$ and air temperature (temperature effect), 637 samples for $\delta^{2}H$ and 1,105 samples for $\delta^{18}O$ were available. Isotopic compositions of $\delta^{2}H$, $\delta^{18}O$, and d-excess were ranged from -337.01 to -79.18‰, from -42.51 to -6.07‰, and from -9.90 to 34.12‰, respectively, and the Local Meteoric Water Line is $\delta^{2}H=7.83*\delta^{18}O-0.3$ (r=0.98). Air temperature at Tiksi was ranged from -47.8 to 24.1℃, and temperature effects for $\delta^{18}O$ was 0.50 (r=0.90). From the temporal analysis in the monthly basis, increasing trend of $\delta^{18}O$ in March and April and depleting trend of d-excess in October and November were significant. The difference in air temperature, evaporation, and 850hPa winds fields between first 5 years (1998-2002) and last 5 years (2014-2018) of the observation period were investigated by using the NCEP reanalysis. In March and April, positive anomalies in air temperature, evaporation, and southwesterly wind anomalies were found in the northern Siberian continent. On the other hand, positive anomalies in air temperature, evaporation along the Siberian coast of the Arctic Ocean, and north wind anomalies were found in October and November. The depleting trend in d-excess might be caused by the moisture source evaporated from the open water in the Arctic Ocean.

キーワード：precipitation、d-excess、Siberia
Keywords: precipitation, d-excess, Siberia

