

Frontier of using stable water isotopic information in studies on land-ecological, hydrological, and atmospheric process

YOSHIMURA, Kei^{1*}

¹Atmosphere and Ocean Research Institute, The University of Tokyo

In this study, it was clearly shown that vapor isotope data retrieved by satellite sensors or in situ monitoring networks have the potential to constrain the atmospheric fields. The results of this study can be applied in two directions. The first direction is a better analysis skill in current weather forecasting systems. Though our understanding of the atmosphere is improving, understanding the hydrological cycles of the mid- to upper troposphere and lower stratosphere in association with convective clouds remains difficult. Because it is apparent that water vapor isotopic information has unique characteristics with regard to the atmospheric hydrological cycle and technical improvements in satellite and in situ instruments are occurring rapidly, this direction is indeed quite promising. The second direction, regarding proxy data assimilation, is even more challenging and is significant in several disciplines. In the past, we lacked direct measurements of the Earth and were forced to rely on proxy data. Interpretation of proxy data is important but can be over-simplified. By using data assimilation for proxy data, an objective analysis of the past (specifically before the nineteenth century) can be achieved without simplifying the empirical relationship between proxy data and climate/environment information. Although there are many technical and theoretical obstacles in both directions, the authors strongly believe that scientific benefits can be achieved.

Keywords: stable water isotope ratio, data assimilation, hydrologic cycle, climate proxy, climate reanalysis, spectroscopic analysis