Geophysical Research Abstracts
Vol. 15, EGU2013-3771, 2013
EGU General Assembly 2013


# Modern monsoon extent and moisture dynamics over eastern Asian: evidence from precipitation and water vapor isotopes

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The climate of eastern Asia is dominated by the Asia monsoon (AM) system, which controls seasonal patterns of moisture sources and transport to the region. Measurements of water isotopes can provide insight into monsoon extent and moisture dynamics. Here we present an analysis of a spatially dense network of precipitation isotopes (d18O and dD) from a ground-based network and water vapor dD retrieved from satellite measurements. The results show that isotopic seasonality for both precipitation and water vapor exhibits two distinctly different, spatially coherent modes. Summer-season isotope ratios are relatively low to the south of $\sim$35°N and high to the north, with the transition between these zones reflecting the approximate northward extent of Asia summer monsoon influence. In the southern monsoon domain, low isotope values with relatively low precipitation d-excess (9.4‰ in SE China) in summer appear not to reflect the amount effect, but rather the dominance of monsoon moisture with long-distance transport from the Indian and southern Pacific oceans and continental convective recycling (contribute to about 30-48% moisture in SE China). In contrast, other seasons are dominated by dry continental masses, characterized by high d-excess (12.7‰ and isotope values. In northern China, a region that is beyond extent of monsoon, the moisture is derived overwhelmingly from the dry continental air masses. Here, water isotope ratios exhibit stronger temperature dependence, with enriched values in summer and depleted values in other seasons. The relatively low precipitation d-excess (<8‰ in northern China and inverse spatial isotope patterns between precipitation and water vapor across China during the summer further suggest that re-evaporation of falling raindrops is a key driver of water isotope behavior in northern China.