

Amount effect on the diurnal isotopic composition of precipitation in the Kra Isthmus of Thailand

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Diurnal variability of stable isotopes in precipitation and its controlling factors are poorly understood, especially in the tropics. This study investigated the diurnal variability of stable isotopes in rainfall observed at Ranong Province in the Kra Isthmus of southern Thailand. Rainfall samples were collected at daily intervals from 1st March 2013 to 25th September 2015. The oxygen and hydrogen isotopic compositions ($\delta^{18}\text{O}$ and $\delta^2\text{H}$) of the rainwater varied from -15.86‰ to 1.42‰ and from -121.65‰ to 10.61‰ , respectively, and the d-excess varied from 0.73‰ to 18.51‰ . The observations revealed that diurnal variation in isotope was not statistically correlated with rainfall amount for the entire period. However, the precipitation amount was highly significant when increasing timescale. At monthly timescale, the $\delta^{18}\text{O}$ is highly correlated to the average precipitation amount (in term of rainfall intensity) rather than an accumulative amount. It can be attributed to the adjoining sea surface which is the dominant source of water vapor to the observed site, providing for shorter water vapor trajectories and characterizing less accumulative isotopic fractionation. Moreover, the gradual depletion of $\delta^{18}\text{O}$ was found to be correlated with the Madden-Julian oscillation, which organizes the passage of regional convective activity from Indian Ocean to Pacific Ocean. Furthermore, the differences in moisture source and ratio of stratiform/convective rain rate might affect the isotopic composition of rainfall in the tropics. This showed that the precipitation events of the Kra Isthmus were provided by various air masses and moisture sources between the Indian and Pacific Oceans.

Keywords: Amount effect, Hydrogen-2, Oxygen-18, Rainfall, Kra Isthmus, Thailand