Identifying Correlated Water Extreme Event and Isotope Meteoric Water in Thailand Tributaries of Lower Mekong River Basin: During 2013-2015

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Abstract

The Mekong river basin covers about 38% of Southeast Asia, and there are forming many sub-basins. The major tributary systems acquire in the Lower Basin, from the upstream in Laos to the delta in Vietnam. A study area belongs the tributaries on the right bank, mainly the Moon and Chi rivers that drain a large part of northeast Thailand. Mainstream water transfers have long been considered by Thailand, to complement national approaches to mitigate droughts in the northeast of the country. The climate of the Lower Basin is controlled by the southwest monsoon, which usually endures from May until late September. Tropical storms and cyclones strongly affect the climate of the basin during the later in the season, heavy rainfall usually occurs, and which corresponds to the flood period in the Lower Basin. Base on the observed extreme events and the isotope data ($\delta^{18}O$, δD) during 2013-2015, this study investigated the possible correlation of the water extreme event (flood and drought) and the isotopic composition in precipitation, and climatic anomalies (e.g., precipitation, temperature, and potential evapotranspiration). The remote sensing technique was employed to analyze the flood and the drought area. The results of the spatial analysis show the extreme flood occurred in 2013 (wet year), which was about 5% of the basin area, while the record drought area occurred in 2015 (dry year) with about 42% of the area. The impact of climatic anomalies and the Oceanic Nino Index were additionally explored to reflect these extreme events. In addition to the isotopic differentiation of precipitation in the area, LMWLs for local rainfall in each site were generating with some seasonal variation of rainfall isotope signature due to amount effect. The evaporative enrichments of isotope values in some station were influenced by evaporation at some degree, revealing that the primary source of rainfall in the basin may be originating from land moisture rather than ocean sources. The results of stable isotope analyses show the dry year's isotope values are far more $\delta^{18}O$ and δD-enriched compared to the wet year, suggesting the isotopic compositions in the continental basin were affected by precipitation amount and positive phrase of temperature anomalies. *d*-excess stable isotope analyzes were beneficial to identify the relative contributions of the wet and dry seasonal sources to the moisture origin. The result indicates that moisture sources in the area are composed of dominant land moisture sources and slight ocean sources.