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Effects of ecological construction on the transformation of different water types on Loess Plateau, China

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Water is the most essential resource for the ecological and biological survival of organisms as well as being an important strategic socio-economic factor. Stable isotopes of δD and $\delta^{18}O$ in water are important indicators of hydrological and ecological process. In this study, temporal and spatial variations in δD and $\delta^{18}O$ and transformations between three water bodies (precipitation, stream water, and groundwater) under ecological construction were studied in two contrasting watersheds of the Wuding River, China. In order to understanding the spatial and temporal variation of stable isotopes and water transmission times (WTT) under ecological construction, a total of 1028 water samples were collected from the 30 sites, and 79 precipitation samples were collected at the weather station. The results show that variation range of three water bodies occurred in the order
precipitation>stream water>groundwater, the local meteoric water line was above the level of the last two, and the isotopic composition of stream water and groundwater in controlling watershed is more enriched than that in natural watershed. WTT from precipitation to stream water in Jiuyuangou were 1.53 times those of Peijiamao. Similarly, WTT from precipitation to groundwater was about 7.6 times than that form precipitation to stream water. Supply ratios exhibited obvious seasonal variation. Precipitation and groundwater recharged stream water mostly in the dry season, while precipitation and stream water recharged groundwater during the wet season. Overall, this study shows that ecological construction measures extend WTTs and enhance water evaporation and fractionation. The results of this research are significant as they enhance our understanding of water transformation on the Loess Plateau under ecological construction.