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Dew formation and its long-term trend in a desert riparian forest ecosystem on the eastern edge of the Taklimakan Desert in China

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Dewfall can be a substantial water resource crucial for maintaining water balance in desert ecosystems such as the hyper-arid zone of the Taklimakan Desert in China. However, little is known about the formation, quantitative characteristics, and factors influencing dewfall in this region. This study elucidates dew formation and its long-term trend in this region using observation data, including flux, meteorological, and soil water content data obtained using the Eddy covariance system and those recorded by weather station in the area. The results are as follows: (1) Dew forms in the Populus forest, with nighttime dewfall duration being about 2 h. The average daily dewfall amount during the observation period (June 4-October 24,2011) was 0.12 mm. The number of dewfall days was 104 days (73% of total days), and the cumulative dewfall amount was 12.87 mm. (2) The dewfall days and amount on the canopy and soil surfaces were 86 days and 8.64 mm, and 38 days and 4.23 mm, respectively. The top soil can absorb more water vapor than condensed dew. (3) At different time scales (half-hour, day, and half-year), obvious variations in dewfall duration, dewfall amounts, and meteorological factors occurred. (4) Over the past 51 years, changes in the number of dewfall days during the summer (June - October) exhibited a trend similar to that of changes in total dewfall amount during the same period. The average dewfall amount during the summer half-year was 17.2 mm, which is about 64% of the summer half-year rainfall and 50% of the annual rainfall. In particular, the total dewfall amount was higher than the annual rainfall amount during the one -fifth of the past 51 years. The study proved dewfall is one of the important water resources in the arid Taklimakan Desert region, and it also significantly influenced the water balance.
Keywords: Dewfall; canopy condensation; Eddy covariance; meteorological factors; long-term trend