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Sap flow dynamics of xerophytic shrubs differ significantly among rainfall categories in the Loess Plateau of China

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Global climate change is likely to change the timing, frequency and magnitude of precipitation events, studying the response of sap flow (SF) of plants to rainfall events is thus important for understanding the response of ecosystems to global climate change. Here, we conducted a comprehensive study on the SF, rainfall events, meteorological factors and soil water for two typical xerophytic shrub stands (*Caragana korshinskii* and *Salix psammophila*) on the Loess Plateau of China for two rainy seasons (from June-September) in 2015 and 2016. The rainfall events were classified into three rainfall categories using the K-means clustering based on the rainfall amount (RA), rainfall duration (RD) and rainfall intensity (RI) (category I: lowest mean RA, RD and RI, category II: moderate mean RA, RI and highest mean RD and category III: highest mean RA, RI and moderate mean RD). The results showed that the response of SF at both *C. korshinskii* and *S. psammophila* stands to rainfall events differed under the three categories. The occurrence of rainfall events significantly decreased daily SF of *C. korshinskii* in three rainfall categories, whereas the daily SF of *S. psammophila* is more strongly influenced by rainfall category II. Maximum decreases in daily SF between the pre-rainfall and the rainfall weather condition of the two stands both occurred in rainfall category II. Daily rainfall SF at both stands was strongly correlated with daily SR, RH and VPD, regardless of the rainfall categories. Diurnal variation of hourly SF at both stands also differed among the days with similar RA and RD in the same rainfall category. It can be inferred that SF of *C. korshinskii* is more susceptible to rainfall events than *S. psammophila*. Rainfall characteristics (RA, RD and RI) and rainfall distribution should be fully considered when assessing the response of SF of shrubs to rainfall events.