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Connecting ecohydrology and hydropedology in desert shrubs: stemflow as a source of preferential flow in soils

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Abstract. Ecohydrology and hydropedology are two emerging fields that are interconnected. In this study, we demonstrate stemflow hydrology and preferential water flow along roots in two desert shrubs (*H. scoparium* and *S. psammophila*) in the south fringe of Mu Us sandy land in North China. Stemflow generation and subsequent movement within soil-root system were investigated during the growing seasons from 2006 to 2008. The results indicated that the amount of stemflow in *H. scoparium* averaged 3.4% of incident gross rainfall with a range of 2.3 – 7.0%, while in *S. psammophila* stemflow averaged 6.3% with a range of 0.2 – 14.2%. Stemflow was produced from rainfall events with total amount more than 1 mm for both shrubs. The average funneling ratio (the ratio of rainfall amount delivered to the base of the tree to the rainfall that would have reached the ground should the tree were not present) was 77.8 and 48.7 for *H. scoparium* and *S. psammophila*, respectively, indicating that branches and stems were fully contributing to stemflow generation and thereby provided sources of water for possible preferential flow into deeper soil layer. Analysis of Rhodamine-B dye distribution under the shrubs showed that root channels were preferential pathways for the movement of most stemflow water into the soil. Distribution of soil water content under the shrubs with and without stemflow ascertained that stemflow was conducive to concentrate and store water in deeper layers in the soil profiles, which may create favorable soil water conditions for plant growth under arid conditions. Accordingly, a clear linkage between aboveground ecohydrology and belowground hydropedology in the desert shrubs is worth noticing, whereby an increase in stemflow would result in an increase in soil hydrologic heterogeneity.

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