

## **The role of pre-event canopy storage in throughfall and stemflow using isotopic tracers**

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Stable isotopes can be a valuable tool for tracing the redistribution, storage, and evaporation of water associated with canopy interception of rainfall. Isotopic differences between throughfall and rainfall have been attributed to three mechanisms: evaporative fractionation, isotopic exchange with ambient vapor, and temporal redistribution. We demonstrate the potential importance of a fourth mechanism: rainfall mixing with water retained within the canopy (in bark, epiphytes, etc.) from prior rain events. Amount and isotopic composition ( $^{18}\text{O}$  and  $^2\text{H}$ ) of rainfall and throughfall were measured over a three month period in a Douglas-fir forest in the Cascade Range of Oregon, USA. The range of spatial variability of throughfall isotopic composition exceeded the differences between event-mean isotopic compositions of rainfall and throughfall. Inter-event isotopic variation of precipitation was high and correlated with the isotopic deviation of throughfall from rainfall, likely related to a high canopy / bark storage capacity storage bridging events. Both spatial variability of throughfall isotopic composition and throughfall-precipitation isotopic differences appear to have been controlled by the temporally varying influence of residual precipitation from previous events. Therefore isotopic heterogeneity could indicate local storage characteristics and the partitioning of flow-paths within the canopy.