



Stable isotopes used as artificial tracers of snow melt infiltration and plant water uptake

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Environmental isotopes were used in many hydrological studies but their use as artificial tracer is rather rare. Successful applications were reported for example in laboratory, unsaturated zone, xylem flow and groundwater studies. We used the stable isotopes deuterium (^2H) and oxygen-18 (^{18}O) as artificial tracers in the unsaturated zone to characterize snow melt infiltration, water movement and plant water uptake. Deuterium and oxygen-18 are non-toxic, completely soluble, chemically and biologically stable and not subject to radioactive or light-influenced decay. A snow melt infiltration experiment with isotope enriched water (1000 ml 70% $^2\text{H}_2\text{O}$ and 5 ml 10% HH^{18}O) was conducted on four soil plots of a volcanic ash dominated soil in the north-western USA in January 2007. On two of the soil plots early snow melt was induced and the plots were covered with plastic foil during the process of melting. The two other soil plots were sampled under natural melting conditions. Soil samples were collected every 2.5 cm in time steps of several weeks until mid July 2007 and soil water was extracted cryogenically. Snow melt was traced to a depth of up to 60 cm. After six months ^2H concentrations of soil water of approximately 1000 ‰, and peak concentrations were found at depths of 20 to 40 cm. Plant samples (*Thinopyrum intermedium*) taken from the soil plots during late spring and summer indicate the depth of water uptake.