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# Reproducing in-situ measurements over a high-elevation grassland using HYDRUS-1D and a snow isotope model

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Stable water isotopes are increasingly used for tracking water fluxes in the critical zone offering new possibilities for model calibration and validation. Past studies revealed that the main discrepancies between simulated and measured values in a soil profile can occur when snow-related processes are under investigation. Indeed, the amount and timing of infiltrated meltwater and its isotopic composition remain largely unexplored to date.

In this work we use HYDRUS-1D (H-1D) to simulate water flux and isotope transport in a soil profile and in vegetation over a high-elevation (2600 m a.s.l.) grassland located in Valle d'Aosta (Italy). The H-1D inputs deriving from snow-related processes are computed in two steps: i) the amount of snowmelt is obtained through a classical degree-day model ii) the meltwater isotopic composition is simulated with a recently proposed snow isotope model which further assumes that any rainfall on a pre-existing snowpack mixes with the water stored in the snowpack. Model results have been compared with in-situ observations, including isotope measurements in both soil water and xylem water.

Our results show a satisfactory correspondence between model outputs and observations, but the raised discrepancies indicate other potential processes at play, e.g., soil freezing and thawing, preferential flow, isotopic fractionation, that will demand future attention. In addition, is still an open challenge to collect both meltwater samples for isotopic analysis and snowmelt measurements to validate the results deriving from models that attempt to reproduce the inputs intended for other models.