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Ground cover influence on evaporation and stable water isotopes in soil water

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Forest ecosystems are characterized by complex structures which influence hydrological processes such as evaporation. The vertical stratification of the forest modifies the effect of the evaporation process due to the composition and local distribution of species within the forest. The evaluation of it will improve the understanding of evaporation in forest ecosystems. To determine the influence of forest understory on the fractionation front, four ground cover types were selected from the Speulderbos forest in the Netherlands. The native species of Thamariskmoss *(Thuidium thamariscinum)*, Rough Stalked Feathermoss *(Brachythecium rutabulum)*, and Haircapmoss *(Polytrichum commune)* as well as one type of litter made up of Douglas-Fir needles *(Pseudotsuga menziesii)* were used to analyse the rate of evaporation and changes on the isotopic concentration of the soil water on an in-situ basis in a controlled environment. Over a period of 4 weeks soil water content and atmospheric conditions were continuously measured, while the rainfall simulations were performed with different amounts and timings. The reference water added to the boxes keeps a stable composition along the trial period with a δ^2H value of -42.59±1.15 ‰ and δ^{18}O of -6.01±0.21 ‰. The evaporation front in the four ground covers is located between 5 and 10 cm depth and deuterium excess values are bigger than 5 ‰. The litter layer of Douglas-Fir needles is the cover with higher fractionation in respect to the added water at 10 cm depth (δ^2H: -29.79 ‰), while the Haircapmoss keeps the lower fractionation rate at 5 cm and 10 cm (δ^2H: -33.62 and δ^2H: -35.34 ‰). The differences showed by the soil water beneath the different ground covers depict the influence of ground cover on fractionation rates of the soil water, underlining the importance of the spatial heterogeneity of the evaporation front in the first 15 cm of soil.