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Influence of understory cover on soil water and evaporation fluxes: a trial

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Within a forest ecosystem the litter layer is an important hydrological component and contributes towards the water and energy exchange between the sub-canopy and the soil. Evaporation within a forest is made up of different fractions coming from the dry soil, vegetation and litter layers. The quantification and partitioning of each fraction remains difficult as there is hard to estimate correctly the amount of water moved by evaporation or percolation at ecosystem level. With the aim to determine the influence of forest understory on the evaporation fluxes, four ground cover types were selected from the Speulderbos forest in the Netherlands. The mosses species of “Thamariskmoss” (Thuidium thamariscinum), “Rough Stalked Feathermoss” (Brachythecium rutabulum), and “Haircapmoss” (Polytrichum commune) were compared with a litter layer made up of Douglas-Fir needles (Pseudotsuga menziesii). Four PVC basins with 40cm x 60cm were filled with forest soil and sheltered with the selected ground covers. Each box was equipped with a soil moisture sensor, and a set Temperature and Relative Humidity sensors to determine the VPD during the study period. The study period lasts 4 weeks, while the percolation rates were measured in a daily basis. The rainfall events were simulated in the lab, applying the same rain event to each box at the same time. A total amount of 43.12 mm of rain were added to the boxes during the 4 weeks of the experiment, and distributed in 11 rain events which differ in amount and timing between events. The percolation in all the boxes was more than the 50% of the rain events due to the sandy condition of the soil, while the evaporation rates were affected not only by the room atmospheric conditions, but for the cover type present in each box. Except for the Polytrichum moss, a moss known for its water conducting abilities, all cover types showed a decline before and increase after a rain event. This species showed a steady increase in soil water content over the sampling period due to keeping the water longer in the surface. The evaporation was driven partly by the temperature in the room, while the structural characteristics of the mosses allow the differences in evaporation rates showed along the study period.