EGU2020-20447
https://doi.org/10.5194/egusphere-egu2020-20447
EGU General Assembly 2020

Comparative study: Do grasslands canopies create less spatial heterogeneity in net precipitation than forest?

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Vegetation characteristics strongly influence interception loss as well as the redistribution of precipitation. In contrast to forests, net precipitation is rarely measured in grasslands. Over the long term, grasslands are often assumed to evapotranspire less than forests because of their shallower root structure and smaller leaf area, although some studies also indicate the opposite.

This research focuses on interception by grass canopies. We propose a new way to measure net precipitation in a grassland. We designed an in-situ net-precipitation measurement tool for the low vegetation, named interception grid. It consists of four half-pipes connecting to a sheltered sampling funnel per sampling point. The small size of the sampler allows for natural growth of the grass canopy. The spatial dimension of each interception grid is approximately 1m. This method does not separate stemflow and throughfall. We applied the new interception device in a grassland and compared results obtained with those from conventional throughfall samplers in an adjacent forest.

The research area is located in central Germany as a part of Hainich Critical Zone observatory. We conducted field observations for net precipitation synchronously in an adjacent forest (25 location, 1 ha) and grassland (25 samplers, 0.047 ha) plots in 2019 (March- August). We measured gross precipitation above the canopy (ca. 1 meter). Care was taken that the extent of sampling points was similar in both grassland and forest (1 m).

During nine of the total 22 measurement weeks, the grass was short and left the grids uncovered. This provided a chance to compare gross precipitation both by the grid and by the dedicated gross precipitation samplers. These data suggest that the grids were accurate up to 30 mm precipitation per week. However, heavier precipitation was underestimated. Further work is currently underway to understand the reason for the underestimation.

During thirteen weeks, the grids were covered by the grass canopy, and interception data were acquired. Preliminary data show that the grassland exhibited a similar level of interception loss as

the forest (34 % for the forest and 28 % for the grassland). Surprisingly, for weeks with gross precipitation higher than 5 mm, measures of spatial variation of throughfall in both land uses were similar in magnitude. The coefficient of variation of net precipitation in the forest varied between 0.06 and 0.16, and in grassland between 0.05 and 0.14. Both average interception and spatial variation in throughfall decreased with increasing gross precipitation for both vegetation types. An overall taller grass cover (later in the growing season) increased interception and increased the spatial variation of net precipitation.

In the long term, by these measurements, we aim to understand the influence of vegetation-induced water input on percolation at the plot scale with the help of intensive field observations.