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Method proposal for net precipitation measurements on grassland

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Most net precipitation measurements are reported from forest and shrubs, while comparatively less information is available from low vegetation, especially grassland. However, previous research suggests that also grassland interception loss can be substantial. Also, while some information exists on the spatial variation of net precipitation in forests, such as the existence of cold and hotspots, none is available for grassland ecosystems.

One reason for this research gap lies in the difficulty of measuring net precipitation in low canopies. Hence, most of the techniques for assessing interception loss for grass canopies are laboratory based. For example, cut grass plots in baskets are sprinkled and weighed in saturated and dried conditions. Techniques in the field are based on sealing the soil surface and are only applicable in very sparse canopies. Others use weighing lysimeters. Either of those field techniques need much space and come along with considerable soil disturbance, and do not allow for assessment of spatial variation of net precipitation in natural grassland settings. Finally, Dunkerley (2010, J. Hydrol) proposed an indirect method suitable for low canopies, which relates net precipitation to the weight loss of calcium sulphate hemihydrate (plaster) tablets, which is of small scale and low impact and would allow for measurement of spatial variation.

Here, we present a test of the plaster tablet method both in controlled conditions in the laboratory and in the field. In both cases, tablet weight loss correlated well with the precipitation flux. However, weight loss is confounded by precipitation intensity and also differed between lab and field conditions, thus preventing calibration of weight loss to the actual received precipitation. Therefore, we propose a very early stage prototype for an alternative low impact measurement. Our proposed design for net precipitation measurement in grassland constitutes of several half pipes per sampling point, arranged like a star, and resting on soil nails. The installation of the pipes has to be at a slight angle to provide the unhindered gravity-driven precipitation flow in the sampling bottle, yielding a receiving surface of roughly 0.1 squaremeter per sampling location. We will use a coarse fabric filter on the low-level side of the pipes, to prevent clogging with organic debris and insects. From there, the pipe will yield into a small silicon tube, to channel the water from the receiving surface to the sampling bottle which is located in a box to protect from weathering and intruding animals.

The long-term goal of this research is to evaluate the interception loss for grasslands together with its spatial variation, and thus allowing for comparison of net precipitation with other vegetation types, such as forests.