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On the effect of different moss species on soil erosion, percolation and carbon relocation

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For decades, soil erosion has been a major environmental problem as it degrades the most productive soil layers, which threatens, among other things, food production worldwide. Although these effects have been known for a long time, there are still a variety of challenges to mitigating soil erosion in different ecosystems. As climate change progresses, the risk of soil loss increases, making the preparation of effective solutions very urgent. A current research focus is on the restoration of a protective soil cover following disturbances in the vegetation layer, e.g., through the reestablishment of biological soil crust communities. These are often dominated by bryophytes in humid climates. So far, several studies examined the general protective influence of bryophytes against soil erosion, however only few of them addressed how individual species affect specific erosion processes in detail.

To fill this research gap we investigated the impact of six moss species on soil erosion, percolation and carbon relocation by means of rainfall simulations. Therefore, we used topsoil substrate from four sites in the Schönbuch Nature Park in South Germany which covers different kinds of bedrock and varying soil texture and pH. Subsequently, they were sieved by 6.3 mm and filled into metal infiltration boxes (40 x 30 cm) up to a height of 6.5 cm. The moss species differ in origin (either collected in the field or cultivated in the lab) as well as growth form (pleurocarpous or acrocarpous). Rainfall simulations were performed for bare soil substrates, as well as for moss-covered soil substrates six months later and both in dry and wet conditions. Additionally, we conducted rainfall simulations with leaf and coniferous litter on bare soil substrates. During the simulations we monitored soil moisture in two position - 3 cm depth plus soil surface - with biocrust wetness probes (BWP) and quantified surface runoff, percolation and sediment discharge. Afterwards we determined carbon contents of the sediment and dissolved organic carbon in the liquid phase of runoff and percolated water.

While surface runoff was increased by 5% due to the litter cover compared to the bare soil substrate, sediment discharge decreased to 97%. Runoff rates could also be mitigated by 90 % as a result of the moss cover. Furthermore, due to the dense moss cover sediment rates were almost

reduced to zero. Preliminary results show that there are differences between the moss species in terms of sediment discharge, but not in context with runoff. The analyses of carbon contents in surface runoff and the percolated water are still in progress, as is the evaluation of the BWP measurements. These outcomes will be presented at vEGU21.