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Bryophyte-lichens dominated biological soil crusts affect soils and ecohydrology in temperate forests in Germany

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Forest dieback can be both a consequence and a cause of climate change. The changing climate does not only lead to temperature increases but also changes in the precipitation regime. Extreme events have increased sharply in recent years, making drought and heat waves ubiquitous. Meanwhile, for temperate forests, drought stress is considered one of the most serious impacts of climate change. In this context, forest soils are of great importance in their hydrological functions, as well as their feedbacks with ground vegetation. In this context, biological soil crusts are key drivers of functional processes and ecosystem development, also under forest, where they have been less studied so far. Bryophyte and lichen dominated communities can importantly affect e.g. water storage and discharge as well as soil development and stabilization. Moreover, they contribute to carbon and nitrogen cycling and play an important role in biogeochemical processes. Their species composition depends on soil properties such as texture and pH, on microclimate and as poikilohydric plants, their ecophysiology is strongly dependent on water availability, differing in time and space.

For a better understanding of ecohydrological and soil stabilizing functions of biological soil crusts within forest ecosystems, their spatial and temporal activity needs to be linked with microclimate and monitored continuously in the field. Therefore, we investigate the microclimatic conditions and activity of bryophyte-lichen-dominated biological soil crusts on sandy soils in Linde, Brandenburg and silty-clayey soils in the Schönbuch Nature Park, Baden-Württemberg, Germany. Water regimes within mosses and substrates are continuously determined with a novel biocrust wetness probe (BWP). Moreover, the interactions between mosses and soils are investigated in infiltration boxes with cultivated moss species. It could be shown so far, that moss-dominated biological soil crusts decrease infiltration and soil water availability in the dry sandy soils in Brandenburg and further comparative investigations will now be processed. We thus contribute to the study of effects of bryophyte-lichen communities on soil water retention, soil structure, with a focus on drought resistance of forest stands, as well as soil development at disturbance sites in temperate forest ecosystems.