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Future scenarios of soil water availability at managed grassland ecosystems in the Austrian Alps

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Available soil water is a major constraint for numerous ecosystem functions and is likely to be considerably affected by projected shifts in temperature and precipitation. Quantifying likely future changes in soil water content is therefore essential for assessing impacts of climate change on ecosystem functions.
We present a data fusion approach addressing changes in soil water content of temperate grasslands in the Austrian Alps under future climate scenarios. We use a simple soil bucket model, characterized by an efficient structure and minimal requirements regarding meteorological inputs (solar radiation, precipitation and air temperature). The model is therefore suitable for the analysis of a wide range of ecological datasets. Model parameter were constrained by up to three different datasets (soil water content, evapotranspiration and snow water equivalent) using a Bayesian inversion scheme.
Given a repository of data collected at ten sites in the Eastern Alps as well as a set of downscaled and error corrected (quantile mapping) regional climate scenarios, developed for the years 1961 – 2050 with 5 different regional/global climate models (CNRMRM, AITCCLM, KNMIRACMO, DMIHIRHAM, ETHZCLM) we simulated soil water content conditions under these future climate scenarios.
Despite the simple model structure calibrated model runs do show a very good performance at the majority of investigated sites. Results show that if any trend can be found, the investigated ecosystems tend to higher soil water contents on average, associated with a distinct decrease in snow cover duration under future climate conditions. Regardless of these average trends some climate models cause an increasing frequency and a longer duration of extreme dry soil water conditions under future climate scenarios.