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Application of an efficient soil water content model in ecosystem modeling and scenario development

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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.
Here we present a modeling study addressing changes in future soil water content of temperate grasslands in the Austrian Alps. We use "SoilBucket", a soil moisture 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 and in combination with climate change scenarios.
Our analysis relies on two data sources, a repository of soil water content and meteorological data collected at more than ten sites in the Eastern Alps as well as a set of downscaled regional climate scenarios, developed for years 1961 – 2050 with 5 different regional/global climate models (CNRMRM, AITCCLM, KNMIRACMO, DMIHIRHAM, ETHZCLM). Calibration of SoilBucket is carried out using a Bayesian inversion scheme. Calibrated model runs do show a very good performance at the majority of investigated sites despite the simple model structure.
First results of investigated grasslands show that if any trend can be found, these ecosystems tend to higher soil water contents under future climate conditions. Despite these stable or increasing general trends some climate models cause an increasing frequency in extreme dry soil water conditions under future climate scenarios.