



Strategies for soil initialisation of regional decadal climate predictions

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Climate variables, such as surface temperature and precipitation, are strongly affected by the state of the soil. The deep soil layers are expected to have a long-term memory, which influences the climate on time-scales of up to several years. This study analyses five different ways to initialise the soil for regional climate predictions with COSMO-CLM. The simulations were driven by a MPI-ESM decadal forecast, and were compared to each other and observational data of the 2m-temperature and precipitation. Compared to a prediction, where the soil initial fields are taken from the MPI-ESM model itself, the usage of soil initial fields from long-term spin-up runs increased the agreement with observations. A positive skill was found by applying the soil fields of a long-term spin-up run with the COSMO-CLM SVAT model TERRA-ML, which was run in an offline version with forcing data provided by the WATCH project. Tests with the assimilation of satellite-based surface soil moisture data showed promising results. Even with a low data density the assimilation technique was able to transfer soil moisture information down to the deep soil, which resulted overall in the highest scores of all analysed approaches.