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Assimilating land surface states into the MPI Earth System Model

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Soil moisture assimilation has been shown to improve the predictive skill of land surface models, particularly in numerical weather forecasts and seasonal climate predictions. There are indications that the assimilation of land surface states might also be beneficial for predictions on longer time-scales, as some states, e.g. deep layer soil moisture, possess considerable memory in certain regions. Whether such states are coupled to the atmosphere strongly enough to affect predictability or if their memory results from an isolation against atmospheric states, is not yet clear. Our study aims at providing additional insight into this issue by actually assimilating land surface states into decadal climate simulations.

For this task, we implemented a data assimilation scheme into the land component (JSBACH) of the Max-Planck Institute for Meteorology's Earth System Model (MPI-ESM). The assimilation scheme is based on a simple nudging algorithm and updates land surface states whenever respective observations are available. As observational input satellite based datasets of top layer soil moisture and snow water equivalent are used. Both are scaled towards model statistics using different techniques. In our presentation we will show the impact of land surface assimilation on global and regional climate statistics in general as well as analyse differences caused by the various scaling techniques.