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Sensitivity examination of soil moisture simulation in Huaihe River Basin of China

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Land surface models (LSMs) have various important applications such as for prediction and upscaling of soil moisture, soil temperature and CO2 flux etc. However large uncertainties exist in LSMs simulations. Some uncertainties come from atmospheric forcings and some from physical and ecological parameterizations in models. In this study we make an effort to analysis LSMs uncertainties by performing a series of sensitivity experiments and comparing simulation results to observations. These sensitivity experiments are designed by making perturbations on atmospheric forcing fields, model parameters respectively. Results from this study are useful for design of ensemble forecast using LSMs and for ensemble data assimilation of LSMs.

Location and time of this study is at the Huaihe River Basin of China during monsoon season of 1998. The LSM used is an atmosphere-vegetation interaction model (AVIM). The simulation of soil moisture in top layer (0-0.1m) is better than in deep layer (0.1-0.9m) when compared with soil moisture observations. The uncertainties of soil moisture simulation mainly result from the atmospheric forcing data (e.g., precipitation, radiation), the empirical parameters of model (e.g., hydraulic potential and conductivity of saturated soil), and water transfer processes (e.g., infiltration, evapotranspiration). Result shows that the simulation of top layer soil moisture is sensitive to the alteration of forcing data and physics parameters of model, especially in dry period of soil. The uncertainty of simulation in deep layer soil is due to physical processes. Slow infiltration process of water in soil cause great model error in deep layer.