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Impacts of interaction between land-surface and cloud on regional rainfall and convection

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By analyzing rainfall events over U.S. Southern Great Plains (SGP), the study investigates the impact of interaction between land-surface and cloud on regional rainfall and convection over a land-atmosphere coupling hotspot region. The study aims to improve the prediction accuracy of high-resolution (1-10 km) surface precipitation distribution and variability, which are of vital importance to local aspects of air pollution, wet deposition, and regional climate. Interactions between land-atmosphere coupling and cloud are analyzed using Noah land model and Weather Research and Forecasting (WRF) model simulations. A dynamic coupling strength and an updated Kain-Fritsch (KF) scheme based on scale-aware parameterized cloud dynamics are adopted for the model simulations. A series of 48-hour retrospective forecasts are performed over the SGP for the summers of 2002 and 2012 on 9- and 3-km grid spacings. The results highlight the impact of convective parameterization and land-surface coupling strength on precipitation forecast, and indicate the improvements on the intensity and general location by adopting the dynamic coupling coefficient and the updated KF scheme.