

Assessment of Soil Moisture–Temperature Feedbacks with the CCSM-WRF Model System over East Asia

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We perform two regional climate simulations with the Weather Research and Forecasting model driven by outputs from the Community Climate System Model (CCSM-WRF) to investigate the role of soil moisture feedbacks in summer surface air temperature variability over East Asia for the period of 1976–2005. Strong soil moisture feedbacks on the daily mean and maximum temperatures identified by the CCSM-WRF model system mainly appear over the region from southern Siberia to eastern Mongolia, northern China, the Tibetan Plateau and most regions of central and eastern China, accounting for 30–70% of the total variances. Meanwhile, the simulated soil moisture feedbacks on daily minimum temperature are shown to be much weaker than those on daily mean and maximum temperatures. The soil moisture–temperature feedbacks in the CCSM-WRF model system are generally well validated with those from two reanalysis products. The analysis of the physical mechanism shows that soil moisture feedback strength is mainly determined by the ability of soil moisture to influence the local surface heat fluxes and planetary boundary layer processes. The reasonable simulations of present soil moisture–temperature feedbacks indicate that the CCSM-WRF model system can be further applied to understand the role of soil moisture in influencing projected climate change over East Asia.