

Modification of near-surface temperature over East Asia associated with local-scale paddy irrigation

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The Sichuan Basin is a major region for paddy irrigation in China. We conducted two kinds of numerical experiment using the Weather Research and Forecasting (WRF) model to assess the impact of paddy irrigation in the Sichuan Basin on the regional climate over East Asia. In the control experiment (CTL run), which was used to calculate soil moisture using the unmodified Noah land-surface scheme, near surface temperature was higher than in the observation. The sensitivity experiment (SEN run), which incorporated an increase in soil moisture over the basin at the beginning of the rice-growing season, improved the simulated near surface temperature because of the change in the Bowen ratio associated with the increase in soil moisture. The modification of the land surface wetness in the Sichuan Basin also decreased the near surface temperature over northeastern China and increased it over southern China comparing with the CTL run, which are caused by the changes in the cloud convection and the solar & net radiation at the surface as well as the partitioning into the sensible and latent heat fluxes. The greenhouse effect associated with an increase in precipitable water in the SEN run also influences near-surface warming over southeastern China and the ocean north of southwestern Japan, where the impacts of radiation processes and surface heat fluxes on the near-surface temperature are small. The local-scale modifications to soil moisture in the Sichuan Basin results in changes in the larger-scale spatial distribution of near surface temperature over East Asia.

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