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Regional climate and land surface modeling of Jinta Oasis with a Subgrid-Scale Topography and Land Use Scheme

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Abstract

Regional climate modeling with long-term simulation is an important tool to help understand the characteristics of local underlying surface and its impacts on regional short-term climate, but it can't use for a high-resolution simulation as large as an oasis scale with a typical scale of several kilometers due to the limitation of hydrostatic balance frame. In this paper, a mosaic-type parameterization of subgrid-scale topography and land use is implemented within the framework of a regional climate model, and its effects on the desert-oasis circulation over Jinta Oasis in Northwest China are tested, with focus on the characteristics of land surface hydrological processes. Compared to the original simulation and observations, the scheme leads to an improvement of the finescale structure and overall simulation of surface air temperature, both over desert and oasis, and a more realistic simulation of evaporation as driven by the complex terrain features and subgrid landuse distribution, which demonstrate details of Wet–cold island effect occur in Jinta Oasis. The subgrid scheme also affects precipitation process simulation through feedbacks between precipitation and the surface hydrology. However, it still fails to describe the finer structure of the local Oasis breeze circulation in lower-layer troposphere. This work is a valuable addition to existing numerical research on local circumfluence over the oasis areas.

Keywords: Jinta Oasis; Oasis Breeze Circulation; Wet–Cold Island; RegCM3; Sub_Bats