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Improvement and Validation of A Soil-Atmosphere Model for Simulation of Bare Soil Surface Energy Balance in Semiarid Area

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Simulation study on the surface energy budget, especially of bare soil in arid and semi-arid areas is important for climate change simulation and weather forecast. In this study, a 1-D soil model was evaluated at Tongyu cropland station and Audubon Research Ranch in arid and semiarid areas, where their land covers was sparse grass or bare soil during simulation period. Comparisons of simulation results by this soil model were made between two parameterizations of surface thermal roughness length (Z98 and Y08 schemes) against observations from the two sites. The results show that Y08 scheme made the soil model produce a better performance than Z98 for simulation of midday soil surface temperature, sensible heat flux and ground heat flux at Tongyu cropland station. However, at Audubon Research Ranch, it could be seen that Y08 scheme only improved soil surface temperature in the daytime and failed to improve sensible heat flux relative to Z98. In a conclusion, the soil model is capable of providing good simulation of surface energy balance components as well as soil temperature and water content profiles, and proper parameterization of surface thermal roughness length is selected to help improve model performance.