

Different sensitivities of precipitation to surface condition in terms of with or without cumulus parameterization and horizontal resolution

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This study demonstrates the different sensitivities of precipitation to surface condition over tropical and mid-latitude during rainy season and summer using a regional climate model, in terms of with or without cumulus convective parameterization (CCP) and different horizontal resolution. We conducted a series of experiments driven by observational atmospheric and constant soil moisture conditions to investigate the impact of land surface condition on regional climate. Six experiments were conducted with volume soil moisture content of 0.2, 0.25, 0.3, 0.35, 0.4 and 0.45. The potential sensitivity of each meteorological variable to surface condition was defined as the slope of calculated values as a function of soil moisture in the series of six experiments.

Results showed that the sensitivity of precipitation to land surface condition was very different between with or without CCP. The difference of the sensitivity due to horizontal resolution is relatively smaller than that due to with or without CCP.

Major difference between with or without CCP was that much clearer signals were calculated in with CCP experiments. In experiment over Japan, strong signals were only calculated over the Central mountain range in without CCP experiments. On the other hand, in with CCP experiments, the signals over the Central mountain range were enhanced and other signals over flat plains were calculated. This results may suggest that with CCP experiments overestimate the sensitivity of precipitation to land surface condition or without CCP experiments underestimate the sensitivity.

Key words: sensitivity of precipitation, land surface condition, cumulus convective parameterization, horizontal resolution, Asian monsoon