



Regional Climate Simulations of Summer Diurnal Rainfall Variations over East Asia and Southeast China

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This study evaluates the simulations of summer (June-August) precipitation over East Asia by the Regional Climate Model Version 3 (RegCM3), with emphasis on the diurnal variations of precipitation over Southeast China (P_{SEC}) during the 1998-2002 summer seasons. The evaluation focuses on the maintenance mechanisms of the diurnal variations in P_{SEC} as proposed by previous observational studies. It is found that the diurnal variations of P_{SEC} are sensitive to the choice of cumulus parameterization schemes (CPSs). In particular, the Grell scheme with the Frisch-Chappell convective closure assumption (GFC) produces reasonable diurnal variations of P_{SEC} . Other CPSs such as the Emanuel scheme produces a weaker late-afternoon maximum of P_{SEC} , and the Kuo scheme as well as the Grell scheme with the Arakawa-Schubert closure assumption (GAS) is unable to simulate the occurrence of the late-afternoon maximum of P_{SEC} . The simulations show that the adoption of the GFC scheme reproduces the large-scale land-sea breeze circulation and the moisture flux convergence that have been documented by previous studies as the maintenance mechanisms of the diurnal variations of P_{SEC} . This feature illustrates the importance of convective cloud feedback at the diurnal timescale in maintaining the large-scale circulation. Furthermore, when the simulation domain covers the entire Tibetan Plateau, the diurnal variations of precipitation over East Asia are found to exhibit a noticeable improvement without changes in the physics schemes.