

Frequency of noon/afternoon convective precipitation dominates on wet surface conditions over Indian summer monsoon region

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Soil moisture can play an important role for determining precipitation characteristics over the tropical Asian region. In this study with the help of convection-permitting regional climate model (RCM), impacts of soil moisture on precipitation characteristics are investigated on different temporal scales over the Indian monsoon region. A set of wet and dry soil moisture surface conditions were forced to the Weather Research and Forecasting model WRFv3.9.1.1 as the RCM during the summer monsoon season. The contrasting soil moisture conditions found to affect the timing, frequency, intensity, and duration of precipitation during the peak monsoon over central India, along the mountains of foothills of Himalayas and over the Bay of Bengal. To understand diurnal contribution to daily accumulated rainfall, we also analyzed diurnal variations of precipitation characteristics. The changes in precipitation characteristics due to the surface conditions are basically regional characteristics. During noon/afternoon, a greater frequency of convective precipitation over the Indian land region, along the mountains of western Ghats and foothills of Himalayas was simulated under the wet surface condition, compared with the dry surface condition. Weakening of convective precipitation was found associated with the wetter surface conditions over the Indian land region. The frequency of short duration (3-6 hours) rainfall events were found to increase over Indian land region under the wet surface conditions than dry. In addition, the frequency of mesoscale convective systems propagating from land to the offshore Bay of Bengal found to decrease during the early morning over the wet land surface condition, compared with the dry condition. Moreover, we will discuss the mechanisms why these changes are simulated.

Keywords: Convection-permitting simulation, impact of land surface condition, Indian summer monsoon, precipitation characteristics