Diurnal variations of precipitation and convective clouds over South China Sea during summer monsoon onset

Wei-Ting Chen and Peng-Jen Chen

Department of Atmospheric Sciences, National Taiwan University

Abstract

The abrupt onset of the South China Sea (SCS) summer monsoon is a key precursor of the East Asia summer monsoon. The present study provides a climatological analysis on the evolution of diurnal precipitation and cloud vertical structures over SCS during the critical transition periods of onset. Pre-onset and post-onset composites are created from the 17-year precipitation estimates of the Tropical Rainfall Measuring Mission (TRMM) 3B42 datasets and the 4-year vertical cloud mask data based on the near-coincident CloudSat radar and CALIPSO lidar profiles. Clear signals in the diurnal peak time and amplitude of precipitation, as well as the daytime and nighttime contrast of cloud types, cloud size, and cloud radiative forcing are observed. After monsoon onset, the northern part of SCS experiences significant intensification in diurnal cycle, with increasing frequency of deep convection cloud, anvil, high cirrus, and the growth in convective cloud size; however, the precipitation rate contributed by individual convective cloud only increases at daytime while decreases at nighttime. In the southern SCS, diurnal variation of precipitation is strong in both pre- and post-onset periods; after onset, a slight shift in diurnal phase, decreasing occurrence of extreme large type of convective clouds, and lower nighttime precipitation rate per convective cloud is observed. The current results highlight the sensitivity of moist convection processes to environmental conditions over the monsoonal regions, such as the triggering and aggregation of convection.