Intraseasonal and diurnal variation of summer cloud and precipitation over the South China Sea

Chung-Hsiung Sui, Jing-Shu Hung, Wei-Ting Chen, and Peng-Jen Chen
Department of Atmospheric Sciences, National Taiwan University

Abstract

The northward propagation of the Boreal Summer Intraseasonal Oscillation (BSISO) through South China Sea (SCS) is closely related to the onset of the SCS summer monsoon, and the subsequent establishment and heavy rainfall events of the East Asia summer monsoon. The present study aims to understand how the prominent diurnal cycle (DC) convection over SCS is modulated by the BSISO. Strong BSISO events from 1998 to 2009 were identified by using the observation data of outgoing longwave radiation. Composites of the suppressed and convective stages of the BSISO are collected from the precipitation estimates of the Tropical Rainfall Measuring Mission (TRMM) 3B42 datasets and the vertical cloud mask data based on the CloudSat cloud radar profiles. Signals in the DC peak time and amplitude of precipitation, as well as the daytime and nighttime contrast of cloud types, cloud size, and cloud radiative forcing were analyzed and compared. The intensification of the amplitude of the DC rainfall accounts for over 60% of the BSISO precipitation signal in areas with prominent mean diurnal variability. Over the open ocean of central SCS, the DC peak hour shifts earlier from late afternoon in the suppressed stage to mid-noon in the convective stage. Near the coastal ocean, the off-shore propagation of precipitation is modulated by the changes of background wind. The increased frequency of deep convection cloud, the growth in convective cloud size and enhanced cloud radiative forcing is also analyzed. The current results highlight the importance to understand the scale interaction of the diurnal cycle over SCS and the sensitivity of moist convection processes to environmental conditions over the tropical monsoonal regions.