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A Study on the Precipitation Characteristic over the South China Sea Before and After the Monsoon Onset

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This paper presents a study on the temporal and spatial variations of the precipitation over the area of the South China Sea (SCS) during the monsoon onset period. The data used are from the Tropical Rainfall Measuring Mission (TRMM) observations between April and June over the nine years from 1998 to 2006. This study focuses on the central and northern part of South China Sea (110-120 °E, 10-20 °N). Based on the observations, the 27th pentad is selected as the occurrence time of the SCS monsoon onset. The conclusions are as follows:
(1) The abrupt change in precipitation characteristics before and after the SCS summer monsoon onset is most obvious over the central and northern part of the SCS (110-120 °E, 10-20 °N). In normal years, the monsoon onset date is the 27th pentad; it occurs later in El Niño years and earlier in La Niña years.
(2) The precipitation specific area and specific rainfall show evident differences before and after the monsoon onset. Before the monsoon onset, the specific areas for convective and stratiform rainfalls are very close to each other; after the monsoon onset, both specific areas increase significantly and the increase for stratiform rain is much larger than that for the convective rain. Before the monsoon onset, the specific rainfall for the convective precipitation (70% $\sim$80%) is much larger than that for the stratiform precipitaion (20% $\sim$ 40%), yet after the monsoon onset, the specific rainfall for the convective precipitation decreases to 50% $\sim$ 60%, while the specific rainfall for the stratiform precipitation increases to 40% $\sim$ 50%. The differences between the two reduce significantly.
(3) Rainfalls with different strength demonstrate different characteristics before and after the monsoon onset as well. After the monsoon onset, the portion of heavy rainfall increases evidently, while the portion of weak rainfall decreases.
(4) After the monsoon onset, precipitation increases evidently over the SCS. The minimum for convective rain moves to the southern part of the SCS and the corresponding value is about 1.5 times as much as before the onset. For stratiform rain, the minimum moves to the northwestern part of the SCS and the corresponding minimum is about 2.5 times as much as before the onset.
(5) Before and after the SCS summer monsoon onset, the vertical structures of the regional rainfall show clear differences. Before the monsoon onset, the change of the rain rate with height is small and less latent heat is released; after the monsoon onset, change of rain rate with height increases and hence more latent heat. The development of summer monsoon results in deeper convection and a higher freezing level over the SCS.