

Toward comprehensive understanding of diurnal cycle of precipitation in tropical Asia

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Physical processes responsible for diurnal cycle of precipitation in tropical Asia is an old and new scientific problem in tropical meteorology. Whereas it is widely accepted that diurnal cycle of insolation is the root cause of that of precipitation, detailed processes how the former activates the latter are still in discussion. In particular, the diurnal cycle in coastal waters is generally characterized by offshore migration of convective systems from near the coast to sometimes several hundred kilometers off the coast during nighttime and early morning, and how daytime abundant insolation causes such nighttime precipitation should not be straightforward.

It can be said that recent rapid growth of some of the tropical Asian countries provides us new opportunity for the research of the diurnal cycle. Until at least a decade ago, we had to analyze satellite observations to examine statistical feature and spatiotemporal structure of the diurnal cycle. On the other hand, meteorological agencies of these countries have installed a number of weather radars and operate them in a good condition with observed data stored and potentially available for future scientific research. Analyzing these data will make clear the statistical and spatiotemporal behavior much more in detail than analyzing satellite data only. In particular, we can compare the behavior in different regions and countries through analyzing observations of multiple radars. I will talk about an example of such studies that used data of a routine weather radar in Indonesia.

Field campaign projects consisting of intensive observation are still important research activities to understand the diurnal cycle yet. This is because information of thermodynamic and wind profiles with high temporal resolution that is necessary for investigating the physical processes can only be obtained by conducting the field campaigns, as routine upper-air soundings are generally performed only once or twice a day. I will talk about studies that analyzed observations of several recent field campaigns that we have conducted in tropical Asia to stress this point, and introduce our coming field campaign this summer.

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