Numerical Study on the Diurnal Cycle of Precipitation Observed near the West Coast of Sumatra Island

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Diurnal cycles of precipitation events are often observed around the Indonesian maritime continents region. Around the western coast of Sumatra, a diurnal cycle has a feature that a precipitation system develops over land in the afternoon, and then, moves offshore from evening through nighttime. Several mechanisms has been proposed about this precipitation movement but has not been sufficiently evaluated yet. Recently, two intensive observation campaigns named as the Pre Years of the Maritime Continent (Pre-YMC) and the Years of the Maritime Continent (YMC) have been operated near the west coast of Sumatra by the Japan Agency for Marine-Earth Science and Technology (JAMSTEC) to observe diurnal cycles and their interactions with larger-scale features. In this study, we simulate atmospheric phenomena in the Pre-YMC period using the Scalable Computing for Advanced Library and Environment –Regional model (SCALE-RM) and examine the mechanism of the precipitation migration.
At first, we perfomed a one week simulation initialized at 00 UTC on November 28, 2015 with a cumulus parameterization. In this simulation, the movements of the precipitation systems were reproduced every day at least marginally. Comparisons of the SCALE-RM simulation with the Pre-YMC radiosonde data confirms that the zonal wind and the specific humidity were quite similar. Then, another simulation was performed by setting the initial time at 00 UTC on November 23, 2015. This calculation was performed without any cumulus parameterization. Precipitation was reproduced everyday over land but its migration toward offshore did not happen except for one day. We are planning to examine the reason for this difference possibly due to with or without the cumulus parameterization.

Keywords: Diurnal Cycle of Precipitation, Simulation, Pre-YMC Observation Campaign