The Evolution of Microphysical Properties of Tropical MCSs

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The Maritime Continent of Indonesia (15°S – 15°N and 90° – 150°E) is one region that has a large occurrence of mesoscale convective system (MCS; one prominent feature that contributes to tropical precipitation and atmospheric latent heating), especially during the Asian winter monsoon. Although the occurrence and variability of MCS over this region has become a common knowledge, the study of MCS microphysics is still limited, mostly are classical studies during a particular campaign with small area coverage (e.g. Houze and Churchill, 1984). This study aims to gain a better understanding on the microphysical properties of MCSs at each of their life stages: initiation, mature, and decaying stage; over the Maritime Continent. The MCSs are tracked using GTG algorithm (Whitehall et al., 2014) during 2007 by using MTSAT-1R channel IR1 dataset (resolution: one hour; 4 km). The evolution of brightness temperature and size of the MCS will be used to determine its life stage (Futyan and Del Genio, 2007).

The composite of collocated CloudSat dataset suggests a distinct signature of radar reflectivity for each life stage of the MCS. All stages shows similar bright band location of around 3 to 5 km within the convective region, but the initiation stage has a large reflectivity (~10 dBZe) at the upper level (8 – 12 km) associated with large amount of ice water content (IWC). This large reflectivity decreases in mature stage as the dominant mode of IWC shifts to a moderate value. Large occurrence of high IWC at those stages is more dominant in convective core compared to anvil region, but the decaying stage has more fairly uniform large occurrence of IWC both in the convective and anvil region. Assessment of the other parameters is still underway. The atmospheric profile will also be considered to understand the mechanisms that yield the observed characteristics.

Key words: cloud microphysics, MCS, life stage, Indonesia, CloudSat

References

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