

Semi-diurnal variation of precipitation over the tropics analyzed from TRMM 3G68 data

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Diurnal variation of deep convection and/or rainfall over the tropics has been studied using satellite data and/or surface data. Many numerical models have still deficiency in representation of this diurnal variation. While semi-diurnal variation of rainfall was reported in the global cloud system resolving model (Nonhydrostatic ICosohedral Atmospheric Model; NICAM) by Tomita et al. (2005) and Yasunaga et al. (2011) for aqua-planet experiment. Miura et al. (2007) simulated the realistic structure of a Madden-Julian Oscillation (MJO) event that occurred during December 2006 using the NICAM with land-sea contrast. Some areas over the tropics show semi-diurnal variation of rainfall in the 3.5 km grid hindcasting experiment of this NICAM MJO simulation. Here, we studied the semi-diurnal variation of rainfall using microwave (TMI) and radar (PR) observations from TRMM and infrared observations from geostationary satellite.

Harmonic analysis is applied for the 14 years TRMM 3G68 TMI data of December over the tropics. Amplitude of diurnal variation is larger over the southern Africa, Madagascar, Amazon and maritime continent. Semi-diurnal variation over the southern Africa, Amazon and western Pacific indicate larger amplitude. Semi-diurnal variation over the southern Africa and Amazon is characterized as primary peak in the afternoon and secondary peak in the morning from TMI and PR. PR observation indicates that afternoon peak is mostly consist of convective rain and morning peak is mostly consists of stratiform rain over both area. Infrared observation indicates that afternoon peak coincides with large number of deep convective cloud that is rapidly increasing stage of size, while morning peak coincides with re-enhanced size of deep cloud. This cloud configuration suggests that afternoon peak corresponds to developing stage of convective cloud and morning peak corresponds to re-enhanced anvil cloud.

Keywords: TRMM, precipitation, semi-diurnal variation, NICAM