



Diurnal variations of tropical cyclone precipitation and cloud

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Using 15 years (1998–2012) of satellite-measured precipitation data and tropical cyclone (TC) information, this study estimates the diurnal variations of TC precipitation in its inner core and outer rainbands. It is found that for both weak (tropical storms to category 1 TCs) and strong (categories 2–5 TCs) storms over all six TC basins, the TC precipitation reaches its daily maximum in the morning, but the mean rain rate and diurnal variations are larger in the inner core than in the outer rainbands. With increasing radial distance from the TC center, the diurnal amplitude of precipitation decreases, and the peak time appears progressively later. The outward propagation of diurnal signals from the TC center dominates as an internal structure of the TC convective systems. The outward propagation of diurnal signals from the TC center was not observed in the TC cloud. The mean areal extent of very cold cloud cover (IR BTs < 208K) reached a maximum in the early morning (0000–0300 LST), then decreased after sunrise. This was followed by increasing cloud cover between 208 and 240K, reaching its maximum areal extent in the afternoon (1500–1800 LST). The time at which cloud cover reached a maximum was sensitive to the temperature thresholds used over the ocean. IRBTs < 240K reached minima in the morning (0300–0600 LST), and IRBTs > 240K reached minima in the afternoon (1500–1800 LST). Maximum occurrence of clouds with IR BTs < 208K in the morning and maximum occurrence of clouds with 208K < IR BTs < 240K in the afternoon suggest that two different mechanisms might be involved in causing diurnal variations under these two types of tropical cyclone cloud conditions.