

Diurnal Variations of Clouds in Tropical Cyclones

Qiaoyan Wu and Zhenxin Ruan

Second Institute of Oceanography, State Key Laboratory of Satellite Ocean Environment Dynamics, Hangzhou, China
(wuqiaoyan@gmail.com)

Using 14 years (2000–2013) of pixel-resolution infrared (IR) brightness temperature data and best track data, this study estimates the diurnal variations of convective systems in tropical cyclones (TCs) in the western North Pacific. The very cold cloud cover (IR brightness temperatures $< 208 \text{ K}$) of TCs reaches a maximum areal extent in the early morning (0000–0300 LST) and then decreases after the sunrise. The decrease of very cold cloud cover is followed by an increase of cloud cover between 208 K and 240 K with a maximum areal extent in the afternoon (1500–1800 LST). TC IR cloud top temperatures $< 240 \text{ K}$ have minimum values in the morning (0300–0600 LST), while TC IR cloud top temperatures $> 240 \text{ K}$ have mean minimum values in the afternoon (1500–1800 LST). The out-of-phase relation between different cloud conditions with IR cloud top temperatures $< 240 \text{ K}$ and IR cloud top temperatures $> 240 \text{ K}$ lead to radius-averaged IR temperature show two minima within a day. Different diurnal evolution under different cloud conditions suggests that TC convective systems are better described in terms of both areal extent and cloud-top temperature. The maximum cloud cover with IR cloud top temperatures colder than 208 K in the morning and the maximum cloud cover with IR cloud top temperatures between 208 K and 240 K in the afternoon suggest that two different mechanisms might be involved with the diurnal variations of these two types of TC cloud conditions.