



Influence of environmental flow on tropical cyclone rainfall area in the subtropical oceans

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Recent satellite observations have suggested tropical cyclone (TC) rainfall area is primarily controlled by sea surface temperature (SST) under the TCs. In this study, variations of TC rainfall area over the tropical (25°S–25°N) and subtropical (25–50°S, and 25–50°N) oceans are investigated using the Tropical Rainfall Measuring Mission precipitation (TRMM) precipitation data collected from 1998 to 2014. In the tropics, TC rainfall area shows significant increase with SST under the TC, which is consistent to the previous studies. In contrast, variation of TC rainfall area in the subtropics is primarily affected by the TC moving speed and vertical wind shear rather than SST. In the subtropics of the Northern (Southern) hemisphere, TC rainfall area clearly expands in the right (left) side of TC motion and downshear left (right) side, respectively. In addition, the expansion of TC rainfall is positively related to the magnitude of TC moving speed and vertical wind shear. Such different variations of TC rainfall area between the tropics and subtropics is attributed to the different environmental conditions of the two regions. TCs in the subtropics generally meet cooler SSTs with stronger environmental flows compared to those in the tropics, which makes TC rainfall area in the subtropics sensitive to environmental flows. Our results suggest that the environmental conditions which control TC rainfall area significantly differ by region to region. Therefore, various environmental conditions and related mechanisms controlling TC rainfall area should be considered for accurate prediction of TC rainfall area.