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The Implication of Outflow Structure for the Rapid Intensification of Tropical Cyclones under Vertical Wind Shear

Abstract

The implication of outflow structure for tropical cyclone rapid intensification (RI) is investigated by a climatological study using the best track, reanalysis, and infrared brightness temperature data during 1980-2019. The result of composite analysis shows that for the RI events under moderate (4.5 m s^{-1}) or strong (>11 m s⁻¹) environmental shear, the intensified outflow blocks the upper-level environmental flow and thus decreases the local shear. Therefore, a favorable environment is built for RI. In comparison, the RI under weak environmental shear (<4.5 m s⁻¹) is found to be less related to this outflow-blocking mechanism.

Comparison between the RI and non-RI cases under moderate or strong environmental shear indicates that the RI cases tend to have stronger outflow and convection in the upshear flank than the non-RI cases, highlighting the significance of outflow blocking on the occurrence of RI. Statistical analysis also reveals that the 24-h future intensity change under moderate or strong shear is more negatively correlated with the local shear than with the environmental shear, suggesting that local shear and upshear outflow could be valuable predictors to improve the forecasting of TC intensity change and especially RI.

Keywords

Rapid Intensification (RI)

Reference

Shi, D., and G. Chen, 2021: The Implication of Outflow Structure for the Rapid Intensification of Tropical Cyclones under Vertical Wind Shear. *Mon. Wea. Rev.*, **149**, 4107–4127, <u>https://doi.org/10.1175/MWR-D-21-0141.1</u>.