The Effects of Shear-relative Low-level Flow on Tropical Cyclone Intensification and Size Expansion

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Although deep-layer (200−850 hPa) vertical wind shear (VWS) is generally an inhibiting factor for tropical cyclone (TC) intensification, there is still a considerable variability of TC intensification and structural evolution under similar VWS magnitudes. A hypothesis to address this variability is that the interaction between a vertically-sheared TC and the shear-relative low-level mean flow (LMF) modifies the convective structure and its azimuthal distribution, resulting in various pathways of TC structure evolution. This hypothesis was explored from three different perspectives: (1) a global, climatological statistical analysis of the correlations between the 24-hour intensity/size changes and the shear-relative LMF orientations, (2) examining the structural evolution of 180 western North Pacific TCs based on satellite composites, (3) a set of idealized numerical simulations produced with Weather Research and Forecasting (WRF) Model. Based on the best track data of 775 TCs from all basins during 2003−2016, statistical results suggest that a TC affected by an LMF orienting toward down-shear-left favors a relatively large intensification rate, while an LMF orienting toward up-shear-right is favorable for TC expansion. Also, in a storm-motion-relative and shear-relative framework, the analyses based on satellite observations and idealized WRF simulations reveal possible mesoscale processes in the boundary layer causing the distinct convective features associated with TCs affected by various shear-relative LMF.

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NOTE SPECIAL LOCATION

Thursday, 1 February 2018, 3:30 PM
Refreshments 3:15 PM
NCAR-Foothills Laboratory
3450 Mitchell Lane
Bldg. 2, **Small Seminar Room 1001**

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