MMM SEMINAR SERIES

Hemispheric-Scale View of Mesoscale Tropical Cyclogenesis Environments

Thomas J. Galarneau, Jr.
University of Arizona

Recent idealized modeling studies have suggested that environmental vertically sheared flows are not necessarily unfavorable for tropical cyclogenesis. In fact, tropical cyclogenesis may be more favorable within environments characterized by modest westerly vertical wind shear with counter-aligned (easterly) surface winds. Counter-aligned westerly shear provides a mesoscale environment favorable for tropical cyclogenesis, where enhanced surface latent heat fluxes north of the vortex favor convection upshear from the circulation center, thereby providing a moisture source and vorticity tendency that offsets the vertical shear. The question remains, however, on how applicable these idealized results are for tropical disturbances embedded in more complex flow regimes.

The aim of this presentation is to examine mesoscale environments near developing tropical cyclones in the Northern Hemisphere during an 11-year period (2002-2012) to determine how consistent the idealized results are to the real atmosphere. The tropical cyclogenesis efficiency for different vertical shear orientations and geographical regions will be examined by utilizing a database of developing and nondeveloping tropical disturbances identified by a vortex-tracking algorithm employed on the ERA-Interim dataset. In addition to the hemispheric-scale climatology, a case study of the development of North Atlantic tropical cyclone Ida (2009) will be presented to highlight the key linkages between meso- and hemispheric-scale processes that contribute to a favorable mesoscale environment for tropical cyclogenesis.

Emerging results show that the climatology supports the idealized results regionally, and that the subtropical west Pacific and west Atlantic are the most efficient geographical regions for genesis anywhere in the Northern Hemisphere. Counter-aligned easterly shear associated with low-level westerly surges is most favorable in the subtropical west Pacific, while counter-aligned westerly shear associated with upper-level troughs is most favorable in the subtropical west Atlantic. Inspection of a counter-aligned westerly shear case in the West Atlantic - Ida (2009) - showed that the favorable mesoscale environment for genesis developed as an upper-level trough moved southwestward to the northwest Caribbean Sea. This upper-level trough developed in response to anticyclonic wave breaking in the midlatitude western Atlantic that occurred at the terminus of a midlatitude Rossby wave train. This Rossby wave train was triggered over the western Pacific by a recurving tropical cyclone. The development of Ida highlights how the interaction between meso-, synoptic-, and hemispheric-scale processes can contribute to tropical cyclone development. The implication of these multiscale interactions on the medium-to-long range prediction of tropical cyclogenesis will be discussed.

SPECIAL DAY & TIME

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Monday, 17 April 2017, 1:30 PM
Refreshments 1:15 PM
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