

## *Synergistic Effects of Midlevel Dry Air and Vertical Wind Shear on Tropical Cyclone Development*

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To better understand how midlevel moisture and vertical wind shear (VWS) synergistically modulate tropical cyclone (TC) development via ventilation, a three-dimensional modeling framework is utilized to conduct a suite of experiments. Each experiment has a different combination of initial midlevel moisture and VWS environments. A strong, positive, linear relationship exists between the low-level vertical mass flux in the inner core and TC intensity. The linear increase in vertical mass flux with intensity is not due to an increased strength of upward motions, but instead, is due to an increased area of strong upward motions ( $w > 0.5 \text{ m s}^{-1}$ ). This relationship suggests that physical processes influencing the vertical mass flux, such as downdraft and radial ventilation, directly influence the intensity of a TC.

The three-dimensional structure of downdraft ventilation has different orientations and strengths, which are controlled by the vertical tilt of the vortex. The modulating effect of downdraft ventilation on TC development is the transport of low-equivalent potential temperature air left-of-shear and into the upshear semicircle from downdraft ventilation regions, which aids in reducing the area of strong upward motions, reducing the vertical mass flux in the inner core, and stunting TC development.

The three-dimensional structure of radial ventilation shows two pathways: the first pathway is associated with rainband activity at low- and mid-levels, and is co-located with downdraft ventilation; while the second pathway at mid- and upper-levels is associated with the vertical tilt of the vortex and, in stronger-sheared environments, storm-relative flow induced by VWS. The modulating effect of radial ventilation on TC development is the inward transport of low-equivalent potential temperature air left-of-shear and in the upshear semicircle at low- and mid-levels, and low-RH air upshear and right-of-shear at mid- and upper-levels, which aids in reducing the area of strong upward motions, reducing the vertical mass flux in the inner core, and stunting TC development.

**Thursday, 8 August 2019, 3:30pm**

**Refreshments 3:15pm**

NCAR-Foothills Laboratory, 3450 Mitchell Lane, FL2-1022, Large Auditorium

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