

The boundary layer of Tropical Storm Erika (2015) observed by airborne Doppler Wind Lidar

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Abstract

This talk presents analysis of the Doppler Wind Lidar (DWL) measured wind profiles in Tropical Storm (TS) Erika (2015) by NOAA's P3 aircraft. This work was funded by NOAA's Sandy Supplemental Program that supports new technologies such as the DWL for hurricane research. It is for the first time, the DWL onboard a NOAA P3 has become operational in hurricane reconnaissance missions and collected highquality wind profile data. The DWL wind profiles were first verified against the collocated dropsonde and Doppler radar observations, showing good agreement. To the authors' knowledge, the DWL data collected in TS Erika provided the best data coverage in the boundary layer of any given TS. This data set allows us to investigate the detailed boundary layer structure, including the boundary layer height, the strength of the inflow and outflow, and their asymmetric distributions. Composite analysis of the DWL data shows that the axisymmetric boundary layer structure of TS Erika is largely different from that of a typical hurricane from previous dropsonde observations. The vorticity budget conducted using the DWL data suggests that the boundary layer of TS Erika is far from being in vorticity balance. The large magnitude of boundary-layer divergence and the small magnitude of mass flux above the boundary layer may explain why TS Erika did not intensify during the period of observation. The boundary-layer structure asymmetry is found to be tied to the vortex tilt that is induced by the environmental vertical wind shear.