Impacts of Assimilating Airborne Doppler Wind Lidar data into NOAA's Hurricane Weather Research and Forecasting (HWRF) System.

L. Bucci, S. Majumdar, R. Atlas, B. Dahl, G.D. Emmitt and S.A. Wood

Abstract

An accurate initial structure of tropical cyclones (TCs) in numerical models is required in order to produce accurate TC forecasts. To achieve this, instruments aboard NOAA's WP-3D Orion (P-3) aircraft that provide critical in situ inner-core observations can be assimilated. As an example, the Tail Doppler Radar (TDR) has the ability to measure winds in areas of precipitation. However, outside these regions and below about 0.5 km altitude, it either cannot make observations or the data are less reliable. The Doppler Wind Lidar (DWL) samples three-dimensional wind profiles that are complementary to data from the TDR. The DWL was flown onboard the P-3 for a portion of the 2016-2018 Atlantic hurricane seasons. It sampled a variety of storms including Hurricane Earl (2016), Tropical Storm Javier (2016), and category 5 Hurricane Lane (2018). This study investigates the impact of airborne DWL measurements on numerical analyses and forecasts of these sampled TCs, using the Hurricane Weather Research and Forecasting (HWRF) model and an Ensemble Kalman Filter (EnKF) data assimilation system. Emphasis is given to the modified structure of the analyzed boundary layers.

34th Conference on Hurricanes and Tropical Meteorology, New Orleans, LA, May 12 2020.