

## **Evaluation of the Simulated Structure of Hurricane Sandy Using Synthetic Flight Paths**

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This work will examine the structure of Hurricane Sandy during its extratropical transition period from the perspective of several Advanced Hurricane WRF (AHW) simulations that cover the period 28-30 October 2012. Ultra high resolution simulations are being conducted on the state-of-the-art Blue Waters supercomputer at the University of Illinois. These simulations use a horizontal grid spacing of 500 m over the entire model domain, with 150 levels in the vertical, providing an unprecedented view of both the near-storm and far-field environment. For comparison, NCAR has conducted a more standard nested simulation with horizontal grid spacing of 4 km. Both simulations capture the formation of intense, baroclinically-enhanced outer jets on the south and north sides of the cyclone, even as the inner hurricane portion of Sandy is maintained. The 500-m simulation differs markedly from the 4-km simulation in the following gross and fine-scale features: (1) the 500-m simulation contains very extreme horizontal shear zones that slice into the inner core, with a more marked strong wind curl-up around the eye of the storm, whereas the 4-km run appears to have less interaction between the inner and outer wind jets; (2) meso-gamma scale wave-like structures occur in the 500-m simulation and appear to correlate with similar structures observed by ground-based radars during the event, whereas such features are absent in the 4-km simulation; (3) there are significant differences in the location of the outer convective bands on the eastern side of the storm between the two simulations; and (4) the ultra high resolution run appears to have a different shape of energy cascade, with more energy being partitioned into the smaller scales than the 4-km simulation. A burning question is whether the ultra high resolution affords more fidelity and accuracy with respect to the real storm, or whether the increased resolution results in problematic energy cascade or other issues. To attempt to answer this question, synthetic flight paths that mimic the flight paths of actual aircraft reconnaissance will be constructed in a frame moving with the center of the simulated cyclone. To the extent possible, synthetic radial passes of flight level and surface wind speed and temperature will be compared with observed 1 Hz flight level data to determine which simulation most accurately represents the aforementioned features.