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High resolution simulation of the hurricane vortex employing a dynamics core utilizing the explicit representation of the Lamb vector

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High (1km) resolution simulations of several hurricanes are being conducted as part of the Hurricane Forecast Intensity Project conducted by NOAA to compare the effect of cloud resolving resolution on hurricane forecasts produced by several different mesoscale models and the GFDL hurricane model. The University of Wisconsin Nonhydrostatic Mesoscale Model is one of the 6 mesoscale models being evaluated and is unique among the tested models by virtue of its dynamics core which explicitly simulates the 3D Lamb vector using enstrophy conserving dynamics proposed by Arakawa and Lamb (1980) and extend to 3D nonhydrostatic dynamics by Tripoli and Smith (2009). The Lamb vector, which is the 3D cross product of vorticity and velocity is known in the CFD community to be a critical parameter to the growth, merger and decay in vortex dynamics. Traditional momentum based Nonhydrostatic models designed to explicitly conserve momentum, do so at the expense of the Lamb vector which tends to be shred by numerical truncation near the grid resolution scale. The Lamb vector on the other hand is the key variable that balances the pressure gradient in a balanced vortex. The results of several of the NMS simulations will be presented at the conference presentation.