Enhancing the prediction of landfalling hurricanes with advanced atmospheric data assimilation, improved PBL parameterization, and coupled land-atmosphere data assimilation

Zhaoxia Pu, *University of Utah, Collaboration* with **NOAA/NCEP/EMC**, Supported by **NOAA/WPO/JTTI**

Current Accomplishments

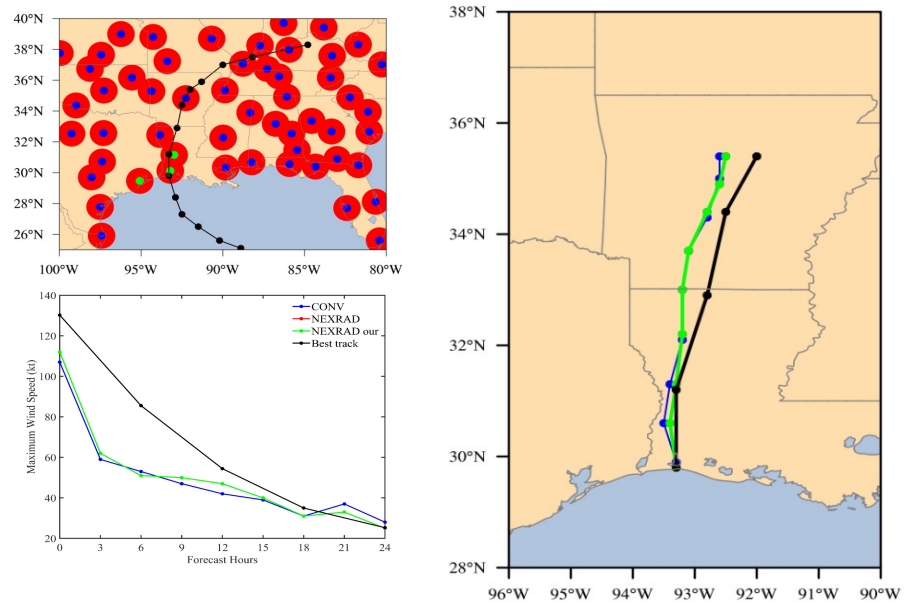
1) NEXRAD radar radial velocity assimilation

Identified the best configuration of the GSI 3DEnVAR Data assimilation system to assimilate NEXRAD data for improved landfalling hurricane forecasts with HWRF system. [data coverage; super-obs/thinning; localization; hybrid weight factors] **(Transition has been made)**

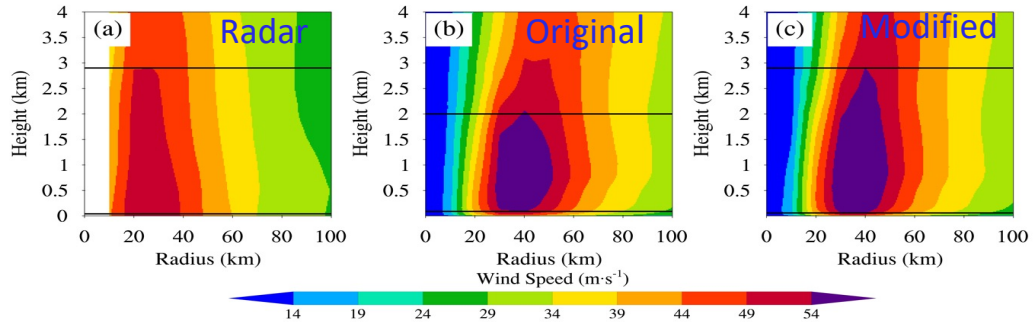
2) Improving hurricane inner-core representation with Airborne Doppler Radar and Doppler Wind Lidar data. **(Transition is planned)**

3) Improved PBL scheme

Developed a vertical eddy diffusivity parameterization within HWRF PBL scheme based on large-eddy simulations of landfalling hurricanes. Testing results with operational version of HWRF model show positive impacts on predicting landfalling hurricanes. **(Transition is in process)**



Assimilation of NEXRAD data improves forecasts of Laura (2020)



The azimuth-averaged wind profile of Hurricane Harvey

1800 UTC 25 August 2017

Moving forward with UFS/JEDI

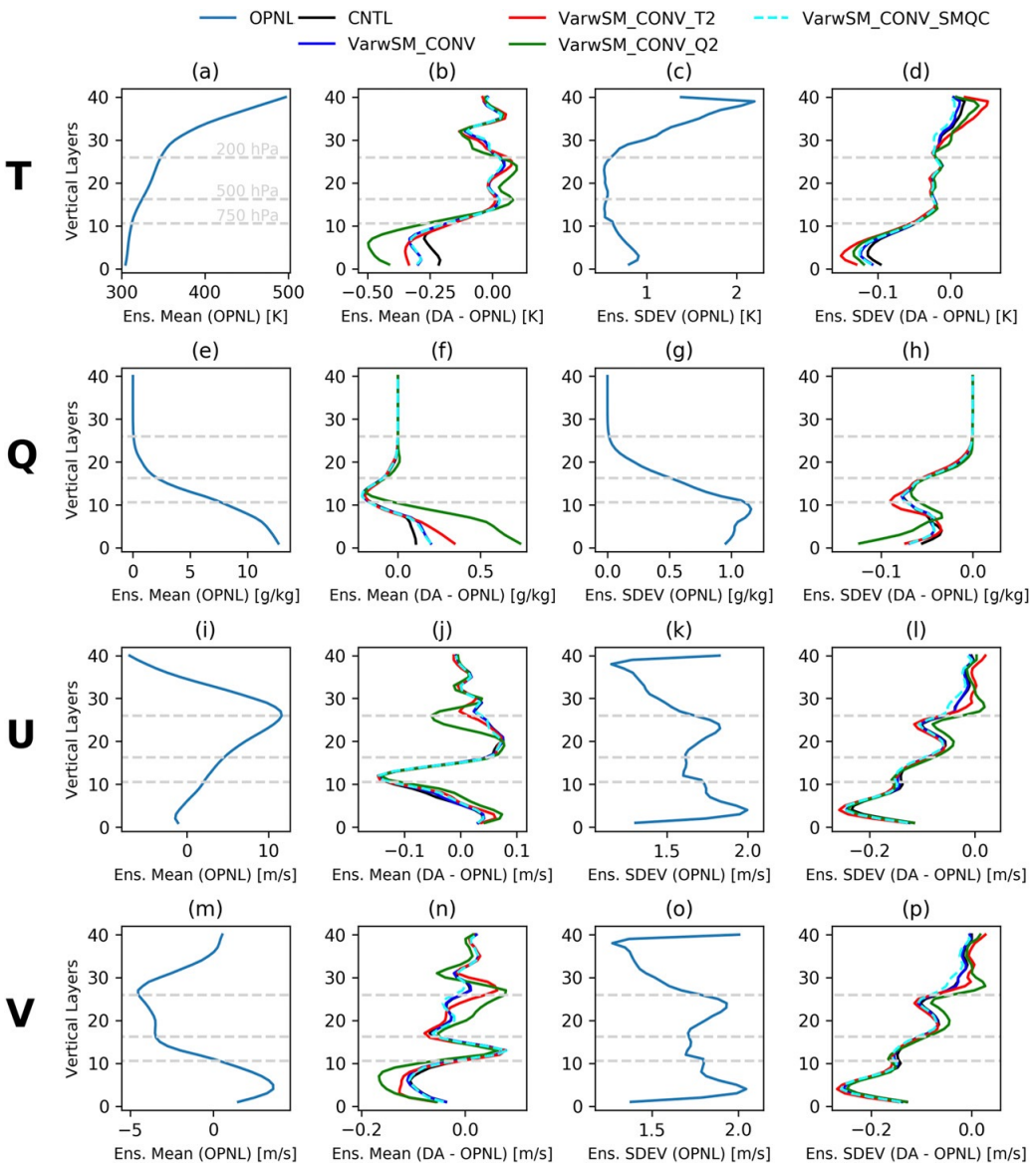
- **Developing strongly coupled land-atmosphere (L-A) data assimilation (DA) system with UFS and JEDI**

- Strongly coupled L-A DA adjusts atmosphere/soil states simultaneously with cross covariances between land and atmospheric variables.

- Previous implementation has been made with GSI EnKF.

- The current project will implement strongly coupled L-A DA with UFS/JEDI

- Impacts on severe weather (e.g., landfalling hurricanes) forecasting and S2S will be evaluated.



Ensemble mean and spread during July 2018 (GSI EnKF)