



## *Clustering tropical cyclone forecasts using regression mixture models*

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Ensemble forecasts provide a wealth of data to operational forecasters and researchers, but fully utilizing the information remains a challenge. Regression mixture-model clustering is explored as a method to partition forecasts of tropical cyclone track and structural evolution. By partitioning storm tracks or Cyclone Phase Space paths into clusters, it can distill many forecasts into a small number of representative and distinct scenarios.

The method and utility of regression mixture-model clustering are demonstrated for forecasts of Hurricane Sandy (2012) from four global ensemble prediction systems initialized between 23 and 27 October. The relationship between the track of Sandy and its structural evolution is examined in detail using an ensemble of WRF simulations initialized from ECMWF and GEFS ensemble forecasts. The WRF ensemble is partitioned into six clusters by track and the four most populous clusters are compared.

Sandy is found to undergo a warm seclusion extratropical transition in each analyzed cluster. Extratropical transition timing is the clearest difference among clusters; more westward clusters show earlier storm-trough interaction, warm seclusion formation, and warm core collapse. Inter-cluster differences are much smaller, but still relevant, when analyzed relative to the landfall time of each simulation.

Finally, regression mixture-model clustering is discussed as a method to understand and describe uncertainty in storm related hazards, using ensemble simulations of Hurricanes Harvey and Irma (2017). After partitioning the simulations into clusters by storm track, inter-cluster differences in the spatial distribution of rainfall and storm surge hazards are examined.

**Thursday, 25 October 2018, 3:30 PM**

**Refreshments 3:15 PM**

NCAR-Foothills Laboratory

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