Exploring Multi-Model Ensemble Performance in Extratropical Cyclones over Eastern North America and the Western Atlantic Ocean

NATHAN KORFE AND BRIAN A. COLLE

School of Marine and Atmospheric Sciences, Stony Brook University, Stony Brook, New York

Abstract submitted for the 17th Cyclone Workshop

Forecasting extratropical cyclones in the medium to long range requires the use of ensembles. However, there has not been a comprehensive verification of these cyclones in various global ensemble systems, and a physical understanding what may be leading to systematic errors for these storms in these ensembles. The gridded archive within the Observing System Research and Predictability Experiment (THORPEX) Interactive Grand Global Ensemble (TIGGE) provides an opportunity to determine the cyclone performance in the global ensembles as well as explore some of the reasons for any systematic errors. This presentation will verify the intensity, tracks, and skill of these cyclones in these ensembles along the United States (U.S.) East coast and Western Atlantic from 2007 to early 2015. Some of the physical reasons for the model differences will be explored using a cyclone relative composite approach from cyclogenesis to decay.

The operational models evaluated include the 50-member European Centre for Medium-Range Weather Forecasts (ECMWF), the 20-member National Centers for Environmental Prediction (NCEP), and the 20-member Canadian Meteorological Centre (CMC). The ECMWF ERA-Interim Re-Analysis and Global Forecast System analysis are used to verify cyclone properties for the cool seasons (October to March) from 2007-2015. The Hodges surface cyclone tracking scheme was used to track cyclones using 6-hourly MSLP from the analyses and ensemble members. The cyclone verification is binned into different groups according to forecast lead time, cyclone intensity, and magnitude of the cyclone errors for different lead times. The probabilistic skill is assessed using the Brier Skill Score, among other metrics; to show how representative the ensemble spread is relative to the uncertainty in the ensemble forecast. Cyclone relative composites will average those periods in which one particular ensemble system outperforms another ensemble (EC versus GFS ensemble), or cases when the analysis falls outside the ensemble envelope. There are systematic errors in these ensembles, such as an underprediction of cyclone intensity in the medium to long range. The cyclone composites will illustrate the large-scale evolution (upper-level potential vorticity, precipitation, jet interactions, etc.) resulting in some of these systematic cyclone biases in the ensembles.