

Factors affecting the structural evolution and predictability of the tropical transition of Hurricane Alex (2016)

Juan Jesús González-Alemán (1), Jenni L. Evans (2), Alex M. Kowaleski (2) and Miguel Ángel Gaertner (1)

(1) University of Castilla-La Mancha

(2) Department of Meteorology and Atmospheric Science, The Pennsylvania State University, University Park PA

In January 2016, an extratropical low-pressure system formed over the western North Atlantic. After moving eastward, the storm transitioned to a subtropical cyclone on 12 January and became Hurricane Alex on 14 January. An exceedingly unusual, event, Alex was the first North Atlantic hurricane to form in January since 1938.

We examine herein the factors affecting the formation of Hurricane Alex and the predictability of that evolution. Fifty-one ensembles from the European Centre for Medium-Range Weather Forecasts Ensemble Prediction System (ECMWF-EPS) are grouped using a regression mixture model, based on the trajectory of Alex in Cyclone Phase Space in each ensemble member. This clustering yields varying possible scenarios of structural development. After clustering is performed, representative ensemble members for each cluster are chosen. High-resolution WRF simulations are run using these ECMWF-EPS ensemble members to provide initial and boundary conditions. These WRF simulations are used to show the role of the synoptic and meso- scale in promoting the tropical transition of Hurricane Alex, and how the interaction between Alex and its environment prior to and during tropical transition varied among clusters. Another important aim of this study is to analyze the performance of this technique as a potential method for improving the complex forecasting challenge of the evolution of an extratropical cyclone into hurricane while embedded in the midlatitude atmospheric flow.