



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

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In January 2016, an extratropical low-pressure system that formed over the western North Atlantic basin, underwent tropical transition after moving to the eastern basin, becoming Hurricane Alex, an extremely rare hurricane event and the first to form in January since 1938.

We examine herein the factors affecting the transition of the extratropical cyclone into Hurricane Alex and the predictability of that evolution. 51 ensembles from the European Centre for Medium-Range Weather Forecasts Ensemble Prediction System (ECMWF-EPS) are grouped, using a regression mixture model, based on similarities related to the storm's path within its cyclone phase space, giving various possible scenarios of structural development.

First results indicate synoptic differences between scenarios. Three of them are shown to be statistically significant different and meteorologically consistent, and are further investigated. It can be therefore analyzed these different developments of the cyclone continuing as an extratropical cyclone or transitioning into subtropical or tropical (as in the reality). To analyze mesoscale processes' role in each development, WRF model simulations are nested in those ensemble members which better represent each cluster composite.

As a result, it is possible to shed light on the role of synoptic and meso- scale processes in promoting the tropical transition of Hurricane Alex, which demonstrates the potential use of this methodology to investigate cyclones' behavior. On the other hand, another important aim of this study is to analyze the performance of this technique when used to improve the complex forecasting issue of the development of an extratropical cyclone into hurricane while embedded in the midlatitude atmospheric flow.