Assessing High Variability Forecasts of African Easterly Waves in the ECMWF Ensemble Prediction System: A Case Study Perspective
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During the boreal summer, African Easterly Waves (AEWs) are the primary synoptic-scale feature that influences North African weather, and are associated with the majority of the rainfall seen in this region. Although numerous studies have investigated the composite mean structure and evolution of these waves through observational case studies, few studies have explored the predictability of AEWs in operational forecasts. Furthermore, the processes leading to the growth of uncertainty within these forecasts remains unknown.

This project utilizes a climatology of AEW forecasts from the European Centre for Medium-Range Weather Forecasts (ECMWF) ensemble forecasts, which are available through the THORPEX Interactive Grand Global Ensemble (TIGGE) dataset, during July-August-September 2007—2009 and 2011—2013. Our previous work comparing high variability intensity forecasts against low variability cases suggests the downstream thermodynamic environment in the large variability cases is more favorable for convection. While this result may be valid for a large number of cases, it is worth understanding how forecast errors grow within individual forecasts.

The goal of this study is to understand the growth of AEW intensity forecast errors within two case studies (one from 2007, and another from 2011) characterized by large increase in ensemble standard deviation. For each case, the ensemble members are subdivided into the 10 strongest members and the 10 weakest members to diagnose the kinematic and thermodynamic sources of forecast variability in a wave-centric framework. Moreover, the growth in forecast variability due to barotropic, baroclinic, and diabatic processes will be compared to confirm that latent heat release is the largest source of forecast uncertainty.