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Examining High/Low Variability Forecasts of African Easterly Waves in the ECMWF Ensemble Prediction System

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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 summer rainfall found in this region. Although numerous studies have investigated the composite mean structure and evolution of these waves through observational case studies and idealized modeling, few studies have explored the skill and predictability of these systems in operational deterministic or ensemble forecasts. Furthermore, it is unclear whether the predictability of these features depends on the large-scale environmental factors, such as equatorial waves, mid-level moisture, etc.

This study investigates the predictability of AEW forecasts, defined here as the ensemble standard deviation, using European Centre for Medium-Range Weather Forecasts (ECMWF) ensemble forecasts, which are available through the THORPEX Interactive Grand Global Ensemble (TIGGE) dataset, during the periods of July-August-September 2007—2009 and 2011—2013. Whereas the ensemble standard deviation in AEW position forecasts increase at a relatively constant rate with time, the ensemble standard deviation in AEW intensity forecasts often exhibit rapid non-linear growth. Therefore, this study explores forecasts exhibiting the largest standard deviation in intensity at 72h (top 10% of forecasts) and compares them against forecasts with the smallest standard deviation in intensity (bottom 10%). Preliminary results from 2007—2009 suggest the growth of variability is strongly associated to large-scale factors that would promote convection near the AEW, after the first diurnal cycle. Whereas variability in forecasts from 2011—2013 are more associated with the initial AEW structure instead of the large-scale environment.