Using Feature-Based Methods to Improve Tropical Cyclone Forecasts in the National Blend of Models

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Blending multiple model forecasts using bias correction and whole-grid weighted averages can be challenging for discontinuous, high magnitude forecast features such as Tropical Cyclones (TCs). Additionally, it can be problematic to smoothly marry the blended Direct Model Output (DMO) inputs with the official National Hurricane Center (NHC) gridded forecast product (wTCM). These challenges can result in forecast oddities such as TCs with multiple eyes, washed out magnitudes, and unrealistically large areal extents, which impacts forecasters' workflow by requiring manual editing to arrive at a reasonable starting point for a forecast. We adapted feature-based techniques to address these challenges. First identifying TC features from each respective model forecast, we then create a hybrid feature by matching via a fuzzy logic method across models and then stacking input forecasts over the center of each TC, better preserving magnitudes and eliminating extraneous eye features. This hybrid TC is then placed on a background National Blend of Models (NBM) forecast grid. Our results so far have been encouraging -- the technique has reliably created coherent TC structures that preserve the wTCM track and wind speed forecasts > 34 kts (when wTCM is present) and provide a more realistic starting point for forecasters than current NBM Tropical guidance. Feature matching is currently running live experimentally on WCOSS. We plan on observing and making modifications over the course of this current tropical season as we continue to share with and get feedback from collaborators at NHC, before implementing with NBM v4.1 in the future.