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Evaluation of Subseasonal Errors and Skill in the FIM-iHYCOM Model

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We have produced both real-time and retrospective forecasts at subseasonal timescales for NOAA's Subseasonal Experiment (SubX) using the FIM-iHYCOM model. FIM-iHYCOM couples the atmospheric Flow-following finite volume Icosahedral Model (FIM) to an icosahedral-grid version of the Hybrid Coordinate Ocean Model (HYCOM). This coupled model is unique in terms of its grid structure: in the horizontal, the icosahedral meshes are perfectly matched for FIM and iHYCOM, eliminating the need for a flux interpolator; in the vertical, both models use an adaptive ALE (Arbitrary Lagrangian-Eulerian) coordinate. For SubX, FIM-iHYCOM initializes four time-lagged ensemble members around each Wednesday, which are integrated forward to provide 32-day forecasts.

Because FIM-iHYCOM is a fairly new modeling system, it is important to evaluate the model in terms of systematic biases as well as predictive skill (both deterministic and probabilistic). Here, FIM-iHYCOM biases and skill are evaluated against NOAA's operational CFSv2; overall, the performance is comparable. FIM-iHYCOM has a smaller global precipitation bias than CFSv2 (verifying against GPCP), which is partially attributable to FIM-iHYCOM's use of a modified version of the Grell-Freitas scale aware convective parameterization. FIM-iHYCOM also has a better probabilistic skill of 2-m temperature in terms of Ranked Probability Skill Score over North America at lead weeks 3 and 4. Blocking patterns are examined using two different indices; one with a focus on mid-tropospheric flow (Tibaldi-Molteni) and another on near-tropopause flow (Pelly-Hoskins). FIM-iHYCOM is able to maintain realistic blocking frequencies. Current research includes investigation of how FIM-iHYCOM simulates stratospheric processes such as sudden warmings and the quasi-biennial oscillation (QBO).