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Title: Blocking error in 1-12 month global model forecasts, dependency on numerics and resolution
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Abstract:
Atmospheric blocking can produce extreme weather conditions with extended periods of anomalous warmth/cold or precipitation/drought. Deficiency in blocking in global climate models is a well-known (e.g., Scaife et al. 2010, D. Andrea et al. 1998) problem, and blocking frequency was found to be related to horizontal resolution (Project ATHENA, e.g., Jung et al. 2012). More recent studies (Hamill and Kiladis 2013) indicate that while seasonal forecast blocking frequency is not far from observed, onset and cessation of blocks are a more difficult problem for the NCEP GEFS, as they are for all medium-range global forecast models.

NOAA/ESRL has developed a global model option, the Flow-following finite-volume Icosahedral Model (Bleck et al., 2010, Mon. Wea. Rev.). FIM uses an isentropic-sigma hybrid vertical coordinate designed for improved conservation of potential vorticity and accuracy in 3-dimensional transport. A related coupled atmospheric-ocean model linking FIM with an icosahedral version of the HYCOM ocean model is also now being tested for suitability for subseasonal-seasonal forecasting. FIM has been tested extensively for 1-14-day weather forecasts showing equal or improved skill over GFS when run at similar resolution.

In this study, ESRL will carry out 1-12 month forecasts using the FIM coupled global atmosphere/ocean model at horizontal resolution ranging from 120km to 15km to investigate blocking frequency and relationship in these model runs to MJO and stratospheric events. Results will also be shown for sensitivity to vertical coordinate (sigma-pressure as used in GFS/CFS vs. the isentropic-sigma coordinate) and momentum diffusion.

This research is part of the beginning of an expected sustained effort to improve global modeling on blocking and understanding of processes related to block onset, sustenance, and cessation under Demonstration #1 of the US Earth System Prediction Capability.

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