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The Influence of Tropical Forecast Errors on Higher Latitude Predictions

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ABSTRACT

The atmospheric response to variations in tropical latent heating is known to extend well beyond its source region, and therefore it is thought that a reduction of tropical forecast errors in numerical prediction models should also benefit forecasts over the extratropics. This study is based on the hypothesis that a positive correlation between short range tropical forecast skill and later lead times extratropical forecast skill implies that when the tropics is well predicted, subsequent extratropical skill is gained due to a better handling of connections between the two. This relationship between tropical and extratropical predictive skill is evaluated using a conditional skill analysis applied to subseasonal reforecasts from the National Centers for Environmental Prediction Coupled Forecast System (NCEP CFSv2) and the European Centre for Medium-Range Weather Forecasts Integrated Forecast System (ECMWF IFS). These two prediction systems are chosen to contrast the link between tropical and extratropical skill in a model that is known to perform relatively well in the tropics (IFS) to a model with lower tropical skill (CFSv2). It is shown that in both systems there is enhanced or attenuated skill in Northern Hemisphere Week 2-4 forecasts when tropical short range precipitation forecasts are ``good" or ``poor", respectively (Fig. 1). This conditional skill is further modulated by both El Nino Southern Oscillation (ENSO) and the Madden and Julian Oscillation (MJO), particularly in the IFS. The results presented here indicate that while midlatitude Week 2-4 predictive skill in both systems would benefit from improvements in Week 1 tropical performance, this improvement would be particularly advantageous for the NCEP system.

The paper has been submitted to *Geophysical Research Letters (GRL)* for publication.

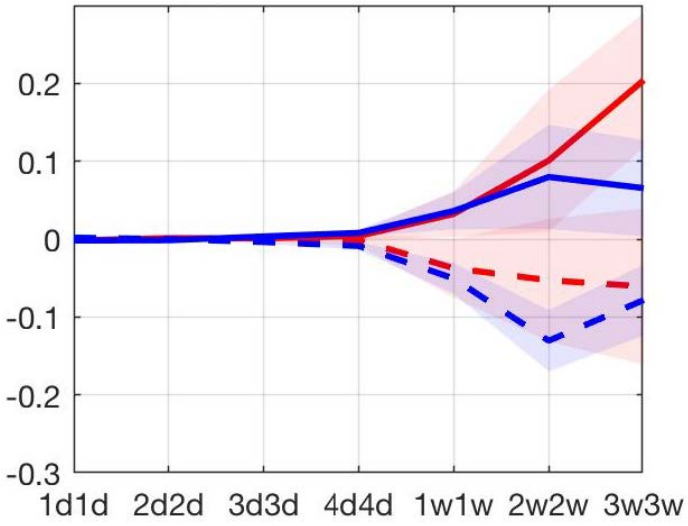

Fig. 1 Solid (dashed) lines show the fractional increase (decrease) in N.H. z500 anomaly pattern correlation (APC) when Day-2 tropical precipitation model forecasts are "good" ("poor") relative to the mean APC. The x-axis correspond to the lead and averaging window used to calculate the APC (Zhu and Wheeler 2014), *e.g.* 1w1w is the APC of the average Week 2 prediction. CFSv2 (ECMWF) fractional APCs are shown in blue (red). CFSv2 (ECMWF) APCs are averaged from October through March from 1999-2010 (1999-2016), using reforecasts from the S2S database.

(Figure 3b from the manuscript submitted to GRL)

Reference

Zhu, H. and M. C. Wheeler, 2014: Seamless precipitation prediction skill in the tropics and extratropics from a global model. *Mon. Wea. Rev.*, **142**, 1556-1569, https://doi.org/10.1175/MWR-D-13-00222.1

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