



EGUsphere, referee comment RC2
<https://doi.org/10.5194/egusphere-2022-183-RC2>, 2022
© Author(s) 2022. This work is distributed under
the Creative Commons Attribution 4.0 License.

Comment on egusphere-2022-183

Anonymous Referee #2

Referee comment on "Exploring the relationship between temperature forecast errors and Earth system variables" by Melissa Ruiz-Vásquez et al., EGU sphere,
<https://doi.org/10.5194/egusphere-2022-183-RC2>, 2022

Review for the manuscript titled "Exploring the relationship between temperature forecast errors and Earth system variables" by Ruiz-Vásquez et al.

General Comments

In this study, the authors have investigated the relative contribution of observation based ecological, hydrological and meteorological variables in explaining weekly temperature forecast errors in the ECMWF Subseasonal to Seasonal (S2S) reforecasts during 2000-2017, using lead times of 1-6 weeks. Temperature forecast errors are found to be most strongly affected by climate related variables such as surface solar radiation and precipitation. However, vegetation greenness and soil moisture are found to be relevant for central Europe, eastern North America and southeastern Asia. Authors claim that the relationships between forecast errors and independent Earth observations reveal new variables on which future forecasting system development could focus by considering related process representations in detail and data assimilation, to improve subseasonal to seasonal forecasts.

The paper is well-written, lucid and enjoyable and could be a valuable contribution to subseasonal to seasonal scale research. I have a few comments which may be noted below.

Specific comments

- Why was annual mean temperature considered in the computation of the metric? It is possible that the forecasts and the observations have different annual cycles in a year

as well as different interannual variability; so that would add additional biases while computing the weekly forecast errors.

- The areas in Figure 3 either have proximity to the ocean or are inland, and the results based on these small areas have been generalized for these six regions. I wonder, how much does the position of the selected areas affect the relative influence of climate, circulation and land surface variables on temperature forecast errors?
- If we compare Figure A4 and the global "hot-spots" of land-atmosphere coupling (Koster et al. 2004), it is surprising that in JJA, surface and deep layer soil moisture do not turn out to be the most relevant Earth system variables for temperature forecast errors over Africa, NA and India. Rather, climate and circulation related variables appear to have a greater impact. I wonder if this is due to some deficiencies in the land surface scheme, land-atmosphere coupling or some other factor?
- The memory of surface soil moisture anomalies is much less (except in arid, forested and snow-covered regions) compared to that of the root zone and is certainly lower than the lead time of 3 weeks considered for temperature forecasts. However surface soil moisture turns out to be the relevant variable for temperature forecast errors than deeper layer soil moisture. What is the reason?
- In the South Asian summer monsoon region the atmosphere depicts significant 'internal' low-frequency variability that could be generated due to various factors such as non-linear scale interactions, the distribution of orography, land and ocean and their interaction with wind flow etc. How much does this factor affect the evolution of temperature forecasts errors over the SA region in JJA?

References

Koster R. D. and Co-authors (2004), Regions of strong coupling between soil moisture and precipitation, *Science*, 305, 1138-1140.