Natural Hazards
and Earth System
Sciences

Discussions

# *Interactive comment on* "Improving sub-seasonal forecast skill of meteorological drought: a weather pattern approach" *by* Doug Richardson et al.

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Review of the study "Improving sub-seasonal forecast skill of meteorological drought: a weather pattern approach" by Richardson et al. This study aims at analysing the predictability of meteorological droughts over UK and the potential interest of using predictors based on weather patterns. The authors conclude about the improvement of the forecasts by using this approach, and depending the seasons and regions, they provide recommendations to forecasters. This study is well documented, the figures and the text are clear and the statistics are robusts. After a careful reading, I recommend to publish this study that bring innovative and interesting results after substantial revisions. I provide here my recommandations:

Major comments: To clarify the different forecasts, I suggest to add a schema of the different forecast systems. The assignment procedure (from the forecasted WP to precipitation) is not clear enough and part of it should be moved from the Sup. Mat. to the main document.

Figures 4, 5 and 6: Since the scores are depending the regions, I would suggest to plot maps (with one value per region) instead of radar-plots. That will also provide more accurate information about the spatial variability of the scores.

It is quite surprising to use the same WPs for all the year long since there is a strong seasonal cycle. What are the results when splitting the year in 2 or 4 seasons? The use of several classification could improve the predictions, for instance in Spring and Summer (L289, Fig. 6b and c, Fig. 7b and c).

Detailed comments: l102: it is not clear if there is a post-processing of the reforecasts. Do you observe any drift with lead time ? Is there a bias between the distribution of assigned WP for short and long lead time ?

l111: same question for the forecasted precipitation. Is there a correction/post-processing applied?

4.1 I think the improvement of forecast with lead time deserves more attention. This result should be better analyzed. The classification of WP is done with reanalysis, correct? The sentences, "the observation and the forecasts tend towards climatology at longer lead time' and 'As the lead-time is increased, the observations become noisier ...' sound weirds to me. There is no 'lead time' for the observations. Please clarify.

L238 How do the authors explain the fact that EPS-WP outperforms Perfect-WP in summer? That could reflect a bias in the forecasted WP compared to the observed ones.

L250 "The difference in skill . . . for northern and western regions..." this will be more visible if the authors use maps instead of radar-plots.

L265 Maybe the sentences are a bit too optimistic. Indeed, for several regions, the differences between EPS-WP and EPS-P do not look significant (ES, NEE, SEE in winter for different lead times). The potential benefit of the use of WP (perfect-WP) could be also discussed since if the WP are not well forecasted and if the processes between WP and precipitation is well represented in the model, that means the main mistake of the model is the same when using forecasted WP and precipitation. That could limit the interest of using such predictors. This should be discussed.

L266 Does "simple statistical WP prediction" mean Markov here? I suggest to keep the same name of the experience.

L279 and Fig 6: Please remind to the readers that mild droughts mean here. Also I am a bit confused about the definition of droughts with lead time d-46. Droughts are calculated with 30-d cumulated periods. Since the authors used the Extended ensemble, how they calculated droughts with 16 and 46-d lead time? Please clarify.

L284 (and elsewhere): Because of the radar-plots it is quite complicated to locate the regions (here Scotland). That requires constantly back and forth to the UK map (Fig. 2).

L292 It is not clear why the authors conclude "... but not for more severe droughts." since these results are not shown nor discussed previously. Does it mean the same results with severe droughts provide negative BSS? These results could be discussed and added in Sup Mat.

L313 "EPS-WP is the most reliable forecast model" The authors should clarified that perfect-WP is the most reliable but not a real forecast.

L325 "... forecasts from EPS-WP are more reliable than from Perfect-WP..." According to several figures, I am not convinced with that conclusions (Fig. 9c, 9g, 10a, 10c, 10g)

Discussion section: In the recommendation section, the authors should redefine their drought definition. Also these conclusions could be different if they change the defini-

C3

tion of WP (by splitting the year in 2 or 4 seasons).