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Hydrology and Earth System Sciences
Discussions

Interactive comment on "A coupled human-natural system to assess the operational value of weather and climate services for irrigated agriculture" *by* Yu Li et al.

Yu Li et al.

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General comments: The paper is interesting and novel and it certainly falls within the scope of HESS. The paper presents a novel approach to evaluate climate predictions through the impacts they have on the user decisions. This is an important aspect in the evaluation of the predictions which is often overlook in the context of climate services. The paper try to reach some substantial and interesting conclusions but the results are somehow weakened by the design of the experiments and the methodology that has been followed. The assumptions made are clearly outlined but the scientific methods (bias-correction) and datasets used (ENSEMBLES) lag a bit behind what I

would consider the current state of the art.

Specific comments: More information on the bias correction methodology should be provided to allow the reproduction of the results by fellow scientists. In particular reading section 3 it is not clear whether the bias correction is applied to the forecast on a lead-time basis or weather instead the author perform the Q-Q bias correction using a CDF obtained looking at the entire forecast period. If, as it seems, it is the latter, the approach is likely to lead to incorrect results as the forecast bias is lead-time dependent (e.g. Doblas-Reyes et al 2013) whilst the CDF would be calculated on a full 7 month forecast. This is unlikely to be a major problem in regions characterise by a limited seasonal cycle and a small model drift as you could assume the relationship linking model output and observations to be roughly the same throughout the year. Unfortunately I don't think such an assumption would hold in the region of study.

We agree that part of Section 3 was probably not completely clear. Specifically, given the strong intra-annual seasonal cycle of our study site, the bias-correction was applied on a monthly basis and not using a CDF calculated on the full 7 month forecast period. We will clarify this point in the revised manuscript.

The paper appears to be based on a set of seasonal prediction ensembles characterised by a relatively small ensemble size. Given that we now know that, at least in the case of the NAO in Europe, the climate model signal strength depends on the number of ensemble members (e.g. Scaife et al. 2014) the results presented here may significantly under represent the real usefulness of seasonal climate prediction for the target users.

We agree with the reviewer comment – which is shared by other reviewers - that a larger ensemble (note that all the products we used are in the form of forecasts' ensemble) might attain a better performance in terms of forecast quality and, possibly, also in terms of operational value. However, the use of large ensembles, potentially multi-model ensembles, opens up a number of challenges - such as how to limit the

smoothing effect on the extreme events, how to combine multiple products with different levels of accuracy, how to simplify the uptake of the resulting large ensemble - which goes beyond the scope of this paper and can be explored in a future analysis. We will clarify this point in the discussion of limitations of the study that we will include in the conclusion section as suggested by R1.

As noted by other reviewers the evaluation was made on an extremely short time period something which can only further reduce the significance of the results. In the light of the points raised above I am not convinced the approach, despite its novelty and user-consideration, is necessarily fair in the analysis of the seasonal predictions and their value for informing decision makers.

The motivation for limiting the analysis to the time period (2001-2005) is manifold: 1) the historical observations available for running the model covers the period (1993-2005), and we used the first period for post-processing the forecast products and the second one for performing the analysis; 2) ECMWF forecast products are obtained from the "Ensemble" project, which provides hindcasts over the period (1960-2005); 3) CSF v2 and CanSIps cover the period (1981-2010), but they are outperformed by ECMWF products. We will clarify this point in the discussion of limitations/assumptions of the study that we will include in the conclusion section as suggested by R1.

Technical comments:

Weather and Climate Services (WCS) is not an acronym I came across before. Given the fundamental difference between the way in which climate and weather model output are typically dealt with I am not sure this is particularly useful. Furthermore World Climate Services. (WCS) is also a trade name of a MeteoGroup product.

By googling WCS we found the acronym with the meaning it was used in the paper. In any case, to avoid confusion, we will change into W&C Services everywhere across the paper.

Stream 2 was an experiment in the context of ENSEMBLE project rather than a project per-se as erroneously stated in section 4.

We thank the reviewer for pointing this out. In the revised version of the manuscript we will clarify that Stream2 was part of ENSEMBLE project.

The statement about usefulness of seasonal prediction in agricultural application that appears in line 9 of the abstract is too general too be correct as there are regions of the world where these kind of predictions are known to be usable and useful.

We agree with the reviewer that this sentence a too vague. In the revised version of the manuscript, we will clarify that this conclusion holds for the case study analyzed in the paper.

Cloke and Pappenberger 2009 doesn't strike as being the most relevant reference to describe the recent development of WCS especially considering is nearly 10 years old now.

Following the reviewer suggestion of citing more recent works, in the revised version of the paper we will add the following references: 1) *Bauer, Peter, Alan Thorpe, and Gilbert Brunet, The quiet revolution of numerical weather prediction, Nature, 2015* and 2) *Brunet, Jones, and Ruti, eds. Seamless Prediction of the Earth System: From Minutes to Months. World Meteorological Organization, 2015*.

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