Geoscientific
Model Development
Discussions

Interactive comment on "S^{4}CAST v2.0: sea surface temperature based statistical seasonal forecast model" *by* R. Suárez-Moreno and B. Rodríguez-Fonseca

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Thank you very much for these interesting comments, suggestions and constructive criticism, surely will help to improve the work. We try to reply raised points in the best possible way. Thus, we firstly introduce each point as done by the referee to be subsequently addressed.

Framework and introduction

We really appreciate the suggestion of addressing "various and general" studies of lag-lead relationships between climate variables at the first, but it is important to mention that one of such variables is always the sea surface temperature (SST), never arbitrary

variables, as reflected in the introduction. In a previous version of the manuscript, the influence of SST on different variables as rainfall, vegetation, crop yields, development and propagation of diseases or even SST itself was addressed to be finally settled in the conclusions (page 3991, lines 8 to 25) leaving only references to climatic variables (rainfall, SST) in the introduction. Anyway, following the recommendations of the referee, we agree that it might be more appropriate to move it again to the introduction.

Regarding the studies about lead-lag relationship, S4CAST ONLY consider SST field as predictor field, either simultaneously or preceding the variable to predict. For this reason, we don't consider appropriate to add an overview of specnific lag-lead relationships between random variables. Of course we would if eventually required i a revised version.

About Sahelian rainfall references, they are not explicit in the introduction, but it is true that excessive mention of West African Monsoon (WAM) is appreciated and it might be convenient to move it to the section about the application of the model (case study). We also agree that some statements can be modified and/or extended to make them clearer (e.g. "Nevertheless, there are works discussing ..., and on the limitations in their applications") in addition to reviewing some grammatical errors (e.g. "the capacity of storage heat and release it . . .") for a better understanding.

The version number of the model is a sentimental issue. As mentioned in the work, the idea to develop and create the model arises from a project from the VIII UCM Call for Cooperation and Development projects (VR: 101/11) between the Universtity Complutense of Madrid (UCM) and the University Cheikh Anta Diop (UCAD) of Dakar. The project was named "Creation and Donation of a statistical seasonal forecast model for West African rainfall". What we call first version, is the model restricted to study the predictability of West African rainfall from tropical Atlantic SST under some limited input parameters. First version was donated and then presented in some meetings as oral or poster presentations. The reason for developing what we refer as version 2.0 is the motivation arising from colleagues in different institutions to expand the model.

Thus, the model is being currently used as part of some studies of predictability as: influence of El Niño Southern Oscillation (ENSO) on European rainfall, influence of tropical Atlantic SSTA on precipitation in Angola, predictability of rainfall in different regions of South America from tropical Atlantic and Pacific SSTA, influence of tropical Atlantic and Pacific SSTA on malaria-related parameters in a specific region within the Sahel, influence of SSTA on crop yields in the Iberian Peninsula, influence of ENSO on the Senegalese near coastal upwelling. Anyway, regarding the title of the paper and version number, we have no problems in changing the version number or even not to include a number, simply S4CAST. Other suggestion, following referee advice, consists of including a brief explanation and history of the first version.

Referee also suggests a couple of applications to show the applicability of the new model. In this way we have complied with Geoscientific Model Development (GMD) recommendations for writing a model description paper, according to which an application of the model should be included as a case study. In this way, we consider appropriate to introduce Sahelian rainfall predictability taking into account that, on the one hand, it was the motivating factor to create the model and, on the other hand, and as it is stated in the manuscript, one of the main applications of the model is related to Sahelian rainfall, and previous studies have confirmed the nonstationary influence of SST on Sahel, so this region is a good benchmark for testing the model. Note that, previously mentioned applications of the model, are currently being done by several researchers after making preliminary studies for a long period to meet the physical mechanisms and establish hypotheses. In this way and as mentioned in the manuscript, we strongly encourage not to use the model in an arbitrary way.

Model description

Of course, the framework of model description can be revised in order to be modified.

Model validation and applications

A. (page 12, line 21) equivalent to (page 3986, line 5)

C1409

The model validation is intrinsic to the model methodology as model contains a cross-validated hindcast and, for each application, the predictability is checked for the different predictand variables, SST selected region as predictor and monthly lags selected for predictand. Anyway, thank you for the comment, it is a missunderstanding due to a wrong explanation. Thus, we suggest to change the sentence by: "In this section the model has been applied through. . ."

We have presented just ONE application but we have appplied the model to different fields and, if required by the journal, we can add as many applications as needed.

B. (page 14 and page 19) equivalent to (page 3988 and page 3994)

According to referee comments about doing a thorough scientific discussion of the results showing an improvement in predictability, we had some doubts and finally not delve into the analysis. It was just a decision not to overextend the text, but of course a deeper discussion on a revised manuscript can be done. Indeed, we are very focused in Sahelian rainfall predictability and we don't have any problems in further discuss the results.

An analysis of the methodologies used in Climate Predictability Tool (CPT) and S4CAST can be performed in order to compare the predictability provided by both models. Basically, CPT does not include stationarity in the analysis and this is one of the main novelties of the model.

C. (page 15, lines 1 − 3) equivalent to (page 3988 , lines 27 − 29)

(i) Observing all the comments and referenced page numbers and lines by the referee, we note that referee has focused in the first manuscript version, not the edited one (http://www.geosci-model-dev-discuss.net/8/3971/2015/gmdd-8-3971-2015.html) in which mentioned typographical errors are corrected.

(ii) Thank you very much for this comment, a clarification is needed to facilitate understanding of the figure.

C1410

(iii) We appreciate this indication and will reproduce the figures with a higher resolution to improve the quality.

Please also note the supplement to this comment:
http://www.geosci-model-dev-discuss.net/8/C1407/2015/gmdd-8-C1407-2015-supplement.pdf

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