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Interactive Comment

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 all detailed comments. We really appreciate the recommendations, corrections and criticism in order to improve the work and develop a revised manuscript for better describing the S4CAST model. The points addressed by Anonymous Referee#3 are replied as best as possible in the following paragraphs:

1. (page 3980, line 15)

With "particular institution" we refer to different institutions responsible of various datasets (i,e., NOAA, NCEP, NCAR, ECMRWF, etc.). Thus, is probably better to change the sentence by "different centers of climate and environmental research".

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2. (page 3981, line 10)

Correct, it should be and will be “if the forecast period”, thanks for this correction. Regarding explanations about lead-time, and following this advice and other from previous Referees, we also consider that this section should be modified and clarified. Thus, in a revised manuscript we will remove the reference to Sahelian rainfall as example and will consider an arbitrary one in addition to better explain lead-time, lag-time, forecast time and forecast period concepts. In this way, lead-time refers to time (in months) between the last month for predictor season and the first month for predictand season (forecast period), being equal to zero (medium-range forecast) when the predictor immediately precedes the predictand or positive (long-range forecast) when there is one or more months between both fields. Strictly, we can’t speak about lead-time when the predictor partially or totally overlaps (synchronous) the predictand field. In this last case we refer to lag-time (in months) between the last month comprising the forecast period (predictand season) and the last month for predictor season. Following previous explanation, there is a relationship between lead-time and lag-time which depends on the number of months comprising the forecast period. Finally, forecast-time is commonly used in seasonal forecasting to describe the time gap between predictor and predictand fields, so that forecast-time and lead-time represent the same concept.

Synchronous and partially overlapping seasons between predictor and predictand fields are not useful when referring to predictability, although this option is available in order to perform simulations focused on the study of physical mechanisms (teleconnections) between climate-related variables which keep a link with sea surface temperature. It is worth noting that the model may be focused in the study of the predictability but it can be also used to detect teleconnections between SST (predictor) and a predictand field.

Referee also suggests that AMJ is considered as zero-lag regarding the forecast period (JAS), but we don’t mention lags. We refer to lead-time equal to zero (forecast-time equal to zero) which would be a three months lag.

GMDD

8, C1633–C1638, 2015

Observing previous considerations and taking into account common coments with other referees, some modifications and clarifications will be included in a revised manuscript.

3. (page 3981, line 25)

In fact, applying or not a frequency filter, either high pass or low pass filter, depends on user requeriments and should be based on previous studies of the predictor-predictand relationships so that a random selection of input parameters can lead to a meaningless simulation. Thus, as mentioned by the referee, selection of low pass filter is not suitable for seasonal forecast and subsequently is not useful in the current version. Anyway, we keep the possibility of selecting a low pass filter in order to include decadal predictability in a future version of the model.

In its current configuration, the application of the model in forecast mode (not hindcast) mainly depends on selected data set for predictor and predictand variables. In this way, forecast will be performed if predictor and predictand data are available until the season before the present and predictor is available for future prediction. This is better explained by an example: considering from September to November (SON) as forecast period concerning the predictand and selecting a lead-time of two months regarding the predictor (from April to June, AMJ), the prediction for SON 2015 will be performed if predictand field is available at least until November 2014 and predictor is available at least until June 2015. Thus, the model construct the regression coeficient by using the common period until November 2014. Regression coefficients along with predictor data (AMJ 2015) will provide the forecast for SON 2015. To do this, the model firstly checks predictor and predictand availability and shows by screen if future forecast is enabled. Once this is accomplished, the model performs three types of prediction depending on the stationarity: for the entire period (EP) forecast is as explained before, for significant correlation period (SC) and no-significant correlation period (NSC) forecast is performed by computing the regression coefficient respectively for each period. In all three cases the predictor for the current year is necessary, being AMJ 2015 in the

GMDD

8, C1633–C1638, 2015

example above.

When a filter is selected, it is applied to the raw data for the initial data preprocessing. Thus, the results must be interpreted for the frequencies kept and the forecast and hindcasts are done just for those frequencies.

4. (page 3982, line 10)

As mentioned in the first paragraph of point 2, AMJ (April-May-June) is defined as the predictor with a lead-time of zero months r when the predictand is taken for JAS (July-August-September). Remember that lead-time, also named as forecast-time, is the time in months between the last month comprising the predictor season and the first month for the predictand season (forecast period). If we want to define this example with lag-time, it would be 3 months, the time between the last months of both predictor and predictand seasons. Repeat again that the relationship between lag-time and lead-time depends on the number of months comprising the forecast-period.

5. (page 3983, line 15)

Indeed, it is true that only delayed correlation coefficients are the most suitable in a forecast context. Nevertheless, centered and advanced correlation coefficients are also available for application no matter the aim of the user. As pointed by Referee, moving correlations are used for defining SC/NSC periods. For any of the three types of mobile windows hindcast could be done, while delayed moving correlations windows are preferable when referring to future prediction.

6. (page 3984, line 10)

Yes, the method is named as “leave-one-out” crossvalidation. This will be corrected in the revised manuscript.

7. (page 3987, line 5)

Once the filter is applied, the results should be interpreted accordingly. Thus, if a high

GMDD

8, C1633–C1638, 2015

pass filter is applied to predictor or predictand, we are talking about high frequency predictability of anomalous predictand or predictor fields.

8. (page 3987, line 10)

We construct a statistical model using all three seasons as predictors. Doing this, we can check the influence of the predictor (multiple time selections) on the predictability if no overlapping is selected or in the teleconnection if there is an overlap. Synchronous selection between predictor and predictand field is focused on the study of teleconnections. Comparing synchronous and asynchronous selection is done by using different time domains for predictor (different simulations). In fact, synchronous refers to the selection of predictor and predictand in the same period (forecast period), while overlaps between predictor periods (seasons) are focused on the contribution of all information given by the predictor.

9. (figure 3 caption)

More descriptive terms beyond SL0 and SL1 will be provided in the revised manuscript.

10. (page 3989, top)

Correct, MCA is repeated for the NSC period for which the leading mode (regression map) exhibits no significant relationship between the leading mode of the predictor and preditand fields (less than 90% under a Montecarlo test) in the rainfall box and therefore worsens predictability. This implies that, for the NSC period the relationship between the predictor and the predictand field is led by another pattern and affecting other regions, reinforcing the theory of a time dependence (non-stationary) of the relationship between the two variables.

11. (page 3990, line 15)

Negative skill in figure 8 is related with a poor or null predictability. Take into account that the prediction for each period is done by using the leading mode which shows no significant signal in the rainfall box for the NSC period. There is always useful informa-

GMDD

8, C1633–C1638, 2015

tion in the NSC period that should be interpreted as a change, sometimes improving and other worsening predictability.

12. (page 3990, line 20)

Yes, should be fig 9, will be corrected.

13. (page 3992, bottom)

We refer to a general pooling of the results from different types of models, but following referee advice we can change this paragraph to not generalize so much.

13. (page 3993, line 15)

Correct, should be “hierarchical Bayesian methods being one”.

All pointed corrections, comments and advices, will be taken into account when preparing a revised version of the manuscript.

Please also note the supplement to this comment:
http://www.geosci-model-dev-discuss.net/8/C1633/2015/gmdd-8-C1633-2015-supplement.pdf

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Interactive comment on Geosci. Model Dev. Discuss., 8, 3971, 2015.