Nonlinear Processes in Geophysics Discussions

Nonlin. Processes Geophys. Discuss., referee comment RC2
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Comment on npg-2022-4

Anonymous Referee #2

Referee comment on "Predicting sea surface temperatures with coupled reservoir computers" by Benjamin Walleshauser and Erik Bollt, Nonlin. Processes Geophys. Discuss., https://doi.org/10.5194/npg-2022-4-RC2, 2022

A domain-decomposed set of coupled reservoirs
that share the same set of hyperparameters are trained over multiple years of reanalysis daily sea surface temperature (SST) data and used to predict SST at lead times of between one day and six weeks.

The application of RC to the specific problem the authors consider, the analysis of the results and the write-up, all seem to be of a somewhat preliminary nature. As such it is not clear what a potential reader is expected to take away from this article. This issue needs to be addressed in a substantive fashion to be further considered for publication. A few other issues are noted below.

The authors state: To observe the effect of
the randomly selected input and middle weights on the performance of the RCs, the model was ran 15 times all with the same metaparameters as described in Table 1, to collect data for the examination of the error.
Please state how the ensemble of predictions that use random variations of input and middle weights was analyzed. Meaning, what error is being shown is say figures 4-13

In the context of Figs. 6 and 7, while the authors chose to spinup/warmup the reservoirs over a period of a week, the results suggest that a longer spinup of the reservoirs (of about 4 weeks) is called for. Please comment on the a priori choice of one week and the longer timescale that is required as indicated by the results. How does the longer timescale vary with changes in the hyperparameters? What is the relevance of the leakage parameter in the context of a leaky reservoir update in this context? (and which the authors do not consider)

Please comment on possible reasons for 4-5 day timescale seen in Figure 8, particularly since the data itself, e.g., as seen in fig. 4, seems to display variations on a broader range of timescales.

Given the results presented, it may seem somewhat of an over-statement when the authors state that "The results are demonstrated to replicate the actual dynamics of the system over a forecasting period of several weeks."