

# ***Interactive comment on “Impact of Optimal Observational Time Window on Parameter Optimization and Climate Prediction: Simulation with a Simple Climate Model” by A. A. Yuxin Zhao***

**Anonymous Referee #2**

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Dear Editor, I have read the manuscript "Impact of Optimal Observational Time Window on Parameter Optimization and Climate Prediction: Simulation with a Simple Climate Model" by Zhao et al.

This paper deals with the optimal choice of the time window in order to better estimate the parameters of a toy climate model. The model is a low-dimensional system characterized by different time scales.

Reading the manuscript it appears that the ratio between the largest and the smallest time scales is  $O(100)$ .

The authors test a data assimilation procedure based on the Ensemble Kalman filter

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in order to estimate the model parameters through noisy observations. The technique of formally transform the model parameters as state (constant in time) variable is well-known and it is surely the best approach to the problem analyzed by the authors.

The original part of the work regards to the optimal choice of the time window used to collect different observations for the assimilation step. I must confess that I found the original part of the paper deeply unclear. Very often the English is incorrect (e.g. complex used as a verb) and prevent from understanding the procedure adopted by the authors.

Here is a list of the main issues:

- a) it is not clear if the different observations collected during the OTW are assimilated as they were all contemporary. This is in my opinion incorrect. There are several tricks to assimilate together non-contemporary observations but it is not clear to me if the authors apply one of them.
- b) The authors present several setup using different acronyms. The text is very hard to follow and probably the authors should focus on lower number of cases. Moreover some statements are really difficult to follow. For example in Sec. 3.2 Pag. 9 the line from 1 to 13 the authors speak about four OTW but the details are completely unclear to me.
- c) The results shown in the figures suggest the existence of a best value for OTW but also in this case the results are presented in a confused way.

After the authors strongly modify the manuscript increasing the English quality and the clarity of their findings and procedure the paper may be considered again for publication.

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