Nonlinear Processes in Geophysics

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Discussions

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Interactive comment on "Joint state-parameter estimation of a nonlinear stochastic energy balance model from sparse noisy data" *by* F. Lu et al.

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GENERAL RESPONSE:

I want firstly thank the editor for selecting me to review this work, and for providing a short extension to the review period – my apologies for being slightly late with completing this review.

I found that this is of very high quality analysis and exposition, and it was quite a pleasure to read. In this regard, I don't have many suggestions for improvement of the text, only a few minor points that I think can be elaborated on. I think the work should

therefore be accepted for publication after the authors address the following points.

MINOR POINTS FOR REVISION:

1) Page 7, line 20: among the references mentioned for local particle filters, I think it is worth mentioning the recent review article (https://www.nonlin-processes-geophys.net/25/765/2018/), which has an up-to-date survey of different localization techniques, and a classification and comparison of methods therein.

2) Page 14, figure 5 caption: I believe there is a typo, where "notes" should be "nodes".

3) Page 20, lines 19 - 25: I think this discussion is very interesting and useful to the reader. I would like this to be expanded to elaborate on the consequences for the analysis of paleo-climate in terms of the contributions of different processes to past states, and how this may affect the inferences we may wish to make based on such models. Likewise, I would like this to elaborate further on the more realistic case of nonlinear observation operators relating proxy measurements to the actual climate system, and how the reconstruction of the climate and parameters will be affected by these additional complications. I think the work will benefit from a longer conclusion and discussion of the implications of the results for more realistic modeling settings.

4) Page 31, algorithm 2, line 5: I believe there is a typo in the statement $U_n^M = U_n(t)$, should the "t" be replaced by an "l"?