Interactive comment on "Review article: Comparison of local particle filters and new implementations" *by* Alban Farchi and Marc Bocquet

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We thank Reviewer 1 for insighful comments and suggestions.

1 Specific comments

1.1 Comment 1

Do I understand correctly that your observations in the L96 setup are of every variable at every time step?

Yes, with the L96 model every variable is observed at every time step.

So your discussion on pre-regularisation in some way is a discussion on whether to use model error or not? Perhaps this could be made more explicit in the main text.

Yes, pre-regularisation is in some way similar to the use of model error. This is already explicit in the text ("using a stochastic extension of the model").

If observations are of every variable at every time step then it will strongly constrain the posterior pdfs to be Gaussian and may well be influencing the results seen. This is alluded to in the main text but I think it would add insight to explicitly state this in the discussion in section 5.1 and that it is also addressed through the use of the barotropic vorticity model (which I understand uses a more sparse observational system in space and time).

Yes, the posterior pdfs are close to Gaussian pdfs, this is already stated in the last paragraph of Sect. 5.1. In Sects. 6.2 and 9.3, we have followed your suggestion and added a remark.

1.2 Comment 2

The paper outlines quite a few different extensions to existing localisation methods. This is stated in the abstract and introduction and when I read the different algorithm descriptions in detail I could find the paragraph were the differences were noted. However, in general I wasn't really left with a strong feeling of where you had introduced new elements and what benefit they had brought i.e. Section 4.4.4 is entirely new work that has the best result for L96 for the state domain localisation but this is only remarked on in the final paragraph of the algorithm description section. If it was possible to include a small summary that highlights the new work and the improvement it brings, either within an already existing concluding section or as something separate, then I think it is a chance to bring your work to the fore. It would also explicitly demonstrate how setting individual schemes in to a general context can bring benefits. This could be split between the state domain localisation and sequential-observation localisation if that was the more natural division.

The outline of the paper has been slightly modified. We have included, at the end of each theoretical section, a sub-section called "Summary for the LPF* algorithms". This sub-section includes highlights where we clarified what already existed, what is new and what was improved. It includes as well as some discussion about the numerical complexity and the asymptotic limit of the algorithms (which was demanded by the other Reviewer and the associate Editor). Thank you for the suggestion, this is a great addition.

2 Technical corrections

2.1 L97

A capital N has slipped in to representatioN
Done.

2.2 L386

It should be 'in order to preserve part of the spatial structure held in the prior particles'
Done.

2.3 L404

So E^r has discontinuities?

Yes, $\mathbf{E}^r$ has discontinuities, which is why we had to improve the resampling step. Remember that $\mathbf{E}^r$ is the matrix implicitely defined by step 5 of Alg. 1.

2.4 L543

The sentence doesn't really make grammatical sense.

The sentence has been corrected.

2.5 L625

I assume this is 's' but it would be good to explicitly state it.

Done. Thank you for the suggestion.

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