Review to *Simplified Kalman smoother and ensemble Kalman smoother for improving reanalyses*

1 General comments

The manuscript presented a simplified (ensemble) Kalman smoother as a post-processing for improving reanalysis. It derived smoother equations (including uncertainty estimation) under a simple decay assumption and demonstrated the proposed method in a Lorentz system (1963). RMSEs were significantly reduced, which is very promising. I find the manuscript is well written and reader-friendly. I have some specific comments and suggest the authors revise the manuscript.

2 Specific comments

L34 Ensemble Kalman filters $->$ The EnKF

L170 In reality, model has bias and is not prefect. I am wondering when the authors consider model bias, will they converge to the same conclusion?

L259–270 I understand in the KS case you should introduce the simple approximation (i.e. Eq 12 or 13). But in the EnKS case, all needed information (ensemble mean, covariance, time cross covariances...) can be derived from the ensemble $\mathbf{X}^a$ that have been restored any way during the simulation. I do not understand why the simplification is necessary. Do the authors store only the ensemble mean and covariance (uncertainties) rather than all individual ensemble members? That is not common.

L286 "The increments are smaller than those from the ExtKF/KS (Fig. 2)"

L287 "the ensemble runs"