

Geosci. Model Dev. Discuss., referee comment RC1  
<https://doi.org/10.5194/gmd-2021-89-RC1>, 2021  
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## Comment on gmd-2021-89

Anonymous Referee #1

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Referee comment on "SymPKF (v1.0): a symbolic and computational toolbox for the design of parametric Kalman filter dynamics" by Olivier Pannekoucke and Philippe Arbogast, Geosci. Model Dev. Discuss., <https://doi.org/10.5194/gmd-2021-89-RC1>, 2021

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The authors' approach of a symbolic toolbox for evolution of parametrized covariances is certainly novel, as indeed are many symbolic packages now-a-days.

### Major Comments

Section 2.3 seems light on description of a fundamental part of the paper. The section above seems to allude to there being a significant savings in terms of memory for a parametrized covariance approach, though this is not explicitly shown in this section, nor is there any discussion about possible parametrizations, other possible benefits, and the disadvantages of such an approach (errors, potential non-physical covariances, etc.). A comparison to other covariance approximation methods in filtering (low-rank methods, the ensemble Kalman filter, etc) would also be worth-while.

Figure 1 seems to be cut off on the right (the bounding box is not fully shown like in some of the other code figures).

Figure 2, unlike figure 1, does not have comments in the code, which is a slight inconsistency. Same in figure 4.

In figure 7, one of the time integration schemes listed seems to be forward Euler. While it seems trivial to implement, for many possible equations, an implicit method could be preferred. As the authors are already dealing with symbolic schemes, a comment about possible symbolic derivations of higher order derivatives needed for such a method would be appreciated in the text.

In general the figures seem to be slightly inconsistent in terms of the fonts used and the sizes of the text. I would appreciate the authors double checking all the figures for such things.

I greatly appreciate the discussion about the limitations not just of the package, but symbolic computation in general in the conclusion.