Comment on gmd-2021-89
Anonymous Referee #1

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

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.