Nonlin. Processes Geophys. Discuss.,
https://doi.org/10.5194/npg-2017-79-RC2, 2018

Nonlinear Processes in Geophysics
Discussions

Interactive comment on "Comparison of stochastic parameterizations in the framework of a coupled ocean-atmosphere model" *by* Jonathan Demaeyer and Stéphane Vannitsem

Anonymous Referee #2

Received and published: 19 April 2018

Review of "Comparison of stochastic parameterizations in the framework of a coupled ocean-atmosphere model" by Demaeyer and Vannitsem

Recommendation: Minor revisions

1) The correlation plots (Figs. 4, 6 and 9) do not seem to be autocorrelations but autocovariances since the value at lag 0 is not 1. I think it would be easier to compare if the authors plot the autocorrelation function.

2) The are a few recent review papers on stochastic modeling. Including them in the introduction would make it more informative: Berner, Judith, et al. "Stochastic parameterization: Toward a new view of weather and climate models." Bulletin of the American

Meteorological Society 98.3 (2017): 565-588.

Franzke, Christian LE, et al. "Stochastic climate theory and modeling." Wiley Interdisciplinary Reviews: Climate Change 6.1 (2015): 63-78.

3) In the introduction the authors seem to distinguish between stochastic parameterizations and backscatter schemes. Backscatter schemes can also be stochastic so can be similar. I also think stochastic parameterizations are implicitly also based on the idea to "backscatter" energy from the unresolved scales into the resolved.

4) Page 2, footnote 2: I do not understand the meaning here.

5) MAOOAM should be defined at first use.

6) Are "weak coupling" and "time scale separation" equivalent in a mathematical sense? How would one measure weak coupling in the real atmos-ocean system? For me weak coupling is rather opaque concept whereas time-scale separation is more tangible (at least I know how to estimate this from real data). Some comments on this would be appreciated.

7) In the "seamless MTV" procedure of Franzke et al. (2005) we generalized MTV and do not need to assume an Ornstein-Uhlenbeck process any longer but just one stochastic process with Gaussian statistics.

8) In Eqs. 36-39 are the coupling and time-scale separation parameters included. Which values have been used for the experiments?

9) In my work I use a split integration scheme: Runge-Kutta 4th order for the deterministic part and Euler-Maruyama for the stochastic part. Such a split scheme might solve parts of your numerical problems.

10) In MTV the cubic terms are nonlinear damping. This has been shown in Majda, Andrew J., Christian Franzke, and Daan Crommelin. "Normal forms for reduced stochastic climate models." Proceedings of the National Academy of Sciences 106.10

(2009): 3649-3653.

Peavoy, Daniel, Christian LE Franzke, and Gareth O. Roberts. "Systematic physics constrained parameter estimation of stochastic differential equations." Computational Statistics & Data Analysis 83 (2015): 182-199.

Perhaps one can also ensure that the cubic term in WL is negative definite then the system should be stable.

11) The manuscript would benefit from a careful proofreading.

Interactive comment on Nonlin. Processes Geophys. Discuss., https://doi.org/10.5194/npg-2017-79, 2018.