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Nonlinear Processes in Geophysics
Discussions
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Interactive comment on "Nonlinear feedback in a six-dimensional Lorenz Model: impact of an additional heating term" *by* B.-W. Shen

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Thanks for your valuable comments and encouragement.

Our ultimate goal is to determine under which conditions increasing resolutions can improve the predictions in weather/climate models. Based on our recent studies with the 5DLM (e.g, Shen 2014), our hypothesis is that system's stability in the LMs, with a finite number of modes, can be improved with additional modes that provide negative nonlinear feedback associated with additional dissipative terms. However, since new modes can also introduce additional heating term(s), the competing role of the heating term(s) with nonlinear terms and/or with dissipative terms deserves to be examined so that the conditions under which solutions become more stable or chaotic can be better understood. This is the focus of this study. To verify the above hypothesis of

whether the nonlinear feedback loop can be extended to provide nonlinear negative feedback to stabilize the solutions, we have started deriving higher-order LMs with three additional modes which are selected based on the analysis of the Jacobian term, $J(\Psi,\theta)$. A paper is being prepared for publication (Yoo and Shen, 2015; See Table 1 in the attached pdf file). Currently, we have been working to implement the trajectory separation method to a weather/climate model to perform the stability analysis. The tool and the weather/climate model will be used to examine the impact of small-scale processes on the solution's stability in a future study.

References:

Yoo, E. and B.-W. Shen, 2015: On the extension of the nonlinear feedback loop in 7D, 8D and 9D Lorenz models. (in preparation)

Please also note the supplement to this comment:
http://www.nonlin-processes-geophys-discuss.net/2/C469/2015/npgd-2-C469-2015-supplement.pdf

Interactive comment on Nonlin. Processes Geophys. Discuss., 2, 475, 2015.