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Interactive comment on "Hierarchical scale dependence associated with the extension of the nonlinear feedback loop in a seven-dimensional Lorenz model" *by* Bo-Wen Shen

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This is a very interesting and well written paper in which the author extends his previous work on the generalized (5D and 6D) Lorenz models to a 7D model. As compared to the original 3D Lorenz model, 4 extra high wavenumber modes are added at three different major scales: the largest (primary), middle (secondary) and smallest (tertiary). The author performs extensive studies of the effects caused by these additional modes on the 7D system, with a special emphasis on negative nonlinear feedback and the smallest scale modes, and their role in stabilizing the solutions. As a result of this stabilization, the onset of chaos occurs at much higher values of the Rayleigh parameter than for the 3D and 5D systems. This increase of stability of solutions with the

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number of added modes is a known effect, nevertheless, the paper gives a new significant insight into the role played by different added modes in stabilizing the solutions. Moreover, a hierarchical scale dependence that appears in the solutions is investigated in details by computing the Pearson correlation coefficients between the primary and secondary, and between the secondary and tertiary modes.

As possible author's future work, I'd like to suggest to explain specifically the fact that the Rayleigh parameter for the onset of chaos in the 7D system increases by a factor of 3 (approximately) as compared to the 5D system, and by a factor of 5 (approximately) when compared to the original 3D Lorenz system. Moreover, I'd like to see discussion of changes of routes to chaos in these higher dimensional Lorenz systems as compared to the original Lorenz system, and what is the physics behind such changes.

In summary, I find this paper an important contribution to studies of the generalized Lorenz systems and to our understanding of the origin of chaos in these systems, and possible ways to control it. I do hope that the paper is published in NPGD very soon!

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