Thanks for your comments very much.

To facilitate discussions, the following quick responses are provided. More detailed discussions will be given in the final responses after the discussion period ends.

The Lorenz model (1963) has been studied extensively and been used to illustrate the sensitive dependence of solutions on initial conditions (i.e., the butterfly effect of the first kind.). Three types of physical processes in the Lorenz model are: heating, dissipation and nonlinear interactions.

Note that the nonlinearity is from the horizontal advection of temperature term, which appears in all of climate and weather models (e.g., Shen et al., 2006, 2012, 2013). Therefore, improving the understanding of the nonlinear term and the associated (thermodynamic) feedback may help improve the representation of the thermodynamic feedback in numerical models, which remains big uncertainties in climate model simulations.

In this study, we focus on the role of nonlinear processes and heating term (i.e., without the inclusion of dissipation). We present several closed-form solutions to the simplified Lorenz model. In addition to the closed-form solution using trigonometric functions, we also present a closed-form solution using elliptic functions in Appendix B. To our best knowledge, the solutions (to X"+X**3/2=0) have not been documented before. The solutions can improve our understanding of the nonlinear processes and thus help examine the competing impact between the heating and nonlinearity.

Physically, we are able to relate the nonlinear term (X**3) to the nonlinear feedback loop and show that the nonlinear feedback loop acts as a restoring force when a heating term (as well as dissipative term) is not included.

We then discuss how the collective impact of the nonlinear feedback loop and the heating may produce three types of solutions, including nonlinear periodic solutions with a small or big cycle and the homoclinic orbit solution, which are discussed in the manuscript. Note that further extensions of the nonlinear feedback loop and their collective impact with dissipations have been discussed in recent studies (Shen, 2014, 2015, 2016).

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