Comment on npg-2021-24

Anonymous Referee #2

Referee comment on "Control simulation experiment with Lorenz's butterfly attractor" by Takemasa Miyoshi and Qiwen Sun, Nonlin. Processes Geophys. Discuss., https://doi.org/10.5194/npg-2021-24-RC2, 2021

General comments

The manuscript "Control Simulation Experiment with the Lorenz's Butterfly Attractor" by T. Miyoshi and Q. Sun proposes very interesting experiments that possibly give some hints to control chaotic dynamical systems of nature in the future, although this reviewer is not sure of any circumstance, when everyone can agree with one direction of weather/climate control in the real world with complex interests. Despite, scientific approach on this topic is fascinating indeed. Starting with OSSE, authors tried to find perturbations that suppress regime shift of the nature run and saw how well the nature run can be controlled by adding perturbations with different parameters.

The manuscript describes methodology and result too concisely, in general. There are many parts that need more explanations and clarifications. First, show how and where the norm D is applied explicitly. Second, do the successful control cases of Figure 3 include the cases of Figure 2 (a) and (b) (the cases where nature run did not change the regime due to adding perturbations and the other cases of so-called false alarm)? If yes, it is confusing because the results of Figure 4 do not look consistent with those of Figure 3. Small ratio of successful control experiments should have dark green dots, but it does not look like that. Figure 4 does not deliver the findings effectively. If there is any misunderstanding of this reviewer, please fix it and clarify your description. Please give more descriptive analysis of results for readers to understand well. Third, Figure 4 shows incredibly small ratio of NR changed cases (magenta). Does it mean that adding perturbation is very unlikely to control the NR indeed, doesn't it? Then, the authors attempted those interesting experiments but it was not easy to find perturbations to control the nature. Is this what we can conclude? Besides, please rephrase the definition of the ratio in Figure 4, which is not easy to intuitively understand. Maybe inconsistency between Figure 3 and 4 came from lack of explanation. Please discuss more about what you have obtained from those experiments. This reviewer is not sure whether this figure

can deliver the result well. Please consider a table with numbers or other type of graph.

This reviewer understands that the manuscript provides an interesting and novel idea of CSE helping one study how to control the chaos. Still, experimental results are not analyzed enough and hence the methodology shown here does not look very effective. This is this reviewer's opinion.

Hope this reviewer's comments help this manuscript improved well enough for the publication.