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Nonlinear Processes in Geophysics
Discussions
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Interactive comment on "Detecting Changes in Forced Climate Attractors with Wasserstein Distance" *by* Yoann Robin et al.

Anonymous Referee #1

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The authors propose the use of the Wasserstein distance in order to discriminate different dynamical systems from their attractors, notably for the case of climate systems. I found the paper really interesting. Moreover, the adoption of such new metric is well motivated and seems really promising for future climatic applications. Thus, I recommend the publication of the manuscript. I have only a general comment and a few specific ones (see below) that could be useful to improve the manuscript.

GENERAL COMMENT:

Did the authors studied the robustness of the Wasserstein distance to variations of the size of the boxes B_{a}? I think this is an important point, in particular once that their method will be applied to realistic systems. Even though an explicit numerical study is not requested, a discussion of this aspect would be really appreciated.

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SPECIFIC COMMENTS:

(2 Distance between measures - line 14) : It could be not easy for any reader how you go from attractors to mass distributions. It would be great to have a short introduction to the definition and use of invariant measures in phase space.

(2 Distance between measures - line 22) : Why the authors did not defined (and discuss the differences respect) the Mahalanobis distance?

(2 Distance between measures - line 11 - second paragraph) : It would be interesting to know why the authors choose network simplex algorithms to compute the distance. Could be explained why they are better than other classical choices like, for instance, simulated annealing algorithms?

(Algorithm 2) : Maybe the authors could give a name to the variable: “total number of boxes B_{a}” like, for example, K.

(3.2 Protocol line – line 16,17) : This sentence is not really clear. It could be expanded a bit.

(3.3 Estimation – line 1) : The first sentence is not really clear.

(3.3 Estimation – line 11 to 15) : This point is interesting and could be linked to my general comment: which is the sensitivity of the method respect to N together with the number of boxes B_{a}? Probably such parameters present an interplay in determining the global robustness of the measure.

(3.3 Estimation – line 4 – second paragraph) : Could the authors specify how they computed the p-values for the KS test? Did they use tables of critical values or simulated numerical p-values?

(4.1 Protocol line – line 31) : Could the authors show also here the comparison with the Euclidean distance? Why they did not show such calculation?

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