Interactive comment on "Challenges and design choices for global weather and climate models based on machine learning" *by* Peter D. Dueben and Peter Bauer

Anonymous Referee #2

The authors show that it will be a challenge to develop neural nets that will beat NWP models. I agree. They also state that it will be difficult to beat long-range (e.g. seasonal) forecasts. However, given the dominance of model error (biases not least) on these longer timescales, here I am much less convinced. What evidence is there that neural nets for ENSO, for example, could not at least equal in skill those based on coupled models?

The authors correctly state that one of the reasons for developing neural nets for parametrisations is to make them much cheaper computationally. Here the neural nets can be trained on the parametrisations themselves. Unfortunately the Lorenz 95 sys-

tem is too simple to really test this idea - it would be trivial to develop a neural net for the Y and Z variables which would be competitive with a simple cubic fit or whatever. It would be good if the authors could speculate on how to test this latter idea in a way which was challenging for the neural nets on the one hand, but without going to full GCMs on the other.

I recommend this paper for publication subject to the authors addressing these two points.

Interactive comment on Geosci. Model Dev. Discuss., https://doi.org/10.5194/gmd-2018-148, 2018.