

Nonlin. Processes Geophys. Discuss., referee comment RC2  
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## **Comment on npg-2021-6**

Anonymous Referee #2

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Referee comment on "Producing realistic climate data with generative adversarial networks" by Camille Besombes et al., Nonlin. Processes Geophys. Discuss.,  
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I apologize for the delay in submitting the report on the manuscript submitted to Nonlinear Processes in Geophysics.

The manuscript developed a weather generator with a convolutional neural network and investigated its performance. The manuscript shows that the generator succeeded in simulating the atmosphere in many regards. The manuscript is exceptionally well written, and the topic would attract many readers of the Nonlinear Processes in Geophysics. I only have a few comments listed below. I recommend that the manuscript is accepted for publication after all the points are properly mentioned.

I feel that the manuscript can attract more readers by providing more information on the background of the study. How about adding more references about weather generators in the introduction?

The authors evaluated the spatial distribution of the variables simulated by the generator and showed that the generator's performance is generally good. This is good to evaluate the generator but lacks thoroughness. The authors should evaluate how well the inter-variable relationships are simulated by the generator. It is also better to investigate the reproducibility of the vertical structure.

L197: is it possible to generate weathers for a specific date? Similarly, is it possible to give the generator SST fields (or any other boundary conditions (e.g. GHGs, orbital parameters, solar, etc.)) as inputs? For the generator to be used for applications you mentioned in the manuscript (e.g. risk assessment, data assimilation), such information

should be included as the inputs.

The most important advantage to use weather generators is, I believe, its low computational cost. Therefore, the authors should show how fast the weather generator is compared to the GCM used as the training data.