

Nonlin. Processes Geophys. Discuss., author comment AC2
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Reply on RC2

Bo Christiansen

Author comment on "The blessing of dimensionality for the analysis of climate data" by Bo Christiansen, Nonlin. Processes Geophys. Discuss.,
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Thanks for the positive and constructive review.

I am in particular pleased that the reviewer likes the connection between climate science and statistical mechanics.

In the revised manuscript I will make changes to address the reviewers minor comments.

More specifically:

1) I will briefly define 'sub-Gaussian' as a distribution which tails decay at least as fast as the tails of a Gaussian distribution.

2) I will consider the use of 'a constant', although I don't really understand the reviewer's concern.

3) There are many areas of machine learning that are influenced by the 'curse/blessing of dimensionality', e.g., distance-based methods may be affected by the almost identical distances between random vectors. But I haven't thought much about the relevance of the curse/blessing for regime detection and multimodality and it is several years since I read the author's paper. However, I will consider to include a few lines about the relevance of the 'curse of dimensionality' for regime detection.

4) I have had the same idea about the 'signal-to-noise paradox' and the 'curse of dimensionality'. In fact 'curse of dimensionality' can be used to derive analytical approximations for correlations between observations and ensemble mean such as those given in Zhang et al. 2021 (10.1007/s00382-020-05621-8) and Siegert et al. 2016 (10.1175/JCLI-D-15-0196.1). These approximations give the mean, but we can also -- with some effort -- derive approximations the spread. I am in the process of writing this up.

5) There is actually a little more details and references regarding the number of degrees of freedom in the paragraph beginning at l151. The widths of the distributions of the angles are related to the degrees of freedom, but there is also an effect of the model dependence as mention in l214 that will disturb a direct calculation of the degrees of freedom.

