

Responses to Reviewers' Comments for Manuscript egusphere-2025-212

Improving dynamical climate predictions with machine learning: insights from a twin experiment framework

Addressed Comments for Publication to
Nonlinear Processes in Geophysics

by

Zikang He, Julien Brajard, Yiguo Wang, Xidong Wang, Zheqi Shen

Authors' Response to Reviewer #2

Comment 1

The authors have made a considerable effort to revise the manuscript, thereby satisfying the concerns I had about the manuscript. I note in particular that they have provided the key informations about the numerical experiments that were missing in the original submission.

Response: We thank the reviewer again for constructive final comments.

Below, we provide our detailed point-by-point responses to the reviewer's further comments. To enhance the legibility of this response letter, all the reviewer's comments are typeset in blue boxes. Rephrased or added sentences in the revised version are indicated in a gray box.

Comment 2

Rigorously speaking the MSE acronym has not been defined.

Response: We have revised the manuscript as follows (L215-L216 in the manuscript):

Assuming sufficiently large sample sizes, the difference between the mean squared error (MSE) can be approximated as normally distributed.

Comment 3

- The equation L 217 (which does not have a number BTW) is only valid if the squared errors of the prediction are independent of the squared errors of persistence and if they have the same mean value, right? I think that these conditions should be mentioned.

Response: We thank the reviewer for this comment. We have revised the manuscript as follows (L215-L217 in the manuscript):

Assuming sufficiently large sample sizes, the difference between the mean squared error (MSE) can be approximated as normally distributed. This approximation is valid under the conditions that the SE from the two methods are independent and have the same mean value:

Comment 4

Typically $N_{\text{prediction}}$ and $N_{\text{persistence}}$ would be the same as N defined L 198? If yes, it is perhaps not needed to introduce these new symbols.

Response: We have removed the redundant notation and use N as follows (L218-L219 in the manuscript):

$$\text{MSE}_{\text{prediction}} - \text{MSE}_{\text{persistence}} \sim \mathcal{N}\left(0, \frac{s_{\text{prediction}}^2}{N} + \frac{s_{\text{persistence}}^2}{N}\right),$$

where $s_{\text{prediction}}^2$ and $s_{\text{persistence}}^2$ are the sample variances of the SE, and N is the total number of prediction experiments.