Response to Reviewer 2

We appreciate the reviewer's time and effort in undertaking this review, and would like to thank them for their comments. We have responded to the individual points below.

General comments

This paper examines CMIP6 models' reproducibility on interannual variability mode, NAO. The study has found increasing trend of the percentage of explained variability by the NAO in the reanalysis datasets, while that is not the case in many of CMIP6 models.

I believe the scope of the research meets the scope of the journal, and the paper was thoughtfully prepared. One concern I have though is about the percentage of the explained variability (PEV) The authors mostly focus on the PEV by the NAO. While I acknowledge that it is an important measure, it could be sensitive to the magnitude of the total variance of the model because the PEV is relative value to the total variance. I think having this addressed in addition would make the paper more robust.

We agree completely with the reviewer that percentage variability alone could be misleading. It is for this reason that we included in the paper the change in total variance in sea level pressure over the same 30-year moving window. As you highlight, it is a portion of this total variance that is explained by the percentage variability explained. These two fields together provide the total variance explained. The three plots of percentage variance explained, total variance explained, and variation in the sea level pressure are all quite similar. We didn't feel it was necessary to show all three. Obviously we wanted to show the percentage variance explained as this is a focus in the paper, however, the question then arose of which of the other two to show in the paper, and we opted for the field itself, being the total variance in sea level pressure.

To address your very reasonable concern, we have now added the plot of total variance explained into the supplemental material and made reference to it in the text.

In the discussion section (line 180), it was discussed that the trend from the reanalysis datasets could be resulted by the combination of the natural variability and the forced response. I wonder if this point could be explored more. One possible path could be working with anomaly monthly PSL field by removing any linear trend in it. This might be helpful to provide some insights on isolating influence of forced response.

Thank you for the suggestion. We do propose in the paper that since the models all have a similar forcing but do not show any consistent response, the trend in the reanalysis is likely the result of internal variability. However, this is not the only possibility and at the request of your fellow reviewer, we have included some discussion of other possibilities. We are currently undertaking some analysis for a follow up paper, however, that focusses primarily on the changes in NAO and its links to precipitation as seen in the climate models. We may at some point pursue this matter further and attempt to demonstrate more robustly that this change is the results of internal variability, and your proposed approach could certainly help with that. At this time however, we are happy for interested readers to pursue the investigation for themselves.

Specific comments

Line 74 "times series": Does this be replaced by "time series"?

Thank you for spotting this typo, we will correct it.

Fig 1: What are the shadings indicating?

This was an oversight on our part, we will update the captions on all the figures to provide a more complete explanation of what is shown.

Table 1 and analysis: Is one ensemble member of each model used for the paper? Please consider clarify this in the paper.

We can add a statement to clarify this point.

Line 130 "In general, the climate models over-estimated the importance of the NAO in the first half of the century and under-estimated its importance in the second half, when compared to the reanalyses.":

I am not sure what "importance" indicates in this description. Does it indicate the "portion of variability explained by the NAO"?

As you suggest, we are referring to the portion of variability explained by the NAO. We will revise to make this more clear.

Also, this is the percentage, not the magnitude of variance itself. I think the magnitude of variance for each 30-year epoch might also need to be analyzed to complement the analysis for the "percentage of variability explained by NAO"

This refers back to your more general point regarding percentage versus absolute magnitude of variance explained. Given the similarity of the three plots of total variance in sea level pressure, percentage variance explained, and total variance explained, we have now included the total variance explained in the supplemental material and referenced it within the paper text, as discussed above.