

## The Decadal Climate Prediction Project Responses to Referee #2

1. Pg 3, L25, fig. 1, It is difficult to argue that initialisation has enhanced prediction skill in years 2 and beyond, as there seems to be equal or greater areas of negative skill. I suggest a more careful formulation, supported by reference to process understanding. In particular, the skill in the NA sub polar gyre has been attributed to initialisation.

- Sorry for the typo where Fig 1 should read Fig3. We have modified the text in response to this comment and made reference to the North Atlantic and Component C.

2. Pg 5, L15, I understand that by “analysis” is used here to refer to data assimilation. This terminology may not be obvious to many readers. Also the list of contributors misses “enhancement of the observing system” which could be argued to be the most important. Furthermore, you could include statistical (flux correction, and anomaly coupling, and anomaly initialisation) methods that reduce forecast drift.

- We have added text with respect to initialization, ensemble generation, and the coupling of model components as suggested. Although we expect enhancement of the observing system to improve initial conditions and hence prediction skill we don’t feel we can appeal to it in the decadal context as yet. Presumably ARGO and other enhancements will do this but we don’t think this has been demonstrated so far.

3. Pg 6, I believe that developing an understanding of the impact of initial shock on forecast skill should be mentioned under scientific aspects (perhaps under point 2).

- We don't disagree that this is important but would like to leave it as an implicit topic under the heading of "broad questions" rather than mentioning it, and other specific points, in this section

4. Pg 17, Appendix A and respective place in main text, I can partly understand the reasoning for limiting the tier-1 hindcasts experiments to years 1-5, however, I would call them multiannual and not near-term or decadal. Personally, I feel the greatest benefit comes from the longer 1-10 year period that focus on capturing predictability associated with the low-frequency component of climate variability rather than the interannual that is dominated by ENSO (which is not predictable beyond a year). It could be useful to make clear why shorter hindcasts are being encouraged and also called “near-term”, which I understand refers to 10-30 years periods.

- We have added text intended to clarify the usage of "decadal" and "near term" and have also added text to indicate that the longer timescale predictions are both important and encouraged when resources permit.
- Unfortunately the terminology is a bit vague in this area and “near-term” is used to mean 10-30 years in Chapter 11 of the IPCC for instance but 1-10 years in the WCRP Grand Challenge of Near Term Climate Prediction. We follow this latter usage.

5. Appendix C. Is there any shock expected from applying a temperature anomaly essentially instantaneously in experiments C1.1-C1.8? If there is one, it could introduce an artefact into the results. How will it be assessed?

- Technical Notes which discusses methods of imposing the temperature anomalies and for minimizing potential shock and drift are now available.

For experiments C1.9 and C1.10, is there a reason for suggesting to start the extended pacemaker experiments exactly in 1920. The early century warming started in 1920, and it wouldn't be prudent to start the runs a little earlier if this is of interest.

- Agreed, we now suggest 1910

6. Pg 29, I think it is important to also include salinity data (surface, upper 300m, 700m and 2000m) in the 2D Ocean data. These quantities are important for verifying the mechanisms for multi-decadal variability in the North Atlantic.

- Surface salinity has been added (it was left out by accident) and salinity data is requested under 3D ocean variables

Typos

1. Pg8, L24, It should be: "to what extent can"
2. Pg 17, Table 17. A1, It should be "and start ....are recommended"
3. C1.1, I believe you mean a 50m deep mixed layer.

- Thanks, we have fixed these.