

## ***Interactive comment on “The “NorESM1-Happi” used for evaluating differences between a global warming of 1.5 °C and 2 °C, and the role of Arctic Amplification” by Trond Iversen et al.***

### **Anonymous Referee #2**

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Review of Iversen et al “The NorESM1-Happi used for evaluating differences between a global warming of 1.5C and 2C, and the role of Arctic Amplification”

#### Summary

The authors look at a range of different versions of the NorESM1 model, and consider how those models hold up against reanalysis. They consider changes in many modes of variability, specifically related to key regional changes. Overall the paper was not what I expected, from the title I expected the paper would be about NorESM1-Happi, Paris Agreement and Arctic Amplification. Very little of this was even mentioned until Figure 17! As it stands the paper is  $\frac{3}{4}$  a model description/validation paper, and  $\frac{1}{4}$  a

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science paper. The science is completely lost due to the first part. Due to this, and a number of other major concerns, I recommend substantial corrections.

#### Major concerns

1. In my view, the paper needs to be split into two. A paper focussing on the Arctic Amplification differences under Paris would be very welcome. So one suggestion is to put everything up to Figure 17 in online material, and just start the paper from there. Any reader that comes to this paper due to the title will be otherwise be completely lost in details of various models, and it will not be a productive read for them. More material would be needed for the science part though (see comments below). Alternatively, you could make this a model development only paper.
2. The title makes it seem that NorESM1-Happi is the main model here, but actually it is not, the SO version is used the most, and the –M and –AMIP versions are used equally as much. I often got confused about which one was being used, as the paper jumped around a fair bit. It was not until half way through that I realised that the Happi version of the model did not have prescribed SSTs (as HAPPI is synonymous with prescribed SSTs).
3. I was hoping to see more of a connection to Arctic Amplification here. Such as more of a focus on latitude temperature gradients, changes in wave characteristics associated with this, and then relating this to blocking etc. This link was missing, and AA just seemed to be a ‘hot topic’ term. The authors should look at the recent work by Screen on this topic.
4. A more comprehensive analysis seems to have already been done by the authors, in Li et al, (<https://www.earth-syst-dynam-discuss.net/esd-2017-107/>). Can the authors highlight what their study adds?
5. I was very surprised by some of the differences between the SO model and the AMIP model. Surely the AMIP model will have smaller biases than the SO model (e.g.

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some Scaife papers could be referenced). It is not always clear that this is the case.  
At this stage, I am not sure minor comments are useful.

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Interactive comment on Earth Syst. Dynam. Discuss., <https://doi.org/10.5194/esd-2017-115>,  
2017.