

***Interactive comment on* “Brief Communication:
The significance for the IPCC targets of 1.5 °C and
2.0 °C temperature rise for an ice-free Arctic” by
Jeff K. Ridley and Edward W. Blockley**

Anonymous Referee #1

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The paper is short, well written and scientifically sound.

The main concern I have is to clarify what the actual contribution of the paper is.

The paper should be better positioned wrt state of the art. In particular the intro should make clear what were the findings from Screen and Williamson (2017) and Sandersen et al. (2017), how the present study differs from those, and how the present methodology brings something different from / completes these studies.

If a clear added value can be defended, then the paper can be published nearly as is.

I would add that, if the contribution is an independent reevaluation of the likelihood of an

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ice-free Arctic under 1.5, 2 and 2.5° C targets, using an alternative method (ensemble vs multi-model vs emulator), I'm quite supportive for the paper to be published, even if the final result duplicates previous findings. Independent, repeated tests are in my view as important as original studies.

In practice, this would probably mean moving material from the end of the paper to the end of the introduction, and complete what is only being suggested at the moment by being more explicit.

More specific comments below.

- The advantages / specificities of the SRM method should be clearer and the reason why it has been chosen as well.
- I find the methodology not fully clear. In particular the story of the time dependence of SO₂ emissions. Could you illustrate or better describe how SO₂ emission depends on time ? Is this constant then stabilised ? Is it ramped up ? Is it non-linear ?
- It is well known that the rate of Arctic sea ice decrease depends on mean state, in particular ice volume. Do you expect a model with less volume and the same experimental setup to give higher probability of sea ice volume loss at 1.5 °C ?
- p. 1 l. 23 I would say that there is a net increase in winter growth because ice is thinning (Bitz and Roe, 2004), but I'm not sure which effects dominates. You should come up with more references or more arguments (for instance a mass balance study in CMIP-X).
- p.1 l. 22. "With global, and regional, warming" sounds weird to my ears.
- p. 1 l. 28 "increased" instead of "increase"

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- p. 1 l. 29. I think the increase in extreme weather due to reduced sea ice is quite challenged, in particular the quite convincing study of Blackport and Kushner J. Clim 2016.
- p. 2 l. 7. Replace "this is because" by "we make this choice" or reference others to clarify whether you propose this or whether this is standard practice.
- p. 2 l. 20. Explain why you use this method.
- One inconsistency is how °C is spelt. Sometimes without the °, sometimes with space, sometimes not. Make it consistent.

Interactive comment on The Cryosphere Discuss., <https://doi.org/10.5194/tc-2017-283>, 2018.