

## ***Interactive comment on “Historical Northern Hemisphere snow cover trends and projected changes in the CMIP-6 multi-model ensemble” by Lawrence Mudryk et al.***

### **Anonymous Referee #1**

Received and published: 11 February 2020

General comment:

This is a relevant article, presenting significant results based on very recent data from the CMIP-6 project. The manuscript is well-written and pleasant to read. I have no major concerns, only a few suggestions for minor revisions, outlined below.

Specific comments:

- A few things appear throughout the manuscript, showing that it was written by different authors. One of those is the use of capital letters (or absence thereof) for "Northern Hemisphere". Another one is the use of "autumn" or "fall". Please be consistent throughout the manuscript.

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- l. 35: "due in part to the insulating properties of snow". This last part of the sentence is a bit confusing and I can't see the causal link with the beginning of the sentence. Could you please elaborate on this?

- l. 88: the acronyms "SCE" and "SWE" are never defined.

- l. 199: There seems to be a sentence missing before the last sentence of the paragraph to explain why the authors refer to "The remaining Tier 1 CMIP-6 ScenarioMIP simulations".

- l. 202: I would maybe change the section title to something like "Observation-based historical trends". As is, the difference between sections 3.1 and 3.2 is not so clear.

- l. 247 and 252: the figure numbering seems wrong. For l. 247, I guess it should read "Figures 5d and 5e" and for l. 252, "Figures 5a and 5b"? Also at l. 254, it would be useful to include: "... in the Hindu-Kush area further west (Figure 5h).

- l. 269: Figure 6 doesn't really show closer agreement between CMIP-6 and observations than for CMIP-5 during the entire fall. The improvement is valid for November and December, but for October for instance, this is not the case. Please reformulate and/or clearly define at some point the seasons you're referring to.

- l. 390: Figure 13d doesn't exist; please replace it by "Figure 12d".

- Figure 2: why does the shading stop in 1967? It would be interesting to see both the grey and blue shadings superimposed during their common period.

- Figures 3 and 4: it is generally not recommended to use both green and red colours on the same figure, especially when they overlap. Please try to find a more colour-blind friendly alternative.

- Figure 5: The resolution and/or quality of this figure seems rather poor. Please improve it.

- Figure 10: I am not sure both panels in this figure are needed, as they show almost

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the same thing. I would recommend keeping panel b), and maybe include it in Figure 9.

Technical corrections:

- l. 12 and 13: "An ensemble ... is used" and "a subset ... is used".
- l. 98 and throughout the manuscript: please order your citations by either chronological order or alphabetical order.
- l. 144: please delete the word "for".
- l. 239: "the upper part ... features".
- l. 365: duplicate use of the word "successive". I would replace one of those by the word "consecutive" for example.
- Figure 9: There is an unnecessary "b)" in the figure title.
- Figure 11: the x-axis label is missing. Additionally, in the figure caption, maybe include "... hemispheric snow cover extent (SCE)".

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Interactive comment on The Cryosphere Discuss., <https://doi.org/10.5194/tc-2019-320>, 2020.