

Weather Clim. Dynam. Discuss., referee comment RC2
<https://doi.org/10.5194/wcd-2021-80-RC2>, 2022
© Author(s) 2022. This work is distributed under
the Creative Commons Attribution 4.0 License.

Comment on wcd-2021-80

Anonymous Referee #2

Referee comment on "Summertime changes in climate extremes over the peripheral Arctic regions after a sudden sea ice retreat" by Steve Delhaye et al., Weather Clim. Dynam. Discuss., <https://doi.org/10.5194/wcd-2021-80-RC2>, 2022

General comments

The authors examine changes in climate extremes in temperature and precipitation in the Arctic summer using 40-member climate model ensembles where the sea ice albedo is replaced by the open ocean value. They include results from two different climate models and two different resolutions, allowing some sampling of model uncertainty. The authors focus on impacts in the peripheral Arctic regions, where changes will likely have societal relevance. This is a welcome addition to the literature, which has often focused more on Arctic-midlatitude linkages, rather than impacts in the peripheral Arctic regions. The methods are generally appropriate, although some aspects require clarification. Some of the presentation and discussion should be improved.

As noted by Sun et al. (2020, <https://doi.org/10.1029/2019GL08578>) and others, the use of albedo reduction to investigate the response to sea ice loss mainly impacts summer sea ice, with little to no impact during the winter. This can be seen in the present manuscript in Fig. 3, panels c and d. However, satellite observations show a decrease in winter sea ice area over 1979-present, and CMIP6 models project this to increase over the 21st century (see e.g. Fig. 2a in SIMIP Community 2021, <https://doi.org/10.1029/2019GL086749>). This manuscript focuses on summer, but the authors should add some discussion on the seasonality of sea ice loss imposed in these experiments, and how that may affect the interpretation of the results. The existence of other techniques for considering the impact of sea ice loss and the seasonality is hinted at in the Conclusions at L357, but I think it deserves more attention in the manuscript, perhaps in the Discussion.

I think the Introduction should be revisited – some of the logical flow is a bit unclear.

Importantly, there is no data availability statement.

Specific comments

L44: I don't follow the logic of the sentence beginning 'Furthermore'

L55: I think this sentence is too strong. Suggest rephrasing to 'An increase of climate extremes (...) can have substantial impacts on human activities' or similar.

L58: Suggest adding a reference to Landrum & Holland (2020, <http://dx.doi.org/10.1038/s41558-020-0892-z>) somewhere in this paragraph.

L159: Can you explain further why these eight variables were chosen? I don't understand what is meant by 'because they can show extreme changes in frequency or in persistence'

L165: I understand that the naming convention of ETCCDI, but the term 'ice days' is confusing here, since it doesn't refer to the presence of sea ice, but rather than the occurrence of freezing conditions.

L181: Are land and ocean grid cells treated equally in these regions? At L255, the text says that Screen et al. 2015 takes oceanic areas into account – does this manuscript not do that? It might also be helpful to add the fraction of each region that is land/ocean in Table 2.

L181: May be worth stating that there is no longitudinal variation in grid cell area.

Figure 3: Please add the satellite observations to the top panels.

L193: 'in the Eastern Arctic' – I would highlight the Barents Sea here.

L194: Suggest softening this sentence from 'The main reason for these discrepancies' to 'These discrepancies may arise due to', as it could be due to other factors.

L196: Can you comment on which is more realistic? It would be helpful to show sea ice thickness maps in the Appendix.

L230: Which kind of ice? Sea ice?

L147 and Figure 5 caption (and elsewhere) – when referring to ‘amount of sea ice loss’, is this total Northern Hemisphere sea ice area loss or sea ice volume?

L244: Please clarify how the regional average metric is computed. Regional average of temperature first, then compute e.g. number of days below freezing?

L263: Why not show this? This seems like an interesting point.

Technical comments

L11: Remove ‘statistically speaking’ – how else would you define robustness?

L19: Replace ‘Actually’ with ‘In particular’, or similar

L30: Replace ‘associated to’ with ‘associated with’

L40: Replace ‘the same confounding factor’ with ‘a common factor’?

L52: Replace ‘less attention was paid’ to ‘less attention has been paid’

L60: Replace ‘The projected Arctic sea ice loss can be responsible’ with ‘The projected Arctic sea ice loss could be responsible’

L150: I found this wording a bit confusing. How about 'which limits spurious local test rejections', or similar?

L191: Replace 'even if the same protocol has been applied' with 'although the experimental set up is the same'?

L196: Replace 'could lead to more sea ice in this model' with 'could lead to more sea ice being retained in this model'?

L207: Replace 'continents' with 'landmasses' – the places named are not continents

L226: Replace 'a further south island' with 'an island further south'

L227: Replace 'is the second region in terms of warming' with 'is the region with the second-strongest warming'

Figure 5 caption: Replace 'associated to' with 'associated with'

L261: Replace 'the importance to study' with 'the importance of studying'

L263: Replace 'extreme frequency' with 'frequency of extremes' and similarly for 'extreme persistence'

L289: Missing 'm' in symmetrical

L294: Replace 'in the northern Canada' with 'in northern Canada', 'generates' with 'generate'

L350: Avoid using the word 'probably' -it's vague.

Figure 6 – Is there a better way of showing the PDFs for the different regions besides adding 0.1 to the y-axis for each region?

