The Cryosphere Discuss.,
https://doi.org/10.5194/tc-2020-232-RC1, 2020

The Cryosphere Discussions
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Interactive comment on "Review Article: Earth's ice imbalance" *by* Thomas Slater et al.

Anonymous Referee #1

Received and published: 8 October 2020

Review of 'Earth's ice imbalance' by Slater et al.,

General Comments: This manuscript uses a variety of satellite observation and numerical models in order to quantify mass change of the Earth's glaciers and ice caps, the ice sheets, sea ice and Antarctic ice shelves. Overall, the manuscript is clear, well written and clearly addresses the stated objectives. Generally, the methods utilized here have been well utilized in past studies and are appropriate for this work. Given this, I only have minor comments listed below for the authors to address and consider for a revised version of this manuscript. Specific items are provided below.

Specific Comments

L41: "...impacts on their marine ecosystem..." suggest change to "... impacts the marine ecosystem..."

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L43: I think it would be worthwhile to note that although in situ records may have been obtained as early as the 1890s, that this would have been limited to only a very few locations.

L50-51: I would revise this last line. I think it is fine to note that trends in permafrost, terrestrial snow and lake/river ice are beyond the scope of this study. However, I would advise removing "which are small in comparison". This might be true, but that should not necessarily diminish the importance of the changes in these elements of the cryosphere.

L58: "within local mass concentration units" can you describe this more fully? Doesn't this just mean "within a region"? Remember this is a review article and the terminology/description needs to be understandable by a wide readership.

L60-63: Can you provide more detail here on CryoSat-2 and diff SAR InSAR methods? In particular, can you comment on whether variable penetration of the radar energy into glacier/ice surface impacts the uncertainty in the elevation differencing? Related to CryoSat-2, are there any issues in terms of using CryoSat-2 to measure changes in glaciated regions with significant topography? If these are not issues, please state why they are not. Related to CryoSat-2 data, can you mention the product level used? Was this an ESA distributed product or a custom derived product created by the authors? Related to DInSAR, can you mention the sensors utilized (broadly) to create the DEM products?

114-180: I know that this section is focused on Antarctic Ice Shelf changes, but you may also want to mention here (or elsewhere if more appropriate) recent changes to Arctic Ice Shelves as well. You do not necessarily need to quantify these changes but they should at least get a mention if this is a review paper of the changes of Earth's ice.

L170-175: Somewhere here you may want to quickly discuss where the major declines in Arctic sea ice occur spatially. And how does this match with other studies?

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END OF REVIEW

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