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The Cryosphere Discussions

Interactive comment on "Freshwater flux to Sermilik Fjord, SE Greenland" *by* S. H. Mernild et al.

Anonymous Referee #2

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1 General comments

This paper contains an analysis of freshwater surface fluxes into Sermilik Fjord. A combination of in situ, and satellite, and model data are used to determine the different fluxes. Ice discharge is estimated with satellite remote sensing data, precipitation with in situ meteorological station observations, and terrestrial water discharge is estimated with a model.

This paper presents an integrated analysis of all surface freshwater fluxes into Sermilik fjord, and finds that ice discharge is the dominant source of surface freshwater. This topic is of great interest of the scientific community. However, there are a couple of methodological issues that need to be addressed before this manuscript can be

recommended for publication.

2 Specific issues

The SnowModel needs to be better described and some choices better motivated. For example, how does the model account for spatial variability in driving forcings over the 400.5 x 300.5 km simulation domain?

The modeled catchment runoff is bias corrected to fit the observed runoff from only a small part of one of the seven sub catchments. A better motivation to why this model is a reasonable choice for the other catchments are needed, particularly given the huge difference in glaciated area of the different sub catchments, and the lack of model calibration.

Englacial and subglacial flow to neighboring basins are mentioned as possible explanations to why the observed runoff from the Mittivakkat Glacier is greater than the observed runoff. However, if these processes are active, the opposite relationship between observations and model would be expected as the observed runoff would only monitor a fraction of the melt water generated at the glacier. In addition, if some of this meltwater is transported to neighboring basins part of the greater Sermilik fjord basin, the bias correction cannot be used uniformly across the basins.

The study does not include oceanic fluxes, you may want to consider clarifying that this study is limited to surface inputs of freshwater fluxes to the fjord.

3 Technical issues

P 1196, L 22: "show" : use present tense, changes are still happening.

P 1201 L18, and other places. The use of the term verification seems somewhat wrong. Verification means confirming that the model agrees with observations. However, here it reads as verification means adjusting the model to fit the observations. A clarification is warranted.

P 1202. L 1-3: Explain how the accuracy was determined for single outlets and stage-discharge. Also, explain the difference between single outlet discharge and stage-discharge. Furthermore, explain why you believe the accuracy is similar to other places in Greenland. Finally, explain why these accuracy issues arise.

Figure 2a. Consider using light colors for all the coastal time series. Some of the temperature time series are drawn in dark colors, which may be confusing for some readers as precipitation is separated into light and dark depending if the station is at the coast or the ice sheet. Furthermore, consider separating the coastal and ice sheet precipitation into two panels. The ice sheet precipitation covers the coastal precipitation, and makes it impossible to examine the coastal precipitation at times with ice sheet precipitation events.

Figure 2b. The y-label is wrong, it should say temperature lapse rate. The figure legend suggest the 'coastal' station is an average from all station, but the figure text suggest only the station 'Coast' and 'Nunatak' was used in the average. Please clarify.

Figure 3a. Explain in the text why different time periods are used.

Figure 3b. Find another term to describe the 'verified' discharge. See earlier comment about the use of 'verify'.

Figure 4a. Explain what 'River Tools' is.

Figure 6. Second upper panel lack y axis label. Add a map showing the respective locations of the three outlet glaciers. At minimum indicate within which sub basin they are.

4 Specific TC evaluation criteria

1. Does the paper address relevant scientific questions within the scope of TC? Yes

2. Does the paper present novel concepts, ideas, tools, or data? The synthesis of the data is relatively unique.

3. Are substantial conclusions reached? Yes, it was found that ice discharge dominate water losses from the Greenland icesheet. This finding is not new. However, this study is more detailed than other studies I have seen, and therefore a valuable contribution to the scientific community.

4. Are the scientific methods and assumptions valid and clearly outlined? The SnowModel needs better explanation.

5. Are the results sufficient to support the interpretations and conclusions? Yes, pending the issues with the SnowModel.

6. Is the description of experiments and calculations sufficiently complete and precise to allow their reproduction by fellow scientists (traceability of results)? No

7. Do the authors give proper credit to related work and clearly indicate their own new/original contribution? Yes

8. Does the title clearly reflect the contents of the paper? Yes

9. Does the abstract provide a concise and complete summary? OK.

10. Is the overall presentation well structured and clear? More information about methods are needed, figures needs to be better explained.

11. Is the language fluent and precise? OK.

12. Are mathematical formulae, symbols, abbreviations, and units correctly defined and used? N/A

13. Should any parts of the paper (text, formulae, figures, tables) be clarified, reduced, combined, or eliminated? Figures can be improved

14. Are the number and quality of references appropriate? Yes

15. Is the amount and quality of supplementary material appropriate? N/A

Interactive comment on The Cryosphere Discuss., 4, 1195, 2010.