The Cryosphere Discuss., 5, C2172–C2178, 2012
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The Cryosphere Discussions

Interactive comment on "A new glacier inventory for 2009 reveals spatial and temporal variability in glacier response to atmospheric warming in the Northern Antarctic Peninsula, 1988–2009" *by* B. J. Davies et al.

B. J. Davies et al.

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Re: Manuscript No, tc-2011-102 "A new glacier inventory for 2009 reveals spatial and temporal variability in glacier response to atmospheric warming in the northern Antarctic Peninsula, 1988-2009".

Dear Professor Gudmundsson, We would like to thank Tobias Bolch for his informative and constructive review, and are glad that he finds the manuscript to be relevant, comprehensive, and thorough. We respond to individual comments below (italic font). All

these points will be taken into consideration in the final revised manuscript.

The main changes we have made are:

- We have worked hard to distil and condense the information conveyed, and have reduced the manuscript by 600 words to 8400, and have assumed more basic glaciological knowledge.

- Supplementary methods are included in the main text, leaving only Figure S1 and Tables S1 and S2 in the Supplementary Methods.

- Uncertainty terms are included throughout

- We have used “shrinkage” instead of “recession” when discussing area changes

- We have referred to “uncertainties” instead of “errors”

- We have made all the specific amendments suggested by the reviewer. More specific responses are detailed below. Yours sincerely,

Bethan Davies

The topic of this paper is very relevant as it presents for the first time comprehensive investigations and thorough analysis of the reaction of glaciers and icecaps to climate and the breakup of the ice shelf on the northern Antarctic Peninsula. This is especially important as these glaciers might significantly contribute to sea level rise. I have the following general comments on the manuscript.

The manuscript is lengthy and can be shortened without significant loss of information. I suggest shortening by about one third. - We have shortened the manuscript throughout, but particularly the introduction, methods and regional setting.

There is too much basic glaciologic knowledge presented (e.g. P. 3550, L. 26 or P. 3351, L. 13ff., P. 52, L. 11 just to mention few examples). The authors should consider that the readers of the article have this knowledge. - It is important that terminology

TCD

5, C2172–C2178, 2012

is clear and defined. We have revised p. 3550 L. 27 and P.3351 L.13 to make them shorter. We have also shortened the manuscript throughout, and assumed more basic glaciological knowledge.

I see no reason why the methodology is presented in the supplements. I suggest to include it in the main text. Only Table S1 and S2 should remain in the supplement. The description of the methods can also be shortened without loss of information. - We have merged the supplementary methods into the main manuscript, and have shortened the methods, leaving tables S1 and S2 in the supplement.

The suggested ELA determination is useful for to get a rough estimation about the glacier characteristics but has to be treated with caution as already mentioned by the short comments. - It is clearly stated in section 4.3 that the ELA determination should be treated with caution; the difficulties are clearly outlined and the uncertainties provided. We acknowledge that it is only a rough estimate but feel that as a first estimation it provides useful information in the inventory.

It is highly appreciated that the glacier outlines are available at the GLIMS data base However, it is enough to mention it once in the beginning of the manuscript. - We have removed the repeated references to GLIMS.

Sometimes the terminology is not used correctly. “retreat” refers to a “reduction in length” while the authors mean the reduction in area. The authors may use “shrinkage” instead. Please check throughout. - We have clearly defined this in section 3.2 and changed usage throughout. “Recession” is used to refer to reduction in glacier length and “Shrinkage” to a reduction in glacier area.

I appreciate that a thorough error analysis is included. I feel that the resultant uncertainty is at the upper bound. However, this is still much better than no uncertainty measure. Assign to all presented numbers the uncertainty term. - The uncertainty is given for area change throughout the manuscript.

TCD

5, C2172–C2178, 2012

More specific comments are presented below:

Title

The title is a bit long. The authors may shorten it to, "Spatial and temporal variability in glacier response to atmospheric warming in the Northern Antarctic Peninsula, 1988 to 2009". - Amended

Abstract

Please include the absolute area of the mapped glaciers. - Amended

L. 12: What does “relatively little” mean? Please be specific and provide numbers. - Amended

L. 13: Use “shrinkage” instead of “recession” as the presented numbers refer to area. Amended

L. 14: Include information about the % change and include terms of uncertainty - Amended

L. 20ff: The statement “Strong variability of tidewater glaciers. . .” is very general and the parameters influence the reaction of all glaciers not only of tidewater glaciers. Please revise. - Removed “tidewater”

L. 22: The sentence “High snowfalls means. . .” is not specific enough. As of course the temperature change is the other most important variable. I suggest reformulation in something like: “Reduced recession . . . may be due to high snowfall”. - Amended

1. Introduction

P. 3543, L. 6: Please indicate the time period to which “the last 50 years” refer. The cited references are 11 years apart. - Added, “from 1950-2000.”

P. . .44, L. 11 ff: This section should be rewritten. The statement in L. 11 should be included in the objectives. - Aims and objectives should be separate; the objectives

TCD

5, C2172–C2178, 2012

should help you achieve your aim. This paragraph, however, has been shortened and simplified.

2. Regional Setting

General: Is there anything known about vertical gradients of precipitation and temperature and its trends? Low elevation weather stations may not reflect the situation in the accumulation area. Please include at least a short statement. - There is a lack of quantified data from the mountain summits; these places are very inaccessible and this data is not available.

P. 45, L. 15: Please include the MAAT of the east and west coast. - Added.

P. 46, L. 11: Include a reference for the statement of the ice thickness. - Changed to read, “The central plateau glaciers of the Antarctic Peninsula Ice Sheet attain altitudes of over 1600 m a.s.l. along its central spine”

P. 47, L. 10ff: You may think to move the specific statements to the discussion to avoid duplication. - Sentence removed.

L. 13: Use shrinkage instead of retreat. See my general comment above. - Amended.

3. Data and Methods

P. 47, L. 21ff: The first sentences are misplaced in this section about data sources. - Second sentence deleted.

P. 49, L. 15: Why do you use GIJR and not GJRI for the glaciers at James Ross Island? - GIJR was used by Rabassa et al. 1980, and we have followed his convention.

P. 50, L. 24: Please include more information here. You may refer to: Haeberli, W., and M. Hoelzle (1995), Application of inventory data for estimating characteristics of and regional climate-change effects on mountain glaciers: a pilot study with the European Alps, Ann. Glaciol. 21, 206–212. - Reference and more detail from supplementary methods added.

TCD

5, C2172–C2178, 2012

5. Glacier change results

General: The section is a bit descriptive and may be shortened. - We have shortened this section.

P. 57, L. 10ff: I do not think it is suitable to use data from an earlier inventory if no data is available. - This is only used for data summary; otherwise, the amount of glacierised area lost will be unnaturally large! The data are blank in the dataset (Supplement) and in the GLIMS files.

P. 59, L. 12ff: The sentences may be moved to the discussion. - No, this is an important part of the results and should be stated here.

P. 25, L. 26. Use “uncertainties” instead of “errors”. Changed- throughout

6. Discussion

General: This section is also lengthy and should be shortened. - We have shortened this section.

The content of the sections does partly not fit to the header of the section, e.g. P. 64, l. 7ff - Moved to section 6.5

7. Conclusions

Also the conclusions can be shortened and should be more specific. E.g. P. 68 L. 11ff can be omitted. - Amended, sentence deleted.

I am missing the influence of precipitation. - We have added this information to the conclusions.

Captions:

The captions are sometimes too long. Do not repeat methods or other sections form the main text. - Captions shortened throughout.

TCD

5, C2172–C2178, 2012

Interactive comment on The Cryosphere Discuss., 5, 3541, 2011.

TCD

5, C2172–C2178, 2012

Interactive Comment