

Interactive comment on “Reconstructing the glacier contribution to sea-level rise back to 1850” by J. Oerlemans et al.

A. Klein (Editor)

klein@geog.tamu.edu

Received and published: 19 October 2007

Overall Assessment

This short paper is a very interesting one that should encourage discussion and future work. It should be accepted with minor revisions. I found it one of the most interesting papers I have recently read. The authors infer sea level rise from changes in glacier length records from 14 regions around the globe. Glacier contribution to sea level rise is estimated as 5.5–1.0 cm for the period 1950–2000 and 4.5–0.7 cm for the period 1900–2000.

The authors address a major issue in global climate change – that of glacier contributions to sea level rise using information on glacier changes that has the longest

Full Screen / Esc

Printer-friendly Version

Interactive Discussion

Discussion Paper

historical record – that of glacier length. While there are certainly issues in scaling observed glacier length changes to changes in glacier volume, the authors appear to take a reasonable and pragmatic approach to the problem. It is one of those papers that after reading you wonder why this research had not been done before.

While it is always possible to take minor issue with some methodological choices, such as use of Stineman filtering as opposed to other smoothing techniques, it would appear that the employed methodology is adequate. The similarities of the normalized glacier length records (Figure 6) are remarkable. Given the similarities between the three estimates of glacier length, it seems doubtful that the general shape of the reconstructed glacier contribution to sea level curve (Figure 7) would differ much if constructed using somewhat different techniques. To some extent, perhaps the authors understate the consistency of this glacier retreat signal, which is certainly as remarkable as their estimate glacier contributions to sea level rise. I must admit that while I have examined many figures similar to the author's Figure 3, the consistency of the global glacier retreat over the historical record has not been made as clear as it is in Figure 6.

The authors appear to take a reasonable approach to scaling glacier length to glacier volume. They properly cite the best recent work on glacier scaling, and their derived relationships seem in line with other studies. Moreover, Figure 7 suggest that the exact choice of a scaling exponent does not appear to greatly affect the estimated sea level change until approximately prior to 1900.

The authors state that their estimates of glacier contribution to sea level rise are higher than previously published estimates – in fact roughly 2 times the estimate of Zho and Oleremans (1997) for a nearly similar time period. The discussion section, and overall paper, could be strengthen if the author's would compare their estimates of glacier's contribution to sea level rise with previous ones and note why the differences may occur between the various estimates.

One interesting point of the paper and on whose discussion should be expanded is that

glacier's contribution to sea level rise seems to be at a maximum in 1850s. While this can be surmised from the normalized glacier length Figure (Figure 6), it is less obvious why it should occur when looking at the stacked global glacier length signal (Figure 5). A bit more discussion on why this occurs, and any implications, could be worthy of more discussion.

Minor points

While the paper is in most very clear and a very reasoned approach, there are a few places where the paper could be strengthened if the techniques were slightly better explained.

While I think most readers could make a reasonable guess at how the Lw14 curve (length weighted according to the proportion of glacirized areas in the regions), however, the text is a bit unclear (Page 83 lines 16-25) as to how the weights for each regions (Table 1 – column weight) were computed. Perhaps directly showing how these weights are computed would be useful.

The discussion of how the estimate of glacier volume change (V_{14}) is calibrated to sea level change (SDM) for the period 1961-2000 is a bit vague, and while the correlation is obvious, it is a bit unclear how robust the correlation actually is and how large of an error in the estimates sea level rise could occur because of the calibration. Also, it is reasonable to assume the correlation will hold outside of the calibration period?

While, this is a minor point given their very small areas, the authors point out that the retreat of the Irian Jaya (now Papua) glaciers is much different than other areas. This is due in part to the use of the Meren glacier length curve rather than the other valley glacier, the Carstenz. The Meren has recently disappeared entirely, while the Carstenz remains. It might be that the curves for the small Papua glaciers would look much more similar to those of the rest of the world if the Carstenz, or an average of both glaciers, was used.

Just a few minor points grammatical suggestions

Page 78 (line 26) – perhaps a comma after “In this paper”. Similarly, on page 80, line 7.

Page 80 lines 16-17, a comma after the phrase “Yet in one way or another”

Page 79 line 12. I am not sure it is best to say backwards in time until...perhaps backwards in time to..

Page 8 line 9. “were” should be “where”

Page 82 line 15, it is perhaps good to replace the phrase “to get” with “to obtain”

Page 87 line 11. “Several test” should be “Several tests”

Interactive comment on The Cryosphere Discuss., 1, 77, 2007.

TCD

1, S222–S225, 2007

Interactive
Comment

Full Screen / Esc

Printer-friendly Version

Interactive Discussion

Discussion Paper