The Cryosphere Discuss., 8, C1456–C1459, 2014
www.the-cryosphere-discuss.net/8/C1456/2014/

The Cryosphere Discussions
Open Access

Interactive comment on "What glaciers are telling us about Earth's changing climate" *by* W. Tangborn and M. Mosteller

J. Małecki

malecki.jk@gmail.com

Received and published: 31 July 2014

I'm affraid that the reviewers raised several questions unanswered in your paper. I have read the paper several times and I still do not get a clear message from it, so I share some of the reviewers' thoughts and please forgive me duplication of some comments. Below I comment reviewers comments beggining with Mr. Wolfgang Gurgiser. I will stick to his original punctation.

MY COMMENTS TO MR. WOLFGANG GURGISER'S REVIEW:

1) The title "What glaciers are telling us about Earth's changing climate?" is very general, but the question is not answered in the conclusions. I think you should better underline what is the new finding that the model introduces to the well-established

glaciological/climatological paradigm. For sure simple temperature/ablation correlation is not new not only for glaciologists, but also for the general public.

2) I agree that more than one publication should be cited in the introduction. I generally agree with the reviewer at this point. More information about the model is essential.

3) Section 2 "Mass balance measurements (background)" should be joined with the first one. It is about manual mass balance measurements on glaciers worldwide, but there is nothing about previous modelling attempts. Maybe shorten the existing text and give a better overview of what is the current state of knowledge in that field?

4) I agree that the key information about the model construction should be given in section 3, not only in Tangborn 1999. I do not know much about callibration, but I feel the paper lacks important information.

Temperature is obviously the key element in modelling the ablation. In PTAA model it is computed from mean daily temperature (cool day/warm day) and from temperatue range, believed to reflect cloudiness. Have you tried to use a uniform lapse rate, averaged from direct observations? On "my" glacier Svenbreen in Svalbard, average lapse rate between the closest station and the glacier fluctuates around -1*C/100 m, a value that seems to be impossilbe to reach in the model, as suggested from fig. 4 in Tangborn 1999. With this example I'm trying to say, that maybe a greater part of the PTAA model could be immersed in direct observations to obtain better mass balance correlations, since some are as low as 0.2 (tab. 1 in the discussion paper). I am however aware that its greatest advantage is indepence from direct observations, which enables to compute glacier mass balance in remote regions where no fieldworks are performed, but I would still suggest more validation with observations.

5) Yes, input stations should be included in the plot. From the presented plot one could think, that Wrangell Range glaciers respond not to local temperature, but to the global one. Was that the point? Is there similarly strong correlation between temp at McKinley/Big Delta and 7000 stations mentioned? Were the input stations included in

those 7000? What is the spatial distribution of 7000 stations used by Hadley Climate Center? Is there any bias towards your region of study or is the distribution more uniform around the hemisphere? Why do you link ablation with CO2 concentration? Give background on the CO2 role in the climate change and some plots to show the relation. Which 30 glaciers have you studied? Why these? Are they representative? Show a map of their location and more characteristics.

6) Although the message to the public is very important, I think the description of the webpage is not necessarily to be found in a scientific paper, because it brings no scientifically new discussion or information. Maybe a supplement would be a better place for that section?

MY COMMENT TO MR. GRAHAM COGLEY'S REVIEW:

Mr. Cogley's comments are a little bit more detailed, but I have a feeling that his review is in general similar to the one from Mr. Gurgiser. At some point he wrote: "Correlations between balances measured and simulated over several decades range from quite good to indistinguishable from zero", so I started to seek for any explanation for that fact in your discussion paper. I haven't found any relevant hypotheses and I think it's worth commenting. What could be the reason for poor and good correlation between measured and modelled mass balance of the investigated glaciers? Further in Cogley's text: "PTAA model seems vulnerable to the criticism that it is not very parsimonious. There are 14 free parameters (that is, "knobs to twiddle"), which may explain why it requires the elaborate simplex optimization". As I do not know much about the optimization and calibration, from the ongoing discussion online I understand that this part really needs to be extended.

Overall, I think the paper needs revision for greater clarity. More information should be provided for the aim of the paper, introduction, methods, study area, results and their global and regional context. After extending these sections, I am sure it will be much better.

With my best wishes,

Jakub Małecki

Interactive comment on The Cryosphere Discuss., 8, 3475, 2014.