

Interactive comment on “New climate change scenarios reveal uncertain future for Central Asian glaciers” by A. F. Lutz et al.

Anonymous Referee #2

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General comments

In principle, this is a well-written paper and could be of important scientific content if some revisions are considered. Reviewer #1 has invested significant effort for suggestions to improve the manuscript and to make it valuable contribution to the state of the art in our understanding of the future of the Central Asian glaciers, and to the methods we develop to investigate it.

I agree with his comments, and add the following from my perspective here.

My major concern is related to the general meaning of what is envisaged as scientific advance in the paper. Glaciers are very complex, non-linear systems and strongly in-

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fluenced by threshold reactions, and feedback effects. Their understanding, and their modelling, is a challenge. In Your paper You put many simplifications together and You make an estimate of future glacier extent in a very large area, where data is scarce and no operational monitoring exists. You should add a robust argumentation for the combined method You present, and why You do not apply another one (or - do so!): E.g., You not even mention the subgrid modelling of future glacier extent and streamflow contribution in the Brahmaputra river basin, that has been developed in the framework of the Glowa-Danube (<http://www.glowa-danube.de/eng/home/home.php>) and BrahmaTwin projects (<http://www.brahmatwinn.uni-jena.de/index.php?id=5314&L=2>). With Your argumentation as background, exactly describe what the meaning of the results really is: It would probably be beneficial to re-think whether You want to write a paper about the difference of the CMIP3 / CMIP5 ensembles (probably the easier way, since You already have most of the required material), or about the future of the Central Asian glaciers (then consider calibration, validation, and the water balance components in more detail; but for that purpose, Your linearizing of the climate change signal is questionable). Sharpen the focus!

Specific comments

- 12694 (2 Study area): the size of the two catchments under investigation would be helpful here, not only the one of the glacierized area

- 12706 to 12708: the entire discussion chapter not really fits the argumentation flow of the paper at this position of the text. The first three paragraphs (until line 20 on page 12707) have the character of an introduction, and the rest the one of an outlook. You should consider to put the two text blocks to the respective positions in the text. Instead, in this section, more detailed figures about the future glacier extent like the two top panels in fig. 12., but much larger, would be beneficial. E.g., You could produce figures for the 4 extremes in the range of future temperature and precipitation (dry/warm, dry/cold, wet/warm and wet/cold, including exact explanation what this is) and discuss them in this section. And: add at least a consideration what this means for the water

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balance components.

Technical corrections

- 12696, line 12: better " . . . refer to the changes during 60 years."

- 12702, line 19 and 23: "Table 2" should be "Fig. 8", I assume?

- 12707, line 4: You should include, consider and discuss here the other existing approaches to estimate future glacier extent, and streamflow contribution, with sparse data conditions, and move this part of the text to where it belongs to (the introduction).

- 12725, figure subscription: "Panel C shows the effect of glacier size for a 1 km², 5 km², 20 km² and 100 km² ????? on change in glacier extent in 2050": subject missing.

12703, lines 8-11: how can this be learned from Panel A and B of of fig. 10? I do see a 30 % increase in average annual precipitation there.

- 12727, fig. 12: add inscription to the vertical axes of the two diagrams.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 9, 12691, 2012.

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