

## ***Interactive comment on “The influence of changes in glacier extent and surface elevation on modeled mass balance” by F. Paul***

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Paul (2010) presents a critical analysis of the impact of changing glacier extent and surface level on the climatic signal from glacier mass balance records. For those of us undertaking long term mass balance programs the resultant climate signal from glaciers with much reduced size is obviously biased. To correct this bias is a matter of import that Paul (2010) quantifies and provides us with a methodology for assessment. This important paper in the introduction brilliantly lays out the problem. The suggestions below primarily focus on a clearer presentation of the various experiment setups and better illustrating the impacts of each experiment by focusing on one or two example glaciers.

There are four experiments run, each with two scenarios. This results in eight outputs.

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I found myself going back over the experimental description section too many times. I recommend using a table that lays out the model parameters in addition to the text, easier to reference. Create a sub-section for each experiment in the text as well.

It would be of particular use to examine one or two glacier in detail as example of how each experiment affected each of those glaciers. The quantitative results for the glacier response to each experiment can be summarized in a table and the qualitative discussion for the glacier just placed in each experiment sub-section, possibly Upper Grindelwald and/or Baltischeider could be used. The figures already display the response of each glacier, but the discussion does not focus on any specific glacier consistently. By consistently focusing on a glacier the reader will better understand qualitatively and quantitatively the impact of changing glacier extent on the mass balance climate signal. We will in most cases be applying such a corrective model to a single glacier.

740-6: Should mention the non-steady state possibility (Paul et al., 2004).

740-19: Can be either Pelto (2006) or Pelto (2010), the latter is in the references.

745-3: “..a mean ELA of 2900 m is used for the entire model domain extent.” At what step in the model is this ELA applied?

746-18: Are the correction factors for various changes in precipitation?

747-27: Why the more positive values in the central basin?

750-25: Should be emphasized that despite the shrinking glacier area that should be increasing mass balance that the increasing negative balances indicate a non-steady state response to current climate. Maybe this only applies to some of the glaciers, but this would be important to identify as well.

752-15: The enhanced sensitivity are for glaciers that end up lacking an accumulation zone and will disappear (Pelto, 2010), versus the reduced sensitivity for those with a protected and avalanche fed accumulation zone that are difficult to eliminate (Hoffman and Fountain, 2005).

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Interactive comment on The Cryosphere Discuss., 4, 737, 2010.

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