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The Cryosphere Discussions

# *Interactive comment on* "Forecasting temperate alpine glacier survival from accumulation zone observations" *by* M. S. Pelto

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Editor: I will take encouragement from the comments of Anonymous Referee #2 and Frank Paul that this paper can be valuable.

"This is an interesting discussion and a salient topic – glaciologists are commonly queried about which glaciers will survive the current century, or how much longer these ice bodies will persist. I suspect that the analysis and conclusions are basically correct. That is, a retrospective look 50 or 100 years from now would probably indicate that Pelto's 'survival forecast' was about right." (Anonymous Referee #2 ) " Though I principally agree that the related observations could indicate whether or not a glacier might survive in the long term," (Paul).



The comments from Frank Paul and the referees indicate that the paper as currently constructed is not providing this potential value. I recently commented on a Cryosphere paper that the authors "could provide important results if the analysis is narrowed, does not stray beyond the bounds of the data, and is interpreted with greater detail." The referee's comments indicate I need to follow this same advice.

All reviewers noted that the forecasting model was not clearly or concisely described. The key idea of the paper is the value offered by focusing observations on the accumulation zone in understanding glacier survival. This will be the first task. I will have to narrow the papers focus to provide enough detail, which means focusing just on the North Cascade glaciers, eliminating Wind River glaciers. Further the focus on describing the forecasting model must be on the detailed field data from these glaciers. I have not been able to, after many drafts, successfully develop the model, and its application using remote sensing methods in the same paper. I will therefore focus on the field observation of accumulation zone thinning, accumulation zone margin changes, mass balance and AAR, and their observed impact on the specific glaciers. I will conclude with the potential that this provides for remote sensing application using an example from the North Cascades and citing recent important remote sensing studies where this could be applied. The application using remote sensing imagery will be covered in a later paper.

Specific Points that will be addressed:

Anonymous Referee #2 identifies that more attention must be given to the AAR data and its relationship and importance to a survival forecast.

Primary support for the model will come from more detailed analysis of the profile, mass balance and AAR data-the field data. This data will illustrate that North Cascade glaciers despite being small have demonstrated that regional climate dominates their annual balance and they are not decoupled from the direct influence of the atmospheric forcing (Pelto and Riedel, 2001).

A more thorough description of the field observations of accumulation zone changes on each glacier will be included, along with the related change in overall glacier extent.

In defense of the model greater attention must be given to the comparative changes in the accumulation zone of glaciers that are surviving and those that are not. All reviewers note that there is some change in the accumulation zone as glaciers retreat. This thinning is however, minor compared to that of glaciers undergoing a non-steady state retreat, as noted by such key studies as Schwitter and Raymond (1993).

Figures 9-11 will be eliminated. Figure 1-8 will mainly be kept, but will be better supported by field data.

An additional table of observed thinning and marginal changes in the accumulation zone will be added. This will also include AAR information and mass balance data.

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Interactive comment on The Cryosphere Discuss., 3, 323, 2009.