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Interactive comment on “Mountain glaciers of NE Asia in the near future: a projection based on climate-glacier systems’ interaction” by M. D. Ananicheva et al.

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The main aim of Ananicheva et al (2008) is to utilize a simple method to project the response of glaciers in Kamchatka and Siberia to global warming. This is an important objective, and the general approach of the authors has considerable merit. However, testing and verification of the specific methods are not contained herein to demonstrate the appropriateness of the model construction assumptions.

In Section 2 it is important to be consistent in describing each range. For example include the ELA in each section. It would also be useful to include basic climate data for each range to the extent possible. Such as the mean annual temperature and precip-

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itation, at the nearest weather station. Assembling these basic climate characteristics in a table would be most useful. This would help the reader understand the extent of the polar or maritime climate. It would be also useful to have a paragraph on the general terminus behavior of the glaciers in the last 50 years. In the Kamchatka section no ELA's are discussed. What is the seasonality of precipitation in Kamchatka? It is noted to be largest of anywhere in Russia.

Section 3: The key objective is determining the average change in ELA for climate change scenarios. This task is attempted on 17 glacier systems. This is far too many to apply a new method to and adequately test the results. A more detailed study of this application to 4 or 5 glacier systems is preferable.

The methodology starts to fall apart Page 7 (20) when accumulation is determined at the mean ELA, which in turn was determined from the mean hypsography of the glacier system. Further, it is pointed out that ablation is more reliably determined from air temperatures and lapse rates than accumulation at high altitudes. Hence, accumulation is set to equal ablation, as determined from the lapse rates at the ELA. No verification of any step in this tenuous chain is provided.

On page 8 data from weather station in Kamchatka and Suntar-Khayata Range are used to determine lapse rates. I suggest the authors focus on the glacier systems in these areas where some ground truth data is available.

The method for extrapolating precipitation 8(20) in NE Siberia also seems tenuous and again is unverified. The extrapolations are further corrected based on accumulation equaling ablation at the ELA. The determination of ablation is further complicated by superimposed ice. It is postulated that a global formula relating ablation to summer temperature can be used. This supposition is supported by a regional variant of the global formula with a single glacier referenced, and no data cited to support either of the two regional variants used, equation 1 and 2.

The result of all of these unverified postulations is equation 3, yielding a temperature



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at the glacier surface as well as ablation. Is this same method applied to all glaciers in all ranges, is that reasonable?

Accumulation is determined based on the estimated solid precipitation share for each month. No data is presented on what this share is for any glacier for any month. Based on the morphology type a coefficient for snow drift and avalanche transfer is derived. Again no verification, no details on how these difficult to parameterize processes are determined.

Equation 4, Page 11(20), is a means to determine a new ELA and terminus elevation. The method may have merit but is not defended using current ELA and terminus elevation data in either climate setting.

The authors have failed to present a simple method for determining ELA change. There are so many dubious extrapolations and assumptions that are unverified with any data, that one can have no confidence in the results section, even if the results are reasonable. This is not a conclusion that the authors cannot and have not in their research accomplished the verification of the methods described. This paper cannot be of value until the process is tightened up with ground truth data presented to support the techniques. If ground truth is not available then attempting to determine the specific conditions at the ELA cannot be verified and would just be good guesswork.

Interactive comment on The Cryosphere Discuss., 2, 1, 2008.

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