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The Cryosphere Discussions

Interactive comment on "Mapping and morphometric analysis of glaciers in Jotunheimen, South Norway, during the "Little Ice Age" maximum" *by* S. Baumann and S. Winkler

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General comments:

The paper by Baumann and Winkler (2009) is focusing on the extraction of glacier data (mainly inventory data such as area, min. - mean - max. - altitude, etc.) using remote sensing methods (based on satellite and aerial photographs), digital elevation models and by some in-situ measurements (GPS). The data are mainly compiled and analysed in a Geographic Information System. The methods applied and data analysis are well described and have been carried out very carefully. The main results are an interesting complementation of already existing studies from the same area and other areas in

different mountain ranges. Especially, the mapping of the glacier extensions during the LIA period and their comparison to the situation in 2003 is very valuable.

However, there are some points, which have to be improved by the authors: Although, the mean glacier length as a variable is proposed in the guidelines for the preparation of glacier inventories by Paul (2009), the implication of the mean length of the glacier flow lines for the presented analysis should be elaborated? Mean glacier length is highly correlated with area and adds no additional information, which is even evident in the results shown in this paper (area change 35% and mean length change 34%). Therefore I posed myself the following questions: a) How many flow lines did the authors use for the determination of the mean value? b) How strong is the mean value influenced by the selection of the flow line? c) What are the criteria for the selection process of the individual flow lines, i.e. when does a glacier branch obtain an individual flow line?

In many cases glacier length and length change strongly depends on glacier dynamics. Taking mean values of glacier length and length changes of a large glacier sample suppresses the important individual signal of the glaciers. How do the authors interpret the value of the mean glacier length of about 1.6 km (value only mentioned in the abstract)? What is the meaning of this value? Why not using the maximum glacier length instead and why not analysing and comparing individual classes of glacier length and glacier length changes (the authors have already given some results in table 2, but it is not mentioned nor discussed in the text)?

In the discussion section (6.4) the results of area change in the investigated region is compared with other mountain ranges by the authors. I would expect a more detailed discussion about the question: why is the relative area reduction in Jotunheimen different from the other regions?

Specific comments:

Page 359, line 5: The differences between field data and mapping should be specified

with a value.

Page 360, line 16: If satellite images and aerial photographs are compared to maps in order to assess their accuracy, the data basis (and the accuracy!) of the maps should be known as well. The maps are probably based on the same aerial photographs as the authors used in their study and therefore not independent. This would result in an interpretation of the interpretation quality, only due to different investigators.

Page 361, line 16: Why do the authors determine the coefficient of determination between min. altitude and total area? Please explain.

Page 362, line 5: It would be useful to have a map like in Andreassen et al. (2008, Fig. 5) with a color coded map of the relative area change per glacier.

Page 365, line 24: The authors write that 'the glacier surface during LIA maximum is not known ...' Please clarify and explain, why the surface of the LIA glaciers could not be reconstructed? In the European Alps several reconstructions of LIA maximum glacier surfaces and volumes have been performed (e.g. Maisch, 2000).

References:

Paul, 2009: Guidelines for the compilation of glacier inventory data from digital sources. GLIMS. 20 p.

Maisch, M., Wipf, A., Denneler, B., Battaglia, J. and Benz, C., 2000, Die Gletscher der Schweizer Alpen. Gletscherhochstand 1850, Aktuelle Vergletscherung, Gletscherschwund-Szenarien. vdf-Hochschulverlag ETH Zürich 373 p.

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