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# *Interactive comment on* "Multi-level spatiotemporal validation of snow/ice mass balance and runoff modeling in glacierized catchments" *by* Florian Hanzer et al.

**Anonymous Referee #2**

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This study uses multiple observed data sources for the validation of distributed hydro-climatological model with high spatial resolution (50 m). The manuscript is well written and easy to read. The methodology applied to constrain individual discharge components (ice-melt, snowmelt..) using several observed parameters is very useful (and novel). For hydrological studies in mountainous areas with higher fraction of snow and glacier melt, one should consider multiple observations in order to constrain model parameters reasonably as it is shown in this study. Considering only discharge for such studies may lead to "good results for wrong reasons" as these good may results from compensation of different discharge components. The manuscript falls within the scope of the journal as snow melt and glacier melt in highly glacierized region is



studied. Therefore, I suggest to publish the manuscript with minor revisions. My few comments are as follows:

Comments:

1. The paper is well structured. However, some explanations are not in corresponding chapters. For example, the section 2 describes the study site and data. In this section all available data is explained, except for MODIS and Landsat snow cover area data. In my view the processing of Landsat data and short description of MODIS data belongs to this chapter rather than chapter 4.

2. Without reading Strasser, 2008 for model description or being familiar with AMUNDSEN model, my concern is with groundwater module and its contribution to total discharge which is not discussed in this manuscript. Is the groundwater discharge marginal in study site so it can be neglecting in analyzing the model components? In figure 15, the authors compare total observed discharge with the simulated discharge. Is the fraction described as "unglaciarized" in this figure correspond to groundwater component? Maybe the authors can state it clearly if this is the case.

3. The description of cold content and liquid water content is not well understandable. Do you mean by cold content the solid water content? If this is the case, maybe it makes sense to call it this way as this is widely used in literature than "cold content".

4. Page 7, lines 11-13: The openness values of study site is computed using zenith angle and nadir angle values. Where do you obtain these values?

5. The validation approach with "observation scale" was not clear to me (without reading Blöschl and Sivapalan, 1995). Maybe a hint for authors to better explain this in the manuscript.

6. Page 11, lines 15-18: If one scene shows snow cover and the other snow free, then the pixel was considered as snow. Please give reasons why the scene with snow covered should compensate the scene without snow cover?

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