Interactive comment on "The evaluation of the potential of global data products for snow hydrological modelling in ungauged high alpine catchments" *by* Michael Weber et al.

Anonymous Referee #2

Received and published: 7 September 2020

Review of "The evaluation of the potential of global data products for snow hydrological modelling in ungauged high alpine catchments" Weber et al.

General overview

The authors present an evaluation of snowpack and hydrological modeling outcomes in a well-characterized and gauged catchment using parameterizations derived from regional and global datasets. They also evaluate the influence of three different global digital elevation models on the derivation of model inputs such as slope, aspect, and solar insolation as well as the impact on model results. The goal was to illustrate and quantify the impacts of using these products to estimate snowpack and runoff in

ungauged catchments in snow-dominated mountainous regions.

General comments

The purpose and need for the study are reasonably clear and such work is important for the advancement of snow and mountain hydrology, in general. While it appears that the work and results are technically sound, I found the manuscript very difficult to follow and as such am unable to fully evaluate their results. I recommend a major revision. Specifically, I recommend: 1) reorganizing the methods and results to more concisely lay out the study (methods then results), including the use of additional tables or figures as recommended in the "Specific comments" section, and 2) rewriting the manuscript with an eye toward brevity and clarity, including working with an English-speaking editor. The manuscript is overly long, repetitive, and full of awkward and difficult to follow sentences.

Specific comments

Introduction: At some point in the introduction, there needs to be a clear statement or bulleted list of the research questions. These questions should then guide the organization of the rest of the paper.

Sections 2,3,4: These appear to be all methods, yet there are partial results mixed in. It would be much clearer, if it were a single methods section with subsections on the catchment, the model method, and the input datasets. Then the first subsection under results could compare the inputs of the various datasets, followed by the rest of Section 5. Otherwise, it is very difficult to follow.

Page 5, line 138. The term "gradient" should be replaced with "relief". "Relief" refers to the absolute difference in elevation of a region, whereas "gradient" refers to the slope.

Page 5, line 142. The term "knee wood" should be replaced by "krummholz", which is the more internationally recognized term for dwarf woody alpine vegetation.

Introduction, lines 112-124. Much of this should be moved to the methods section as it

is repetitive.

Page 5, line 160-199. A figure or table would greatly help the reader understand the model structure and underlying component calculations.

Page 8, line 201-202. Why is the reference referred to as representing the "gauged basin mode"? It would help if the methods section started out with statement about how the study is organized, such as "The approach we use is to model snow and runoff in the well-characterized RCZ using the CRHM and in-situ measurements. Then we repeat the modeling process using alternative datasets. In order to do this, we first describe the watershed, the model, the derivation of the datasets…." Moreover, the derivation of the reference model needs to be more clearly explained. Are you using a single meteorological station's data (Mt. Zugspitze DWD station) to drive the catchment model and compare the results at two other stations in the catchment (LWD, DWD)? Use of standard three-letter station abbreviations for all stations in the study would help clarify this, too.

Page 9, lines 214-219. Place these in a table along with the specific dataset and reference

Page 10, line 257. What does PUB stand for?

Figures 3 and 4. These figures are introduced in the text and appear before section 4.3 which describes the DEM parameterizations. It was unclear, at first, why the DEM datasets were part of the graphs. It would be clearer to present methods in one full section and results in the next. As it is, some results are mixed in with each method section.

Page 18, line 432. What does 'thunderstruck' mean? Do you mean that there are data gaps to power outages caused by lightning strikes?