Review of “The evaluation of the potential of global data products for snow hydrological modelling in ungauged high alpine catchments”

Michael Weber et al.

This article seeks to quantify the magnitude of snow hydrological parameter uncertainty when modelling snowpack using global climate and topographic datasets relative to using local climate and high-resolution topographic measurements. The work generally demonstrates that use of global climate data sets is inappropriate for a basin of this small size, high elevation, and rugged topography. Use of nearby datasets or precipitation products in combination with local climate data may produce acceptable results. Use of mid-resolution global topographic products (30m) also yielded acceptable results and in this case, coarser topography (1 km) yielded results consistent with reference runs, though for the wrong reasons.

General comments: The manuscript is much improved from the initial review and easier to follow. Besides the specific comments to follow, I would recommend focusing on key findings in the results, perhaps generalizing by category, and then discussing the significance of the findings with respect to model choices. While I realize that a full discussion of consideration of basin size, roughness, elevation, etc relative to available datasets in beyond the scope of this paper, the community would benefit from an organized discussion of these factors. This is hinted at when discussing the results of other research but could be made much more explicit. For example, rather than start with “Study A” exhibited better results, consider starting with the theme “basin size and elevation matter” and then demonstrate this with case studies including results from this work. This kind of organized discussion would make this a much stronger and more interesting paper.

Specific comments:

Table 1. Are all measured parameters at DWD really available since 1900? Qsi and Qli were probably added more recently?

Figure 1. What is UFS? Adding locations of glaciers would help readers see where snow depth is measurement on and off glacial surfaces.

Figure 2. What is the large blank area? This seems significant as this appears to be where one of the snow depth measurements is taken.

Line 196. What does it mean to run the model in “gauged basin mode”? Does this mean that parameters are adjusted to match outflow? There is mention of a stream gauge, but it is not clear how or if these data are used. Furthermore, how well does the model work? Summarize findings of Weber et al 2020.

Line 205: Similarly, what does “ungauged basin mode” mean?

Section 2.4: Are the different DEM's used with the reference simulation climatological data? If so, what parameters are adjusted as a result. Section 3.2 states that the reference simulation was used and that it was explained in section 2.3. This however is not the case.

Line 324-326. There is no explanation of how reference climate data are adjusted using ALOS, SRTM, and GTOPO30 DEMs. I believe the referenced section (2.3) is incorrect. It should be section 2.4. Please clarify.

Figure 5. What is "(d) setup"? Is this the reference simulation and Lidar topography? Please clarify.

Discussion: Many of the findings with respect to climate products are not too surprising given their coarse resolution. This has been demonstrated several times in mountainous terrain. What would make this discussion much more interesting is if the authors examined factors that limited their use by topic such as basin size, basin homogeneity, basin elevation, area climatological variability, etc and then supported statements with their findings as well as those of other researchers.

Line 545. How will one know if transferring data from a catchment within 100km will provide the best results? Again, if this were addressed in a framework mentioned in the previous comment, it would be more helpful.

Line 559. Again using a framework to consider the use of alternate topographic products would be helpful. For example, use of GTOPO30 might be ok if the area under consideration is well above the current snowline, but would be problematic in basins where the much of the snow accumulation area lies close to the freezing line (where small errors in Ta result in the wrong precipitation phase).