Geoscientific Instrumentation Methods and Data Systems Discussions

Geosci. Instrum. Method. Data Syst. Discuss., referee comment RC3
https://doi.org/10.5194/gi-2021-16-RC3, 2021

Comment on gi-2021-16

Anonymous Referee #3

Referee comment on "Evaluating methods for reconstructing large gaps in historic snow depth time series" by Johannes Aschauer and Christoph Marty, Geosci. Instrum. Method. Data Syst. Discuss., https://doi.org/10.5194/gi-2021-16-RC3, 2021

In their manuscript "Evaluating methods for reconstructing large gaps in historic snow depth time series", the authors compare different methods for filling large gaps in measured snow depth time series in Switzerland.

The manuscript is very well written and of high technical and scientific quality. The comparison of the presented methods is in general of interest for the respective snow hydrological community, however, in my opinion only for a very small number of real use cases. The authors show that already a very simple snow model approach using measured temperature and precipitation as input can yield more or less the same results. There are much more temperature and precipitation measurements available than snow depth observations, especially in data sparse region. For that reason, I don't see very much applicability of the results.

As the authors state, HS is a good-natured variable for gap-filling. This holds true for measurements in terrain where the presented stations are usually located and for continuous snow coverage and typical seasonal, continuous accumulation and ablation dynamics. Therefore, it is quite obvious that good results can be obtained using statistical interpolation methods (more or less regardless of type) using neighboring stations of similar elevation. Much more interesting would be an extension of the analysis to terrain characteristics (lateral snow redistribution, steep terrain, slope, aspect, i.e. small scale heterogeneity in mountainous terrain). This could be tackled by connecting the presented methods to stations clustered not only by elevation and distance, but also slope, aspect, etc. However, I see that this is probably not possible due to the stations located at "representative", flat, unobstructed terrain locations.

Regarding the results of dHS1, it would be interesting to see the same analysis for dHS10 or dHS5, i.e. a threshold for a snow day of 10 or 5 cm snow depth, as 1 cm is within a range of errors/uncertainties of all measuring and modeling methods. Probably the results will be much clearer using a slightly higher threshold.

As pointed out by reviewer 2, the study would highly benefit from an additional comparison to derivates or direct model values from, e.g. reanalysis products, which are readily available globally.

I support the idea raised in the other comments of including a table with particular strengths and weaknesses of the methods depending on the application and data availability.

Apart from the – in my opinion – rather low applicability of the presented results in other scientific use cases, the article presents a technically well performed study. The findings and conclusion are presented in a very clear and concise way.