

Author's response to RC2

This is a review of “A high-resolution snow dataset for Switzerland (2016–2025) combining physics-based simulations and in situ observations”. The authors present an existing model setup and assimilation scheme to produce a high-resolution snowpack dataset for 10 years.

It is an absolute delight to read a well written and essentially ready-to-go manuscript. A few minor nits, noted below.

My main criticism is that this should include the NWP met forcing data, so the study could be reproduced. This dataset immediately strikes me as a reference dataset for comparing other numerical models against. And in that context, this would require the input data. I realize there might be redistribution license issues with the forcing data. But, if possible, the inclusion would elevate this from “very cool” to “exceptional community dataset for model validation”.

I was able to download and spot check the data. The spot checked metadata looks good.

Thank you for taking the time and effort to review our manuscript.

Providing the necessary forcing fields at hourly resolution and 250 m grid spacing for the entire 10-year period would amount to approximately 2 TB of data, which is not practicable for distribution on a public repository. For that very reason, we have assembled a separate dataset specifically tailored to the needs of model validation, containing detailed observational data alongside NWP forcing data (Magnusson et al., 2025). This separate dataset is from a subdomain of the dataset presented here, featuring a particularly high density of monitoring sites and thus provides an even better testbed for model evaluation. We will mention this in the revised manuscript.

- L29: Add Canada and US example context

We will add Vionnet et al. (2021) and Godsey et al. (2018) as examples for observational datasets from Canada and the US, respectively. Should you have additional specific datasets in mind, we would welcome the suggestions.

- Figure 1: I realize this is just elevation. However, does the green regions correspond to the treeline? I, personally, find a low-bound of green problematic because it gives a sense of vegetation cover that may or may not be there. It would be excellent to have tree line noted in this figure

The green colors in the figures cover elevations up to about 2,000 m, which roughly corresponds to the treeline in Switzerland, ranging between 1,900 and 2,300 m (see red lines in Figure A and Szerencsits, 2012). Therefore, if the green shading is interpreted as vegetation or forest cover, this is not an entirely misleading impression. However, explicitly indicating the treeline in the figure could itself be misleading, given that only about 50 % of the area below the treeline is actually forest-covered.

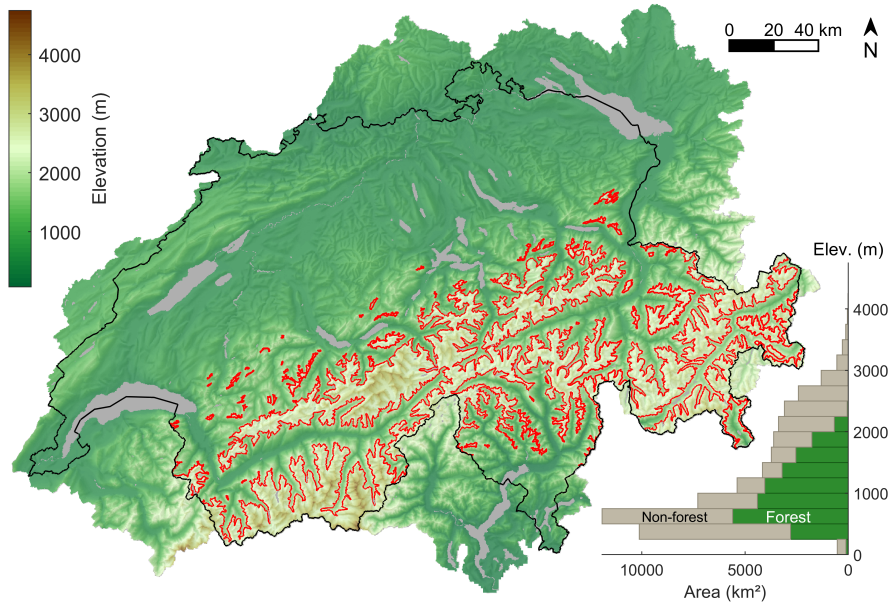


Figure A: Alternative version of Figure 1 in the manuscript showing the model domain. Red lines show a GIS-based approximation of the treeline from Szerencsits (2012).

Instead, we suggest only indicating the forest-covered fraction within the hypsometry plot, as shown in Figure A.

- L98 I don't think m a.s.l requires the a.s.l

We will remove “a.s.l.” throughout the manuscript.

- L102 & L105 Why is Alpine caps? Is it a proper name? If it is, place a map marker in Fig 1 as I don't know where this is.

Alpine with capital A refers to the European Alps, in contrast to *alpine*, in the more general sense of *mountainous*. Hence, it is a geographic reference, but not a single place which could easily be indicated on the map.

- L135 OSHD = define here

The acronym OSHD stands for Operational Snow Hydrological Service and is defined in the introduction at Line 63, where it first appears. We acknowledge that this definition may be easily overlooked and therefore suggest reintroducing the acronym in the first sentence of Section 2 (Line 90).

- L140 “period of 24 hours” is this during the model run? Or some other analysis that uses a constant parameterization in the model

Fresh snow density measurements are manually taken at select locations by measuring the depth/volume and weight of snow accumulated on an artificial surface

(snow board) over the past 24 hours (see e.g., Fierz et al., 2009; Haberkorn, 2019). Hence, we cannot tune directly for fresh snow density but must also account for settling over the 24-hour period. We acknowledge that the sentence was unclear and will revise it in the manuscript.

- L176 “PF-based” for the heading I would not use the abbrv and would write out Particle Filter

We will do as suggested.

- L192 In the context of the distributions, it would be good to state explicitly which dist is used for each variable

We will do as suggested and add the distribution parameters (μ and σ) for the three perturbation prior distributions.

- Figure 5 (and surrounding) how is frozen soil infiltration estimated?

Snowmelt runoff in our model is the meltwater leaving the base of the snowpack, without considering soil processes or what happens to the meltwater once it leaves the snowpack. We will add a proper description of the snowmelt runoff variable to the manuscript.

- L299 is having these data in UTC+0 possible? How is DST handled? A fixed reference UTC+0 would make this easier to ingest (for model inter comparisons)

The operational service runs on UTC+01, which corresponds to local time in Switzerland for the majority of the winter season. Timestamps in the dataset are provided with explicit time zone information, allowing straightforward conversion. Note that UTC(+XX) timestamps do not account for daylight saving time. Furthermore, since only daily values are provided, the precise timestamp is of limited practical importance.

- L308 Remove extra space in EPSG: 2056

We will do as suggested.

- L330 I strongly think that if at all possible, the input NWP fields should be included

As discussed in our general response, providing all forcing fields at hourly resolution and 250 m grid spacing for the entire 10-year period would amount to approximately 2 TB of data, which is unfortunately not practicable for distribution on a public repository.

References

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