

Reply to RC3 (Author Comment on [essd-2021-68](#))

Thank you for reviewing our manuscript and your very valuable comments and suggestions. We address your remarks in the following point by point (response in blue).

Anonymous Referee #3

Referee comment on "Operational and experimental snow observation systems in the upper Rofental: data from 2017–2020" by Michael Warscher et al., *Earth Syst. Sci. Data Discuss.*, <https://doi.org/10.5194/essd-2021-68-RC3>, 2021

General comments

The authors present an extension of their previous ESSD publication that focuses on automated meteorological and snowpack observations collected in an alpine environment in Rofental, Austria. The authors followed the ESSD living data process to guide this manuscript, and accordingly nicely focus on extensions of the time series, instrumentation upgrades, and descriptions of some new instrument installations that offer additional insights into snow cover processes. I found the article easy to follow and was able to download and plot some of the data relatively easily, suggesting this data is readily accessible for future research applications. However, I did find some of the data incomplete and lacking a proper description of errors and uncertainties (see comments below).

We address the mentioned incomplete description of errors and uncertainties at the respective comments in the following.

Specific comments

Based on Fig. 6 it looks like some of the snow depth and SWE measurements have some missing values. Please specify why in the text.

Yes, it is true that there are missing values in snow depth and SWE measurements, mainly because of intermittent data logger failures. We added a respective explanation to the text.

Overall the text is light on descriptions of the uncertainties in the measurements, with only the instrument resolution listed in the tables. The paper would benefit from better discussion of sources of error.

Where possible, we added a more in-depth uncertainty discussion for SWE, the SPA and for the snow drift measurements. Due to the inaccessibility of the stations for longer periods during most of the winter time we were not able to do, e.g., manual measurements for comparison (please see also answer to Reviewer 1). However, we state more clearly now which measurements are potentially prone to larger uncertainties.

Some of the time series for the new sensors are relatively short in duration, such as the snow measurements at Proviandepot. It would make sense to include data from the entire 2020-2021 winter season now that it is mostly completed.

While this would be possible, we decided together with the data curators of PANGAEA to annually upload the data (calendar year) to keep the file structure consistent, and in order to stay consistent in the continuation of the PANGAEA data time series repository.

When downloading the tab-delimited data I found it difficult to work with the column headers because the variable name, units, and method/device details were all in the same cell. If working with a scripting language like R or Python it is much easier when the columns can be indexed with short concise name, in which case the units and descriptions could be on their own rows. That being said, I am not familiar with the standards and limitations of the PANGAEA data platform.

We fully agree on this. However, we are following the standards of PANGAEA in this. The advantage is that all metadata is included in the file.

Technical comments

Line 118: Please define the acronym "GSM"

The sentence now reads "... transmitted by means of mobile network GSM (Global System for Mobile Communications)".

Lines 155-157: Please provide more description of the SPA instrument, and how it can be used to calculate density and SWE as later shown in Fig. 9.

We now provide an in-depth description of the SPA instrument, its measurement principle and performance, and we added the respective references.

Line 167: By "daily values" I assume this means daily averages.

Yes, with „daily values“ we mean daily averages for temperature, humidity, radiation, and wind speed. To avoid misunderstandings, we changed the wording to:

"Daily averages are shown for air temperature, relative humidity, short-wave radiation, long-wave radiation, and wind speed, as well as monthly totals for precipitation."

This wording is also applied to the caption of Fig. 5.

5 and 6: These plots are missing the subplot labels (a-f)

Thank you! We added the missing subplot labels in Fig. 5. In Fig. 6 they are already included.

Fig 9: Would it be more logical to move snow depth from subplot (d) to (a) since it is the first plot discussed in the text?

We arranged the order of the subplots according to their importance, the SPA recordings hence being positioned at the very beginning.

Line 301: Can you provide an actual distance instead of "in close proximity"

We measured the distance (appr. 800 m horizontal distance) and added it to the manuscript.

Table 4: I don't understand the need for the final 2 rows in this table since they simply repeat the same values. It's also unclear why some values are in italics. Perhaps the 6 unique values presented in this table could simply be stated in the text, along with an explanation of how they relate to each other.

We intended to make the comparison clearer with the table, but it obviously creates more confusion than needed (see also comments from other reviewers). Hence, we decided to remove the table and state the values with an explanation in the text according to your suggestion. Thank you!

Fig 13: The caption description of the avalanche should use proper avalanche terminology. The edges are called 'fracture lines' with the one along the top called a 'crown' and the ones along the sides called 'flanks'.

We changed the terminology accordingly.