Reply to RC4 (Author Comment on essd-2021-68)

Thank you for reviewing our manuscript and the valuable suggestions and remarks. We address all issues and questions in the following (response in blue).

Anonymous Referee #4

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-RC4, 2021

General comments:

The manuscript 'Operational and experimental snow observation systems in the upper Rofental: data from 2017-2020' by Warscher et al. provides a description of different types of continuously recorded snow and meteorological datasets - using standard as well as experimental sensors - collected at three sites in the Rofental in the European Alps. The manuscript is an extension of the ESSD paper 'The Rofental: a high Alpine research basin (1890–3770ma.s.l.) in the Oetztal Alps (Austria) with over 150 years of hydrometeorological and glaciological observations' by Strasser et al. 2018.

Although the title and the abstract imply that all data has been available since 2017, a closer look reveals that some datasets do not start before 2019 or even 2020. In addition, data gaps are an issue that has not been discussed in detail. I agree with Reviewer 2 that the covered time period for some recordings (especially for the unique experimental snow measurement setups) is too short for publication at current state. Therefore, I also recommend waiting some more years and collecting a longer time period of data before publication.

We here repeat the statement and our opinion on this issue that we gave to Reviewer 2: we agree that the three years (and in some parts even less) of data are a comparably short time slice and do not represent a long-term climatological period. The aim of the manuscript, however, is to follow the principles of the ESSD 'living data process' (https://www.earth-system-science-data.net/living_data_process.html) of continuous data documentation and to describe and document the state of the measurement network including the new and innovative sensor techniques. Particularly the newly installed sensors allow for addressing research questions intensely discussed at present (e.g., the quantification of snow drift using the innovative snow drift sensor at Station Bella Vista; this process representing the origin of massive lee-side snow loads which triggered a deathly avalanche in December 2019). Hence, our intention is to present our techniques, data and results to the scientific community as soon as possible. The station network in its current state will be maintained and further continue to record data in the described setting and we will continue to upload the data to the PANGAEA repository.

Concerning the data gaps, we added some more details in the text of the manuscript. Here we repeat our argumentation for Reviewer 2 as he raised the same issue: it is true that there are gaps in the dataset. The presented stations are located at very remote and exposed high-alpine locations, two of them only accessible by helicopter during most of the winter time. We permanently do our best to maintain the systems and keep everything running, however logger failures can occur which cannot always be fixed immediately. We decided not to apply gap filling methods, but provide the raw data with only some basic error filtering. If and how the gaps should and can be filled is depending on the application

In general, I agree with the general and specific issues raised by Reviewer 1 and 2 as well as the specific/technical comments raised by Reviewer 3 and will not repeat them here again. In particular, information on assessment data quality should be included.

We included a brief description of the data quality assessment in the manuscript. The issues of the other Reviewers are addressed in the respective Author comments / answers to the reviewers.

However, I see good potential for publication in a few years (i.e. after extending the dataset for approx. two more years: 1) There is a great need for standard and experimental continuous snow monitoring datasets that cover longer periods in high-alpine regions, as such datasets are still very sparse. 2) The Rofental research catchment seems to be an ideal site for glacier, snowpack and hydrological model applications and developments, especially since the basin is not influenced by hydropower structures.

Thank you for this statement, please see our comment above on the length of the presented time series; we follow the principle of the ESSD 'living data process', our manuscript is intended to be the second publication in a continuous series.

As the authors are focusing on datasets for snow observation, it would be wise to include and describe also the other snow measurement sites in the Rofental research basin (stations Hintereisferner and Vernagtbach) in this manuscript, although they were already introduced in Strasser et al. 2018. Adding these two sites in the manuscript would make the multi-station dataset even more valuable.

We included reference to these two stations in Section 4. The respective data recordings will be published in a next joint publication.

I agree with Reviewer 3 that the data provided on the PANGEA platform was easily accessible and, except for the data gaps, was complete as described in the manuscript.

Thank you for checking the data at the PANGAEA repository!

Specific comments:

L. 2: The altitude of the research basin might be of interest for the reader; however, as you describe the data sets of specific measurement sites, the altitude of these sites would be at least as interesting to mention.

Thank you for the suggestion, we added the elevations of the specific sites to the abstract.

3: The expression 'original' (which is written twice in this line) seems strange in this context and implicates your work is somehow not original. Better change to: 'The dataset of our first study published in 2018 (https://doi.org/10.5194/essd-10-151-2018) contains... The time series presented here...'

We changed the sentence according to your suggestion.

Section 1: Please add some information on similar sites and studies (i.e. Ménard et al. 2019, https://essd.copernicus.org/articles/11/865/2019/).

Thank you for the valuable suggestion, we added these similar studies to the introduction (Lejeune et al. 2019, Ménard et al. 2019; Morin et al. 2012).

Lejeune, Y., Dumont, M., Panel, J.-M., Lafaysse, M., Lapalus, P., Le Gac, E., Lesaffre, B., and Morin, S.: 57 years (1960–2017) of snow and meteorological observations from a mid-altitude mountain site (Col de Porte, France, 1325 m of altitude), Earth Syst. Sci. Data, 11, 71–88, https://doi.org/10.5194/essd-11-71-2019, 2019.

Ménard, C. B., Essery, R., Barr, A., Bartlett, P., Derry, J., Dumont, M., Fierz, C., Kim, H., Kontu, A., Lejeune, Y., Marks, D., Niwano, M., Raleigh, M., Wang, L., and Wever, N. (2019). Meteorological and evaluation datasets for snow modelling at 10 reference sites: description of in situ and bias-corrected reanalysis data, Earth Syst. Sci. Data, 11, 865–880, https://doi.org/10.5194/essd-11-865-2019, 2019.

Morin, S., Lejeune, Y., Lesaffre, B., Panel, J.-M., Poncet, D., David, P., and Sudul, M. (2012). An 18-yr long (1993-–2011) snow and meteorological dataset from a mid-altitude mountain site (Col de Porte, France, 1325 m alt.) for driving and evaluating snowpack models, Earth Syst. Sci. Data, 4, 13–21, https://doi.org/10.5194/essd-4-13-2012.

58-60: As you are describing snow drift measurements in detail (Section 4.2.4), I would recommend to introduce this point already here, i.e. extending point I to : I) Improved process understanding of snow drift, accumulation and melt dynamics in high mountain regions.

We changed the sentence according to your suggestion.

92-93: Information on topography and meteorological conditions of the research site should be moved to Section 2.

Yes, we fully agree. We moved the information to Section 2.

Section 3.1 and 3.2: Several statements (especially the site descriptions, coordinates) are repetitive. I would suggest merging these two subsections and describing each site individually introducing their meteorological and snow sensors together in one subsection.

That is true, we followed your suggestion and merged the two sections.

Section 4.2.4: This section is very long compared to the other subsections of 4.2. I would suggest to describe the snow drift measurements in general in this section and move the explicit case study to a new section (i.e. Section 5: Case study - Application of the dataset for an improved assessment of avalanche-critical blowing snow situations).

Thank you for the suggestion! We included a new section for the avalanche case study.