Review of:

The S2M meteorological and snow cover reanalysis over the Frenchmountainous areas, description and evaluation (1958 - 2020)

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Major comments:

This is a paper about a very useful, unique and high-quality snow cover data set in mountain regions in Europe, which is relevant for researchers as well as various applications. The uniqueness of the data set lies in the full physically based information on snow cover properties. It is clearly worth publishing in ESSD. In fact, it contain even more than data on snow cover properties in a consistent manner (as snow cover is derived from a set of atmospheric driving variables), which are also part of the publication. Data are generally well described and presented. My comments are mainly related to the data evaluation/homogeneity and the description of the data set.

Data are derived from re-analysis simulations by well described unique models (SAFRAN for atmosphere and CROCUS and MEPRA for snow cover) originally forced by ERA-40 and ARPEGE. All models used are well described by peer-reviewed publications and are thus perfectly suited for the purpose of the application. Although the used approach of doing simulations at a spatial scale of mountain massifs results in some loss of spatial information, this is a suitable approach.

Data evaluation and data homogenmeity:

Driving data of re-analysis are both ERA-40 and ARPEGE. Additionally, e.g. precipitation data are used as guess for data assimilation which are based on AURELHY interpolation for period 1958-2017 and on ARPEGE thereafter (as ARPEGE is only available from 2017 onwards). All these changes cause (or at least could cause) inhomogeneities in the data series. Even if this inhomogeneities cannot be removed in the reanalysis, their effect should be discussed and if possible quantified (e.g. showing differences for precipitation between AURELHY and ARPEGE).

Interestingly, the temperature trend of the S2M reanalysis seems to be rather week over the period 1958-2020. This seems to be significantly weaker if compared to other data sets (as also mentioned in the paper). Are the trends described significant? It could be useful for the reader to see these differences in the trend curves in the figure (e.g. Fig. 5).

Data presentation:

The description of the S2M data set should generally be somewhat more detailed (see also the examples under "Minor Comments"). It should also be considered that non-meteorologists potentially want to use the data set and therefore the description of the metadata of the variables should be as detailed as possible.

Minor Comments:

Overall, be more specific with describing surface variables. E.g. is surface temperature 2m-temperature (which is used as term several times but not in all cases, is this something different then)?

Figures 3 and 4 as well as in the related text: Even though explained in the text, the terms “available” and “used” number of observations are misleading (as the number of used is higher compared to available). Suggest using other terms here.

Table at page 6 (which has no number, but should have one): Which variable is used for 300hPa? Which variable is measured at 10m? Which variable is measured at 1500m (again rel. humidity)? Be more specific as in table 2.

Figure 6: Why having a scale between 0 and 240 when values in the figure are much smaller?

4.2.3 is on trends of temperature and precipitation. However, related Figure 11 does not show trends but differences. Additionally, difference of total precipitation is in kg/m^2 which is not a unity of precipitation used frequently (suggest to change).

3.1.2 introduces the snow cover and soil variables. I could imagine that information on snow temperature could be useful as well. Please include the time reference (e.g. UTC) of variables.

Figure 8: Why has the trend of fraction of solid precipitation such strong increase for SON (and only for SON)? Additionally, be consistent between the figure and the figure caption by either showing trends or differences. Given that there is also an increase of precipitation and decrease in air temperature (for all elevations) for SON over 1960-90 to 1990-2020, I would expect also stronger increase for snow depth.

Figure 11: The S2M assimilation shows a clear elevation dependency of max. temperature change for 1960-90 vs. 1990-2020 for JJA, however not visible in station observations. Could be worth mentioning this EDW effect in the text.

4.3 evaluated snow depth observations: Given its relevance, it would be good to see how trends of snow depth are captured by the S2M reanalysis (compared to the independent station data).