Earth Syst. Sci. Data Discuss., referee comment RC1
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# Comment on essd-2022-248

Anonymous Referee #1

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Referee comment on "IT-SNOW: a snow reanalysis for Italy blending modeling, in situ data, and satellite observations (2010–2021)" by Francesco Avanzi et al., Earth Syst. Sci. Data Discuss., https://doi.org/10.5194/essd-2022-248-RC1, 2022

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This paper employed an S3M model to blend multi-source in situ data and satellite observations to produce a spatially explicit and multi-year reanalysis of snow cover patterns across Italy at 500 m resolution. After validating with C-SNOW products, in situ measurements, and annual streamflow, this product has been proved effective, and could be potentially used in better understanding the contribution of snow on water resource management.

Despite of its significance, several issues still need to be resolved before a publication to ESSD. More detailed introduction about how to produce snow cover area from multi-source remote sensing images, and how to produce the reliable snow depth maps over the entire study could be sufficiently explained. In addition, it is suggested to add more indexes to validate the output snow estimates. Besides, the figures should be further refined so as to improve the overall presentation.

**Other comments and suggestions:**

- Figure 1, the schematic of S3M was too simple, it is difficult to understand the key model/method, the data flow, and the output data.
- P115-116, please provide the elevation gradient for air temperature when you interpolated in situ air temperature.
- P125-135, the snow covered area used in S3M model are produced from Sentinel 2, MODIS, and H-SAF initiatives. How did you produced snow cover area from Sentinel 2? How did you preprocess the MODIS and H-SAF data? Have you filled up the data gaps caused by cloud cover? How to fill the data gaps? How about the accuracy of the blended snow cover area products?
- Figure 2-4, and 8, please add scale bar and change the color of latitude and longitude grids from black to white or gray. It is difficult to identify detailed numerical value from current stretch effect of color bar.

- P145-155, the in situ stations are primarily distributed in north areas in Figure 2 (a), so how did you produce the reliable snow depth maps over the entire study area? How about the overall accuracy of the daily snow depth maps over the entire 10 homogeneous regions? If some of the homogeneous regions are lack of snow depth data, how about the final output after running the S3M model for these regions?
- Figure 3, please add legend for (a); it is cannot see NaN class (in orange color) from (b); add scale bar for (a)-(c).
- Figure 4, why did not show the results over the entire study area?
- For the validation results, please also add Mean Absolute Error, Positive Mean Error, Negative Mean Error, and R Squared.