

Earth Syst. Sci. Data Discuss., referee comment RC1
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Comment on **essd-2022-134**

Anonymous Referee #1

Referee comment on "HMRFS-TP: long-term daily gap-free snow cover products over the Tibetan Plateau from 2002 to 2021 based on hidden Markov random field model" by Yan Huang et al., Earth Syst. Sci. Data Discuss., <https://doi.org/10.5194/essd-2022-134-RC1>, 2022

This paper generated long-term daily gap-free snow cover products in the Tibetan Plateau over the past two decades by optimally integrating spectral, spatiotemporal, and environmental information within a Hidden Markov Radom Field model. From the report of this paper, the accuracy of the new snow cover products was greatly improved during the snow transitional period and over complex terrains as well as sunny slopes.

As a spatiotemporally continuous and high-quality snow cover product is essential for cryospheric science, the produced long time-series daily snow cover product could be a significant dataset for understanding climate change and the water cycle over the Tibetan Plateau. The paper is scientifically sounding. Despite its significance, several issues still need to be resolved before a publication to *ESSD*. The introduction about the GPU-accelerated model, and why you chose this sample area to illustrate the snow cover percentage obtained from your daily snow cover products and MODIS 8-day composite products could be sufficiently explained. Besides, the total accuracy, omission error, and commission error of your new snow cover products should be compared and discussed with the accuracy reported by other studies. In addition, some figures need to be revised.

Detailed comments and suggestions:

- L40, which rivers are there, please give specific examples.
- L75, the abbreviation of HMRF is already defined on L66 and does not need to be defined again.
- L91, the numbers here appear to be inserted as formulas.
- L91-95, the importance of the Tibetan Plateau as a water tower in Asia and the importance of snow in it should be highlighted.
- Figure 1, change the frame color of the sample area, as its color is very close to the color of the stations.

- In figure 3, some text overlaps with the frame, please check and revise.
- L192, change "snow product is" to "snow products are".
- Line 222, the authors stated that they used a GPU-accelerated model. It is suggested to provide more detailed information about the GPU configuration.
- L255-290, can the authors compare the total accuracy, omission error, and commission error of new snow cover products with the accuracy reported by other studies?
- L291, please add the definition of "snow year".
- L295-296, it is suggested to use the threshold of 90% of overall accuracy to summarize the status of monthly accuracy.
- In figure 4, figure 5, figure 6, and figure 7, you should provide the improvements of OA, OE, and CE of your new snow products.
- Figure 7, change "91.14a" to "91.14".
- L375, explain why you chose this sample area to illustrate the snow cover percentage obtained from your daily snow cover products and MODIS 8-day composite products?