

Earth Syst. Sci. Data Discuss., referee comment RC2  
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## Comment on **essd-2021-189**

Anonymous Referee #2

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Referee comment on "The NIEER AVHRR snow cover extent product over China – a long-term daily snow record for regional climate research" by Xiaohua Hao et al., Earth Syst. Sci. Data Discuss., <https://doi.org/10.5194/essd-2021-189-RC2>, 2021

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This paper employed a multi-level decision tree algorithm to detect cloud and snow based on AVHRR SR V4 data, then combined the HMRF-based spatio-temporal modeling technique and the snow-depth interpolation method to fill data gaps gradually. It produced a daily NIEER AVHRR SCE product with a spatial resolution of 5 km over China from 1981 to 2019. This product was validated using in situ snow depth measurements and SCE maps derived from Landsat-5 TM.

Since the cloud and snow confusion, as well as data gaps caused by cloud are common and occur often when mapping daily snow cover extent from optical sensors, techniques to solve these problems are valuable. The presented processing scheme is able to improve the quality of snow cover detected from AVHRR data. The produced long time-series snow cover extent product could be a significant dataset for studying climate change over China.

Despite of its significance, several issues still need to be resolved before a publication to ESSD. The quality control of AVHRR, why Landsat maps could be the true values to validate the cloud samples from AVHRR maps, and the three levels decision tree in flowchart could be sufficiently explained. In addition, it is not necessary to define a weight in HMRF modeling, since only one energy source was used in this study. Besides, the English of this paper should be further refined so as to improve the overall presentation.

**Other comments and suggestions:**

1. P1, Abstract, change "15 percent" to "15%".

2. P2-3, it is suggested to provide a summary table of the mentioned SCE products, which lists the begin/end time, spatial resolution, temporal resolution, institution, produced methods, referenced paper, and download link.

3. Figure 1, it only shows 7 Landsat sensors for validation. Change "Landsat Snow Maps" to "Landsat sensors for validation".

4. P6, it is not clear that how to deal with these night/ dense dark vegetation /sunglint/ water/ cloud shadow/ cloudy/ unused pixels, according to the quality control information.

5. P6, this paper used Landsat maps as the true values to validate the cloud and snow samples from AVHRR maps at the same days. It is okay for snow samples. However, for cloud samples, it depends on the overpass time of two satellites, since cloud can change in a quite short time period. Please provide more explanation.

6. Figure 2, it is not clear for the three levels decision tree. For example, how about the hierarchical relationships among them? How about the input and output for each level?

7. Figure 3, it is suggested to change the text color of "snow" to green, and that of "cloud" to orange.

8. Figure 4, it is suggested to change the text color of "snow" to green, and that of "Non-Snow" to brown.

9. P9, the original HMRF snow framework integrates spectral information, spatio-temporal information, and environmental information to reclassify snow and non-snow classes. The total energy function includes each energy source and its optimal parameters to minimize the total energy function. Among them, the parameter indicate the contribution of corresponding energy source. The original HMRF modeling technique employs a cubic spatio-temporal neighborhood to represent the combination influence from temporal context and the spatial context, which is effective to fill the overwhelming majority of data gaps in MODIS snow cover products. This research only used the spatio-temporal information, it is not necessary to define a weight for one energy source, as shown in equation 3. It is suggested to replace it by the spatio-temporal cubic energy function.

10. P10-14, it is suggested to add some more thorough analysis and discussion. For example, the accuracy over North Xinjiang, Qinghai-Tibet Plateau, and Northeast China, the accuracy over different land cover types, as well as analyses and discussion with previous studies.

11. Table 2, change "Year" to "Time period".

12. Table 4, change "DEM<300" to "DEM≤300". Please provide more detailed information about the cloud detection and the corresponding thresholds. What are the clues to divide

the Target A into A1-A4 and to divide Target B into B1-B10? All threshold were determined by tests?

13. Table 5, please provide more information about the threshold values. How were they determined?

14. Table 10, the snow column of JASMES SCE should be near the Non-snow column of JASMES SCE.