Comment on hess-2021-556

Anonymous Referee #4

Referee comment on "Development and validation of a new MODIS snow-cover-extent product over China" by Xiaohua Hao et al., Hydrol. Earth Syst. Sci. Discuss., https://doi.org/10.5194/hess-2021-556-RC4, 2022

This manuscript develops a novel method of creating seamless snow cover extent (SCE) data for China. The novelty of this study is significant in that there is currently no other dataset of SCE with such a long time series and quality (e.g., a full spatiotemporal continuity at 500m and daily resolutions, sufficient evaluations, and accuracy) that can be comparable with here developed. The improvement of performance in forested areas is also impressive. I have some minor concerns as follows.

- Landsat-8 OLI data are used as training data in this study, however, how were they processed as reference SCE data? By manually vectorizing or also using an NDSI-like method? This process of course has uncertainties that should be mentioned.
- Why were two groups of Landsat-8 snow maps used for training Terra and Aqua separately? I do not think the overpass time is a good reason for explaining this because most Landsat-8 data are in the morning which is closer to Terra. This could also be an uncertainty for training Aqua data.
- I am a bit confused by Table 2 because there are several duplicate land cover types in the first column and some types with multiple rows. It can be improved to be clearer.
- In section 2.4, I recommend adding more explanations for the use of station observations. I can understand that the station data were used as they were totally free of the effects of cloud blockage. However, for some readers, this could be confusing when Landsat8 snow maps were already used as reference.
- For section 3.1.4, the use of ERA5 LST could be a (possibly not big) problem or not optimal. The MODIS standard product uses MODIS LST with a high resolution of 1km in the aid for temperature screening, however, ERA5 only has a coarse resolution of 0.25° which is much larger than the pixel size of MODIS SCE data.
- In Figure 7, the microwave-based snow depth data are suggested to be additionally plotted against other data. It can be seen in Figure 7 that there are large data gaps in both Terra and Aqua snow map on that day and the microwave-based snow depth data could provide valuable reference data of snow in those areas.
- The English writing has a large potential to be improved.

Typo errors:

Lines 65-66: please add a reference

Lines 133-138: the two paragraphs could be combined to reduce duplications

Line 154: NDIS should be NDSI

Line 213: gas should be gap?

Line 300. Terra? I guess you'd like to say Aqua?