This paper produced a new MODIS snow cover product over China. This product includes Terra SCE and Aqua SCE datasets, as well as a cloud-gap-filled SCE dataset. Validation against with in situ snow depth measurements, these products show obvious improvements than standard MODIS SCE products. The produced 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 possible publication to HESS. 1) OLI snow product is very important for optimal NDSI thresholds, and how do you obtain them? You should describe it more sufficiently; 2) Organization of the paper should be improved, especially section 3. I am confused by the first two paragraphs of section 3. Why you introduce how to obtain the samples here? I think maybe putting them in section 2 is better. More importantly, you should show a flowchart first in section 3.1. Otherwise, it is difficult for readers to understand how you will produce SCE from MOD09GA or MYD09GA. There is a same problem for section 3.2. I would suggest you reorganize this section. 3) Some minor errors that may need to be modified are listed as follows.

Response：Many thanks for your reviewing. We will try our best to modify the manuscript according to your comments and suggestions. About the first suggestion, we have added a sentence to simply introduce how we obtain the OLI snow products. that is "*The first group is derived from 1509 scenes of OLI images, which will be regarded as "true" values to acquire the Terra-MODIS training samples; and the second group comes from 1648 scenes of OLI images, which will be used to acquire the Aqua-MODIS training samples.*

These snow maps are generated by the improved "SNOMAP" algorithm developed by Chen et al. (2020), and have a spatial resolution of 30-m." in the revised manuscript.

About the second suggestion, it is really very good, and we have reorganized the manuscript following your detailed advices. First, we have deleted the contents of how to obtain the samples (first two paragraphs) in section 3, but added them into section 2.2. Please see the new section 2.2, "Landsat-8 OLI snow maps and MOD09GA \ MYD09GA training samples". Second, we reorganized section 3.1 and section 3.2. This time, we first present the flowcharts, and then give the key steps. Please see the blow paragraphs in the revised manuscript.

Guided by the algorithm of the MODIS standard snow products (Hall et al., 2002; Riggs et al., 2006; Riggs et al., 2016) and our motivations that are mentioned in section 1, we develop a new snow discrimination algorithm for clear-skies which is shown in figure 1. Approximately, it contains four steps to finally determine snow-cover conditions from MODIS clear-sky surface reflectance data. The very first step is preliminarily screening with the purpose of precluding the cases that are impossibly covered by snow completely. The second step provisionally determines snow-cover conditions over non-forest land-cover types using the optimized NDSI thresholds; while the third step determines snow-cover conditions over forest land-cover types through importing a new decision rule. Step four is postprocessing based on surface temperature and DEM, which is designed to reverse those false snow pixels determined by the previous two steps into snow-free pixels. Among these steps, step two and three are crucial for snow discrimination under clear skies, and will be emphasized in the paper.

Figure 5 describes the flow of the new cloud-gap removing algorithm we developed in the study. It

can be divided into three steps. The first step is preliminarily excluding some cloud gaps by the synergy of Terra-MODIS and Aqua-MODIS; the second step is further filling gaps according to the implication of the nearby clear-sky pixels using Hidden Markov Random Field (HMRF) technique; and in step three all left gaps will be filled using the auxiliary passive microwave product. Here the step two is crucial, and will be underlined in the paper.

For more modifications, please see the new manuscript. In a word, we have adjusted and revised the manuscript following each your comments. Obviously, after these modifications the manuscript is more readable and easier to understand. Thank you again!

With respect to suggestion 3, please see the following detailed responses.

Minor comments and suggestions:

1. Line 48-55: People who are unfamiliar with MODIS snow products may be difficult to understand your introduction on these products. I would suggest you give a clearer description.

Response: Thanks for your suggestion. We have revised this description. Please see the sentences "*The National Snow and Ice Data Center (NSIDC) routinely produces and continually updates the standard MODIS snow products. Before the C6 version, there were only two sets of standard snow products — MOD10A1 and MYD10A1, which provide conventional SCE information just under clear skies. Since there are abundant cloud-induced gaps in the products, they in fact can not give the complete SCE knowledge. This is an obvious flaw for which reason the previous standard products were criticized most (Liang et al., 2008). As such, among the latest C6.1*

version that is released very recently another two sets of new cloud-gap-filled (CGF) products, MOD10A1F and MYD10A1F, are introduced and generated (Hall et al., 2019). But as of now, this update has not been completed, and these products are only available in some years." in the new manuscript.

2. Section 2.1 line 88-93: You should introduce the MOD09GA, MYD09GA and MCD12Q1 concisely.

Response: Done. Thanks. Please see the new paragraph in section 2.1.

MODIS products we use as the input data to generate new SCE data include: MOD09GA, MYD09GA, and MCD12Q1. MOD09GA and MYD09GA are the standard land surface reflectance products that are derived from Terra MODIS and Aqua MODIS, respectively, after the so-called atmospheric correction. They provide us the 500-m land surface reflectance from MODIS band 1 to band 7, as well as the mask information (e.g., cloud and water masks), and are our main inputting data. MCD12Q1 is the Terra\Aqua composite land-cover-type product, providing us the annual land-cover information that is generated according to the International Geosphere Biosphere Program (IGBP) land cover classification system. In the study, it is another important input which is used to indicate the detailed land cover types. For all of the three products, the newest C6.1version is adopted.

3. Section 2.2: See the first suggestion. A simple introduction on the OLI snow maps is definitely needed.

Response: Done. Thanks.

4. Section 3. 3.1.1 line 130-138: Preliminarily screening, it is repeat for the last two

graphs.

Response: They appear similar but are different. We have reorganized them. Thanks!

As mentioned just, the purpose of the preliminarily screening is to preclude the pixels that are impossibly covered by snow completely. Snow has the distinct spectral characteristic relative to other common land cover types. Generally, its reflectance is high in the visible spectrum, but rapidly drops in the infrared spectrum. As done by the standard MODIS snow products (Riggs et al., 2006), we can use the combination of MODIS band 2 and 4 within the visible spectrum, and band 6 within the infrared spectrum to preliminarily screen out the pixels that must be snow-free, but keep all possible snow pixels (even with a very low possibility) for a further discrimination.

For that purpose, we investigate all available snow samples, and find for Terra-MODIS more than 99% of the snow samples are constrained in the condition of band 2≥ 0.15, band 4 ≥ 0.05, and band 6 ≤ 0.45 . Therefore, the preliminarily screening rule of the Terra-MODIS is adjusted into: all possible snow pixels must meet the condition of band 2 ≥ 0.15, band 4 ≥ 0.05, and band 6 ≤ 0.45, and pixels that do not meet will be identified as snow-free immediately. Similarly, for Aqua-MODIS 99% of the snow samples are constrained in the condition of band 2≥ 0.12, band 4 ≥ 0.07, and band 6≤ 0.40 . The preliminarily screening rule of the Aqua-MODIS is set into: all possible snow pixels should meet this condition, and pixels that do not meet will be deemed as snow-free immediately.

5. Section 3.1.2 line 154: Optimized NDSI thresholds, "However, as expected, only using the NDIS criterion seems not accurate enough to discriminate snows over

those forest land-cover types, except the "Evergreen Needleleaf Forest" (due to its sparse distributions in China)." Change "NDIS" to "NDSI"!

Response: Sorry, there is an obvious clerical error. We have corrected it!

6. Section 3.1.4: Postprocessing based on surface temperature and DEM, how to determine the threshold of surface temperature screen?

Response: The threshold of surface temperature is determined according to our previous investigation (Hao et al., 2021). For lowlands of DEM < 1300 m snow at the surface basically impossibly exists when their temperature is ≥ 275 K (2 degrees Celsius); but for highlands of DEM ≥ 1300 m, a higher temperature threshold, 281 K (8 degrees Celsius), seems more appropriate due to possible existences of warm snow on highlands.

Hao, X. H., Huang, G. H., Che, T., Ji, W. Z., Sun, X. L., Zhao, Q., Zhao, H. Y., Wang, J., Li, H. Y., and Yang, Q.: The NIEER AVHRR snow cover extent product over China – a long-term daily snow record for regional climate research, Earth Syst. Sci. Data, 13, 4711–4726, doi:10.5194/essd-13-4711-2021, 2021.

7. On Figure 2, please provide the full name of Figure 2.

Response: Done. Thanks.

8. Section 3.3.2, line 230: “For the aggregated SCE data”-> “For the aggregated SCE”.

Response: Done. Thanks.

9. Section 4.1: Confuse matrix is a commonly-used tool to evaluate the products relevant to classes. It seems this section is unnecessary.

Response: Thanks for your advice. But if the confuse matrix is deleted here, it is really difficult to understand table 4, 5 and 6. More importantly, here a metric termed as “bias” is introduced, which is not a commonly-used index in the literature. Therefore, we keep the confuse matrix, but delete the headline of “4.1 Accuracy metrics”.

10. Section 4.3, line 268-270: This may be attributed to different snow/non-snow number distributions in nature among different years, and varying sample numbers caused by different ground measurements available in different years. I cannot understand “different snow/non-snow number distributions in nature among different years”.

Response: Thanks. We have deleted these words.

11. Section 5.2, line 325-335: for the two examples, are they all covered by forest?

Response: Yes, they are all covered by forest. The first one is about 20km*20km, and the second one is about 50km*20km.

12. Line 355: During our validations or comparisons, we found this phenomenon is somewhat common in the edges of snow-cover areas and the forest areas of Northeast China. Very awkward sentence. Please consider revising it.

Response: This sentence really seems abrupt here because there is not a background introduction before. Therefore, we have deleted it. Thanks for your advice.

13. Section 6, line 345: finally, a totally cloud-free SCE is mapped through replacing the residual gaps with auxiliary passive microwave snow-depth data. Is “finally the residual gaps are all filled according to the implication given by a auxiliary

passive microwave snow-depth dataset" better?

Response: Done. Thanks.

14. Section 6, line 350: "by a series of processes filling cloud-induced gaps". It seems wordy here because you just mention them in the above paragraph!

Response: We have deleted these words. Thanks.