

This study proposes a new MODIS snow-cover-extent product over China. The optimal NDSI thresholds varying with land cover types are extracted, the NDVI-NDFSII decision rules specific for snow discrimination in forest areas are optimized, and an HMRF gap-filling technique, which can simultaneously assimilate temporally and spatially neighbouring information, is imported. The need for such an approach is well justified and the authors cite ample relevant literature. The study provides examples demonstrating the successful performance of the method. The paper is basically well-written and presented.

There are a few important and minor comments/mistakes that are listed below and should be taken into account.

Response: Thanks for your positive comments. We have revised the manuscript following your suggestions or comments listed below. Please see the detailed responses.

Line 38, “on the other hand”, where is “on the one hand”.

Response: We have changed “on the other hand” into “in addition”. Thanks.

Line 53, “the MODIS band 4 (0.55 μm) and band 6 (1.6 μm) reflectance” should be “the reflectance of MODIS band 4 (0.55 μm) and band 6 (1.6 μm)”.

Response: Very good suggestion. We have revised this sentence. Thank you.

Line 54, “distinguish snow cover or not” should delete “or not”.

Response: Done. Thanks.

Line 58, “research” should be “studies”.

Response: According to suggestion 7 of referee # 1, we have revised these paragraphs. In the new manuscript, this sentence has been deleted. Thanks.

Line 78, the use of GEE is not motivated from the above text.

Response: All of our work is conducted on the GEE platform. Although this is not one of the key points of our paper, it is necessary to give this information here as a background introduction. Of course, our work can be done without GEE, but GEE indeed provides us much convenience. Therefore, we do not explain why we use GEE and only mention GEE as one piece of background information.

Line 80, “surface cover” should be “land cover”.

Response: Done. Thanks.

Line 88, “chiefly” should be deleted.

Response: Done. Thanks. Besides, we have revised section 2.1 following the suggestion of referee # 1.

Line 88-91, all of the definite articles before the acronyms should be deleted. All of the “us” also need to be deleted.

Response: Done. Thanks. Please see the modified 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 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 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 C6.1 version is adopted.

Line 102, only the snow-depth product has linkage?

Response: As mentioned in the manuscript, the other products are accessible directly at GEE. Therefore, we do not give their linkages.

Line 106, “too” should be deleted.

Response: Done. Thanks.

Line 108-115, why was snow-depth data used to validate SCE product? It is not a snow depth product. This need explanation in the text.

Response: Done. Please see the last sentence of section 2.4. At each station, snow-cover condition is determined by the criterion proposed by Klein and Barnett (2003). That is, if measured snow-depth is ≥ 1 -cm, it is covered by snow; else it will be snow-free.

Line 118 and 234, “paper” should be changed to “study”.

Response: Done. Thanks.

Line 119, “Sect.” should be “Sec.” or “Section”.

Response: Done. Thanks.

Line 154, “NDIS” should be “NDSI”.

Response: Done. Thanks.

Line 167, “ \geq ” should be “greater than”.

Response: There are many signs of “ \geq ”, “ $=$ ”, “ \leq ” in the manuscript. We use them because they can convey the same meaning but with less words. This also increases the readability, we think.

Line 187-191, I suggest to move Subsection 3.2 to the front of Subsection 3.1, and to combine Subsection 3.2 and 3.1. The authors should give a general introduction of the method first, and then present the details. There is the same problem in Subsection 3.4 and 3.3.

Response: Very good suggestion. Here we have reorganized these contents following the second general comment from referee # 2. In the revised manuscript, section 3 focuses on the algorithm, and the introduction to the new product is given in section 4. In the section 3, we first present the flowchart of the algorithm. Please see the new manuscript.

Line 281, “this section” should be changed to “we”.

Response: Done. Thanks.

Table 3, 4, 5, and 6, OE is just one minus PA and CE is just one minus UA, thus OE and CE are not need to show if you use PA and UA, and PA and UA are not need to show if you use OE and CE.

Response: Yes, $OE = 1 - PA$ and $CE = 1 - UA$. They are easy to understand, but we often mention only OE and CE in the text. We are afraid some readers may confuse if we do not present them in the tables straightforward.

Line 338 and 340, I suggest to delete “Under the support of several national programs of China” and “Toward this”.

Response: Done. Thanks.

Line 345, “and finally” should be change to “finally”.

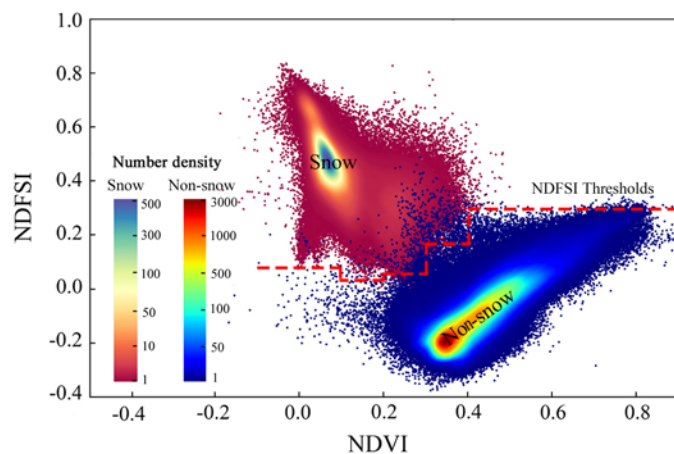
Response: Done. Thanks.

Figure 1, 2, 3, 4, and 6 use “non-snow”, but “snow-free” is used in the text and Figure 7.

Response: We think the word of “snow-free” may be better. But in the figure 1, 2, 3, 4, and 6, the spaces are very narrow. If the word of “snow-free” is used, it will overlay the important contents in the figures. Therefore, we used the word of “non-snow” to save space.

Figure 3, “Number density colorbar” should be “Number density”.

Response: Done. Thanks. Please see the new figure below.



The parentheses in the caption of the figures should be deleted.

Response: We have deleted the parenthesis in the caption of figure 2 in the new manuscript, namely previous figure 1. As for figure 4 and 6, we think the contents in the parentheses are very important. If deleting them, it may decrease the readability of the figures.