Interactive comment on "Screening for Snow/Snowmelt in SNPP VIIRS Aerosol Optical Depth Algorithm" by Jingfeng Huang et al.

Anonymous Referee #4

Received and published: 21 June 2018

This paper described the snow/snowmelt screening scheme for VIIRS AOD. The presentation is quite clear and the article is well-organized and concise. The method obviously works well as it has been implemented in the NOAA operation. It will be a useful documentation for the VIIRS AOD users.

Thank you very much for your very valuable comments and kind encouragement. Please see below for our responses highlighted in blue. Thanks.

Specific points:

Title: AOT is used throughout the manuscript. Why is aerosol optical DEPTH used in the title?

We have revised the paper to use AOD consistently throughout the paper.

Line 49: The word "artificial" is redundant here.

Removed as suggested.

Lines 76-78: It is stated that the snow screening tests "are designed to prevent the aerosol algorithm from making retrievals in inappropriate snow cover conditions" although true Snow/Ice products are also available (Key et al., 2013). Can the authors comment on why the VIIRS Snow/Ice products are not used in the AOD algorithm?

There could be two significant reasons. The first is the operational consideration. The operational VIIRS algorithms run in a chain. In this chain the operational snow/ice algorithm is downstream of the operational aerosol algorithm and thus the snow/ice retrievals are not yet available when the aerosol algorithm runs. The second reason is some consideration related to how the snow/ice product could be used if it was upstream before aerosol retrievals. The requirements of the snow/snowmelt contamination screening in the aerosol algorithm may be more conservative than the general snow detection in the snow/ice product. For example, we would prefer the aerosol algorithm does not retrieve

AOD over pixels with sub-pixel snow while the snow/ice product may not have the exact information of sub-pixel snow existence.

Line 99-103: They are identical to those listed in Table 1. It is better not to repeat the same words. Same for lines 149-153, 176-178.
These lines are only part of the information in Table 1. Table 1 also collects information such as AOD quality criteria and additional notes. The summary of this information in Table 1 provides organized information and better reference for readers.

Line 153: has been set 0.01 in Mx8.10 and in newer versions -> has been set to 0.01 in Mx8.10 and newer versions

Revised as suggested.

Line 170: Are the 7x7 area centered around the snow pixel?

Yes. As described in Line 172, the new snow adjacency test loops through the adjacent 7×7 pixels surrounding the central snow pixel.

Line 188: Something does not correctly show after the parenthesis.
It is ρ_{412}. It is corrected now.

Line 206: Please elaborate what are the criteria for the careful selection?
Since the test is threshold based, the unavoidable fact is, we have to achieve a balance between screening for sub-pixel snow and allowing retrievals of heavy smog. We tested different threshold values of C2, and determined C2=0.004 is optimal for minimizing sub-pixel snow over-screening to allow reasonable heavy smog retrievals at the same time.

Lines 219-281: These two paragraphs are too long. Try breaking them into short ones.
Revised as suggested. The two paragraphs are now broken into several short paragraphs.

Line 432: The sorting is not right here. This reference should be moved to Line 401.
Corrected.

Figure 1: Difficult to read. Please improve the quality of the image.
The images were replaced with high resolution ones as suggested to improve their quality.

Figure 3: The three colors for the last three populations are too difficult to differentiate. Please change them to other distinct colors.
Colors for the last three data populations are changed as suggested.

Figure 4: Difficult to read. Please improve the quality of the image.
The quality of the image is improved as suggested.

Figure 5: Some "N of Good AOD" numbers in (b) are greater than "N of Top2AOD" in some latitude bins (e.g. lat=60). Something seems wrong here.
Thank you very much for pointing out this error to us. Figure 5(a) should be 'Degraded' Quality AOD instead of 'Top 2' AOD. Top 2 AOD retrievals includes both Good and Degraded quality AOD retrievals. We have revised the Y axis label in (a) from 'Top 2' to 'Degraded' and corrected the Figure caption accordingly. The corresponding discussions are also updated.

Figure 5: Showing "-100" and "100" for Latitude Bins should be avoided.

"-100" and "100" are removed and the x-axis labels are revised as suggested.