

## ***Interactive comment on “A Dark Target research aerosol algorithm for MODIS observations over eastern China: Increasing coverage while maintaining accuracy at high aerosol loading” by Yingxi R. Shi et al.***

### **Anonymous Referee #1**

Received and published: 14 December 2020

The authors changed the inland water and snow mask of original MODIS DT algorithm to increase data coverage in China. The aerosol model and the aerosol layer scale height are also changed to increase the accuracy of AOD inversion. The article has a complete structure and clear logic. However, I still have some major comments I hope the authors will explain before publishing as follows:

1. The inland water and snow mask threshold setting of MODIS is strict. Is it a strict mask to reduce the inaccuracy of inversion, or just a misjudgment? From the comparisons in Fig.9b, although the original DT algorithm can retrieve AOD from the additional

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sample size from new mask, the accuracy has decreased. After using the new aerosol model and aerosol layer scale height (Fig.9c), there is not a significant improvement in accuracy, and the percentage of “within EE” also dropped. If the mask causes a decrease in the inversion accuracy, please comment on the impact of changing the mask conditions on the availability of AOD.

2. The author divided geographical areas to obtain three aerosol types, but does not rule out that aerosol type during the observation period find significant changes, such as dust weather. It is suggested that the author use cluster analysis or other methods to classify aerosol types, or discuss the frequency and contribution of special weather. Compared with the original MODIS model, how does the aerosol model proposed in this study contribute to AOD inversion?

3. In this research algorithm, the authors changed the aerosol layer scale height in the vertical profile in order to obtain better inversion results. However, the scale height is not always 0.5 km in all weather conditions. How did the authors choose the scale height under different weather conditions? If the scale height is always set to 0.5km, how much biases can be caused when retrieving the AOD from January to March 2013?

4. Figure 9 shows the validations of the research algorithm, but the advantages of the new algorithm cannot be clearly seen. It is recommended to show the advantages of the new algorithm point by point based on the results of Fig.9b and c like Fig.11. Similarly, the ordinate of Fig10 is too large to see the advantage of the new algorithm. Please adjust the ordinate to a reasonable range.

5. MODIS products have a resolution of at least 10km, and the research algorithm in this paper seems to be unlimited on the spatial resolution. So, why use 0.5° resolution for comparison in the 2013 winter characteristics analysis? Please explain.

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Interactive comment on Atmos. Meas. Tech. Discuss., doi:10.5194/amt-2020-450, 2020.

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