

This manuscript demonstrates innovation and practical value in the research of nighttime aerosol optical thickness retrieval methods, with a clear description and adequate demonstration. The proposed method has practical implications for monitoring air quality and aerosol loading, especially in regions where nighttime data are crucial but traditionally lacking. However, there are still some contents and details that need further improvement and discussion.

Response: We thank the reviewer for the constructive comments.

1. The manuscript compares nighttime VIIRS/DNB AOT retrievals with other spatial collections of aerosol observations, such as daytime satellite AOT from MISR and MODIS. How significant is the impact of wavelength differences on the comparative analysis of AOT?

Response: MODIS and MISR AOTs are available at 550 nm. The VIIRS DNB AOTs are available at 700 nm. There are non-negligible differences in AOTs from 550 nm to 700 nm. Still, we used MODIS and MISR data here simply to show the spatial patterns of aerosol plumes and inter-compare with spatial patterns of aerosol plumes from VIIRS DNB. No intent is made to compare absolute AOT values directly, as converting AOTs from 550 nm to 700 nm spectral channels is not an easy task (can be a study of its own) and thus is not included in the study.

We added the following discussions in the paper:

“Note that MODIS and MISR AOTs are available at 550 nm. The VIIRS DNB AOTs are available at 700 nm. There are non-negligible differences in AOTs from 550 nm to 700 nm. Here, we used MODIS and MISR data simply to show the spatial patterns of aerosol plumes and inter-compare with spatial patterns of aerosol plumes from VIIRS DNB. No intent is made to compare absolute AOT values directly, as converting AOTs from 550 nm to 700 nm spectral channels is not an easy task (can be a study of its own) and thus is not included in the study.”

2. The author's analysis is comprehensive, but it is recommended to further delve into the anomalies and biases present in the results, and their potential implications on the accuracy of AOT retrieval. Furthermore, the author may consider incorporating additional discussions on the impact of aerosol types, seasonal variations, and geographical distributions on the results, in order to offer a more profound understanding.

Responses: Uncertainties in AOT retrievals were extensively discussed in the paper, including a section (Section 4.5) that discussed limitations and potential improvements of the study. The impacts due to aerosol types were included in Section 4.3.2. Comparisons with daytime AOT retrievals were also conducted on both a seasonal and regional basis.

Still, we added absolute errors in VIIRS and lunar AERONET comparisons in the text. We also added the following discussions in the conclusion section.

“The uncertainties/biases in estimated nighttime AOTs from the study contributed mostly from uncertainties in estimated aerosol-free sky artificial light emissions or ΔI_a values, including angular dependence of ΔI_a values. Erroneous aerosol typing, cloud contamination, and the size of artificial light sources can also contribute to biases and anomalies in retrieved AOT values.”

3. In Figure 8, the blue and black scatter points are not easily distinguishable. Please use more contrasting colors or apply a color gradient to differentiate the frequency of the data points.

Response: We revised Figure 8. We changed the blue color to light blue to enhance the contrast (note that the high quality .ps file for figure 8 is also available).

4. The manuscript mentions the portability and universality of the algorithm as one of the strengths of this study. The author is advised to further discuss the specific application scope and limiting conditions of this portability and universality.

Responses. In previous efforts, city locations are needed and retrievals were performed over selected cities. This requires a database of global cities. In this approach, a study region is divided in equal grids, and retrievals can be performed for each grid as long as there are sufficient artificial light pixels (e.g. > 50). This provides a flexibility for performing nighttime aerosol retrievals using artificial lights. We already had related discussions in the paper (discussed in the introduction section and Section 3.2). Still, to perform retrievals, aerosol and cloud free sky artificial light emissions are needed; this requires collection of data from a long period (one year in this study). Thus, temporal variation in artificial light sources, which could introduce uncertainties to the study, are not included. We also realized cloud contamination remains a problem for implementing the developed algorithm and similar discussions already included in Section 4.5. We believe we already discussions major issues we could realize in the text.