

Atmos. Chem. Phys. Discuss., referee comment RC3  
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## Comment on acp-2021-413

Anonymous Referee #1

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Referee comment on "Relating geostationary satellite measurements of aerosol optical depth (AOD) over East Asia to fine particulate matter (PM<sub>2.5</sub>): insights from the KORUS-AQ aircraft campaign and GEOS-Chem model simulations" by Shixian Zhai et al., Atmos. Chem. Phys. Discuss., <https://doi.org/10.5194/acp-2021-413-RC3>, 2021

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The relationships between AOD and PM in East Asia are discussed by using ground-based and aircraft observations, but the whole study focus on direct validation and comparison, lacking in-depth analysis and literature support. In addition, there may be some problems in the use of satellite data. I suggest that the authors add more analysis to enrich the study.

Abstract: Line 35: Himawari-8/AHI provides AOD products at 500 nm, not 550 nm.

### Introduction

It is too short and the authors are suggested to summarize previous studies on investigating the relationships between PM<sub>2.5</sub> and AOD, especially those focusing on Asia.

In addition, studies on PM estimation from satellite AOD products need to be summarized, especially those using geostationary satellites.

Finally, the author should highlight the innovation and difference between the current study and previous related studies, and discuss the importance of understanding the relationships between PM and AOD in these studies.

Lines 85-86: Ångström Exponents at 500 nm? AE refers to a wavelength range. Reference is needed here.

Lines 107-110: Himawari-8/AHI: Which version do you use? Reference is needed. Again, Himawari-8/AHI provides AOD products at 500 nm. I am not sure about GOCI (should be 550 nm). Are they the same? If not, does the wavelength difference be taken into account in the data fusion?

Lines 288-290: What are the potential reasons? Is it the aerosol algorithm or the difference caused by sample matching at different wavelengths?

Lines 295-296: What are the potential reasons?

Lines 297-312: Is there any relevant published literature to support the author's explanations of reasons for these differences between GEOS-Chem and satellites observations?

I also suggest adding some scatter plots to validate and compare the satellite-based and modeled AODs, PM<sub>2.5</sub>s, and other parameters if possible, so that readers can see their differences more clearly.

Figure 6: I suggest adding some satellite PM<sub>2.5</sub> estimated results to see the difference with model simulations since there are many available PM products, especially in China.

Last, the authors should consider the impact of other factors, especially BLH, meteorological conditions, and topography, on surface PM, and to see how much impact can they have on the differences between satellite and model results.