

Atmos. Chem. Phys. Discuss., referee comment RC1  
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## Comment on acp-2021-413

Anonymous Referee #3

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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-RC1>, 2021

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This paper attempts to understand the relationship between AOD and PM<sub>2.5</sub>. However, after reading through, I feel that the paper is more of a GEOS-Chem validation and uncertainty analysis work, rather than offering physical explanation of the AOD-PM<sub>2.5</sub> relationship. Specifically, could the authors clarify, perhaps with additional analysis, how different factors, such as PBL height, RH, organic matter fraction, etc, contribute to the uncertainty in AOD-PM<sub>2.5</sub> relationship? How does the role of each factor vary with region (e.g., Korea vs. China)? The only clear conclusion is that AOD and PM<sub>2.5</sub> have reversed seasonality because of seasonally varying PBL height, but this is already well known.