Comment on acp-2021-413
Anonymous Referee #3

Referee comment on "Interpretation of geostationary satellite aerosol optical depth (AOD) over East Asia in relation to fine particulate matter (PM$_{2.5}$): insights from the KORUS-AQ aircraft campaign and seasonality" by Shixian Zhai et al., Atmos. Chem. Phys. Discuss., https://doi.org/10.5194/acp-2021-413-RC1, 2021

This paper attempts to understand the relationship between AOD and PM$_{2.5}$. 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$_{2.5}$ 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$_{2.5}$ 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$_{2.5}$ have reversed seasonality because of seasonally varying PBL height, but this is already well known.