

Interactive comment on **“Observationally-constrained estimates of global small-mode AOD” by K. Lee and C. E. Chung**

Anonymous Referee #1

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General

In this paper, the authors estimated long-term variation of aerosol optical depth (AOD) and its fine mode component (sAOD) by integrating satellite retrievals (MISR and MODIS), ground-based observations (AERONET), and global chemical model (GOCART, not mentioned in the Abstract). The proposed methods are complicated and may introduce inhomogeneity to the data. The quality of data used is low and the results are questionable.

Major (1) Previous studies have shown that trends of AOD from MODIS and MISR are substantially different, in particular, over the land. As mentioned in the paper, the quality of GOCART simulation is also very low.

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(2) The AERONET data are too sparse to do any regional and global study. For example, there is only one station in China, Beijing AERONET station where data were available from 2003 to 2007. In this paper, the authors believe AERONET is accurate and give a high weight to it when doing the integration of AOD. This introduced the spurious high values of AOD and sAOD in China, around Beijing, such as Fig. 6. This spurious high value center cannot be found in satellite data (MODIS and MISR, Figs. 6b and 6c). The method also introduced spurious trend into Fig. 8. As I just mentioned data were only available from 2003 to 2007 at Beijing AERONET station, and AOD over Beijing reduced after 2007 because the emission control for Beijing Olympic Game 2008. This also introduced a spurious strong positive trend of AOD and sAOD around Beijing in Fig. 8.

(3) The similar situation also occurred in Africa (Figs. 3, 4, 6).

(4) The results shown in Fig. 8 are questionable for (a): Why the trends of AOD and sAOD have so strong longitude coherence (south-north coherence in 60W, 60E, and 120E)? (b) Spurious strong positive trend center around Beijing, (c) Why AOD was decreasing in East and Middle China while it increased in Northwest China? And (d) Why AOD increased in North Africa and Middle Asia?

(5) The trends of AOD and sAOD from original data of MISR, MODIS, AERONET, and GOCART simulation should be provided to figure out what contribute the trends shown in Fig. 8.

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