

Interactive comment on “Classification and investigation of Asian aerosol properties” by T. Logan et al.

Anonymous Referee #3

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The manuscript “Classification and investigation of Asian aerosol properties” by Logan and coauthors selects four AERONET sites in China and Thailand to investigate aerosol properties and seasonal variations, the authors also attempt to develop a clustering method to distinguish aerosol contributions and seasonal dependence of different aerosol types. The topic is interesting and within the scope of ACP, however, the quality of the manuscript does not meet the standards of ACP. Major revisions are needed in order for this manuscript to be accepted for publication in ACP.

Major concerns are listed below:

The manuscript analyzed parameters, such as Angström exponent and single scattering co-albedo between 440 and 870 nm, brief descriptions about the reasons of choosing this wavelength range will help readers to understand the methodology bet-

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ter.

The quality of almost all figures is not good enough for publication. For example, legends in Fig. 3 are almost illegible. Higher resolution and bigger fonts are required for all figures, except for Fig. 1.

It is not clear to me why only the two parameters, $\alpha_{440-870}$ and $\omega_{\text{abs}440}$, were involved in the clustering method, while six parameters were employed in other sections of the manuscript. This clustering method is an important part of the manuscript, thus the reviewer suggests the authors to add a paragraph at the beginning of section 4.3 to describe the reasons of using ONLY these two parameters in this clustering method.

Cluster II and IV in Figs. 5 and 6 were almost identical, it is quite difficult to tell the differences between these two clusters. And it said in the texts that “Comparing the Cluster IV results at Mukdahan with the Clusters I and II results at Xianghe and Taihu, we conclude that biomass particles represent the mixture of Clusters I and II with larger $\alpha_{440-870}$ and smaller $\omega_{\text{abs}440}$ values (but similar variability) on average”. Did the authors mean that cluster IV is the combination of clusters I and II? Overall, the description and result analysis of this cluster method were kind of ambiguous. More clarifications might help readers to understand this method.

Other specific comments:

P 18931 Line 20 to 23: All six aerosol parameters were used in the manuscript to investigate “how the absorptive nature of the aerosols varies as a function of season, physical and chemical processes and source region”. But this sentence somehow gave the reviewer the impression that only “the latter two parameters” (ω_{abs} and $\alpha(\omega_{\text{abs}})$) were used for this purpose, please rewrite the whole sentence.

P 18936 Line 19: The whole section 3 is about “Modeled vs. observed wavelength dependence of τ and τ_{abs} ”, but the reviewer had difficulties to find the reference (Yoon et al. 2011) for this “theoretical model” online. It is also necessary to add some brief

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descriptions for this “theoretical model”.

P 18938 Line9: Both τ_{440}/τ_{abs440} and $\tau_{440nm}/\tau_{abs440nm}$ were used throughout the manuscript. Please keep the consistency.

P 18943 Line 20: Please specify the time period of the data from these “four additional sites” shown in Fig. 5.

P18941 Line 8: The reviewer had problem to see “Mukdahan had low, nearly constant $\tau_{abs440nm}$ values” in Fig. 4b. To me, $\tau_{abs440nm}$ for Mukdahan in Fig. 4b varied significantly with time. For example, the monthly mean for September (~ 0.09) was almost tripled of that for February (~ 0.03).

Figure 3: The figure caption reads “means (standard deviation) of aerosol optical depth (τ) and Angström exponent”, but only the means were provided for τ in the legends, please also add the standard deviation for τ .

Figure 4: Standard deviations of the monthly means are suggested to be added in the figure.

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