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Atmospheric Chemistry and Physics Discussions

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

T. Logan et al.

timothy.logan@my.und.edu

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1) 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 better.

We use this wavelength range to be consistent with previous studies using AE and AAE to classify aerosols. A power law relationship can be assumed between the 440-870 wavelength range such that a log-fit can be used to determine the extinctive and absorptive properties of aerosols. We no longer use the single scattering co-albedo in this way since a power law relationship does not exist for this parameter.

2) It is not clear to me why only the two parameters, a440-870 and woabs440, 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.

We first describe the physical meaning behind the wavelength dependences of a440-870 and woabs440 in Section 3 and then discuss how the co-albedo reduces the amount of overlap that is usually seen in other clustering methods involving wo and aabs440-870.

3) 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 a440-870 and smaller woabs440 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.

We claim Cluster IV is its own separate cluster with similarities to Clusters I and II. Biomass particles (Cluster IV) are generally smaller (higher AE) and less absorptive (lower woabs) than pollution on average depending mode of generation and BC/OC content. We have refined our discussion to decrease the amount of ambiguity as per your suggestion.

Other specific comments: 4) 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" (woabs and a(woabs)) were used for this purpose, please rewrite the whole

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sentence.

We have removed this sentence and the discussion of the a(woabs) parameter.

5) P 18936 Line 19: The whole section 3 is about “Modeled vs. observed wavelength dependence of t and tabs”, 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 descriptions for this “theoretical model”.

We re-wrote this section and cite the Chung et al. 2012 study which has similarities to our results. We also clarify how the Chung et al. 2012 results compare with our own.

6) P 18938 Line9: Both t440/tabs440 and t440nm/tabs440nm were used throughout the manuscript. Please keep the consistency.

We have revised the manuscript as per your suggestion.

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

We have revised the manuscript as per your suggestion.

8) P18941 Line 8: The reviewer had problem to see “Mukdahan had low, nearly constant tabs440nm values” in Fig. 4b. To me, tabs440nm for Mukdahan in Fig. 4b varied significantly with time. For example, the monthly mean for September ($\sim$0.09) was almost tripled of that for February ($\sim$0.03).

We have re-worded this sentence to reflect higher tabs440 values in the spring and lower values in the autumn due to variations in vegetation types that are burned throughout the year as well as possible outside aerosol influences.

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

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The standard deviation for t has been added to the figure.

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

The standard deviations have been added to the figure.

Interactive comment on Atmos. Chem. Phys. Discuss., 12, 18927, 2012.

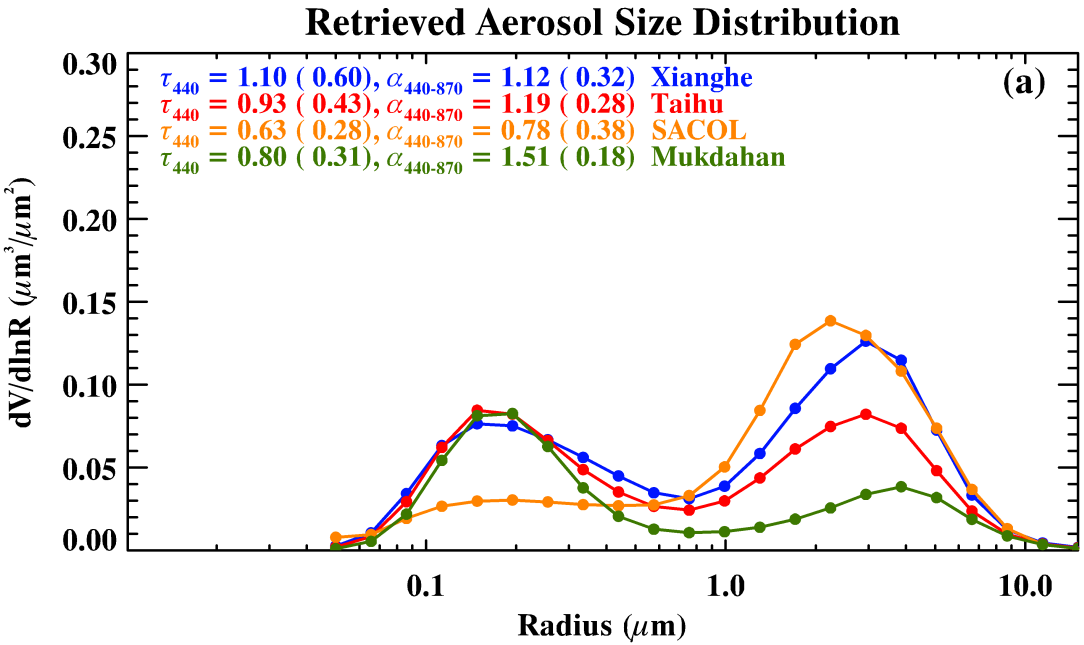

Fig. 1. Re-plot for Figure 3a

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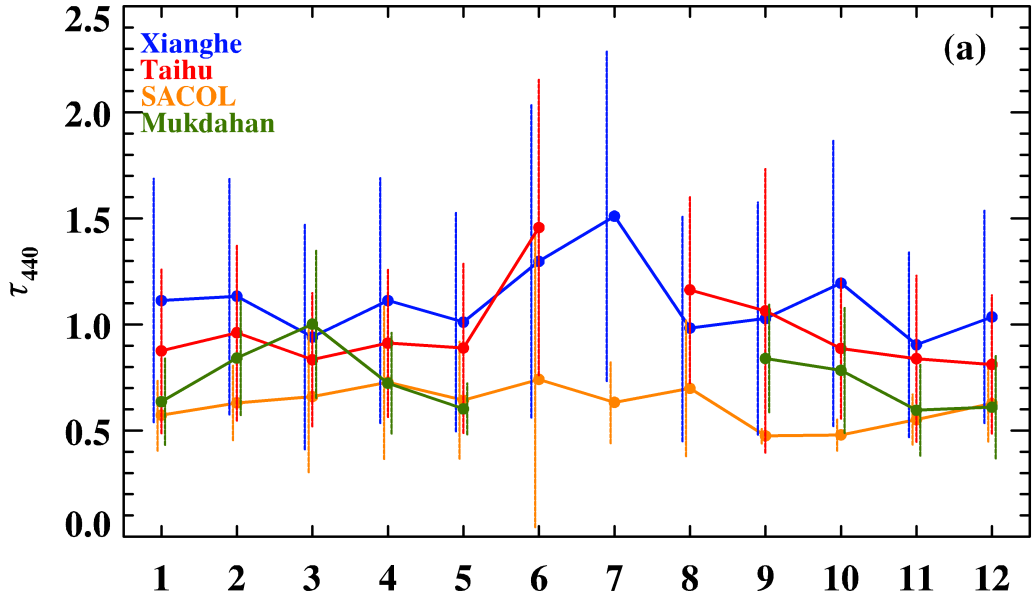

Fig. 2. Re-plot for Figure 4a

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