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Discussions

Interactive comment on "Aerosol optical properties and instantaneous radiative forcing based on high temporospatial resolution CARSNET ground-based measurements over eastern China" *by* Huizheng Che et al.

Anonymous Referee #3

Received and published: 6 August 2017

This paper presented the aerosol optical properties as observed over seven CARSNET sites over eastern China. Aerosol loading, together with aerosol SSA, refractive index, and particle size were analyzed in a monthly scale. Authors also evaluated MODIS AOD retrievals, analyzed aerosol type, and calculated radiative forcing using those ground-based measurements. Their study covered many aspect of aerosol properties over the studied domain, providing a comprehensive analysis.

However, the paper lacks focus, by simply redundantly piling data analysis variable by variable. As indicated by the other two reviewers, the paper is poorly structured. Sub-

stantial revisions are needed to improve the organization of data analysis on various parameters and make the paper more concise and focused. Some aerosol variables (i.e, AE and aerosol size, and SSA and refractive index) are highly related and should to be presented interactively. The paper also needs to be re-organzied in three different section, i.e., (1) analysis of aerosol properties; (2) validation of MODIS (this part indeed does not sever the objectives of this paper, should consider to remove); (3) radiative forcing estimate. In addition, a discussion section may be added to discuss the results and how they can be interpreted in perspective of previous studies, as well as the strength and limitation of the present study (see my below comments).

Specific comments:

1.Page 3, L18-19: Many networks are listed here. But is not clear "which" network "includes several automated sites in China". Please revise this in a more accurate way.

2.Page 6, L14: The SSA was retrieved using only -> The retrieved SSA was used only when Also, please provide reference for selecting AOD440 of 0.4 as the threshold.

3.Page 6, L15-19: These two sentence are very confusing and need rewords like: Real and imaginary parts of refractive index at 4 wavelengths (440, 675, 870, and 1020 nm) were retrieved from sky radiance and were confined in the range of ..., respectively. Also retrieved were aerosol volumes of xx size bins within the 0.05 - 15 um radius range.

4.Page 7, L10: Justification is needed for using 3x3 pixel averaging.

5.In the first paragraph of the result section (and in many places in the following sections), authors included a lot of comparisons of AOD between YRD area to other regions of China. Such comparisons may be interested but would distract readers. The result section should focus on presenting the findings, and such extensive discussion should be placed in a discussion section.

6.Figure 2: The font size of the figure labels and legends should be increased.

7.Page 14, L2-3: Could authors explain in more detail on the reasoning of "method for estimating the surface reflectance was suitable for this region"? What about surface reflectance estimation in Hangzhou site?

8.Section 3.2: Please note that AERONET inversion algorithm assume refractive index does not vary with aerosol particle size [Dubovik et al. 2000]. In other words, refractive indices are same for retrieved fine mode and coarse mode. As a results, mode-specific SSA were not recommend to use due to large uncertainty. Furthermore, the coast-mode aerosol loading is too small to offer sufficient information on absorption of the coarse-mode particles. Therefore, only total SSA should be used for the analysis to avoid misleading (even AERONET total SSA has error of 0.03). In addition, SSA on a longer wavelength could be included to examine the absorbing aerosol type, as different absorbing particles (dust and smoke) appear different spectral contrast of SSA.

9. Figure 5: As in comments, please consider removing SSA of each mode and retaining the total SSA. Font size of labels should be increased.

10.Section 3.3: Again, AERONET refractive index retrievals are not size dependent.

11. Section 3.6: Is Figure 13 based on monthly averaged variables? If true, monthly data may cause problem in classifying aerosol type. Those would simply represent the mean values of those parameters rather the mean states of aerosol types. The information of actual aerosol types may fade out during averaging process.

12.Table 2: Pie chart may be a better option to present the aerosol type category.

Corrections:

Page 3, L25: aerosols present -> aerosols

Page 6, L 21: Do you intend to say "from 0.2 to 4.0 um"?

Page 6, L26-27: I believe the reference for AERONET inversion algorithm (sphericity

fraction) should be Dubovik et al. [2006], please verify.

Page 7, L1: "were used to provide an evaluation of MODIS AOD retrieval with" -> were evaluated against

Page 7, L16: the variation range of AOD at 440 nm is -> the annual mean of AOD at 440 nm ranges

Page 7, L24: The word "trend" often refers to change with time. "pattern" could be better option.

Page 8, L3: a little bit higher -> slightly higher

Page 9, L16: Please use "fine-mode fraction of AOD"; consistent higher -> consistently higher

Page 9, L18: variation for -> variation of