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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 #2

Received and published: 31 July 2017

In this paper, the authors analyzed aerosol optical and physical properties derived from CARSNET ground-based measurements for 7 locations in the RYD region. Ground-based observations are definitely welcomed in the community. However, this paper needs major revisions. Firstly, also suggested by the first reviewer, this is a poorly written paper. Also, there are several major technical issues with the paper. The first reviewer has done a great job highlighting issues and I have added several more comments below.

Aerosol radiative forcing values are computed using a radiative transfer model (Global

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Atmospheric ModEl, GAME). However, no details are provided on their radiative transfer modeling efforts. For example, how do they define surface (broadband) characteristics? What are the required aerosol properties such as vertical distributions? The CARSNET observations are in discrete channels, how the authors perform a narrowband to broad band conversion? A detailed uncertainty analysis is also needed but is lacking.

The authors compared CARSNET measurements with a merged MODIS Deep Blue and Dark Target product. Given that the MODIS Deep Blue and Dark Target methods are fundamentally different in their retrieval processes, I would recommend the authors evaluating each product separately.

Also, in lines 248-249, it states "The EAE was lower in March ($\sim$1.16$\pm$0.24) and April ($\sim$1.13$\pm$0.22), which reflects the effect of mineral dust aerosols (Gong et al., 2003)." This seems to contradict to a later conclusion (Table 2) that the dust aerosol presence is insignificant for the region. This actually brings up an issue, as the authors try to compare mean properties of the 7 sites and try to provide explanations for the differences. Some explanations are weak with little or no supporting evidence. In addition, the differences in some of the mean properties are actually way smaller than variations (numbers after $\pm$ sign) of the data, and thus some statistical methods are needed to back up the authors' comments with consideration of data spreads.

Line 108-109, I am not sure what the authors mean by "Levy et al. (2013) refined the MODIS Collection 6 (C6) aerosol retrieval process to provide better AOD retrievals". What is "better AOD retrieval"? May be the authors referring to more accurate AOD retrievals?

Line 135 "Jiande, Xiaoshan Tonglu and Xiaoshan" should be "Jiande, Xiaoshan, Tonglu and Xiaoshan"?

Lines 143-144, "Instantaneous direct data for the AOD were selected at least ten times each day at temporal resolution of about three minutes" Define "direct data". Also, what

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are the section criteria? Details need to be provided.

Line 156, define EAOD.

Lines 169-171, "The AOD data from Terra-MODIS were validated by matching the CARSNET AODs within 30 minutes of the MODIS overpass within the 3×3 pixels surrounding the CARSNET site." Are both CARSNET and MODIS data averaged for the process? Need some details.

Lines 180-182, "The AOD at the urban site of Hangzhou was the highest of all the study sites as a result of high local anthropogenic activity in this urban area compared with the other suburban and rural sites." Results do not support this comment, as the three sites, including Handzou, Xiaoshan and Fuyang, have mean AOD of 0.76. Also, as I mentioned before, variations in data are larger than differences in mean values. Some statistical analyses are needed to back up their conclusions.

Lines 189-197, the authors compared AOD values from the 7 sites to other regions in China as reported from other papers. However, the authors should also take the temporal variation into consideration (e.g., mean values change from year to year, right?).

Line 241, what is extinction Ångström exponent?

Lines 311-314, "The characteristics of the SSA at these seven sites gradually increased from the east coast (0.91±0.06 at Hangzhou) inland toward the west (0.94±0.03 at ChunAn). These results indicate the emissions caused by human activity affect the absorption of aerosols in urban areas." Again, the authors need to consider other possibilities and worry about data varibility. How about meteorological conditions? What about hygroscopic growth? Again, the authors need to back up their comments with evidence.

Figure 10, what do the colors represent?

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