

Interactive comment on “Spatial distribution of aerosol microphysical and optical properties and direct radiative effect from the China Aerosol Remote Sensing Network” by Huizheng Che et al.

Anonymous Referee #1

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General comments: This study makes an extensive and comprehensive national distribution of the aerosol optical properties and direct radiative effect during 2008-2017 in China over decade change. The aerosol key optical parameter obtained from CARSNET, and this ground-based observation net was established independently with Chinese characteristics. The instrument calibration and inversion algorithm from CARSNET has been recognized by the international community, and the results have also been compared by the global ground based observational organizations such as AERONET, etc. Generally, five regions including 50 ground stations nationwide were defined in this study, covers almost the whole region of China, which is of great research value contributed to the regional aerosol optical properties in China, East Asia

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or the whole world. An emphasis on the estimation of the aerosol optical properties over China vast and varied terrain under different background and aerosol sources driven by the meteorological factors and climatology changes have been employed. The objective of the paper is challenging to use the National scale, ground-based measurements of aerosol microphysical and its optical properties as well as direct radiative effect obtained from the sunphotometer with good quality and large databases. The paper is well written with most importance to complement and support the climatology for aerosol microphysical and optical properties of China and provide better understanding of the aerosols' climate effects over the different types of sites covering a broad expanse of China. Thus, I would suggest a minor revision before it is considered for publication as following:

Special comments: 1. Line 40, the time period for the data at the observation site need a brief description in the Abstract. 2. Line 60-61, the word “useful” could be changed as “important” to avoid repetition. 3. Line 95-96, some references could be added there. 4. Line 126-127, “aerosol size distribution” could be changed as “aerosol size distribution (volume and aerosol effective radii)”. 5. Line 196, “Angström” should be changed as “Ångström exponent” to make consistency in the text. 6. Line 271, “...was found to be substantially...” should be better revised as “...was found substantially...”. 7. Line 297, “...also was high, 0.30 $\mu\text{m}^3/\mu\text{m}^2$.” should be better revised as “...also was high to 0.30 $\mu\text{m}^3/\mu\text{m}^2$.” 8. Line 331-332, please specify the results of Zhao et al. (2018) in detail. 9. Line 375, “...in and around...” should be better revised as “...in or around...”. 10. Line 432, “...these particles originate from a multitude of sources...” should be better revised as “...these particles originate from multitude sources...”. 11. Line 437, “were more than likely” should be better revised as “were more likely”. 12. Line 442, “(EAE 0.25)” should be better revised as “(EAE = 0.25)”. 13. Line 474, “...the aerosol was more absorbing in fall,...” should be better revised as “...the aerosol was more absorbing in autumn,...”. 14. Line 482-483, “Therefore, the different SSA440nm distributions in the two regions may be attributed by the special aerosol composition.” Is the special aerosol composition because of

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the industrial structure of different regions^{ij} Like the Northeastern China was once the significant heavy industries base in China. 15. Line 542, “aerosol direct radiative effect” in the section title should be better revised as “direct aerosol radiative effect”. 16. Line 554, “-22.13 and -17.43” should be better revised as “-22.13 and -17.43 W/m²”. 17. Line 583, “A notably small” should be better revised as “A notably small positive”. 18. Line 588, “(SSA 0.92)” should be better revised as “(SSA = 0.92)”. 19. Line 607, “as” should be deleted.

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