

***Interactive comment on* “The optical, physical properties and direct radiative forcing of urban columnar aerosols in Yangtze River Delta, China” by Bingliang Zhuang et al.**

Anonymous Referee #3

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Aerosols have significant impacts on air quality and global climate change and their influences have considerably uncertainties due to the spatial-temporal variations of the aerosol optical properties. This manuscript presents the observed results of the aerosol optical and physical properties in an urban site in the YRD region, and estimates the aerosol direct radiative accordingly. The methods are reliable and the results are helpful to improve the model performance on the aerosol climate effects. I think the manuscript can be accepted after the following concerns are addressed. Major comments: 1. Plenty of data and results are presented in the manuscript. Just as summarized by the authors, altogether nine types of aerosols' optical properties are discussed. In addition, DRF of aerosols are also presented and discussed. The au-

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thors are encouraged to clarify the most important finding(s) of this study. Also, the novelty of the study should be strengthened. 2. I think the manuscript (including the figures and tables) is too long to catch the key information. It is suggested that many parts of the manuscript (such as Section 3.1.1, the conclusion and so on) should be shortened and some parts (such as Section 3.1.2, Table 1 and so on) should be moved to the supplemental materials at least if not deleted. 3. A more in-depth discussion on aerosol classification (Section 3.3) should be provided, such as their uncertainties, since optical properties of aerosols are highly dependent on the chemical compositions and mixing state and so on. 4. What are the vertical resolutions of aerosol profiles from CALIPSO and Lidar? And what is the spatial resolution of CALIPSO? Why did the authors choose CALIPSO to represent the aerosol profile at the urban site? 5. I have to repeat that the conclusion is too long and many sentences in this part are redundant. It should be shortened. 6. What are the inter-annual variations of the aerosol optical properties and direct radiative forcing in urban area of Nanjing? 7. There are still some grammatical errors. The editing and proofreading of the manuscript by a native English speaker is highly recommended. Specific comments

1. The title is confusing. What is “urban columnar aerosols”? Does it refer to aerosols emitted from urban area or aerosols in urban area? It is suggested to reword the title. 2. The period of study seems to be not clearly mentioned in the manuscript. 3. Why Fig. 7 shows larger error bar for CE-318 derived AOD than MODIS derived AOD? 4. Why the profiles are shown in terms of percentage instead of extinction coefficient? 5. Line 59-62: Rewrite this sentence to make it clear. 6. Line 64-105: Make this paragraph more concise and do NOT list the results of each study. 7. Line 112-121: Move this part to the Section 2 (Methodologies). 8. Which kind of aerosols did the Aethalometer measure? Fine particles or total aerosols? Please clarify.

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