

Interactive comment on “In-situ vertical characteristics of optical properties and heating rates of aerosol over Beijing” by Ping Tian et al.

Anonymous Referee #1

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This manuscript presents a valuable observational dataset of in-situ aircraft measurement of BrC and BC optical profiles in Beijing. The corresponding influences on heating rate and radiative forcing are analyzed and extensively compared with AERONET dataset. Although the pollution and meteorology interaction over North China Plain (NCP) were widely investigated through surface observations and modelling, limited studies have considered the evolution of pollutants in vertical profile. This work could fill this gap well. The method and uncertainties are well described and discussed. The manuscript is well-written, but some parts of it are not clear enough. I would recommend for publication after the authors address the following specific comments:

Specific Comments:

1) line 22: “replying” or “relying” ?

- 2) line 68-69: “and regional transport will introduce enhanced aerosol loading to high level”. Please introduce the corresponding vertical transport processes in more details base on previous studies over NCP, such as the influence of mountain valley breeze led by the special topography over Beijing.
- 3) line 73. Suggest delete “successive”, which is too subjective.
- 4) line 77. Suggest delete “for the first time”. There are lots of previous studies regarding aerosol optical property observations over NCP, although may not elaborate the detailed BrC properties as this work does. The “first time” description is not appropriate here.
- 5) line 86. At which temperature level are maintained?
- 6) line 93. Please give the criteria of screening out the “in-cloud data”.
- 7) line. 116. “which is independent of the filter artifacts”. I do not understand here.
- 8) Eq.3. Please modify it as the same format of the Eq.1.
- 9) line 152. Please specify the values (with units) of “air mass density” and “Cp” here.
- 10) line 269. Where was the study of Andrews et al. (2017) conducted?
- 11) line 384. They are the heating rate at which level? And are they the rate at noon time? Please clarify it.
- 12) line 386. “when regional transport”. I do not understand here.
- 13) line 386. “contribution of BrC” to what? You mean contribution to the aerosol mass or heat rate or light absorption, or what?
- 14) Figure 1. The title of Fig. 1c is difficult to understand. And please add labels for the colorbar.
- 15) Figure 2 and following profile figures. Here, use blue, black and red to indicate the clean, transition and polluted period, respectively. However, it is ambiguous that in

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one profile belongs to two different period (black for lower part, but red for upper part). In my understanding or the common understanding the “period” is separated by time windows.

16) Figure 4. The quality of this figure is poor and unreadable.

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