Chen (Referee)

Interactive comment on "Impacts of short-term mitigation measures on $PM_{2.5}$ and radiative effects: a case study from a regional background site near Beijing, China" by Qiyuan Wang et al.

This study was conducted in a regional background site near Beijing during the 19th National Congress of the Communist Party of China. The authors investigated the effectiveness of short-term mitigation measures on $PM_{2.5}$ and aerosol direct radiative forcing. They found that $PM_{2.5}$ mass and its sources are reduced significantly during the control period compared with the non-control period. Those decreases in aerosol concentration in turn, as shown by the climate radiative effect estimates, alleviated aerosol cooling effects. Moreover, the authors further analyzed two pollution episodes after control period based on the WRF-Chem model. This is an interesting study. I believe that this paper makes a useful contribution to the literature and could be published in ACP after a minor revision in response to the following suggestions (see specific comments below).

Response: The authors appreciate the reviewer for his or her valuable time to review our manuscript.

Specific Comments:

1. In section 2.2.1: the authors should give the storage condition of the samples.

Response: We have added information concerning storage conditions for the samples in the revised manuscript. It now reads: "To minimize the evaporation of volatile materials, the samples were stored in a refrigerator at -4 °C before the chemical analyses."

2. Page 8, Line 11-13: It should be noted that the equation (12) is based on the assumption of no contribution from brown carbon, a light-absorbing organic matter. It should be pointed out this in the article.

Response: Following the reviewer's suggestion, we revised the text to read: "A second assumption for this part of the study was that there was negligible absorption by brown carbon in the visible region (Yang et al., 2009), and on this basis, the b_{abs} can be determined from the EC mass concentration using linear regression (Eq. 12)."

3. Section 3.1: This study analyzed data from a single site near Beijing, even though it included detail chemical and optical measurements. The emission control for NCCPC control period included a wide range of measures and could impact the air quality for a lager domain. Therefore, it would be more convincing if the authors could also include measurements for surrounding areas from other platforms, such as the AERONET AODs and satellite aerosol retrievals.

Response: Although the AERONET AODs are helpful for providing a spatial distribution of aerosols in Beijing-Tianjin-Hebei (BTH) region, the observation periods were limited, typically at ~10:30 and 13:30 local time. Another complicating factor is

that relative humidity can have an important influence on AODs. After careful consideration, we concluded that it is more useful to focus on $PM_{2.5}$ concentrations at different locations in BTH region to illustrate the effectiveness of the control measures. As shown in Figure S3 (revised supporting information, also see Figure R1 below), the $PM_{2.5}$ concentrations over much of the BTH region showed a decreasing trend during the NCCPC-control period compared with the non-control period. In the revised manuscript, we added the following text: "Meanwhile, the PM2.5 mass concentrations obtained from the China Environmental Monitoring Center also showed a decreasing trend over most of the BTH region during the NCCPC-control period (see Figure S3)."

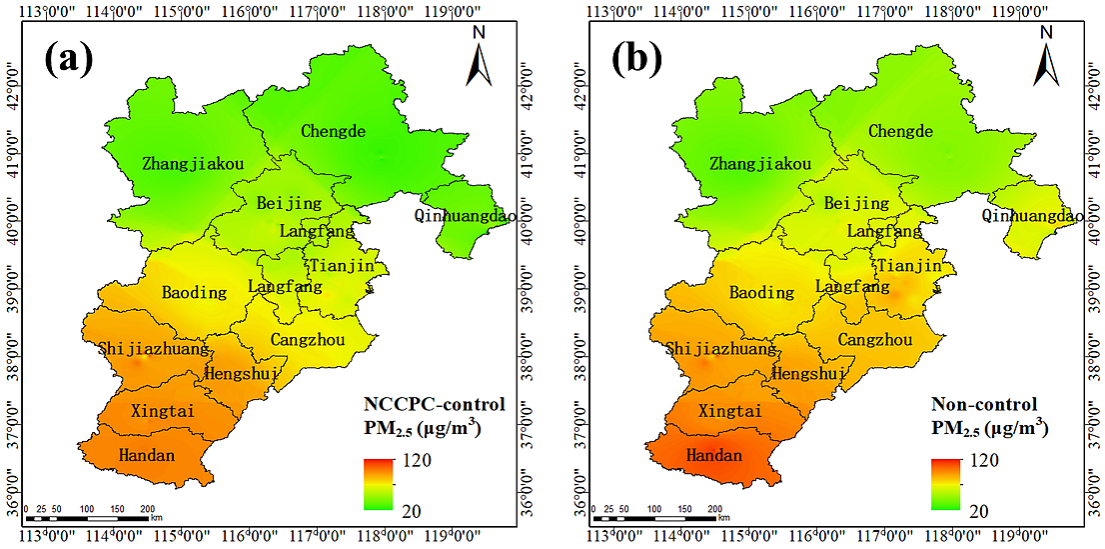

Figure R1. Spatial distribution of $PM_{2.5}$ mass concentration in Beijing-Tianjin-Hebei region during the (a) 19th National Congress of the Communist Party of China (NCCPC) control period and (b) non-control period.

4. About the light scattering construction of the particles (Sec 3.4, "Impacts of $PM_{2.5}$ emission reduction on aerosol radiative effects"), the reconstructed b_{scat} shows some deviation from the estimated b_{scat} values. What is the reason for the difference?

Response: Although the IMPROVE-based method provides reasonable estimates of the chemical b_{scat} in this study, the lack of locally-derived mass scattering efficiency information is a probable reason for the ~10% underestimates of measured values. In the revised manuscript, we revised the text, which now reads: "This result indicates that the IMPROVE-based method provided a good estimation of the chemical b_{scat}; nonetheless, it is likely that more locally-measured mass scattering efficiencies for each chemical species could reduce the underestimates of measured values."

5. The paper must be polished and edited for English grammar and word usage before it can be published in ACP.

Response: Our revised manuscript has been polished by a native English speaker.

Please see our new manuscript.