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Reply on RC1

Suping Zhao et al.

Author comment on "Response of particle number concentrations to the clean air action plan: lessons from the first long-term aerosol measurements in a typical urban valley in western China" by Suping Zhao et al., Atmos. Chem. Phys. Discuss.,
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RESPONDS TO COMMENTS FROM REVIEWER #2

First of all, we appreciate your very positive evaluation of our work. The responses of your specific comments/questions are outlined in detail below.

(1) Thank you for your suggestion. As you said, aerosols can affect the local climate and environment by light absorption or scattering, which significantly depended on chemical composition and size distribution of aerosol particles. Liu et al. (2020) indicated that coating plays an important role in light absorption. The amplification of black carbon absorption by the coating increased from 1.21 to 1.75 with increasing aerodynamic diameter (D_{ae}) due to the thicker coating of BC-containing particles with a larger D_{ae} . Their study highlights the strong dependence of the microphysical and optical properties of BC on size. The more recent study of Zhao et al. (2021) found that interdecadal AOD was negative trend from 2009 to 2018, which may be related to the variation in particle size distribution. AOD and Alpha were measured continuously by CE-318. The above discussions and the previous studies will be added to the revised manuscript.

(2) Thank you for your good suggestion. In this study, the measurement campaign was conducted at a Chinese cities in west China, but the similar PNCs trends and influencing factors should be expected in other Chinese cities. In future work, we will established the PNSD observation network in some megacities to better evaluate the response of PNCs to emission mitigation policies in China. The above explanation will be added to the revised manuscript.

(3) Thank you for catching that. All abbreviations will be defined when they firstly appear throughout the revised manuscript.

(4) Thank you for your question and suggestion. The sampling site can represent urban background, which will be explained in the "Data and methods" of the revised manuscript.

(5) Thank you for your good suggestion. The atmospheric horizontal and vertical dispersion conditions inside the basin were poor due to weak winds and strong multi-layer temperature inversion induced by basin terrain (Pandolfi et al., 2014). Therefore, the air pollutants were easily trapped inside the basin and hard to disperse to the upper air. Furthermore, basin aerosol pollution was largely controlled by vertical than horizontal

dispersion as compared to the plain (Zhao et al., 2019). We will add the above explanations to the section of Introduction in the revised version of our manuscript.

(6) Thank you for your good suggestions. The conclusions will be revised and some novel findings will be clearly listed in the revised version of our manuscript.

(7) Thank you for your constructive suggestion. As you said, all figures are not easily seen by the readers and they will be revised in the new manuscript.

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