

## ***Interactive comment on “A review of current knowledge concerning PM<sub>2.5</sub> chemical composition, aerosol optical properties, and their relationships across China” by Jun Tao et al.***

**Anonymous Referee #3**

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General Comments Aerosol is very important to impact atmospheric cycle and climate system by direct and indirect effects, a hot issue of scientific researches internationally. The paper summarizes the recent published on Chinese PM<sub>2.5</sub> and reviews the tempo-spatial distribution of PM<sub>2.5</sub>, chemical composition, aerosol optical properties, and reveals their relation across the whole country, based on ground-based filter measurements of particles, gases (e.g. SO<sub>2</sub>, NO<sub>2</sub>, CO). In fact, high aerosol burden regions such as areas in Asia are still not well characterized in terms of particle chemical and microphysical properties and long-term variation trend. The topic of this paper is of common interest within the scientific community. Although the manuscript includes some important data, however, the quality is not sufficient in the current state to be

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directly published. The authors should take the suggestions made here into consideration for revision.

Specific suggestions 1. The paper mainly presents the PM<sub>2.5</sub> measurements in urban sites, especially in eastern areas and other areas with relatively strong human activities (Figure 1). In addition, the variation of PM<sub>2.5</sub> is very different in the North, the Middle and the South, so the authors should address it clearly (Figure 3). This paper somewhat provides more efforts to give a long-term trend of PM<sub>2.5</sub>. However, it lacks some remote sites such as in northeastern, Xinjiang, Yunnan areas etc, maybe it is better to select one typical year to focus on these sites and compare with the sites in the paper. 2. In lines of 620-624, AOD can reflect the column amount of aerosol in the whole atmosphere, while PM<sub>2.4</sub> is only the mass of particles at the surface. The differences in fine structures of PM<sub>2.5</sub> and AOD are related to PM<sub>2.5</sub>-AOD comparison and spatial variations of chemical composition, the size, number, vertical distribution and transport of aerosol are also responsible for these differences. The authors should address them clearly.

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