

Interactive comment on “Impacts of aerosol direct effects on tropospheric ozone through changes in atmospheric dynamics and photolysis rates” by Jia Xing et al.

Anonymous Referee #2

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In this paper, the authors have applied the WRF-CMAQ model to analyze the impact of aerosols on tropospheric ozone through their impacts on atmospheric dynamics and photolysis rates. Their results indicate that reducing aerosols may have negative impacts on ozone which need to be considered for air quality management in China. The topic is of general interest given the focus on reducing PM_{2.5} pollution. The simulations have been designed appropriately to address the goals of the study. However, the authors have not considered the prominent way aerosols impact tropospheric ozone formation - via heterogeneous reactions - which leads me to question the conclusions of this study. Several studies have highlighted the role of aerosols in modulating ozone via heterogeneous reactions (eg., Liao and Seinfeld, 2005; Ti et al., 2005; Pozzoli et al.,

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2008; Xu et al., 2012; Lou et al., 2014), which have largely been ignored in this study. The authors need to provide a strong justification for ignoring the impact of aerosols on ozone via heterogeneous reactions, before I can recommend this paper for publication. The presentation of the analysis also needs to be significantly revised, particularly the figures are too small to be legible.

Specific Comments:

P2L10: Please provide a reference for “ADE modulate the temperature, atmospheric ventilation, cloud and rainfall”.

P3 Section 2.1: What meteorological fields are used to drive WRF-CMAQ?

P3L5,6: Please define acronyms (e.g., AERO6, BHCOAT) before using them.

P4L20: Please clarify if this is for observations. The observations are hardly visible in Figure 2.

P4L24: Please provide a reference for “In January, O₃ production in north China is VOC-limited regime”

P4: It would also be helpful to see maps of PM_{2.5} to assess if the reductions in O₃ due to aerosol feedbacks are co-located with PM concentrations.

P4-5: How significant are the changes in O₃ in response to Δ Dynamics and Δ Photolysis

References: H. Liao, J.H. Seinfeld, Global impacts of gas-phase chemistry–aerosol interactions on direct radiative forcing by anthropogenic aerosols and ozone, *J. Geophys. Res.*, 110 (2005), p. D18208 <http://dx.doi.org/10.1029/2005JD005907>

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Interactive comment on *Atmos. Chem. Phys. Discuss.*, doi:10.5194/acp-2017-198, 2017.