

Atmos. Chem. Phys. Discuss., referee comment RC2
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Comment on acp-2021-799

Anonymous Referee #3

Referee comment on "Formation, radiative forcing, and climatic effects of severe regional haze" by Yun Lin et al., Atmos. Chem. Phys. Discuss.,
<https://doi.org/10.5194/acp-2021-799-RC2>, 2022

This study investigated the severe regional haze episodes in 2013 over the Northern China Plain through both measurements and simulations. The authors showed strongly correlated OOA and Ox concentrations during transition periods and positive feedback to haze formation by aerosol-PBL interactions during polluted periods. In general, this paper is well written and suitable for publication after the minor comments below are addressed.

- I couldn't find any tables in the main text.
 - I couldn't find in the paper how the OOA concentrations were measured or determined. Can the authors add more details of how the OOA data were obtained? Also, can the authors add OOA time series to Figure 1, on top of PM_{2.5} concentrations?
 - Line 246: The authors retrieved PBLH from MERRA2, but PBLH can also be estimated by the Nozaki's equation provided here. I wonder if the PBL estimations from the two methods were consistent.
 - Figure 3: Can the authors add R² between OOA and total PM_{2.5}? It seems that even OOA only accounted for less than 1/3 of PM_{2.5} mass, their concentrations were highly correlated. In this way, would PM_{2.5} also show a good correlation with O_x? In addition, it would be helpful to add the same set of graphs for clean days.
 - Figure 4: Can the authors add the PBLH profile for transition days?
 - Line 405: How did these calculated RH compare to the measured RH in Figure 1?
 - Line 406: where did the 1000 m decrease come from? I only find in Line 371 "the simulated maximal height of PBL under the polluted condition is reduced by more than 300 m relative to the clean condition".
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- Figure 4&5: Both figures show PBLH diurnal profiles, but with very different magnitude. Only looking at clean days, Figure 5 PBLH is only half of that in Figure 4. Why are the simulated results so different from the MERRA2 reanalysis?
 - Figure 5: Can the authors either add legend or rewrite the caption? It should be clearly stated that the top 6 figures and bottom 6 figures are for two episodes.

