

Interactive comment on “Persistent primary organic tar particles during the regional wintertime hazes in North China: insights into their aging and optical changes” by Lei Liu et al.

Anonymous Referee #1

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In this study, an aging and optical change of organic tar particles in the regional haze was observed. Domestic coal and biomass burning are suggested to be the important reasons for haze formation in the NCP. It is found that with the evolution of haze, organic particles decreased, secondary inorganic aerosol increased, POT-SIA particles increased, and POT (primary organic tar) particles decreased, indicating that POT particles could provide surface for heterogeneous reactions of SO₂ and NO_x. It is also concluded that POT particles are coated with secondary inorganic aerosol, which leads to increased light absorption of particulate. Therefore, the “lensing effect” should be further considered on the POT particles in radiative forcing models. The results obtained in this study are interesting, and worthy to be published in ACP.

C1

Followings are my suggestions to the manuscript: 1. The diagrams are too complex to understand, and some of the parameters in the diagrams have not been analyzed. For example, the mass concentrations of CO and NO₂ in Figure 2. 2. The offline bulk sample analysis is used for rural site while the online analysis is used for urban site. Can the values from two methods for the two sites be compared? Are there any errors or deviations between the results from offline bulk sample analysis and online analysis for urban site? 3. The analysis shows that fossil fuel burning and biomass burning are the main sources of pollution. What is the difference between POT particles produced by these two sources? 4. It is concluded that the particle size of the rural point is larger than that of the urban point, because the particles with small particle size are easier to be transmitted. However, in this transportation process, the formation of new particles or secondary chemical reaction (aging) may occur, which would increase the particle sizes, do the authors take into account this factor? 5. The second paragraph of the conclusion: “The primary pollutants from the intense coal and biomass burning in rural areas can also pose serious threats to human health”. This looks unnecessary as the health effects are not the focus of this current study and it may need to be removed. 6. Line 251 “Figure S2a shows higher fractions of OM, EC, and CI— at nighttime than daytime during the whole haze episode at the GC rural site, suggesting the continuous strong local combustion emissions at nighttime”. We notice that the whole haze period was from November 22 to 27, and Figure 2A shows that the EC quality score was higher at nighttime than in the daytime on November 22. Please also explain why the nighttime would have higher level combustion emissions. 7. Figure S2b shows only the ion concentration of 5 parameters, and the concentration of other ions at the rural points should also be listed. 8. It is better to have discrimination of the ion concentration between daytime and nighttime for Figure S2 and Figure 2. In addition, the variation trend of CO concentration in Figure 2 may need to be put together with gaseous pollutants such as SO₂ and O₃. 9. The specific calculation formula of light absorption cross section needs to be provided in methodology section. 10. Figure 9. Legend error. Ratio should be replaced by Eabs. 11. Line 390: “pore” may be core

C2

