

I would like to thank the authors for their thorough responses to all the points raised by the reviewers. The document was well organized and easy to follow, and the explanations and additions to the text have significantly improved the manuscript.

Nevertheless, I still have a few minor points for which I would appreciate further clarification. Addressing these would, in my view, make the manuscript suitable for acceptance.

- 1) Main point is concerning Reviewer 1 (R1), specifically questions 11 and 12 (Q11-Q12) regarding the methodology used to estimate secondary NAC (%). The elevated secondary NAC % observed at the northern and southern Chinese stations (~90%), is totally dependent on the NAC/[Tracer] ratio value, using CO as tracer (Eq. 1). As stated in the manuscript and also in the replies to the reviewer, the authors followed Salvador et al., 2021; Liu et al., 2023; Chen et al., 2023. The measurements presented by those authors were performed in much faster time resolution, capturing more realistic oscillation on the NAC/tracer ratio, allowing for example to measure during rush hour and/or to capture specific biomass burning events. Since in this manuscript the sampling was performed in a 2-3 day frequency cycle, representing more regional average levels (L153-154), what would be the implications of such approach in the results? Could that implicate in an overestimation of the secondary NAC fraction? In addition, did the authors conducted any sensitivity tests around the 15% suggested by Chen et al., 2023 and adopted in this manuscript? On the other hand, based on further presented results it is reasonable that secondary NAC fraction be larger in the southern than in the northern Chinese stations (i.e. O₃, nitrate, ALC, ...), however, the larger estimations compared to previous studies (also conducted during the wintertime in China and considering the huge heterogeneity in such a large country!) raises some concern about the elevated obtained amounts. For this reason, I'd like to ask the authors to comment and to add some text discussing the methodology limitations and possibly uncertainties. For example, if applicable, the authors could conduct some sensitivity tests and generate some uncertainty around the obtained %. Unfortunately, the previous studies did not present any discussion on that.
- 2) Please clarify in the legend of the Fig. S1 the reason for different colors (red and blue) for the stations.
- 3) Please verify the color legend used to represent north and south in Figure S6.