Atmospheric Chemistry and Physics
Ref: EGUSPHERE-2025-41

Measurement report: Year-long chemical composition, optical properties, and sources of atmospheric aerosols in the northeastern Tibetan Plateau

Response Letter to Reviewers' Comments

Dear editors and reviewers,

We sincerely thank the editors and reviewers for their constructive comments and insightful suggestions. We have carefully revised the manuscript accordingly. A detailed, point-by-point response to each comment is provided below. For clarity, the reviewers' original comments are presented in *italic black*, our responses are in red, and the corresponding revisions in the manuscript are shown in blue. We hope that these revisions have adequately addressed all concerns and that the revised manuscript meets the expectations of the editors and reviewers.

Response to Reviewer #3:

This is a revised paper after addressing the reviewers' comments. After a careful reading of the original paper and the responses to the reviewers as well as the revised version, this reviewer think the authors have relatively well addressed the issues raised by the reviewer, and the paper can be accepted by the ACP. I only have a few minor suggestions

(1) In order to make the seasonal differences more robust and reliable, I suggest to do a student t-test also on the different pairs of Abs365 data and provide the p values.

Response: As suggested by the reviewer, we conduct pairwise Student's t-tests to evaluate the statistical significance of seasonal variations in Abs_{365}, MAE_{365} and $PM_{2.5}$ mass concentrations. The results indicate that the most pronounced seasonal difference in Abs_{365} occurs between spring and summer ($p < 0.01$), followed by summer-winter and fall-spring ($p < 0.1$). In contrast, the differences between winter-spring, fall-winter, and summer-fall are not statistically significant ($p > 0.1$).

MAE_{365} exhibits a statistically significant difference between summer and winter ($p < 0.05$) and a marginally significant difference between spring and autumn ($p < 0.1$). Furthermore, $PM_{2.5}$ concentrations between spring and winter are significantly higher than those in summer and autumn ($p < 0.05$); while the difference between spring and winter, as well as between summer and autumn are not significant ($p > 0.1$). These results have been incorporated into the revised manuscript accordingly.

"Seasonal Student's t-tests revealed that the mass concentrations during spring (14.0 μg m^{-3}) and winter (12.5 μg m^{-3}) were both significantly higher than those in summer (7.1 μg m^{-3}) and fall (8.0 μg m^{-3}) ($p < 0.05$) (Figure 2c)" (lines 293-295)

"The results of the Student's t-test confirmed that the most pronounced seasonal difference in Abs_{365} occurred between spring and summer ($p < 0.01$), followed by the pairs of summer-winter and fall-spring ($p < 0.1$)." (lines 339-341)

"The average absorption efficiency of WS-BrC at unit WSOC content (MAE) during the summer at 365nm (MAE_{365}, 0.40 ± 0.24 m^2g^{-1}) is significantly lower than that of the other three seasons (0.92 ± 0.54 m^2g^{-1} in spring, 0.81 ± 0.46 m^2g^{-1} in fall and 0.97 ± 0.49 m^2g^{-1} in winter) ($p < 0.1$) (Figure 6a)." (lines 343-347)

(2) As your measured OC and also water-soluble OC, but the source analysis was only conducted on WSOC which is understandable due to technical limitations. Can you provide a scatter plot of WSOC vs OC, and check the correlations and slope, therefore readers can know the recovery ratio of WSOC from OC, and understand the representativeness of WSOC for OC.

Response: As suggested by the reviewer, we examine the relationship between WSOC and OC to evaluate the representativeness of WSOC for the total OC. The WSOC/OC values range from 0.31 to 0.99, with an average of 0.63 ± 0.21. A strong positive correlation is observed between WSOC and OC ($R^2 = 0.81$) (Fig. S1). These results indicate that WSOC accounts for a substantial fraction of OC and can serve as a reliable representativeness for total OC. In the updated manuscript, relevant descriptions have all been included as follows.

"Note that the relationship analysis between WSOC and OC indeed exhibited a tight correlation ($R^2 = 0.81$) and a relatively high ratio (0.63 ± 0.21), suggesting the representativeness of water-soluble fraction on bulk OM." (lines 341-343)

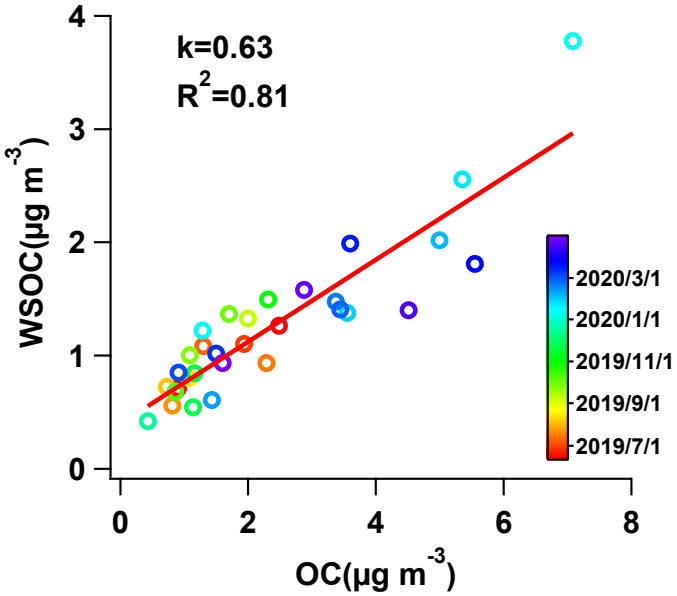

Figure S1 Scatter plot of WSOC and OC.