Supplement of

Chemical characterization and sources of submicron aerosols in the northeastern Qinghai-Tibet Plateau: insights from high-resolution mass spectrometry

Xinghua Zhang et al.

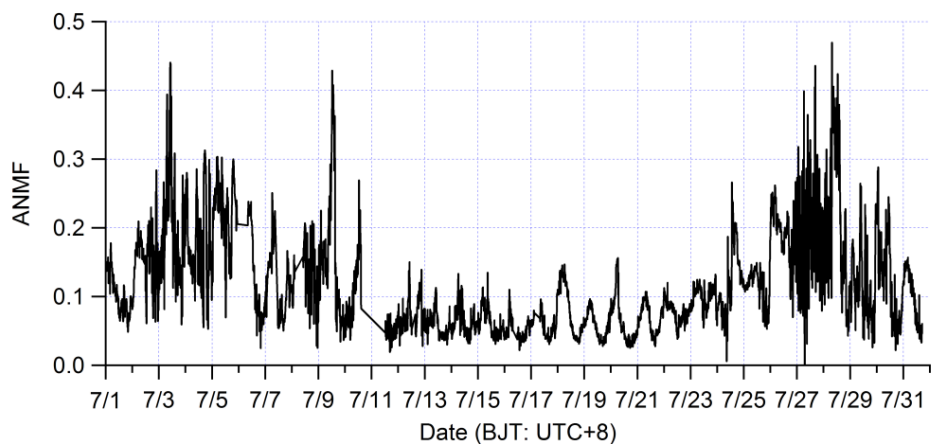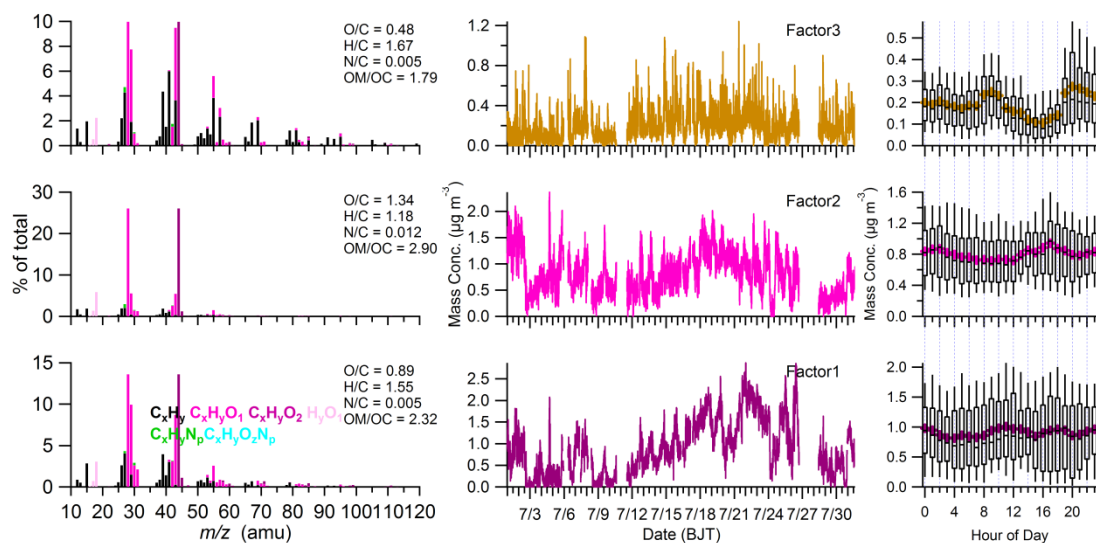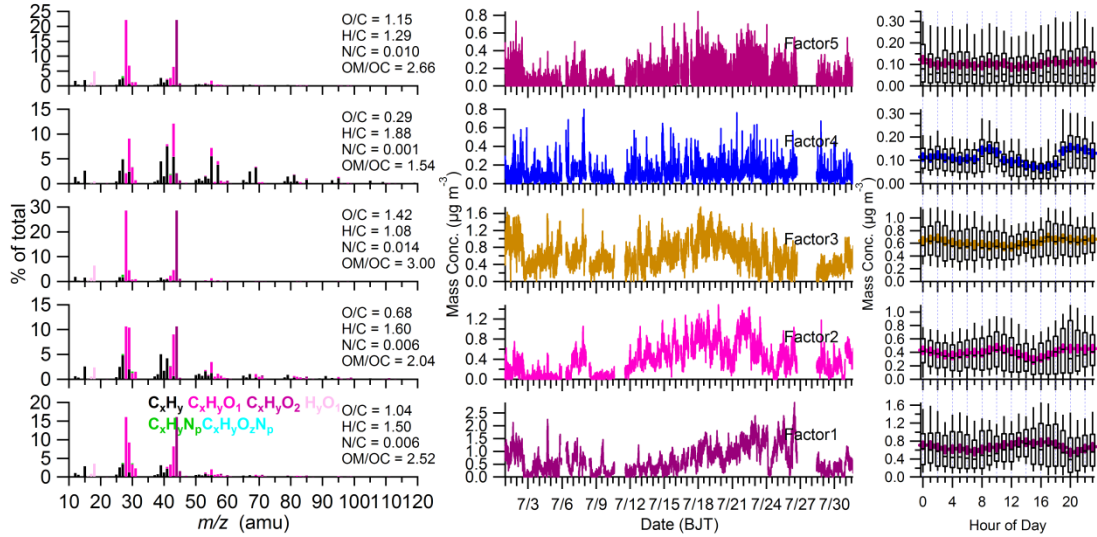*Correspondence to*: Jianzhong Xu (jzxu@lzb.ac.cn)

Figures

Figure S1. The time series of ANMF (ANMF = $(80/62 \times NO_3)/(NH_4 + SO_4 + NO_3 + Chl + Org)$) in this study.

5   **Figure S2.** The 3-factor solution PMF results: **(left)** high-resolution mass spectrum of three OA factors colored by six ion categories at m/z < 120, **(middle)** time series of the three OA factors, and **(right)** diurnal variations of mass concentrations of the three OA factors (the whiskers above and below the boxes indicate the 90th and 10th percentiles, the upper and lower boundaries respectively indicate the 75th and 25th percentiles, the lines in the boxes indicate the median values, and the cross symbols indicate the mean values).

Figure S3. The 5-factor solution PMF results: **(left)** high-resolution mass spectrum of five OA factors colored by six ion categories at $m/z < 120$, **(middle)** time series of the five OA factors, and **(right)** diurnal variations of mass concentrations of the five OA factors (the whiskers above and below the boxes indicate the 90th and 10th percentiles, the upper and lower boundaries respectively indicate the 75th and 25th percentiles, the lines in the boxes indicate the median values, and the cross symbols indicate the mean values).
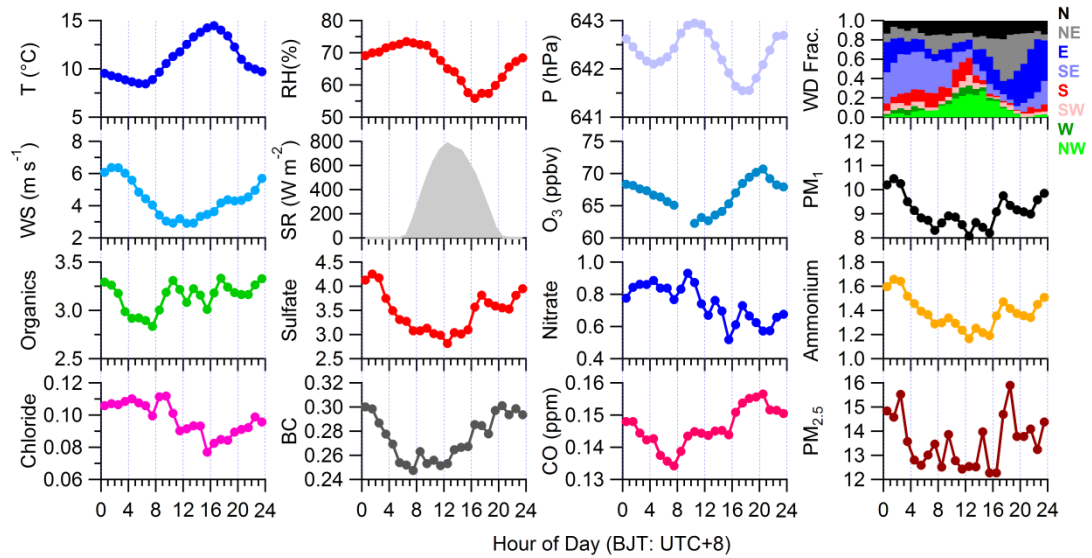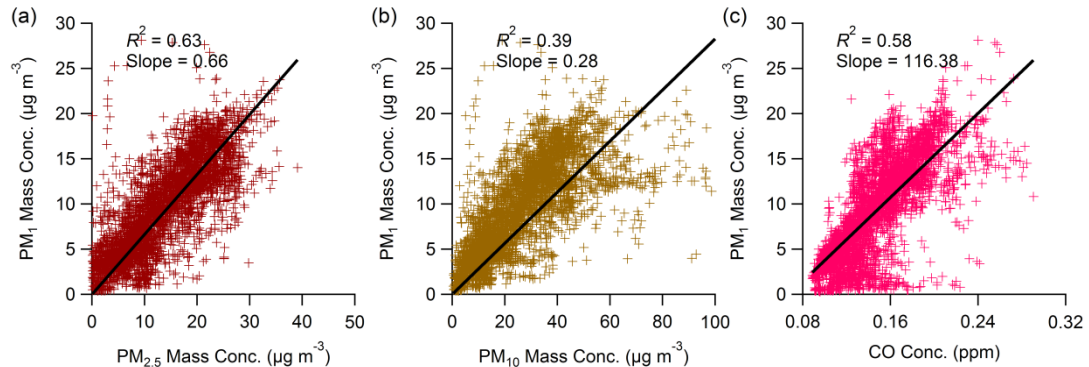

Figure S4. Diurnal variations of meteorological conditions, PM_1 chemical species and other relevant gaseous and particulate parameters.

Figure S5. Scatterplots of mass concentrations of **(a)** PM_1 vs. $PM_{2.5}$, **(b)** PM_1 vs. PM_{10}, and **(c)** PM_1 vs. CO in this study.
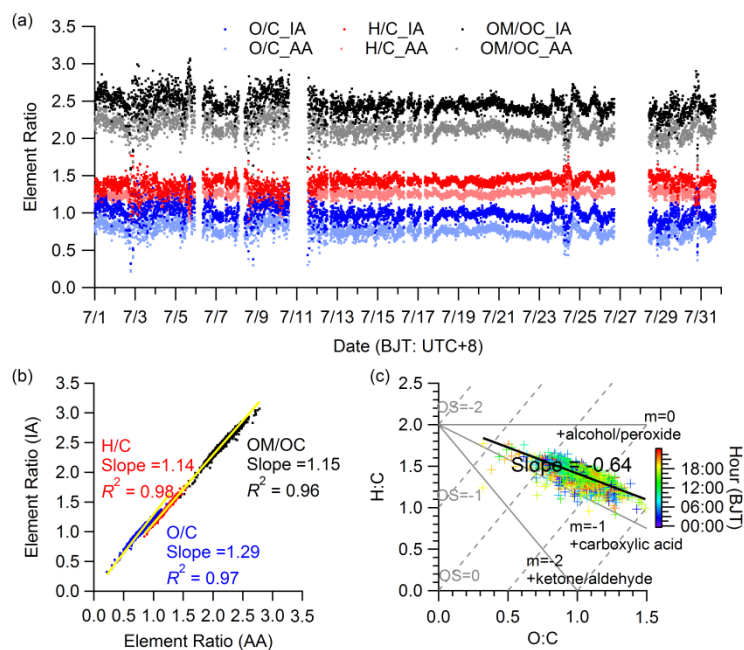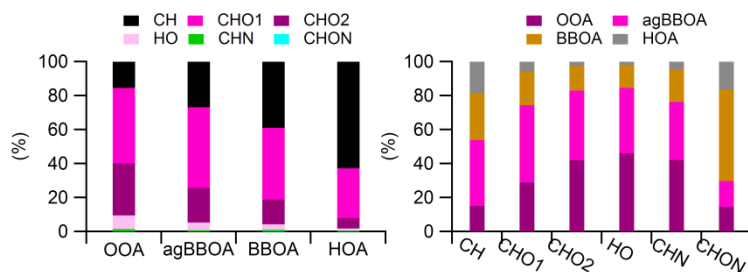
Figure S6. (a) Comparison of the temporal variations of O/C, H/C, and OM/OC ratios using "Improved-ambient" method versus "Aiken ambient" method for the whole study period, **(b)** scatterplot of elemental ratios with "Improved-ambient" method versus that with "Aiken ambient" method and **(c)** Van Krevelen diagram of H/C versus O/C for OA in this study.

Figure S7. The contributions of **(left)** six ionic categories to PMF factors and **(right)** PMF factors to six ionic categories.
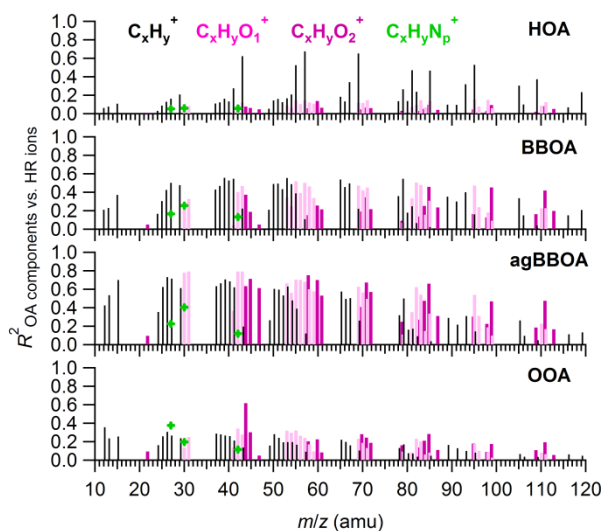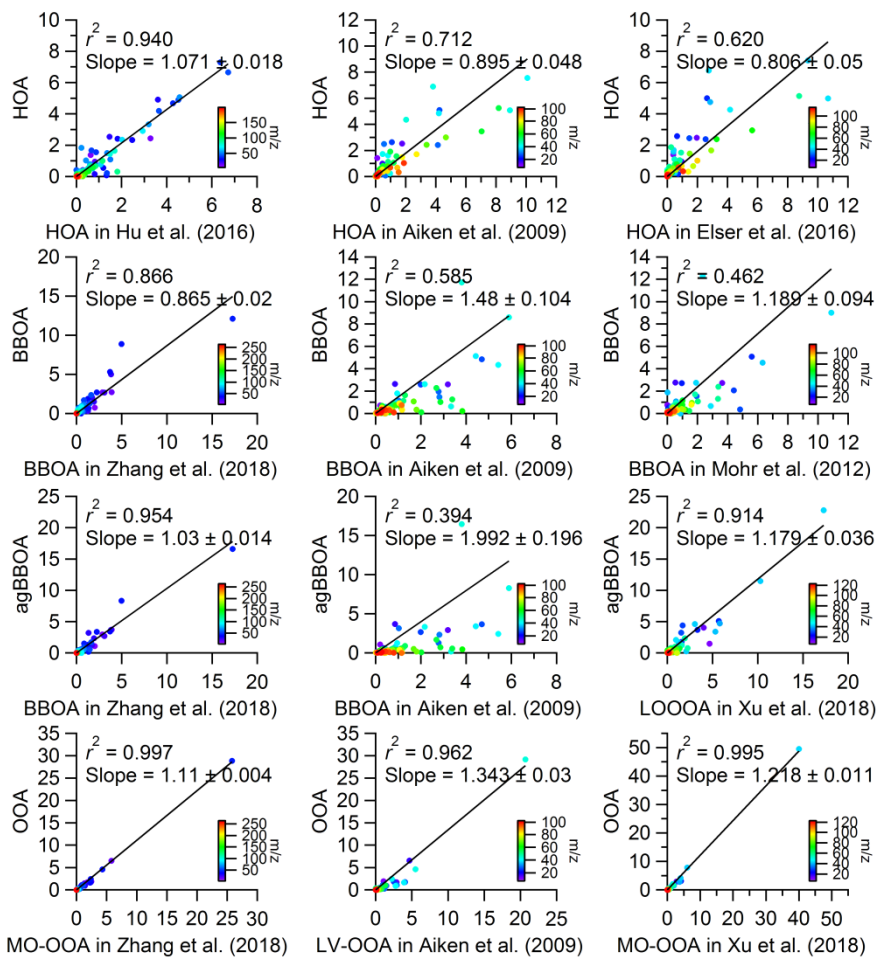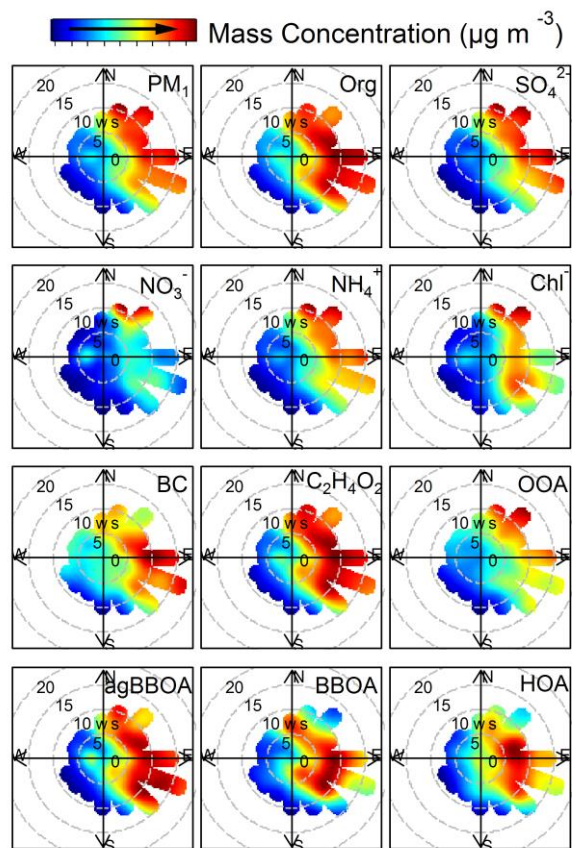

Figure S8. Correlations between each organic component and HRMS ions colored by four ion categories ($C_xH_y^+$, $C_xH_yO^+$, $C_xH_yO_2^+$, $C_xH_yN_p^+$).

Figure S9. Scatter plots of the comparisons between the four high-resolution mass spectrums identified in this study and those mass spectrums determined from other studies.

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Figure S10. Bivariate polar plots that illustrate the variations of mass concentrations (colored) of each PM$_1$ species and organic components as a function of wind speed (m s^{-1}) and wind direction in this study.