Supplement of Atmos. Chem. Phys., 14, 6477–6495, 2014
http://www.atmos-chem-phys.net/14/6477/2014/
doi:10.5194/acp-14-6477-2014-supplement

Atmospheric Chemistry and Physics Open Access

Supplement of

Chemistry of new particle growth in mixed urban and biogenic emissions – insights from CARES

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Supplemental material to:

Chemistry of new particle growth in mixed urban and biogenic emissions - Insights from CARES

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Size distributions of ammonium and sulfate using high resolution data

Particle time-of-flight (PToF) data in AMS is usually used in unit mass resolution to determine size distributions of species. However, during the present study, PToF data of ammonium were too noisy and not usable to determine size distributions for short selected periods. Therefore, in the present case, PToF data have been used in high resolution, in which ammonium fragments had satisfactory signal to noise (S/N) ratios. First, 86 size bins recorded in the PToF mode and covering 40-1400 nm (in D_{va}) have been grouped into 7 different size ranges in order to increase the S/N ratio. Given that the PToF data processed in the PIKA software is without DC markers applied, an eighth size range between 1400-2200 nm has been used as a background signal to subtract the signals of the other size ranges (Fig. S1). Then, for each size range, average high resolution mass spectra have been plotted, and the signals of the ammonium and sulfate fragments having the best S/N ratios have been integrated. For that purpose, we chose NH_3^+ (m/z 17) for ammonium and SO^+ (m/z 48) for sulfate (Fig. S1). The scatterplots of NH_3^+ vs. total ammonium and SO^+ vs. total sulfate (Fig. S2) have then been used to reconstruct the concentrations of ammonium and sulfate for each of the 7 size ranges. Finally, these results have been used to reconstruct size distributions of the two species in Hz, and converted to µg/m^3 by scaling the size distributions to the concentrations of these species in MS mode.

Figure S1. Average high resolution mass spectra between 14:00-15:00 during NPE days at T1 for particles in the range (a, b) 250-400 nm, (c, d) 1400-2200 nm, and (e, f) top MS minus bottom MS, for m/z 17 (left panel) and m/z 48 (right panel).

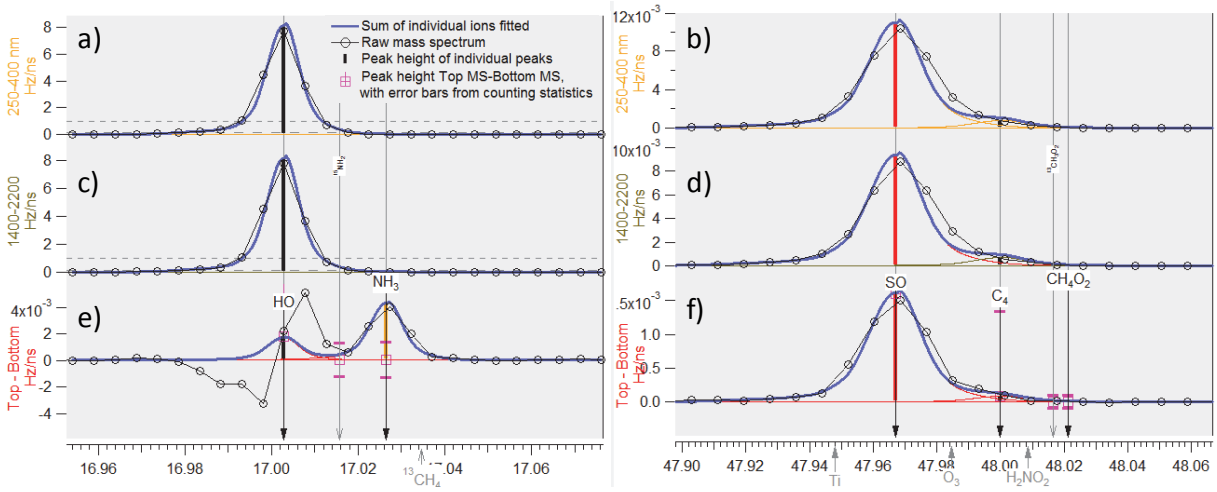

Figure S2. Scatterplots of (a) NH_3^+ vs. total ammonium, and (b) SO^+ vs. total sulfate for T1. The data fitting was performed using the orthogonal distance regression (ODR).

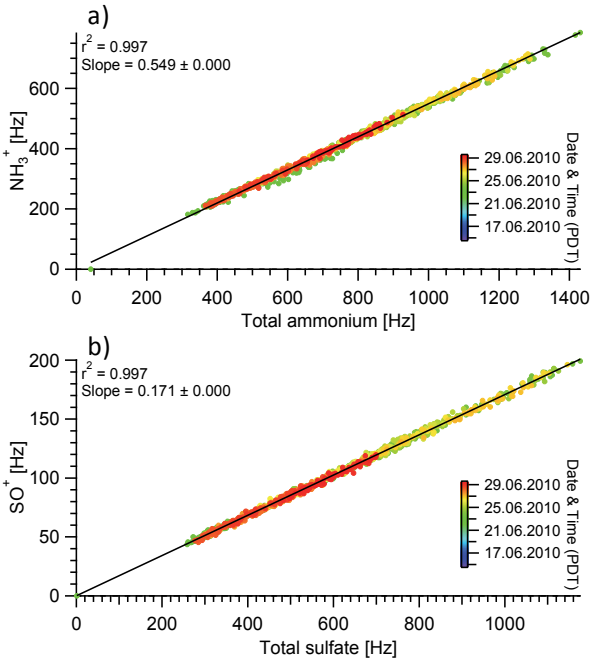

Figure S3. Diurnal patterns of (a) temperature, (b) relative humidity, and (c) broadband solar radiation during new particle event (NPE) days and non-NPE days at T1.

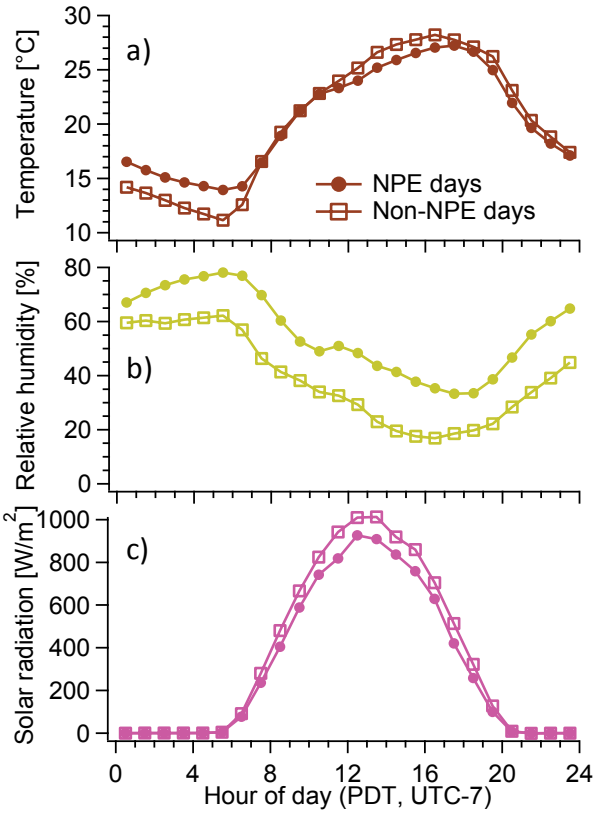

Figure S4. Diurnal patterns of (a) isoprene, (b) terpenes, (c) sum of methacrolein (MACR) and methyl vinyl ketone (MVK), (d) formaldehyde, (e) acetic acid, (f) acetaldehyde, (g) benzene, (h) toluene, (i) black carbon, (j) CO, (k) O_3, (l) NO_x, and (m) condensation sink during NPE and non-NPE days at T1.

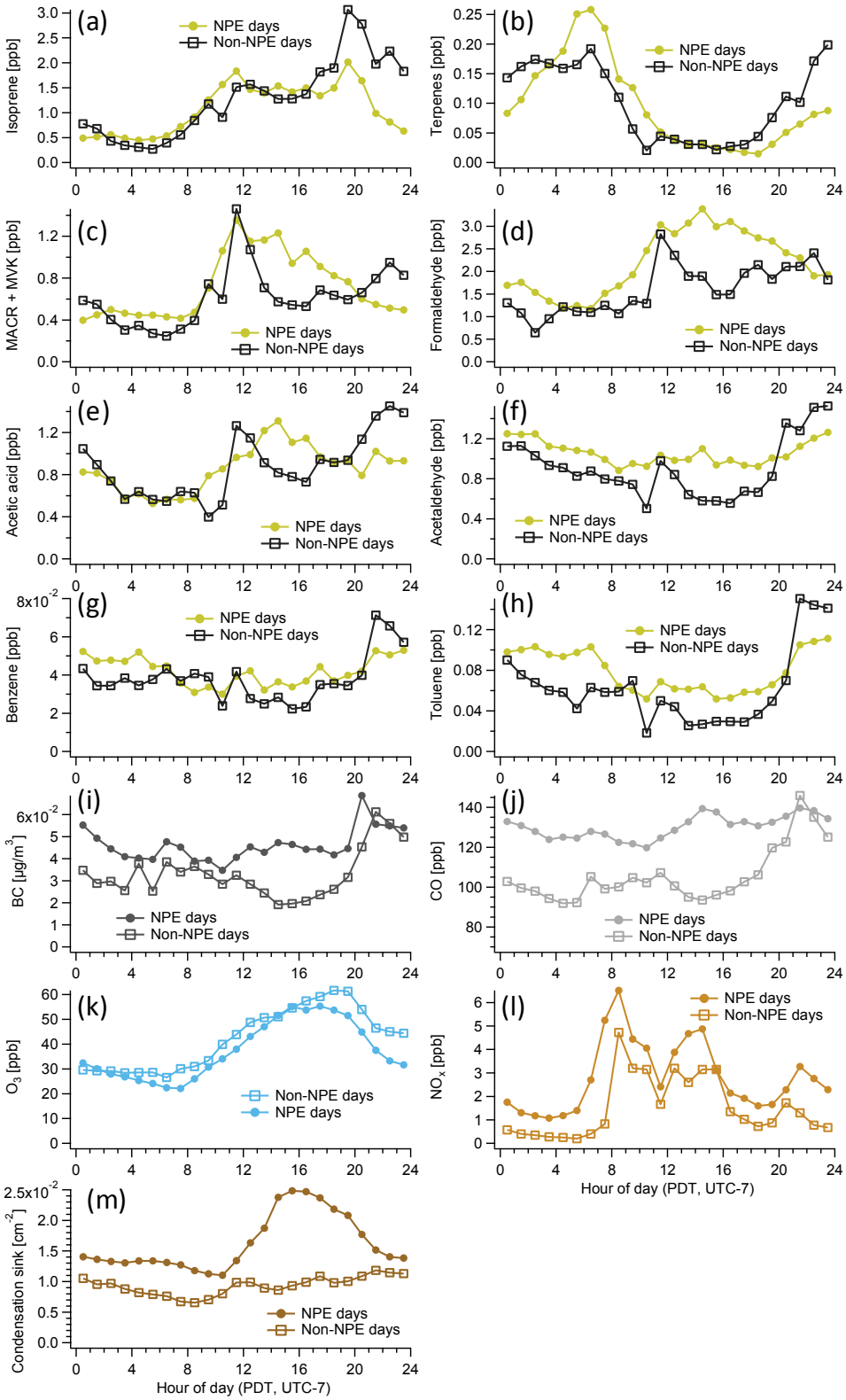

Figure S5. Time series of (a) broadband solar radiation and O_3, (b) CO and NO_x, (c) Org, SO_4^{2-}, NO_3^-, NH_4^+ and Cl^-, (d) OA components, and (e) particle number concentration and condensation sink at T1. Periods of T0 to T1 transport and northwesterly wind periods are shaded in pink and green, respectively.