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Supplement of

Traffic-originated nanocluster emission exceeds H_2SO_4-driven photochemical new particle formation in an urban area

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Condensation sink calculation

Condensation sink (CS) is calculated using the function (Kulmala et al., 2001):

$$CS = 2\pi\mathcal{D}\int_0^\infty \beta(D_\mathrm{p})\cdot D_\mathrm{p}\cdot \frac{\mathrm{d}N}{\mathrm{d}\log D_\mathrm{p}}(D_\mathrm{p})\cdot \mathrm{d}\log D_\mathrm{p} \tag{S1}$$

where $\mathcal{D}$ is the diffusion coefficient of the condensing vapor and $\beta(D_\mathrm{p})$ and $\frac{\mathrm{d}N}{\mathrm{d}\log D_\mathrm{p}}(D_\mathrm{p})$ are the transition regime correction factor (Fuchs and Sutugin, 1971) and particle number size distribution at particle diameter of D_p, respectively. CS is in most cases calculated only for $\mathrm{H_2SO_4}$ (Lehtinen et al., 2007) but here it is calculated also for two other vapors generally participating in NPF processes (Kerminen et al., 2018): one with a high $\mathcal{D}$ (ammonia, $\mathrm{NH_3}$) and one with a low $\mathcal{D}$ (a low volatile organic compound with a high molecular mass, $\mathrm{C_{19}H_{28}O_{11}}$, Ehn et al., 2014). Time series of CS for $\mathrm{H_2SO_4}$ is presented in Fig. S4 and the diurnal variations in CS for all three calculated condensing vapors in Fig. S1.

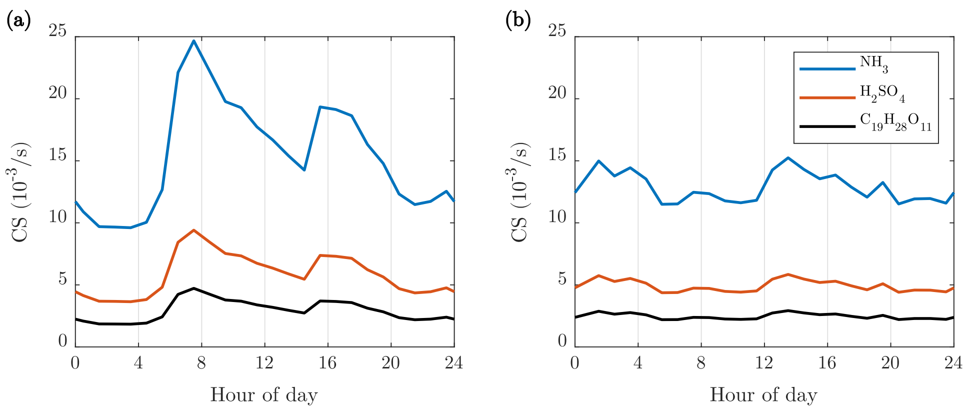

Figure S1. Diurnal variations in CS for different condensing vapors participating in NPF processes, (**a**) on weekdays and (**b**) on weekends.

Coagulation sink calculation

Coagulation sink (CoagS) for a particle diameter of D'_p is calculated using the function (Dal Maso et al., 2005):

$$\mathrm{CoagS}(D'_\mathrm{p}) = \int_0^\infty K(D_\mathrm{p}, D'_\mathrm{p}) \cdot \frac{\mathrm{d}N}{\mathrm{d}\log D_\mathrm{p}}(D_\mathrm{p}) \cdot \mathrm{d}\log D_\mathrm{p} \tag{S2}$$

where $K(D_\mathrm{p}, D'_\mathrm{p})$ is the coagulation coefficient of particles with the diameters of D_p and D'_p. CoagS and its inverse, coagulation time constant (τ_CoagS), for the smallest and largest measured NCA particles are presented in Fig. S2.

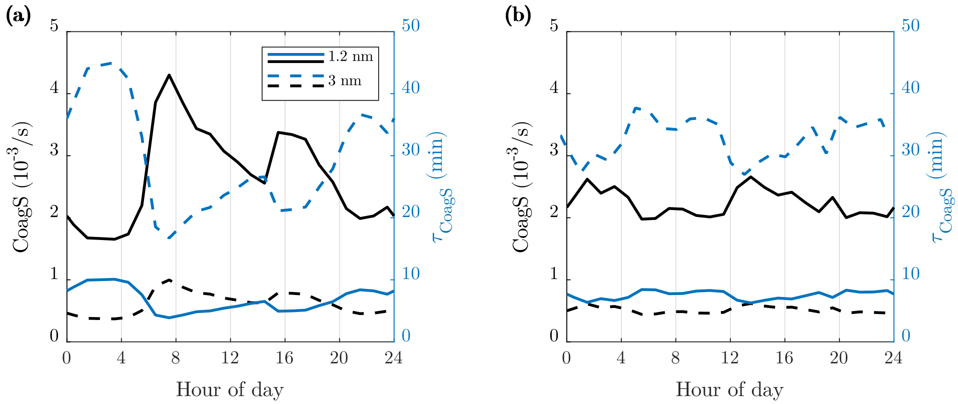

Figure S2. Diurnal variations in coagulation sinks and coagulation time constants for 1.2 nm and 3 nm particles, (**a**) on weekdays and (**b**) on weekends.

Time series

Figures S3 and S4 present the time series of all analyzed quantities.

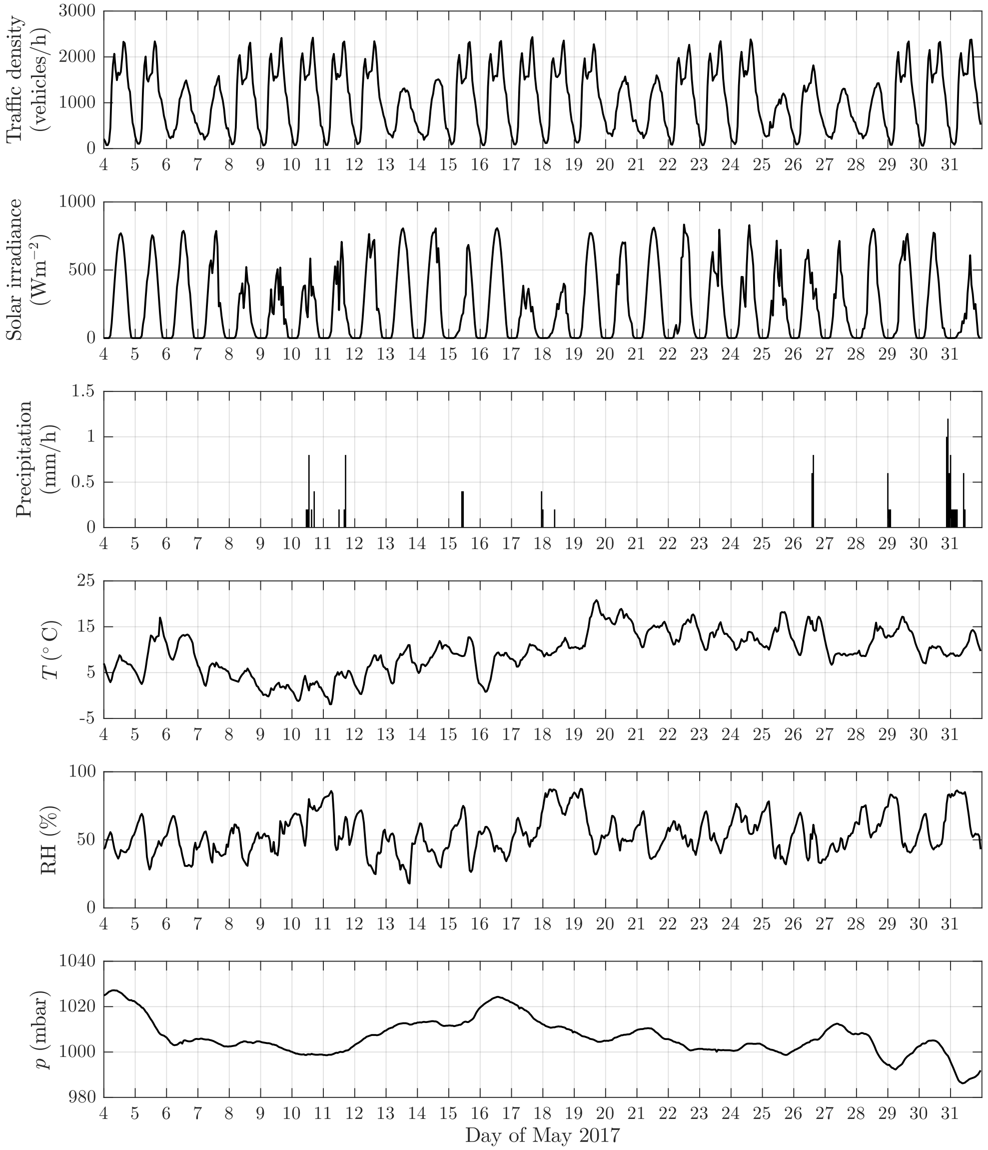

Figure S3. Time series of traffic density, solar irradiance, precipitation, temperature (T), relative humidity (RH), and atmospheric pressure (p).

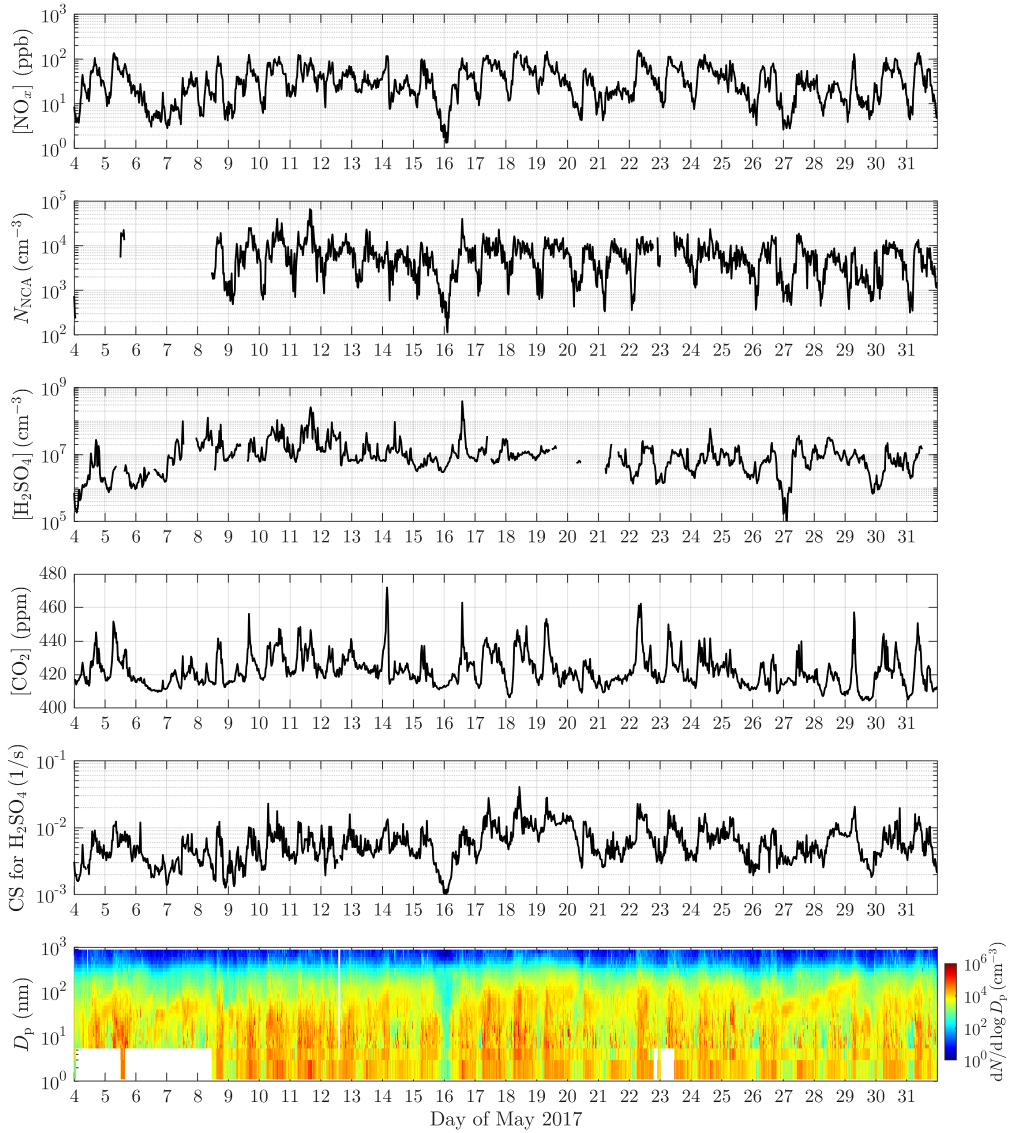

Figure S4. Time series of the NO_x, NCA, H_2SO_4, and CO_2 concentrations, CS for H_2SO_4, and particle size distribution. The size distributions include data from PSM, CPC 3776, CPC A20, and DMPS.

Solar irradiance as a function of CO_2 concentration

Figure S5 presents solar irradiance as a function of CO_2 concentration for the same SI ranges used in Fig. 7.

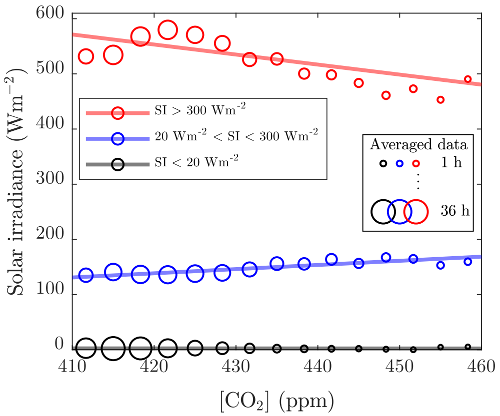

Figure S5. The 1 min averages of solar irradiance (SI) as a function of CO_2 concentration for the SI ranges used in Fig. 7 (see Fig. 6 for the details on averaging and linear regression).

Comparison of the NCA concentration and condensation sink time series

Figure S6 presents the time series of the NCA concentration and CS for H_2SO_4 together.

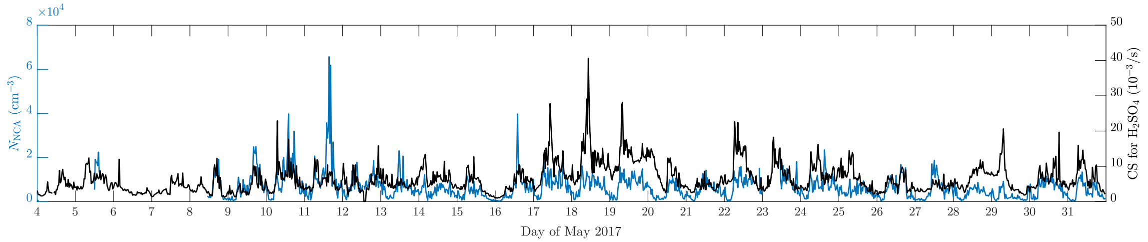

Figure S6. Time series of the NCA concentration and CS for H_2SO_4.

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