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Supplement of

Traffic-originated nanocluster emission exceeds H$_2$SO$_4$-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):

\[
CS = 2\pi D \int_0^{\infty} \beta(D_p) \cdot D_p \cdot \frac{dN}{d\log D_p}(D_p) \cdot d\log D_p
\]  

where $D$ is the diffusion coefficient of the condensing vapor and $\beta(D_p)$ and $\frac{dN}{d\log D_p}(D_p)$ 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 $\text{H}_2\text{SO}_4$ (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 $D$ (ammonia, $\text{NH}_3$) and one with a low $D$ (a low volatile organic compound with a high molecular mass, $\text{C}_{19}\text{H}_{28}\text{O}_{11}$, Ehn et al., 2014). Time series of CS for $\text{H}_2\text{SO}_4$ 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):

$$\text{CoagS}(D'_{p}) = \int_{0}^{\infty} K(D_p, D'_{p}) \cdot \frac{dN}{d\log D_p}(D_p) \cdot d\log D_p$$

(S2)

where $K(D_p, D'_{p})$ is the coagulation coefficient of particles with the diameters of $D_p$ and $D'_{p}$. CoagS and its inverse, coagulation time constant ($\tau_{\text{CoagS}}$), 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.
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\textsubscript{x}, NCA, \(\text{H}_2\text{SO}_4\), and \(\text{CO}_2\) concentrations, CS for \(\text{H}_2\text{SO}_4\), 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$_2$SO$_4$ together.

**Figure S6.** Time series of the NCA concentration and CS for H$_2$SO$_4$. 
References


