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Supplementary Information of

Investigating evidence of enhanced aerosol formation and growth due to autumnal moth larvae feeding on mountain birch at SMEAR I in northern Finland

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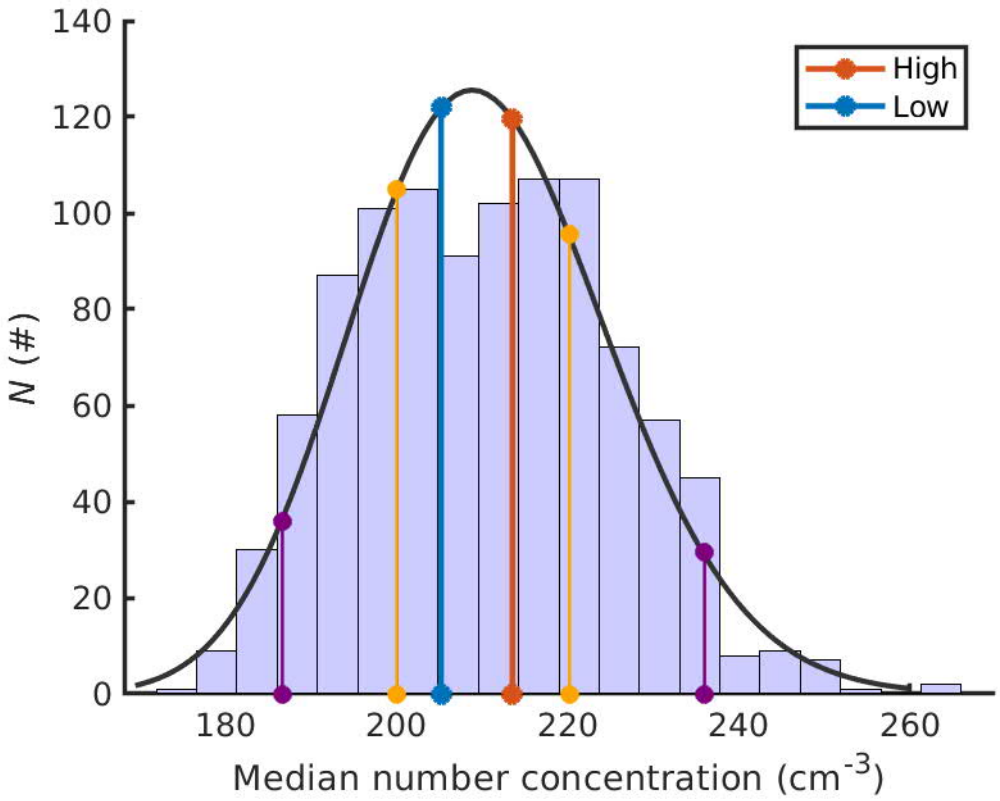


Fig. S1. Statistical analysis related to median diurnal DMPS number size distribution (Fig. 7). We took the median diurnal DMPS number size distribution over the June–July data from the four highest (red) and lowest (blue) autumnal moth density years, and from all other combinations of sets of four years between 2003 and 2016 (histogram). By fitting a lognormal distribution (black line) to the distribution of medians, we could calculate the positions of the 25th (left yellow) and 75th (right yellow) and 5th (left purple) and 95th percentiles (right purple). Then the median values from low and high moth density years could be compared to the statistics of the distribution.

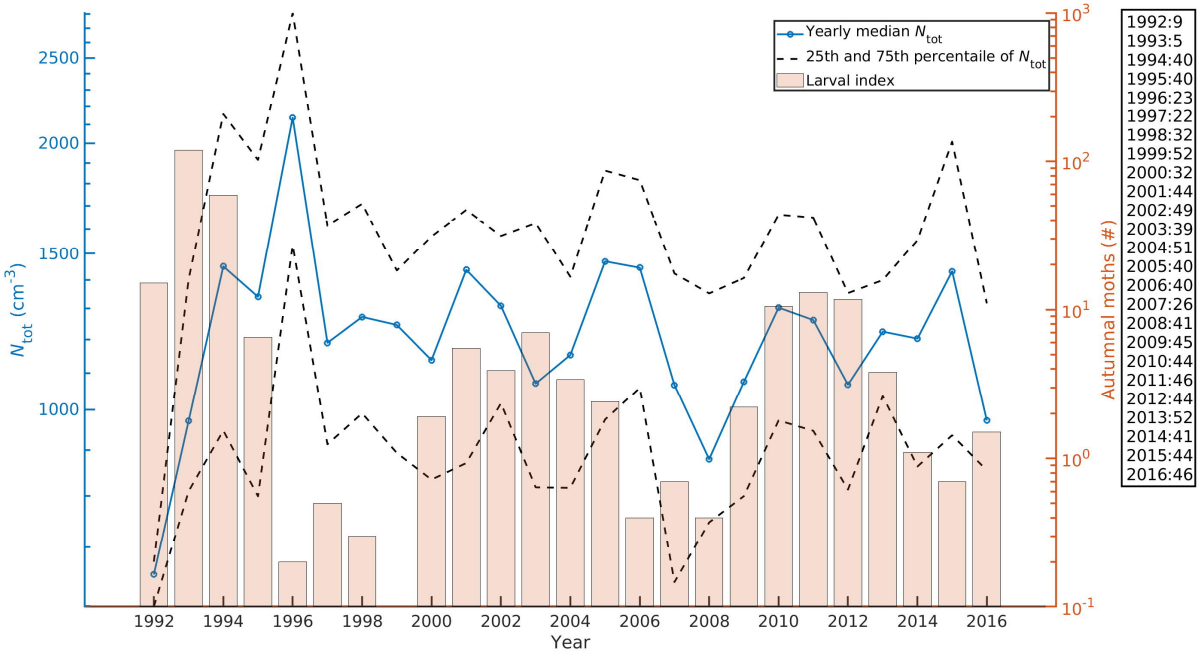
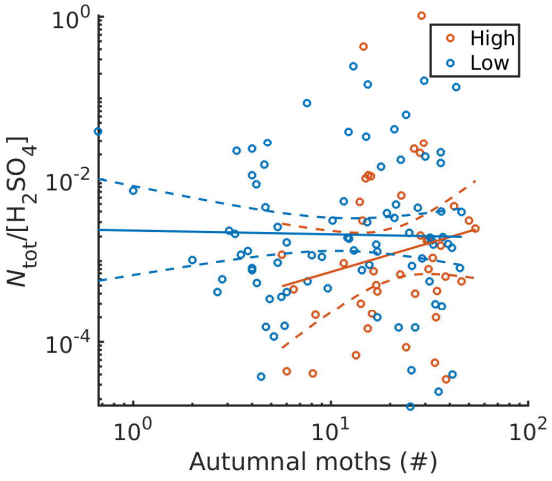


Fig. S2. Median of June–July total particle concentration (from CPC) and 25th and 75th percentiles (left *y*-axis) and larval index data (right *y*-axis) from the whole measurement period. Only days with high total particle and low SO_2 concentrations were included. The number of data points per year are shown in the box. Note that in 1992 and 1993 there were only a few total particle concentration data points, and in 1999 the larval index data were not missing but had a value of 0, which could not be presented in logarithmic scale.



	r	*p*	*s*	*n*
High	0.18	0.25	0.71	42
Low	-0.02	0.85	-0.05	83

Fig. S3. Daytime (09:00–17:00) median total particle concentration (from DMPS) normalized by corresponding H_2SO_4 concentration from high (2003, 2010–2012; red) and low (1998, 1999, 2007, 2008 and 2016; blue) autumnal moth density years. The estimate of moth density is from sweeping measurements integrated to daily scale. Meaning of the lines and statistical values are the same as earlier (Fig. 5).

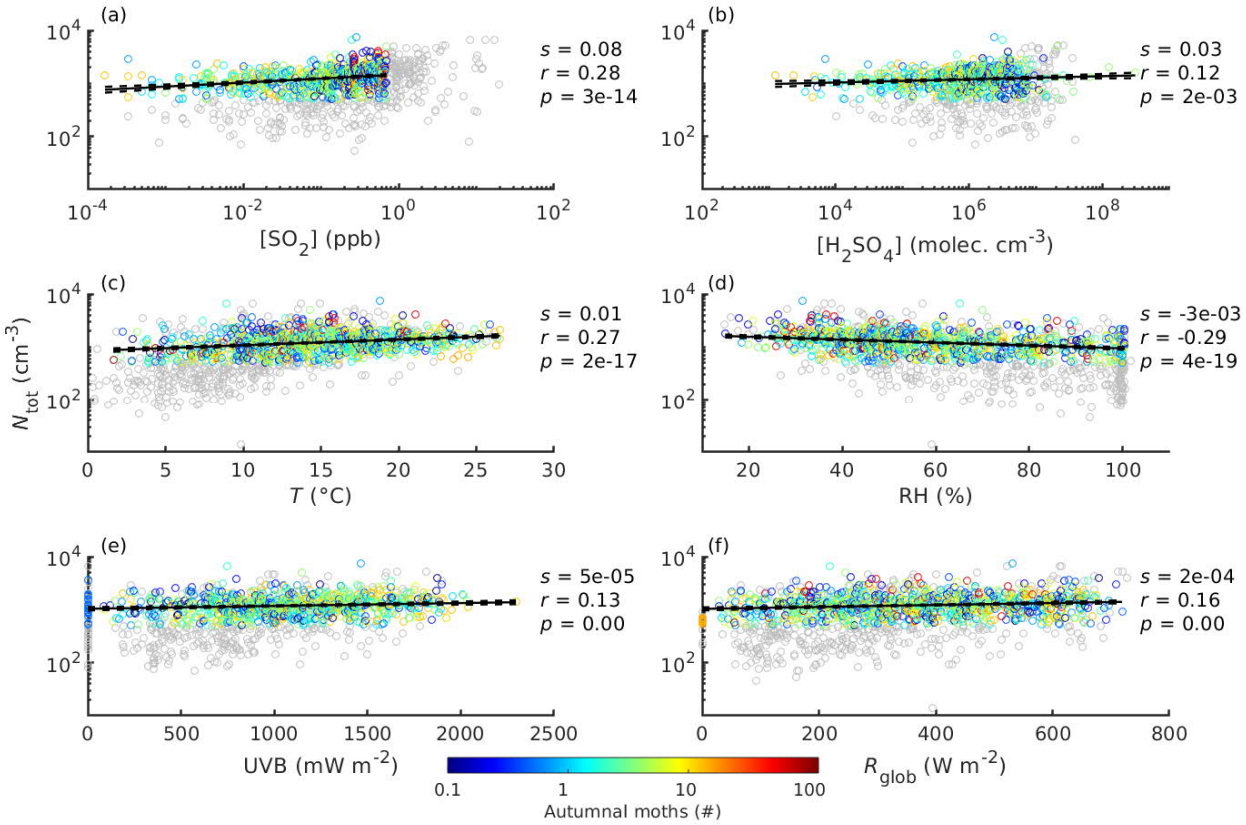


Fig. S4: Scatter plots of daytime median total particle concentration (CPC) as a function of SO_2 and H_2SO_4 concentrations, temperature, relative humidity, and UV-B and global radiation (1992–2016). The data were filtered so that the considered days had high total particle and low SO_2 concentrations. These data points are colored by the number of autumnal moths estimated by larval index. The statistical values are presented in the figure for each subplot. Gray dots show the non-filtered data, and the statistical values related to non-filtered data are presented in Table S2. The data coverage is presented in Table S1. Meaning of the lines and statistical values are the same as earlier (Fig. 5).

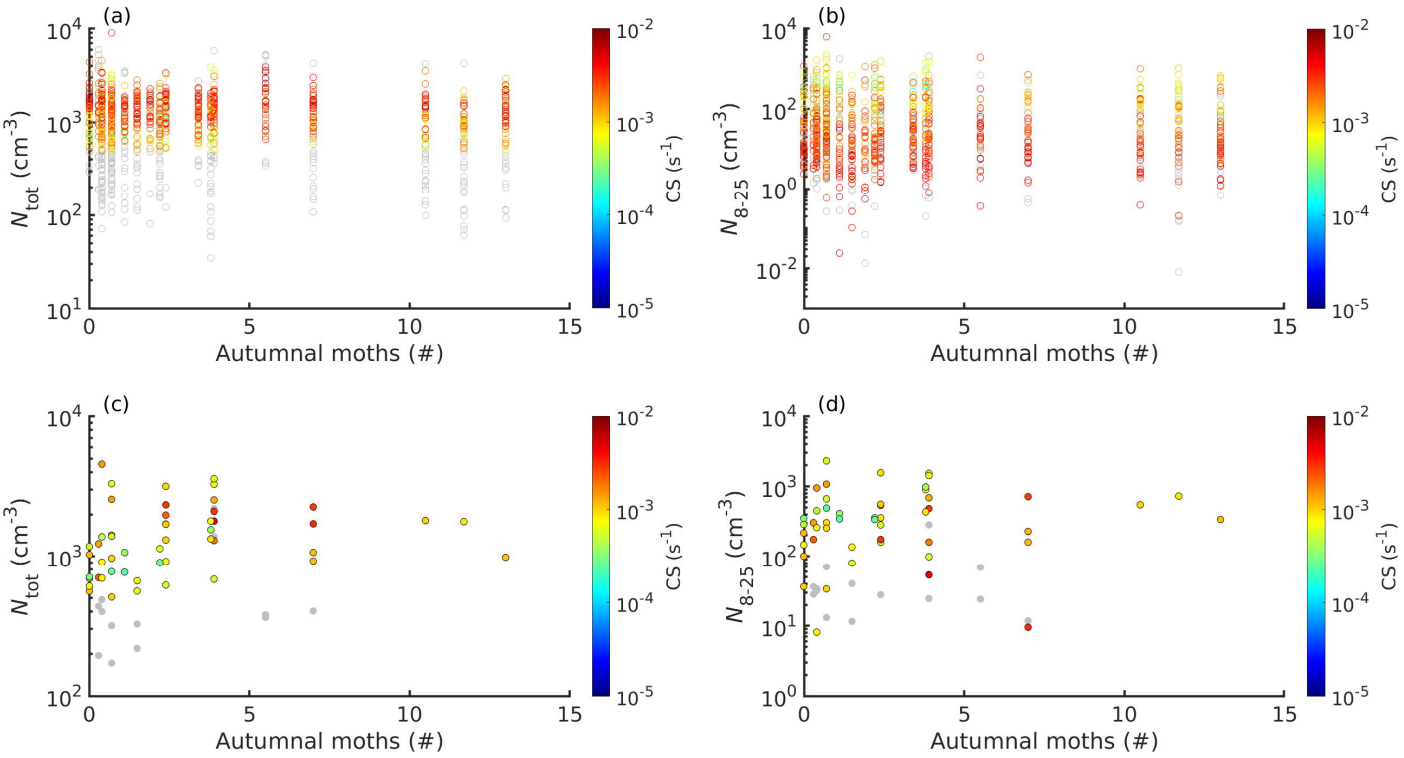


Fig. S5: Scatter plots of daytime median (**a**) total particle concentration (DMPS) and (**b**) nucleation mode particle concentration as a function of larval index data. The plots (**c**) and (**d**) are similar to (**a**) and (**b**), but contain data only from NPF event days. The data were filtered so that the considered days had high total particle and low SO_2 concentrations. Gray dots show the non-filtered data whereas the color indicate the calculated CS. Notice the differences in the scaling of *y*-axes.

Table S1: Data availability of atmospheric variables (Fig. S4 in Supplementary Information). The first and second numbers in each column indicate data availability after filtering and without filtering, respectively. The maximum number of data points per year is 61 (one point per day from June and July). E.g., instrument problems cause a decrease in the available days from the maximum value.

Year	$[SO_2]$	$[H_2SO_4]$	T	RH	UV-B	R_{glob}
1992	4/6	-/-	9/13	-/-	-/-	9/14
1993	5/9	-/-	5/9	-/-	-/-	5/9
1994	40/58	-/-	38/55	40/58	-/-	38/55
1995	40/61	-/-	40/61	40/61	-/-	40/61
1996	23/60	-/-	23/59	23/60	13/29	23/59
1997	22/55	-/-	22/56	20/53	22/56	22/56
1998	32/58	32/58	32/58	32/58	32/58	32/58
1999	51/60	51/60	52/61	52/61	52/61	52/61
2000	32/41	32/41	32/41	32/41	32/41	32/41
2001	44/60	44/60	44/60	44/60	44/60	44/60
2002	47/59	33/59	49/61	48/60	49/61	49/61
2003	39/57	37/57	39/57	39/57	39/57	39/57
2004	48/54	37/54	51/60	51/60	51/60	51/60
2005	38/44	34/44	40/47	40/47	40/47	40/47
2006	7/12	7/12	40/54	40/54	8/13	40/54
2007	26/43	26/43	26/43	26/43	26/43	26/43
2008	39/56	30/56	41/61	41/61	41/61	41/61
2009	44/57	42/57	45/58	44/57	45/58	45/58
2010	8/17	1/17	40/55	44/60	40/55	38/53
2011	46/60	36/60	46/60	46/60	46/60	46/60
2012	44/61	42/61	44/61	44/61	44/61	44/61
2013	51/60	41/60	52/61	52/61	52/61	52/61
2014	39/59	35/59	41/61	41/61	41/61	41/61
2015	44/61	25/61	44/61	44/61	44/61	44/61
2016	46/61	36/61	46/61	46/61	46/61	46/61

Table S2: Correlation coefficients (r) and p-values between non-filtered data of atmospheric measurements and aerosol particles (Fig. S4 in Supplementary Information).

	$[SO_2]$	$[H_2SO_4]$	T	RH	UV-B	R_{glob}
r	0.31	0.10	0.50	–0.43	0.31	0.32
p	8×10^{-25}	0.006	2×10^{-87}	3×10^{-59}	7×10^{-27}	1×10^{-32}