Characterization of Aerosol Particles Produced by a Skyscraper Demolition by Blasting
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Supplementary Information

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To support the data and conclusions of the main paper, the complete dataset is shown here, including Appendix A, meteorological data taken by the portable weather station and Appendix B, the size-resolved number concentration measured by SMPS, OPC and APS. Supplementary information Appendix C is an estimation of the maximum spread of the plume, Appendix D is the chemical analysis of the sediment samples and Appendix E an Ice Nuclei analysis.

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Appendix A. Meteorological Data

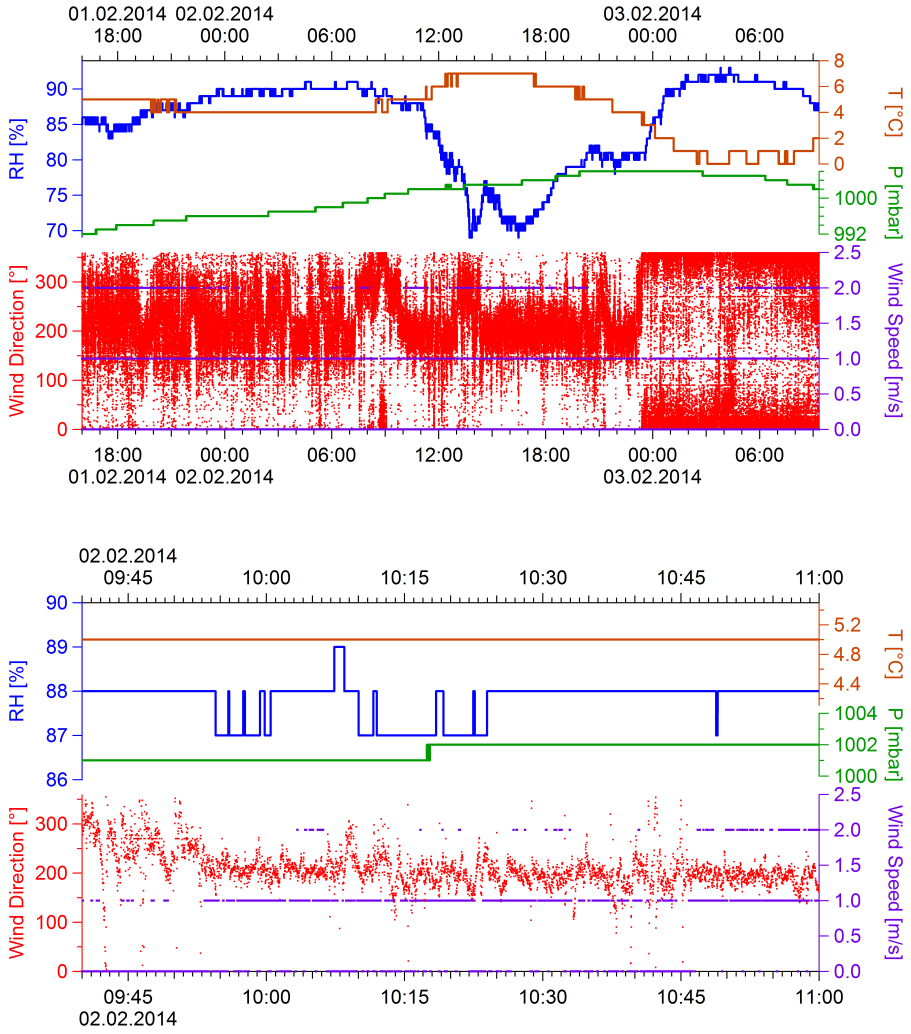

Figure A.1: Meteorological data from the day of the blasting. Shortly after the blasting, the local wind direction (red) was 197° with a wind speed (purple) of $0.74\,\mathrm{m\,s^{-1}}$. The relative humidity (blue) was 87%, the temperature (brown) about 5° and the pressure (green) 1001.7 mbar.

Appendix B. Size-Resolved Number Concentration

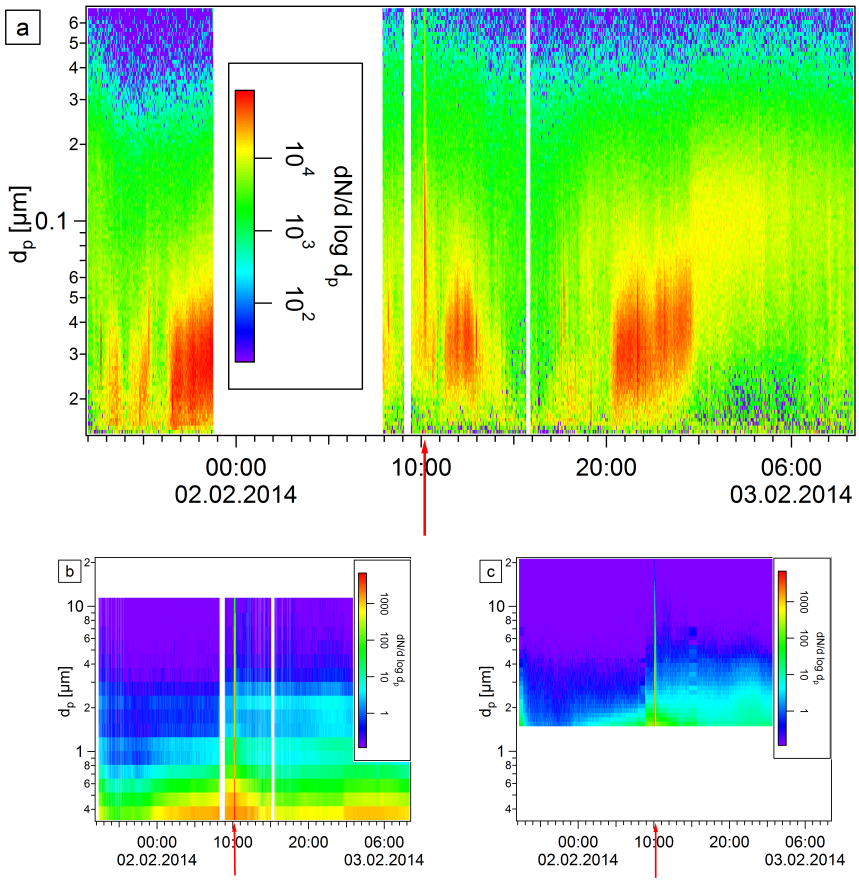

Figure B.1: Size-resolved number concentration measured by a) SMPS b) OPC and c) APS. For larger particle diameters (OPC and APS), the blasting is dominant, whereas the smaller sizes (SMPS) have a higher background. For comparability, OPC and APS data are shown on equal scales.

Appendix C. Maximum Spread

The PM_{10} mass concentration data taken at the measurement site near the tower were compared to data from regular air quality monitoring stations of HLUG (Hessian Agency for the Environment and Geology) in Frankfurt. The stations "Friedberger Landstraße" (50.125656 8.693006, northeast of the tower), "Höchst" (50.102906 8.542172, west) and "Ost" (50.126914 8.748594, east), which are 3.148 km, 7.936 km and 7.040 km linear distance from the tower, respectively, show a similar diurnal variation, but the blasting cannot be seen. Thus, this can be used to estimate a maximum spread of the particles from the blasting. The enhanced concentrations spread no further than 3.148 km north-east direction and 7.936 km in west direction.

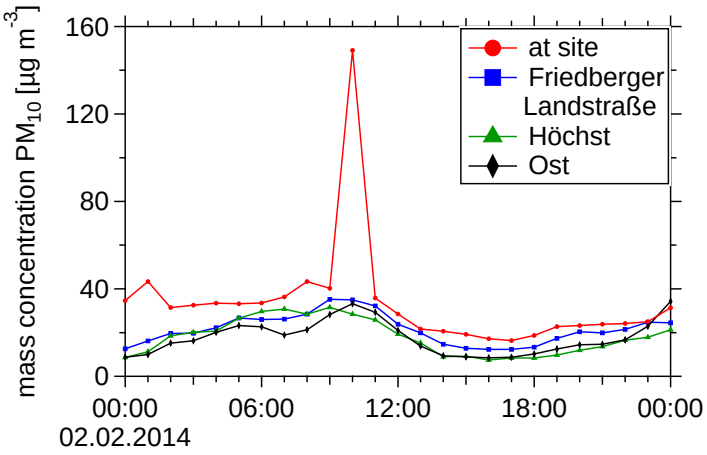

Figure C.1: PM_{10} mass concentrations at the measurement site near the tower (red), compared to "Friedberger Landstraße" (blue), "Höchst" (green) and "Ost" (black) in 30 minute time resolution. The stations further away from the tower show no detectable enhancement in concentration due to the blasting.

Appendix D. Chemical Composition - Metals

Element	Sample M	Sample 4	Sample 5	Sample 7	Sample 8	Sample 10	Sample 11
Sb	12.5	4.0	11.4	25.0	20.8	20.8	16.1
As	9.1	11.4	9.1	10.0	9.1	8.3	6.5
Pb	81.4	71.2	84.4	79.1	54.0	51.9	46.8
Cd	0.9	0.8	0.7	1.5	1.6	1.2	1.1
Cr	66.2	131.5	88.9	108.8	68.6	171.6	314.9
Fe	8018.8	16928.0	10489.0	4192.6	3330.2	2610.4	2280.6
Cu	207.7	89.9	101.7	390.3	224.7	178.5	458.9
Ni	50.8	61.6	37.7	87.4	48.1	88.2	161.3
Tl	5.0	1.6	4.5	10.0	8.3	8.3	6.5
V	14.6	32.7	21.7	10.0	12.4	9.4	6.5
Mn	205.6	406.0	278.0	85.2	81.2	66.6	50.6
Co	6.1	15.9	11.2	3.5	4.2	3.2	3.0
total mass	564.3	1763.5	620.8	282.2	338.6	338.6	437.4

Element	Sample 12	Sample 15	Sample 16	Sample 22	Sample 24	Sample 29	Sample 30
Sb	19.2	11.4	11.6	20.8	29.4	4.9	16.7
As	7.7	7.6	10.8	12.4	18.2	4.3	6.7
Pb	53.7	61.0	79.3	117.8	138.1	28.8	63.6
Cd	1.2	0.8	0.8	1.6	2.7	1.0	3.3
Cr	130.0	70.4	89.7	155.8	165.3	31.6	115.8
Fe	2594.2	9715.9	15680.0	9744.8	19676.0	2393.5	4844.2
Cu	229.7	261.4	190.2	210.2	409.4	77.2	284.1
Ni	74.1	42.5	58.2	73.3	109.3	21.8	67.0
Tl	7.7	4.5	4.7	8.3	11.8	3.7	6.7
V	7.7	47.9	30.3	20.2	41.6	5.5	8.9
Mn	43.8	253.0	433.0	229.9	555.0	59.8	143.1
Co	2.7	6.5	10.8	5.6	12.2	1.6	5.2
total mass	366.8	620.8	606.7	239.8	423.3	211.6	183.4

Table D.1: Chemical composition of deposition samples. Mass fractions of elements in $\mu g\,g^{-1}$. Total mass in $mg\,m^{-2}\,d^{-1}$. Sample M was taken directly at the main measurement site.

Appendix E. Ice Nuclei

The ice nuclei counter FRIDGE (Klein et al. (2010)) was used to study the particles ice nucleation ability in deposition mode. Therefore, aerosol particles were collected on silicon wafers before, during and after the skyscraper blasting (wafers 1 + 2, 3 + 4 and 5, respectively). Afterwards the sample was analyzed in the FRIDGE chamber, where it was exposed to a temperature of -18°C and a stepwise increased relative humidity of 111% - 118% with respect to ice. The absolute number of activated ice nuclei as well as the ice nuclei concentration were not significantly increased in the samples from the blasting (fig. E.1). The measurement suggests that the particles from the blasting do not generate ice nucleation under the analyzed conditions, thus the blasting apparently did not affect the ice nuclei concentration.

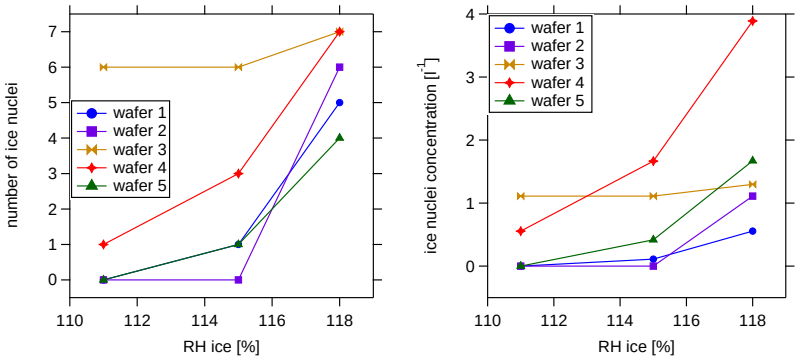

Figure E.1: Number of ice nuclei per sample and ice nuclei concentration under different relative humidities with respect to ice. Wafers 1, 2 and 5 are samples with background aerosol, wafers 3 and 4 contain aerosol from the blasting. The samples taken during the blasting do not show significantly enhanced ice nuclei concentration compared to background.

References

Klein H, Haunold W, Bundke U, Nillius B, Wetter T, Schallenberg S, Bingemer H. A new method for sampling of atmospheric ice nuclei with subsequent analysis in a static diffusion chamber. Atmospheric Research 2010;96(23):218–24.