Supplementary Information

Size-resolved aerosol pH over Europe during summer

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Site	Type of site	Dust levels	Sea salt levels	Location in Europe
Finokalia, Greece	Remote	Low	High	South
Cabauw, Netherlands	Rural	High	Low	North
Melpitz, Germany	Rural	High	Low	North
Mace Head, Ireland	Coastal rural	Low	High	North-west
Bologna, Italy	Urban	High	Low	South
Brussels, Belgium	Urban	High	Low	North
Paris, France	Urban	High	Low	West
Iza, Ukraine	Rural	Low	Low	East

 Table S1 Characteristics of the eight selected sites.



Figure S1. Position of the examined eight different sites.



-1.5 -1.0 -0.5 0.0 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5

Figure S2. Box plots for hourly pH values for the examined particle size ranges and for the eight different sites for the base case simulation. The line represents the median, the star is the mean value, the upper box line is for the 90% of the pH distribution and the lower box line for the 10%.



Figure S3. Average predicted aerosol water content (in μ g m⁻³) for different size ranges and altitudes: **a**), **b**), **c**), **d**), **e**) for PM₁, **f**), **g**), **h**), **i**), **j**) for PM_{1-2.5}, **k**), **l**), **m**), **n**), **o**) for PM_{2.5-5}, **p**), **q**), **r**), **s**) **t**) for PM₅₋₁₀ for altitudes: 50-140 m, 250-380 m, 550-780 m, 1000-1500 m, and 2000-2500 m for the base case simulation during May 2008.



Figure S4. Average ground level aerosol nitrate predictions (in μ g m⁻³) for **a**) PM₁, **b**) PM_{1-2.5}, **c**) PM_{2.5-5} and **d**) PM₅₋₁₀ for the base case simulation during May 2008.



Figure S5. PM₁, PM_{1-2.5}, PM_{2.5-5} and PM₅₋₁₀ ammonium diurnal profiles for **a**) Cabauw, Netherlands, **b**) Melpitz, Germany, **c**) Paris, France and **d**) Finokalia, Greece for the base case simulation during May 2008.



Figure S6. Increase of average ground level aerosol water (in μ g m⁻³) for **a**) PM₁, **b**) PM_{1-2.5}, **c**) PM_{2.5-5} and **d**) PM₅₋₁₀ for the base case simulation compared to the inert dust case during May 2008.



Figure S7. Average ground level aerosol dust predictions (in μ g m⁻³) for **a**) PM₁, **b**) PM_{1-2.5}, **c**) PM_{2.5-5} and **d**) PM₅₋₁₀ for the base case simulation during May 2008.



Figure S8. Increase of average ground level aerosol nitrate (in μ g m⁻³) for **a**) PM₁, **b**) PM_{1-2.5}, **c**) PM_{2.5-5} and **d**) PM₅₋₁₀ for the base case simulation compared to the inert dust case during May 2008.



Figure S9. Increase of average ground level aerosol water (in μ g m⁻³) for **a**) PM₁, **b**) PM_{1-2.5}, **c**) PM_{2.5-5} and **d**) PM₅₋₁₀ for the base case simulation compared to the case when calcium in dust is neglected during May 2008.