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Effects of simulated secondary organic aerosol water on PM$_1$ levels and composition over the US

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Table S1: Characteristics of the four selected sites

Site	SOA levels (μg m^{-3})	Ammonium levels (μg m^{-3})	Nitrate levels (μg m^{-3})	Sulfate levels (μg m^{-3})	RH levels (%)	Location in CONUS
Sacramento, California	1	0.7	0.5	1	61	West
Houston, Texas	2.5	1.2	0.7	1.8	75	South
Atlanta, Georgia	4	1.2	0.7	1.7	69	South
Toronto, Canada	2.5	1.2	1.2	1.6	73	North

Figure S1. PMCAMx modeling domain and position of the four examined sites.

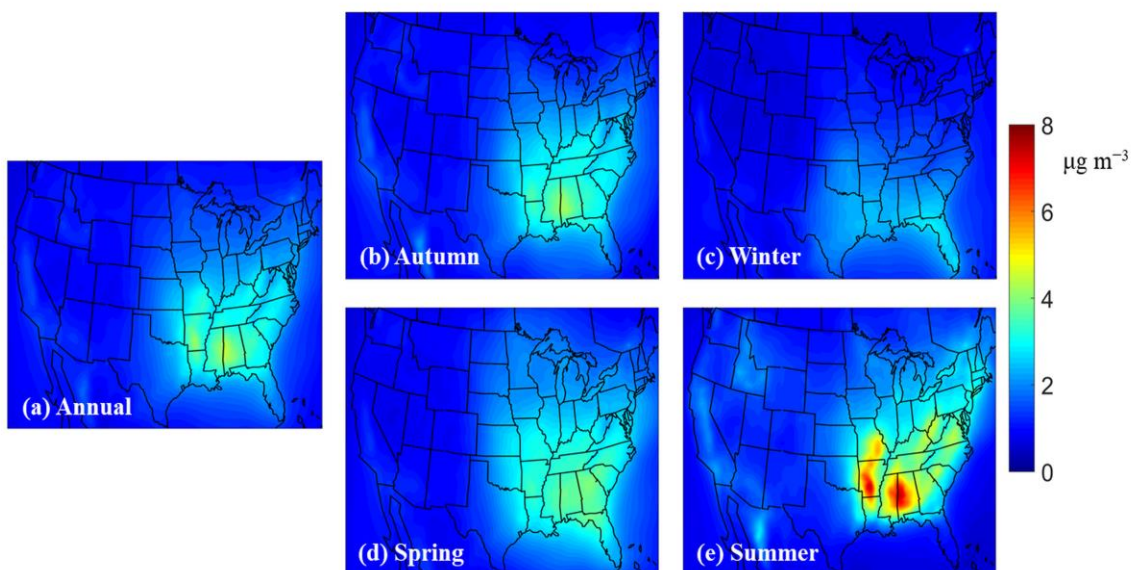**Figure S2.** Average ground-level concentrations (in μg m^{-3}) of PM$_1$ SOA: **(a)** annual, **(b)** during autumn (SON), **(c)** during winter (DJF), **(d)** during spring (MAM), and **(e)** during summer (JJA) of 2010.
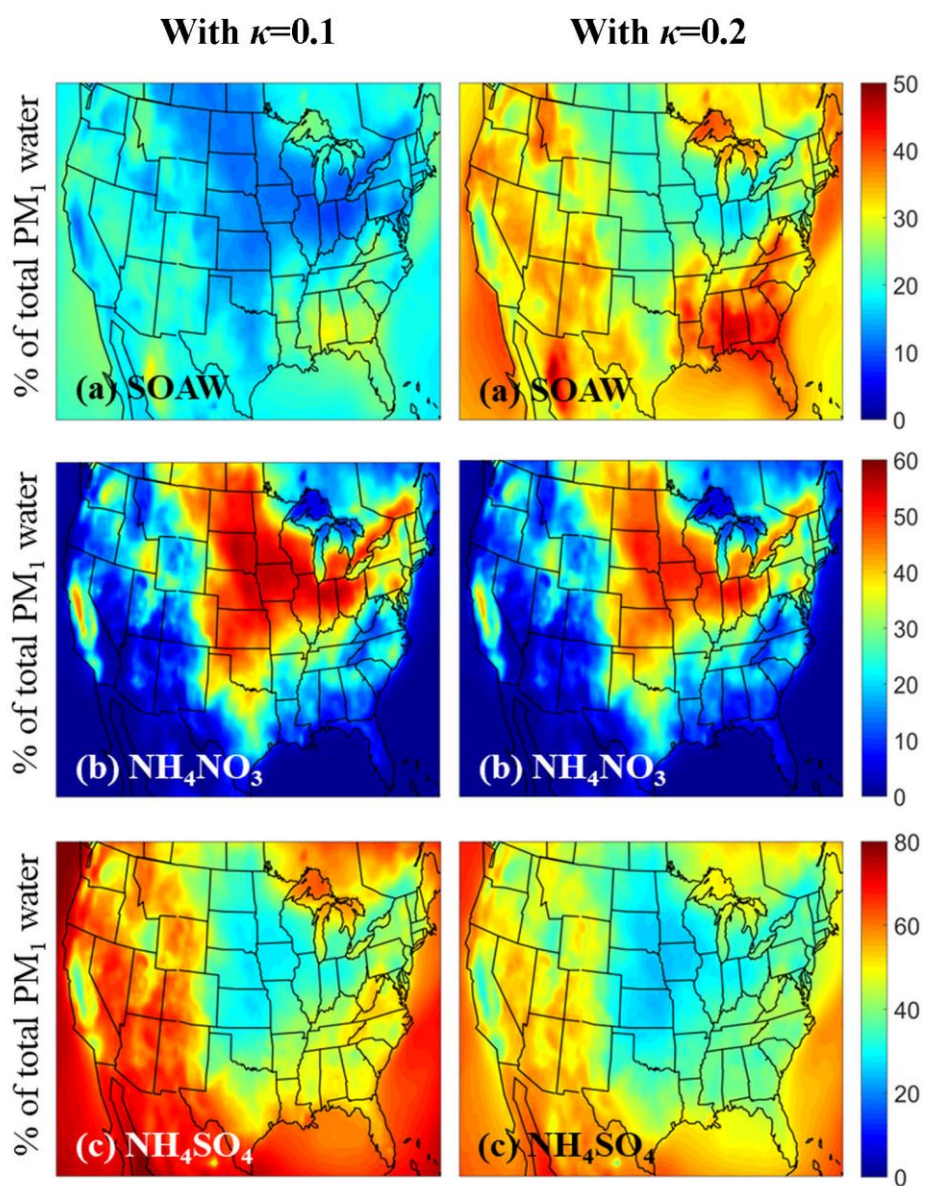
Figure S3. Annual average contribution to total PM$_1$ water concentrations from: **(a)** SOAW, **(b)** ammonium nitrate water, and **(c)** ammonium sulfate water when SOAW is present in the simulations with κ=0.1 and with κ=0.2 during 2010.
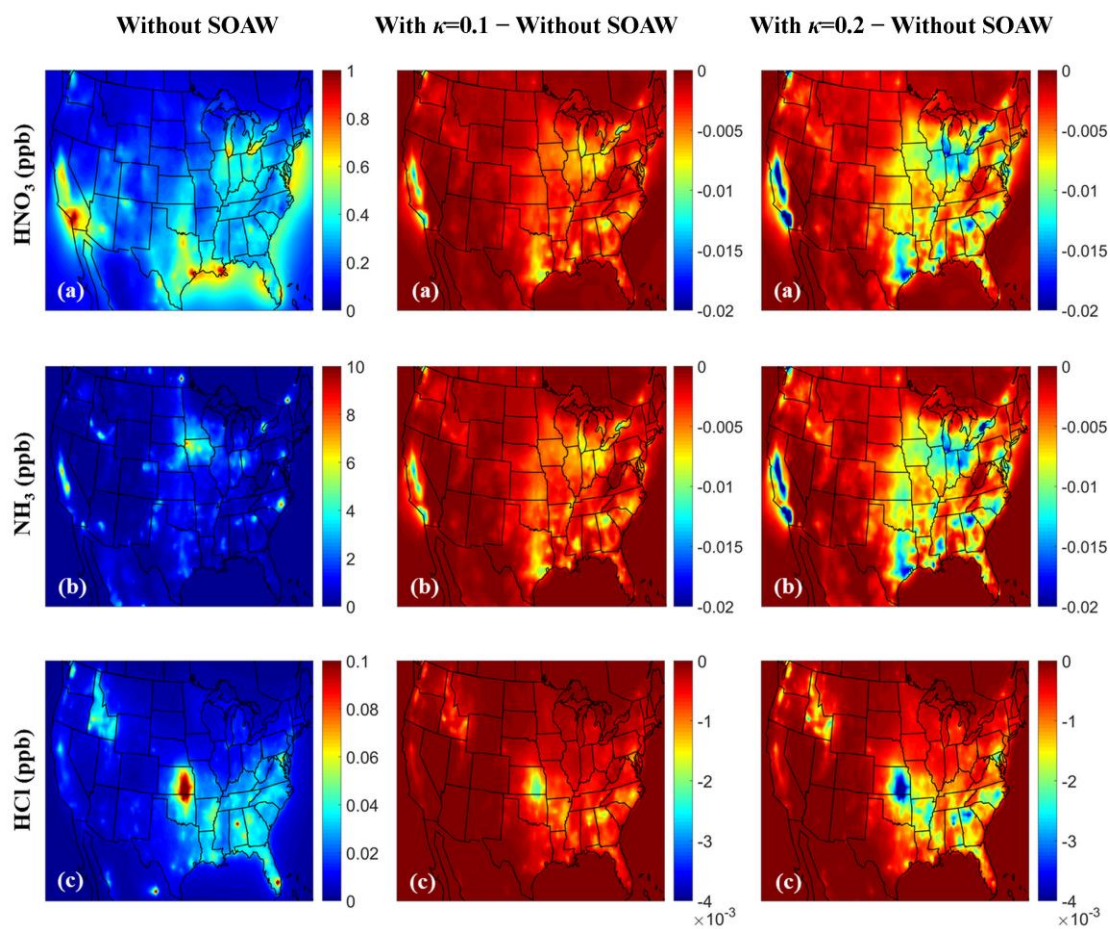
Figure S4. Annual average ground-level concentrations (in ppb) of gas phase: **(a)** nitric acid, **(b)** ammonia, and **(c)** hydrochloric acid neglecting SOAW and the annual concentration changes when SOAW is present in the simulations with κ=0.1 and κ=0.2. A negative change corresponds to a decrease.
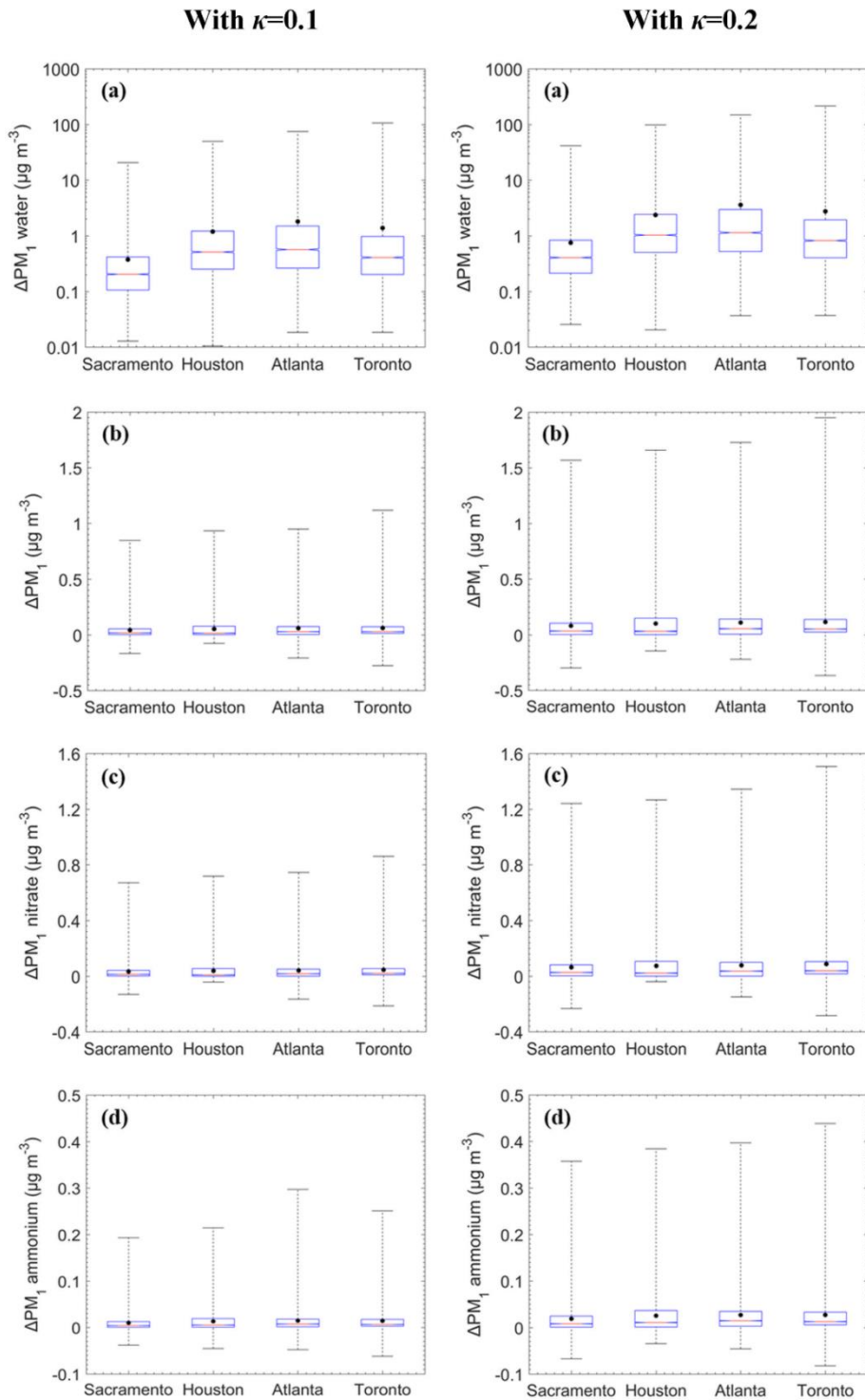
With κ=0.1   **With κ=0.2**

Figure S5. Box plots for concentration changes in the hourly PM_1: **(a)** water, **(b)** total dry, **(c)** nitrate, and **(d)** ammonium due to SOAW when κ=0.1 and κ=0.2 for Sacramento, California; Houston, Texas; Atlanta, Georgia; and Toronto, Canada during 2010. The red line represents the median, the black dot is the mean value, the upper box line is the upper quartile (75%) and the lower box line is the lower quartile (25%) of the distribution. A negative change corresponds to a decrease. Water is in log scale to show clearly both the relatively small average and the large range of high values.
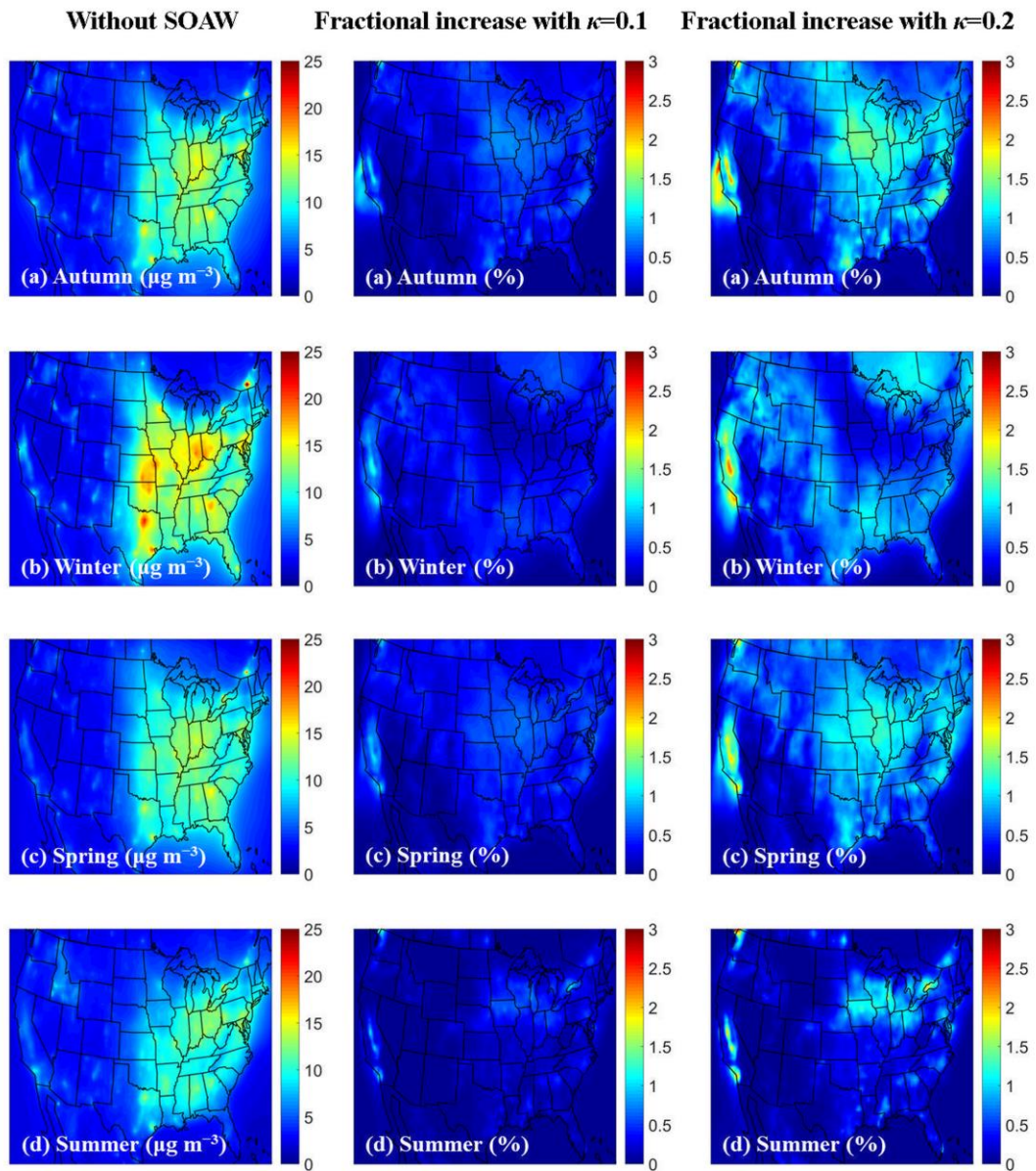
Figure S6. Average ground-level concentrations of total dry PM_1 neglecting SOAW (in µg m^{-3}) and the fractional increase when SOAW is present in the simulations with κ=0.1 and κ=0.2 during: **(a)** autumn (SON), **(b)** winter (DJF), **(c)** spring (MAM), and **(d)** summer (JJA) of 2010.