Effects of Secondary Organic Aerosol Water on fine PM levels and composition over US

Supporting Information

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Number of tables: 1

Number of figures: 8
Table S1: Characteristics of the four selected sites

<table>
<thead>
<tr>
<th>Site</th>
<th>SOA levels</th>
<th>Ammonium levels</th>
<th>Nitrate levels</th>
<th>Sulfate levels</th>
<th>Location in CONUS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sacramento, California</td>
<td>Low</td>
<td>Modest</td>
<td>Modest</td>
<td>Modest</td>
<td>West</td>
</tr>
<tr>
<td>Houston, Texas</td>
<td>Modest</td>
<td>High</td>
<td>Modest</td>
<td>High</td>
<td>South</td>
</tr>
<tr>
<td>Atlanta, Georgia</td>
<td>High</td>
<td>High</td>
<td>Modest</td>
<td>High</td>
<td>South</td>
</tr>
<tr>
<td>Toronto, Canada</td>
<td>Modest</td>
<td>High</td>
<td>High</td>
<td>High</td>
<td>North</td>
</tr>
</tbody>
</table>

Figure S1. PMCAMx modeling domain and position of the four examined sites.
**Figure S2.** Annual average ground-level concentrations (in μg m⁻³) of PM₁: (a) nitrate, (b) ammonium, (c) sulfate, and (d) chloride neglecting SOAW and the annual concentration changes when SOAW is present in the simulations with κ=0.1 and κ=0.2. A positive change corresponds to an increase. A negative change corresponds to a decrease.
**Figure S3.** Average ground-level concentrations (in $\mu$g m$^{-3}$) of PM$_1$ SOA: (a) annual, (b) during autumn, (c) during winter, (d) during spring, and (e) during summer of 2010.
**Figure S4.** Average ground-level concentrations of PM$_1$ water neglecting SOAW (in μg m$^{-3}$) and the fractional increase when SOAW is present in the simulations with $\kappa=0.1$ and $\kappa=0.2$ during: (a) autumn, (b) winter, (c) spring, and (d) summer of 2010.
Figure S5. 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 $\kappa=0.1$ and with $\kappa=0.2$ during 2010.
Figure S6. 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 $\kappa=0.1$ and $\kappa=0.2$. A negative change corresponds to a decrease.
Figure S7. Box plots for concentration changes in the hourly PM$_1$: (a) water, (b) total dry, (c) nitrate, and (d) ammonium due to SOAW when $\kappa=0.1$ and $\kappa=0.2$ 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.
**Figure S8.** Average ground-level concentrations of total dry PM$_{1}$ neglecting SOAW (in $\mu$g m$^{-3}$) and the fractional increase when SOAW is present in the simulations with $\kappa=0.1$ and $\kappa=0.2$ during: (a) autumn, (b) winter, (c) spring, and (d) summer of 2010.