Interactions of atmospheric organic particles with inorganic pollutants and cloud water

ILONA RIIPINEN[12], SILJA HÄKKINEN[3], NARGES RASTAK[1], MARYAM DALIRIAN[1], BENJAMIN MURPHY[14], JAN JULIN[1], SPYROS PANDIS[5] AND ANNICA EKMAN[2]

[1]Department of Environmental Science and Analytical Chemistry (ACES), Stockholm University, Stockholm, Sweden, ilona.riipinen@aces.su.se
[2]Bolin Centre for Climate Research, Stockholm, Sweden
[3]Department of Physics, University of Helsinki, Helsinki, Finland
[4]Now at: US Environmental Protection Agency, Raleigh, NC, US
[5]ICE-HT FORTH, Patra, Greece

Organic compounds form a significant fraction of atmospheric sub-micron particulate matter. The biosphere has traditionally been thought to be the primary source of organic aerosol, suggesting that organic particulate matter would be an important component of the atmospheric composition even without any human interference. Knowing the sources, atmospheric processing and loss mechanisms of biogenic organic particles is necessary for quantifying the pre-industrial baseline to which the present day conditions are compared when estimating the human effects on atmospheric composition, radiative forcing and climate.

After entering the atmosphere, organic aerosol constituents interact with inorganic compounds (such as sulfate, nitrate and sea salt) and cloud water. Understanding these interactions is necessary for accurate assessment of the consequences of political choices related to e.g. land-use change, urban air quality or agricultural emissions.

I will present an overview of our recent work focusing on the interactions of atmospheric organic compounds with inorganic aerosol constituents and cloud water – ranging from studies of molecular scale phenomena to macroscopic scale modeling of atmospheric composition and clouds. On one hand, I will focus on the condensed-phase processes influencing the volatility, solubility and surface activity of organic aerosol involving interactions between organic, inorganic, and water molecules. On the other hand, I will present results from large-scale modeling studies investigating the sensitivity of atmospheric aerosol loadings and effects to the representation of these molecular phenomena. Finally, I will discuss the important future directions for understanding the key processes coupling the anthropogenic and biogenic impacts on atmospheric composition, air quality and climate.