Geophysical Research Abstracts
Vol. 18, EGU2016-15401, 2016
EGU General Assembly 2016

Unraveling the Complexity of Atmospheric Aerosol: Insights from Ultrahigh Resolution Mass Spectrometry

Lynn R. Mazzoleni (1), Yunzhu Zhao (1), Vera Samburova (2), A. Gannet Hallar (3), and Douglas Lowenthal (2)

(1) Department of Chemistry, Michigan Technological University, Houghton, MI, United States (lrmazzol@mtu.edu), (2) Division of Atmospheric Science, Desert Research Institute, Reno, NV, United States, (3) Storm Peak Laboratory, Desert Research Institute, Steamboat Springs, CO, United States

Atmospheric aerosol organic matter (AOM) is a complex mixture of thousands of organic compounds, which may have significant influence on the climate-relevant properties of atmospheric aerosols. An improved understanding of the molecular composition of AOM is needed to evaluate the effect of aerosol composition upon aerosol physical properties. Products of gas, aqueous and particle phase reactions contribute to the aerosol organic mass. Thus, ambient aerosols carry a complex array of AOM components with variable chemical signatures depending upon its origin and aerosol life-cycle processes. In this work, ultrahigh-resolution Fourier transform-ion cyclotron resonance mass spectrometry (FT-ICR MS) was used to characterize ambient aerosol AOM collected at the Storm Peak Laboratory (3210 m a.s.l.) near Steamboat Springs, CO. Thousands of molecular formulas were assigned in the mass range of m/z 100–800 after negative-ion electrospray ionization. Using multivariate statistical analysis, correlations between the site meteorological conditions and specific molecular compositions were identified. For example, days with strong UV radiation and high temperature were found to contain large numbers of biogenic SOA molecular formulas. Similarly, days with high relative humidity and high sulfate concentrations were found to contain many sulfur-containing compounds, suggesting their aqueous phase formation.