Identification of Organic Aerosol Sources and their Impact on Ambient Aerosol: Aerosol Mass Spectrometry in Houston, Texas

D.R. Worsnop (1), M.R. Canagaratna (1), Q. Zhang (2), I. Ulbrich (3), J.T. Jayne (1), T.B. Onasch (1), A. Trimborn (1), J.H.. Kroll (1), J.L. Jimenez (3)

(1) Aerodyne Research Inc., Massachusetts, USA, (2) State University of New York, University at Albany, New York, USA, (3) University of Colorado, Colorado, USA (worsnop@aerodyne.com, / Fax: 1-978-663-4918)

About half of observed atmospheric particulate matter (PM) consists of organic matter. Complete characterization of this PM fraction is difficult since the aerosol can contain hundreds of individual organic species, produced by a variety of sources. We present results from lab and field studies that utilize Aerosol Mass Spectrometers (AMS) to obtain signatures that can separate different sources of organic aerosol. The complexity of AMS mass spectra preclude identification of individual organic molecules. However, quantitative AMS mass spectra can be decomposed into linear combinations of mass spectral components corresponding to organic classes or factors. These inherently linear spectra, measured at high time resolution, enable statistical multivariate analysis to unravel classes of organic species that contribute to AMS mass spectra. Here we present results from aerosol sampled in Houston, TX (during the TEXAQS 2000 campaign) as a case study to demonstrate the use of multivariate deconvolution techniques on AMS mass spectra (using multicomponent analysis and positive matrix factorization; see Zhang et al 2005 and Lanz et al, 2006, respectively for application to AMS data). Correlations with ancillary measurements are used to identify the likely sources of these aerosol components. In particular, mass spectra, and size distributions of hydrocarbon-like and oxygenated organic aerosols (HOA and OOA, respectively) correlate with local emissions, photochemical processing and transport of aerosol derived from biomass burning in the region. Results will also be compared to high resolution mass spectra observed during the TexAQS-GoMACCS campaign in Houston during the summer of 2006.