Improved Characterization of Ambient Organic Aerosols with the Aerodyne High Resolution Time-of Flight Aerosol Mass Spectrometer (HR-ToF-AMS) at T0 in Mexico City during MILAGRO / MCMA-2006

Allison C. Aiken[1,2], Dara Salcedo[2,3], J. Alex Huffman[1,2], Ingrid Ulbrich[1,2], Michael Cubison[2], Ken Docherty[2], Peter DeCarlo[2,4], Donna Sueper[2], Douglas R. Worsnop[5], Achim Trimborn[5], Megan Northway[5], and Jose L. Jimenez[1,2]

[1]*Department of Chemistry, University of Colorado at Boulder, 215 UCB, Boulder, CO 80309*

[2]*Cooperative Institute for Research in the Environmental Sciences (CIRES), University of Colorado at Boulder, 216 UCB, Boulder, CO 80309*

[3]*Centro de Investigaciones Quimicas, Universidad Autónoma del Estado de Morelos, Cuernavaca Morelos, Mexico*

[4]*Atmospheric and Oceanic Sciences, University of Colorado at Boulder, UCB 311, Boulder, CO 80309*

[5]*Aerodyne Research Inc., 45 Manning Rd., Billerica, MA, 01821*

ABSTRACT

Non-refractory sub-micron (approx. PM_1) ambient aerosol was analyzed from March 10 – March 30, 2006 in Mexico City at the T0 (IMP) site with a new version of the Aerodyne Aerosol Mass Spectrometer, the High-Resolution Time-of-Flight Aerosol Mass Spectrometer (HR-ToF-AMS, DeCarlo et al., 2006). Time series of mass concentrations of inorganic species (Ammonium, Chloride, Nitrate, Sulfate) and of the Organic fraction along with averaged AM and PM size distributions are presented and compared with results from MCMA-2003 with a Quadrupole AMS (Q-AMS, Salcedo et al., 2006). The HR-ToF-AMS has the ability to resolve the elemental composition of most mass fragments, especially for the low *m/z* (below 100) where the majority of the signal in the AMS occurs when using electron impact ionization (EI). Organic mass spectra below 100 *m/z's* have been separated into four fragment types ($C_xH_y^+$, $C_xH_yO_z^+$, $C_xH_yN_z^+$, $C_wH_xN_yO_z^+$), while still retaining quantitative mass concentrations, and O/C ratios have been computed for total organics. Primary emissions and SOA formation are important for this dataset, while the impact of large biomass burning plumes appears to be more episodic at this ground site. Organic amines are observed in the aerosol during some mornings. Additionally, Positive Matrix Factorization (PMF) has been used to analyze the components of the organic mass fraction, and the chemically-resolved aerosol volatility is characterized using a thermal denuder in front of the AMS.

References

P.F. DeCarlo, J.R. Kimmel, A. Trimborn, M.J. Northway, J.T. Jayne, A.C. Aiken, M. Gonin, K. Fuhrer, T. Horvath, K. Docherty, D.R. Worsnop, and J.L. Jimenez. Field-Deployable, High-Resolution, Time-of-Flight Aerosol Mass Spectrometer. Analytical Chemistry, 78: 8281-8289, 2006.

D. Salcedo et al. Characterization of ambient aerosols in Mexico City during the MCMA-2003 campaign with Aerosol Mass Spectrometry: results from the CENICA Supersite. Atmospheric Chemistry and Physics, 6, 925-946, 2006.