

Fast airborne aerosol size and composition measurements from the C-130 during the MIRAGE-Mex 2006 field campaign

Peter DeCarlo^{1,2}, Ed Dunlea¹, Allison Aiken¹, Ingrid Ulbrich¹, Joel Kimmel¹, Jose-Luis Jimenez¹,
John Crounse³, Paul Wennberg³, A. Clarke⁴, J. Zhou⁴, Y. Shinozuka⁴, S. Howell⁴, J.
Tomlinson⁵,
D. Collins⁵, Teresa Campos⁶

¹CIRES, University of Colorado, ²Department of Atmospheric Science, University of Colorado,
³California Institute of Technology, ⁴University of Hawaii, ⁵Texas A&M University, ⁶NCAR

A high mass resolution time-of-flight aerosol mass spectrometer (HR-ToF-AMS, DeCarlo et al., 2006) was deployed for the first time on an airborne platform during the MIRAGE-Mex campaign on the NCAR C-130 research aircraft, for measurements of size-resolved sulfate, nitrate, ammonium, and organics. Onboard the C-130 the HR-ToF-AMS was operated in a medium resolution mode known as “V-ToF mode”, allowing added chemical resolution of the measured aerosol, while still maintaining good spatial (time) resolution and allowing the measurement of size distributions. Organic species accounted for approximately half of the non-refractory submicron aerosol mass and showed strong correlation with gas phase measurements of CO and HCN. Due to the strong correlations with HCN and CO, the sources of organic aerosol are thought to be a combination of biomass burning, transportation, and anthropogenic secondary organic aerosol (SOA). The organic aerosol measured was oxidized, and its O/C ratio was derived from high mass resolution data. The organic O/C ratio was observed to increase with distance from the city. Ammonium Nitrate levels were high in the city and in the fresh city outflow. Ammonium Sulfate showed a more regional characteristic, and dominated the inorganic fraction away from the city and in point source plumes (e.g. Tula and Popocatepetl). Aerosol chloride in the form of NH₄Cl was elevated in plumes tentatively identified as biomass burning. Positive matrix factorization was applied to organic aerosol data and a number of factors were determined for the organic aerosol component. The results over the city are roughly consistent with the results of Salcedo et al. during MCMA-2003 (2006).

Reference

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