

A Comprehensive study of Metal Rich Aerosol in an Industrial Region of Mexico City

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Several single particle measurements in Northern Mexico City have indicated the presence of fine particles that are internal mixtures of Pb, Zn, Cl, P and S. Previous studies in Mexico City have indicated the presence of Zn and Cl particles that exhibited similar diurnal temporal trends to the particles observed in this work. The significance of the current results is that they are derived from single aerosol particles, proving that many of these components are internally mixed and likely from the same source. A comparative analysis was performed on Mexico City aerosols using Aerosol Time-of-Flight Mass Spectrometry (ATOFMS), Computer Controlled Scanning Electron Microscopy/Energy Dispersive X-Ray analysis (CCSEM/EDX), Scanning Transmission X-Ray Microscopy/Near Edge X-ray Absorption Fine Structure Spectroscopy (STXM/NEXAFS) and Proton Induced X-Ray Emission (PIXE). Using a rule based search method, single particle characteristics of ATOFMS and CCSEM/EDX data sets are found to be in complementary agreement. PIXE data indicate that Zn, Pb, Na and Cl are strongly correlated over entire period of study and that there are higher concentrations of Zn compared to all other detected metals. Morphology measurements indicate these metal-rich aerosols are a mixture of spherical and non-spherical particles. STXM/NEXAFS measurements showed that the needle-like particles appear to be composed of Zinc Nitrate and Zinc Oxide. This is consistent with the observations by CCSEM/EDX and single particle mass spectrometry. Given that similar events have been regularly observed in previous field studies, this source of particles is likely important in this growing megacity.