

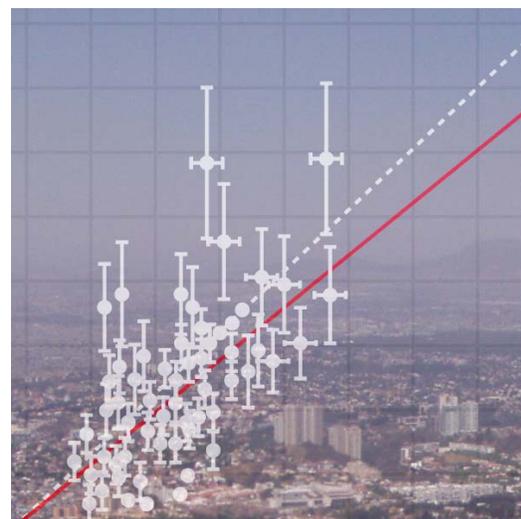
Science Made Possible

Study Provides Comprehensive Analysis of Urban Atmospheric Aerosol

Collaborative team applies multifaceted approach to analyze aerosols in Mexico City

A multidisciplinary team from Massachusetts Institute of Technology, Department of Energy's EMSL, University of Colorado, Molina Center for Energy and the Environment, and Universidad Autonoma del Estado de Morelos in Mexico published the first comparison of data sets obtained from proton-induced X-ray emission (PIXE) and proton elastic scattering analysis (PESA) to aerosol mass spectrometry (AMS) measurements. The team compared the results of PIXE and PESA, both at the Department of Energy's EMSL, with AMS results. PIXE, PESA, and AMS use different methods of analysis yet provided complementary data sets. By utilizing the strengths of each instrument, scientists can more accurately interpret the results of studies on air pollution, an important issue for human health and environmental protection.

As part of the novel study, the team found good agreement between the sulfur measurements from PIXE and AMS. This comparison will allow scientists to vet field results with laboratory measurements and vice versa. Also, they found discrepancies between the hydrogen mass fractions assessed from PESA and AMS measurements. The discrepancy was attributed to the presence of nonvolatile organic compounds in aerosol samples. These compounds were not vaporized in the PESA and therefore were detected by the PESA method, while AMS detects organic aerosols of relatively high volatility. The study highlights the fact that complementary aerosol analysis capabilities can be used in the same environmental setting to provide comprehensive information about the amount of volatile and nonvolatile particles in the air.



Complementary capabilities of PIXE, PESA, and AMS measurements were used to provide comprehensive data for analysis of atmospheric aerosols in Mexico City.

Scientific impact: This study is the first comparison of data sets obtained from PIXE and PESA to AMS aerosol measurements. To the authors' knowledge, it is also the first report of PESA hydrogen fraction measurements in urban organic aerosols.

Societal impact: This multidisciplinary research can help scientists more accurately interpret the data from large, expensive aerosol studies. These studies are vital in devising strategies to reduce the impact of aerosols on the climate.

For more information, contact EMSL Communications Manager Mary Ann Showalter (509-371-6017).

Reference: Johnson KS, A Laskin, JL Jiminez, V Shutthanandan, LT Molina, D Salcedo, K Dzepina, MJ Molina. 2008. "Comparative Analysis of Urban Atmospheric Aerosol by Particle-Induced X-ray Emission (PIXE), Proton Elastic Scattering Analysis (PESA), and Aerosol Mass Spectrometry (AMS)." *Environmental Science and Technology* 42(17):6619-6624 .

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