

Presentation title: Seasonal and daily variations in lung-deposited surface area of ambient fine PM in Los Angeles

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Abstract:

The aim of this was to measure particle number concentration (PNC), as well as concentrations of lung-deposited surface area (LDSA), organic carbon (OC), and elemental carbon (EC) in ambient fine particulate matter (PM). The sampling campaigns were conducted during cold and warm periods at the particle instrumentation unit of the University of Southern California in Los Angeles. Hourly measurements of PNC and LDSA data were collected employing Discmini and Scanning Mobility Particle Sizer (SMPS), while OC, OC volatility fractions (OC₁-OC₄), and EC concentrations were measured by the Sunset Lab Monitor. The diurnal profiles of PNC and EC throughout the campaigns indicated peaks in the early morning hours and evening, which both were consistent with higher traffic flux, supporting prior studies linking a significant fraction of EC with ultrafine PM. Comparing LDSA hourly readings, the levels reported by Discmini were consistently higher than those from SMPS, indicating a significant presence of irregularly shaped ultrafine particles, especially during high loads of traffic. It should be noted that the LDSA ratio was relatively lower during the colder periods, a trend attributable to the effect of higher relative humidity, which tends to increase water adsorption on particles. In the warmer periods, PNC levels also increased around midday, likely due to photochemical reactions triggered by the sunlight. This trend was similarly recorded in OC levels, particularly for OC₄ as a tracer of secondary reactions. On the other hand, during the colder months, a nighttime peak was observed in PNC, attributing to the aqueous phase formation of secondary aerosols leading to higher OC₄ levels, which is prevalent during the nighttime period of the cold seasons. This study offers a better insight into more effective air pollution regulation and associated health impacts.

Biography:

Professor Sioutas has been appointed the first holder of the Fred Champion Professorship in the Civil and Environmental Engineering department at the University of Southern California. He started his academic career at the Harvard School of Public Health in 1995 and joined the faculty of the VSOE in 1998. His research focuses on developing technologies for measuring the physio-chemical characteristics of air pollutants, emphasizing PM and their toxic properties. He has authored over 395 peer-reviewed journal publications and holds 14 U.S. patents in aerosol instrumentation.