NSF CENTER FOR RESEARCH ON COMPLEX NETWORKS (CRCN)

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CENTER RESEARCH SEMINAR

Source Apportionment Methods to Assess Effects of Urban Traffic on Ambient Air Quality

Suresh Raja, Ph.D.
Providence Engineering and Environmental Group, LLC,
1200 Walnut Hill Lane, Irving, Texas 75038

Thursday, February 7, 2013
3:00 p.m. – 4:30 p.m.
Room **153** at Science Building

Biography

Dr. Raja has over ten years of experience in air quality research and management. His contributions to the air quality management field include: development of methods to monitor and model spatial distribution of ambient particulate matter, exposure assessment of particulate matter, indoor air quality and its effect on asthma symptoms, and development of methods to test emissions of criteria pollutants from stationary combustion systems. He has also served as an expert witness in air quality litigation cases using models he developed to simulate source contribution analysis. Dr. Raja has published over 18 peer-reviewed journal papers and presented over 30 peer-reviewed conference papers. He currently serves as reviewer for journals such as Atmospheric Environment, Environmental Science and Technology, and the Canadian Journal of Environmental Engineering. Dr. Raja has led several projects funded by the Syracuse Center of Excellence in Environmental and Energy Systems and the New York State Energy Research and Development Authority through the USEPA while he was a Research Assistant Professor at Clarkson University. These projects are related to particulate matter exposure and health effects, indoor air quality, asthma and human exposure of airborne pollutants and statistical data analysis.

Abstract

Samples of airborne particulate matter (PM2.5) were collected at a site in Lahore, Pakistan from November 2005 to January 2006. A total of 129 samples were collected using an Andersen Reference Ambient Air Sampler 2.5-400 sampler and analyzed for major ions, trace metals, and organic and elemental carbon concentrations. The data set was then analyzed by positive matrix factorization (PMF) to identify the possible sources of the atmospheric PM collected in this urban area. Six factors reproduced the PM2.5 sample compositions with meaningful physical interpretation of the resolved factors. Analysis of variance among the three groups of PM2.5 mass ranges for each source revealed no statistically significant differences for secondary particles and two-stroke emissions. All other sources (diesel, biomass, coal, and industrial) showed statistically significant differences between the three PM2.5 mass groups, indicating that the three mass groups in these sources are distinct groups. Therefore, from the foregoing, it is possible to conclude that most of the high PM2.5 mass values measured in Lahore were likely due to emissions from diesel trucks, two-stroke vehicles, and possibly from vehicle-emitted primary sulfate that has been included in the "secondary aerosol" factor. Similar modeling and analysis methods can be used in Urban Transportation Environment Networks (UTEN) assessments to determine the effects of vehicle traffic based on fuel usage and vehicle type on ambient air quality. In this presentation, we will focus on applications of PMF modeling methods to assess the role of urban traffic on ambient air quality.