Environmental Engineering & Sciences

Department of Civil and Environmental Engineering

CEE 595AG Seminar

Friday, November 3, 2023 | 10:00 – 10:50 a.m. CST | 2311 Yeh Center

Relationship among PM2.5 mass, oxidative potential, and cellular toxicity at large spatial scale across different continents

Moderated by Manho Park

Most epidemiological models use mass concentrations of particulate matter (PM) as a metric to predict its health effects. These models use globalized concentration-response (CR) functions which have been constructed using relative risk (RR) estimates from cohort studies conducted in limited regions. Thus, they include an inherent assumption that the toxicity of PM is a function of mass alone and is immune to atmospheric processing and the resulting chemical composition. In recent years, although oxidative potential (OP) has been proposed as an alternate metric of PM toxicity, the relationships between OP, PM mass and toxicity on a large spatial extent and the assumption of epidemiological studies that PM mass can sufficiently capture the spatiotemporal variation in aerosol toxicity have never been investigated. In this study, we address some of these issues using a large number of PM2.5 samples (n=387) collected from 14 different sites across 4 different continents and evaluating 5 commonly used measures to evaluate OP and PM toxicity [3 acellular OP and 2 cellular endpoints] of water-soluble PM2.5 extracts. Our results show that the variation in mass concentrations within a site is much smaller than the variation in extrinsic toxicity and OP of the PM. Although the extrinsic toxicity and OP were generally correlated with PM mass, the relationships were non-proportional with substantial heterogeneity in the slope of OP (or cytotoxicity) vs. PM mass, attributable to the differences in intrinsic toxicity or OP resulting from the heterogeneous chemical composition of the PM. These results emphasize the need for the development of localized CR functions incorporating other measures of PM properties (such as OP or intrinsic toxicity) to better predict the health burden attributable to ambient PM2.5 concentrations.

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Bio: Sudheer Salana is a 5th year Ph.D. Candidate at CEE, working with Prof. Vishal Verma. His area of research includes acellular and cell-based toxicity measurements of ambient particulate matter. Sudheer did his Bachelors in Civil Engineering from the National Institute of Technology Silchar, India, and a Masters in Environmental Engineering and Science from the Indian Institute of Technology Bombay, India. He joined UIUC in 2019. In his free time, he likes reading fiction and watching movies.