Center for Environmental & Applied Fluid Mechanics

"Beyond Boundaries: Unraveling Urban Canopy Effects and Implications on Heat and Heavy Particle Transport"

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Civil and Environmental Engineering

Urban land surface modifies the flows in the lower atmosphere, called the atmospheric boundary layer (ABL); it also represents a critical source of various scalars (e.g., heat and passive pollutants) and particles (e.g., dust, microplastics, etc.). However, it remains a persistent challenge in large-scale weather and climate modeling systems to represent these transport processes. In the first part of the talk, we discuss the transport of heat in the context of mixed convection for an idealized coastal-rural-urban setting by conducting large-eddy simulations. To further understand the impact of urban canopy, a model based on the mean momentum and energy transport equations is proposed to explain the different mechanisms that urban canopy, thermal heterogeneity, and mean advection contribute to the canopy urban heat island effect. In the second part of the talk, we focus on the implications of anthropogenic sources of microplastic particles, especially fibers in global atmospheric long-range transport. We develop a semi-analytical model based on the slender body theory and parameterization of the rotational dynamics. The model is applied to field measurement data of airborne microplastic fibers collected in the US national parks and implications of the results will be discussed.

Fall 2023 CEAFM Seminar Series

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