

Johns Hopkins University

Center for Environmental & Applied Fluid Mechanics

3:00 PM, Friday, March 27, 2026

Gilman Hall 50

Zoom: <https://wse.zoom.us/j/93762992307>

[Link for Spring 2026 recordings](#)



Prof. Marcus N. Hultmark

Department of Mechanical and Aerospace Engineering
Princeton University

“Bringing the Lab to the Field and the Field to the Lab: Investigations of Environmental Flows”

Abstract: The turbulent flow in the atmospheric surface layer remains a challenge to investigate, as they are typically stratified, at high Reynolds numbers, and with very large length scales. This limits our ability to probe, understand, and make predictions of, important quantities, such as fluxes of heat and water vapor, as well as dispersion of scalars. Here, I am presenting a particle tracking system designed for ABL investigations, which uses four DSLR cameras and high-powered LEDs to track bubble trajectories in a 400 m³ measurement volume. A Helium-filled soap bubble generator is designed and manufactured using a 3D-printer and used in a field experiment. The high Reynolds number ($Re_\lambda \approx 2400$) data are used to evaluate Lagrangian models for turbulent dispersion without the need to extrapolate based on Reynolds number or boundary conditions. In addition to the field work, a new compressed-air flow facility will be introduced. The facility is designed to increase the Reynolds numbers that can be achieved in laboratory experiments while retaining stratification effects and will enable first-of-its-kind laboratory experiments with relevance for our understanding of the atmospheric surface layer and other high Reynolds number stratified flows.

For more details, visit: <https://mae.princeton.edu/people/faculty/hultmark>

Hosted by: Prof. Dennice Gayme (MechE)