



JOHNS HOPKINS
Center for Environmental
& Applied Fluid Mechanics

Weekly CEA FM Seminar: Spring 2013

Date: **Friday, February 22, 2013**
Time: 11:00 AM
Location: Gilman 50 (Marjorie M. Fisher Room)
Speaker: **DR. EVAN A. VARIANO** (UC Berkeley, Civil & Environmental Engineering)
Title: ***"PARTICLES SUSPENDED IN TURBULENT FLOW: EFFECT OF PARTICLE SHAPE"***

Abstract

We investigate particles suspended in turbulence, focusing on those with near-neutral buoyancy. This choice of buoyancy is relevant to aquatic organisms, sediment aggregates, and oil droplets. Because neutrally buoyant particles can remain suspended even when very large, it is not always possible to treat them with the common point-particle approach. Understanding the dynamics of such large particles is the focus of this work. We develop a laboratory measurement technique to record particle translation and rotation simultaneously with the ambient fluid flow. We use this technique to investigate particles suspended in high-Reynolds-number homogeneous isotropic turbulence. The large size of particles requires that we reconsider the standard scaling parameter (Stokes number). We investigate particles translation, rotation, and fluid-phase coupling. The fluid-phase coupling is characterized in terms of "turbulence modulation effects," *i.e.* changes in turbulent kinetic energy, dissipation rate, and spectral slope. Of particular interest to us is the effect of particle shape on the fluid-particle coupling. One outcome of these measurements is that Lagrangian timeseries of particles' angular velocity show that the evolution of particle orientation can be characterized as a diffusion process.



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Bio

Dr. Variano studied at Princeton, Cornell, and Columbia Universities before joining the faculty at UC Berkeley. His research is on mass transport in the aquatic environment, focusing on fluid dynamics of flows with significant stochastic components. These include wetlands, particle suspensions, and the air-water interface.