Date: **September 23rd, 2005**

Time: **11:00 AM**

Location: **Maryland Hall 110**

Speaker: **Dr. Joseph Katz**
Johns Hopkins University

Title: **"Measurements of Complex Oceanic Flows, from Turbulence in the Coastal Ocean to Interaction of Zooplankton with its Local Environment"**

Abstract

The presentation has two parts, both dealing with oceanic flows, but at substantially different scales. The first part examines PIV data obtained in the bottom boundary layer of the coastal ocean in periods when the mean currents are higher, of the same order and weaker than the wave induced motions. The mean velocity profile has a log layer only when the mean flow is higher than the wave induced motion. Distributions of Reynolds stresses, production and dissipation rates are consistent with laboratory boundary layer data, but not with the production-dissipation balance and/or existence of a constant shear stress layer, which are typically assumed by oceanographers. The energy spectra display anisotropy at all scales, and the flow consists of periods of gusts whose frequency increase with Reynolds number, separated by quiescent periods. The Reynolds shear stress is generated only during periods of gusts while dissipation occurs continuously. Conditional sampling based on phase of the surface waves, performed using Hilbert spectra, shows that the Reynolds stresses are phase dependent, but trends are unclear.

The second part introduces examples of interactions between zooplankton with the local flow. For example, digital holography is used for measuring the three-dimensional trajectory of a free-swimming copepod, and simultaneously the instantaneous 3-D velocity field around it. The velocity field has a recirculating pattern in the copepod's frame of reference, which is caused by the combined effects of sinking and a propulsive force generated by the feeding appendages. Using Stokeslets to model the velocity field, the measured velocity distributions enable us to estimate the excess weight of the copepod and the propulsive force generated by its feeding appendages. The seminar will conclude with a demonstration of our new submersible, free drifting digital holographic cinematography system. The first successful field deployment for this system took place in June 2005, in the Ria de Pontevedra, Spain.