Abstract Submitted
for the DFD13 Meeting of
The American Physical Society

Turbulent flow from a microscopic organism's perspective: What does it feel like to be tiny in the ocean? RACHEL E. PEPPER, EVAN VARIANO, M.A.R. KOEHL, University of California, Berkeley — Microscopic organisms in the ocean live in turbulent flows. Swimming organisms navigate through the water (e.g. larvae land on substrata, predators find prey), but the mechanisms by which they do so in turbulent flow are poorly understood. Because microscopic organisms are smaller than the Kolmagorov length, they experience turbulence as a Lagrangian time series of varying linear gradients in velocity, and as a Lagrangian time series of varying accelerations. But what are these time series like? While the average gradients, accelerations, and timescales can be estimated from the dissipative scales of the flow, there are indications that organisms are disproportionally affected by intermittent events. Understanding the frequency of such events in different environments is critical to understanding how microorganisms respond to and navigate in turbulent flow. To understand the hydrodynamic cues that microscopic organisms experience in the ocean we measure velocity gradients and accelerations along Lagrangian trajectories in realistic ocean flow on the spatial and temporal scales encountered by such organisms. Here we compare results measured using PIV for hydrodynamic cues above rough biological substrata and smooth substrata, as well as cues near and far from substrata.

Rachel Pepper
University of California, Berkeley

Date submitted: 02 Aug 2013 Electronic form version 1.4