Abstract Submitted
for the DFD17 Meeting of
The American Physical Society

Copepod behavior response to Burgers' vortex treatments mimicking turbulent eddies D. ELMI, D.R. WEBSTER, Georgia Tech, D.M. FIELDS, Bigelow Laboratory — Copepods detect hydrodynamic cues in the water by their mechanosensory setae. We expect that copepods sense the flow structure of turbulent eddies in order to evoke behavioral responses that lead to population-scale distribution patterns. In this study, the copepods' response to the Burgers' vortex is examined. The Burgers' vortex is a steady-state solution of three-dimensional Navier-Stokes equations that allows us to mimic turbulent vortices at the appropriate scale and eliminate the stochastic nature of turbulence. We generate vortices in the laboratory oriented in the horizontal and vertical directions each with four intensity levels. The objective of including vortex orientation as a parameter in the study is to quantify directional responses that lead to vertical population distribution patterns. The four intensity levels correspond to target vortex characteristics of eddies corresponding to the typical dissipative vortices in isotropic turbulence with mean turbulent dissipation rates in the range of 0.002 to 0.25 cm^2/s^3. These vortices mimic the characteristics of eddies that copepods most likely encounter in coastal zones. We hypothesize that the response of copepods to hydrodynamic features depends on their sensory architecture and relative orientation with respect to gravity. Tomo-PIV is used to quantify the vortex circulation and axial strain rate for each vortex treatment. Three-dimensional trajectories of the copepod species *Calanus finmarchicus* are analyzed to examine their swimming kinematics in and around the vortex to quantify the hydrodynamic cues that trigger their behavior.

Donald Webster
Georgia Tech

Date submitted: 27 Jul 2017 Electronic form version 1.4