Abstract Submitted
for the DFD14 Meeting of
The American Physical Society

Response of *Acartia tonsa* to Burgers' Vortex: Deconstructing Turbulence-Copepod Interactions D.L. YOUNG, D.R. WEBSTER, J. YEN, Georgia Tech — *In situ* studies suggest that in many oceanic regimes, turbulence affects the vertical position of copepods primarily by changing their behavior, and only secondarily by altering their physical position. We test the hypothesis that fine-scale turbulence alters copepod behavior, presenting as alterations in directed movement and changes in swimming kinematics. To this end, we create two Burgers' vortices, specifying the rotation rate and axial strain rate to correspond to turbulent vortices with size scale equaling the inverse wavenumber of the median viscous dissipation rate (i.e. $r = 8.1\eta$) for typical turbulent conditions in the coastal or near surface region (i.e., mean turbulent dissipation rates of 0.009 and 0.096 cm^2/s^3). The vortex flow is quantified via tomo-PIV. Behavioral assays of *Acartia tonsa* are conducted, generating 3D trajectories for analysis of swimming kinematics and response to hydrodynamic cues. *A. tonsa* did not significantly respond to the vortex corresponding to dissipation rate of 0.009 cm^2/s^3, but drastically altered their swimming behavior in the presence of the 0.096 cm^2/s^3 vortex, including increased relative swim speed, angle of alignment with the vortex axis, net-to-gross displacement ratio, and escape acceleration, along with decreased turn frequency (relative to stagnant control conditions). Further, *A. tonsa* escape location is preferentially in the core of the stronger vortex, indicating that the hydrodynamic cue triggering the distinctive escape behavior is vorticity.

D.R. Webster
Georgia Tech

Date submitted: 24 Jul 2014 Electronic form version 1.4