

Abstract Submitted
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Measurements of fluid transport by controllable vertical migrations of plankton¹ ISABEL A. HOUGHTON, JOHN O. DABIRI, Stanford University — Diel vertical migration of zooplankton has been proposed to be a significant contributor to local and possibly large-scale fluid transport in the ocean. However, studies of this problem to date have been limited to order-of-magnitude estimates based on first principles and a small number of field observations. In this work, we leverage the phototactic behavior of zooplankton to stimulate controllable vertical migrations in the laboratory and to study the associated fluid transport and mixing. Building upon a previous prototype system, a laser guidance system induces vertical swimming of brine shrimp (*Artemia salina*) in a 2.1 meter tall, density-stratified water tank. The animal swimming speed and spacing during the controlled vertical migration is characterized with video analysis. A schlieren imaging system is utilized to visualize density perturbations to a stable stratification for quantification of fluid displacement length scales and restratification timescales. These experiments can add to our understanding of the dynamics of active particles in stratified flows.

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