Abstract Submitted
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Experimental measurements of diatom trajectories and distributions in a small-scale turbulence tank[1] NIMISH PUJARA, University of Wisconsin - Madison, KEVIN DU CLOS, STEPHANIE AYRES, LEE KARP-BOSS, University of Maine, EVAN VARIANO, University of California, Berkeley — Interactions of phytoplankton (aquatic photosynthetic micro-organisms) with ambient turbulence has important consequences for life in the ocean since their vertical transport affects primary production at the base of the ocean food web. To understand this vertical transport, we use an experimental setup where the motion of live Cosinodiscus diatom cells is measured in a 3D volume using a Volumetric Particle Imager (VoPI) in a small-scale turbulence tank. The tank is small enough to allow use of lab-grown cultures in sea water and produces a turbulent flow with homogeneous statistics and a low mean flow in the tank centre. The VoPI is be able to measure 3D positions of individual cells that can be tracked to obtain cell trajectories, cell velocities, and spatial distributions of cells. Experimental data from tracer particles and phytoplankton cells show that the root-mean-squared velocities of diatom cells in turbulence are similar to those of tracer particles, but diatom cells show increased clustering at small scales relative to tracer particles. Moreover, this clustering does not show a simple Stokes number scaling leading us to postulate that the flow Reynolds number also plays an important role for diatom-turbulence interactions at small scales.

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