Abstract Submitted
for the DFD16 Meeting of
The American Physical Society

Dynamics of motile micro-organisms in stably-stratified turbulence SALVATORE LOVECCHIO, IMFT Tolouse, FRANCESCO ZONTA, TU Wien, CRISTIAN MARCHIOLI, University of Udine, ALFREDO SOLDATI, University of udine; TU Wien — Motile micro-organisms populating terrestrial water bodies swim upward towards the air-water interface to capture light and activate photosynthesis. These micro-organisms have the center of mass displaced below the center of buoyancy and are usually called gyrotactic swimmers. Gyrotactic swimmers (which are almost neutrally-buoyant) are extremely sensitive to the local flow field, which is often stably stratified (due to solar heating at the water surface). Stable stratification has a deep influence on the transport processes of mass, momentum, heat and chemical species at the water surface. In this work we use Direct Numerical Simulation (DNS) and Lagrangian Particle Tracking (LPT) to analyze the dynamics of gyrotactic swimmers in stratified turbulence. Our results show that swimmers surfacing and clustering at the surface depend strongly on the reorientation time of swimmers and on the level of stratification. Obtaining accurate predictions of the surfacing time for gyrotactic swimmers is extremely important to estimate the global CO_2 exchange across the air-water interface.

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Date submitted: 29 Jul 2016 Electronic form version 1.4