Abstract Submitted
for the DFD15 Meeting of
The American Physical Society

**Micro-swimmer dynamics in free-surface turbulence subject to wind stress** CRISTIAN MARCHIOLI, SALVATORE LOVECCHIO, ALFREDO SOLDATI, University of Udine — We examine the effect of wind-induced shear on the orientation and distribution of motile micro-swimmers in free-surface turbulence. Winds blowing above the air-water interface can influence the distribution and productivity of motile organisms via the shear generated just below the surface. Swimmer dynamics depend not only by the advection of the fluid but also by external stimuli like nutrient concentration, light, gravity. Here we focus on gyrotaxis, resulting from the gravitational torque generated by an asymmetric mass distribution within the organism. The combination of such torque with the viscous torque due to shear can reorient swimmers, reducing their vertical migration and causing entrapment in horizontal fluid layers. Through DNS-based Euler-Lagrangian simulations we investigate the effect of wind-induced shear on the motion of gyrotactic swimmers in turbulent open channel flow. We consider different wind directions and swimmers with different reorientation time (reflecting the ability to react to turbulent fluctuations). We show that only stable (high-gyrotaxis) swimmers may reach the surface and form densely concentrated filaments, the topology of which depends on the wind direction. Otherwise swimmers exhibit weaker vertical fluxes and segregation at the surface.

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Date submitted: 31 Jul 2015 Electronic form version 1.4