

Abstract Submitted  
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**Accelerated Settling of Swimming Plankton in Turbulence**<sup>1</sup> JIN-GRAN QIU, ZHIWEN CUI, AML, Department of Engineering Mechanics, Tsinghua University, 100084 Beijing, China, ERIC CLIMENT, Institution of Fluid Mechanics of Toulouse, 31400 Toulouse, France, LIHAO ZHAO<sup>2</sup>, AML, Department of Engineering Mechanics, Tsinghua University, 100084 Beijing, China — The chain formation of some harmful plankton species is suspected as a self-adaptive behavior to the turbulent environment, which increases their motility and enhance the chance of survival in harsh turbulent environment. However, the hydrodynamic mechanism behind this phenomenon is still unclear. For the first time, we consider the coupling of settling and swimming effect on swimming plankton in turbulence, and find the swimming accelerates the settling velocity of prolate plankton. We model plankton as prolate spheroidal swimmers, and we analysis their motions in homogeneous isotropic turbulent flow with direct numerical simulation. Settling and swimming plankton preferentially sample downwelling regions, and tend to swim in the direction of gravity, which accelerates the settling. The accelerated settling occurs when the swimming velocity is comparable to the Kolmogorov velocity scale of turbulence. Plankton swim faster when forming chains, which accelerates the settling to avoid the unbeneficial regions with intensive turbulence. On the other hand, plankton can break up and shorten the chains to reduce settling and stay in the regions suitable for their growth and reproduction.

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