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Dispersion statistics of microswimmers in turbulence JOSE AGUSTIN ARGUEDAS LEIVA, MICHAEL WILCZEK, Max Planck Institute for Dynamics and Self-Organization — Many plankton species are motile. Motility is, for example, key for grazing and evading predation. Apart from the swimming speed, shape is a critical parameter in defining the response to hydrodynamic flows. A comprehensive understanding of the relation between the relevant microswimmer parameters, shape and motility, and their transport properties and rotation rates in turbulent flows is still missing. Here, we study self–propelled ellipsoids in turbulence as a simple model for motile microorganisms in aquatic environments. Using direct numerical simulations, we find non–trivial dispersion properties and rotation statistics as a result of a complex interplay between turbulent advection, motility, and particle spinning and tumbling rates. We show that one important aspect is the effect of rotation on particle transport. In contrast to spinning, tumbling constantly changes particle orientation. As tumbling rates are shape–dependent, this leads to intrinsically different transport properties for differently shaped particles. Our investigation thus helps to characterize the intricate dynamics of microswimmers in turbulent flows and sheds light on the role played by shape and motility.

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