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Noise-driven aggregation of swimmers in the Kolmogorov flow<sup>1</sup> KYLE FERGUSON, Bucknell University, SIMON BERMAN, KEVIN MITCHELL, University of California, Merced, TOM SOLOMON, Bucknell University — We investigate theoretically the dynamics of ellipsoidal microswimmers in an externally imposed, laminar Kolmogorov flow. Through a phase-space analysis of the dynamics without noise, we find that swimmers favor either cross-stream or rotational drift, depending on their swimming speed and aspect ratio. When including noise, i.e. rotational diffusion, Langevin simulations of our model show a transition from swimmer aggregation in low-shear regions of the flow to aggregation in high-shear regions as the parameters are varied. We find that rotational diffusion tends to drive swimmers into certain parts of phase space. We characterize the dependence of this noise-driven phase-space aggregation on a swimmer speed, aspect ratio, and rotational diffusivity. The properties of the swimmer trajectories with noise explain the transition from high-shear to low-shear aggregation.

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