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Flocking in Flow NICHOLAS OUELLETTE, NIDHI KHURANA, Department of Mechanical Engineering & Materials Science, Yale University — Models of active, self-propelled particles with simple interaction rules have long been shown to produce large-scale emergent behavior reminiscent of collective animal motion seen in nature. Such model flocks can be shown to be robust against random noise terms added to the equations. But real animals, such as birds, fish, or insects, live in fluid environments, where the background flow field is nonzero and is often turbulent. In this case, the fluctuations experienced by the individuals in the aggregation are not random, but rather are correlated in space and time. We explore the impact of such spatiotemporally correlated perturbations on flocking by numerically simulating the behavior of a simple flocking model in a turbulent-like flow field produced by a kinematic simulation. The introduction of flow strongly changes the flock formation dynamics. Additionally, we find that under some conditions the background flow tends to break stable flocks into smaller units. We study these clusters, and discuss their relation to the underlying flow field.

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