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APS March Meeting 2024
Monday–Friday, March 4–8, 2024; Minneapolis & Virtual

Session Y27: Biological Active Matter IV
8:00 AM–11:00 AM, Friday, March 8, 2024
Room: 101H

Sponsoring Units: DBIO DSOFT GSNP
Chair: Enkeleida Lushi, New Jersey Institute of Technology

Abstract: Y27.00005 : From chaos to order: Boundary-driven flow transitions in microtubule-kinesin active fluid*

8:48 AM–9:00 AM

← Abstract →

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Microtubule-kinesin active fluids are distinguished from conventional passive fluids by their unique ability to consume local fuel, ATP, to generate internal active stress. This stress drives internal flow autonomously and promotes micromixing, without the need for external pumps. When confined within a looped boundary, these active fluids can spontaneously self-organize into river-like flows. However, the influence of a moving boundary on these flow behaviors has remained elusive. Here, we investigate the role of a moving boundary on the flow kinematics of active fluids. We confined the active fluid within a thin cuboidal boundary with one side serving as a mobile boundary. Our data reveals that when the boundary's moving speed does not exceed the intrinsic flow speed of the active fluid, the fluid is dominated by chaotic, turbulence-like flows. The velocity correlation length of the flow is close to the intrinsic vortex size induced by the internal active stress. Conversely, as the boundary's moving speed greatly exceeds that of the active fluid, the flow gradually transitions to a conventional cavity flow pattern. In this regime, the velocity correlation length increases and saturates to those of water. Our work elucidates the intricate interplay between a moving boundary and active fluid behavior.

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