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Active nematics confined within a shell RUI ZHANG, YE ZHOU, MOHAMMAD RAHIMI, JUAN DE PABLO, University of Chicago, DEPABLO TEAM — Active fluids exhibit many striking flow patterns when confined within complex geometries. For example, recent work has demonstrated that when a thin film of extensile microtubules is confined within a vesicle, the four +1/2 defects periodically oscillate between a tetrahedral and a planar configuration (Keber, *et al.* Science (2014)). Here we employ hybrid lattice Boltzmann simulations to study the dynamics of active nematics confined between two concentric spherical surfaces. We find that in both extensile and contractile systems, the four defects are coupled with noticeable macroscopic velocities and they move along their symmetry axes, even-though in different patterns. We observe that in extensile systems with moderate activity, defects repel each other due to elastic forces, and their collective motion leads to the same patterned dynamics as observed in the above experiment. We further show that this periodic dynamics is accompanied by oscillations of the defect velocity, system's elastic energy, and the emergence and annihilation of vortices. We also observe that with stronger activity, the extensile system evolves to chaos. In contrast, the contractile system remains passive for the entire activity range, with defects being attracted to each other in pairs.

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