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Instabilities and patterns in an active nematic film[1] PRAGYA SRIVASTAVA, CRISTINA MARCHETTI, Physics Department, Syracuse University, NY-13244 — Experiments on microtubule bundles confined to an oil-water interface have motivated extensive theoretical studies of two-dimensional active nematics. Theoretical models taking into account the interplay between activity, flow and order have remarkably reproduced several experimentally observed features of the defect-dynamics in these "living" nematics. Here, we derive minimal description of a two-dimensional active nematic film confined between walls. At high friction, we eliminate the flow to obtain closed equations for the nematic order parameter, with renormalized Frank elastic constants. Active processes can render the "Frank" constants negative, resulting in the instability of the uniformly ordered nematic state. The minimal model yields emergent patterns of growing complexity with increasing activity, including bands and turbulent dynamics with a steady density of topological defects, as obtained with the full hydrodynamic equations. We report on the scaling of the length scales of these patterns and of the steady state number of defects with activity and system size.

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