Movie captions

Movie 1 Dancing of topological Ceilidh dynamics. (a) Vorticity field ω (r,t) and streamlines of the highly ordered vortex lattice. The dynamically ordered state of disclinations within the channel is shown as −1/2 topological disclinations near the channel walls (magenta diamonds) and +1/2 disclinations transversing the mid-region (green dots). The system has zero net-topological charge and equal numbers of +1/2 disclinations travel to the left as to the right. (b) The scalar order field q(r,t) and director field n(r,t) for the same simulation as Movie 1(a).

Movie 2 Vorticity field ω (r,t) and and topological defects for the four types of flow states observed in simulations of active nematic fluids confined within two dimensional micro-channels. Magenta diamonds denote −1/2 topological disclinations and self-motile +1/2 disclinations are represented as green dots. (a) Unidirectional flow in a spontaneously chosen direction along the channel occurs at low activity. (b) Oscillating but unidirectional laminar flow, with temporary traveling vorticity patterns that intermittently dissipate then re-form. (c) Ceilidh dynamics with a well-defined vortex lattice at intermediate activity. (d) The chaotic flow state of meso-scale turbulence with the continual creation and annihilation of topological disclinations at the highest activity numbers.

Movie 3 Broken-pair lattice defect. Vorticity field ω (r,t) and topological disclinations (−1/2 magenta diamonds; +1/2 green dots) for topological Ceilidh dynamics with a single broken-pair lattice defect, in which the number of disclinations moving leftward remains equal to the number moving rightward. The lattice defect locally skews the vorticity field about the two separated +1/2 disclinations.

Movie 4 Drift-lattice defects for a single defect (top) and for three defects. (a) Vorticity field ω (r,t) and topological disclinations (−1/2 magenta diamonds; +1/2 green dots) for Ceilidh dynamics with a single drift-lattice defect (n = 1), in which two more disclinations are moving leftward than rightward. A vertical dashed line is drawn across the channel to mark a static point against which the leftward drift of the vortex lattice can be identified. Alternatively, an arrow points to a single −1/2 defect so that the distance travelled can be assessed at all times. (b) The same system as Movie 4(a) but for an example simulation with three driftlattice defects (n = 3). Comparison with Movie 4(a) shows that the drift velocity is substantially faster than when only a single drift-lattice defect is present.