Abstract Submitted
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The geometry and topology of turbulence in active nematics LUCA GIOMI, Univ of Leiden — The problem of low Reynolds number turbulence in active nematic fluids is theoretically addressed. Using numerical simulations I demonstrate that an incompressible turbulent flow, in two-dimensional active nematics, consists of an ensemble of vortices whose areas are exponentially distributed within a range of scales. Building on this evidence, I construct a mean-field theory of active turbulence by which several measurable quantities, including the spectral densities and the correlation functions, can be analytically calculated. Due to the profound connection between the flow geometry and the topological properties of the nematic director, the theory sheds light on the mechanisms leading to the proliferation of topological defects in active nematics and provides a number of testable predictions. A hypothesis, inspired by Onsager's statistical hydrodynamics, is finally introduced to account for the equilibrium probability distribution of the vortex sizes.

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