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Modeling flow of nematic liquid crystal down an incline[1]
MICHAEL LAM, LINDA CUMMINGS, New Jersey Institute of Technology, USA, TE-SHENG LIN, Loughborough University, UK, LOU KONDIC, New Jersey Institute of Technology, USA — The flow of nematic liquid crystals (NLCs) down an inclined substrate is studied. Under the usual long wave approximation, a 4th order nonlinear parabolic partial differential equation (PDE) of diffusion type is derived for the free surface height, $z = h(x, y, t)$. The model accounts for elastic distortions of the director field due to different anchoring conditions at the substrate and the free surface. The PDE we derive admits 2D traveling-wave solutions, which may translate stably or exhibit instabilities in the flat film behind the traveling front. These instabilities, which are distinct from the usual transverse instability of downslope flow, may be analyzed and explained by linear stability analysis of a flat translating film. Intriguing parallels are found with the instabilities exhibited by Newtonian fluid flowing on an inverted substrate [T-S. Lin and L. Kondic, Phys. Fluids **22**, 052105 1-10, (2010)].

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