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Convergence to equilibrium for a non-wellposed thin film equation

We study a lubrication model of the time-evolution of a thin liquid film on a horizontal stationary cylinder. The PDE equation defines a generalized gradient flow. We prove that for each given mass there is a unique steady state, which minimizes the energy and attracts all global strong solutions with finite-entropy initial values. The steady state is symmetrically decreasing, supported on a compact subinterval, and meets the dry region at a zero contact angle. We show that the distance of any solution from the steady state cannot decrease faster than a power law. The proofs rely on new applications of energy and entropy inequalities.

Joint work with Almut Burchard and Benjamin Stephens