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Instability, rupture and fluctuations in thin liquid films: Theory and computations[1] RISHABH GVALANI, MIGUEL DURAN-OLIVENCIA, SERAFIM KALLIADASIS, GRIGORIOS PAVLIOTIS, Imperial College London — Thin liquid films are ubiquitous in natural phenomena and technological applications. They are commonly studied via deterministic hydrodynamic equations, but thermal fluctuations often play a crucial role that still needs to be understood. An example of this is dewetting, which involves the rupture of a thin liquid film and the formation of droplets. Such a process is thermally activated and requires fluctuations to be taken into account self-consistently. Here we present an analytical and numerical study of a stochastic thin-film equation derived from first principles. We scrutinise the behaviour of the stochastic thin film equation in the limit of perfectly correlated noise along the wall-normal direction. We also perform Monte Carlo simulations of the stochastic equation by adopting a numerical scheme based on a spectral collocation method. The numerical scheme allows us to explore the fluctuating dynamics of the thin film and the behaviour of the system's free energy close to rupture. Finally, we also study the effect of the noise intensity on the rupture time, which is in good agreement with previous works.

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