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The influence of viscoelasticity on the dewetting of ultrathin polymer films[1] DANIEL MORENO-BOZA, ALEJANDRO MARTíNEZ-CALVO, ALEJANDRO SEVILLA, Universidad Carlos III De Madrid — The influence of viscoelasticity on the dewetting of ultrathin polymer films is unraveled by means of theoretical analysis and numerical simulations. The Oldroyd-B, Giesekus, and FENE-P models are employed to analyze the dynamics of film rupture in the limit of negligible inertia. The onset of temporal instability is analyzed for the first time using linear theory. For times close to the rupture singularity, the self-similar regime recently obtained by Moreno Boza et al. (Phys. Rev. Fluids 5, 2020), is asymptotically established independently of the rheological model. The spatial structure of the flow is characterized by a Newtonian core and a thin viscoelastic boundary layer at the free surface, where polymeric stresses become singular as rupture is approached. The Deborah number and the solvent-to-total viscosity ratio emerge as the relevant parameters controlling the rupture time and the length scale of the resulting dewetting pattern. The asymptotic flow structure close to rupture is however unaffected by the choice of rheological model, which is thus shown to be universal.

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