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Thin Film Evolution Over a Thin Porous Layer: Modeling a Tear Film on a Contact Lens[1] DANIEL ANDERSON, KUMNIT NONG, George Mason University — We examine a mathematical model that describes the behavior of the pre-contact lens tear film of a human eye. Our work examines the effect of contact lens thickness and lens permeability and slip on the film dynamics. A mathematical model for the evolution of the tear film is derived using a lubrication approximation applied to the hydrodynamic equations of motion in the fluid film and the porous layer. The model is a nonlinear fourth order partial differential equation subject to boundary conditions and an initial condition for post-blink film evolution. We find that increasing the lens thickness, permeability and slip all contribute to an increase in the film thinning rate although for parameter values typical for contact lens wear these modifications are minor. The presence of the contact lens can, however, fundamentally change the nature of the rupture dynamics as the inclusion of the porous lens leads to rupture in finite time rather than infinite time.

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