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Annular thin-film flows driven by azimuthal membrane tension variations. LEAH BAND, SARAH WATERS, DAVID RILEY, University of Nottingham, UK. — Thin films lining a rigid tube have been extensively studied assuming both constant and axially varying membrane tension at the film-core interface. Importantly though, the influence of azimuthal variations in the membrane tension has received far less attention. An annular geometry is considered. The outer boundary of the annulus is a rigid wall lined by two layers of viscous fluids. The layers are bounded by extensible membranes with specified variable membrane tensions. Nonlinear coupled evolution equations for the widths of the fluid layers are determined using thin-film asymptotics. For a range of membrane tensions, the steady state film profiles are determined and their linear stability examined. In addition, a pseudo-spectral method is used to obtain solutions to the full nonlinear evolution equations. For all variable membrane tensions there exists an unstable perturbation, in sharp contrast to the constant membrane tension case where all perturbations are stable. These results will be interpreted in the context of plaque growth within arteries.

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