

On the existence of quasi-self-similar solutions of the weakly shear-thinning equation

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We consider the spreading of a thin droplet of viscous liquid on a plane surface driven by capillarity alone in the complete wetting regime. In the case of constant viscosity, the no-slip condition leads to a force singularity at advancing contact lines. It is well known nowadays that the introduction of appropriate slip conditions removes this paradox. Here, we investigate a different approach, which consists in keeping the no-slip condition and assuming instead a shear-thinning rheology. This relaxation leads, in lubrication approximation, to fourth order degenerate parabolic equations of quasilinear type. We obtain results on the existence of quasi-self-similar solutions to these equations in the limit of Newtonian rheology.