

Abstract Submitted
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A theory for undercompressive shocks in tears of wine¹ HANGJIE JI, YONATHAN DUKLER, CLAUDIA FALCON, ANDREA BERTOZZI, Department of Mathematics, University of California, Los Angeles — We revisit the tears of wine problem for thin films in water-ethanol mixtures and present a new model for the climbing dynamics. The new formulation includes a Marangoni stress balanced by both the normal and tangential components of gravity as well as surface tension which lead to distinctly different behavior. The prior literature did not address the wine tears but rather the behavior of the film at earlier stages and the behavior of the meniscus. In the lubrication limit we obtain an equation that is already well-known for rising films in the presence of thermal gradients. Such models can exhibit non-classical shocks that are undercompressive. We present basic theory that allows one to identify the signature of an undercompressive wave. We observe both compressive and undercompressive waves in new experiments and we argue that, in the case of a pre-coated glass, the famous “wine tears” emerge from a reverse undercompressive shock originating at the meniscus.

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