Shocks in driven liquid films

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Driven contact line problems in thin liquid films are an active area of research. The mathematical theory of shock waves has recently been shown to play an important role in our understanding of basic properties of the contact line motion. I will present the theory for two recently studied experimental systems: (1) Thermally driven films counterbalanced by gravity are described by a scalar conservation with a non-convex flux. Such systems are known to produce 'undercompressive shocks' in which characteristics emerge from the shock on one side. (2) A related problem is that of particle laden flow driven by gravity. The differential settling rate of the particles with respect to the fluid results in the formation of double shock fronts which are solutions of a system of two conservation laws for the motion of the species. Comparison between theory and experiment will be discussed, along with open mathematical problems directly related to the experiments.