Abstract Submitted
for the DFD12 Meeting of
The American Physical Society

**Self-similar rupture of thin heated viscous sheets** M. BOWEN, Waseda University, B.S. TILLEY, Worcester Polytechnic Institute — We consider the evolution and rupture dynamics of a thin viscous planar sheet subject to a symmetric initial disturbances in the thermal and velocity fields. We consider the long-wave limit where deviations from the mean sheet velocity are small, but thermocapillary stresses, fluid inertia, van der Waals effects, capillarity, and heat transfer to the environment can be significant. The result is a coupled system of three equations that describe the sheet thickness, the sheet velocity, and the sheet temperature. When van der Waals effects are dominant, the sheet ruptures due to disjoining pressures for sufficiently long-wave disturbances on a faster time-scale than convection or conduction. However, in cases when disjoining pressures are small, we find a self-similar rupture process where inertia, viscous stresses, thermocapillarity, convection and conduction all balance. We quantify how solutions transition from this similarity solution to the van-der-Waals-driven self-similar solution when the thickness of the sheet becomes sufficiently thin.

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Date submitted: 03 Aug 2012 Electronic form version 1.4