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Thermocapillary Control of Thin Fluid Sheets BURT TILLEY, WPI, MARK BOWEN, Waseda University — We consider the evolution and rupture dynamics of a thin viscous planar sheet subject to a symmetric initial long-wave disturbances in the thermal and velocity fields. We apply a long-wave analysis in the 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. From a linear stability analysis, we find that a stable thermal mode couples the velocity and interfacial dynamics. The phase difference between the initial temperature and velocity distributions is a key parameter in determining the time to rupture. Using phase modulation in the initial temperature along with amplitude modulation in the initial velocity allows the potential for control of the rupture patterns along the sheet. Self-similar rupture dynamics in the limit of zero van der Waals forces are also presented.

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