Abstract Submitted
for the DFD13 Meeting of
The American Physical Society

Elastically dominated viscous spreading JEROME NEUFELD, BP Institute, Department of Earth Sciences, Department of Applied Mathematics and Theoretical Physics, University of Cambridge, MARCIN MALINOWSKI, Department of Physics, University of Cambridge — The spreading of viscous liquid drops on a floating elastic sheet is a rich problem exhibiting striking new phenomena across a wide array of scales, from the buckling of nanoscale elastic sheets to the deformation of the Indian subcontinent by the Tibetan plateau. Here we show that when density of the fluid exceeds that of the "ocean" supporting the elastic sheet ($\rho_f > \rho_o$) a steady state radius is reached. In contrast, for relatively light liquid droplets ($\rho_f < \rho_o$) two modes of propagation are found. At early times bending provides a small correction to the classic viscous gravity current, while at late times a new bending-dominated mode of propagation emerges. The results are applicable to the spreading of droplets on elastic membranes and, at very much larger scales, to the dynamics and topology of the Tibetan plateau.

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Date submitted: 02 Aug 2013 Electronic form version 1.4