Abstract Submitted
for the DFD17 Meeting of
The American Physical Society

Dynamics of viscous drops confined in a rough medium[1] LUDOVIC KEISER, ARMELLE GAS, KHALIL JAAFAR, JOSE BICO, ETIENNE REYSSAT, ESPCI Paris, Laboratory PMMH, PSL Research University, Sorbonne Universites, Universite Paris Diderot — We focus on the dynamics of viscous and non-wetting "pancake" droplets of oil conned in a vertical Hele-Shaw cell filled with a less viscous surfactant solution. These dense drops settle at constant velocity driven by gravity. The surfactant solution completely wets the walls, and a thin lubrication film separates the drops from the walls. With smooth walls, two main dynamical regimes are characterized as the gap between the walls is varied. Viscous dissipation is found to dominate either in the droplet or in the lubrication film, depending on the ratio of viscosities and length scales. A sharp transition between both regimes is observed and successfully captured by asymptotic models. With rough walls, that transition is dramatically altered. Drops are generally much slower in a rough Hele-Shaw cell, in comparison with a similar smooth cell. Building up on the seminal works of Seiwert et al. (J.F.M. 2011) on film deposition by dip coating on a rough surface, we shed light on the non-trivial friction processes resulting from the interplay of viscous dissipation at the front of the drop, in the lubrication film and in the bulk of the drop.

[1]We acknowledge funding from Total S.A.

Ludovic Keiser
PSL Research Univ., Sorbonne Univ., Univ. Paris Diderot

Date submitted: 01 Aug 2017 Electronic form version 1.4