

Abstract Submitted  
for the MAR15 Meeting of  
The American Physical Society

**Kinetics of Gravity-Driven Water Channels under Steady Rain**

REMI DREYFUS, CESARE CEJAS, REMI BARROIS, CNRS-Solvay-UPenn UMI3254, Complex Assemblies of Soft Matter, COMPASS, Bristol, PA, USA 19007, YULI WEI, Department of Physics and Astronomy, University of Pennsylvania, Philadelphia, PA 19014, CHRISTIAN FRETIGNY, CNRS UMR 7615 Sciences et Ingénierie de la Matière Molle (SIMM), ESPCI, Paris, France 75005, DOUGLAS DURIAN, Department of Physics and Astronomy, University of Pennsylvania, Philadelphia, PA 19014 — We investigate the physical mechanisms that govern the formation of water channels that develop from finger instabilities at the wetting front. Using controlled experiments in a quasi-2D cell and varying physical parameters (particle size, fluid viscosity, etc.), we simulate rainfall and characterize the homogeneous wetting front as well as channel size and estimate relevant time scales associated with the instability as well as channel velocity. We validate the results by developing a model based on linear-stability analysis with the addition of another term describing the homogenization of the wetting front. This shows that the way we introduce a fluid into a granular medium affects the formation of water channels. Results permit us to calculate the ideal flow rate for maximizing water distribution and minimizing runoffs using granular and fluid properties.

Remi Dreyfus  
CNRS

Date submitted: 14 Nov 2014

Electronic form version 1.4