Domain wall in a ferromagnetic Ising Co thin film

Lemerle, Ferre, Chappert, Mathe,
Giamarchi, PLD (Phys. Rev. Lett. 1998)

D =1+1 interface (d=1,N=1)

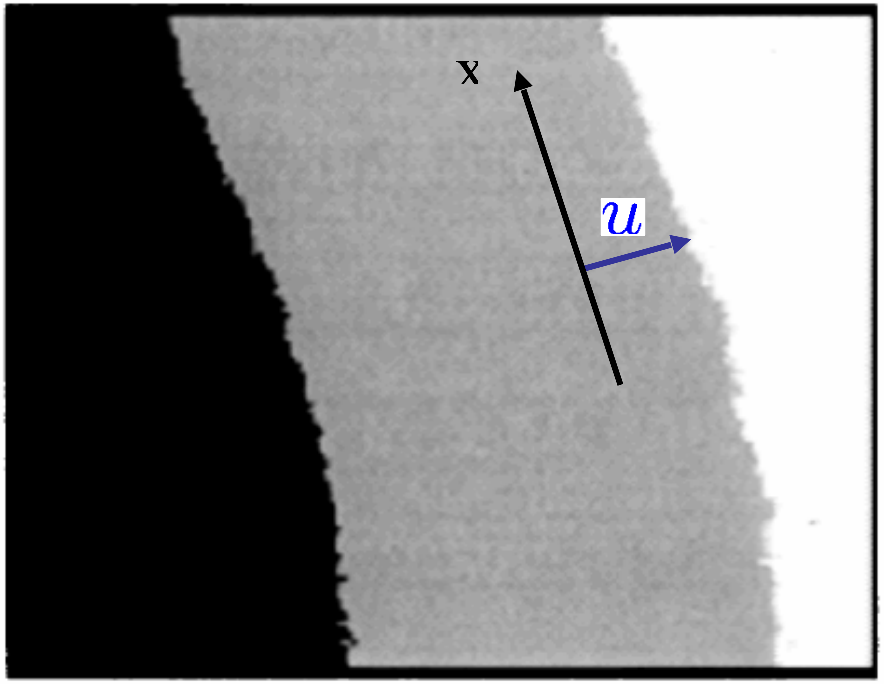


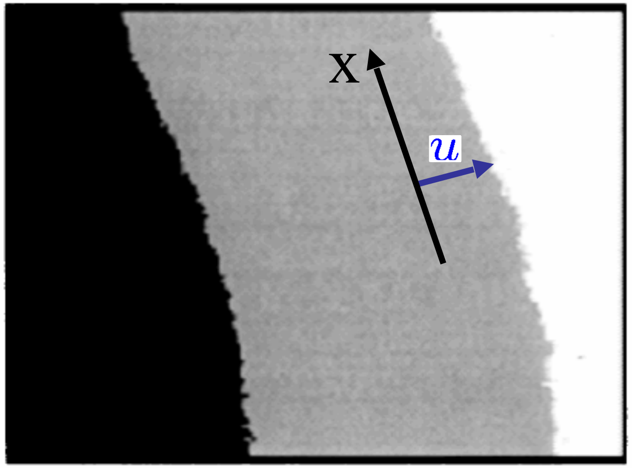
FIG. 1. Typical magneto-optical image (size $90 \times 72\ \mu m^2$, $\lambda = 638.1$ nm). The gray part corresponds to the surface swept by the domain wall during 111 μs at 460 Oe ($T = 23\ °C$). The dark part is the original domain.

D =1+1 interface (d=1,N=1)

short-range disorder

$$\langle\langle [u(x+L)-u(x)]^2 \rangle\rangle \propto u_c^2 \left(\frac{L}{L_c}\right)^{2\zeta}$$

thermally equilibrated



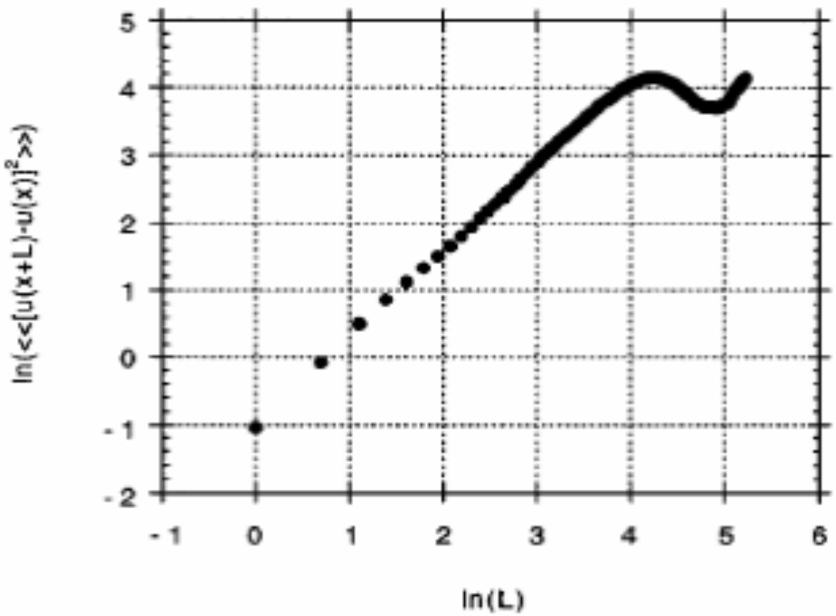


FIG. 4. Typical correlation function drawn in a ln-ln plot. The unit of L is the pixel of the CCD camera, i.e., 0.28 μm.

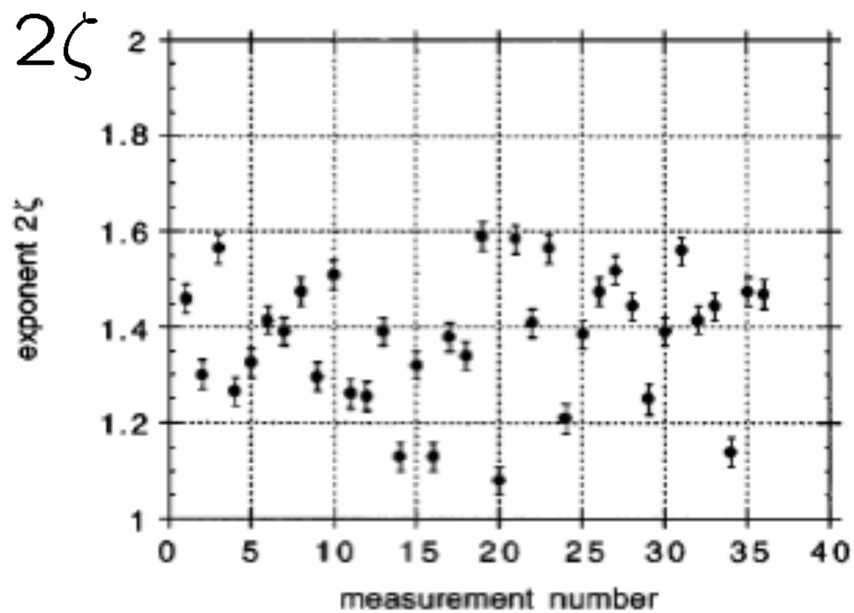


FIG. 5. Wandering exponent 2ζ. Measurements on different MDW driven at $H = 50$ Oe during 20–45 min and then frozen ($T = 300$ K, estimated error on 2ζ for a given image: ± 0.03).

(a)

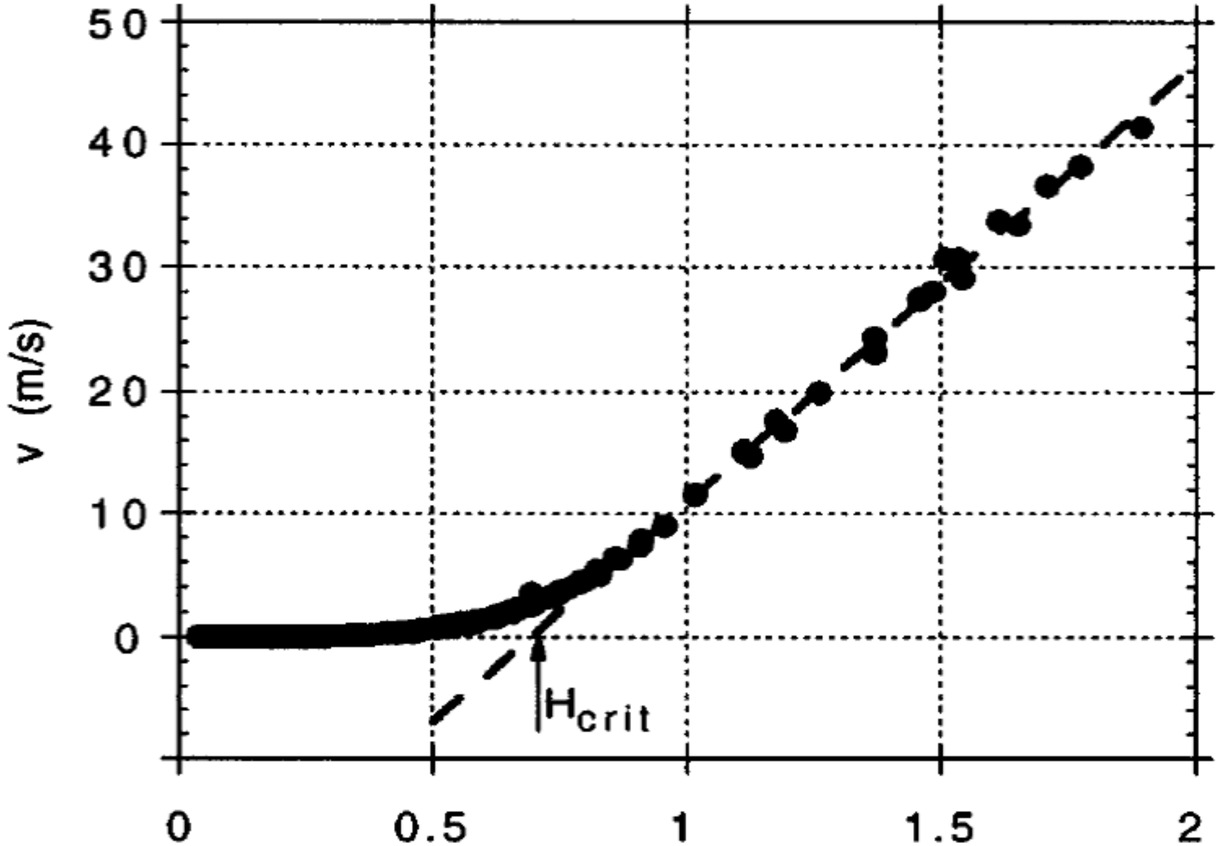


FIG. 2. (a),(b): MDW velocity versus applied magnetic field at room temperature (v in m/s). The dashed line in (a) is the linear fit of the high field part ($H > 0.86$ kOe) and the arrow marks its intersection with the line $v(H) = 0$. This is the definition of H_{crit}.

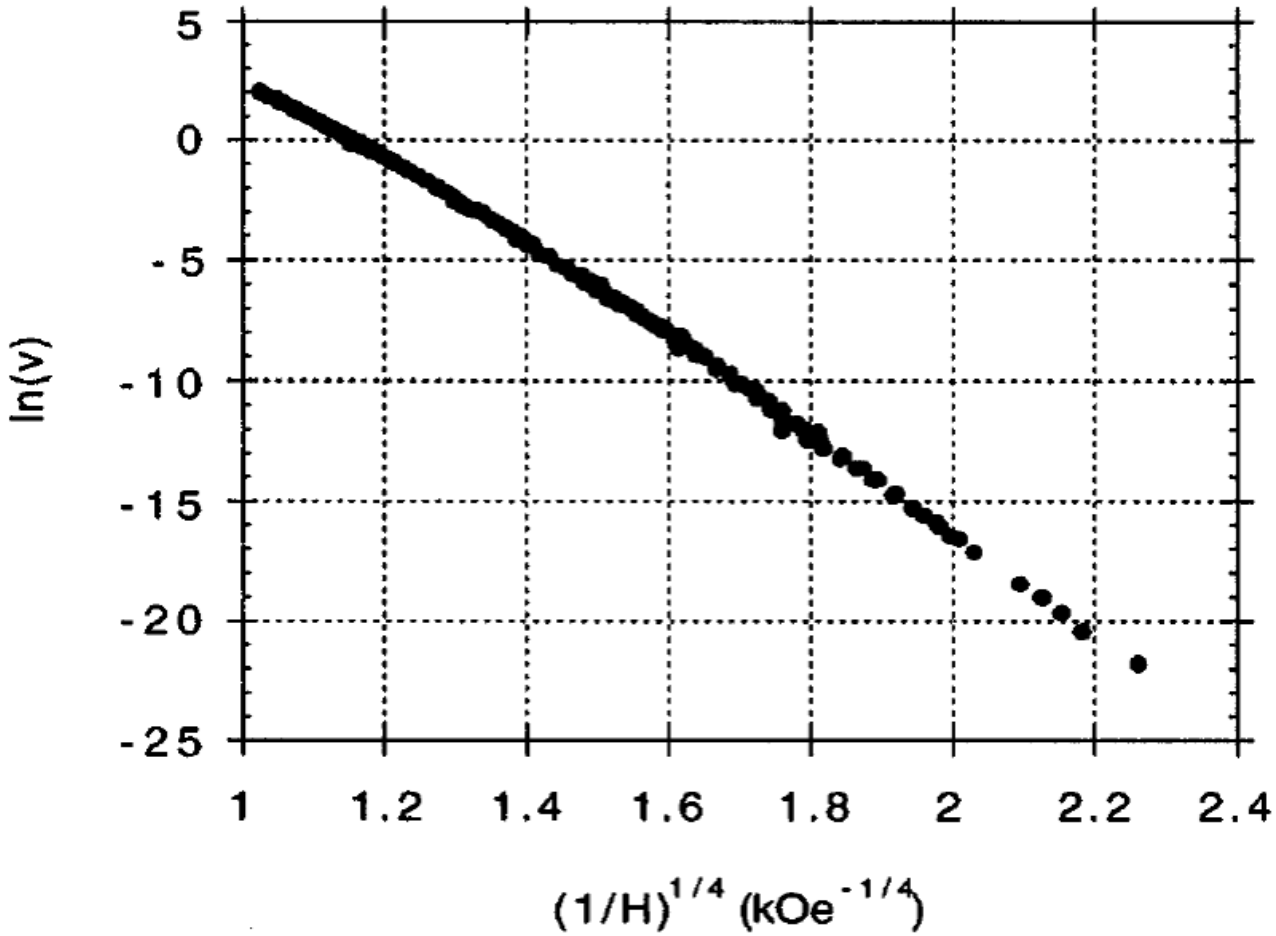


FIG. 3. Natural logarithm of MDW velocity as a function of $(1/H)^{1/4}$ (room temperature, $H \leq 955$ Oe).

Contact line of a fluid

quasi-static depinning

E. Rolley et al. (ENS)

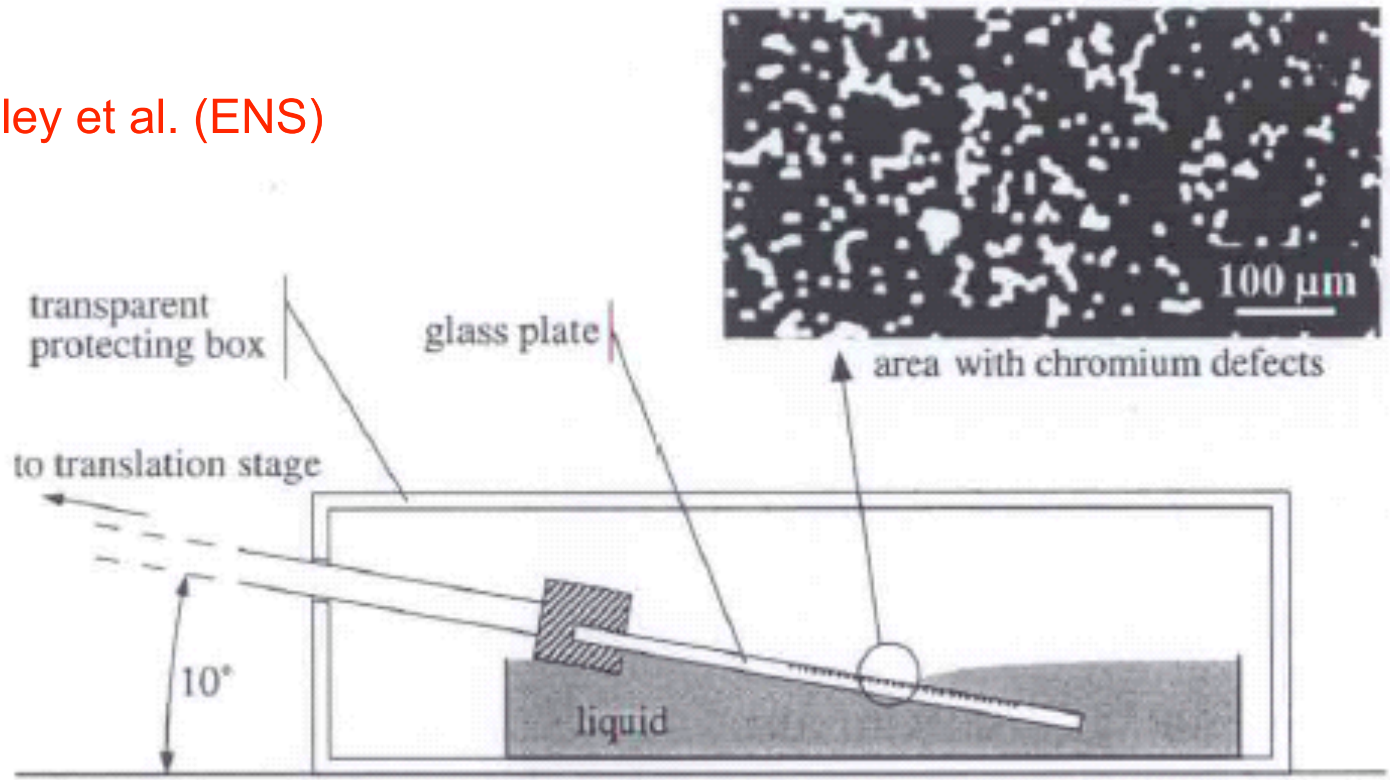


Fig. 2. Sketch of the experimental setup. Inset: photograph of the disordered substrate, the chromium defects appear as white square spots.

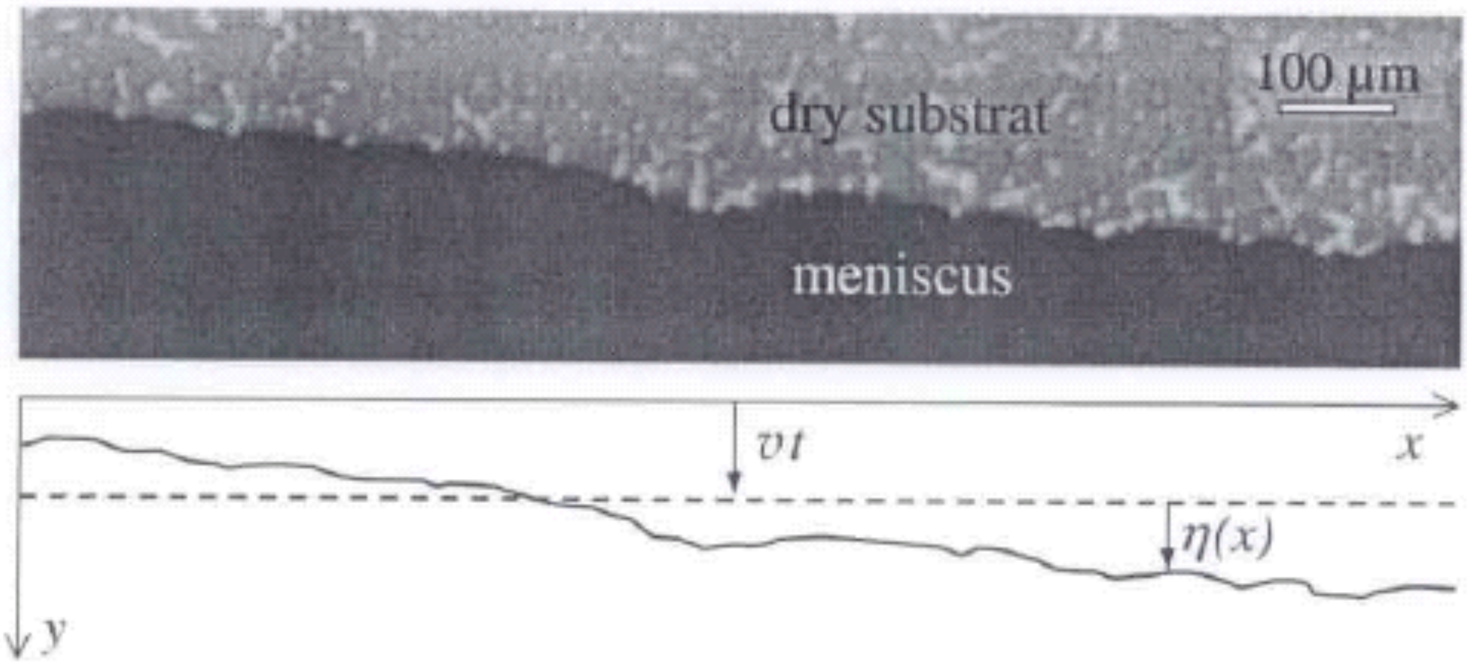


Fig. 1. Upper part: image of the contact line obtained with an ordinary CCD camera. Lower part: the position $\eta(x,t) \equiv y(x,t) - vt$ of the CL is defined with respect to its average position vt.

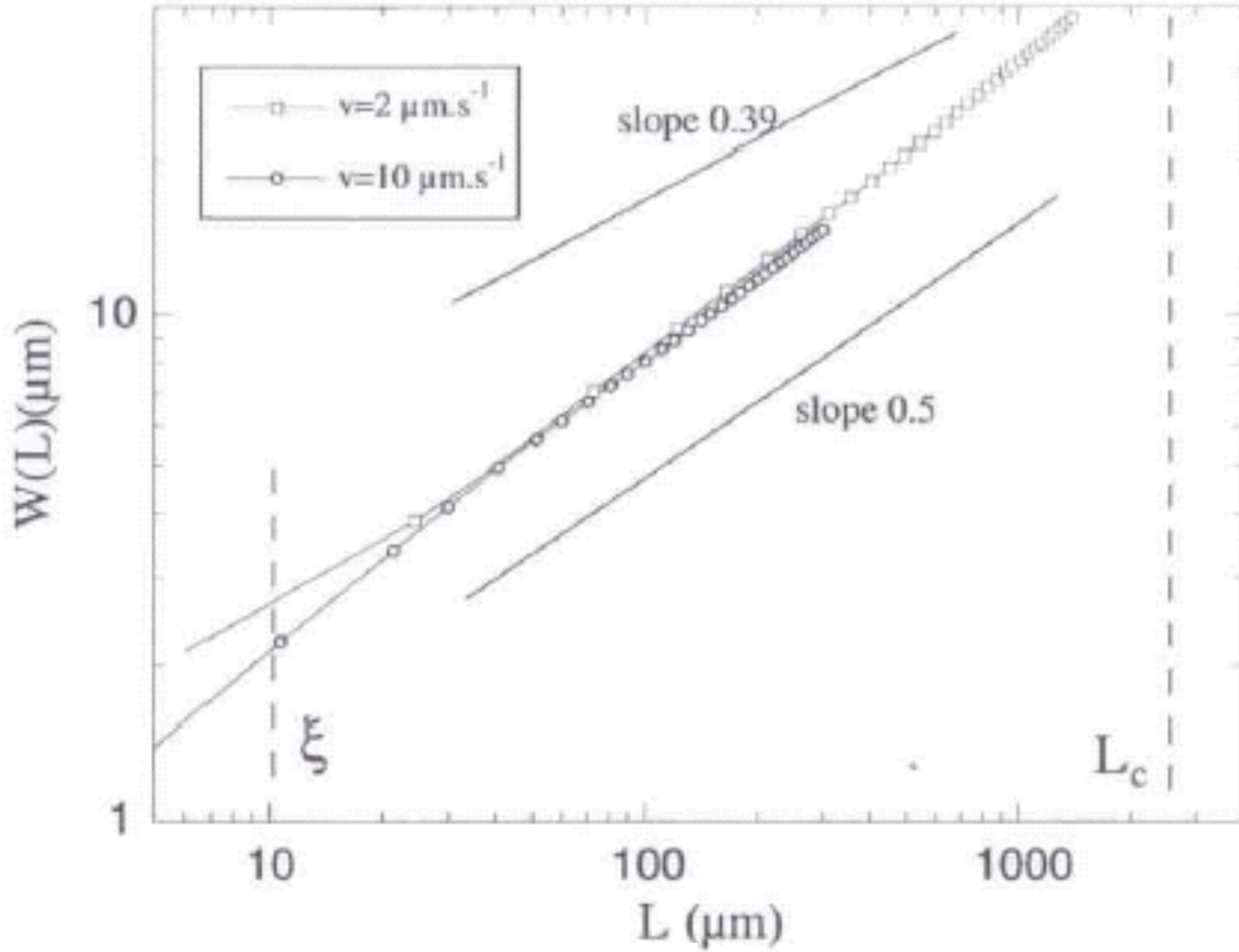


Fig. 3. Roughness W as a function of distance L for different drift velocities. The upper (respectively, lower) graph corresponds to data obtained with water (respectively, water-glycerol mixture). For both graphs, the data ∘ have been obtained with a larger magnification (resolution 2.1 μm) than the others (resolution 6.1 μm).

Avalanches: reproducible

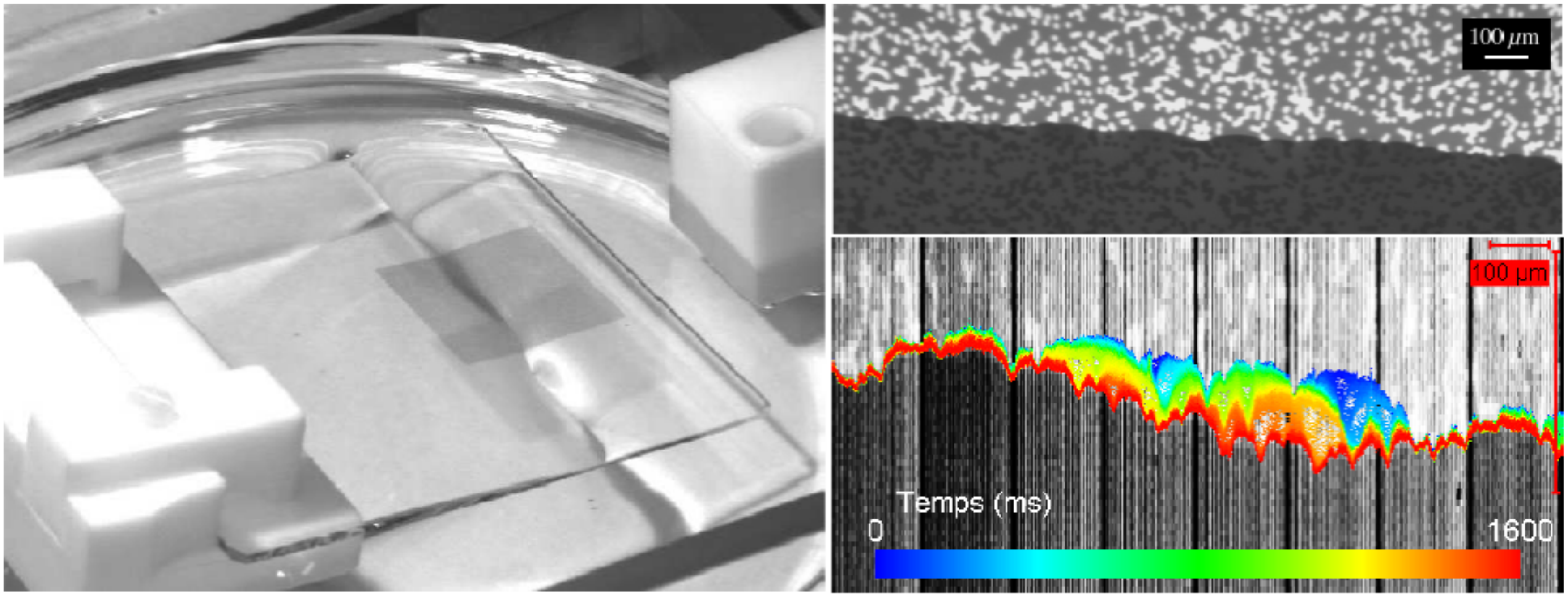
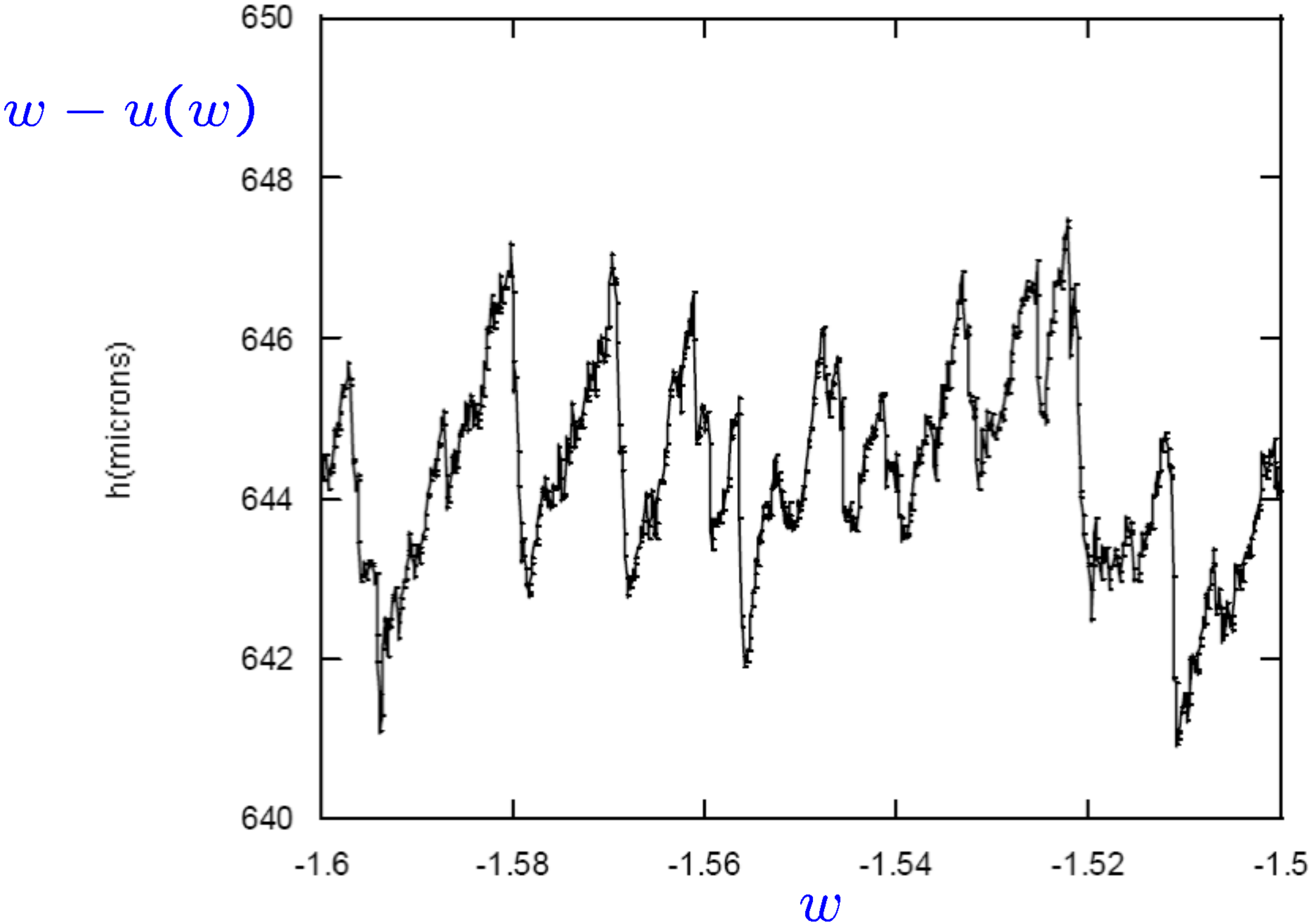


Figure 2: A contact line for the wetting of a disordered substrate by Glycerine [7]. Experimental setup (left). The disorder consists of randomly deposited islands of Chromium, appearing as bright spots (top right). Temporal evolution of the retreating contact-line (bottom right). Note the different scales parallel and perpendicular to the contact-line. Pictures courtesy of S. Moulinet, with kind permission.

u(w) = center of mass of the contact line (over 2 Lc)



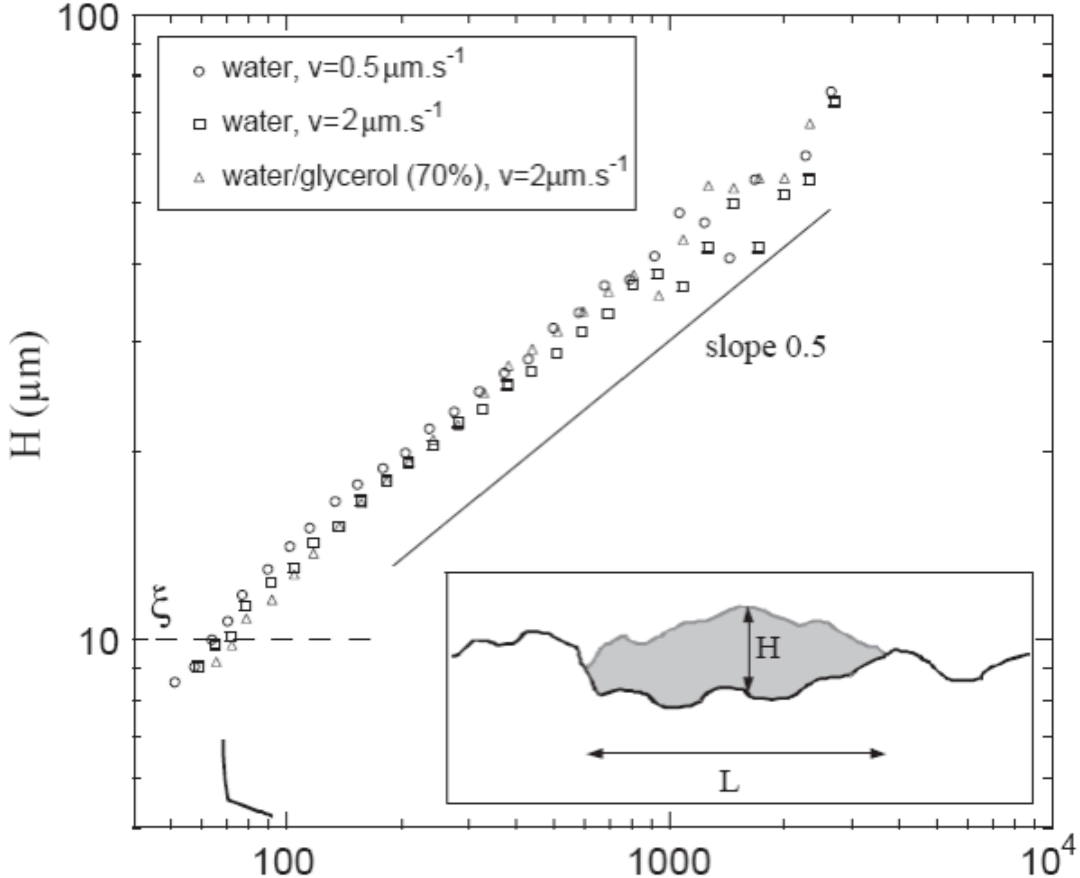


Fig. 6. Average height H of an avalanche of length L for different drift velocities and different viscosities. One finds that H scales roughly like $L^{0.5}$, which is consistent with the value of the roughness exponent ζ. Inset: schematic representation of an avalanche.

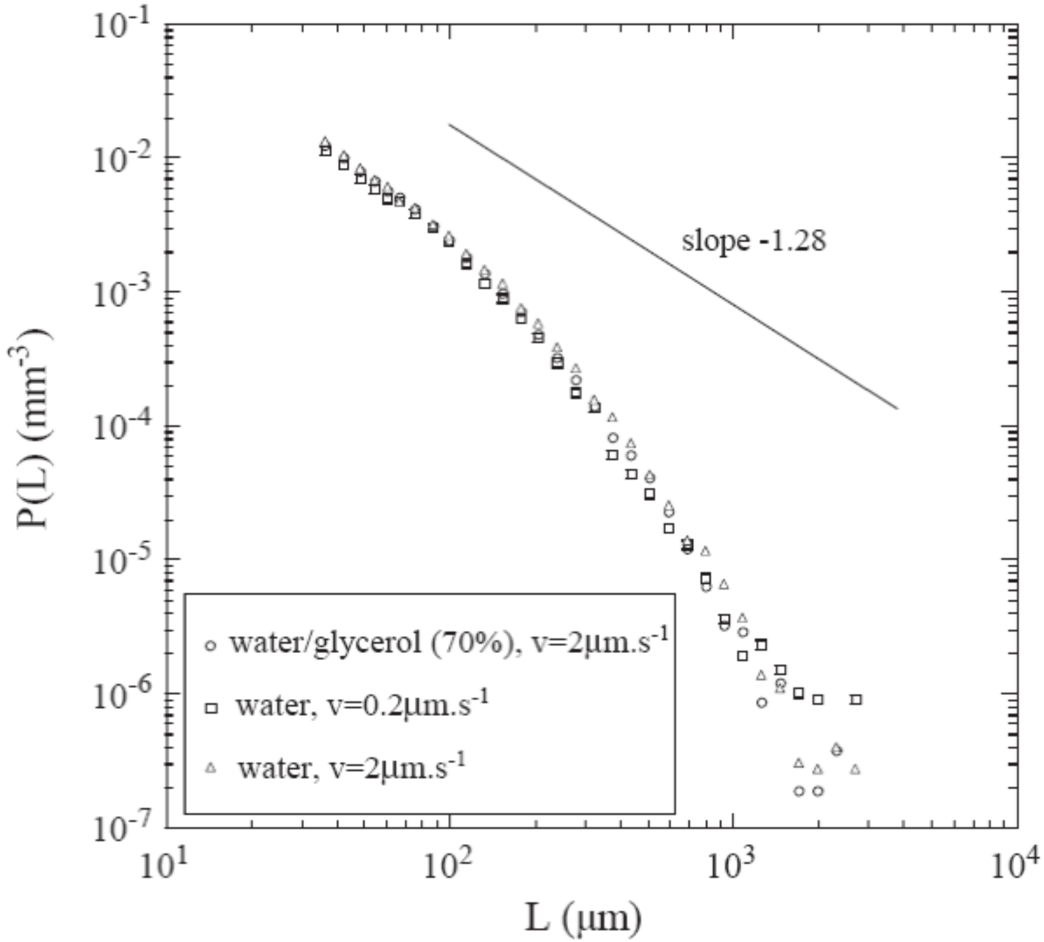


Fig. 7. Probability $P(L)$ of occurrence of an avalanche of length L for different drift velocities and different viscosities. P is the number of avalanches divided by the effective area swept by the CL and by the effective pixel size. This curves are obtained with the same magnification of the microscope; other magnifications lead to the same curves. The solid line is the power law dependence expected from numerical simulation.

Reviews

- Pinning of elastic manifolds

  Blatter et al. Rev. Mod. Phys. 66 (1994) 1125.

  Nattermann and Scheidl Adv. Phys. 49 (2000) 607 cond-mat/0003052.

  Giamarchi and PLD, in book "Spin glasses and random fields" cond-mat/9705096

  PLD in book BCS: 50 years, and Int. J. of Mod. Phys. B, **24** 20-21, 3855 (2010).

  (with more applications to superconductors)

- Functional RG

  PLD, K. Wiese, cond-mat/0611346, Markov Proc. Relat. Fields **13** (2007) 777.

  P. Le Doussal, arXiv:0809.1192, Annals of Physics **325** 1, 49-150 (2010).