Downslope granular flow through a forest of obstacles

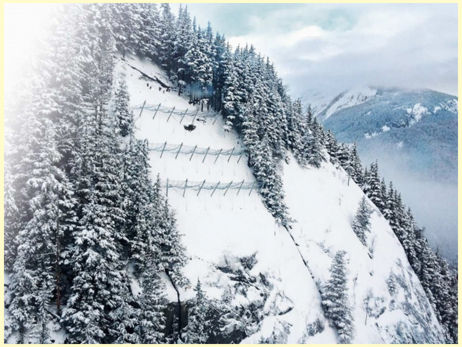
Baptiste Darbois Texier, Yann Bertho, Philippe Gondret

FAST Fluides, Automatique et Systèmes Thermiques

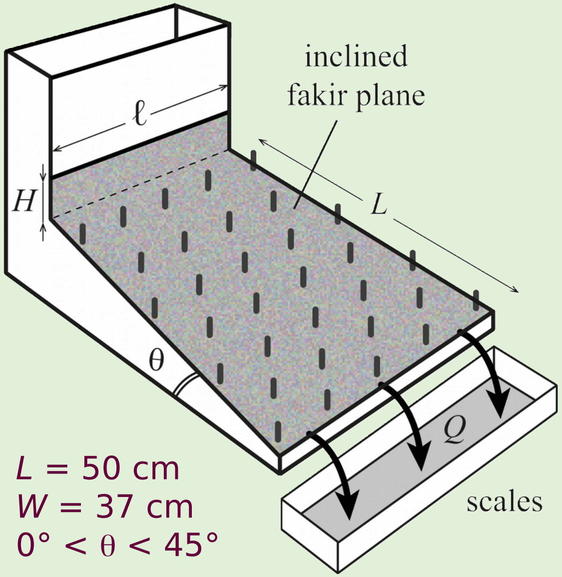
université PARIS-SACLAY | FACULTÉ DES SCIENCES D'ORSAY

cnrs

CONTEXT

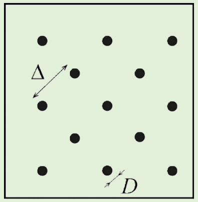


EXPERIMENTAL SETUP



L = 50 cm
W = 37 cm
0° < θ < 45°

d_g = 450 µm

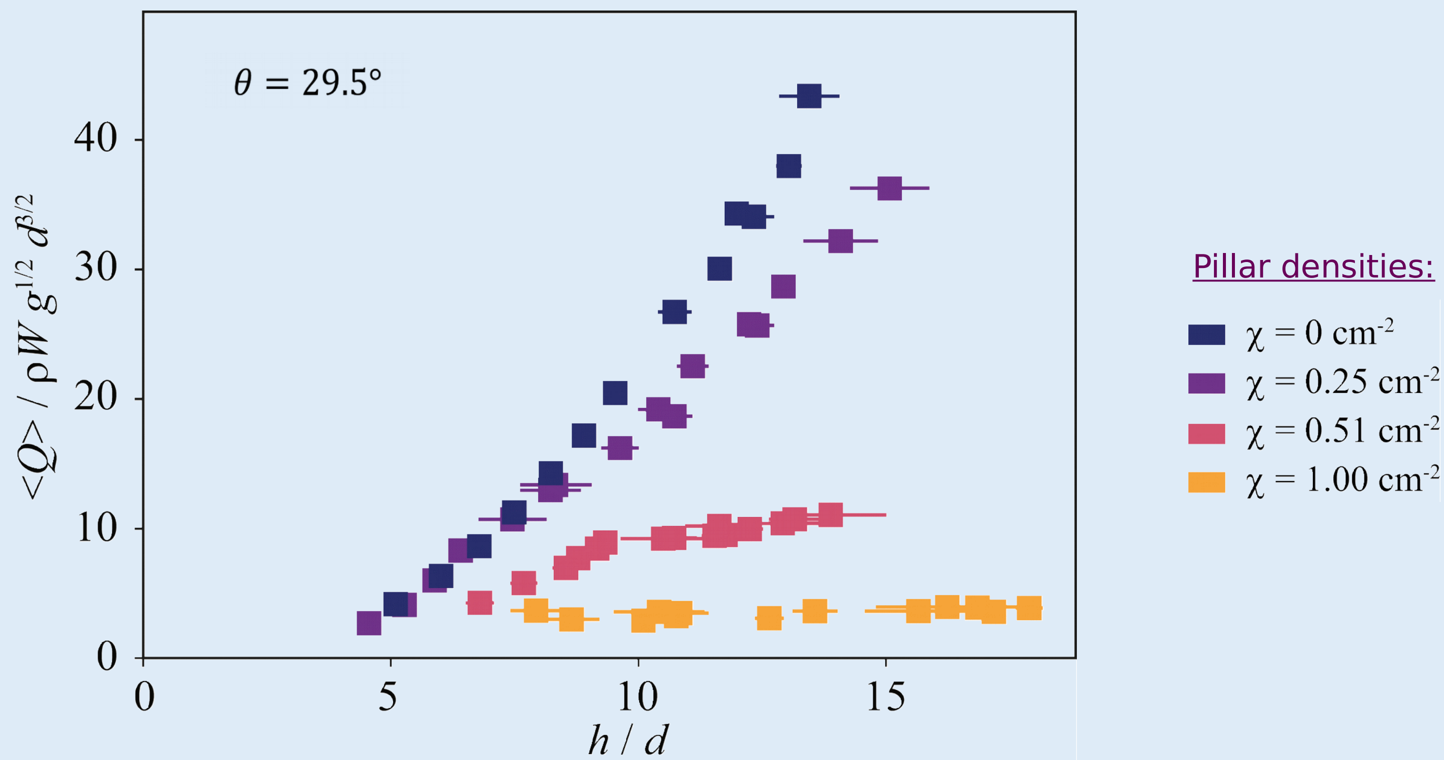


D = 2 mm
Δ = 10, 14 and 20 mm

Pillar densities: $\chi = 1/\Delta^2$

- $\chi = 0\ \mathrm{cm^{-2}}$
- $\chi = 0.25\ \mathrm{cm^{-2}}$
- $\chi = 0.51\ \mathrm{cm^{-2}}$
- $\chi = 1.00\ \mathrm{cm^{-2}}$

STATIONARY FLOW



MODEL

µ(I)-rheology

<u>Force balance with independant pillars :</u>

$$\rho g h \sin\theta - \mu_b(u,h)\rho g h \cos\theta - \alpha\rho g \chi h^2 D \cos\theta - C_d \rho \chi h D u^2 = 0$$

$$\tilde{Q} = \frac{2I_0}{5}\,\frac{\tan\theta - \tan\theta_1 - \alpha\chi h D}{\tan\theta_2 + \alpha\chi h D - \tan\theta}\sqrt{\phi\cos\theta}\left(\frac{h}{d}\right)^{5/2}$$