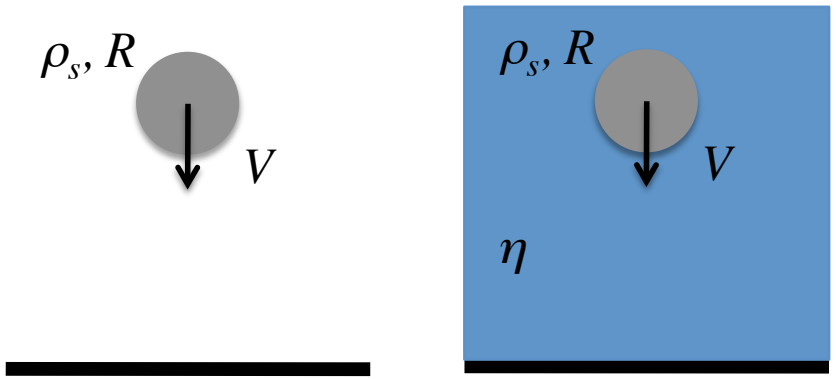
Collision d'une sphère sur une surface texturée dans un fluide

Thibault Chastel, Anne Mongruel (PMMH, Paris)
Philippe Gondret (FAST, Orsay)

restitution coefficient of collision $\varepsilon = \dfrac{V_r}{V_i}$

$\varepsilon = 1$ elastic bouncing, no dissipation

$\varepsilon = 0$ no rebound, total dissipation



dry case

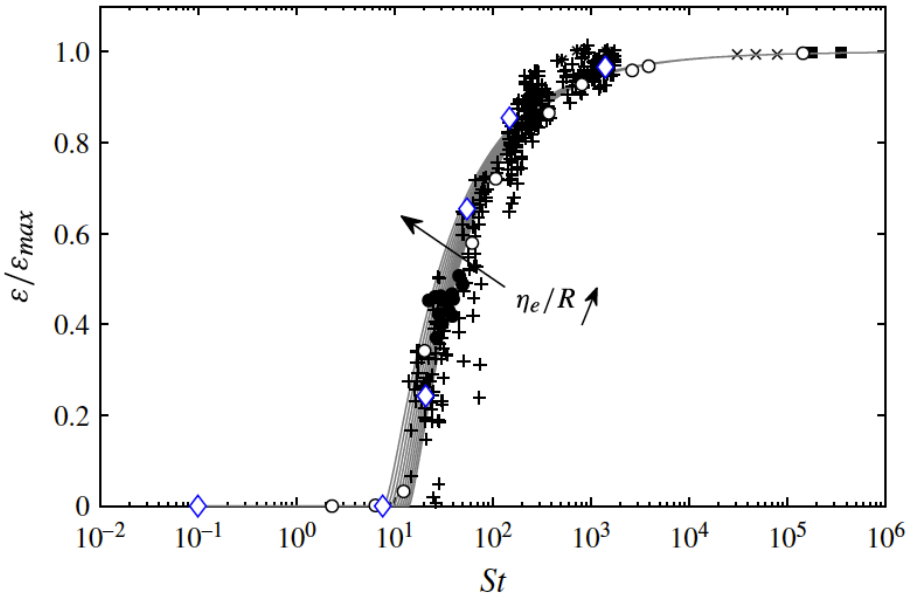
Raman (1918)

$\varepsilon(\ldots)$

immersed case

Gondret et al. (2002)

$\varepsilon(\mathrm{St})$



Stokes number

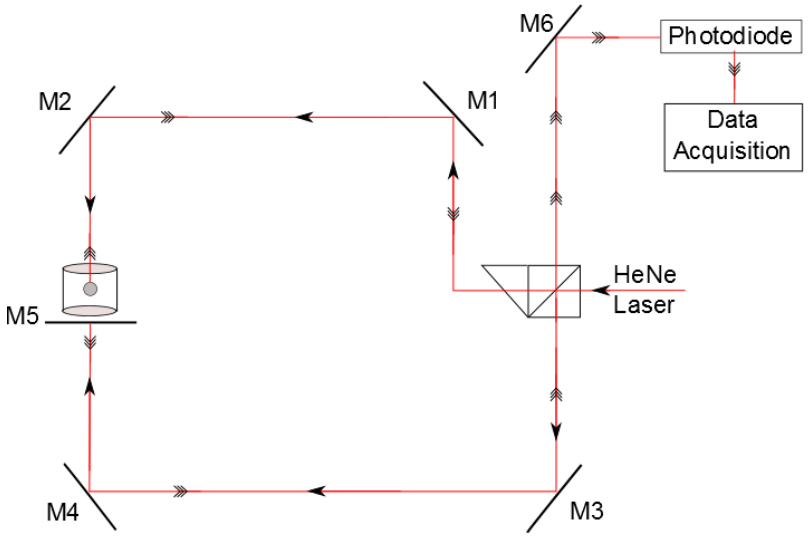
$$\mathrm{St} = \frac{\text{grain inertia}}{\text{viscous forces}} = \frac{2}{9}\frac{\rho_s R V_i}{\eta}$$

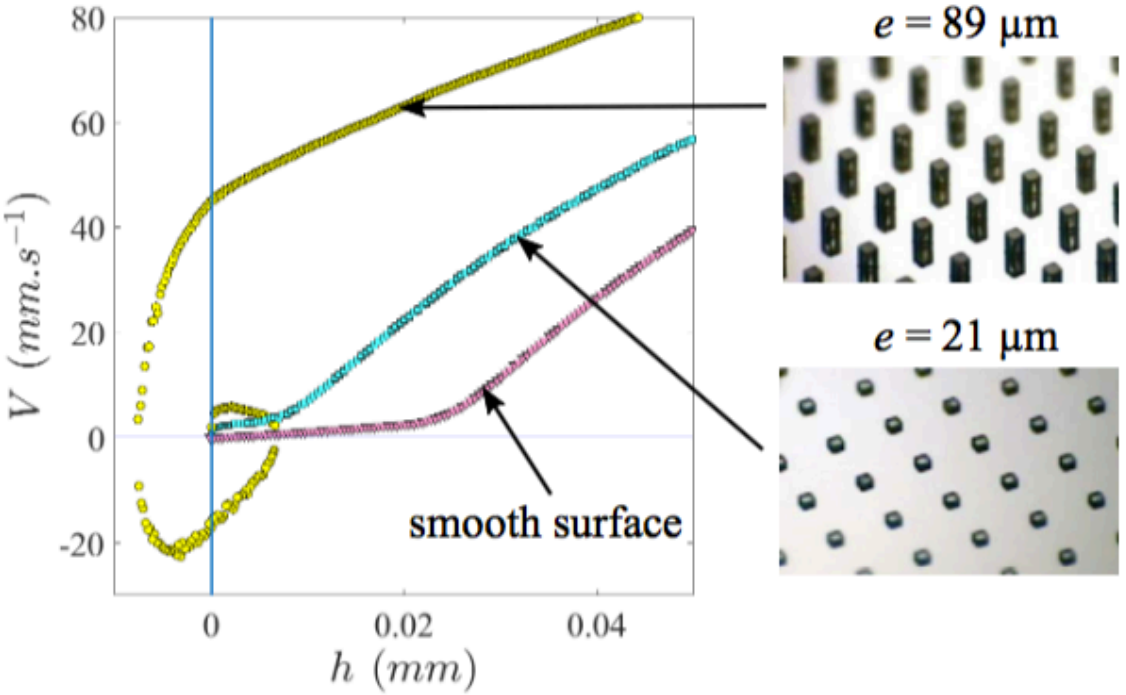
Critical value for bouncing $\mathrm{St_c} \approx 10$

Influence of roughness on bouncing?

High Frequency Interferometry

time resolution 0.1 ms and spatial resolution 0.1 µm





Measurements of : Impact velocity
Critical Stokes number for bouncing
Time of collision τ
Penetration depth δ_{max}

Modified Hertz model taking into account the roughness
(height and density number of micro textures)