

Force de masse ajoutée en milieu granulaire

Added-mass force in dry granular media



with

$$F_{AM} = C_{AM} \rho V_{\text{object}} \frac{dU}{dt}$$

$$C_{AM} = 1 \text{ for a cylinder}$$

$$C_{AM} = 1/2 \text{ for a sphere}$$

in simple fluids

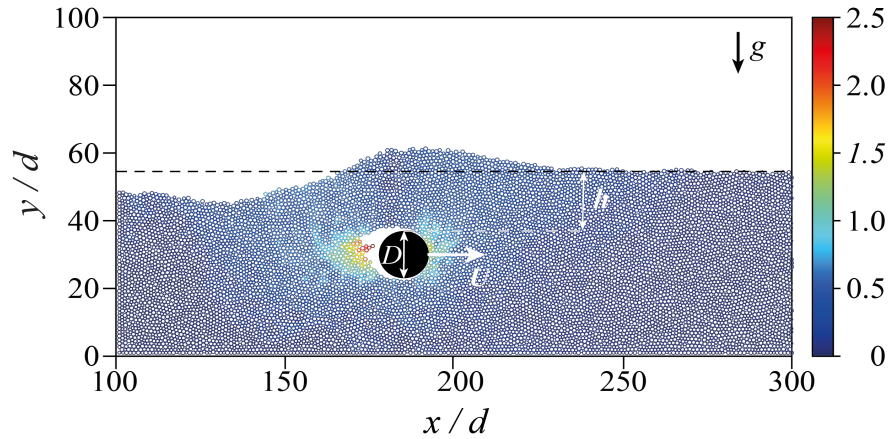
and in dry granular matter ?

Pendulum motion in fluids

Bessel (1828)

Stokes (1851)

2D numerical simulations (DEM)



Analytical calculations

$$C_{AM} = \frac{4}{\pi D^2} \int_{r=D/2}^{+\infty} \int_{\theta=0}^{2\pi} \left[\frac{\mathbf{u}(r, \theta)}{U} \right]^2 r dr d\theta$$

$$C_{AM} = \frac{39}{32} \approx 1.2 \quad \text{for vanishing } d/D$$

and increases with d/D

