Rolling, sliding and adhesion on a viscous wall

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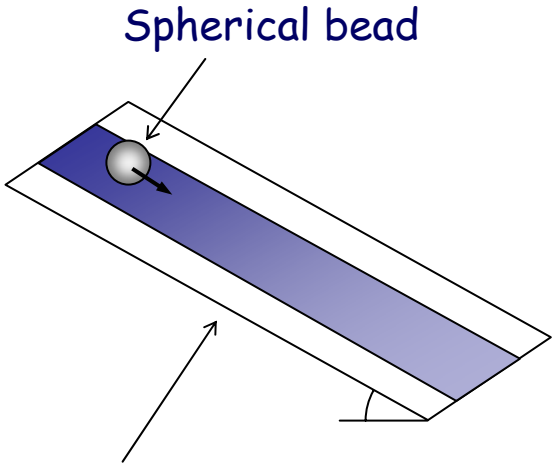
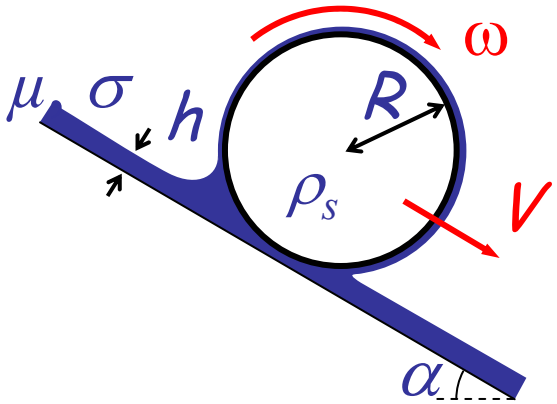
Like a rolling stone?

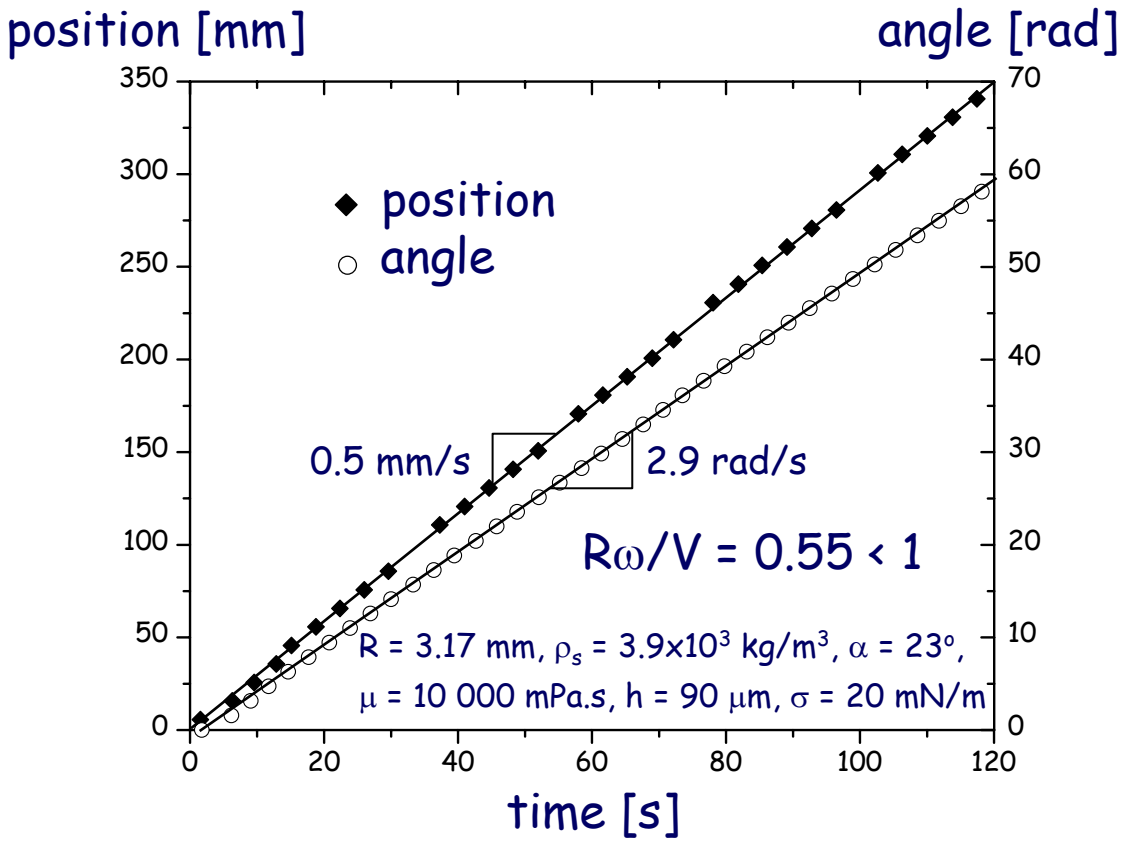


Plane lubricated with a thin layer of viscous liquid.



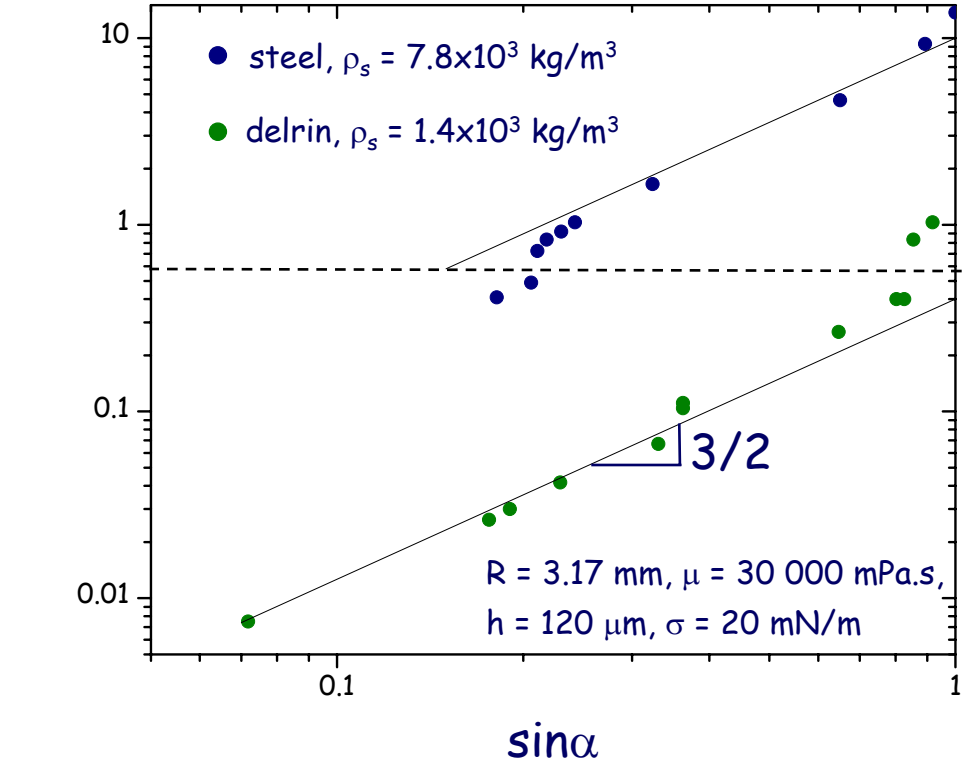
V, ω ?

A steady motion

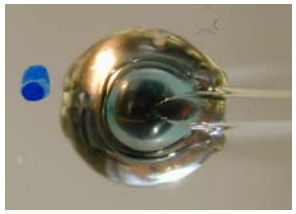


Combination of rotation and sliding

Slugs and comets



Wake viewed from underneath

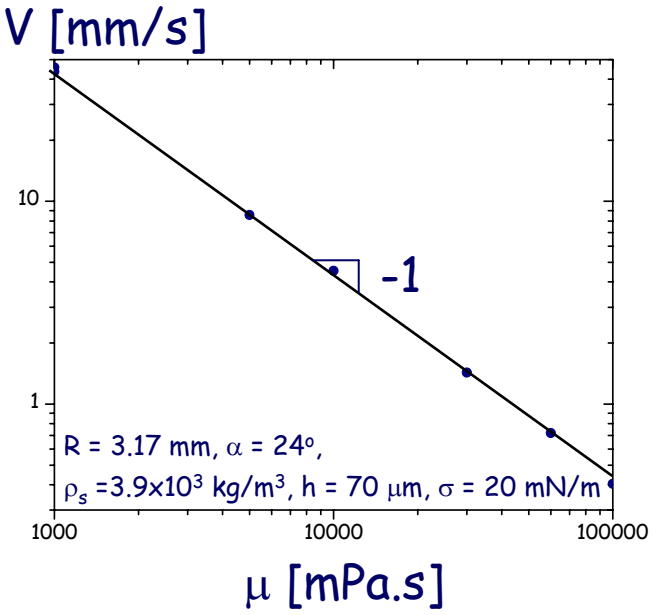


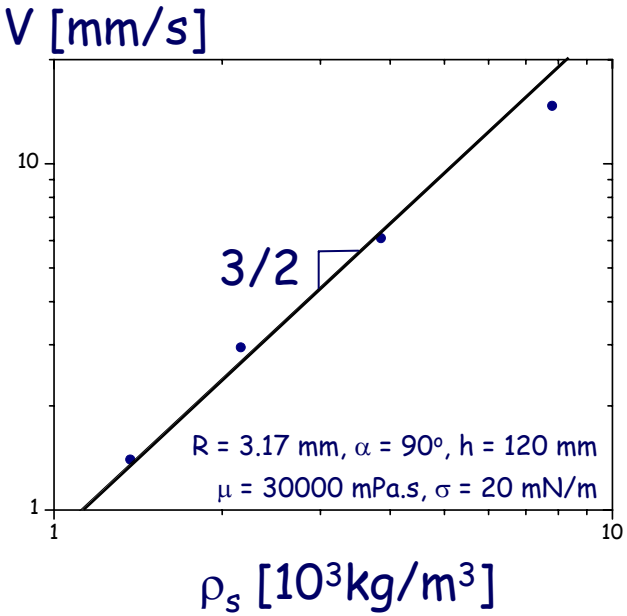
"comet"

"slug"

$V \sim (\sin\alpha)^{3/2}$ for both regimes
Transition at $\mu V/\sigma \sim 1$

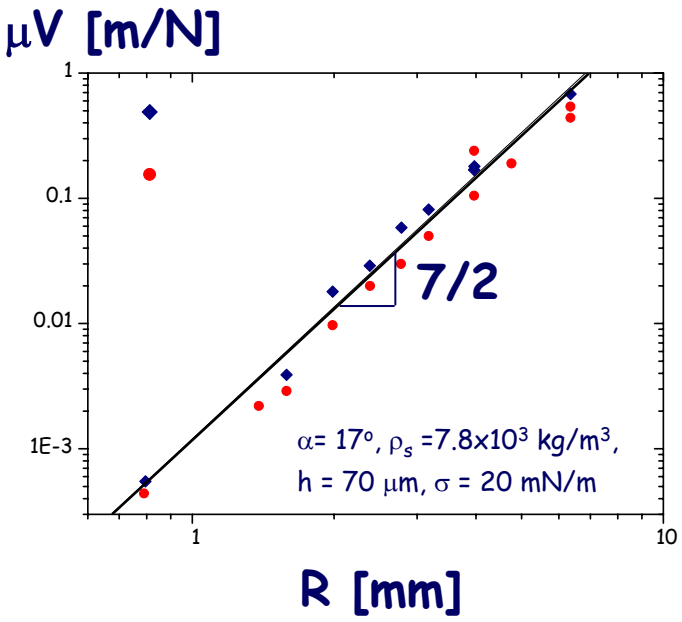
Some scalings

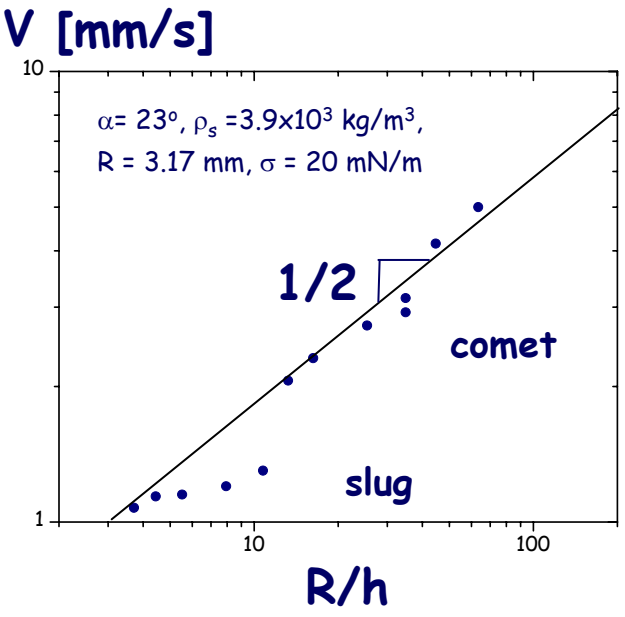




lubrication!

Radius and thickness





A scaling law ?

Non-dimensional groups

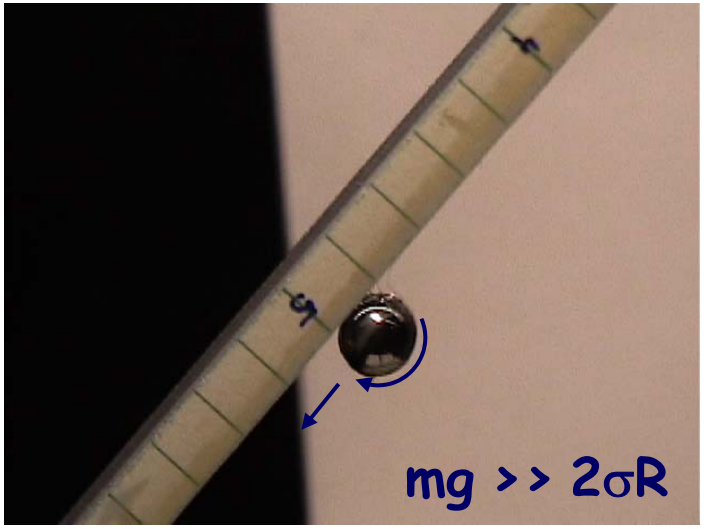
Capillary number: $\mu V/\sigma$

"Bond" number: $\rho_s g \sin\alpha R^2/\sigma$

Aspect ratio: R/h

$$V \sim \frac{\sigma}{\mu}\left[\frac{\rho_s g \sin\alpha\, R^2}{\sigma}\right]^{3/2}\left[\frac{R}{h}\right]^{1/2} \quad ?$$

Overhang situation



Lubrication force in addition to capillarity

Current work

Theoritical arguments

Sliding / Rotation

Gap between the sphere and the plane?

Normal force?

Limits of the "adhesion" force

Acknoledgements

This work has been inspired by the nice experiments from A.Samadani and A.Kudrolli on wetted granular media, and is supported by a Rohsenow fellowship from MIT.