

# Slumping regime in lock-release turbidity currents

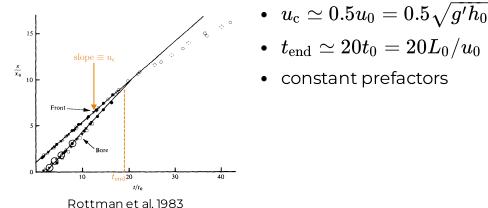
## ■ - Introduction



?

natural hazards → reliable predictive models ?

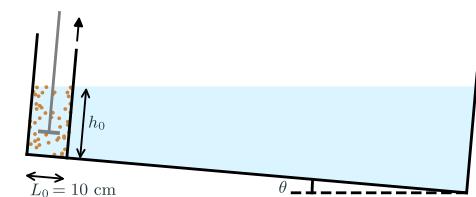
- saline currents, horizontal bottom:



?

dynamics of particle-ladden currents on slopes ?

## ⚙ - Methods



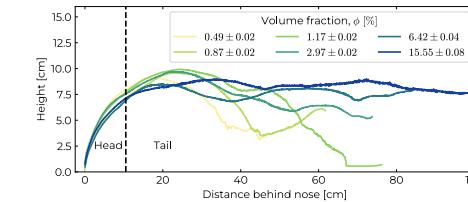
- Systematic parameter space exploration:
  - 2 different set ups:  $\theta \in [0^\circ, 15^\circ]$ ,  $h_0 \in 20, 30 \text{ cm}$
  - 5 different particle diameters + saline water
  - particle volume fraction  $\phi \in [0.5, 15] \%$



Slumping of a suspension of silica sand ( $d \sim 180 \mu\text{m}$ ).

## 💡 - Results

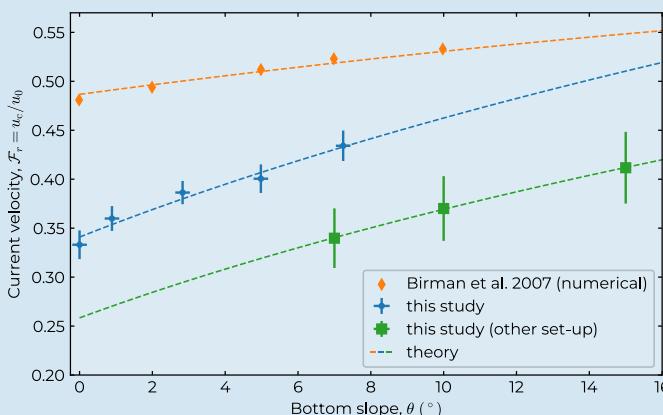
- Existence of a constant-velocity regime on a sloping bottom → slope-induced acceleration occurs later (Birman et al. 2007)
- Bottom slope increases this velocity
- Settling decreases the constant-velocity regime duration
- Current head shape ( $\sim L_0$  behind nose) independant of  $\phi$ ,  $v_s$  and  $\theta$



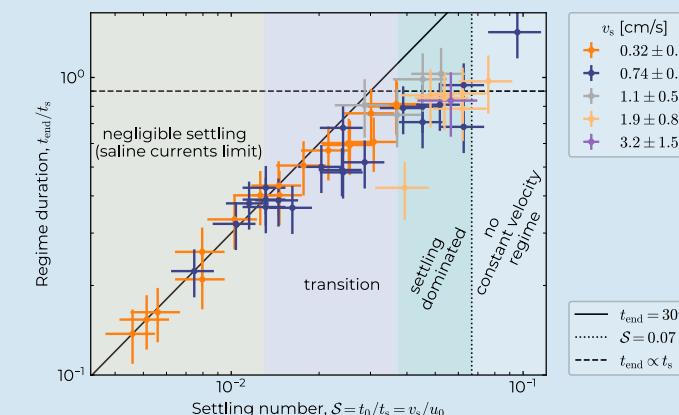
# Bottom slope and particle settling matters for turbidity current slumping dynamics !



## Bottom slope increases velocity

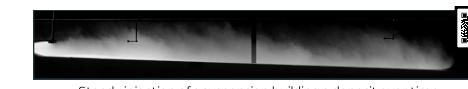


## Settling decreases regime duration



## 💡 - Discussion/Perspectives

- Origin of the influence of  $\theta$  on  $\mathcal{F}_r$  ? (early times)
- How to include this on depth-averaged models ? (to be tested)
- Influence of lock aspect-ratio ( $h_0 / L_0$ ) on velocity ?
- What about steady-influx turbidity currents on slopes ?



## ⚠ - Definitions

- slumping regime: first, constant-velocity, phase of current propagation (see intro)
- $u_0 = \sqrt{(\delta\rho/\rho_f)\phi gh_0}$ : characteristic slumping velocity
- $\delta\rho = \rho_p - \rho_f$ : excess particle density
- $t_0 = L_0/u_0$ : characteristic slumping time
- $v_s$ : particle settling velocity
- $t_s = h_0/v_s$ : characteristic settling time