

Slumping regime in lock-release turbidity currents

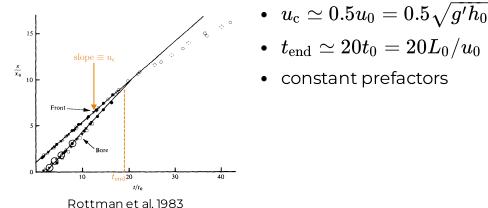
■ - Introduction



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natural hazards → reliable predictive models?

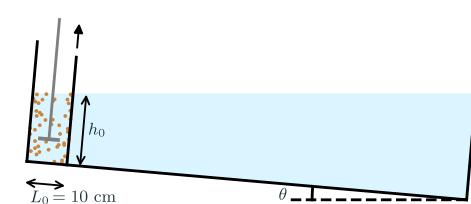
- saline currents, horizontal bottom:



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dynamics of particle-laden 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 $\phi \in [0.5, 15] \%$

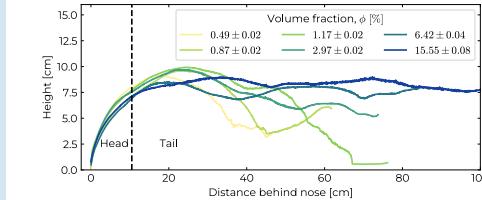


Slumping of a suspension of silica sand ($d \sim 180 \mu\text{m}$).



💡 - Results

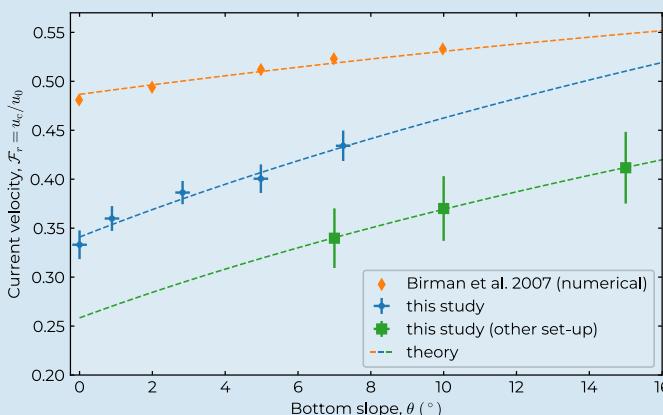
- Existence of a constant-velocity regime on a sloping bottom → slope-induced acceleration occurs later (Birman et al. 2007)
- Bottom slope increases this velocity
- Settling decreases the constant-velocity regime duration
- Current head shape ($\sim L_0$ behind nose) independant of ϕ , v_s and θ



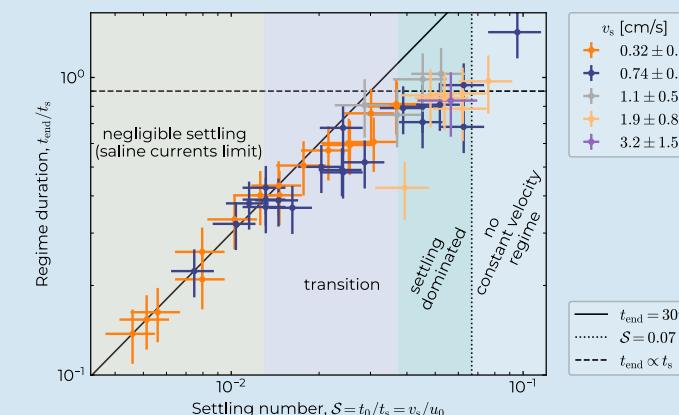
Bottom slope and particle settling matter for turbidity current slumping dynamics!



Bottom slope increases velocity



Settling decreases regime duration



⌚ - Discussion/Perspectives

- Origin of the influence of θ 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 introduction)
- $u_0 = \sqrt{(\delta\rho/\rho_f)\phi gh_0}$, 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