Morphogenesis and morphodynamics of sandy beaches

Eduardo Monsalve[(a)], Benjamin Thiria[(b)] and Sylvain Courrech du Pont[(a)]

(a) Lab. Matière et Systèmes Complexes, Université Paris Diderot
(b) Lab. Physique el Mécanique des Milieux Hétérogènes, ESPCI – Paris, Sorbonne, Université, Université Paris Diderot




Experimental set-up

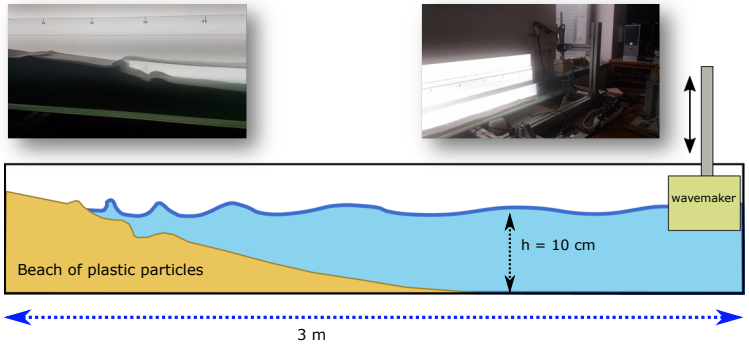
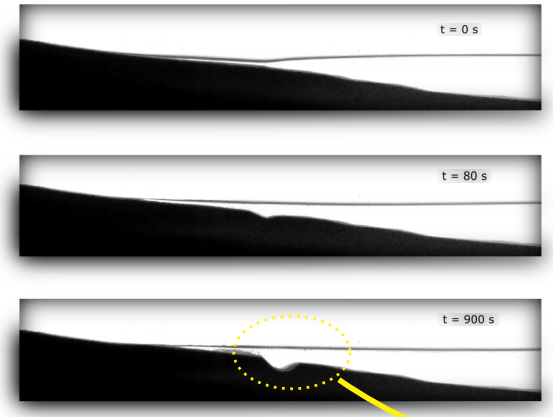


Fig 1: Experimental set-up. A piston type wavemaker generate waves propagating trough a deep water region before attaining a mild slope beach of monodirsperse PVC grains.

Temporal evolution



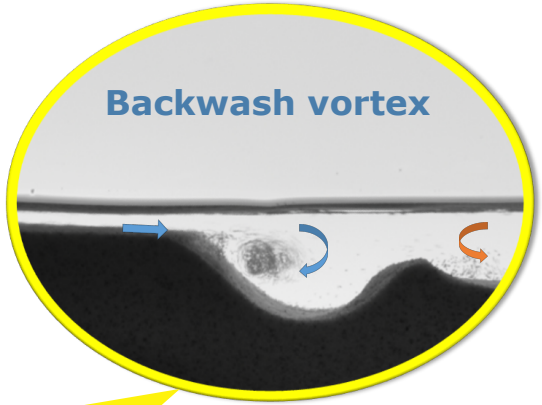


Fig 2: Shapshots of the beach profile at different times for one experiment. f=0.8Hz, a=1.5 mm.

Breaking depth

$$h_b = H_0^{4/5}\left(\frac{\tanh k_0 h_0}{\gamma k_0}\right)^{1/5} \qquad \gamma = \frac{H_b}{h_b},$$

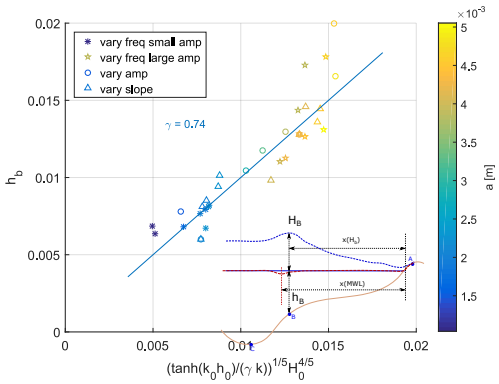


Fig 3: Experimentally measured breaking depth an prediction curve with fitted γ. Inset shows wave height H_B and depth h_B

Wave parameters and beach slope

$$\Omega = \frac{H_0}{u_\infty T}$$

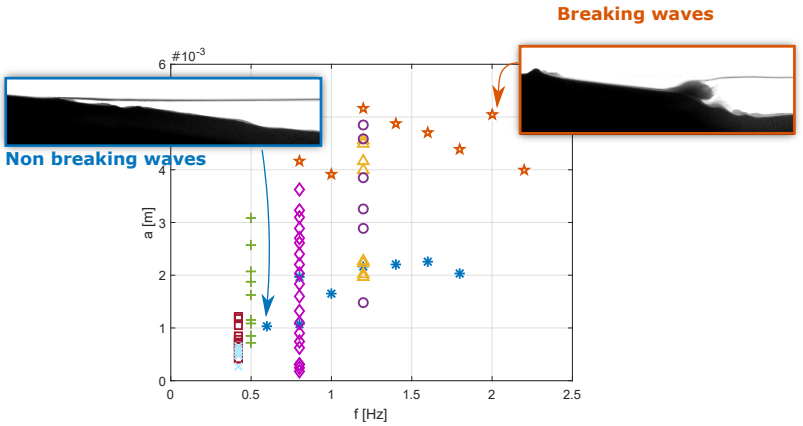


Fig 4: Phase diagram *a* vs *f* for different experimental series

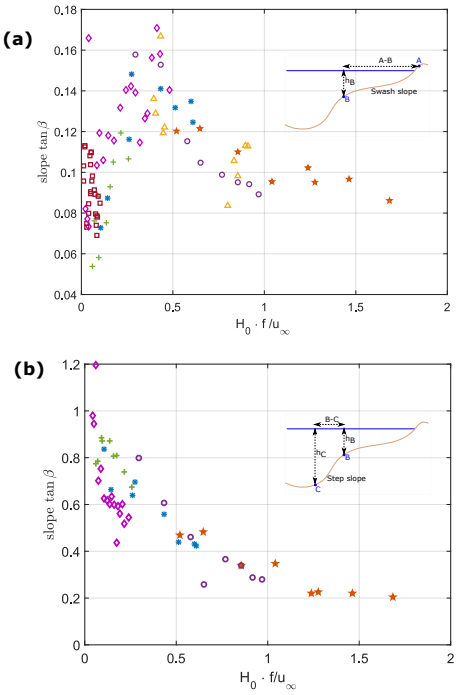


Fig 5: (a) Swash zone slope. (b) Beach step slope

Vortex life time

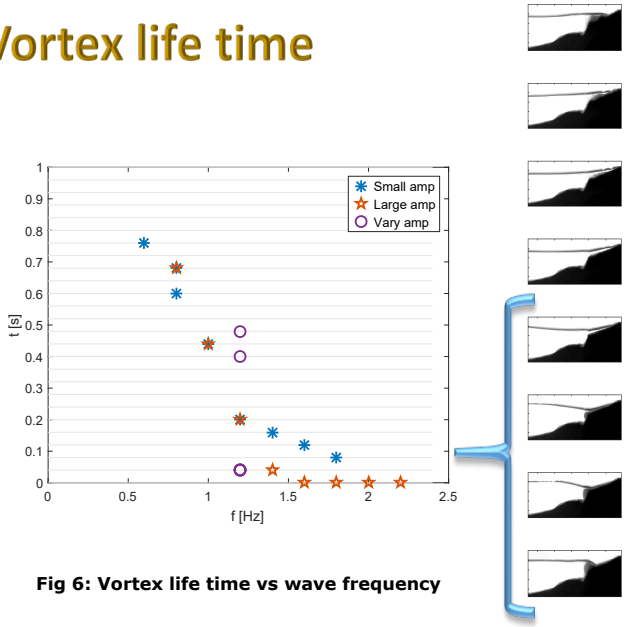


Fig 6: Vortex life time vs wave frequency

Reflection coefficient

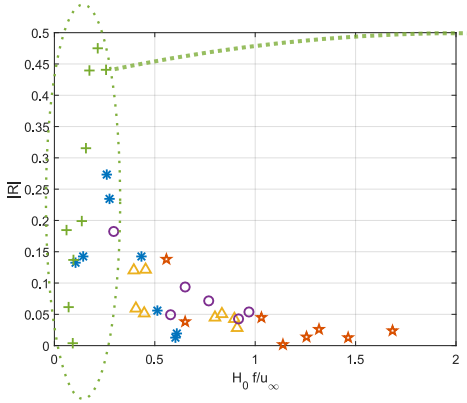


Fig 7: Reflection coefficient as a function of Dean parameter.

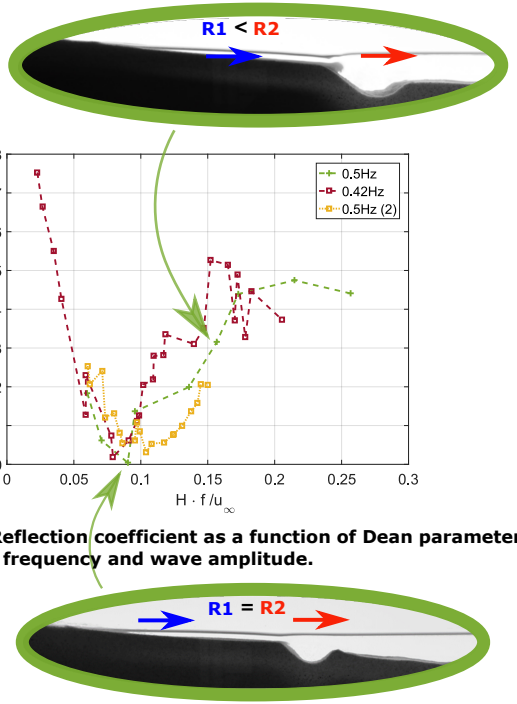


Fig 8: Reflection coefficient as a function of Dean parameter for low frequency and wave amplitude.