BREAKING BAR MIGRATION INDUCED BY INFRAGRAVITY WAVES

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TOPIC
Processes (Hydrodynamics; Morphodynamics).

EXPERIMENTAL SET-UP
Experiments have been designed to reproduce beach morphodynamics in a small scale physical model with light-weight sediment (see details in Rocha, 2016). Bichromatic wave packets with associated bound long waves are let to propagate and shape the beach profile. Examples are shown in Figure 1a where C1 is a steady wave packet while C2 has an enhanced infragravity component. The beach profiles exhibit a bar at x=21.8m where the short waves break (Figure 1b). The wave packets are sent successively (C2, then C1, C2, C1), waiting for rest in between. Wave and beach profile variations are highly reproducible.

EVIDENCE OF BREAKING BAR MIGRATION
The short wave heights are identical for the two conditions, while the infragravity wave heights for C2 are about twice that of C1 (Figure 1c). Larger wave skewness and asymmetry (Figure 1d) in the surf zone (x>22.3m) for C1 promote on-shore transport (Figure 1e). The wave non-linearities are similar for the two conditions off-shore and over the bar. Off-shore sediment transport and bar migration are observed for C2. Video and velocity measurements show that the sediment suspension, which is enhanced by the breaking of the largest short waves, is advected by the off-shore directed flow associated to the long wave.

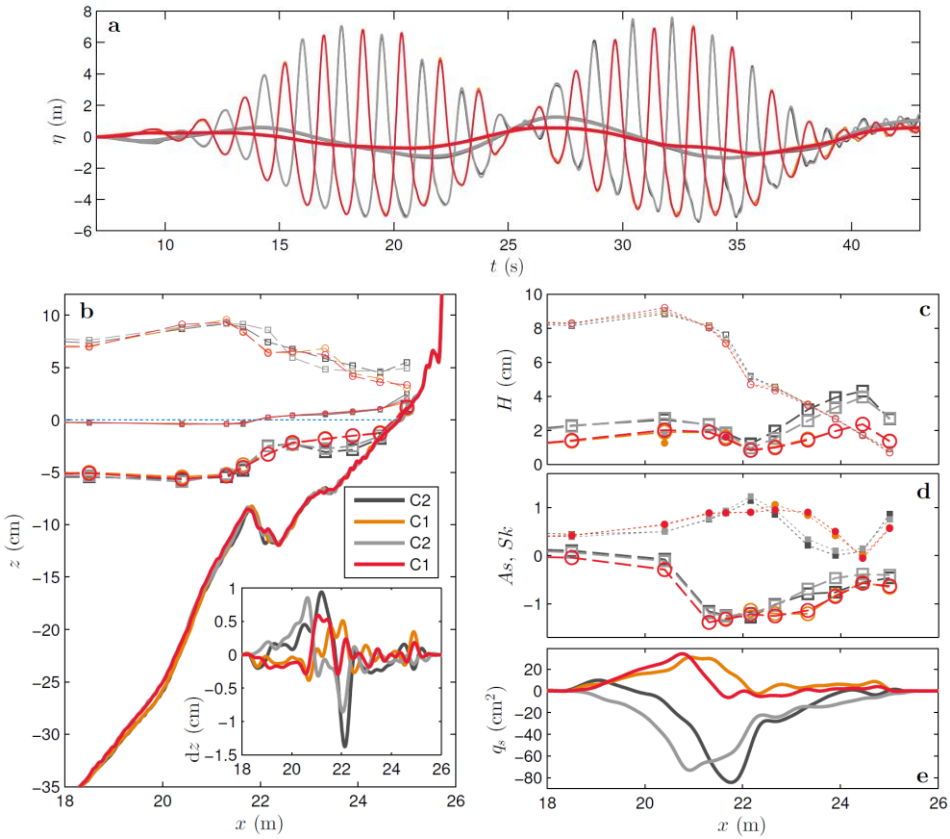

Figure 1 - a: Superimposed time series of the free surface elevation (thin lines) at x =18.5m (x=0 is the wave-maker mean position) for conditions C1 (red) and C2 (grey) with infragravity wave components in thick lines. b: Beach profiles (thick lines) after the successive wave conditions (C2 in black, C1 in orange, C2 in grey and C1 in red), with corresponding maximum (medium symbols), mean (small symbols) and minimum (large symbols) water elevation, the bed variations are plotted in the insert. c: Short wave height (small symbols) and infragravity wave height (large symbols). d: Wave skewness (filled symbols) and wave asymmetry (blank symbols). e: Sediment transport.

REFERENCES
Rocha (2016). *Observation and modelling of wave nonlineariites and infragravity waves in the nearshore*. Ph.D. thesis Univ. Aveiro and Univ. Grenoble-Alpes.