INTERMEDIATE STATES TRANSITIONS IN A LOW MICROTIDAL BEACH

SOCIB Balearic Islands Coastal Observing and Forecasting System

Morphodynamical models have been used to describe beach state for short and long time periods. These models classify the beach by means of hydrodynamical parameters such as wave height and period and sediment related variables giving a rough approach in the description of the beach state. The most popular from the above models is the Wright and Short (1984) (hereinafter WS) model where six different beach states are defined ranging from dissipative to reflective. However, several studies pointed out the uncertainties of WS model in describing intermediate states as well as their transitions (Ranasinghe et al., 2004; Jiménez et al., 2008). Nevertheless, classification based on the WS-omega can be useful when related with some other wave parameters such as wave energy flux (Scott et al., 2011), recent studies have pointed out the importance of wave incidence angle in the transition of beach states (Ferrer et al., 2009; Price and Ruessink, 2011). In this work, we analyze the conditions driving intermediate upstate and downstate beach transitions based on wave energy considerations.

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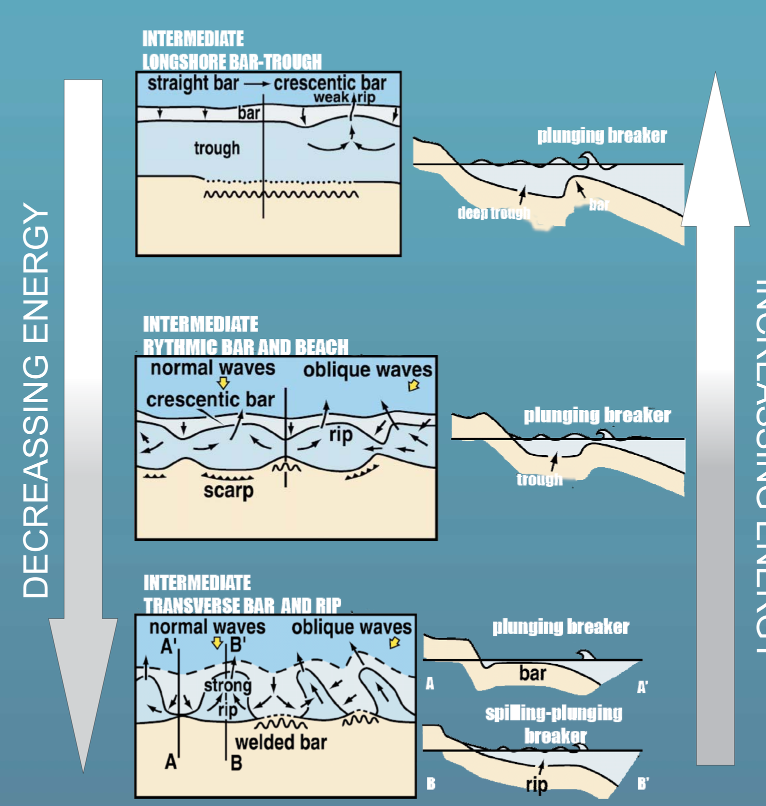
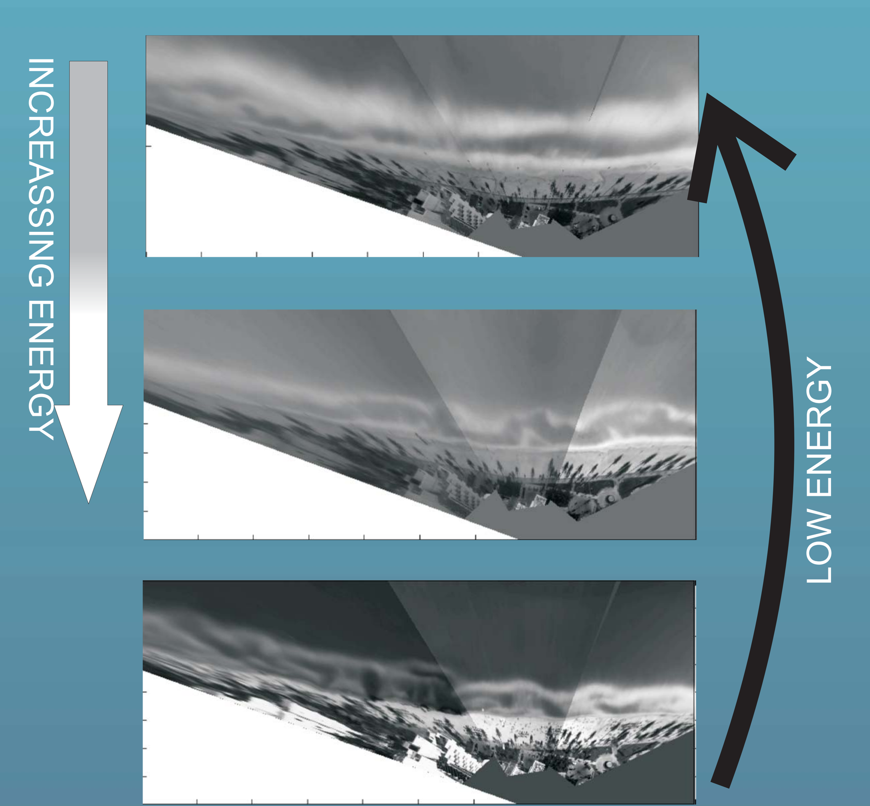
WHAT ARE WE LOOKING FOR?

Four intermediate states defined by WS



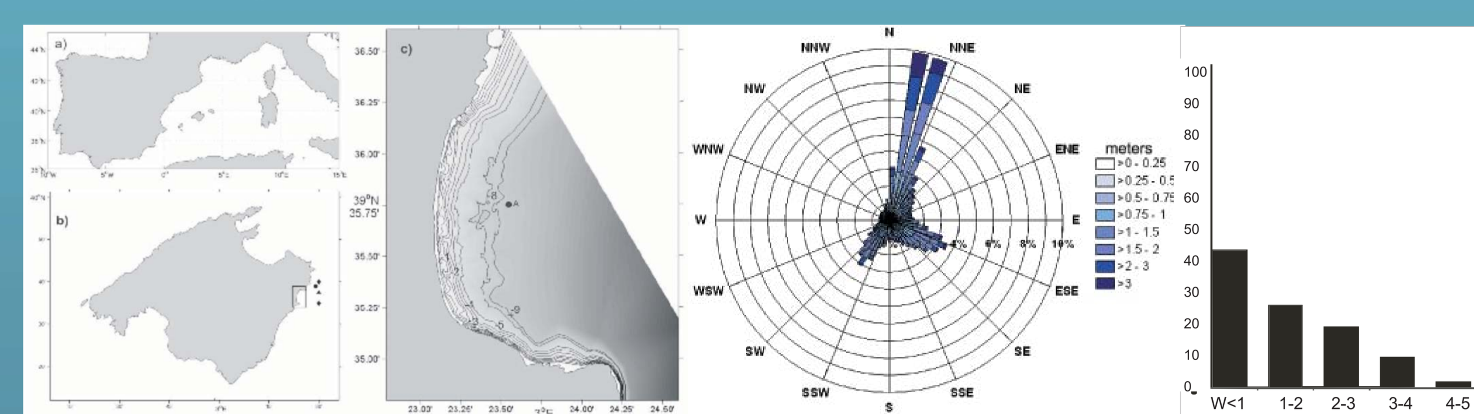
WHAT HAVE WE FIND

Three intermediate states observed with Hs(deep)>1.5m



STUDY SITE

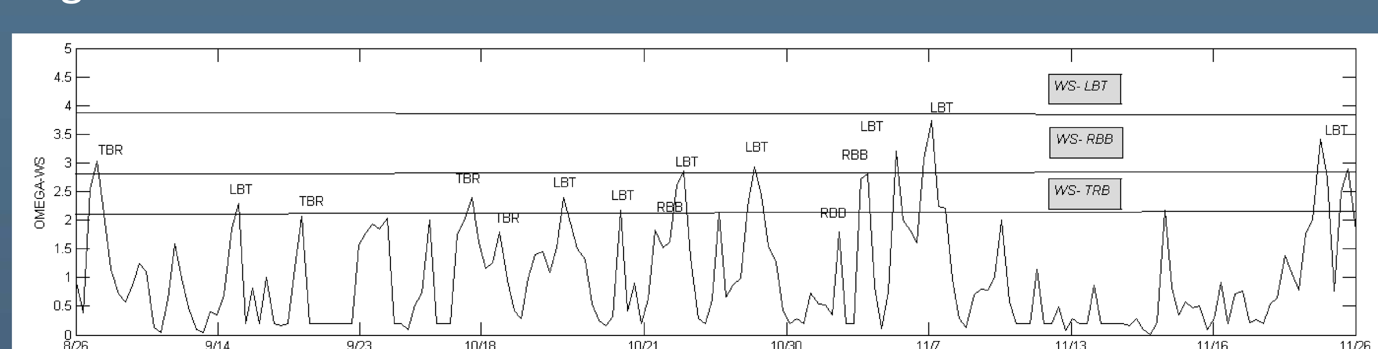
The work has been carried out in an intermediate low energetic barred beach in the Western Mediterranean, formed by biogenic sediments with median grain values ranging between 0.28 and 0.38 mm at the beach front.

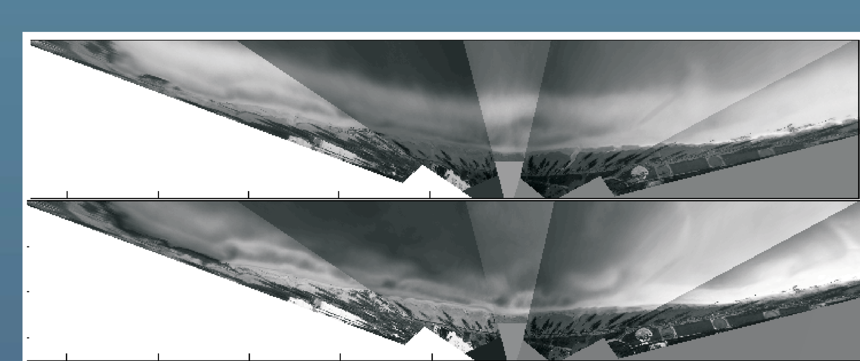


During 28 months, a SIRENA video monitoring station (Nieto et al., 2010) obtained continuously images of the aerial beach and the surfzone. Wave data were recorded at a 45 m depth scalar wave buoy and from a numerical model both operated by the Spanish Harbour Authority. Deep water wave conditions were propagated using a parabolic mild slope numerical model. Additionally, an ADCP moored at 17 m depth was used to validate the hydrodynamic conditions in the beach.

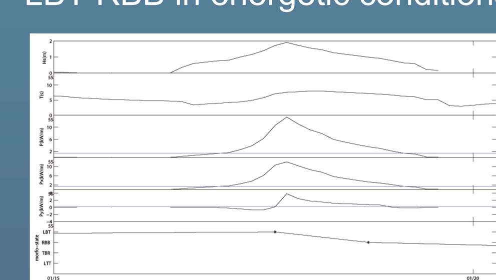
DATA ANALYSIS

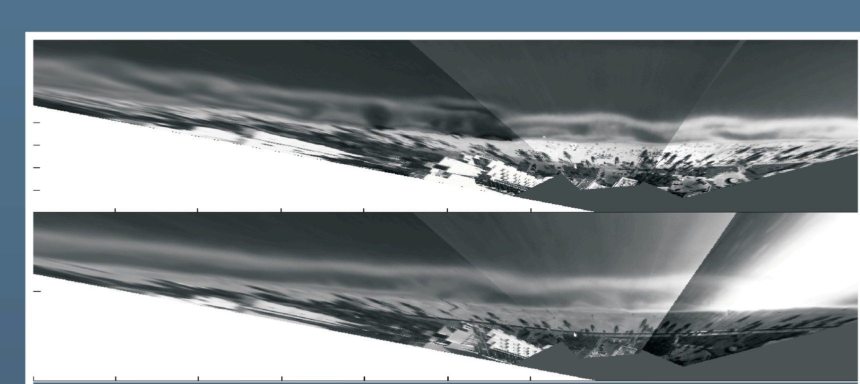
Mean images resulting after averaging images taken at 7.5 HZ during 10 minutes were used to obtain the bar position. Classification of beach states has been done visually using only those images associated with Hs between 0.65m and 1m (in shallow waters). A total of 71 intermediate states have been detected. From these, 28% are Longshore Bar Trough (LBT), 41% are Rhythmic Bar Beach (RBB), 28% Transversal Bar Rip (TBR) and 3% a state similar to Low Tide Terrace (LTT). These results differ from the beach states obtained by using the WS-omega.



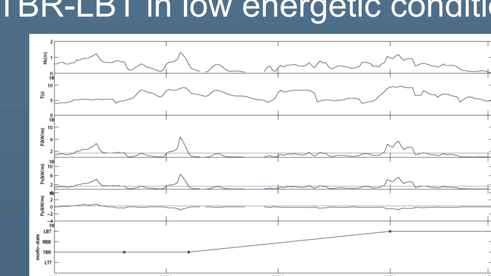


LBT-RBB in energetic conditions





TBR-LBT in low energetic conditions

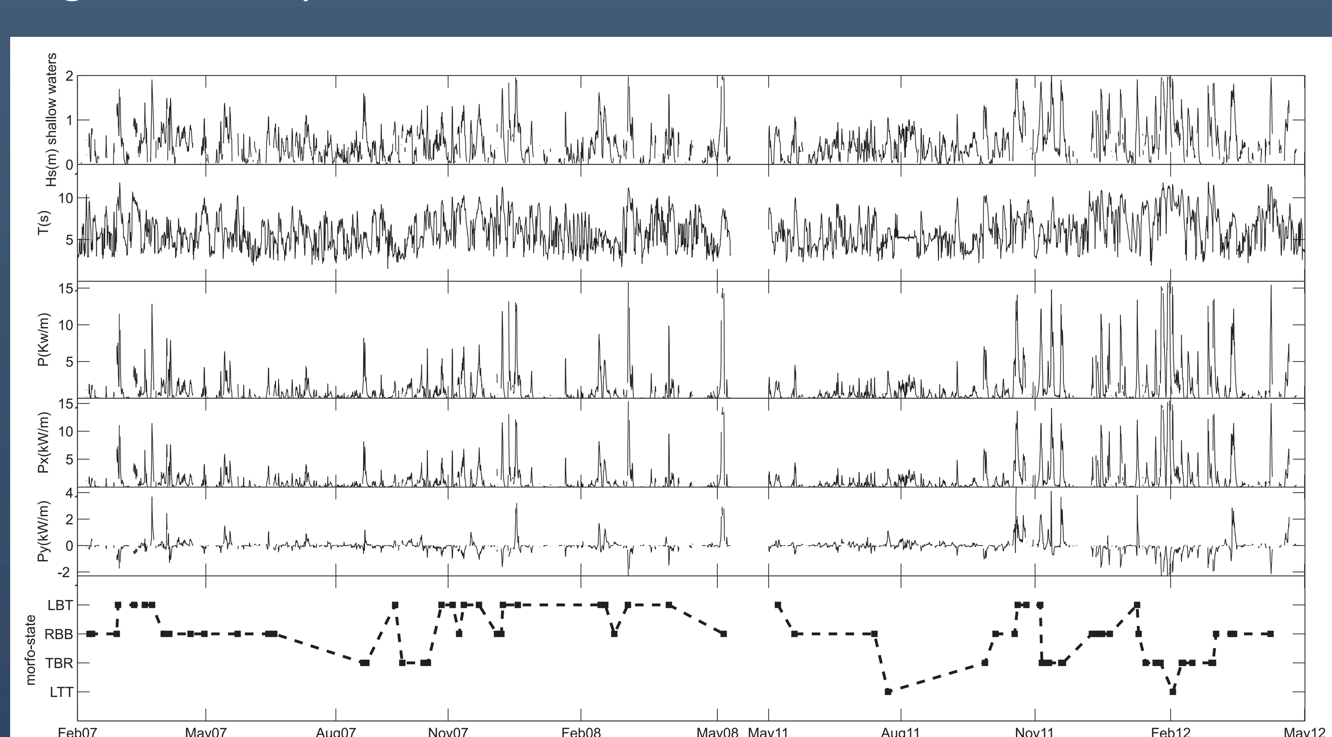


During the study period, 20 transitions have been observed in the images. We have focused on LBT to RBB and TBR to LBT transitions. The associated hydrodynamic conditions have been analyzed both in deep and shallow waters. Wave Power defined as, $P=1/16\rho g Hs^2 Cg$, has been split in its cross-shore and longshore components to infer the relevance of wave directionality in the upstate or downstates transitions.

	LBT-RBB	TBR-LBT	RBB-LBT
EVENTS	4	3	6
DAYS	1-10	10-20	1-10
P (kW/m)	3	1,075	5,595
Px(kW/m)	2,895	1,012	5,363
Py(kW/m)	0,564	0,202	0,903

Nearshore wave power

mean P =1,37 kW/m
mean Px=1,3 kW/m
mean Py= 0,23 kW/m



DISCUSSION AND CONCLUSIONS

Our results support recent studies that pointed out the importance of energy as the descriptor of beach morphodynamic states. In fact, we found that, besides of being the correct descriptor, the wave power together with the incidence angle explains the direction of the transition (upstates or downstates). Transitions from LBT to RBB (from high to low WS-omega values) can occur with wave power over the average but with waves directed cross-shore. Besides, transitions from TBR to LBT (from low to high WS omega) can occur with wave power below the average but with oblique incidence. These results are in accordance with those presented by Ferrer et al., 2009 and Price & Ruessink, 2011.

REFERENCES

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