

Barrier transgression driven by aeolian processes along the Portuguese coast

Susana Costas (1), Óscar Ferreira (1), and Dano Roelvink (2)

(1) University of Algarve, CIMA, Faro, Portugal (scotero@ualg.pt), (2) UNESCO-IHE Institute for Water Education

Coastal barriers around the world developed following sea level stabilization about 7000 years ago. Along the Southwestern European coast, this fact was largely supported by recent works exploring the sedimentary record of coastal lagoons and estuaries. However, direct evidences of barrier evolution/age obtained from the actual coastal barriers are rare, limiting our understanding about the dynamics and life time of these systems at long time scales.

Here, we reconstruct the evolution of three coastal barriers located along the western Portuguese coast, determining their age, trends and life cycles. For that, we integrate information (stratigraphy and ages) from different coastal deposits indicative of major shifts on evolutionary trends, including published and unpublished data.

Examined beach deposits set the age of the explored sand barriers between 6400 and 300 years ago, suggesting the coexistence of very mature and very recent coastal barriers. In addition, the results document the occurrence of transgressive dunefields with ages older than the preserved coastal barriers, supporting the existence of former barriers from which the dunes could derive and migrate inland. The latter suggests the occurrence of episodes of barrier building and shoreline progradation alternating with episodes of inland migration of transgressive dunefields and thus barrier rollover.

Resultant trends are carefully examined to identify the major factors driving barrier evolution, with special attention to climate variability and local boundary conditions. Indeed, the episodic response of the explored sand barriers provides indications for shifting wave and wind conditions as a consequence of climate variability. Additionally, inter-site comparison provides significant insights into regional trends and allows rating the identified factors, based on the degree of direct influence over the evolution of the coast. In this regard, the exposure to wind and wave climate, usually linked to shorter time scale processes, may have a remarkable importance over coastal barrier response at long (hundreds of years) time scales. In addition, this work remarks the important role that transgressive dunefields have within the overall process of barrier transgression through rollover.