

The Role of the Geological Inheritance in the Present Littoral – Shelf Sedimentary Interactions

Alcántara-Carrió J^{1*}, Albarracín S² and Fontán Bouzas A³

¹Oceanographic Institute, University of Sao Paulo, Pça, Oceanográfico, 191, Butanta, SP, 05508 900, Brazil

²Institute of Environmental and Marine Sciences, Catholic University of Valencia, 94 Guillem de Castro, 46001 Valencia, Spain

³CIMA/University of Algarve, Building 7, Campus Gambela Faro, Faro 8005-139, Portugal

Normally, sedimentary processes in the littoral and the shelf (continental or insular shelf) are studied separately. However, there are complex interactions between them that cannot be ignored, because they are not isolated sedimentary environments. On the contrary, the fluxes of energy and materials are continuous between them. These feedbacks occur at the different geological scales, from long (centuries, thousands and millions of years), to medium (years, decades) and short (hours-days) time scale, and each one of these temporal scales has associated its spatial scale [1,2].

At long term, geomorphological evolution of the littoral and shelf is controlled by three factors: sea level oscillations, sediment supply and tectonics. Thus, sea level oscillations generate a continuous alternation of coastal and shelf sedimentary environments, resulting that sediment filling of shelves can be composed in a very significant portion by Pleistocene coastal deposits [3,4] formed during sea level falls, and even continental subaerial deposits [5-7] formed during lowstands.

At short and medium time, littoral – shelf sedimentary interactions are mainly determined by the input of energy from the outer shelf and the supply of sediments, mainly from the coast [8]. Then, they are the two main factors controlling the sedimentary budget and recent geomorphological evolution of both, the littoral and the shelf, at this time scale. However, the three factors acting at long term scale also affect the morphodynamics in the short time, acting as a geological framework or geological inheritance. Thus, for instance, the bathymetric contour of the shelf, result of this geological inheritance, affects to the present hydrodynamic processes in the shelf and littoral, and consequently, it conditions the availability and fluxes of sediments to the beaches and dunes. Therefore, it can be highlighted that the interaction between sedimentary processes in the littoral and the shelf includes also a complex feedback between hydrodynamics and sedimentary processes at the different time scales.

Combined studies at short, medium and long term scales are really useful to determine current source of sediments to the coastal environments, pathways and mechanisms of coastal sediment transport, and impact of human disturbances in the coastal morphodynamics [9]. In summary, sedimentary processes at the

different scales are clearly related, and consequently, it is necessary to know the sedimentary processes at the long term scale to a correct understanding of the sedimentary processes in the short and medium term scale. The geological inheritance has a very important influence in present hydrodynamics and morphodynamics of both, coastal and shelf environments, and consequently in their sedimentary interactions. Unfortunately, this assumption is frequently ignored in coastal engineering studies.

References

1. Cowell PJ, Tom BG (1994) Morphodynamics of coastal evolution. In: Carter R.W.G, Woodroffe C.D (Eds). Coastal Evolution. Late Quaternary Shoreline Morphodynamics. Cambridge University Press, Cambridge 33-86.
2. Larson M, Kraus NC (1995) Prediction of cross-shore sediment transport at different spatial and temporal scales. *Marine Geology* 126: 111-127.
3. Albarracín S, Alcántara-Carrió J, Barranco A, Sánchez García MJ, Fontán Bouzas A (2013) Seismic evidence for the preservation of several stacked Pleistocene coastal barrier/lagoon systems on the Gulf of Valencia continental shelf (western Mediterranean). *Geo-Marine Letters*, 33: 217-223.
4. Alcántara-Carrió J, Albarracín S, Montoya Montes I, Flor-Blanco G, Fontán-Bouzas A (2013a) An indurated Pleistocene coastal barrier on the inner shelf of the Gulf of Valencia (western Mediterranean): evidence for a prolonged relative sea-level stillstand. *Geo-Marine Letters* 33: 209-216.
5. Putney TR, Katuna MP, Harris MS (2004) Subsurface stratigraphy and geomorphology of the Grand Strand, Georgetown and Horry Counties, South Carolina. *Southeastern Geology* 42: 217-236.
6. Alcántara-Carrió J, Fontán Bouzas A (2009) Factors controlling the morphodynamics and geomorphologic evolution of a cusped foreland in a volcanic intraplate island (Maspalomas, Canary Islands). *Journal of Coastal Research S.I.* 56: 683-687.
7. Barnhardt WA, Andrews BD, Ackerman SD, Badwin WE, Hein CJ (2009) High-Resolution Geologic Mapping of the Inner Continental Shelf: Cape Ann to Salisbury Beach, Massachusetts. U.S. Geological Survey Open-File Report 2007-1373. pp. 47.
8. Alcántara-Carrió J, Albarracín S, Fontán Bouzas A, Montoya I, Flor Blanco G et al. (2013b) Interacción entre el litoral y la plataforma interna en diferentes escalas temporales. *Geo-Temas* 14: 11-17.
9. Kelley JT, Barber DC, Belknap DF, FitzGerald DM, Heter S et al. (2005) Sand budgets at geological, historical and contemporary time scales for a developed beach system, Saco Bay, Maine, USA. *Marine Geology*, 214: 117-142.

*Corresponding author: Alcántara-Carrió J, Oceanographic Institute, University of Sao Paulo, Pça, Oceanográfico, 191, Butanta, SP, 05508 900, Brazil, Tel: +55 11 3091-3116; E-mail: javier.alcantara@ucv.es

Received December 29, 2013; Accepted December 30, 2014; Published December 31, 2014

Citation: Alcántara-Carrió J, Albarracín S, Bouzas AF (2015) The Role of the Geological Inheritance in the Present Littoral – Shelf Sedimentary Interactions. *J Marine Sci Res Dev* 5: 155. doi:[10.4172/2155-9910.1000155](https://doi.org/10.4172/2155-9910.1000155)

Copyright: © 2015 Alcántara-Carrió J, et al. This is an open-access article distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.