Geophysical Research Abstracts
Vol. 20, EGU2018-18540, 2018
EGU General Assembly 2018

The medium-term shoreface morphodynamics of a deltaic coast: driving forces and sedimentation patterns

Florin Tatui (1), Alfred Vespremeanu-Stroe (1), Florin Zainescu (1), Radu Dimitriu (2), and Adrian Stanica (2)

(1) University of Bucharest, Faculty of Geography, Bucharest, Romania (florin.tatui@geo.unibuc.ro), (2) National Institute of Marine Geology and Geoecology – GeoEcoMar, Bucharest, Romania

Compared to non-deltaic coastal environments, ranging from sandy mobile coasts to geologically constrained ones, the shoreface of the wave-dominated deltaic coasts is much more dynamic (even at annual time-scale) as it is continuously evolving under the combined influence of waves and nearshore currents, river plumes and river-borne sediments which settle down to delta front and prodelta.

The objective of this study is to make a radiography of shoreface changes of a deltaic coast under different forcing related to floods and storms. Our data comprise multiple bathymetric surveys (2003-2004, 2005-2006, 2008, 2011, 2012, 2014 and 2015) of the shoreface (between shoreline and 20 m depth) along different sectors of the Danube Delta coast (Black Sea). The study interval (2003 – 2015) was characterised by a highly variable Danube flow regime – the ever-recorded lowest discharge (in 2003) but also historical floods in 2005, 2006 and 2010 – and by relatively low storminess with the exception of a very energetic storm in February 2012.

The present Danube Delta shoreface morphology (in terms of longshore variability of cross-shore profile shape and slope) and behaviour (sediment distribution and transport, bed-level changes) reside from the co-existence of different types of accretionary, stable and erosive sectors. This configuration is the result of the inherited long-term evolution of the delta and of each deltaic lobe, on one hand, and of various controlling factors (the up/downdrift distance to the river mouths, the position of each sector into a specific littoral cell – expressed in sediment availability, the angle made by shoreline with the incident waves and the presence of engineering structures), on the other.

Extended erosion affected the Danube Delta shoreface after 1970s in close relation with the significant decrease of Danube sediment supply due to dam construction in its watershed and with the increased storminess. This trend was interrupted by 2005-2006 historical floods, which supplied sufficient sediments in order to produce slight aggradation of the shoreface over large areas and even at high depths (up to 20 m). The erosional processes restarted quickly after the flood period (since 2008), especially on the historically retreating sectors, but with lower erosional rates in the context of decreased storminess in the last decade. Moreover, the recent low to moderate storminess favoured the expansion of stable regime for several areas and even accumulation along some sectors.

The depositional and erosional patterns (especially on the lower shoreface) are in good agreement with the multi-annual turbidity patterns extracted from MODIS satellite images, demonstrating the importance of river plumes in supplying fine sediments to different areas of the Danube Delta coast.

The in-depth understanding of the present shoreface behaviour is meant to support the sustainable management of deltaic coasts in the process of forecasting coastal response due to predicted sea-level rise, storminess variability and human pressure on coastal environment.