Alongshore variability in foredune and nearshore bars dynamics

Luminita Preoteasa, Alfred Vespremeanu-Stroe, and Florin Tatui

Faculty of Geography, University of Bucharest, 1 Bd. N. Balcescu, 101004, Romania (luminita@geo.unibuc.ro)

This study is a contribution to foredune development in relation with the nearshore morphology and especially with the longshore sandbars dynamics on the Danube Delta tideless coast (Sf. Gheorghe sandy beach).

The study implies the quantitative analysis of 13-years (1997-2010) and 7-years (2003-2010) datasets for the beach-dune system and nearshore bars respectively, corresponding to 12 km coastline which comprise three coastal dynamics patterns: retreating / stable / accumulative. Topographical measurements of the beach-dune system were performed at 7 landmarks and on three high-resolution digital terrain models (DTM) ranging from 300m2 to 16.000 m2 which were seasonally monitored. Moreover, in 2007 and 2011 a total of 50 cross-shore profiles 200-m alongshore spaced were surveyed. The CEOF analysis of the main topographical profiles has been performed in order to highlight the main patterns of the longshore and cross-shore dynamics and volume changes of the foredune. Wind direction and intensity, precipitations and vegetation density data for this time interval were computed in order to assess the linkage with the foredune dynamics.

The results show a net spatial and temporal pattern of foredune evolution imposed both by the wind regime and the beach fetch length via wave climate and bar dynamics. Foredune behavior was analyzed in relation with the shoreline and nearshore bars dynamics. Longshore and cross-shore foredune volume changes have been computed and linked with the morphometric parameters of nearshore bars (bar crest position and depth, bar volume, width, height and bar zone slope). Cluster analysis of nearshore topography splits up the study area into three longshore sectors with different bar behavior which fit well with subaerial beach width (determining the beach fetch) and foredune development.

This study also reveals that the foredune behaviour correlates with the net offshore migration rates and cumulated sandbars volume, in the sense that the best developed foredune areas corresponds to the lowest migration rate and to the biggest volume of the bars.