

Coastal Research Group in the frame of CRMD – overview of research activities

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Abstract. The Coastal Research Group in the frame of CRMD Research Centre undertakes various research activities in Danube Delta, on the Romanian Black Sea Coast and along the Danube river valley related to coastal morphodynamics, coastal hazards, geoarchaeology, large-scale evolution of coastal environment, GIS and remote sensing analyses applied in coastal geomorphology and coastal system integrated management. The general aim of our group is to get a well-grounded understanding of the coastal processes and associated coastal behaviour at multiple spatial and temporal scales.

Keywords: *Danube Delta, Romanian Black Sea coast, SCMF, marine and coastal environment.*

The Coastal Research Group in the frame of CRMD Research Centre undertakes various research activities in Danube Delta, on the Romanian Black Sea Coast and along the Danube river valley. Many of these activities use as research facility the Sf. Gheorghe Marine and Fluvial Research Station (SCMF) of the Faculty of Geography, University of Bucharest. It was created as an initiative of our group members and operates since 2002 at Sf. Gheorghe, Tulcea County (in Danube Delta, at the mouth of St. Gheorghe branch), providing local support for developing research and educative activities in marine and coastal sciences.

We provide researchers and students the logistic support for undertaking observations, measurements and field experiments on natural processes, modelling factors and associated landforms or on coping ways of human communities to local environmental conditions while providing the opportunity of exploring the entire coastal system, including current and past form (geomorphology, geology), controlling factors of coastal processes (wind, waves, currents – oceanography), biodiversity (biogeography, ecology, palaeontology) or landscape (management, spatial planning, anthropology).

Our research activities cover therefore a wide range of areas and topics aimed at gaining a better understanding of marine and coastal environment functionality and its changes at various spatial and temporal scales for configuring the optimal conditions for living in such a sensitive environment. Thus, the research activities include:

- **Coastal morphodynamics:** The dynamics of beaches, dunes, sandbars and cliff coasts is tracked by seasonal monitoring and sediment budget calculations taking into account the parameters of environmental factors such as wind, waves, currents and flooding in modelling the coastal forms. The correlated behaviour of the beach-dune system, the water line and the longshore sandbars is monitored on the Sf. Gheorghe beach, located in the Danube Delta, updrift of the mouth of the southernmost Danube branch that flows into the Black Sea, at seven landmarks distributed along the beach (11 km long). The development of these landforms in the temperate, micro tidal climate of the Danube Delta accounts for the small and medium morphometric characteristics, rendering them sensitive to the finest variations of control

factors (e. g. wind, waves, local sea level and precipitations). The particularity of spatial and temporal development of beach-dunes system on Sf. Gheorghe shore is represented by the gradual growth of morphometric characteristics along shoreline under the influence of unidirectional, southward directed longshore currents. This is the physical framework in which two beach sectors with different morphodynamic behaviour succeed in accordance with the longshore currents: an erosive sector followed by another in dynamic equilibrium close to the river mouth. Measurements of seasonal beach dynamics are also made on the Southern Romanian Black Sea shore at Midia, North Eforie, Pescărușul Gulf, and Vama Veche. Bathymetric measurements, which cover upper (represented by submerged sandbars movement area) and lower shoreface until 20 m depth, are undertaken annually on the Danube Delta coast between Sulina and Periteașca. Due to its major influence on the deltaic shore dynamics, given by its position within the alongshore sediment transport system, a special attention is granted to high precision monitoring of Sf. Gheorghe mouth bar, regularly during the summer, but also after major hydro – meteorological events (e.g. floods, drought, storms).

- **Coastal hazards:** Measurement data offer a new perspective on the climate and the impact of coastal storms, as well as on the importance of these events on littoral cell's dynamics and coastal areas vulnerability.
- **Geoarchaeology:** Geoarchaeological studies comprise the reconstruction of the evolution of natural and cultural landscapes, offering the opportunity to study the landscape transformation dominated by the combined action of natural and anthropic factors on different time scales, as well as the evaluation of socio-environmental resilience in coastal area. Geoarchaeological studies in Danube Delta are conducted in site areas of Histria, Orgame, Enisala, Halmyris, and Caraorman.
- **Large-scale evolution of coastal environment:** The reconstruction of deltaic system evolution requires detailed investigations regarding deltaic

lobes, hydrological network, beach ridge plains and barrier islands development. Studies dealing with large-scale landscape evolution are grounded on detailed stratigraphic, sedimentological, geochemical, palynological and paleontological analyses. The chronological framework is determined by absolute ages obtained through Optically Stimulated Luminescence (OSL) and radiocarbon dating methods. In the case of recent sediments (deposited during the last 150 years), sedimentation rates are determined by isotopic measurements of P_{210} and C_{137} .

- **GIS and remote sensing analyses applied in coastal geomorphology:** Geographical Information Systems and remote sensing allow quantification and analyses of spatial data, offering valuable information regarding the dynamics of coastal areas, sea water characteristics, land use changes etc.
- **Coastal system integrated management:** A holistic understanding of coastal system behaviour is fundamental for providing and applying valid management policies based on the concept of sustainable development.

These research activities are part of numerous research projects funded by national or international research agencies (UEFISCDI, CNCSIS, CEEX-AMTRANS, PAI- Brâncuși, ERA-Net, and ESA) or individual companies (Halcrow). Our research group comprises experienced researchers, young scientists, post-docs, PhD, Master and Bachelor students. Students who work on bachelor, master's or doctoral theses learn methods and techniques for exploring the marine and coastal systems, thus gaining various knowledge and skills necessary to address specific coastal environment problems, as well as global ones related to climate change, sea level rise, renewable energy development and a sustainable environment.

Our group is connected with other coastal communities from Romania and abroad, aiming to get a well-grounded understanding of the coastal processes and associated coastal behaviour at multiple spatial and temporal scales through various programs of coastal monitoring, data analyses, interpretation and valorification as scientific reports or review papers. We developed collaborative

works with local authorities in support of optimal management of coastal resources and activities.

The research results were published as scientific articles in well-known international journals (*Nature, Geomorphology, Earth Surface Processes and Landforms, Marine Geology, Geology, Continental Shelf Research, Quaternary Science Reviews, Quaternary International, Scientific Reports, Anthropocene, Natural Hazards, Journal of Coastal Research*), books or book chapters (edited at *Springer, Lexington Books*) addressed to

specialized or general public, being also presented in numerous scientific events in our country or abroad (*International Coastal Symposium, International Conference on Geomorphology, European Geosciences Union General Assembly, Medcoast*), or as specialized courses (*Oceanography, Geography of the Black Sea, Coastal reconstruction and dynamics*) at the Faculty of Geography, University of Bucharest (bachelor or master studies).

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