RAPID SEDIMENTARY PROCESSES AT THE SOUTHERN OUTLET OF THE ISTANBUL STRAIT

Bedri Alpar [1]* and Selma Ünlü [1]
[1] Istanbul University Institute of Marine Sciences and Management - bedrialpar@gmail.com

Abstract
Using available hydrodynamic field data, swath bathymetry map, seismic sections and radiometric age data from cores, the sedimentary processes occurred during the last glacial - Holocene ages and in the present were described at the southern outlet of the Istanbul Strait, which is a highly dynamic transition zone due to sediment transport processes under a typical two-layer and quasi-steady exchange flow system. Together with the global sea level changes, water and sediment exchange throughout the Istanbul Strait, the initial bathymetry, minor sediment sources and deep water currents along the slopes of the strait's banks, were responsible on the rapid sedimentary processes and structures in this outlet zone.

Keywords: Sediment transport, Bosphorus Strait

Introduction
The southern open boundary of the Istanbul Strait, a narrow and strongly stratified water channel between the Black Sea and Marmara Sea, is a transitional buffer zone that is mainly controlled by sediment load transported from various sediment pathways, sea level changes and hydrodynamic conditions moving sediments from one place to another (Figure 1a). This scope of the present study is to describe the surficial sediments and the sedimentary processes that are active in this outlet zone at the present day, using available geological and geophysical data. The last glacial - Holocene events and processes that contributed to the present day seafloor morphology and sediment distribution are also reviewed.

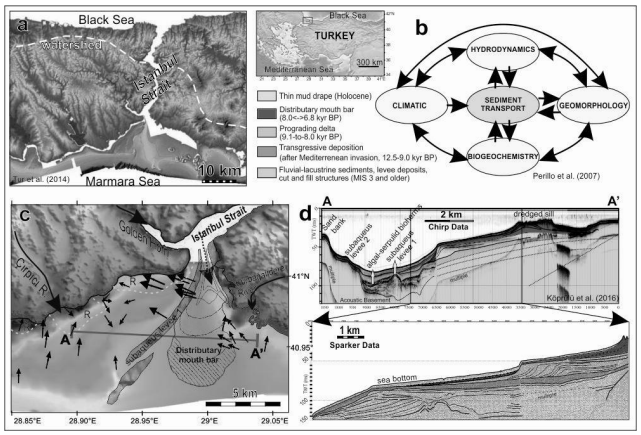

Fig. 1. A) Major morphological landforms and swath bathymetry of the region. b) Major controls that act upon environmental processes and their relations. c) Net sediment transport pathways and distribution of some critical subbottom elements were superimposed on bathymetry. R stands for the low-sediment-quality areas of medium to high priority. d) Distribution of sedimentary units along the cross section A-A'.

Material and Methods
Knowledge of how sediment dynamics in coastal environments is affecting the distribution of sediment [1], especially at shallow and hydrodynamic transition zones, is a very powerful tool for environmental management, civil engineering applications and development of modelling systems (Figure 1b). On the basis of different databases available, such as conductivity-temperature-depth casts, acoustic Doppler current profiler data, multibeam bathymetry maps [2], high-resolution shallow seismic profiles (115-km-line Sparker, 453-km-line boomer [2] and 538-km-line Chirp [3]), and ^{14}C age data from sediment cores [4], the studied area is open to rapid interaction of dominant processes such as climatic and hydrodynamic features, sediment sources, sediment transport and seafloor morphology. The granulometric fingerprints of available sea bottom surface sediments [5] were also used for sediment transport analyses in order to evaluate the actual mobility of the seabed material.

Results and Discussion
Hydrodynamic and sediment transportation models revealed that the modern sediments in the region are brought in through the Bosphorus canyon and partly by the short rivers flowing south. Its transportation over the shelf is mainly under the control of the persistent southerly waves, the Bosphorus jet stream at the outlet and its associated currents. The density-induced circulation movements in the region are able to produce responsible currents for actual sediment transportation. One of the most striking transportation patterns is towards the depression area behind a sand ridge (a subaqueous levee) located at the eastern bank of the strait and the other is over a local distributary mouth bar formation, which is mostly confused with the submarine delta of Kurbagalidere River (Figure 1c). In these places a succession of marine-lacustrine and some riverine sediments overlie the lower to middle Pleistocene age basement rocks (Figure 1d). The distributary mouth bar deposits are represented by aggradational and progradational seismic reflection patterns deposited under the control of rapid sediment input during a flood stage from the Istanbul Strait with friction between the sediment plume and basin bottom. The uppermost thin marine sediments show the Holocene transgression over the shelf and marking the onset of the highstand systems tract over the maximum flooding surface. In conclusion, the southern outlet of the Istanbul Strait is a dynamic depositional environment as it was during the last glaciation and Holocene. The sedimentary processes during the accelerated deglaciation following the Last Glacial Maximum, depend mostly on the water exchange along the Istanbul Strait; the availability of sediment sources to the depositional environments; their input rate and the hydrodynamic conditions during transport and deposition of the sediments. All these rapid sedimentary processes might have potentially significant impacts on the geomorphic, hydrodynamic and biogeochemical processes. Similarly the geomorphic setting of the seafloor, dominant hydrodynamic processes, such as the jet currents at the strait's exit, reverse and bottom currents, and partly biogeochemical processes on the seafloor control sediment input by different sources, its transportation and erosion.

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