

MICRO-REEF MORPHOLOGY IN THE SEMI-ENCLOSED SHALLOW EMBAYMENTS OF LESVOS ISLAND, NE AEGEAN SEA, GREECE

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Abstract

Unique morphological features have been detected in Kalloni and Gera embayments in Lesvos Island. The observed micro-reefs consist of benthic assemblages over a very soft mounded substrate and their comparison in both study areas show similarities as well as few contrasts. Their peculiar relief probably results from the combination of the regional oceanographic conditions, slow fluid seepage, surrounding tectonics and nutrient inputs from the adjacent drainage systems.

Keywords: *Aegean Sea, Acoustics, Coastal systems, Geomorphology, Mollusca*

Introduction - Methodology

The Gulfs of Kalloni (~110 km²) and Gera (~42 km²) are two semi-enclosed shallow (< 20 m depth) embayments located in the SW and SSE sides of Lesvos Island (Fig. 1), which is characterized by intense tectonic and hydrothermal activity. Both gulfs are connected with the Aegean Sea through elongated channels (Kalloni having the deepest but shortest channel) and they receive discharges from seasonal streams/small rivers. Currents have been found to be more intense close to the gulfs entrances [1,2]. Bathymetric (echo-sounder) and high resolution geophysical (side scan sonar and subbottom profiler) surveys were conducted for the detection of the regional geomorphology. Scuba diving, a drop down camera system and sediment sampling were also employed to ground-truth the geophysical results.

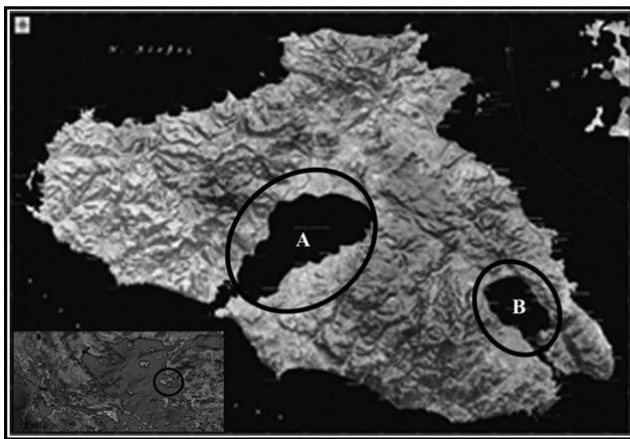


Fig. 1. Location of Lesvos island and of Kalloni (A) and Gera (B) Gulfs.

Results and Discussion

The main morphological features identified are numerous small reef structures that populate the seafloor (Fig. 2). They generally appear in water depths deeper than ~12 m and occur individually or coalesce, locally forming elongated features. Their height is < 6 m in Kalloni, occurring mainly at the centre of the Gulf, whereas in Gera they are < 2.5 m having a more expanded distribution, with the highest occurring near the Gulf entrance. Based on their morphological characteristics, they appear to have either symmetric or asymmetric structure, locally being more composite, and in Kalloni they are often followed from small and shallow (0.5-1 m) depressions around their base. Small pockmarks are also randomly observed. Subbottom profiles in both gulfs show the presence of an almost homogeneous surficial layer (Holocene) that overlies almost concordantly earlier sedimentary units. The bottom-echo becomes more intense at the top of the hummocks. Acoustic anomalies such as enhanced reflectors, turbid zones and small plumes, mainly within the surficial layer, imply the potential presence of fluids in the sediments. Of great interest is the detection of similar buried micro-relief structures in the surficial layer (Fig. 2), located at the boundary of the transgressive and highstand system tracts, implying physical conditions favouring their growth the last ~5500y. Camera images and seabed

sampling in both Gulfs revealed that the reefs consist of assemblages of molluscs (mainly) of various sizes in a fine muddy sediment matrix. Scuba diving along the two highest observed reefs in Kalloni revealed holes, being ~ 30 cm in diameter. Conditions that favour the micro-reef formation in both gulfs are probably related to the (a) local hydrodynamics [1,2], (b) slow seepage of fluids (gas, water, hydrothermal fluids) that has been reported elsewhere to be connected with high concentration of bivalves and other benthic life [3], (c) local geology and tectonics (fault-controlled gulfs) [4] and (d) nutrients supply from the surrounding land areas [5].

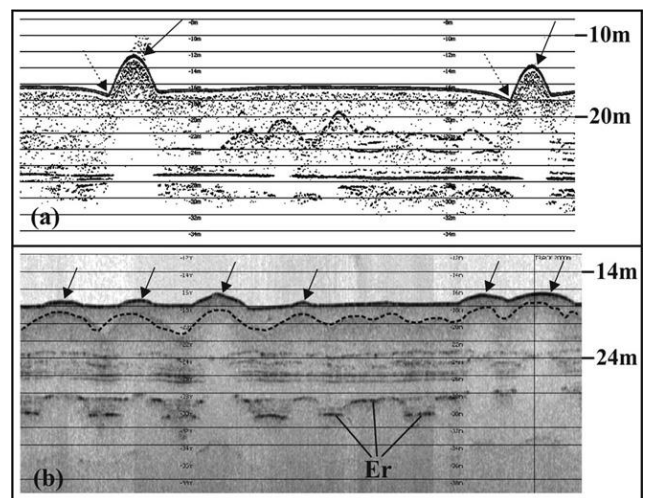


Fig. 2. High resolution subbottom profiles in Kalloni (a) and Gera (b) Gulfs showing the micro-reef morphology (arrows), shallow depressions (dashed arrows) and buried micro-relief structures (dashed lines). Er: enhanced reflectors due to fluid presence in the sediment pores.

References

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