

Microfacies analysis and paleoecological implications of Miocene reefal limestones in Gavdos Island, southern Greece.

H. Drinia, F. Pomoni-Papaioannou, A. Antonarakou, N. Tsaparas

National and Kapodistrian University of Athens, Faculty of Geology and Geoenvironment, Panepistimiopolis 157 84, Athens, Greece

The island of Gavdos is located in the Eastern Mediterranean and constitutes the southernmost part of the Hellenic region. Mid-Upper Miocene reefs are well represented in the western part of the island (Tsaparas, 2005).

Arrangement of lithofacies associations were combined with detailed micropaleontological and microfacies aiming to the correlation of the Miocene reefs of eastern Mediterranean with time-equivalent deposits from the western Mediterranean.

Bo section consists of two different types of lithofacies associations. The basal part is composed of a marl succession. These marls are well bedded, variably lithified, composed almost entirely of calcium carbonate rich in foraminifera (Antonarakou et al. 2007; Drinia 2009). Approximately half way up the section, the dominantly fine-grained deposits change from blue marl to rhythmic bioclastic limestone-marl alternations. This transition takes place over a few tens of centimetres passing from bluish marl with abundant planktonic foraminifera to marl with macrofossils and then into hard limestones. A mass occurrence of hermatypic corals, with dominant *Heliastrea oligophylla*, *Porites maicietensis*, *Thegioastrea roasendal* and *Porites collegniana*, characterize these limestones representing a reefal build-up, indicative of highly variable environmental conditions related to higher temperatures and salinities and sea-level change. Bryozoans are neither abundant, nor diverse in the sampled coral facies. Most are encrusting and only some of them can be considered as accessory framework builders.

The hermatypic scleractinians involved belong to a limited number of species and genera. The low diversity of corals in these reefs, together with the presence of high-tolerance species as *Porites*, is characteristic of Mediterranean Miocene reefs, particularly in the middle to late Miocene (Chevalier, 1961; Rouchy et al., 1986; Flecker et al., 1995) and suggests that the environment was under stress conditions.

The relatively sharp transition from the lower succession that consists entirely of deeper-water, lower energy, planktic-foraminiferal rich marls, to shallow-water, high-energy reefs, implies that a major relative sea level fall took place.

Microfacies analysis showed that the patch reefs consist of scleractinid corals and in places coralline algae (boundstones: framestones/ bafflestones, SMF 7, sensu Wilson, 1975, FZ 7-8, sensu Flügel 1982). The in-between matrix consists of mudstone – wackestone with small-sized bioclasts. Due to meteoric diagenesis intraskeletal porosity is reduced by cement growth (dog-teeth and blocky cement). Patch reefs are associated by bioclastic packstones, characterized by spines of echinoids, gastropods and molluscs.

The coral boundstone is laterally associated by a bioclastic limestone rich in planktonic forams, as well as in clastic material (fragments of quartz, feldspars, quartzites and cherts). Depositional structures, benthic organisms, and the carbonate microfacies indicate deposition in restricted to open-marine, moderate-energy conditions in peritidal to lagoonal environments.

Keywords: Eastern Mediterranean, Mid-Upper Miocene, reefal limestones, paleoenvironment

References:

- Antonarakou A., Drinia H., Tsaparos N., Dermitzakis M.D., 2007. Assessment of micropaleontological sedimentary parameters as proxies of surface water properties and paleoclimate, in Gavdos island, eastern Mediterranean. *Geodiversitas*, 29: 379-399.
- Chevalier J.P., 1961. Recherches sur les Madréporaires et les formations récifales Miocene de la Méditerranée occidentale. *Mém. Soc. Géol. Fr.*, 40/90.
- Drinia H., 2009, Foraminiferal biofacies and paleoenvironmental implications of the Early Tortonian deposits of Gavdos island (Eastern Mediterranean). *Revue de micropaleontologie*, 52:15-29.
- Flecker R., Robertson A.H.F., Poisson A., Müller C., 1995, Facies and tectonic significance of two contrasting Miocene basins in south coastal Turkey. *Terra Nova*, 7:221-232.
- Flügel E., 1982, Microfacies Analysis of Limestones. *Springer-Verlag*: 375 p.,
- Rouchy J.-M., Saint Martin J.-P., Maurin A., Bernet-Rollande M.-C., 1986. Evolution and antagonism of coral and microbial communities in the Miocene in the western Mediterranean: biology and sedimentology. *Bull. Cent. Rech. Expl. Prod. Elf-Aquitaine*, 10:333-348.
- Tsaparos N., 2005, *Contribution to the history of sedimentation of the Upper Cenozoic marine formations in Gavdos Island*. PhD Thesis, University of Athens.
- Wilson J.L., 1975, Carbonate Facies in Geologic History. *Springer-Verlag*: 471 p., Berlin.