Foraminiferal Assemblages and Paleoclimatic changes in the Langhian record of the Ionian Sea

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Keywords: planktonic foraminifera, SST, Levkas island

Introduction

As evidence of global climate change continues to accumulate, scientists concentrate on models that might indicate the impacts of such change. Insight comes from examining past global change. One of the largest known global-climate shifts occurred in Middle Miocene time (between about 15.6 and 12.5 million years ago). During this period the Antarctic ice sheets almost reached their present-day dimensions (Kennett & Barker 1990) and the global climate progressed rapidly towards present-day conditions.

This work is aimed to improve the general knowledge about some specific aspects of the environmental changes underwent by the eastern Mediterranean area during the Middle Miocene. Our study focuses on determining what effects Middle Miocene global climatic changes had on sediments and biota of Eastern Mediterranean. The Middle Miocene sedimentary succession of Asprogerakata Section (Levkas Island, Ionian Sea) provides a unique record of paleoceanographic events.

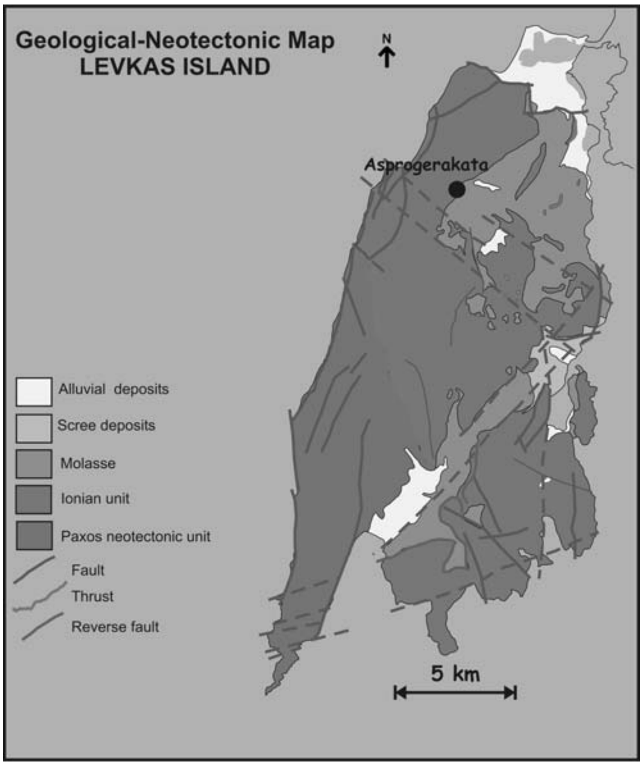

Fig. 1. Simplified geological map of Levkas island indicating the location of the studied section.

Geological Setting and Lithology of the studied section

Levkas Island belongs to the Ionian Islands which are located in the west segment of the Hellenic Arc, the most active plate margin of the Mediterranean region. The tectonic setting of the wider area is determined by the continental collision between northwestern Greece in the east and the Apulian platform in the west, as well as by the subduction of the African plate under the Aegean microplate along the active Hellenic Arc in the southwest.

Levkas island is built up mainly by Alpine Mesozoic-Cenozoic sedimentary rocks belonging to the external units of the Hellenides, the Pre-Apulian (Paxos) zone and the Ionian zone (Fig. 1; Bornovas, 1964) separated from one another by a major west-directed thrust fault.

The Asprogerakata Section is located in the northeast part of the Island (Fig.1) and belongs to the Ionian Zone. The section (62 m thick) consists of well-bedded, grey-brown, medium to fine grained, ill-sorted, bioturbated calcareous sandstones and silty to sandy, burrowed marls with some intercalations of thin, calcareous sandstones (Fig. 2).

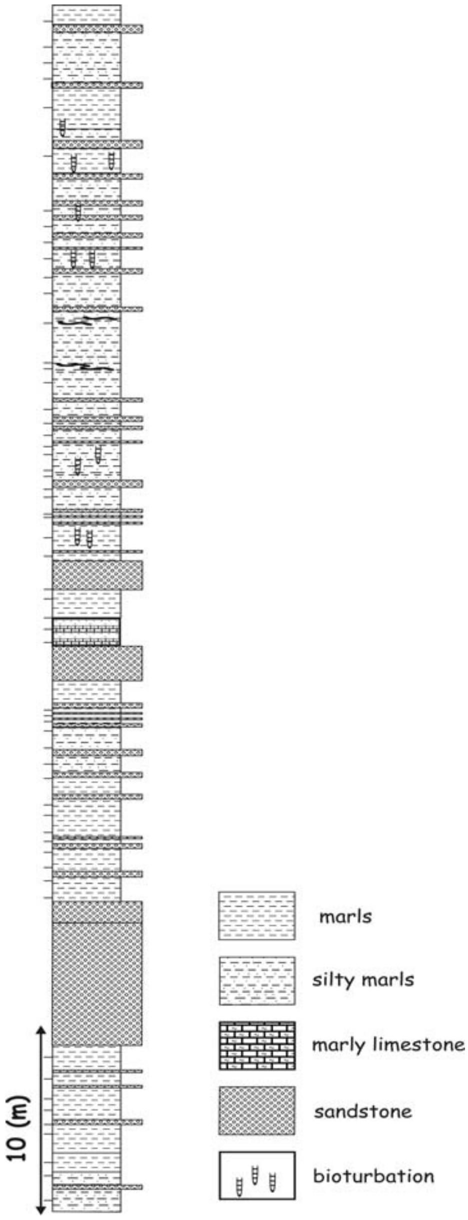

Fig. 2. Lithostratigraphical column of the studied section.

Material and Methods

Planktonic foraminiferal analysis has been performed on a total of 58 samples collected at a mean interval of 0.50-0.60 meters. Quantitative analysis was carried out on splits of the ›125 μm fraction. The distribution of selected taxa having biostratigraphic and/or paleoecological significance is expressed as a percentage of the total planktonic fauna. In order to reconstruct the paleoclimatic changes of the studied period we made an a-priori selection of warm and cool water species and we construct the climatic curve according to Cita et al. (1977), (Fig. 3).

Results-Discussion

Planktonic foraminifera are abundant but poorly to moderate preserved. The main changes in the planktonic foraminifera abundance pattern are related to the distribution of the taxa having biostratigraphic significance. The taxa *G. bulloides, G. glutinata, G. decoraperta, G. quadrilobatus*, are continuously present throughout the section in high percentages whereas *T. quinqueloba, C. parvulus, D. altispira*, and *G. obesa* occur in small percentages showing several fluctuations. Among the species having discontinuous distribution, *Globigerinoides* sp., *G dehiscens*, keeled globorotaliids (*G. praemenardii, G. miozea*), *Dentoglobigerina* spp., *G. druryi* rhythmically or occasionally reach significant percentages (Fig. 3). *G. peripheroronda* random coiled reach highest abundance at interval 20-30 m of the section whereas the dextral coiled specimens show a distinct peak at 50 m. *Globorotalia praescitula* is abundant at the lower part, reaching highest abundance at the interval 35-45 m of the section. The sinistral coiled specimens dominate the assemblages. *Paragloborotalia siakensis* (dextral and sinistral coiled) is abundant at the lower part of the record.

For the biostratigraphic analysis we only consider the appearance/ disappearance of marker species and acme interval of selected taxa which are used as biohorizons according to the intergraded biostratigraphic sheme of Iaccarino et al. (2005). The biostratigraphic analysis of the planktonic foraminifera revealed that the section spans the interval from the Acme end of *Paragloborotalia siakensis* (15.28 Ma) random coiled up to the first occurrence (FO) of *Praeorbulina circularis* (14.668Ma).

The climatic curve reveals that the studied period is a cool period following the general climatic cooling reported for the Middle Miocene. In particular, the lower part of the section up to 20 m seems to be subjected to more ameliorated climatic conditions implied by the occurrence of *P. siakensis* (Turco et al., 2002) whereas the acme end of this species could be the response to the progressive cooling recorded above this level. Climatic fluctuations towards warmer conditions are recorded into the cool interval. A major cooling event is detected at around 45 m of the record.

Conclusions

The Middle Miocene planktonic foraminiferal assemblages documented from the Asprogerakata section, reveal a complex record which reflects the paleoclimatic changes recorded in this interval.

Our data suggest that during the deposition of Asprogerakata section (15.28 to 14.66 Ma) a major cooling event took place. This event probably coincides with the climate deterioration recorded by Miller et al. (1991), at 15 to 14.5 Ma.

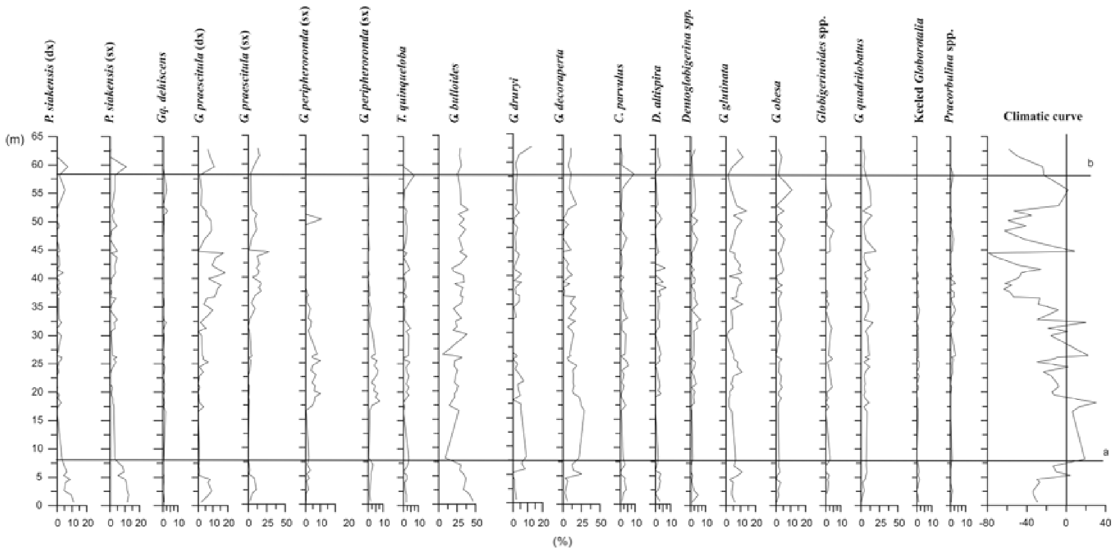

Fig. 3. Distributional pattern of the most significant planktonic foraminifera species identified in the studied section, together with the reconstructed climatic curve. Lines a and b represent the Acme End of *P. siakensis* and FO of *P. circularis* respectively.

Acknowledgements

This work is part of Italy-Greece Joint Research and Technology Programmes (2005-2007) and is co-funded by the European Social Fund and National Resources (EPEAEK II) PYTHAGORAS II (70/3/8020).

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