Stable isotope signatures for paleoenvironmental reconstructions of the early Late Miocene deposits of the Pre-Apulian zone (Levkas Island, Ionian Sea)

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INTRODUCTION

Levkas Island is built up mainly by Alpine Miocene-Cenozoic sedimentary rocks belonging to the external units of the Hellenides, the Pre-Apulian (Paxos) zone and the Ionian zone.

The Manassi section belongs to the Pre-Apulian (Paxos) zone, the most external domain of the Hellenic realm. According to Drinia et al. (2007), seismic stratigraphic and biostratigraphic studies based on planktonic foraminifera enabled to distinguish a Lower Tortonian age (Paragloborotalia elatensis planktonic foraminiferal zone, 11.54-12.2 My). This lower interval is considered very crucial for the studied area as it marks the Wenlockian-Early Tortonian transition, the gradual onshore sand injection, platform progradation towards the inner shelf, and the establishment of a shelf edge (Ionian Sea). This transition is preserved in the external zone of Levkas Island.

The studied sediments contain a rich fossils assemblage dominated, in numbers of individuals, by planktonic foraminifera. The benthic foraminiferal assemblage is characterized by a high number of taxa with a low number of individuals.

According to Drinia et al. (2007), the succession represents deposition in upper to lower bathyal depths and highlights a period of intense tectonic activity. The micropaleontological and paleobathymetrical analyses of the studied sediments indicate that these correspond to shallow shelf deposits in the foredeep depocentre of the most external domain (the Apulian zone of the Hellenic foreland basin).

The quantitative distribution of planktonic and benthic foraminifera and their stable isotope composition provide a basis for paleoenvironmental interpretation of the Early Tortonian section. The 2 My interval is generally considered to be characterized by relatively stable climatic conditions (Kennett and Stuiver, 1975). The plankton and benthic isotope record is based on measurements of the carbonate shells of the species Globigerinoides glutinatus and Globorotalia bulloides, respectively. Oxygen and Carbon isotope values, which reveal the difference between benthic and planktonic stable isotope, were also utilized to evidence changes in the isotopic gradient of the water column through the record and the evolution of the 3D hydrodynamic of the basin.

METODOLOGY

The plankton and benthic isotope record is based on measurements of the carbonate shells of the species Globigerinoides glutinatus and Globorotalia bulloides, respectively. Oxygen and Carbon isotope values, which reveal the difference between benthic and planktonic stable isotope, were also utilized to evidence changes in the isotopic gradient of the water column through the record and the evolution of the 3D hydrodynamic of the basin.

Stable Isotope Signatures

The planktonic δ18O values show relatively high degree of correlation with the gradient of the 0°C surface water mass temperature through the record and the evolution of the 3D hydrodynamic of the basin. The planktonic δ18O values indicate to evidence changes in the isotopic gradient of the water column through the record and the evolution of the 3D hydrodynamic of the basin.

CONCLUSION

Paired analyses of planktonic foraminiferal abundance and stable isotope measurements highlight discrepancies between the SST and δ18O records. Planktonic foraminiferal assemblages generally reflect global climate change. We should attribute part of the measured δ18O variations to local instability effects.ectonic records, as well as changes in the geometry of the basin, might have induced changes in the water masses circulation patterns, leading to the local water budget of the basin.

REFERENCES


This work is part of the project "Early Miocene Palaeoenvironmental records of Levkas Island (Ionian Sea): Evidence of climate and ocean circulation changes" (EU-funded project EUKITT, No: 506966-1-2005-3-MDE-GR). It was funded by the Hellenic Society and National Resources (EPEAEK) and the European Union (ERDF).