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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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The quantitative distribution of planktonic and benthic foraminifers and their stable isotope composition provide a basis for paleoenvironmental interpretation of an Early Tortonian section (*Paragloborotalia siakensis* planktonic foraminiferal zone, 11.54-11.2 Ma) of the Pre-Apulian zone (Levkas Island). This time interval is generally considered to be characterized by relatively stable climatic conditions interrupted by the global cooling Mi5 event (Miller et al., 1991).

The plankton and benthic isotope record of the studied section is based on measurements of the carbonate shells of the species *Globigerinoides obliquus* and *Cibicidoides kullenbergi*, respectively. Oxygen and carbon $\Delta\delta$ values, which equal the difference between benthic and planktonic stable isotopes, were also calculated to evidence changes in the isotopic gradient of the water column through the record and the evolution of the 3D hydrodynamic of the basin.

Benthic and planktonic δ^{18}O values show a relatively high degree of correlation all along the record indicating a generally coupled control of oxygen isotopic composition in the surface and bottom waters. Moreover, changes in average δ^{18}O records appear generally to be reflected by significant variations in the structure of the planktonic assemblage indicating a primary control of the hydrographical changes of the basin on the dynamics of the faunal associations.

The oxygen $\Delta\delta$ isotope gradient reflects about constant characteristics for surface and

deep water masses through the section, with an average value of 1.17‰, but shows an abrupt positive shift (∼1.5‰), in the uppermost part of the sedimentary record. This seems to suggest an increasing vertical stratification of the water column in the younger part of the record.

The planktonic δ^{13}C curve displays positive values (ranging from 0.30 and 2.22), while the carbon isotope values of the benthic foraminifera recorded in the lower part of the section display average negative values (-1‰) suggesting high values of productivity in the surface waters. Then, a slight decrease in benthic carbon isotope values, mirrored by an evident positive excursion of the planktonic δ^{13}C record, in the upper part of the records, was interpreted in terms of enhanced surface productivity and organic matter preservation at the bottom of the basin in this part of succession. The negative shift in the δ^{18}O signal, measured in the uppermost part of the succession, in correspondence to the abrupt increase in the δ^{13}C values of planktonic foraminifera, possibly suggests a significant contribution of riverine runoff from continents with a consequent increase of surface productivity.

The high frequency oscillations, modulating the faunal and isotope records, were analysed by spectral analysis evidencing a primary control of orbital forcing on the different signals.

Miller, K.G., Wright, J.D. & Fairbanks, R.G., 1991. Unlocking the ice house: Oligocene-Miocene oxygen isotopes, eustasy and margin erosion. Journal of Geophysical Research, 96B, 6829-6848.

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