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Isotope records from *Turborotalia cerroazulensis* and *Turborotalia pomeroli* near the middle/late Eocene boundary (North Adriatic Sea, Croatia)

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High-resolution biostratigraphic and isotopes analyses have been conducted on 6m cored interval from Istra more-5 well (North Adriatic Sea, Croatia), which consists of hemipelagic marl with rare silty intercalations. The succession studied was deposited on the eastern edge of the Venetian Basin in a slope to basinal environment. The sedimentation rate is estimated at 7.7cm per 1kyr enabling a high resolution record of geological events. A moderately diverse planktonic foraminiferal association indicates warm to temperate Mediterranean bioprovince in the latest middle Eocene and lower part of the upper Eocene. Zone E13 (roughly equivalent to P14) is documented by *G. index, G. tropicalis, C. unicavus, S. linaperta, Dentoglobigerina galavisi, A.. praetopilensis, M. crassatus* and others. Zone E14 (roughly equivalent to P15) is characterized by *S. linaperta, Globorotaloides* sp., *Catapsydrax* spp., *A. echinata*. High dominance of two species of the *T. cerroazulensis* lineage is documented for the whole interval by quantitative methods. *T. cerroazulensis* is more abundant than *T. pomeroli*, and *T. cocoaensis* is present rarely in the fine fraction. Two extinction horizons of the muricate species have been observed. The first extinction level is at 1172.6m where all large acarininids abruptly disappear, i.e. *Acarinina praetopilensis, A. rohri* and others. Small acarininids, represented by *A. medizzai, A. rugosoaculeata* and *A. echinata* occur to the top of the study interval. *M. crassatus* occurs in the fine fraction (160-250µm) until 1171.80m, above which no specimens have been found. The 80cm interval between the extinctions corresponds to approximately 10kyr, according to the long-term average sedimentation rate of 7.7cm per 1 kyr. These data correspond very well to the investigations of Wade (2004). Isotopic analyses have been conducted on three size fractions of tests of *T. cerroazulensis* and *T. pomeroli* (160-250, 250-315 and >315µm.).

Samples are well preserved, exhibiting 'glassy' preservation suitable for quantitative isotope analysis. All samples studied for both species show similar $\delta^{13}C$ values, although *T. cerroazulensis* (1.175-0.160‰) shows more variability than *T. pomeroli* (1.065-0.136‰). All $\delta^{13}C$ signals indicate a thermocline habitat. A shift in $\delta^{13}C$ to heavier values is visible at the first extinction level (1172.6m) for both species. One possible explanation for this is a decrease in surface ocean productivity coincident with the *Acarinina* extinction, in which the transport of organic carbon to subsurface levels was reduced. Alternatively it may be related to global changes in $\delta^{13}C$. The heavier $\delta^{13}C$ values continue to the end of the interval studied. Oxygen isotope results from both species show distinct variability close and between extinction levels and range from (-1.227) to (-1.627) ‰ for *T. cerroazulensis* and (-1.094) to (-1.713)‰ for *T. pomeroli*. Fluctuation in both $\delta^{18}O$ and $\delta^{13}C$ values near and between the two extinction levels could imply changes of ocean circulation and instability of the water column, possibly indicating a period of increased ecological stress for all group of planktonic foraminifera. After both extinction events the $\delta^{13}C$ values show less variability suggesting a period of stability in ocean circulation. According to the isotopic ratios, an ontogenic change in ecology or depth habitat may have occurred in the turborotaliids. The finest fraction (160-250µm) consistently records the lightest $\delta^{13}C$, while the larger (> 315µm) fraction shows heavier values. These differentials are most pronounced during the more stable temperature period in the upper cored interval, 1170.30-1171.55m, i.e. after the second extinction event, when finest fraction show deeper habitat than two larger fractions for both species. All turborotaliid tests studied show relatively light $\delta^{13}C$ signals suggesting that they were not associating with large numbers of dinoflagellate symbionts as is believed to have occurred in the muricate species. However, the glassy, transparent tests of *T. pomeroli* and *T. cerroazulensis* may have hosted internal symbionts like some recent globorotaliids which associate with some algae. Like the subbotinids they survived the extinction events which affected surface dwelling forms.

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