

Early Pliocene calcareous nannofossils contribute to the paleoceanographic reconstruction of the Cretan Basin (southern Aegean Sea, NE Mediterranean)

Elisavet Skampa

National and Kapodistrian University of Athens, Faculty of Geology and Geoenvironment, Panepistimioupolis, 15784, Athens, Greece; elskampa@geol.uoa.gr

Margarita D. Dimiza

National and Kapodistrian University of Athens, Faculty of Geology and Geoenvironment, Panepistimioupolis, 15784, Athens, Greece; mdimiza@geol.uoa.gr

Agnieszka Arabas

Polish Academy of Sciences, Institute of Geological Sciences, Research Centre in Kraków, Kraków, 31-002, Poland; agnieszka.arabas@gmail.com

Alexandra Gogou

Hellenic Centre for Marine Research, Institute of Oceanography, 19013 Anavyssos, Greece; agogou@hcmr.gr

Ioannis P. Panagiotopoulos, Theodora Tsourou

National and Kapodistrian University of Athens, Faculty of Geology and Geoenvironment, Panepistimioupolis, 15784, Athens, Greece; ioapanag@geol.uoa.gr; ttsourou@geol.uoa.gr

Dimitrios Velaoras

Hellenic Centre for Marine Research, Institute of Oceanography, 19013 Anavyssos, Greece; dvelaoras@hcmr.gr

Marios Karagiorgas

National and Kapodistrian University of Athens, Faculty of Geology and Geoenvironment, Panepistimioupolis, 15784, Athens, Greece; mariosk3gmail.com

Karl-Heinz Baumann

University of Bremen, Department of Geosciences, 28334 Bremen, Germany; baumann@uni-bremen.de

Maria V. Triantaphyllou

National and Kapodistrian University of Athens, Faculty of Geology and Geoenvironment, Panepistimioupolis, 15784, Athens, Greece; mtriant@geol.uoa.gr

<https://doi.org/10.58998/jnr3283>

A detailed investigation of calcareous nannofossil accumulation rates and hydroclimatic proxies in the Deep Sea Drilling Project (DSDP) Site 378 sediment record located in the Cretan Basin aims to improve our knowledge of the response of the NE Mediterranean during the warm Early Pliocene (Skampa et al., 2024). The studied sequence has been dated between ~5.2 and 3.9 Ma (i-cycles 490–374). The age of the first Zanclean marine sediments that overlie the Messinian deposits demonstrates that the Cretan Basin was partially desiccated for at least ~400 kyr, reflecting the fact that it was a shallow epicontinental area in the Late Miocene. This multiproxy study, including elemental concentrations and stable isotope measurements, revealed intervals of warm surface waters and low-oxygen conditions on the seafloor that were associated with the orbitally driven occurrence of rhythmic sapropelic layers in the Early Pliocene. Between ~5.2 and 4.6 Ma, the sapropelic layers were characterized by an elevated abundance of *Reticulofenestra* spp. and *Florisphaera profunda*, indicating increased productivity throughout the photic zone. The dominance of the former in the accumulation rates reflects adequate nutrient availability in the surface layers, which is most likely associated with increased riverine runoff into the eastern Mediterranean. In addition, the moderate abundances of *F. profunda*, compared to in the Levantine Basin (Athanasίου et al., 2017), may suggest that the formation of Levantine Intermediate Water (LIW) was not strong enough to reach the Cretan Basin at the beginning of the Pliocene. In the subsequent time interval of ~4.6–3.9 Ma, the increase in the middle photic zone of the productivity index *Helicosphaera* spp. and the salinity thriving taxon *Umbilicosphaera jafari* in the sapropelic and intercalated marly layers, respectively, imply freshening and enhanced middle photic zone productivity that was associated with an intensification of the saline and nutrient enriched LIW

presence at intermediate water depths. The increase in LIW intrusion, combined with the complete restoration of north–south Aegean marine gateways, led to the establishment of a hydrographic system similar to the modern Aegean Sea.

Acknowledgements:

This research is cofinanced by Greece and the European Union (European Social Fund [ESF]) through the Operational Programme «Human Resources Development, Education and Lifelong Learning» in the context of the project “Strengthening Human Resources Research Potential via Doctorate Research – 2nd Cycle” (MIS-5000432), implemented by the State Scholarships Foundation (IKY) and by the Greek National Project CLIMPACT: Flagship Initiative for Climate Change and its Impact by the Hellenic Network of Agencies for Climate Impact Mitigation and Adaptation.

References:

- Athanasίου, M., Bouloubassi, I., Gogou, A., Klein, V., Dimiza, M.D., Parinos, C., Skampa, E. & Triantaphyllou, M.V. 2017. Sea surface temperatures and environmental conditions during the “warm Pliocene” interval (~4.1–3.2 Ma) in the Eastern Mediterranean (Cyprus). *Global and Planetary Change*, **150**: 46–57. <https://doi.org/10.1016/j.gloplacha.2017.01.008>
- Skampa, E., Dimiza, M.D., Arabas, A., Gogou, A., Panagiotopoulos, I.P., Tsurou, Th., Velaoras, D., Karagiorgas, M., Baumann, K.-H. & Triantaphyllou, M.V. 2024. The Cretan Basin (South Aegean Sea, NE Mediterranean) in the Early Pliocene: a paleoceanographic reconstruction. *Palaeogeography, Palaeoclimatology, Palaeoecology*, **640**: 112085. <https://doi.org/10.1016/j.palaeo.2024.112085>