15th International Congress of the Geological Society of Greece
Athens, 22-24 May, 2019 | Harokopio University of Athens, Greece
Bulletin of the Geological Society of Greece, Sp. Pub. 7 Ext. Abs. GSG2019-164

Revealing the Eocene-Oligocene transition in Pindos Foreland Basin, western Greece

S. Kostopoulou[1], A.G. Maravelis[1], C. Mpotziolis[1], A. Zelilidis[1]

(1) Laboratory of Sedimentology, Department of Geology, University of Patras, 26504 Rion, Greece, kost.sofia@hotmail.com

Introduction-Geological setting

The middle Eocene to early Oligocene transition (EOT) is of particular interested because it corresponds to significant climatic changes in the Cenozoic (Maravelis and Zelilidis, 2012). The EOT marks the shift from greenhouse to icehouse conditions and the last major extinction of marine fauna (Miller et al., 1992). Calcareous nannofossils are abundant in submarine fan deposits and are regarded as very good biostratigraphic indicators (Winter and Siesser, 1994). Thus, calcareous nannofossil analysis has been employed for determining the age of such sediments. The submarine fan deposits in the Pindos Foreland Basin, western Greece offer a case study to precisely define the EOT and investigate potential fingerprints of this climatic change at low latitude settings. The basin is bounded to the east by the Pindos Thrust and to the west by the Ionian thrust and is further dissected by smaller thrusts (Gavrovo, internal and middle Ionian thrusts). Although the studied deposits are Eocene to Oligocene in age, detailed biostratigraphic analysis to define their time span has not been yet conducted and the EOT has not been documented. In view of the absence of such data, calcareous nannofossil analysis has been carried out, adding constraints on the depositional age of the submarine fan deposits in Pindos Foreland Basin and documenting the EOT in western Greece.

Material and methods

For calcareous nannofossil analysis, 70 samples were collected from the submarine fan deposits in Pindos Foreland Basin. These deposits correspond to the infill of the basin, as a result of the growing Pindos Thrust (Konstantopoulos and Zelilidis, 2012). The submarine fan system documents progradation and therefore, outer fan deposits are stratigraphically below inner fan sediments (Konstantopoulos and Zelilidis, 2012). Prior to sample selection and collection, systematic field work was performed to assure that the samples are placed to the right stratigraphic position and cover the entire sedimentary succession. The sample preparation was made using standard smear slide techniques, as described in Bown and Young (1998) and Giunta *et al*. (2003). Smear slides were analyzed with an optical Optica Italy B-1000POL microscope at 1250× magnification. Calcareous nannofossils were generally abundant and well preserved. The biostratigraphy was based on the biozonal definitions of Martini (1971) and Agnini *et al*. (2014).

Results and conclusions

The biostratigraphic analyses of more than 70 samples in outer fan deposits, until now, calcareous nannofossils (Fig.1; Fig.2) confirm the late Eocene to early Oligocene time interval. The studied samples referred to a 221 m total sequence that rest uncomfortably over the Eocene limestones. The transition zone from carbonates to clastic deposits showed a late Eocene age.

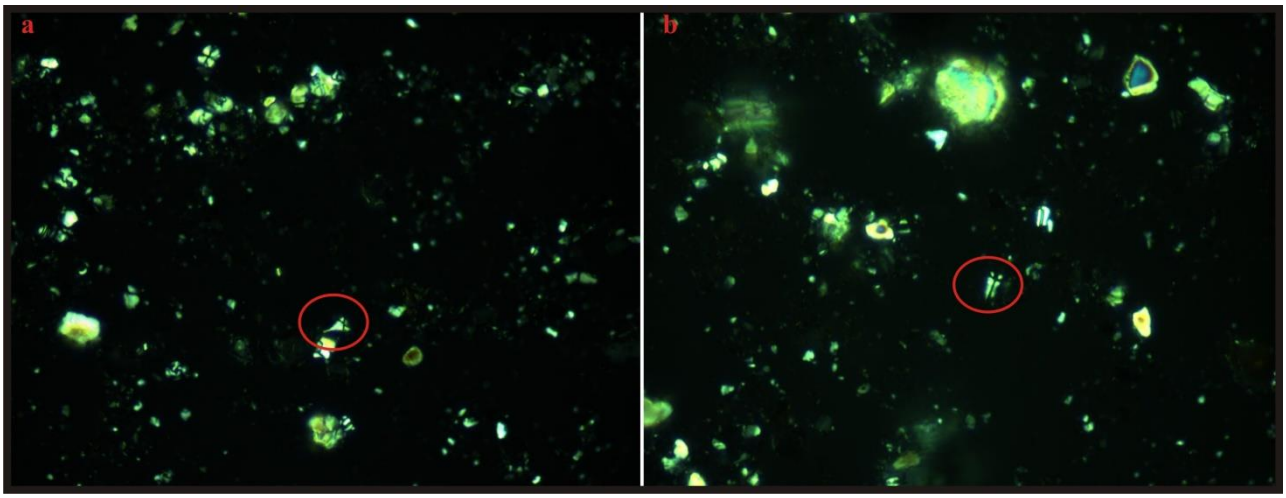

Figure 1. Sphenolithus species. a) Sphenolithus ciperoensis, sample AGX 31; b) Sphenolithus predistentus, sample AGX 20.

The Eocene-Oligocene boundary is observed in the lower part of the turbiditic system. In particular, the presence of *Discoaster barbadiensis*, *Discoaster saipanensis*, *Ericsonia formosa*, *Cyclicargolithus floridanus*, *Reticulofenestra floridana*, and *Sphenolithus predistentus* confirms late Eocene. The presence of *C. floridanus*, *Reticulophenestra bisecta*,

R. floridana, *S. predistentus*, *Sphenolithus distentus* and *Sphenolithus ciperoensis* in combination with the absence of *D. barbadiensis*, *D. saipanensis* indicates the early Oligocene time interval in the middle/upper part of outer fan deposits. In conclusion, the sedimentation in western Greece started on late Eocene and continues on early Oligocene. Subsequently, further investigation is to be conducted for:

- The biostratigraphic analysis of outer and inner fan deposits using calcareous nannofossils and planktonic foraminifera.
- The foraminiferal analysis (both planktonic and benthic foraminifera) because of the palaeoclimatological, palaeoenvironmental and palaeoecological interest of Eocene-Oligocene epoch.

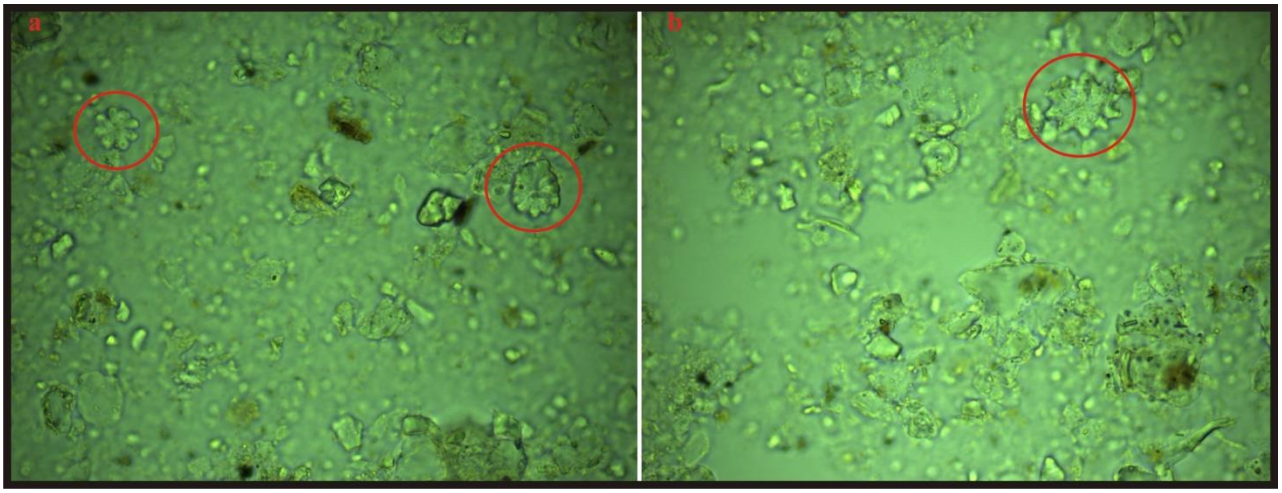

Figure 2. Discoaster species. a) Discoaster barbadiensis, sample AM 1; b) Discoaster barbadiensis, sample AM 35.

Acknowledgements

This work was funded by the H.F.R.I. (Hellenic Foundation for Research & Innovation) and GSRT (General Secretarial for Research and Technology) through the research project "Global climate and sea-level changes across the Latest Eocene-Early Oligocene, as reflected in the sedimentary record of Pindos foreland and Thrace basin, Greece, 80591".

References

Agnini, C., Fornaciari, E., Raffi, I., Catanzariti, R., Pälike, H., Backman, J. Rio, D. 2014. Biozonation and biochronology of Paleogene calcareous nannofossils from low and middle latitudes. Newsletters on Stratigraphy 47, 131–181.

Bown, P.R., Young, J.R., 1998. Techniques, in: Bown, P.R. (Ed.), Calcareous Nannofossil Biostratigraphy. British Micropalaeontology Society Series. London, UK: Chapman & Hall, p. 16-28.

Giunta, S., Negri, A., Morigi, C., Capotondi, L., Combourieu-Nebout, N., Emeis, K.C., Sangiorgi, F., Vigliotti, L., 2003. Coccolithiphorid ecostratigraphy and multi-proxy paleoceanographic reconstruction in the Southern Adriatic Sea during the last deglacial time (Core AD91-17). Palaeogeography, Palaeoclimatology, Palaeoecology 190, 39-59.

Konstantopoulos, P., Zelilidis, A., 2012. Sedimentation of submarine fan deposits in Pindos foreland basin, from late Eocene to early Oligocene, West Peloponnesus peninsula, Greece. Geol. J., doi:10.1002/gj.2450**.**

Maravelis, A., Zelilidis, A., 2012. Paleoclimatology and paleoecology across the Eocene–Oligocene boundary, Thrace Basin, northeast Aegean Sea, Greece. Palaeogeography, Palaeoclimatology, Palaeoecology 365-366, 81-98.

Martini, E., 1971. Standard Tertiary and Quaternary calcareous nannoplankton zonation, in: Farinacci, A. (Ed.), Second Planktonic Conference Proceedings, Roma 1970. Second Planktonic Conference Proceedings, Roma 1970. Rome: Edizioni Tecnoscienza, p. 739-785.

Miller, KG. 1992. Middle Eocene to Oligocene stable isotopes, climate and deepwater history: The Terminal Eocene Event? See Prothero and Berggren 1992, pp. 60-77.

Pälike, H., Norris, R.D., Herrle, J.O., Wilson, P.A., Coxall, H.K., Lear, C.H., Shackleton, N.J., Tripati, A.K., Wade, B.S. 2006. The heartbeat of the Oligocene climate system. Science 314(5807), 1894-1898.

Winter, A., Siesser, W.G., 1994. Coccolithophores. Cambridge University Press, 242.

Zachos, J., Pagani, M., Sloan, L., Thomas, E., Billups, K., 2001. Trends, rhythms, and aberrations in global climate 65 Ma to Present. Science 292, 686-693.