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. GSG2019-287

A multi-proxy approach for reconstructing environmental dynamics since the mid Holocene, in Ismarida Lake (N. Greece)

O. Koukousioura[1], K. Kouli[2], K. Vouvalidis[1], E. Aidona[1], G. Karadimou[1], G. Syrides[1]

(1) Aristotle University of Thessaloniki, Department of Geology, 54124, Thessaloniki, Greece, okoukous@geo.auth.gr
(2) National and Kapodistrian University of Athens, Department of Geology and Geoenvironment, 15784, Athens, Greece

During the last decades, a great number of studies have been conducted in the Holocene coastal plains of the Aegean Sea, using multi-proxy approaches. In particular, the combination of benthic foraminiferal, palynological and molluscan analysis, along with stratigraphical, sedimentological, magnetic susceptibility and radiocarbon dating techniques, have been proven to be an invaluable tool box for such researches (e.g., Pavlopoulos *et al*. 2010; Theodorakopoulou *et al*., 2009; Triantaphyllou *et al*. 2010, 2016; Vouvalidis *et al*., 2010). However, limited information is available for the north coastal zone of Greece (Karadimou *et al*., 2016; Koukousioura *et al*., 2012; Pavlopoulos, 2010).

Lake Ismarida, known also by Herodotus description, is located in the lowlands of Thrace near the north Aegean coast. Therefore, it is a valuable archive for reconstructing palaeoenvironmental changes in the area. The lake is placed 20 Km south of Komotini city (Thrace, N. Greece), in the western side of Filiouris River valley, bordered on the west by Neogene sediments and on the east by the alluvial sediments of the Filiouris plain. The ISMR-2 5.8-m long sediment core was retrieved from Lake Ismarida area, in order to reconstruct the paleoenvironments and paleovegetation since mid-Holocene. Systematic stratigraphic, sedimentological, and paleontological analyses were performed, while the magnetic susceptibility of the recovered deposits was measured. More than 50 samples were used for combined micropaleontological and palynological analysis and 190 for mollusc analysis (Karadimou *et al*., 2016). Furthermore, four horizons were radiometrically dated with AMS ^{14}C.

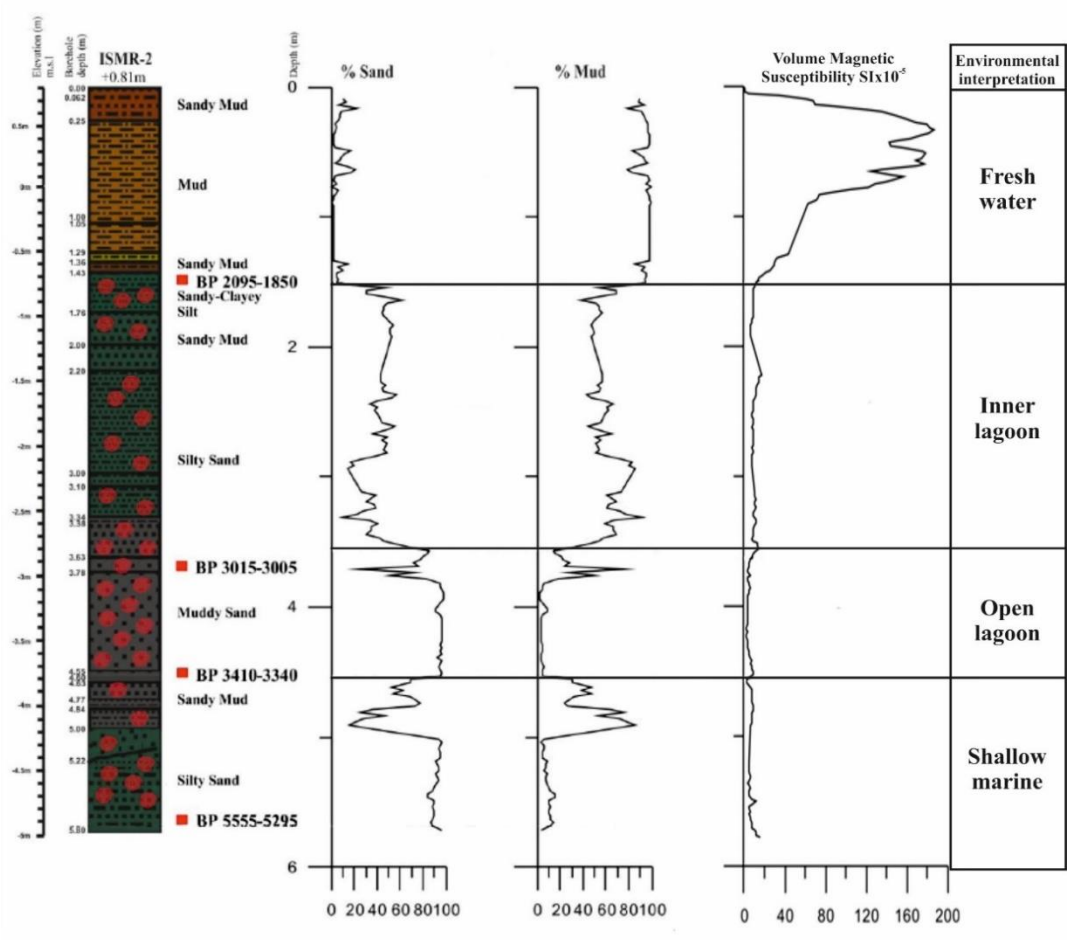

Figure 1. Lithostratigraphy, relative frequencies of sand and mud and magnetic susceptibility measurements of ISMR-2 core (modified from Karadimou *et al*., 2016).

The analysis of paleontological, stratigraphical, sedimentological and magnetic susceptibility data as well as the evaluation of ^{14}C datings, revealed four well-distinguished evolutionary phases in the mid-Holocene Ismarida Lake succession:

(i) from ~5500 to ~3500 cal BP silty sand with coarse sand horizons was deposited bearing mainly marine foraminiferal and mollusc species and high abundances of marine dinoflagellate cysts. Magnetic susceptibility values were low (Fig. 1), confirming a shallow marine environment in accordance with fauna and flora findings

(ii) between ~3500 and 3000 cal BP the distinct lagoon features recorded are indicating the isolation of the area. Nevertheless, the communication with the sea is still evident in both fauna and flora. Benthic foraminiferal assemblage is characterized by a mixture of mainly marine but also some euryhaline species, while macrofauna and flora present a similar composition. The low magnetic susceptibility values agree with an open lagoonal environment, in good communication to the sea

(iii) subsequently the isolation of the core area took place with the establishment of an inner lagoon with limited communication to the sea, until ~2000 cal BP. The overall aquatic palynomorph and mollusk assemblages reflect a complex depositional environment with both marine and fresh water inputs. Furthermore, benthic foraminiferal species composition represents mesohaline to oligohaline biofacies, showing clear similarities to modern Aegean closed lagoons (e.g., Koukousioura *et al.*, 2012; Dimiza *et al.*, 2016)

(iv) after ~2000 cal BP, the silty clay was deposited, exhibits high magnetic susceptibility and the highest mud values of the sedimentary sequence (Fig. 1), in a fresh-water environment with possible river discharges. No fauna was detected in this phase, while fresh-water indicators and aquatic pollen were encountered in an environment analogue to today's Ismarida Lake.

Acknowledgements

The authors would like to thank the "Molyvoti Project" headed by Professor Nathan Arrington, Department of Art and Archeology, Princeton University, for the financial support of the fieldwork and AMS datings.

References

Dimiza, M.D., Koukousioura, O., Triantaphyllou, M.V., Dermitzakis, M.D., 2016. Live and dead benthic foraminiferal assemblages from coastal environments of the Aegean Sea (Greece): Distribution and diversity. Revue de Micropaléontologie 59(1), 19-32.

Karadimou, G., Vouvalidis, K., Syrides, K., Koukousioura, O., Aidona, E., 2016. Geomorphological and paleoenvironmental changes of Ismarida Lake during Holocene (N. Greece). Bulletin of the Geological Society of Greece 50(1), 424-433.

Koukousioura, O., Triantaphyllou, M.V., Dimiza, M.D., Pavlopoulos, K., Syrides, G., Vouvalidis, K., 2012. Benthic foraminiferal evidence and paleoenvironmental evolution of Holocene coastal plains in the Aegean Sea (Greece). Quaternary International 261, 105-117.

Pavlopoulos, K., Triantaphyllou, M., Karkanas, P., Kouli, K., Syrides, G., Vouvalidis, K., Palyvos, N., Tsourou, T., 2010. Paleoenvironmental evolution and prehistoric human environment, in the embayment of Palamari (Skyros Island, Greece) during Middle-Late Holocene. Quaternary International 216, 41-53.

Theodorakopoulou, K., Pavlopoulos, K., Triantaphyllou, M., Kouli, K., Tsourou, T., Bassiakos, Y., Zacharias, N., Hayden, B., 2009. Geoarchaeological studies in coastal area in Istron-Kalochorio (gulf of Mirabello-Eastern Crete): landscape evolution and palaeoenvironmental reconstruction. Zeitschrift für Geomorphologie 53(1), 55-70.

Triantaphyllou, M.V., Kouli, K., Tsourou, T., Koukousioura, O., Pavlopoulos, K., Dermitzakis, M.D., 2010. Paleoenvironmental changes since 3000 BC in the coastal marsh of Vravron (Attica, SE Greece). Quaternary International 216, 14-22.

Triantaphyllou, M.V., Pavlopoulos, K.P., Kouli, K., Koukousioura, O., Dimiza, M.D., Aidona, E., Syrides, G., Pallikarakis, A., Goiran, J.-P., Fouache, E., 2016. Multiproxy paleoenvironmental reconstruction: the Piraeus coastal plain case study. Bulletin of the Geological Society of Greece 50(1), 478-487.

Vouvalidis, K., Syrides, G., Pavlopoulos, K., Papakonstantinou, M., Tsourlos, P., 2010. Holocene palaeoenvironmental changes in Agia Paraskevi prehistoric settlement, Lamia, Central Greece. Quaternary International 216, 64-74.