A SAPROPELIC SEDIMENT UNIT FROM THE SOUTHERN MARMARA SHELF

M. N. Çagatay [1]*, O. Algan [1], C. J. Eastoe [2], M. Sakinc [3], L. Egesel [4], N. Balkis [1], D. Ongan [1], H. Caner [1]

[1] Institute of Marine Sciences and Management, University of Istanbul, Vefa, 34470, Ystanbul, Turkey
[2] Department of Geosciences, University of Arizona, USA
[3] Mining Faculty, Istanbul Technical University, Turkey
[4] Marmara Research Centre, Tübitak, Gebze, Turkey

Abstract

A sapropelic unit, having an age of 4.7 - 3.4 ^{14}C ky, was identified in the Holocene sediments on the southern shelf of the Marmara Sea. It is a 10-35 cm-thick, phosphorescent green, plastic, clayey hemipelagic mud horizon, located at depths ranging 1-2.35 mbsf. The increase in organic carbon (up to 2.5 %) and biogenic carbonate (8-12% $CaCO_3$), together with a rich planktonic foraminiferal fauna, indicates increased organic productivity and warm surface waters during the deposition of the sapropelic layer. The benthonic foraminiferal fauna indicates reduced oxygen levels in bottomwaters during the deposition. Deposition of this sapropelic layer was initiated by a large input of terrestrial organic matter and fresh water under a relatively warm and wet climate. The fresh water probably caused a strong water stratification, which in turn together with the high organic matter input, resulted in reduced oxygen levels in the bottomwaters.

Key-words : sapropel, Sea of Marmara

Sapropel/sapropelic layers are found from the Black Sea and Mediterranean Sea which range in age from 7.000-3.000 to 400.000 - 6.300 y BP, respectively (1, 2, 3, 4). The youngest Mediterranean sapropel (S1) was deposited between 8.3 and 6.3 ^{14}C ky BP (5, 6, 7). There is no previous report on the sapropelic sediments from the Marmara Sea which is a transitional basin between the Black Sea and Mediterranean. The sapropelic layer found in this study is dated at 4.7-3.4 ^{14}C ky BP, and thus younger than the latest Mediterranean sapropel, but overlaps the age of the Black Sea sapropel.

The sediment cores from sites 1, 2, 4, 6, 13, and 22, (Fig. 1) from the the southern Marmara shelf consist mainly of various tints of brown, gray and green, texturally homogeneous, hemipelagic, plastic, clayey muds (Fig. 2). The sapropelic layer is typically a phosphorescent green, plastic, clayey mud horizon, which contain the highest organic carbon and the total carbonate values.

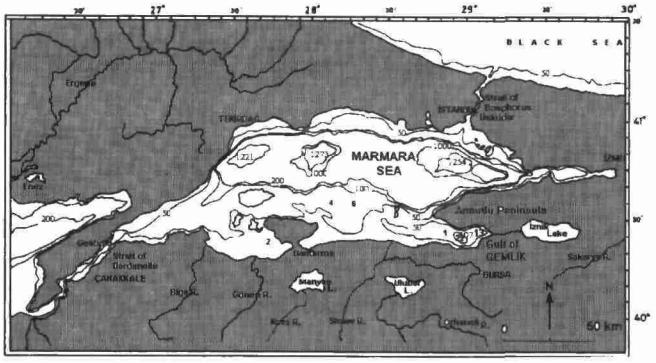

Fig. 1 : The locations of gravity core sites.

The carbonate and C_{org} contents of the core samples vary between 8-13 % $CaCO_3$ and between 0.2-2.1%, respectively (Fig. 3). The organic carbon values are relatively higher in cores 6, 4 and 2, compared to those in cores from the eastern part of the shelf. The thickness of sapropelic layer is about 35 cm in the cores from the Gemlik Bay and 50 cm in cores 4 and 6. The total-carbonate profiles show a good match with the organic carbon profiles along the cores, suggesting that the carbonate fraction is mainly of biogenic origin. The enrichment of biogenic carbonate in the sapropelic layer suggests increased organic productivity during their deposition.

The high organic productivity is supported by a rich planktonic foraminiferal fauna during the sapropelic sediment deposition (Fig. 4). The planktonic assemblage (mainly, Globogerinidae and Goborotalidae, including *Globigerina calida* Parker, *Globigerina rubra* d'Orbigny, *Globigerina ruber* d'Orbigny and *Orbiluna universa* d'Orbigny) in the sapropelic layer and the layer immediately below points to a warm climate during deposition. The planktonic forams decrease in abundance towards the upper levels and start to increase again both in diversity and abundance in the top 20 cm of the cores. Similar to the planktonic one, the benthic foraminiferal assemblage, becomes more diversified and abundant in the top 20 cm part of the cores, with the appearance of new species. The benthic foraminiferal assemblage include Brazilinidae, Cassudilinidae, Nonionidae,

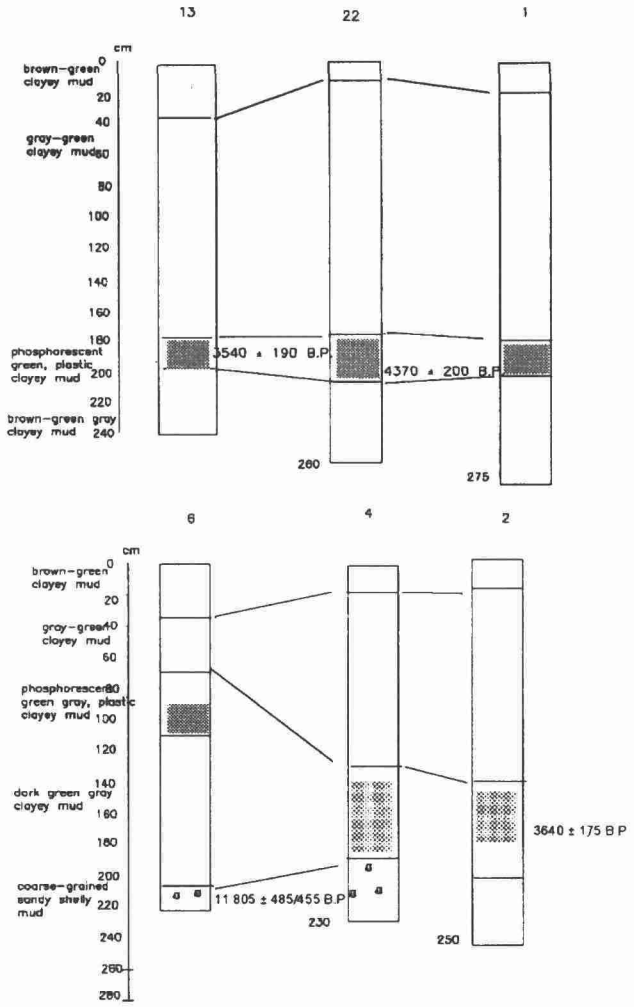

Fig. 2 : Lithological description of the studied cores.

Chilostomellidae, Uvigerinadae, and Milliolidae in the lower levels of the cores, including the sapropelic layer (Fig. 4). Although the presence of benthonic forams, in general, implies well oxygenated water, in these levels, the abundant presence of particular benthic forams, such as Brazilinidae together with Cassidulinidae, indicates reduced oxygen levels in bottomwaters during deposition. The decrease in the abundance of both the benthic and planktonic forams between 40-70 cm bsf. show high fresh or brackish water input during this interval.

The Marmara Sea, being on the waterway between the Mediterranean and the Black Sea, was a lake separated from its neighbouring seas during the last glaciation. The connection with the Mediterranean was established with the inflow of the Mediterranean