Deep chlorophyl- a maximum in the Northeastern Mediterranean

A. YILMAZ, D. GOCMEN, O. BASTURK, A.C. SAYDAM and I. SALIHOGLU

Middle East Techical University, Institute of Marine Sciences,
P.O.Box 28, 33731 Erdemli-Icel (Turkey)

Chloropyll-α used as an estimation there of the standing phytoplankton crop, investigated in the Northeastern Mediterranean. The analysis of chlorophyll-α was performed on the 90% acetone extracts and both spectrophotometrically and spectrofluorometrically. Strickland and Parsons' (1968) formula was employed for the calculation of spectrophotometric results from the absorbances measured at 750, 600-665, 645 and 630 nm. Calibration used coproporphyrin I-tetra methyl ester as a standard and this chlorophyll-like substance was absolutely measured spectrophotometrically for the determination of low chlorophyll-α concentration by spectrofluorometry. An emission wavelength of 660 nm and exitation wavelength of 425 nm were used with a 60 nm bandwith. The vertical attenuation of light was measured by a submarine photo-detector. The detector measured the percentage of light at selected depths with respect to the intensity of the surface light. Inorganic phosphate, (nitrate+nitrite) and reactive silicate were measured by Technicon II Autoanalyzer following the methods given by Strickland and Parsons, (1968).

Sea water samples were collected by R/V BİLİM, a research vessel of Middle East Technical University, covering the period from April,1983 to February,1987. Deep chlorophyll-α maxima were observed in the NE Mediterranean regardless of the time of the year execpt winter and the location. Deep chlorophyll-α layer usually located at a depth of 1-10 % of the incident suface solar radiation and the layer coincided with the depth range of slight nutrient gradient layer and this corresponded to the 80-130 m range in the water column in the NE Mediterranean. The typical examples of deep chlorophil-α maxima together with the vertical distribution of temperature, solar radiation and nutrients are illustrated in Figure 1. Deep chlorophyll-α has regularly been noted in oligotrophic waters (Cullen, 1982) and in the Eastern Mediterranean, off the Israeli Coast (Berman *et al*;, 1984 a).

The reasons for the deep chlorophyll-α maxima can be discussed as follows: Phytoplankton cells may aggregate within the nutricline due to increased buoyancy or other behavioral characteristics. As is clearly seen from Figure 1 the euphotic zone is poor in nutrient supply and a slight increase of nutrients with depth encourages the primary producers to inhabit deep waters. A very significant portion of phytoplankton biomass and phytosynthetic activity in oligotrophic regions is associated with organisms smaller than 3 μm even 1 μm (Johnson and Sieburth,1979; Li *et al*., 1983). Often these pico-planktons are relatively more numerous towards the bottom of the euphotic zone or in deep chlorophyll maxima and they are adapted to low intensity of light in the green region of the spectrum (Platt *et al*., 1983). At all seasons both for nearshore and pelagic waters, the majority of the chlorophyll in the Eastern Mediterranean is associated with organisms smaller than 3 μm (Berman *et al*., 1984 b). The euphotic zonein the NE Mediterranean is relatively deep since the 1% of the incident solar radiation was detected in the range of 100-120 m and photosynthetic active phytoplankton prefer to inhabit the deeper levels of the euphotic zone.

The horizontal and vertical distribution of chlorophyll-α were also influenced by the physical aspescts in the NE Mediterranean, especially the regional (cyclonic and anticyclonic) circulation systems.

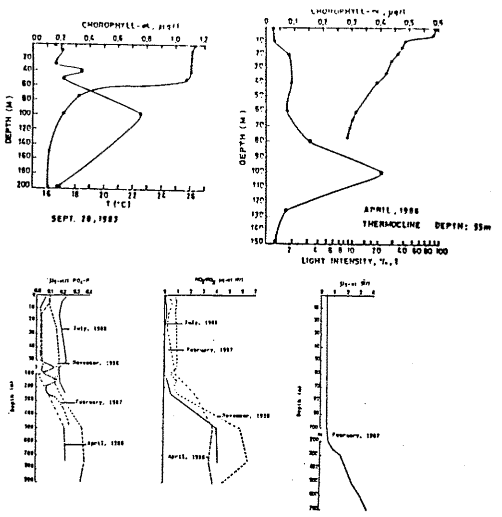

Figure 1. Vertical distribution of chlorophyll-α, water temperature, light and nutrients in the NE Mediterranean

REFERENCES

Berman,T., D.W. Townsend, S.Z. El Sayed, C.C. Trees and Y. Azov (1984 a) "Optical Transparency,Chlorophyll and Primary Productivity in the Eastern Mediterranean near the Israli Coast" Oceanologia Acta, 7(3) pp.367-372 .

Berman,T., Y. Azov and D. Townsend, (1984 b), "Understanding oligotrophic oceans: Can the Eastern Mediterranean be a useful model? Marine phytoplankton and productivity Lecture Notes", Coastal Estuarine Stud. 8. Springer pp. 101-112.

Cullen, J. J., (1982), "The deepchlorophyll maximum-comparing vertical profiles of chlorophyll-α", Can. J. Fish Aqua. Sci.,39, pp.791-803.

Johnson, P.W. and Mc. N. Sieburth, (1979), "Chroococcoide cyanbacteria in the sea: a ubiquitous and diverse phototrophic biomass", Limnol. Oceanogr., 24, pp. 928-935.

Li, W.K.W., D.V. Subba Rao, Harrison, W. G., Smith, J. C., Cullen, J. J. Irwin, B. and T. Platt, (1983), "Autotrophic picoplankton in the tropical ocean", Science, 219, pp. 292-295.

Platt, T., D. V. Subba Rao, and B. Irwin, (1983), "Photosynthesis of picoplankton in the oligotrophic ocean", Nature 301, pp. 702-704.

Strickland, J. D. H. and T. R.Parsons, (1968), "A Practical handbook of sea water analysis" Bull. Fish. Res. Bd. Canada, 167.

The composition of sediments from the Northeastern Mediterranean

A. YILMAZ and I. SALIHOGLU

Middle East Technical University, Institute of Marine Sciences,
P.O.Box 28, 33731 Erdemli-Icel (Turkey)

ABSTRACT

Mediterranean waters are quite oligotrophic and water becomes increasingly poor as it moves eastwards. Thus the sediment underlying these waters is not as rich in organic material as have been expected, but 1-10cm thick Halocene and Pleistocene sapropels -organic rich clays- are widely distributed in the Eastern Mediterranean (Kullenberg, 1952; Calvert,1983; Shaw and Evans, 1984). The nature, distribution and origin of sapropels in the sediments of especially the Northeastern Mediterranean is lacking, thus the present study is just a start for the future investigation of the chemical compostion of the sediments and the sapropel and sapropelic layer of the sediments in the region. For this purpose core samples were collected during the April,1983 cruise of R/V BİLİM to the NE Mediterranean.

The core samples were collected using a piston corer lined with plastic tube. Opal and quartz were determined on smear slide sediment samples by X-Ray Fluorescence Spectrometer with CuKα radiation following the methods of Eisma and Van der Gaast, (1971) and Calvert, (1966) respectively. The total organic carbon and carbonate were determined using a gravimetric Carbon Analyzer and measuring the carbondioxide evolved by dry combustion at 1100 °C and by hot 10% HCl respectively. Humic acid was extracted from the dry sediment with 0.5M NaOH at reflux temperature. The extracted humic acid is precipitated by the acidification of the extract with 0.1M HCl to pH=2.

The organic carbon content of the sediment samples from the coastal shelf of the NE Mediterranean was very low and measured less than 1% of dry weight. The low percentage of opal, >5%, is also consistent with the low organic carbon content. The concentrations of quartz and clay minerals were also low in the analyzed sediment samples their quantities can be given as >7% and >28% respectively. Thus the major component of the Northeastern Mediterranean coastal sediments is calcium carbonate since for all the analyzed sediment samples the concentration of $CaCO_3$ was in the range of 61-63% . The concentration of total organic carbon in the sediment was found relatively high, 3.8%, at one of the sampling station since the area seems to be under the effect of terrestrial input. On the other hand there is weak possibility of the presence of sapropelic layer in this core sample. The assumption is weak because the total depth of the water column was around 70 m depth where the core sample was collected and it was previously shown that the sapropelic layer was observed in the sediments of 400 m depths or more in the NE Mediterranean (Shaw and Evans, 1984).

The amount of humic acid extracted from the NE Mediterranean coastal sediment samples is quite low, being approximately 1% of dry weight. Humic acid accounts for about 2.0-5.5% of the organic matter in these sediments. In the Eastern Mediterranean sapropels, humic acids were found to amount 22-60% of the total organic material (Deroo, 1978).

REFERENCES:

Calvert, S.E., 1966, "Accumulation of diatomaceous silica in the sediments of the the Gulf of California", Geol. Soc. Am. Bull., 77, pp.569-596.

Calvert, S.E., 1983, "Geochemistry of Pleistocene sapropels from the Eastern Mediterranean", Oceanol. Acta., 6, pp.255-267.

Deroo, G., J.P.Herbin and J.Joucache, 1978, "Organic geochemistry of some Neogene cores from Eastern Mediterranean", Initial Reports of the Deep Sea Drilling Project, Volume XLII, Part 1, April-May, 1975, National Science Foundation, National Ocean Sediment Coring Program

Eisma, D. and S.J. Van Der Gaast, 1971, "Determination of opal in marine sediments by X-Ray Diffraction", Neth. J. Sea Res., 5, pp.382-389.

Kullenberg, B., 1952, "On the salinity of the water contained in marine sediments", Goteborgs, Kungl. Vetenskaps och. Vitterhets-samhalles Handlinger, Sjatte Foljden, Ser. B., Band 6, No. 06, p.3-37.

Shaw, H.F. and G. Evans, 1984, "The nature, distribution and origin of a sapropelic layer in sediments of the Cilicia Basin, Northeastern Mediterranean" Marine Geology, 61, pp.1-12.