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LONG TIME VARIATIONS OF NUTRIENTS AND CHLOROHYLL *A* IN THE COASTAL WATERS OF THE SEA OF MARMARA

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Abstract
Temporal variations of nutrients and chlorophyll *a* (Chla) in the Sea of Marmara were investigated in relation to the eutrophication between March 2002 and December 2005. Average nutrient levels in Tekirdag were higher (NO^-_2+NO^-_3, PO^{-3}_4 and SiO_4 were 0.65±0.86, 0.19±0.37 and 3.91±5.56 mM, respectively) than the average concentrations in Çanakkale (NO^-_2+NO^-_3, PO^{-3}_4 and SiO_4 were 0.51±0.54, 0.08±0.08 and 2.41±1.69 mM, respectively). While average elemental ratios of N/P, Si/N and Si/P were 7.10±10.7, 27.7±107.6 and 62.3±110.7, respectively in Tekirdag, they were 12.3±23.1, 8.57±7.87 and 51.6±46.6 respectively in Çanakkale. In light of these ratios, the system was limited by nitrate than phosphate. Annual average chla concentration was over the 2.50 µg L^{-1} (average: 2.78±3.21 µg L^{-1}). Chla reached to 20.0 µg L^{-1} in some productive periods.

Keywords: Marmara Sea, Nutrients, Chlorophyll-A, Eutrophication, Time series

Introduction

The Sea of Marmara is located between the Aegean Sea and the Black Sea and has two flow systems reverse to each other [1]. The surface waters of the system are originated from the Black Sea surface waters. However, the surface layer waters of south west area of the Dardanelles (St. D) are largely affected by under layer waters due to the topographic upwelling [2].

To determine eutrophic situation of the surface waters in coastal stations of the Sea of Marmara, long temporal variations of nutrients and chlorophyll *a* (chla) were carried out connected with the CTD parameters in the period of March 2002 and December 2005.

Materials and Methods

The data was collected during cruises in the period of March 2002 and December 2005, in the framework of a National project of DIE (TUIK) - DPT, Turkey. It was collected 184 surface samples for each variable during the four years sampling period in the Dardanelles (Fig. 1). While CTD parameters were measured by using YSI 6600 MPS, nutrients and chla were analyzed according to the method of Strickland and Parsons (1972) [3].



Fig. 1. The Sea of Marmara and Sampling Stations

Results and Discussion

Findings showed that while surface temperature varied between 5.83 and 29.80 °C (average: 17.33±6.94 °C) in the costal waters of Tekirdag (Sea of Marmara: St.M), it varied between 5.83 and 26.6 °C (average: 16.1±6.37 °C) in the costal waters of Çanakkale (Dardanelles: St.D). Due to different water layers, surface salinity values varied between 21.08 and 28.76 ppt (average: 23.83±1.79 ppt) in the Sea of Marmara, whereas the salinity varied between 21.9 and 37.1 ppt (average: 25.3±2.71 ppt) in the Dardanelles. Average level of dissolved oxygen was generally close to saturation limit (8.79±1.69 mg L^{-1}). Moreover, pH levels were in limit values and varied between 7.68 and 8.67 (average: 8.26±0.18).

Nutrient levels in the study area were dramatically higher than oligotrophic waters. On the other hand, the concentrations in the Dardanelles (St.D) were lower (NO^-_2+NO^-_3 = 0.51±0.54 µM; PO^{-3}_4 = 0.08±0.08 µM; SiO_4 = 2.41±1.69 µM) than the concentrations in the Sea of Marmara (St.M) (NO^-_2+NO^-_3 = 0.65±0.86; PO^{-3}_4 = 0.19±0.37; SiO_4 = 3.91±5.56 µM) (Fig. 2). It is known that the high nutrient concentrations in the Sea of Marmara decrease considerably as far as the Dardanelles during the Marmara surface flow due to high photosynthetic processes in the Sea of Marmara. Additionally, nutrients are partly exported to the Marmara lower layer. Ultimately, the brackish Black Sea waters reach the Dardanelles Strait with modified biochemical properties [4].

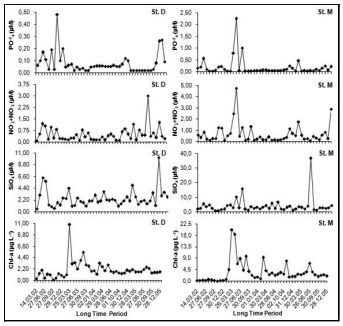


Fig. 2. Long time variations of nutrients and chlorohyll *a* in the coastal waters of the Dardanelles (St.D) and Sea of Marmara (St.M)

Average elemental ratios of N/P, Si/N and Si/P in the Sea of Marmara (St.M) were 7.10±10.7, 27.7±107.6 and 62.3±110.7, respectively, whereas average elemental ratios of N/P, Si/N and Si/P in the Dardanelles (St.D) were 12.3±23.1, 8.57±7.87 and 51.6±46.6, respectively. In light of these ratios, the system was exposed to hypereutrophication and so nitrate was more limiting nutrient than phosphate and silicate. The system was so productive that annual average phytoplankton chla level was 2.78±3.21 µg L^{-1}. On the other hand, chla levels reached to 20.0 µg L^{-1} in some spring and late summer periods (Fig. 2).

In light of the high levels of nutrients and chla, the Sea of Marmara and the Dardanelles are underneath all the heavy pollution due to the urban waste waters of Istanbul and North West Black Sea surface waters more polluted by Danube.

References

1 - Turkoglu M., Unsal M., Ismen A., Mavili S., Sever T.M., Yenici E., Kaya S. and Coker T., 2004. Dinamics of lower and high food chain of the Dardanelles and Saros Bay (North Aegean Sea). *Tubitak Research Project Final Report*, Project No: 101Y081.

2 - Turkoglu M., Baba A. And Ozcan H., 2006. Determination and evaluation of some physicochemical parameters in the Dardanelles (Canakkale Strait-Turkey) using multiple probe system and geographic information system. *Nordic Hydrology*, 37 (3): 293-301.

3 - Strickland J.D.H. and Parsons, T.R., 1972. A Practical handbook of seawater analysis, 2nd ed. Canada.

4 - Polat S.C. and Tugrul S., 1996. Chemical exchange between the Mediterranean and Black Sea via the Turkish strait. *Bull. Inst. Oceanography*, 17: 167-186.