

SPATIAL DISTRIBUTIONS OF NUTRIENTS IN THE NORTH EAST MEDITERRANEAN DURING 2008 – 2009

Fatih Sert ^{1*} and Süleyman Tugrul ¹

¹ Middle East Technical University, Institute of Marine Sciences - fsert@ims.metu.edu.tr

Abstract

North Eastern Mediterranean waters has been surveyed as two distinct basin in Turkish coasts in 2008 – 2009 period. Including Mersin Bay, Cilician Basin were examined with several cruises between March 2008 and October 2009. Moreover, we visited 10 stations (20 miles apart) on a south-north transect in Levantine Sea in March and September 2008. These studies aimed to assess spatial distributions of principal hydro-chemical properties (nutrients, DO, Chl-a) of these two basin with surface distribution and depth profiles.

Keywords: Nutrients, Levantine Basin, Oxygen, Chlorophyll-a, Eastern Mediterranean

The Cilician basin of oligotrophic NE Mediterranean has a wide and shallow shelf zone, so-called Mersin Bay receiving discharges of polluted rivers (Berdan and Seyhan) and domestic wastewaters of Mersin city ^{[1],[2]}. In order to sound understand hydrochemical dynamics of Cilician shelf zone, seasonal cruises were carried out between September 2008 and August 2009. Pre-defined stations on the shelf were visited for measurements of CTD, dissolved inorganic nutrient, total-P, DO, and chl-a concentrations. In September, when the upper layer was thermally stratified and river discharges remained at minimal levels, dissolved inorganic nutrient concentrations were very low in offshore zone of the basin. However, markedly high values of nutrients and Chl-a were recorded in the nearshore waters fed by the rivers. In the winter period, when the upper layer was well mixed and flushed by open sea, nitrate was at levels of 15 – 20 μM in near shore waters; it decreased to levels of 0.1-0.2 levels in the offshore waters. Surface PO_4 concentrations ranged between 0.02 and 0.4 μM , with the largest values in the nitrate and silicate-replete nearshore waters. Total phosphorus (TP) concentrations displayed a similar trend, decreasing from 0.4 μM level to 0.08 μM in the offshore. High TP/ PO_4 molar ratios (10-12) demonstrate that TP pool in the upper layer is dominated by organic P in the shelf zone. In summer of 2009, Chl-a concentration ranged regionally from 0.05-0.1 $\mu\text{g/L}$ levels in offshore to 2.5 – 3.0 $\mu\text{g/L}$ in the coastal waters of the bay. The NO_3/PO_4 (N/P) ratio was apparently high in the nearshore waters fed by nitrate and silicate rich river waters. The offshore N/P ratio declined to levels of 5 – 10 in the studied periods. However, surface Si/ NO_3 ratios ranged between 0.5 – 1.0 in coastal waters of the Cilician basin, whereas the offshore ratio values were in the range of 5 – 8 for 2008-2009. DO concentration in shelf water exceeded the saturation values by up to 10-30% in the eutrophic nearshore zone having markedly high Chl-a values and low water transparency.

The SESAME cruises were carried out in the Cilician and Levantine basins of NE Mediterranean, in March and September 2008. In Cilician basin, relatively higher NO_3 and Si and TP were recorded in the nearshore waters receiving discharges of nutrient-rich rivers and domestic wastes of Mersin city. Surface TP values steadily declined from 0.4 – 0.5 μM in the productive nearshore zone to levels of 0.08-0.10 μM in the offshore water column. A similar spatial pattern was seen in nitrate and phosphate values and also in the N/P ratio.

The N/P ratio in P-depleted offshore waters could be underestimated because PO_4 values could be below the detection of the method (nearly 0.02 μM). The Levantine deep water contained 5-6.5 μM of nitrate and 0.18 - 0.22 μM of PO_4 below 350-400 m, with N/P ratios of 35 - 40. TP values increased from 0.1 – 0.12 μM in the upper layer to 0.25 – 0.30 μM levels in the deep layer. It appears that the TP pool in the deep layer was dominated by PO_4 , whereas organic-P was the major fraction of TP in the upper layer. Surface silicate concentrations were lower in October-08 than in April-08; however, the euphotic zone values generally varied between 1.0-2.0 μM in the upper layer water, increasing up to 10-11 μM levels below 500 m. In the DO-saturated upper layer, Chl-a was relatively low (0.03-0.20 $\mu\text{g/L}$) in the near-surface waters, displaying its characteristic deep maximum (DCM) below 75m. DO declined to levels of 170 – 190 μM in deep layer. POM concentrations were as low as 2 – 4 μM for POC and 0.3 - 0.5 μM for PON in the euphotic zone of the oligotrophic NE Mediterranean. However; POC/PON ratio ranged merely between 6 and 8 in the water column.

References

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