

# DISSOLVED OXYGEN AND NUTRIENT DISTRIBUTION IN NORTH AEGEAN SEA

Alexandra Pavlidou<sup>1\*</sup>, Evagelia Krassakopoulou<sup>1</sup> and Ekaterini Souvermezoglou<sup>1</sup>  
<sup>1</sup> HELLENIC CENTER FOR MARINE RESEARCH (HCMR) - aleka@ath.hcmr.gr

## Abstract

In this work we present Dissolved Oxygen (DO) and inorganic nutrient (nitrate, nitrite, phosphate and silicate) distribution in the North Aegean Sea during April 2008 under the influence of different water masses. The Black Sea Water outcoming from the Dardanelles strait is not enriched in dissolved inorganic nutrients. On the contrary, the North Aegean Deep Waters carry higher concentrations of nutrients. According to DO data, formation of deep waters occurred at station NA2, but not at station NA7.

*Keywords: Aegean Sea, Nutrients, Oxygen*

## Introduction

The brackish, relatively cold and mesotrophic waters exported from the Black Sea to the Marmara upper layer, reach the saline, oligotrophic waters of the Aegean Sea via the Dardanelles surface outflow. Thus, the Black Sea waters (BSW) are expected to contribute to the nutrient balances in the North Aegean Sea [1,2]. On the other hand, the salty Aegean waters enter the Marmara deep basin. The bottom layers of the North Aegean Sea contain one of the denser waters of the world ( $\sigma_\theta > 29.5 \text{ kg m}^{-3}$ ), making it one of the principal dense water formation regions of the Mediterranean [3]. Below the surface layer there is a warm and highly saline water layer originating from the South Aegean and the Levantine, Levantine Intermediate Water (LIW), extending down to 350-400m depth [4,5]. The present work reports the Dissolved Oxygen (DO) and nutrient characteristics in the North Aegean Sea under the influence of the aforementioned different water masses.

## Results and discussion

During the first week of April 2008, sampling was performed at 10 stations; among them, 4 stations were located close to the Dardanelles Strait, 2 northeastern of Lemnos Island and 3 northwestern of Samothraki Island (Fig.1).

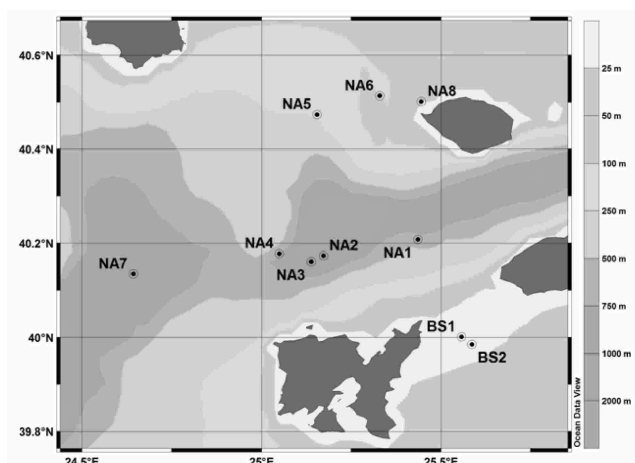


Fig. 1. Bathymetric map of the study area and sampling stations

Mean concentrations of our data are presented in Table I. The DO vertical distribution seem to follow the salinity differences, showing maximum at the surface less saline light waters at the stations located near to the Dardanelles strait which indicate biological production. The significant decrease of DO which was observed at the bottom waters of station NA7 suggest a rather long stagnation period where bottom water formation has not occurred [6]. The BSW outcoming from the Dardanelles strait does not seem to be enriched in dissolved inorganic nutrients, but in organic nutrients [1]. Low inorganic nutrient concentrations have also been reported in other studies in the area, probably because of their exploitation by phytoplankton [7]. On the contrary, the North Aegean Deep Waters (bellow 400m depth,  $\sigma_\theta > 29.35$ ) carry higher concentrations of nutrients.

Tab. 1. Mean concentrations of DO and nutrients in North Aegean Sea

	Stations close to Dardanelles (max depth =1000m)	Northeastern of Lemnos Isl. (max depth =40m)	Northwestern of Samothraki Isl. (max depth =250m)
<b><math>\sigma_\theta &lt; 28.8</math></b>			
DO ( $\mu\text{M}$ )	260 $\pm$ 8.45	260 $\pm$ 1.36	257 $\pm$ 7.28
DIN ( $\mu\text{M}$ )	0.19 $\pm$ 0.14	0.31 $\pm$ 0.13	1.42 $\pm$ 0.22
Phosphate (nM)	5.01 $\pm$ 0.91	2.13 $\pm$ 0.41	10.1 $\pm$ 8.25
Silicate ( $\mu\text{M}$ )	1.54 $\pm$ 0.51	2.00 $\pm$ 0.60	1.20 $\pm$ 0.23
DIN:P	37	~90	22.2
	n=12	n=3	n=15
<b><math>28.8 &lt; \sigma_\theta &lt; 29.35</math></b>			
DO ( $\mu\text{M}$ )	236 $\pm$ 5.16	248 $\pm$ 3.73	237 $\pm$ 8.18
DIN ( $\mu\text{M}$ )	1.05 $\pm$ 0.42	0.33 $\pm$ 0.22	1.56 $\pm$ 0.36
Phosphate (nM)	47.8 $\pm$ 24.3	4.05 $\pm$ 2.70	77.4 $\pm$ 15.1
Silicate ( $\mu\text{M}$ )	1.34 $\pm$ 0.43	1.65 $\pm$ 0.54	1.50 $\pm$ 0.23
DIN:P	29.6	84	20.2
	n=20	n=7	n=5
<b><math>\sigma_\theta &gt; 29.35</math></b>			
DO ( $\mu\text{M}$ )	225 $\pm$ 3.82		
DIN ( $\mu\text{M}$ )	1.70 $\pm$ 0.39		
Phosphate (nM)	59.0 $\pm$ 10.9		
Silicate ( $\mu\text{M}$ )	2.21 $\pm$ 0.79		
DIN:P	26		
	n=6		

At the deep layer of station NA2 nutrients found to be lower than the ones measured at the deep waters of station NA7. More specifically, a decrease of 1.75  $\mu\text{M}$  for inorganic nitrogen, 117.9 nM for phosphate and 3.81  $\mu\text{M}$  for silicate is observed, while the accompanied increase of DO is 17  $\mu\text{M}$ . According to our results it is obvious that formation of deep waters occurred at station NA2, but not at station NA7.

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