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Abstract

The Transitional Mediterranean Water (TMW) and the Cretan Dense Water (CDW) were well defined in the south Aegean Sea during the cruise of July 2000. The dissolved oxygen concentrations at the TMW layer ranged between 4.66-4.77 ml/l. The deep layer of the Cretan Sea appeared well oxygenated with values reaching 4.93 ml/l at 1170m depth. The maximum of nutrient concentrations were recorded at the same layer that exhibits the minimum oxygen concentrations (TMW layer).

Keywords: Aegean Sea, seawater, sediments.

Introduction

The southern Aegean Sea is one of the most oligotrophic sub-basins of the Mediterranean Sea. It is noticeable that nutrient concentrations in the Aegean Sea are twelve times lower than in Atlantic Ocean and three times lower than in Ionian Sea. In the framework of several international programs during the last years (e.g. POEM, POEMBC, PELAGOS/MTP-I, MED/POL-Aegean Sea), a number of studies have dealt with the Southern Aegean Sea (Cretan Sea) and the straits of the Cretan Arc [1,2,3].

This paper aims to record the dissolved oxygen and nutrient distributions in the south Aegean sea and the organic content in the sediments as well as to compare with data from previous studies.

Materials and Methods

Seawater and surface sediment samples (0-3 cm) were collected at five stations in the Aegean Sea, with the oceanographic vessel "Aegeo" (fig. 1). DO measurements were performed on the oceanographic vessel "Aegeo" using the Winkler method [4]. Phosphate were also measured on board with a Perkin-Elmer UV/VIS (Lambda 2S) spectrophotometer using standard method [5], whereas silicate, nitrate and nitrite were measured with a RAN+LUEBBE autoanalyzer according to standard methods [6,7].

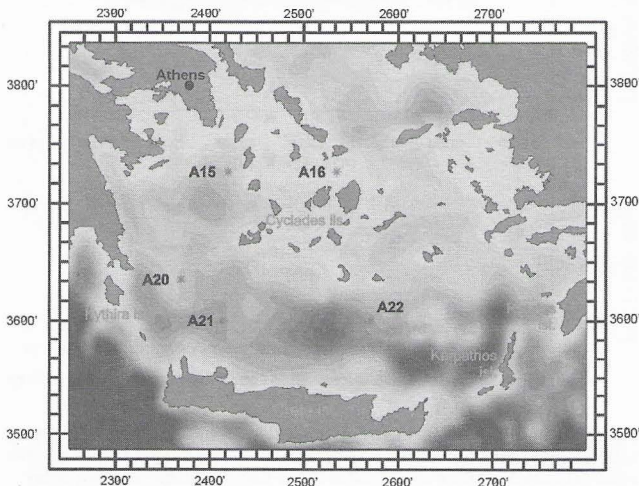


Fig. 1: Bathymetric map and location of the sampling stations in the Aegean sea during July 2000.

Results and discussion

In the upper layer (up to 100m) of the south Aegean Sea, the temperature, salinity and density values ranged as follows: temperature: 15.09-24.65°C, salinity: 37.84-39.18 psu and density: 25.91-28.93. In the deep layer (100m-bottom) the respective temperature, salinity and density variations recorded as follows: temperature: 14.24-15.67°C, salinity: 38.86-39.04 psu and density: 28.82-29.26.

DO concentrations at the surface do not exceed 4.9 ml/l, diminishing with depth below 75 m. Below 400m strong negative gradient of DO concentration is observed, associated with the presence of Transitional Mediterranean Water (TMW) in the intermediate layer (500-700m), which is a rather "old" water mass [2]. The deeper (>700m) layers of the Cretan sea are well-oxygenated (4.93 ml/l at 1170m), identifying the presence of the Cretan Dense Water (CDW), which is relatively "young" water mass.

Nutrient distribution shows enrichment in reactive phosphate, nitrate and silica below 200m, which rises progressively with depth (figs.1, 2). The TMW layer of the Cretan Sea is characterized by the maximum nutrient concentrations associated with the biochemical processes (oxidation, regeneration) that occur in this layer. The TMW layer is a "nutrient-rich and oxygen-poor" water mass. The nutrient concentrations recorded in the intermediate layer of the Cretan Sea, are within the same range of values reported after 94-95, and much higher than those measured during 1980-90 [8].

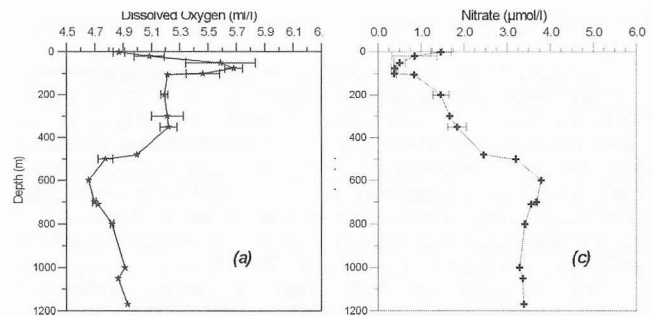


Fig 2: Vertical distribution of the mean concentrations of DO in the Aegean Sea during July 2000. Fig 3: Vertical distribution of the mean concentrations of nitrate in the Aegean Sea during July 2000

Total carbon content in sediments ranged between 7.1 to 9.3. The ratio organic carbon to nitrogen is rather high according to the Redfield value and ranged between 9.0-11.6, indicating that surficial sediments are relatively impoverished in nitrogen, possibly due to the oligotrophic character of the study area and/or to the higher turnover rate of nitrogen relative to carbon. The C:N ratio of these Southern Aegean sediments is comparable with the recently reported values for sediments from the northern Aegean Sea.

Conclusions

Minimum values of dissolved oxygen and maximum of nutrients were observed at the TMW layer, whereas the higher oxygen and lower nutrient content observed in the deep layer of the South Aegean is related to the presence of the Cretan Dense Water (CDW).

The nutrient concentrations recorded in the intermediate layer of the Cretan Sea are within the same range of values reported after 94-95, and much higher than those measured during 1980-90. The relative nitrogen deficiency of the sediments defines the oligotrophic character of the Aegean Sea.

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