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# SHORT TIME VARIATIONS OF CHLOROHYLL A AND NUTRIENTS IN THE DARDANELLES, TURKEY

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## Abstract
The distribution of chlorophyll a and nutrients were investigated in relation to the hydrography in the period of January 2002 and January 2004 in the Dardanelles. Nutrient levels were lower in the upper layer waters than in the lower layer waters due to excessive algal blooms in the surface waters. In vision of nutrient ratios (N:P=3.21, Si:P=33.17 and Si:N=12.71), nitrate was more limiting nutrient than phosphate. In addition to high chlorophyll a levels in surface waters (3.01±2.83 µg $L^{-1}$), there were secondary high values of chlorophyll a in subsurface depths especially in spring and summer periods.
*Keywords: Dardanelles, Chlorophyll-a, Nutrients, Hydrography, Time Series*

The distribution of phytoplankton chlorophyll a and inorganic nutrients were investigated along with hydrography in just nouthern part of the Nara Cape of the Dardanelles (Fig. 1).

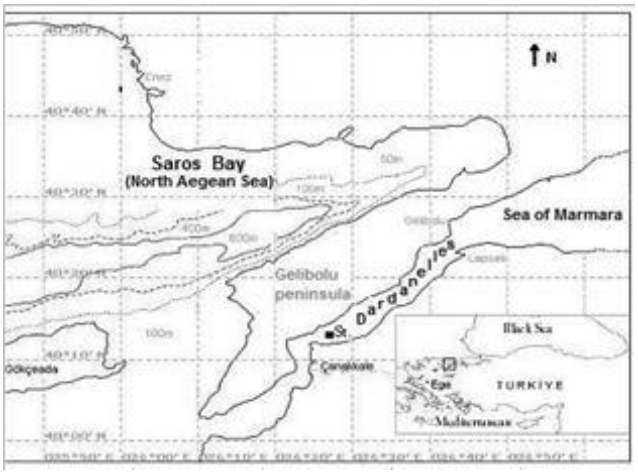



Fig. 1. Map of the Dardanelles (Çanakkale Strait) and sampling station (St.)

The Dardanelles is located between the Aegean Sea and the Sea of Marmara and has two flow system reverse to one another [1]. The data were collected during cruises in the period of January 2002 and January 2004, in the framework of a National project of TUBITAK, Turkey [1]. It was collected 74 surface samples for chlorophyll a and nutrient during the two years sampling period. CTD parameters, nutrient and chlorophyll a were measured by using YSI 6600 MPS, Autoanalizor and spectrophotometer, respectively [2]. Results showed that temporal temperature variations in surface waters (6.25-25.99 °C) originated from the Black Sea were higher than deep waters (13.09-18.44 °C) originated from Mediterranean. Due to two different water systems, there were two temperature stratification reverse to one another during the year. Since surface water of the Dardanelles was affected by the Black Sea, there was a vertical salinity profile increasing with depth (from 22.28-26.95 to 38.09-38.93 ppt) during the year. Dissolved oxygen in surface waters were generally close to saturation limit (10 mg $L^{-1}$) and sometimes were higher than the limit (>10 mg $L^{-1}$). Due to excessive algal blooms in the surface waters [1], surface levels of nutrients were lower (0.21±0.22 µM for $NO^{-}_{2}$+$NO^{-}_{3}$, 0.08±0.05 µM for $PO^{-3}_{4}$ and 1.80±1.14 µM for $SiO_4$) than deep levels (0.50±0.35 µM for $NO^{-}_{2}$+$NO^{-}_{3}$, 0.08±0.06 µM for $PO^{-3}_{4}$ and 2.80±0.97 µM for $SiO_4$) except for $PO^{-3}_{4}$ (Fig. 2). Elemental ratios of N:P, Si:P and Si:N were calculated to be 3.21±2.70, 33.17±34.47 and 12.71±11.52 in surface waters respectively, whereas they were calculated to be 6.66±5.92, 38.40±19.86 and 8.76±7.14 in deep waters respectively. In vision of the elemental ratios, nitrate was more limiting nutrient than phosphate. Chlorophyll a ranged from 0.13 to 15.21 µg $L^{-1}$ (3.01±2.83 µg $L^{-1}$) in surface waters. In addition to high chlorophyll a levels in surface waters, there were secondary high values of chlorophyll a (min-max: 0.47-16.16; mean: 3.18±3.02 µg $L^{-1}$) in subsurface layer waters (10 m) in some periods, especially in spring and summer periods (Fig. 2).

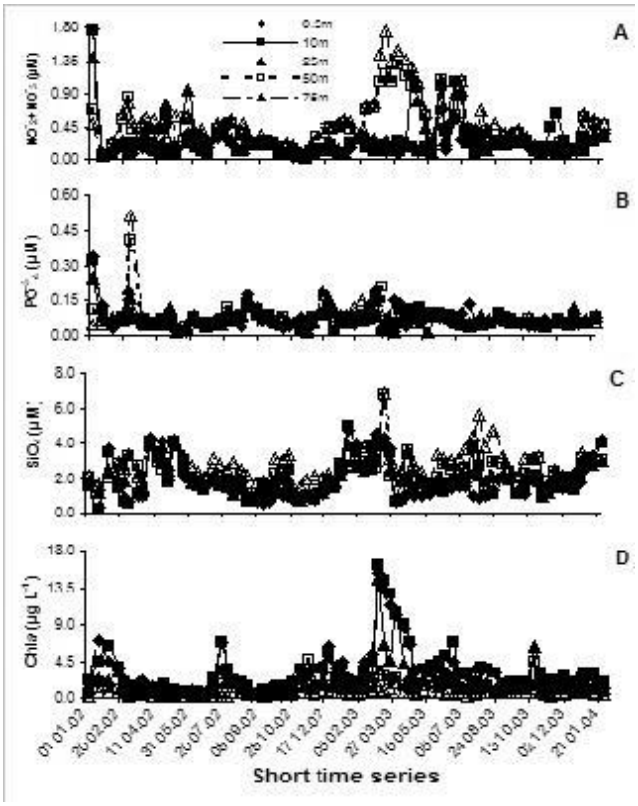



Fig. 2. Short time variations of nutrients and chlorophyll a in the Dardanelles (Çanakkale Strait)

At sight of high levels of nutrients and chlorophyll a, Dardanelles is under the heavy eutrophication due to the fact that it is a part of the Turkish Strait System affected by the Black Sea.

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