OPTICAL AND THERMOHALINE CHARACTERISTICS OF THE SOUTH ADRIATIC WATER IN JULY 2003

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Abstract

Vertical irradiance attenuation coefficients were determined for 14 wavelengths from recent spectral irradiance measurements in the South Adriatic, during Meduza experiment. The first results enabled optical and thermohaline characterization of the water masses.

Key words: spectral irradiance attenuation; fluorescence; thermohaline conditions.

Introduction

Thermohaline, chemical and biological conditions in the intermediate layer of the South Adriatic are influenced by inflows of more saline (1), warmer and nutrient richer LIW from the Mediterranean. These intrusions fluctuate, causing increase of temperature, salinity and productivity in the waters of the South Adriatic, influencing also optical properties (2). Summer season, like this measuring period is generally characterized by weaker influence of LIW, entering the Adriatic in the intermediate layer only.

Measurements were performed in the frame of international experiment Meduza (see www.izor.hr/meduza/index.htm) onboard the 35m long research vessel *Naše More* , from the Croatian Ministry of Science.

Materials and methods

The spectral irradiance and radiance were measured with Biospherical profiling radiometer at 14 wavelengths in the range 340-710nm, together with the PAR attenuation, and natural fluorescence. The CTD measurements were taken with the Idronaut probe. The cruise from 22-29 July 2003 was confined to the area above 1200m isobath, within 5miles around the position 42.17° N 17.82° E. The daylight attenuation measurements were performed three times, while CTD casts and other parameters (not presented here) were taken four times a day. Since measurements were repeated daily in the same time, aparent optical data with the same solar altitudes were acquired. The measurements were interupted from the noon time 25th till the morning 27th July, due to unconvenient weather conditions.

Results

Vertical attenuation coefficients for downwelling irradiance were about two times higher than the coefficients for upwelling radiance, but their spectral dependence is very similar. Considering the different solar elevation, attenuation was stronger for the lower solar elevation (3). In the investigated water column, between 0-80m, distinguished are spectral characteristics by layers (Fig. 1).

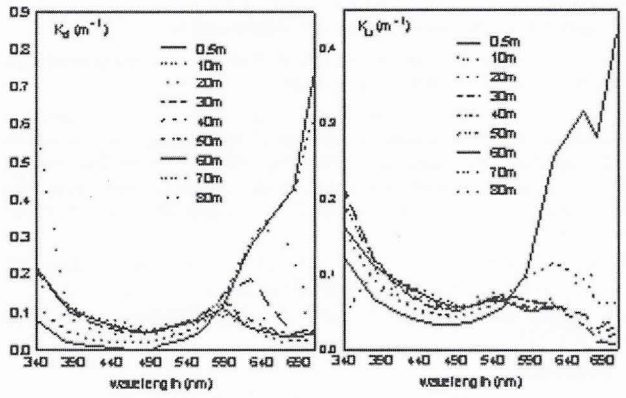

Fig 1. Vertical attenuation coefficients for downwelling irradiance and upwelling radiance for 24.07.2003, measured at the noon time.

Both attenuation coefficients for downwelling irradiance and upwelling radiance have in the first 10m maximum in the red spectrum, due to strong apsorption in water. Attenuation coeficients have minimum at 490nm, showing that South Adriatic is most transparent for this nuance. Attenuation coefficients are increasing from the blue light toward the UV wavelengths. Especially in the deep layers, coefficients for UV are high, while the minimum is reached in the first few meters.

Since the area of measurements is far from the coast in the oligotrophic sea, it is assumed that principal factor influencing optical properties is phytoplankton, and eventualy its decomposing products. Therefore, part of attenuation in UV and blue spectral region come from chlorophyll.

From the natural fluorescence channel Lu(chl), vertical profile was obtained (Fig. 2). In addition to exponential decrease of Lu(chl), in deep layers, increased upwelling signal from fluorescence appears from the first deep chlorophyll maximum. Depth of more intense fluorescence signal moved around 60 to 80m during the measuring period. These data, together with the rate of PAR attenuation enabled calculating fluorescent flux (4).

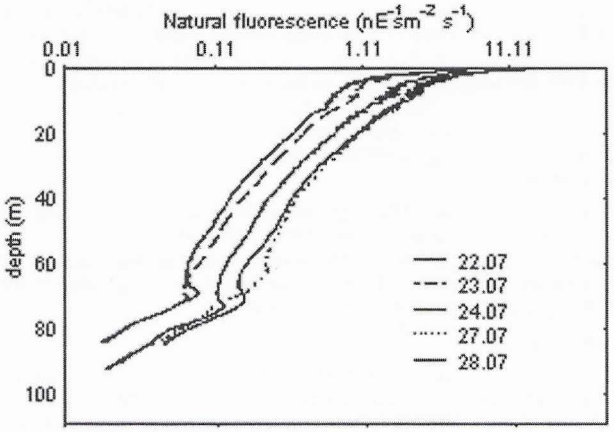

Fig 2. Natural fluorescence signal determined from upwelling radiance Lu (Chl) during 22-28.07. period at 18h.

The thermohaline conditions during the cruise were characterized with very warm and stratified surface layer (around 27°C). Relatively shallow thermocline for the mid-summer at only 10m is caused by the lack of stronger wind action this summer. Salinities were high (>38.7), but within the usual range for the recent period and for the summer season.

Conclusions

The surface 80 meters of the South Adriatic are the most transparent for 490nm, as expected for the oligotrophic waters. Depth dependence of attenuation coefficients and natural fluorescence indicate the presence of higher chlorophyll concentrations in the deep layers around 60-80m.

Optical measurements performed for the first time in the Eastern part of Adriatic waters with sofisticated instrumentation, opened new possibilities for obtaining high resolution vertical profiles of chlorophyll concentration, and primary production estimates.

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