SEASONAL VARIABILITY OF PHYSICAL AND CHEMICAL PARAMETERS OF THE NORTHERN AND CENTRAL ADRIATIC SEA DURING 2001

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Abstract
During 2001 three oceanographic cruises were carried out in the northern and central Adriatic Sea. Several measurement were situated along multiple transects. In each station physical and chemical parameters were collected in order to study the dynamics of the coastal and off-shore area through the space and the time. The basin showed high nutrient variability during all the year. Nutrient concentrations appeared influenced by river discharge, vertical mixing in the different cruises and uptake from phytoplankton groups.
Keywords: Adriatic Sea, Nutrients, Salinity, River Input

The Adriatic is a continental basin of the Eastern Mediterranean Sea, located between the Italian peninsula and the Croatian coast; it is elongated in the SE-NW direction. The northern sub-basin is very shallow and gently sloping, with an average bottom depth of about 35 m. River runoff is particularly strong in this area and affects the circulation through buoyancy input and the ecosystem by introducing large amounts of organic matter. the Po river, with an average annual discharge of 1500 m^3s^{-1}, accounts for about 50 % of the total northern Adriatic river runoff [1]. The middle Adriatic is a transition zone between northern and southern sub-basins, with the three Jabuka depressions reaching 270 m depth. Two currents dominate the circulation in the Adriatic: the West Adriatic Current (WAC) flows toward southeast along the western (Italian) coast, and the East Adriatic Current (EAC) flows northwest along the eastern (Croatian) coast, [2, 3].

The temporal variations of physical and chemical parameters in the Adriatic Sea were observed during three periods (January, June and September 2001) in order to increase the understanding of the area. The CTD (Conductivity-Temperature-Depth) data were collected at all the stations with a SeaBird Electronics SBE 911-plus CTD, equipped with other ancillary sensors. Water samples were obtained by the upcasts with a SeaBird Carousel rosette water sampler. Water samples were collected to analyse nutrient salts and DO (Dissolved Oxygen) with the potentiometric titration method.

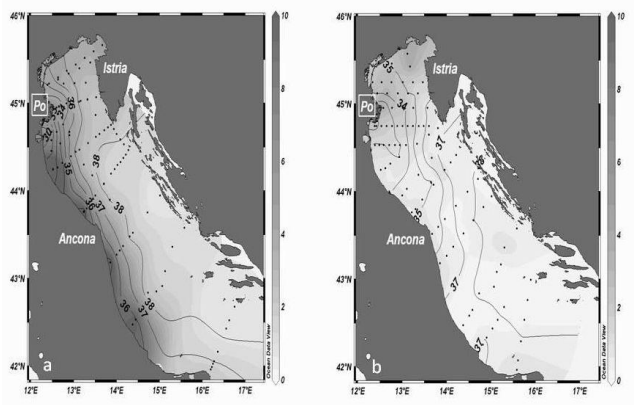

Fig. 1. Winter (a) and late spring (b) surface field of: Salinity (black contour, interval 1) and Nitrate (color shading, µmol l^{-1}). The dots represent the sampling

During the winter cruise (figure 1a) in situ measurements indicated cooler, fresher water to the north and warmer, saltier water to the south of the front located at the southern tip of Istria. Furthermore two months before the cruise the river discharge was about 3 times higher that the mean value (about 5500 m^3 s^{-1}). Nutrient concentrations were high along the western boundary and decreased rapidly toward the east forming a strong front along the western side of the Adriatic. The nutrient contribution from the Po plume to the north-western basin is evident in the high nitrate concentrations (6-8 µmol l^{-1}) associated with the salinity minimum of the plume. During the late spring cruise (June, figure 1b) the Po plume remained a significant feature in the northern and western Adriatic. Offshore from the mouth of the Po River, the surface layer was characterized by low salinity (30-32) and high temperature (22-23 °C). The Po plume extended much more eastward in late spring than in winter because the vertical mixing is reduced [4, 5]. Low nutrient concentrations were observed in the central basin despite the northern Adriatic shown relatively high nitrate + nitrite concentrations (2-4 µmol l^{-1}). The late summer cruise (September) showed similar patterns of the late spring cruise.

The Adriatic basin showed more nutrient variability during the winter period because of major river discharge during autumn 2000 and vertical mixing. In particular, during spring and summer the nutrient concentrations decreased in most of the basin and this was probably due to uptake from phytoplankton groups under conditions of high available light. This feature was also evidenced by high DO concentrations in these periods respect to winter cruise. The redfield ratios (N/P and Si/P) off-shore were similar to the classic ocean model but with nutrient concentrations slightly higher. The western coast showed high redfield ratios that implied processes of eutrophycation probably due to high river input.

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