ISTRIAN COASTAL COUNTERCURRENT IN THE YEAR 2000

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Abstract

The Istrian Coastal Countercurrent (ICCC) appeared in March and August 2000, when a mucilage event occurred in the northern Adriatic. The ICCC intensity was lower than in some years in the past when mucilage and/or anoxia events were observed (1977, 1989, 1991, 1997). However, transverse transport of freshened waters was in the year 2000 registered already in March, despite the unusually low Po river discharge. This indicates a reduction of the water exchange rate between the northernmost part and the rest of the Adriatic, which favours the development of undesirable phenomena.

Keywords : Adriatic sea, mucus aggregates, currents

Introduction

Changes in the circulation pattern have been assumed to play an essential role in the development of undesirable phenomena (extended mucilage and bottom anoxia events) that were periodically observed in the northern Adriatic (e. g. 1, 2). Originally, it was held that surface circulation in the region is cyclonic, with a northerly flow along the eastern (Istrian) coast. However, an analysis of relative geostrophic currents in the 1966-1997 period has indicated that countercurrent can also be established within the eastern coastal belt, up to 12 NM wide (2). This southerly current has been named the Istrian Coastal Countercurrent (ICCC). It was well developed in August and was intense (7-15 cm/s) or pronounced (up to 7 cm/s) in most of the years of the investigated period. Summer mucilage or autumn anoxia events in the northern Adriatic in the 1966-1997 period were observed in the years in which the ICCC was intense (in 1977, 1988, 1989, 1991 and 1997; 2).

In this paper the geostrophic currents in the Istrian coastal belt and the ICCC occurrence during the year 2000, when a mucilage event occurred in the northern Adriatic, are described.

Materials and methods

The geostrophic currents with respect to the 30-dbar surface between stations RV001 and SJ107 (Fig. 1) during the year 2000 were computed by the standard oceanographic method (2) using salinity and temperature data collected monthly at 0, 5, 10, 20 and approximately 30 m depths.

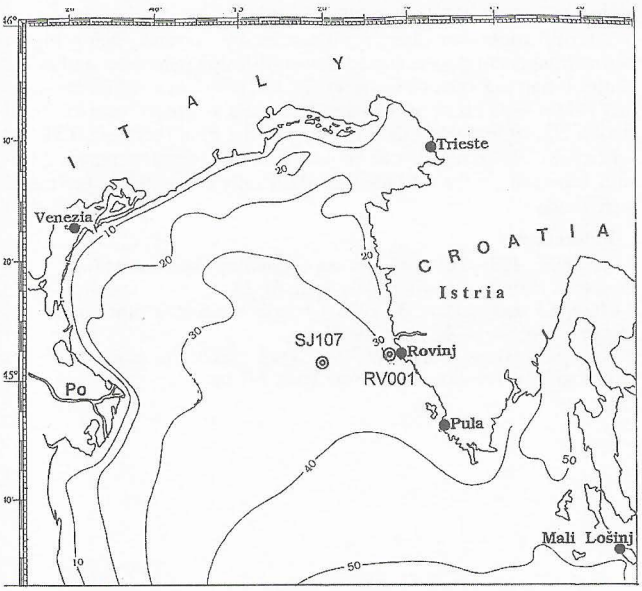

Figure 1. The northern Adriatic with the oceanographic stations.

Results and discussion

During the year 2000 the ICCC occured in March (7 cm/s), in late August (5 cm/s) and in September (4 cm/s; Fig. 2). Strong density gradients in northeastern Adriatic, resulting in the appearance of the ICCC, were caused by inflow of low saline water – presumably of the Po origin – in the area (CMR, unpub. results).

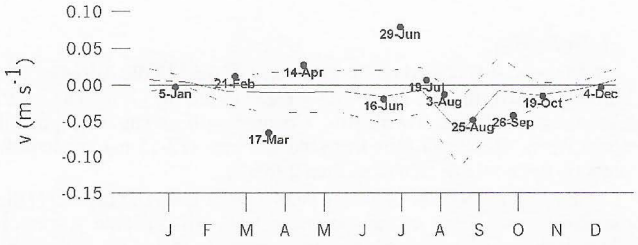

Figure 2. Geostrophic current speeds, computed relative to the 30-dbar surface, between the stations RV001 and SJ007 during the year 2000 (filled circles). Solid and dashed lines represent averages and standard deviations for the 1972-1992 period. Positive values indicate inflow into the northern Adriatic.

Generally, in winter the freshened Po-influenced waters are confined to the western coast, whereas during late spring and summer, when the river discharge rates often increase considerably, they can spread over larger areas of the northern Adriatic. However, their influence on the northeastern Adriatic significantly varies from year to year. Low salinity waters in the northeastern Adriatic in March 2000 give evidence that Po influenced the region by the end of winter, despite its discharge rate being significantly lower than the long term average for this month (CMR, unpub. results).

It has been hypothesized that the ICCC occurred in August in years in which a significant amount of freshened waters entered the northeastern Adriatic and was kept in the area within an anticyclonic gyre (3). That led to reduction in the water exchange rate between the northernmost part and the rest of Adriatic. An increased residence time of low salinity and nutrient rich Po-influenced waters would favour eutrophication processes and mucilage accumulation in the area. Data collected during the summer 2000 seemingly support the hypotheses, but they can be thoroughly verified only by a comprehensive research effort, designed to collect reliable data on water exchange rates, circulation patterns, and their influence on the ecosystem of the region.

References

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