TRENDS IN GEOSTROPHIC CURRENTS IN THE VICINITY OF ISTRIAN COAST (NORTHERN ADRIATIC)

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Abstract

The analysis of the 1966-2005 data series shows that trends in geostrophic circulation in the coastal zone off Istria are pronounced and closely follow trends in temperature and salinity in the region.

Keywords : Adriatic Sea, Circulation, Temperature, Salinity.

Intoduction

Trends in temperature and salinity of the northern Adriatic are nowadays widely investigated. In this preliminary study we analyse geostrophic currents in the vicinity of the Istrian coast over the 1966-2005 interval, in order to find out whether they are subject to trends as well. A long term analysis [1] showed that on average there is a summertime outflow of water near the Istrian coast, named Istrian Coastal Countercurrent (ICCC). The summer mucilage and autumn anoxia events in the northern Adriatic in the 1966-2002 period were observed exclusively in the years in which the ICCC was more intense [1, 2]. It is held that the ICCC is part of an anticyclonic gyre, which encircles a pool of warm and low salinity waters of Po river origin.

Data and methods

Sea temperature and salinity data were collected in August over the 1966-2005 period at stations RV001 and SJ107 in the coastal zone off Istria (Figure 1) at 0, 5, 10 and 20 m and at 2 m above the bottom, and were used to compute surface geostrophic currents relative to 30 m between the two stations as practiced before [1]. Currents are positive when they indicate an inflow to the northern Adriatic.

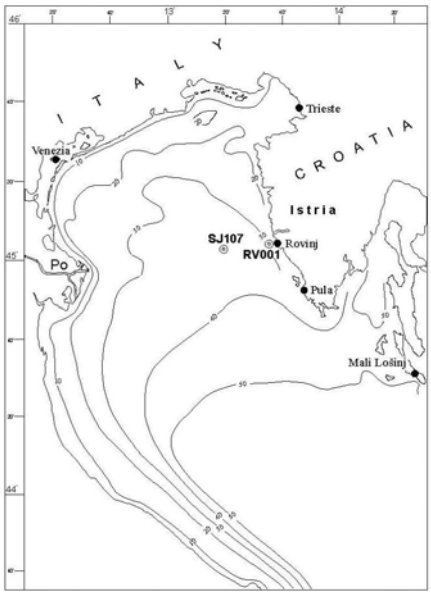

Fig. 1. Map of the northern Adriatic.

Results

As shown in Figure 2, over the 1966-1992 interval summertime currents near the Istrian coast were generally negative (i. e. of south-eastern direction, ICCC). However, while year-to-year changes of the currents in the 1966-1982 interval were highly pronounced, in the 1983-1992 period the currents were relatively strong and quite persistent. After 1992 the currents showed a positive trend - they were more often positive (i. e. of north-western direction) while intensity of currents with negative sign (ICCC) decreased with respect to the previous, 1983-1992 interval. Figure 2 also shows that trends in changes of coastal currents closely followed trends in the August temperature and salinity in the region (computed as average temperature and salinity of the 0-30 m layer at RV001 and SJ107). In the 1966-1982 interval both temperature and salinity were highly variable, from 1983 to 1992 they were rather stable, while after 1992 the values of both parameters increased.

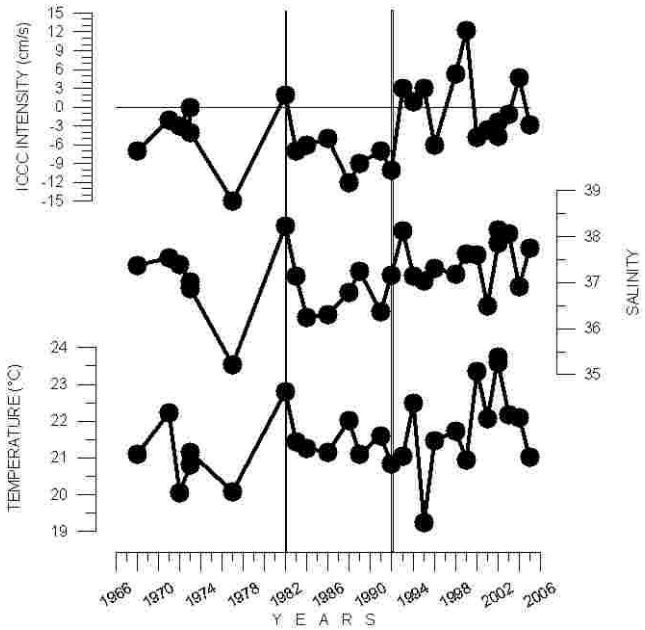

Fig. 2. Speed of geostrophic currents determined from data collected at stations RV001 and SJ107 in August over the 1966-2005 interval in comparison with average August values of temperature and salinity in the region. Positive speeds imply an inflow to the northern Adriatic.

Conclusion

Our analysis shows that trends in circulation in the coastal zone off Istria are pronounced and closely follow trends in temperature and salinity in the region. In addition, we show that after 1992 occurrences of the ICCC become less frequent and less intense. This change coincided with the appearance of a strong positive trend in temperature and salinity in the region. A preliminary analysis indicates that changes in temperature and salinity in summer are highly influenced by the preceding meteorological and hydrologic conditions.

References

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2 - Grilli F., Pascini E., Precali R., Russo A. and Supic N., 2005. Circulation and horizontal fluxes in the northern Adriatic in the period June 1999-July 2002. Part 1: Geostrophic circulation and current measurement. *Sci. Total Environ.*, 353: 57-67.