SEASONAL VARIABILITY OF NORTHERN ADRIATIC'S CARBONATE SYSTEM

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Abstract
The considerable amount of anthropogenic carbon dioxide absorbed by oceans since the Industrial Revolution, brought to acidification of the sea on a global scale and it represents one of the worst danger of this century for marine ecosystems. The negative impact of this phenomenon could be greater especially in coastal ecosystems, characterized by a higher variability, as the northern Adriatic Sea. The temporal and spatial variability of the carbonate system has been studied, on a seasonal scale, focusing on a representative area of the northern Adriatic Sea.

Keywords: Carbon, North Adriatic Sea, Deltas

Shallow semi-enclosed ecosystems as the northern Adriatic Sea (NAd) are characterized by a high variability. In this area an acidification process of 0.0025 pHT units year^{-1} was observed [1]. Riverine waters inflow in the NAd contribute to increase the total alkalinity due to the carbonate weathering in the drainage basin.
Samplings have been performed at 4 depths (0, 10, 20 and bottom) on an almost monthly basis from December 2014 to January 2016 on 6 sampling stations along a transect crossing the NAd (figure 1). Total alkalinity (TA) and pH were measured by open cell potentiometric titration and by m-cresol purple spectrophotometric method, respectively Other parameters as salinity, temperature, dissolved oxygen, nutrients, chlorophyll a were measured. TCO_2 was derived from the measured variables of the carbonate system with CO2SYS software [2].

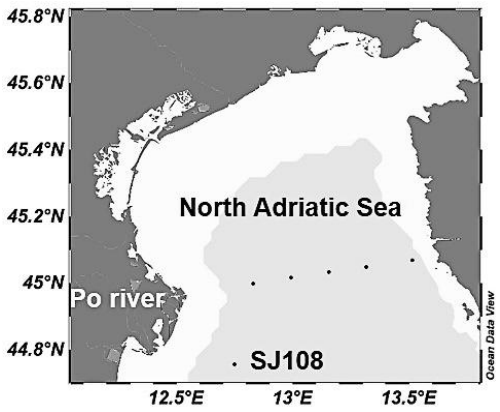

Fig. 1. Map of the sampling stations along a transect from Istria to Po river delta and of the SJ108 station positioned south of the delta.

The data showed a strong influence of riverine waters on the majority of the parameters, indeed, smaller variations of temperature, pH_T(25°C), total alkalinity, dissolved inorganic carbonate (TCO_2) and oxygen concentration have been observed in the oriental sector of the basin (oligotrophic) rather than in the occidental sector (mesotrophic). During spring, with the beginning of stratification, superficial waters were characterized by negative values of apparent oxygen utilization (AOU) and by high values of in situ pH_T, index of the prevailing of primary production processes, in the same period a positive correlation between TCO_2 and AOU was found ($p<0.0001$) indicating a strong influence of respiration on TCO_2. In months with higher riverine discharges, both alkalinity and TCO_2 were increasing in correspondence with higher nutrients concentrations. TA and TCO_2 showed a significant negative correlation with salinity ($p<0.0001$) in surface waters, stronger for samplings performed closer to flood events. Moreover an inverse linear regression between AOU and pH_T(25°C) was indicating a crucial influence of primary production and respiration processes in determining pH. The overall variations of pH_T were similar to the annual variations observed in the Trieste gulf [3, 4].
The freshwater discharges increase alkalinity and TCO_2 and the overall effect is an increase of the buffering capacity of the system. During the seasonal stratification under the pycnocline the respiration processes highly contribute to increase the TCO_2 in summer, as shown in figure 2 for a station (SJ108) under the direct influence of the Po river discharge.

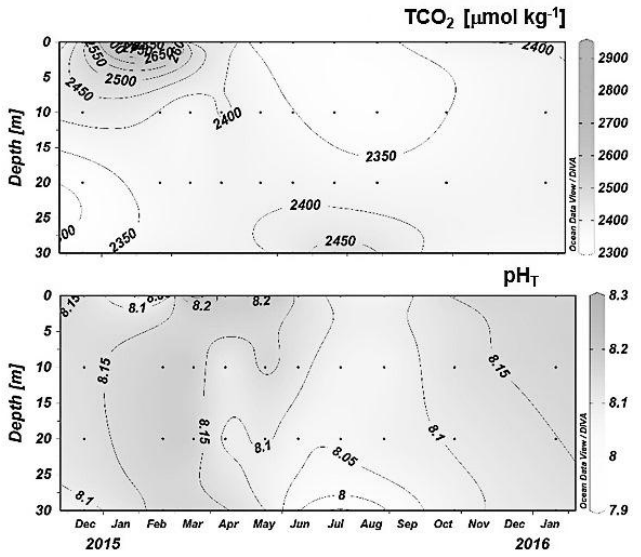

Fig. 2. Temporal variations of TCO_2 and *in situ* pH_T in the water column at the station SJ108.

References

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