

OXYGEN - TOTAL CARBON DIOXIDE - PHOSPHATE CORRELATION IN THE ADRIATIC
WATERS

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SUMMARY

Correlation between O_2 , total CO_2 and PO_4-P was studied in Central and South Adriatic waters. These parameters are good indicators of water mass properties in the sea. Our results showed the presence of two water types, the water coming from the north and the eastern intermediate water coming from Mediterranean. The latter one seriously affects the Adriatic sea.

RÉSUMÉ

La corrélation de l'oxygène (O_2) à savoir AOU, du total CO_2 et du phosphate PO_4-P a été recherchée dans deux vallées adriatiques. Ces paramètres peuvent servir de très bons indicateurs à la caractérisation des masses d'eau dans une mer donnée. Les résultats ont démontré la présence de 2 types d'eau dans les régions recherchées.

Material and Methods

The paper reports some results of studies of the above mentioned parameters at two open-sea stations in the central and southern Adriatic during 1977. Standard oceanographic methods were applied.

Results and Discussion

Table 1. Annual means of studied parameters at station 3 (Jabuka Pit)

Z (m)	CO_2 mol/l	O_2 ml/l	AOU ml/l	(PO_4) $\mu mol/l$	P-tot. $\mu mol/l$	Po $\mu mol/l$	a
0	2.21	5.30	0.18	0.071	0.117	0.046	7.2
20	2.30	5.66	0.03	0.067	0.109	0.042	0.12
50	2.31	5.67	0.12	0.014	0.106	0.032	4.28
100	2.33	5.20	0.64	0.076	0.106	0.030	13.9
200	2.37	5.56	1.42	0.103	0.178	0.075	50.3
260	2.43	4.20	1.71	0.148	0.223	0.075	22.8

According to the Redfield et al. (1963) model which applies to a calm, closed system, $O_2:CO_2$ correlation is linear. We, however, established this linear correlation for the Station 3 only. This non-linearity is, to a certain extent, due to the fact that O_2

Table 2. Annual means of studied parameters at station 15 (Southern Adriatic)

Z (m)	CO_2 mmol/l	O_2 ml/l	AOU ml/l	$(PO_4)_{ox}$ $\mu\text{mol/l}$	P-tot. $\mu\text{mol/l}$	Po $\mu\text{mol/l}$	a
0	2.29	5.08	0.19	0.060	0.140	0.080	9.5
20	2.22	5.74	0.20	0.060	0.237	0.177	5.0
50	2.28	5.64	0.12	0.057	0.146	0.089	3.7
100	2.30	4.84	0.94	0.080	0.141	0.061	49.5
300	2.30	4.83	0.97	0.082	0.175	0.093	88.2
500	2.31	4.98	0.83	0.093	0.150	0.057	23.0
1000	2.32	5.14	0.72	0.085	0.174	0.089	18.0
1190	2.28	4.95	0.92	0.107	0.164	0.057	18.4

utilization, that is $AOU = O_2 - O_2$, is not caused only by organic matter oxidation, but by other factors as well, such as water masses mixing. Our calculations showed that about 0.4 ml O_2 /l was lost by mixing. This was obtained for Station 3. However, this calculation could not be applied to Station 15 owing not only to the presence of a number of different water types there but also to their very intensive mixing. Accordingly, AOU may be a very good indicator of water masses mixing and movements.

Since biochemical processes of O_2 generation and utilization are linearly correlated to the phosphate $(PO_4)_{ox}$ utilization and release, it may be assumed that maximum O_2 quantities will be recorded from areas with minimum PO_4 quantities. We actually recorded this situation.

The correlation between oxidative phosphates $(PO_4)_{ox}$ and pre-formed phosphours (P_o) and AOU is given by equation after Pytkowicz (1966).

$$(PO_4)_{ox} = P_o + 1/a$$

where a is the stoichiometric ratio of utilized oxygen to phosphate $(PO_4)_{ox}$ release.

We calculated this ratio for studied stations (Tables 1 and 2).

Results showed that only surface Adriatic layers show the ratio which approached the mean ocean values ($3 \text{ ml O}_2 / 1 \mu \text{ mol PO}_4$). Values from intermediate and bottom layers were considerably higher. These higher values in the intermediate layer may be accounted for by the effects of Mediterranean water of somewhat higher Sal ‰, lower O_2 values and considerably higher nutrient levels. These higher values of a factor could be expected for the Adriatic since the overall Adriatic may be held to be an oligotrophic basin with rather low organic production.

References:

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