Chemical parameters distribution in the Ionian Sea during POEM-06 Cruise (October 1991)

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In this paper the dissolved oxygen and nutrients distribution of the POEM grid for the Ionian Basin is reported (Fig. 1), data were collected in October 1991 during the Italian POEM 06 Cruise.

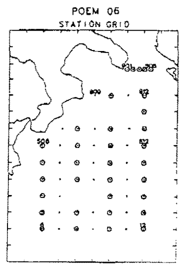

Fig. 1.
•: station with nutrients data

Typical dissolved oxygen profile is shown in Fig. 2. It exihibits a subsurface maximum (about µM) between 50 and 100 m. A wide water body with oxygen content of 190-200 µM lyes between 500 and 2.000 m. The minimum value is observed at about 1.000 m. In the deepest layer the oxygen content slowly rises up the value greater than 205 µM.

The nutrients distribution of the surface layer (0-150 m) is nearly homogeneous, exihibiting concentration values of 0.1, 0.05 and 1.0 µM for nitrate, phosphate and silicate respectively. Nutricline occures at about 150-200 m, corresponding to the oxygen minimum. Below 500 m, a wide, homogeneous region with the highest concentration values (nitrate: 5-5.5 µM; phosphate : 0.3-0.35 µM; silicate : 9-10 µM) extends as far as 2000 m, going on well with the oxygen minimum region. In the bottom layer concentration values go down as far as 4.5 µM, 0.15 µM, 8 µM for nitrate, phosphate and silicate respectively.

Distribution anomalies for all the investigated parameters were observed in the layer between 100 and 500 m. Fig. 3 shows both the location and the extension of these anomalies with respect to dissolved oxygen and nitrate, at 300 m.

In Fig. 4 dissolved oxygen profiles of four stations along the transect at 37°N are reported. An increase of concentration is observed going to the middle of the transect, in particular the stations at the ends of the transect (406 and 412) results to ressemble each other much more than the central stations. Both this behaviour and the distribution anomalies shown in Fig. 3 could be attributed to the presence of gyres.

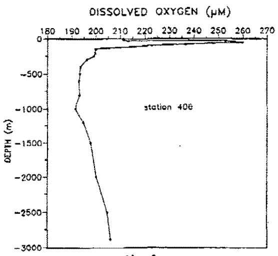

Fig. 2.

We can distinguish all over the basin :

a) the surface layer (0-150 m) characterized by the maximum concentration of oxygen, with)versaturation values, and the minimum concentration of nutrients. This layer can be nterested by the diffusion of Atlantic water into the Ionian Basin;

b) the layer between 100 and 500 m characterized by the anomalies of the stations involved n cyclonic areas;

c) the wide layer between 500 and 2.000 m with th minimum oxygen content and the iighest nutrients content, whose extension is the widest at the depth of 1.000 m where the vater body spreads over the eastern half of the basin;

d) at last, the bottom layer influenced by the Adriatic waters and by the bottom circulation.

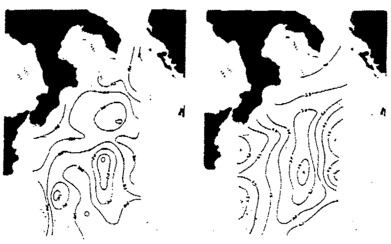

Fig. 3 : Dissolved oxygen (left) and nitrate (right) at 300 m.

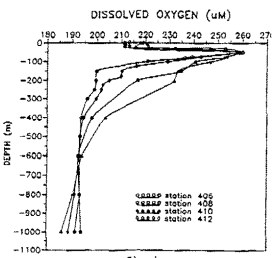

Fig. 4.

In conclusion, knowledge of the dissolved oxygen and nutrients distribution in the Ionian Basin has been considerably risen by the POEM Program results. In particular by the POEM 06 cruise, where a fine sampling was performed on the whole grid. From our results, peculiar chemical characteristics of Levantine Intermediate water (300-500 m) failed to point out. Whereas a water body (500-2.000 m) of Aegean origin is clearly recognizable below the LIW, however we don't have enough data to discuss its dynamic behaviour. In addition, the necessity of a finer sampling for the bottom water comes out from our work.

A model for the stable isotope characterisation of water masses in the Eastern Mediterranean Sea

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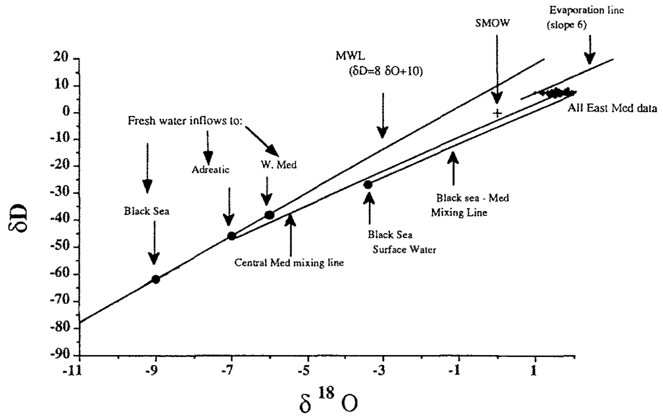
Water samples from thirteen hydrographic stations of the POEM program in the Eastern Mediterranean Sea were sampled July 1988 - March 1989 and analysed for their stable isotope content {$\delta^{18}O$ and δ^2H} and their tritium levels {TU}. Characteristic and distinguishable values are obtained for different water masses, with greater uniformity at depth and seasonal and spatial scatter in the surface waters. Averaged values were as follows:

depth (m)	mean salinity (‰)	$\delta^{18}O$ (‰)	δ^2H (‰)
below 1000	38.68	+1.505 ± 0.15	+7.64 ± 0.41
500 - 1000	38.80	+1.545 ± 0.19	+7.83 ± 0.46
50 - 400	38.94	+1.690 ± 0.15	+7.94 ± 0.35

The $\delta^{18}O$ values reported by PIERRE *et al.* (1986) for their hydrographic stations #10, 11, 14, 16 fall in line with these data, but the relationships between the enrichment of the oxygen and hydrogen isotopic species and of salinity differ from those found in other evaporative basins, i.e. the Red Sea (CRAIG, 1966) as well as in the western part of the Mediterranean (PIERRE *et al.*, 1986). In particular the relatively small enrichment of the deuterium is noted, with $\Delta\delta^2H/\Delta\delta^{18}O \sim 1.57$ compared to a value of 6 in the Red Sea. The value of $\Delta\delta^{18}O/\Delta S$ is found to be larger by a factor of two or three compared to a usual evaporative system, but the enrichment of the deuterated species is much reduced, i.e., $\Delta\delta^2H/\Delta S \to 0$.

This apparently anomalous pattern can be explained by the admixture of fresh waters through the Adriatic and Aegean (Black Sea) system. These continental fresh waters are depleted in the heavy isotopic species relative to the ocean waters.

A multi-stage model of evaporative enrichment followed by dilution with freshwater runoff seems to reproduce data rather well. Based on this model, the degree of admixture of freshwater runoff to the "evaporated" waters of the Mediterranean Sea can be specified.



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