

Nutrient enrichment and deep chlorophyll maximum along the Algerian current.

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The *Médiprod VI* cruise was performed in June 1990 to obtain hydrological, chemical and biological data in the Algerian current between 1°E and 5°E with a high space resolution. The main objective was to understand what dynamical processes bring nutrients in the euphotic zone and explain the high values of chlorophyll concentrations encountered near the basis of the photic zone.

From an hydrological point of view, the surface waters are characterized by two different water bodies separated by a strong salinity gradient: near the coast was de Modified Atlantic Water (MAW) with salinities lower than 36.60 and, at about 60 km off the coast, the Surface Mediterranean Waters (SMW) with salinities ranging from 36.80 to 36.90. The boundary of the "Atlantic jet" appears to be the 36.60 isohaline.

Main features of the nutrient field (nitrate) (fig. 1) are:

1/ below the nitracline, the vertical nitrate distribution shows a tongue-like distribution with superposition of minima and maxima.

2/ the presence near the coast of a relatively nitrate-rich water (4-5 μM) of deeper origin along the 27.5 isopycne and of a nitrate-poor layer (< 3 μM) along the 27.5 isopycne, associated to high levels of dissolved oxygen (> 5.0 ml.l⁻¹) and to chlorophyll concentrations greater than 0.2 mg.m⁻³, showing its subsurface origin.

3/ in the offshore area, it can be noted successively the presence of a nitrate-rich layer (> 5 μM) crossing the isopycnals and of a nitrate-poor layer (< 3 μM) which do not follow an isopycnal level.

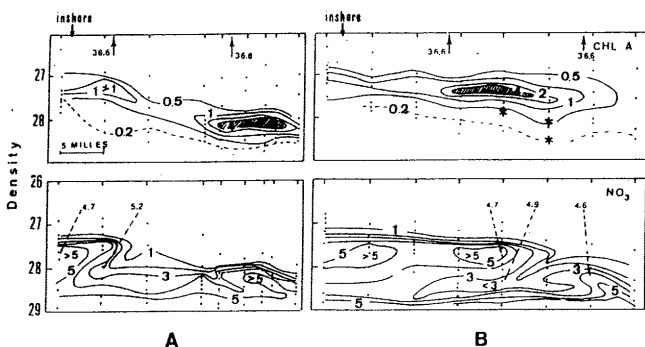


Figure 1: Chlorophyll and nitrate concentrations along the 1°10' E transect (A) and the 3°10' E transect (B). Chlorophyll concentrations greater than 4 mg.m⁻³ have been shaded. Some oxygen values (ml.l⁻¹) are reported on the nitrate diagrams.

The surface chlorophyll concentrations are less than 0.10 mg.m⁻³ over the whole area. Higher concentrations from 2 to more than 15 mg.m⁻³ occurred as a Deep Chlorophyll Maximum (DCM) in a narrow band between 15 to 30 miles off the coast line. This DCM has a width of 10 to 15 meters at a depth of 50-65 meters; it is associated with nitrate concentrations higher than 1 μM and with low light intensity (1 to 3% of the surface irradiance). On each side of the narrow band with high chlorophyll values the DCM is characterized by concentrations ranging from 0.5 to 1 mg.m⁻³ and a sharp gradient.

DCM was correlated to density values of 28.0-28.1 on the western part of the studied area while eastward it was associated to densities of 27.4.

DCM was always located just above the sharp nitrate gradient associated to intrusions of nitrate-rich waters.

These observations can be explained by nutrient inputs into the photic zone resulting of the cross-frontal circulation: 1/ on the inshore side of the current the nutrient enrichment would originate in isopycnal vertical motions as proposed by YENTSCH (1974), FASHAM *et al.* (1985), PRIEUR (1986) and BOUCHER *et al.* (1987); 2/ on the offshore side, the nutrient intrusion would be due to diapycnal mixing according to the scheme proposed by TANG (1983).

Thus the DCM in this area can be explained as resulting of an equilibrium between nutrient fluxes, light availability and water stability.

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