PRIMARY PRODUCTION

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Carbon absorption has been quantified according to the experimental protocol recommended by France-JGOFS-P.F.O. (1991). Samples were obtained with 12-l Niskin bottles with silicone rubber closures and tubing that had been carefully checked to avoid introducing toxic metals during sampling. Up to 12 depths of sampling were chosen according to the « in vivo » fluorescence profiles. Each sample (320-ml polycarbonate bottle, 3 light and one dark sample per depth) was collected before sunrise, inoculated with 250 µl of the ^{14}C working solution[a] just before sunrise, and then incubated *in situ* (except station in the upwelling and short lasting stations) where incubation was down in deck incubators equipped with Nickel screens. After several hours (station 1 to 9) or after 24h (UPW, M IO & DYF), the samples were filtered on GF/F filters to measure net absorption (A_N mgC m^{-3}). Filters were immediately covered with 500 µl of HCl 0.5 M and stored for counting at the laboratory. Each day, 3 samples were filtered immediately after inoculation for t_o determination, and 250 µl of sample was taken at random from 3 bottles and stored with 250 µl of ethanolamine to determine the quantity of added tracer (Q_i). At laboratory, samples were dried during 12 h at 60°C, 10 ml of ULTIMAGOLD-MV (Packard) were added to the filters and dpm was counted after 24h with a Packard Tri carb 2100 TR liquid scintillation analyser.

Net absorption $A_{N(Ti\ ;T)}$ for dark and light bottles was calculated from :

$$A_{N(Ti\ ;T)}\ (mgC\ m^{-3}) = (dpm\text{-}dpm_{(to)})/(dpm_{(Qi)}*1280) * TCO2^{b}$$

where T_i corresponds to the starting time of the incubation since dawn and T to the incubation duration.

Primary production rates PP* (* = 24h from dawn-to-dawn) were obtained from :

$$PP^*\ (mgC\ m^{-3}\ j^{-1}) = A_{Nlight^*} - A_{Nblack^*} = A_{Nlight(Ti\ ;T)} / \tau_{(Ti\ ;T)}{}^{c} - (A_{Nblack(T)}/T)*24$$

Integrated primary production IPP* (mg m^{-2} d^{-1}) has been calculated with trapezium method assuming (1) that subsurface (about 5 m) rates are identical to surface rates (not measured) and (2) that rates are zero at 20 m below the deepest sampled depth.

[a] Working solution : 12.5 ml of $NaH^{14}CO_3$ (25 mCi, 50-60 mCi/mmole, Amersham CFA3) was added to a solution containing 0.09 g of Na_2CO_3 (Aldrich 20,442-0) per 300 ml of sterilized milliQ water. This solution was stored in sealed 15 ml glass flasks.

[b] TCO2 (mgC m^{-3}) was determined according to Copin-Montégut (1993).

[c] $\tau_{(Ti\ ;T)}$ (conversion factor depending on the date and the latitudinal position) was determined according to Moutin *et al.* (1999). Applying this procedure allows to normalize primary production rates obtained from incubation duration ≤ 24h in a given region at a given date, to

daily rates, thus allowing the comparison of data obtained from different experimental incubation durations.

Remark : for all the 24-h incubation duration, $\tau_{(Ti\ ;T)} = 1$.

Fig. 1. shows a comparison between 24-h primary production rates (mgC m^{-3} h^{-1}) estimated from a 6.75-h incubation duration with the model proposed by moutin *et al.* (1999), PP*, and 24-h PP rates measured with a 24-h (dawn-to-dawn) incubation duration at the upwelling site. The model has been made using only data from the western Mediterranean Sea. The very significant correlation between PP* and PP obtained at this highly productive station in the Atlantic ocean, seems to indicate that the model may be applied to different situations. Integrated primary production (IPP) was about 4 g m^{-2} j^{-1} while a classical value for the Mediterranean Sea is about 0.4 g m^{-2} j^{-1}.
Fig. 2. Shows the vertical profiles of primary production rates (24h dawn-to-dawn) obtained at the 3 long lasting stations.

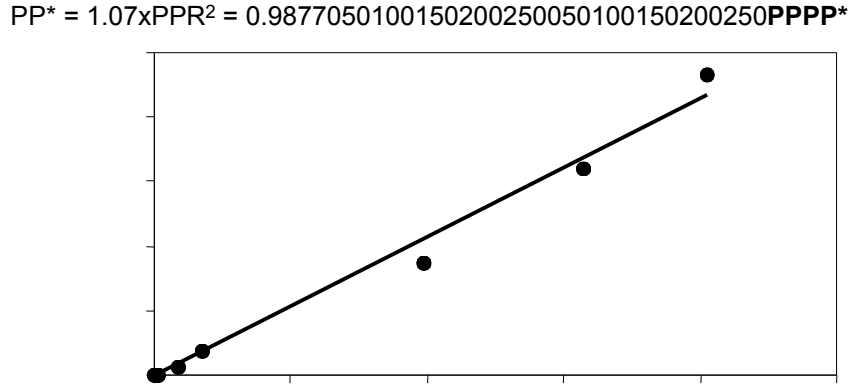

Fig. 1 : 24-h primary production rates (mgC m^{-3} j^{-1}) estimated from a 6.75-h incubation duration with the model proposed by moutin *et al.,* (1999), PP*, compared with 24-h PP rates measured with a 24-h (dawn-to-dawn) incubation duration in the upwelling.

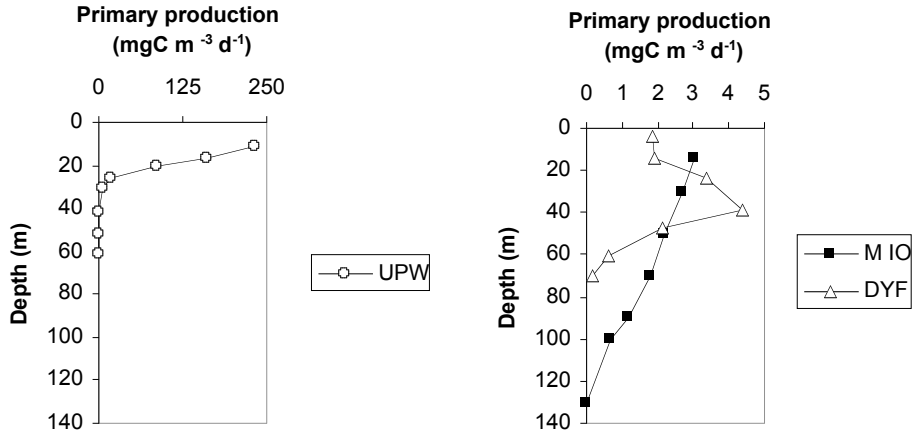

Fig. 2 : 24-h primary production rates (mgC m^{-3} j^{-1}) at the 3 long lasting stations.

Références :

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