

# EUMELI - EUMELI 3

*L'Atalante*

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Data set **pCO<sub>2</sub> surface** : **C. COPIN**

## CONTINUOUS pCO<sub>2</sub> MEASUREMENTS

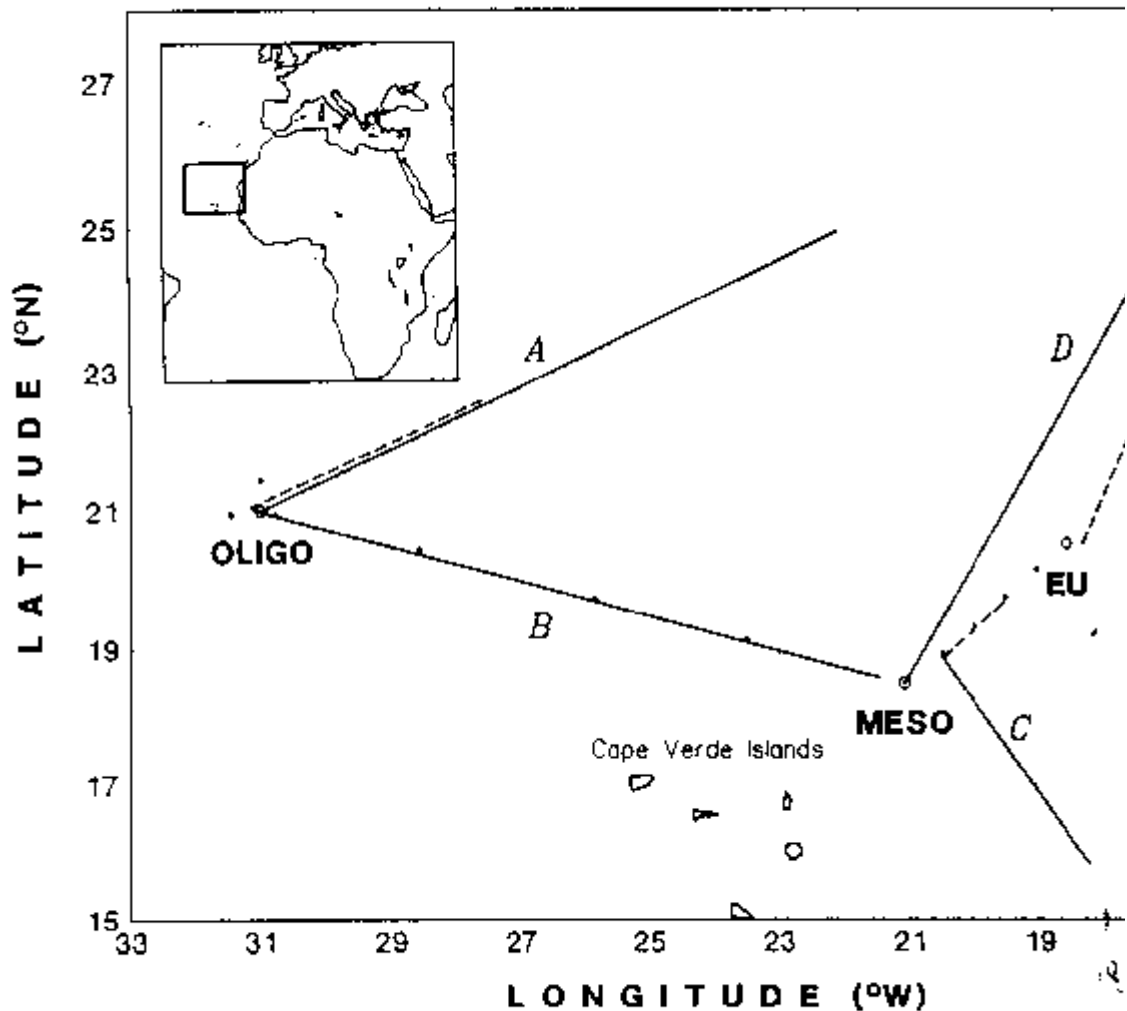


Fig. 1. Location of the CO<sub>2</sub> measurements during the Eumeli 3 Cruise in September–October and during the Eumeli 4 Cruise in May–June 1992 (transects A, B, and E).

## MEASUREMENTS of pCO<sub>2</sub> in surface water, à temp. in situ

File name	LAT.	LON.	First Day	Last Day
EUM3DAME.DAT.txt	15.489	-18.129	14.09.91	15.06.91
EUM3MO1.DAT.txt	18.378	-21.777	18.09.91	20.09.91
EUM3OLLA.DAT.txt	20.582	-31.047	25.09.91	27.09.91
EUM3LPME.DAT.txt	26.524	-15.491	04.10.91	06.10.91
EUM3MEOL.DAT.txt	18.350	-21.281	10.10.91	12.10.91

## METHODS

The measurements were performed on water pumped at the bow to supply the shipboard thermosalinometer. The water flow was directed to a debubbler and then to the various measurements systems. The measurements and acquisition methods have been previously described in detail (Copin-Montegut and Raimbault, 1994).

The chlorophyll fluorescence was measured with a Turner Design fluorometer, **the pCO<sub>2</sub> measurements** were performed according to the method of Copin-Montegut(1985), using a Maihak Infrared Analyser for CO<sub>2</sub> model Defor, with a barometric pressure compensation.

Calibrations were made with mixtures of 350+/-0.15ppmv, 213+/-0.15ppmv, and 490+/-0.25ppmv of CO<sub>2</sub> in air manufactured by Air Liquide.

**The pH measurements** were made with a Radiometer 84 pHmeter and a Ross combination electrode (Orion 8102).

As the calibrations and the pH measurements were not performed exactly at the same temperature, a correction for the variation of the liquid junction potential of the electrode with temperature was made. The signal of the quartz temperature probe located at the ship bow was calibrated by comparison with the temperature signal of the CTD Sea Bird probe used during the cruises.

The same procedure was used to correct the salinity given by the thermosalinometer. The data were logged at 1-min intervals. The precisions on the pCO<sub>2</sub> and pH measurements were better than 1 µatm for pCO<sub>2</sub> and 0.001 units for pH, but the accuracies were lower. They may be estimated to be close to 2 µatm for pCO<sub>2</sub> and 0.010 units for pH.

The simultaneous measurements of pCO<sub>2</sub> and pH permit the validation of the results. From the alkalinity measurements on discrete samples along transec D (using the method described by Copin-Montegut, 1993), a linear relationship between total alkalinity (TA) and salinity (S) was established :

TA=42.41 x S + 858.4+/-2.0µmole kg<sup>-1</sup>, at the 95% confidence level.

Then  $p\text{CO}_2$  was calculated from pH and TA (deduced from salinity) using the dissociation constants of Goyet and Poisson (1989) for carbonic acid, that of Dickson (1990) for boric acid, the Weiss (1974) equation for the solubility of  $\text{CO}_2$ , and the ionic product of water determined by Dickson and Riley (1979).

The standard deviation between the measured and calculated values was 1.2  $\mu\text{atm}$  for 2283 samples along transect D.

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*From Tellus (1995), 47B, 86-92 article " Continuous  $p\text{CO}_2$  measurements in surface water of the Northeastern tropical Atlantic"*