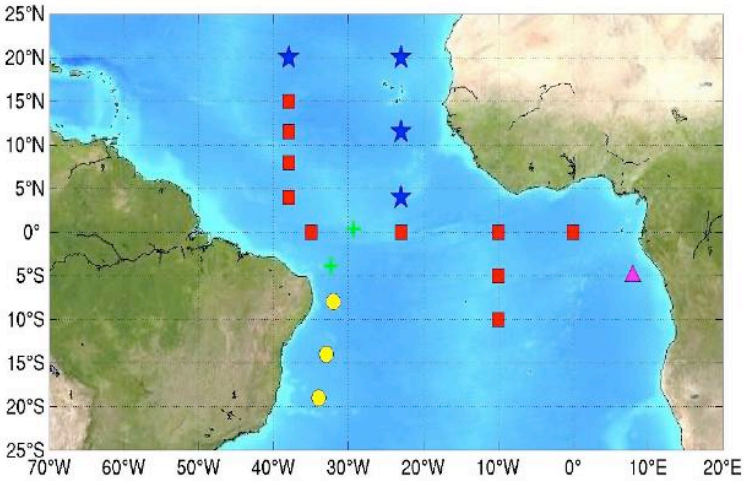
PIRATA 6°S, 10°W readme File

Platform Information

A CARIOCA CO_2 sensor and an oxygen optode 3830 (Aanderaa) have been installed, since June 2006, on the mooring of the PIRATA network (Bourlès et al., 2008) at 6°S, 10°W for monitoring fCO_2 and dissolved O_2 in surface water.

Buoy equipped with a CARIOCA sensor and an Anderaa optode



Network of instrumented moorings (PIRATA, Predicted and Research moored array in the Tropical Atlantic)

The seawater intake is at 1.5 m below the surface. Other measurements recorded at the mooring are shortwave radiation, precipitation, wind, relative humidity, air temperature, seawater temperature at the surface, at 20m, 40m, 60m, 80m, 100m, 120m, 140m, 180m, 300m and 500m, salinity at the surface, at 20m, 40m and 120m.

Cruise information
Instrumented mooring of the PIRATA network (Bourlès et al., 2008).

Period: 23 May – 25 October 2013

Class of Data: Surface ocean carbon dioxide

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CARIOCA CO_2 sensor (fCO2)

The measurement principle for CO_2 is to flow seawater across a gas permeable membrane filled with pH sensitive dye. The CO_2 will diffuse across the membrane until the fugacity of CO_2 in the dye reaches that of the seawater. The fugacity of CO_2 is deduced from the pH of the dye solution. The pH is determined by the change in ratio of optical absorbance at two wavelengths (596 nm and 434 nm) corresponding to the maximum absorbance of the acid and conjugate base of the dye and are measured with a spectrophotometer. A third wavelength (810 nm) where the dye does not absorb is used for control.
The accuracy of the CARIOCA system is ±3 μatm.

The calibration is done in the laboratory by comparing the response of the spectrophotometer to the fCO_2 of a seawater solution determined with an infrared analyzer (Licor 7000). The CARIOCA response is determined over the anticipated range of fCO_2. The CARIOCA sensor is calibrated before and after deployment.

Temperature sensor

Temperature measurements are made with a Betatherm thermistor. It is calibrated at the metrology laboratory of IFREMER (certified by COFRAC). The thermistor is calibrated between -2 and +32°C, with an accuracy of 0.01°C.

Pressure sensor

Atmospheric pressure on the buoy is measured using a Vaisala PTB101C, 900-1100 hPa. The accuracy is ±0.3 mb at 20°C and ± 1 mb from 0 to 40°C.
The sensor did not work during this deployment but the data are not used for fCO_2 calculations (spectrophotometric method) so it does not affect the quality of the fCO_2 data.

Variables info

Column header	Explanation
Day	Day of the year
dd	Day
mm	Month
yy	Year UTC date
hh	Hours UTC time
mn	Minutes
ss	Seconds
fCO_2	Fugacity of CO_2 (μatm)
sst	Sea surface temperature (^oC)
sss	Sea surface salinity from the PIRATA mooring

DATASET REFERENCES:

Lefèvre, N., A. Guillot, L. Beaumont, and T. Danguy (2008), Variability of fCO_2 in the Eastern Tropical Atlantic from a moored buoy, *J. Geophys. Res.*, *113, C01015*, doi:10.1029/2007JC004146.

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METHOD REFERENCES:

Bourlès, B., et al. (2008), The PIRATA program: history, accomplishments and future directions., *Bulletin of the American Meteorological Society*, *89*, 1111-1125.

Boutin, J., L. Merlivat, C. Henocq, N. Martin, and J.-B. Sallee (2008), Air–sea CO_2 flux variability in frontal regions of the Southern Ocean from CARbon Interface OCean Atmosphere drifters, *Limnology and oceanography*, *53*, 2062-2079.

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Hood, E. M., and L. Merlivat (2001), Annual to interannual variations of fCO_2 in the northwestern Mediterranean Sea: Results from hourly measurements made by CARIOCA buoys, 1995-1997, *Journal of Marine Research*, *59*(1), 113-131.

Lefèvre, N., and L. Merlivat (2012), Carbon and oxygen net community production in the eastern tropical Atlantic estimated from a moored buoy, *Gl. Biogeoch. Cycles*, *26*(GB1009), doi:10.1029/2010GB004018.

Lefèvre, N., J. P. Ciabrini, G. Michard, B. Brient, M. Duchaffaut, and M. Merlivat (1993), A new optical sensor for PCO_2 measurements in seawater, *Mar. Chem.*, *42*, 189-198.

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