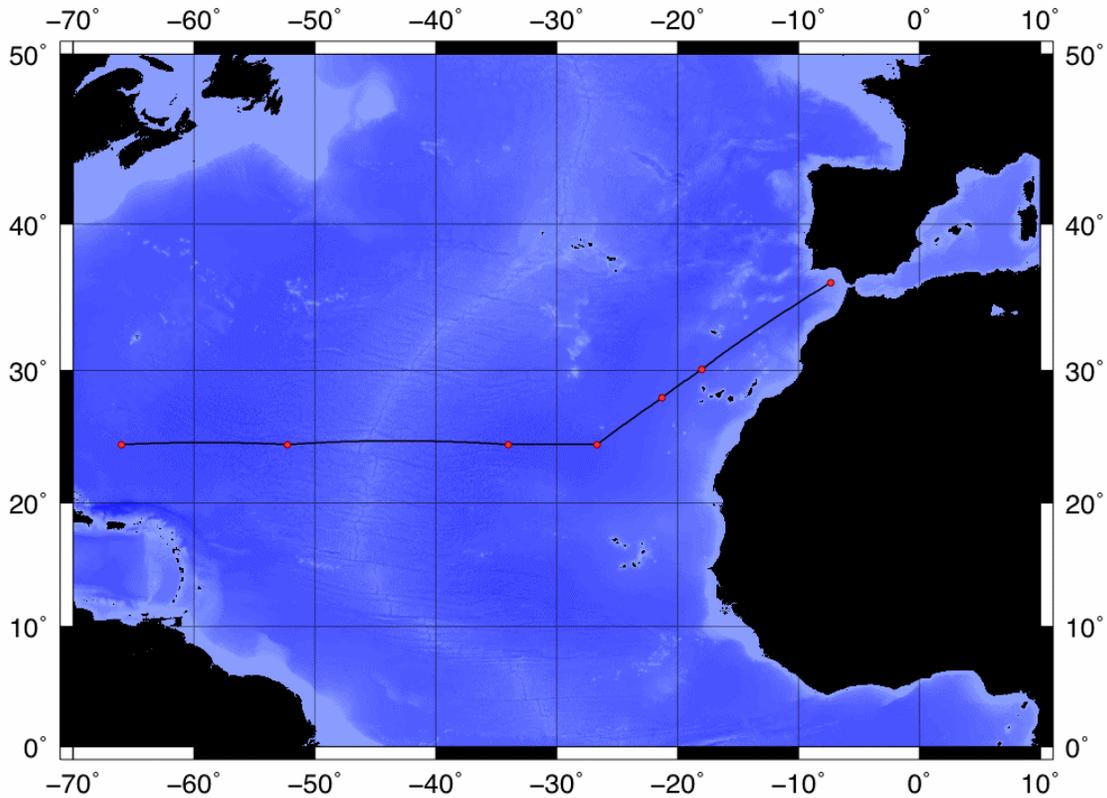


CRUISE REPORT: A17

(Updated Dec 2014)



Highlights

Cruise Summary Information

Section Designation	A17 (aka: FICARAM VI, HE091)		
Expedition designation (ExpoCodes)	29HE20030408		
Chief Scientists	Aida F. Rios / IIM-CSIC		
Dates	2003 April 8 - 2003 April 24		
Ship	<i>R/V Hespérides</i>		
Ports of call			
Geographic Boundaries	70° W	31° N	15° W
		23° N	
Stations	7		
Floats and drifters deployed	0		
Moorings deployed or recovered	0		

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Links To Select Topics

Shaded sections are not relevant to this cruise or were not available when this report was compiled.

Cruise Summary Information	Hydrographic Measurements
Description of Scientific Program	CTD Data:
Geographic Boundaries	Acquisition
Cruise Track (Figure): PI CCHDO	Processing
Description of Stations	Calibration
Description of Parameters Sampled	Temperature Pressure
Bottle Depth Distributions (Figure)	Salinities Oxygens
Floats and Drifters Deployed	Bottle Data
Moorings Deployed or Recovered	Salinity
	Oxygen
Principal Investigators	Nutrients
Cruise Participants	Carbon System Parameters
	CFCs
Problems and Goals Not Achieved	Helium / Tritium
Other Incidents of Note	Radiocarbon
Underway Data Information	References
Navigation Bathymetry	
Acoustic Doppler Current Profiler (ADCP)	
Thermosalinograph	
XBT and/or XCTD	
Meteorological Observations	Acknowledgments
Atmospheric Chemistry Data	
Data Processing Notes	

CRUISE FICARAM VI

R/V Hespérides

Cruise: He091

Dates: 8 to 24 April 2003

Chief scientist: Aida F. Rios (IIM-CSIC)

Alkalinity and pH responsible (A.F. Rios)

DIC analysis responsible (coulometric method): Rik Wanninkhof (NOAA/AOML)

Nutrients analysis responsible: Carmen G. Castro (IIM-CSIC)

During the cruise FICARAM VI, seven stations were performed. Alkalinity and pH were measured on board. The variables of carbon system, pH and alkalinity, in surface waters together with the $f\text{CO}_2$ measured, were used to study the internal consistency of the measurements.

pH was measured spectrophotometrically following Clayton and Byrne (1993).

Total Alkalinity (TA) was measured using potentiometric titrations with hydrochloric acid to a final pH of 4.40 (Pérez and Fraga, 1987). The electrodes were standardised using a buffer of pH 4.42 made in CO_2 free seawater (Pérez et al., 2002).

Dissolved oxygen was determined by Winkler potentiometric titration. The estimated analytical error was $\pm 1 \mu\text{mol}\cdot\text{kg}^{-1}$. Oxygen saturation was calculated following Benson and Krause equation (UNESCO, 1986).

Nutrient samples were frozen before the analysis. Nutrient concentrations were determined by segmented flow analysis with Alpkem system, following Hansen and Grasshoff (1983) with some improvements (Mouriño and Fraga, 1985; Álvarez-Salgado *et al.*, 1992). The analytical error was $\pm 0.05 \mu\text{mol}\cdot\text{kg}^{-1}$ for nitrate, $\pm 0.05 \mu\text{mol}\cdot\text{kg}^{-1}$ for silicic acid and $\pm 0.01 \mu\text{mol}\cdot\text{kg}^{-1}$ for phosphate.

To check the accuracy of the pH and TA measurements, samples of CO_2 reference material (CRM, batch 54 distributed by A.G. Dickson from the Scripps Institution of Oceanography) were analysed during the cruises. The uncertainties of pH and alkalinity were ± 0.002 and $\pm 0.7 \mu\text{mol kg}^{-1}$, respectively. The corresponding theoretical $\text{pH}_{25\text{T}}$ value (7.918) for this batch was calculated using the dissociation constants from Lueker et al. (2000), which was in agreement with the theoretical value (± 0.0002).

Figure 1 compares the CO_2 fugacity ($f\text{CO}_2$) values measured at every station sampled during FICARAM VI cruise and those calculated from pH_T and total alkalinity with the Mehrbach et al. (1973) dissociation constants refitted by Dickson and Millero (1987) dissociation constants. The agreement between both $f\text{CO}_2$ is excellent ($r^2 = 0.94$), confirming the good internal consistency of our measurements. The average and standard deviation of the differences between both calculated and measured CO_2 was $-0.5 \pm 3.1 \mu\text{atm}$.

Figure 2 compares the DIC measured using coulometric method with those calculated from pH and total alkalinity with the Mehrbach et al. (1973) dissociation constants refitted by Dickson and Millero (1987). The agreement between both DIC is excellent ($r^2 = 0.995$). The average and standard deviation of the differences between both calculated and measured DIC was $-5.0 \pm 4.7 \mu\text{mol/kg}$.

FICARAM VI

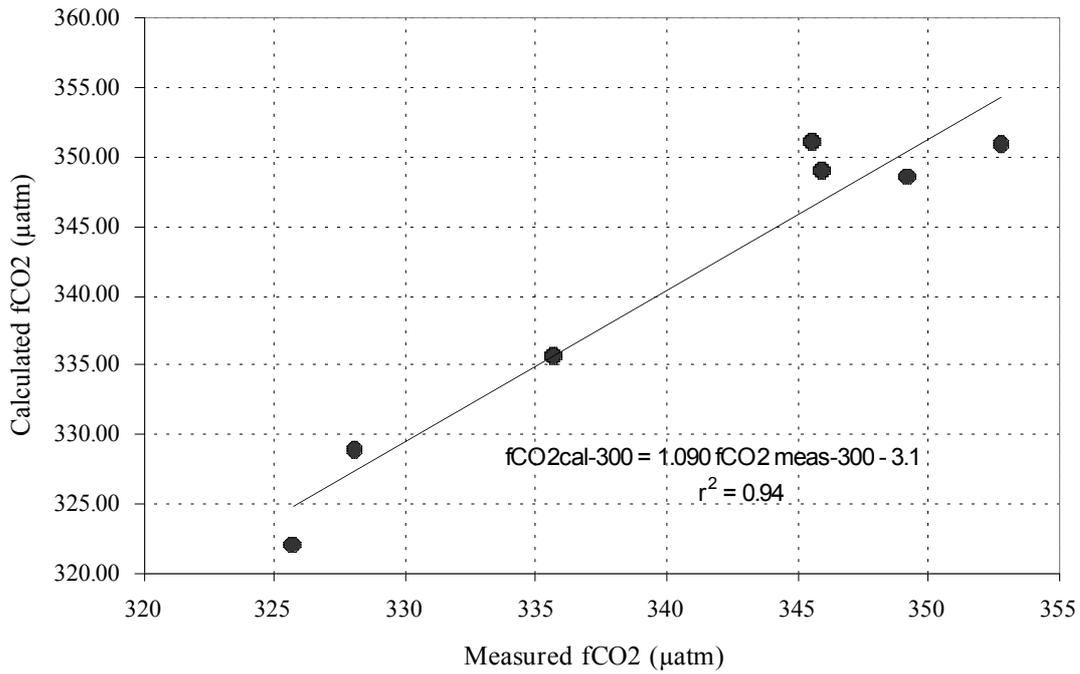


FIGURE 1: Relationship between measured CO₂ fugacity and that calculated as a function of TA and pH measured at the surface of the FICARAM VI stations.

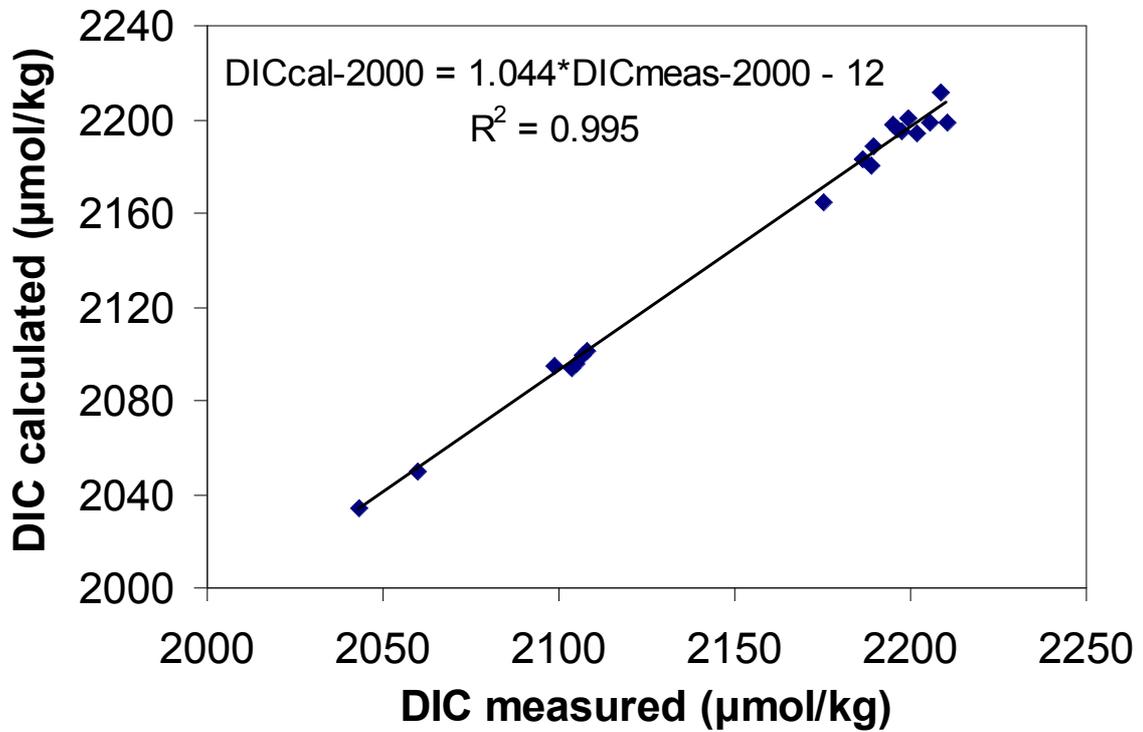


FIGURE 2 Relationship between measured DIC and that calculated as a function of TA and pH

References

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- Mouriño C., Fraga F., 1985: Determinacion de nitratos en agua de mar. *Investigacion Pesquera*, 49, 81-96.
- Pérez F.F., Fraga F., 1987. A precise and rapid analytical procedure for alkalinity determination. *Marine Chemistry*, 21, 169-182.
- Pérez F.F., Ríos A.F., Rellán T., Álvarez M., 2000. Improvements in a fast potentiometric seawater alkalinity determination. *Ciencias Marinas*, 26, 463-478.

Data Processing Notes

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|------------|---------------|--|-------------------------------|
| 2010-08-26 | BTL | Website Updated | Copied from CARINA collection |
| | Justin Fields | This bottle file was part of the CARINA collection compiled by Bob Key. | |
| 2014-12-16 | CrsRpt | Website Updated | PDF version online |
| | Jerry Kappa | I've uploaded a new PDF version of the cruise report to the CCHDO website. | |
| | | It includes all the reports provided by the cruise PIs, summary pages and CCHDO data processing notes, as well as a linked Table of Contents and links to figures. | |