

Joint Brazilian Ocean Acidification Research and SOLAS Workshop

Third International Symposium

Effects of Climate Change on the World's Oceans

Santos City, Brazil
March 23-27, 2015

On the progress of the BrOA Network: two years of activities

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Mission and objectives...

Mission:

Create a network of scientists working on Ocean Acidification in Brazil, concomitant to establishing **LONG TERM OBSERVATIONS** of CO₂ - related parameters in marine ecosystems.

Objectives:

✓ Short-term:

Identify and integrate the Brazilian researchers through a cooperative interdisciplinary network on different OA aspects; contribute to ongoing international programmes.

❖ Medium-term:

Make OA research **OPERATIONAL** → Brazilian protocol of analyses, reporting results, certifying results through intercalibration exercises (at national and international level).

❖ Long-term:

CAPACITY BUILDING → enable a critical mass of trained researchers to tackle the different issues related to OA: (i) advancing science; (ii) tools for protection, mitigation, adaptation of endangered ecosystems; (iii) societal aspects (fisheries, food security, tourism).



*1st Report – Kerr et al. 2013
In Portuguese*

*2nd Report – Kerr et al. 2014
In English*

*3rd Report – Expected to result from
this Workshop*

Download available at:

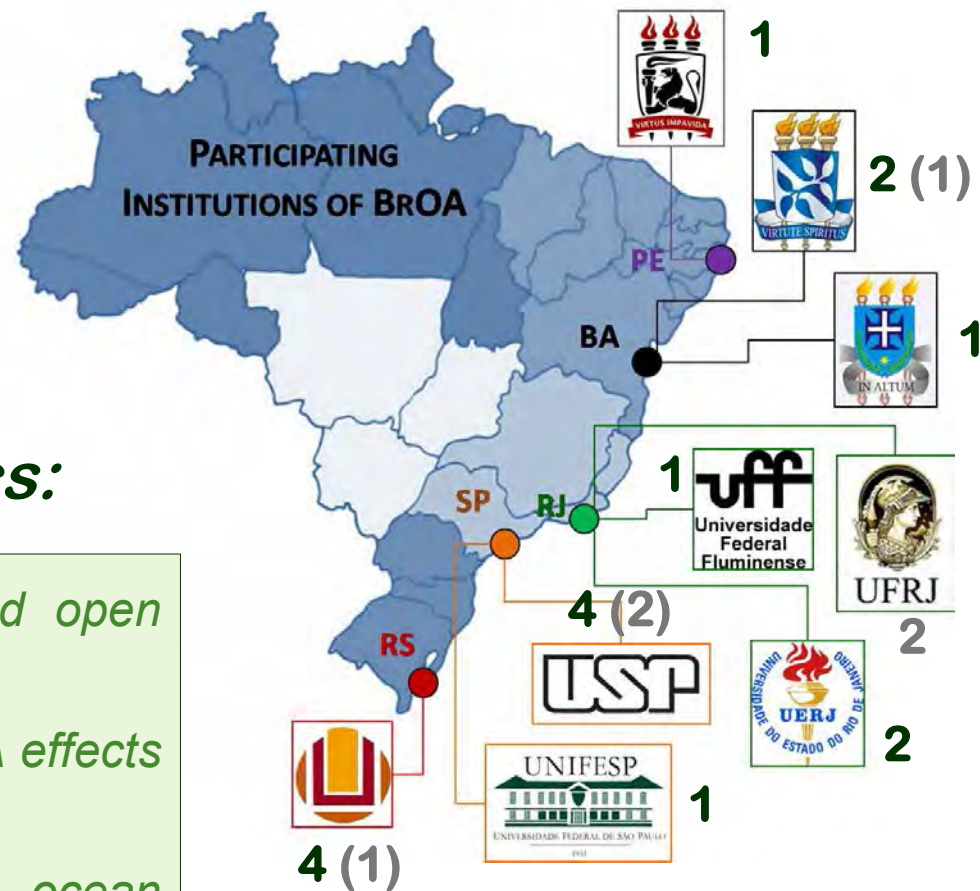
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BrOA Today...

9 Institutions
 18 Laboratories
 33 Researchers
 18 Students

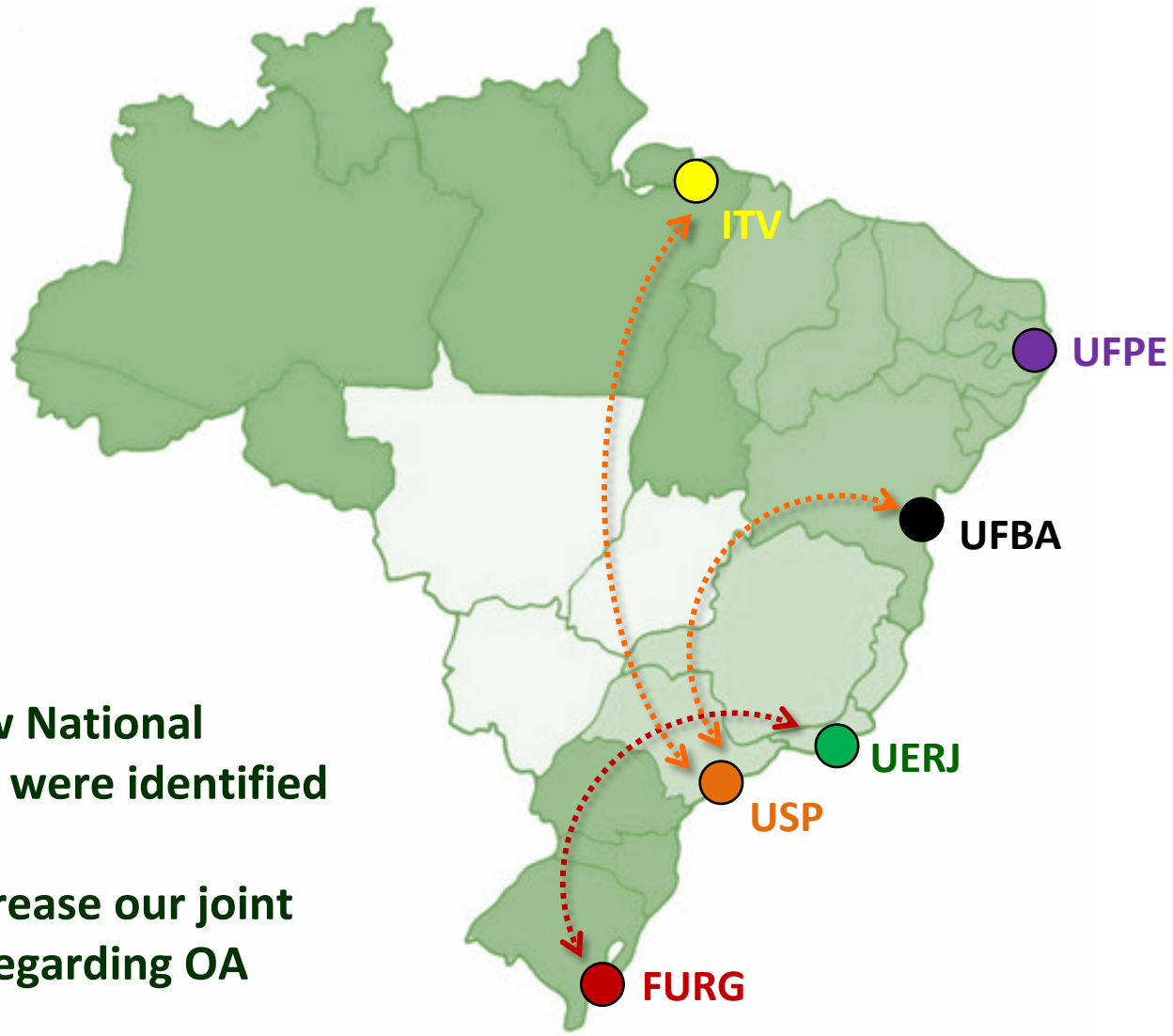
BrOA's main research topics:

- ✓ Marine biogeochemistry (coastal and open ocean areas)
- ✓ Response of marine organisms to OA effects (bio-assays)
- ✓ Paleoceanography proxies to past ocean acidification events and → carbonate system
- ✓ Biogeochemistry modeling
- ✓ Physical and biogeochemical processes controlling sea ↔ air CO₂ fluxes



Certified by CNPq

National Collaborations...



- FURG – UERJ**
- USP – UFBA**
- USP – ITV**

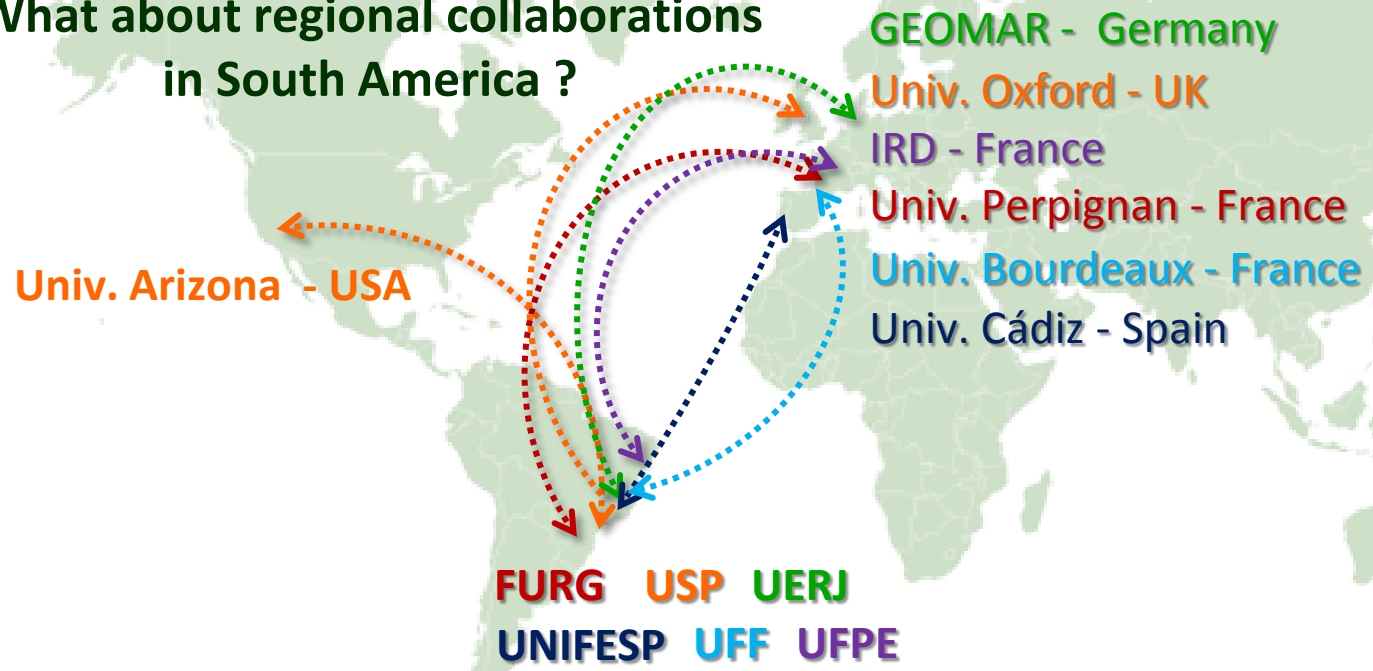
Only Few National Collaborations were identified

We must increase our joint activities regarding OA

International Collaborations...

- FURG – Univ. Perpignan/France
- USP – Univ. Oxford/UK & Univ. Arizona/USA
- UERJ – GEOMAR/Germany
- UNIFESP – Univ. Cádiz/Spain
- UFF – Univ. Bourdeaux/France
- UFPE – IRD/France

What about regional collaborations in South America ?



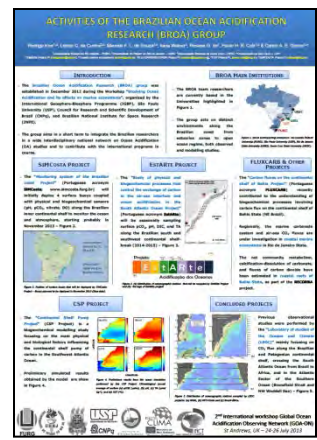
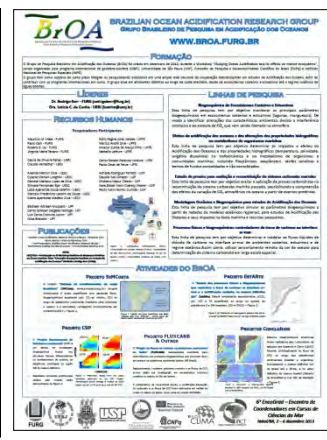
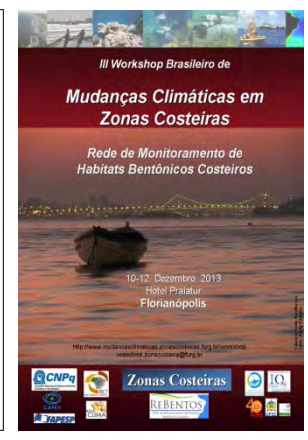
2013 - 2014

- ✓ 1st BrOA report (Dec 2012)
- ✓ GOA-ON Workshop (Jul 2013)
- ✓ BrOA webpage released (Sep 2013)
- ✓ Brazil-France Meeting (Nov 2013)
- ✓ 6th EncoGrad meeting & 3rd Workshop “Coastal zones and global changes” (Dec 2013)
- ✓ Dr. Leticia da Cunha is the Brazilian SOLAS representative since Dec. 2013

✓ **Short term goal achieved!**

- ✓ Advances in medium-term goals (2014)
- ✓ Scientific projects approved (2014)
- ✓ 2nd BrOA report (May 2014)
- ✓ Several Scientific Cruises around the Brazilian coast (Jul – Oct 2014)

✓ **Medium term goals in progress!**

Have a look of some of our activities during the last two years

From estuaries/coastal to open ocean...

...From laboratories to field.

Souza et al. Contribution from UESC researchers
Kikuchi et al. Contribution from UFBA researchers



Fluxes of carbon and nutrients in the Cachoeira River estuary, Ilheus, Bahia – FAPESB/CNPq (2013 – 2016)



Effects of pCO₂ on metabolism and carbonate dissolution by epi and endolithic communities – UESC (2014 – 2016)



Residual circulation and dynamics of suspended and organic matter in the Todos os Santos Bay – FAPESB (2013 – 2015)



Effects of interaction of acidification and temperature rise on the calcification of corals and crustose coralline algae
CNPq (2013-2015)



The marine carbonate system and air sea CO₂ fluxes in the estuary of the Barra Grande River (Ilha Grande, RJ)

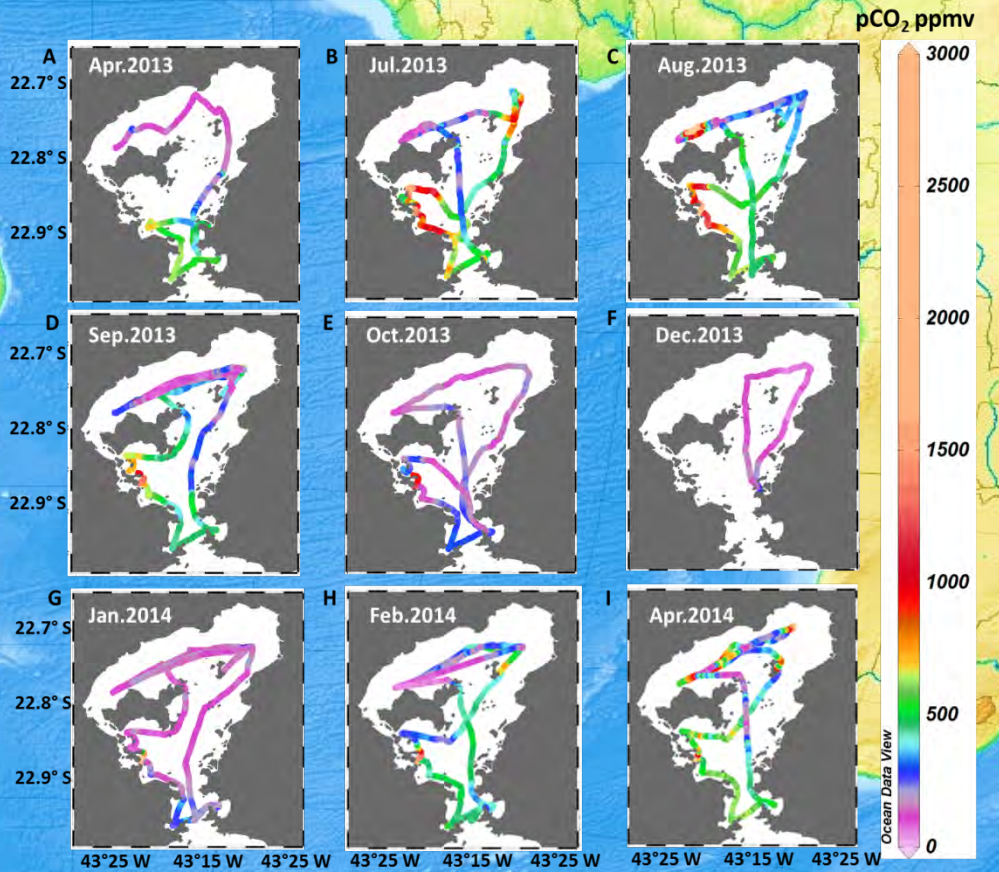


- ✓ **2-year seasonal sampling period (2013-2014)** for determining CO₂ system parameters, nutrients and particulate organic matter fluxes;
- ✓ **At a fixed station in the Joatinga Channel**, an urban estuary in Rio de Janeiro city, Brazil.



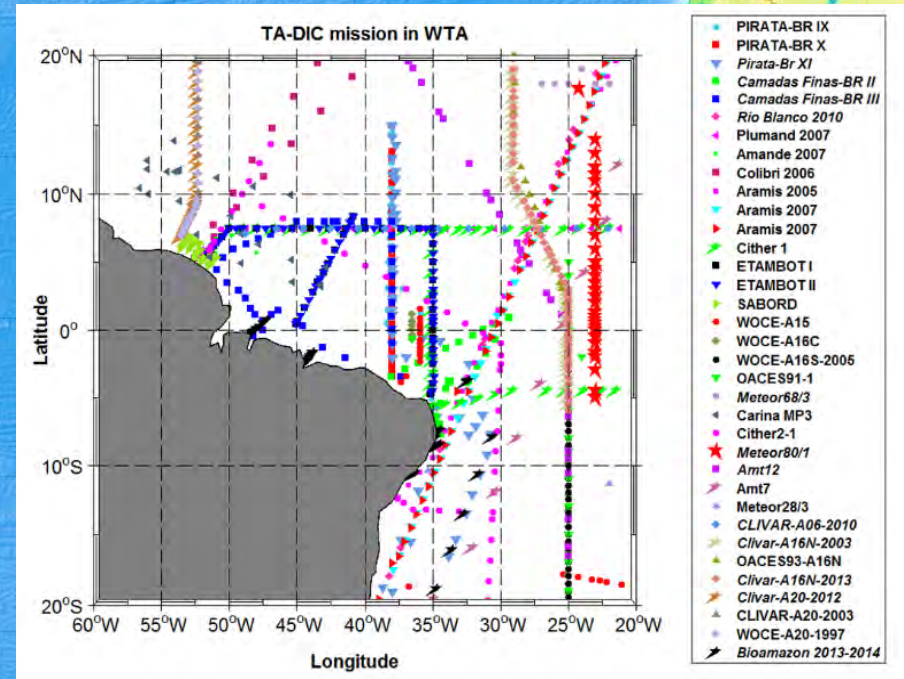
Spatial and temporal distributions of continuous pCO₂ measurements in Guanabara Bay, Rio de Janeiro, Brazil.

- ✓ Tropical eutrophic coastal embayment
- ✓ More than 7 million inhabitants
- ✓ Monthly continuous pCO₂ measurements
- ✓ Large annual CO₂ sink enhanced by eutrophication (-19.6 mol C m² yr⁻¹)



Distribution of CO₂ parameters in Western Tropical Atlantic Ocean

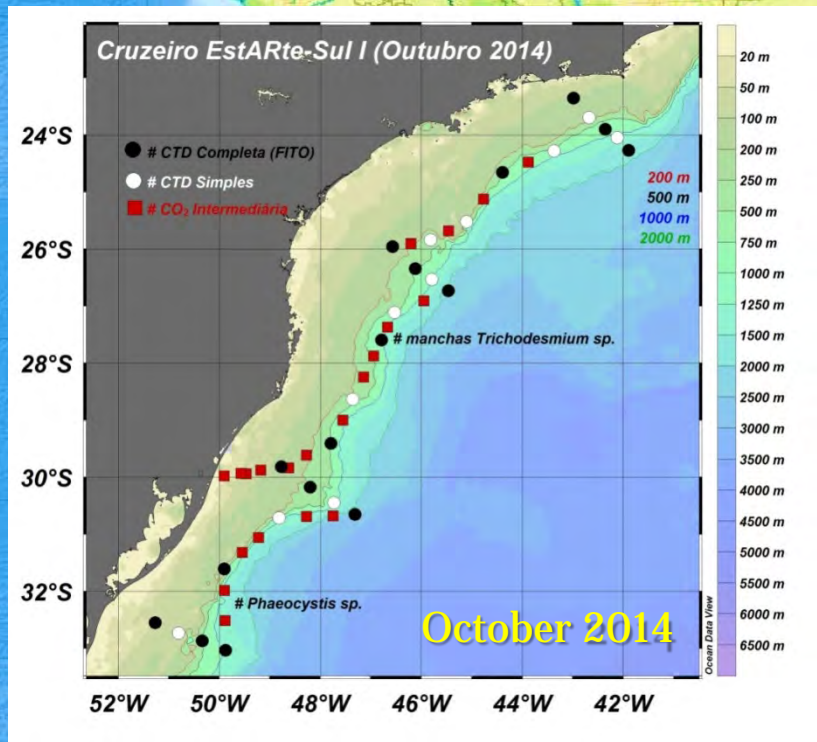
- ✓ **Compilation** of more than 1260 samples of **AT and DIC** recorded through 35 different cruises in the Western Tropical Atlantic **from 1989 to 2014**;
- ✓ Tested the existing relationship between the physical parameters (SSS/SST) and the carbonate system (TA,CT);
- ✓ **New relationship** was determined for **CT** using the SSS and time factor (year);
- ✓ Many processes controlling the CO₂ parameters have been discussed in this work.



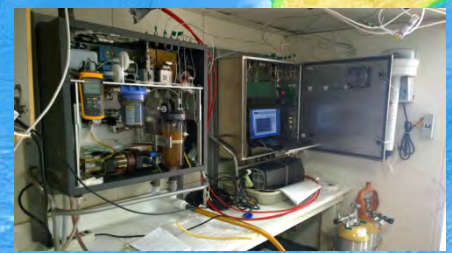
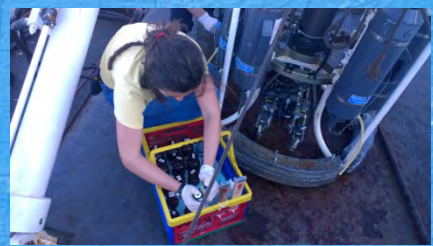
Projeto
EstARte
 Acidificação dos Oceanos

em 2000 1990 1800
 7.8 8.1 8.2

CO₂

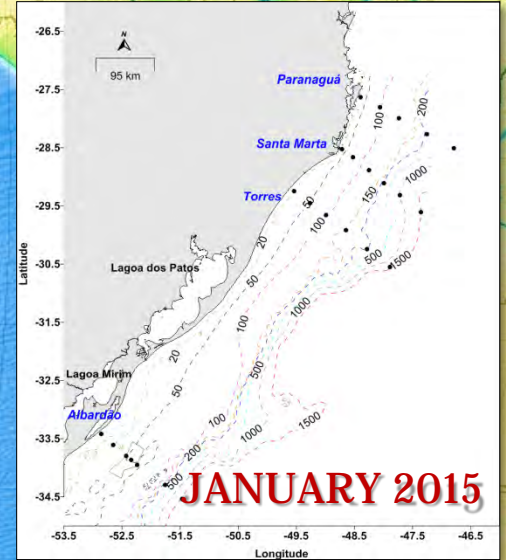
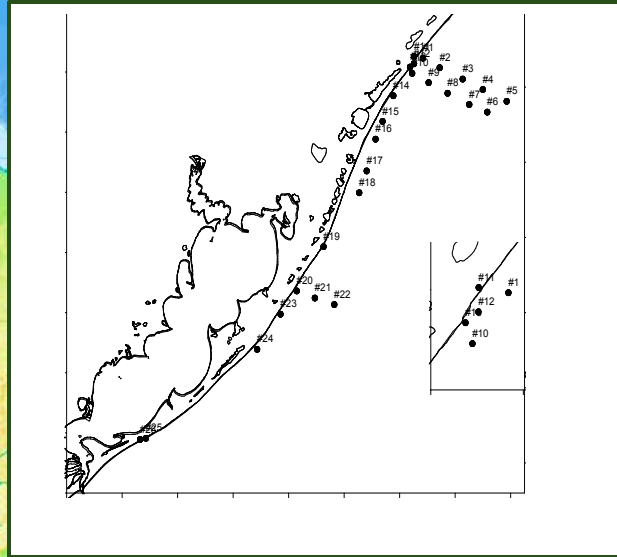


- ✓ All carbonate system parameters: pCO₂ continuous monitoring system, AT/DIC, pH;
- ✓ Plus complete CTD casts, MPS, POC/PN, Pigments (Phyto), Isotopes, OD, Nutrients, DOC/TOC;
- ✓ Another cruise planned for 2015.



JANUARY 2013 and JULY 2014

INCT-MAR COI
INCT-MAR-COI

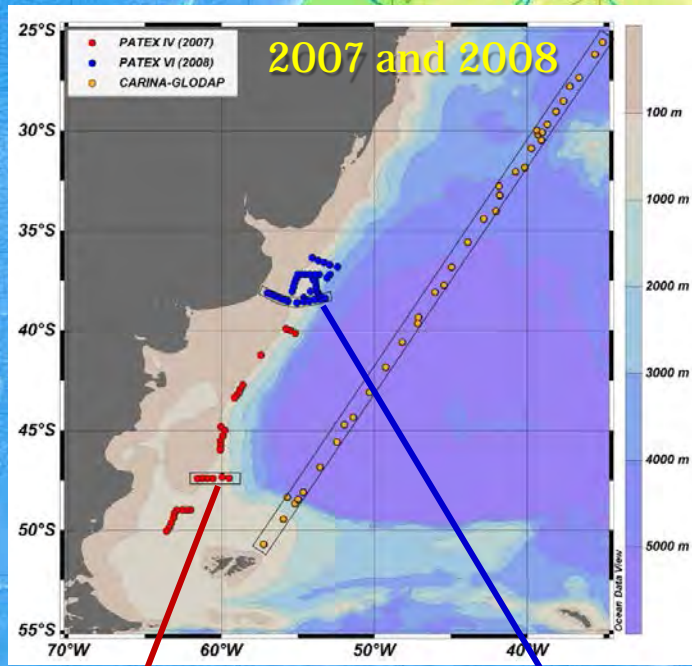


✓ Parameters sampled with CTD profiles: pH, OD, turbidity, SPM, total alkalinity, dissolved iron, nitrite, nitrate, nitrogen amoniacal, phosphate, organic carbon and total particulate nitrogen, Radio^{223, 224, 226 e 228}, radon (Rn²²²).

✓ Jan 2015 cruise: first step using the new rosette system to collect traces.

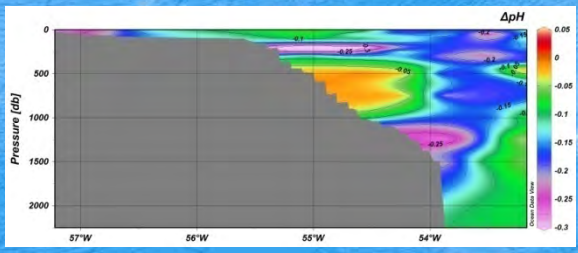
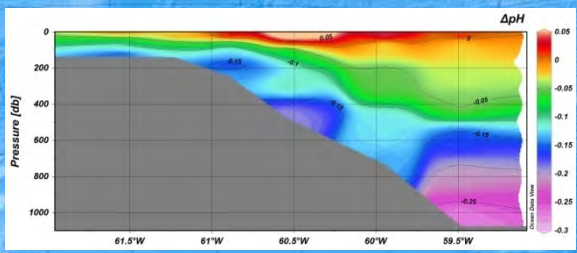
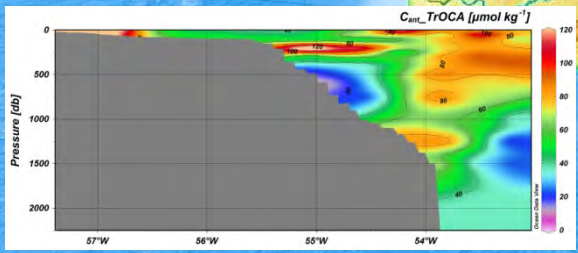
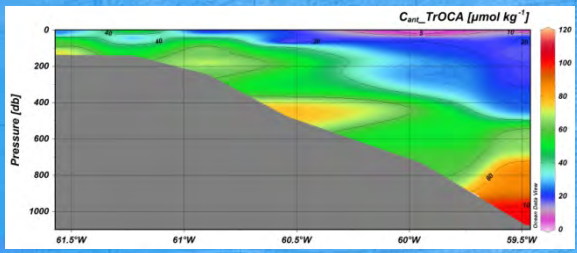


Patagonian Experiment: PATEX



✓ To determine Anthropogenic carbon and ΔpH in the Patagonian shelf waters;

✓ Poster presentation by Iole Orselli



Estações oceanográficas ocupadas pelos projetos NAUTILUS e INTERBIOTA

50 m

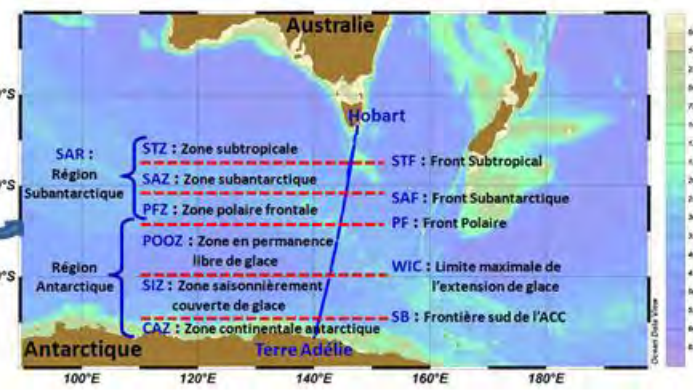
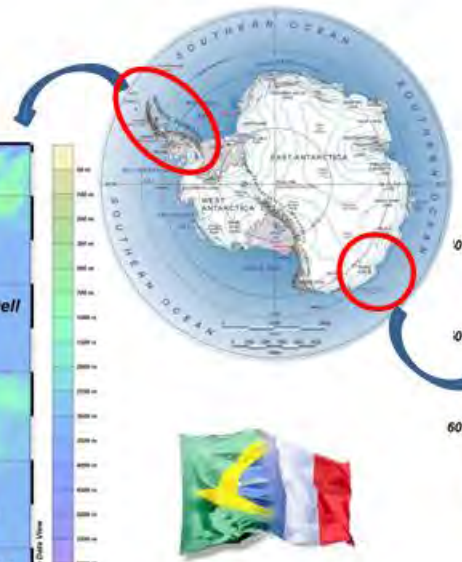
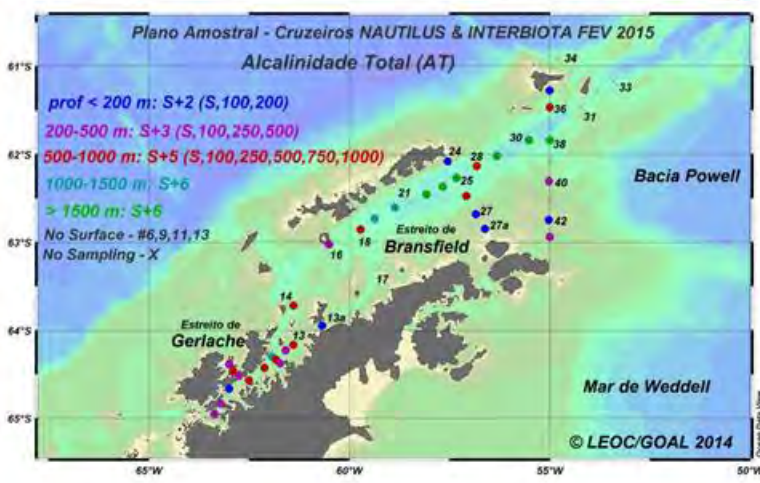


Brazil – France collaboration NAUTILUS and MINERVE programs

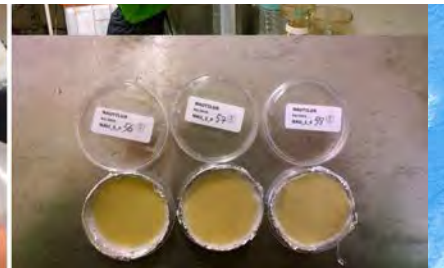
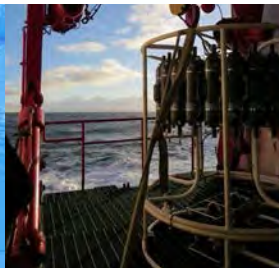


NAUTILUS: ✓ **FEV/2015**
Biogeochemical parameters
Water column AT/CT, pH, OD

MINERVE: 2015/2016
Biogeochemical parameters
Surface AT/CT



2015-2017



Carbon in the Southern Ocean: a synthesis

- ✓ **Phase 1:** Reference review → atmospheric carbon in the Southern Ocean, processes and state of the art;
- ✓ **Phase 2:** Next 5 Years
- ✓ Release of 10 floats in the Antarctic Circumpolar Current (2 floats / year);
- ✓ Analysis of in situ data sampled by the floats;
- ✓ Biogeochemical modeling (Carbon flux).



Research area:

Evaluation of proxies for marine carbonate system

Researchers:

Dr. Adriana Rodrigues Perretti
Prof. Dr. Cristiano Mazur Chiessi

Actual project:

Evaluation of marine carbonate dissolution proxies on a low carbonate ion saturation environment

Partnerships established:

- Recent records (coral):

Ruy Kikuchi (UFBA - BR)
Julia Cole (University of Arizona - USA)

- Element/Ca proxies (multiproxy study):

Ros Rickaby (University of Oxford - UK)

Instalation of mass spectrometer MAT 253 with Kiel IV:

Will allow the analysis of stable isotopes ($\delta^{18}\text{O}$ and $\delta^{13}\text{C}$), on small carbonate samples (foraminifera and corals), used to reconstruct the environmental properties of past ocean

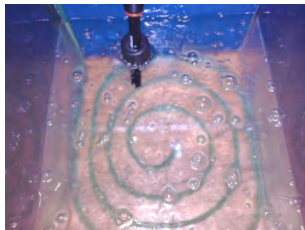


Ongoing Project:

➤ “ *The effects of CO₂ acidification on the bioavailability of contaminants in marine sediments associated with petroleum reservoirs leaks (ECO2Mar)*”

Colaboration between UNIFESP-Brazil (Marine Ecotoxicology Research Group, Ocean Science Department) and University of Cádiz -Spain. Financed by Science without borders Program-MEC-Brazil (Process: 126/2012)

CO2System was developed in the Laboratory to conduct experiments with several organisms, in order to evaluate the interactions of Ocean Acidification and contaminants.



- Automatic pH control and CO₂ injection from AquaMedic;

- Control of Carbonate Chemistry by Alkalinity and pH measurements;

- Different endpoints, such as mortality, growth, reproduction and larval development.

Obrigado!

www.broa.furg.br



OA timeline and BrOA...

