latin american ocean acidification network
LAOCA

1er TALLER REGIONAL RED LATINOAMERICANA DE ACIDIFICACIÓN DEL OCÉANO (LAOCA)

14 Y 15 de Diciembre del 2015
Camino del Agua Business Center
Concepción – Chile

Brazilian Ocean Acidification Network

Chairs:
Rodrigo Kerr (FURG)
Leticia da Cunha (UERJ)

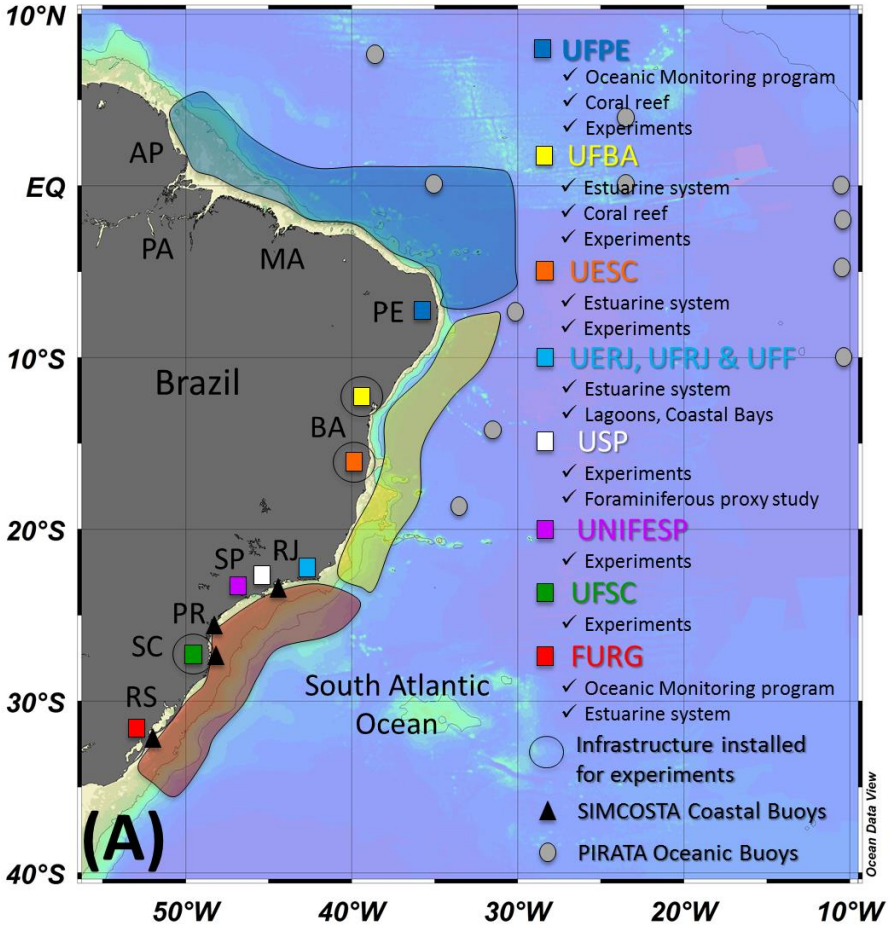
Members:
Ruy Kikuchi (UFBA)
Paulo Horta (UFSC)

with collaborations of several other BrOA members

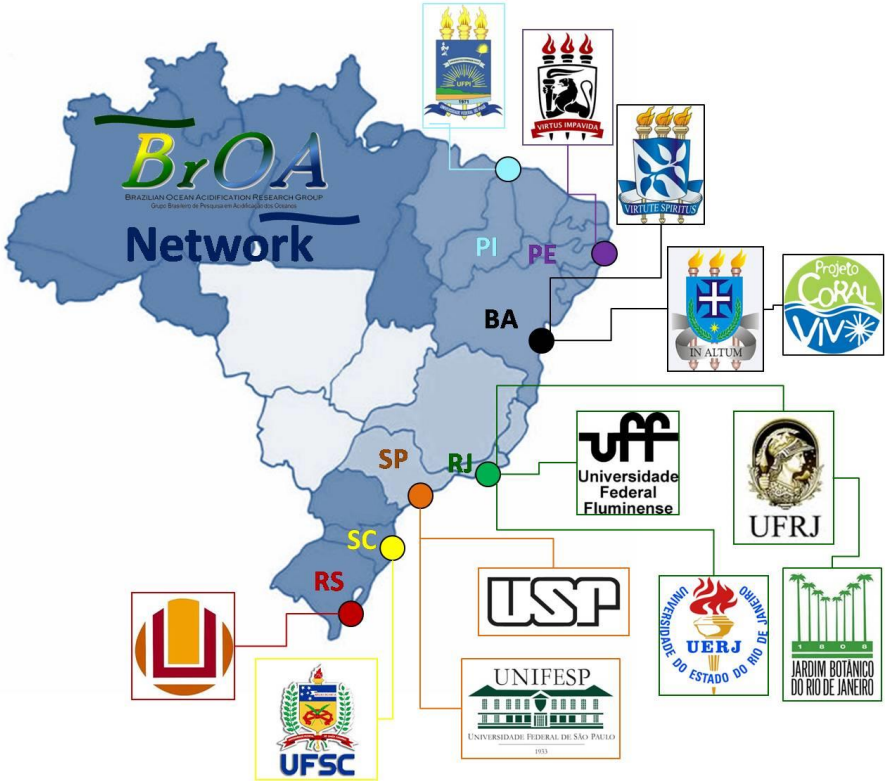
BrOA
BRAZILIAN OCEAN ACIDIFICATION RESEARCH GROUP

Who we are?

- 12 Institutions, 19 Laboratories
- ~60 Researchers, ~20 Students



Kerr et al. (2016)



OA timeline and BrOA...

A little of history...

DEC 2012 – *Cananéia Workshop: "Studying OA and its effects on marine ecosystems" (organized by OA-ICC, IGBP, USP, INPE, CNPq). 1st BrOA Report.*

JUL-DEC 2013 – *National and International involvement (GOA-ON, SOLAS); BrOA Webpage.*

MAY 2014 – *2nd BrOA Report, resulted from the Florianópolis Workshop: "Climate Changes in Coastal Zones".*

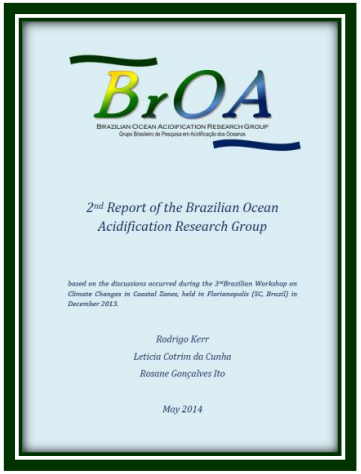
MAR 2015 – *1st BrOA/SOLAS Workshop (Santos).*

NOV 2015 – *BrOA Manuscript in Environmental Management.*


BRAZILIAN OCEAN ACIDIFICATION RESEARCH (BROA)
(PESQUISA BRASILEIRA SOBRE A ACIDIFICAÇÃO DOS OCEANOS)

TEXTO ELABORADO A PARTIR DAS DISCUSSÕES ENTRE OS PARTICIPANTES DO WORKSHOP "STUDYING OCEAN ACIDIFICATION AND ITS EFFECTS ON MARINE ECOSYSTEMS"

Dezembro de 2012


BrOA
BRAZILIAN OCEAN ACIDIFICATION RESEARCH GROUP
Grupo Brasileiro de Pesquisa em Acidificação dos Oceanos

2nd Report of the Brazilian Ocean Acidification Research Group

based on the discussions occurred during the 3rd Brazilian Workshop on Climate Changes in Coastal Zones, held in Florianopolis (SC, Brazil) in December 2013.

Rodrigo Kerr
Leticia Cotrim da Cunha
Rosane Gonçalves Ito

May 2014

Documents available at:

www.broa.furg.br

Mission and objectives

Mission:

To better understand on Ocean Acidification in Brazil, concomitant to establishing **LONG TERM OBSERVATIONS of CO_2-related parameters** in marine ecosystems.

Objectives:

✓ Short-term:

To identify and integrate the Brazilian researchers through a cooperative interdisciplinary network on different OA aspects; contribute to ongoing international programmes. **Constant pursuit.**

❖ Medium-term:

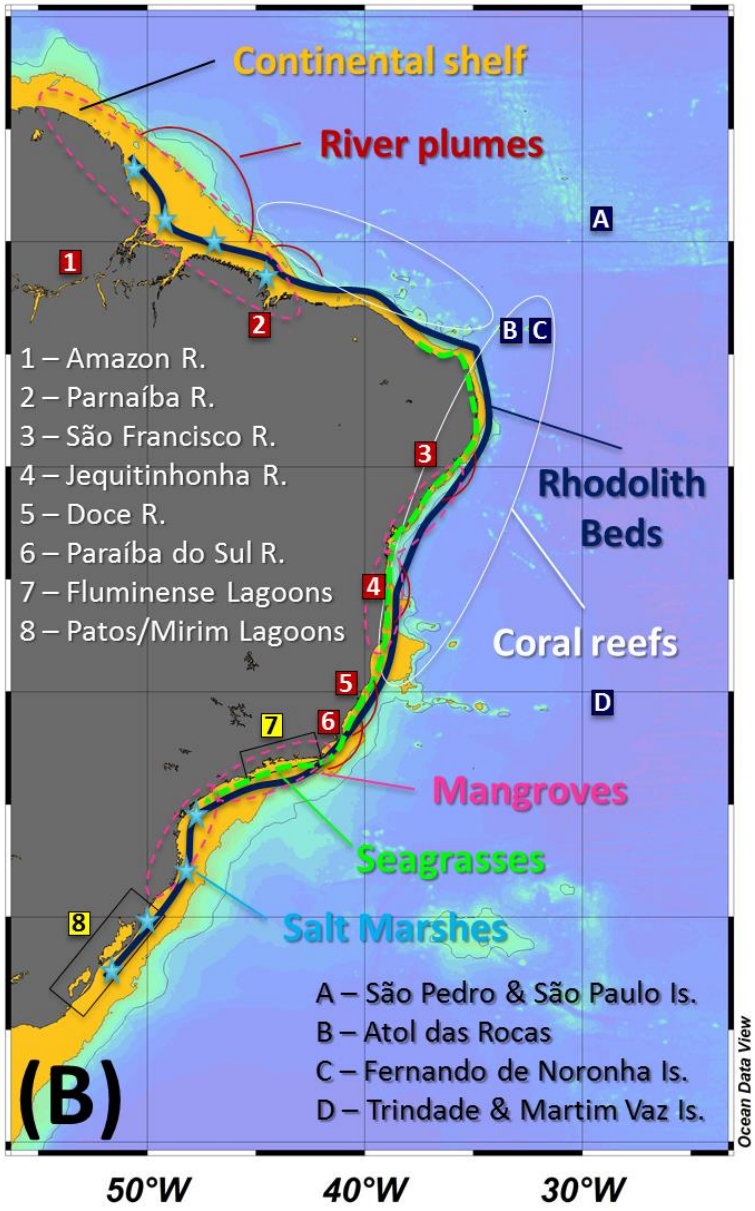
Make OA research Operational → Brazilian protocol of analyses, reporting results, certifying results through intercalibration exercises (at national and international level).

❖ Long-term:

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

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 the carbonate system*
- ✓ *Biogeochemistry modelling*
- ✓ *Physical and biogeochemical processes controlling sea ↔ air CO_2 fluxes*



Kerr et al. (2016)

In fact, the BrOA Network is searching for information

From estuaries/coastal to open ocean...

...From laboratories to field.

From local to large scales...

...From organisms to ecosystems.

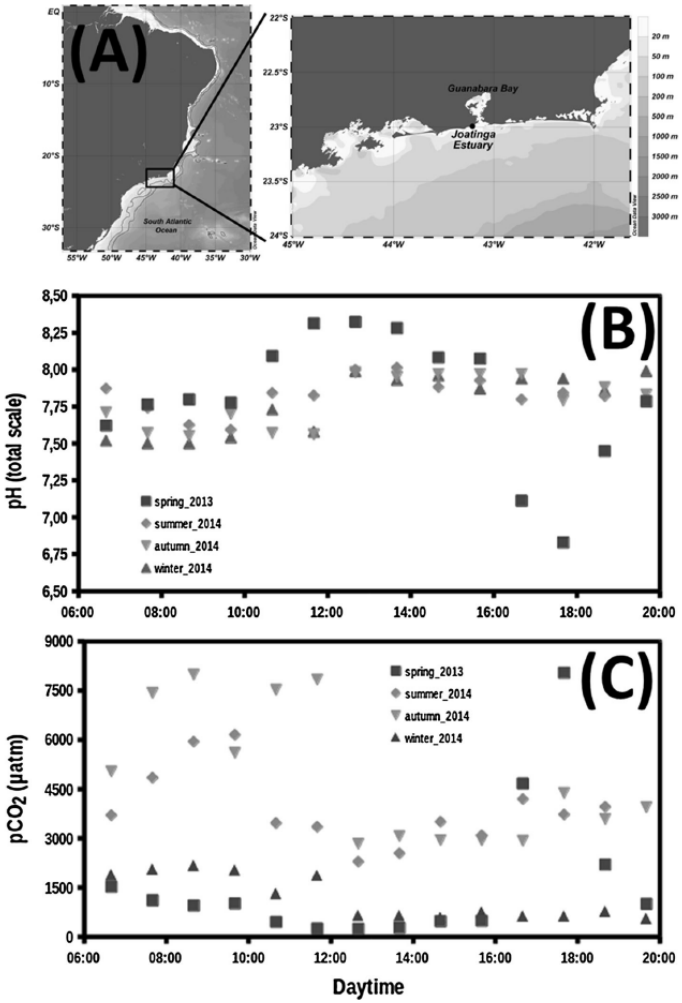
1) Actions related to observations

- Estuaries and Coastal Zones
  - Todos os Santos Bay and other estuaries – BA;
  - Guanabara Bay and other estuaries – RJ;
  - Patos Lagoon – RS;

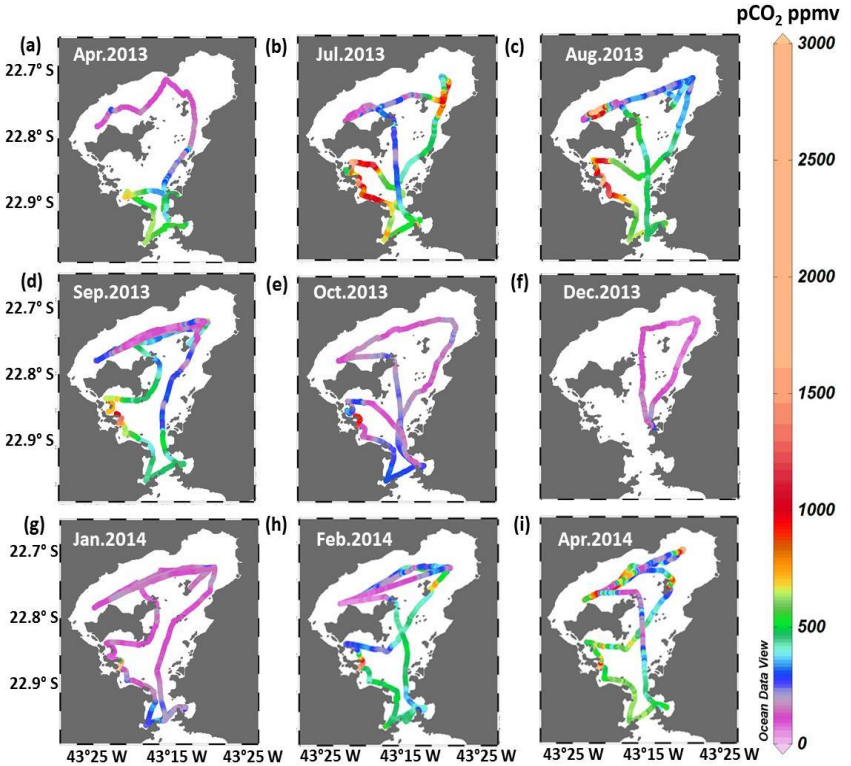



- ✓ **Monthly sampling started October 2015 at Patos Laggon** for determining CO_2 system parameters;
- ✓ **Sampling along river estuaries in the NE Brazil.**

Kerr et al. (2016)



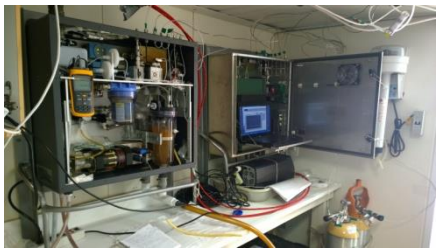
Cotovitz Jr. et al. (2015)

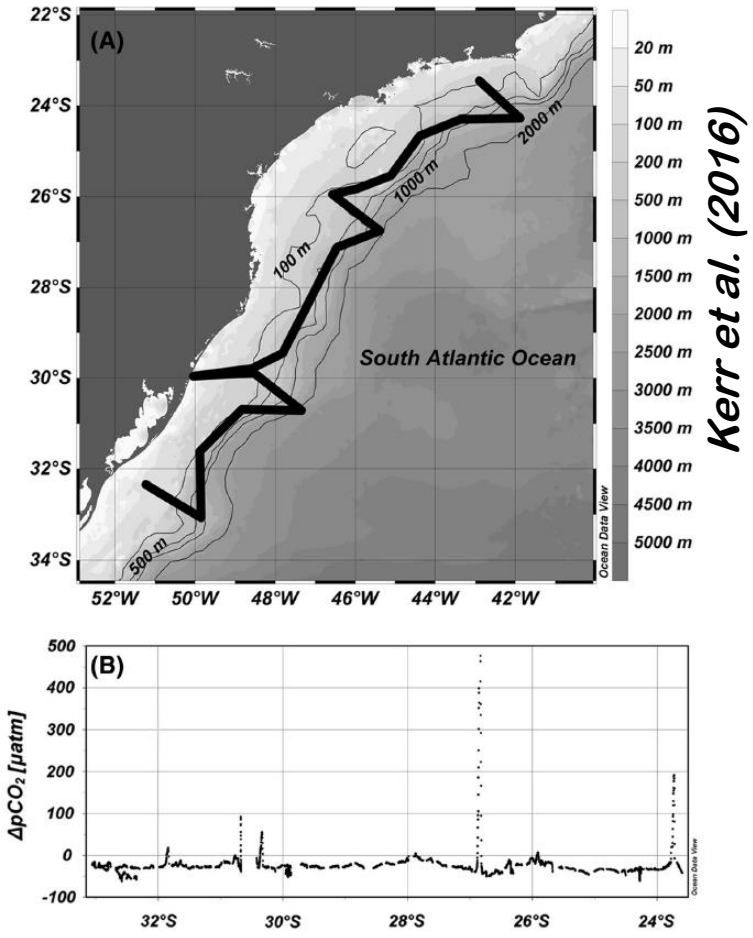


- ✓ **2-year seasonal sampling period (2013-2014)** for determining CO_2 system parameters and other parameters. At a **fixed station in the Joatinga Channel**, an urban estuary in Rio de Janeiro city, Brazil.
- ✓ **Monthly continuous pCO_2 measurements.** Large annual CO_2 sink enhanced by eutrophication (-19.6 mol C m^2 yr^{-1}).

1) Actions related to observations

- Open ocean – Medium/Large scales
  - Camadas Finas Project – AM to BA;
  - EstARte Project – RJ to RS;
  - PATEX Project – Patagônia Argentina
  - FORSA cruise – crossing the South Atlantic Ocean;
  - GOAL activities in Southern Ocean – Bransfield Strait



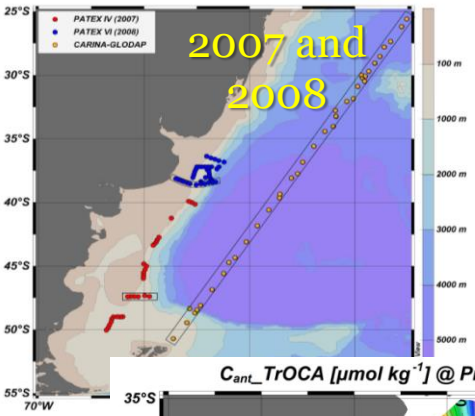


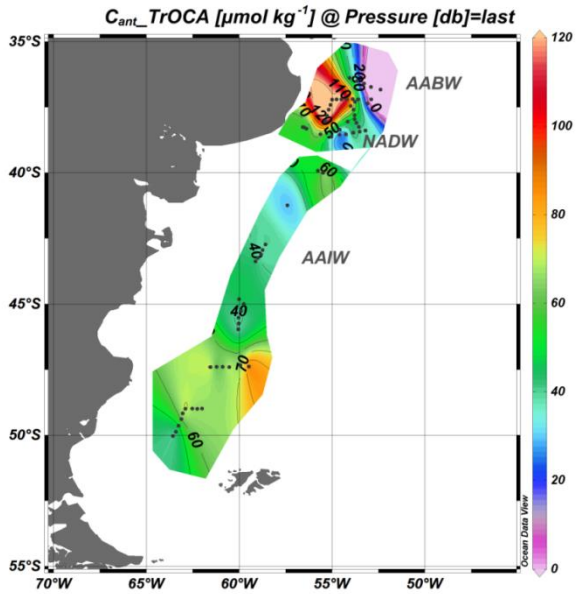
Kerr et al. (2016)

✓ **Continuous pCO_2, AT/CT & pH measurements.**

✓ **Anthropogenic carbon estimations.**

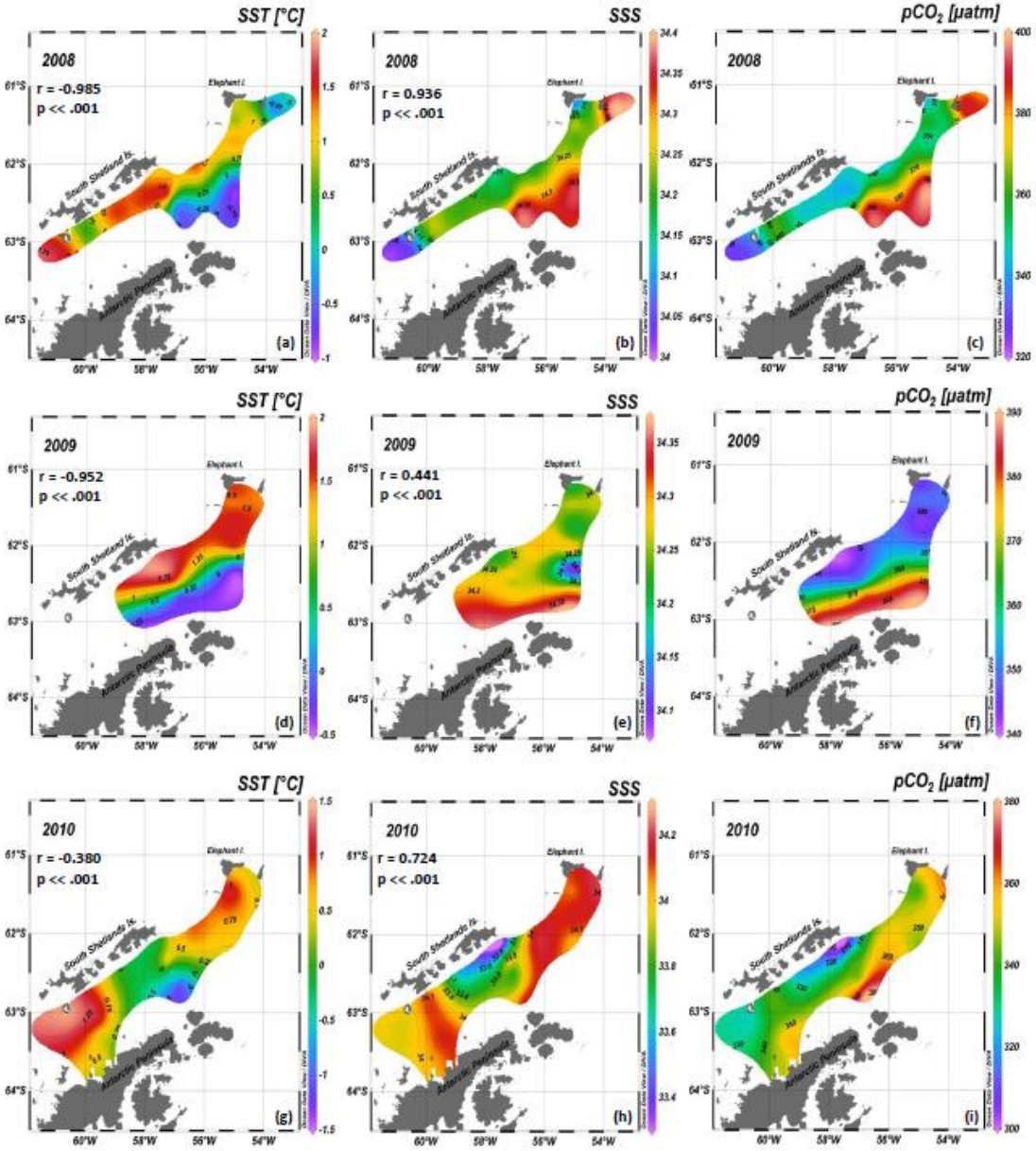
✓ PATAGONIA SHELF-BREAK





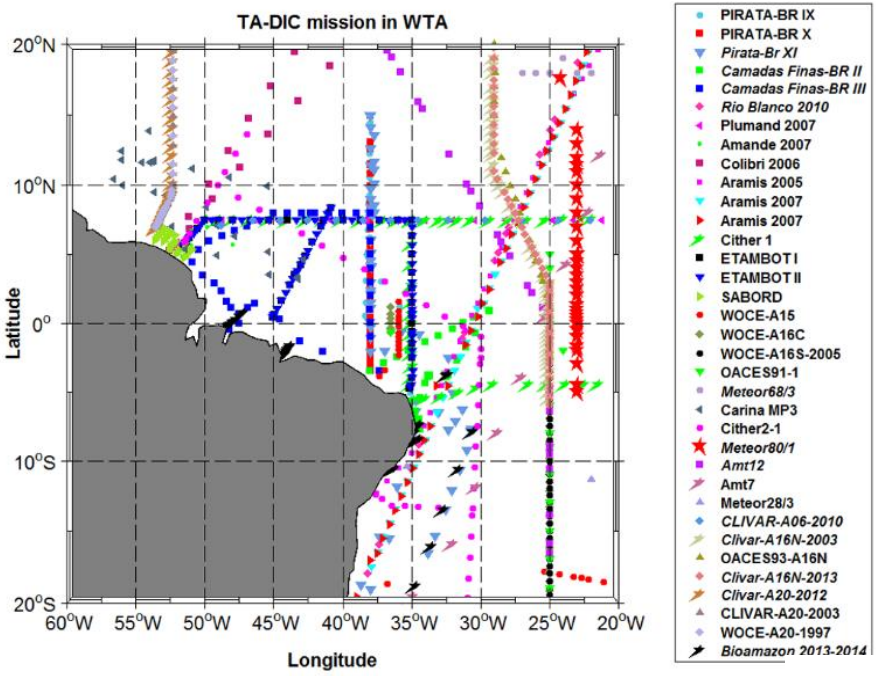
- ✓ **Carbonate system reconstruction (pCO_2, AT/CT & pH).**
- ✓ **Anthropogenic carbon estimations.**

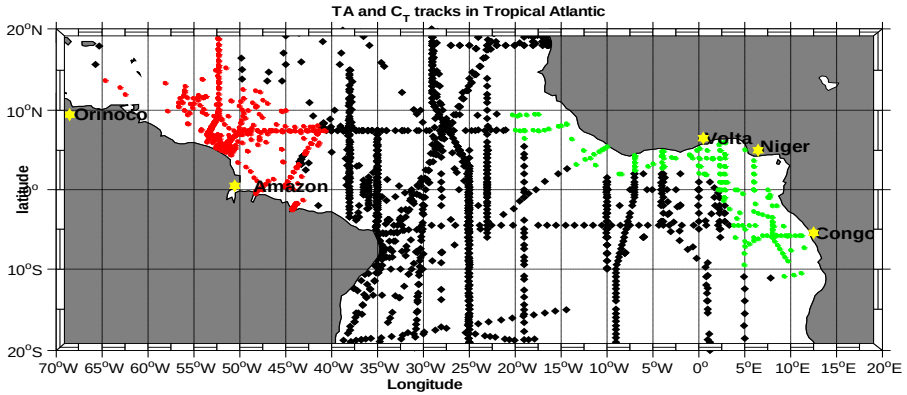
✓ BRANSFIELD STRAIT, SOUTHERN OCEAN



✓ TROPICAL ATLANTIC OCEAN

Bonou et al. (2016). DAO.

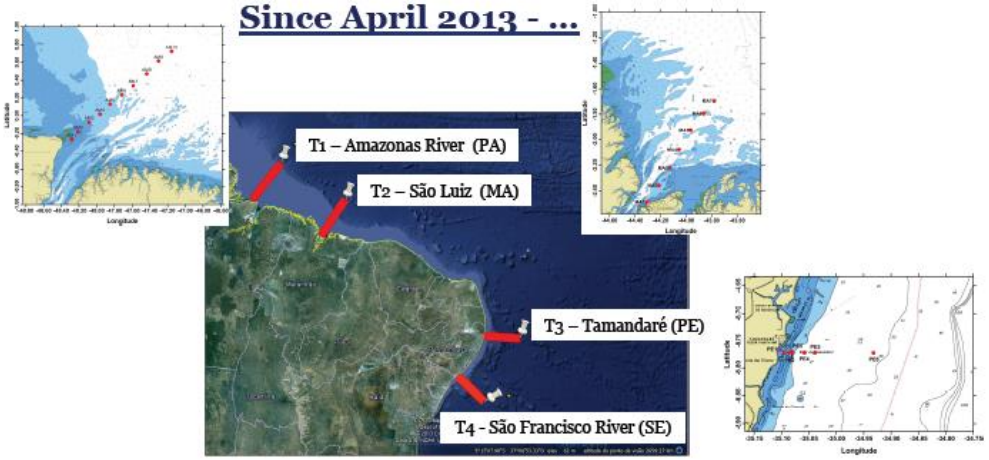




✓ **Compilation** of more than 1260 samples of **AT and DIC recorded** through 35 different cruises in the Western Tropical Atlantic **from 1989 to 2014**.

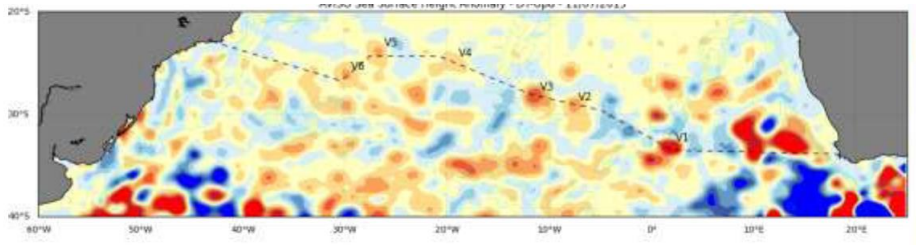
✓ **New relationship was determined for CT** using the SSS and time factor (year).

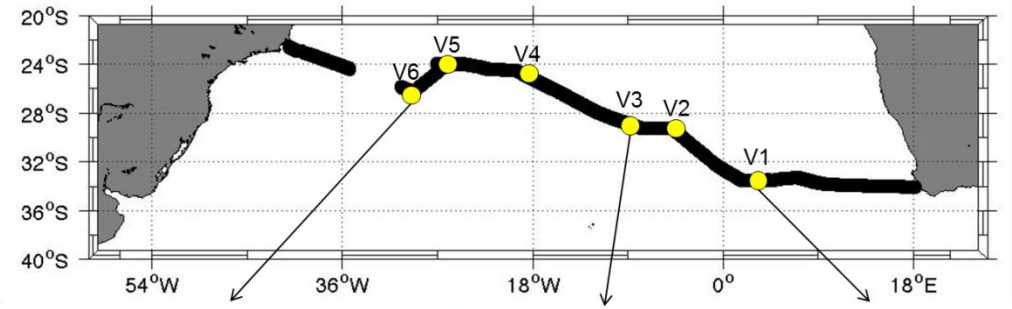
✓ **Bimonthly water sampling (pH, DIC, TA) in different cross-shelf transects along the NE Brazilian coast, from Amazon River (equator) to the São Francisco River (10°S)**

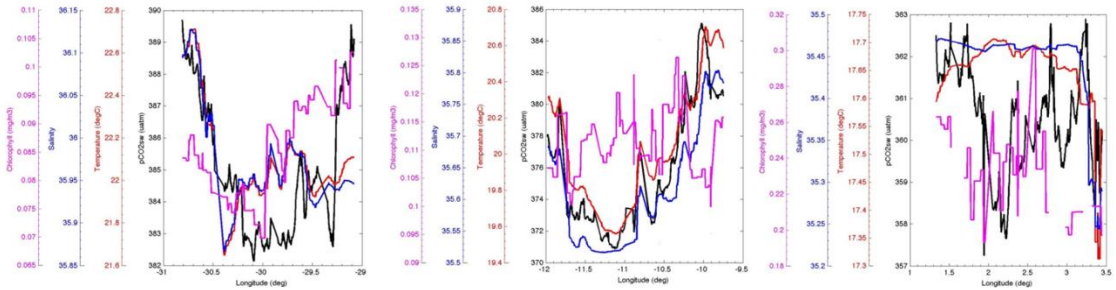


- **SOUTH ATLANTIC OCEAN**

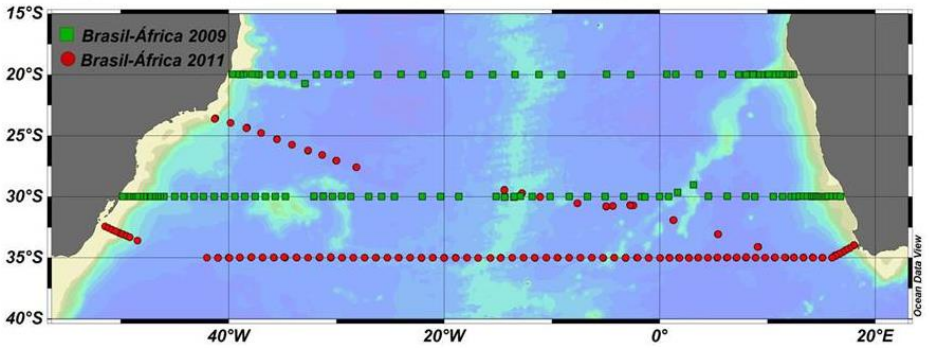
NPqHo VITAL DE OLIVEIRA
FORSA - 2015





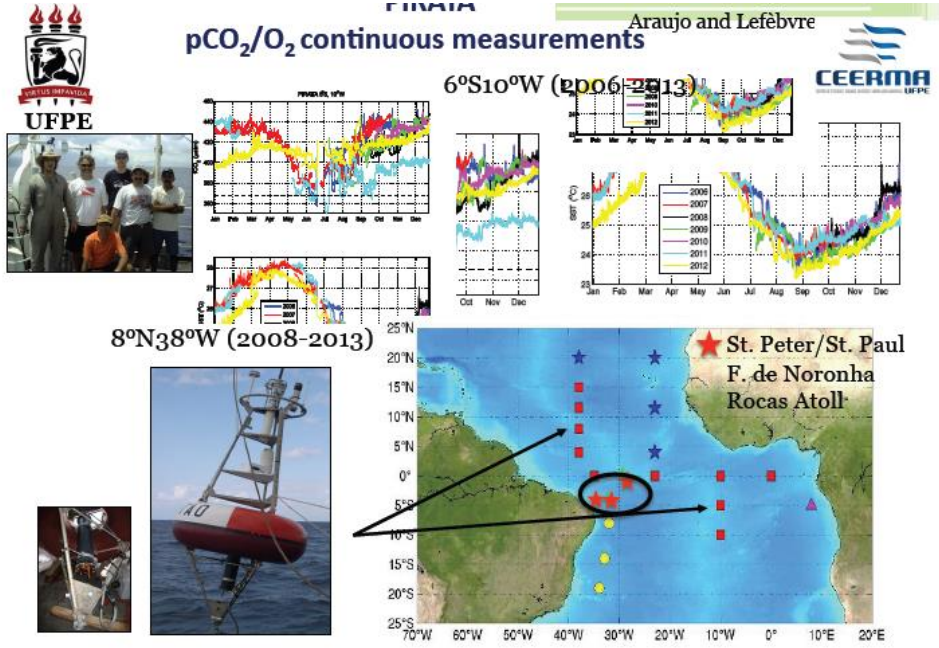


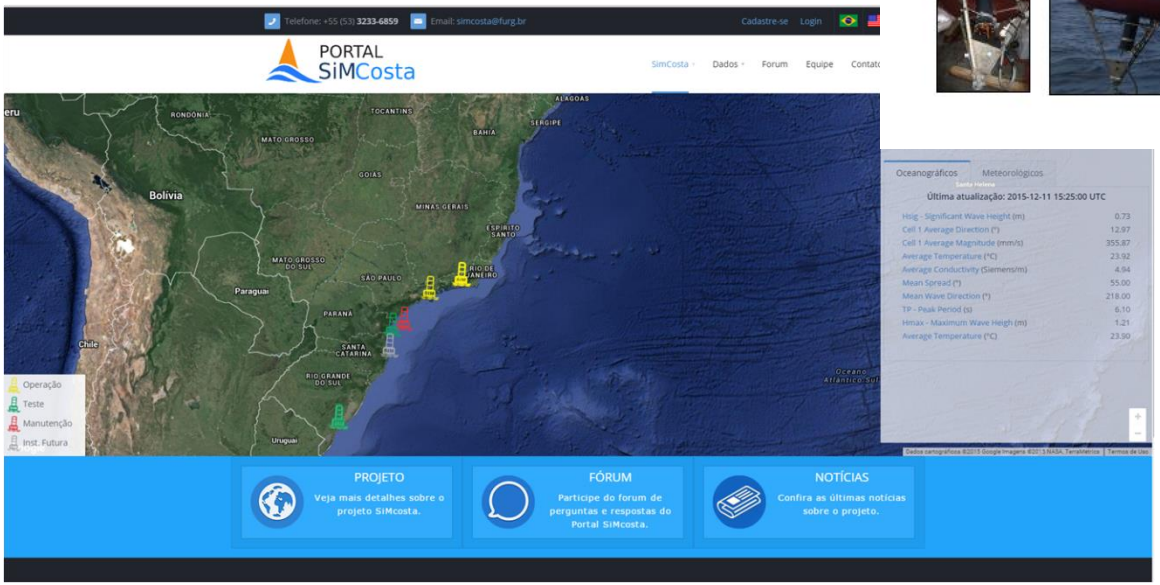
- **pCO_2 continuous measurement.**
- **Carbonate system reconstruction (pCO_2, AT/CT & pH).**
- **Anthropogenic carbon estimations.**



1) Actions related to observations

- Autonomous Monitoring
  - PIRATA buyos
  - SiMCosta buyos

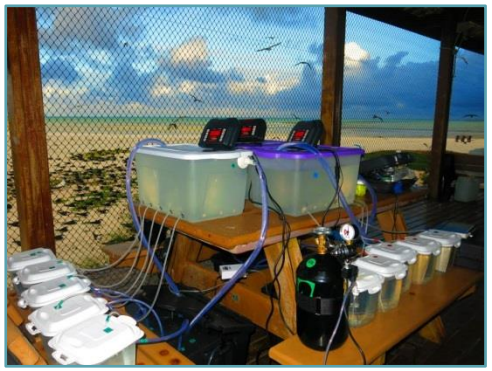


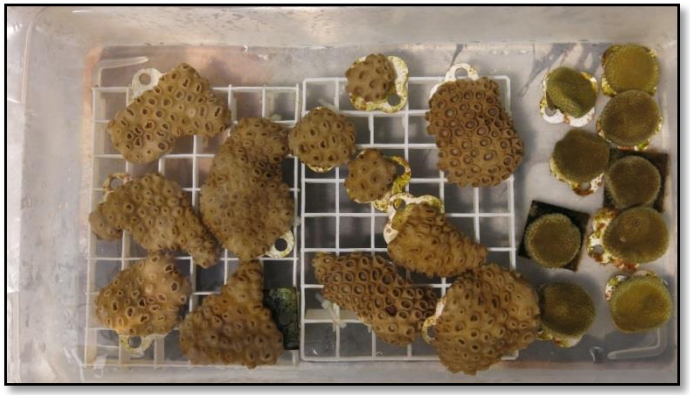


- ✓ **www.simcosta.furg.br**
- ✓ **http://www.pmel.noaa.gov/pirata/**
- ✓ 3 CARIOCA buyos in St.Peter/St.Paul, F. de Noronha Islands & Roca Atoll (2016)

2) Actions related to experimentation

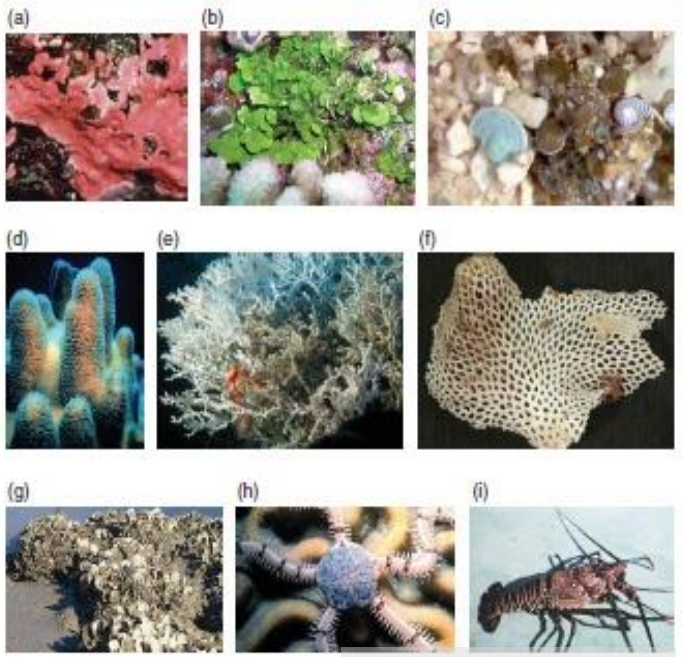
- 5 centers with facilities
  - UFSC – SC
  - UNIFESP – SP
  - UESC & UFBA – BA
  - CORAL VIVO



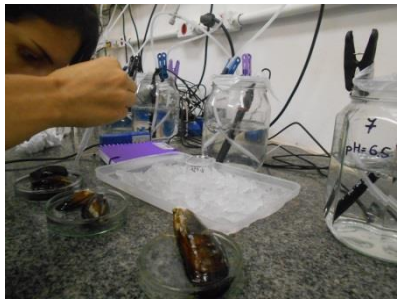


- ✓ Comparison of the **physiological effects** of OA and rising SST between a **soft coral** (*Palythoa caribaeorum*) and a **hard coral** (*Porites astreoides*).
- ✓ CO_2 Treatments: control 400 uatm & High 900 uatm
- ✓ T treatments: control 27.5 °C & high 31.5°C.
- ✓ Evaluating: Growth= buoyant weighing; Respiration and phothosyntesys; Lipids, Chl.a & zooxanteles contents.

- ✓ Evaluate the independent and combined **effects of OA and nutrient enhancement** on physiological processes of **crustose coralline algae (CCA).**
- ✓ CCA are among the calcifying organisms the most sensitive to OA.
- ✓ Evaluating: Primary production; Growth rate; Calcification rate & Photosynthetic efficiency



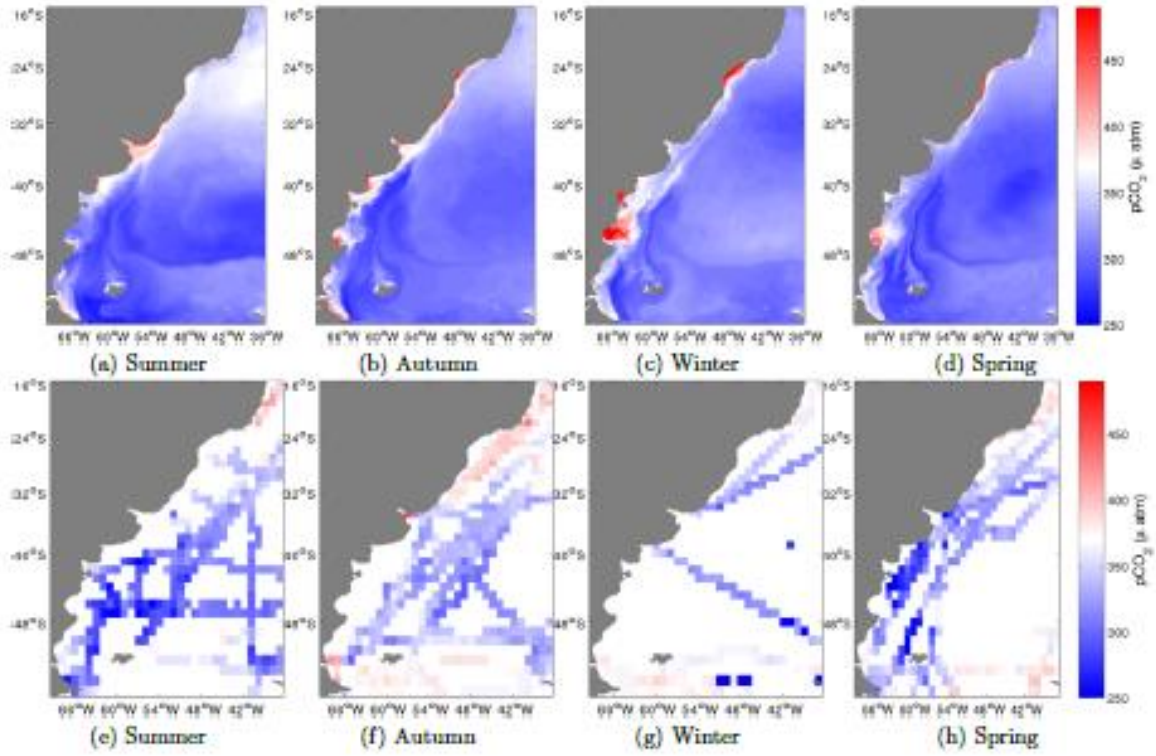
Kleypas et al., 2006



- ✓ Evaluate the **interactions of OA and contaminants** in marine sediments associated with petroleum reservoirs leaks . Metal mobilization & Biota effects
- ✓ **Polychaeta** (*H. Diversiculor*), **Mollusca** (*R. Philippinarum; P. perna*), **Amphipod** (*A. brevicornis, Hyale yongi*).
- ✓ Evaluating: mortality, growth, reproduction & larval development.

3) Actions related to biogeochemistry modelling and paleoceanography studies

Arruda et al. (2015)



- ✓ Modelling surface ocean pCO2 (blue – sink; rede – source).
- ✓ To identify the main drivers of pCO2 variability.
- ✓ Lack of observations to product validation.

- ✓ Analysis of stable isotopes ($\delta^{18}O$ and $\delta^{13}C$), on small carbonate samples (foraminifera and corals), used to reconstruct the environmental properties of past ocean.

Strengths and weaknesses...

- ✓ The group has **multidisciplinary**, making easier to understand integrated aspects of OA (biology, physical oceanography, chemical oceanography, biogeochemistry, etc.).
- ✓ Most of the group's researchers are using the **international protocols** to determine the carbonate system parameters.
- ✓ The group has researchers with extensive experience in the **measurement of net CO_2 fluxes** in the ocean-atmosphere interface.
- ✓ Purposes for **conducting experiments** are found in four main institutions in Brazil.
- ✓ OA is still an abstract concept in Brazil (better dialog with society, politicians and stakeholders) – Actions are in progress!!
- ✓ Vulnerable and/or impacted marine organisms of the Brazilian coast (economically important or not) did not yet identified – Actions are in progress!!
- ✓ Modelling efforts must be intensified.
- ✓ Need to carry out intercalibration exercises for chemical analysis. Actions are in progress!!
- ✓ Very young researchers in OA studies, we need to capacity people.

What we propose for LAOCA Network...

- Actions for **students exchanges and training** to facilitate capacity building.
- Extend the idea of the **BrOA manuscript** published in Environmental Science to the entire Latin America coast (Pacific and Atlantic Oceans).
- Institutions near the coast should start **monitoring your ecosystem**.
- Design of new marine organisms experiments should consider **multiple estressor** (OA, deoxygenation, temperature increase...).
- Utilize **existing monitoring systems and older databases** to reconstruct and describe the long-term changes in oceanic carbon chemistry and coastal ecosystems.

Obrigado!

www.broa.furg.br

BrOA

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