A snapshot of the marine CO_2-system in three coastal ecosystems in SE Brazil

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PICES 2015 Symposium, Joint BrOA/SOLAS Sorkshop
Santos, March 2015

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

UERJ
UNIVERSIDADE DO ESTADO DO RIO DE JANEIRO

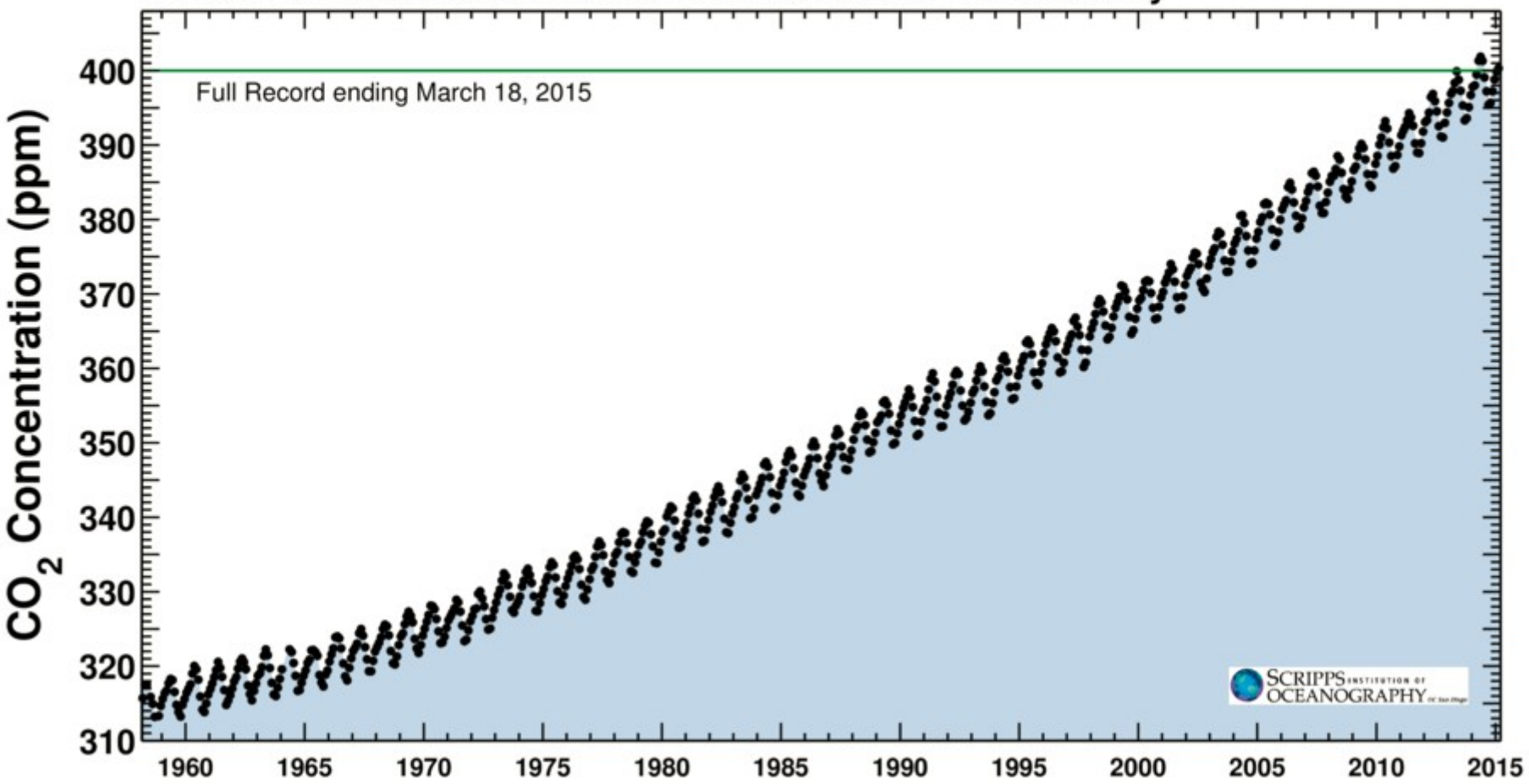
FACULDADE DE OCEANOGRAFIA

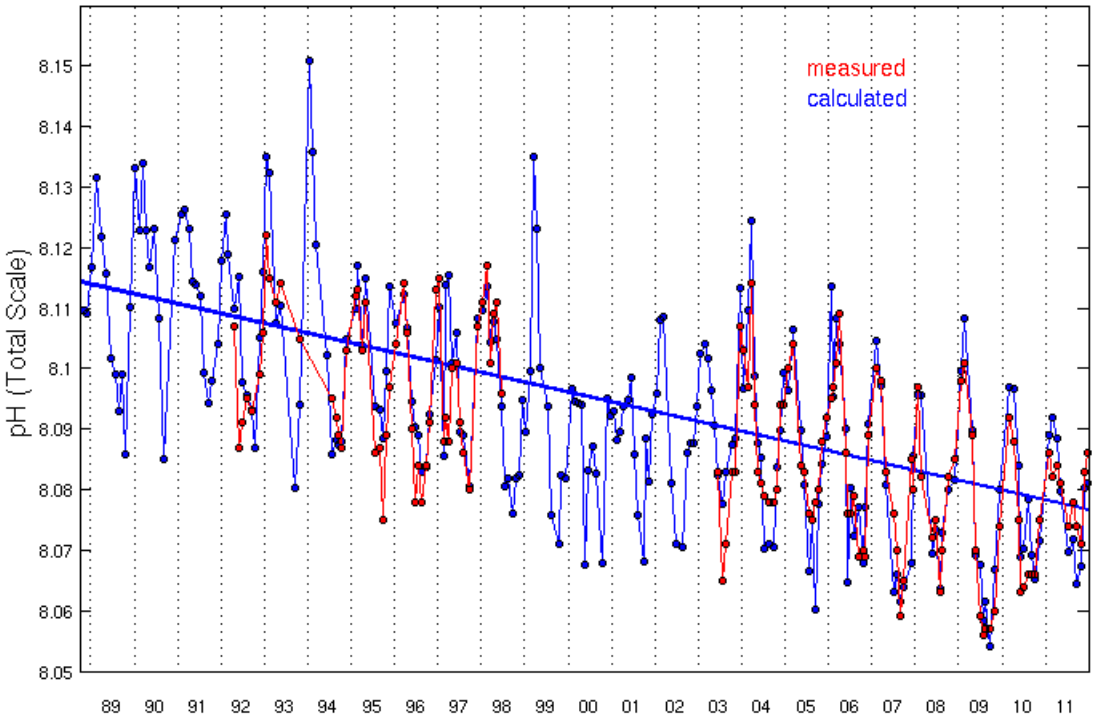
LAGOM
Laboratório de Geoquímica Orgânica Marinha | UERJ

LABOQUI
Laboratório de Oceanografia Química UERJ

Latest CO_2 reading
March 18, 2015

400.38 ppm

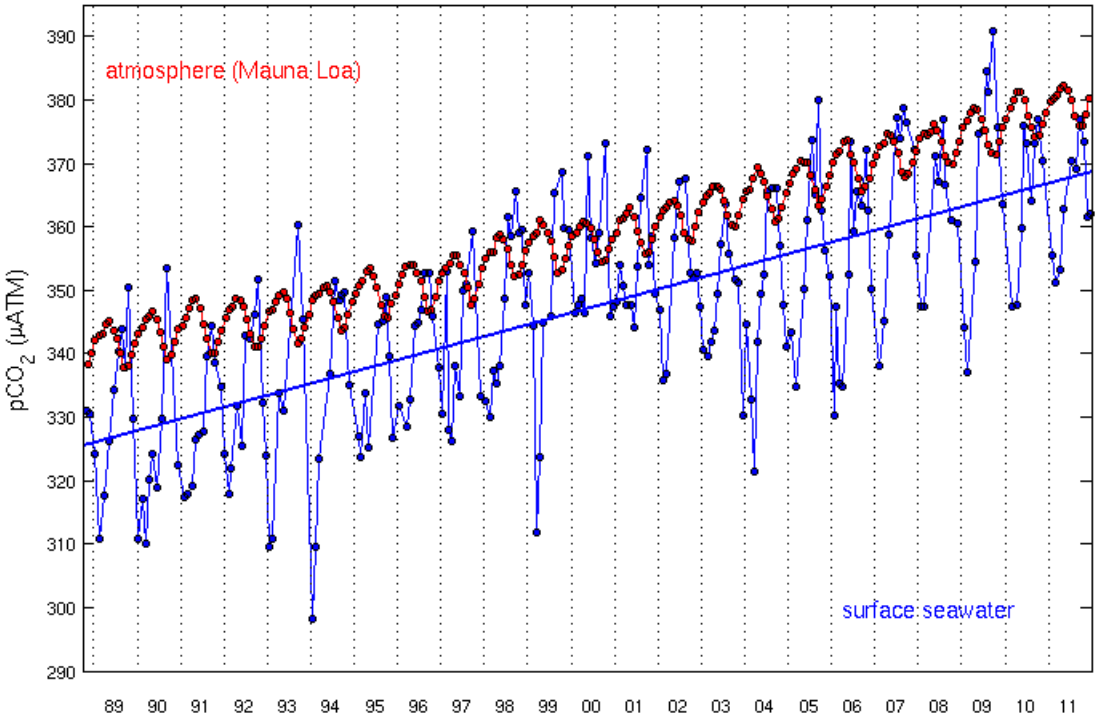




Open ocean areas

Data from Station HOT (Pacific Ocean)

Partial Pressure of CO_2

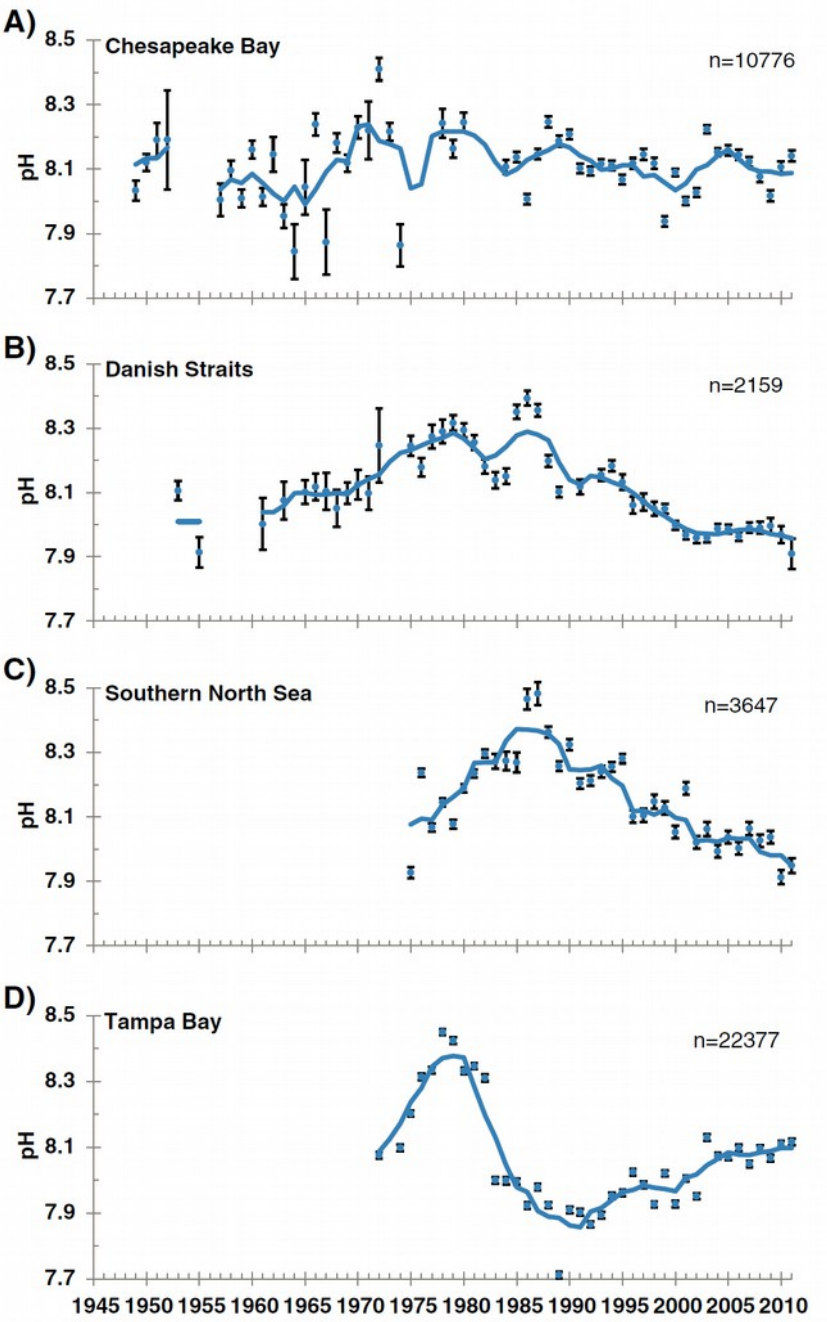


http://hahana.soest.hawaii.edu/hot/trends/trends.html

What about the coastal ocean? And coastal ecosystems?

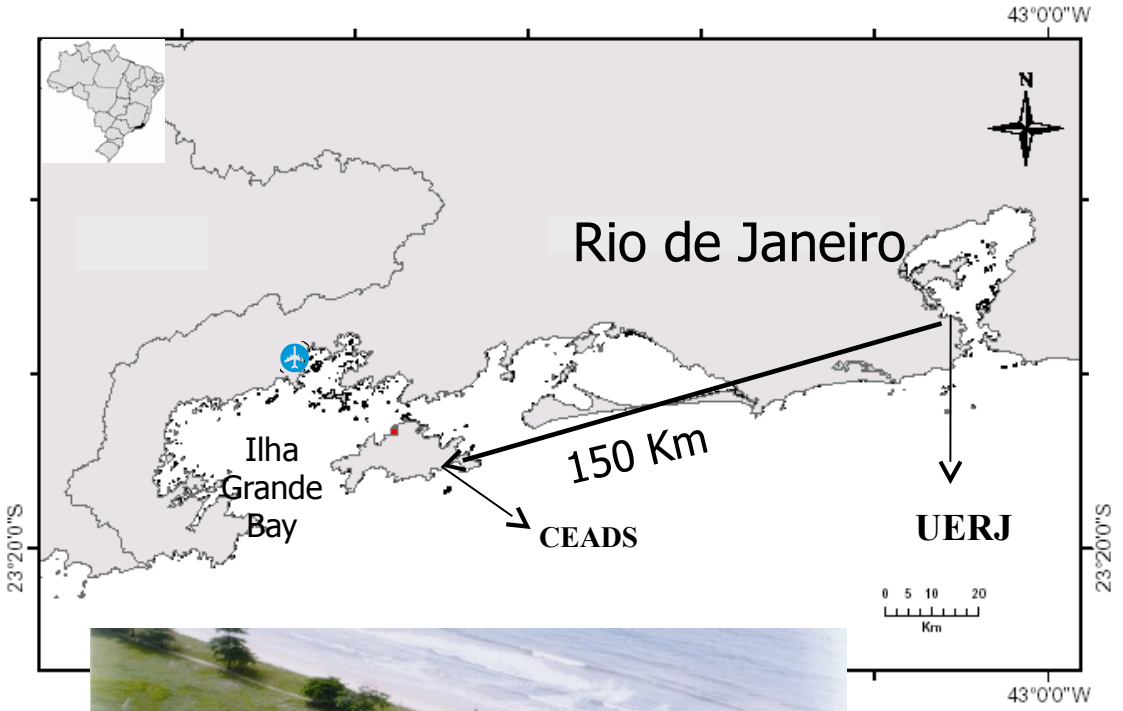
Long-term data for some N-hemisphere coastal areas

(from Duarte et al 2013 doi 10.1007/s12237-013-9594-3)



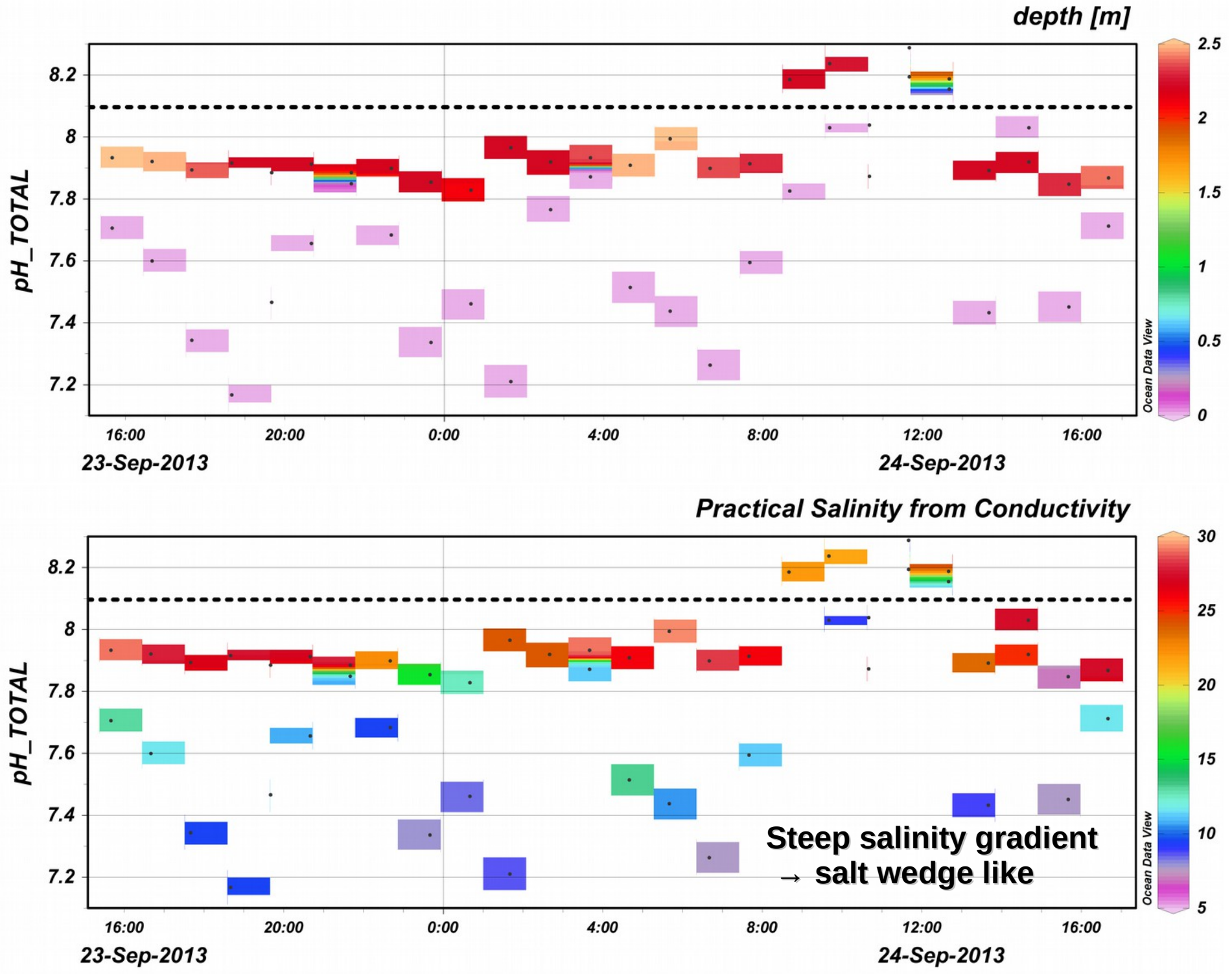
Coastal ecosystems in Rio de Janeiro: a snapshot

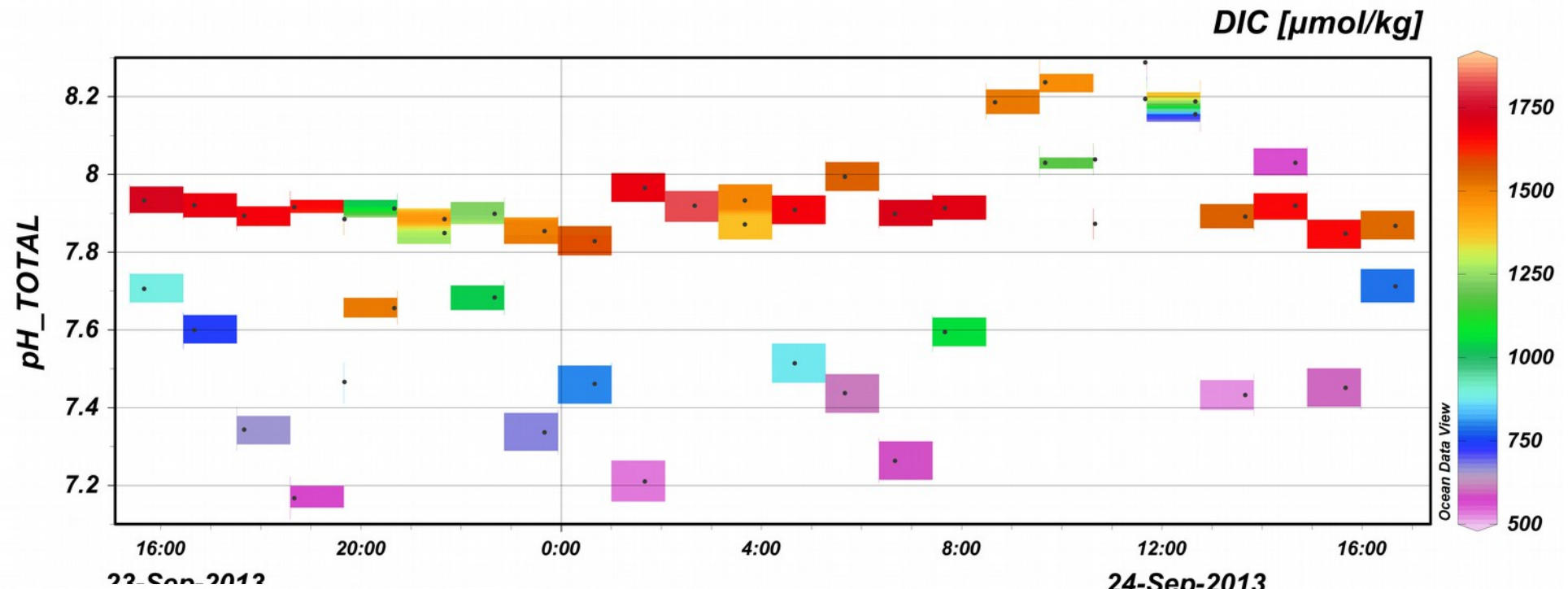
- **Barra Grande Estuary – a semi pristine area**
- **Rodrigo de Freitas Lagoon (LRF), Joatinga Channel (CJ)**
- **Summer conditions over a tidal cycle**
- **Potential CO_2 sinks or sources ?**
- **Pristine vs. urban areas: what about regional acidification ?**

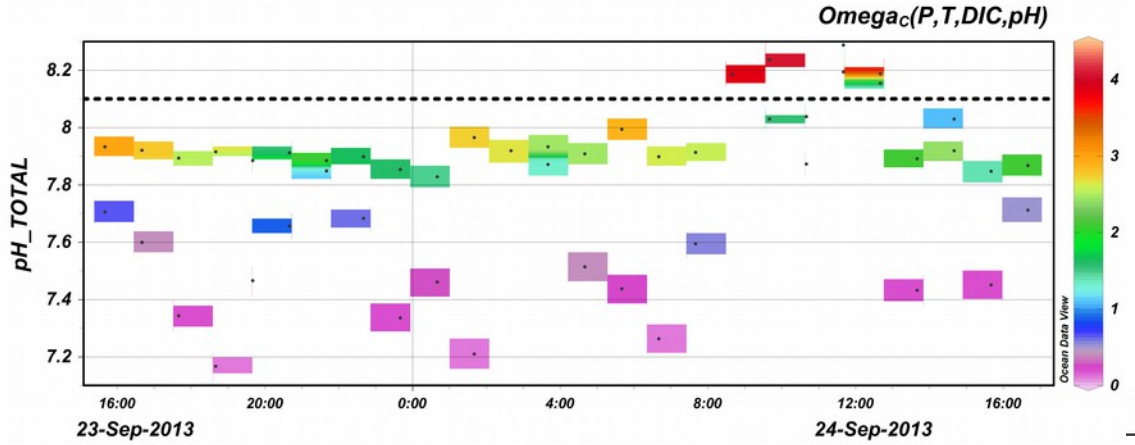


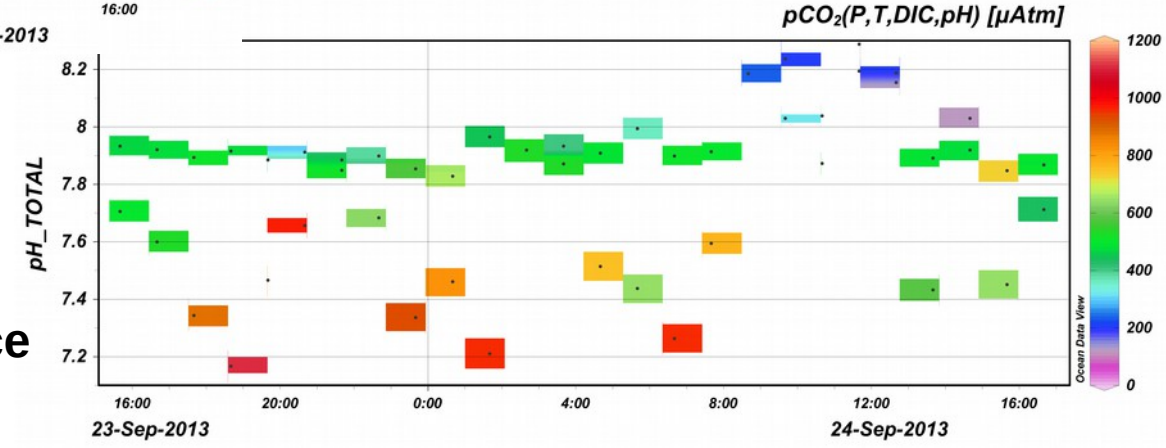
UERJ Campus:
Protected area

Fixed station at
Barra Grande Estuary


depth [m]
pH_TOTAL
8.2
8
7.8
7.6
7.4
7.2
16:00
20:00
0:00
4:00
8:00
12:00
16:00
23-Sep-2013
24-Sep-2013
2.5
2
1.5
1
0.5
0
Ocean Data View
Practical Salinity from Conductivity
30
25
20
15
10
5
Steep salinity gradient
→ salt wedge like



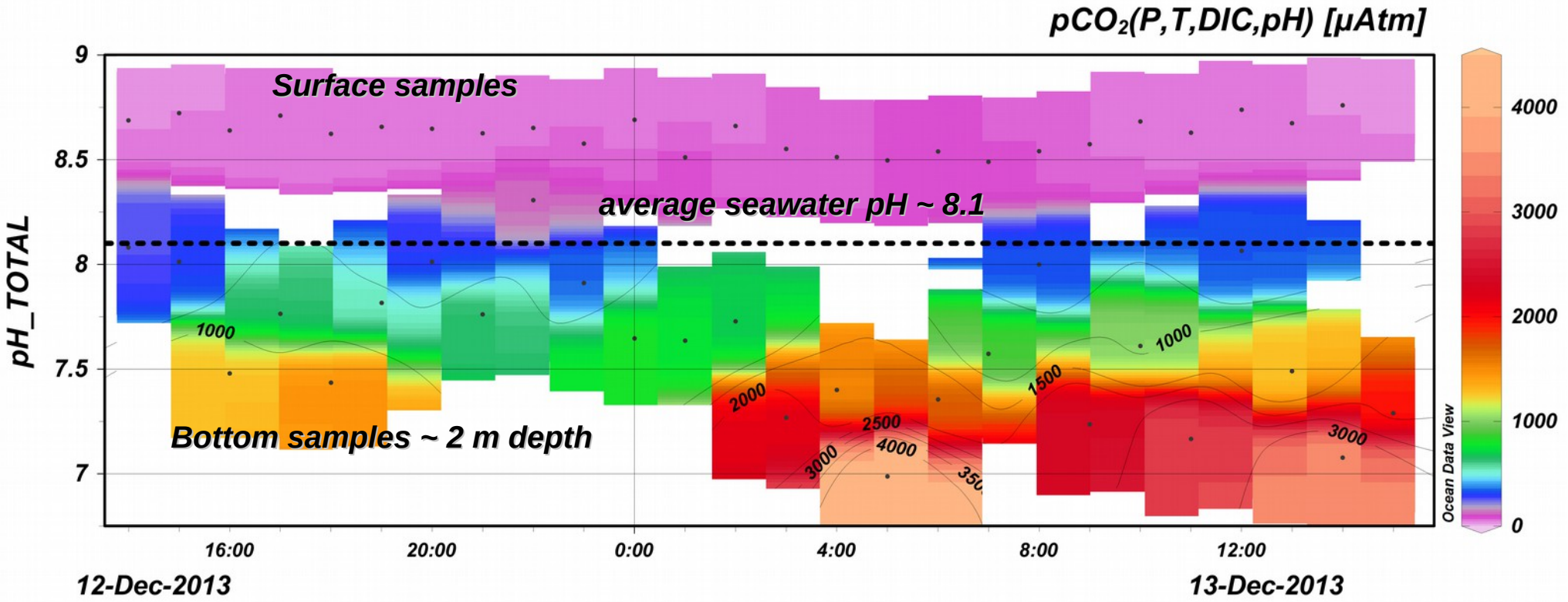


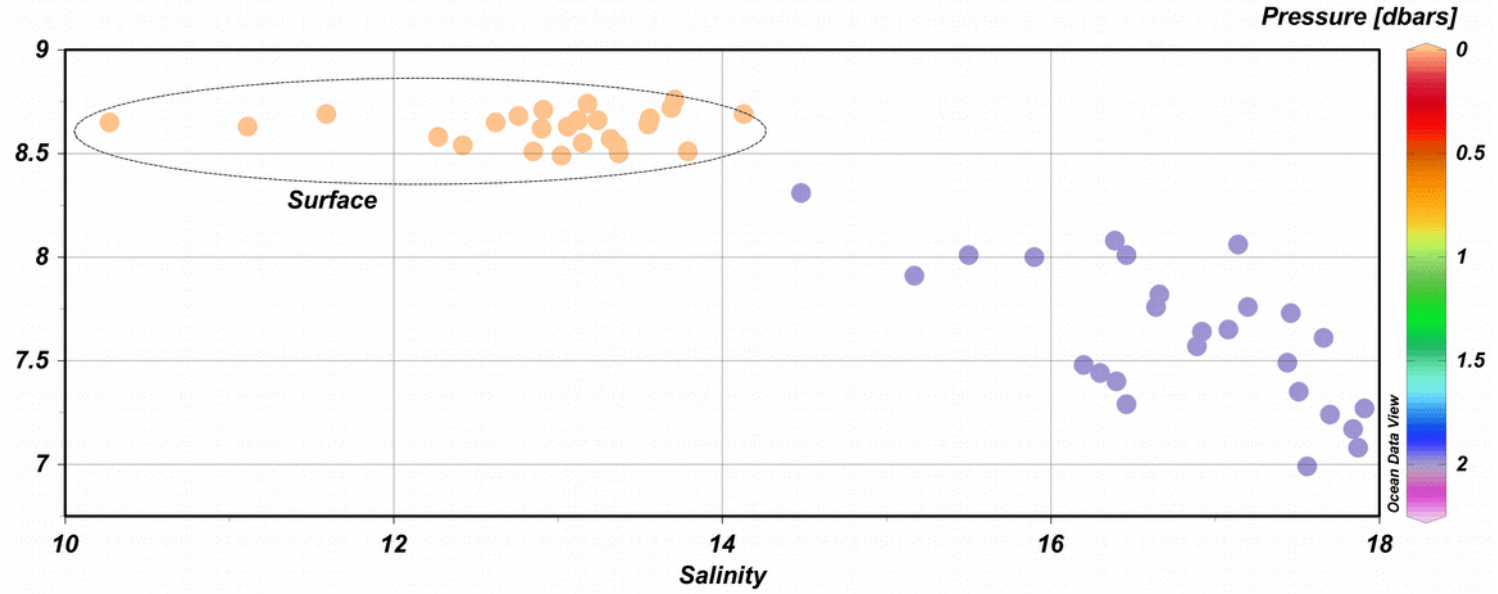


Surface layer → potential CO_2 source

Lagoa Rodrigo de Freitas – LRF – seen from above

By Marceloquaglioz at pt.wikipedia [Public domain], href="http://commons.wikimedia.org/wiki/File%3ALagoaRodrigoFreitasRJ10092006.jpg"





Surface layer → potential CO_2 sink

Bottom layer → "Acidic" conditions

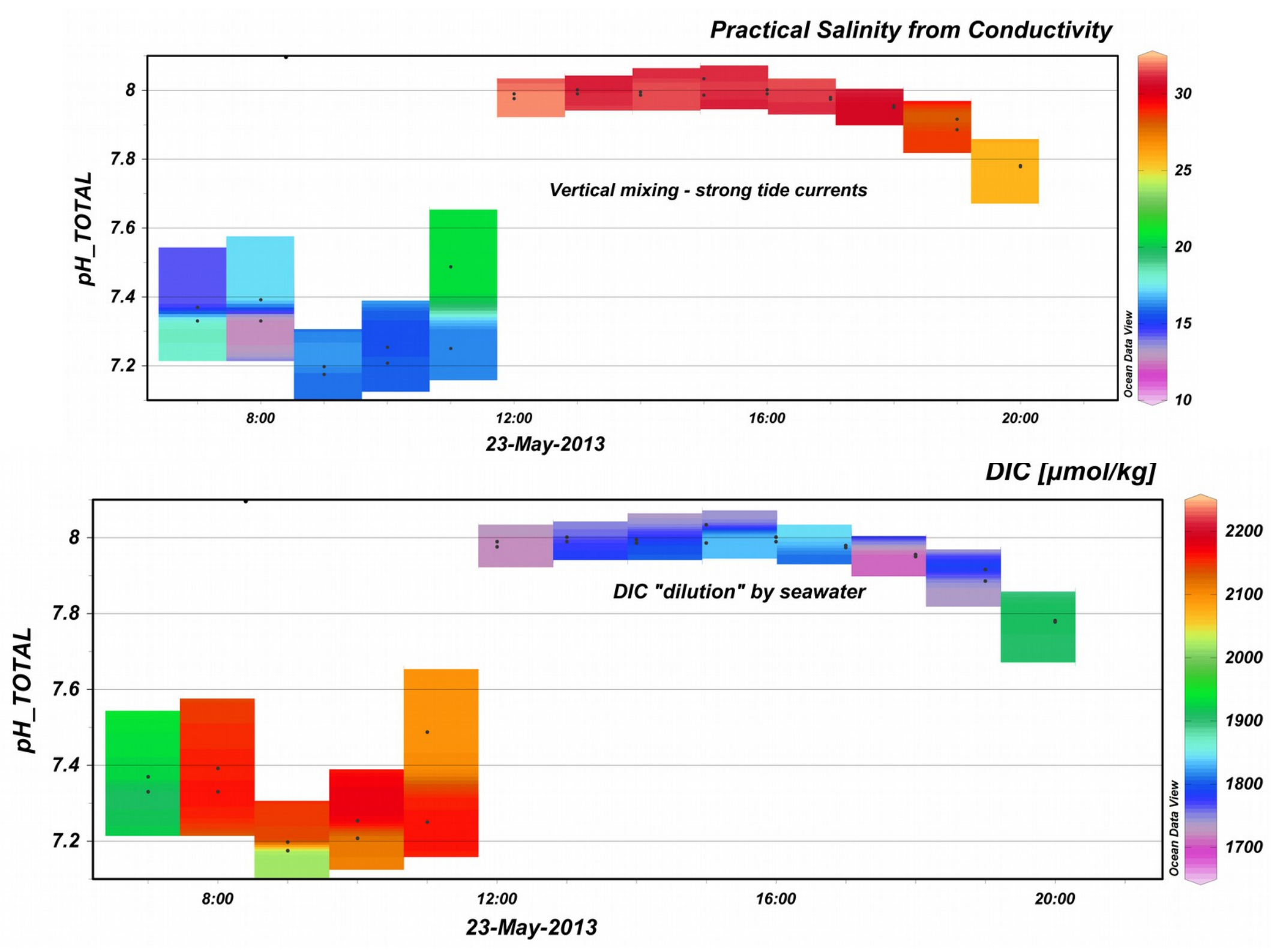
FAOC – M.Sc. Graduation School students, A. Fernandes, C. Hamacher, C. Farias, L. da Cunha (unpublished data)

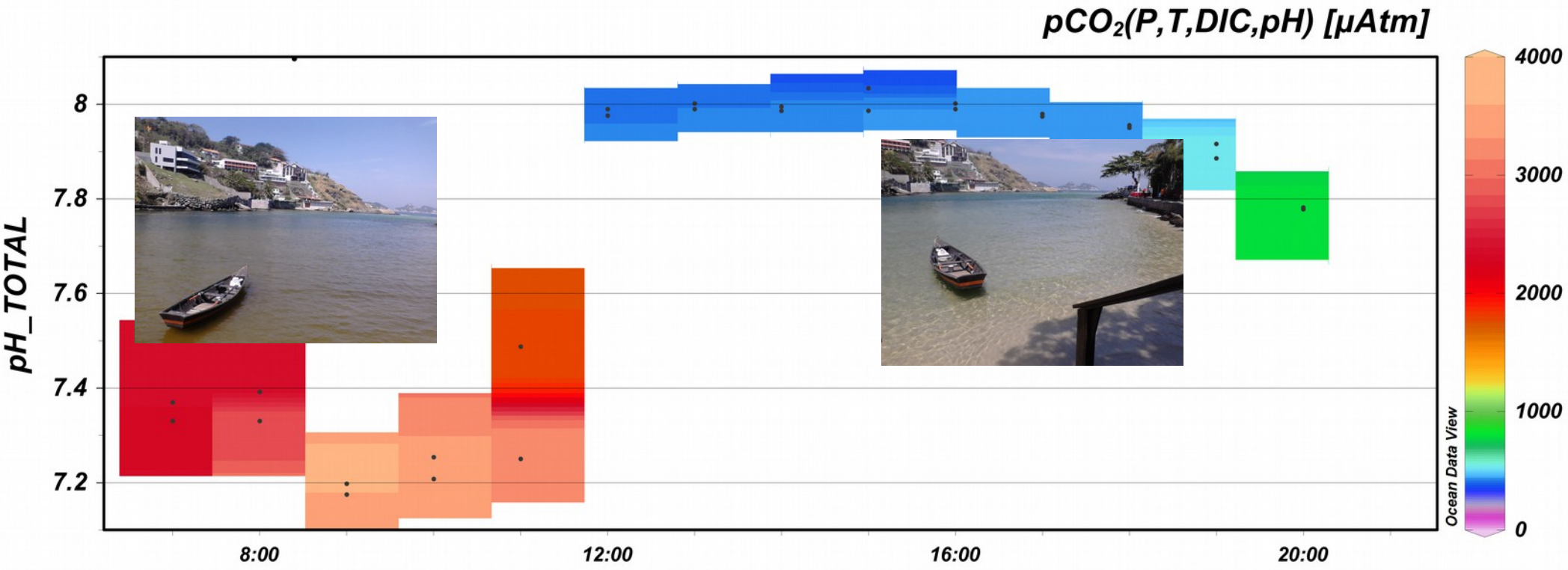
Lagoas de Jacarepaguá

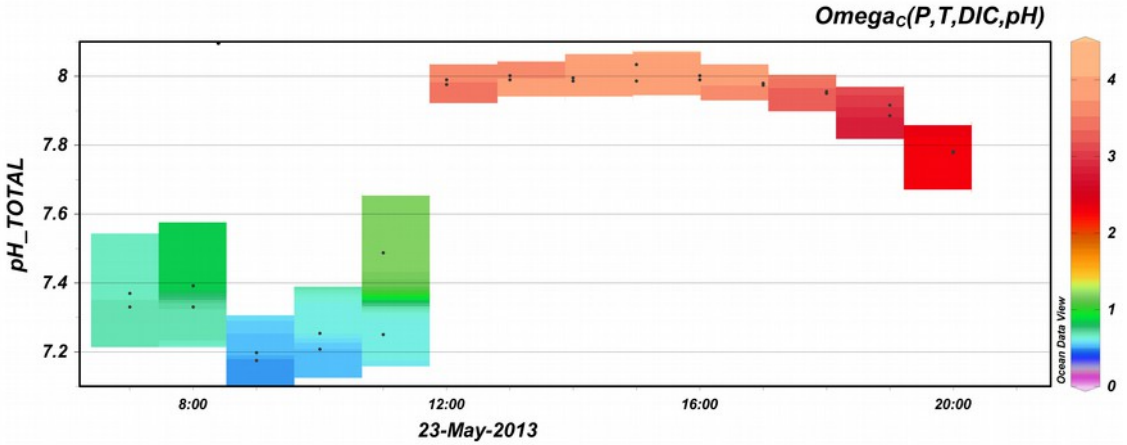
No. Inhabitants ~ 1.000.000

Joatinga Channel is the only connection to the sea

www.angularaerofoto.com.br%2Ffotos-areas-rio-de-janeiro%2Ffoto-area-barra-da-tijuca-8_5_237.html


Practical Salinity from Conductivity
pH_TOTAL
8
7.8
7.6
7.4
7.2
Vertical mixing - strong tide currents
8:00
12:00
16:00
20:00
23-May-2013
Ocean Data View
30
25
20
15
10
DIC [µmol/kg]
pH_TOTAL
8
7.8
7.6
7.4
7.2
DIC "dilution" by seawater
8:00
12:00
16:00
20:00
23-May-2013
Ocean Data View
2200
2100
2000
1900
1800
1700





High organic matter load from eutrophic, choked coastal lagoons ~ 6.5 mg C/ L (as DOC)

Lagoon water has “acidic conditions”

Mixed water column → potential CO_2 source

Coastal ecosystems

- Extreme heterogeneity
- CO_2 system parameters vary at daily AND seasonal time scales
- CO_2 system regulated by nutrient loads + biological processes in these areas
- Eutrophication also promotes acidification
- Continuous monitoring programmes → tackle biogeochemical processes processes and their variability

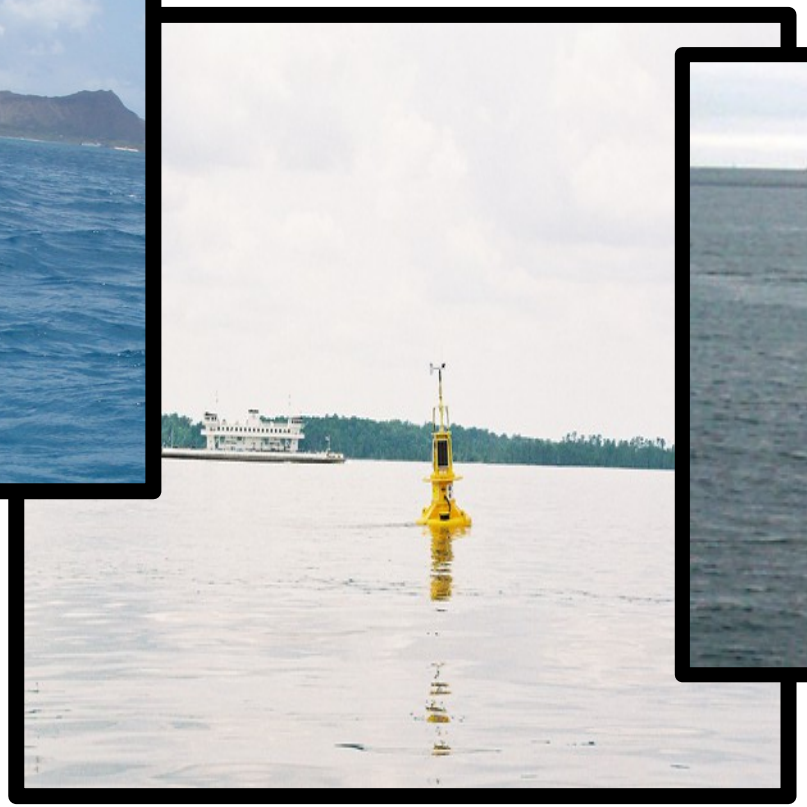
July 9th 2014 → Agência O Globo

O Globo, 14/03/2013
http://og.infg.com.br/in/7837116-843-92b/FT1500A/550/peixes-lagoa.jpg

Thank you

Benefits from a continuous monitoring programme:

- Predict/prevent extreme events like fish kills, harmful algae blooms
- Strengthen local fishermen communities (food security, acidification)
- Tourism issues → "Should I bathe here?"
- Navigation, dredging → how would it affect the above issues?



Pictures: USA – NOAA

January 2014 → ciliate Myrionecta sp. blooms off the SE Brazilian coast

Process studies:

Coastal ecosystems

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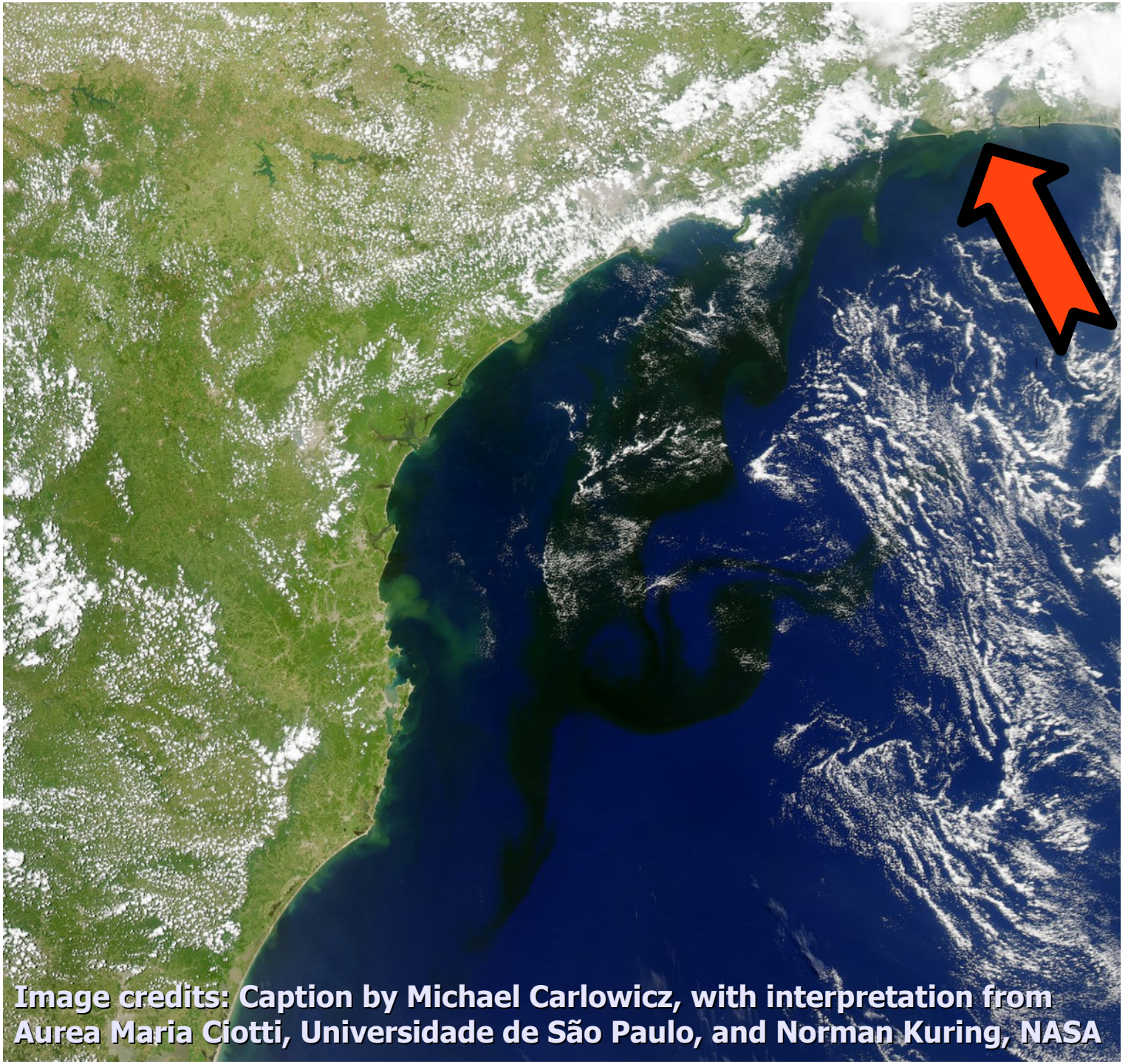
Shelf

Climate change

Ocean acidification

Population dynamics



Same graphic for a summer vs winter situation @ Joatinga

Same graphic for 2Rios campaigns