

Carbon pathways in the South Atlantic

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Outline

- 1 Introduction
 - The Program
 - Scientific Interest
 - Study areas
 - Brazilian Continental Shelves
 - Circulation study
 - Lagrangian drifters

- 2 Brazilian Projects & SAMOC

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CARBOM-OCEANS

This initiative is part of a master project recently approved by the Brazilian Federal Agency - CNPq

Environmental Characterization and Evaluation of Biogenic Ocean Resources from the Brazilian Continental Shelf and Adjacent Oceanic Zone - CARBOM-OCEANS

- Coordination: University of São Paulo (USP)
- Main theme: the budget of carbon and chemical elements associated with the production of organic matter in the South Atlantic ocean, as well as the annual flux between biogeochemical compartments of the Brazilian continental margin and adjacent deep-ocean areas

Scientific Hypothesis

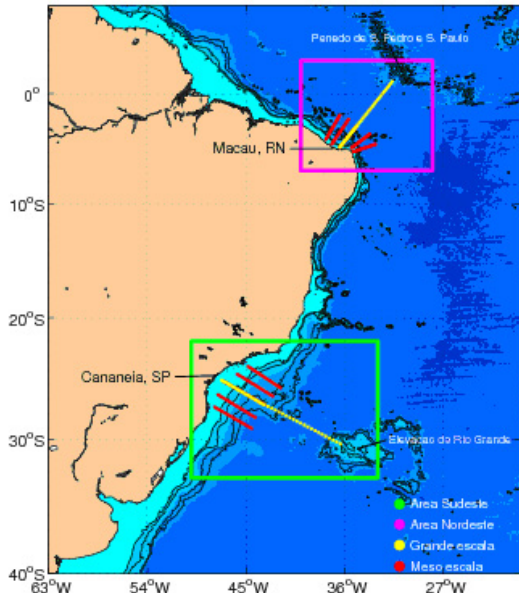
One of the scientific hypothesis of the project is:

The origin of most of the organic matter in the Brazilian Southeastern Continental Shelf (SECS) is in the South Atlantic Central Water (SACW).

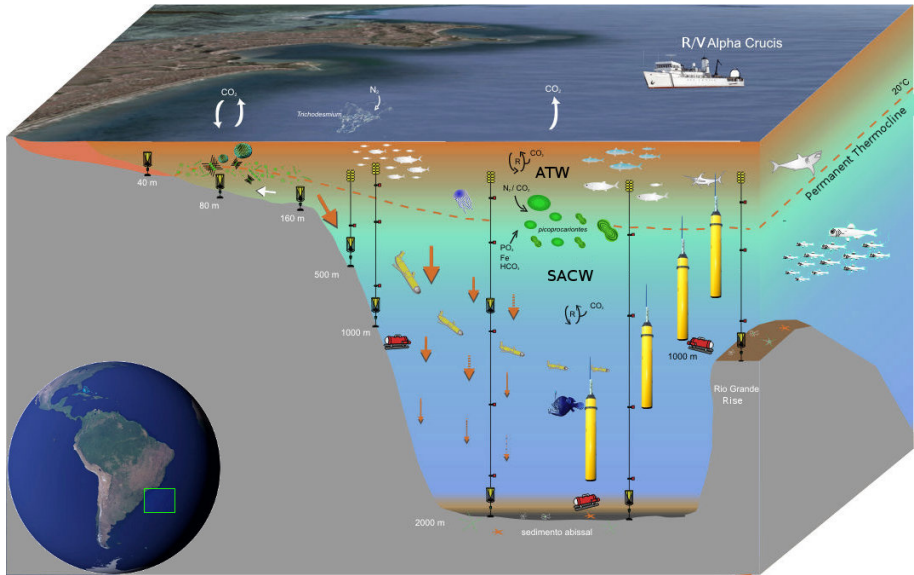
Thus, the physical processes that induce the intrusion of this body of water toward the coast determine the fertilization of the euphotic zone and maintain a working ecosystem in this sector of the Brazilian continental shelf.

Study area: NE and SE Shelves

- Inventory of carbon at the Brazilian NE and SE continental shelves and its adjacent oceanic regions.
- Strategic interest for the marine conservation in the South Atlantic and Equatorial regions and for a sustainable exploitation of mineral and biotechnological resources.



Southeastern Continental Shelf - SECS



Circulation and material transport

The role of along-shore advection due to mean current patterns and cross-shelf exchanges between coastal and open oceans must be better understood to describe the biogeochemical cycle in the ocean properly, which will be addressed using:

- 1 CTD profiling
- 2 ADCP
- 3 Glider
- 4 Moored stations
- 5 Lagrangian drifters
- 6 Satellite
- 7 Modelling

Use of lagrangian drifters

- The use of particles that follow the flow, i.e. motion from a Lagrangian point of view, introduces valuable information of the variability at sub-inertial frequencies which, in turn, are useful to improve physical-biological models.
- The advantage of the description of particle motion is their ability to capture spatio-temporal details of the flow while measurements from hydrographic sections and moorings are fixed in time and space respectively.

Large-scale and long-term experiment

- Groups of Argo profilers will be launched simultaneously and programmed to derive at different depths, e.g. 500, 1000, 1500 and 2000 m.
- Investigate the divergence and convergence of the mass flux.
- The trajectories at different levels will provide a description of the baroclinicity of the flow responsible for the transport of organic and inorganic materials in the ocean.
- In particular, we are interested in deploying the profiling floats on regions where satellite images indicate the presence of meanders and eddies.
- The vertical velocity anisotropy of these features can significantly change the final destination of particles carried by the flow from a common geographic point of origin.

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Impersonating Edmo Campos



The ATLAS-B Project Construction and Mooring of an Atlas-like Buoy in Brazil

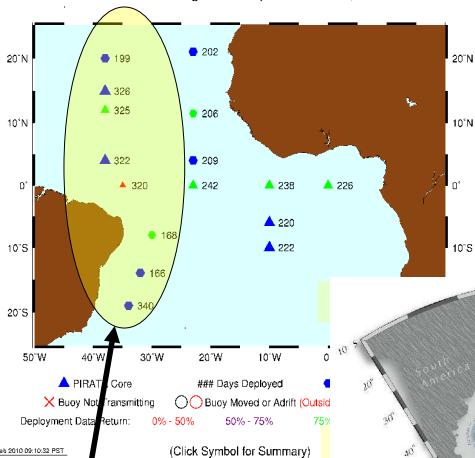
Edmo Campos

University of Sao Paulo - Brazil

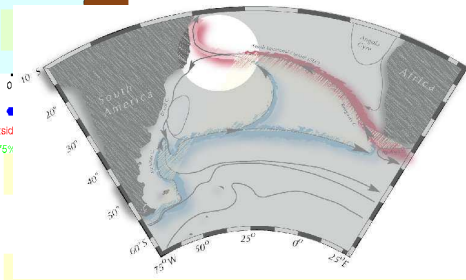


The PIRATA original Array and its extensions

PIRATA Mooring Status Update: Feb 15, 2010



The SEC bifurcation and the variability of the SACZ were the main rationales for the PIRATA Western Extension



The "Brazilian" buoys

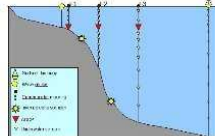
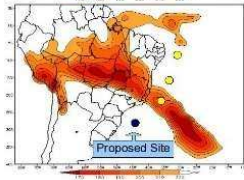
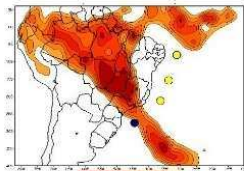
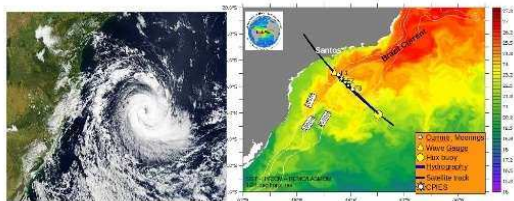
To fully enable the PIRATA WE for understanding the SACZ, a fourth buoy is needed

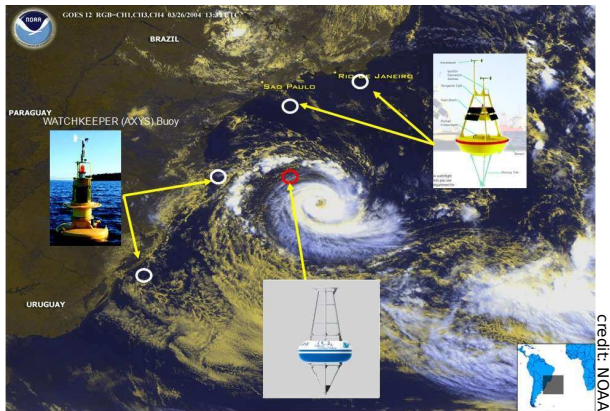
We are constructing a Brazilian Prototype of the Atlas Buoy (ATLAS-B) for monitoring the SACZ and the mixed layer in a regional with intense cyclogenetic activity.

This work is being carried out in close cooperation with PMEL.

The buoy is planned to be moored at 28°S , 42°W .

Repeat hydrographic section, together with current-meter mooring, will be carried across the Brazil Current.

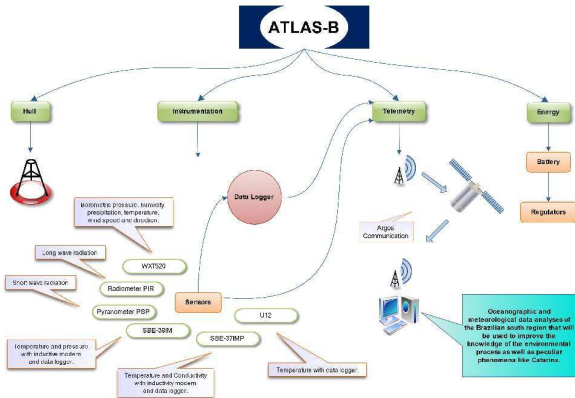




Proposed ATLAS-B buoy installation site superimposed to a satellite image. The image, obtained in March 2004, shows a fully developed tropical storm off the Brazilian south coast, the Catarina storm.

Catarina was a particularly destructive extreme phenomenon, which caused heavy losses to South Brazil agriculture, industry and housing, including loss of lives. Offshore sea surface temperature and air humidity at the region were abnormally high for that time of the year (SST was 1.5 oC higher than average). If real time offshore meteorological and oceanographic measurements were available at the time of the storm, early warning procedures could have been adopted, which might have minimized the losses.

(ATLAS-B drawing: Holos Brasil)

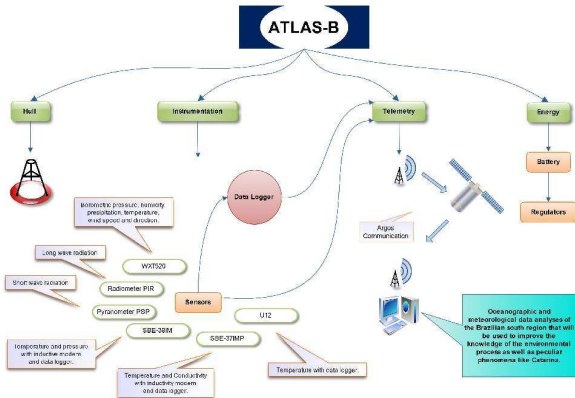


One of the project's main goals is to build a prototype as compatible as possible to the original NOAA first-generation ATLAS buoy.

Meteorological (air temperature, humidity, barometric pressure, rain and wind) and oceanographic parameters (water temperature, salinity and pressure) will be sampled at the same levels as in the PIRATA buoys.

Some alterations, however, will be implemented. Instead of custom meteorological sensors, a commercially available weather module (Vaisala WXT-520) will be employed.

A standard commercial ARGOS PTT should also be adopted. Mooring hardware, whenever available, will be purchased locally.



At present, detailed specification process for the buoy is in its final stage.

Construction of the buoy hull has been initiated.

It is expected that the buoy first sea test will be carried on at the second quarter of 2011. Buoy should be deployed till the end of 2011.

If this prototype fulfill the project's expectations, additional buoys will be built, including enhancements such as additional sensors (current meters and CO2 flux sensors), as well as an improved data acquisition and transmission systems (IRIDIUM, probably).

Thank You All

