Report for the year 2017 and future activities

SOLAS Brazil
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This report has two parts:

- Part 1: reporting of activities in the period of January 2017 – Jan-Feb 2018

The information provided will be used for reporting, fundraising, networking, strategic development and updating of the live web-based implementation plan. As much as possible, please indicate the specific SOLAS 2015-2025 Science Plan Themes addressed by each activity or specify an overlap between Themes or Cross-Cutting Themes.

1. Greenhouse gases and the oceans;
2. Air-sea interfaces and fluxes of mass and energy;
3. Atmospheric deposition and ocean biogeochemistry;
4. Interconnections between aerosols, clouds, and marine ecosystems;
5. Ocean biogeochemical control on atmospheric chemistry;
6. Integrated studies;
7. Environmental impacts of geoengineering;

IMPORTANT: This report should reflect the efforts of the SOLAS community in the entire country you are representing (all universities, institutes, lab, units, groups, cities).

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<th>PART 1 - Activities from January 2017 to Jan/Feb 2018</th>
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<td>1. Scientific highlight</td>
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A) Air-sea CO2 fluxes for the Brazilian north-east continental shelf in a climatic transition region
In this study, fCO2 underway measurements were made in the Brazilian Equatorial Northeastern coastal zone from about 5°S to 0°S, as an effort to contribute to better understand the fCO2 variability in this region. Leading institution: UFC, in cooperation with IRD (France).
Figure 1 - a) fCO2sw spatial distribution during the first campaign, October 2012. b) fCO2sw distribution during the September 2014 campaign.


B) Variability of CO2 fugacity at the western edge of the tropical Atlantic Ocean from the 8°N to 38°W PIRATA buoy
The objective of this study was to quantify the fCO2 variability in the northwestern tropical Atlantic region using data recorded at 8°N–38°W from 2008 to 2011. The high-frequency fCO2 variability was associated to diurnal cycle of solar radiation and heavy rainfall. This study was lead by UFPE, in cooperation with IRD (France) and the PIRATA project team (Brazil, France, USA).
Figure 2 - High-frequency variation of precipitation (heavy rain event) and its influence on SSS and fCO₂ on August 13–14, 2008, at the 8°N–38°W PIRATA buoy.


C) A Synoptic Assessment of the Amazon River-Ocean Continuum during Boreal Autumn: From Physics to Plankton Communities and Carbon Flux

The main objective of this work is to improve our understanding of the processes and organisms responsible for carbon and nutrient cycling along a large-scale tropical river-ocean continuum (Amazon River to offshore). The CO₂ fugacity (fCO₂sw) confirms that the Amazon River plume is a sink of atmospheric CO₂ in areas with salinities <35 psu, whereas, in regions with salinities >35 and higher-intensity winds, the CO₂ flux is reversed. This study was lead by UFPE in cooperation with IRD (France) and University of Abomey-Calavi, Benin.


D) Phytoplankton x carbon biogeochemistry, including sea-air CO₂ fluxes in an eutrophic tropical bay

Temporal and spatial survey of organic carbon and CO₂ within Guanabara Bay (SE Brazil). The authors found that POC and DOC concentrations varied positively with total pigments, and negatively with DIC. Strong linear correlations between these parameters indicate that the production of organic carbon translates to an equivalent uptake in DIC, with 85% of the POC and about 50% of the DOC being of phytoplanktonic origin.

assessments such as IPCC, interactions with policy makers or socio-economics circles, social sciences, and media).

Field Campaigns:

A) **NAUTILUS** – In Feb. 2017 and Feb. 2018 took place the two final cruises of the project “New autonomous technologies investigation and monitoring of AABW transformations in the Weddell Sea and Antarctic Peninsula: a contribution to the study of those implications in ocean circulation and climate” (Portuguese acronym NAUTILUS). In this context, samples for carbonate system and surface underway measurements pCO2 were performed in 2017 and 2018 in the North Antarctic Peninsula. (FURG)

B) The ongoing project “**Long term ecological research**” Estuário da Lagoa dos Patos aims to understand natural phenomena influence and human impacts on biota and ecological processes in the Patos Lagoon Estuary, south Brazil. This project is being developed since 1998, and in 2015 monthly samples for the carbonate system are being taken in this ecosystem. (FURG)

C) The ongoing project “**Long term ecological research**” Baía de Guanabara has a detached group to study the metabolism of the inner portion of Guanabara Bay, SE Brazil. Sampling campaigns (25 hours, monthly basis) have started in November 2017, and are foreseen to last for a whole year at least. Parameters: Greenhouse gases (CO2 and CH4, in continuous (former) and discrete (latter) samplings), physical-chemical parameters, carbonate system parameters, nutrients, organic carbon, organic contaminants in suspended matter, phytoplankton. (UFRJ, UFF and UERJ)

D) **PIRATA-BR XVII / GEOTRACES cruise** (Nov/17 to Jan/18)

During the servicing of the PIRATA buoys, 65 oceanographic stations were occupied along 22S to 15N in the tropical western Atlantic Ocean. In addition to the essential ocean variables, trace elements and C and O stable isotopes samples in the framework of GEOTRACES were collected for analysis. Additional measurements included underway surface ocean pCO2, eddy-covariance measurements of fluxes of heat, momentum, and CO2, as well as aerosol sampling (Figure 3).


3. Top 5 publications in 2017 (only PUBLISHED articles) and if any, weblinks to models, datasets, products, etc.


4. Did you engage any stakeholders/societal partners/external research users in order to co-produce knowledge in 2017? If yes, who? How did you engage?


PART 2 - Planned activities for 2018/2019 and 2020

1. Planned major field studies and collaborative laboratory and modelling studies, national and international (incl. all information possible, dates, locations, teams, work, etc.).

Modelling studies:

Please refer to items I, II, and II in section 3 (funded projects) regarding the use and development of the Brazilian Earth System Model (BESM). These 3 projects are multi-institutional within Brazil and include cooperation with foreign partners.

2. Events like conferences, workshops, meetings, schools, capacity building etc. (incl. all information possible).

Participation in short courses, and Summer Schools:


Foreseen participation in:

1) Polar 2018 (https://www.polar2018.org/) - FURG group
2) OceanObs’ 19 (http://www.oceanobs19.net/) - Abstracts submitted by PIRATA-Brazil group, and LAOCA (Ocean Acidification) group, including Brazilian authors.
3) PIRATA 23rd Meeting (Marseille, France, October 2018) – Brazilian PIRATA members and other participants (INPE, USP, FURG, UFPE, UERJ etc)

3. Funded national and international projects / activities underway.

Since 2016 – PELD Baía de Guanabara (Long-Term Ecological Research Baía de Guanabara)
CNPq funding
SOLAS-related activities:
a) Ocean biogeochemical control on atmospheric chemistry (Coastal zone – Measurements of Volatile Organic Carbon – VOC – Researchers from UERJ, UFF and UFRJ)
b) Atmospheric deposition and ocean biogeochemistry (Coastal zone – Measurements of nutrients and carbonate-systems parameters – Researchers from UERJ, UFF and UFRJ)

c) Since 2015 – PELD Lagoa dos Patos (Long-Term Ecological Research)
CNPq funding
SOLAS-related activities:
a) Atmospheric deposition and ocean biogeochemistry (Coastal zone – Measurements of carbonate-systems parameters – Researchers from FURG)

Since 2016: Greenhouse Gas Emissions in Brazilian Coastal Waters
FAPERJ Funding, researchers from UFF and IRD (France)
SOLAS-related activities:
a) Air-sea greenhouse gases (CO2, CH4 and N2O) fluxes in estuarine and shelf waters of South-eastern Brazilian Coast;
b) Assessment of carbon and carbonate cycling (TA, DIC, underway pCO2, POC, DOC, δ13C-DIC)
c) Coupling of field campaigns with remote sensing techniques.

2014 – 2018 NAUTILUS
CNPq funding
SOLAS-related activities:
a) Ocean biogeochemical control on atmospheric chemistry (Southern Ocean – underway pCO2 measurements, phytoplankton, ocean biogeochemistry – Researchers from FURG and UERJ)

since 1998 – PIRATA
Ministry of Science and Technology funding (Brazil), in cooperation with USA and France
Tropical Atlantic moored buoy array
SOLAS-related activities:
a) Air-sea interface and fluxes of mass and energy
b) Ocean biogeochemistry parameters

2018 – 2021 – Modelling projects using the Brazilian Earth System Model (BESM)
SOLAS-related activities:
a) Air-sea interface and fluxes of mass and energy
b) Modelling approaches
Funded BESM-PROJECTS related to SOLAS
I) Road- Besm - Regional Oceanic and Atmospheric Downscaling
PI: Prof. A. Klein (UFSC)

II) Coupled Ocean-Atmosphere-Cryosphere modelling study – BESM/SOAC
PI: Dr. R. B. de Souza (INPE)

III) Validating aerosol chemistry within BESM, a climate approach – BESM/AERCHEM
PI: Dr. D. Herdies (INPE)
4. Plans / ideas for future projects, programmes, proposals national or international etc. (please indicate the funding agencies and potential submission dates).

5. Engagements with other international projects, organisations, programmes etc.
Brazil-SOLAS community, especially the researchers actively working on ocean carbon biogeochemistry, is actively cooperating with:

a) Latin American Ocean Acidification Network – LAOCA (http://www.eula.cl/musels/laoca/)
b) Global Ocean Acidification Observing Network – GOA-ON (http://goa-on.org/)
c) GEOMAR (Kiel, Germany – Prof. Arne Körtzinger and Dr. Tobias Steinhoff) – Partnership with UERJ through a DFG-FAPERJ (Brazil call) and a BMBF call (Germany)

Comments

Acronyms of cited institutions:

BrOA: Brazilian Ocean Acidification Research Network
INPE: Instituto Nacional de Pesquisas Espaciais
FURG: Universidade Federal do Rio Grande
UFC: Universidade Federal do Ceará
UERJ: Universidade do Estado do Rio de Janeiro
UFRJ: Universidade Federal do Rio de Janeiro
UFF: Universidade Federal Fluminense
UFSC: Universidade Federal de Santa Catarina
USP: Universidade de São Paulo