

ANNUAL REPORT ON GEOTRACES ACTIVITIES ARGENTINA

May 1st, 2023 to April 30th, 2024

GEOTRACES workshops and meetings

WORKSHOP: Iron supply in the Patagonian shelf-break front: Malvinas Current and the interaction with slope sediments and submarine canyons.

Dates: January 16-18, 2024

City: Buenos Aires, Argentina

Venue: Centro de Investigaciones del Mar y de la Atmósfera (CIMA) & Instituto Franco-Argentino del Estudio del Clima y sus Impactos (IFAECI) & Departamento de Ciencias de la Atmósfera y los Océanos (DCAO), at the Facultad de Ciencias Exactas y Naturales (FCEN) - Universidad de Buenos Aires (UBA).

Chairs: Federico Ibarbalz (CIMA-IFAECI) & Valeria Guinder (IADO-UNS-CONICET)

Website: <https://workshop2024.github.io/web/>

Motivations

- The Patagonian Shelf-Break Front (PSBF) in the SW South Atlantic Ocean is a permanent thermohaline front with very high biological activity along 100s-1000s km. Intense phytoplankton blooms during spring and summer support large biodiversity and fisheries. Understanding the underlying physical and chemical processes that sustain this productivity and the associated carbon fluxes may allow delineating/predicting its trajectories and feedbacks in response to the ongoing climate change.
- Primary productivity requires not only C, N and P but also trace elements or 'micronutrients' such as iron, copper or manganese as fundamental components of enzymes or electron transporters. As this, their concentration and bioavailability regulate the phytoplankton yield and the ecosystem productivity.
- A biogeochemical hypothesis formulates that the high biological productivity and diversity of the PSBF beyond the initial spring bloom may be related to the supply of micronutrients (in particular, iron) into the shelf through intrusions of the Malvinas Current and its interaction with slope sediments and submarine canyons.
- Currently there are no trace element measurements in waters of the Argentine Patagonian shelf and adjacent westerly edge currents of the SW South Atlantic. One exception is found near Malvinas Islands (see Bowie et al., 2002) and then there is the western end of the GA10 GEOTRACES section (this has not been exploited; requires further examination to assess relevance for the more southern Patagonian shelf). Moreover, from the beginning, the international GEOTRACES programme has prioritised a micronutrient section along the Patagonian shelf (denoted GA09) due to the potential importance of micronutrients in this region.
- The sophisticated set of geochemical techniques for in-situ sampling and lab determination of trace elements is currently not available in Argentina. Therefore, a careful planification and probably a joint international effort will be required. This would allow the obtention of reliable standardized data of its bio-available forms.
- The visit of Dr. Prof. Alessandro Tagliabue, expert in the global ocean iron cycle and ocean biogeochemical models (incoming co-chair of the Scientific Steering Committee of GEOTRACES), largely motivates the three-day workshop. His expertise fueled scientific discussion with Argentinean and international partners interested in the creation of a

network to study the input, cycling and availability of iron, as well as other biogeochemical processes in the Patagonian shelf-break front and adjacent oceanic waters.

Objectives of the Workshop

- Discussing the science and most important gaps around our understanding of the biogeochemistry regulating the phytoplankton in the PSBF to then define specific scientific questions
- Presenting the state of the art regarding the key processes shaping the external input and internal cycling of iron in the region
- Evaluating the incorporation of the standard protocols of Fe measurements according to GEOTRACES
- Identifying future collaborations and funding sources
- Planning joint future research cruises
- Drafting a scientific project for a future proposal with the newly developed BioGeoSCAPES perspective (GEOTRACES + microbiomes)

List of in person participants

1. Alessandro Tagliabue. University of Liverpool, UK.
2. Federico Ibarbalz. CIMA-IFAECI, CONICET, UBA. Buenos Aires, Argentina.
3. Valeria Guinder. IADO, CONICET, UNS. Bahía Blanca, Argentina.
4. Pedro Flombaum. CIMA-IFAECI, CONICET, UBA. Argentina.
5. Martin Saraceno. CIMA-IFAECI, CONICET, UBA. Buenos Aires, Argentina.
6. Nicolas Cosentino. CIMA-IFAECI, CONICET, UBA. Buenos Aires, Argentina.
7. Flavio E. Paparazzo. CESIMAR, CONICET, Puerto Madryn. Argentina.
8. Silvia Romero. SHN, UBA, Buenos Aires, Argentina.
9. Ronald Buss de Souza. Earth System Numerical Modeling Division, INPE, Brazil.
10. Lucía Carolina Kahl. SHN, Buenos Aires, Argentina.
11. Graziella Bozzano. SHN, CONICET, Buenos Aires, Argentina.
12. Fernando Becker. SHN, Buenos Aires, Argentina.
13. Paola Dávila. SHN, Buenos Aires, Argentina.
14. Celeste Antieco. SHN, Buenos Aires, Argentina.
15. Milagro Urricariet. SHN, Buenos Aires, Argentina.
16. Ornella Silvestri. SHN, Buenos Aires, Argentina.
17. Axel Toledo. SHN, Buenos Aires, Argentina.
18. Melina Martínez. CIMA-IFAECI, CONICET, UBA. Buenos Aires, Argentina.
19. Carola Ferronato. IADO, UNS, Bahía Blanca, Argentina.
20. Juan Muglia. CESIMAR, CONICET. Puerto Madryn, Argentina.
21. Juan José Pierella Karlusich. Harvard University, USA.
22. Mónica Wallner. Universidad Federal de Río Grande, Brazil.
23. Juan Cruz Carbajal. CADIC, CONICET. Ushuaia, Argentina.

List of virtual participants

1. Helene Planquette. LEMAR, Brest, France
2. Martha Gledhill. GEOMAR, Kiel, Germany
3. Sebastián Giacomino. CESIMAR, CONICET, Puerto Madryn. Argentina.
4. Melisa Fernández Severini. IADO, UNS, Bahía Blanca, Argentina.
5. Santiago Gasso. NASA, USA

6. Daniela del Valle. INIDEP, Mar del Plata, Argentina.
7. Georgina Cepeda. INIDEP, Mar del Plata, Argentina.
8. Carla Berghoff. INIDEP, Mar del Plata, Argentina.
9. Ricardo Silva. INIDEP, Mar del Plata, Argentina.
10. María Inés Torres. INIDEP, Mar del Plata, Argentina.

As a result of the workshop, the following initiatives have been generated:

The long-term scientific objective that emerged from the workshop is to investigate the inventories and cycling of marine trace metals and their impact on primary production in the Patagonian shelf (Southwestern Atlantic).

With this objective, the following actions have been carried out to date:

- **February-Currently. 2024 - Virtual meetings.** F. Ibarbalz organized a series of follow-up virtual meetings during 2024 to discuss trace metal studies and plan for future grant and shiptime applications. M. Gledhill, M. Saraceno, F. Paparazzo, N. Cosentino and L. Ruiz Etcheverry took part, as well as H. Planquette.
- **Apr. 2024 - Falkor (too) SOI submission.** F. Ibarbalz, M. Saraceno, L. Ruiz Etcheverry and P. Flombaum presented in 2024 (in collaboration with researchers from the SHN and from marine stations in Argentina) a cruise proposal to the Schmidt Ocean Institute and its RV Falkor (too) for 2025. Objective: study the interaction between submarine canyons, ocean currents and plankton dynamics at two sites in the Patagonian shelf. If selected, the cruise could provide key information about the presence and extension of canyons relevant for trace metal fluxes between shelf and deep sea.
- **A current proposal for the DAAD CONICET** program is particularly aimed at funding face-to-face meetings to plan, train and learn to work together effectively.

Participant's contributions:

Principal investigators / project coordinators: Federico Ibarbalz and Martha Gledhill
 Trace elements / isotopes in the ocean: Eric Achterberg, Martha Gledhill
 Aerosols (sources, composition, deposition events, impact): Nicolas Cosentino, Flavio E. Paparazzo, Eric Achterberg
 Physical oceanography: Laura Ruiz Etcheverry, Martin Saraceno
 Plankton nutrient limitation, omics and ecology: Federico Ibarbalz, Pedro Flombaum, Tom Browning

Other related activities

- During 2023, a series of trace metal measurements were carried out in the Argentine Sea. Paparazzo and Fernandez-Severini conducted a study on the interconnection between land and sea, within the framework of the Pampa Azul initiative. The results of that study are in press in the journal "Science of the Total Environment."
- The CCT-CENPAT (Technological Scientific Center in which Dr. Paparazzo's institution is part), recently acquired an isotope ratio mass spectrometer (IRMS), Thermo Scientific Delta Q. Although it is not yet available for analysis, this will happen soon.

Submitted by Flavio Emiliano Paparazzo (paparazzo@cenpat-conicet.gob.ar).