

FROM MESO- TO SUBMESOSCALE OCEAN CIRCULATION STRUCTURES: SATELLITE AND IN-SITU MEASUREMENTS, PHYSICAL MECHANISMS AND BIOLOGICAL IMPACT

Postgraduate course

15-20 July 2024

Facultad de Ciencias Exactas y Naturales, Universidad de Buenos Aires
Pabellón Cero+Infinito, Ciudad Universitaria, C1428EHA, Intendente Güiraldes 2160
Ciudad de Buenos Aires, ARGENTINA

Language: English

Modality: in person only, 24 students maximum

Registration deadline: 1st April 2024

Confirmation of acceptance: 15 April 2024

Link for pre-registration: <https://forms.gle/Akhx58jAQjJb3ZFM8>

Cost: Free (*)

NEW: Grants A limited number of grants are available. Each grant consists of a lump sum of up to 400 euros that will be provided in cash on the first day of the meeting. Please apply only if you can ensure complementary funds to afford the whole trip.

Priority: PhD students and early-career researchers (max 3 years since graduation) in physical and biological oceanography. Knowledge of fluid mechanics and Python programming language is desirable.

Objective: To bring the opportunity to postgraduate students and early career researchers to learn about meso- and submesoscale ocean circulation structures and the impact that those structures have on the biogeochemistry of the ocean.

Rationale:

The ocean provides tangible (e.g., from fisheries, tourism, transport, oil and gas exploitation) and non-tangible (e.g., the key role of the ocean to control climate, ecosystems and biodiversity both in the ocean and on land) benefits to society.

Why focus on meso- and submesoscale features in the ocean?

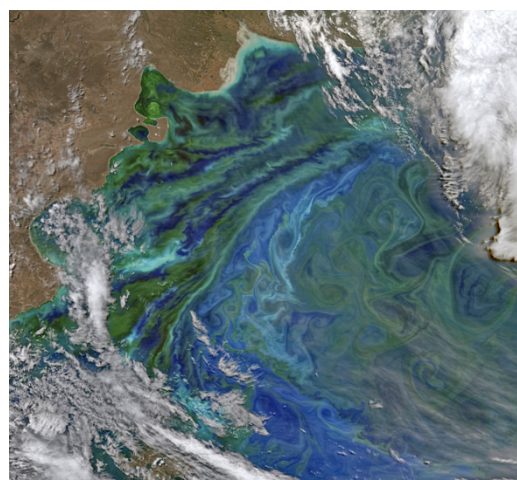
Time and spatial sampling are limiting factors of the spatio-temporal resolution of the phenomena we can describe in the ocean. In-situ observations and high (e.g., 1 km) spatial resolution satellite images of sea surface temperature and color clearly show the complexity of the ocean. Being able to increase the spatial and temporal resolution of observations is of critical importance: productivity in the surface layer of the ocean is up to an order of magnitude larger at scales of 100 m to 1 km (submesoscale) than at scales of 40 to 200 km (mesoscale).

Thus, current observations of air-sea fluxes of climate-related variables such as CO₂ could be seriously biased if a proper biological pump is not considered. Furthermore, ocean circulation at scales shorter than 100 km is responsible for transporting half of the heat and carbon from the upper ocean to the deep ocean, two critical processes we should further explore to understand global climate change. A major change in our knowledge of these processes is expected with the recent dataset that is being delivered by the Surface Water and Ocean Topography (SWOT) satellite mission, launched in December 2022. Also, the tracking of dense arrays of surface drifters helps to quantify vertical velocities in the upper layer of the ocean.

The course aims to provide the basics to understand how meso- and submesoscale structures:

- develop and propagate in the ocean,
- can be detected both from satellites and from in-situ measurements, and
- affect biophysical processes in the ocean and all the trophic levels.

(*): Attendance to the course is free. The University of Buenos Aires is currently evaluating the contents of the course and might decide to request a fee from those students who will require an official certificate from the University. More news on this point will be available by the end of March 2024.



Guest Lecturers



Dr Andrea Doglioli, Associate Professor at Université Aix-Marseille, France. *He obtained his PhD in Marine Science at the University of Genoa (Italy), and he was visiting student at the RSMAS-University of Miami (FL, USA). As post-doctoral researcher he worked at the LPO-Laboratory of Physics of Oceans in Brest (France) before joining the MIO- Mediterranean Institute of Oceanography in Marseille (France). His research focuses on fine-scale ocean dynamics. In particular, he is interested in oceanic eddies and fronts, and their impact on marine biodiversity and biogeochemistry. He*

conducts field measurements at sea, and deals with both satellite observations and numerical modelling with a preference for Lagrangian methods. <https://www.mio.osupytheas.fr/fr/andrea-doglioli>

Dr Louise Rousselet, LOCEAN, Sorbonne University Pierre and Marie Curie Campus, Paris, France

Holds a PhD in Physical and Biogeochemical oceanography (Aix-Marseille Univ, France). She studies the ocean circulation from large to small scales to better understand the heat, salt, mineral and organic matter exchanges between ocean regions. Her recent research focuses on understanding how fine-scale structures (fronts, eddies) can drive and influence phytoplankton dynamics (horizontal and vertical distribution) by use of in-situ and satellite-derived data and Lagrangian techniques.

<https://scholar.google.com/citations?user=OLMORgoAAAAJ&hl=en>



Dr Maristella Berta, Istituto di Scienze Marine-Consiglio Nazionale delle Ricerche, Italy

Holds a Master in Environmental Physics (Univ. of Torino) and a PhD in Environmental and Industrial Fluid Mechanics from the Univ. of Trieste. Her interests are mainly devoted to the reconstruction of the 3D ocean current dynamics and to the combination of sea observations coming from complementary instruments and approaches. The developed techniques and metrics are applied to the investigation of meso and submesoscale dynamics through the analysis of targeted Lagrangian observations in combination

with Eulerian and modeled data. She participated and coordinated several Lagrangian experiments and coordinated an international multiplatform experiment in the Mediterranean Sea.

<https://scholar.google.it/citations?user=XWxGCNUAAAAJ&hl=it>

Dr Ilson da Silveira, Universidade de Sao Paulo, Brazil

Full professor of Physical Oceanography at the Oceanographic Institute of the University of São Paulo. His area of expertise is mesoscale-submesoscale dynamics associated with western boundary currents, with emphasis on studies of geophysical instability and vortex formation. He develops research in experimental, theoretical and numerical modeling of the oceans. <https://www.researchgate.net/profile/Ilson-Silveira>



Dr Carolina Parada Veliz, Universidad de Concepción, Chile

Associate Professor of Oceanography and coupled biophysical processes at the Department Geophysics of the University of Concepcion. Her research focuses on coupled ocean modeling, mesoscale and submesoscale oceanographic processes, dispersion and population connectivity, population dynamics and life history models on the climate change context.

<https://orcid.org/0000-0003-1311-5563/>

<https://scholar.google.com/citations?user=rjr5R3kAAAAJ>

Local Lecturers



Dr Martin Saraceno, Universidad de Buenos Aires, Argentina

Associate Professor at the Department of Atmospheric and Oceanographic Sciences of the University of Buenos Aires. His area of expertise is the joint analysis of remote sensing and in-situ data, including data from moorings, surface drifters and satellite altimetry data. His research focuses on mesoscale and larger oceanic features like fronts, eddies and boundary currents. He studies the exchange between shelf and outer waters at the shelf-break front and how physical processes and biological observations are related.

<https://www.researchgate.net/profile/Martin-Saraceno-2>

Dr Laura Ruiz Etcheverry, Universidad de Buenos Aires, Argentina

Adjoint professor at University of Buenos Aires and assistant researcher at the Centro de Investigaciones del Mar y la Atmósfera (CIMA - CONICET/UBA). She finished her PhD in 2016 and got a postdoc position at the University of Hawaii for three years. Her main interest is the dynamics of the sea level and salinity using satellite data. Since June 2023 she is the President of the National Committee of International Association for the Physical Sciences of the Oceans (IAPSO). <https://www.researchgate.net/profile/Laura-Ruiz-Etcheverry>



Dr Juan Pablo Pisoni, Centro Para el Estudio de Sistemas Marinos, CONICET, Argentina.

PhD in Oceanography at the University of Buenos Aires and Associate Professor at the Universidad Nacional de la Patagonia San Juan Bosco. His research focuses on fine-scale coastal dynamics, particularly fronts, topographic eddies and internal waves using high-resolution satellite imagery. He performs field measurements to understand how these processes influence productivity.

<https://scholar.google.com/citations?user=sYL-W98AAAAJ&hl=es&oi=ao>

Primary sponsors

- Universidad de Buenos Aires (UBA, Argentina)
- International Association for the Physical Sciences of the Oceans (IAPSO)
- Instituto Franco-Argentino de Estudios sobre el Clima y sus Impactos (IFAECI, CNRS-CONICET-UBA-IRD)
- Departamento de Ciencias de la Atmósfera y de los Océanos (DCAO)

Organizing Committee

Dr Martin Saraceno, CONICET-UBA, Argentina (chair)

Dr Laura Ruiz-Etcheverry, CONICET-UBA, Argentina

Dr Juan Pablo Pisoni, CONICET-UNP, Argentina

Dr Maristella Berta, Consiglio Nazionale delle Ricerche, Italy

Dr Marcelo Barreiro, Universidad de la República, Uruguay

Dr Carolina Parada Veliz, Universidad de Concepción, Chile

Dr Antonio Fetter, Universidade Federal de Santa Catarina, Brazil

Preliminary Course Agenda**Day 1**

9:00-9:15	Welcome, objectives of the course, logistic announcements	13:30-15:00	Lecture 1: Satellite altimetry principles (L Ruiz-Etcheverry)
9:15-10:30	Student self-presentation (1 slide, 5' each)		
10:30-11:00	coffee-break	15:00-15:15	coffee-break
11:00-12:15	Student self-presentation (1 slide, 5' each)	15:15-16:45	Lecture 2: Satellite images: towards submesoscale (M Saraceno)
12:15-13:30	Lunch	16:45-17:00	wrap-up day 1

Day 2

9:00-10:30	Lecture 3: Fine scale dynamics and its coupling with marine biology (A. Doglioli)	13:30-15:00	Lecture 5: Detection of meso- and submesoscale structures from in situ data (M. Berta)
10:30-10:45	coffee-break	15:00-15:15	coffee-break
10:45-12:15	Lecture 4: Detection of meso finescale structures from space (L.Rousselet)	15:15-16:45	Lecture 6: Characterization of meso and submesoscale structures from in-situ data (M. Berta)
12:15-13:30	Lunch	16:45-17:00	wrap-up day 2

Day 3

9:00-10:30	Lecture 7: Adaptive and Lagrangian strategies to study fine mesoscale structures and their associated biophysical interactions (A. Doglioli)	13:30-15:00	Hands-on students with SPASSO (L.Rousselet)
10:30-10:45	coffee-break	15:00-15:15	coffee-break
10:45-12:15	Lecture 8: introduction to SPASSO and application (L Rousselet)	15:15-16:45	Hands-on students with SPASSO (L.Rousselet)
12:15-13:30	Lunch	16:45-17:00	wrap-up day 3

Day 4

9:00-10:30	Lecture 9: Frontiers in fine-scale in-situ Studies: the SWOT opportunity (A Doglioli)	13:30-15:00	Hands-on students
10:30-10:45	coffee-break	15:00-15:15	coffee-break
10:45-12:15	Lecture 10: Detection of nearshore topographic eddies and wakes a macrotidal coastal region. The influence of tidal currents on generation (JP Pisoni)	15:15-16:45	Hands-on students
12:15-13:30	Lunch	16:45-17:00	wrap-up day 3

Day 5

9:00-10:30	Lecture 11: Mesoscale and submesoscale biophysical interactions associated to ocean islands in the Southeastern Pacific: Connectivity and genetic patterns (C Parada Veliz)	13:30-15:00	Hands-on students
10:30-10:45	coffee-break	15:00-15:15	coffee-break
10:45-12:15	Lecture 12: Submesoscale and mesoscale motions off Cape São Tomé and Cape Frio, Brazil (I da Silveira)	15:15-16:45	Hands-on students
12:15-13:30	Lunch	16:45-17:00	wrap-up day 3

Day 6

9:00-9:15	upload students' presentations
9:15-10:45	Students' presentations
10:45-11:00	coffee-break
11:00-12:30	Students' presentations
12:30-13:00	final remarks, end of meeting

Some information for a pleasant stay in Buenos Aires

Arriving in Buenos Aires City

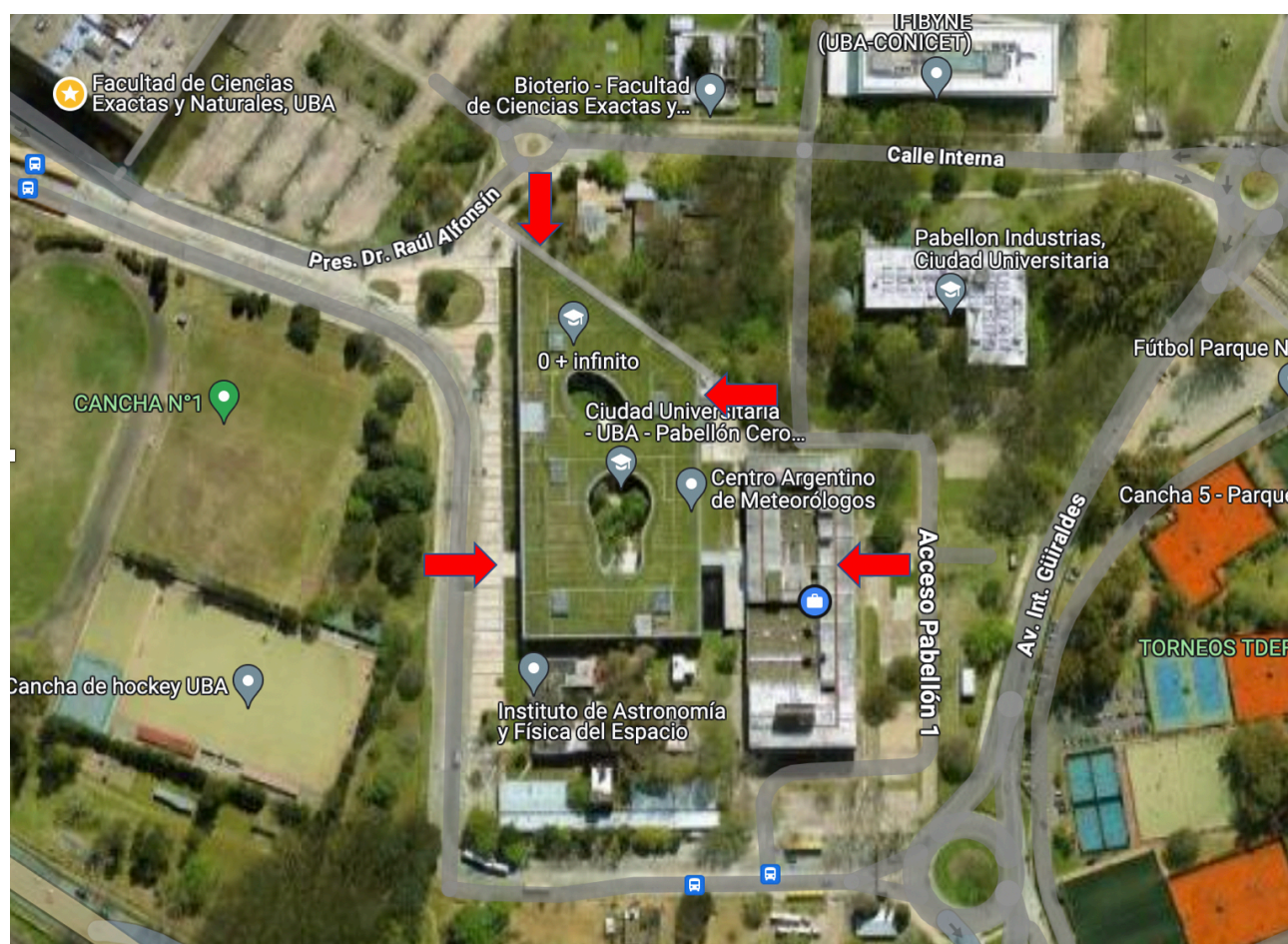
Buenos Aires has two international airports: Ezeiza (Ministro Pistarini) and Aeroparque. The former is quite far away from the city while the second one is within the city (and very close to Ciudad Universitaria). Please use official cabs or public transport as “Tienda León”, <https://www.tiendaleon.com/> to get to your hotel.

Venue

Facultad de Ciencias Exactas y Naturales, Universidad de Buenos Aires
Pabellón Cero+Infinito, Ciudad Universitaria, C1428EHA, Intendente Güiraldes 2160
Ciudad de Buenos Aires, ARGENTINA

See the venue on Google maps: <https://maps.app.goo.gl/KuhT9DrUU2EfUM5X8>

In the following picture the red arrows indicate the four accesses to the building. Bus stops are indicated with a small blue bus.



Lodging

Ciudad Universitaria is a bit far (2 km) from any neighborhood in Buenos Aires city. The closest neighborhoods are Nuñez and Belgrano. Palermo and Palermo Hollywood are not that far, and many prefer them because of the large number of restaurants and shops.

As of today (January 10th, 2024) you can use booking.com to book a nice flat in Palermo, Belgrano or Nuñez for the 7 days of the course for 250 USD, and without advancing a cent. For a few more dollars you may find an apartment to share.

List of hotels and apartments close to Ciudad Universitaria:

Hotel	Hotel Las Familias	Cuba 3146
Hotel	Hotel Pedraza	Manuela Pedraza 2189
Hotel	Hotel Manzanares Plaza	Manzanares 2339
Hotel	La Cascada Townhouse Hotel	Vuelta de Obligado 4578
Hotel	Hotel Mordomo	Ciudad De La Paz 2942
Hotel	Hotel Ker	Vuelta de Obligado 2727
Apartment	Alojamiento Beños	Arribeños 2490

Food

The cost of a meal in Ciudad Universitaria is about 4 USD and there is a student menu for 1 USD (prices might change). Dinner in a fancy restaurant in Palermo can be quite expensive (>30 USD) but you can find a nice pizza with a cold beer for about 15 USD or less.

Safety

Like most big cities in the world, Buenos Aires has its pickpockets. So please be aware when approached by unknown people in the street. Always keep an eye on your belongings (in particular, try not to use your cell phone in the street or on the bus).

Moving around & getting to Ciudad Universitaria

You need to buy a transport card to use public transport (named SUBE). You can buy it at any subway entrance and in many “Kioscos” in the street. Bus lines 28, 33, 34, 37, 42, 45, 107 and 160 arrive at Ciudad Universitaria from different points in the City of Buenos Aires. You can also get there by train using the Belgrano Norte line (Ciudad Universitaria station). The moovit app (<https://moovitapp.com/>) works quite well to know where the bus stops are etc.

You may also move around by cab (black and yellow) or uber, didi or cabify apps.