

## Organization

Director: **Mario Sprovieri**

### Members of the Scientific Committee:

<b>Elisabetta Erba*</b>	(Università di Milano) <a href="mailto:elisabetta.erba@unimi.it">elisabetta.erba@unimi.it</a>
<b>Marco Ligi*</b>	(ISMAR-CNR) <a href="mailto:marco.ligi@cnr.it">marco.ligi@cnr.it</a>
<b>Gemma Aiello</b>	(ISMAR-CNR) <a href="mailto:gemma.aiello@cnr.it">gemma.aiello@cnr.it</a>
<b>Alessandra Asioli</b>	(ISMAR-CNR) <a href="mailto:alessandra.asioli@cnr.it">alessandra.asioli@cnr.it</a>
<b>Francesco Chiocci</b>	(Università di Roma) <a href="mailto:francesco.chiocci@uniroma1.it">francesco.chiocci@uniroma1.it</a>
<b>Marco Cuffaro</b>	(IGAG-CNR) <a href="mailto:marco.cuffaro@cnr.it">marco.cuffaro@cnr.it</a>
<b>Giovanni De Alteris</b>	(ISMAR-CNR) <a href="mailto:giovanni.dealteris@cnr.it">giovanni.dealteris@cnr.it</a>
<b>Laura De Santis</b>	(OGS-Trieste) <a href="mailto:ldesantis@ogs.trieste.it">ldesantis@ogs.trieste.it</a>
<b>Fabiano Gamberi</b>	(ISMAR-CNR) <a href="mailto:fabiano.gamberi@cnr.it">fabiano.gamberi@cnr.it</a>
<b>Derek Keir</b>	(Università di Firenze) <a href="mailto:derekboswell.keir@unifi.it">derekboswell.keir@unifi.it</a>
<b>Giuseppe Mastronuzzi</b>	(Università di Bari) <a href="mailto:giuseppeantonio.mastronuzzi@uniba.it">giuseppeantonio.mastronuzzi@uniba.it</a>
<b>Salvatore Passaro</b>	(ISMAR-CNR) <a href="mailto:salvatore.passaro@cnr.it">salvatore.passaro@cnr.it</a>
<b>Alina Polonia</b>	(ISMAR-CNR) <a href="mailto:alina.polonia@cnr.it">alina.polonia@cnr.it</a>
<b>Attilio Sulli</b>	(Università di Palermo) <a href="mailto:attilio.sulli@unipa.it">attilio.sulli@unipa.it</a>
<b>Guido Ventura</b>	(INGV-Roma) <a href="mailto:guido.ventura@ingv.it">guido.ventura@ingv.it</a>

\*Chair

### Secretariat ISMAR-CNR:

Valentina Ferrante ([valentina.ferrante@cnr.it](mailto:valentina.ferrante@cnr.it))  
 Alessandra Mercorella ([alessandra.mercorella@cnr.it](mailto:alessandra.mercorella@cnr.it))  
 Mattia Vallefuoco ([mattia.vallefuoco@cnr.it](mailto:mattia.vallefuoco@cnr.it))  
 Contacts: [segreteria.sgm@ismar.cnr.it](mailto:segreteria.sgm@ismar.cnr.it)

### CHALLENGES IN MARINE GEOLOGY

Marine geology, the study of the Earth's oceanic crust and sediments, presents several challenges due to the harsh and inaccessible nature of the marine environment. Some of the key challenges in marine geology include:

- 1.Inaccessibility and Depth:** The majority of the Earth's surface is covered by oceans, and much of it is deep and difficult to access.
- 2.Extreme Pressure:** The pressure in deep-sea environments increases with depth, creating challenges for equipment design and durability.
- 3.Remote Sensing:** Large portions of the seafloor remain unexplored or are difficult to access.
- 4.Sample Collection:** Collecting samples from the seafloor is challenging due to the depth, pressure, and complex geologic features.
- 5.Corrosive Environment:** The marine environment can be corrosive, affecting the durability of equipment and instruments.
- 6.Limited Direct Observation:** Unlike terrestrial geology, where researchers can directly observe and study rock formations, marine geologists often rely on indirect methods.
- 7.Data Integration:** Data collection in marine geology involves a variety of techniques, such as seismic surveys, sediment coring, and bathymetric mapping.
- 8.Environmental Impact:** Conducting research in the marine environment can have environmental impacts.
- 9.Tectonic Plate Boundaries:** Many key geological processes, such as plate tectonics and subduction, occur beneath the ocean.
- 10.Climate Change Impacts:** Understanding the impact of climate change on marine geology requires data collection for a long-term monitoring (paleoceanography).

Under the patronage of SGI, SIMP, SPI and IODP-Italia



## MARINE GEOLOGY Advanced School

### Deep Sea Frontiers

(January 2025)



### A comprehensive understanding of the geological frontiers that lie beneath the ocean depths

The School offers an advanced exploration of geological processes within the ocean depths, encompassing the entire life cycle of the oceanic lithosphere, from its formation to its eventual subduction and destruction. Topics covered include the in-depth examination of abyssal regions, exploration of ocean ridges, analysis of sediments, and the study of marine bio-geology in extreme environments, as well as the use of advanced exploration technologies

## Advanced School

### Deep Sea Frontiers

Dates: January 27<sup>th</sup>, 2025 — January 31<sup>st</sup>, 2025

Venue: Area della Ricerca di Bologna – Room #216  
 Application Deadline: October 13<sup>th</sup> 2024



A limited number of travel grants for attending the full seminar series are available to master or PhD students

**Contacts:**  
[www.ismar.cnr.it](http://www.ismar.cnr.it)

**APPLY HERE**

## Day 1: INTRODUCTION TO MARINE GEOLOGY

- **Morning: registration, introduction to the school**  
08:00–09:00 Welcome and Registration  
09:00–09:30 Introduction to the School and Agenda

## METHODOLOGIES FOR THE EXPLORATION OF THE DEEP-SEA

- **Morning: Exploring the Subseafloor**  
10:00–11:30 Age Determinations: Rock and sediment dating techniques  
11:30–13:00 Biostratigraphy
- **Afternoon: Exploring the Subseafloor**  
14:00–16:00 Seismic Reflection and Refraction: Data acquisition & processing  
16:30–18:00 Heat Flow, Gravity and Magnetism: Data acquisition & processing  
18:00–20:00 Icebreaker Activities

## Day 2: METHODOLOGIES FOR THE EXPLORATION OF THE DEEP-SEA (CONTINUED)

- **Morning: Exploring the Seafloor**  
08:30–10:30 Seafloor Mapping: Data acquisition & processing  
11:00–13:00 ROVs, AUVs, and Manned Submersibles
- **Afternoon: Deep Sea Exploration in Practice**  
14:00–14:30 A Gateway to Ocean Exploration: ECORD/IODP-Italia  
14:30–15:15 Featured Lesson: Tyrrhenian Sea IODP Leg 402 - Preliminary Results  
15:15–16:00 Featured Lesson: Eastern Fram Strait IODP Leg 403- Preliminary Results  
16:30–18:30 Seafloor Dynamics: Insights from Multibeam & Seismic Data Analysis

## Day 3: GEOLOGY OF THE DEEP SEA

- **Morning: Plate Tectonics: How the Earth Works**  
08:30–10:30 Plate Tectonics and Seafloor Spreading  
11:00–13:00 Mid- Ocean ridges, Faulting, Detachment faults & Hydrothermal activity
- **Afternoon: Transfer and Storage of Matter, Chemicals and Energy**  
14:00–16:00 Deep-Marine Sedimentary Processes & Systems  
16:30–18:30 Ground Truth: Analysis & Interpretation of Deep-sea Cores

## Day 4: GEOLOGY OF THE DEEP SEA (CONTINUED)

- **Morning: Geochemical Processes in Seafloor Environments**  
08:30–10:30 Major, Trace and Isotopes Geochemistry of Oceanic Lithosphere  
11:00–13:00 Geochemistry of Sediments
- **Afternoon: Geochemical Processes in Seafloor Environments**  
14:00–16:00 Fluid Circulation: Seawater Interactions with Rocks and Sediments  
16:30–18:00 Geochemistry & Geodynamics in Practice: Implications in Reconstructions

## Day 5: IMPORTANCE & INTERDISCIPLINARY CONNECTIONS OF MARINE GEOLOGY

- **Morning: Marine Geology and Life**  
08:30–09:30 Sapropels: Climate, Oceanography and Paleoenvironment  
09:30–10:30 Marine Geology and Climate  
11:00–12:00 Marine Geology and Biosphere  
12:00–13:00 From Rocks to Rotation Poles: Insights from Paleomagnetism
- **Afternoon: Hazards and Resources**  
14:00–15:30 Geological Hazards in the Deep Sea  
16:00–17:00 Deep Sea Resources  
17:00–17:30 Closing Remarks

## LECTURERS

Fabio CARATORI TONTINI  
Christian BERNDT  
Antonio LANGONE  
Elisabetta ERBA  
Salvatore PASSARO  
Alessandro BOSMAN  
Fabian BONETTI  
Marcia MAIA  
Xavier ESCARTIN

Javier Hernández MOLINA  
D. BRUNELLI & A. SANFILIPPO  
Gert DE LANGE  
Chiara BOSCHI  
Gert DE LANGE

Paolo MONTAGNA

Marco TAVIANI  
Luca LANCI

Lisa MCNEIL  
Marzia ROVERE

## TOPIC

Marine heat flow, gravity & magnetism  
Seismic data acquisition & Processing  
Rock dating  
Biostratigraphy  
Seafloor mapping data acquisition  
Seafloor mapping data processing  
ROVs, AUVs, and manned submersible  
Plate tectonics and seafloor spreading  
MOR, faulting, detachment faults & hydrothermal activity  
Deep-sea sedimentary processes  
Geochemistry of oceanic lithosphere  
Sediment geochemistry  
Fluid circulation  
Sapropels: Climate, Oceanography and Paleoenvironment  
Geochemical proxies for paleoclimate reconstructions  
Marine Geology and the Biosphere  
From Rocks to Rotation Poles: Insights from Paleomagnetism  
Deep sea hazards  
Deep sea resources

## PRACTICAL EXERCISES – SEAFLOOR DYNAMICS: INSIGHTS FROM GEOPHYSICAL DATA

Fabiano GAMBERI/Federica FOGLINI/Giovanni DE ALTERIIS/Gemma AIELLO

## PRACTICAL EXERCISES – GROUND TRUTHING: ANALYSIS OF DEEP-SEA CORES

Hernández MOLINA/Fabiano GAMBERI/Alina POLONIA/Alessandra ASIOLI

## PRACTICAL EXERCISES – ROCK GEOCHEMISTRY & GEODYNAMICS

Alessio SANFILIPPO/Daniele BRUNELLI/Luca LANCI/Marco LIGI

## FEATURED LESSON - TYRRHENIAN SEA IODP LEG 402 – PRELIMINARY RESULTS

Nevio Zitellini

## FEATURED LESSON – NORTH ATLANTIC IODP LEG 403 – PRELIMINARY RESULTS

Renata Lucchi

Candidates must fill in the application form and send it with all supporting documents in digital form, from September 1<sup>st</sup>, 2024 and no later than October 13<sup>th</sup>, 2024. Only complete applications will be assessed. Incomplete applications may be rejected without further notification. A complete application consists of:

1. Personal information about the applicant as reported in the application form.
2. Diploma and transcripts (diploma supplement or list of the subjects taken during the study and correspondent marks).
3. Motivation letter (in English) – the letter should present the applicant's motivation to enroll the School, including the competencies and skills he/she would like to achieve, future perspectives and aspirations.
4. An extended abstract of their research activity as reported in the application form.
5. Curriculum Vitae (CV) with information about relevant experience and professional training.
6. Up to a maximum of 30 students will be admitted to the course. Registrations beyond this maximum will be placed on a waiting list.
7. The course fee is €350 including course materials, daily lunches and coffee breaks and social dinner.  
Travels, accommodation and other meals must be covered by the participants. Confirmation of Registration will be sent once the registration fee has been paid via the appropriate link (communicated via email) starting from October 14<sup>th</sup> no later than October 27<sup>th</sup>, 2024.
8. Up to a maximum of 5 scholarships covering school fee, travel and accommodation will be awarded to the most deserving Masters and PhD students. The members of the Steering Committee will evaluate the CV and motivation letter of the applicants, with priority for Master's students. The registration fee will be refunded to the scholarship winners.



## Deep Sea Frontiers

### ICEBREAKER ACTIVITIES (DAY 1, 18:00–20:00)

The proposed activities include a mini conference for the participants, where students present very short talks (max 3 min) on their recent activities or illustrate their posters. This allows the sharing of the students' backgrounds and areas of interest or research, and it also helps the lecturers to evaluate students' level and focus.