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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 27th, 2025 — January 31st, 2025

Venue: Area della Ricerca di Bologna – Room #216

Application Deadline: October 13th 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

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 Magnetics: 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 Practise**

  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

  16:00–18:00 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	TOPIC
Fabio CARATORI TONTINI	Marine heat flow, gravity & magnetics
Christian BERNDT	Seismic data acquisition & Processing
Antonio LANGONE	Rock dating
Elisabetta ERBA	Biostratigraphy
Salvatore PASSARO	Seafloor mapping data acquisition
Alessandro BOSMAN	Seafloor mapping data processing
Fabian BONETTI	ROVs, AUVs, and manned submersible
Marcia MAIA	Plate tectonics and seafloor spreading
Javier ESCARTIN	MOR, faulting, detachment faults & hydrothermal activity
Javier Hernández MOLINA	Deep-sea sedimentary processes
D. BRUNELLI & A. SANFILIPPO	Geochemistry of oceanic lithosphere
Gert DE LANGE	Sediment geochemistry
Chiara BOSCHI	Fluid circulation
Gert DE LANGE	Sapropels: Climate, Oceanography and Paleoenvironment
Paolo MONTAGNA	Geochemical proxies for paleoclimate reconstructions
Marco TAVIANI	Marine Geology and the Biosphere
Luca LANCI	From Rocks to Rotation Poles: Insights from Paleomagnetism
Lisa MCNEIL	Deep sea hazards
Marzia ROVERE	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/Maria Filomena Loreto

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 1st, 2024 and no later than October 19th, 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 14th no later than October 27th, 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.

CNR ISMAR ISTITUTO DI SCIENZE MARINE

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.