UNIVERSITÀ
DEGLI STUDI DI MILANO-BICOCCA

COURSE SYLLABUS

Paleoceanography and Paleoclimatology

2526-2-F7401Q095

Aims

The course will provide the knowledge of climatic variations and their forcing factors at different time scales, through the study of proxies from different archives and the knowledge of the main oceanographic processes in the present and in the past (DD1). The classes and practicals allow the student to apply the acquired knowledge to elaborate quantitative indicators to analyse clinatic and environmental changesof the marine ecosystems occurring in thelast decades, centuries and millennia, thus contributing to provide future scenarios (DD2).
The laboratory work and the preparation of the laboratory report will improve the students' critical thinking and assessment capacities (DD3) and the students' ability to study and analyze data autonomously (DD5); the group presentation will improve their communication skills, using an appropriate scientific language (DD4).

Contents

Bases of Paleoceanography and Paleoclimatology: climate system, chronology, proxies.
Climatic variability and climate variations: timescales of changes. Paleoceanographic and paleoclimatic variations reconstructed through proxy data at different time scales. The paleoclimatic and paleoceanographic history of the Earth, from its origins to the present day. Variations of CO2 concentration through the Earth's history.

Detailed program

Lectures
The climate system, time scales of change (climatic variability vs. variation) and forcing factors.
Paleoclimatic proxies: examples and applications in the marine, ice and terrestrial record.
Paleoclimatic evolution in the geological past: early Earth climate states and climate evolution; greenhouse and icehouse states; the Cenozoic mid-house; climate variations and Milankovitch cycles; millennial, centennial and

decadal-scale variability in the recent past.
Paleoceanographic applications; climate and sea level; paleocirculation and paleoproductivity; ocean acidification in the present-day and in the paleo-record.

Practical classes
Case study: eastern Mediterranean sapropels. Description and analysis of a sediment core in the lab; sample analysis under the microscope; processing and interpretation of paleoclimatic and paleoceanographic data; analysis and discussion of literature data; final interpretation.

Field work
Two day excursion on the following paleoceanographic themes: a) the Messinian salinity crisis as preserved in the Appennines; b) the oceanic anoxic events in marine sedimentary successions.

Prerequisites

Course of Safety on the Field

Teaching form

All classes will be taught in English

- 14 two-hour Lectures in person (4 ETCS, 28 hours), of which 10 classes as Delivered Didactics (20 hours), 4 classes initially as Delivered Didactics, then actively involving students through Interactive Teaching (8 hours)
- 4 three-hour Practical classes, in person, Interactive Teaching (1 ETCS, 12 hours)
- 1 twelve-hour Field activity, in person, Interactive Teaching (1 ETCS, 12 hours)

Textbook and teaching resource

Bradley - Quaternary Paleoclimatology

Slides provided by the teacher through the e-learning page

Semester

First semester

Assessment method

- Group oral presentation at the end of the practical classes, to assess: the acquired knowledge, the ability to chose the most important data related to the case study; the ability to work in group and to communicate with a specific scientific language, proper for the course.

- Personal written report on the activities done during the practical classes, related to a case study. The aim is to assess the acquired knowledge, tha capacity to analyse the dataset and the ability to interpret, synthetise and communicate in a written text the results of the case study. The report must be submitted at least 3 days before the oral examination

- Personal written report on the activities done during the field work, in order to assess the understanding of subjects, the ability to synthesize and the capacity of autonomous thinking on the explored scientific themes.

- Oral examination: 3 questions related to the scientific themes addressed in class, of which: a) one proxy selected by the student; b) one question to assess the knowledge on proxies, mechanisms and time scales of changes; c) one question related to the changes occurred within one specific time frame, among those shown in class and in the slides: approximate drawing of a graph if required.
  During the exam, the teacher will evaluate the knowledge of the relevant information provided in the course, the ability to correlate the information obtained from different archives and the capacity to explain clearly and with an appropriate terminology the themes of the course.

Final grade: oral presentation and written report on the practical classes (15%) + report on field activities (15%) + oral examination (70%)

The final grade will be in /30.

Office hours

Upon appointment by e-mail: elisa.malinverno@unimib.it

Sustainable Development Goals

QUALITY EDUCATION | CLIMATE ACTION | LIFE BELOW WATER