60439 - Climatic changes, associated events and geologic record

Información del Plan Docente

Academic Year	2017/18
Faculty / School	100 - Facultad de Ciencias
Degree	541 - Master's in Geology: Techniques and Applications
ECTS	5.0
Year	1
Semester	Second semester
Subject Type	Optional
Module	---

1.General information

1.1.Introduction

Past climate changes are reflected in the geological record through diverse lithological, biological and geomorphological attributes. Their study reveals that the causes of climate changes are a complex interaction of intrinsic and extrinsic parameters that affect the Earth system. The analysis of such attributes is of great importance for assessing the response of the Earth system to climate changes and provides information to calibrate predictive models of climate evolution.

1.2.Recommendations to take this course

1.3.Context and importance of this course in the degree

1.4.Activities and key dates

2.Learning goals

2.1.Learning goals

2.2.Importance of learning goals

3.Aims of the course and competences

3.1.Aims of the course

3.2.Competences

4.Assessment (1st and 2nd call)

4.1.Assessment tasks (description of tasks, marking system and assessment criteria)

5.Methodology, learning tasks, syllabus and resources

5.1.Methodological overview

The designed learning process will allow the students to acquire knowledge of the main causes and consequences of

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climate change events, to understand the interaction among different systems, and to identify and interpret climatic proxies in the geological and biological record.

The knowledge acquired in the participatory lectures is complemented with practical laboratory activities and field work, where the student will learn and demonstrate methods and analyses, and the results of their application.

5.2.Learning tasks

The course includes the following learning tasks:

- 1. Participatory Lectures.
- 2. Laboratory sessions: Implementation of the working methods in the laboratory with appropriate equipment and techniques.
- 3. Field work: Identification of relevant geological characteristics of the study areas and implementation of study and sampling strategies appropriate for identifying characters with paleoclimatic significance.

5.3.Syllabus

The course will address the following topics:

Section I. Introduction

1. Causes of climate changes.

Section II. Paleoclimatology and facies.

1. Sedimentary facies with climatic significance.

2. Glacial facies. Distribution of glacial deposits through time. Causes of glaciations. Facies models.

3. Desert sandy aeolian facies. Geologic and climatic context. Conservation of sandy deposits. Examples of ancient and modern aeolian systems.

4. Marine and continental evaporitic facies. Geologic and climatic context. Facies associations. Distribution of evaporites through time.

5. Lacustrine and fluvial carbonate facies. Geologic and climatic context. Facies associations and facies models. Examples of ancient and modern carbonate lacustrine and fluvial systems.

6. Coal. Conditions and environments of formation. Conservation. Paleogeographic evolution.

7. Other sedimentary facies with climatic significance.

Section III. Quaternary continental morphosedimentary records with paleoclimatic interest

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1. Climatic structure of Quaternary. Climatic cycles and terminations. The Last Glacial Cycle. The Holocene.

2. Glacial and periglacial records. Quaternary glacial evolution at regional scale. Ice caves as singular archives.

3. Fluvial and alluvial records. Terrace formation and paleoclimatic control. Regional sequence of terraces.

4. Karstic records: tufa and speleothem archives. The karstic system dynamics. Paleoenvironmental significance of isotopic and geochemical proxies. Regional setting.

5. Lacustrine records. Multiproxy approach to the paleoenvironmental meaning. Paleohydrological interpretation. Regional scenery.

Section IV: Climate changes and the paleontological record

1. Fossil fauna and flora and paleoclimatic proxies. Bioclimatic modelling and fossil groups.

2. Evolutionary and extinction events associated with climate changes. Geological record of Paleozoic and Mesozoic events. Climatic and biotic consequences of the Cretaceous/Paleogene boundary asteroid impact.

3. Multiproxy analysis of hyperthermal events: evolution and extinction across the Paleocene-Eocene transition. Consequences of the Antarctic isolation and the albedo effect on the middle-upper Eocene and Eocene/Oligocene extinctions.

4. The sixth mass extinction across the Quaternary. The extinction of the megafauna since 100.000 years ago. Agroecological change and extinction over the last 10.000 years.Global warming and extinction during the Antropocene.

Practice sessions

Section II.

Laboratory (4 h)

- 1. Analysis and interpretation of sedimentological and paleogeographic data.
- 2. Analysis and interpretation of geochemical data.

Field work (1 day)

- 1. Ebro Basin: Evolution of the Miocene lacustrine systems through space and time.

Section III.

Laboratory (4 hours)

- 1. Recovering and sampling Quaternary lacustrine archives.
- 2. Interpretation and treatment of chronological, isotopic and geochemical data from stalagmite records.

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Field work (1 day, 4 hours)

- 1. Recognition and description of Quaternary glacial and fluvial records in the Central Pyrenees (Gállego river valley, Northern Spain). The Penultimate and the Last climate cycles in the Mediterranean Mountains.

Section IV.

Laboratory:

- 1. Evidence of the asteroid impact at the Cretaceous/Paleogene boundary.
- 2. Multiproxy analysis and interpretation across the Paleocene-Eocene transition (palaeontology, stable isotope geochemistry of bulk sediment and fossils, organic biomarkers, mineralogical composition, etc.).

5.4.Course planning and calendar

This course is taught during the second semester, on Monday from 16:00 until 20:00. The dates of fieldwork are scheduled by university.

5.5.Bibliography and recommended resources

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- Tucker, Maurice E.. Carbonate sedimentology / Maurice E. Tucker, V. Paul Wright ; with a chapter by J.A.D. Dickson . - 1st ed., repr. Oxford [etc.] : Blackwell Scientific Publications, 1992
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