

Paleoclimatology (C002664)

Course size *(nominal values; actual values may depend on programme)*

Credits 6.0

Study time 150 h

Course offerings and teaching methods in academic year 2024-2025

A (semester 1)

English

Gent

group work

seminar

lecture

Lecturers in academic year 2024-2025

Verschuren, Dirk

WE11

lecturer-in-charge

De Batist, Marc

WE13

co-lecturer

Offered in the following programmes in 2024-2025

[Master of Science in Teaching in Science and Technology\(main subject Geology\)](#)

6

offering

A

[Master of Science in Bioscience Engineering: Land, Water and Climate](#)

6

A

[Master of Science in Geology](#)

6

A

[Master of Science in Geology](#)

6

A

[Exchange programme in Geology \(master's level\)](#)

6

A

Teaching languages

English

Keywords

Paleoclimate, paleoceanography, climate change, global change, Quaternary, Holocene, El Niño, tectonics, thermohaline circulation, climate mechanism

Position of the course

The aim of this course is to provide the students with a basic understanding of the global climate system, as starting point for the teaching of advanced knowledge in late-Cenozoic climate history and the full range of natural climate variations on both short (years to centuries) and long (thousands to millions of years) time scales; and of how the long-term perspective gained from paleoclimate data can be exploited for better prediction of future climate change resulting from the interaction of natural and anthropogenic climate drivers.

Contents

- 1 Overview of the structure and functioning of the world climate system with emphasis on components subject to variation at time scales of years and longer.
- 2 History and mechanisms of natural climate variation at all time scales (tectonics, Milankovitch factors, thermohaline circulation, bipolar see-saw, monsoons, solar activity, volcanoes, ENSO, NAO) with emphasis on the processes, their temporal and spatial scale of operation, periodicities in external forcing, feedback mechanisms and interactions between atmosphere, geosphere, biosphere, hydrosphere and cryosphere.
- 3 Overview of the principal archives and proxy indicators of climate change, their (potential) applications and characteristic limitations.
- 4 Historical perspective and scientific basis for anthropogenic climate change, with in-depth discussion of recent findings and the associated uncertainties.

Initial competences

Bachelor geology, biology or geography

Final competences

- 1 The student demonstrates basic knowledge of the functioning of the large-scale physical elements of the global climate system, and of potential and limitations of all important natural

archives and techniques in paleoclimate reconstruction.

- 2 The student demonstrates advanced knowledge of the complete range of patterns, frequencies and natural mechanisms of climate change during the late-Cenozoicum, with emphasis on Quaternary ice ages and the Holocene.
- 3 The student demonstrates insight in the scales (both in space and in time) of operation of the various climate mechanisms, and their modulation through variable influences from and interactions between the atmosphere, geosphere, biosphere, hydrosphere and cryosphere.
- 4 The student displays an objective critical attitude towards new data, interpretations, theories and models of anthropogenic climate change in the context of the long-term perspective obtained from paleoclimate research.
- 5 The student demonstrates the ability to process, combine, evaluate, and synthesize in a structured manner complex information from the primary scientific literature of multiple relevant sub-disciplines.
- 6 The student has acquired the following competences: competences in geology and related sciences, general scientific competences and intellectual competences, competences in collaboration and communication, and social competences.

Conditions for credit contract

Access to this course unit via a credit contract is determined after successful competences assessment

Conditions for exam contract

This course unit cannot be taken via an exam contract

Teaching methods

Group work, Seminar, Lecture

Extra information on the teaching methods

Lectures: 18 recorded PPT presentations with text and figures, made available beforehand on Ufora

Teamwork: group assignments involving a literature review with synthesis and written report, on 1) topics of debate in the fields of paleoclimatology and global change, and 2) methods of paleoclimate research

Seminar: class presentation and discussion of group assignment, using a PPT presentation

Study material

Type: Handbook

Name: EARTH'S CLIMATE: PAST AND FUTURE (3rd Edition, 2014)

Indicative price: € 76

Optional: no

Language : English

Author : W. F. Ruddiman

ISBN : 978-1-31915-400-4

Number of Pages : 390

Alternative : EARTH'S CLIMATE: PAST AND FUTURE (3rd Edition, 2014) 6 months of E-book access

Oldest Usable Edition : EARTH'S CLIMATE: PAST AND FUTURE (2nd Edition, 2008)

Online Available : No

Available in the Library : Yes

Available through Student Association : No

Usability and Lifetime within the Course Unit : intensive

Usability and Lifetime within the Study Programme : regularly

Usability and Lifetime after the Study Programme : occasionally

Type: Slides

Name: 6 Powerpoint presentations for 18 lectures

Indicative price: Free or paid by faculty

Optional: no

Language : English

Number of Slides : 255

Oldest Usable Edition : 2022-2023

Available on Ufora : Yes

Online Available : No

Available in the Library : No

Available through Student Association : No

Type: Handouts

Name: Print-out of Powerpoint presentations group assignments

Indicative price: Free or paid by faculty

Optional: no

Language : English

Number of Pages : 50

Available on Ufora : Yes

Online Available : No

Available in the Library : No

Available through Student Association : No

Usability and Lifetime within the Course Unit : one-time

Usability and Lifetime after the Study Programme : not

References

Bradley, R.S., 1999. Paleoclimatology: reconstructing climates of the Quaternary. Academic Press, London, ISBN: 0-12-124010-X

Course content-related study coaching

Moderation/supervision of group assignments; pre-evaluation feedback on written reports.

Contact with teaching staff via Ufora, or in person on appointment.

Assessment moments

end-of-term and continuous assessment

Examination methods in case of periodic assessment during the first examination period

Written assessment with open-ended questions

Examination methods in case of periodic assessment during the second examination period

Written assessment with open-ended questions

Examination methods in case of permanent assessment

Oral assessment, Assignment

Possibilities of retake in case of permanent assessment

examination during the second examination period is possible in modified form

Extra information on the examination methods

PE: On-campus exam with questions testing both knowledge and insight in material presented in lectures and personal work or group assignments of fellow students. Examination in the 2nd examination period is possible.

On-line exam is exceptionally possible with valid reason.

NPE: Evaluation of the written report, presentation and discussion abilities of the student regarding the group assignments.

Students who miss the non-periodical evaluation cannot pass for the course. A 2nd chance for evaluation is offered in modified form between the 1st and 2nd examination period.

Calculation of the examination mark

25% NPE

75% PE

Facilities for Working Students

1. Possible exemption from educational activities requiring student attendance
2. Possible rescheduling of the exam to a different time in the same academic year