



# Paleoclimatology Syllabus

EARTHSC 6750 Spring 2025 – Scott Hall

## Course Information

- **Course times and location:** Class meets on Tuesday and Thursday from 9:00 AM to 10:50 AM in Room 177 Scott Hall (Byrd Polar and Climate Research Center), West Campus
- **Credit hours:** 4
- **Mode of delivery:** In person

**Undergraduate students should request an authorization from the instructors to attend this course.**

## Instructors

- **Names:** Dr. Lonnie Thompson, and Dr. Emilie Beaudon.
- **Emails:** [Thompson.3@osu.edu](mailto:Thompson.3@osu.edu); [beaudon.1@osu.edu](mailto:beaudon.1@osu.edu)
- **Phone number:** 614-292-6652; 614-292-2682
- **Office location:** 82C/50 Scott Hall (West Campus) and 325 Mendenhall Laboratory
- **Office hours:** 13:00 to 14:00 T and Th; or by appointment in person or by Zoom.



THE OHIO STATE UNIVERSITY

College of Arts & Sciences  
School of Earth Sciences

# Teaching Assistant (TA)

TBD

## Course Description

Paleoclimatology is an increasingly important discipline within the fields of Geography, Geology, Earth System Sciences, Engineering, Public Health, and Business, among others. It is essential for understanding modern global environmental change which impacts most aspects of human activities and charts the direction of earth science in the 21<sup>st</sup> Century. The purpose of this course is to improve student understanding of natural climate variations in the Earth System as revealed in multiple proxy records including those preserved in ice, lake, and marine cores. Students of Earth System Sciences, Geography, and other disciplines need the skills and experience to interpret these records of past changes to understand the present and project the future. It is important to understand what we know (and don't know) about the characteristics and rate of natural climate change, the extent of human-induced forcing, and its potential impact on society. Climate change is emerging as a powerful causal agent in the evolution of civilizations, and by comparing historical and geological records of climate variations we are able to comprehend how the rise and fall of past cultures were impacted by such perturbations. Many students here will directly or indirectly be involved in careers that will require professional understanding of both Quaternary and modern climate variations.

## Course Learning Outcomes

Students will use their critical and logical thinking while building better intuition of how climate change impacts most aspects of life and the direction of science in the 21<sup>st</sup> century. This course is designed to provide students with a current overview of what we know and what we need to know about paleoclimate and climate change. Paleoclimatology is of vital importance today due to current concerns regarding future global climate and environmental changes. The main objective of the course is to improve student understanding of the geological record of climate change by exploring what we know and ascertaining what we need to know to better project future changes. This will be accomplished by engaging with the interpretation of actual records from ice, lake, and marine cores, tree rings, corals, speleothems, and historical records. We will examine these records as recorders of abrupt climate changes that have occurred in the past. The class will build on some aspects of Edmond A. Mathez and Jason E. Smerdon's book entitled Climate Change, The Science of Global Warming and our Energy Future, second edition (2018), Columbia University Press, New York as well as Mark Maslin's book entitled Climate Change, A Very Short Introduction (fourth edition) Oxford University Press (2021).

### Overview of Topics

This class will provide a contemporary overview of the field of paleoclimatology and records of climatic changes during the Quaternary. Specific topics include new material on methods of dating, calibration of the radiocarbon time scale, amino acid geochronology, and the application of dating to ice cores, marine core, lake cores, corals, tree rings and historical records. Students will also examine the sources of climate change and the relative roles of:

- Volcanic Activity/Dust
- Orbital Parameters
- Greenhouse Gases
- Variations in Solar Input
- Variations in Atmospheric Water Vapor
- Interactions between Tectonic and Surface Processes and Climate
- Oceanic Variability

## How This Course Works

**Mode of delivery:** This course is taught in the classroom. If you are unable to regularly attend class at the scheduled time you must enroll in another class.

Class will meet twice a week (Tuesdays and Thursdays). The course is composed of a combination of lectures, videos, discussions, guest lectures, and student presentations. We will explore the use of the internet to facilitate class interaction. In recitation we will set Climate Lab to provide a perspective on climate and environmental truths and human nature in order to address the question “*Which Future Will We Choose?*” We will discuss how we can convince the public and our political leadership to take the climate crisis and its consequences seriously, and the need to develop young scientists to undertake leadership necessary for the future. We will investigate the urgency for action on climate change and investigate why humans are ill-equipped to deal with the crisis and how we can find solutions. The Climate Lab will help explore ways to inspire the public to step up to the plate and figure out how we can use their time and talent to make a difference.

**Credit hours and work expectations:** This is a 4-credit-hour course. According to [Ohio State policy](#), students should expect around 3 hours per week of time spent on direct instruction (instructor content and Carmen activities, for example) in addition to 6 hours of homework (reading and assignment preparation, for example) to receive a grade of (C) average.

**Attendance and participation requirements:** your attendance is based on your in-class activity and participation. The following is a summary of everyone's expected participation:

**Group project:** We anticipate this to be a semester-long class project, with one team documenting the climate crisis that we all face and a second team exploring the human capacity to deal with these changes and discuss how current and past societies coped with climate change. A third team will explore solutions to the climate crisis and how these solutions could be implemented locally, regionally, nationally and internationally. Each team will investigate how we might implement a Climate Lab that is upscaled to include SES, the Byrd Polar and Climate Research Center and other units across the University. In recitation we will discuss specific climate records, climate models, current literature, preparation of research results, and the impact of climate on past and current societies. We will also work on climate records and observe demonstrations of ice core analysis techniques. During Weeks 11 through 14 students will present the results of both their class team projects as well as their individual research projects on the natural climate tipping points that might move climate change away from human ability to control it. Specific topics will be determined in part by the paleoclimate interest of students. The presentations will be 15 minutes long, followed by a 5-minute Q&A. This timed presentation will familiarize students with conference and meeting formats such as those used at the American Geophysical Union meetings. At the end of the semester each student will have a short oral examination before the class, the purpose of which is to help students practice “thinking on their feet” which is imperative in thesis defenses, and in the case of PhD students, oral candidacy exams.

# Course Materials and Technologies

## Textbook (required)

*Paleoclimatology, Reconstructing Climates of the Quaternary* by Raymond S. Bradley (Third Edition, 2015)

## Course Technology

For help with your password, university email, Carmen, or any other technology issues, questions, or requests, contact the OSU IT Service Desk. Standard support hours are available at <https://ocio.osu.edu/help/hours>, and support for urgent issues is available 24/7.

- **Self-Service and Chat support:** <http://ocio.osu.edu/selfservice>
- **Phone:** 614-688-HELP (4357)
- **Email:** [8help@osu.edu](mailto:8help@osu.edu)
- **TDD:** 614-688-8743

## Required Technology Skills Needed for This Course

- Carmen Connect text, audio, and video chat

## Required Equipment

- Computer: current Mac (OS X) or PC (Windows 7+) with high-speed internet connection
- Webcam: built-in or external webcam, fully installed and tested
- Microphone: built-in laptop or tablet mic or external microphone
- Other: a mobile device (smartphone or tablet) or landline to use for BuckeyePass authentication

## Required Software

**Microsoft Office 365:** All Ohio State students are now eligible for free Microsoft Office 365. Visit the installing Office 365 ([go.osu.edu/office365help](http://go.osu.edu/office365help)) help article for full instructions.

## CARMEN Access

You will need to use **BuckeyePass** multi-factor authentication to access your courses in Carmen. To ensure that you are able to connect to Carmen at all times, it is recommended that you take the following steps:

- Register multiple devices in case something happens to your primary device. Visit the **BuckeyePass - Adding a Device** help article for step-by-step instructions.
- Request passcodes to keep as a backup authentication option. When you see the Duo login screen on your computer, click “Enter a Passcode” and then click the “Text me new codes” button that appears. This will text you ten passcodes good for 365 days that can each be used once.
- Download the **Duo Mobile application** to all of your registered devices for the ability to generate one-time codes in the event that you lose cell, data, or Wi-Fi service.

If none of these options will meet the needs of your situation, you can contact the IT Service Desk at 614-688-4357 (HELP) and the IT support staff will work out a solution with you.

# Grading and Faculty Response

## Paper and Presentation: 40%

The major component of student evaluation is preparation and presentation of research papers on paleoclimatology. The written format for the paper is to be suitable for a major scientific journal. Each student will review someone else's research paper. The review will count for participation credits (see below). The timed (15 + 5) formal presentation will be in the American Geophysical Union format. Preliminary drafts of the paper and presentation will also be reviewed by the instructors for improvement.

## Class Participation: 20%

This includes quality and quantity of discussion participation, written group and individual responses to in-class questions, relevance of reviews of individual papers, and the degree of preparation and follow-up of classroom topics.

## Examination: 30%

Oral examination will also have the objective of preparing students for professional interaction.

## Recitation Activities and Assignments: 10%

Problem-solving activities, discussions, and the development and critique of demonstrations.

**Course Evaluation** The course and instructors will be evaluated by students using OSU's Student Evaluation of Instruction survey.

See [Course Schedule](#) for due dates.

## Late Assignments

Late submissions will not be accepted. Please refer to Carmen for due dates.

## Instructor Feedback and Response Time

We are providing the following list to give you an idea of our intended availability throughout the course. (Remember that you can call **614-688-HELP** at any time if you have a technical problem.)

- **Grading and feedback:** For large weekly assignments, you can generally expect feedback within **7 days**.
- **Email:** We will reply to emails within **24 hours on days when class is in session at the university**.
- **Discussion board:** We will check and reply to messages in the discussion boards every **24 hours on school days**.

## Grading Scale

This course follows OSU's standard grading scale:

Letter Grade	Range
A	93% to 100%
A-	90% to < 93%
B+	87% to < 90%
B	83% to < 87%
B-	80% to < 83%
C+	77% to < 80%
C	73% to < 77%
C-	70% to < 73%
D+	67% to < 70%
D	60% to < 67%
E	0% to < 60%



# Other Course Policies

## Discussion and Communication Guidelines

The following are my expectations for how we should communicate as a class. Above all, please remember to be respectful and thoughtful.

- **Writing style:** While there is no need to participate in class discussions as if you were writing a research paper, you should remember to write using good grammar, spelling, and punctuation. A more conversational tone is fine for non-academic topics.
- **Tone and civility:** Let's maintain a supportive learning community where everyone feels safe and where people can disagree amicably.
- **Citing your sources:** When we have academic discussions, please cite your sources to back up what you say. (For the textbook or other course materials, list at least the title and page numbers. For online sources, include a link.)
- **Backing up your work:** Consider composing your academic posts in a word processor, where you can save your work, and then copying into the Carmen discussion.

Throughout this semester, you will work in the same small group. Collaborating as a group does not come natural to everyone, in general, and working with a group of people with all different backgrounds can take even more practice. But an abundance of research has demonstrated that diverse teams are most effective. Many successful companies now try to capitalize on the full breath of their 'human capital'.

Diverse teams make strong teams. Assuming of course that

- all team members are respectful towards each other,
- one or more team members do not dominate discussions at the expense of others, and
- all team members carry their weight and contribute equally.

## Diversity Statement

As your instructors in this course, we strongly support OSU's general commitment to diversity:

“The Ohio State University affirms the importance and value of diversity in the student body. Our programs and curricula reflect our multicultural society and global economy and seek to provide opportunities for students to learn more about persons who are different from them. We are committed to maintaining a community that recognizes and values the inherent worth and dignity of every person; fosters sensitivity, understanding, and mutual respect among each member of our community; and encourages each individual to strive to reach his or her own potential. Discrimination against any individual based upon protected status, which is defined as age, color, disability, gender identity or

expression, national origin, race, religion, sex, sexual orientation, or veteran status, is prohibited.”

If you experience any lack of respect in this context either by us or any of your fellow students, please do not hesitate to reach out to us, our TA, or a neutral party (e.g. the Office of Diversity and Inclusion: [odi@osu.edu](mailto:odi@osu.edu)). Also, if you have a name and/or set of pronouns that differ from those apparent on Carmen, please let us know!

## Academic Integrity Policy

### POLICIES FOR THIS COURSE

- **Reusing past work:** In general, you are prohibited in university courses from turning in work from a past class to your current class, even if you modify it. If you want to build on past research or revisit a topic you've explored in previous courses, please discuss the situation with us.
- **Falsifying research or results:** All research you will conduct in this course is intended to be a learning experience; you should never feel tempted to make your results or your library research look more successful than it was.
- **Collaboration and informal peer-review:** The course includes many opportunities for formal collaboration with your classmates. While study groups and peer-review of major written projects is encouraged, remember that comparing answers on an assignment is not permitted. If you're unsure about a particular situation, please feel free just to ask ahead of time.
- **Group projects:** This course includes a group project, which can be stressful for students when it comes to dividing work, taking credit, and receiving grades and feedback. We have attempted to make the guidelines for group work as clear as possible for each activity and assignment, but please let us know if you have any questions.
- **Note: The use of GenAI is prohibited in this course.**



Given that the learning goals of this class are to help you develop tools to research climate and environment related issues, to critically evaluate them, and to summarize your results both orally and in writing], the use of generative artificial intelligence (GenAI) tools such as [Copilot or ChatGPT] is not permitted in this course. Any use of GenAI tools for work in this class may therefore be considered a violation of Ohio State's Academic Integrity policy and Code of Student Conduct because the work is not your own. The use of unauthorized GenAI tools will result in referral to the Committee on Academic Misconduct. If we suspect that you have used GenAI on an assignment for this course,

we will ask you to communicate with us to explain your process for completing the assignment in question.

If you feel you need to use GenAI for translation, please contact us first. If you have any other questions regarding this course policy, please contact us.

## Ohio State's Academic Integrity Policy

Academic integrity is essential to maintaining an environment that fosters excellence in teaching, research, and other educational and scholarly activities. Thus, The Ohio State University and the Committee on Academic Misconduct (COAM) expect that all students have read and understand the university's [Code of Student Conduct](http://studentconduct.osu.edu) (studentconduct.osu.edu), and that all students will complete all academic and scholarly assignments with fairness and honesty. Students must recognize that failure to follow the rules and guidelines established in the university's *Code of Student Conduct* and this syllabus may constitute "Academic Misconduct."

The Ohio State University's *Code of Student Conduct* (Section 3335-23-04) defines academic misconduct as: "Any activity that tends to compromise the academic integrity of the university or subvert the educational process." Examples of academic misconduct include (but are not limited to) plagiarism, collusion (unauthorized collaboration), copying the work of another student, and possession of unauthorized materials during an examination. Ignorance of the university's *Code of Student Conduct* is never considered an excuse for academic misconduct, so I recommend that you review the *Code of Student Conduct* and, specifically, the sections dealing with academic misconduct.

**If we suspect that a student has committed academic misconduct in this course, we are obligated by university rules to report my suspicions to the Committee on Academic Misconduct.** If COAM determines that you have violated the university's Code of Student Conduct (i.e., committed academic misconduct), the sanctions for the misconduct could include a failing grade in this course and suspension or dismissal from the university.

If you have any questions about the above policy or what constitutes academic misconduct in this course, please contact us.

Other sources of information on academic misconduct (integrity) to which you can refer include:

- [Committee on Academic Misconduct](http://go.osu.edu/coam) (go.osu.edu/coam)
- [Ten Suggestions for Preserving Academic Integrity](http://go.osu.edu/ten-suggestions) (go.osu.edu/ten-suggestions)
- [Eight Cardinal Rules of Academic Integrity](http://go.osu.edu/cardinal-rules) (go.osu.edu/cardinal-rules)

## Copyright for Instructional Materials

The materials used in connection with this course may be subject to copyright protection and are only for the use of students officially enrolled in the course for the educational purposes associated with the course. Copyright law must be considered before copying, retaining, or disseminating materials outside of the course.

## Creating an Environment Free from Harassment, Discrimination, and Sexual Misconduct

The Ohio State University is committed to building and maintaining a community to reflect diversity and to improve opportunities for all. All Buckeyes have the right to be free from harassment, discrimination, and sexual misconduct. Ohio State does not discriminate on the basis of age, ancestry, color, disability, ethnicity, gender, gender identity or expression, genetic information, HIV/AIDS status, military status, national origin, pregnancy (childbirth, false pregnancy, termination of pregnancy, or recovery therefrom), race, religion, sex, sexual orientation, or protected veteran status, or any other bases under the law, in its activities, academic programs, admission, and employment. Members of the university community also have the right to be free from all forms of sexual misconduct: sexual harassment, sexual assault, relationship violence, stalking, and sexual exploitation.

To report harassment, discrimination, sexual misconduct, or retaliation and/or seek confidential and non-confidential resources and supportive measures, contact the Office of Institutional Equity:

1. Online reporting form at [equity.osu.edu](https://equity.osu.edu),
2. Call 614-247-5838 or TTY 614-688-8605,
3. Or email [equity@osu.edu](mailto:equity@osu.edu)

The university is committed to stopping sexual misconduct, preventing its recurrence, eliminating any hostile environment, and remedying its discriminatory effects. All university employees have reporting responsibilities to the Office of Institutional Equity to ensure the university can take appropriate action:

- All university employees, except those exempted by legal privilege of confidentiality or expressly identified as a confidential reporter, have an obligation to report incidents of sexual assault immediately.

- The following employees have an obligation to report all other forms of sexual misconduct as soon as practicable but at most within five workdays of becoming aware of such information: 1. Any human resource professional (HRP); 2. Anyone who supervises faculty, staff, students, or volunteers; 3. Chair/director; and 4. Faculty member.

## Your Mental Health

As a student you may experience a range of issues that can cause barriers to learning, such as strained relationships, increased anxiety, alcohol/drug problems, feeling down, difficulty concentrating and/or lack of motivation. These mental health concerns or stressful events may lead to diminished academic performance or reduce a student's ability to participate in daily activities. No matter where you are engaged in distance learning, The Ohio State University's Student Life Counseling and Consultation Service (CCS) is here to support you. If you find yourself feeling isolated, anxious, or overwhelmed, [on-demand mental health resources](https://go.osu.edu/ccsondemand) (go.osu.edu/ccsondemand) are available. You can reach an on-call counselor when CCS is closed at [614- 292-5766](tel:614-292-5766). **24-hour emergency help** is available through the [National Suicide Prevention Lifeline website](https://www.suicidepreventionlifeline.org) (suicidepreventionlifeline.org) or by calling [1-800-273-8255\(TALK\)](tel:1-800-273-8255). [The Ohio State Wellness app](https://go.osu.edu/wellnessapp) (go.osu.edu/wellnessapp) is also a great resource.

## Other resources

For an overview and contact information regarding student academic services offered on the OSU main campus, please visit: <http://advising.osu.edu/welcome.shtml>

For an overview and contact information for student services offered on the OSU main campus, please visit: <http://ssc.osu.edu>.

# Accessibility Accommodations for Students with Disabilities

## Requesting Accommodations

The university strives to make all learning experiences as accessible as possible. If you anticipate or experience academic barriers based on your disability including mental health, chronic or temporary medical conditions, please let us know immediately so that we can privately discuss options. To establish reasonable accommodations, we may request that you register with [Student Life Disability Services \(SLDS\)](#). After registration, make arrangements with us as soon as possible to discuss your accommodations so that they may be implemented in a timely fashion.

## Disability Services Contact Information

- Phone: [614-292-3307](tel:614-292-3307)
- Website: [slds.osu.edu](http://slds.osu.edu)
- Email: [slds@osu.edu](mailto:slds@osu.edu)
- In person: [Baker Hall 098, 113 W. 12th Avenue](#)

## Accessibility of Course Technology

This course requires use of Carmen Canvas (Ohio State's learning management system) and other online communication and multimedia tools. If you need additional services to use these technologies, please request accommodations as early as possible.

- [CarmenCanvas accessibility](http://go.osu.edu/canvas-accessibility) (go.osu.edu/canvas-accessibility)
- Streaming audio and video
- [CarmenZoom accessibility](http://go.osu.edu/zoom-accessibility) (go.osu.edu/zoom-accessibility)

## Course Schedule

Week	Dates	Topics, Readings, Assignment, Dues dates
1	7-Jan 9-Jan	<b>Introduction</b> Overview Class —Introduction Climate and climatic variation and causes
2	14-Jan 16-Jan	<b>Dating Methods</b> Solar variations and dating methods Dating Methods
<p><b>In weeks 3 through 8 we will examine various systems that record climatic and environmental information and thus facilitate paleoclimate reconstruction.</b> For each of the archives discussed, the course will provide a detail perspective on the various parameters measured and recorded, how the time control was established, and what calibration techniques were used.</p>		
3	21-Jan 23-Jan Recitation	<b>History of glaciation and ice cores</b> The Coriolis effect and the history of glaciation Ice Cores/ Ice core perspective on paleothermometer Overview of ice core analysis; Tour of BPCRC ice core laboratories; Interpretation of proxy records
4	28-Jan 30-Jan	<b>Ice cores (continued); Ocean and Marine Sediments</b> Ice cores Marine sediments (theories of abrupt climate change, such as the Younger Dryas event, Dansgaard/Oeschger and Bond Cycles, etc.)
5	4-Feb 6-Feb Recitation	<b>Marine/non-Marine geological evidence</b> Corals, loess, and the role of water vapor Non-marine geological evidence Class projects
6	11-Feb 13-Feb Recitation	<b>Biological records and speleothems</b> Biological evidence Speleothems Class projects
7	18-Feb 20-Feb Recitation	<b>Pollen and Dendrochronology</b> Pollen analysis Dendrochronology Class projects
8	25-Feb 27-Feb	<b>Instructional Break and climate and environmental reconstruction from historical records</b> Oral Review Climate reconstruction from historical records
9	4-Mar 6-Mar Recitation	<b>Paleoclimate models and Communicating science and interdisciplinary research</b> Paleoclimate models and Communicating science and interdisciplinary research Communicating science in print and on TV Class projects



Week	Dates	Topics, Readings, Assignment, Dues dates
10	11-Mar 13-Mar	<b>Spring Break</b> No class No class
11	18-Mar 20-Mar Recitation	<b>Summary and review</b> Synthesis: Climate Change, ENSO, Archeology, History, and "Black Swans" Student presentations: Team projects Paper preparation
12	25-Mar 27-Mar	<b>Student Presentations</b> Student presentations: Team projects Student presentations: Teams projects
13	1-Apr 3-Apr	<b>Student Presentations</b> Student presentations: Team projects Student presentations: Individual projects
14	8-Apr 10-Apr Recitation	<b>Student Presentations</b> Student presentations: Individual projects Student presentations: Individual projects/Exam Review Course evaluation
15	15-Apr 17-Apr	<b>Oral Exams</b> Oral Exams Oral Exams