

PALEOCLIMATOLOGY

Instructor:

Dr. Jacalyn *Wittmer* Malinowski
 Office Hours: Virtual (Teams) and in-person in ISC 19
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Lecture: M W 9:30 – 10:20 am, ISC 133

Laboratory Time: M W 10:30 – 11:45 am, ISC Rm 19

Course Description: Paleoclimatology is a lecture and lab-intensive course that explores in detail climate proxies and how proxies are used to interpret past, current, and future climate change. The study of fundamental concepts of global-scale environmental and climatic changes in the context of Earth-surface processes and Earth history. The course focuses on physical, chemical, and biological signatures of past environments preserved in the geologic record; causes and effects of major climate change over various timescales in Earth history; and geologic responses to Pleistocene, Holocene, geohistorical, and future climate change. Laboratory exercises involve characterizing climate proxies, data-rich studies of climate-change records, and discussions of evidence for climate change using the most recent IPCC report. Prerequisites: None.

Learning Outcomes:

After successful completion of the course, a student will be able to

- Understand the paleoclimatic signal from proxy data to interpret the physical, chemical and biological preservation of climate.
- Understand the seminal climate events in Earth's past climate history related to current climate and environmental changes.
- Competently collect field or lab data that is reliable and reproducible.
- Analyze independently collected data from the field/lab and make informative interpretations from their own data.
- Use and understand statistical methods from statistical programs that aid in the interpretation of paleoclimate datasets.

Connections to General Education Requirements

After successful completion of the course, a student will develop

Contemporary Global Challenges (CGC)

- Develop an understanding of the intricacies of climate change at multiple scales.
- Identify and investigate the global and local responses towards climate change.
- Explore future climate change and global solutions to limit a warming planet.

Sustainability (SST)

- Discuss current climate change-related events, research and findings, and solutions to learn about the effects of climate change on people, society, and the Earth system.
 - Predict the short-term and long-term effects of climate change and its impact on the Earth system.
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Optional Recommended Text:

- Ruddiman, W.F., 2014, Earth's Climate: Past and Future, W.H. Freeman, 3rd Edition, 445 p.
- Bradley, R.S., 2017, Paleoclimatology: Reconstructing Climates of the Quaternary, Academic Press Elsevier, 3rd Edition, 675 p.
- Bender, M., 2013, Paleoclimate, Princeton University Press, 306 p.

OER sources:

- Bralower and Bice, [Earth in the Future](#) (Penn State)
- Schmittner, A., [Introduction to Climate Science](#) (Oregon State University)

- Weart, S., [The Discovery of Global Warming](#) (American Institute of Physics)
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Course Structure

This is a **3-credit hour In-Person** course. The course spans the entire semester (**16 weeks** long and consists of 5 content modules). You should dedicate approximately **8-10 hours** per week to working on the course itself, but actual time commitments will vary depending on your input, needs, and personal study habits. To be successful, you will need to attend in-person lectures on Monday and Wednesday in addition to attending **weekly in-person lab meetings on Mondays & Wednesdays**.

- The course has a consistent and predictable structure, organized around the weekly modules, with a course Brightspace site that should be straightforward and easy to navigate. Instructions and due dates for activities and assignments are clearly articulated so that you know what is expected of you and you can easily stay on track.
- Most assignments are due by 11:59 PM of their respective due dates as listed on the course calendar. At the end of each week students will have an opportunity to make sure that they have completed all the required activities and assignments before the new week's content is released.
- For most weeks of the course, the future week's materials will be available a few days ahead of schedule, likely on the Friday before that week officially begins. This is done for students who need to get ahead in the course due to some sort of major event planned.

Face-to-Face Information

- I greatly value the learning opportunities we'll have in our in-person lab and lecture meetings and hope that you will actively participate in this important element of the learning process.
- It is essential that all students in in-person classes follow some basic processes to help keep themselves, other students, and our faculty and staff safe. Please incorporate essential health and safety measures into your normal routine, consider the ways that your actions may affect the health and wellbeing of those around you, and try to approach this semester with a spirit of empathy and compassion.
- If you are feeling unwell on a day that we meet in-person, do not attend. Remember that it is better to stay home if you are not feeling well than to attend class and risk spreading illness to others. Throughout the semester, please be proactive in communicating about absences and contact the Dean of Students if you expect to be out for an extended period of time. Rest assured that there will be no penalty for missing class and that I've designed our course so that there's a path for you to make up any learning that takes place that you miss.

Online Instruction

- Many course materials are available on Brightspace and I've made every attempt to ensure that they are accessible to everyone. If you have difficulties accessing any materials (including needs for alternative formats), please let me know as soon as possible and I will rectify the situation.
- Accessing course materials online may be challenging - we've all experienced things like unforeseen emergencies and internet disruptions. Please try to be understanding about the challenges posed by the limits of technology. If you are experiencing longer-term disruptions, please be proactive in communicating with me and contact the Dean of Students if you expect to be out for an extended period of time.

- CIT has developed a number of [resources that can help you formulate good strategies for success in online courses](#). These include general strategies for keeping on track with your courses as well as more specific resources about learning experiences that you may encounter in an online course. The Office of the Dean for Academic Planning and Advising has also introduced the new [KOALA \(Knights' Online Academic Learning Assistance\)](#) course support resource. Throughout the semester, if you need help with online learning strategies, you can contact the KOALA support desk, which will assist you with identifying resources and strategies for success.
- [CIT also provides a range of technology support resources](#). When you are in Brightspace, the Help menu on the left side of the screen will also direct you to a number of CIT supports, including self-help resources and options to request technology assistance.

Student Support Hours (aka Office Hours)

- Support hours are times outside of class that you can meet with your instructor to discuss the material being presented in class or questions about lab content. Support hours are for you to ask for extra help, seek clarification of material, follow up on parts of the class you are interested in, and for you to check the progress you have made on your work.
- You are not required to attend support hours and you will decide on your own what you need or if you want to participate in support hours. These hours are free-flowing periods of time where there is no lesson planned or structure, you are expected to 'drive' the meeting with your questions and your thoughts.
- Do not expect the instructor to give you the answers during these hours, but instead they will help you work through towards the answers so that you can become an independent learner. The course student support hours will be posted on Brightspace and announced on the first day of class.

Class policies and expectations

Posting material on Brightspace

- There are four content-based modules in the course, each module will contain a section overview followed by week content and assessment information. The Overview section will go over weekly expectations, due dates and discuss major class changes.
- Lecture notes and annotated powerpoints will be posted with additional linked sites for optional and supportive readings. Readings will include the suggested chapters related to lab and lecture content, but also linked OER sources when available. There will also be pre-laboratory readings to help you prepare for the lab components of the class.
- Assignments such as labs, blogs or quizzes will be posted in each section module under Assignments.

Required Student Work

- Weekly readings from textbook or website
- Viewing and Note-taking from recorded lectures
- In-person Lab exercises
- Mini Exams
- Tri-weekly Discussions

Late Assignments

- For all assignments (labs, take-home assignments, blogs, etc.) I will allow submission up to **three days after the assignment deadline**. This is a three-day grace period to allow you to

catch up on work and submit your work within a reasonable window after the due date. I will not accept assignments after the three-day grace period.

Mini Exams

- The course will have four mini exams (at the end of each section of the course) that will cover material delivered in lectures, readings, and labs as chunked assessments. The mini exam questions will be a mixture of short answer, multiple-answer, and diagram questions. Mini Exam dates are provided in the course schedule and will be available in weekly overview and communications. Mini Exams are non-cumulative and will be delivered at the beginning of in-person lecture meetings.

Laboratory Exercises

- Laboratory exercises are set up as staggered exercises where you will develop skills such as observation, applied analysis, and interpretations. The labs will be delivered into two parts on Brightspace: Hand-sample data collection and investigation followed by database/dataset analysis. These labs are for you to learn skills and appreciate the data provided by proxies to understand past and present climate. Further guidance, e.g. rubrics, will be provided throughout the semester. Due dates for the labs are posted in the course schedule and will be available in weekly overview and communications.

Discussions

- This course will have a tri-weekly discussion forum delivered in Discussions in Brightspace. Discussions will involve an initial post once every three weeks where the student will report, highlight or discuss recent events in the field of climate change and paleoclimate. Students will participate in this discussion by reading each other's posts and participating in the forum with two responses to the initial posts.

Grading Scale

- Your course grade will be calculated as follows:
 - Labs 45%
 - Mini Exams 35%
 - Discussions 20%

Grading Scale

93.30 – 100 % = A	86.60 – 89.99 % = B+	76.60 – 79.99 % = C+	60.00 – 69.99 % = D
90.00 – 93.29 % = A-	83.30 – 86.59 % = B	73.30 – 76.59 % = C	≤ 59.99 % = E
	80.00 – 83.29 % = B-	70.00 – 73.29 % = C-	

Assignments and Point Distributions

You can access your scores by clicking the [Grades](#) link from top of the course Brightspace page. All assignments have due dates, please see the course schedule to determine deadlines.

<u>Assignments</u>	<u>Labs</u>	<u>Mini Exam</u>	<u>Discussions</u>	<u>Total points for the week</u>
<u>Week 1</u>				
<u>Week 2</u>	100			100
<u>Week 3</u>	100		30	130
<u>Week 4</u>		50		50

<u>Week 5</u>				
<u>Week 6</u>	100		30	130
<u>Week 7</u>				
<u>Week 8</u>	100			100
<u>Week 9</u>		50		50
<u>Week 10</u>	100			100
<u>Week 11</u>			30	30
<u>Week 12</u>	100			100
<u>Week 13</u>		50		50
<u>Week 14</u>			30	30
<u>Week 15</u>	100			100
<u>Week 16</u>		50		50
<u>Total points per assignment</u>	700	200	120	1020
<u>Relative Weight</u>	45%	35%	20%	100%

Additional Support and Services

Accommodations: SUNY Geneseo makes reasonable accommodations for persons with documented physical, emotional or learning disabilities. Students should consult with the Assistant Dean of the Office of Accessibility (Dr. Amy Fisk, 22 Erwin, afisk@geneseo.edu). During the first week of the semester, students should alert the professor regarding any needed accommodations by the beginning of the second week of the semester.

Academic Dishonesty Policy: Academic dishonesty includes cheating, knowingly providing false information, plagiarizing, and any other form of academic misrepresentation. If an incident of academic dishonesty occurs, I will enforce the policies of the university, meaning that I document the incident with the Office of the Dean and the student(s) receive a failing grade of 'E' for that assignment and potentially

for the course. Consult the following link for details: (<http://www.geneseo.edu/handbook/academic-dishonesty-policy>)

Statement of Commitment to Inclusion and Diversity: It is my intention to have a course that is accessible and inclusive to students from all backgrounds and perspectives and addresses students' learning needs both in and out of class. The diversity of perspective and experience that students bring into our classroom is a resource, strength and benefit and we seek to cultivate a learning community that is inclusive to all identities (including race, gender, class, sexuality, religion, ability, etc.). I would like to state that no field of science is neutral and the sciences, including paleoclimatology, have participated in discrimination, oppression, and erasure of people from marginalized groups throughout history. As part of this class, we will acknowledge our history and work on transforming our society and ourselves to commit to change.

To help accomplish this:

- If you have a name and/or set of pronouns that differ from those that appear in your official Geneseo records, please let your instructor know.
- If you feel like your performance in the class is being impacted by your experiences outside of class, please come and talk with me, Dr. Wittmer. I care and can help you find support resources on campus. If you prefer to speak with someone outside of the course, robbie routenberg (routenberg@geneseo.edu), is the Chief Diversity Officer for the College and they and their office can provide help and support.
- If something was said in class (by anyone) that made you feel uncomfortable, please communicate this to your instructor, Dr. Wittmer. (Note: Anonymous feedback is always an option). Reporting divisive comments or behavior is an essential step in continuing the education of people who are still in the process of learning about diverse perspectives and identities.
- Know that your suggestions are encouraged and appreciated. Please let me know ways to improve the effectiveness of the course for you personally or for other students or student groups.
- If any of our class meetings conflict with your religious events, please let Dr. Wittmer know so that she can make arrangements for you.

For more details on SUNY Geneseo's community commitment to diversity, equity, and inclusion, please see the content at found at the following location: <https://www.geneseo.edu/diversity/commitment>

Course Schedule

Week	Date	Course Content	Labs	Deadlines
1	Aug. 28	Introduction to Paleoclimate Proxies	Lab 1: Introduction to Paleoclimate - Prelab Reading: Introduction to Using Excel	
	Aug. 30	Climate System Forcings		
2	Sep. 4	No Class - LABOR DAY		Lab 1 Due Sep. 8 @ 11:59pm

	Sep. 6	Feedbacks Energy Budget Heat Transfer		
3	Sep. 11	Atmosphere Basics Atmospheric Circulation	Lab 2: Microfossil Proxies - Prelab Reading: Introduction to Microfossils as Proxies	Lab 2 Due Sep. 15 @ 11:59pm Discussion Post due Sep. 14, Responses due Sep. 17
	Sep. 13	Surface Oceans Deep Oceans		
4	Sep. 18	Cryosphere Biosphere		Mini Exam 1 (Intro. to Paleoclimate - Biosphere)
	Sep. 20	Mini Exam 1		
5	Sep. 25	Carbon Tectonic Timescale Chemical Weathering	Lab 3: Lake Core Proxies - Prelab Reading: Lake Sediments as Proxies	
	Sep. 27	Faint Young Sun Paradox Snowball Earth		
6	Oct. 2	Icehouse Pangaea		Lab 3 Due Oct. 6 @ 11:59pm Discussion Post due Oct. 5, Responses due Oct. 8
	Oct. 4	BLAG Uplift Weathering		
7	Oct. 9	No Class - FALL BREAK	Lab 4: Plant Proxies - Prelab Reading: Plants as Paleothermometers	Lab 4 Due Oct. 20 @ 11:59pm
	Oct. 11	Radioisotopes and Stable Isotopes		
8	Oct. 16	Cretaceous Greenhouse Paleomagnetism		
	Oct. 18	PETM Cenozoic Cooling		
9	Oct. 23	Mini Exam 2	Lab 5: Coral Proxies - Prelab Reading: Corals as Proxies	Mini Exam 2 (Carbon Tectonic Timescale - Cenozoic Cooling)
	Oct. 25	Astronomical Cycles Insolation		
10	Oct. 30	Orbital Cycles		Lab 5 Due Nov. 3 @ 11:59pm
	Nov. 1	Orbital Cycles		
11	Nov. 6	Orbital Cycles	Lab 6: Ice Core Proxies - Prelab Reading: Introduction to Ice Cores	Discussion Post Due Nov. 9, Responses Due Nov. 11
	Nov. 8	Last Glacial Maximum		
12	Nov. 13	Deglacial Times		Lab 6 Due Nov. 17 @ 11:59pm
	Nov. 15	PreIndustrial Climates		
13	Nov. 20	Mini Exam 3	-	Mini Exam 3 (Astronomical Cycles - Deglacial Times)
	Nov. 22	No Class - Thanksgiving Break		
14	Nov. 27	1000 years and ENSO	Lab 7: Tree Rings - Prelab Reading on Dendrochronology	Discussion Post Due Nov. 30, Responses Due Dec. 3
	Nov. 29	Current Records of Climate Change		
15	Dec. 4	Natural and Anthropogenic Causes of Climate Change		Lab Due Dec. 8 @ 11:59pm
	Dec. 6	Future Climate Change		
16	Dec. 11	Future Climate Projections and Modifications	-	Mini Exam 4 on Dec. 15 at 12pm (PreIndustrial Climate - Future Climate Modifications)
	Dec. 15	Mini Exam 4		