PALEOCLIMATOLOGY

Instructor:
Dr. Jacalyn *Wittmer* Malinowski
Office Hours: Virtual (Zoom) and in-person in ISC 19
Email: malinowski@geneseo.edu

Lecture: Recordings Posted on Canvas
Laboratory Time and Room: 10:30am-12:20pm, Tuesdays: Group A
10:30am-12:20pm, Thursdays: Group B
ISC Rm 19

Course Description: This is a lecture, field, and lab-intensive course that explores in detail about climate proxies and how proxies are used to interpret past, current and future climate change. The course focuses heavily on reconstructing the Earth's past climate using different records and measures of climate change by collecting samples, conducting data analysis, and making interpretations of the NY region climate history. The goals of the course are to analyze proxies, instrumental records, and assess global and regional datasets to determine the timing and magnitude of climate change in Earth history, in the current record and to aid in our preparation for future environmental change. This course involves field and lab research, experiments, data synthesis and exploration. Prerequisites: GSCI 170.

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.

Optional 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.

Highly Recommended Text:

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)

Course Structure

This is a **3–credit hour HYBRID** course. The course spans the entire semester (**15 weeks** long and consists of 15 content modules). You should dedicate approximately **12–16 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 log on to the course canvas site a minimum of **4 days per week** in addition to attending **weekly in-person lab meetings**.

- The course has a consistent and predictable structure, organized around the weekly modules, with a course canvas 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 weekly content module, participants 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 meetings and hope that you will actively participate in this important element of the learning process. The COVID-19 pandemic presents challenges to in-person learning, but by working together we can make this a safe experience.
    - 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. Although these processes may seem inconvenient, they reflect current public health guidance that helps minimize the spread of coronavirus. Please incorporate these 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.
    - In the context of the COVID-19 pandemic, it is vital that we all do what we can to protect the health and safety of each other. If you are feeling unwell on a day that lab meets 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 in a lab meeting you miss.
    - The college has developed an online COVID-19 screening report for students. Be sure to familiarize yourself with this process and complete the brief screening report before leaving for lab. If you are experiencing common symptoms of COVID-19, stay home and contact Health and Counseling Services as soon as possible. I strongly encourage you to set a daily reminder to fill out the screening report.
    - Face masks are required in all instructional spaces (including classrooms, lecture halls, and laboratories) and all common areas including residence halls and academic buildings. If you forget your mask, please be sure to pick up a disposable one before entering the classroom. Masks must be worn for the duration of lab. If you do not have a mask or are unwilling to wear one, you will be asked to leave the classroom. I cannot safely hold lab if all students are not wearing face masks.
    - If you would feel more comfortable or if my teaching could be more accessible if I wear a clear face mask, please let me know as soon as possible.
    - Please familiarize yourself with any special seating arrangements in the classroom and be sure to practice 6-foot physical distancing at all times. This includes entering and exiting the classroom.
- Online Instruction
    - All course materials are available on Canvas 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. Although this course may include

some "live" or synchronous course activities, we can all be understanding about the challenges posed by the COVID-19 pandemic and the limits of technology. If you miss a synchronous session, please let me know as soon as possible so that we can discuss ways to keep you on track. 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 Canvas, 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.

Health and Wellbeing

The changes brought on by COVID-19 have impacted us all in a number of ways, and will continue to do so at various times and to varying degrees during the upcoming semester. Your health and wellbeing are foundational to your ability to learn, and if you find that you are feeling unwell (physically or mentally) and it is impacting your ability to complete your coursework, please reach out. Because the learning environment will be different than it has been in the past, the indicators that usually let you know something is wrong may not be as clear to you or those around you as they would be during a typical semester. Additionally, the ways in which you normally engage in self-care may have been disrupted. Please remember that it's never too late to ask for help. The Dean of Students (585-245-5706) can assist and provide direction to appropriate campus resources. The college also has collected resources in a Coping with COVID webpage.

Class policies and expectations

- Posting material on Canvas
  - Every week, there will be a new Weekly Module posted with three main sections: Overview, Lectures, Readings and Assignments. The Overview section will go over weekly expectations, due dates and discuss major class changes.
  - Lectures will be posted as videos with additional lecture notes and linked sites for each Weekly Module. Readings will include the suggested chapters related to lab and lecture content, but also linked OER sources when available.
  - Assignments such as labs, blogs or quizzes will be posted for each Weekly Module under Assignments.
- Required Student Work
  - Weekly readings from textbook or website
  - Viewing and Note-taking from recorded lectures
  - In-person Lab exercises
  - Bi-weekly Quizzes
  - Tri-weekly Blogs
- Late Assignments
  - For all assignments (labs, take-home assignments, projects, etc.) I will allow submission up to **three days after the assignment deadline.** Each day late, I will deduct 10% off the final grade for the assignment. I will not accept assignments after the three-day grace period if students are unwell, quarantined or encounter extenuating circumstances.
- Quizzes
  - Exams will not be part of this course; this course will not have a final exam. The course will have bi-weekly quizzes that will cover material delivered in lectures, readings, and labs as

chunked assessments. The quiz questions will be a mixture of short answer, multiple-answer, and diagram questions. Quiz dates are provided in the course schedule and will be available in weekly overview and communications. Quizzes are non-cumulative and will be delivered at the beginning of in-person lab 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 Canvas: 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.
- **Blogs**
  - This course will have a tri-weekly blog forum on the Geneseo wiki platform. These **Blogs** will be part of the course wiki entitled *Climate Change*. Blogs 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 blog by reading each other's posts and participating in the forum with two responses to the initial posts.
- **Field Collection**
  - The class *may* have one field collection trip to one of the Finger Lakes during a lab session. Depending on quarantine criteria, we may collect a lake core that will be used for subsequent analysis. The method of collection will vary depending on the state of the lakes during the time allotted for lake coring.
- **Grading Scale**
  - Your course grade will be calculated as follows:
    - Labs 40%
    - Quizzes 30%
    - Blogs 15%
    - Lab Exercise Partic. 15%
  - 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 the left column of the course canvas page. All assignments have due dates, please see the course schedule to determine deadlines.

Assignments	Lab Participation	Lab Exercises	Quizzes	Blogs	Total points for the week
Week 1	30				30
Week 2	30	50			80
Week 3	30		40	30	100
Week 4	30	50			80
Week 5				30	30
Week 6	30		40		70

Week 7	30				30
Week 8	30	50		30	110
Week 9	30		40		70
Week 10	30	50		30	110
Week 11	30		40		70
Week 12					-
Week 13	30	50	40		120
Week 14	30			30	60
Week 15	30	50	40		120
Total points per assignment	390	300	240	150	810
Relative Weight	15%	40%	30%	15%	100%

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.)

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

WEEK	DATE	LECTURE TOPICS	LABS + QUIZZES + DUE DATES
1	Feb. 1 - 5	Introduction to Paleoclimatology, Proxies and the Climate System *Ice Core Proxies*	**LAB 1: Ice Core Proxies**
2	Feb. 8 - 12	Climate Interactions and the Atmosphere	**LAB 1: Ice Core Proxies** • Group A: Lab 1 Due Feb. 15 @ 11:59pm • Group B: Lab 1 Due Feb. 17 @11:59pm
3	Feb. 15 - 19	Climate Interactions, the Oceans, and Climate Models *Microfossil Proxies*	**LAB 2: Microfossil Proxies** • *Quiz 1 (Intro. to Paleoclim. - Atmosphere)* • Blog Posting due Feb. 18, Replies Feb. 20 @ 11:59pm
4	Feb. 22 -26	Carbon and Climate, The Faint Young Sun Paradox and Snowball Earth	**LAB 2: Microfossil Proxies** • Group A: Lab 2 Due Mar. 1 @ 11:59pm • Group B: Lab 2 Due Mar. 3 @11:59pm
5	Mar. 1 - 5	Tectonics and Climate, RadioIsotope Dating Techniques	**No LAB:** *REJUVENATION DAY on Mar. 2* • Blog Posting due Mar. 4, Replies Mar. 6 @ 11:59pm
6	Mar. 8 -12	The Phanerozoic Climate: Greenhouse vs. Icehouse, RadioIsotope Dating Techniques *Lake Sediment Paleotemperature Record*	**LAB 3: Lake Core Proxies** • *Quiz 2 (Climate Interactions – Tectonics and Climate)*
7	Mar. 15 - 19	Modeling Mesozoic and Cenozoic Climate: Rapid Warming, Paleomagnetism, Chemical Dating Methods and Isotopes	**LAB 3: Lake Core Proxies**
8	Mar. 22 - 26	Astronomical Cycles and Climate, Isotopes	**LAB 3: Lake Core Proxies** • Group A: Lab 3 Due Mar. 29 @ 11:59pm • Group B: Lab 3 Due Mar. 31 @11:59pm • Blog Posting due Mar. 25, Replies Mar. 27 @ 11:59pm
9	Mar. 29 – Apr. 2	Orbital variations in Climate, Insolation, and the 100,000 year mystery *The PETM and Plant Paleothermometers*	**LAB 4: Plant Proxies** • *Quiz 3 (RadioIsotopes – Astronomical Cycles, Isotopes)*
10	Apr. 5 - 9	Glacial and Interglacial Cycles	**LAB 4: Plant Proxies** • Group A: Lab 4 Due Apr. 12 @ 11:59pm • Group B: Lab 4 Due Apr. 14 @11:59pm • Blog Posting due Apr. 8, Replies Apr. 10 @ 11:59pm
11	Apr. 12 - 16	Millennial Oscillations and Variations *Corals as proxies for the Cenozoic*	**LAB 5: Coral Proxies** • *Quiz 4 (Orbital variations – Interglacial)*
12	Apr. 19 - 23	Climate Change over the last 100,000 years, ENSO	**No LAB:** *REJUVENATION DAY on Apr.22*
13	Apr. 26 - 30	Industrial Climate Change, Instrumental Record	**LAB 5: Coral Proxies** • *Quiz 5 (Oscillations – ENSO)* • Group A: Lab 5 Due May 3 @ 11:59pm • Group B: Lab 5 Due May 5 @11:59pm
14	May 3 - 7	Causes of Warming over the last 125 years	**LAB 6: Tree Ring Proxies** • Blog Posting due May 6, Replies May 8 @

		Dendrochronology	11:59pm
15	May 10 - 12	Paleo Perspective of Future Climate Change	**LAB 6: Tree Ring Proxies** • *Quiz 6 (Industrial Climate – Future Clim. Change)* • Group A: Lab 6 Due May 15 @ 11:59pm • Group B: Lab 6 Due May 16 @ 11:59pm