

Global Climate Change and the Carbon Cycle

Course Number: **EPS S130**

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Distributional Designations

This course can be applied towards the following Yale College distributional requirements:

- Sciences

2025 Summer Session A (May 26 - June 27)

3 days/week, (MWF 1:00 pm - 3:15 pm), 5 weeks

Location: KGL-116

Office hours: TBA and by email request

Course description and audience:

An introductory science course for the general student interested in better understanding Earth's climate system, covering mechanisms of the carbon cycle, greenhouse gases, insolation, and weathering. Measurements of ancient climate cycles, ice age cycles, and post-industrial climate trends and causes will also be discussed.

There are no prerequisites besides high-school algebra.

Textbook:

W.F. Ruddiman, Earth's Climate: Past and Future, 3rd edition, 2014, W. H. Freeman and Co., New York, NY.

Additional reading materials will be supplied.

Topics per lecture period

15 periods of 2.25 hour

(Ruddiman chapter indicated)

1. Our place in the universe and overview of climate science (ch. 1)
2. The current climate (ch. 2)
3. Climate data and models (ch. 3, Appendices 1 & 2)
4. Long-term climate and CO₂ (ch. 4)
5. Plate tectonics (ch. 5)
6. Greenhouse and icehouse climates (ch. 6 & 7)
7. Astronomical control of radiation and insolation (ch. 8 & 9)
8. Discussion, questions, and **Midterm Exam** (covering Ruddiman Chapters 1-7)
9. Insolation control of ice; orbital scale changes of CO₂ and methane (ch. 10 & 11)

10. Orbital-scale interactions and feedbacks; the last glacial maximum (ch. 12 & 13)
11. Climate during and since the last deglaciation; millennial oscillations (ch. 14&15)
12. Humans and preindustrial climate; climate of the last 1000 years (ch. 16 & 17)
13. Climate since 1850 and causes of recent warming (ch. 18 & 19)
14. Future projections, mitigation, adaptation, economic impacts, fossil fuels and alternatives (ch. 20 and additional material)
15. Questions, discussion, and **Final Exam** (covering all Ruddiman)

Grading:

60% Homework (Daily or weekly problem sets, primarily aimed at qualitative understanding)
15% Midterm
20% Final
5% Participation and short presentation.

Policy for late homework:

30% off for 1 day late
50% off for 2 days late
100% for more than 2 days late.
(Special circumstances may be accommodated)

Academic Integrity:

All writing must be **in your own words**. Document and cite all your source material used for numbers, ideas, or other information (if not from the textbook). If you have any questions about what does or does not constitute plagiarism: ask! Plagiarism is a serious offense and will not be treated lightly. Plagiarism could result in a failing grade. Fortunately, plagiarism is easy to avoid and if you are the least bit careful about giving credit where credit is due you should not run into any problems. Please be sure to review Yale's Academic Integrity Policy: (<https://poorvucenter.yale.edu/undergraduates/using-sources/understanding-and-avoiding-plagiarism>)

Accommodations for students with disabilities:

Early planning is critical to successful accommodations. If you are a student with a disability, contacting Student Accessibility Services is a required first step in the process of obtaining disability-related accommodations. Students are encouraged to register with Student Accessibility Services to verify their eligibility for appropriate accommodations. (<https://advising.yalecollege.yale.edu/student-accessibility-services>)