

# Geography 461: Advanced Topics in Physical Geography

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**Text:** Assigned readings

**Course purpose:** The topic covered will focus on climate change. The goal of this course is for students to gain a conceptual understanding of 1) the hierarchy of controls and responses in the climate system 2) the proxy data used to reconstruct environmental conditions including the drawbacks of particular proxy data discussed, 3) the advantages and limitations of models that are used to predict future environmental conditions 4) the possible impacts that future climate change may have on ecosystems and societies.

**Assignments:** All reading assignments should be done before the class meeting.

**Assessment:** Your final grade is based on your scores from 3 exams and a research paper. The exams will cover subjects discussed in lecture and the readings. The paper topic will be one of the major topics discussed in class. Points will be distributed as follows: 1<sup>st</sup> exam 20 points, 2<sup>nd</sup> exam 25 points, 3<sup>rd</sup> exam 30 points, research paper 25 points. TOTAL = 100 points

**Evaluation:** There will be no curve. Students will strive for mastery rather than competing against each other. A = 100-93.0 points, A- = 92.9-90.0 points, B+ = 89.9-87.0 points, B = 86.9-83.0 points, B- = 82.9 – 80.0, C+ = 79.9 – 77.0 points, C = 76.9 – 72.0 points, C - = 71.9-69.0 points, D+ = 68.9-66.0 points, D = 65.9-63.0 points, D- = 62.9 – 60.0 points, F = less than 60 points. Without acceptable documentation of illness or other emergency, failure take an exam at the appointed times will result in a score of 0 for that exam. Without acceptable documentation of illness or other emergency, failure to turn in the research paper at the appointed time will result in a 5 point deduction for every day it is late. There will be NO extra credit opportunities in this class.

**Special Accommodations:** Reasonable accommodations will be made for students with disabilities. Please contact Disability Services (424-3100 (voice) or 424-1319 (TTY)) or visit their web site at <http://www.uwosh.edu/dean/disabilities.htm> for the University's accommodation request form and documentation requirements. Information related to an individual's accommodation request will be kept confidential.

**Academic Integrity:** The University of Wisconsin Oshkosh is committed to a standard of academic integrity of all students. The system guidelines state: "Students are responsible for the honest completion and representation of their work, for the appropriate citation of sources, and for respect of others' academic endeavors. Students are subject to disciplinary action of academic misconduct which is defined in the UWS 14.03 Wisconsin Administrative code. Students are encouraged to review the code, located on the "Dean of Students" web page (see Student Conduct) in order to understand your rights and responsibilities.

## TENTATIVE SCHEDULE

| Date | Subject   | Reading   |
|------|---|---|
|      | <i>Remember the climate system?</i><br>General circulation<br>Orbital parameters  | Lutgens and Tarbuck (2006)<br>(205-210, 234-247, 115-120)<br>Williams et al. (2003) (75-85)                           |
|      | <i>Climate system cont.</i><br>Semi-permanent pressure centers<br>Air masses<br>Causes of precipitation   | Lutgens and Tarbuck (2006)<br>(219-222, 210-212, 222-230)   |
|      | <i>Regional scale mechanisms that control climate</i><br>Thermohaline circulation<br>ENSO<br>Monsoons (Asia, US SW)   | Rahmsdorf (2002)  |
|      | <i>Regional scale mechanisms cont.</i><br>Seasonal rainfall in the tropics<br>Rain shadows<br>Conceptual framework of climate variability<br><b>EXAM 1 Feb. 22</b>                      | Bartlein (1997)   |
|      | <i>What can proxy data tell us about environmental change?</i><br>Radiometric dating<br>Trace gases from ice cores<br>Oxygen isotopes   | Williams et al. (2006) (272-282)<br>Bartlein et al. (1995)<br>Petit et al. (1999)<br>Williams et al. (2006) (134-138) |
|      | <i>What can proxy data tell us about environmental change?</i><br>Diatoms<br>Pollen<br>Charcoal<br>Tree rings   | Battarbee et al. (2001)<br>Bennet and Willis (2001)<br>Whitlock and Larson (2001)<br>Hardin et al. (2001) (491-493)   |
|      | <i>What does proxy data tell us about environmental change?</i><br>Long-term trends in climate<br>Glacial-interglacial cycles<br>Short-term trends<br>Younger Dryas                     | Zachos et al. (2001)<br>Dansgaard et al. (1989), Taylor et al (1997)  |
|      | <b>SPRING BREAK</b>   |   |
|      | <i>What does proxy data tell us about environmental change?</i><br>Short-term trends<br>8200 year event<br>Holocene droughts<br>Late Holocene pluvial periods<br><b>EXAM 2 March 29</b> | Alley et al. (1997)<br>Stine (1994), Laird et al. (1997)<br>Shipley et al. (2005)                                     |
|      | <i>General Circulation Models</i>   | COHMAP (1998)   |

|  |   |   |
|--|---|---|
|  | Efforts in recreating past environmental conditions   | Mock and Brunelle (1999)<br>Hostetler et al. (2000) |
|  | <i>GCMs cont.</i><br>Efforts in predicting future environmental conditions                                      | Shafer et al. (2005)<br>Additional reading TBA      |
|  | <i>The effects of future environmental change</i><br>Impacts on ecosystems                                      | Climate Change Impacts (2000)                       |
|  | <i>The effects of future environmental change</i><br>Impacts on societies<br><b>Research paper due April 26</b> | Climate Change Impacts (2000)                       |
|  | <b>Exam 3 session</b>   |   |
|  | <b>Exam 3 session</b>   |   |

### Research paper.

Individually you will investigate in more detail one of the aspects of global climate change discussed in class. Papers will be worth 25 points. *Papers will be penalized for incomplete or incorrect citations.*

Papers should include:

A description of the climate characteristic, or environmental response, and the mechanisms that control it.

5 points

Describe the evidence used by researchers in studying the characteristic or environmental response. This can include the types of proxy data used, what they actually measure and any assumptions that go along with those data.

5 points

What has been the impact of the characteristic, or the effect of the environmental response?

5 points

Why we should know about this characteristic or environmental response and how this information will help us understand climate variability in the future.

5 points

Correct citations and clarity of writing

5 points

Your paper should be approximately 2000 words (7 pages), double-spaced 12-pt font, and include a bibliography. Be sure to include proper scientific citations for any ideas that you paraphrase; no direct quotes, footnotes, or citations from class discussions. URL(web page) references are okay **only** if you include reference to the peer-review publication from which the information was taken.

## Reference template for research paper citations

### For chapters in books:

Birks, H. J. B. 1986: Late-Quaternary biotic changes in terrestrial and lacustrine environment, with particular reference to northwest Europe. In Berglund, B. E., editor, Handbook of Holocene Palaeoecology and Palaeohydrology, John Wiley, 3-65.

### For books:

Roberts, N. 1989: The Holocene. Blackwell, Basil.

### For articles:

Worsely, A. T. and Oldfield, F. 1988. Palaeoecological studies of the lakes in the highlands of Papua New Guinea II. Vegetation history over the last 1600 years. *Journal of Ecology* 76, 1-180.

Bartlein, P. J., Whitlock, C., and Shafer, S. L. 1997. Future climate in the Yellowstone National Park region and its potential impact on vegetation. *Conservation Biology* 11, 782-792.

### For websites:

Stuiver, M. and Reamer, P. 1993. version 4.4 extended 14 C database and revised CALIB radiocarbon calibration program (retrieved November 30 1995 from <http://radiocarbon.pa.qub.ac.uk/calib>).

When citing an idea or evidence from a published source place the date after the full author reference

If you have questions ask.

Final exam will be a one-on-one closed book, oral exam with the instructor. Six questions will be distributed on April 19<sup>th</sup> and will cover topics discussed in class and the readings. Each student will have approximately 15 minutes to answer two of the six questions, along with any follow-up questions. The two questions will be selected at random for each student. Each question will be worth 15 points.