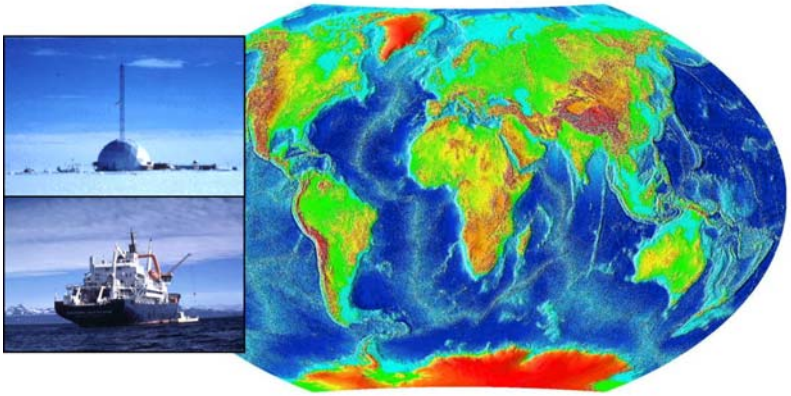

EOS/ESCI 764/864 • PALEOCLIMATE ANALYSIS • SPRING 2004

EOS/ESCI 764/864
Paleoclimate Analysis

SPRING 2004
Tues. & Thurs.
2:10 - 3:30

Laboratory:
Wed. 3:30-5:10

Instructors:
Michael Prentice
Cameron Wake
David Meeker
and others…

Prerequisites: Geochemistry, Paleoclimatology, or Instructor Permission
Reading: Papers to be assigned

Goals

This course is intended to help students develop an advanced, comprehensive view of the field of paleoclimatology. Advanced calibration of natural proxy records to instrumental records will be studied. Multi-proxy records from paleo-oceanography, -glaciology, -limnology, -botany, -dendroclimatology will be evaluated using case studies of key types of past climate change. Considerable primary literature will be examined. Laboratories will provide training in statistical analytical techniques as well as hands-on experience with some primary natural archives, raw data, and record building. Students will research assigned topics and also a topic of their choice as the basis for a term paper.

Major Foci

Quantitative calibration of the distributions and geochemistry of physical and biological systems (snow, foraminifers, glaciers, trees, pollen, ostracods, speleothems, etc.) to climate change;
Statistical methods in analysis of instrumental and proxy records;
Integrating multi-proxy data sets with model investigations

Part 1: Paleoclimate Strategies, Drivers and Physics of Climate Change (3 weeks)
Strategy for and pertinence of paleoclimate research: critical observations, models, statistics;
Key drivers and physics of climate change (water vapor, other greenhouse gases, thermohaline circulation, aerosols, solar radiation)

Part 2: Calibration of Paleoclimate Proxies (4 weeks)
Atmospheric changes from ice cores and glacier extent
Ocean temperature, chemistry, productivity, and circulation from marine fauna and flora
Lake temperature and hydrology from inorganic and organic material

Part 3: Case Studies (6 weeks)
Last 1000 Years: annual to centennial variability in multi-proxy temperature records,
Last 9,000 Years: centennial to millennial-scale changes in land, ocean, and solar-activity archives,
Last 130,000 Years: abrupt climate change in the context of millennial-scale variability.

Part 4 Individual Projects (3 weeks)

Laboratories

(6) Multivariate statistics with MATLAB (times series, regression, principal components)
(1) Building a multi-proxy ocean record (foraminifer distributions, chemistry)
(1) GIS-based mapping, contouring and analysis of point data
(1) Building a multi-proxy atmospheric record from an ice-core
(2) Building multi-proxy lake, vegetation, and tree-ring records
(1) Building a multi-proxy glacier record

Requirements

Term paper, notebooks, exam