



NORTHERN ILLINOIS UNIVERSITY

Institute for the Study of the Environment, Sustainability & Energy



Who we are:

- 15 faculty associates plus additional faculty partners
- 13 departments, 4 colleges
- 4 new faculty hires underway (+2 more promised)
- Staff
 - Melissa Burlingame, program coordinator
 - Ruthanne Yeaton, office manager
 - Student employees
- ~ 100 students already!

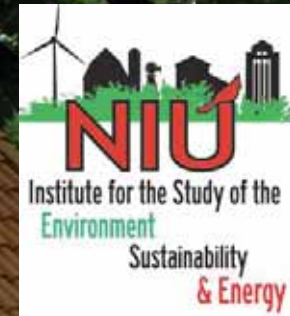
<http://www.niu.edu/ese/>





NORTHERN ILLINOIS UNIVERSITY

Institute for the Study of the Environment, Sustainability & Energy

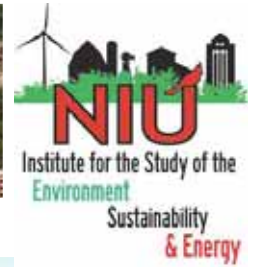


BS and BA degrees in Environmental Studies **Six curricular emphases**

- Biodiversity and Environmental Restoration
- Water
- Energy studies
- Human Experience
- Environmental Policy
- Non-governmental Organizations

<http://www.niu.edu/ese/>





What is a lake to you?

An Antarctic perspective

Reed Scherer

NIU Institute for the Study of the Environment, Sustainability and Energy





What is a lake to you?

- Recreation and sports area?
- Water resource?
- Food resource?
- Quiet sanctuary?
- Dumping ground?





ILUMA-LAKES

ILLINOIS LAKES MANAGEMENT ASSOCIATION



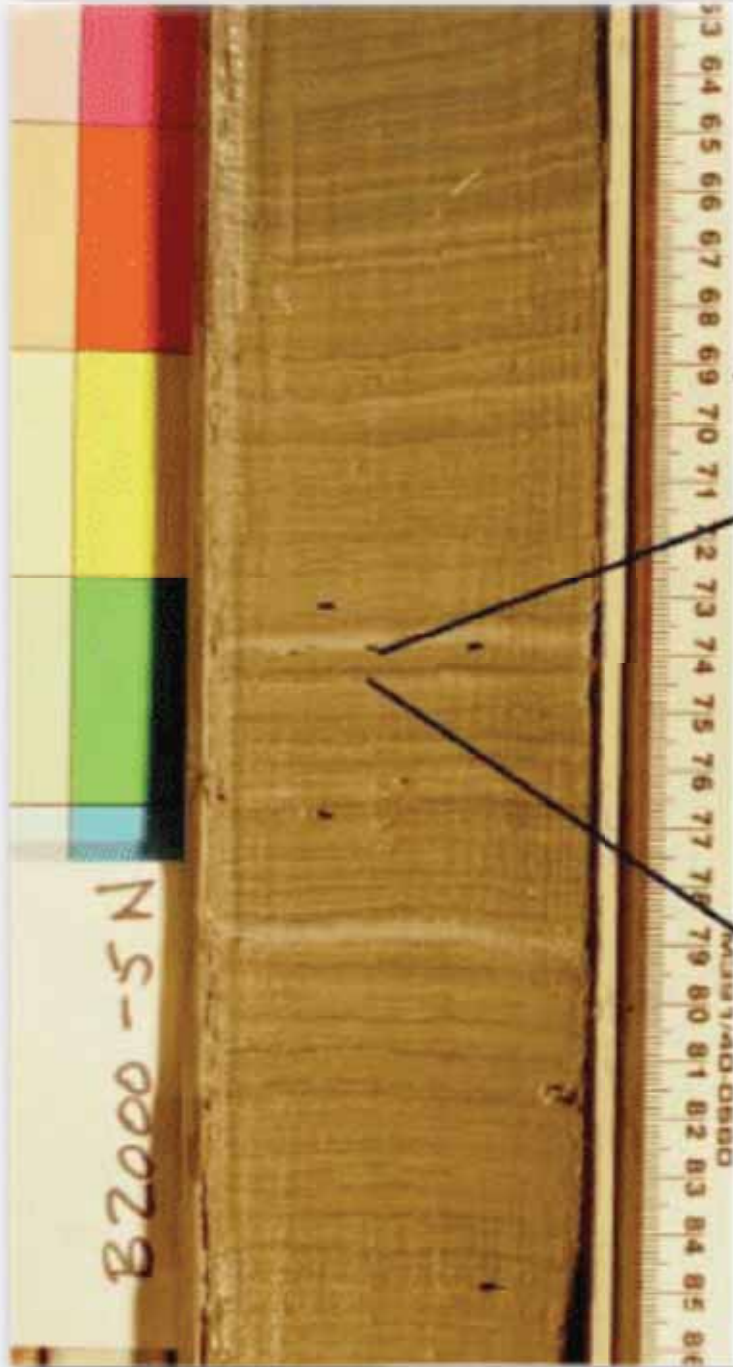
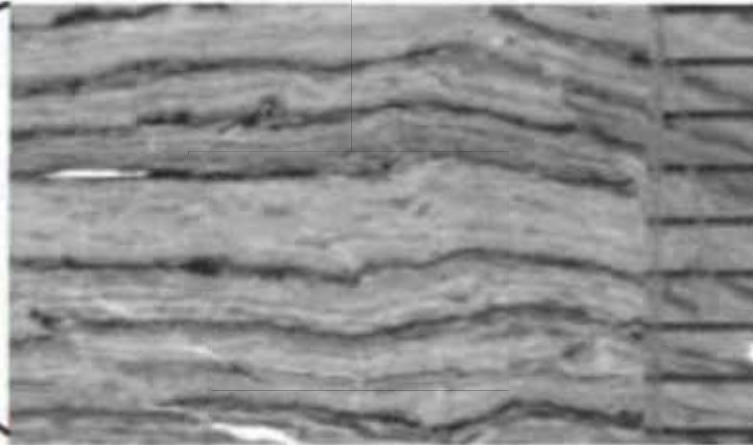
What is a lake to you?

- Recreation and sports area?
- Water resource?
- Food resource?
- Quiet sanctuary?
- Dumping ground?
- To me, a lake is also a long-term archive of changing environments and climate.



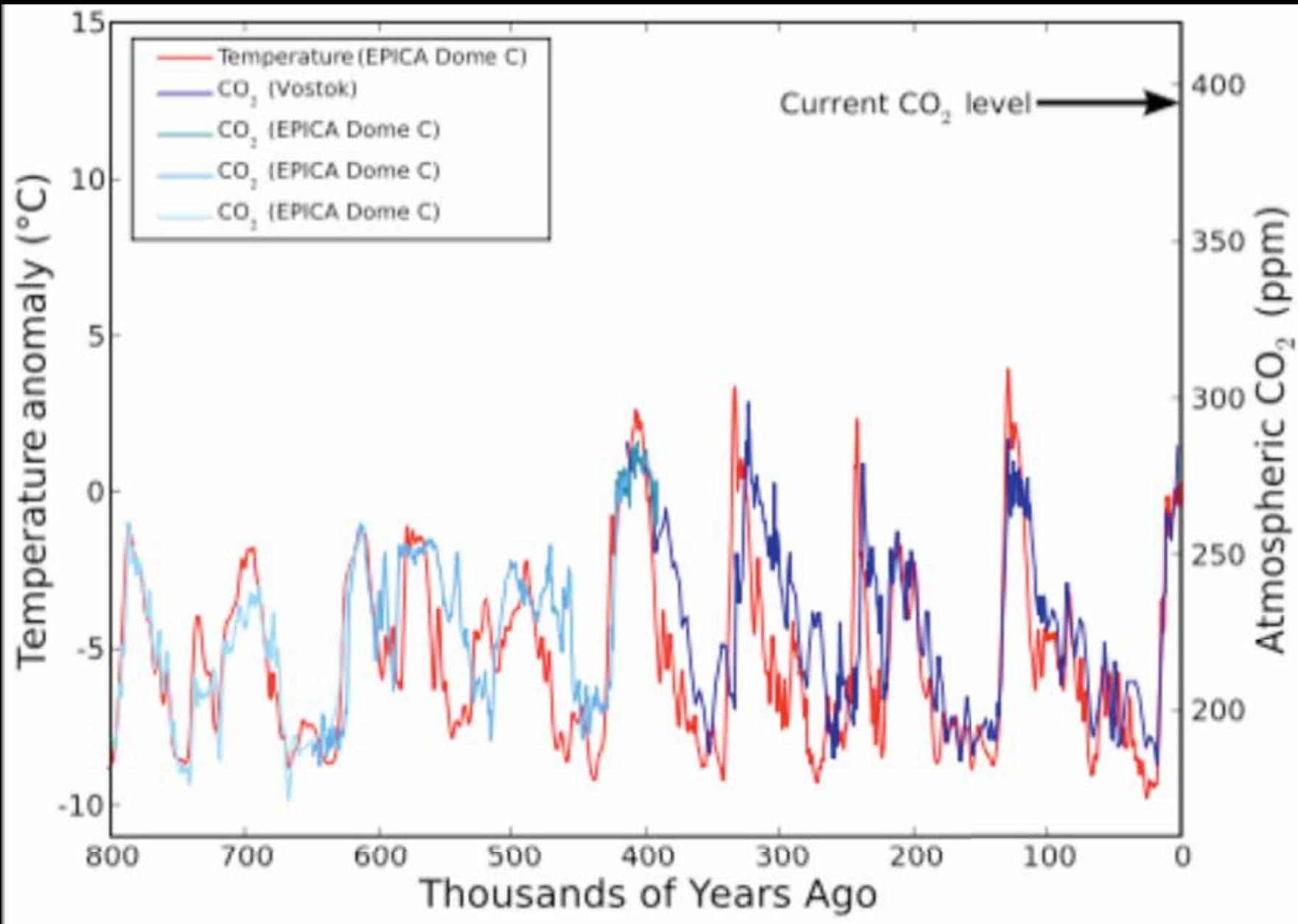
Paleoclimatology

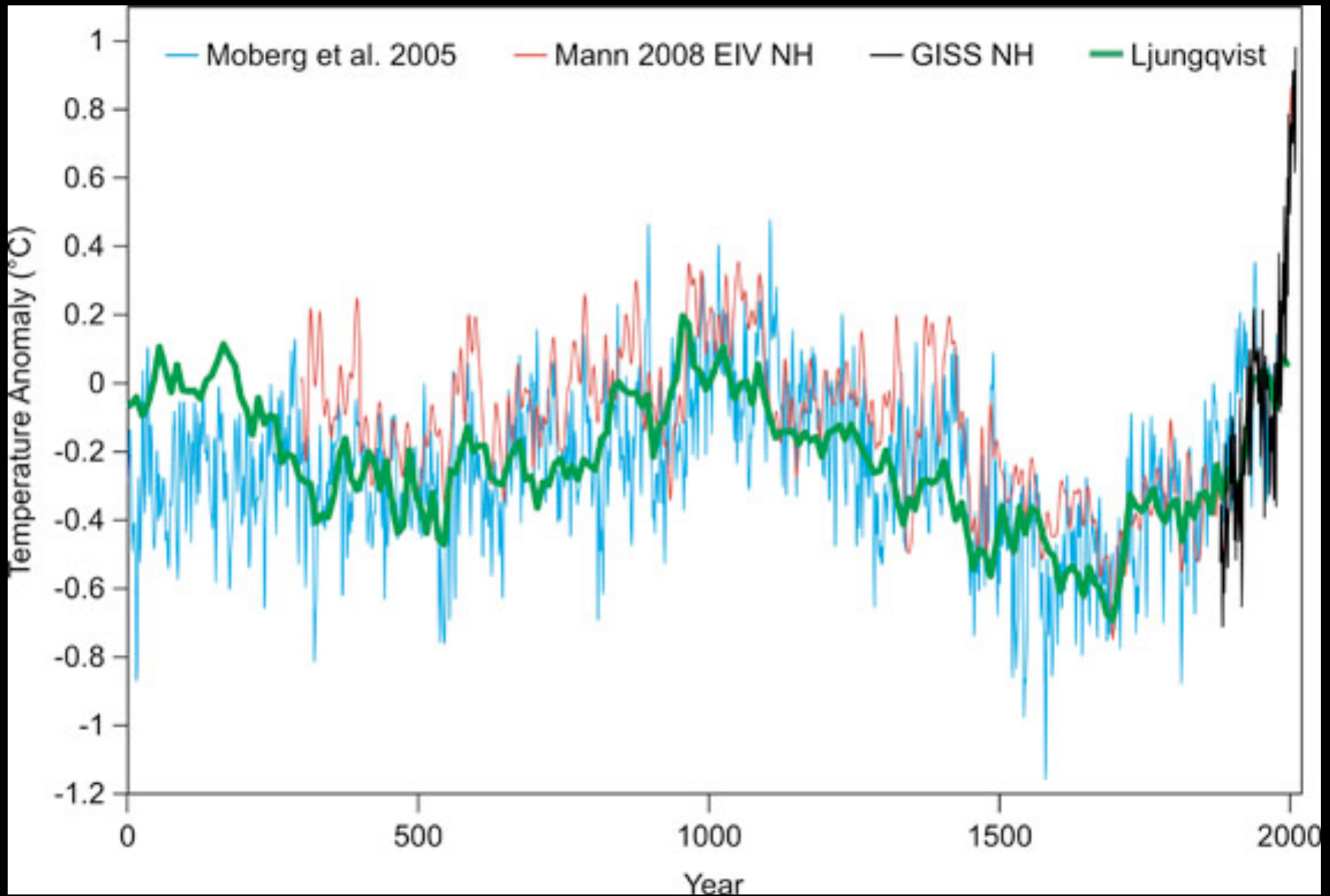
Thin Section Photomicrograph
(mm for scale)



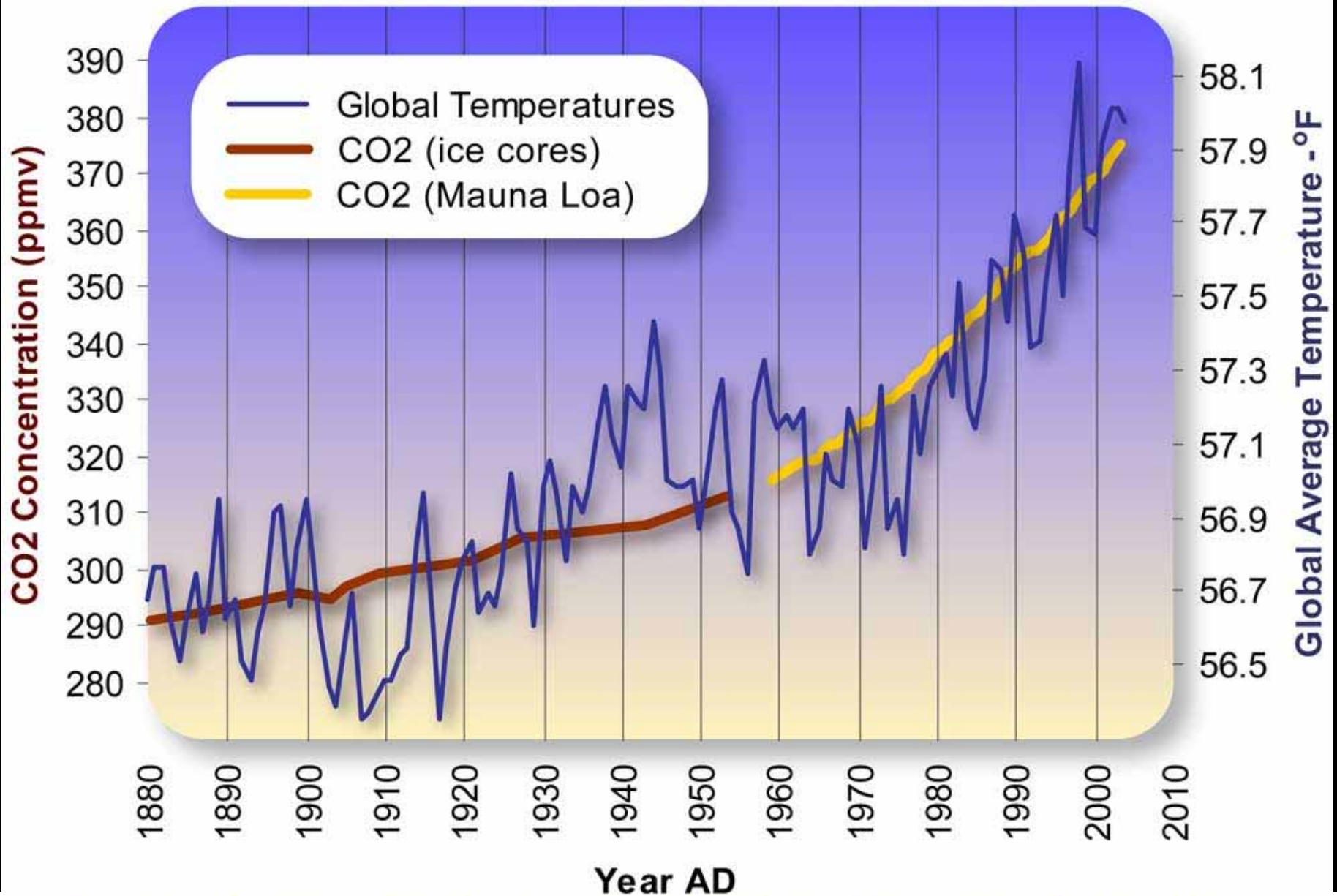
B2000-5N

MUSY140-0880





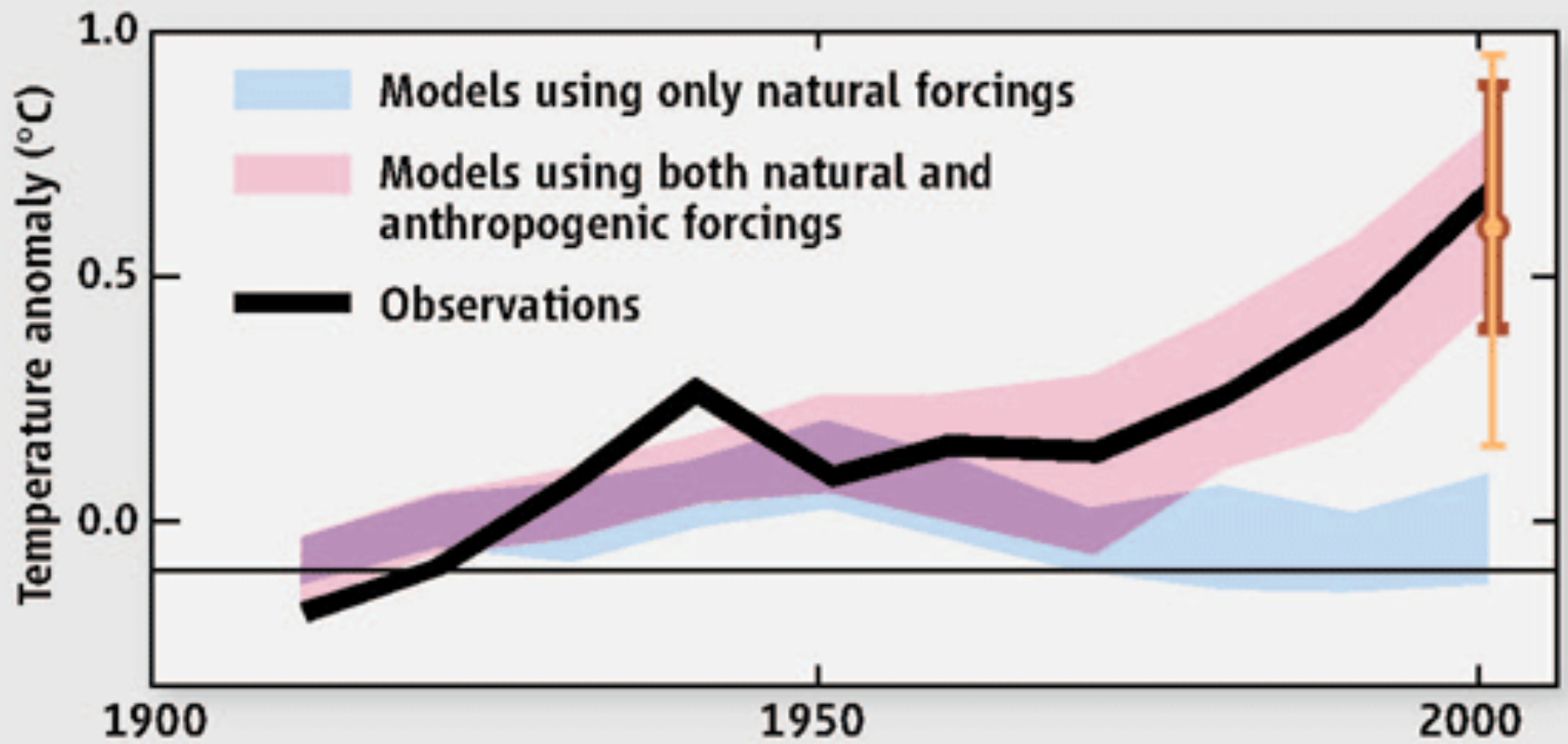
Global Average Temperature and Carbon Dioxide Concentrations, 1880 - 2004

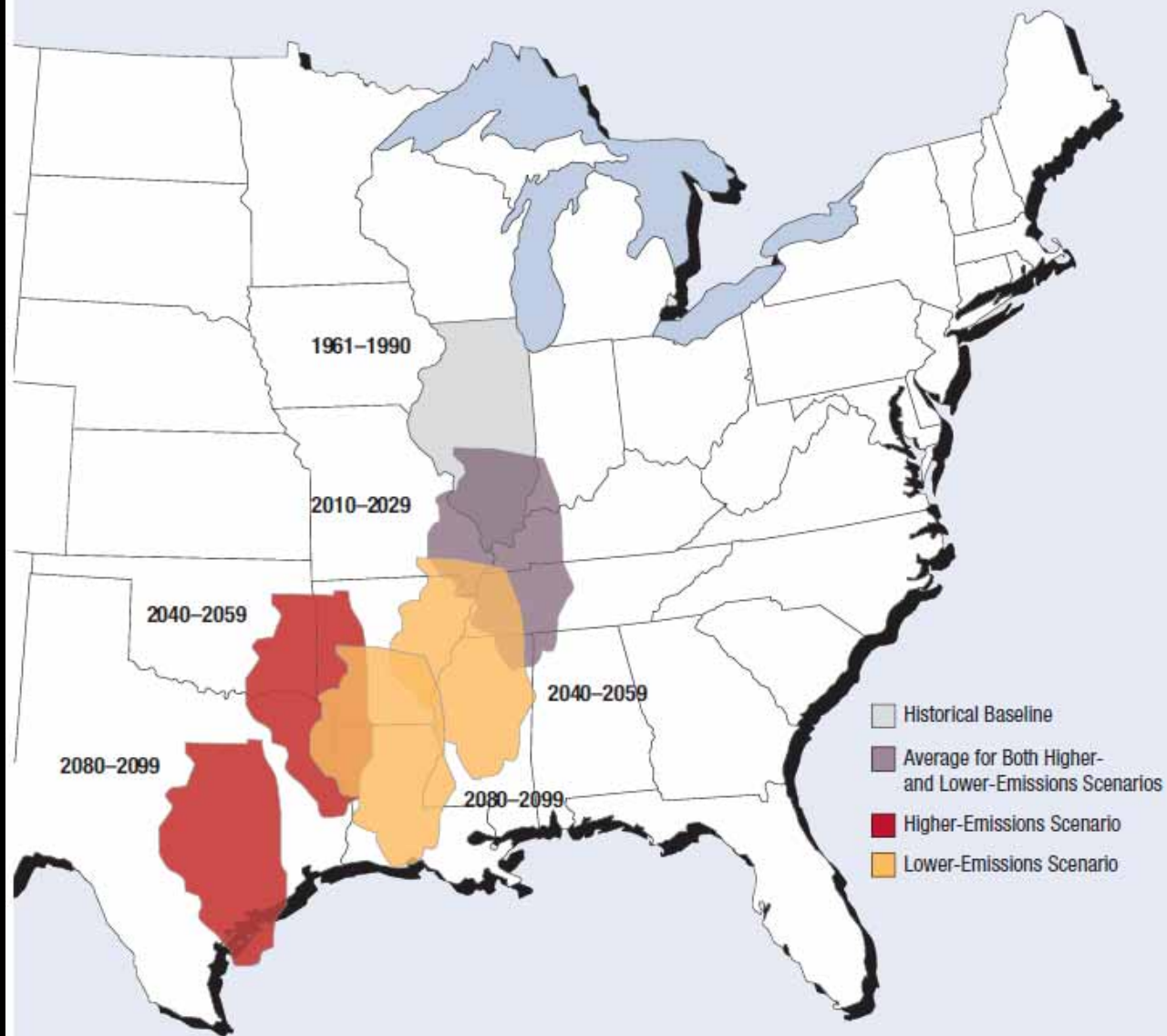


Data Source Temperature: ftp://ftp.ncdc.noaa.gov/pub/data/anomalies/annual_land.and.ocean.ts

Data Source CO2 (Siple Ice Cores): <http://cdiac.esd.ornl.gov/ftp/trends/co2/siple2.013>





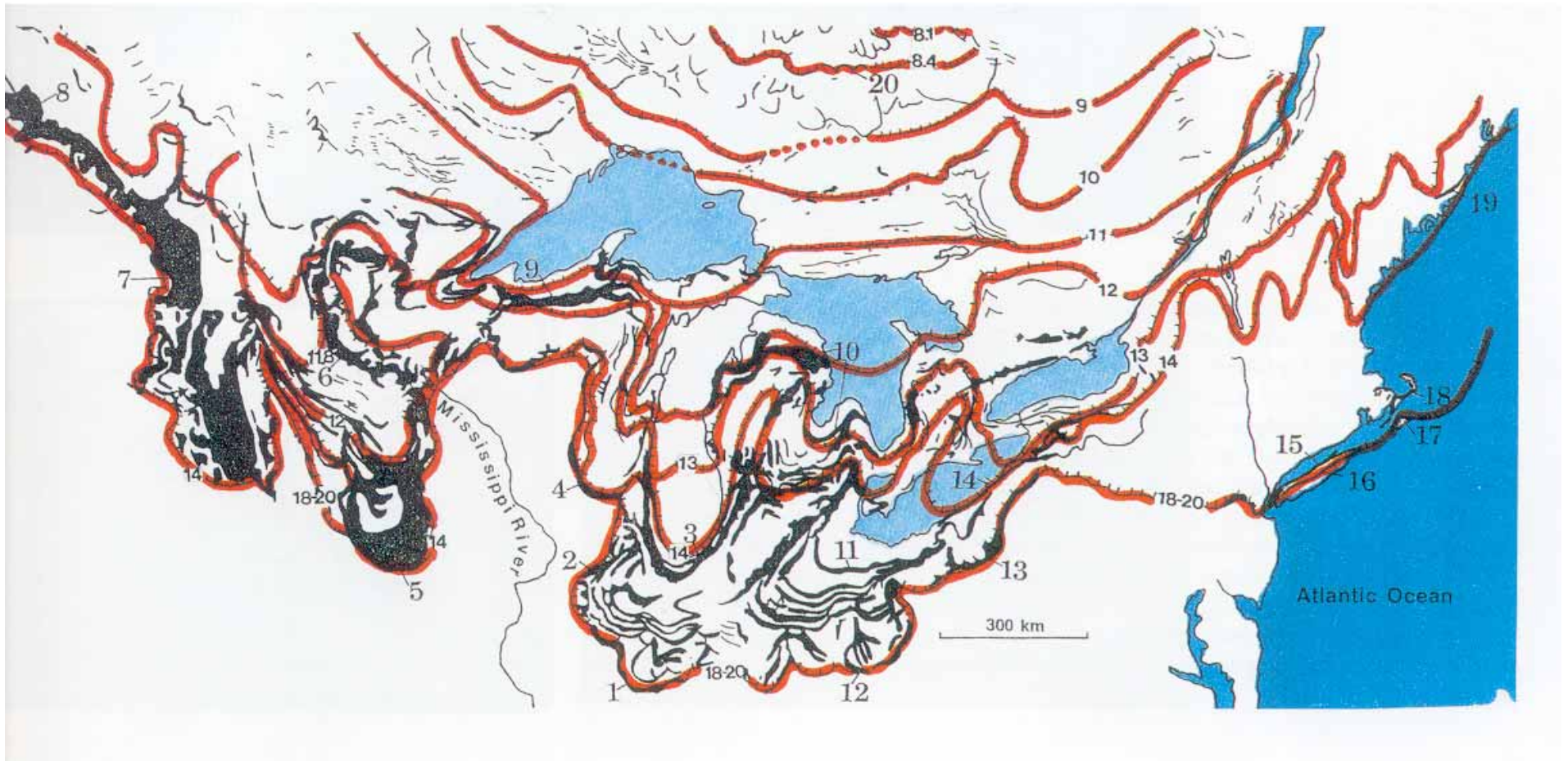


Paleoclimatology

- *“The present is the key to the past”* (Lyell, 1830)
 - But the past is the key to the future
- Paleoclimate records:
 - Establish historical basis, including chronology, for natural variability
 - Provide boundary conditions for climate models
 - Test accuracy of models

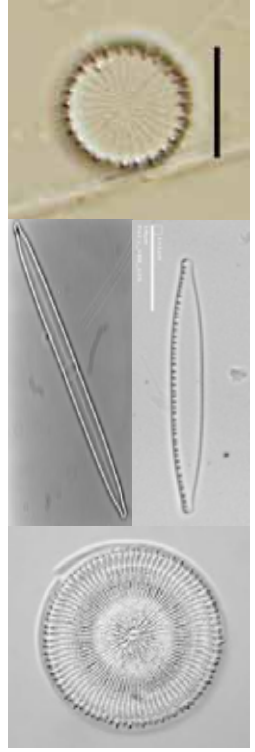
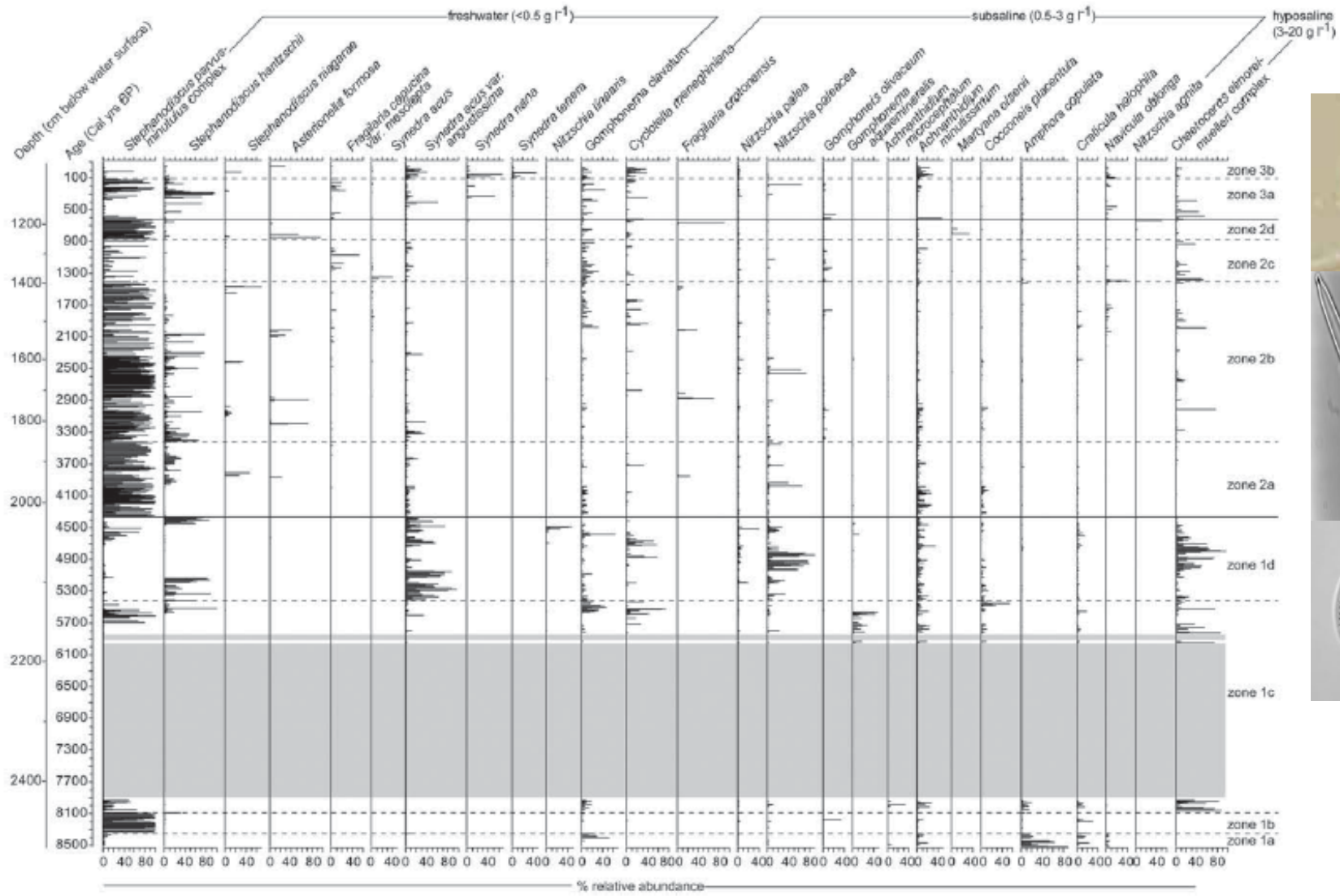
Late Pleistocene ice sheet margin

Most of our lakes were created during retreat of the last great ice sheet



Archives of climate change

Diatoms show environmental changes in the lake or wetland

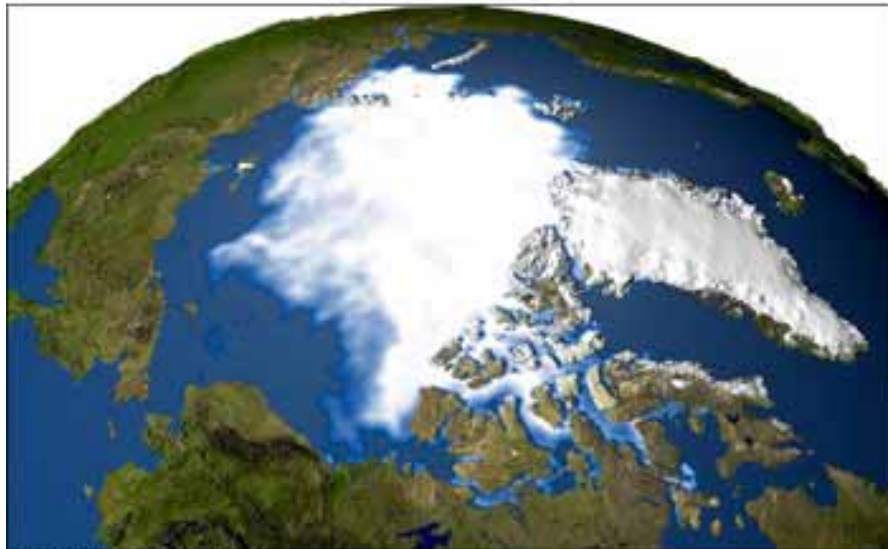


Kettle Lake, ND

Sea Ice Extent
02/28/2012

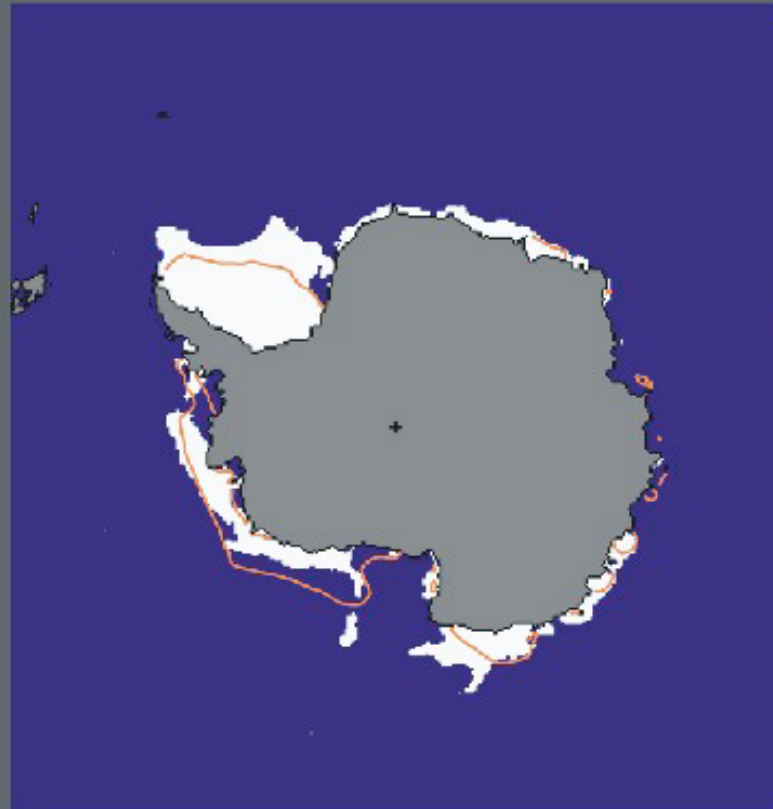


1979 SSM/I Composite Data



2003 SSM/I Composite Data

Sea Ice Extent
02/28/2012



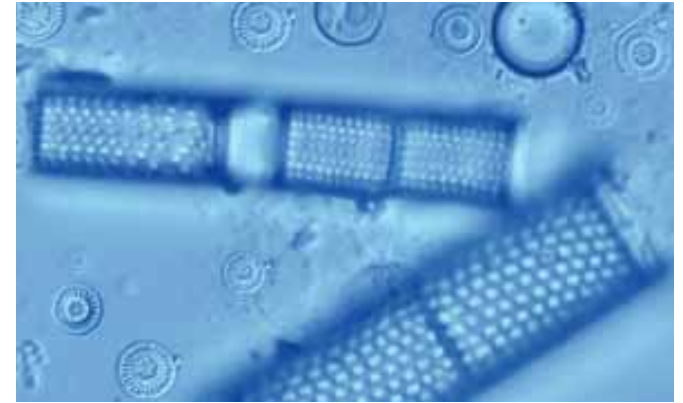
National Snow and Ice Data Center, Boulder, CO

median
1979-2000

John P. Smol (Queens University, Ontario)
Nature 483, S12–S15 (01 March 2012)

A planet in flux

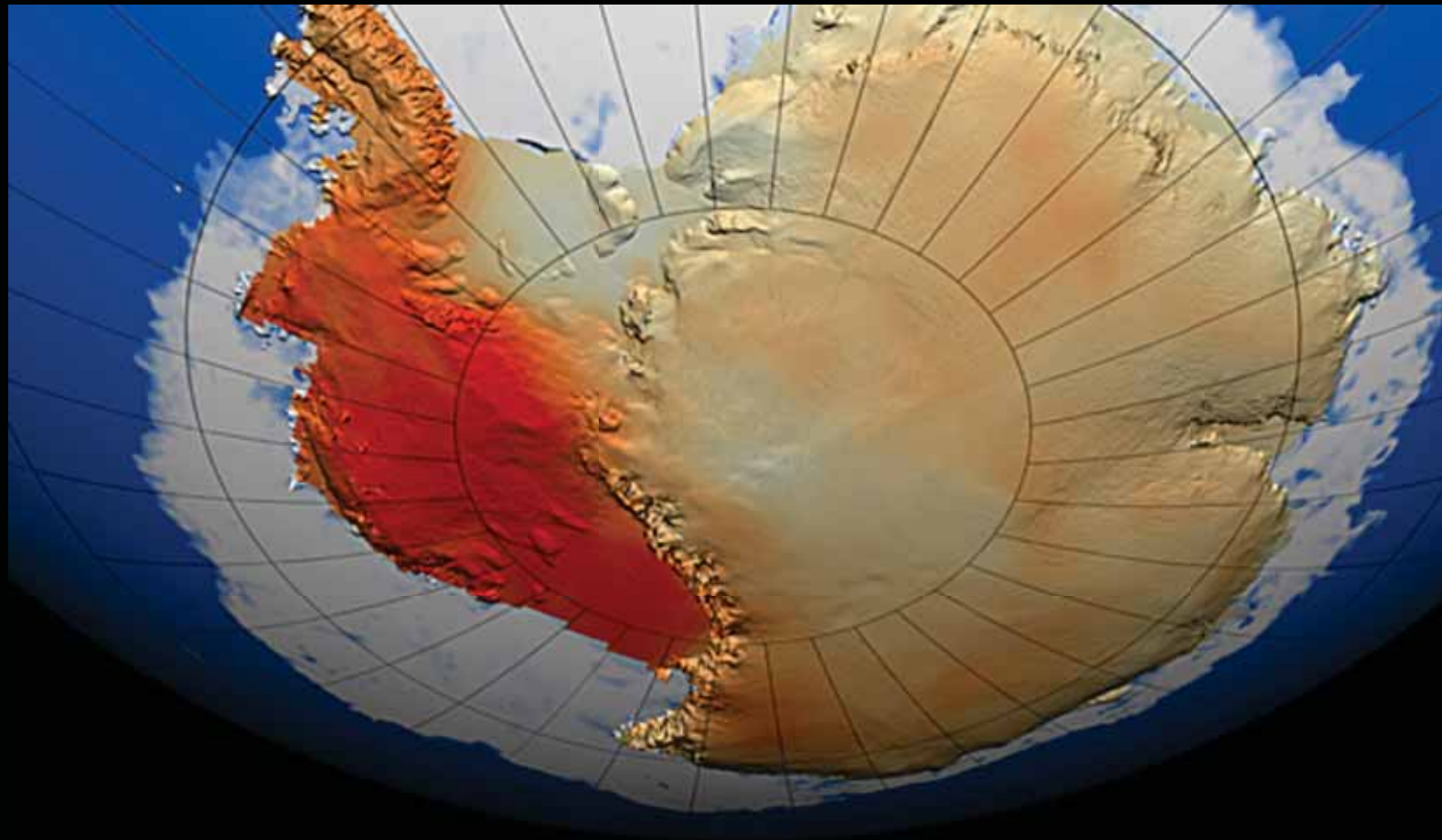
How is life on Earth reacting to climate change?



Diatom records in Arctic lakes and ponds show a fundamental change in the late 1980s



Antarctic warming since 1957

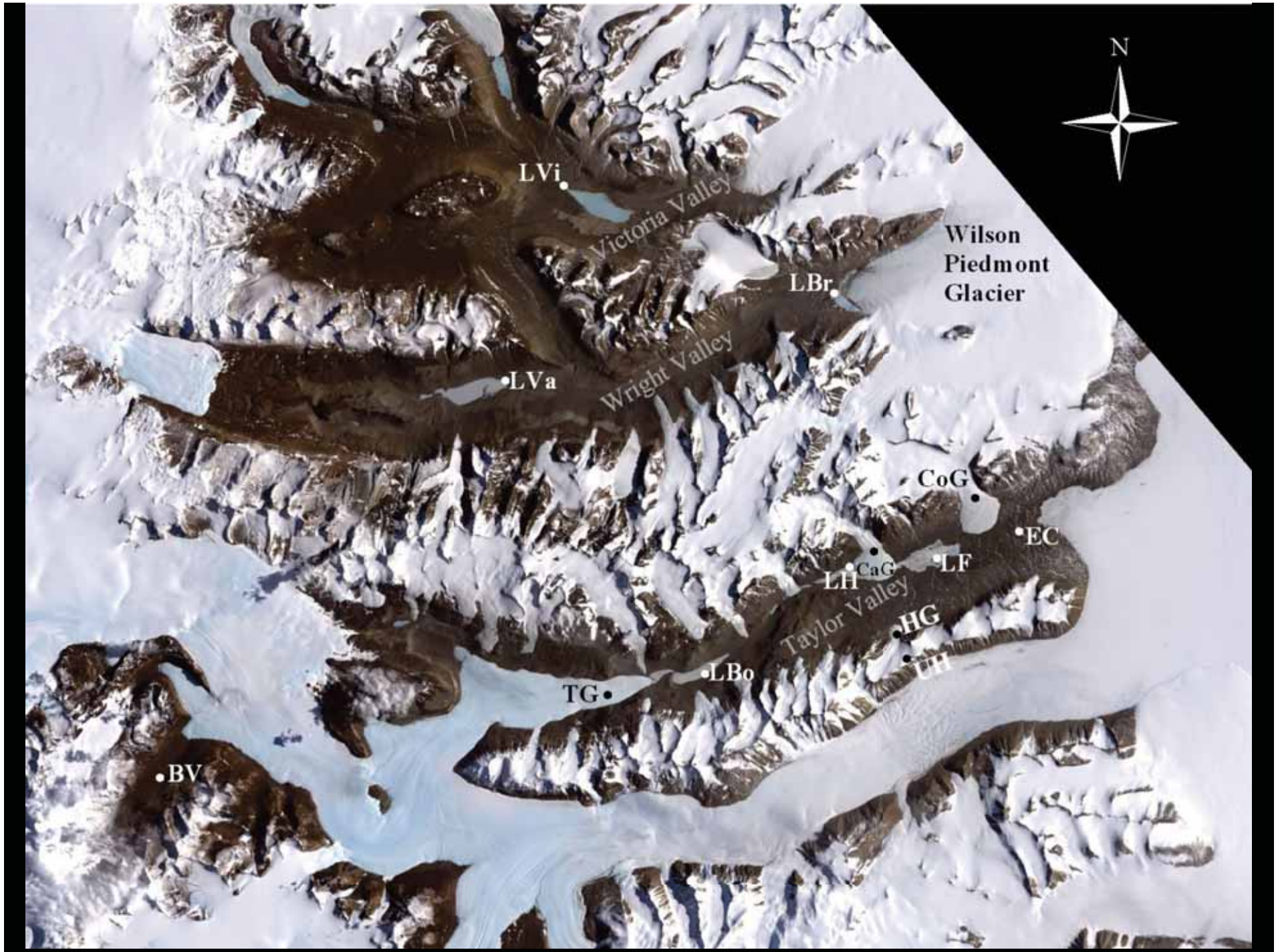


Lakes in Antarctica's Dry Valleys

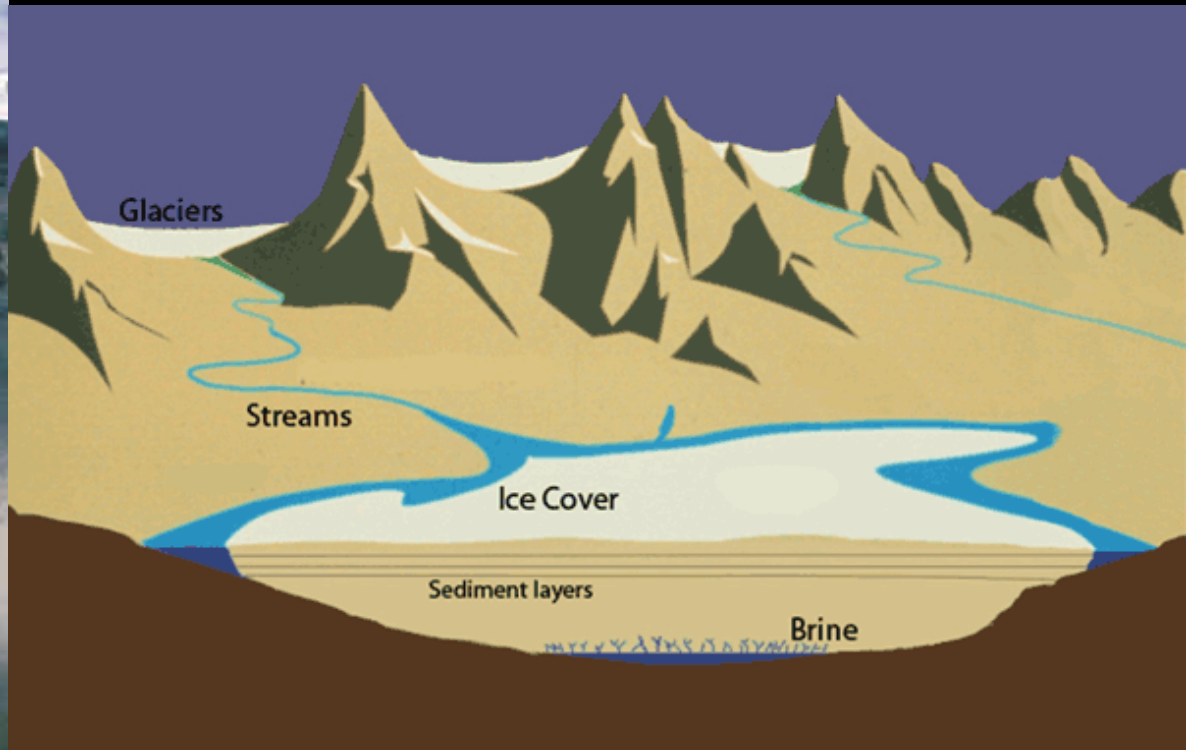


Wright Valley



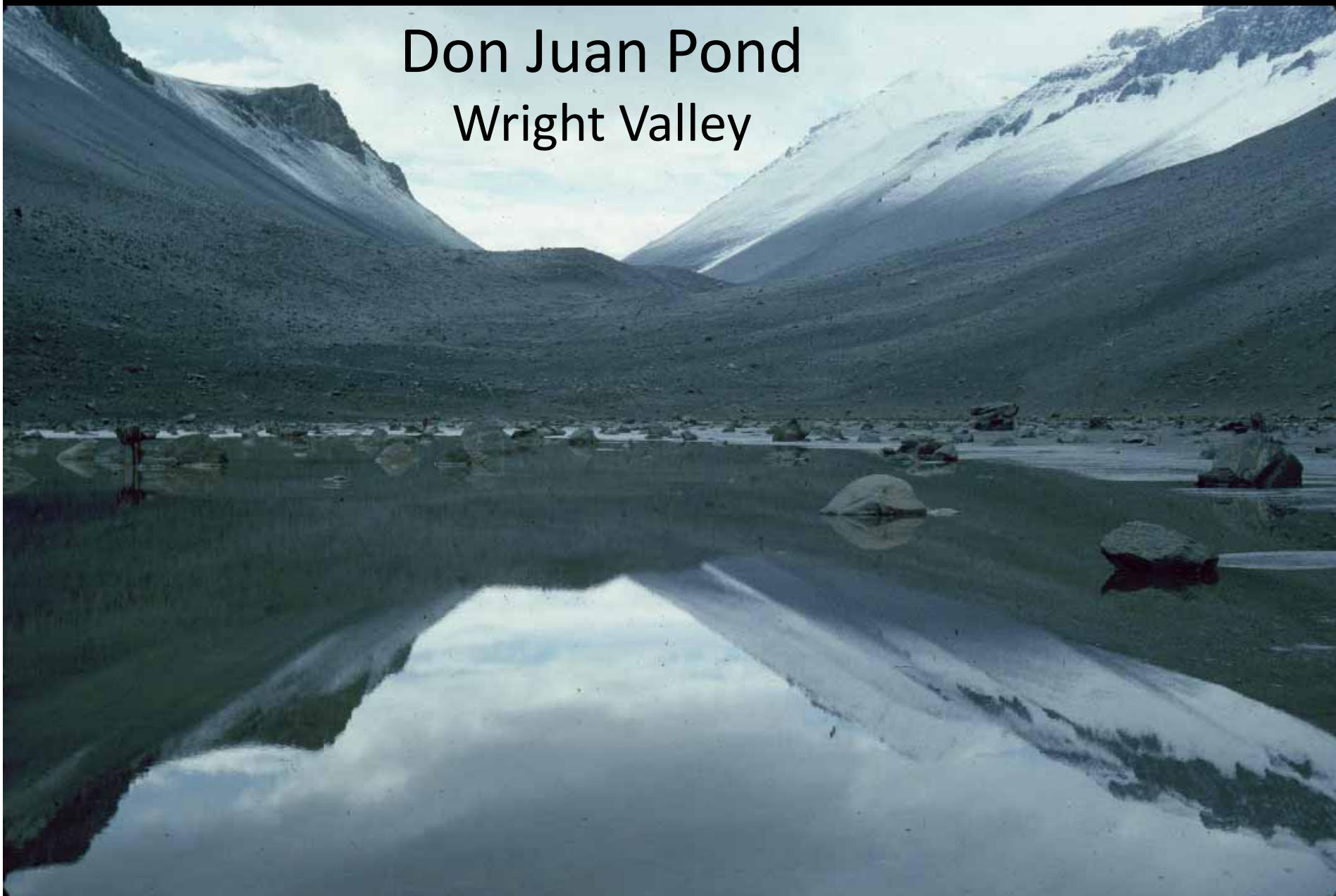


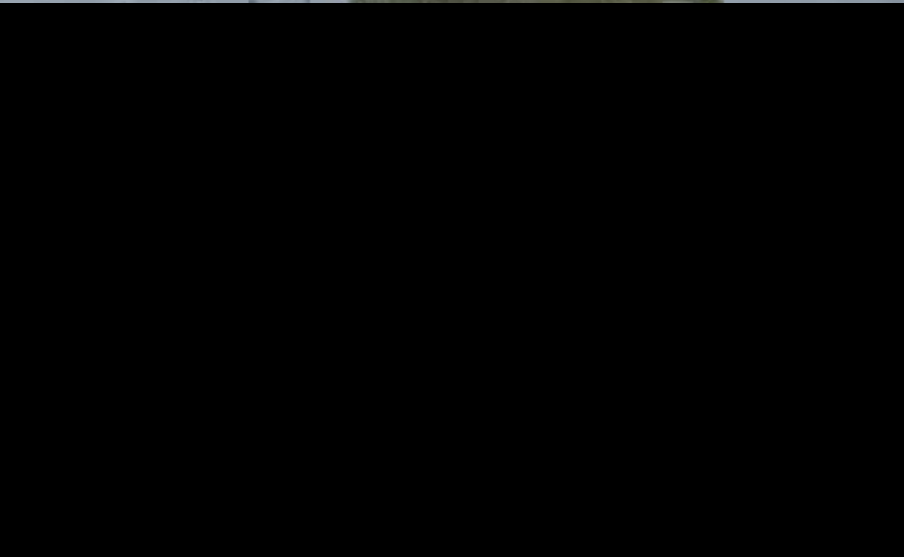
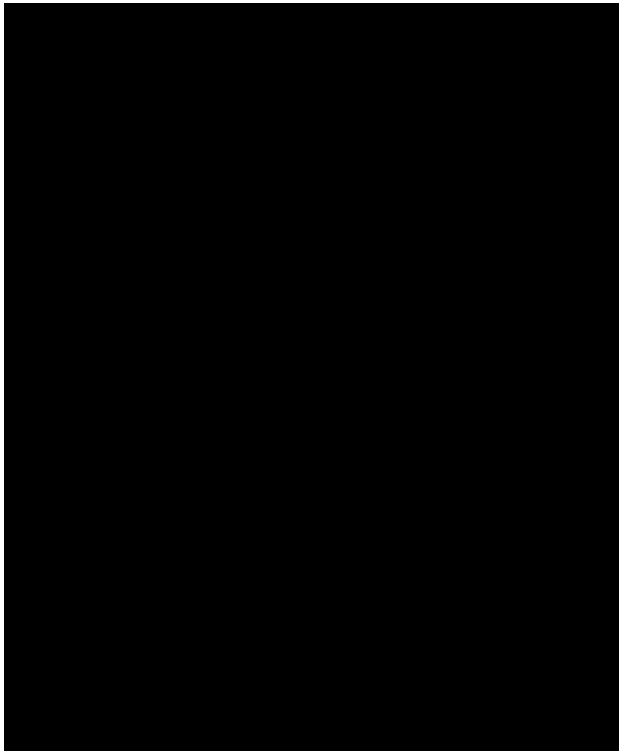
Polar lakes





Don Juan Pond Wright Valley





Lake Vanda, Wright Valley

Lake levels rise with warming
Drop with cooling



A dramatic landscape photograph featuring a large body of water in the foreground, likely a lake or fjord. The water is dark blue with a shimmering reflection of sunlight. In the background, dark, silhouetted mountains rise against a sky filled with heavy, dark clouds. A bright light source, presumably the sun, is breaking through a gap in the clouds, creating a strong lens flare and illuminating the scene. The overall mood is atmospheric and powerful.

An efficient solar trap



Lake Fryxell, Taylor Valley



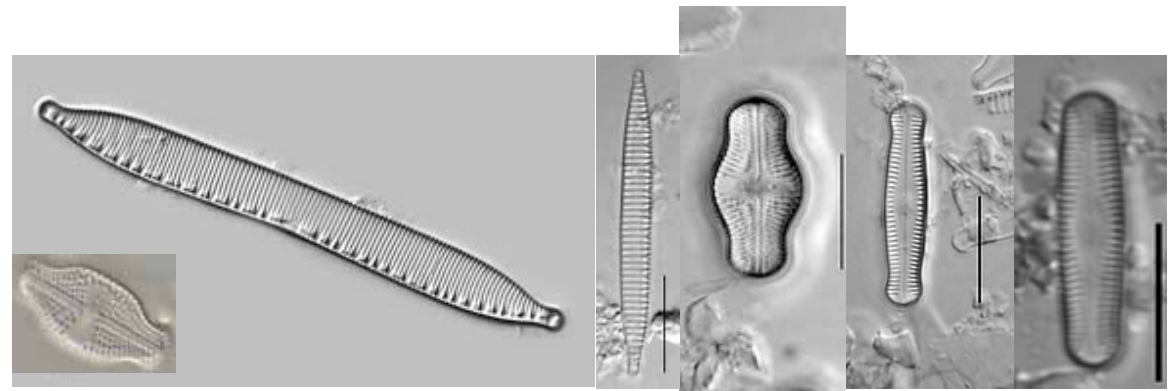


Lake Fryxell, Taylor Valley

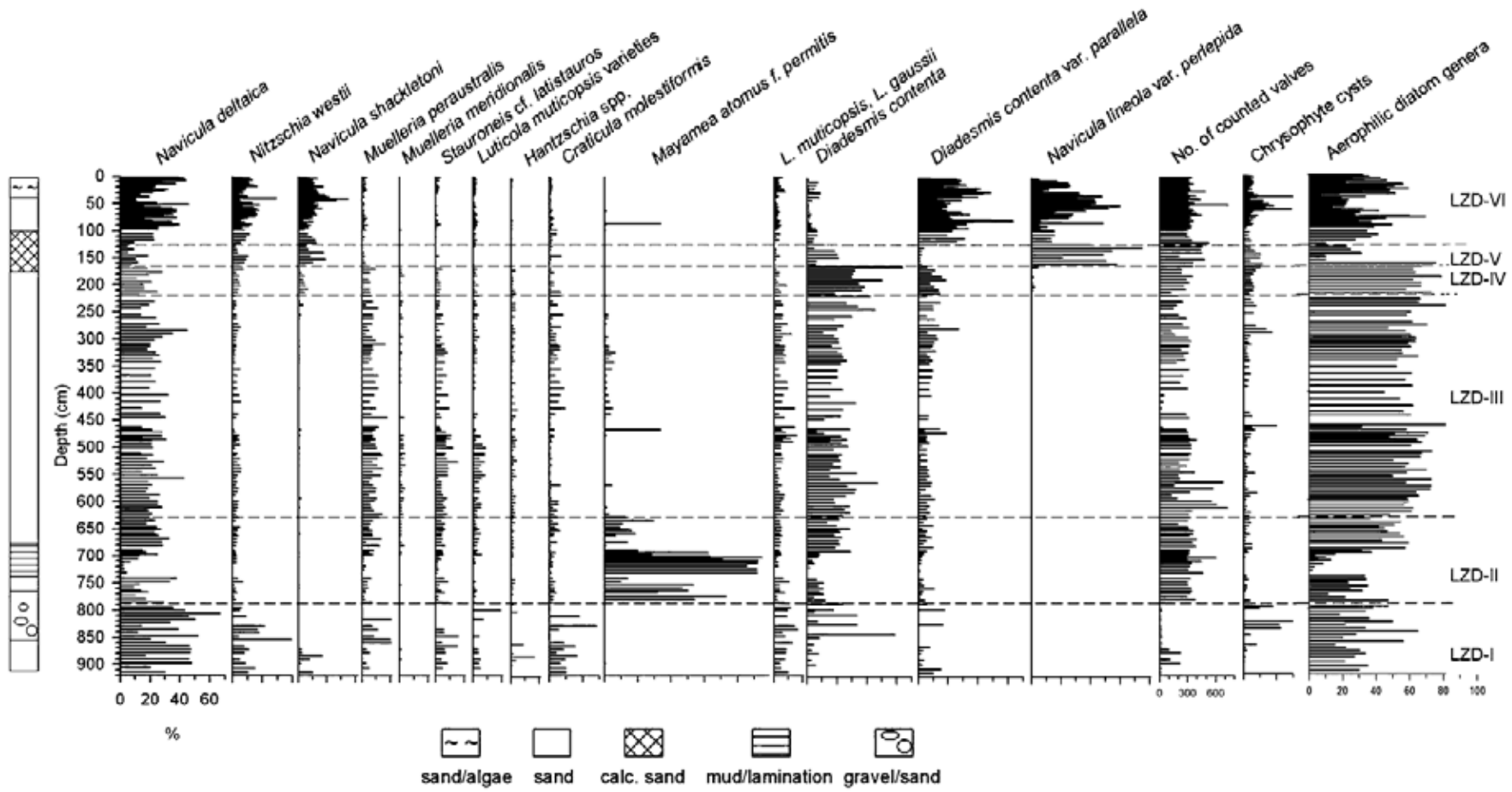


The ice shelf dammed off the valley during the last ice age making a massive lake

Lake Fryxell diatom record



← Antarctic species Widespread species →



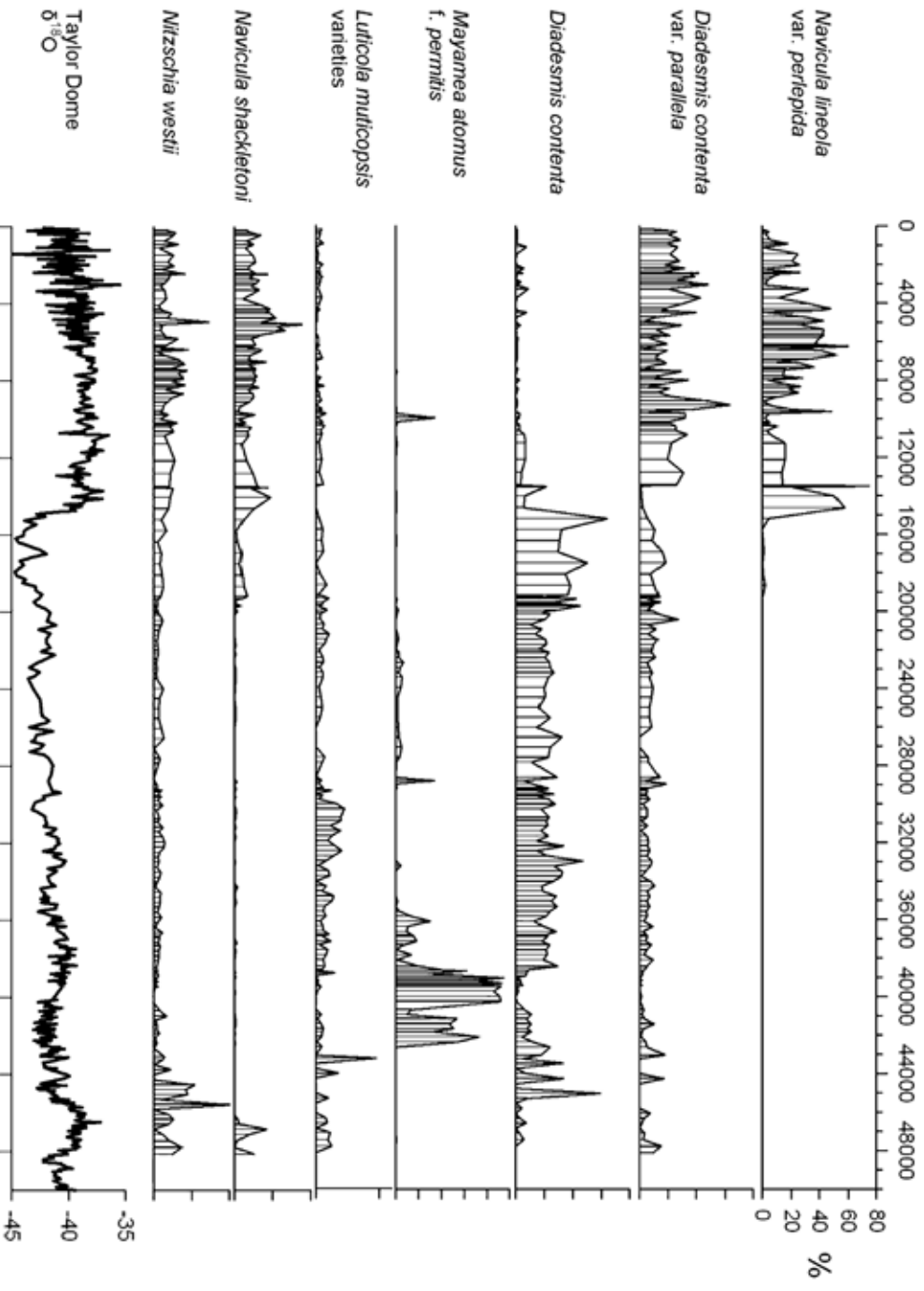
Biozones WRS
NBP94 KC39



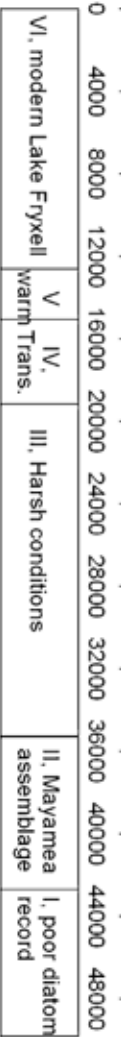
Ross Sea
Events
(Emslie et al. 2007)



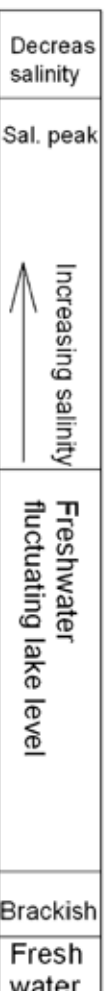
Age (calib)

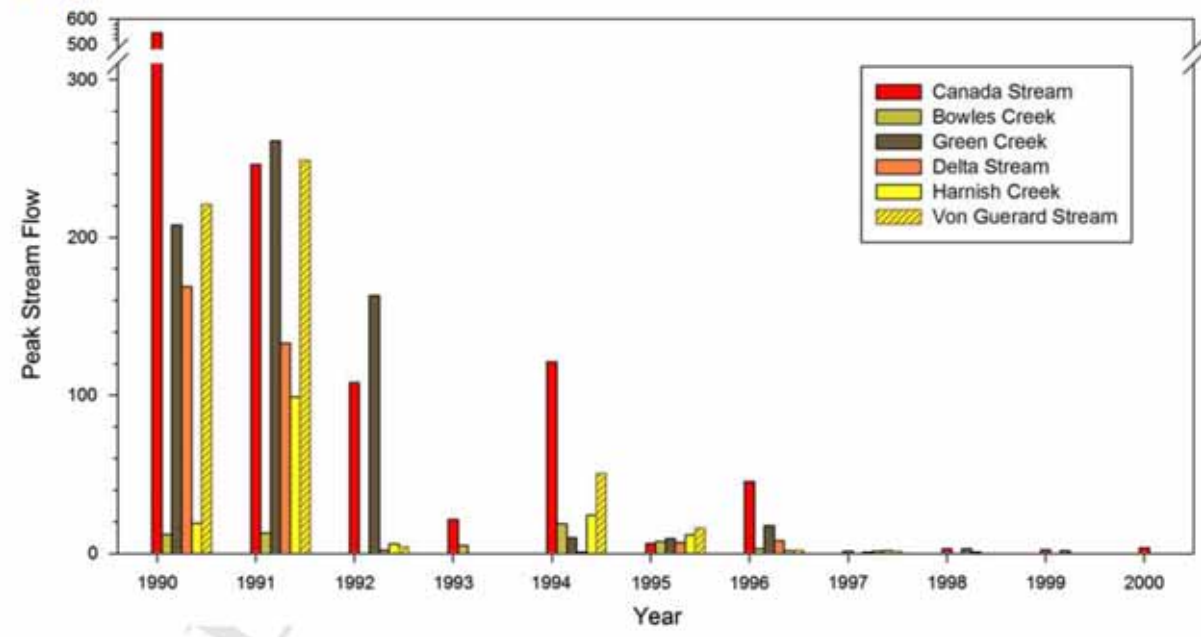
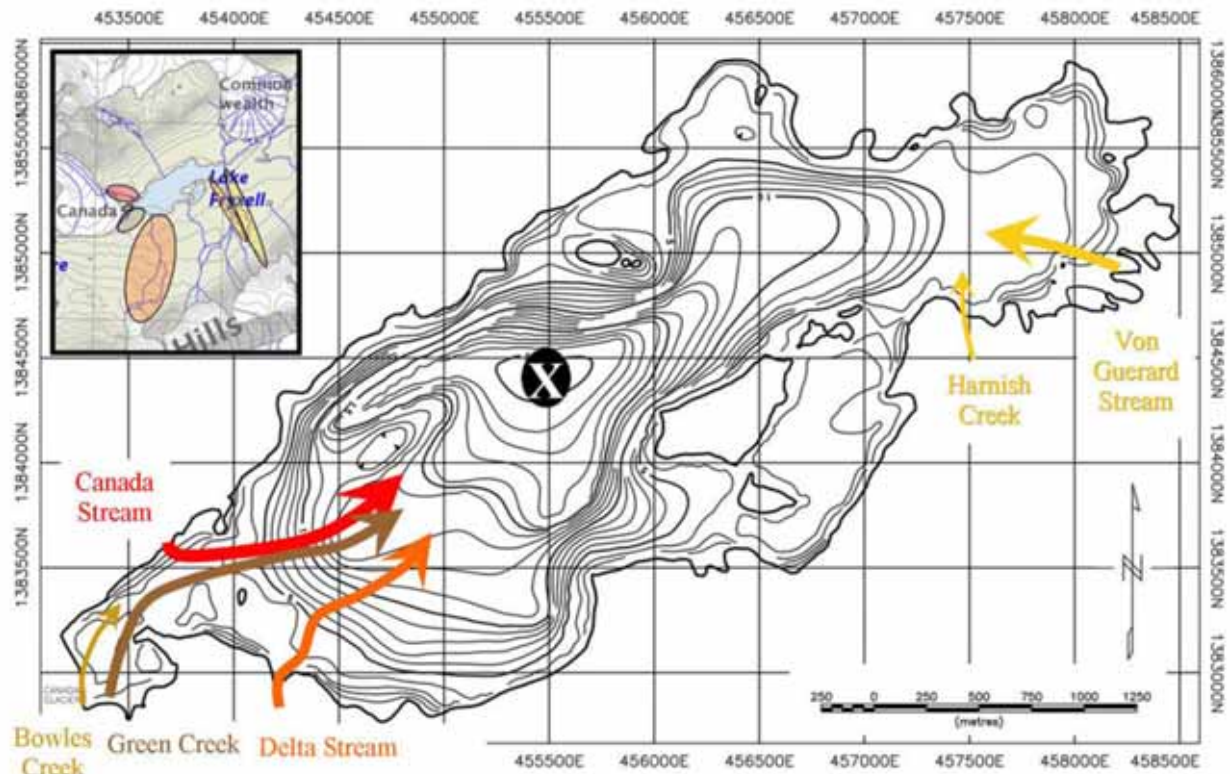


Diatom Zones
Lake Fryxell



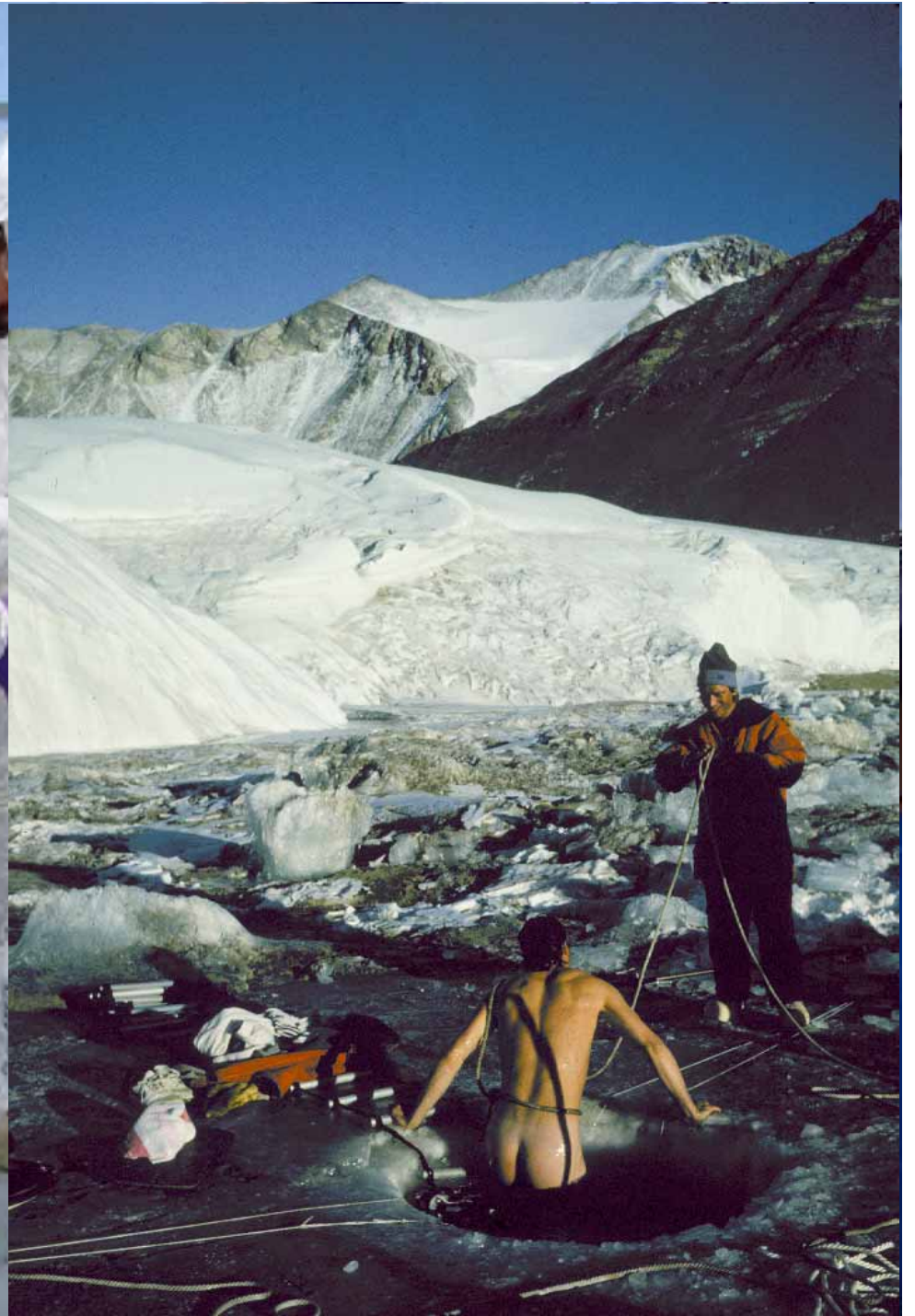
Geochemistry
LZ1021

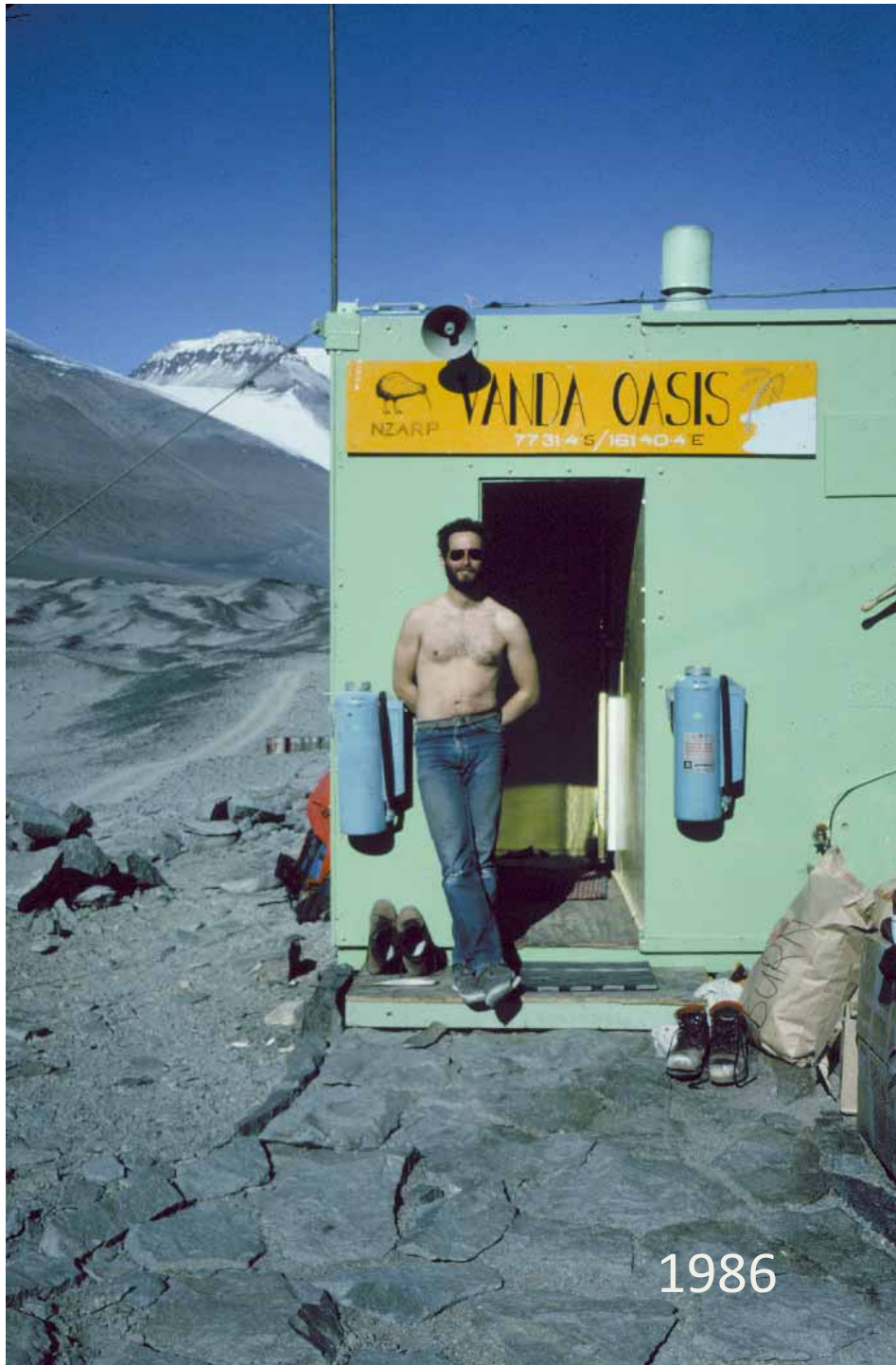




Lake Vida











Recent climate change in Antarctica



1987



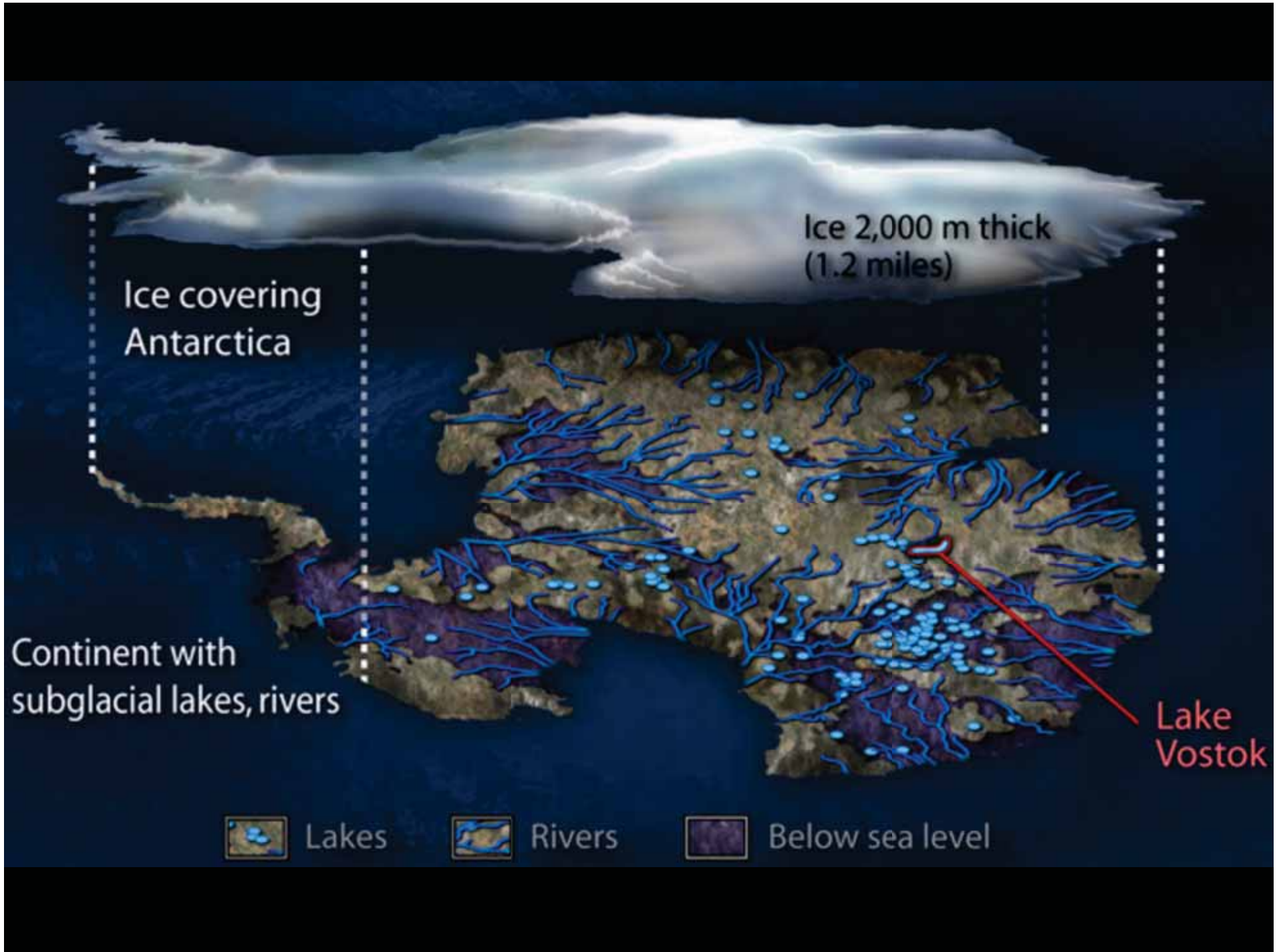
2007





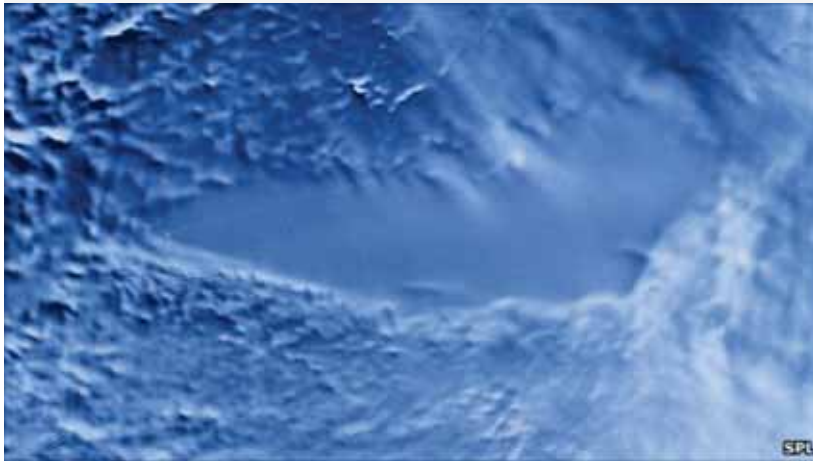
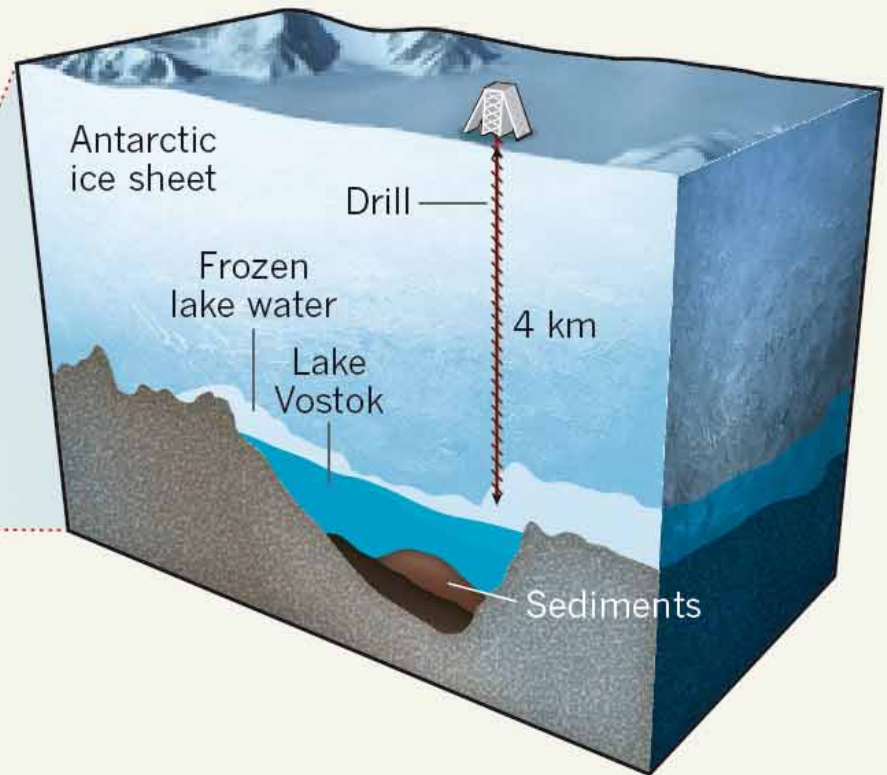
Subglacial lakes

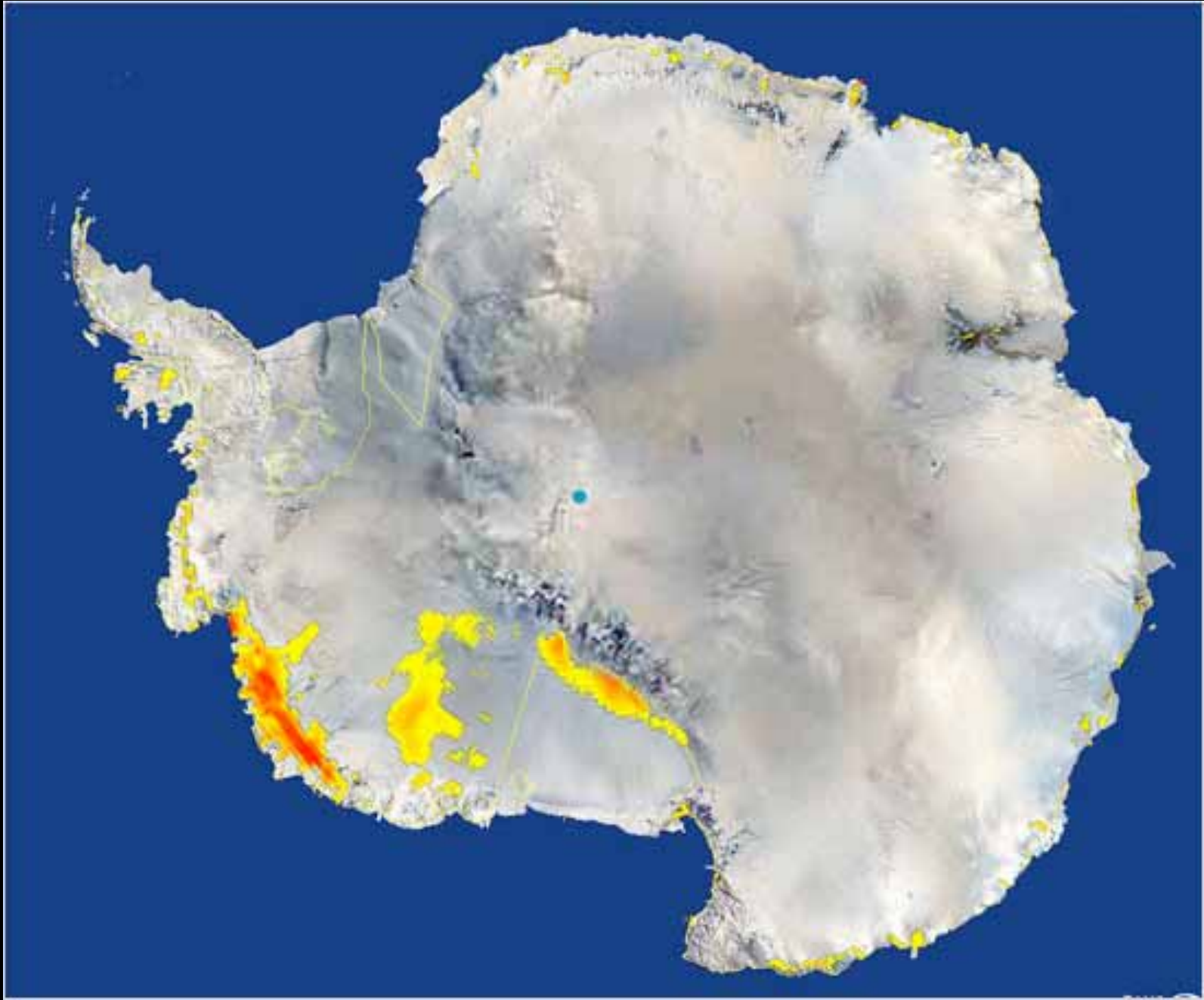




DRILL FOR VICTORY

Russian researchers had to drill through nearly 4 km of ice to reach Lake Vostok.

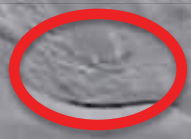






(b)

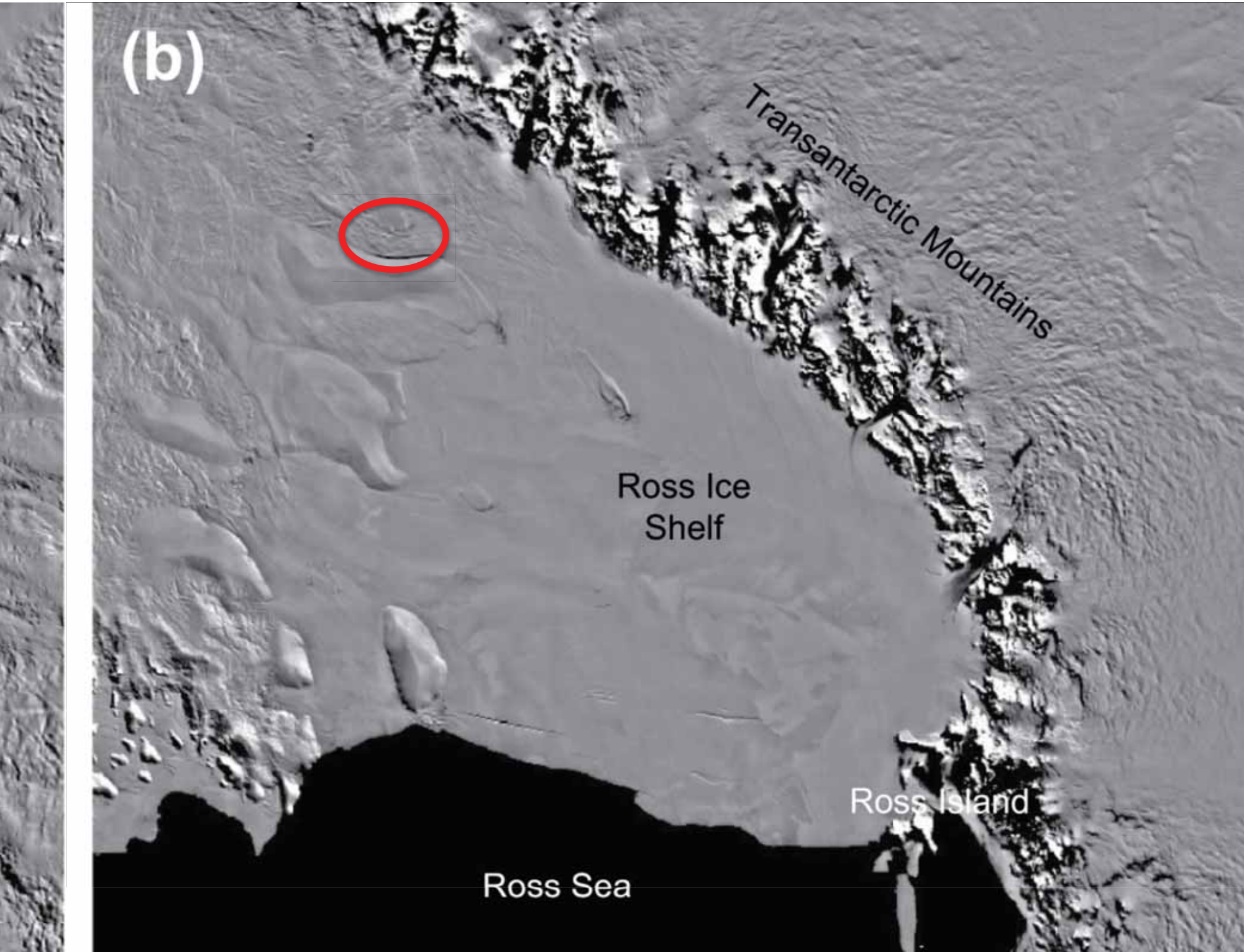
Transantarctic Mountains



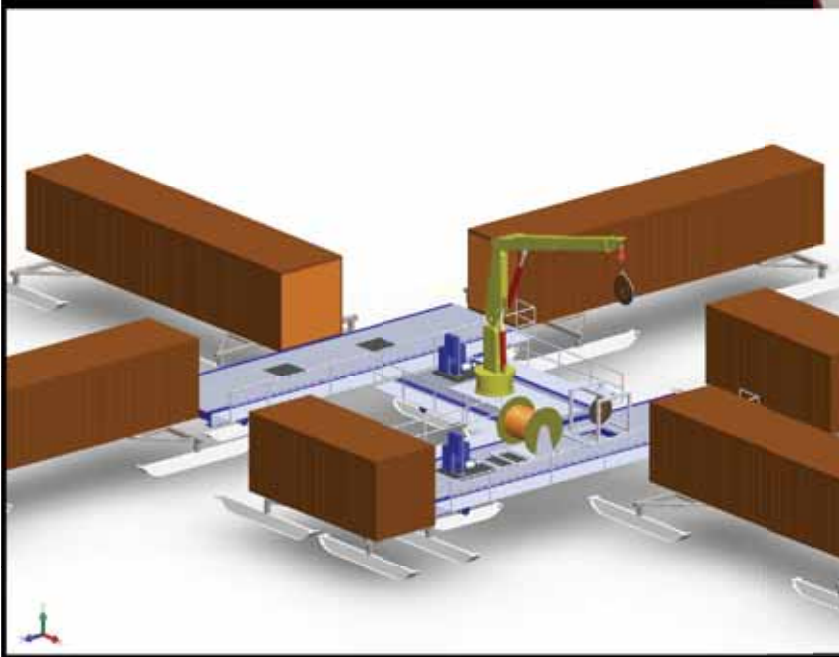
Ross Ice Shelf

Ross Island

Ross Sea



UNL Test of WISSARD HWDS – Filtration & Hot Water Units





SIR - Remote Operated Sub-ice Vehicle will be deployed to the bottom of the WAIS through an 800m long, 80cm wide hole

 National Science Foundation
WHERE DISCOVERIES BEGIN

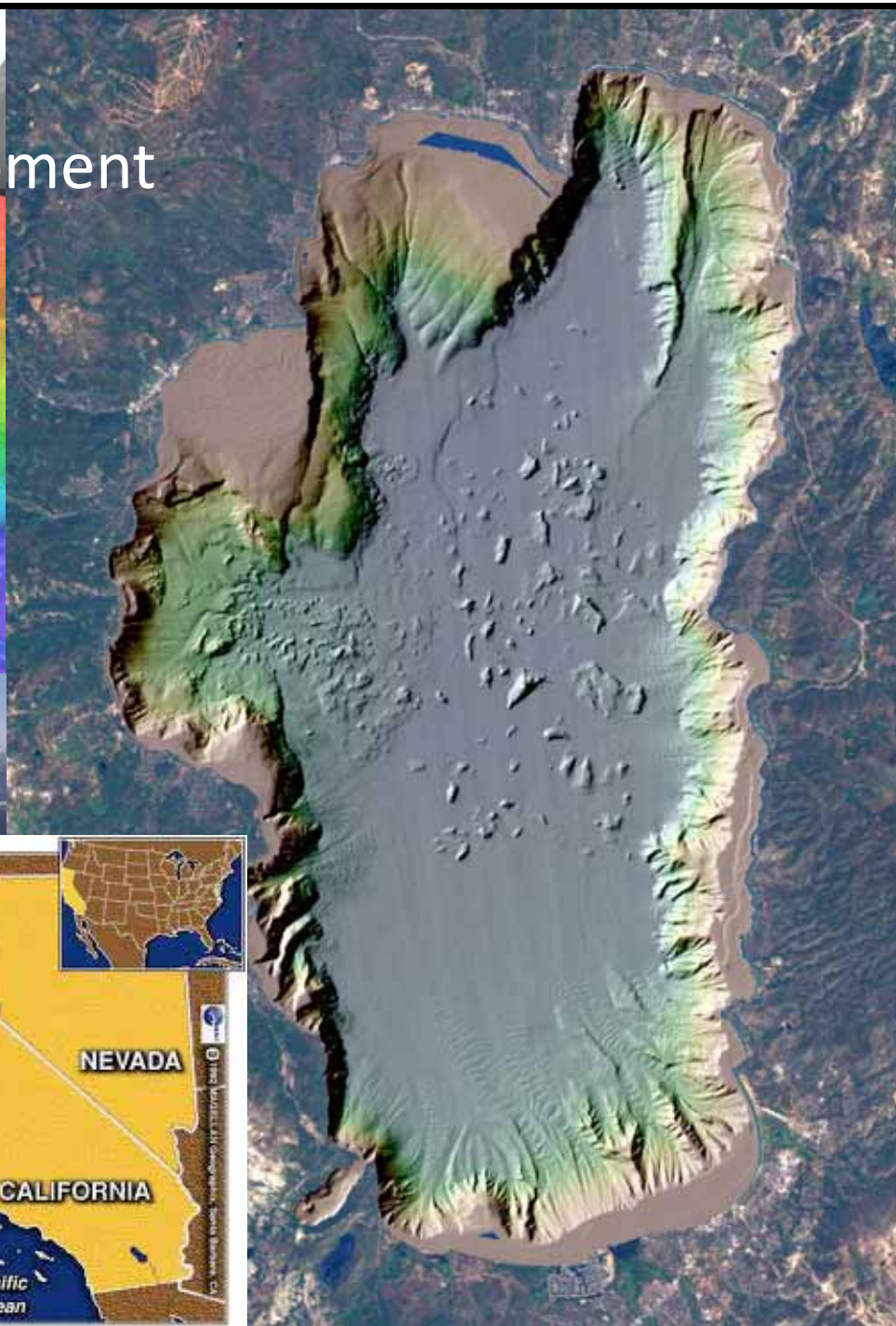
 Wissard

 NOAA NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
UNITED STATES DEPARTMENT OF COMMERCE

 GORDON AND BETTY MOORE FOUNDATION
Creating positive outcomes for future generations



We'll be testing all the equipment
in Lake Tahoe next month
And doing science as well



San Francisco Chronicle

SCIENCE

Antarctica-bound submarine to take test dive in Lake Tahoe

By David Perlman

CHRONICLE SCIENCE EDITOR

An exotic new unmanned submarine, built to analyze the water and sediments moving at the base of a vast sheet of melting ice in Antarctica, will make its first science cruise closer to home — in the rocky depths of Lake Tahoe.

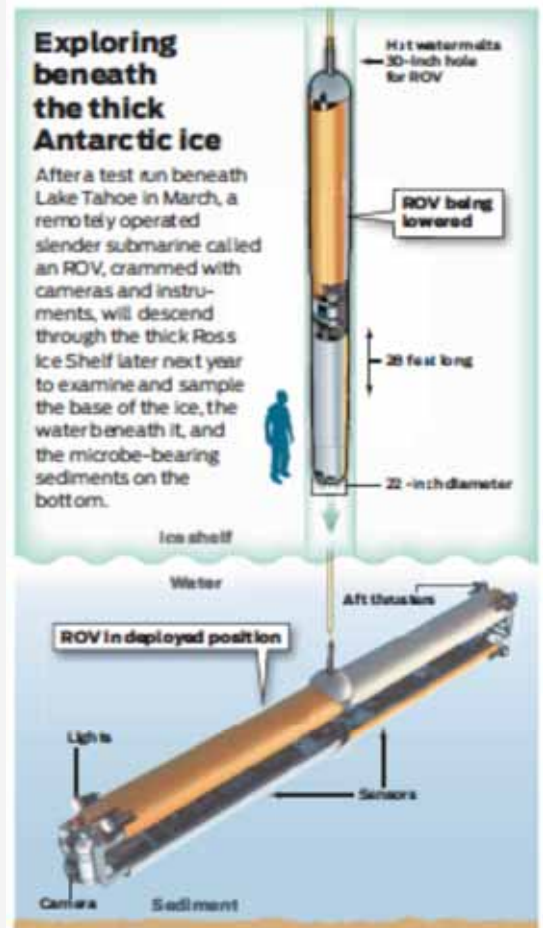
The Tahoe venture in March is planned as a test of the cigar-shaped, 2,200-pound, remote-control vehicle, but later in the year the submarine will play a unique role helping scientists understand the many effects of global warming

Submarine continues on A7



Lance Iversen / The Chronicle

Reed Scherer, a geologist on the research team, explains how the remote-control, yellow submarine works.



Source: ODER Marine

John Blanchard / The Chronicle



Lance Iversen / The Chronicle

Ross Powell, a geologist and leader of the Antarctica project, says the sub will provide valuable data.



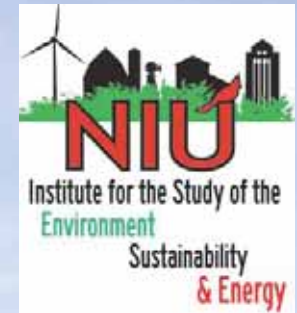


ILMA-LAKES

ILLINOIS LAKES MANAGEMENT ASSOCIATION



Lakes all around the world need to be protected



- Recreation and tourism
- Water resources
- Food resources
- Climate modulators
- Unique environments & ecosystems
- And as a library of knowledge about the world!

