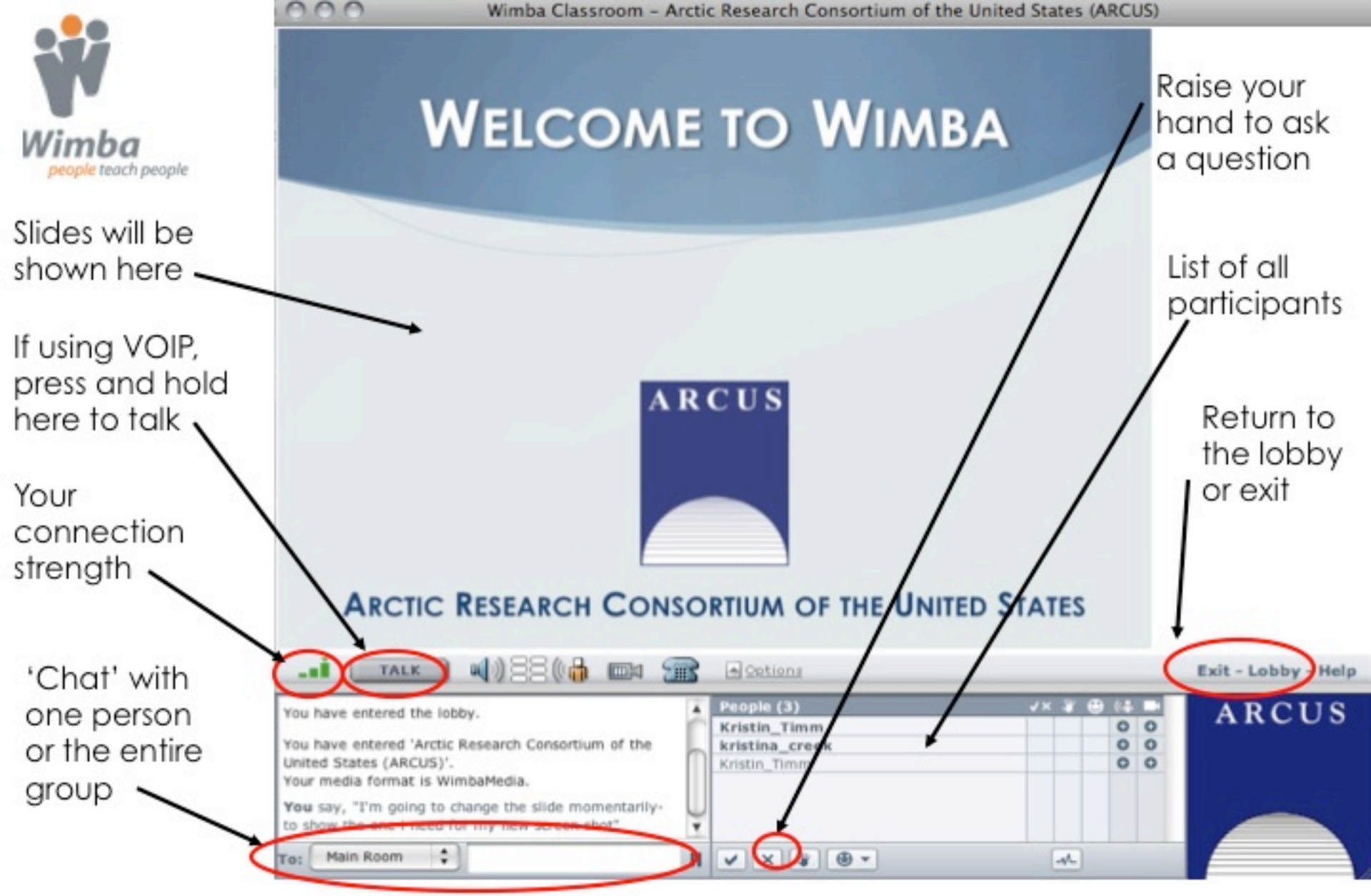
Welcome to Live from the International Polar Year!

How We Know What We Know: Looking at Climate Change Through Polar Science

Friday 16 October 2009 - 9 am Alaska Daylight Time
(7 am HST, 10 am PDT, 11 pm MDT, 12 pm CDT, 1 pm EDT)

If you are a U.S. participant joining via telephone, please dial:
1-800-766-1337 and enter the code 54366779#



Please note:

- Participant using the telephone can mute/unmute by pressing *6 on the phone.
- Today's event will be recorded and archived.

Roll Call

When called, please state your:

- ✓ Name
- ✓ School / Institution
- ✓ The number of students participating with you in the same location

Presenters - Arctic

Julie Brigham-Grette
Department of Geosciences
University of Massachusetts Amherst
Amherst, Massachusetts, USA

Tim Martin
Earth Science Teacher
Greensboro Day School
Greensboro, North Carolina, USA

Presenters - Antarctic

Ross Powell
Dept. of Geology & Environmental Geosciences &
Analytical Center for Climatic and Environmental Change
Northern Illinois University
Dekalb, Illinois, USA

Louise Huffman
Education & Outreach Coordinator
ANDRILL
Antarctic Geological Drilling
Naperville, Illinois, USA

Geography of the Poles

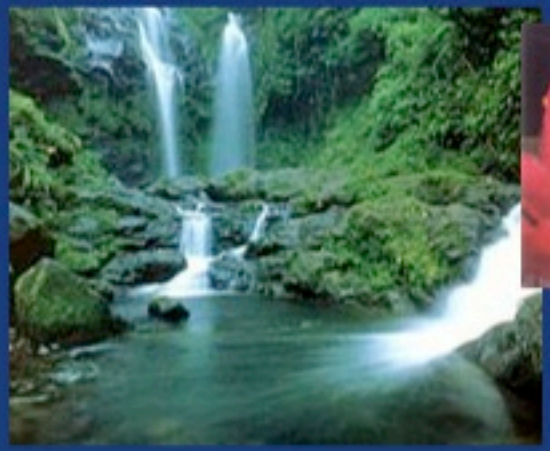
Continental landmass covered with glacial ice surrounded by Ocean

Deep Ocean surrounded by Land and world's largest continental shelves

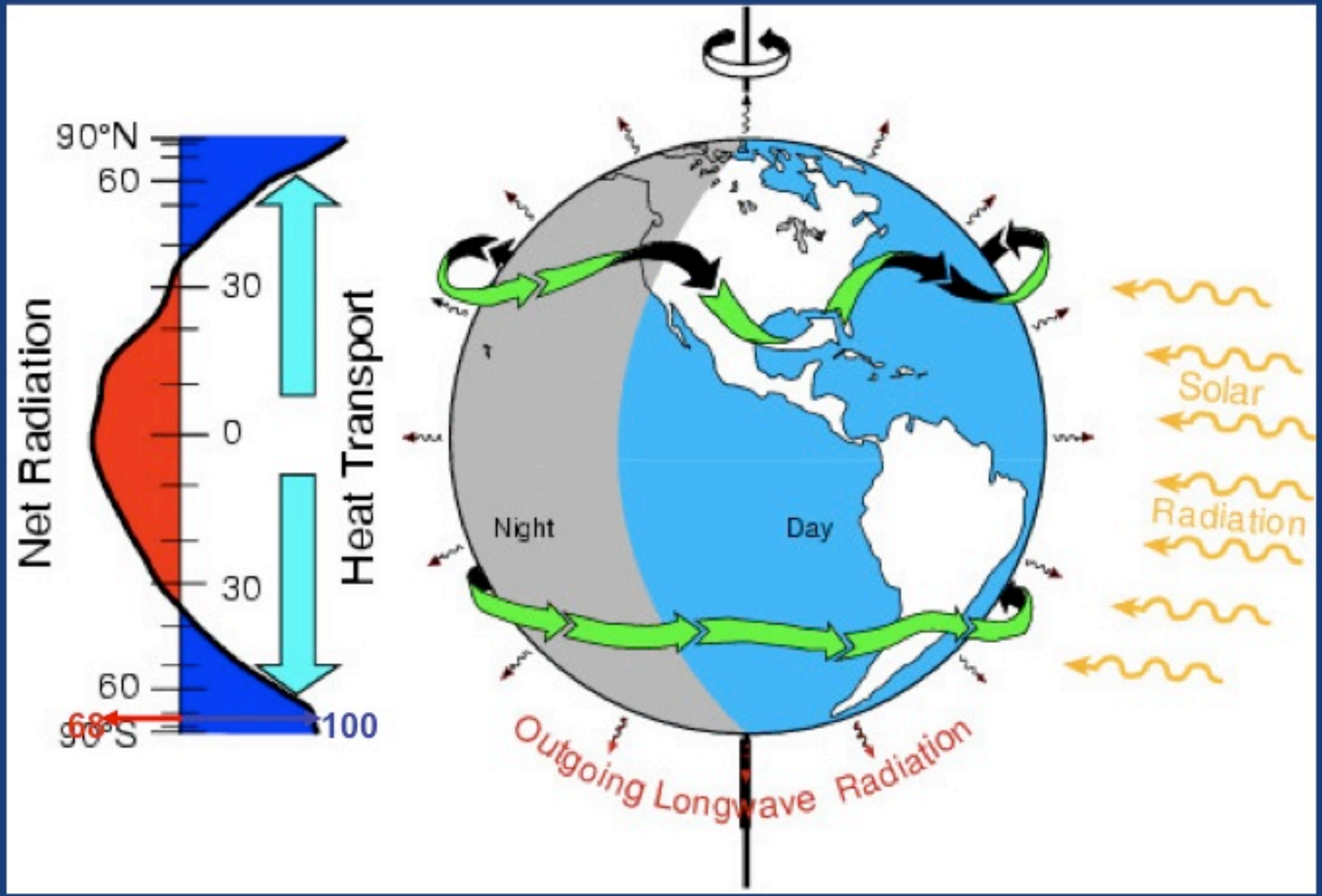
Earth in the Balance

What makes this a habitable planet?

What results from the contrast between the tropics and the poles?



Earth in the Balance: Heat Distribution



Earth in the Balance:

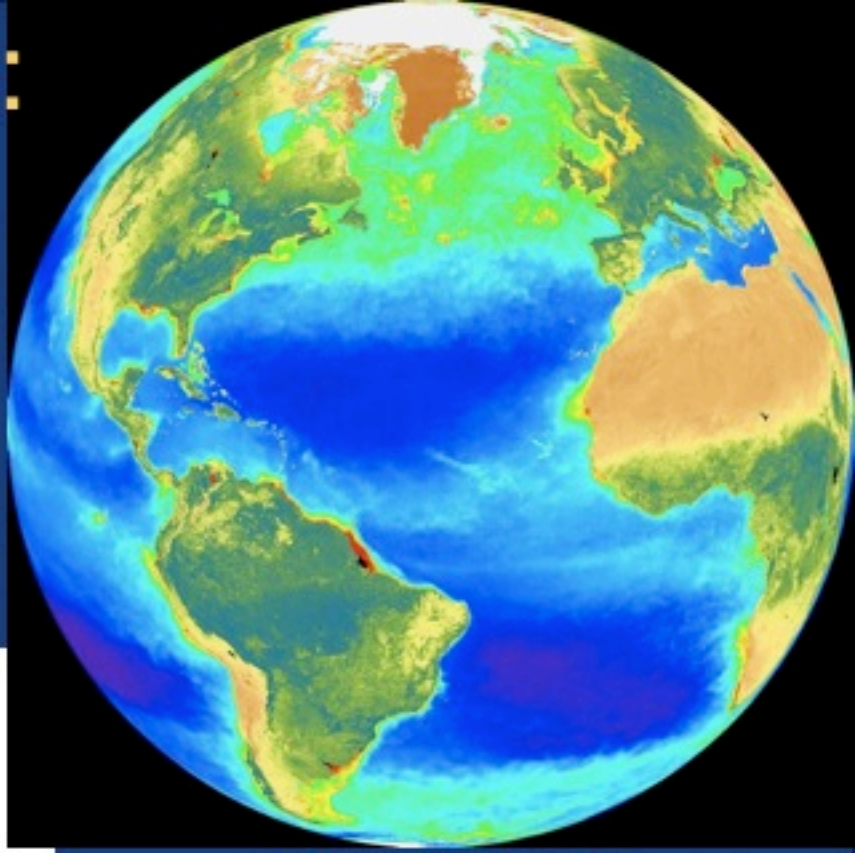
Heat Transport

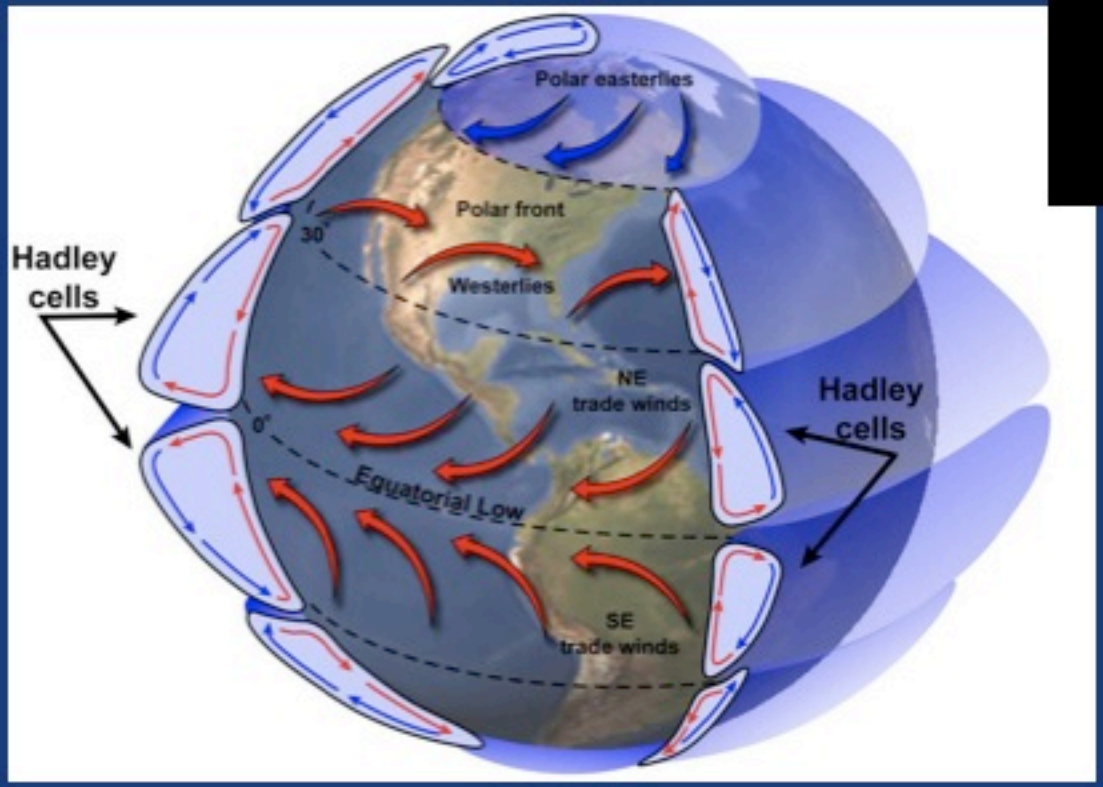
Two ways to move heat :

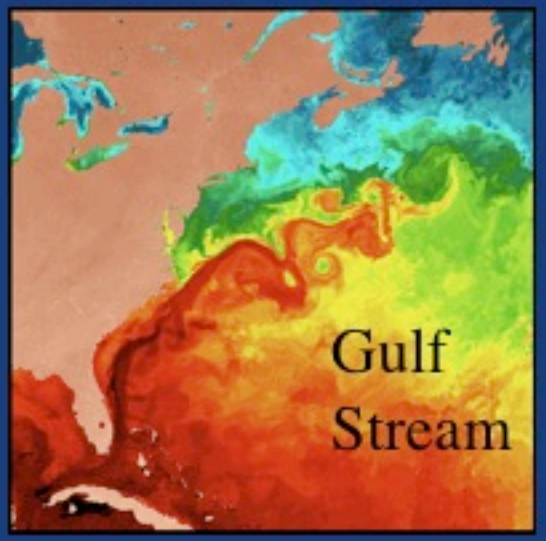
Ocean currents

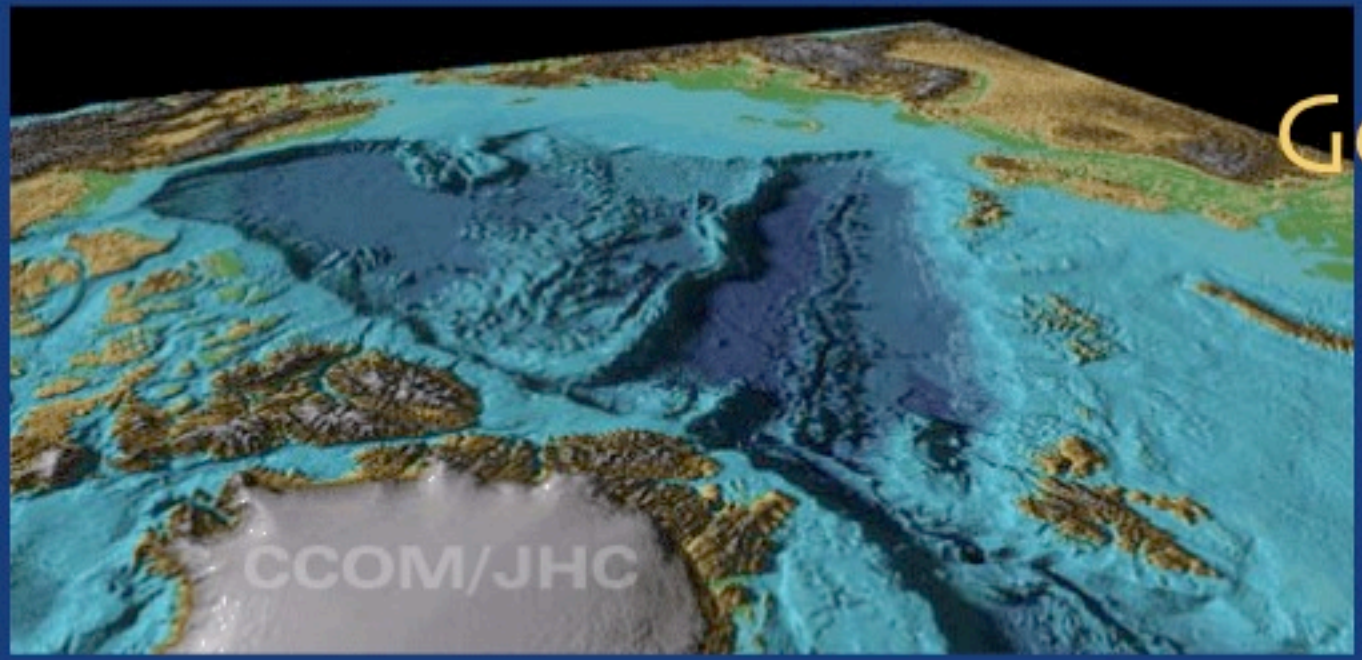
and

Atmospheric Circulation







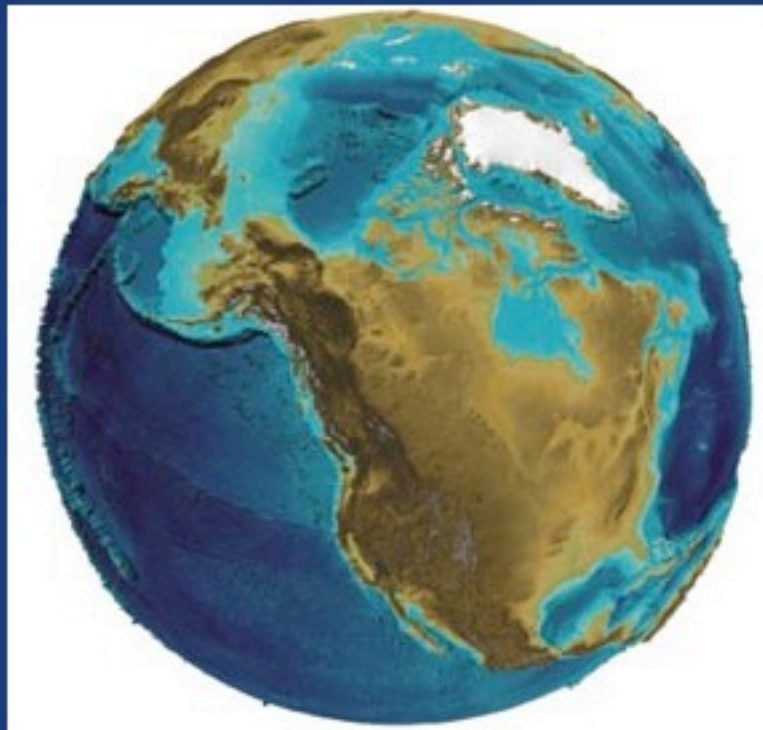


Geography of the Poles

http://www.gebco.net/

Average depth of **Arctic Ocean:**
1038 meters (3407 ft)
Deepest point in the **Eurasian Basin:**
5450 meters (17,881 ft).
Entire basin **:**
1.5 times the size of the contiguous US

Best known for its ice cover!



August Arctic Ocean Ice Extent

Extent (million sq km)

9
8.5
8
7.5
7
6.5
6
5.5
5

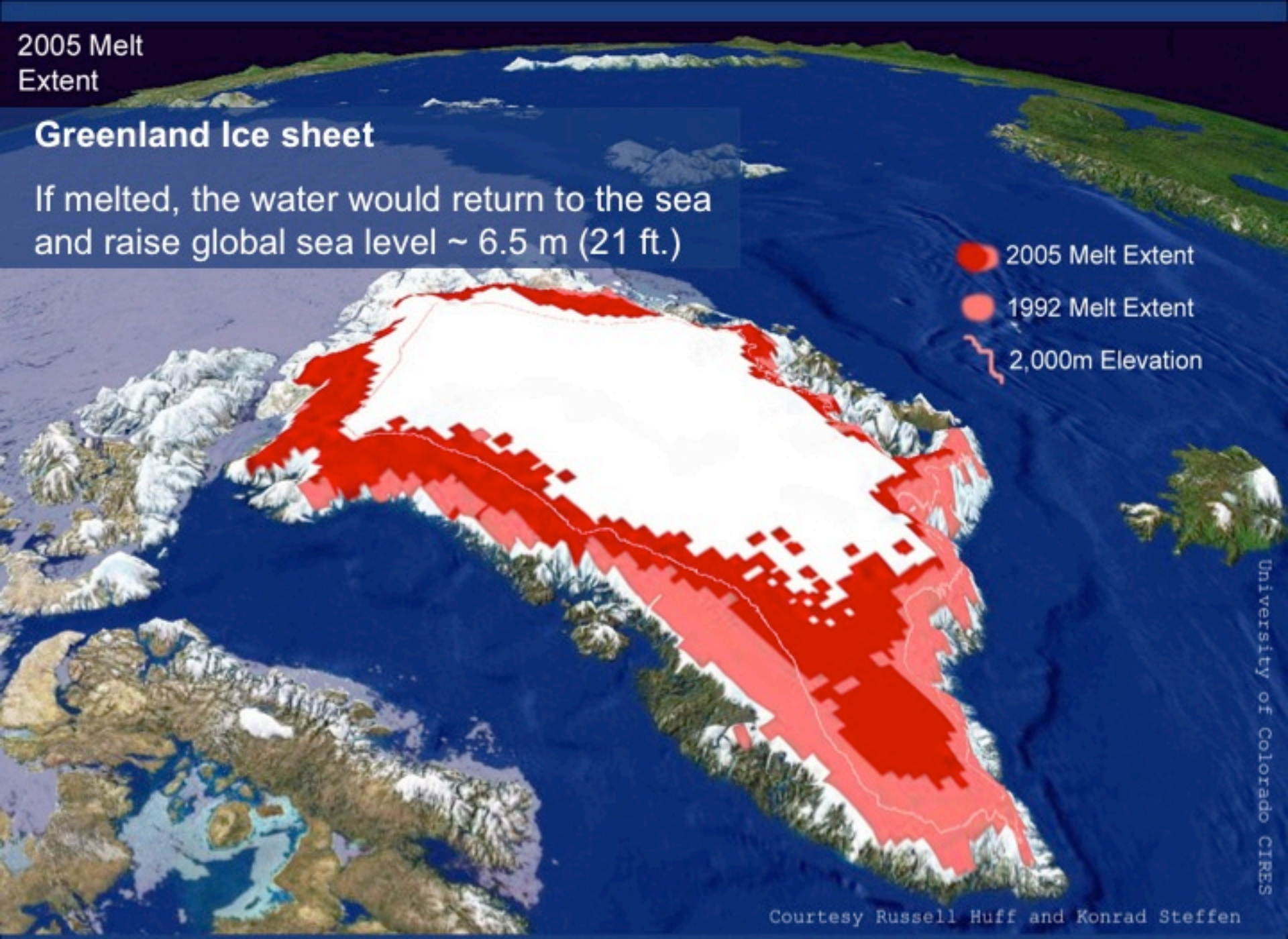
1978 1980 1982 1984 1986 1988 1990 1992 1994 1996 1998 2000 2002 2004 2006 2008

Year

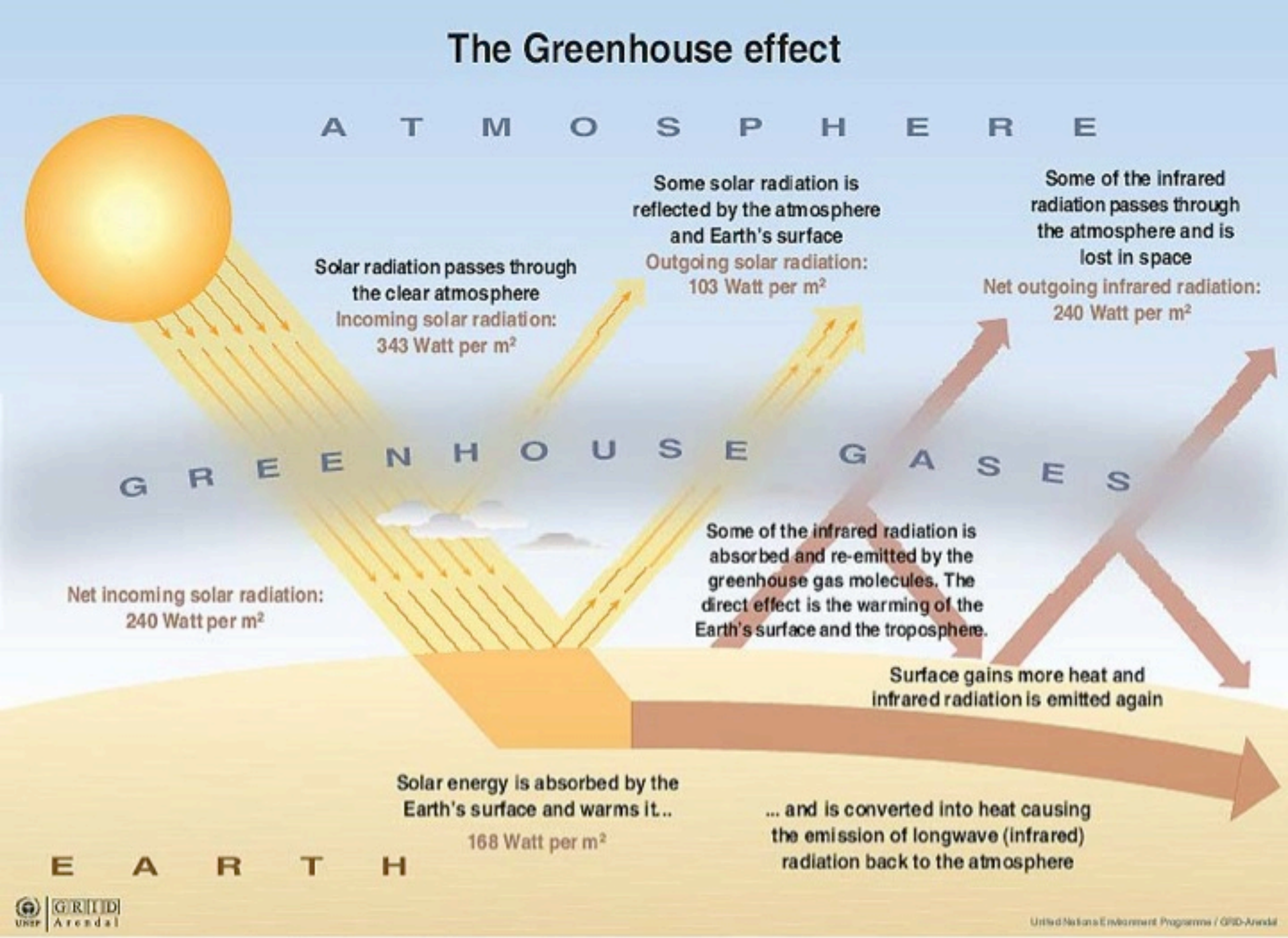
2007
5.32 million km²

National Snow and Ice Data Center

Source: *NSIDC*


2005 Melt Extent
Greenland Ice sheet
If melted, the water would return to the sea and raise global sea level ~ 6.5 m (21 ft.)
2005 Melt Extent
1992 Melt Extent
2,000m Elevation
Courtesy Russell Huff and Konrad Steffen
University of Colorado CIRES

The Greenhouse effect

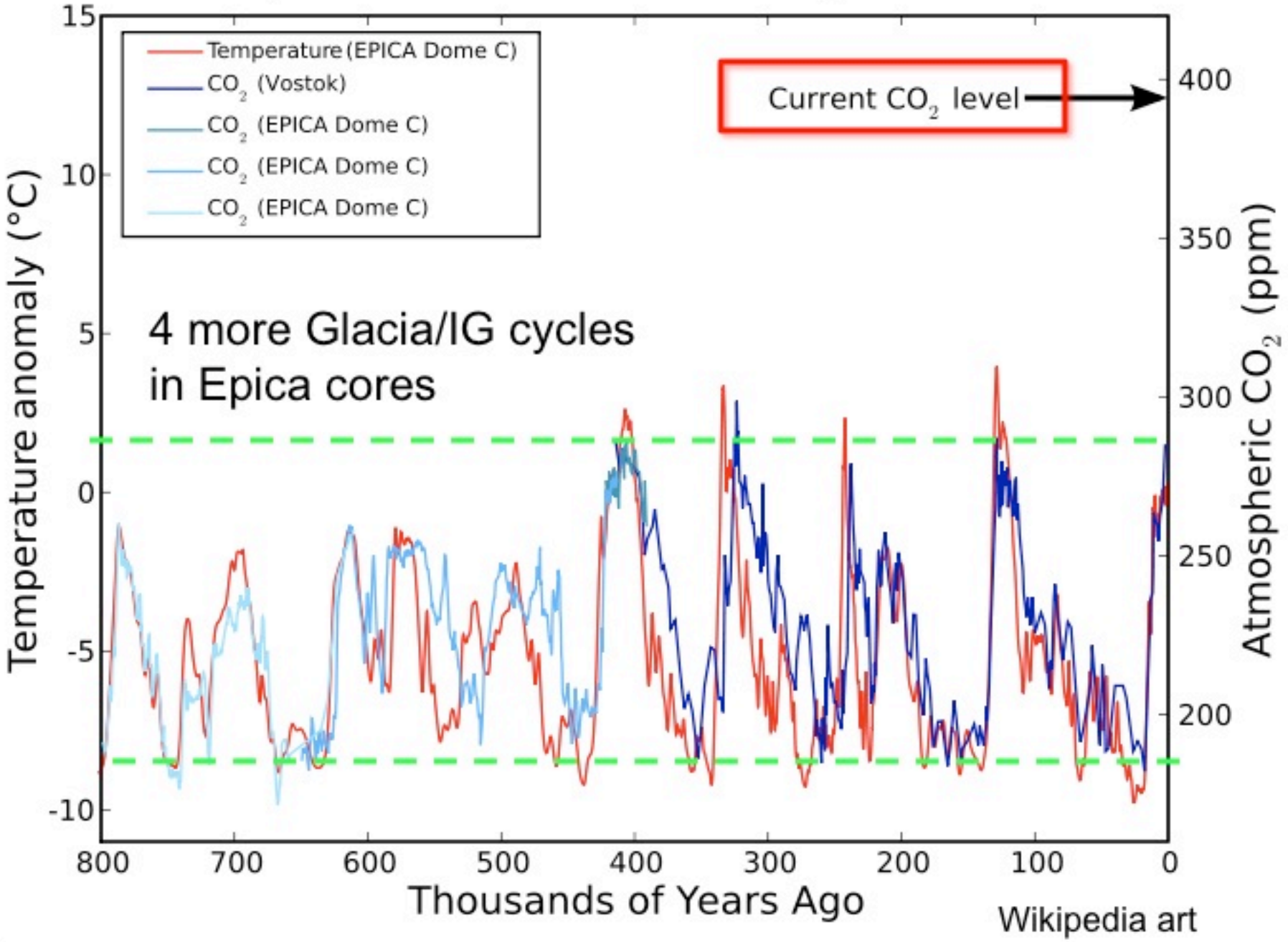


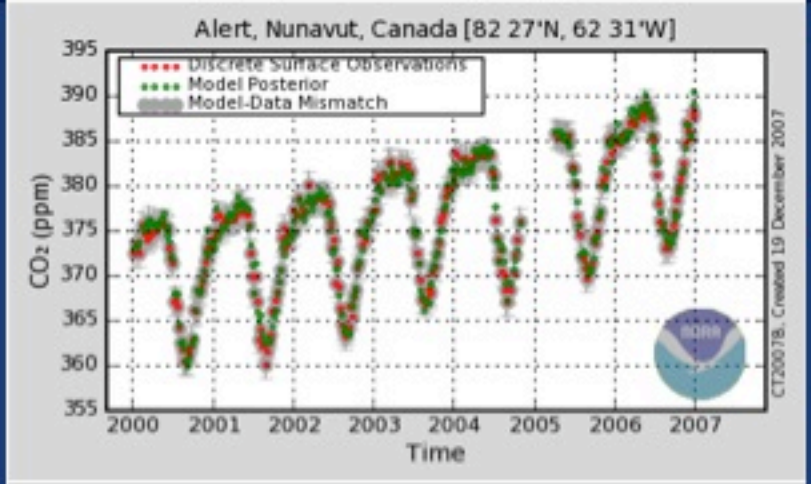
UNEP | GRID Arendal

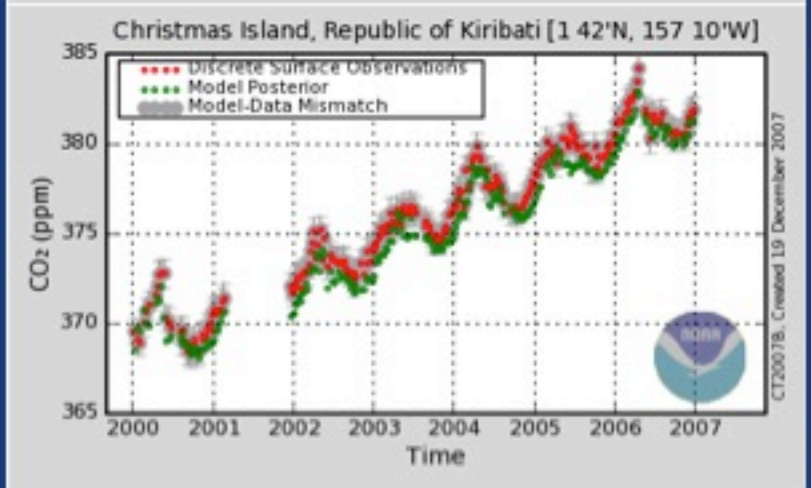
United Nations Environment Programme / GRID-Arendal

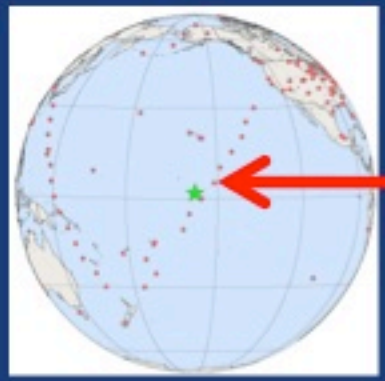
Sources: Okanagan University College, University of Oxford, EPA, IPCC.

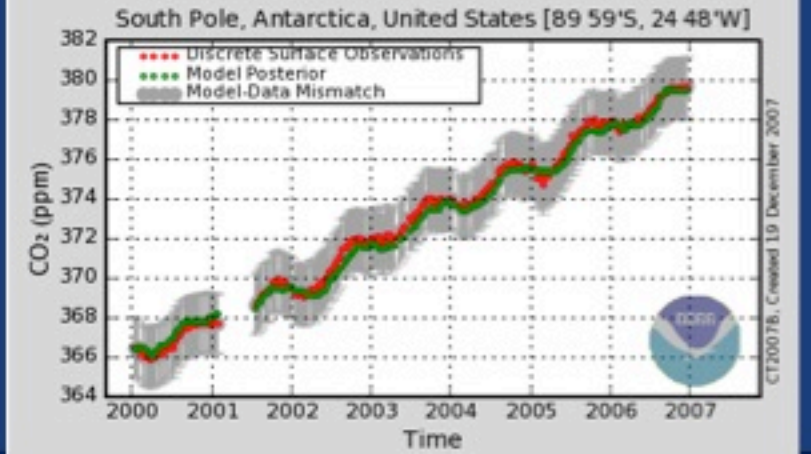
Temperature and CO_2 Records



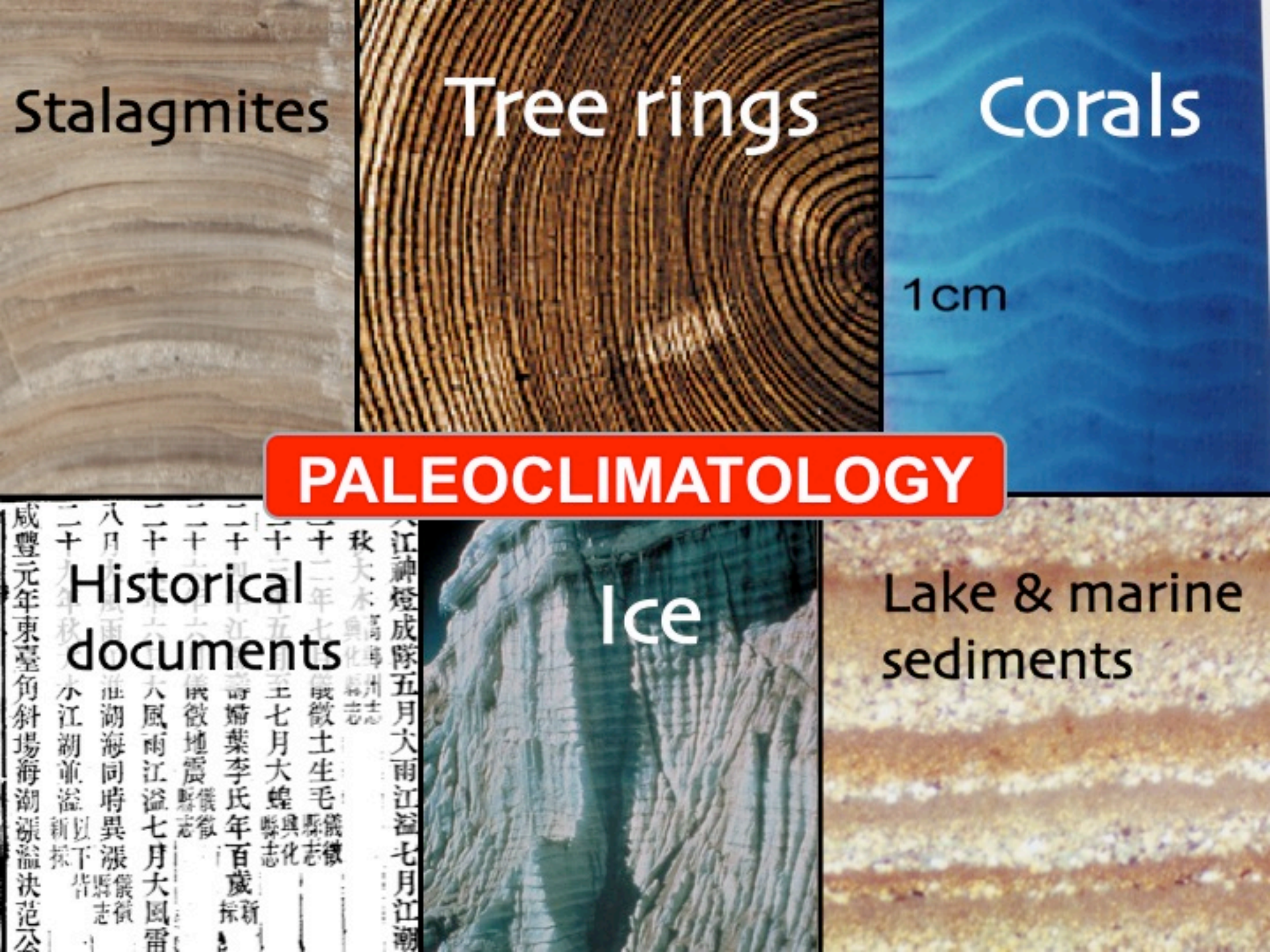


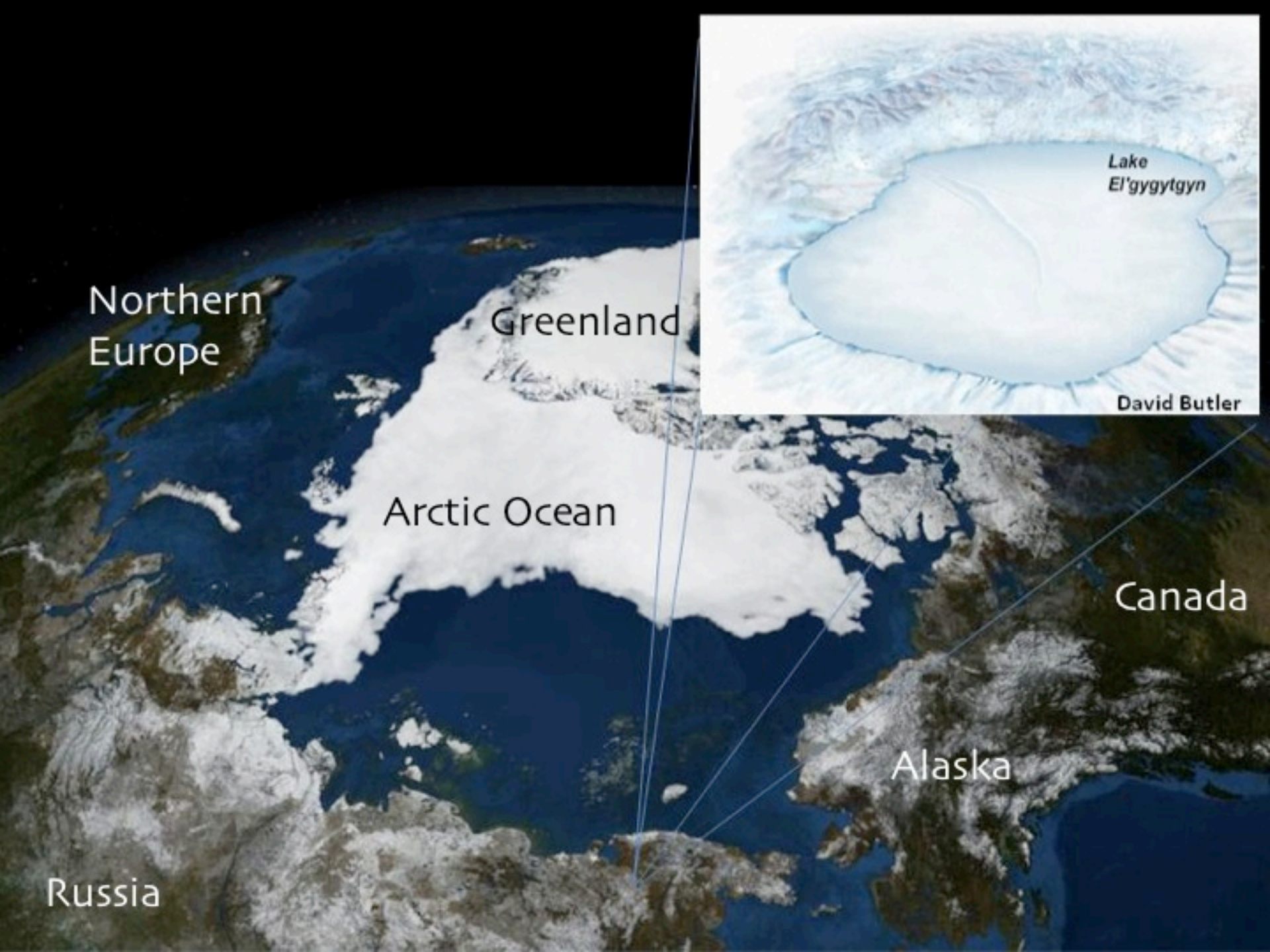






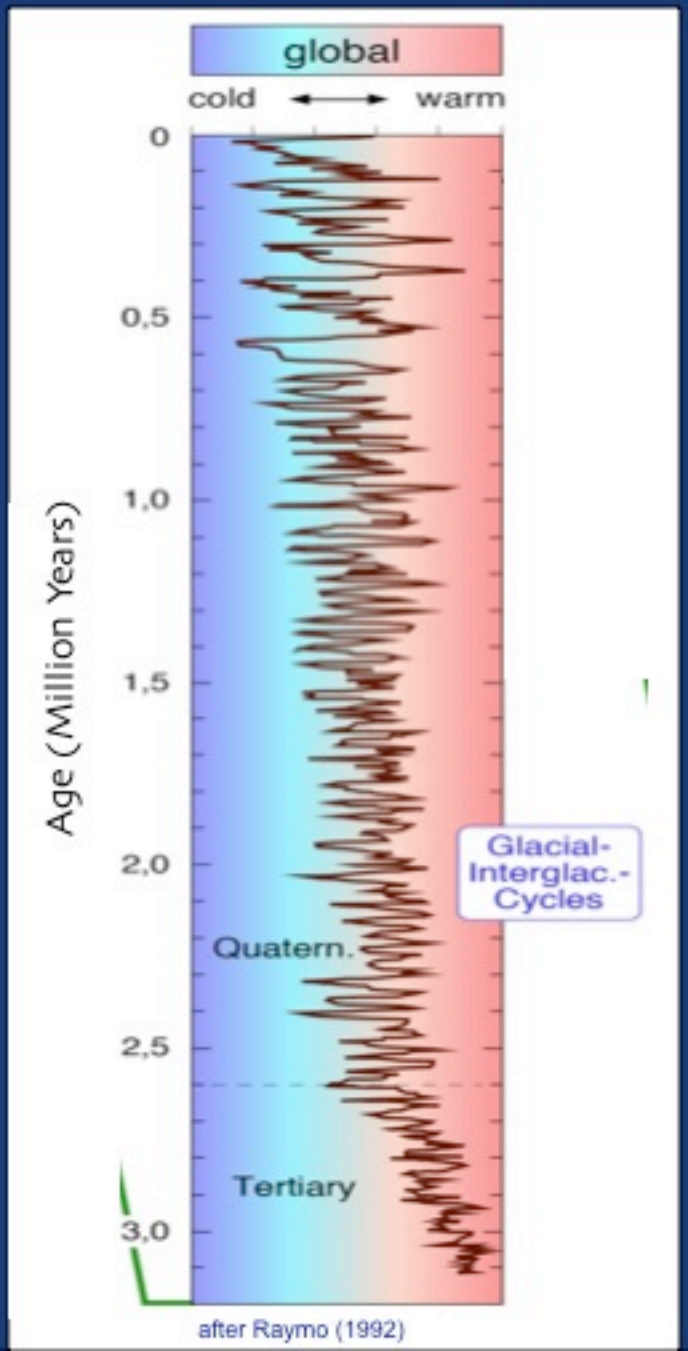
Source: *NOAA ESRL/GMD*

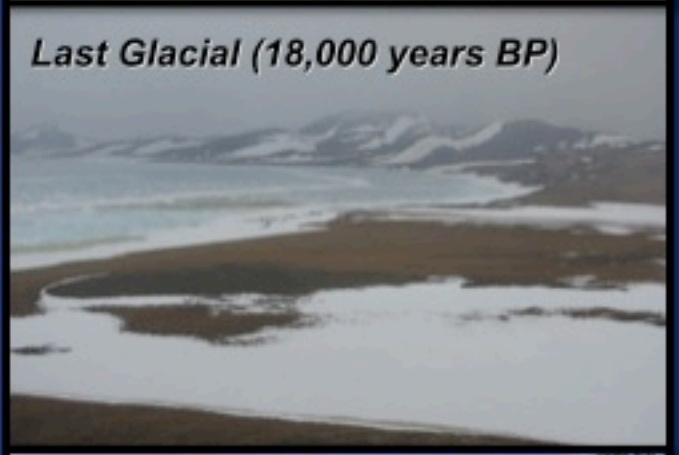

Stalagmites
Tree rings
Corals
1cm
PALEOCLIMATOLOGY
Historical documents
Ice
Lake & marine sediments


Lake
El'gygytgyn
David Butler
Northern
Europe
Greenland
Arctic Ocean
Canada
Alaska
Russia

Climate change in the Past

Lake core



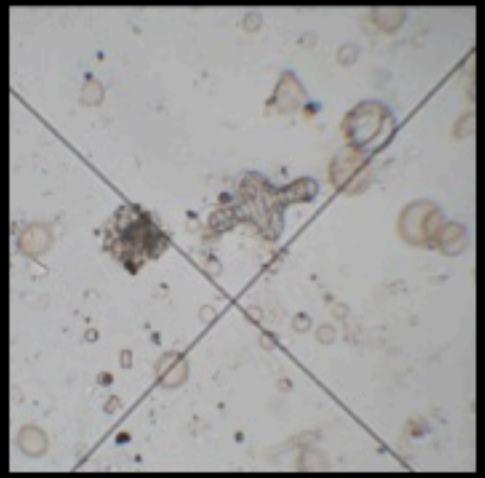



МИ-8


WEBTECH


TIM

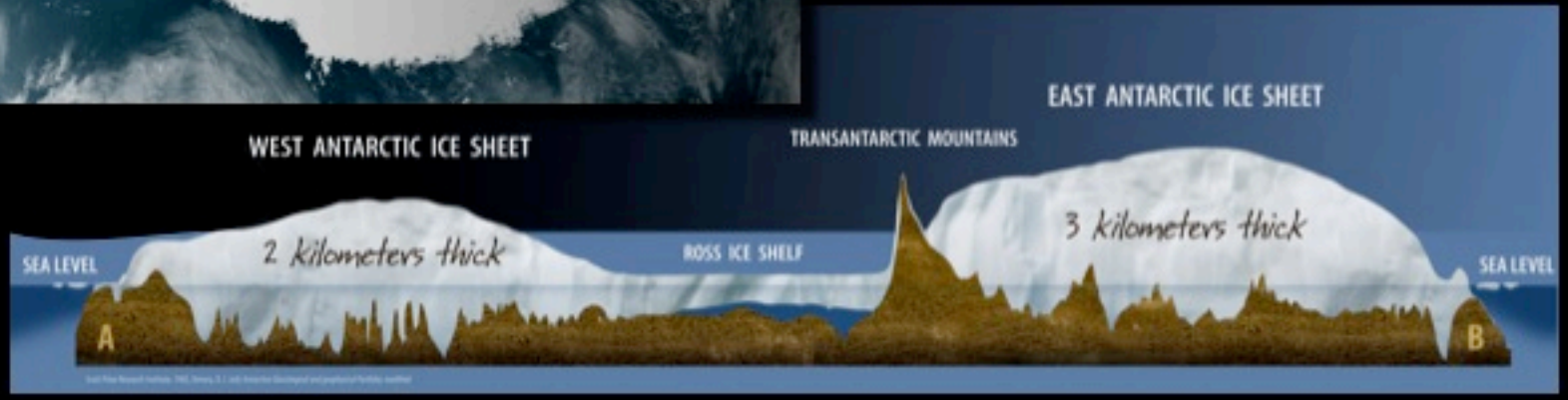

91cm




RA-24422

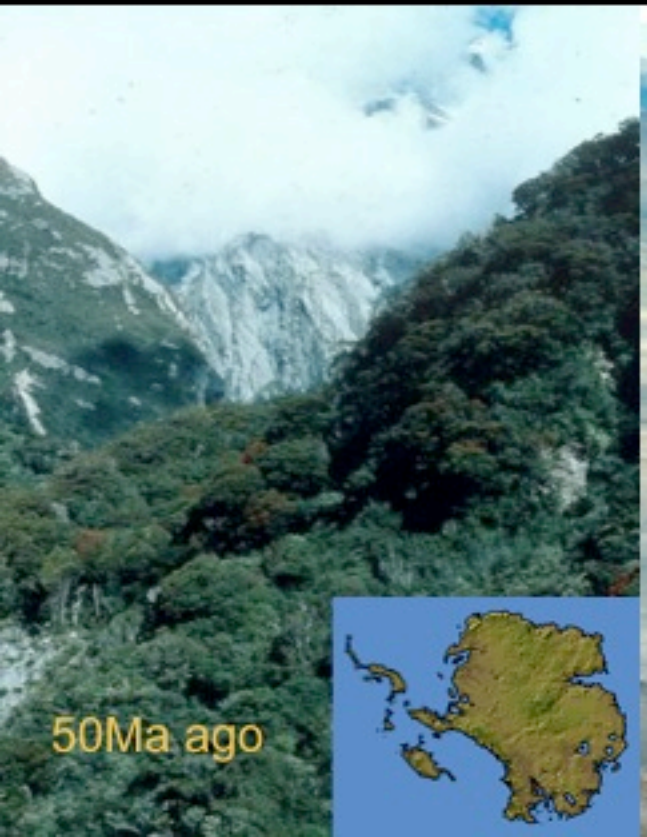
ANTARCTICA

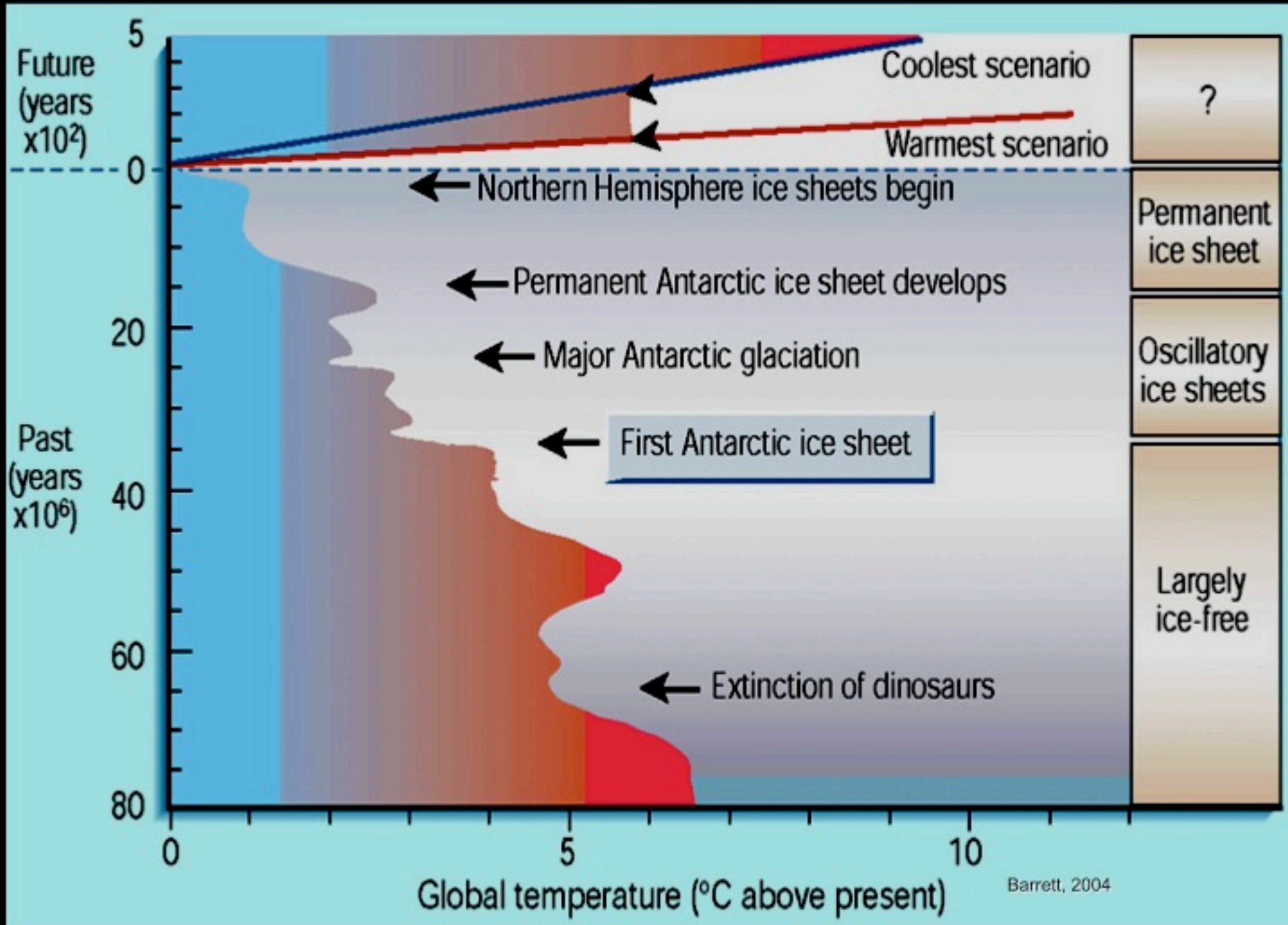
- Continent surrounded by sea ice
- Coldest continent
- Driest continent
- Highest continent
- Biggest ice sheet & ice shelves



Antarctic Ice Sheethas been around at least 34 million years

but what of its future?

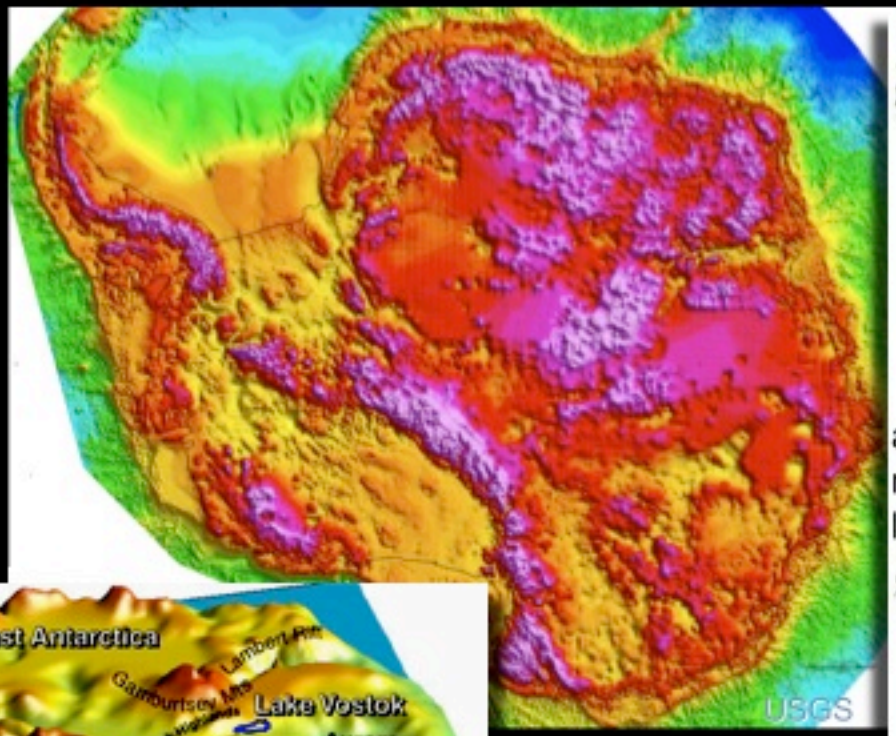


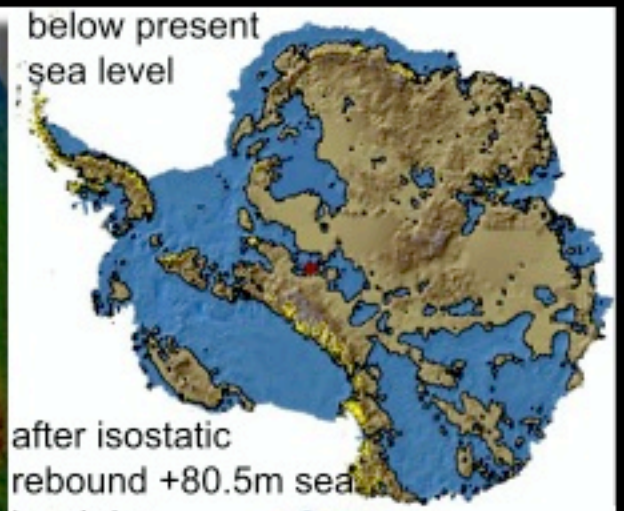

Future (years x10²)
5
0
Coolest scenario
Warmest scenario
Northern Hemisphere ice sheets begin
Permanent Antarctic ice sheet develops
Major Antarctic glaciation
First Antarctic ice sheet
Extinction of dinosaurs
Past (years x10⁶)
20
40
60
80
0
5
10
Global temperature (°C above present)
?
Permanent ice sheet
Oscillatory ice sheets
Largely ice-free
Barrett, 2004

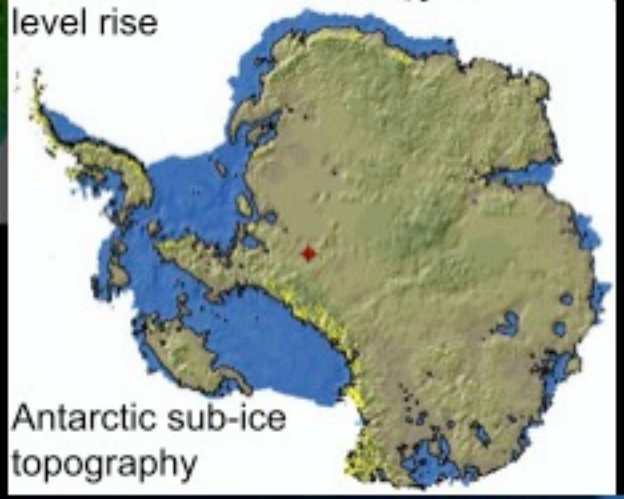
Mountains

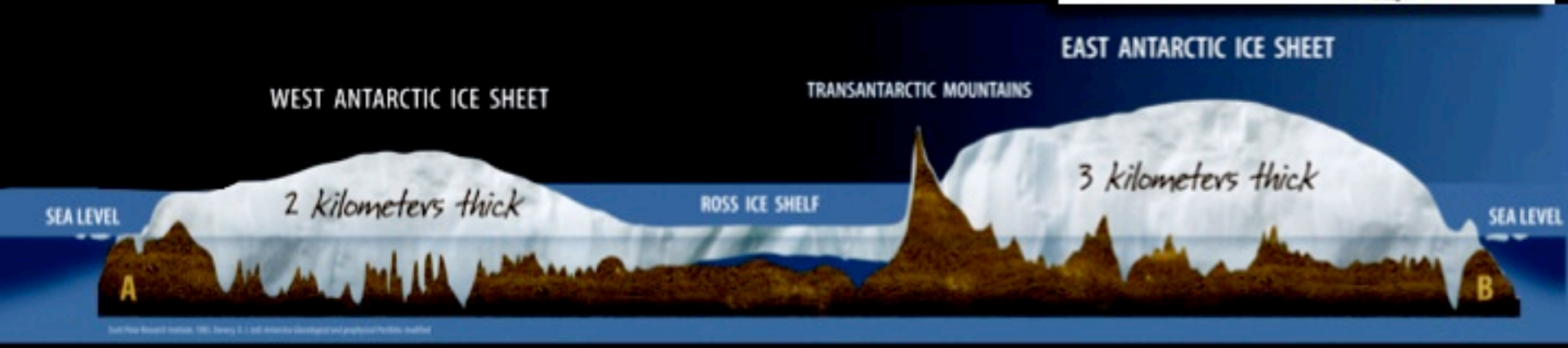
Valleys

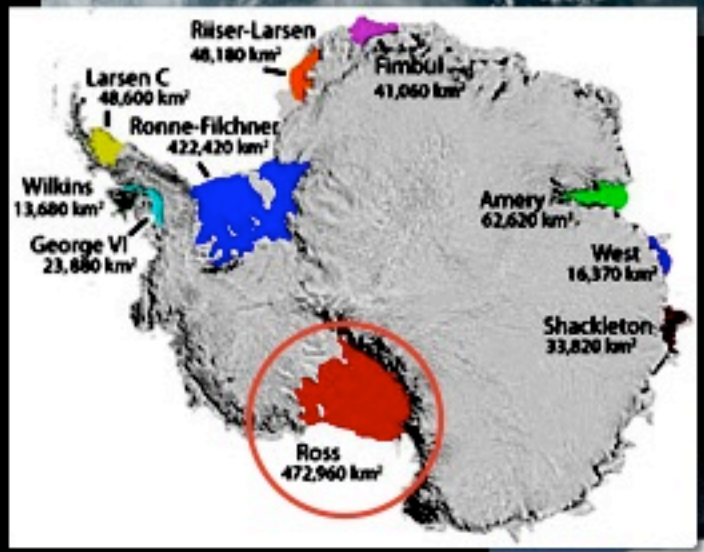
Flooding by sea











Ice shelves are important

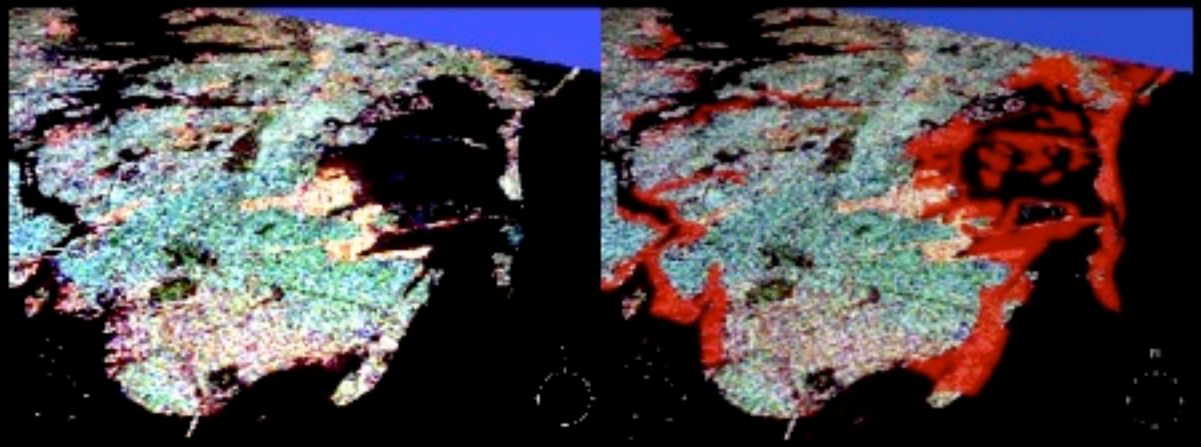
help protect ice sheets

Sea Level Rise and Population at Risk in Southeastern U.S.

Sea Level Rise in Meters	Population Affected in Millions
1	3
2	5.5
3	9
4	13
5	17
6	19

Rowley et al., 2007

A big concern is sea level rise from melting ice sheets: Greenland, Antarctica

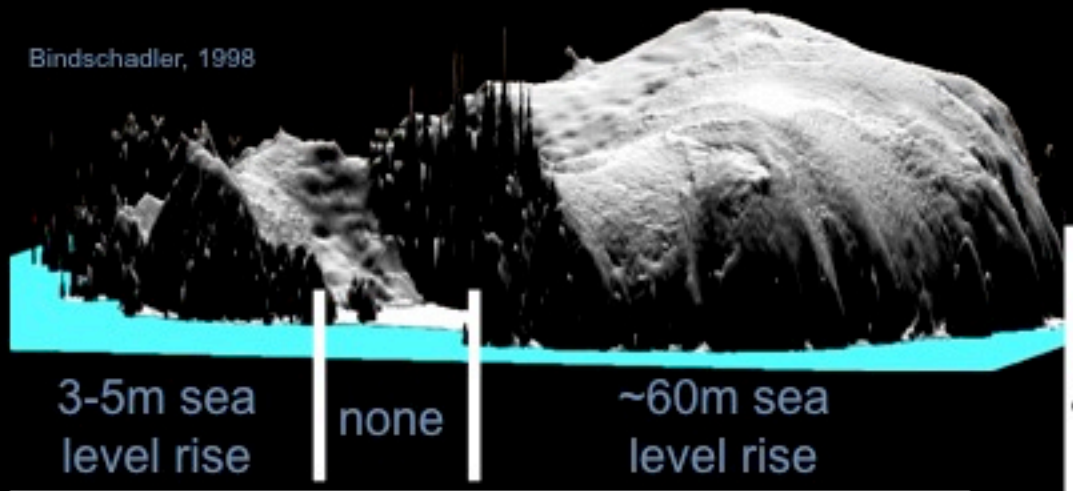


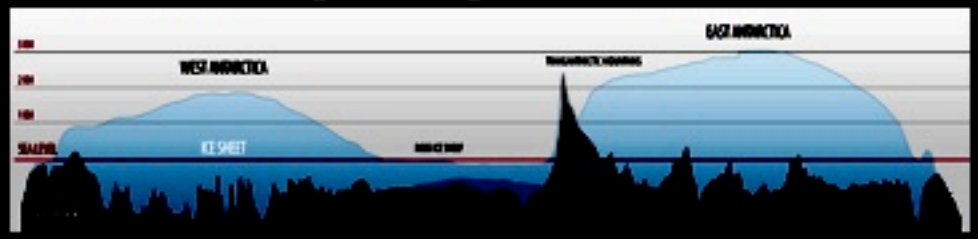
South Florida
Shoreline Change after a
1-Meter Rise in Sea Level

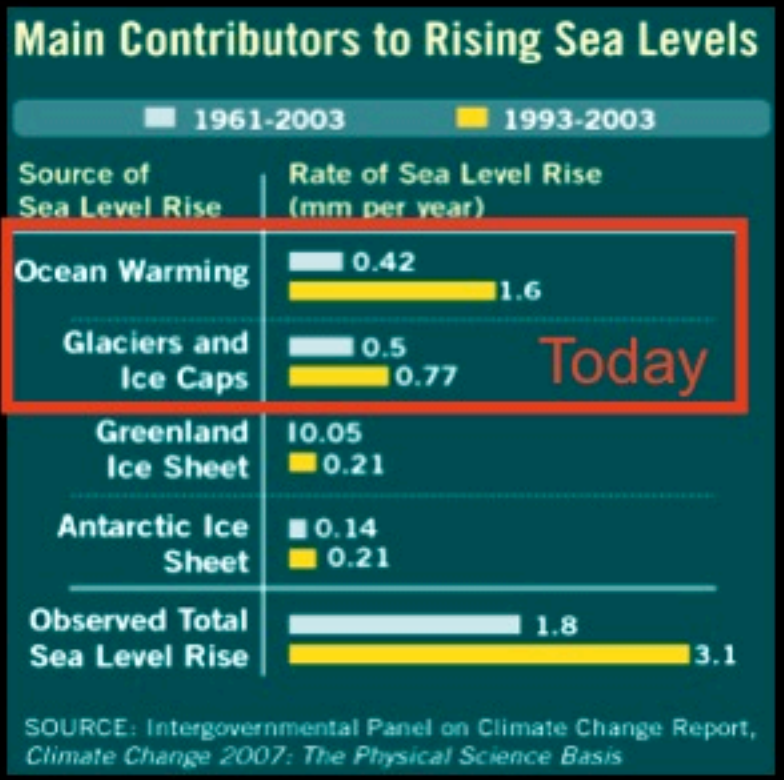
How much water is in ice sheets?

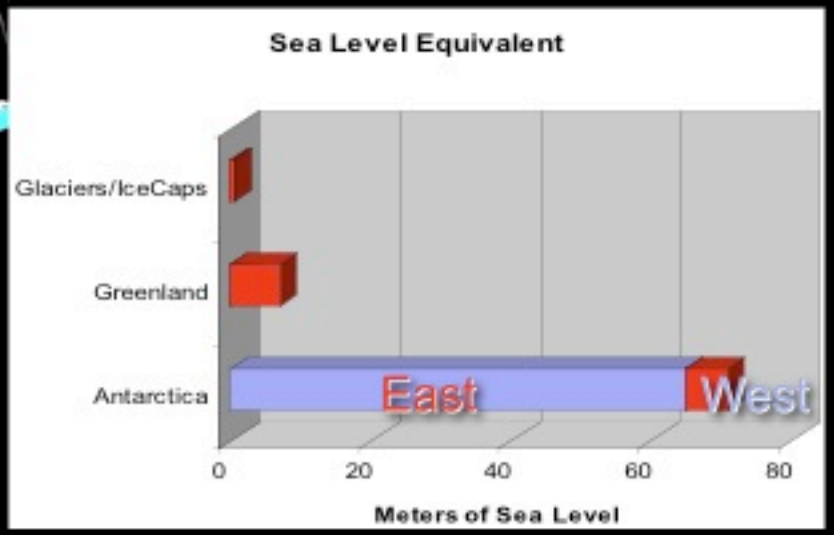
2-6% of all water on Earth

70-80% of all fresh water on Earth

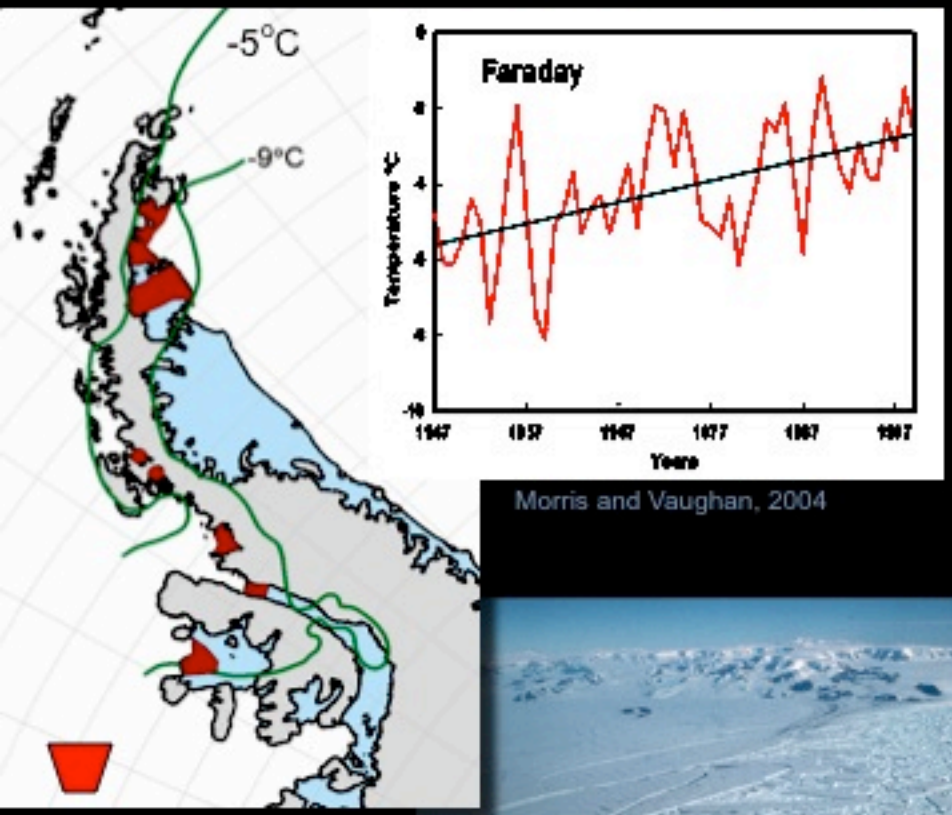








Vulnerable elements of Antarctic cryosphere under warming

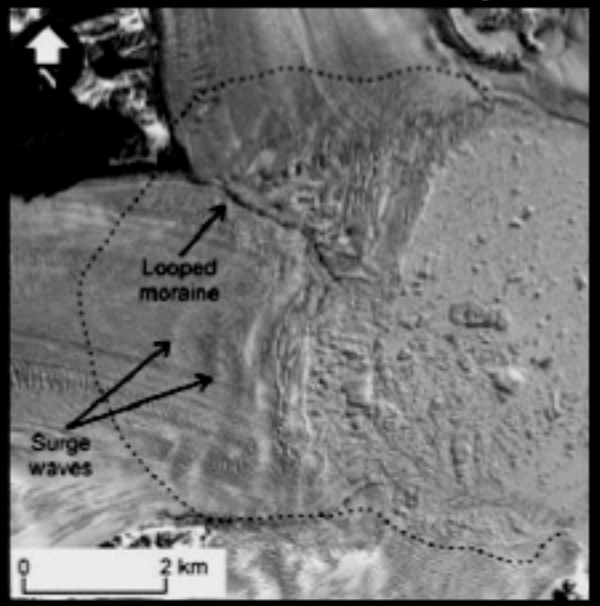


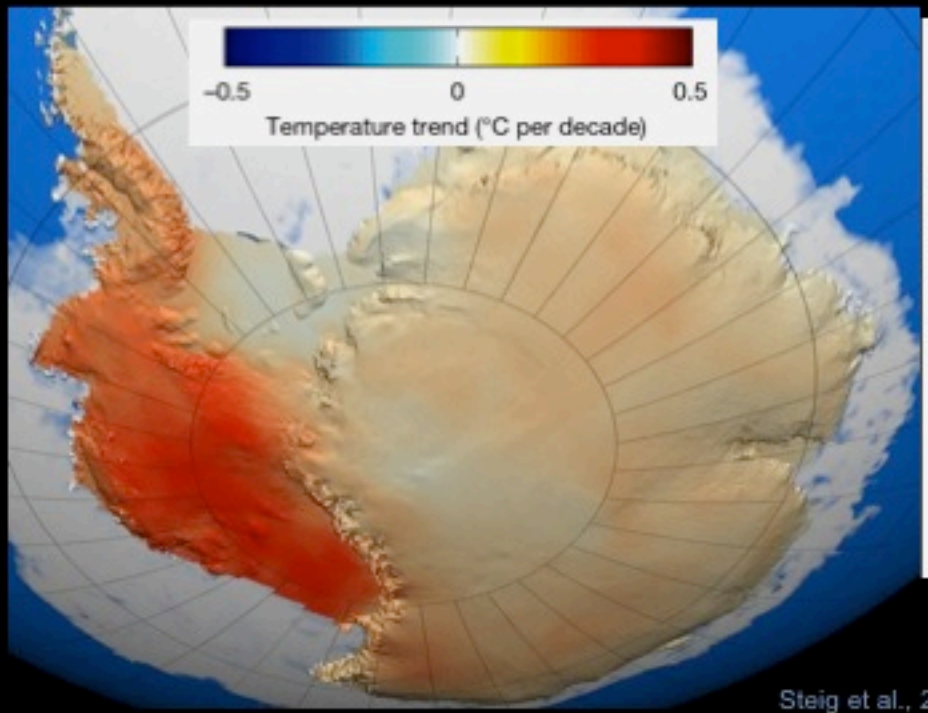
Morris and Vaughan, 2004

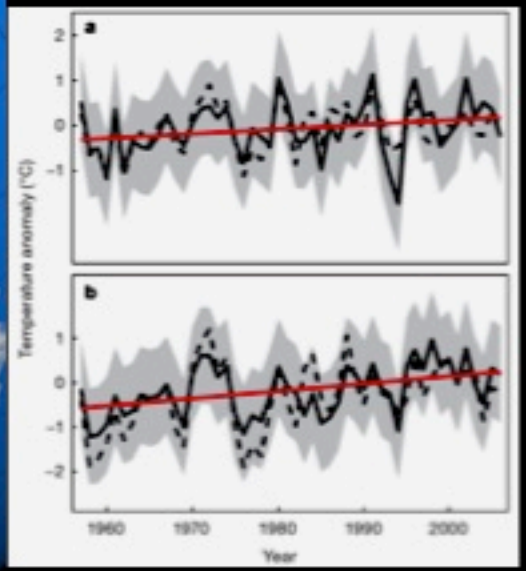
Larsen Ice Shelf breaks up catastrophically in 2003

Glaciers surge into ocean after ice shelves collapse

De Angelis & Skvarca, 2003





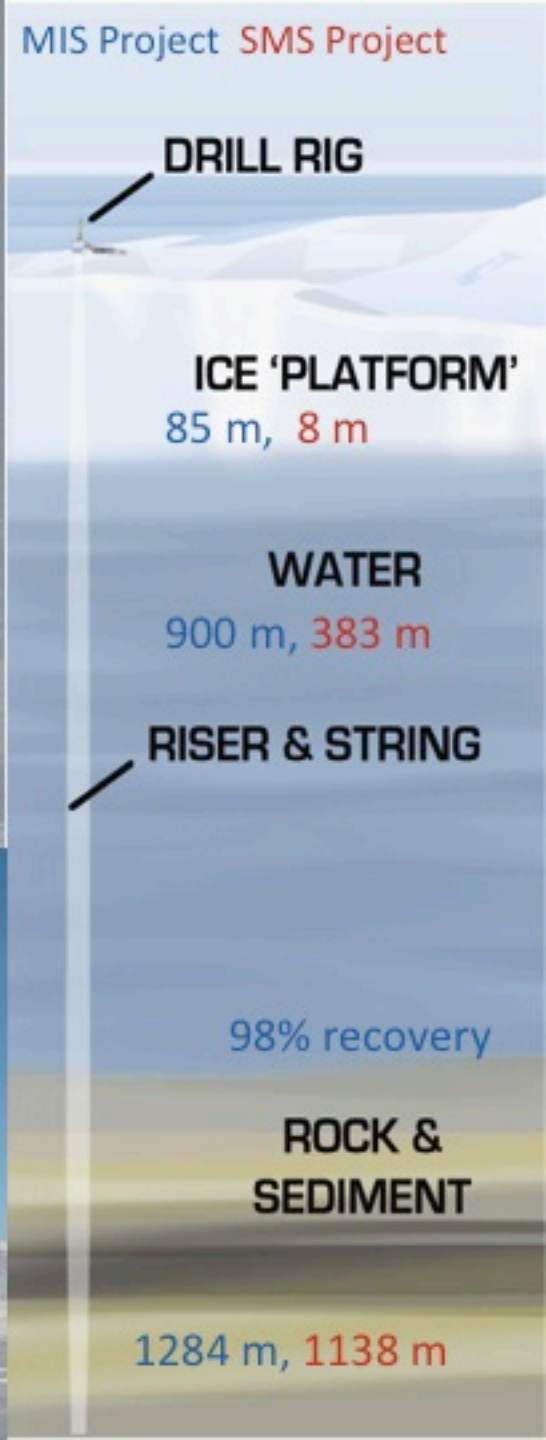


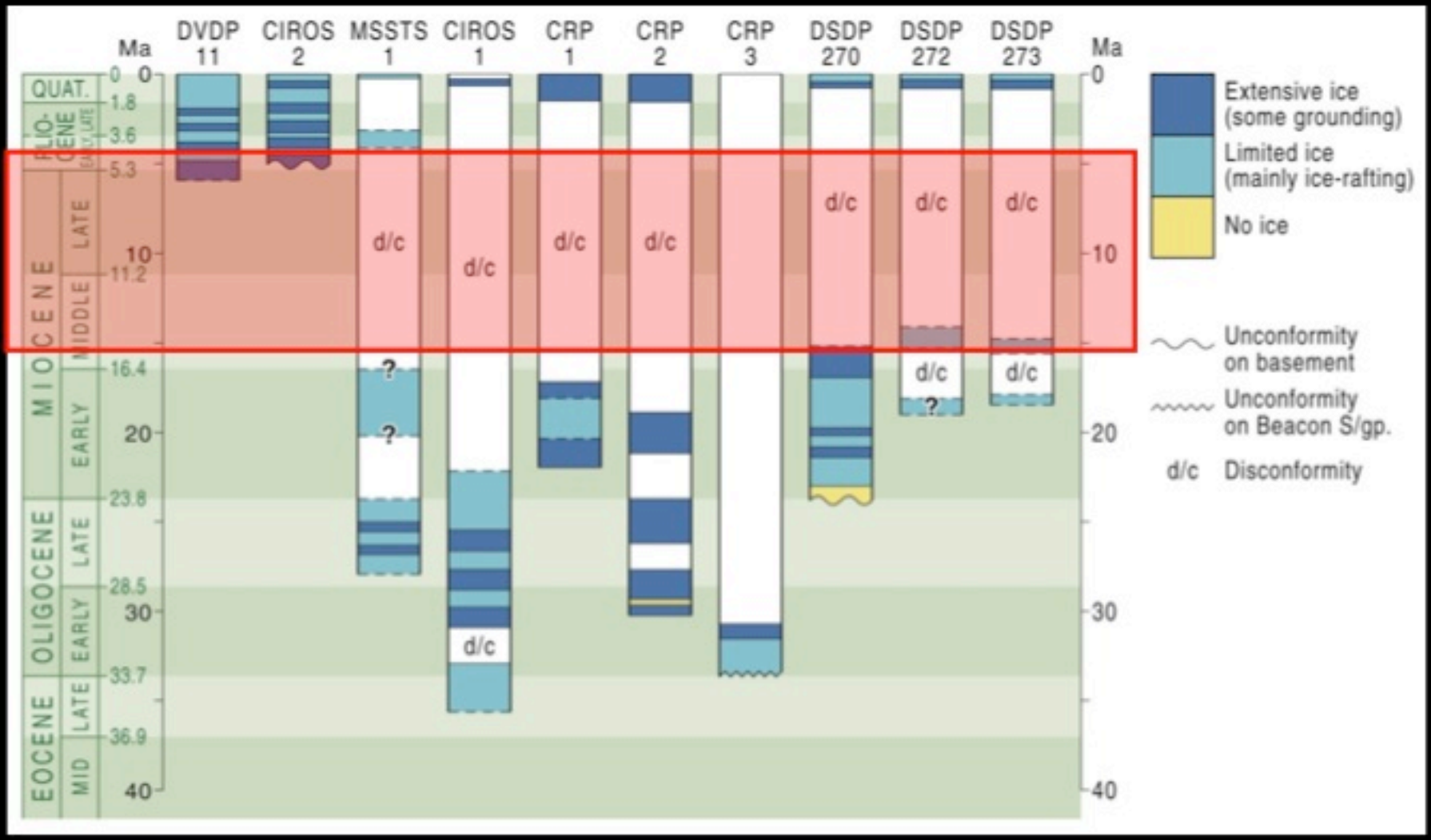
...and West Antarctica is warming faster than previously thought!

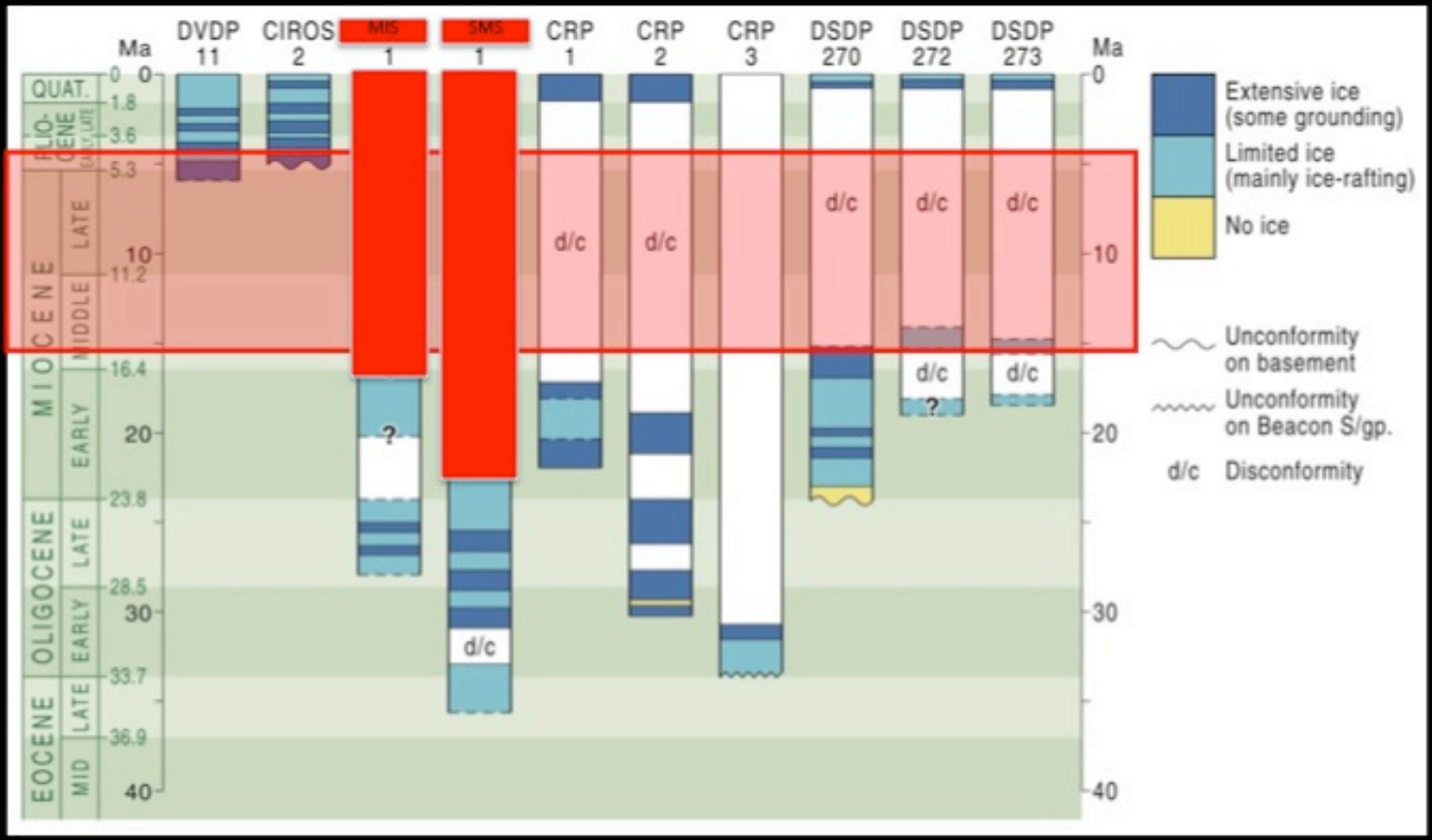
Steig et al., 2009


MIS--McMurdo Ice Shelf Project--2006

SMS—Southern McMurdo Sound Project--2007


MIS Project SMS Project
DRILL RIG
ICE 'PLATFORM'
85 m, 8 m
WATER
900 m, 383 m
RISER & STRING
98% recovery
ROCK & SEDIMENT
1284 m, 1138 m


Ma
DVDP 11
CIROS 2
MSSTS 1
CIROS 1
CRP 1
CRP 2
CRP 3
DSDP 270
DSDP 272
DSDP 273
QUAT.
PLIO-CENE
MIOCENE
LATE
MIDDLE
EARLY
OLIGOCENE
LATE
EARLY
EOCENE
LATE
MID
0
1.8
3.6
5.3
10
11.2
16.4
20
23.8
28.5
30
33.7
36.9
40
d/c
?
Extensive ice (some grounding)
Limited ice (mainly ice-rafting)
No ice
Unconformity on basement
Unconformity on Beacon S/gp.
d/c Disconformity


Ma
DVDP 11
CIROS 2
MIS 1
SMS 1
CRP 1
CRP 2
CRP 3
DSDP 270
DSDP 272
DSDP 273
QUAT.
PLIO-CENE
MIOCENE
OLIGOCENE
EOCENE
EARLY
LATE
MIDDLE
MID
0
1.8
3.6
5.3
10
11.2
16.4
20
23.8
28.5
30
33.7
36.9
40
d/c
?
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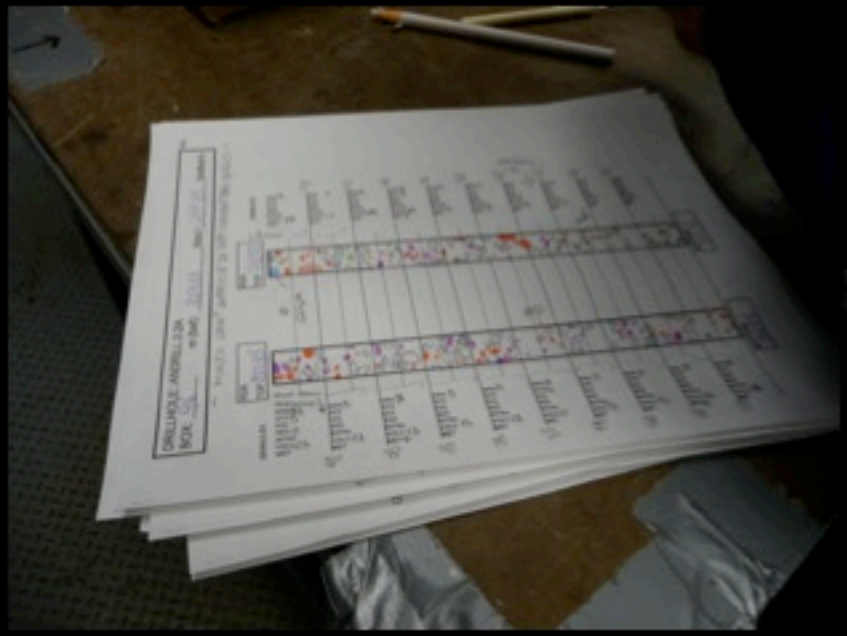
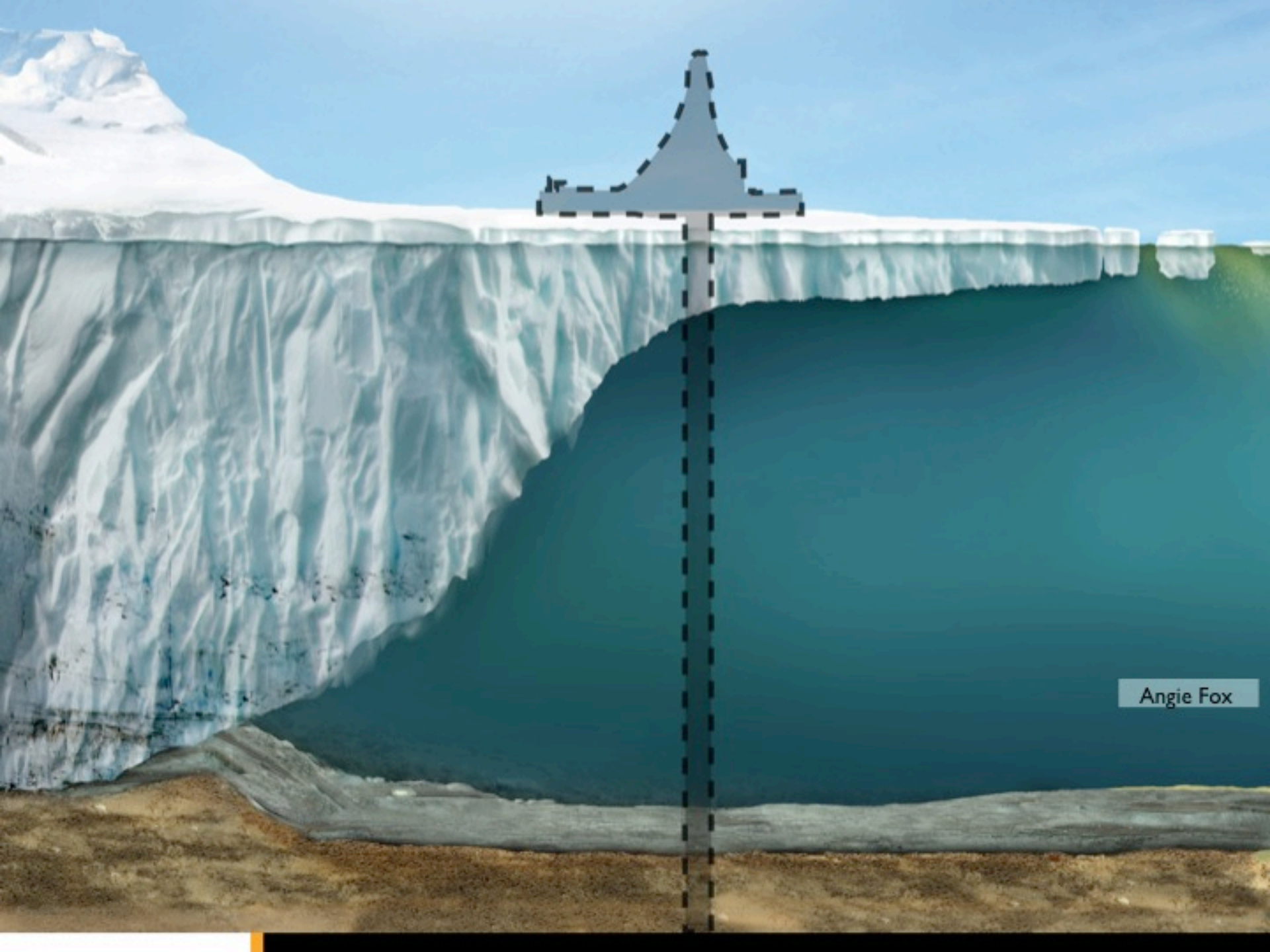
Unconformity on Beacon S/gp.
d/c Disconformity

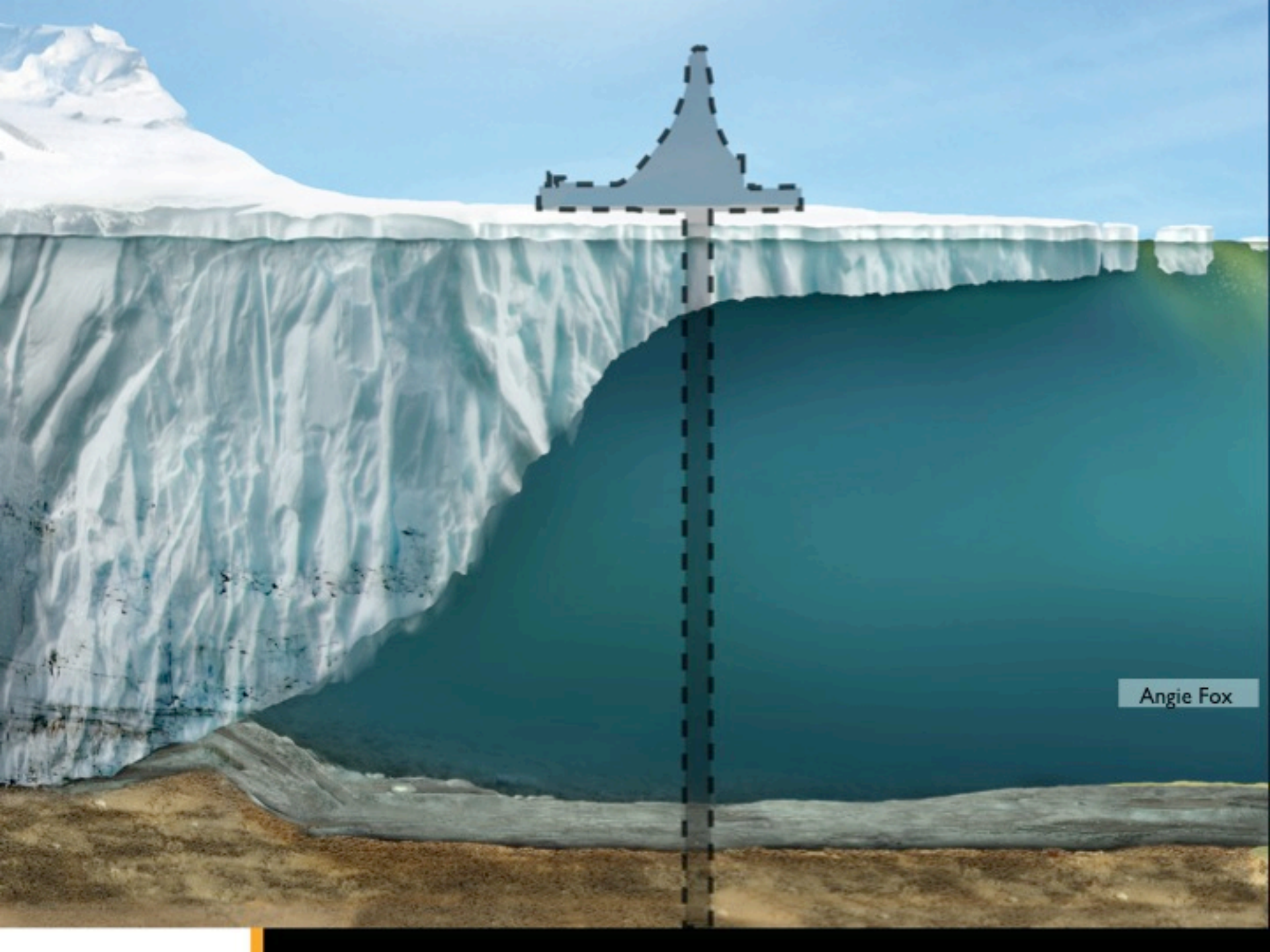


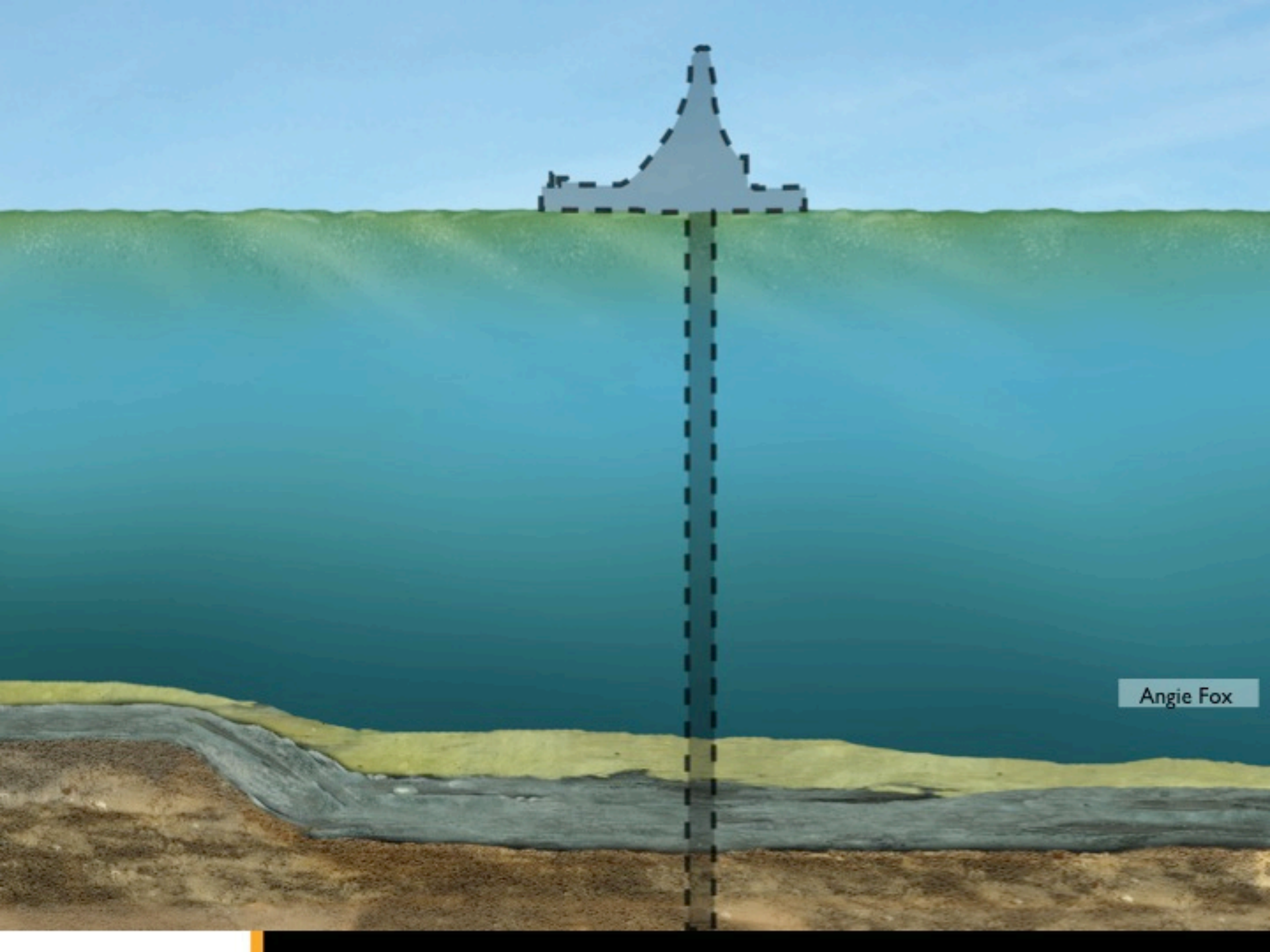
Curation

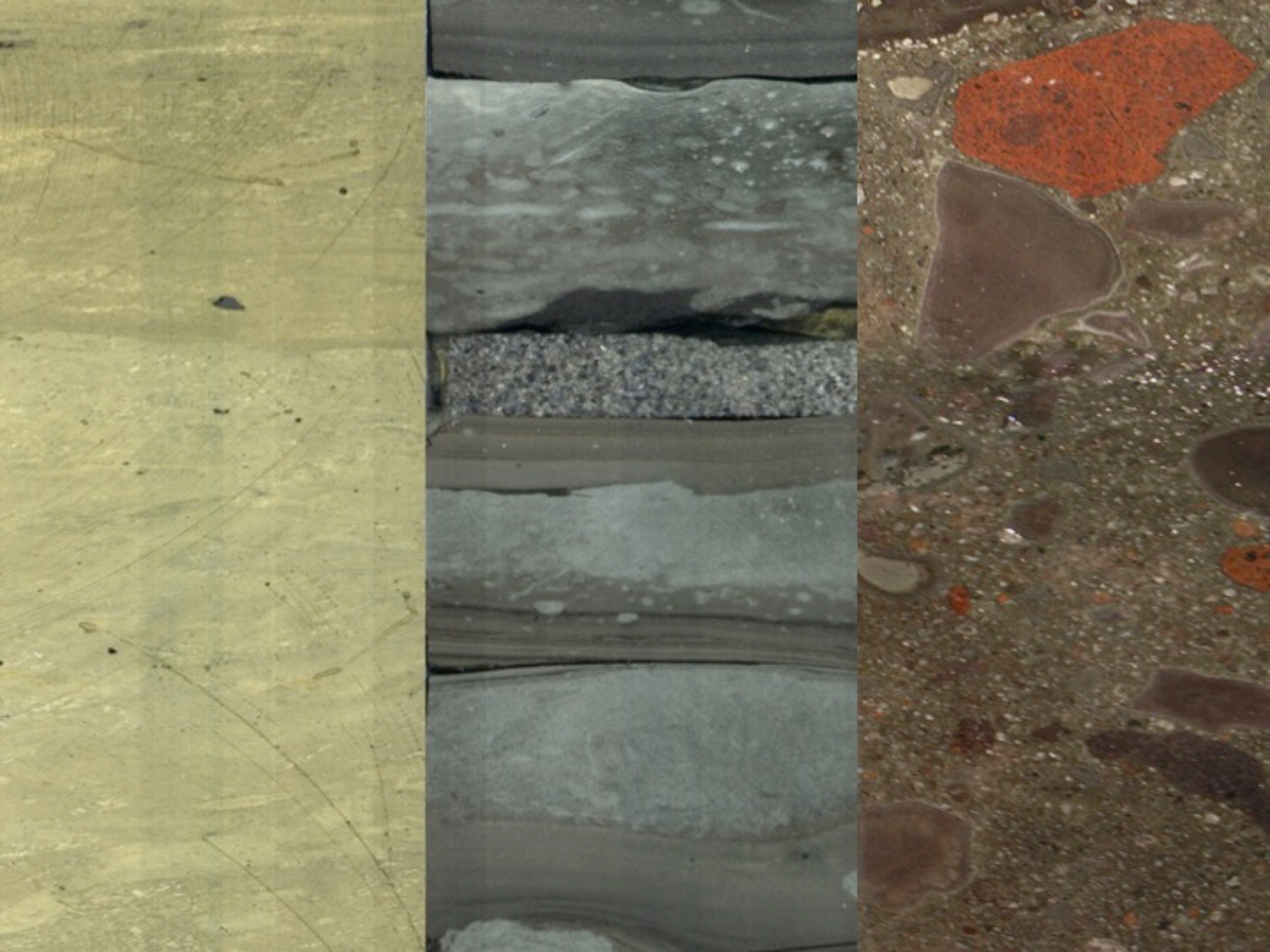
It’s a dirty job!


Angie Fox


Angie Fox

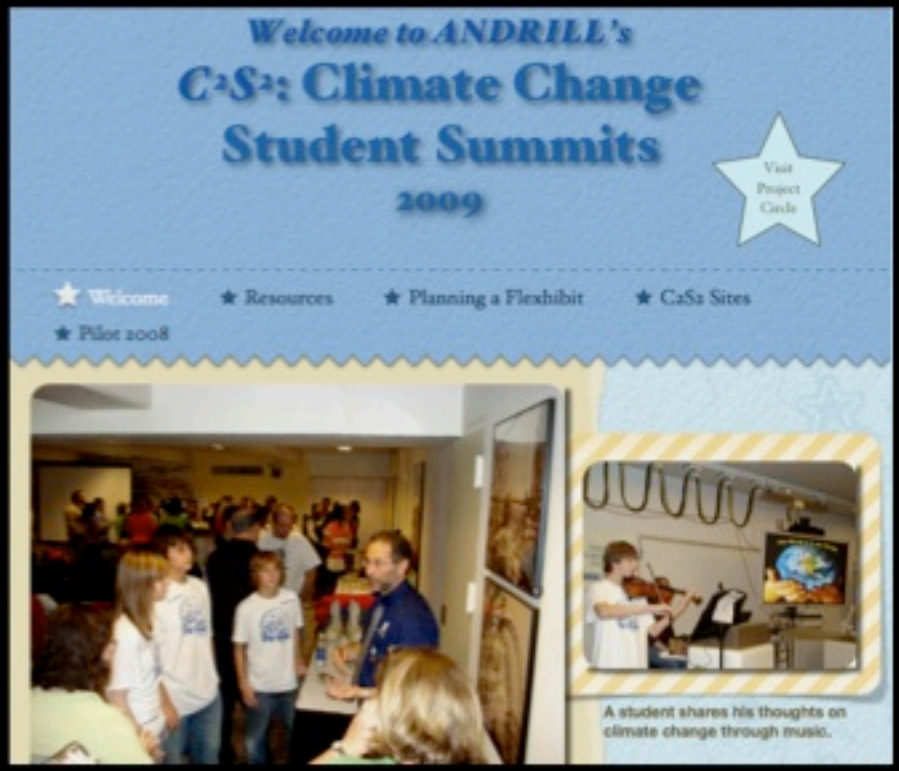

Angie Fox


Angie Fox



www.andrill.org/education

Project Circle



C2S2: Climate Change Student Summits

Questions?

When asking a question, please state clearly:

- ✓ Your Name
- ✓ Your School/Organization
- ✓ Your State or City and Country
- ✓ Who the question is addressed to
- ✓ Your Question

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Thank You!

The archive of this event will be available shortly at: **www.polartrec.com!**

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