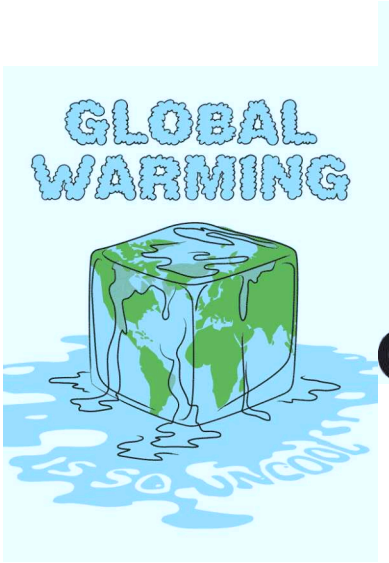
Welcome to ATMS 111 Global Warming

http://www.atmos.washington.edu/2010Q1/111



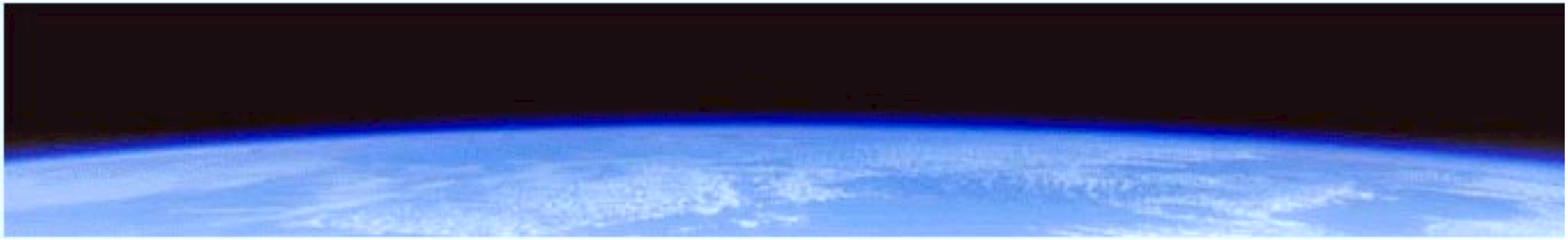

MODIS Snow
GOES Clouds
11:45Z
12/22/2002

Al Gore says global warming “is the only crisis we’ve ever faced that has the capacity to end civilization.”

here receiving the Nobel Peace Prize in 2007

Lowell Wood says, “Human beings are like cockroaches. It’s fairly easy to kill the first 10% of the population. And if you try really hard, you might even get the next 10%. But no matter what you do, you’ll never get the last 10%. We find a way to survive”

Can Dr. Evil save the world?
Rolling Stone, 2006



Instructor - Cecilia Bitz

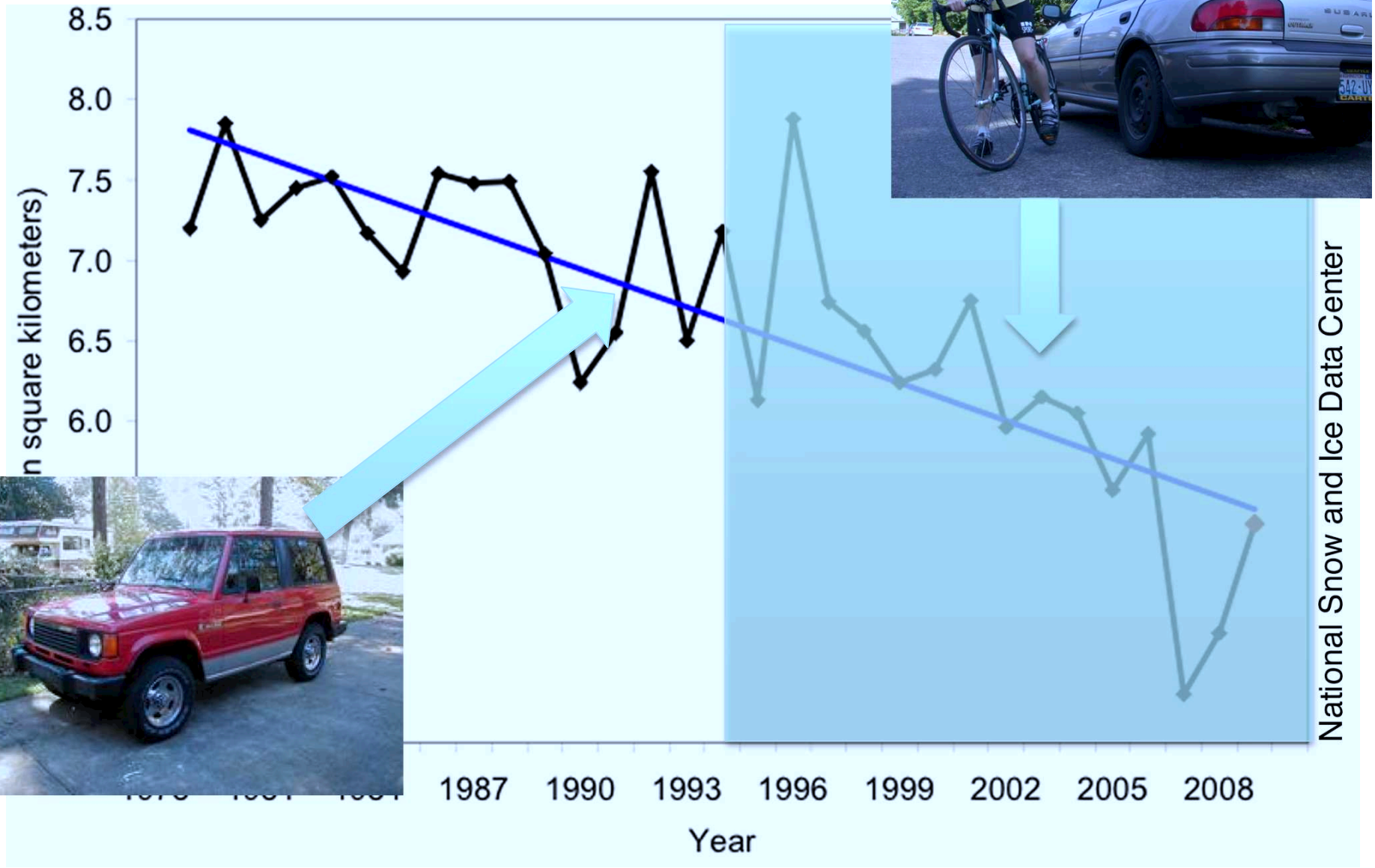
PhD from UW Atmospheric Sciences in 1997

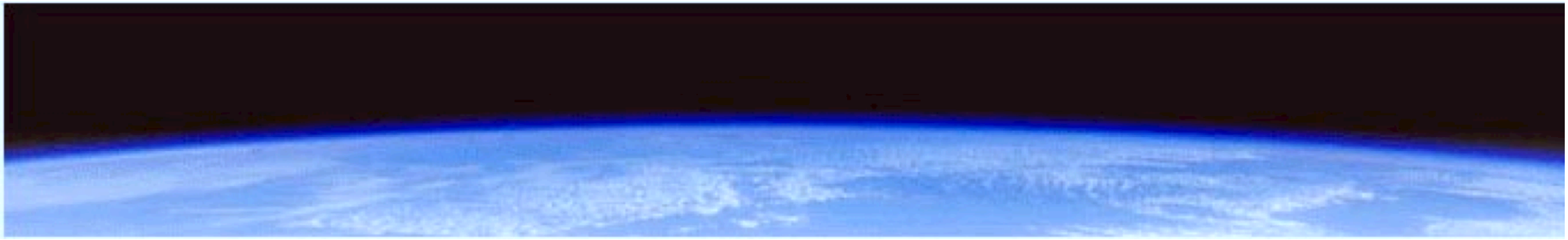
Professor here for 5 years, before that I worked at the UW Polar Science Center for 4 years

Taught “climate change” (catch all for global warming, ice ages, etc), global warming (this class), atmospheric dynamics, climate modeling, etc.

I like to teach and I understand how difficult it can be to learn new ideas!

September Arctic Sea Ice Ext
1979-2009



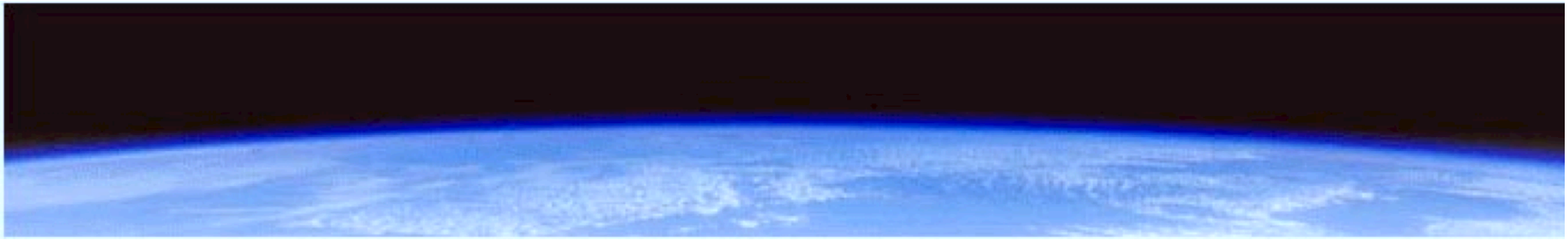


Teaching Assistants

Graduate students in Atmospheric Sciences

Tyler Thorsen

Beth Friedman

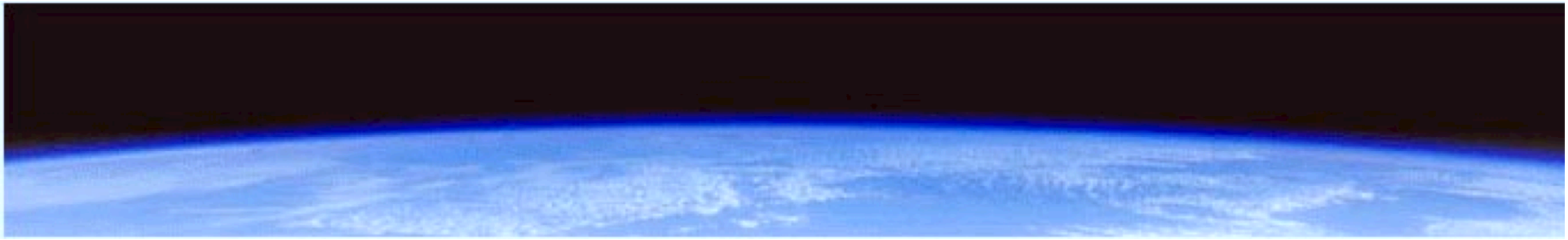


Learning Goals

Explore the science behind global warming and the role of scientific knowledge in formulating effective societal responses.

Learn how to critically evaluate what you hear about climate and global warming.

Gain perspective on related issues such as energy alternatives.

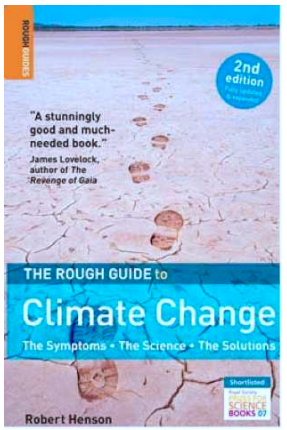


Class outline

Weeks	Topics
1-2	The science behind the global warming problem
3-4	Impacts
5-6	Climate records, long ago and recent past
6-7	Climate modeling and future projections
8	What is the debate?
9-10	Technical solutions, economics and politics

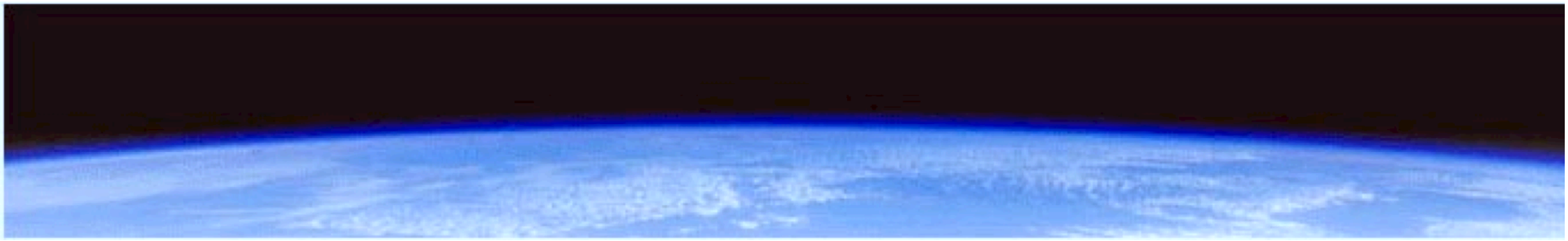
Required course materials

The Rough Guide to Climate Change, 2nd edition by Robert Henson



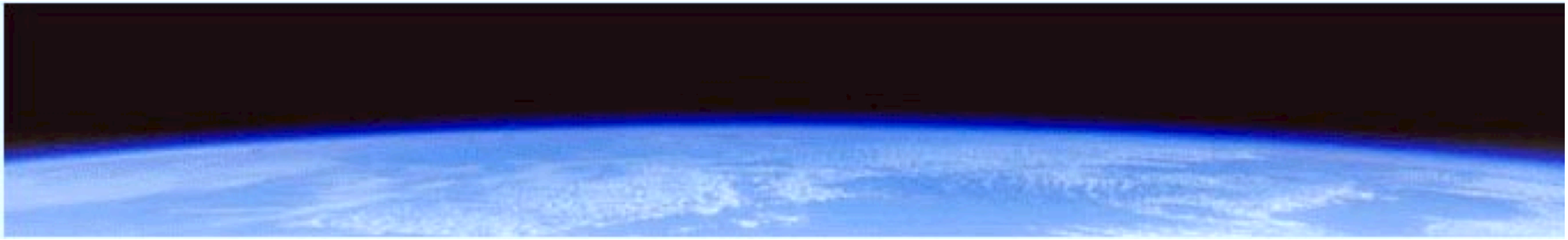
Additional Articles on class web site

"Clickers" for in-class questions and activities



Grading Scheme

Comprehensive Final Exam 25%
Quizzes 40%
Homework 20%
In-class activities 15%
Extra Credit up to 5%



“Quiz” Sections

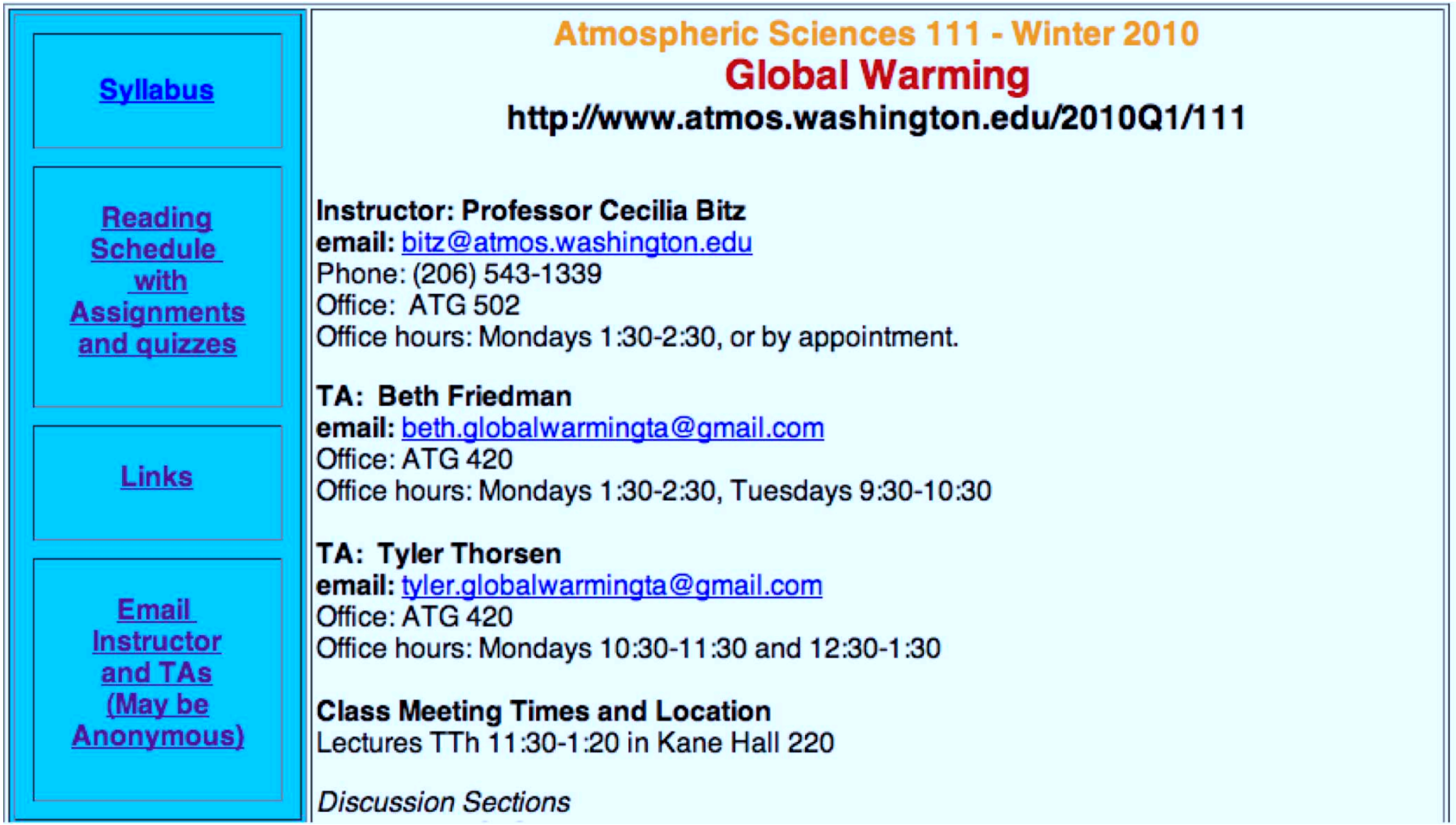
Actually discussion and review sections

With problem solving!

In-class activities for points (no clickers)

Don’t switch section! Or be prepared to stand!

Tour of the Class Homepage



(scroll down for more useful info)

Schedule from the Class Homepage (note reading assignments this week)

Atmospheric Sciences 111 - winter 2010

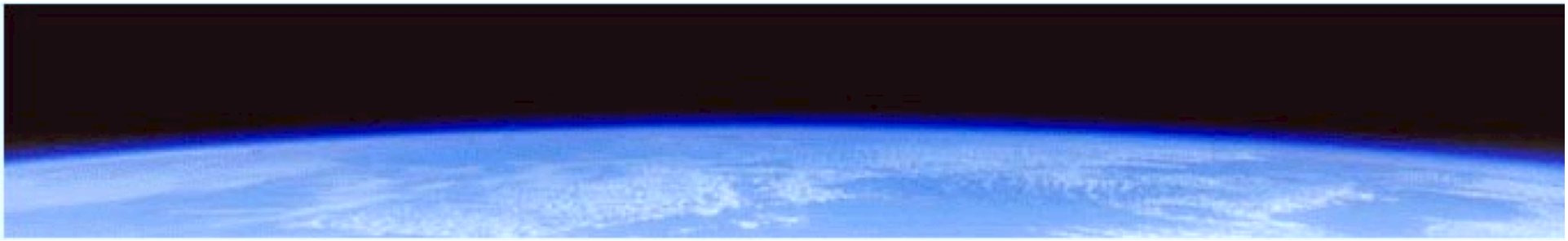
Global Warming

http://www.atmos.washington.edu/2010Q1/111/schedule.html

This schedule will be updated throughout the course. Please check it often.
A pdf of the lecture slides will be posted under the link in the topic column shortly after the lecture.

Homework is given on the our separate Moodle Homework Web Site. You will need the enrollment key given in class.
Instructions to Register your Clicker for this class.

Date	Topic	Reading RG = Rough Guide	Quiz	HW Open/Due
1/5	Climate Change Primer	RG p 3-19		
1/7	Who is Responsible?	RG p 32-42 Copenhagen Accord 2009		
	Sections			HW1 open 1/9
1/12	Causes and Consequences of Climate Change	RG p 20-31		
1/14	Climate Basics	there will be additional reading posted soon		
	Sections			HW1 due 1/15 HW2 open 1/16
1/19	Impacts	RG p 45-74	#1	
1/21	Impacts	RG p 75-105		
	Sections			HW2 due HW3 open

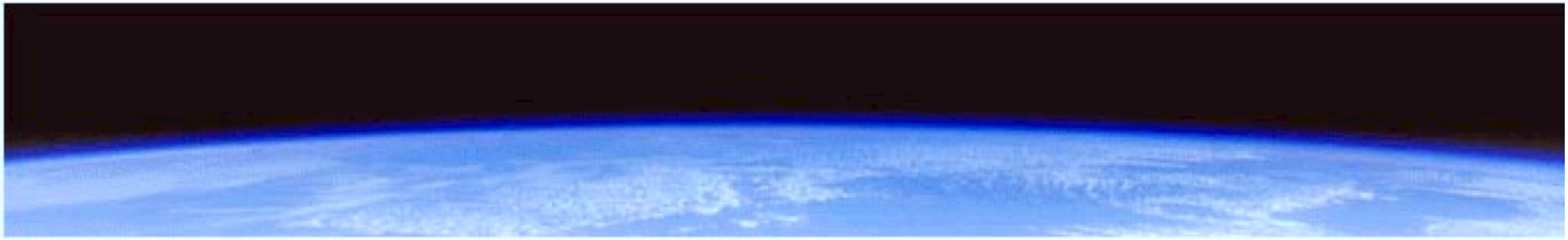


Homework

Online using moodle, link on class web site.
Use Firefox and UWIN ID

Enrollment key: noodle (needed first time only)

Okay to discuss problems, but submit your own work

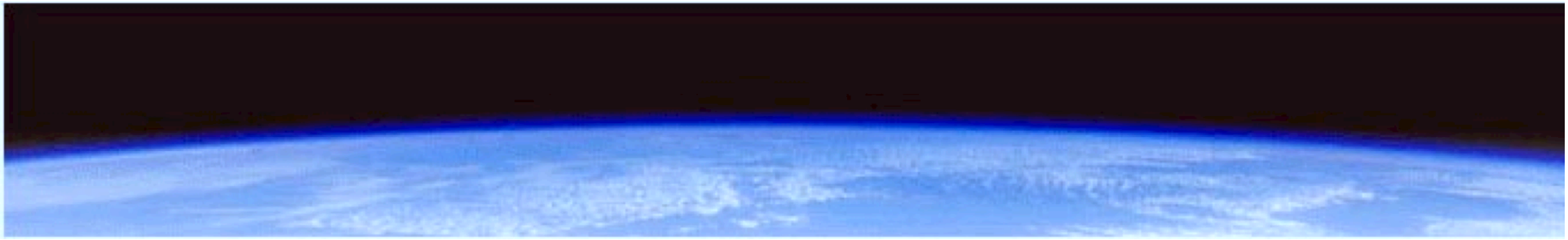


Clicker questions

Half credit for wrong answers

Full credit for right answers and survey questions (no right answers)

Use only your clicker

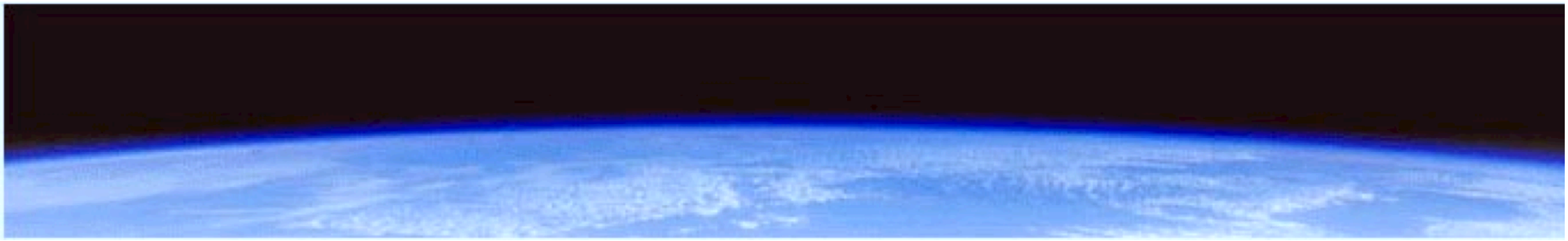


Recommended Lecture (optional)

Title: Peak Oil, Peak Coal and Climate Change

Friday, January 8, 2010 3:30–4:50 p.m.,
Johnson Hall 075. DO NOT LEAVE EARLY

Speaker: James Murray, Professor, Chemical Oceanography, UW



Survey inspired by Washington Post in Dec 2009

I will compare your answers with those from the general public

Do you think the federal government should regulate the release of greenhouse gases from sources like power plants, cars and factories in an effort to reduce global warming?

65% should

29% should not

What if that significantly lowered greenhouse gases but raised your monthly energy expenses by 10 dollars a month?

60% should

37% should not

It's been proposed that the United States and other developed countries contribute 10 billion dollars a year to help developing countries pay for reducing the amount of greenhouse gases they release. Is this something you support or oppose?

39% support

57% oppose

How much do you trust the things that scientists say about the environment - completely, a lot, a moderate amount, a little, or not at all?

		in 2007
29%	a lot or completely	32%
30%	moderately	43%
40%	a little or not at all	19%

Do you think (most scientists agree with one another) about whether or not global warming is happening, or do you think (there is a lot of disagreement among scientists) on this issue?

36% most agree

62% a lot of disagreement

On a final subject, are you a fan of professional golf, or not?

	in 2001
22% yes	27%
72% no	64%

Extra Credit

Write one good class question about global warming (science, politics, etc – not golf though)

Receive a 1% grade boost,
with extra 1% if used in class

Must be willing to have your name credited

Enter on moodle

Picture of earth edge taken from the Shuttle over Brazil at sunset

Radius of earth = 6380 km

Depth of atmosphere = 30 km (99% of mass)

Ratio = 0.5%!

Weather versus Climate

Weather varies from one day to the next

Climate is the statistic (such as the average) of weather, varies on years to decades to longer

Examples:

Wednesday will be a sunny day - weather

This winter is dryer than normal - climate

Can we predict each of these examples? Yes

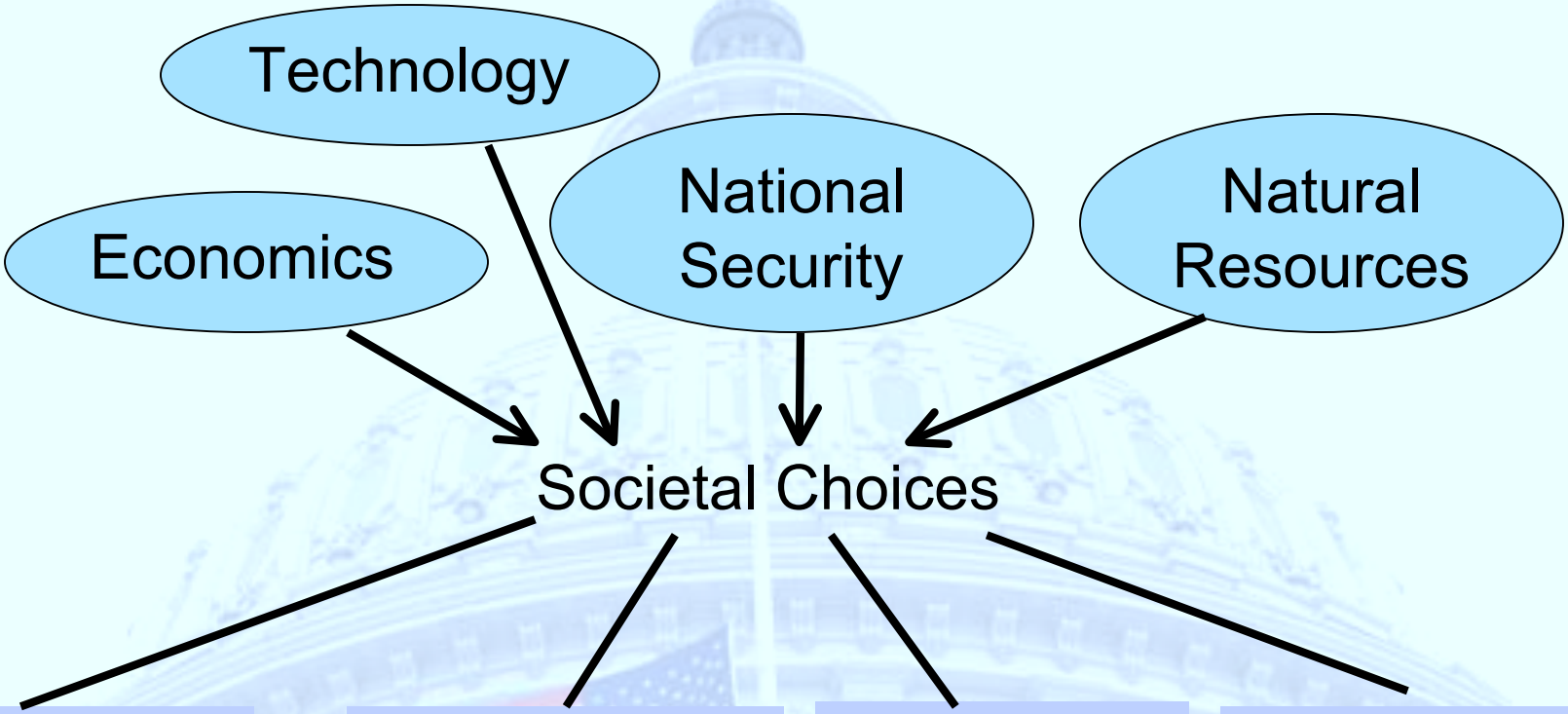
What factors influence climate?

- Sunshine (latitude)
- Topography
- Proximity to oceans and large lakes (heat capacity)
- Atmospheric composition
- Ocean currents
- Biota

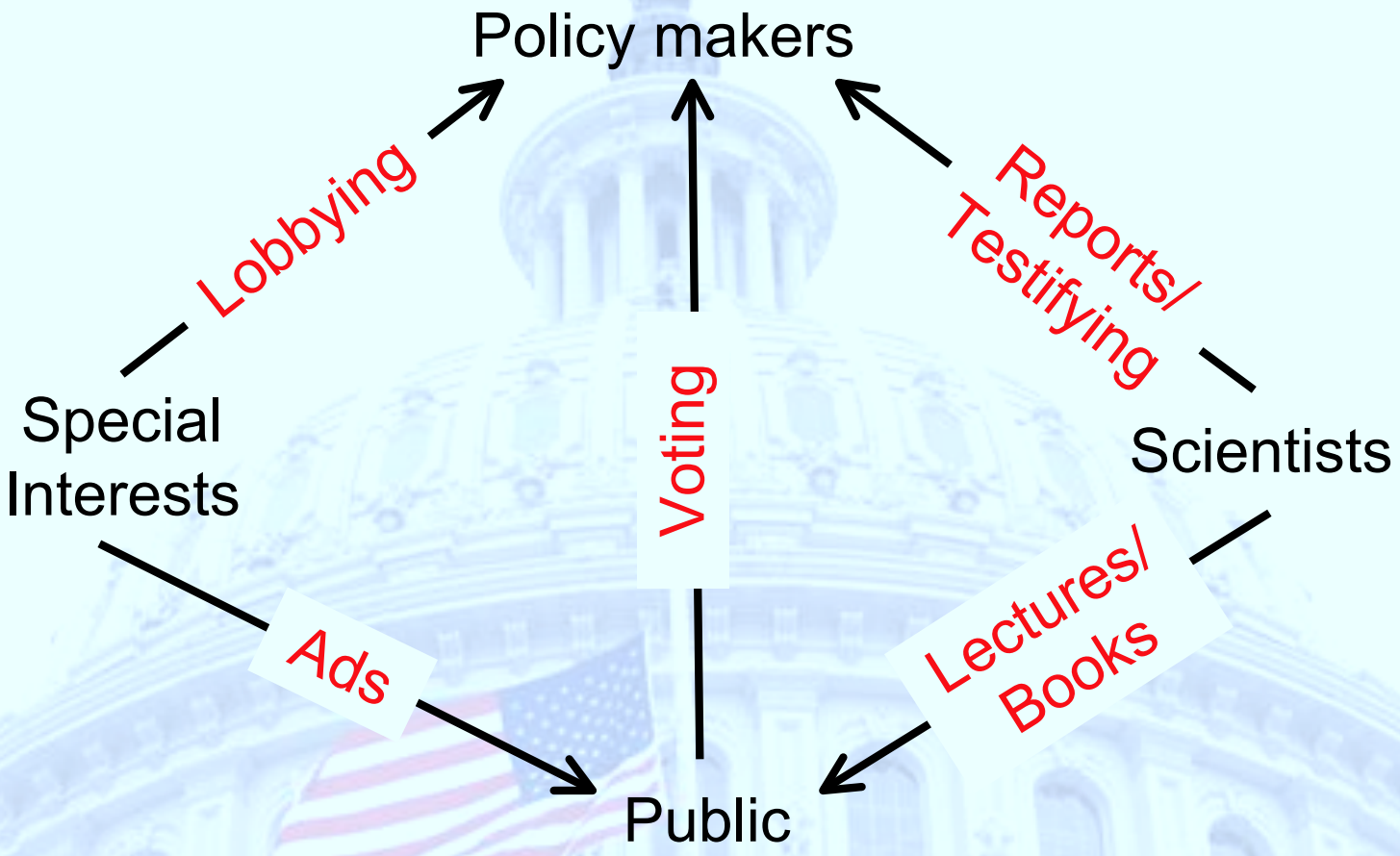
Where science informs public policy

Public health – immunizations, quarantines
Toxic substance control – asbestos, mercury
Regulation of smoking, drugs
National defense
Emergency preparedness
Fisheries and wildlife protection
Use of genetically modified plant species
Transportation safety
Water management

Global Warming Policy Issues



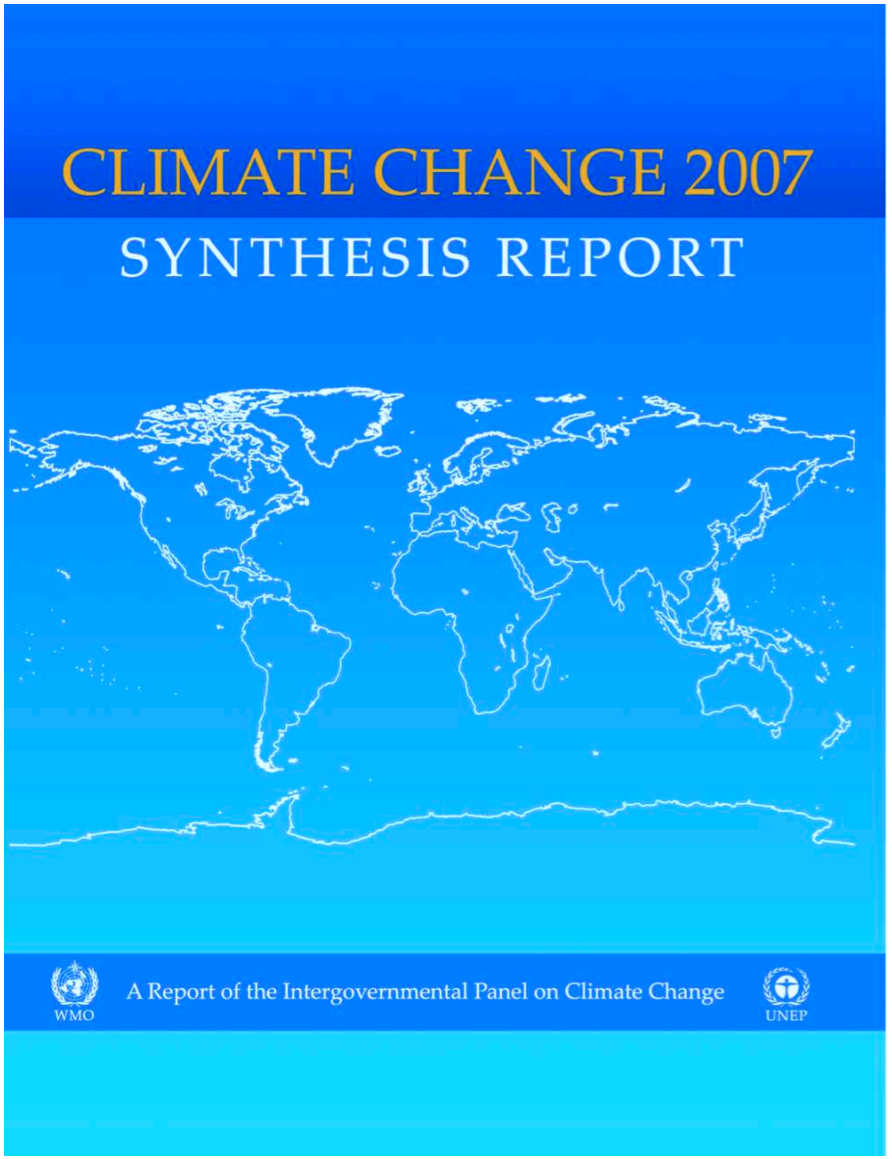
How science informs policy



How scientists communicate with policy makers

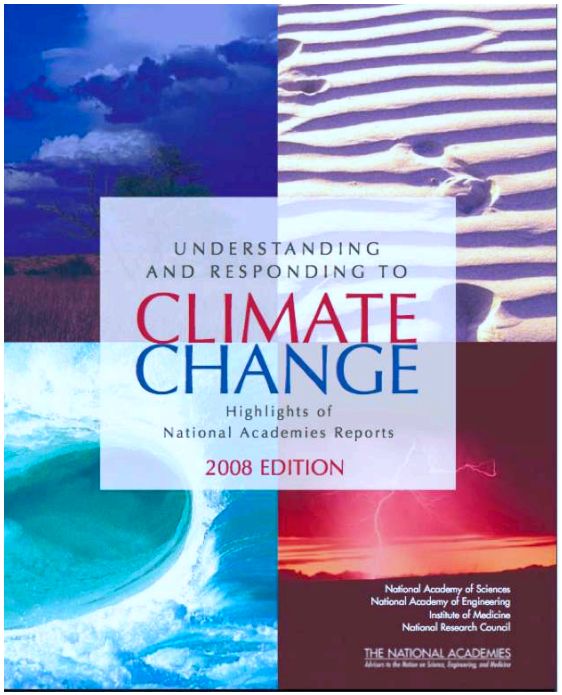
Intergovernmental Panel on Climate Change

Authors shared Nobel Peace Prize with Al Gore



THE NATIONAL ACADEMIES
Advisers to the Nation on Science, Engineering, and Medicine

America's CLIMATE CHOICES



Study groups commissioned by agency (eg congress, white house, navy)

Write reports

Scientists differ in their view of scientific advocacy

James Hansen

writings from his web site

In 2006, the top climate scientist at NASA, **James Hansen,** said the Bush administration tried to gag him from speaking publicly after he gave an academic lecture calling for prompt reductions in greenhouse gases.

Tell Barack Obama the Truth – The Whole Truth

Now our planet itself is in peril. Not simply the Earth, but the fate of all of its species, including humanity. The situation calls not for hand-wringing, but rather informed action.

Can we defuse

The Global Warming Time Bomb?

All glaciers in Glacier National Park are retreating inexorably to their final demise. Global warming is real, and the melting ice is an apt portent of potentially disastrous consequences.

Lead author of the 2007 IPCC AR4 **Susan Solomon** was asked by a reporter "to sum up what kind of urgency this sort of report should convey to policy makers"

She answered, "I can only give you something that's going to disappoint you, sir, … it's not my role to try to communicate what should be done. I believe that is a societal choice. I believe science is one input to that choice, and I also believe that science can best serve society by refraining from going beyond its expertise. In my view, that's what the IPCC also is all about, namely not trying to make policy-prescriptive statements, but policy-relevant statements."


MIKE LUCKOVICH
LET US ENDEAVOR TO AT LEAST COME UP WITH A CATCHIER SLOGAN...
CLIMATE SUMMIT
JUST STUDY IT.

International policy arise from UNFCCC

Copenhagen Climate Conference is an example

Read Copenhagen Accord for Thursday

and find out what these terms mean:

UNFCCC

COP

REDD (why is it so controversial?)

Anex 1 and 2

Questions posed in Ch 1 Rough Guide

Is the planet really warming up?

But don't many experts claim that the science of climate is uncertain?

Is a small temperature rise a big deal?

How could humans change the climate?

When did we discover the issue?

Couldn't the changes have natural causes?

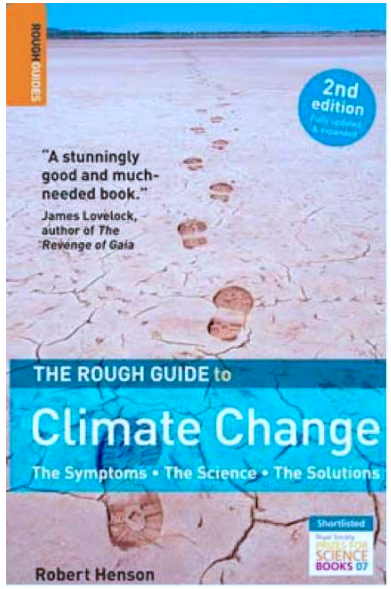
Could some undiscovered phenomenon be to blame?

How do rainforests fit into the picture?

Was Hurricane Katrina related to global warming?

Whatever happened to global cooling?

And the ozone hole?



Is the planet really warming up?

Is it a small amount?

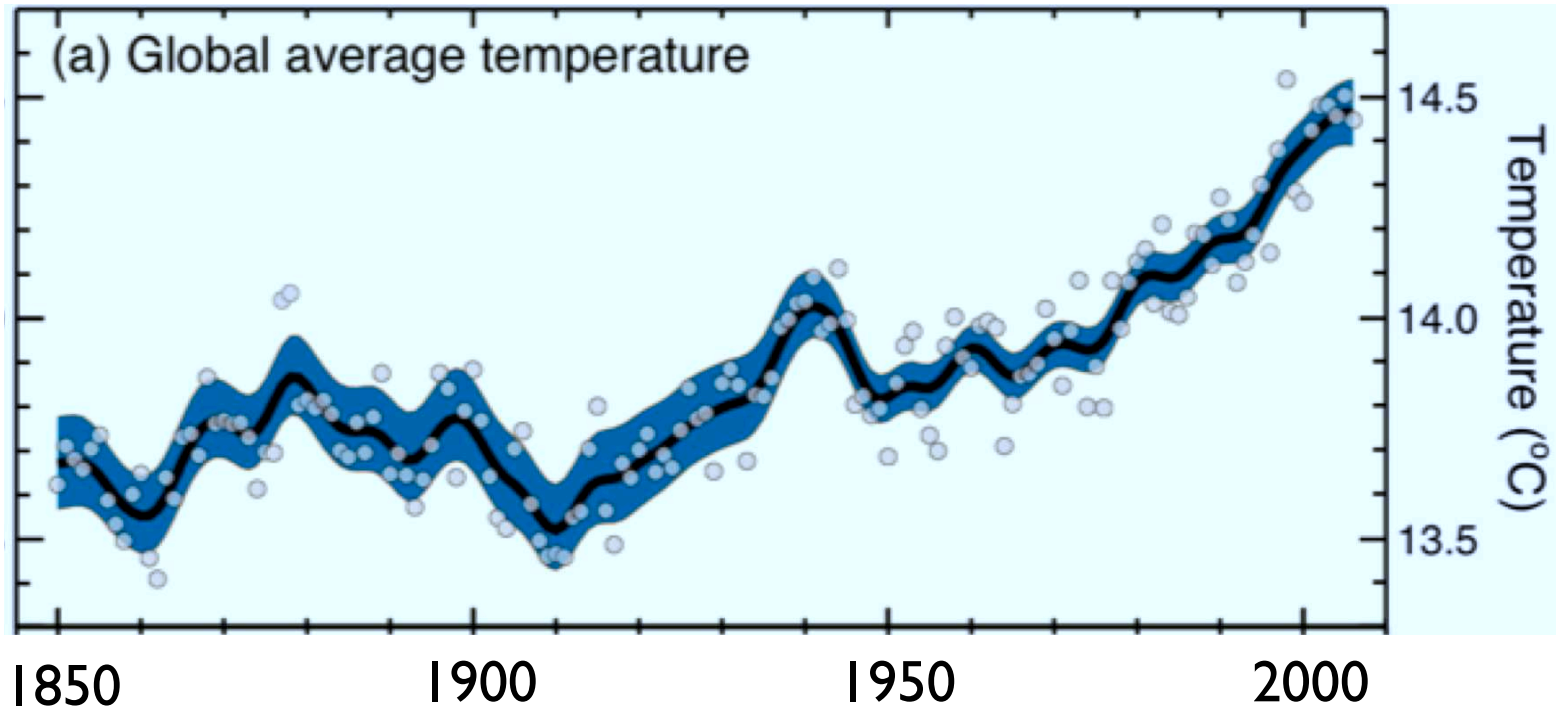
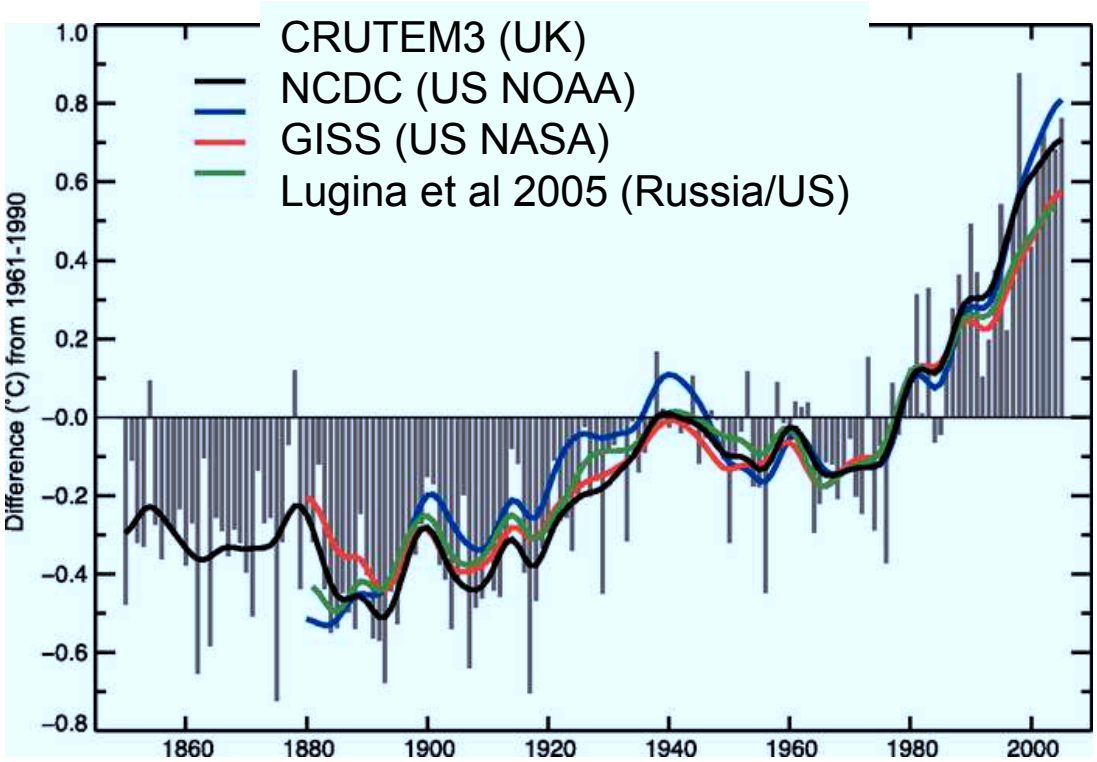


Figure from 2007 IPCC Summary for Policy Makers (SMP)

Were the data tampered with?

Most of the recent hubbub was about how tree ring data were used to produce a record of the past 1000 years.

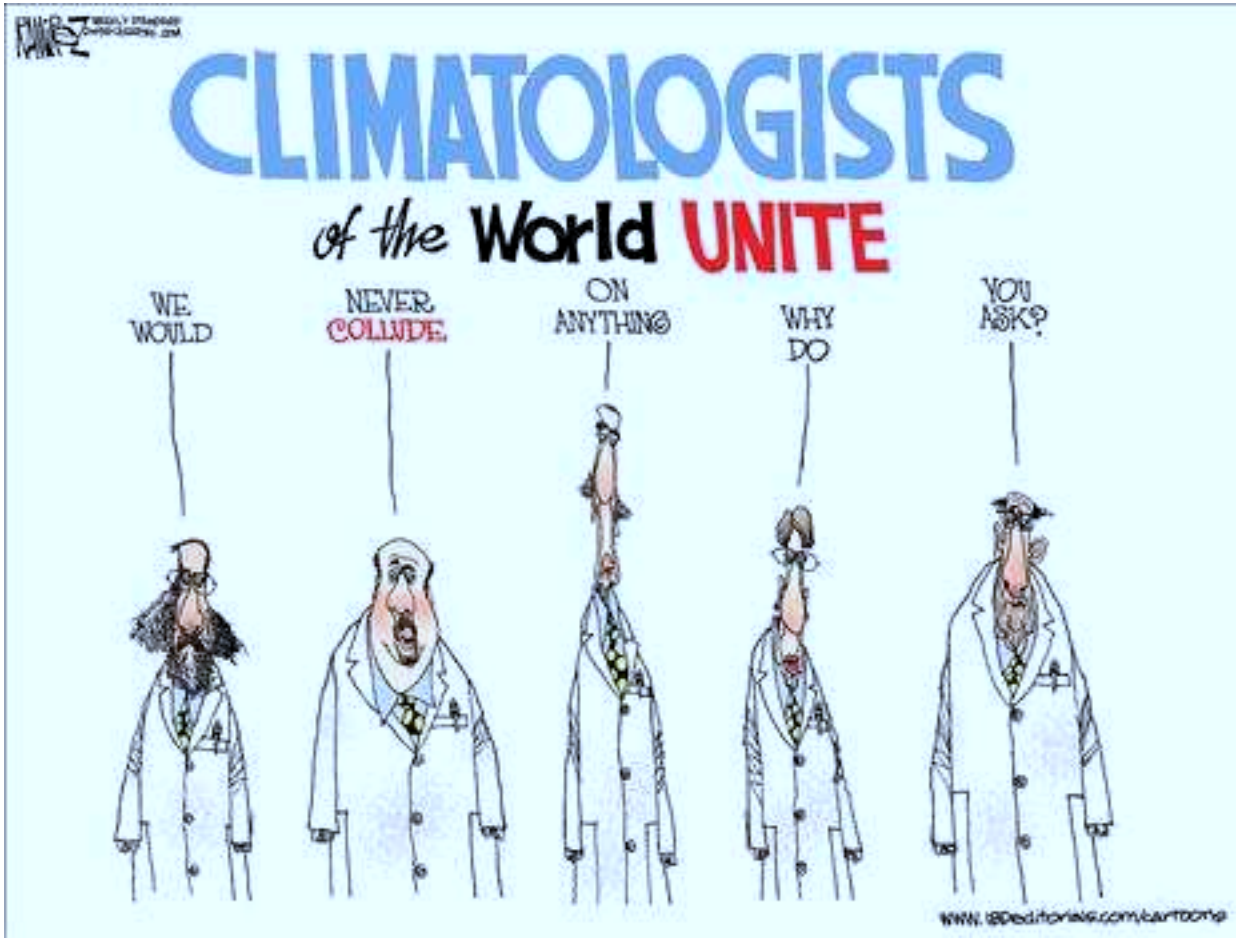


This record since 1850 is ONLY THERMOMETER DATA

Independent groups use different weights. For example, CRUTEM3 uses 68% of NH mean + 32% of SH mean and GISS uses area weight of 0.3, 0.4, and 0.3 for northern, tropical, and southern regions of these proportions.

Figure 3.1 from 2007 IPCC, note greater detail in main report

Skeptic's Humor



Michael Ramirez

More thermometer data, analyzed by NASA GISS

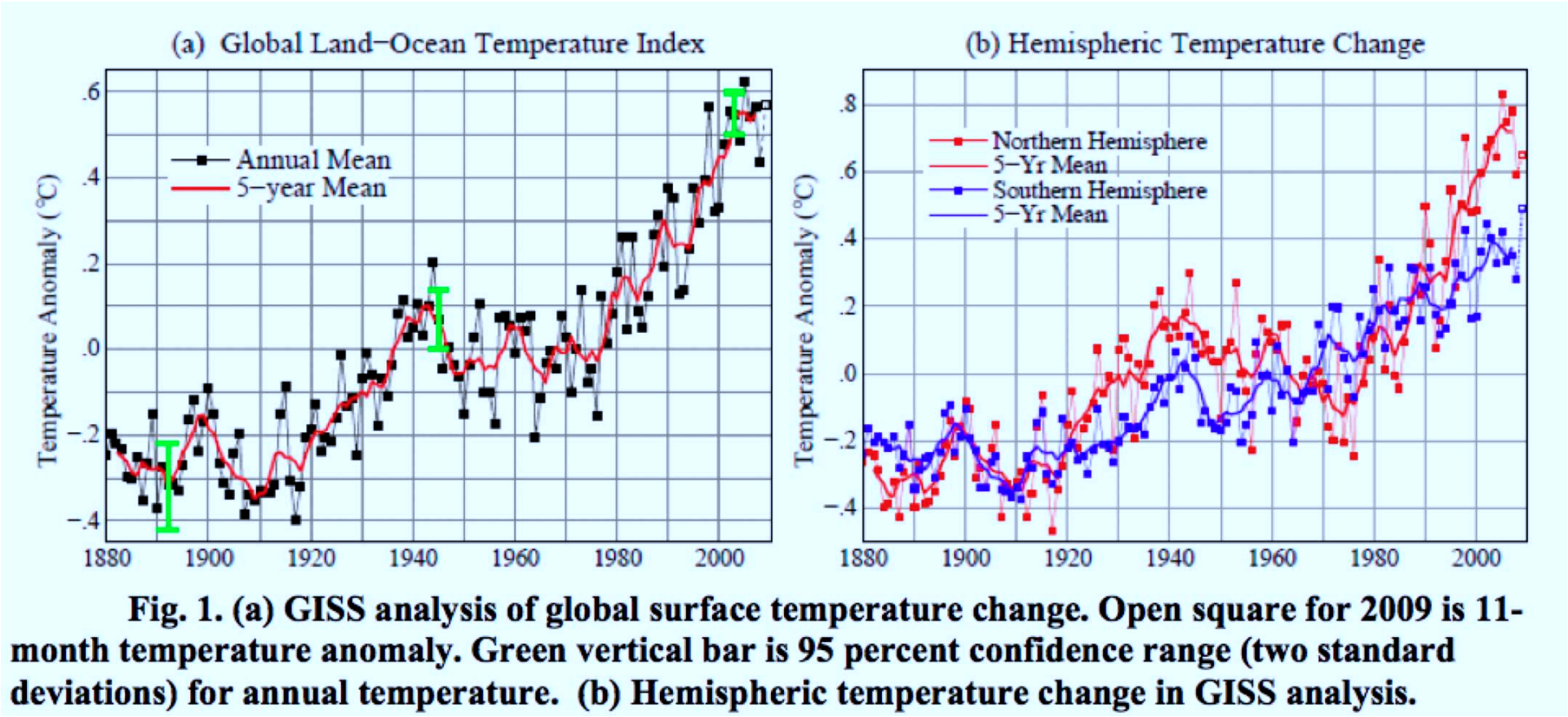


Fig. 1. (a) GISS analysis of global surface temperature change. Open square for 2009 is 11-month temperature anomaly. Green vertical bar is 95 percent confidence range (two standard deviations) for annual temperature. (b) Hemispheric temperature change in GISS analysis.

From excellent essay by James Hansen

http://www.columbia.edu/%7Ejeh1/mailings/2009/20091216_TemperatureOfScience.pdf

A few **climate scientists** cling to views that are at odds with the overwhelming scientific consensus

For example, **Richard Lindzen** at MIT

Proposed that increased CO_2 will decrease water vapor in the upper troposphere (a cooling effect) -- an idea that has been examined and found at odds with observations

"It is generally accepted that a doubling of CO_2 will only produce a change of about 2 deg F [1.1 deg C] if all else is held constant. This is unlikely to be much to worry about." Wall Street Journal Op-ed Nov 30, 2009.

Since 1850 Earth has warmed 0.7 deg C while CO_2 increased by 30%

But don't many experts claim that the science of climate is uncertain?

Headlines in May 2008: “31,000 Scientists Reject Global Warming Agenda - 9,000 with PhDs”

The National Science Foundation reports there are 711,800 doctoral scientists and engineers in the US. See http://www.nsf.gov/statistics/nsf09317/
Hence 1.25% of PhDs signed the petition - mostly not climate scientists.

Petition

We urge the United States government to reject the global warming agreement that was written in Kyoto, Japan in December, 1997, and any other similar proposals. The proposed limits on greenhouse gases would harm the environment, hinder the advance of science and technology, and damage the health and welfare of mankind.

There is no convincing scientific evidence that human release of carbon dioxide, methane, or other greenhouse gases is causing or will, in the foreseeable future, cause catastrophic heating of the Earth's atmosphere and disruption of the Earth's climate. Moreover, there is substantial scientific evidence that increases in atmospheric carbon dioxide produce many beneficial effects upon the natural plant and animal environments of the Earth.

Please sign here

☒ Please send more petition cards for me to distribute.

My academic degree is B.S. ☐ M.S. ☐ Ph.D. ☒ in the field of PHYSICS