TOPIC # 17
GLOBAL WARMING
WRAP-UP

“I'm extremely concerned that the Earth has a chronic disease, and that chronic disease is CO2 syndrome, it's something that's creeping on us.

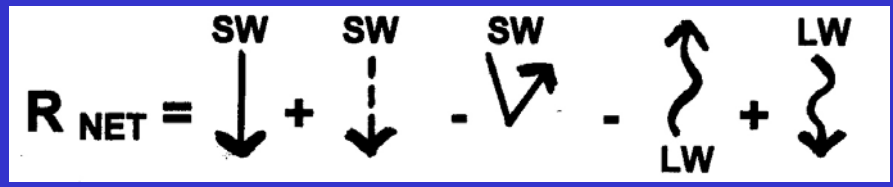
We have plenty of fossil fuel so it's going to continue to get worse, and it's going to affect every aspect of life on the planet, from food production to drinking water to coastlines to the plight of the poor in the tropics, and so forth.”

~Wally Broecker , Paleoclimatologist

Recap of:

RADIATIVE FORCING

(linked to Radiation Balance!)



(expressed in Watts per square meter (Wm-2)

(def) a measure of the influence a factor has in altering the balance of incoming & outgoing energy in the Earth-atmosphere system

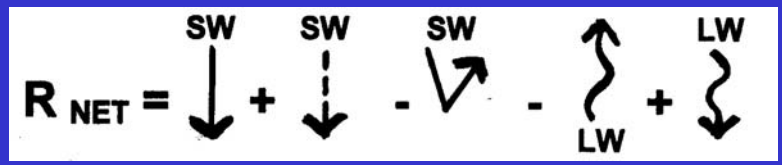
We'll start with a re-cap of Class Notes p 113

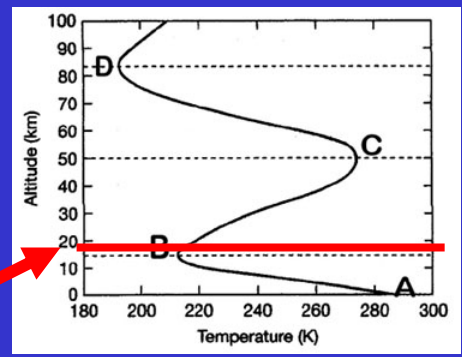
p 113

The IGC GLOSSARY has a more SPECIFC DEFINITION:

RADIATIVE FORCING =

A term for the <u>change</u> in <u>net</u> downward infrared flux (net LW down)





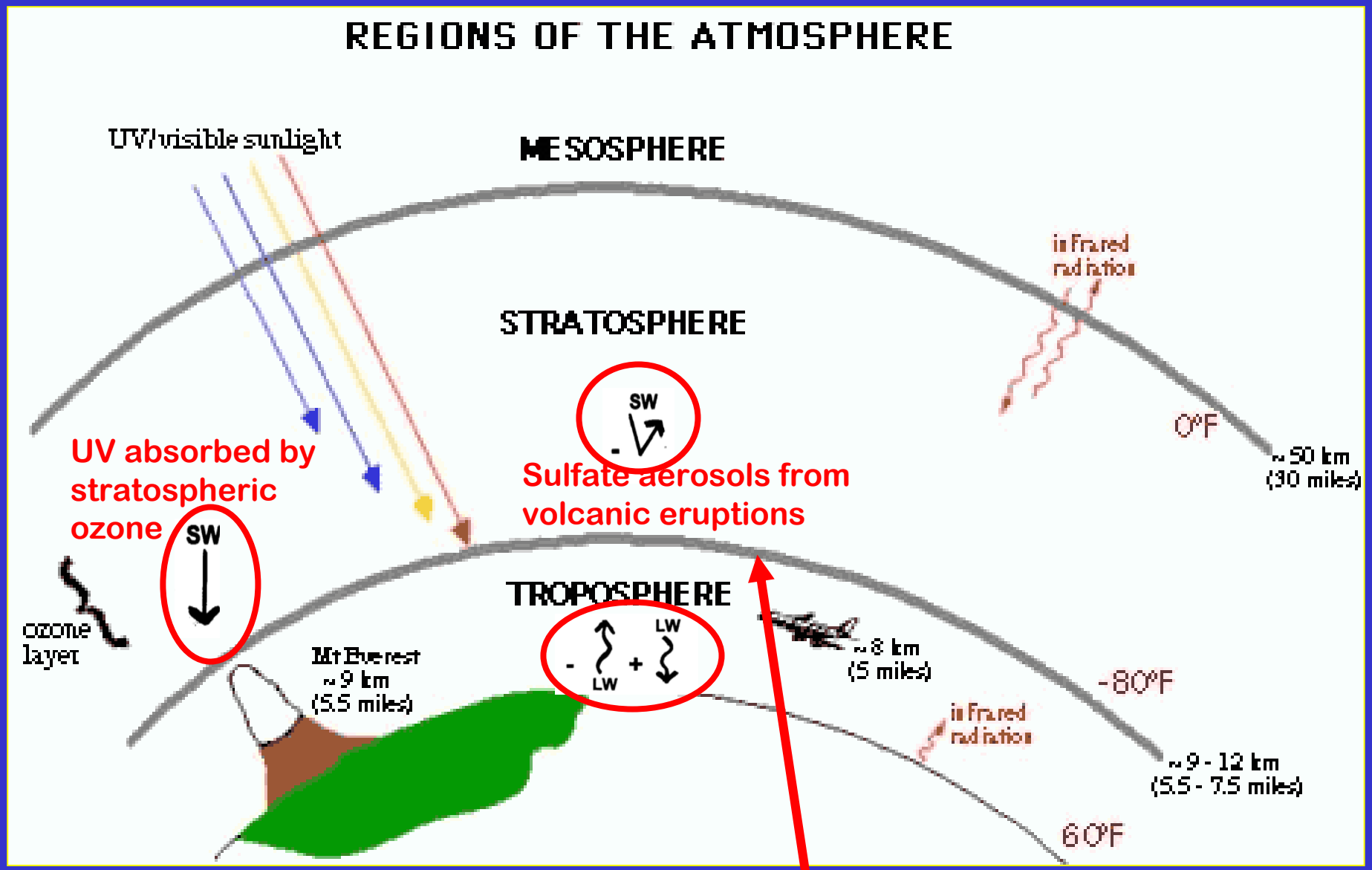
-- measured at the <u>tropopause</u>

(i.e., at the top of the troposphere but below the stratosphere)

-- caused by a given factor

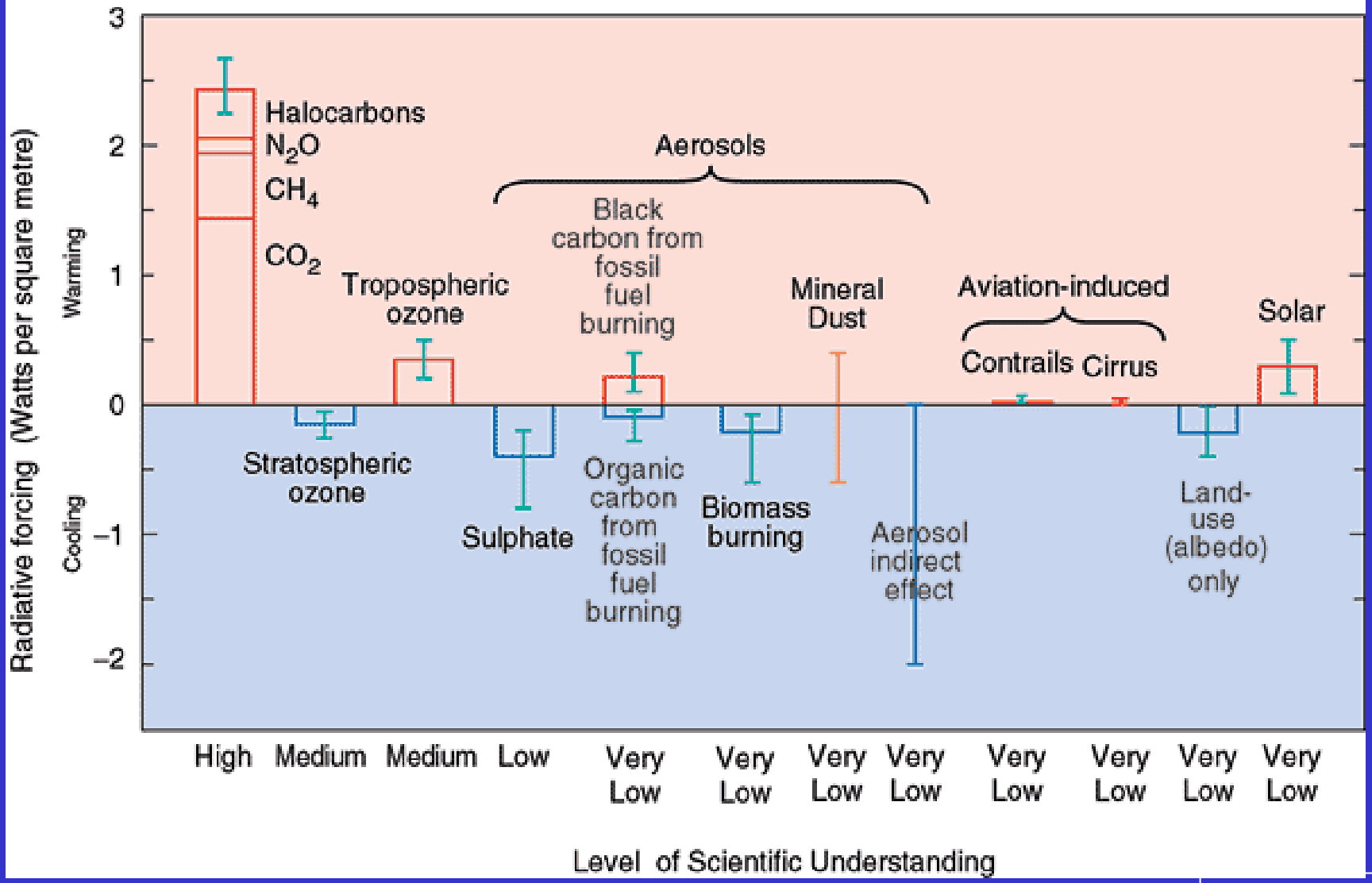
(e.g., a concentration of a GH gas, clouds, or aerosols)

See definition on IGC p 413



Radiative forcing due to atmospheric gases is measured at <u>tropopause</u>

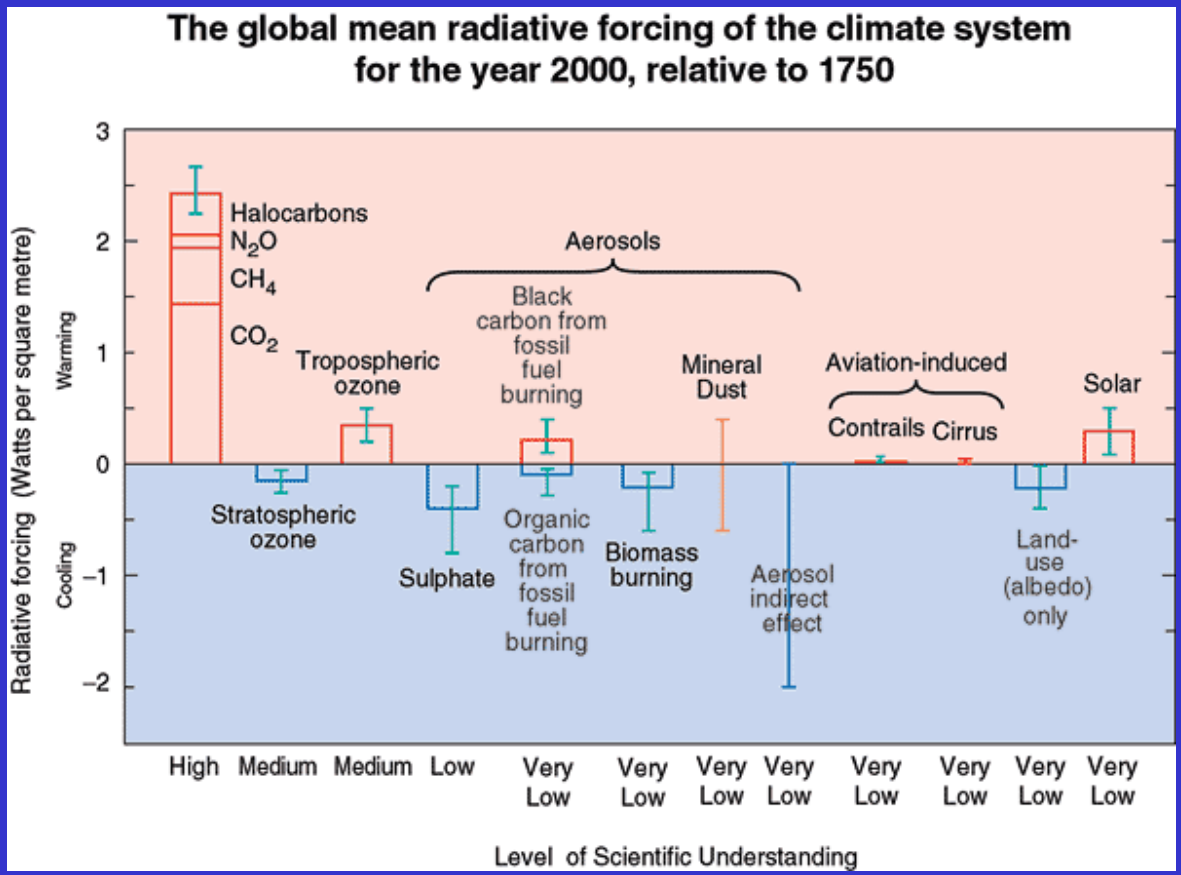
The global mean radiative forcing of the climate system for the year 2000, relative to 1750

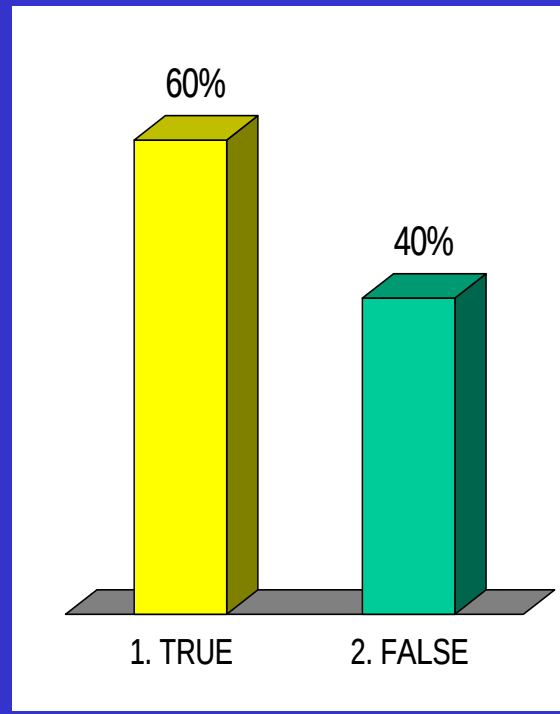


The figure shows that the forcing mechanism that is *BEST* understood by scientists is also the one that leads to the greatest climatic impact.

1. 1.TRUE
2. 2. FALSE

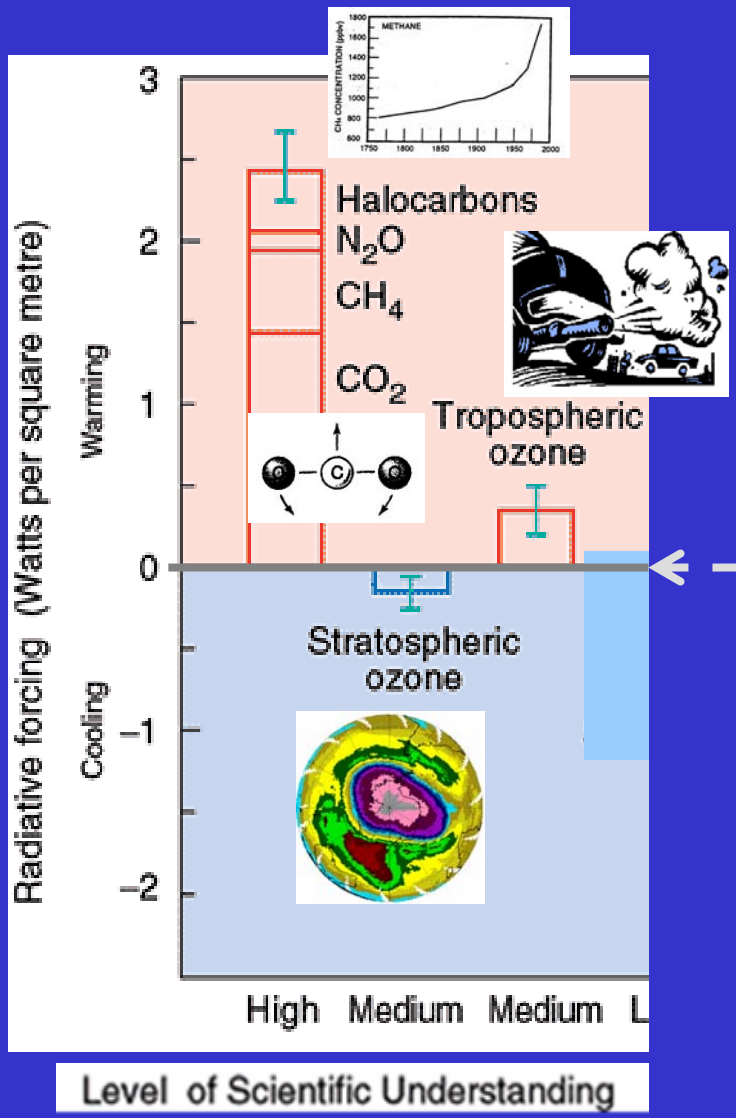
YELLOW = correct answer!





ROLE OF GASES in the atmosphere:

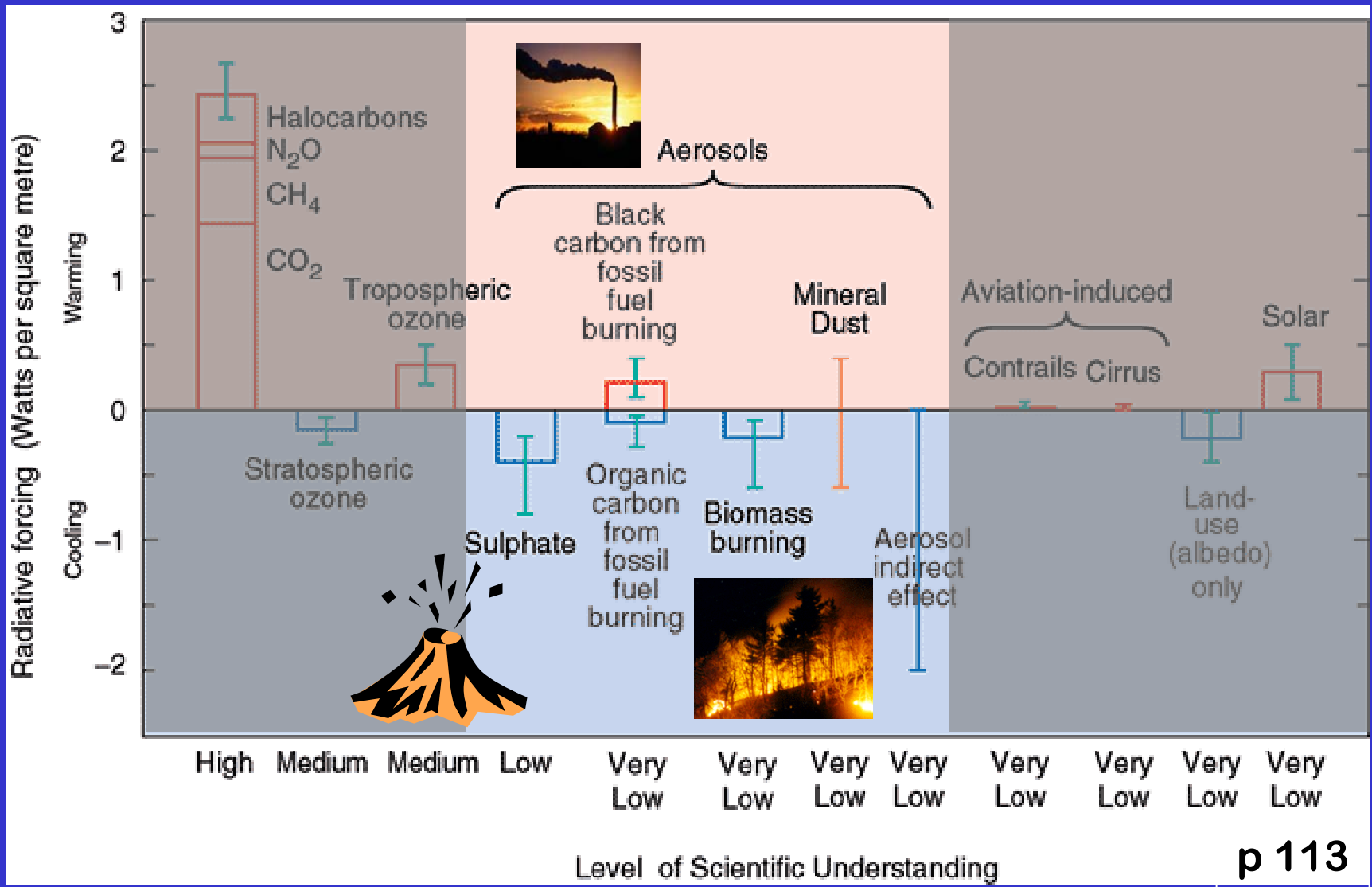
Relative net radiative forcing in the year 2000, when compared to the year 1750) contributed by different gases in the atmosphere



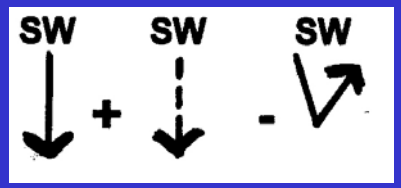
If the forcing is <u>POSITIVE</u> (above the horizontal line) it means that an increase in that gas or factor contributes to WARMING in the troposphere.

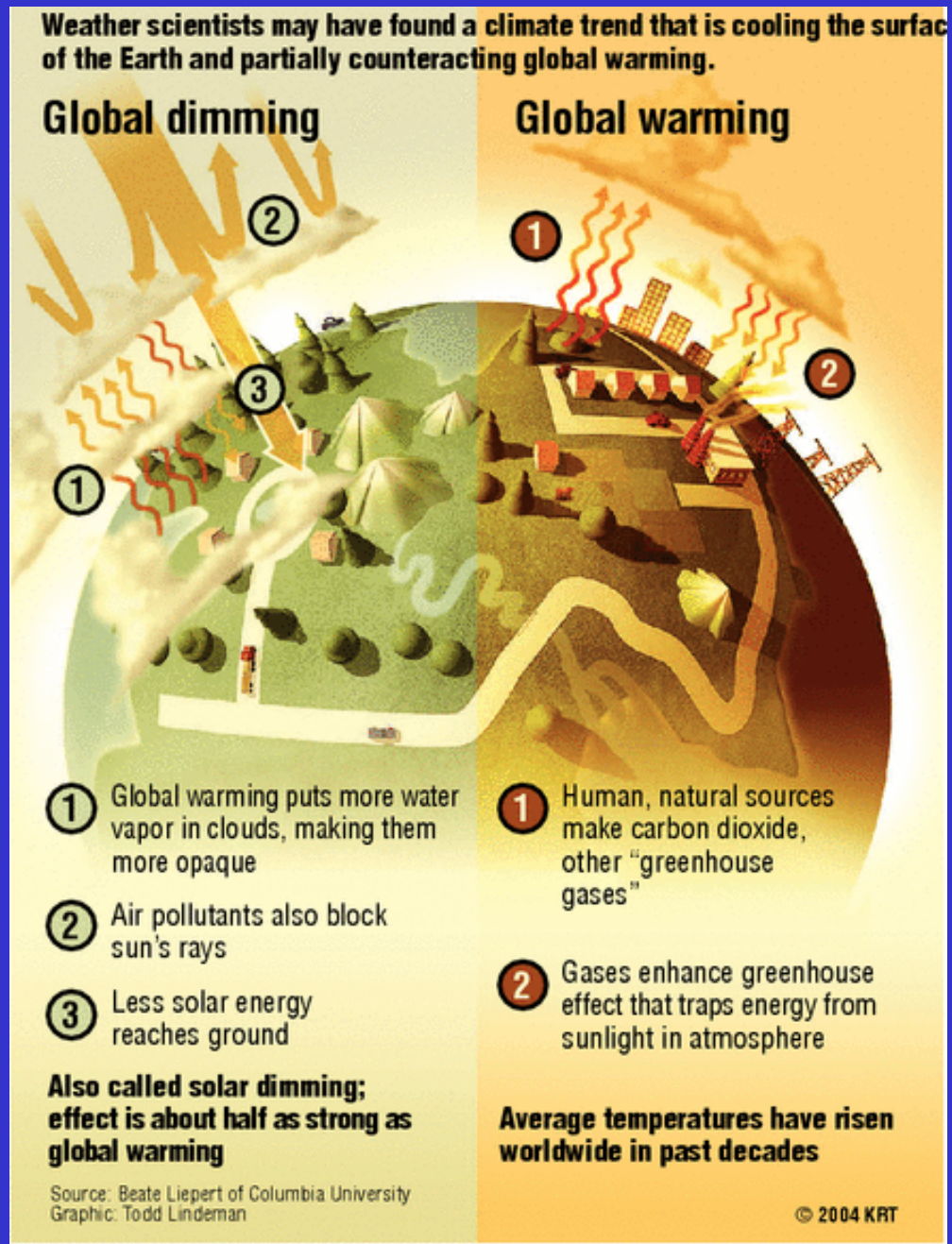
If the forcing is <u>NEGATIVE</u> (below the line) it means that an increase in that gas or factor contributes to COOLING in the troposphere.

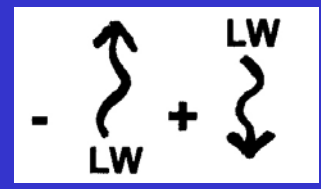
ROLE OF AEROSOLS in the atmosphere:

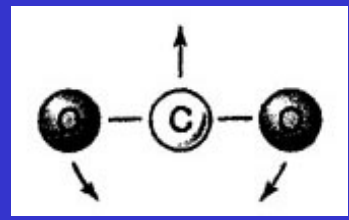


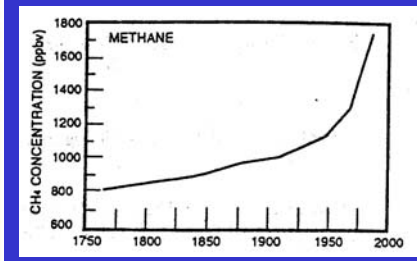
Global "Dimming" vs. Global Warming



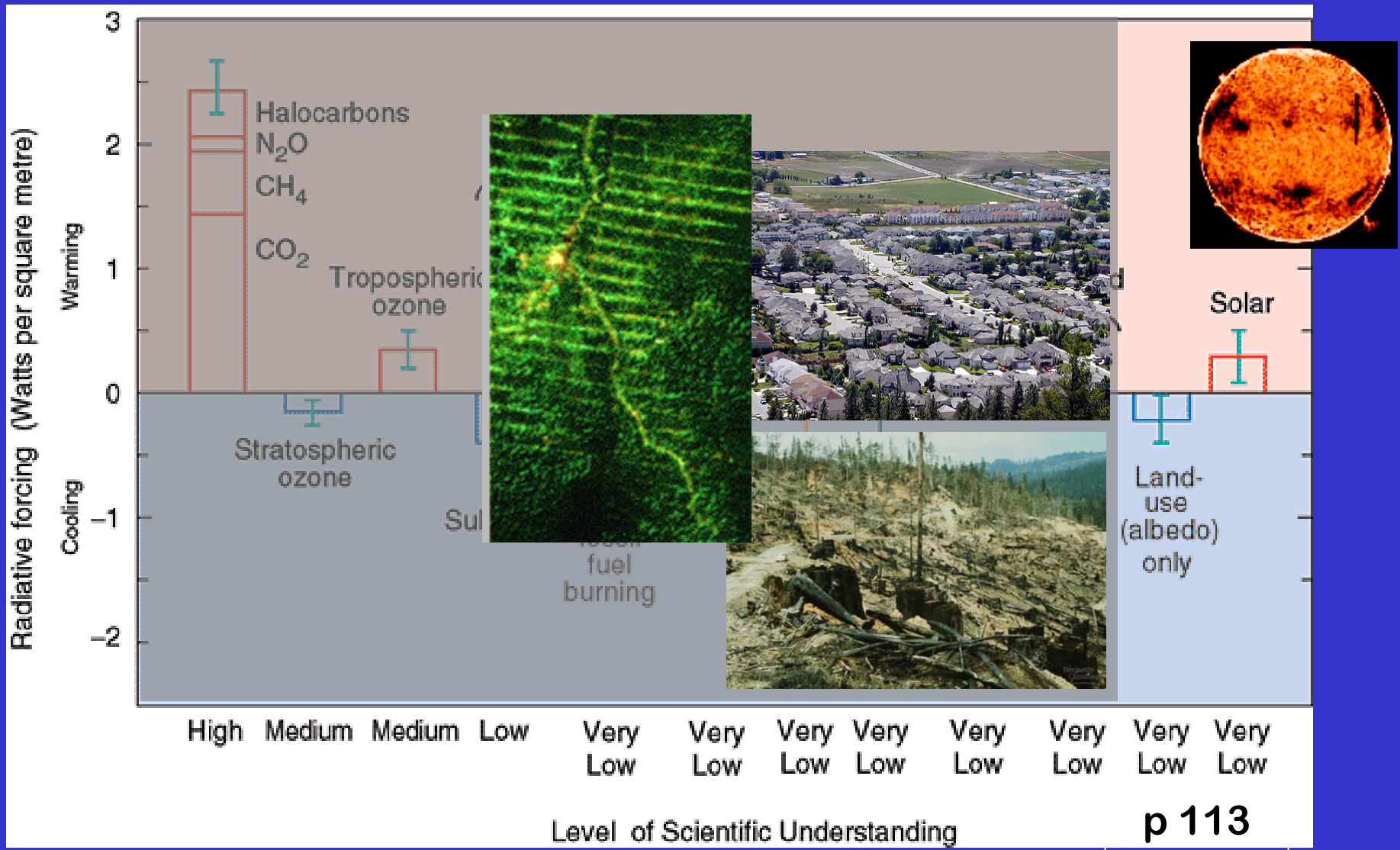


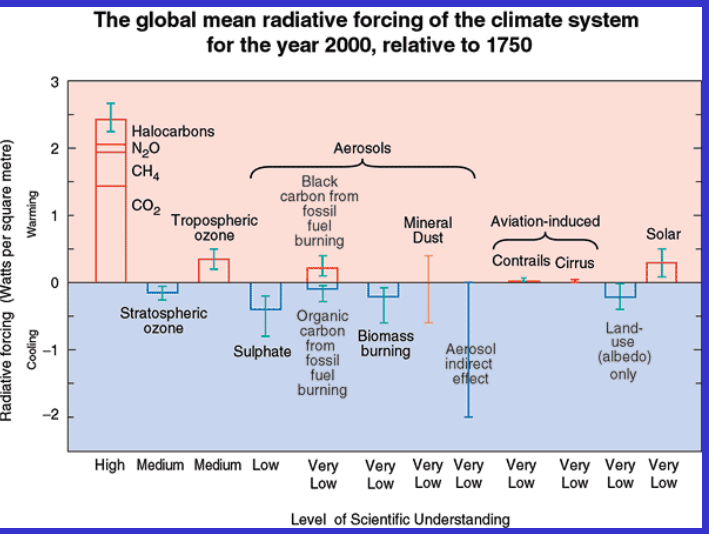






ROLE OF LAND USE (albedo changes) & SOLAR VARIATIONS





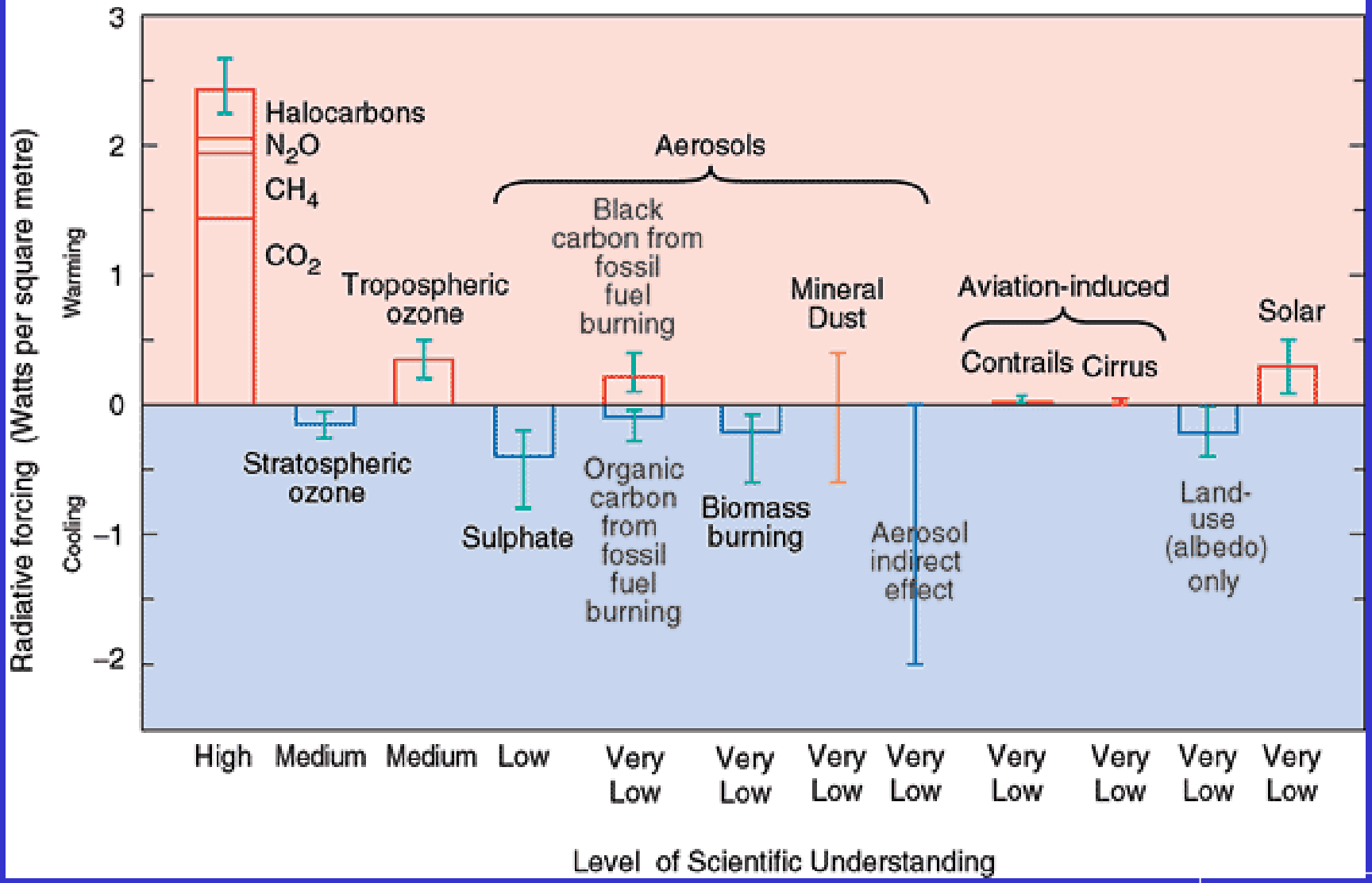
- Some radiative forcing agents are well mixed over the globe (CO2) thereby perturbing the global energy balance.

- Others represent perturbations with stronger regional signatures (aerosols).

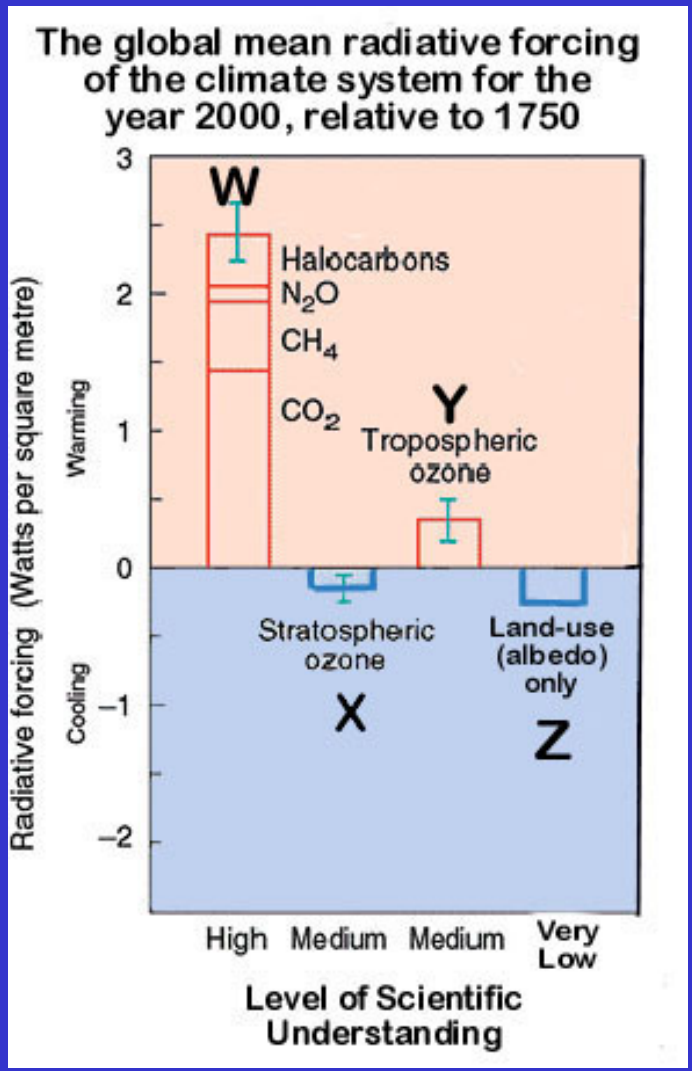
- a simple sum of the positive and negative bars won't yield the net effect on the climate system.

MODEL SIMULATIONS indicate that the estimated net effect of these perturbations is to have warmed the global climate since 1750.

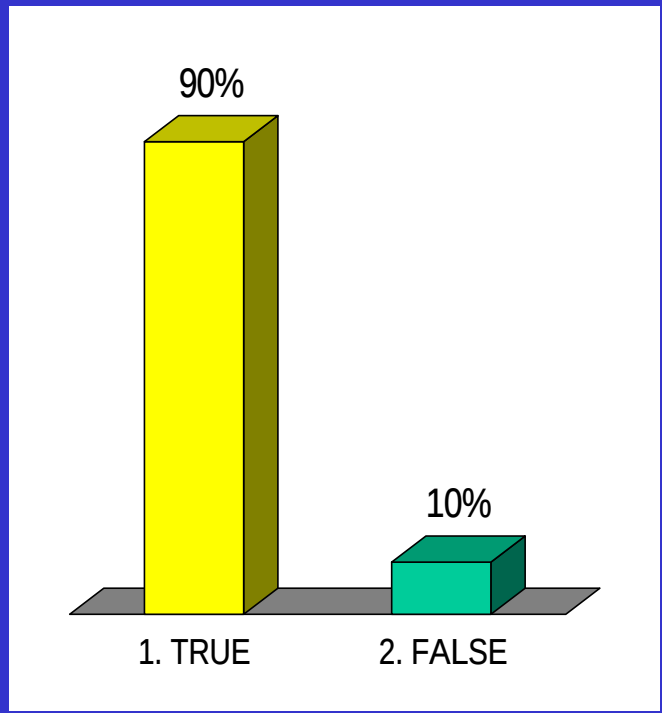
The global mean radiative forcing of the climate system for the year 2000, relative to 1750



ALL of the forcing mechanisms shown here (W, X, Y & Z) are linked to anthropogenic activity in some way:



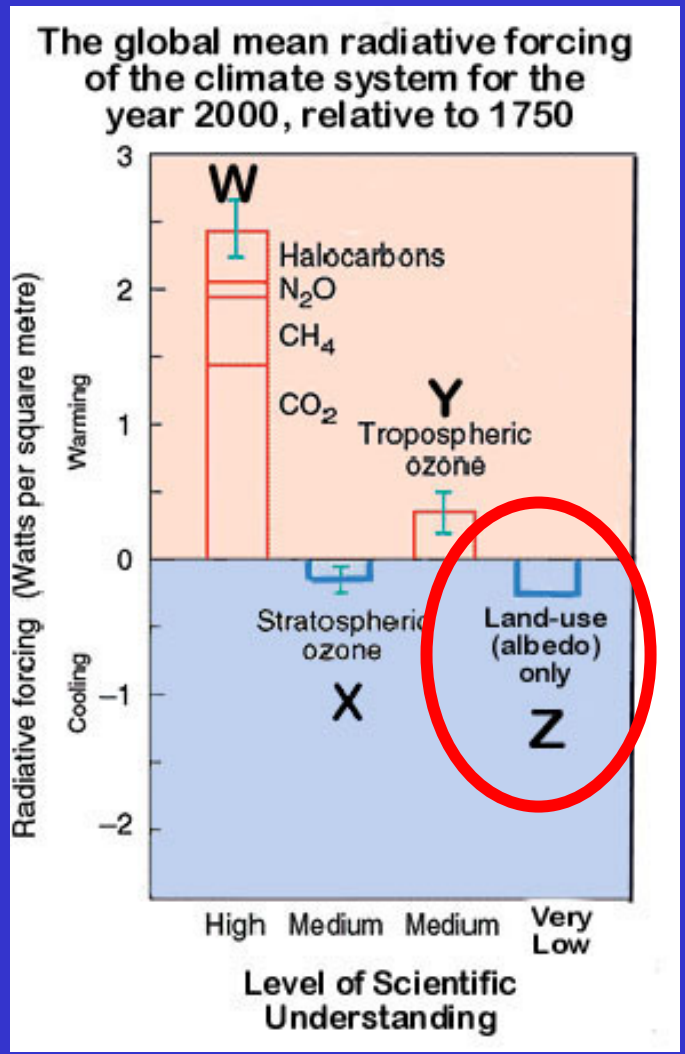
1. 1. TRUE
2. 2. FALSE



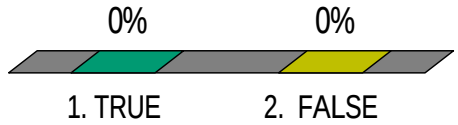
The figure shows that forcing mechanism Z (Land-use as indicated by albedo) leads to cooling. . .

. . . The reason for this is that cooling occurs when surface albedo *increases* and hence MORE energy is absorbed.

TRUE or FALSE?

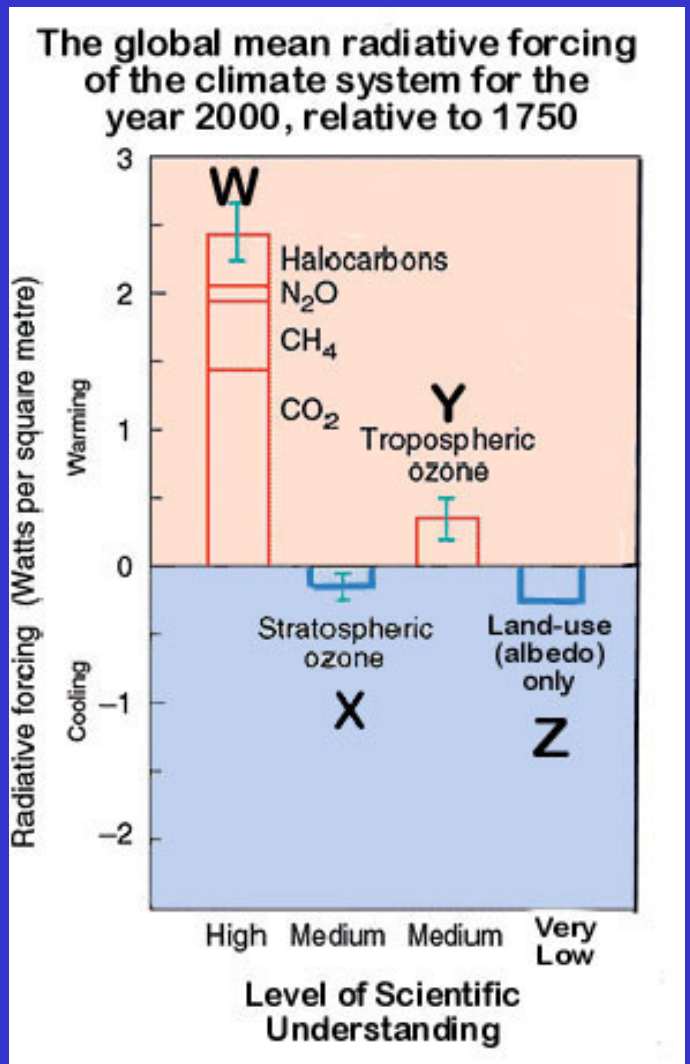


1. 1. TRUE
2. 2. FALSE

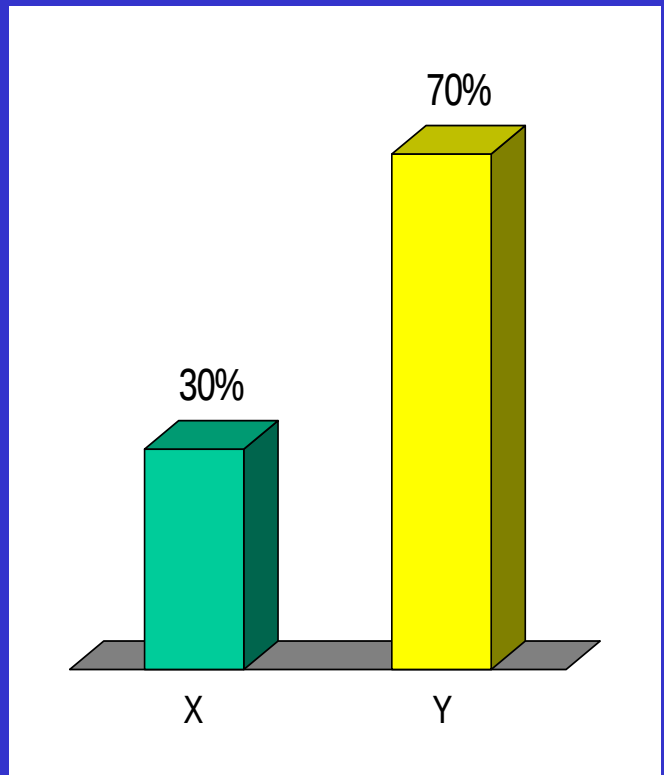


Nope - LESS energy is absorbed!

According to the figure which forcing mechanism has a GREATER influence on global temperature?



1. 1 = X STRATOSPHERIC OZONE
2. 2 = Y TROPOSPHERIC OZONE

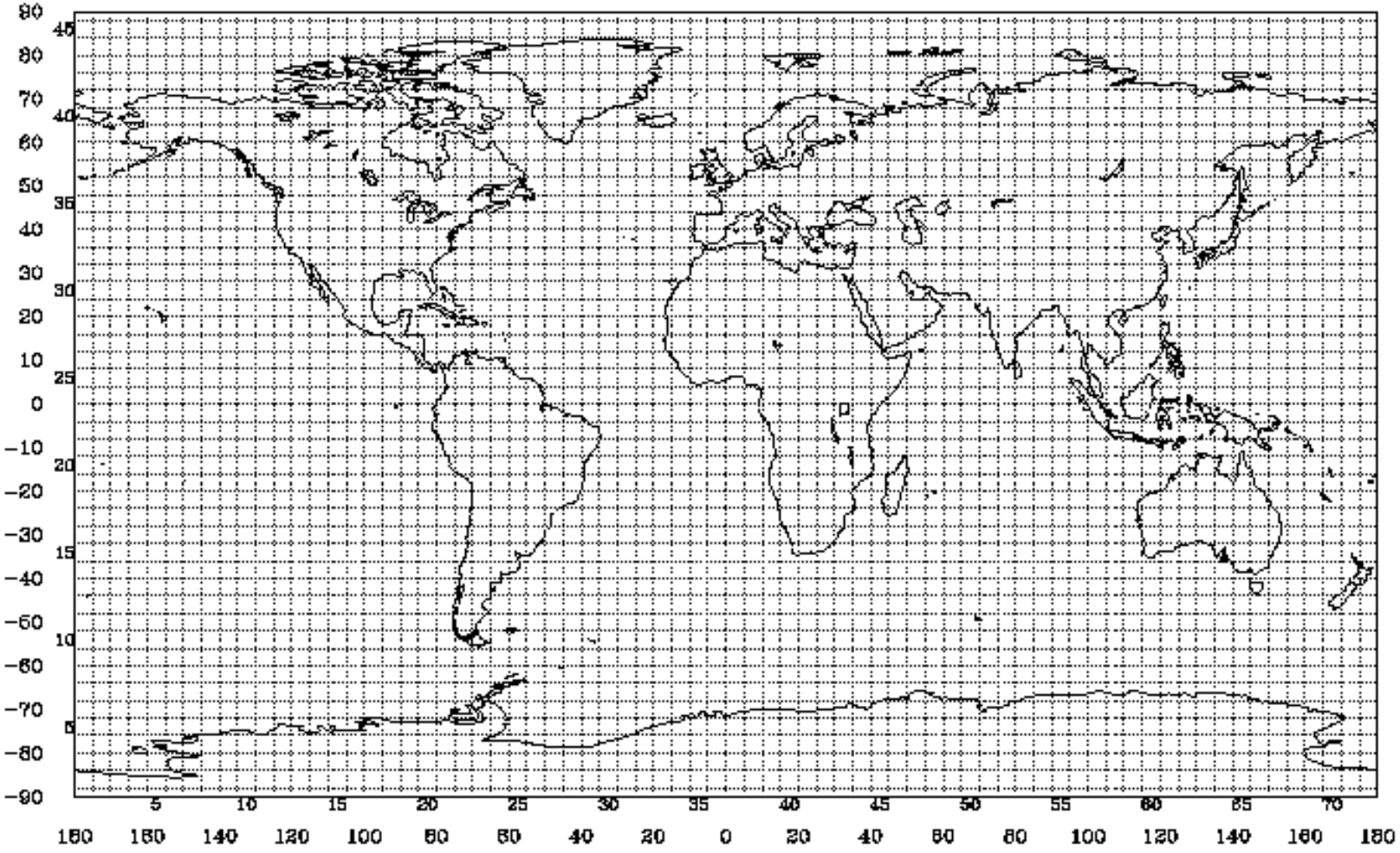


GLOBAL WARMING

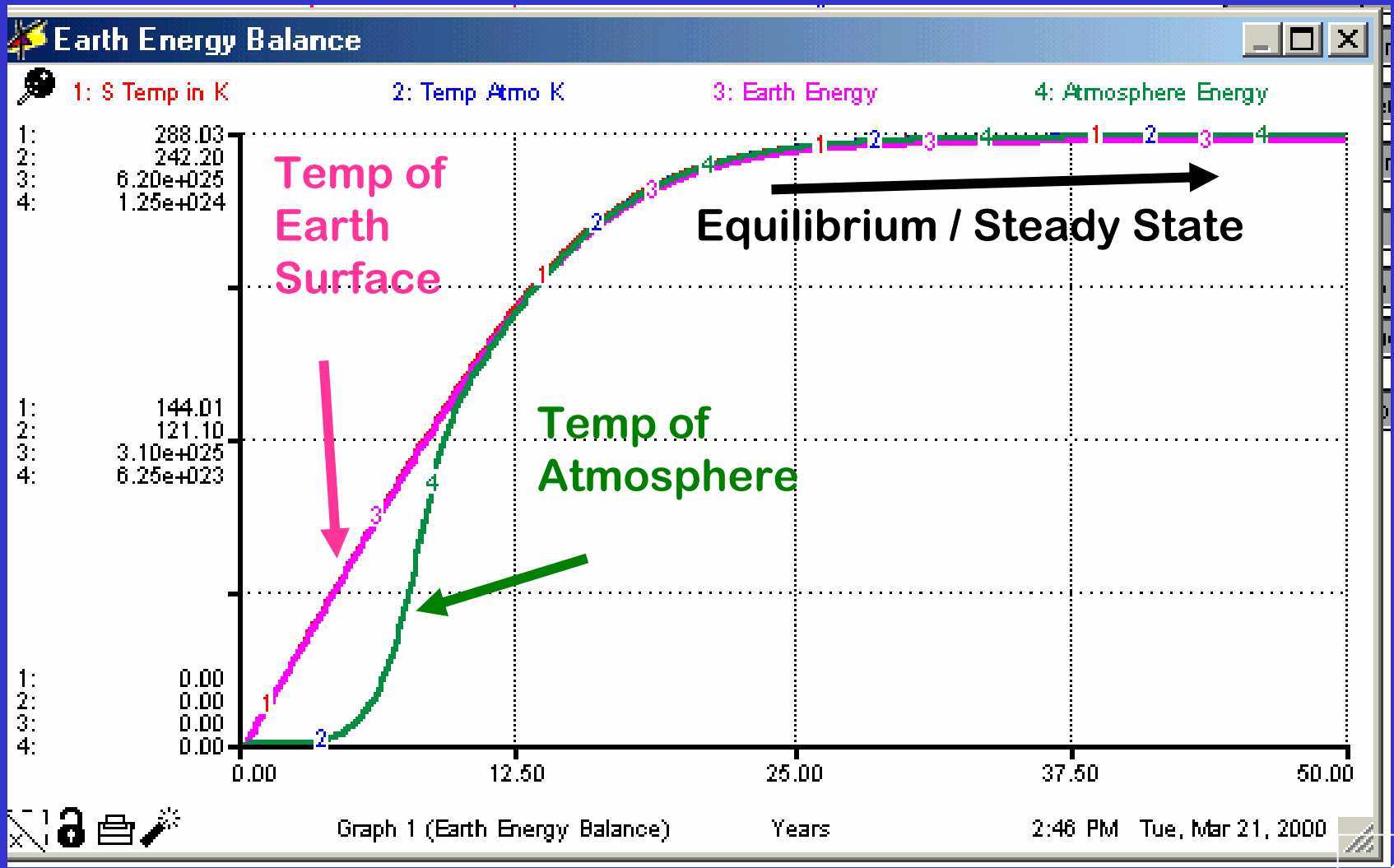
PART III:
Model Results & Projections
"Fingerprints" & "Harbingers"

See p 114 in Class Notes
& take additional notes

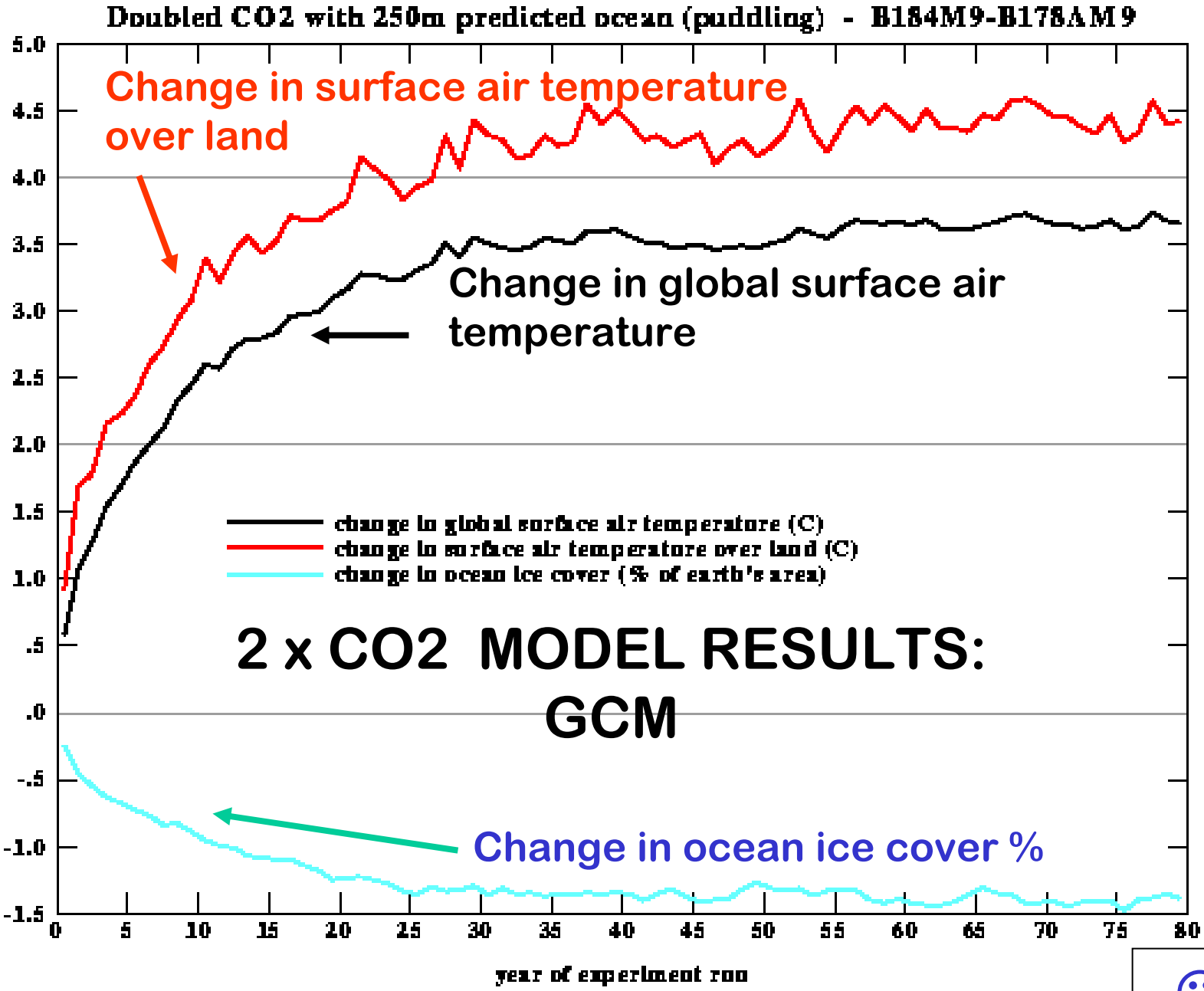
2 x CO2 GCM MODEL RESULTS



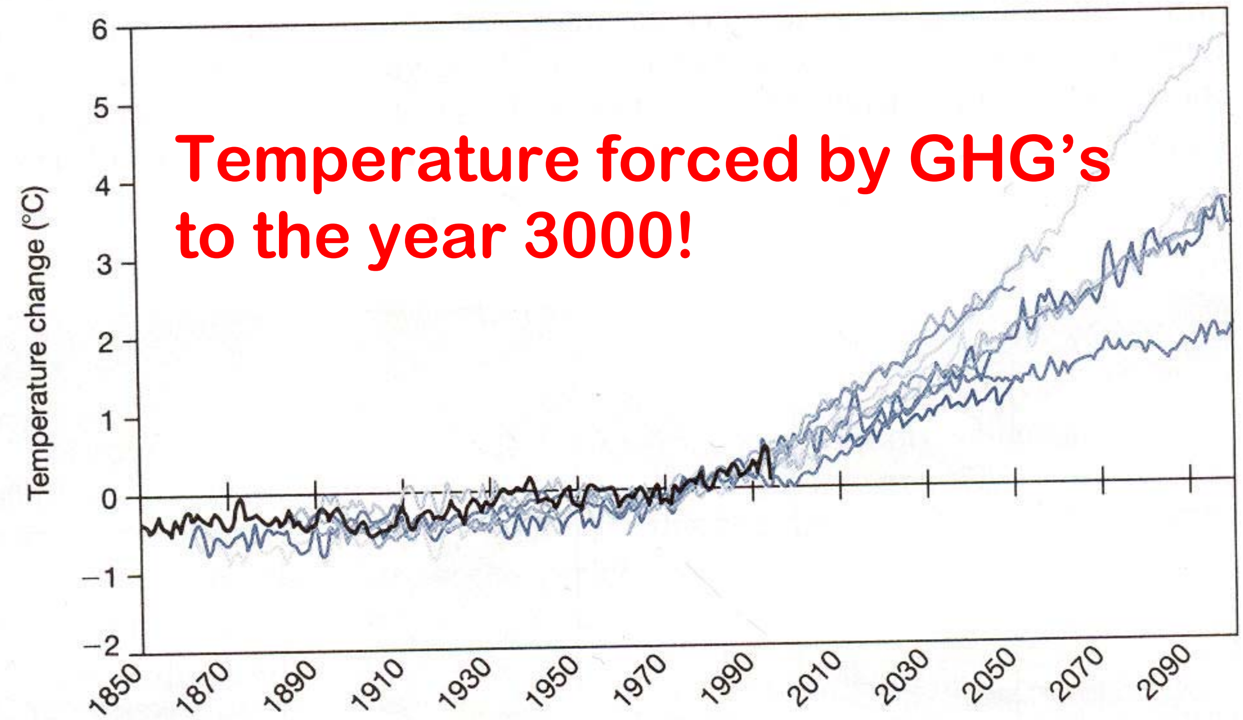
2 x CO2 MODEL RESULTS: Simple One Layer Atmosphere Model

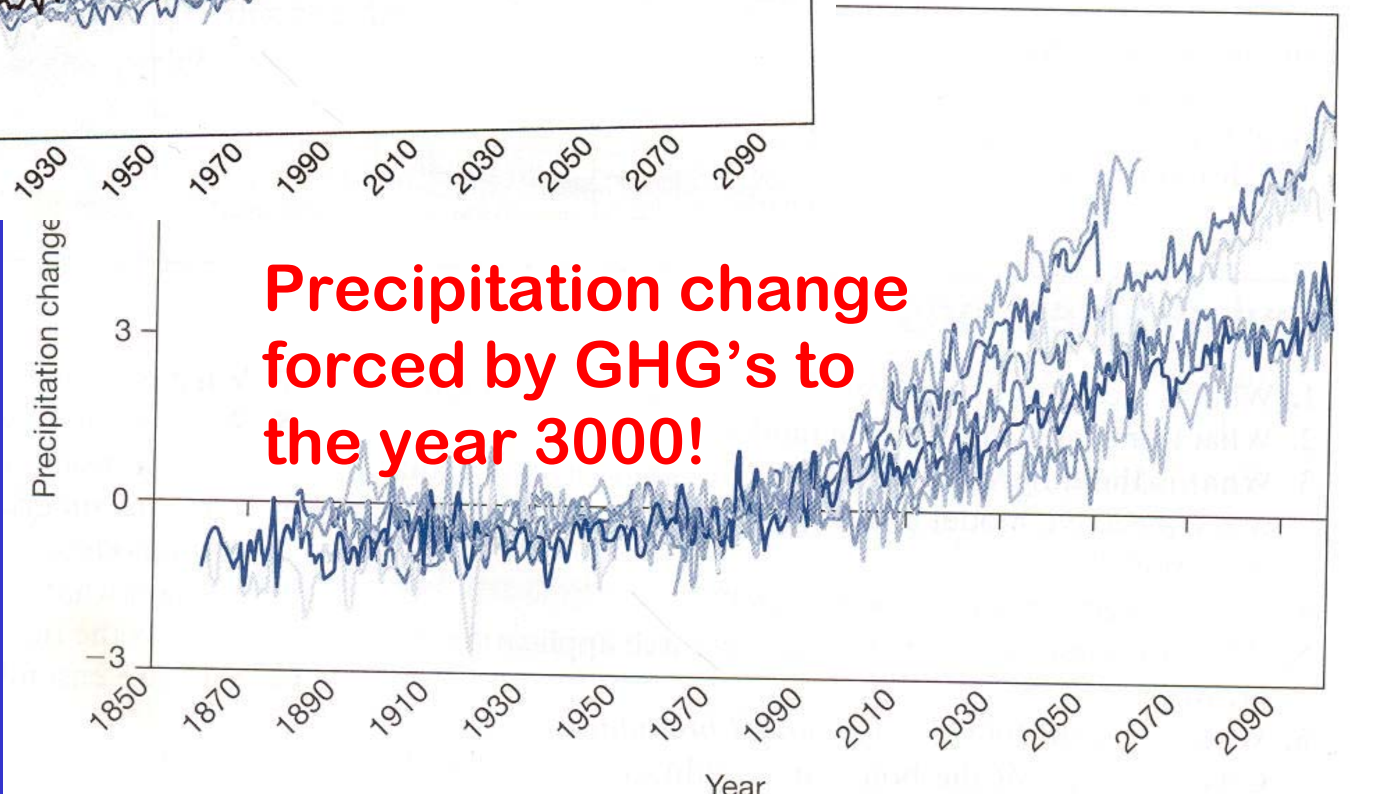


Path to Equilibrium



Results of several different GCM models





From your IGC textbook

Chapter 6 on Modeling

☺

Points on which essentially all GCMs agree:

**** The greatest WARMING should occur in HIGH LATITUDES during autumn and winter**

(warming leads to later sea ice and earlier snowmelt => lower albedo => more warming (positive feedback)

(also: The summertime warming over sea ice in the Arctic and around Antarctica should be smaller than global average warming.

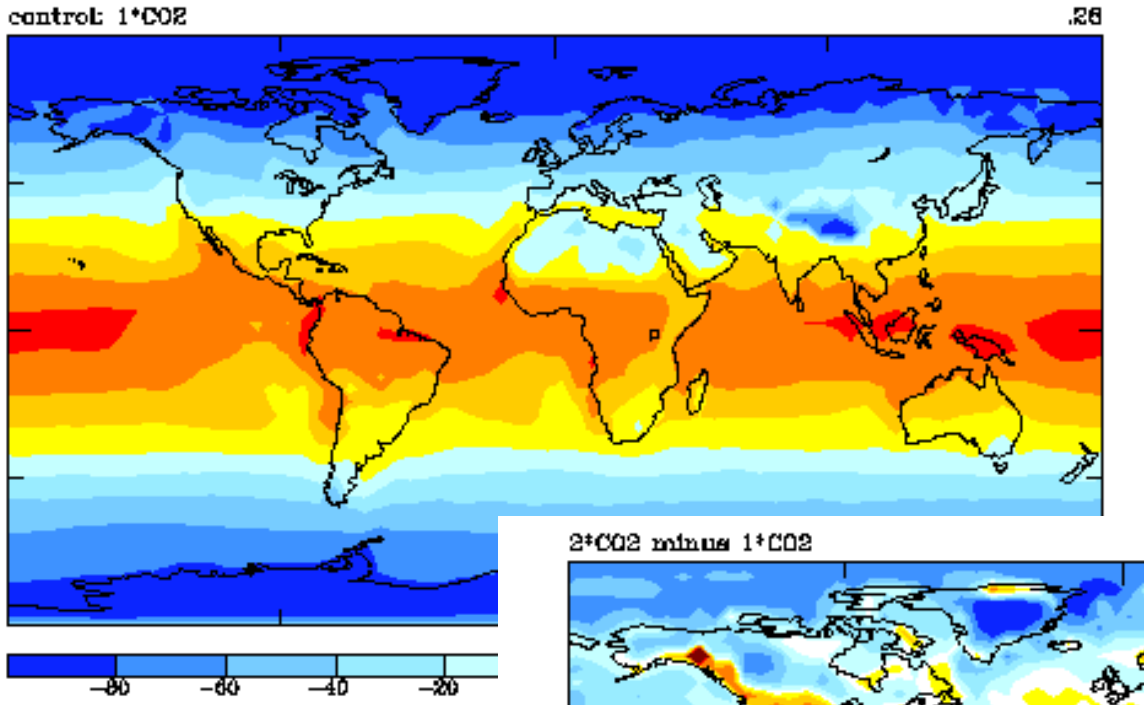
**** Warming in the TROPICS should be SMALLER than the global average warming and VARY LITTLE with season.**

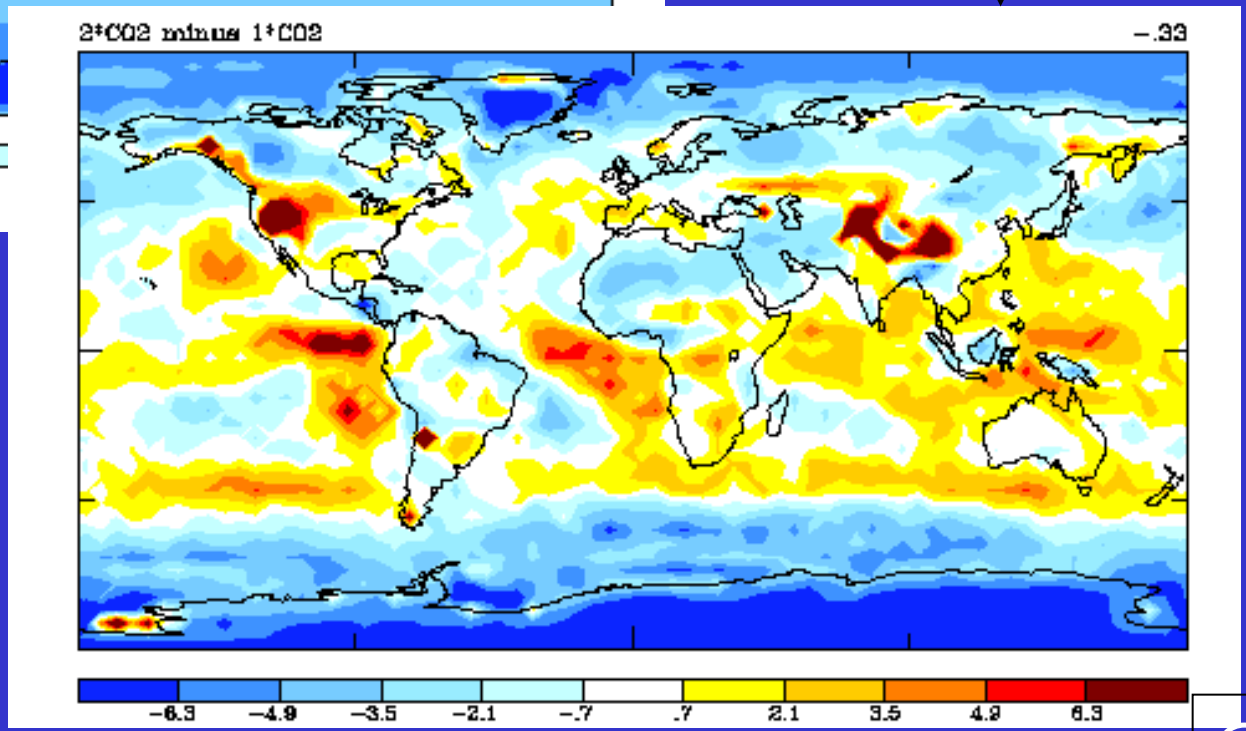
**** PRECIPITATION should increase . . .**

(warmer temperatures => more evaporation => more water vapor in atmosphere => more precipitation)

R net

2 x CO2 MODEL RESULTS





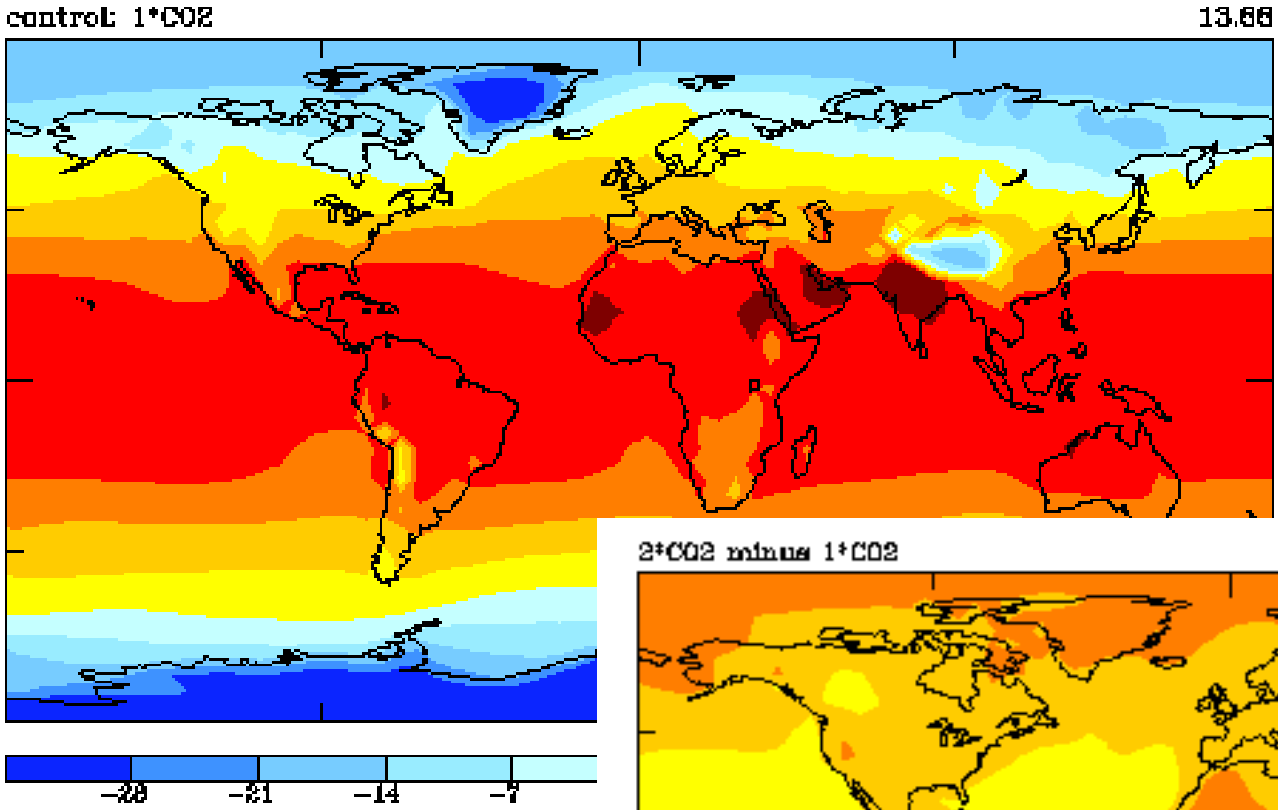
Oranges & reds = MORE after 2 x CO2

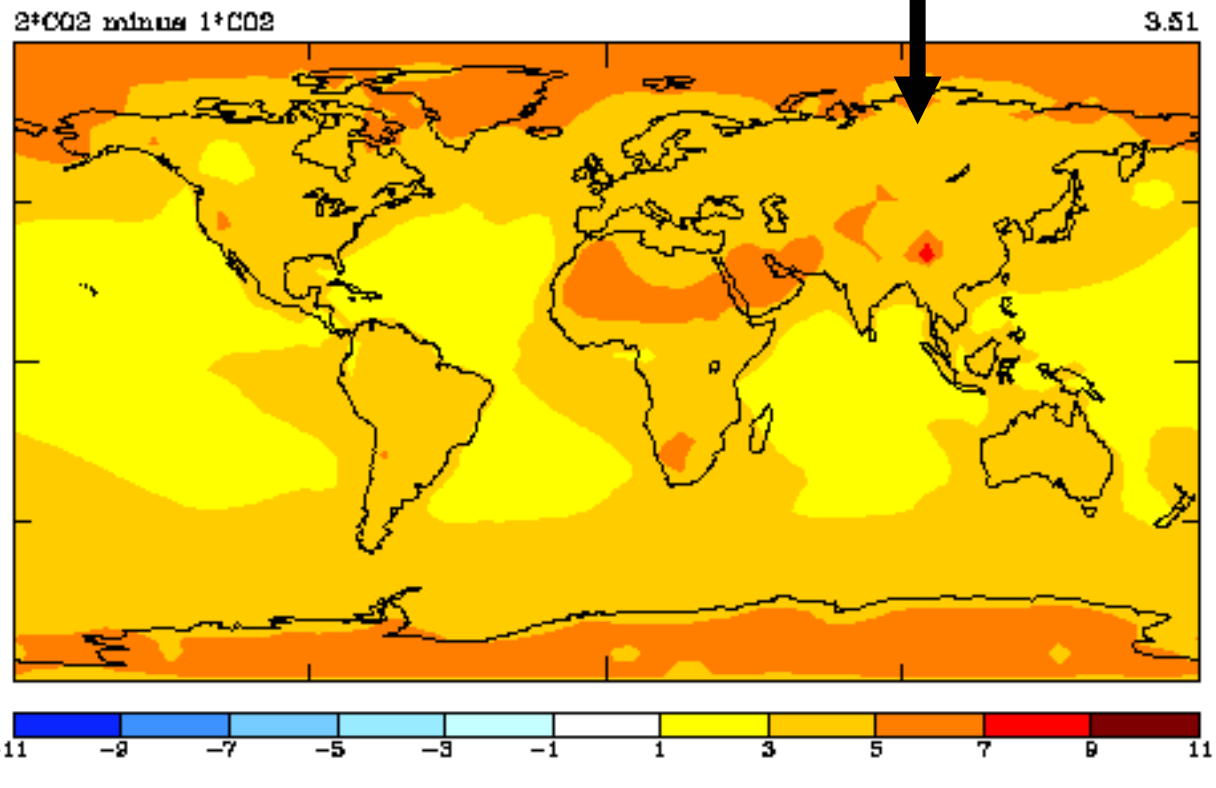
White = about the same after 2 x CO2

Blues = LESS after 2 x CO2

Annual Surface Temp

2 x CO2 MODEL RESULTS





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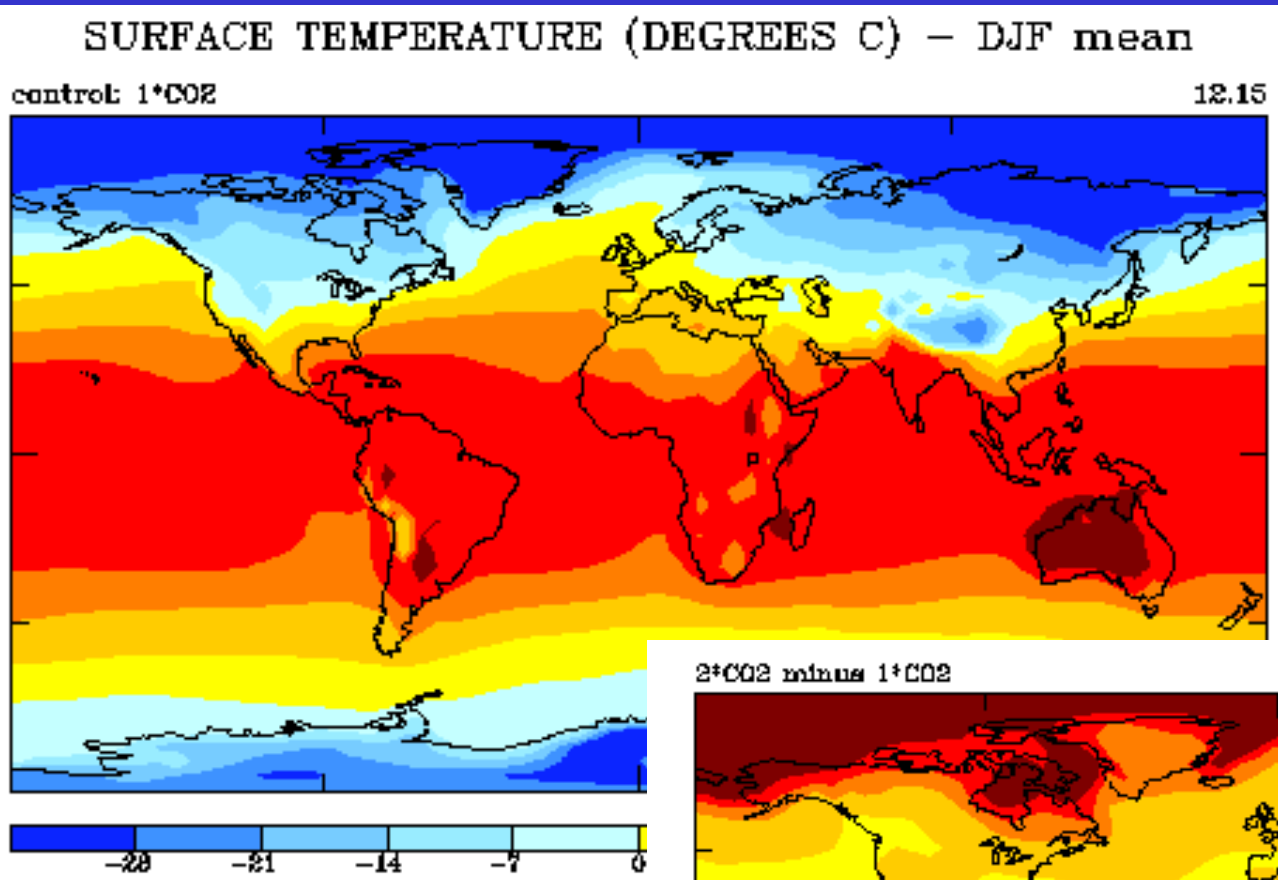
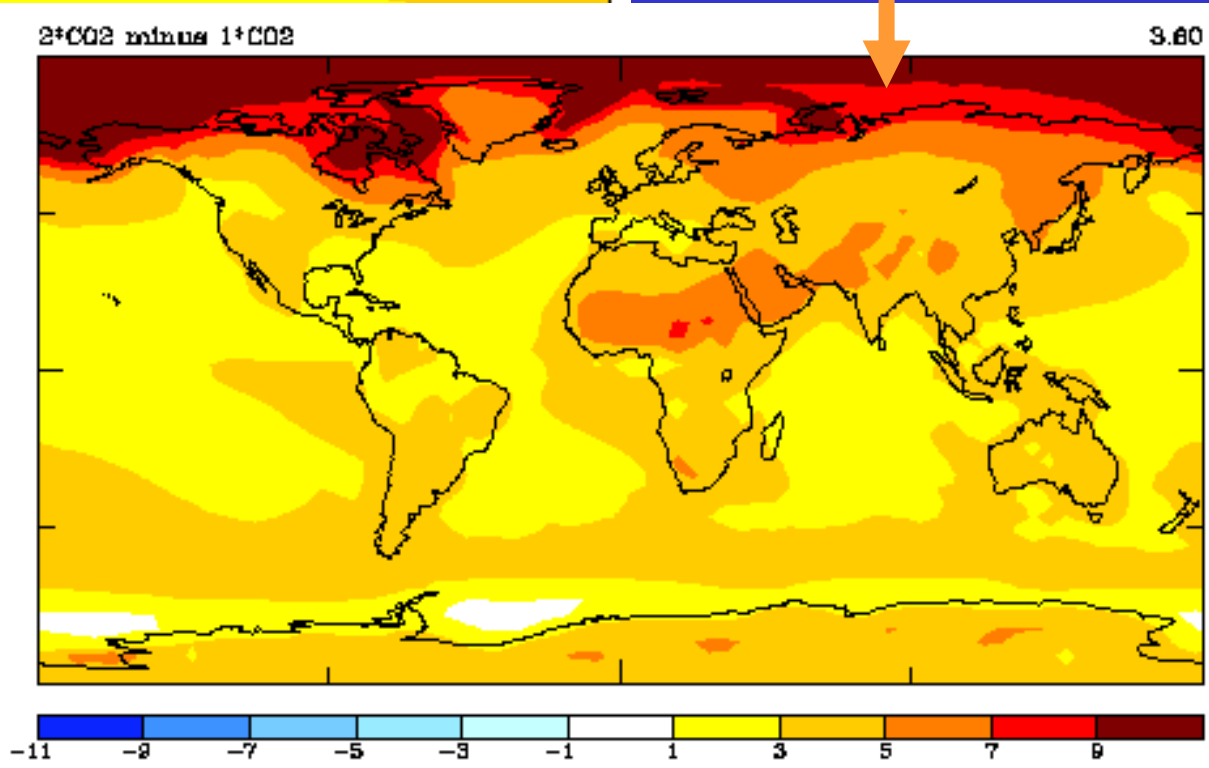


N.H. WINTER Dec,Jan,Feb Surface Temp

2 x CO2 MODEL RESULTS



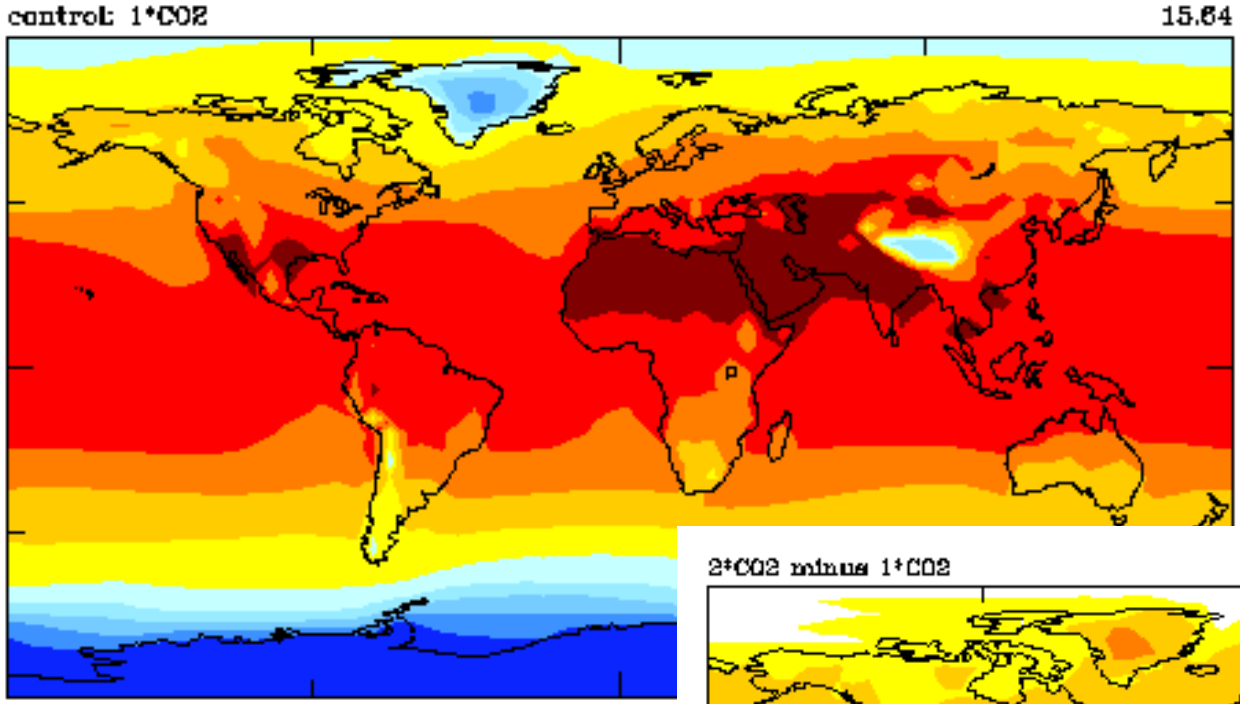
Oranges & reds = MORE after 2 x CO2

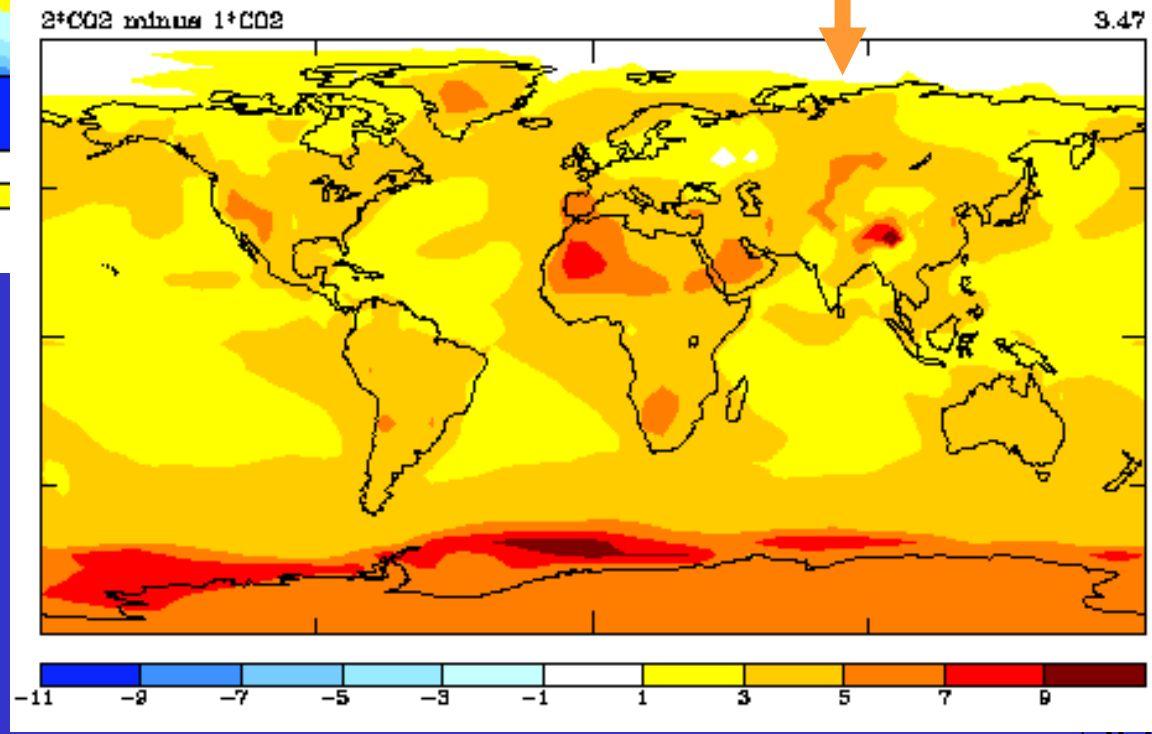
White = about the same after 2 x CO2

Blues = LESS after 2 x CO2

N.H. SUMMER Jun,Jul,Aug Surface Temp

2 x CO2 MODEL RESULTS





Oranges & reds = MORE after 2 x CO2

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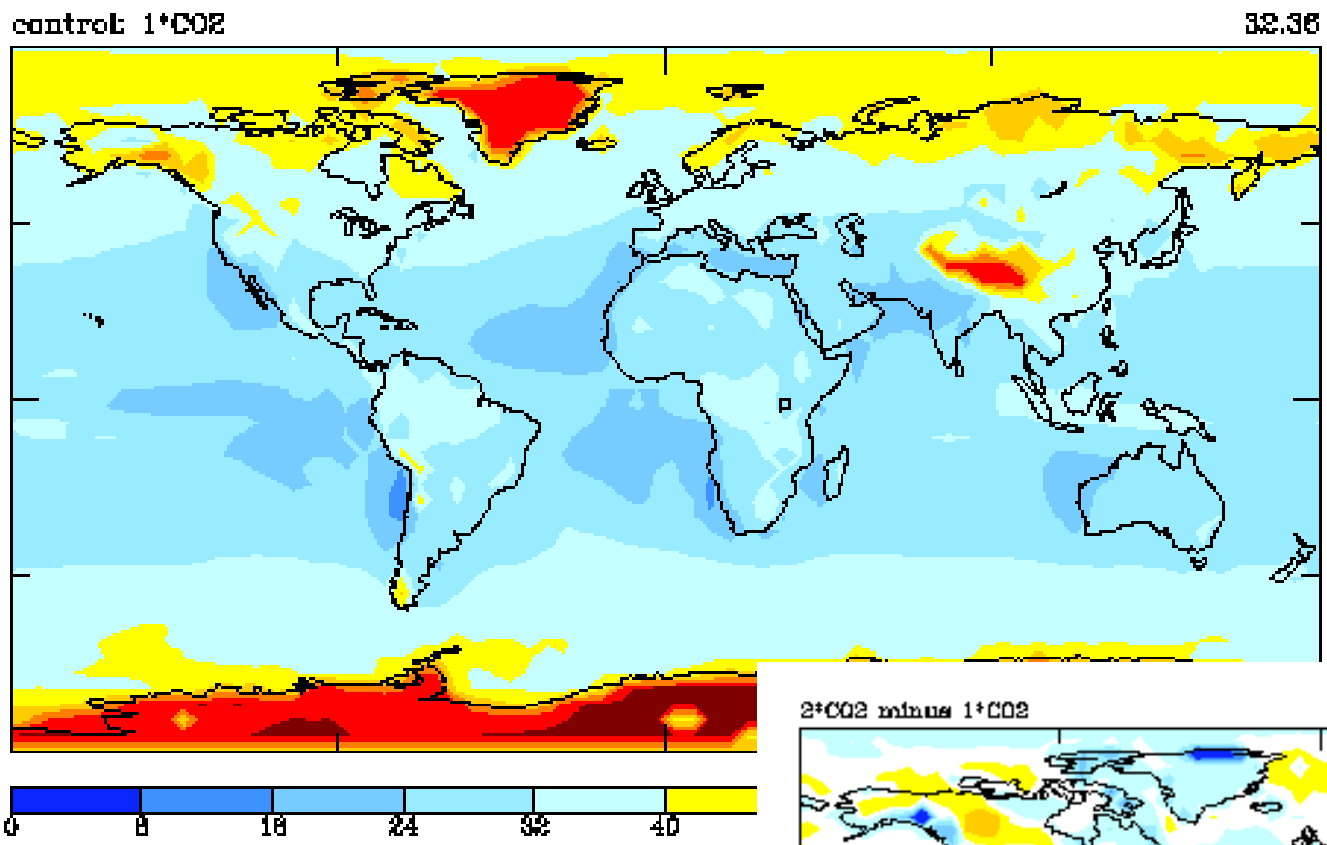
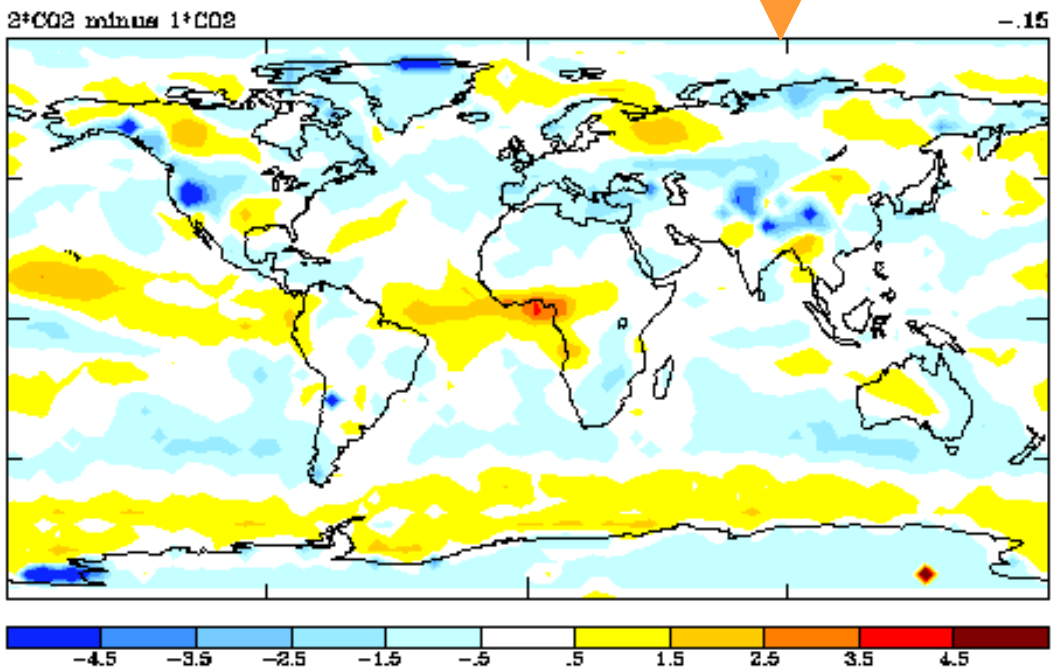
Blues = LESS after 2 x CO2

Annual Planetary Albedo

2 x CO2 MODEL RESULTS





Oranges & reds = MORE after 2 x CO2

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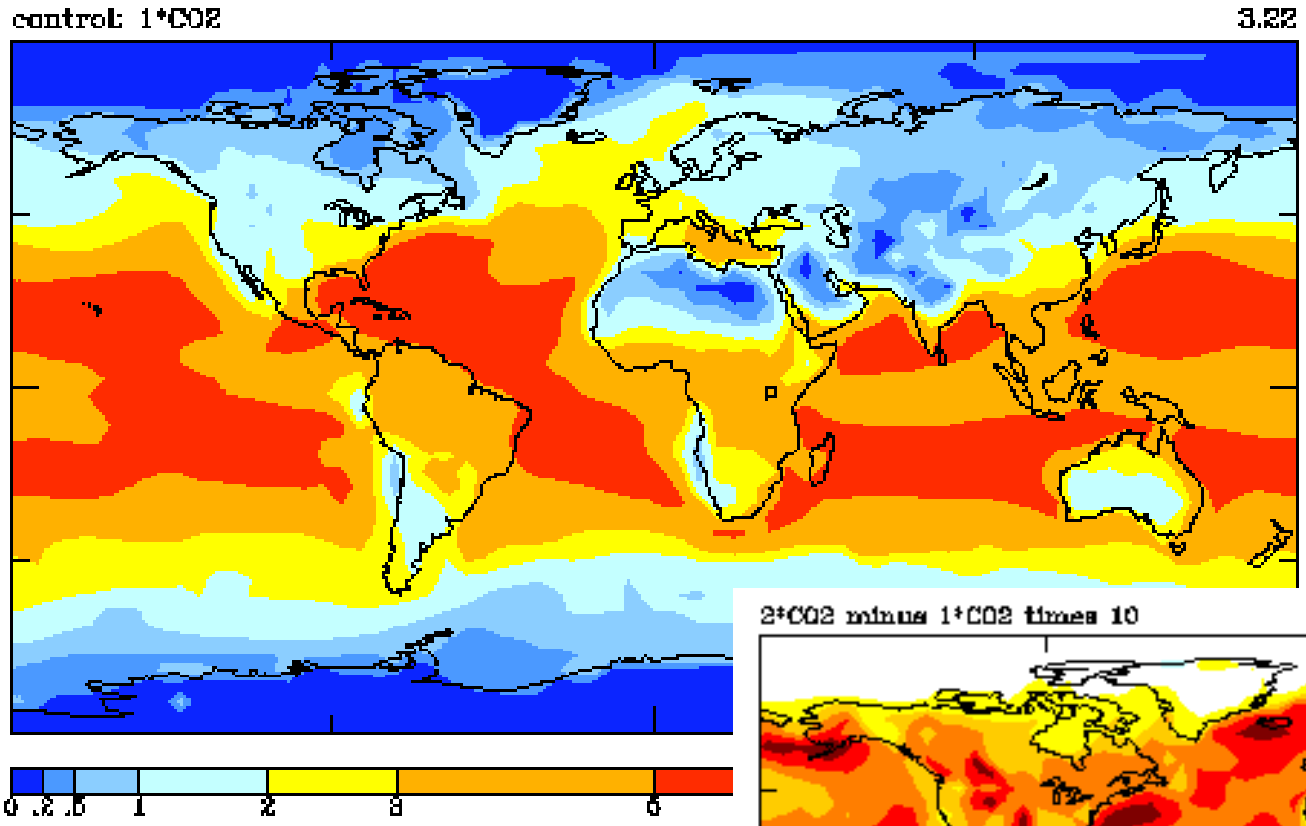
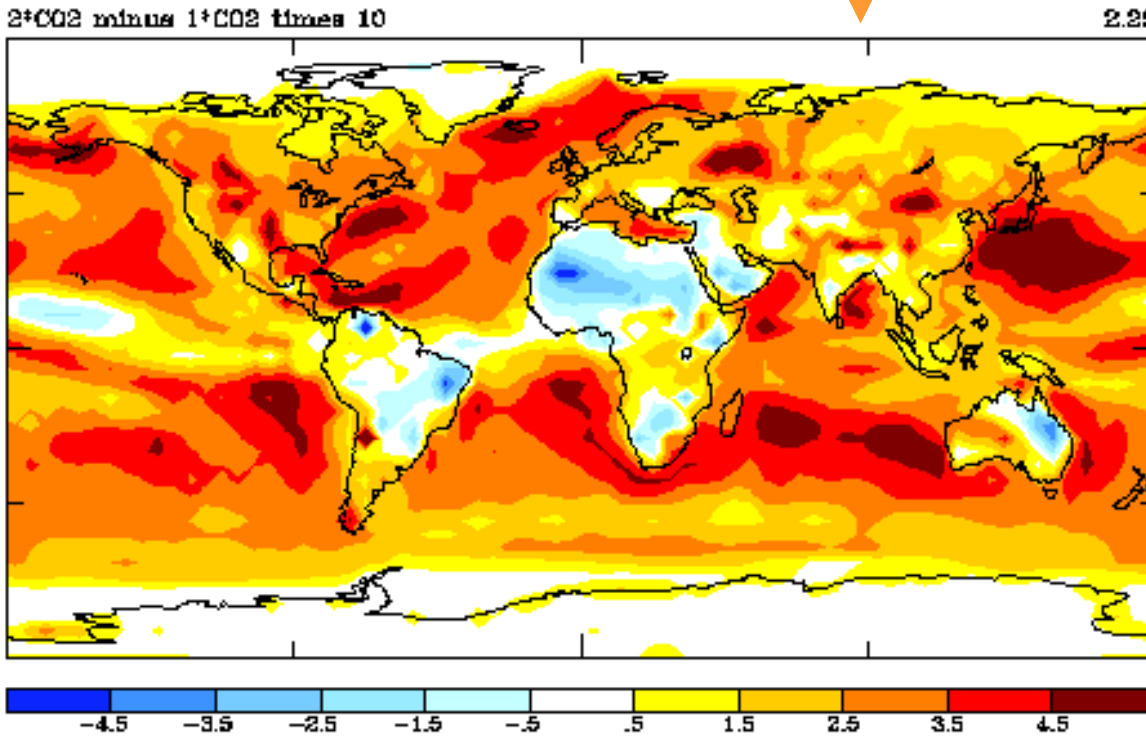
Blues = LESS after 2 x CO2

Annual Evaporation



2 x CO2 MODEL RESULTS



Oranges & reds = MORE after 2 x CO2

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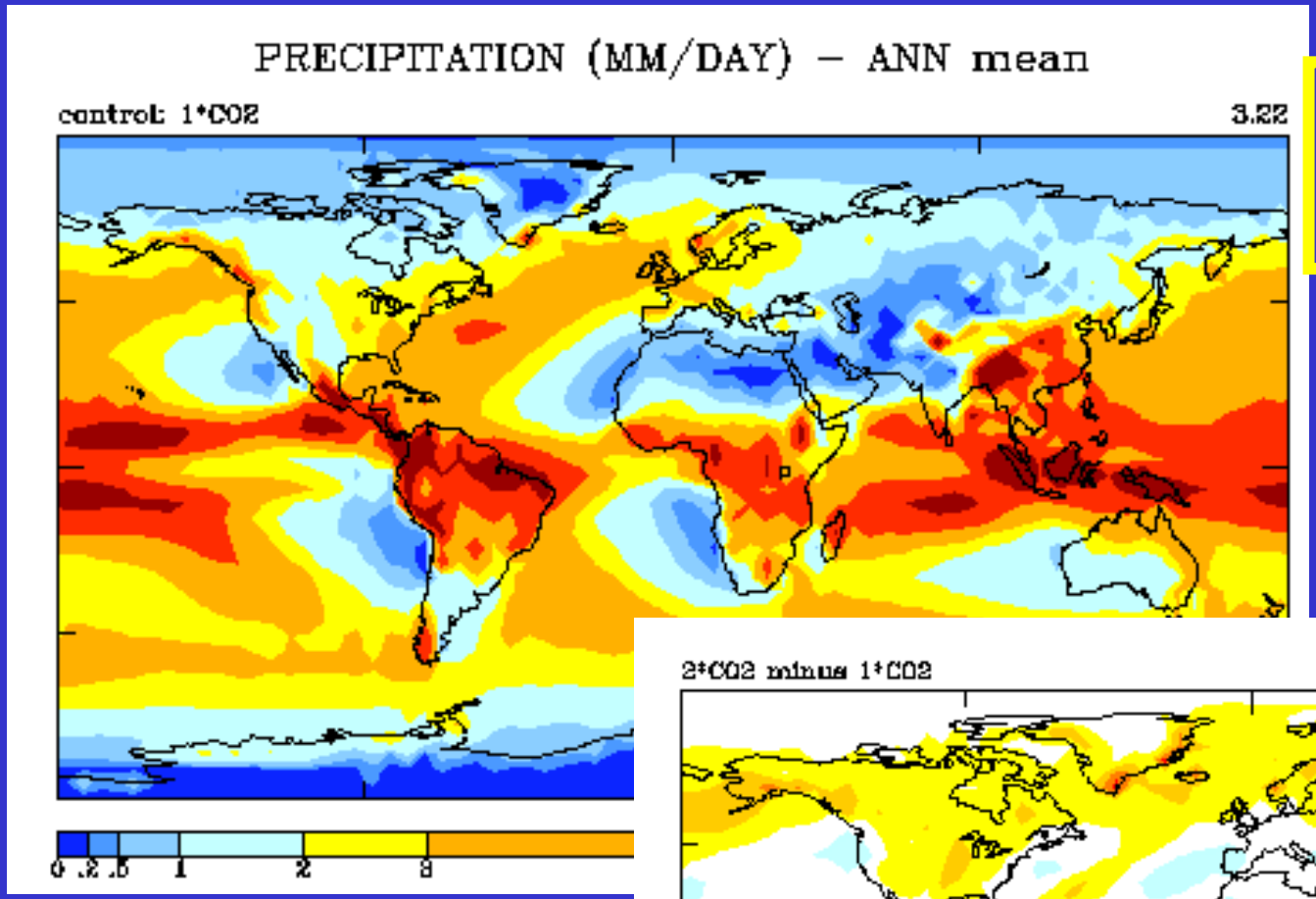
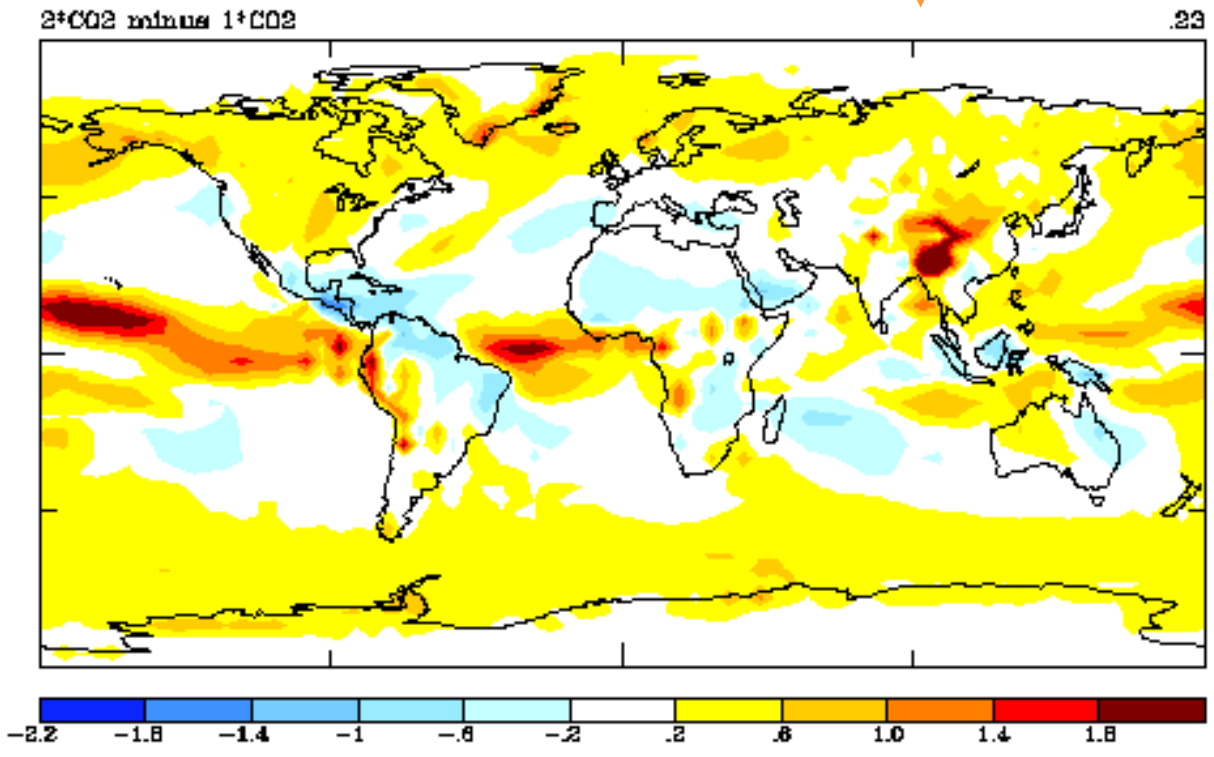
Blues = LESS after 2 x CO2

Annual Precipitation



2 x CO2 MODEL RESULTS



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Some expected consequences and possible concerns, based on the model results:

**** Sea level will continue to rise throughout the 21st century:** LINK TO WEISS & OVERPECK SITE

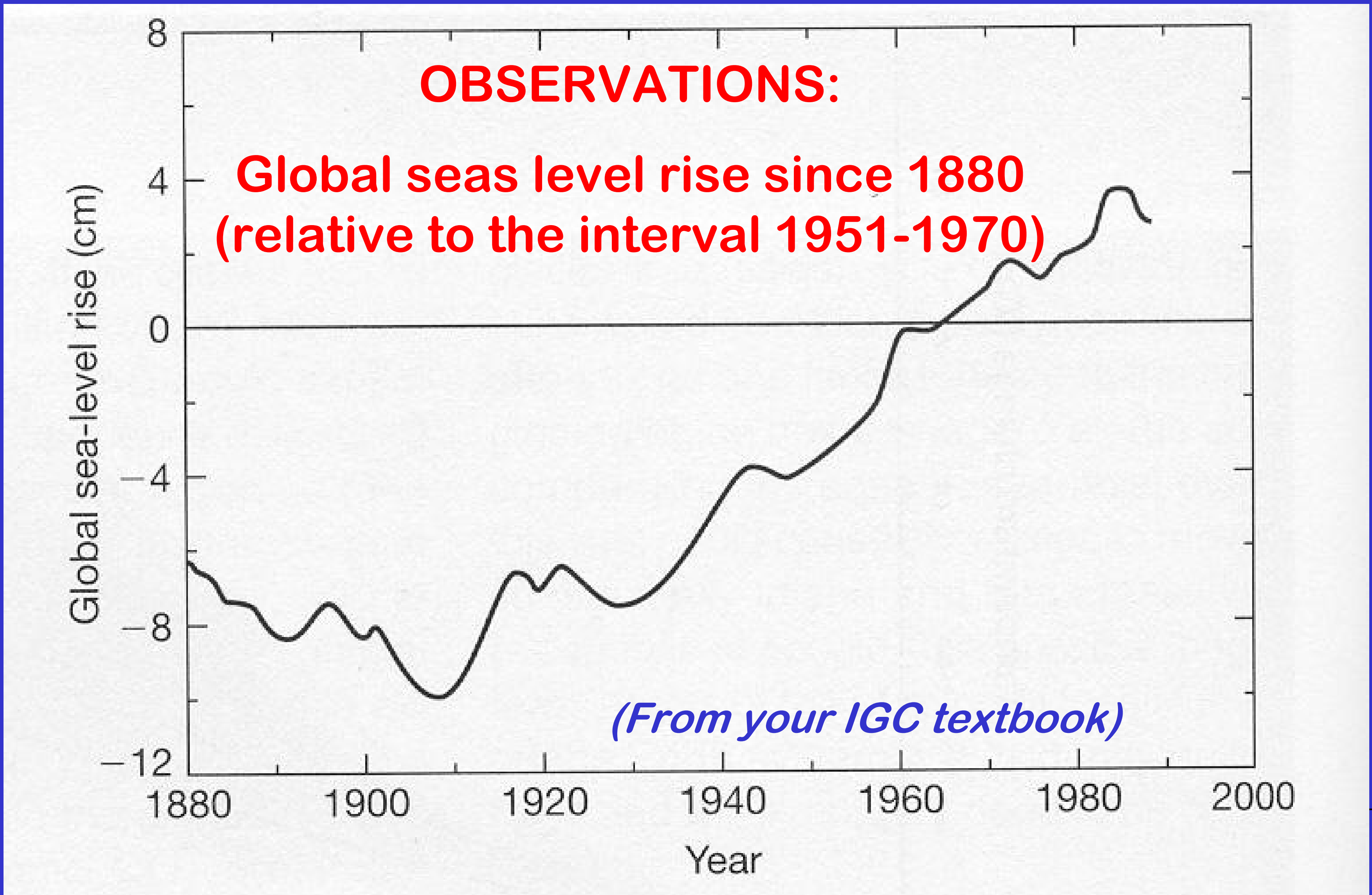
**** Higher atmospheric CO2 concentrations are expected to cause increased rates of plant growth in some types of plants (C3) but not others (C4)**

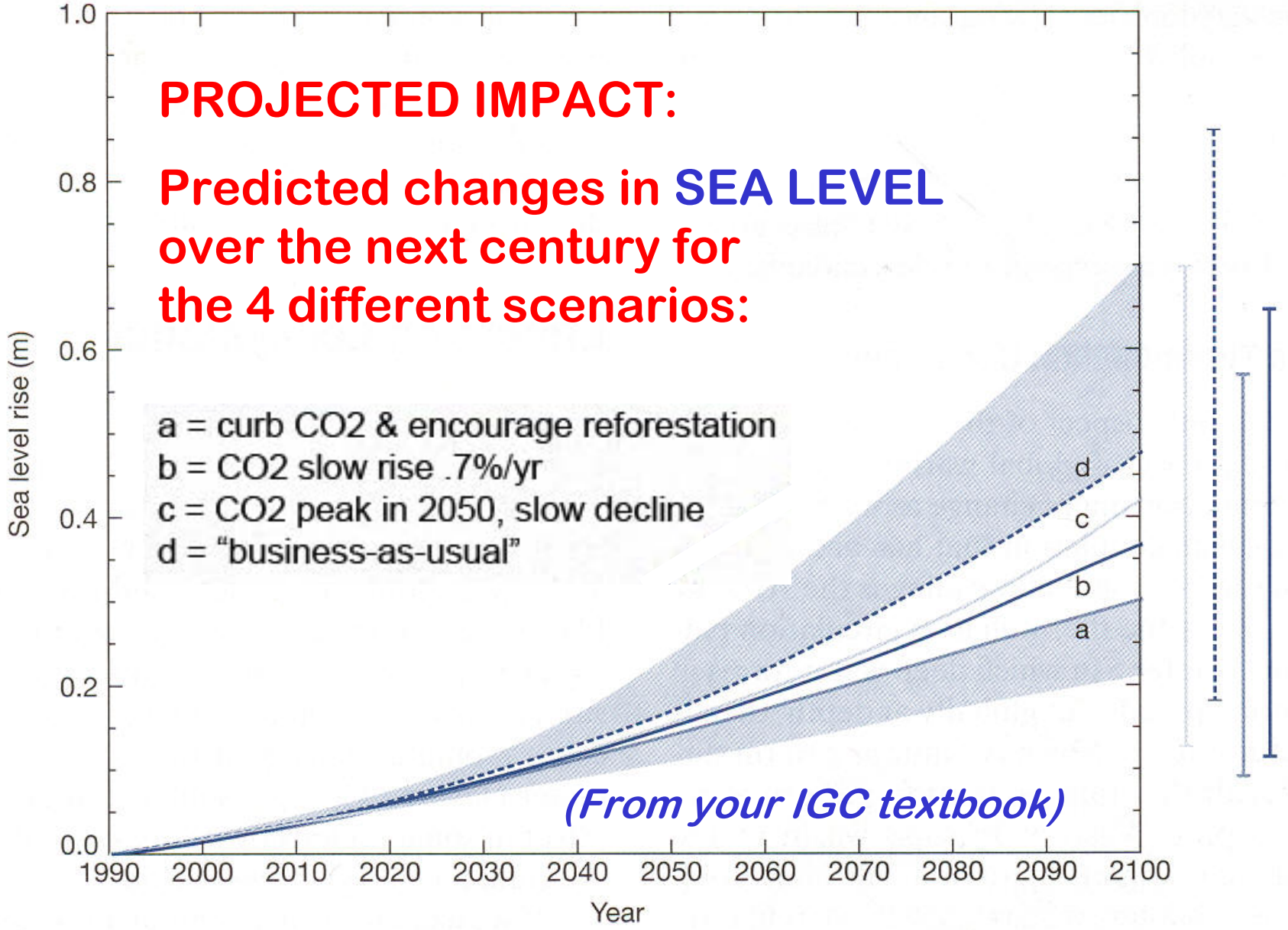
**** Changes in species composition in forests**

** animal and insect migrations

** some diseases of the tropics may become problems at midlatitudes

OBSERVATION vs. PROJECTED IMPACT in SEA LEVEL RISE



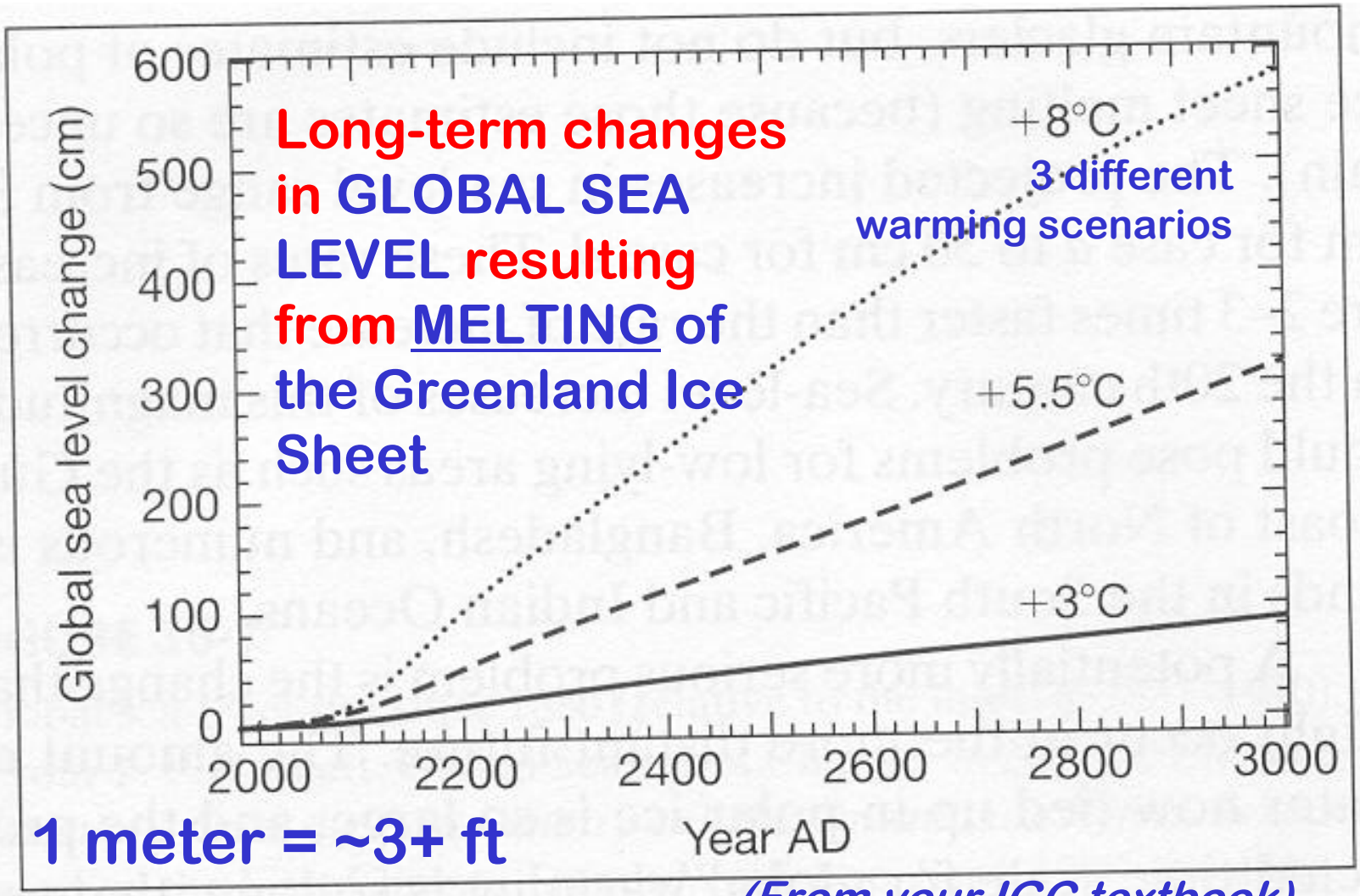

PROJECTED IMPACT:
Predicted changes in SEA LEVEL over the next century for the 4 different scenarios:
a = curb CO2 & encourage reforestation
b = CO2 slow rise .7%/yr
c = CO2 peak in 2050, slow decline
d = "business-as-usual"
(From your IGC textbook)
Sea level rise (m)
1.0
0.8
0.6
0.4
0.2
0.0
1990
2000
2010
2020
2030
2040
2050
2060
2070
2080
2090
2100
Year
d
c
b
a

1 meter = ~3+ ft

☺

**** Sea level will continue to rise throughout the 21st century:** LINK TO WEISS & OVERPECK SITE

PROJECTED IMPACT:



1 meter = ~3+ ft

(From your IGC textbook)

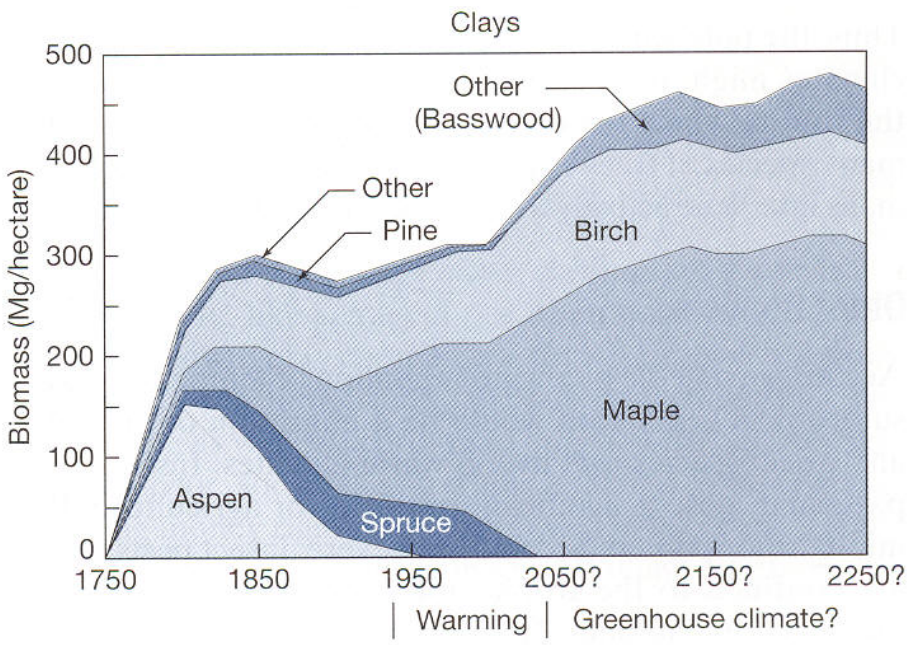
VEGETATION SPECIES COMPOSITION CHANGE

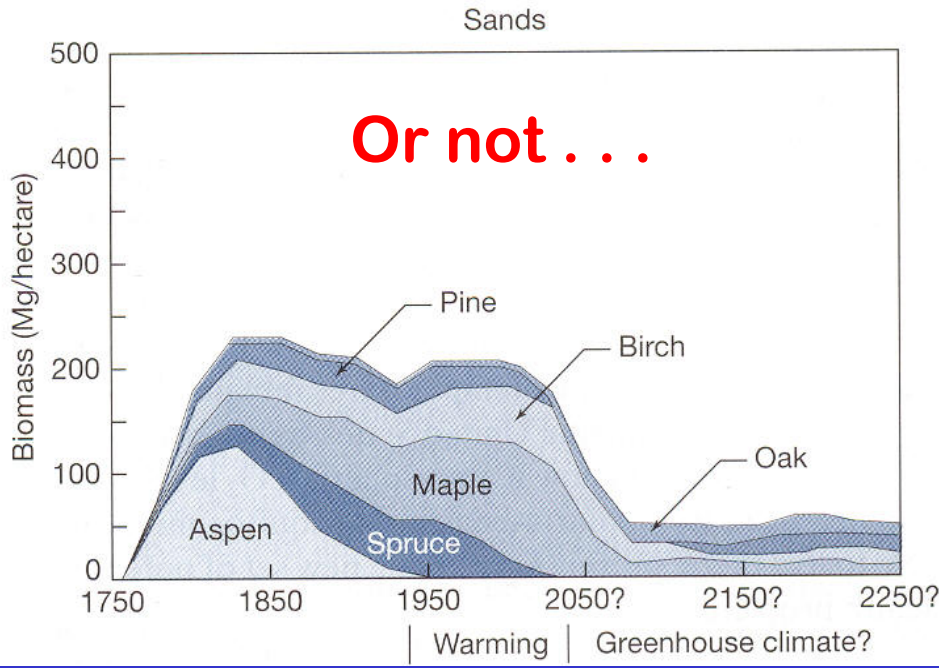
Prediction of future species composition under 2 x CO2

Depending on soil type . . .

(From your IGC textbook)

Some species thrive . . .





GLOBAL WARMING: Early Warning Signs

NEW POINTS!

PHOTOS!

- Home
- About the map
- Regions
  - Africa
  - Antarctica
  - Asia
  - Central America
  - Europe and Russia
  - North America
  - Oceania
  - South America
- Fingerprints
- Harbingers
- Selection Criteria
- References
- Organizations
- Get a copy of the map
- Contact us

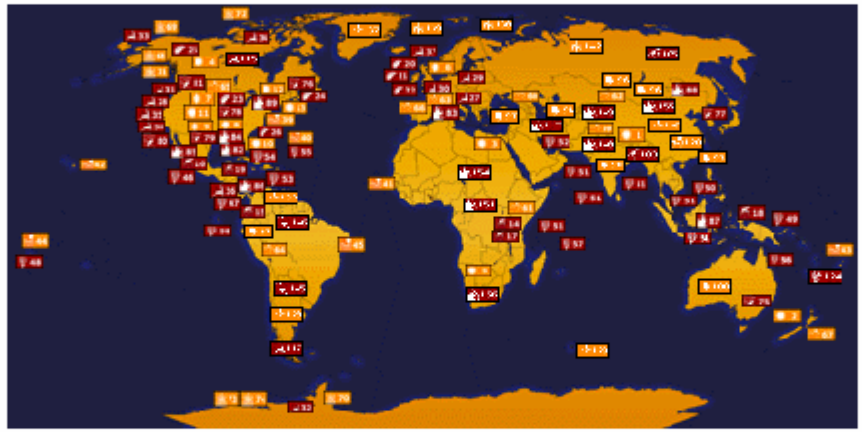
Solutions

For Educators

US Climate Impacts

"An increasing body of observations gives a collective picture of a warming world and other changes in the climate system."

Intergovernmental Panel on Climate Change (IPCC), 2001



This map illustrates the local consequences of global warming.

FINGERPRINTS: Direct manifestations of a widespread and long-term trend toward warmer global temperatures

Heat waves and periods of unusually warm weather

Ocean warming, sea-level rise and coastal flooding

Glaciers melting

http://www.climatehotmap.org/

"Global Warming Fingerprints"

Events that are direct manifestations of a widespread and long-term trend toward warmer global temperatures as projected by models of a changing climate.

The following events are identified as global warming fingerprints:

- Heat waves and periods of unusually warm weather
- Ocean warming, sea-level rise and coastal flooding
- Glaciers melting
- Arctic and Antarctic warming

Earth Hottest in Thousands of Years

WASHINGTON, DC, September 26, 2006 (ENS) - The wo
today's issue of "Proceedings of the National Academy
that human activities are the primary factor.

Study coauthor James Hansen of NASA's Goddard Insti
manmade greenhouse gases.

The study concludes the Earth is now reaching and pass
warming is also forcing a migration of plant and animal s

Worldwide instrumental temperature measurements duri
for the past 30 years. This observed warming is similar to
greenhouse gases, the researchers said.

Earth's temperature is

Furthermore, the warmi
Celsius) of the maximu

"That means that furth
effects of global warmi

During the warmest interglacial periods, the climate was

"But if further global warming reaches 2 or 3 degrees Cel
time it was that warm was in the middle Pliocene, about t

Hansen added that global warming is already beginning

Plants and animals can survive only within certain climat

A 2003 study that appeared in the journal "Nature" foun
the last half of the 20th century.

Hansen said that migration rate is not fast enough to kee
decade in the period 1975 to 2005.

"Rapid movement of climatic zones is going to be anothe
not slow down the rate of global warming, many species

Another key finding is the temperature change in the are

An El Niño is an that typically happens every two to seven years when the warm surface waters in the West Pacific push eastward toward South America, in the process altering weather patterns around the word. Hansen and his colleagues suggest that increased temperature difference between the Western and Eastern Pacific may boost the likelihood of strong El Niños, such as those of 1983 and 1998.

Earth Hottest in Thousands of Years

WASHINGTON, DC, September 26, 2006 (ENS) –

The world's temperature has increased to levels not seen in at least 12,000 years, U.S. climate scientists report in today's issue of "Proceedings of the National Academy of Sciences." Rapid warming has occurred in the past 30 years, the researchers said, and there is little doubt that human activities are the primary factor.

The study comes in the wake of a slew of new research documenting increased warming and the effects on the environment, particularly in the Arctic.

Scientists have found that global warming is having adverse affects on polar bears. (Photo by Robert Taylor courtesy NASA)

European scientists recently reported dramatic openings over large areas of the Arctic's perennial sea ice pack in August and a study released last week found Greenland's ice sheet is melting far faster than scientists had previously thought.

Two other studies published this month by NASA scientists indicate that Arctic sea ice is melting at extraordinary rates.

One study found that the total amount of Arctic sea ice has fallen by 6 percent over each of the last two winters, compared to a loss of 1.5 percent per decade since 1979.

The second study revealed that perennial sea ice in the Arctic shrank by 14 percent between 2004 and 2005, a striking change compared to the period between 1979 to 2003, when perennial ice decreased at a rate of 9 percent per decade.

Furthermore, British scientists reported this month that ice core records from Antarctica show the current levels of atmospheric carbon dioxide - the leading greenhouse gas - are higher now than at any time in the past 800,000 years and increasing at an unprecedented rate.

. . . The study comes in the wake of a slew of new research documenting increased warming and the effects on the environment, particularly in the Arctic.

Scientists have found that global warming is having adverse affects on polar bears.

European scientists recently reported dramatic openings over large areas of the Arctic's perennial sea ice pack in August and a study released last week found Greenland's ice sheet is melting far faster than scientists had previously thought.

Glaciers melting . . .

"Harbingers" of climate change

Events that foreshadow the types of IMPACTS likely to become more frequent and widespread with continued warming.

Spreading disease

Earlier spring arrival

Plant & animal range shifts & population changes

Coral reef bleaching

Downpours, heavy snowfalls, and flooding

Droughts and fires

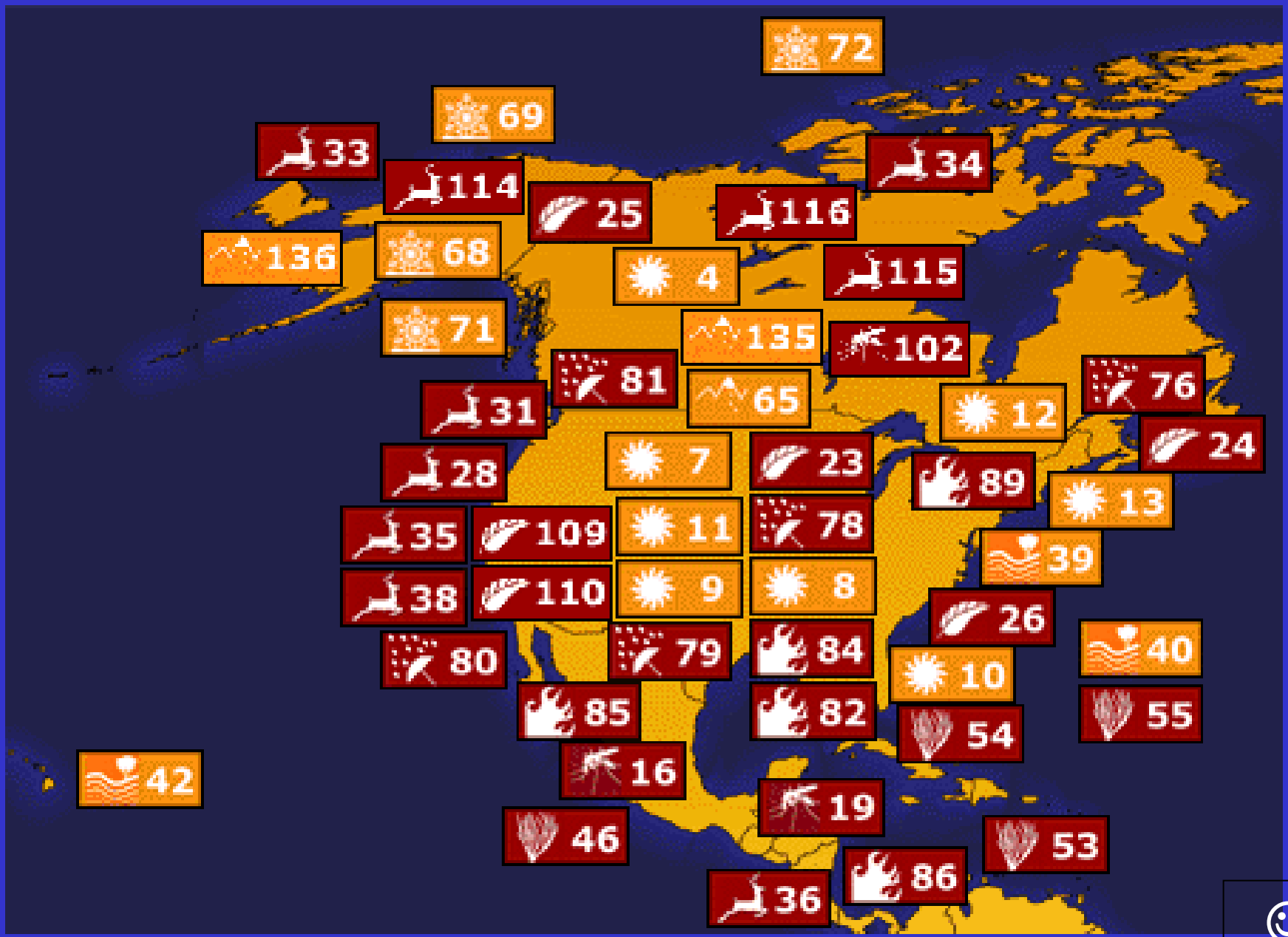

Quercus robur.
© 2001 Gary Braasch • www.worldviewofglobalwarming.org


Edith's Checkerspot.
© 2002 Gary Braasch • www.worldviewofglobalwarming.org

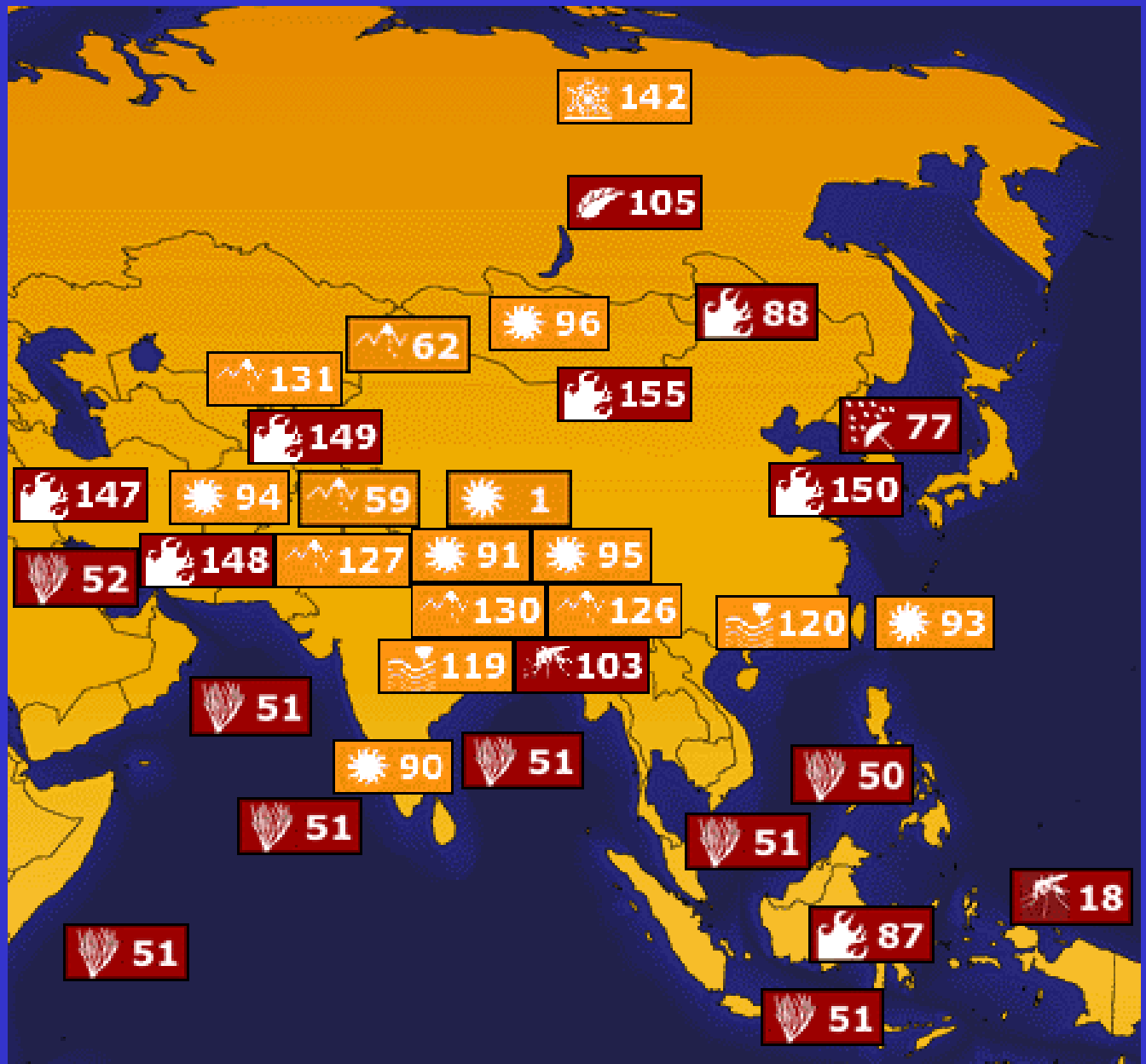

Alaska • © 2000 Gary Braasch • www.worldviewofglobalwarming.org


Marmot
© 2002 Gary Braasch • www.worldviewofglobalwarming.org

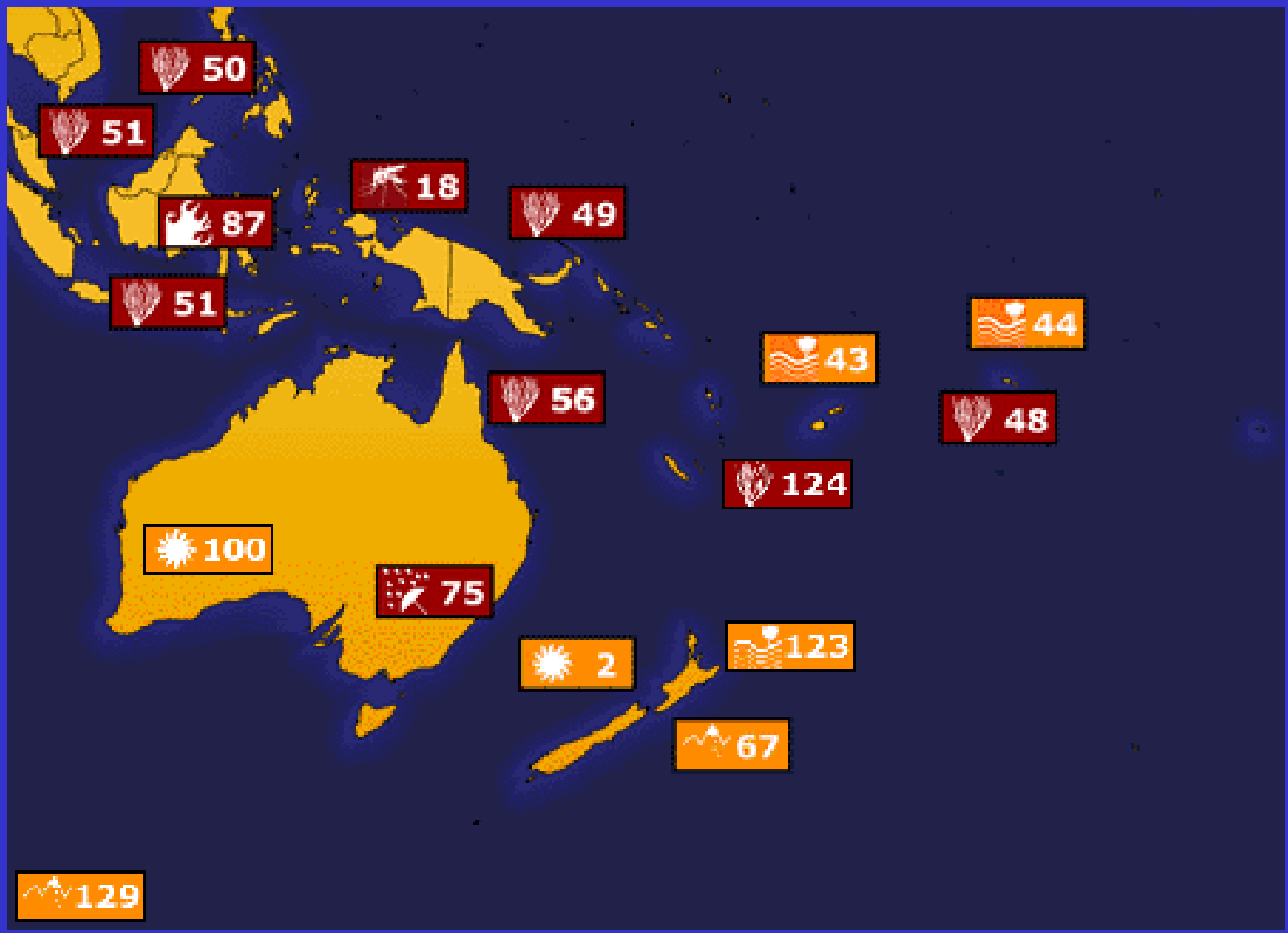
NORTH AMERICA: Early Warming Signs



ASIA: Early Warming Signs



OCEANIA: Early Warming Signs



GLOBAL WARMING

PART IV:

The IPCC

See pp 115 -121 in Class Notes

The most comprehensive source of information on Global Climate Change -- the IPCC

WMO INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE UNEP

- **The role of the IPCC is to assess the scientific, technical and socio-economic information relevant for the understanding of the risk of human-induced climate change.**
- **It does not carry out new research nor does it monitor climate related data.**
- **It bases its assessment mainly on published and peer reviewed scientific technical literature.**

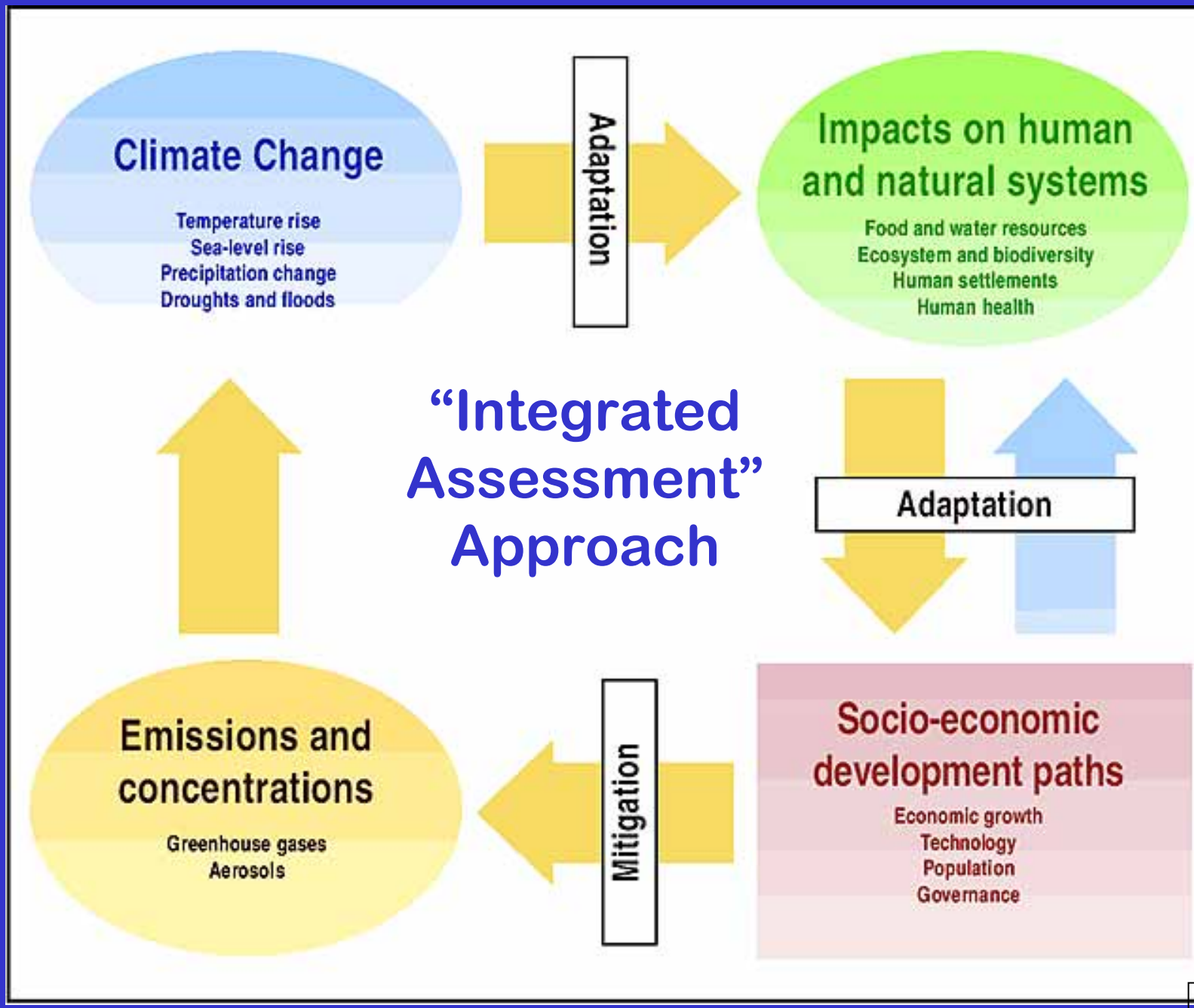
The IPCC has three working groups and a Task Force:

Working Group I (WGI) assesses the scientific aspects of the climate system and climate change.

Working Group II (WGII) addresses the vulnerability of socio-economic and natural systems to climate change, negative and positive consequences of climate change, and options for adapting to it.

Working Group III (WGIII) assesses options for limiting greenhouse gas emissions and otherwise

The Task Force on National Greenhouse Gas Inventories oversees the National Greenhouse Gas Inventories Program


Climate Change
Temperature rise
Sea-level rise
Precipitation change
Droughts and floods
Adaptation
Impacts on human and natural systems
Food and water resources
Ecosystem and biodiversity
Human settlements
Human health
"Integrated Assessment" Approach
Adaptation
Socio-economic development paths
Economic growth
Technology
Population
Governance
Mitigation
Emissions and concentrations
Greenhouse gases
Aerosols

"Climate change" in IPCC usage refers to any change in climate over time, whether due to natural variability or as a result of human activity.

"CLIMATE CHANGE 2001" Report

- 122 Coordinating Lead Authors and Lead Authors
- 515 Contributing Authors
- 21 Review Editors
- 420 Expert Reviewers

NEWEST REPORT ABOUT TO COME OUT in Feb 2007 !

UNIQUE FEATURE OF 2001 REPORTS:

Judgmental estimates of confidence in the report's results / conclusions:

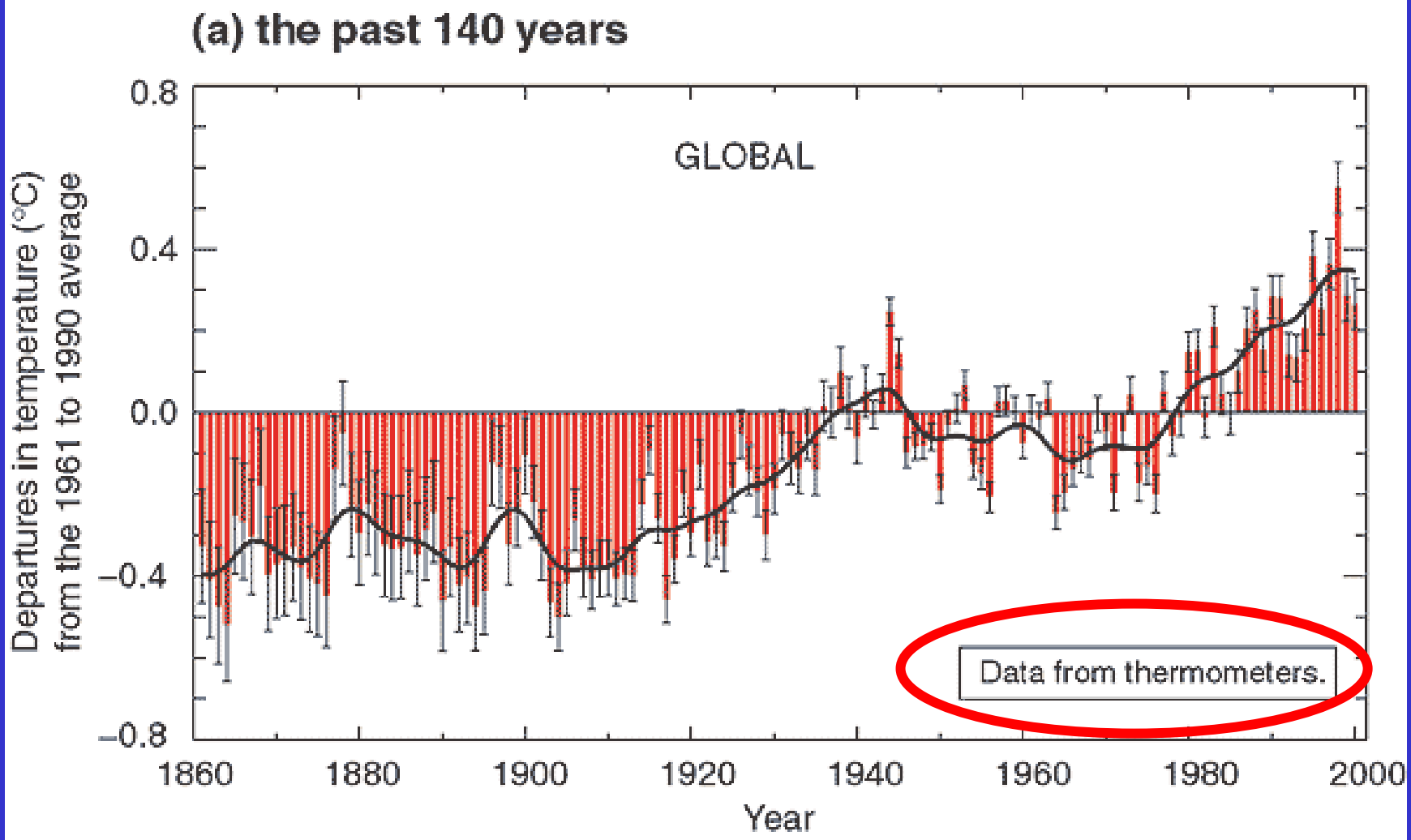
- **virtually certain** (greater than 99% chance that a result is true)
- **very likely** (90-99% chance);
- **likely** (66-90% chance);
- **medium likelihood** (33-66% chance);
- **unlikely** (10-33% chance);
- **very unlikely** (1-10% chance);
- **exceptionally unlikely** (less than 1%) chance).

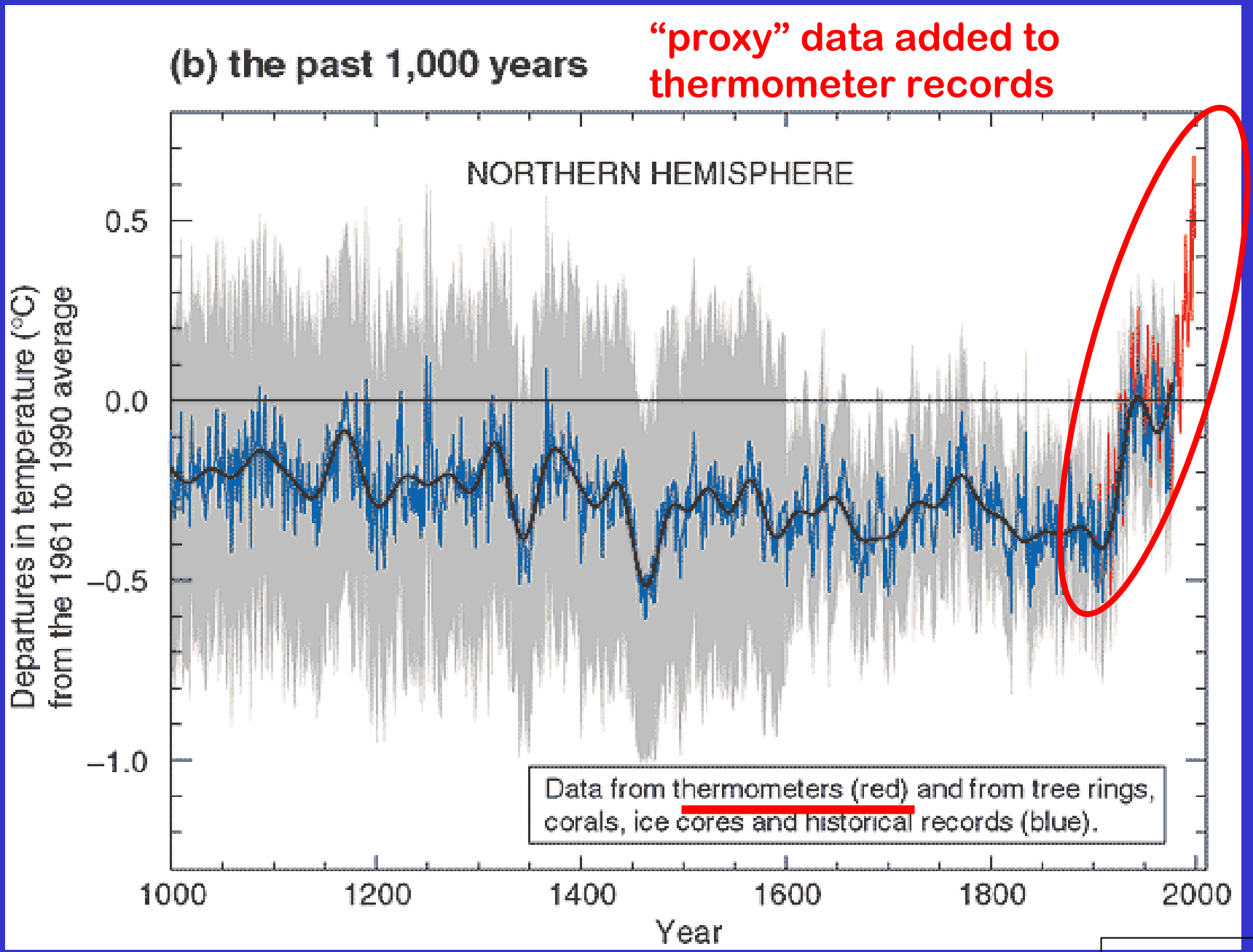
The IPCC REPORT PRESENTS FINDINGS on some of the OBSERVED EVIDENCE . . . .

- For changes in ATMOSPHERIC CONCENTRATION of GHG's
- For global & regional TEMPERATURE increases
- for other change

(later you will review these in the Table on p 120 of CLASS NOTES)

Variations of the Earth's surface temperature for:

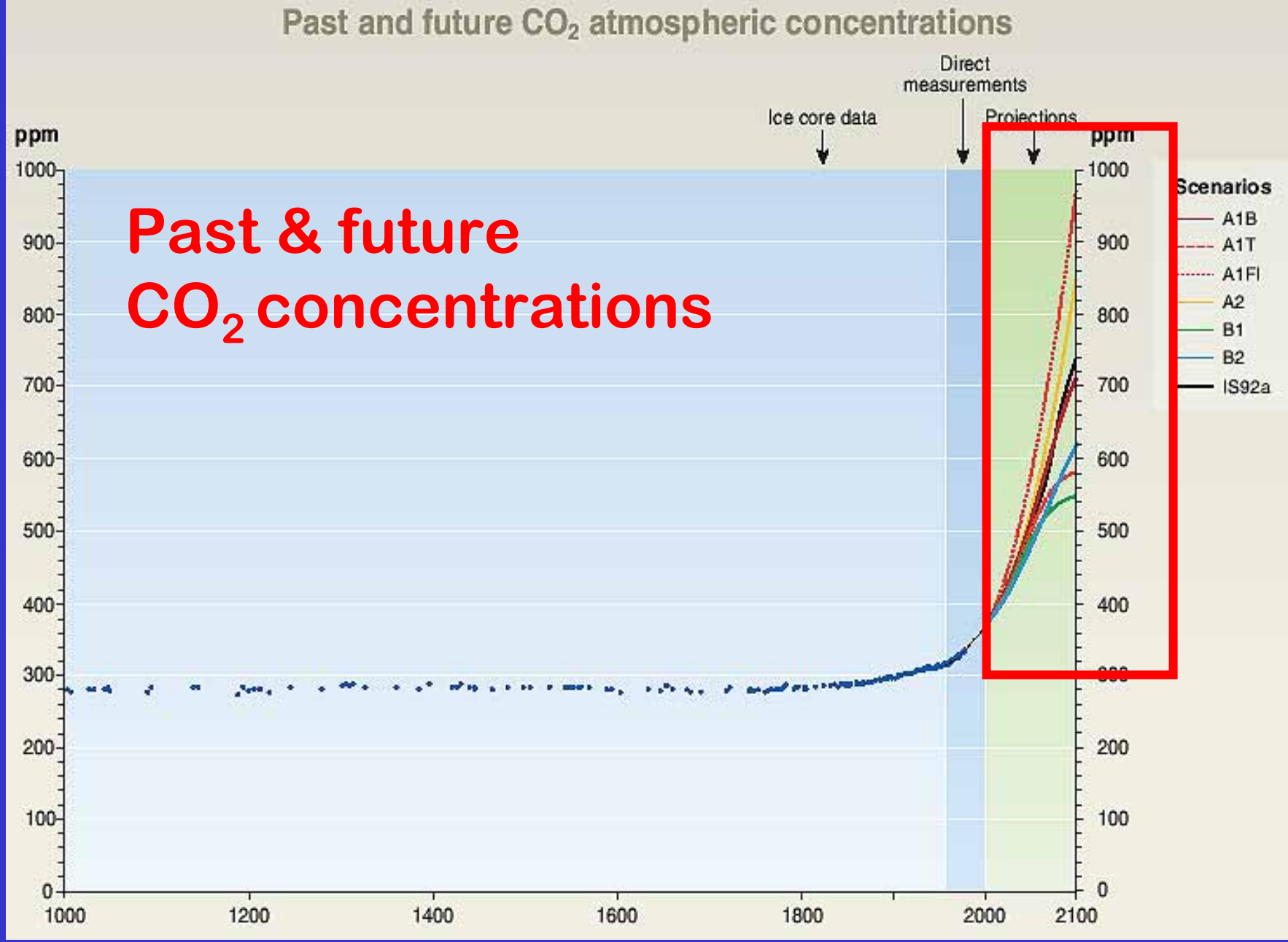


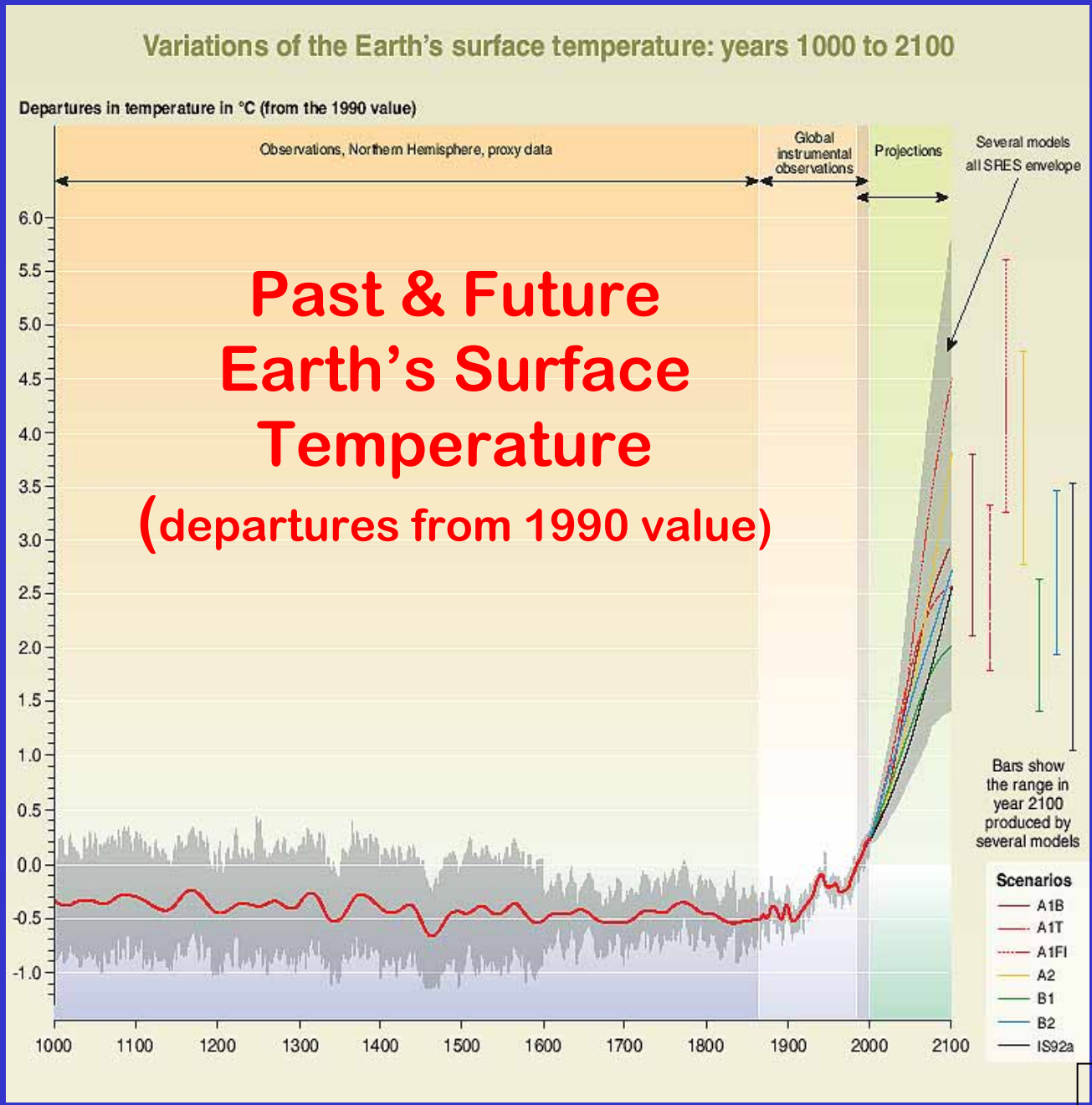

(b) the past 1,000 years
"proxy" data added to thermometer records
NORTHERN HEMISPHERE
Departures in temperature (°C) from the 1961 to 1990 average
0.5
0.0
−0.5
−1.0
1000
1200
1400
1600
1800
2000
Year
Data from thermometers (red) and from tree rings, corals, ice cores and historical records (blue).

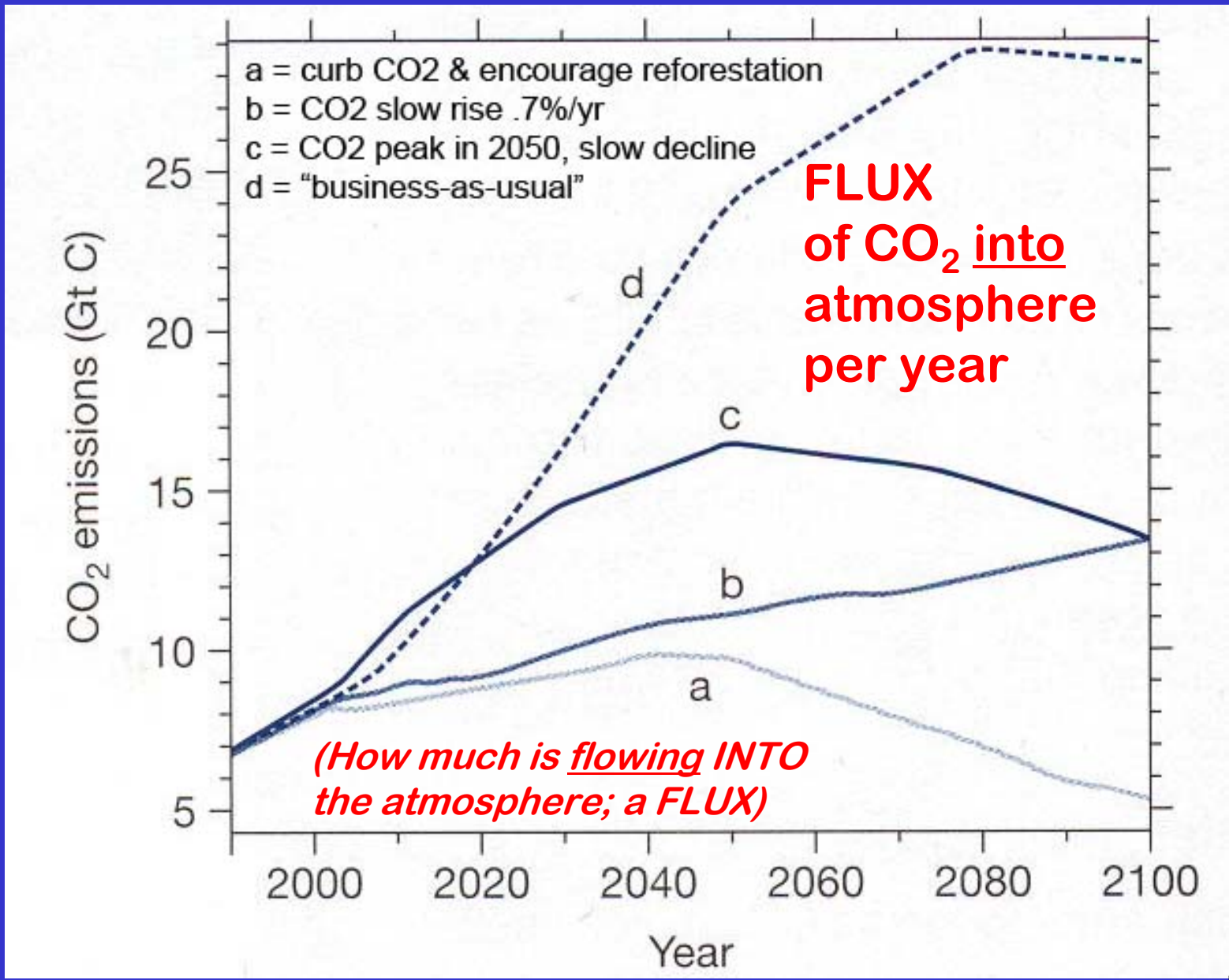
The IPCC Report also presents PROJECTIONS into the future

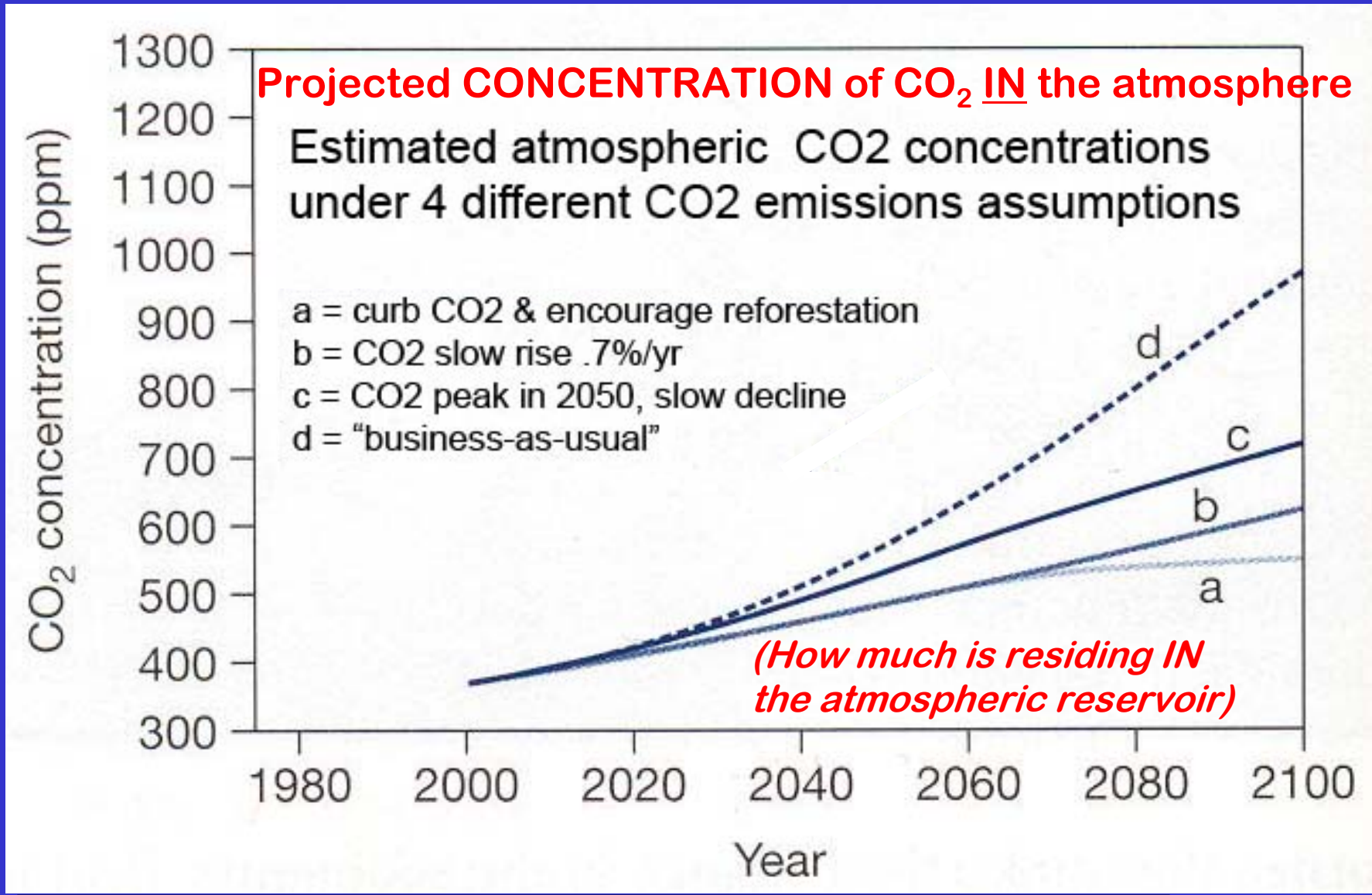
&

possible IMPACTS under different response scenarios . . .


Past and future CO_2 atmospheric concentrations
Ice core data
Direct measurements
Projections
ppm
ppm
1000
900
800
700
600
500
400
300
200
100
0
1000
1200
1400
1600
1800
2000
2100
Scenarios
A1B
A1T
A1FI
A2
B1
B2
IS92a
Past & future
CO_2 concentrations

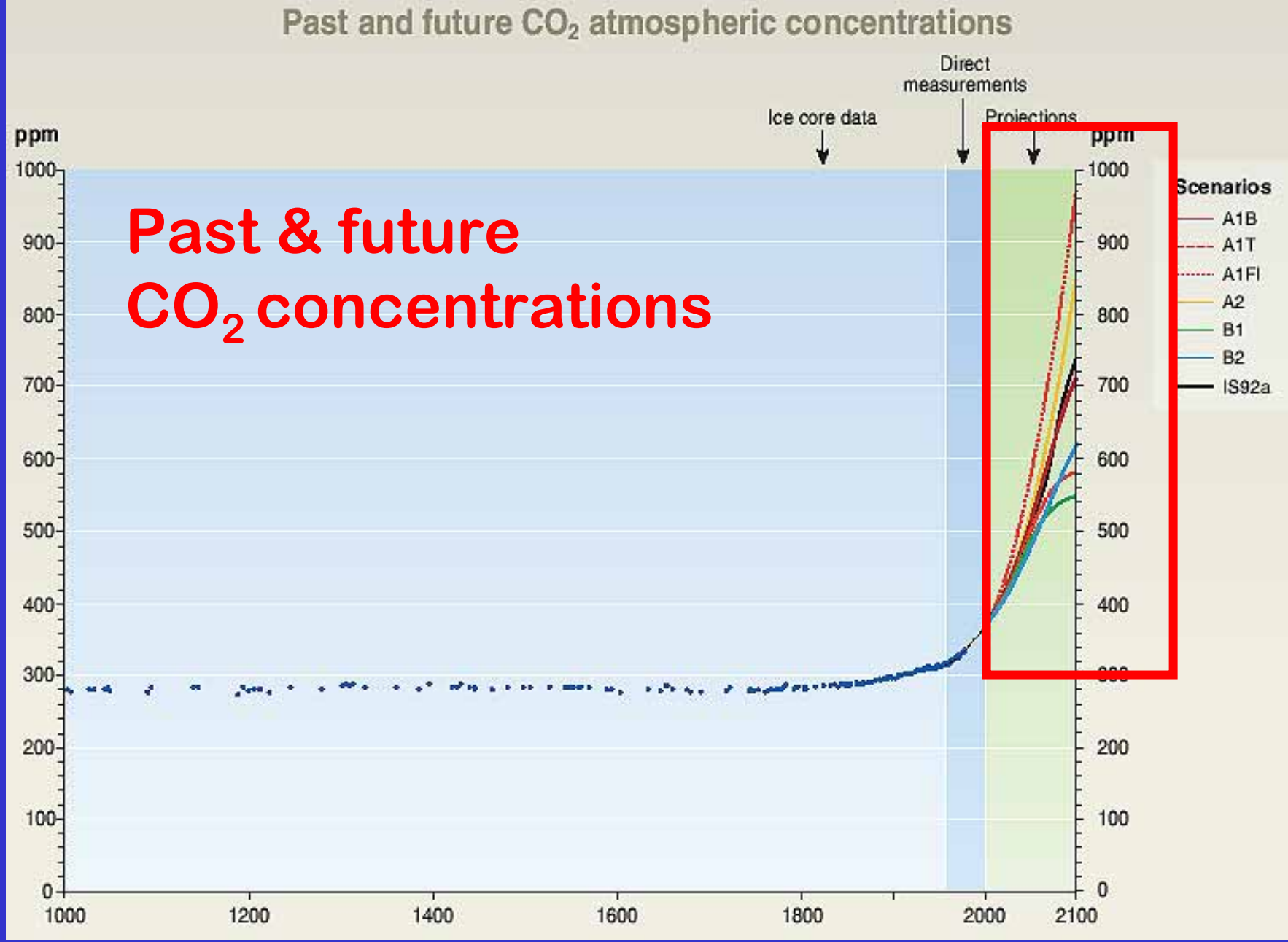

Variations of the Earth's surface temperature: years 1000 to 2100
Departures in temperature in °C (from the 1990 value)
Observations, Northern Hemisphere, proxy data
Global instrumental observations
Projections
Several models all SRES envelope
Past & Future Earth's Surface Temperature
(departures from 1990 value)
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
-0.5
-1.0
1000
1100
1200
1300
1400
1500
1600
1700
1800
1900
2000
2100
Bars show the range in year 2100 produced by several models
Scenarios
A1B
A1T
A1FI
A2
B1
B2
IS92a


a = curb CO2 & encourage reforestation
b = CO2 slow rise .7%/yr
c = CO2 peak in 2050, slow decline
d = "business-as-usual"
FLUX
of CO_2 into
atmosphere
per year
(How much is flowing INTO
the atmosphere; a FLUX)
CO_2 emissions (Gt C)
Year
5
10
15
20
25
2000
2020
2040
2060
2080
2100
a
b
c
d



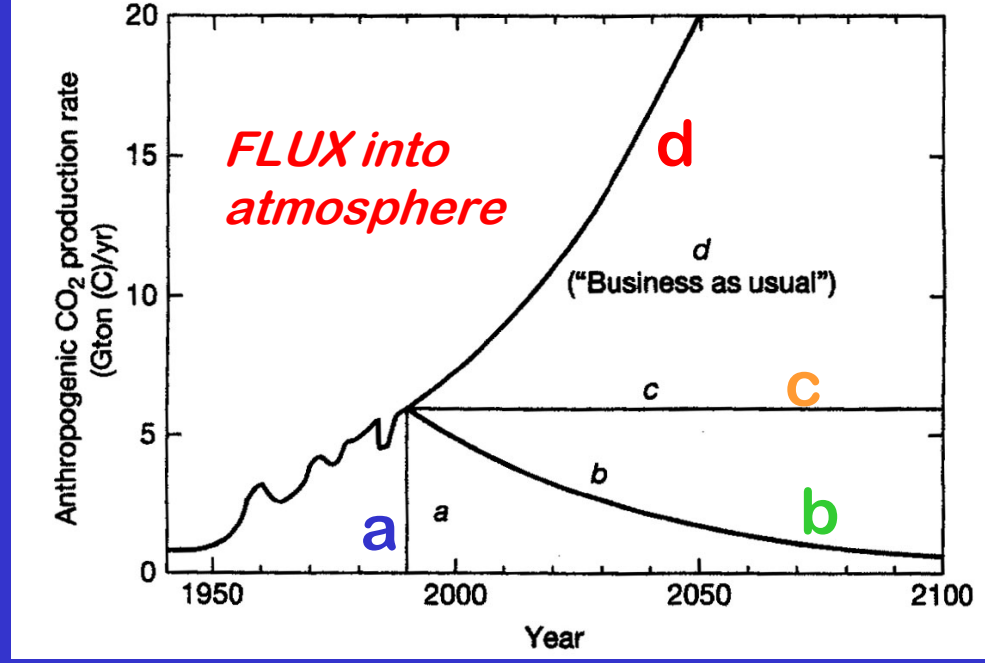
Compare with far right end of top figure on p 116 of Class Notes

☺

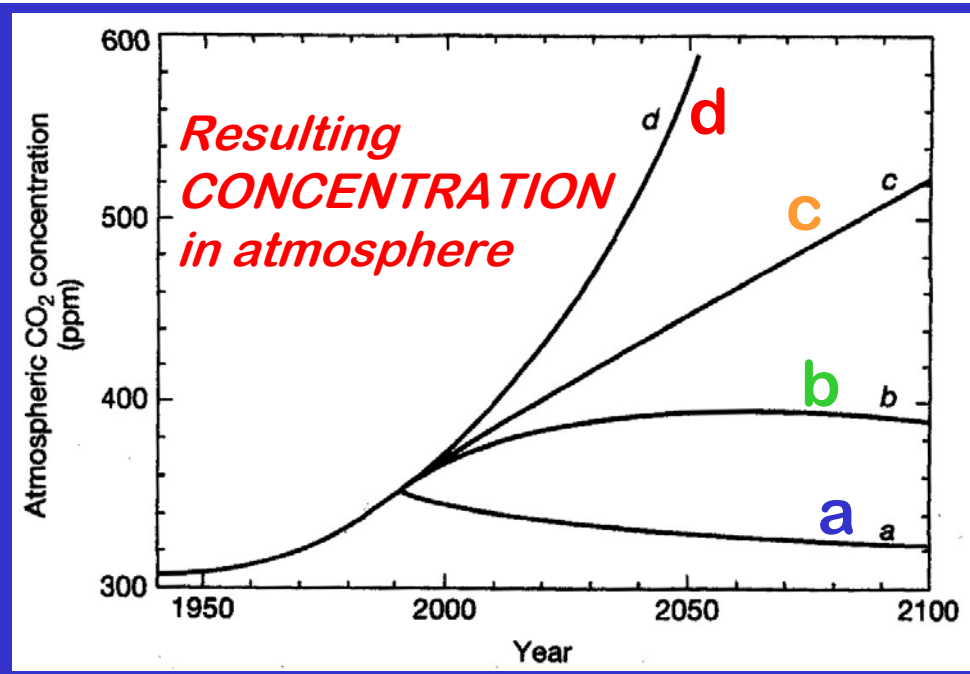

Past and future CO_2 atmospheric concentrations
Ice core data
Direct measurements
Projections
ppm
ppm
1000
900
800
700
600
500
400
300
200
100
0
1000
1200
1400
1600
1800
2000
2100
Scenarios
A1B
A1T
A1FI
A2
B1
B2
IS92a
Past & future
CO_2 concentrations

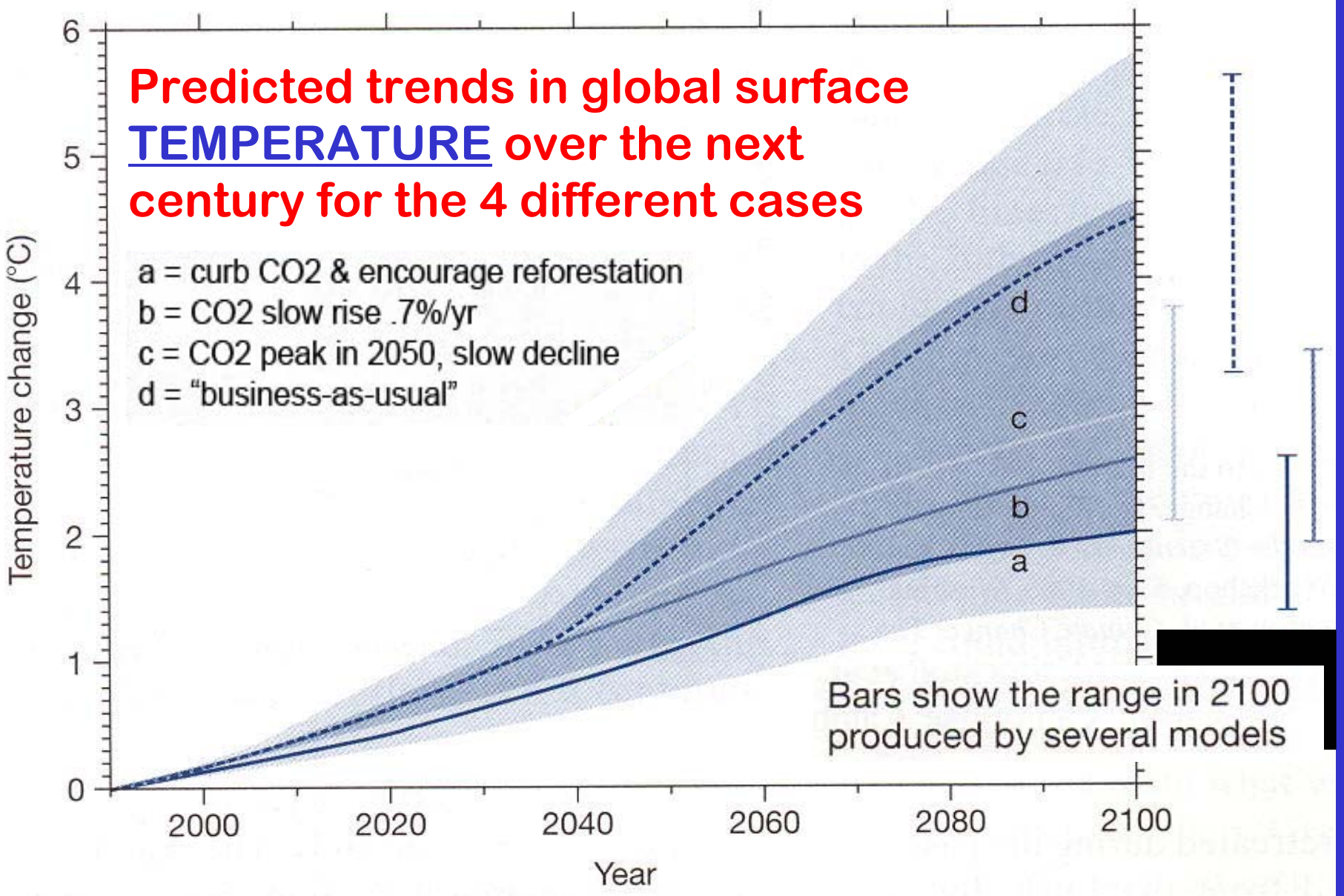
ANOTHER, SIMPLER VIEW OF SAME CONCEPT:

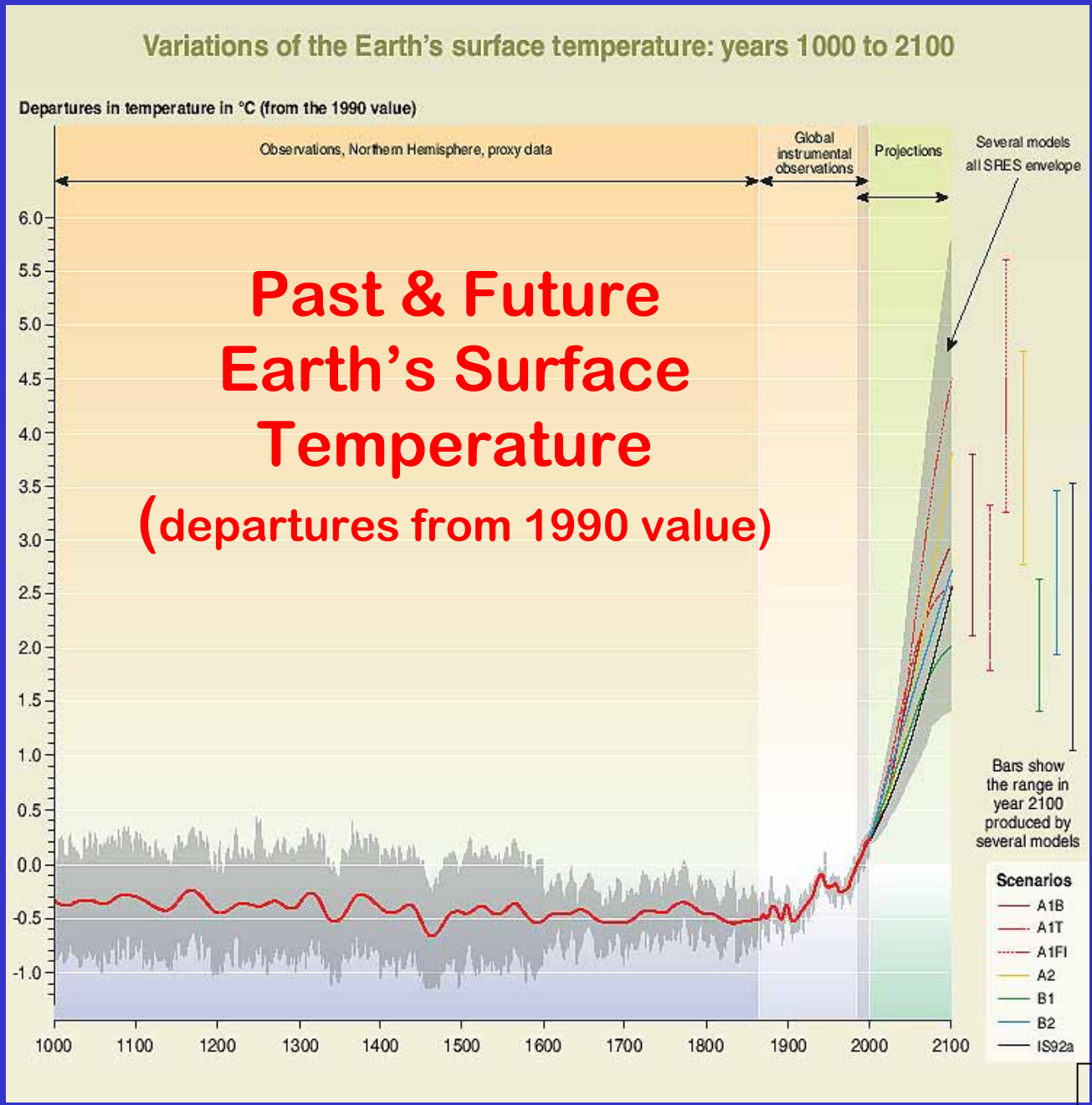
Four different scenarios of CO2 emission rates:



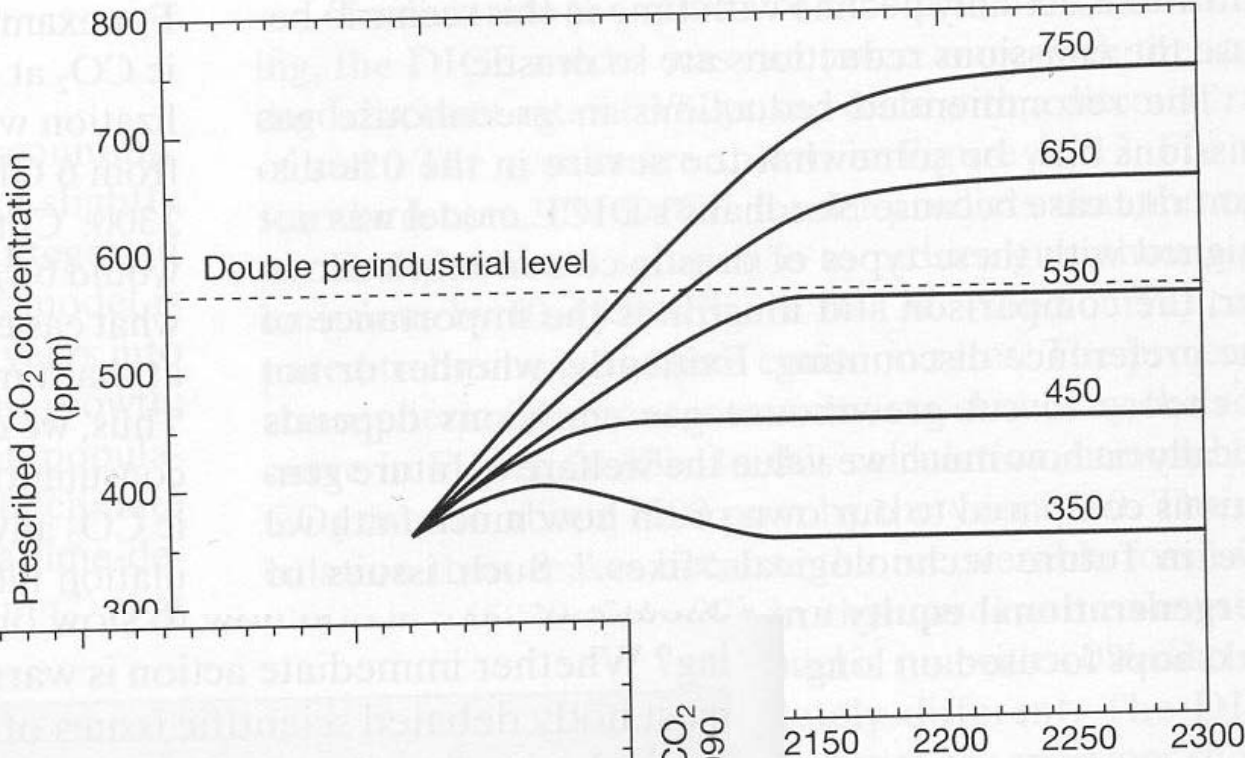
Four different scenarios of resulting atmospheric CO2 concentrations:

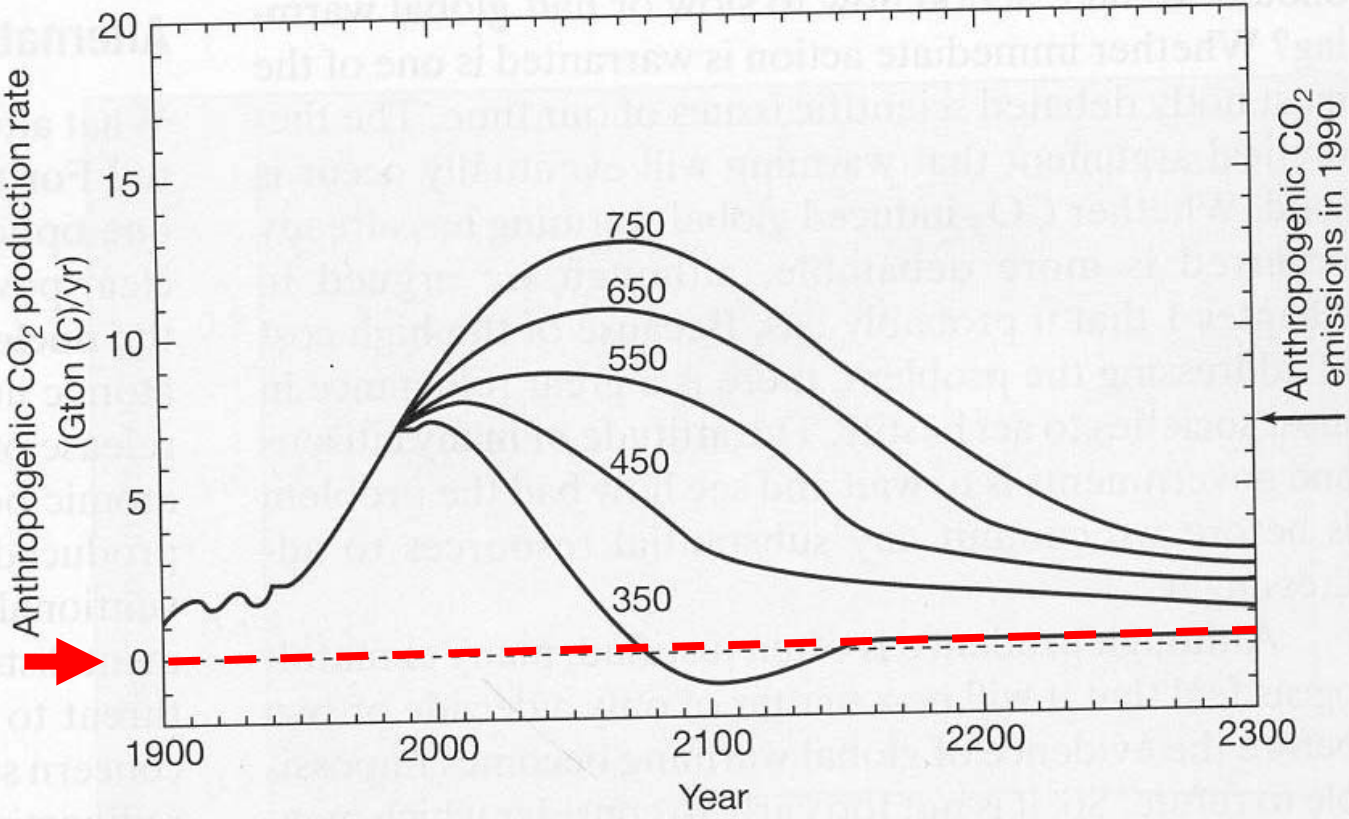



Predicted trends in global surface TEMPERATURE over the next century for the 4 different cases
a = curb CO2 & encourage reforestation
b = CO2 slow rise .7%/yr
c = CO2 peak in 2050, slow decline
d = "business-as-usual"
Temperature change (°C)
0
1
2
3
4
5
6
2000
2020
2040
2060
2080
2100
Year
d
c
b
a
Bars show the range in 2100 produced by several models


Variations of the Earth's surface temperature: years 1000 to 2100
Departures in temperature in °C (from the 1990 value)
Observations, Northern Hemisphere, proxy data
Global instrumental observations
Projections
Several models all SRES envelope
Past & Future Earth's Surface Temperature
(departures from 1990 value)
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
-0.5
-1.0
1000
1100
1200
1300
1400
1500
1600
1700
1800
1900
2000
2100
Bars show the range in year 2100 produced by several models
Scenarios
A1B
A1T
A1FI
A2
B1
B2
IS92a

How much does CO2 production rate need to CHANGE to achieve these ➔ prescribed levels in the atmosphere?





Out to the year 2300!!

☺

The IPCC REPORT also PRESENTS FINDINGS on . . . .

Some of the POSSIBLE IMPACTS of GLOBAL WARMING & CLIMATE CHANGE

(see Table on p 121 in CLASS NOTES)

WHAT CONCERNS YOU MOST ABOUT THE IPCC MODEL-BASED GLOBAL WARMING SCENARIOS & THEIR POSSIBLE IMPACTS??

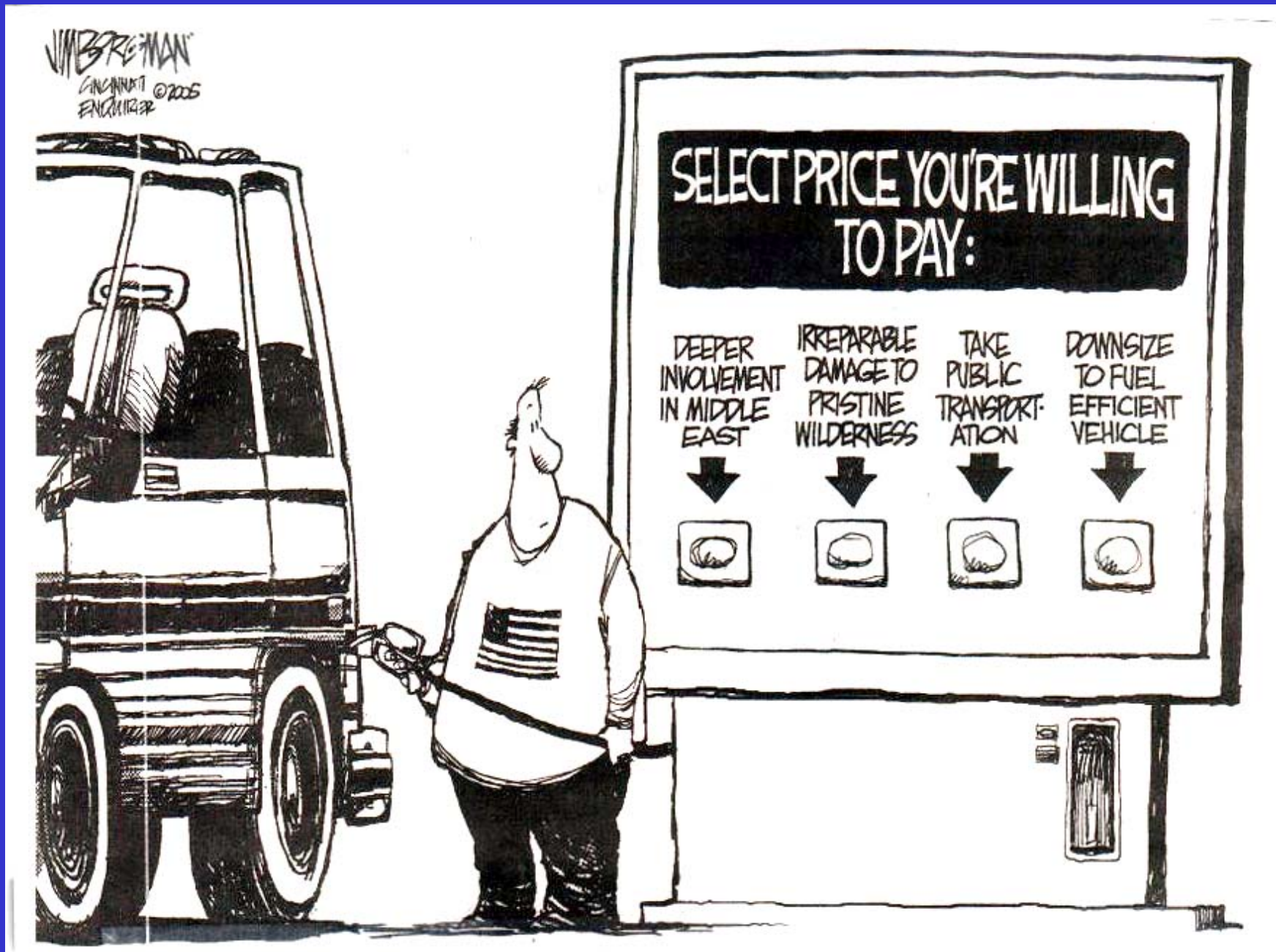
ACTIVE PARTICIPATION POINT

TABLES on pp 117 & 118, 120 & 121

1. Get in pairs -- or groups of 3 or 4
2. Assign a TABLE (or a single page) to each student to read through quietly for 2-3 minutes
3. Share what you read with your fellow students and state what concerns you most
4. On piece of paper, write your NAMES & your pair's conclusions about what you shared

So what do we do about it???

POLICIES & POSSIBLE ACTIONS TO SLOW GLOBAL WARMING . . .


JIM BORGMAN
CINCINNATI ENQUIRER ©2005
SELECT PRICE YOU'RE WILLING TO PAY:
DEEPER INVOLVEMENT IN MIDDLE EAST
IRREPARABLE DAMAGE TO PRISTINE WILDERNESS
TAKE PUBLIC TRANSPORT-ATION
DOWNSIZE TO FUEL EFFICIENT VEHICLE

ADAPTATIONS TO SLOW GLOBAL WARMING:

Energy Conservation

Switch to Alternative Energy Sources

- Nuclear
- Wind & Tidal
- Geothermal
- Biomass-based fuels
- Solar

POLICY ADOPTIONS & OTHER SOLUTIONS:

1. CO2 tax (gas-guzzler tax)
2. Imposition of direct governmental regulations (e.g. CAFE / Combined Automobile Fleet Emissions)
3. International agreements to impose restrictions on CO_2 emissions from fossil fuel burning (e.g. Kyoto Protocol -- roll back to 7% below 1990 levels)
4. Halting tropical deforestation / encouraging reforestation
5. Offsetting carbon impact through investment
6. Drastic changes in lifestyle

CNN.com

SCIENCE & SPACE

Tools: Save | Print | E-mail | Most Popular

Hollywood smog an inconvenient truth

POSTED: 9:35 a.m. EST, November 14, 2006

A UCLA study says that the film and television industry is a major source of air pollution in Los Angeles.

Previous Next

Adjust font size:

LOS ANGELES, California (AP) -- Special effects explosions, idling vehicles, teams of workers building monumental sets -- all of it contributes to Hollywood's newly discovered role as an air polluter, a university study has found.

The film and television industry and associated activities make a larger contribution to air pollution in the five-county Los Angeles region than almost all five other sectors researched, according to a two-year study released Tuesday by the University of California at Los Angeles.

Although Hollywood seems environmentally conscious thanks to celebrities who lend their names to various causes, the industry created more pollution than individually produced by aerospace manufacturing, apparel, hotels and semiconductor manufacturing, the study found.

Only petroleum manufacturing belched more emissions.

"People talk of 'the industry,' but we don't think of them as an industry," said Mary Nichols, who heads the school's Institute of the Environment, which released what researchers called a "snapshot" of industry pollution. "We think of the creative side, the movie, the people, the actors -- we don't think of what it takes to produce the product."

Researchers considered the emissions created directly and indirectly by the film and television industry. For example, they factored in both the pollution caused by a diesel generator used to power a movie set, as well as the emissions created by a power plant that provides electricity to a studio lot.

They also interviewed 43 people who worked in a variety of areas within the industry, and reviewed major trade publications to see the level of attention paid to environmental issues. In doing so, researchers found that some studios have recycling programs and green building practices.

"Nevertheless, our overall impression is that these practices are the exception and not the rule, and that more could be done within the industry to foster environmentally friendly approaches," the study said.

Part of Hollywood's problem is that unlike other industries, film and television work is often done by short-term production companies, in some cases making it difficult to

Although Hollywood seems environmentally conscious thanks to celebrities who lend their names to various causes, the industry created more pollution than individually produced by aerospace manufacturing, apparel, hotels and semiconductor manufacturing, the study found.

Only petroleum manufacturing belched more emissions.

http://www.cnn.com/2006/TECH/science/11/14/hollywood.pollution.ap/index.html

OFFSETTING YOUR CARBON IMPACT . . .

http://www.climatecrisis.net/takeaction/

http://an-inconvenient-truth.com/index.html

Info about Green businesses, energy efficient appliances, etc.

http://www.coopamerica.org/

The Chronicle of Higher Education - issue dated October 20, 2006

THE SUSTAINABLE UNIVERSITY

In Search of the Sustainable Campus

With eyes on the future, universities try to clean up their acts

http://chronicle.com/weekly/v53/i09/09a01001.htm

Getting Involved at UA:

azwildcat online

Home | News | Sports | Opinions | Extra! | UNIVERSITY OF ARIZONA

UA eyes a greener campus

9/28/06

Neil Critchley

Issue date: 9/28/06 **Section:** News

Print Email Article Tools Page 1 of 1

The heated issue of global warming and the drying out of the oil industry have fueled the need for UA scientists and students to focus on environmental sustainability, officials said.

The oil industry peaked last year, and half of the oil in the world has been used up, said Guy McPherson, a professor of natural resources and ecology and evolutionary biology.

"If global warming is a three on a scale of one to 10, then peak oil is a 12," McPherson said.

McPherson estimated a decline in oil supply during the next 20 to 30 years will account for the deaths of tens of millions of Americans. The current price of oil per barrel is $65, but within 10 years, oil is expected to cost about $400 per barrel, McPherson said.

"We will suffer more than any other country because we are so dependent on fossil fuels," he said.

Media Credit: Jake Lacey
Natural resources professor John Koprowski fills up a university truck at the Facilities Management Motorpool Sept. 21. The motorpool is attempting to switch the majority of its fleet over to an ethanol based fuel, E85.

Energy Conservation and Lifestyle Initiative Partnering Students and their Environment, or **ECLIPSE**, is a student club on campus working on bringing solar power to the university through Project Solar.

The Participating Agents in Resource Allocation for Sustainable Living and Learning, or **PARASOL**, is another campus club concerned with environmental sustainability.

asra
Arizona Student Recycling Association

http://clubs.asua.arizona.edu/~asra/

2004: In August:

- an annual report by the Climate Change Science Program and the Subcommittee on Global Change Research — "Our Changing Planet: The U.S. Climate Change Science Program for Fiscal Years 2004 and 2005" — was submitted to Congress.

- In what the NEW YORK TIMES called a "striking shift in the way the Bush administration has portrayed the science of climate change," the report indicated that "emissions of carbon dioxide and other heat-trapping gases are the only likely explanation for global warming over the last three decades."

- Dr. James R. Mahoney, the director of government climate research, told the NEW YORK TIMES that the studies mentioned in the new report are "significant but not definitive."

On September 15, 2004:

- **members of the Senate Committee on Commerce, Science and Transportation heard testimony examining recent scientific research concerning climate change impacts.**

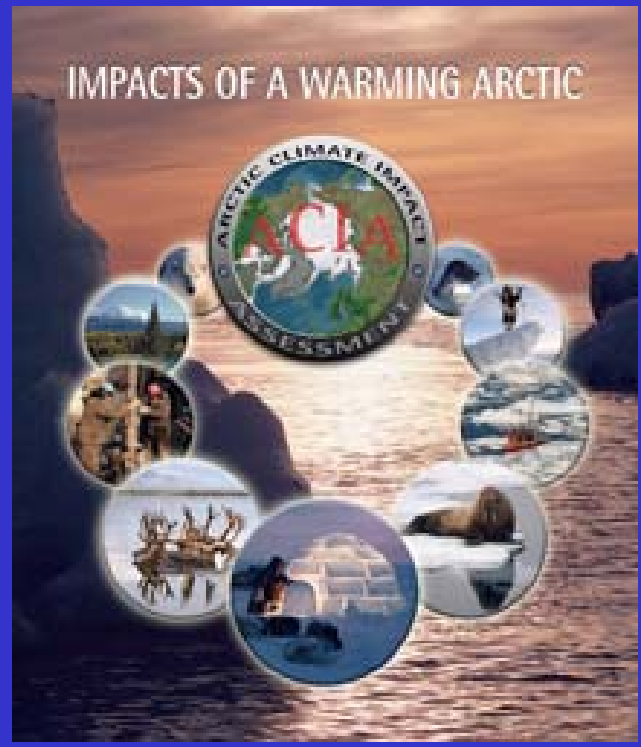
- **Senator John McCain presided, opening the hearing by explaining:**

Last month, I visited the Arctic region and saw first hand the impacts of climate change on the region. These impacts are real and are consistent with earlier scientific projections that the polar regions would experience the effects of climate change at a faster rate than the rest of the globe. The retreating glaciers provide irrefutable evidence supporting the need to take action on this issue. We cannot continue to ignore an issue that is not static. We need to take action that extends well beyond eloquent speeches, and includes meaningful actions such real reductions in the emission of greenhouse gases.

In late 2004,

- the Bush Administration came into conflict with the world community when it appeared to take issue with parts of an eight-nation report compiled by 250 scientists which contended that the Arctic is warming almost twice as fast as the rest of the planet due to a buildup of heat-trapping gases.

- The U.S. State Department argued that the group lacked the evidence to prepare detailed policy proposals.



http://amap.no/acia/

January 2005:

- speech Senator James Inhofe made a speech on the Senate floor again condemning the idea of global warming as **"the greatest hoax ever perpetrated on the American people."**

- Inhofe made frequent reference to the fictional work by author Michael Crichton, best known for the rebirth of dinosaurs in JURASSIC PARK, STATE OF FEAR in which eco-terrorists engineer disasters to prove their theories about global warming.

(More about global warming and the international media.)

February 16, 2005

- **The Kyoto Protocol entered into force (after Russia signed)**

- **Industrialized countries have committed to cut their combined emissions to 5% below 1990 levels by 2008 - 2012.**

- **The emissions covered under the treaty are: Carbon dioxide (CO2), Methane (CH4), Hydrofluorocarbons (HFCs), Perfluorocarbons (PFCs), Sulphur hexafluoride (SF6).**

As of April 19, 2005

149 states and regional economic integration organizations have deposited instruments of ratifications, accessions, approvals or acceptances.

(More about Kyoto.)

From Jan 23, 2004

Want some more info? Watch this NOW program video yourself and read about the HISTORY OF GLOBAL WARMING at the following link:

http://www.pbs.org/now/science/climatechange.html#

This site also contains very useful info for your I-6 Debate Preparation assignment!

NOVA FRONTLINE

what's up with the weather?

NOVA & FRONTLINE examine the truth about global warming

One more "GLOBAL CHANGE AT THE MOVIES" OPPORTUNITY . . . .

Visit the What's Up with the Weather website for I-6 debate help:

http://www.pbs.org/wgbh/warming/

& view the complete written transcript of the video at this link:

http://www.pbs.org/wgbh/nova/transcripts/27gwwarming.html

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