Climate Change/Global Warming: Silly Fantasy or Serious Fact

By
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Rotary Meeting
Buffalo Grove, IL

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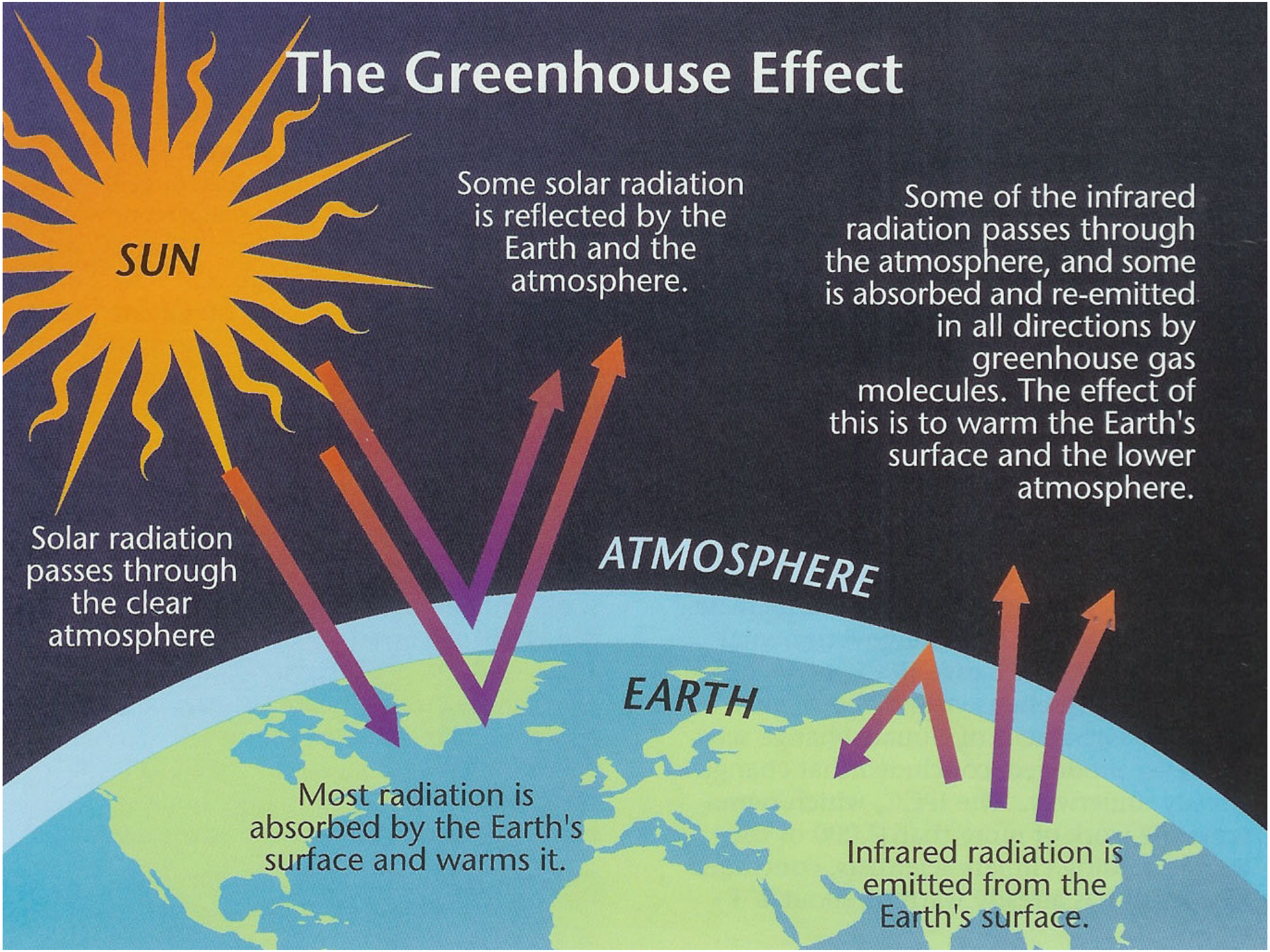
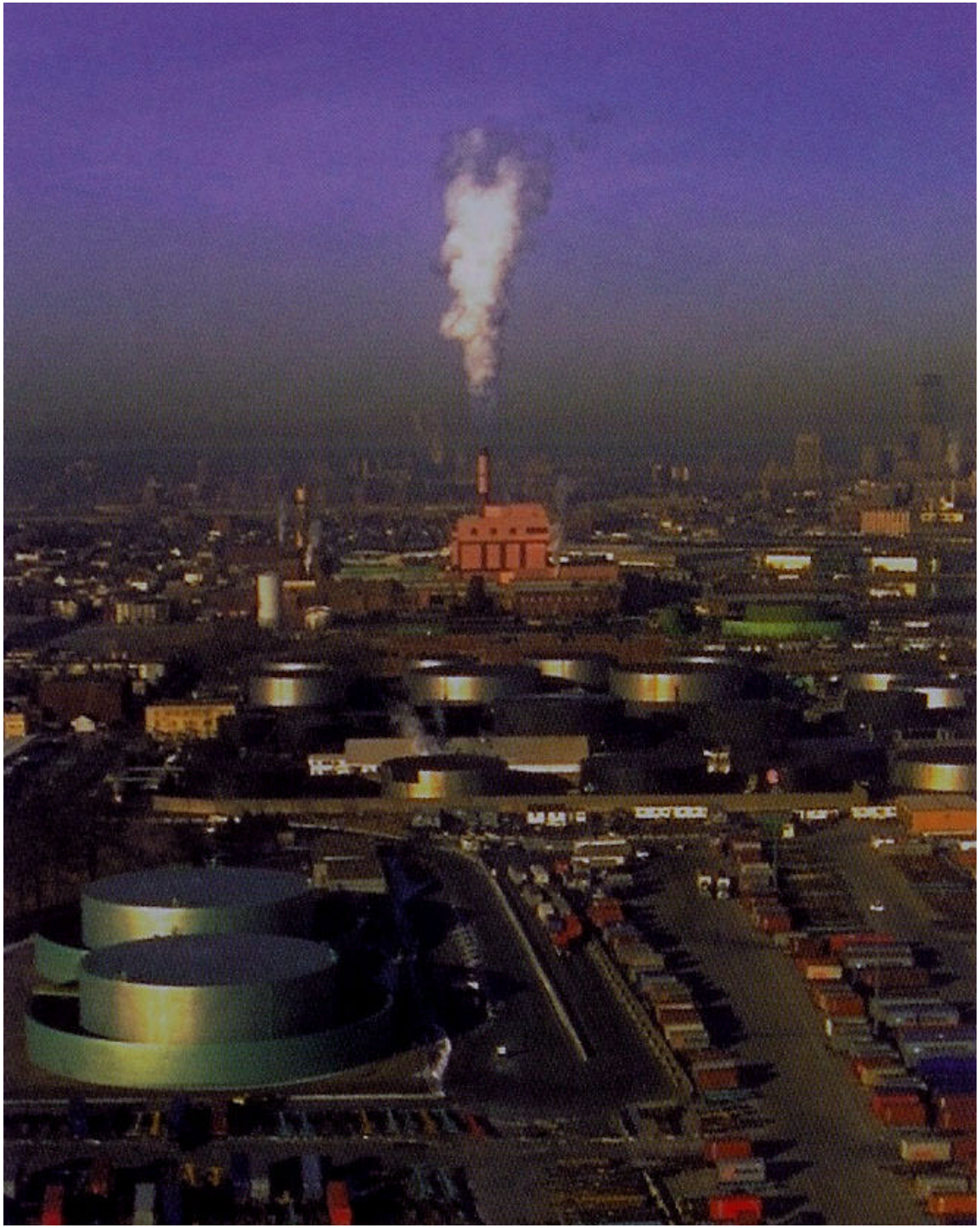
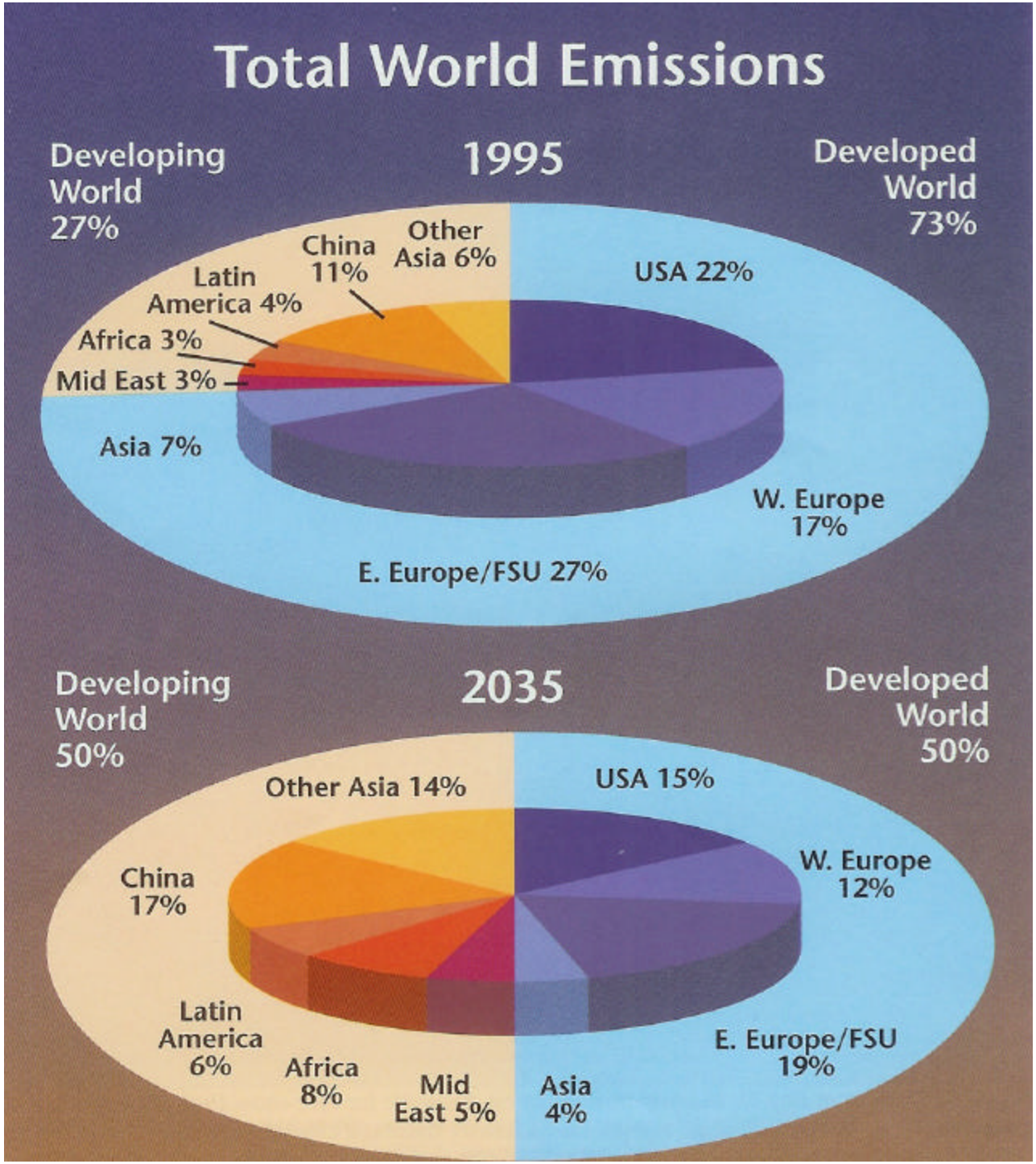

The Greenhouse Effect
SUN
Some solar radiation is reflected by the Earth and the atmosphere.
Some of the infrared radiation passes through the atmosphere, and some is absorbed and re-emitted in all directions by greenhouse gas molecules. The effect of this is to warm the Earth's surface and the lower atmosphere.
Solar radiation passes through the clear atmosphere
ATMOSPHERE
EARTH
Most radiation is absorbed by the Earth's surface and warms it.
Infrared radiation is emitted from the Earth's surface.




Total World Emissions
1995
Developing World 27%
Developed World 73%
Other Asia 6%
China 11%
Latin America 4%
Africa 3%
Mid East 3%
Asia 7%
USA 22%
W. Europe 17%
E. Europe/FSU 27%
2035
Developing World 50%
Developed World 50%
Other Asia 14%
China 17%
Latin America 6%
Africa 8%
Mid East 5%
Asia 4%
USA 15%
W. Europe 12%
E. Europe/FSU 19%

History of Greenhouse Gas Effect

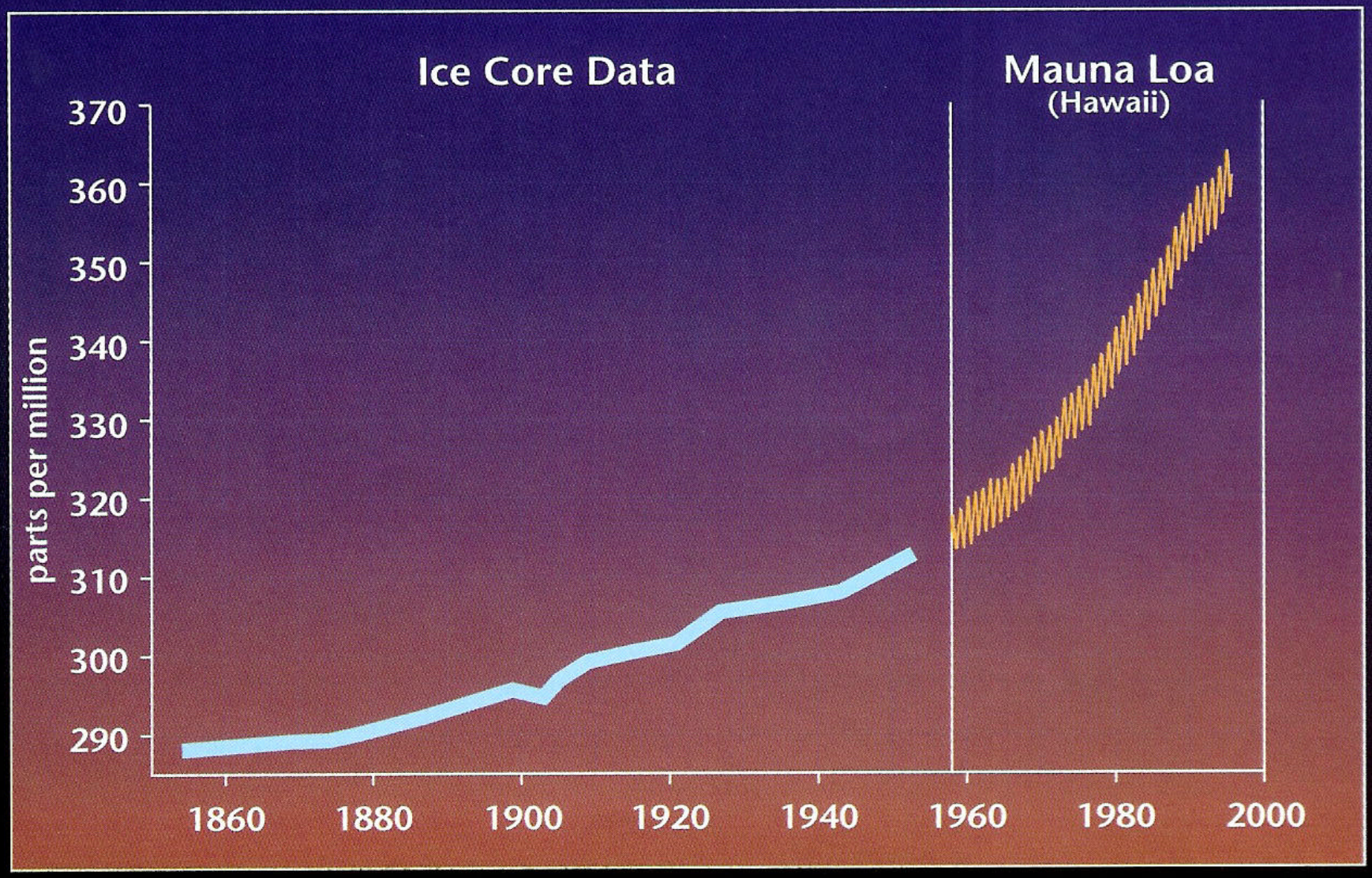
1827- Joseph Fourier predicts the Greenhouse Effect

1863- John Tyndall find CO_2 and water vapor absorb infrared radiation

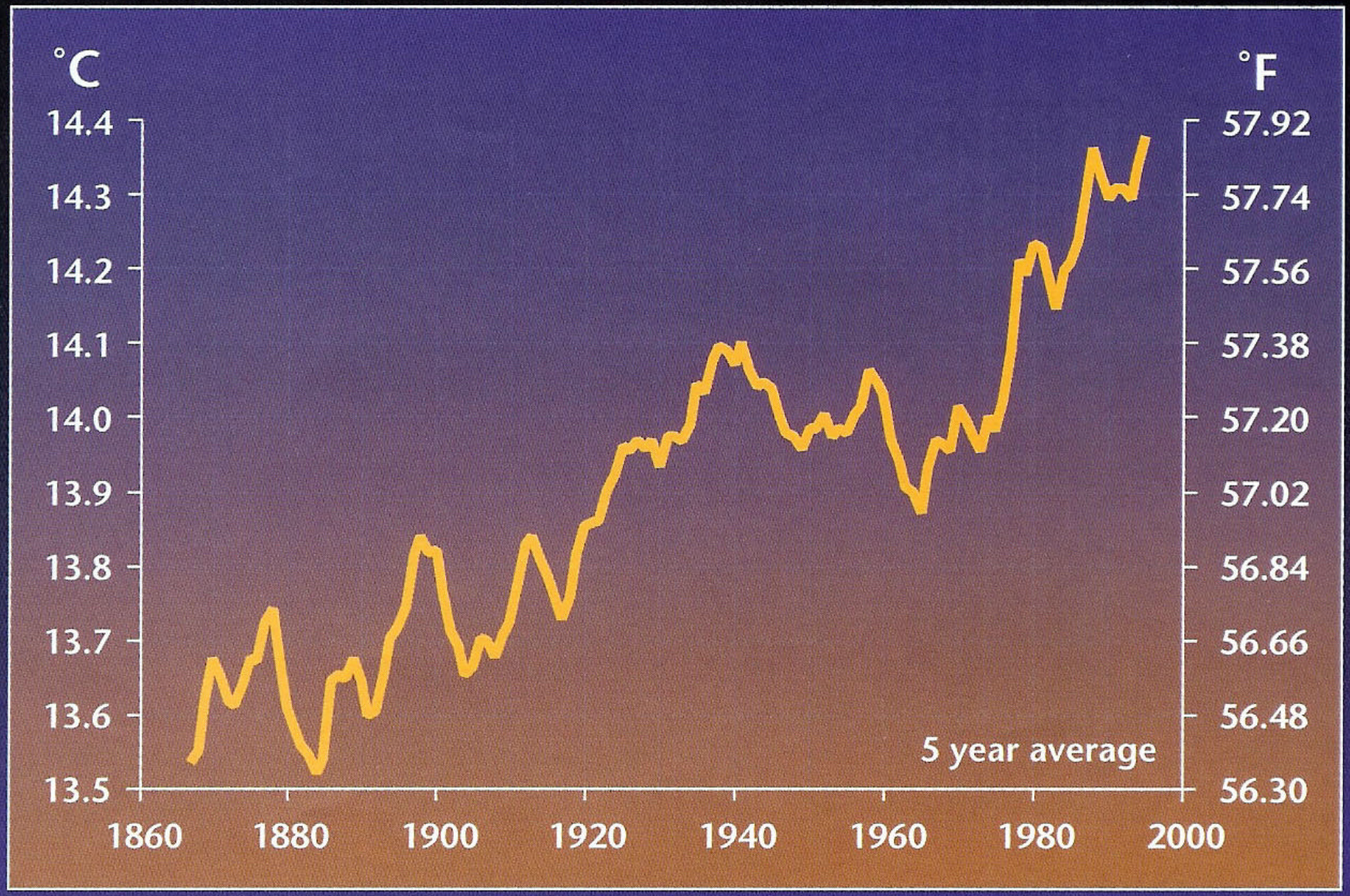
1896- Svante August Arrhenius predicts doubling of CO_2 will raise atmospheric temperature 7-11° F

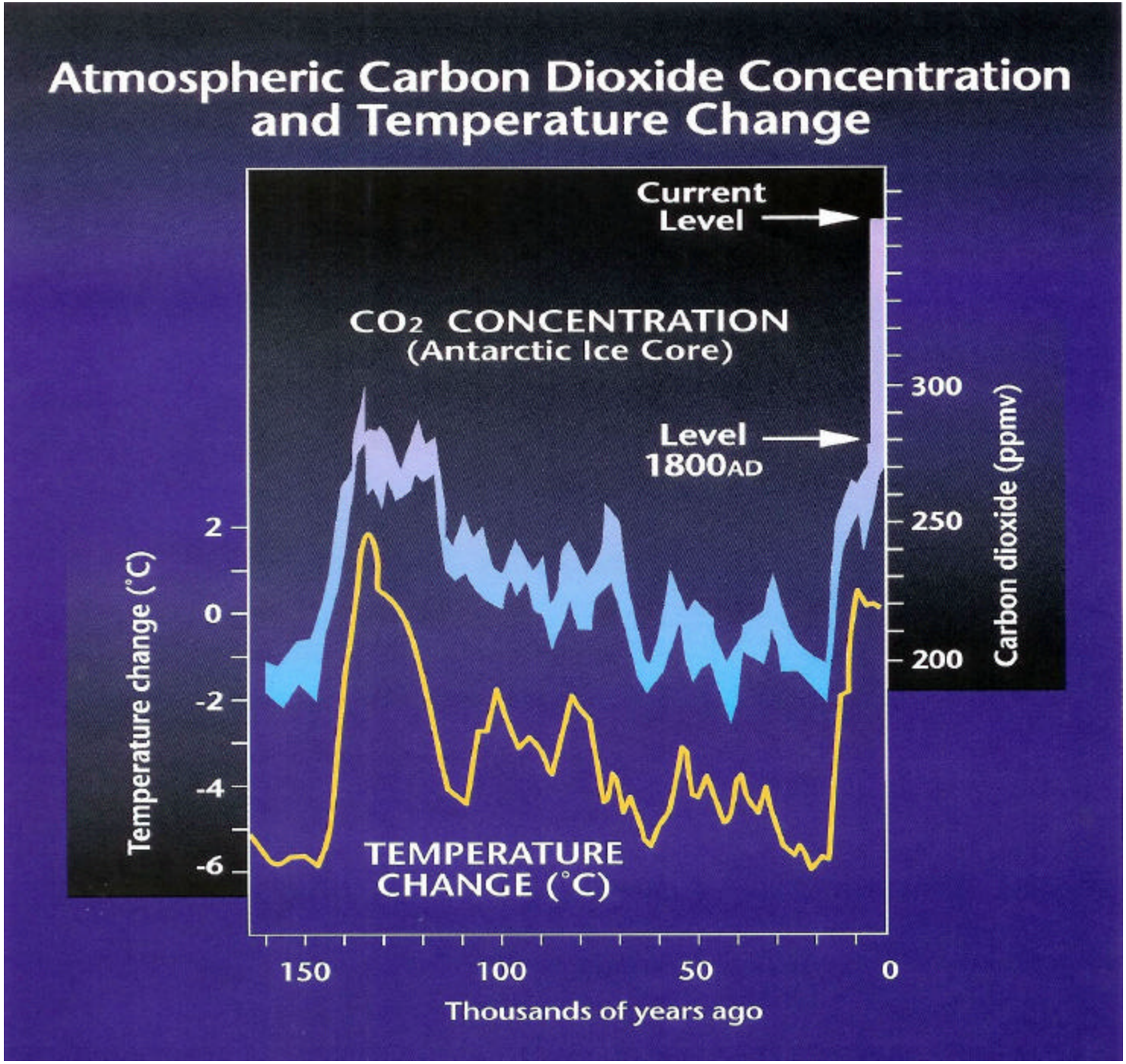
1957- Scientists begin measuring atmospheric CO_2 at Mona Loa, Hawaii, observatory

Carbon Dioxide Concentrations



Global Average Temperature

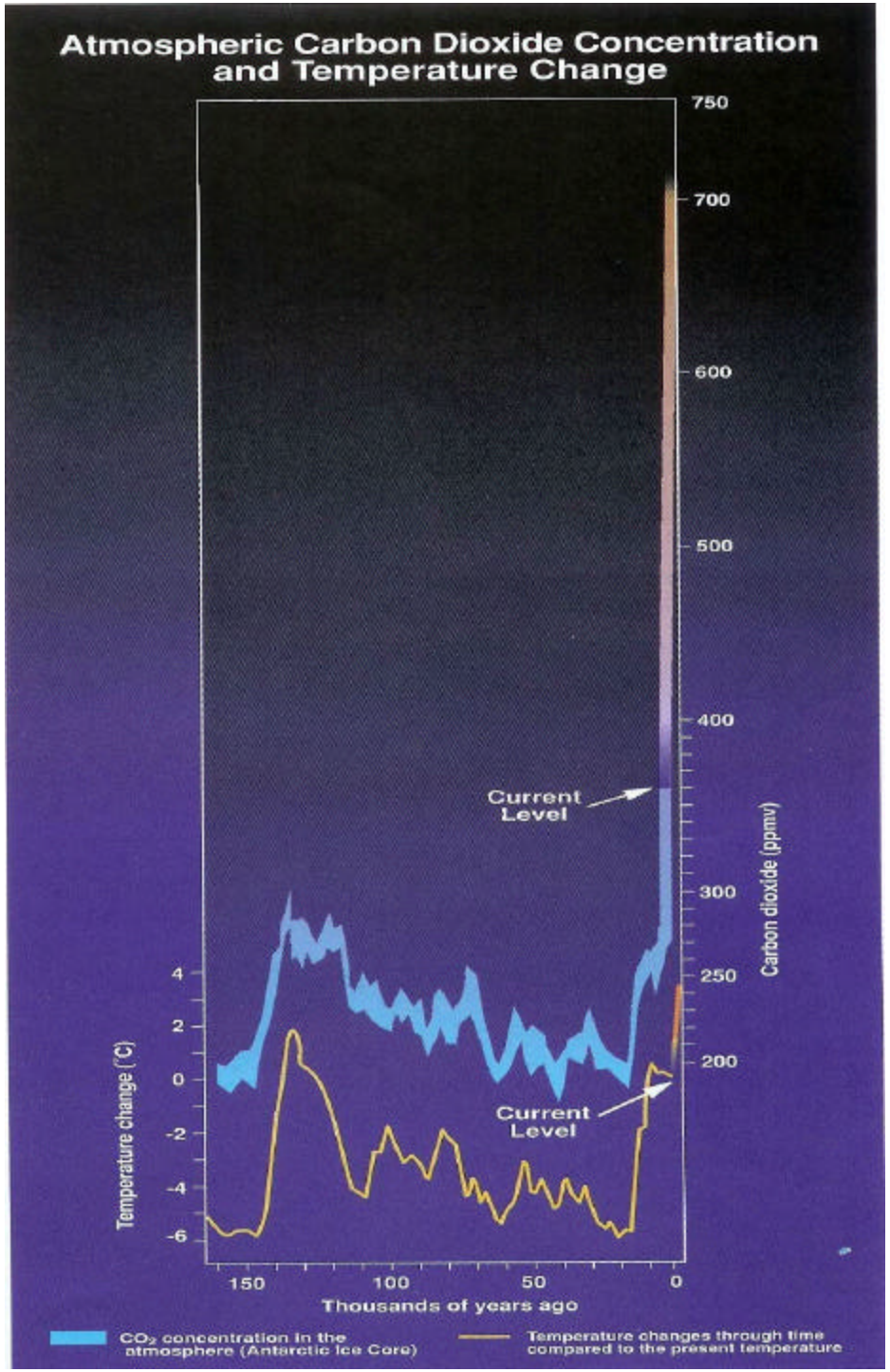



Atmospheric Carbon Dioxide Concentration and Temperature Change
Current Level
CO2 CONCENTRATION
(Antarctic Ice Core)
Level 1800AD
TEMPERATURE CHANGE (°C)
Temperature change (°C)
2
0
-2
-4
-6
300
250
200
Carbon dioxide (ppmv)
150
100
50
0
Thousands of years ago

Intergovernmental Panel on Climate Change (IPCC)

1988- World Meteorological Organization (WMO) and U.N. Environment Programme (UNEP) establish the IPCC

1990- First IPCC Report– No smoking gun


Atmospheric Carbon Dioxide Concentration and Temperature Change
750
700
600
500
400
300
250
200
Carbon dioxide (ppmv)
Current Level
Current Level
4
2
0
-2
-4
-6
Temperature change (°C)
150
100
50
0
Thousands of years ago
CO2 concentration in the atmosphere (Antarctic Ice Core)
Temperature changes through time compared to the present temperature

NASA

SHRINKING CAP: satellite views of the Arctic icecap, in 1970 (left) and 2003

Intergovernmental Panel on Climate Change (IPCC)

1995- Second IPCC Report (2000 scientists):

1. Extensive progress in global systems modeling and scientific consensus

2. Global average temperature rise of 1°F over last century

3. "The balance of evidence suggests a discernible human influence on global climate change."

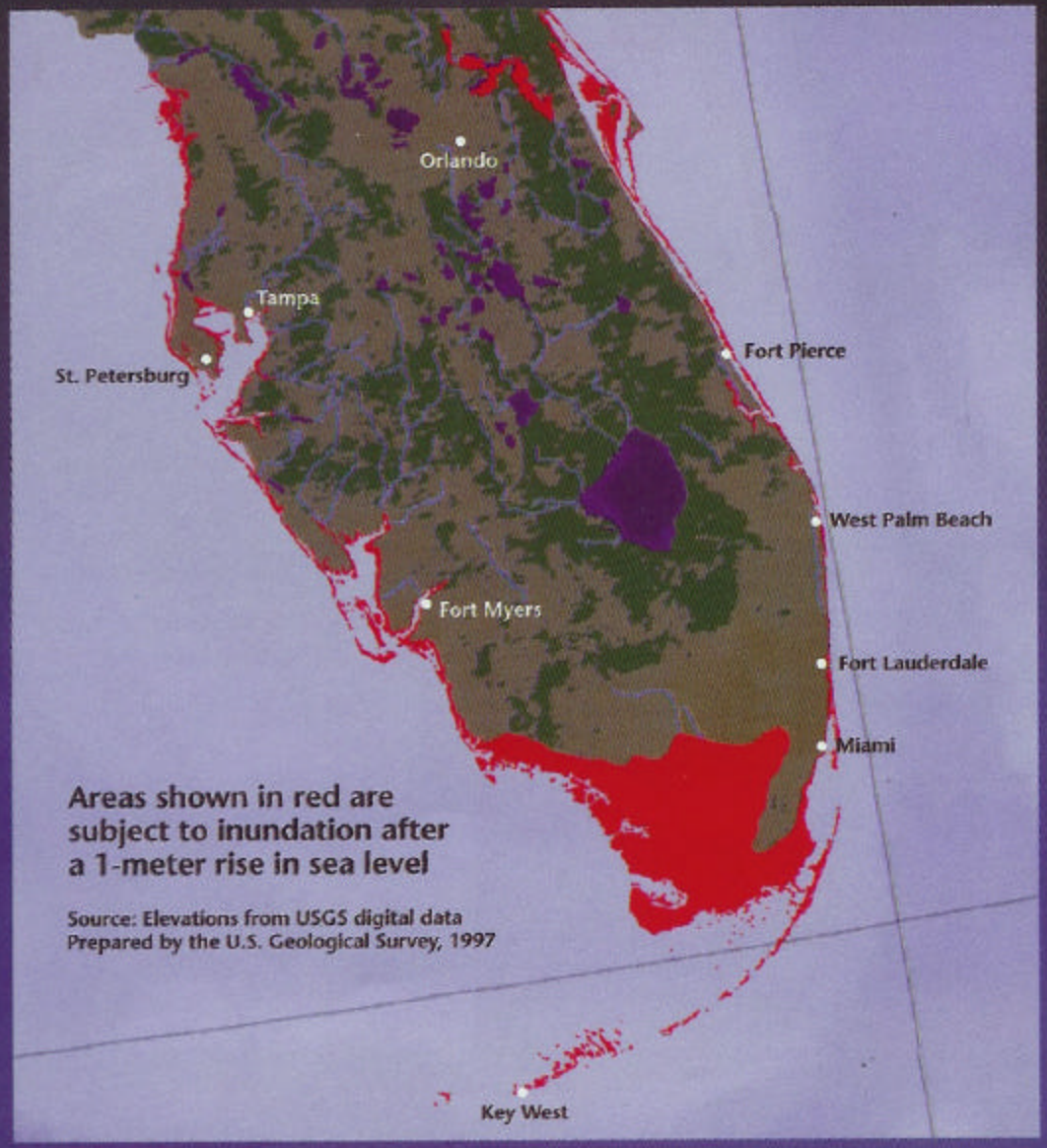
4. "Climate change is likely to have wide ranging and mostly adverse impact on human health with significant lost of life."

Intergovernmental Panel on Climate Change (IPCC)

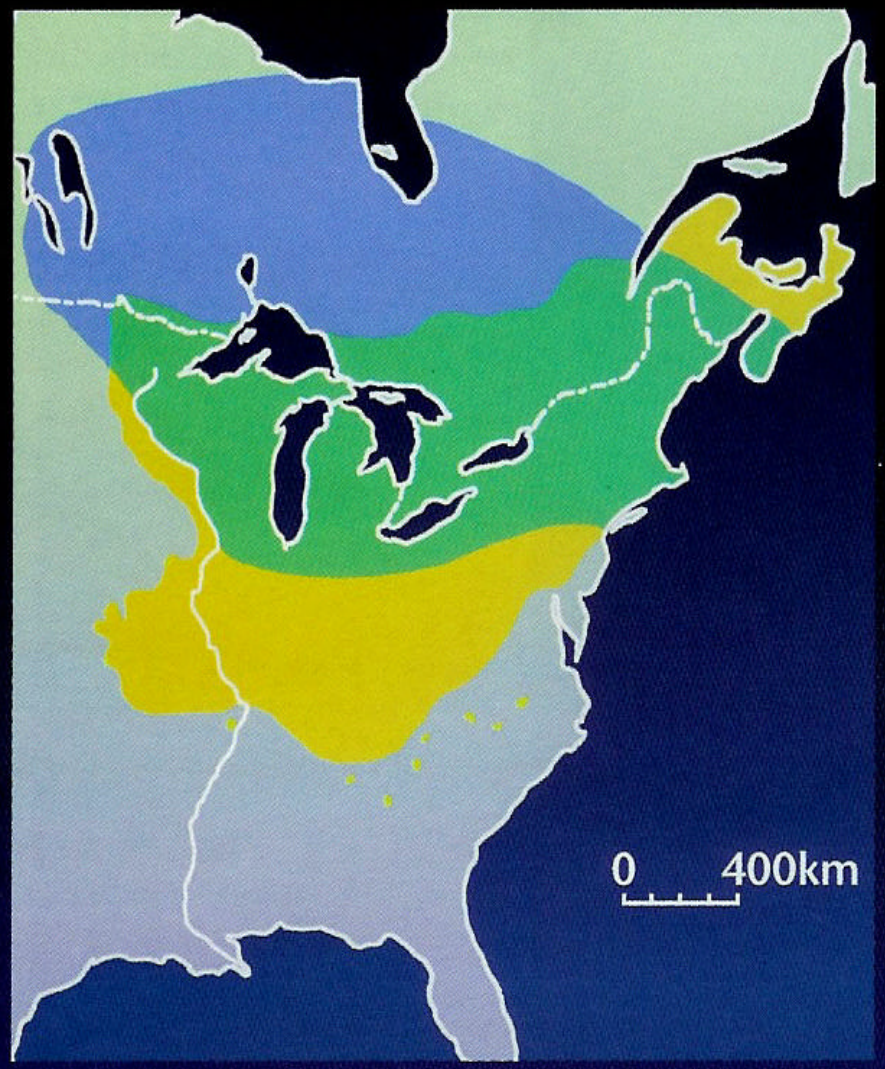
Latest IPCC Opinions About Possible Climate Change (based on 235 predictions using 7 models):

- Increase in global average temperature by 2 to 10° F by 2100
- More severe heat waves
- Changing patterns of hurricanes
- Heavier rains in some locations, little rain in others
- Sea level rise of 3 to 30 inches by 2100

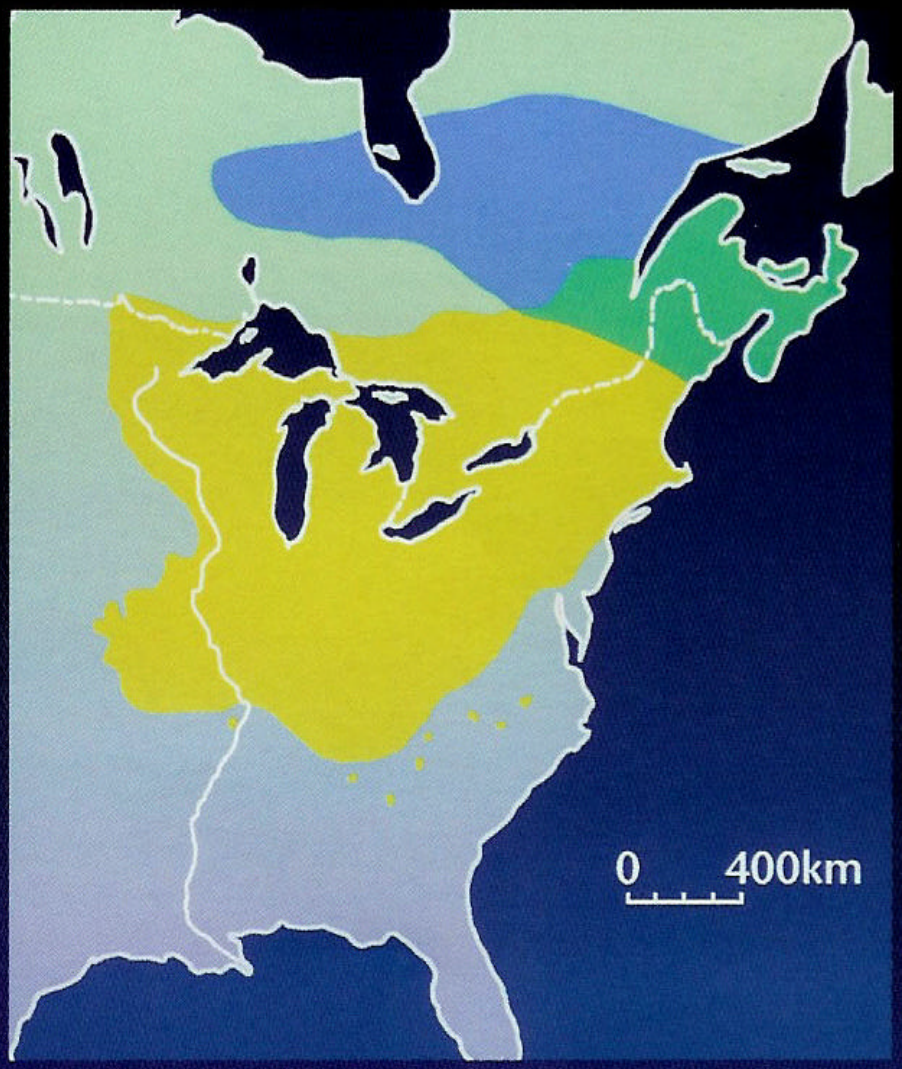
South Florida Shoreline Change after a 1-Meter Rise in Sea Level



Current and Projected Ranges of Sugar Maple



Prediction based on increased temperature

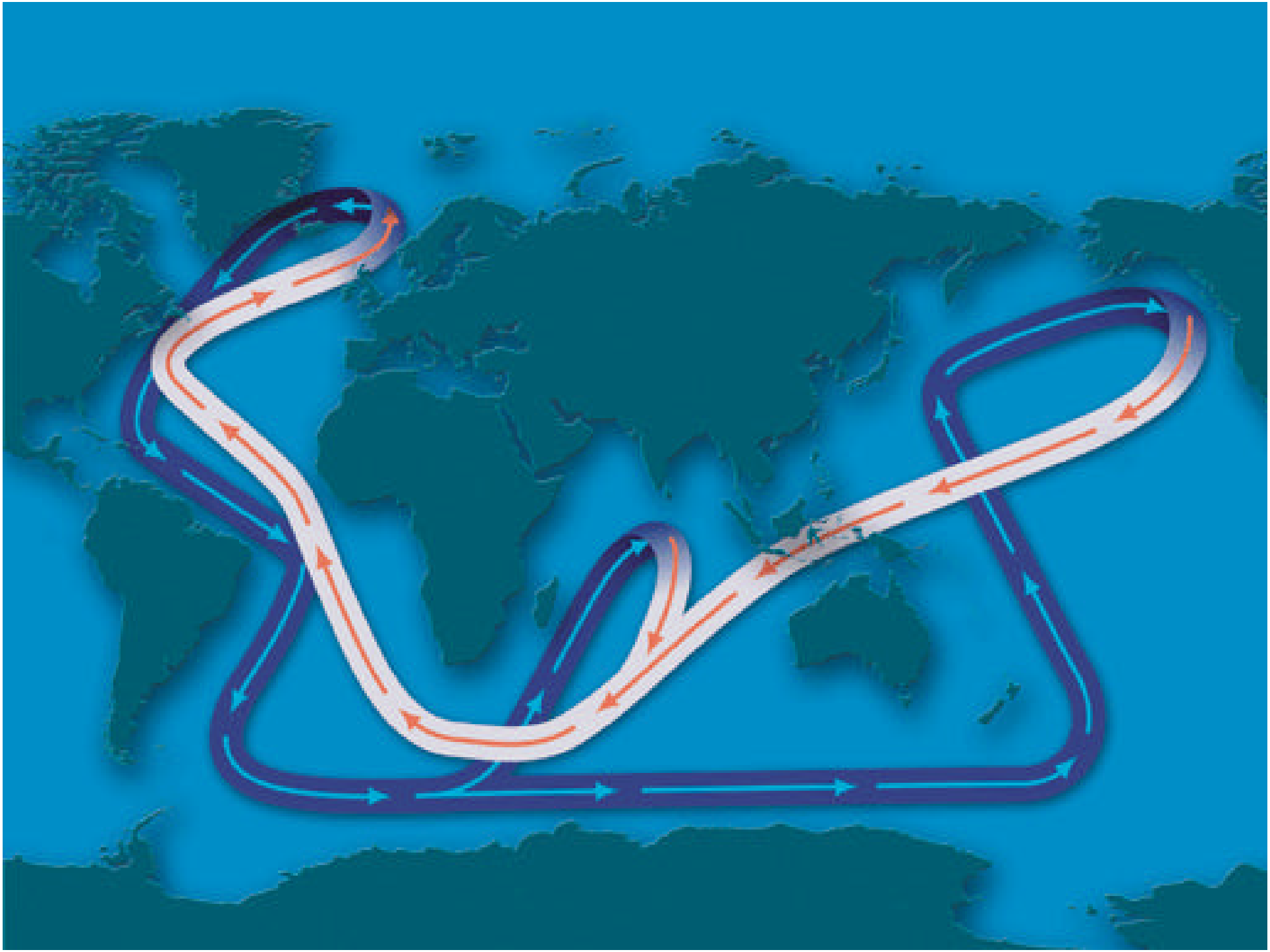


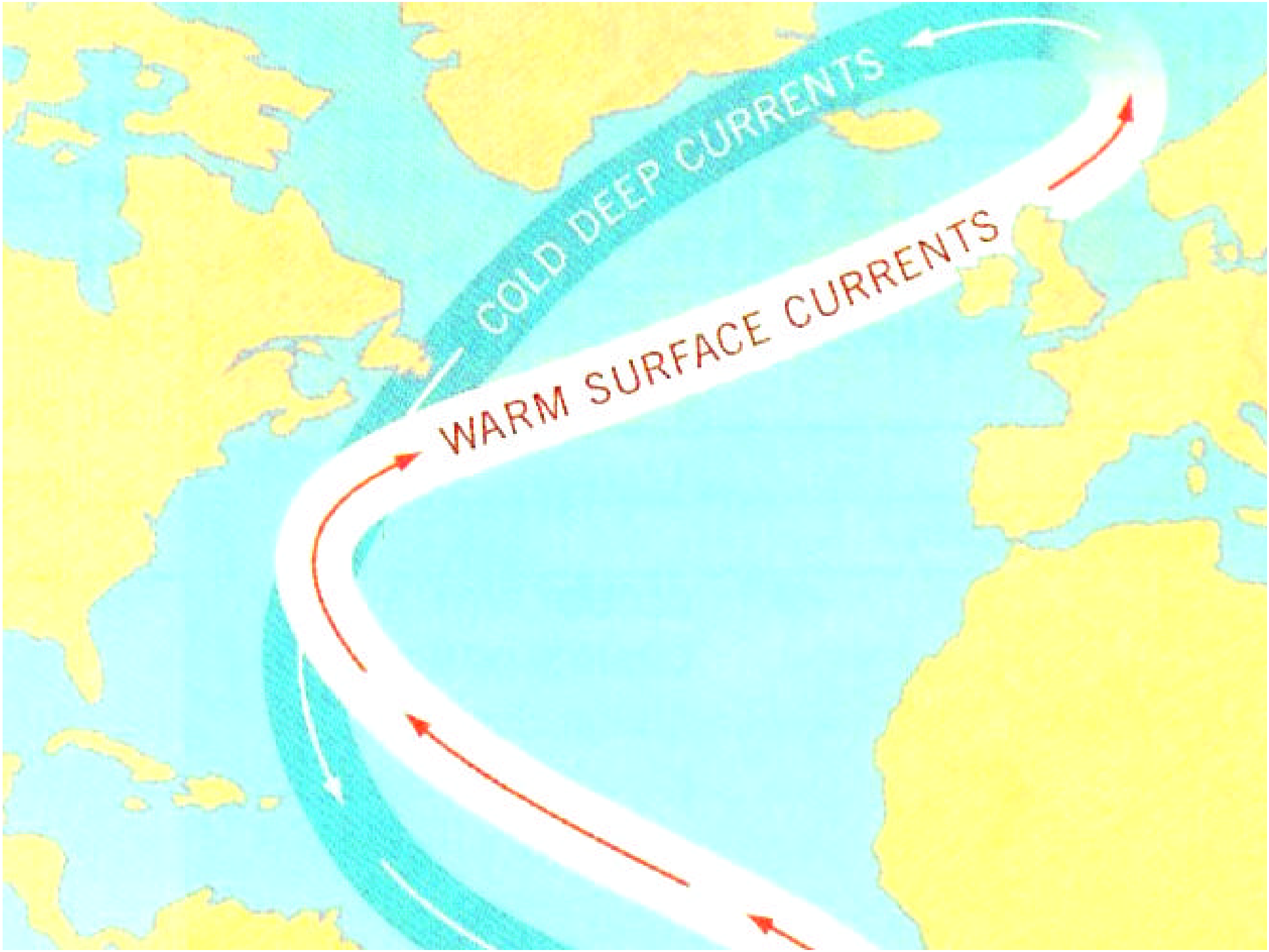
Prediction based on increased temperature and moisture reduction

present range

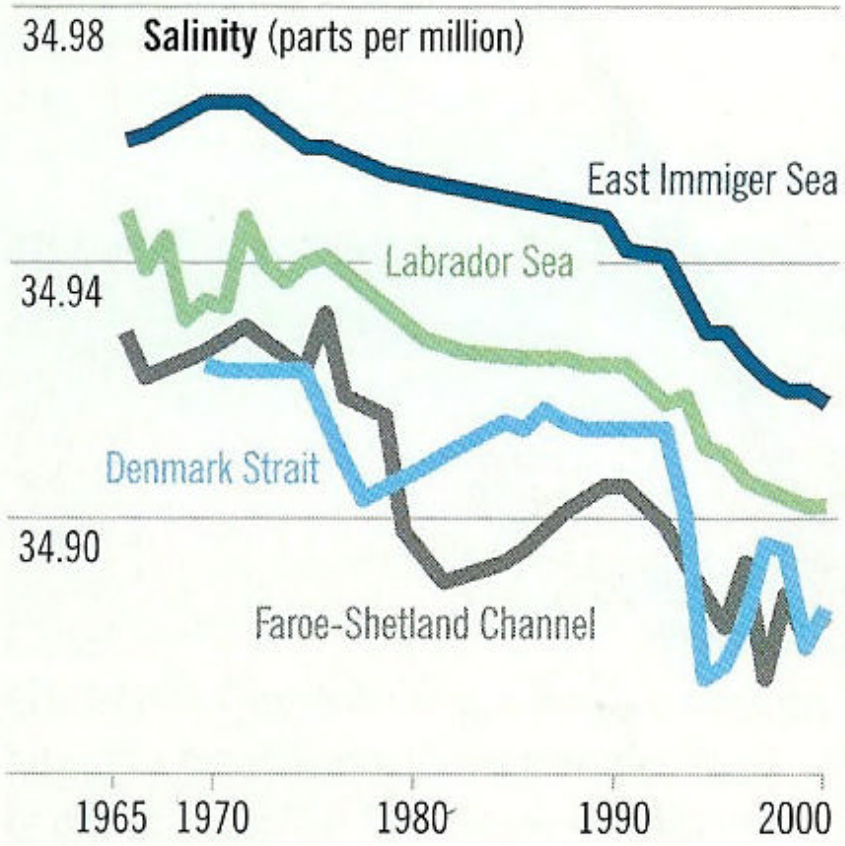
overlap

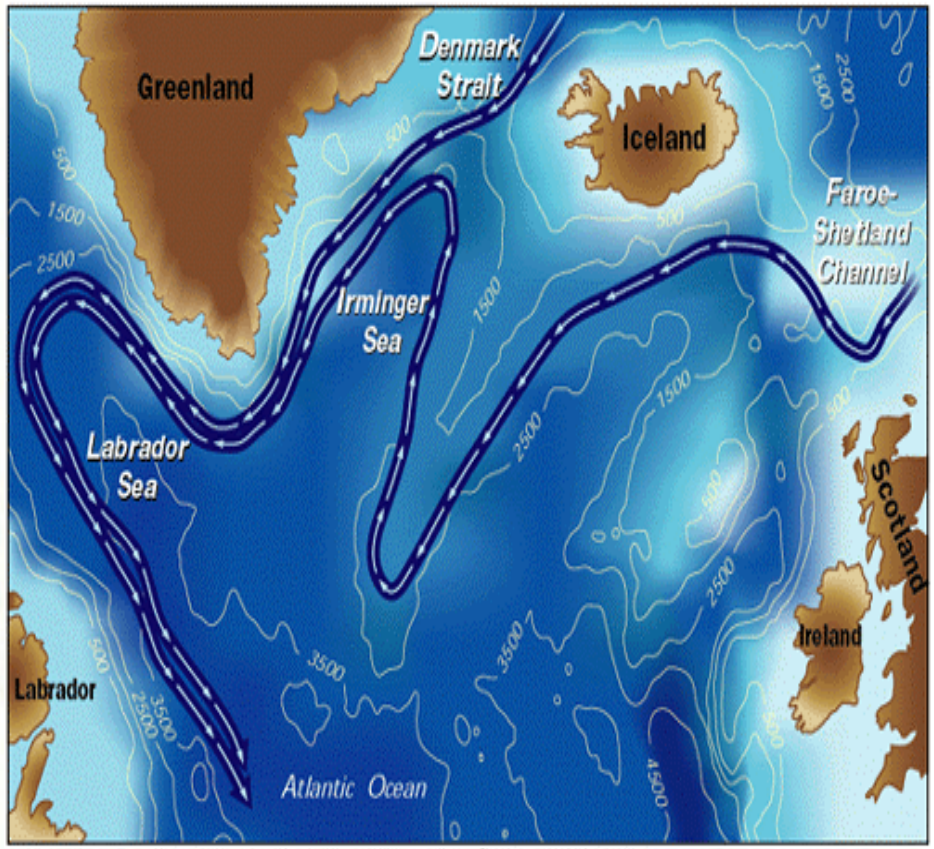
predicted range

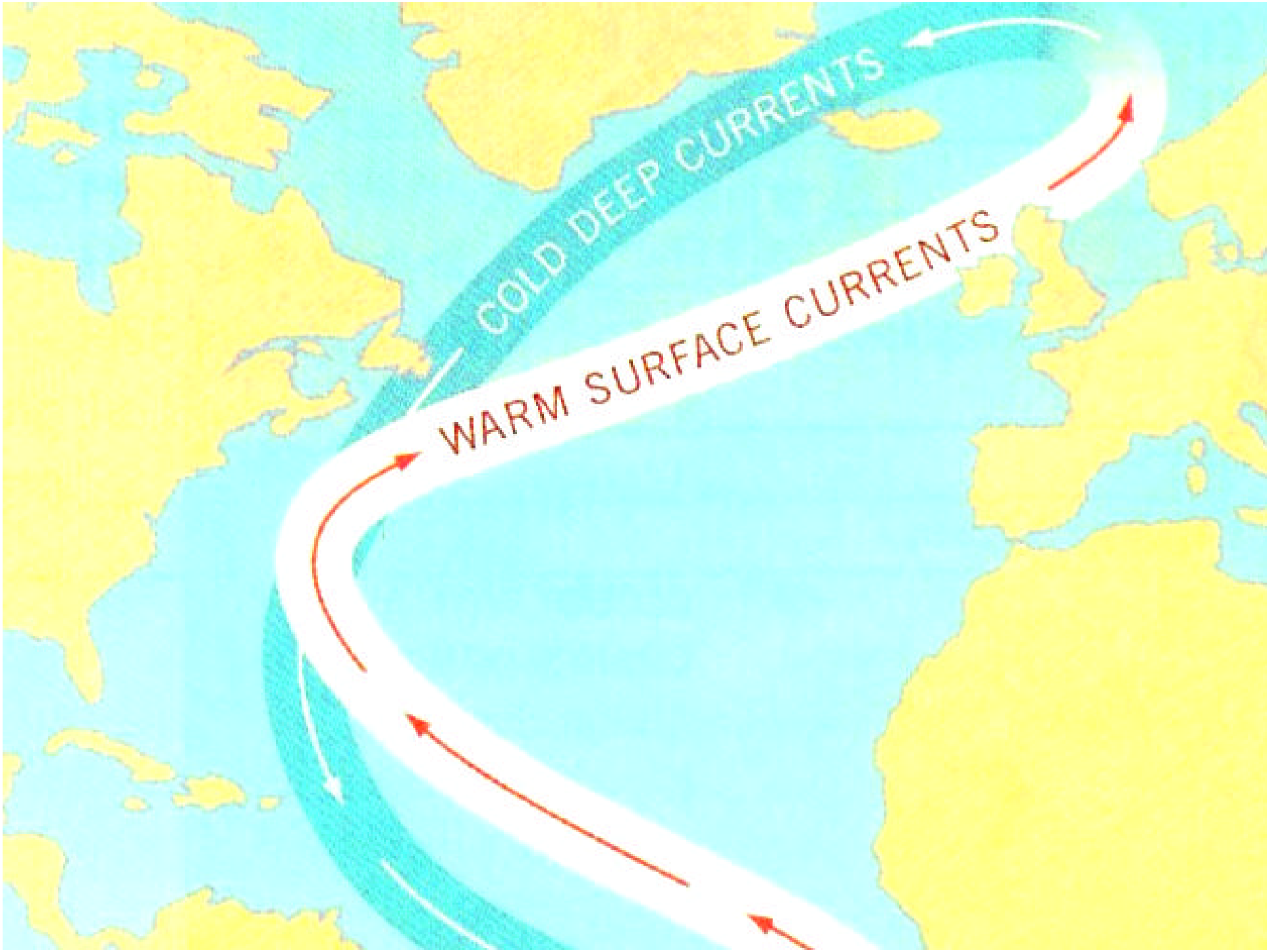



COLD DEEP CURRENTS
WARM SURFACE CURRENTS

TOO FRESH: declining salinity in the North Atlantic



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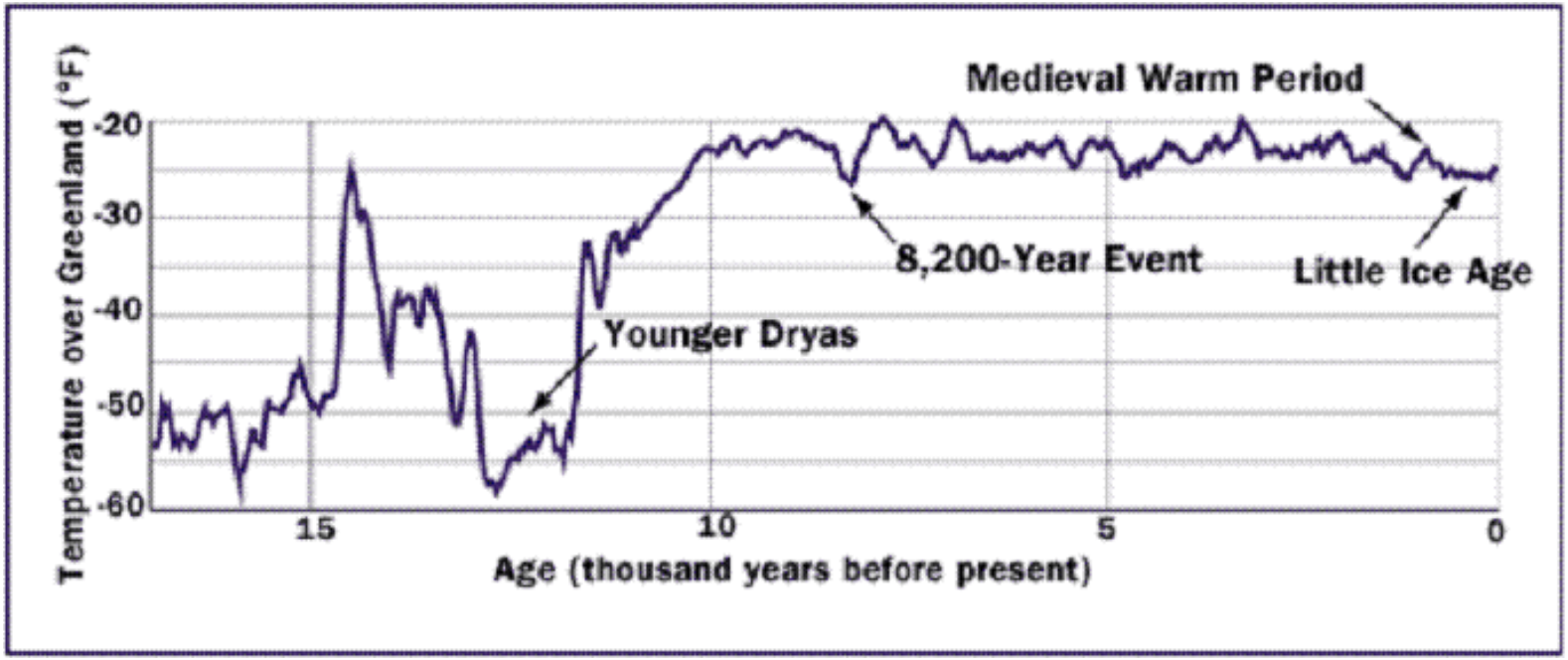

R.B. Alley, from *The Two-Mile Time Machine,* 2000

Greenland ice cores show several times when climate shifted in time spans as short as a decade:

The Younger Dryas —about 12,700 years ago, average temperatures in the North Atlantic region abruptly plummeted nearly 5°C and remained that way for 1,300 years before rapidly warming again.

The 8,200-Year Event —A similar abrupt cooling occurred 8,200 years ago. It was not so severe and lasted only about a century. But if a similar cooling event occurred today, it would be catastrophic.

The Medieval Period —An abrupt warming took place about 1,000 years ago. It was not nearly so dramatic as past events, but it nevertheless allowed the Norse to establish settlements in Greenland.

The Little Ice Age —The Norse abandoned their Greenland settlements when the climate turned abruptly colder 700 years ago. Between 1300 and 1850, severe winters had profound agricultural, economic, and political impacts in Europe.

Some Actions to Address Climate Change

- Kyoto Protocol
  - 160 countries
  - Reduce GHG emissions 5% below 1990 levels by 2012
  - Will Russia agree?
- Greenhouse gas trading (with caps)
- State action
- Pew Center for Global Climate Change
- Energy conservation
- Rain forest preservation