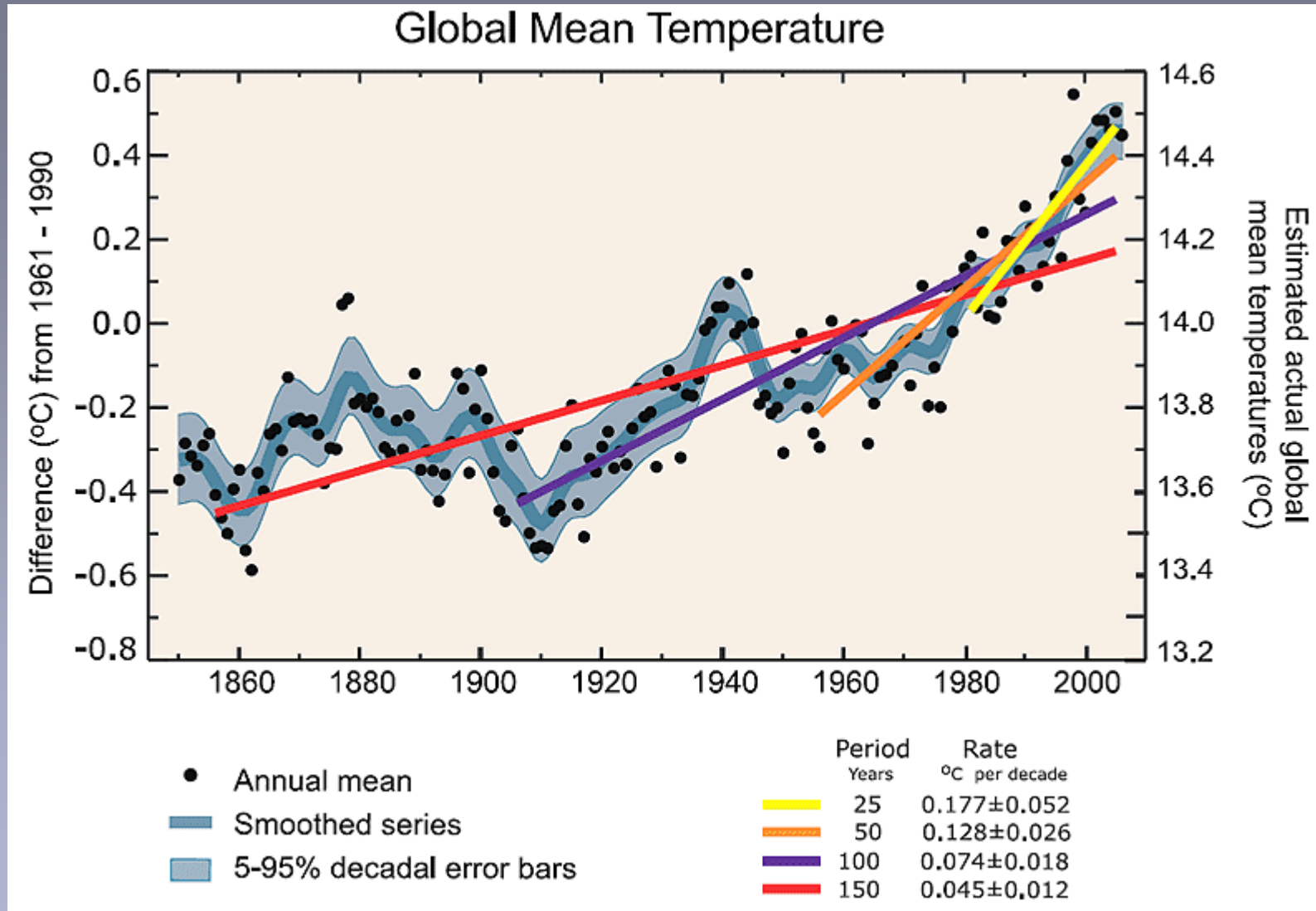


# Evidence for global warming

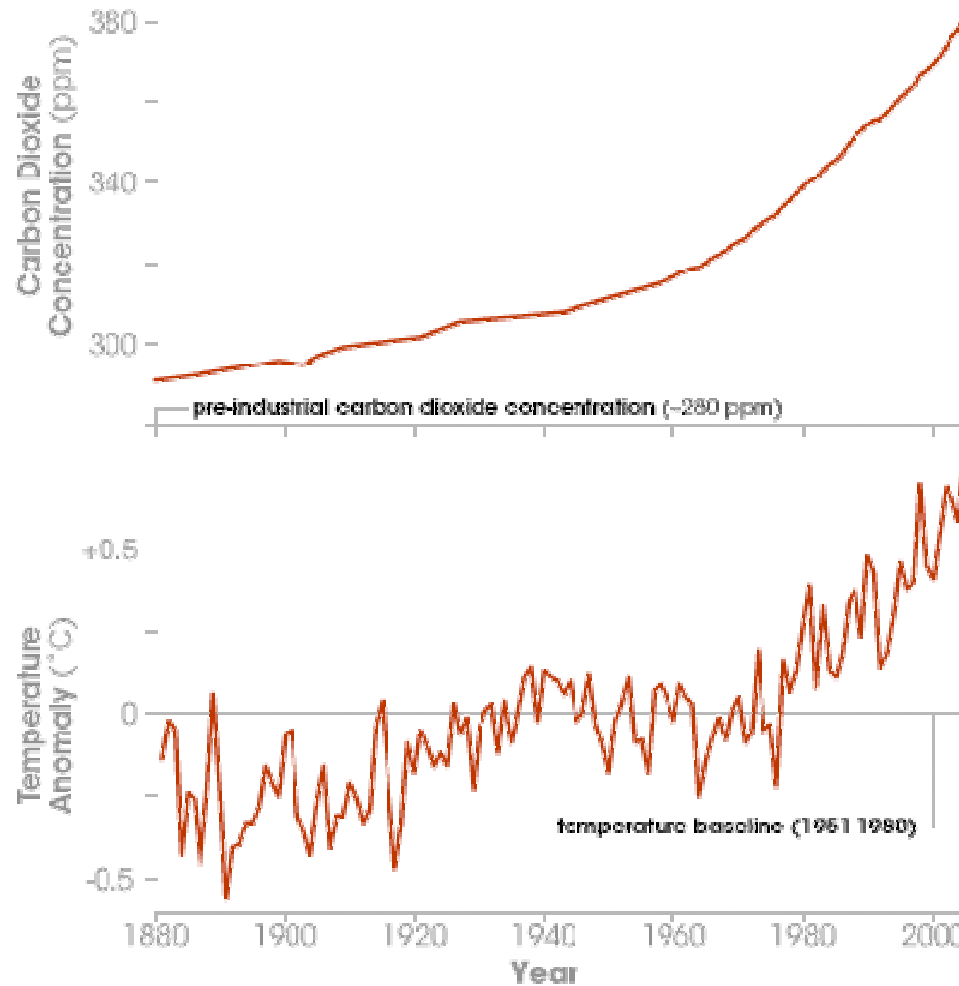


***Observed*** temperatures and trends

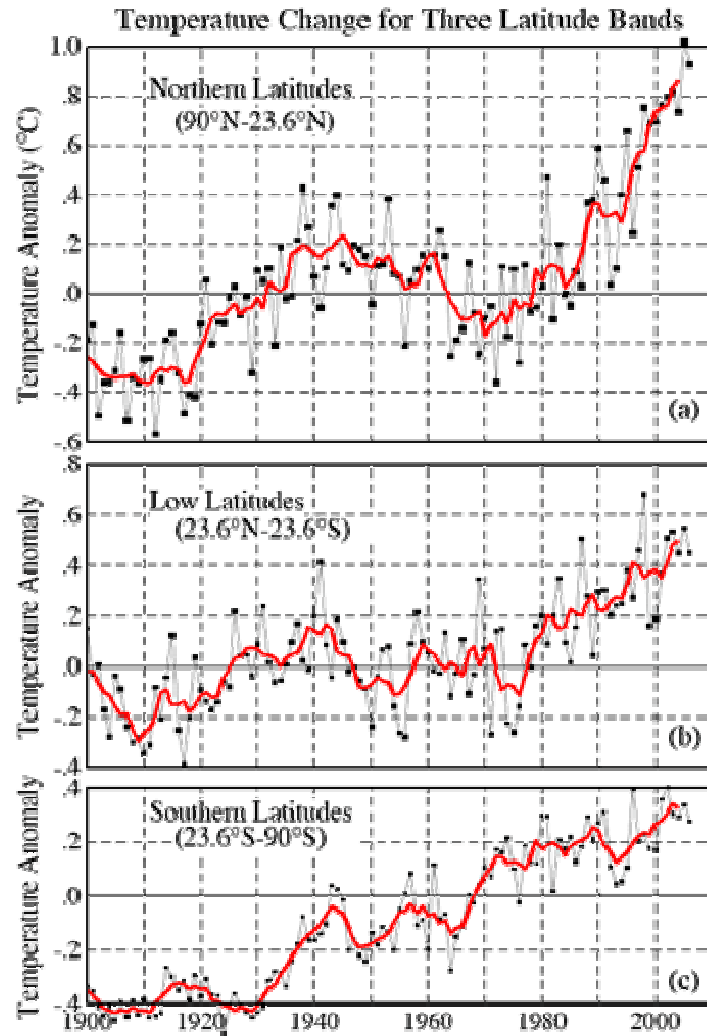
# Atmospheric CO<sub>2</sub> and temperature rise

280 ppm

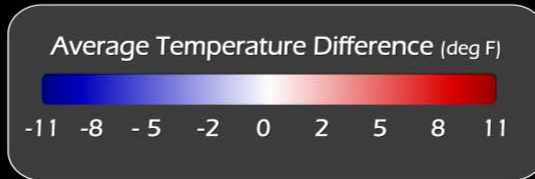
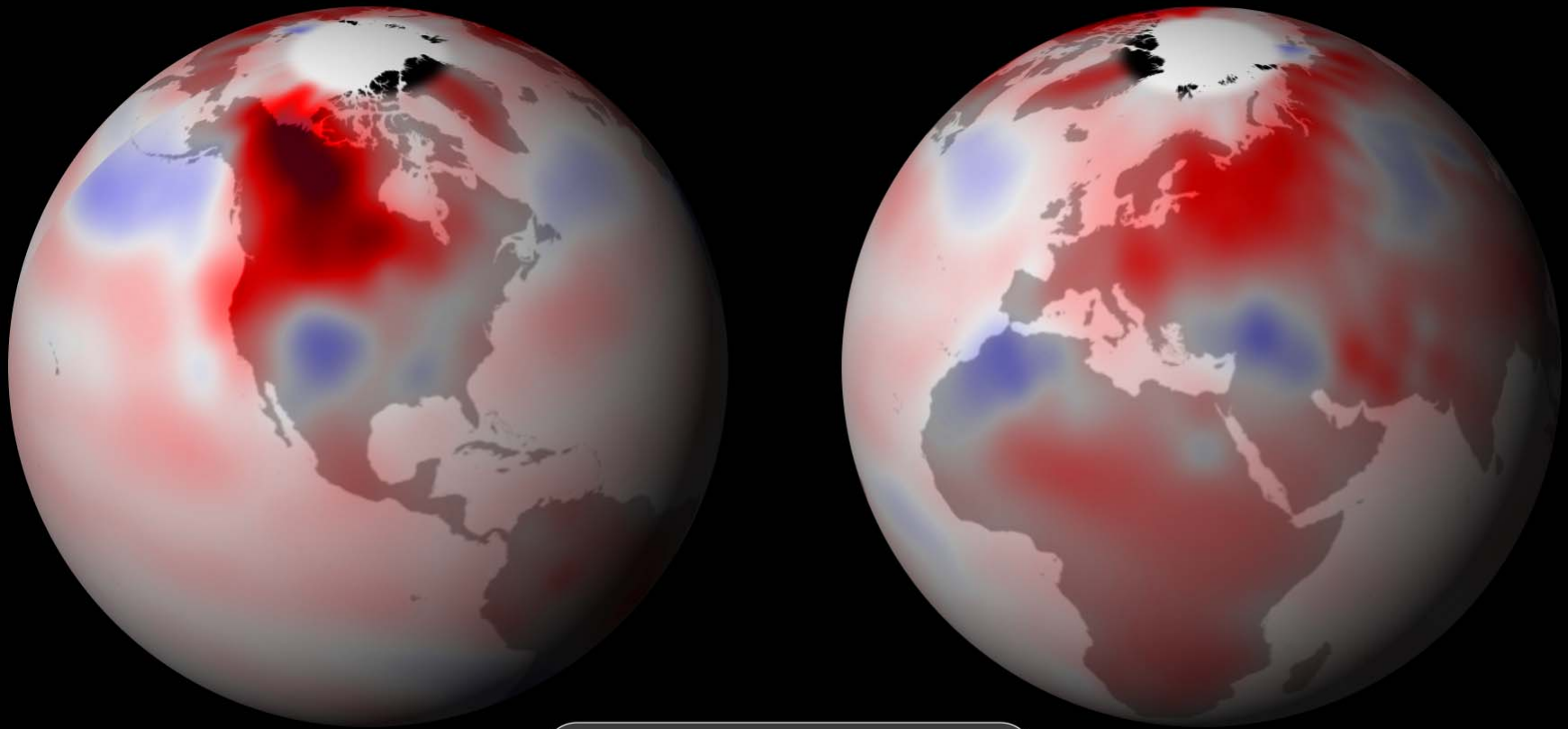
360 ppm



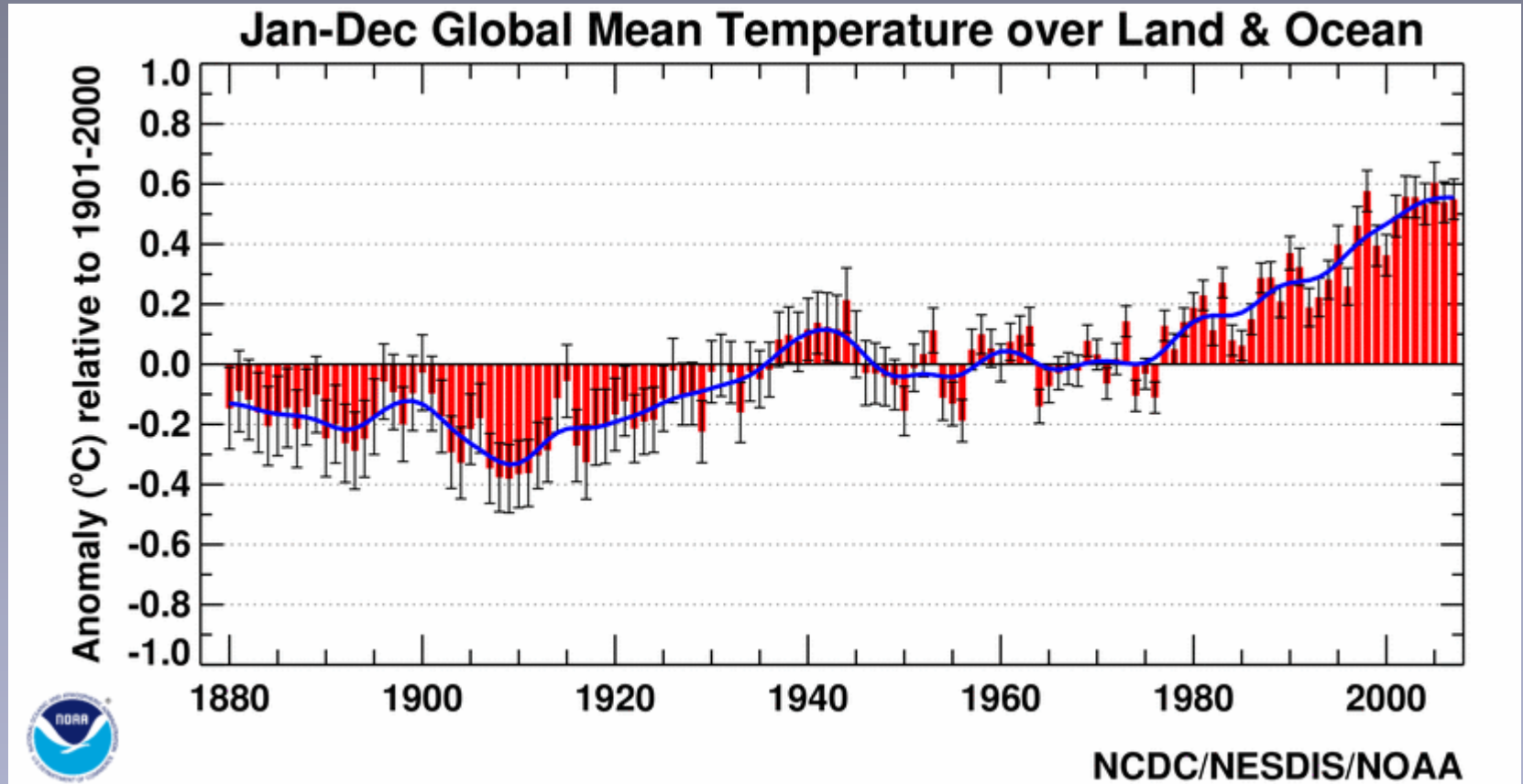
# Surface temperature at different latitudes



# *Observed* temperature anomalies Sep 2009

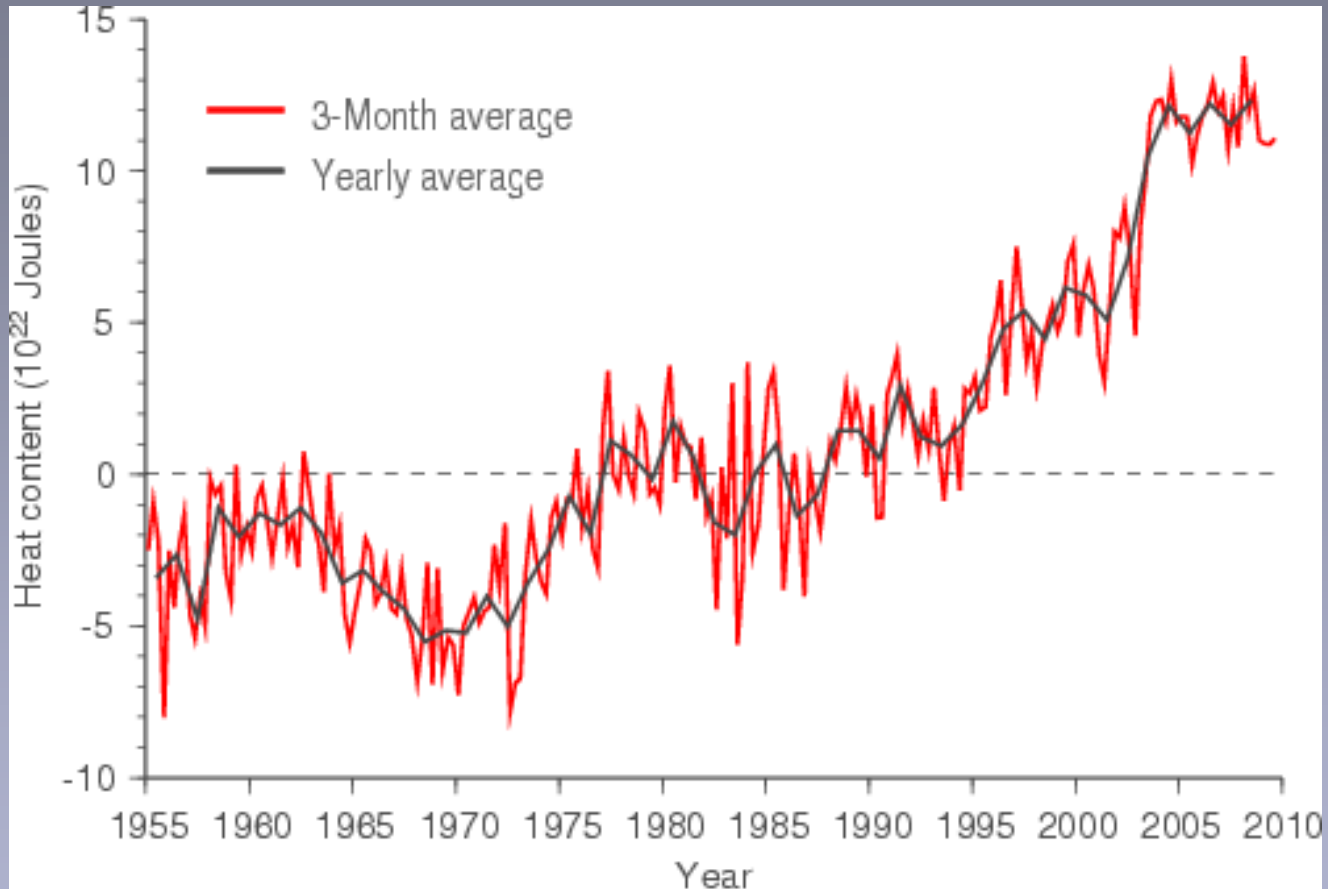


# Winter temperatures since 1880



Greenhouse gases most likely to warm the winter

# 50 years of Arctic temperatures

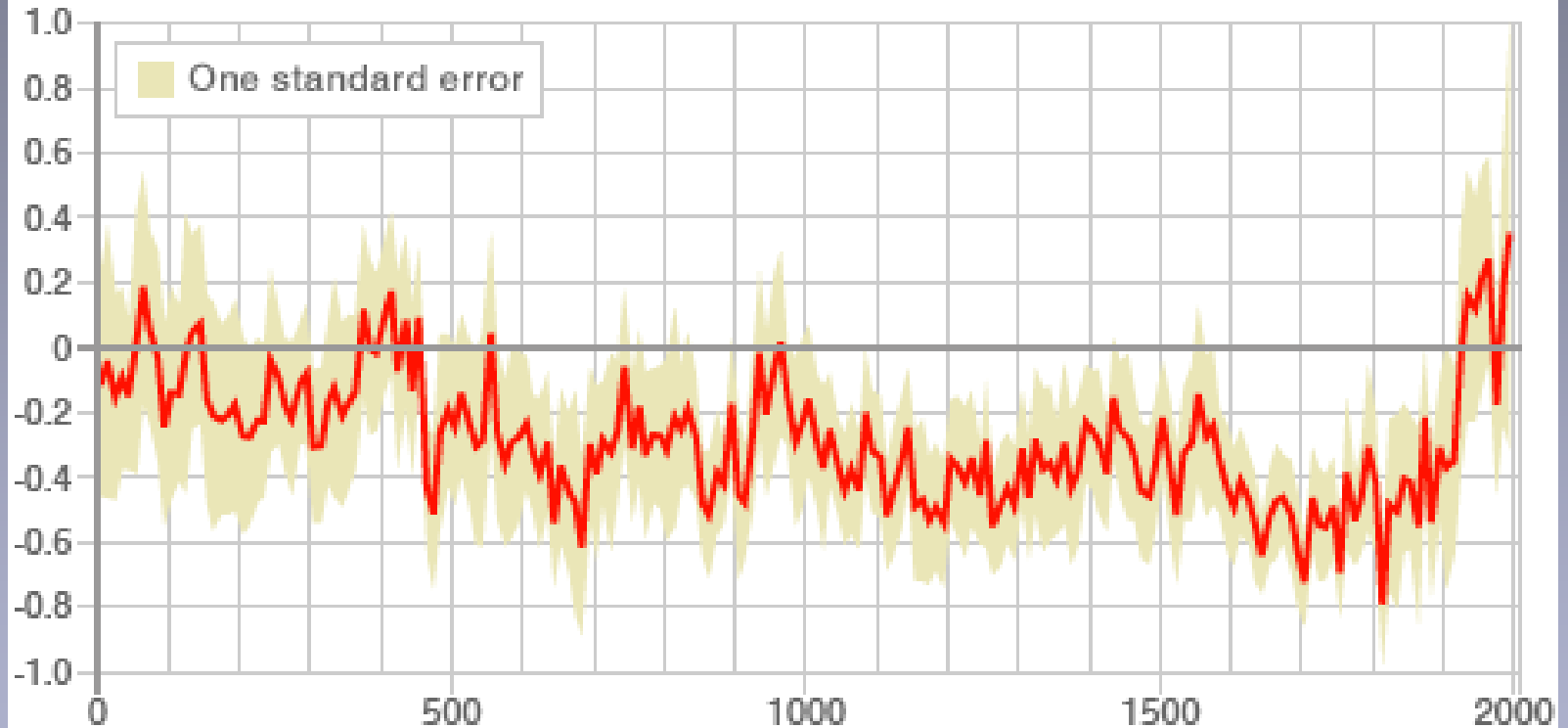


The past decade is the warmest in history

# 2000 years of Arctic temperatures

## Two millenia of Arctic temperatures

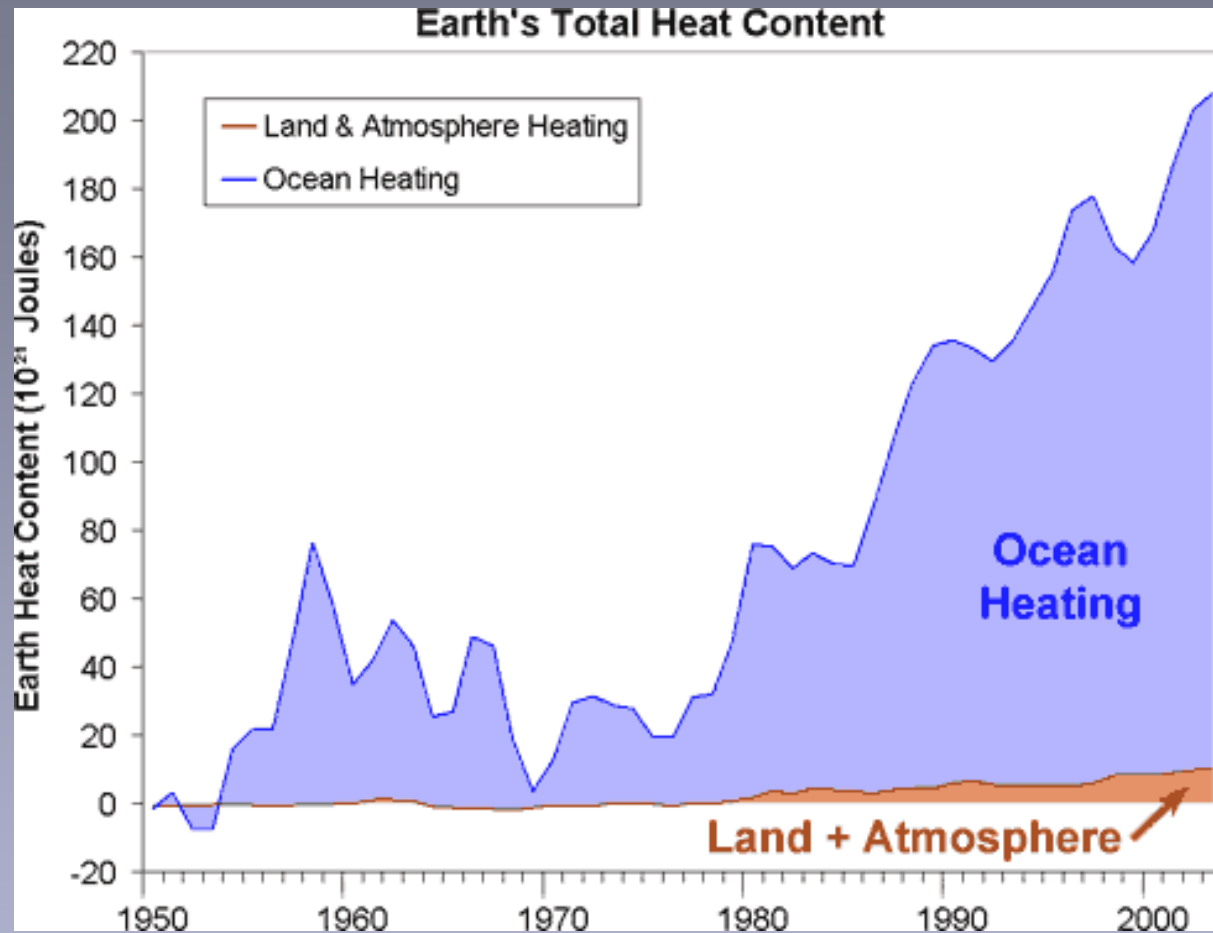
Temperature anomaly °C



SOURCE: Kaufman et al, Science

Start of  
Industrial Rev.

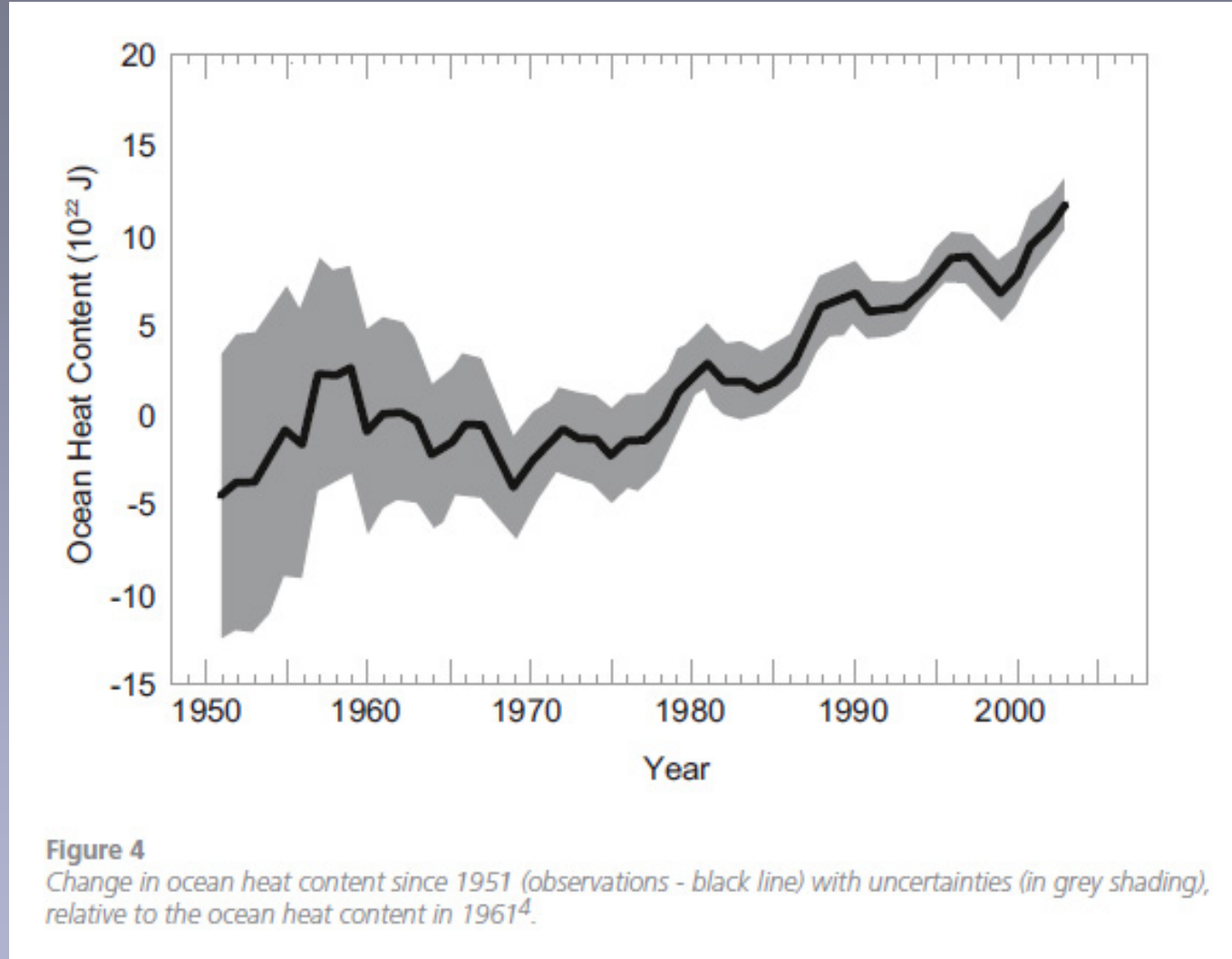
# Total heat content of the Earth



Most of the added heat absorbed by the oceans



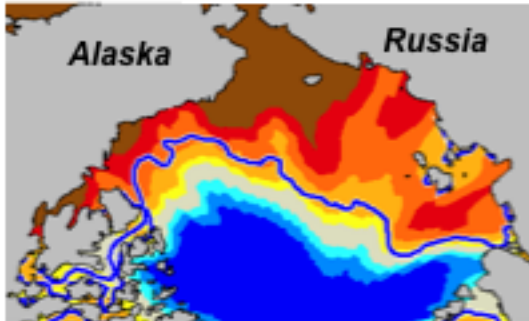
# Increase in ocean heat content 1951-2005



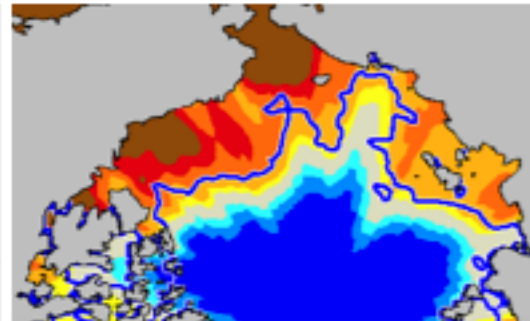
# Arctic Sea Surface Temperatures August 2007 to 2009

August  
Mean

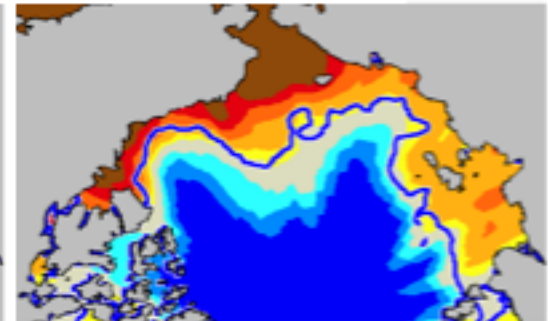
2007



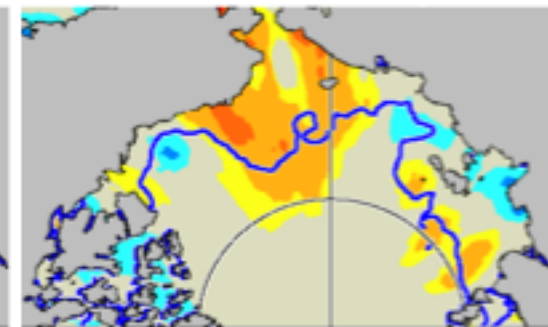
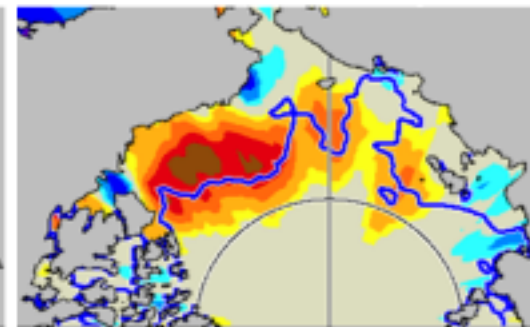
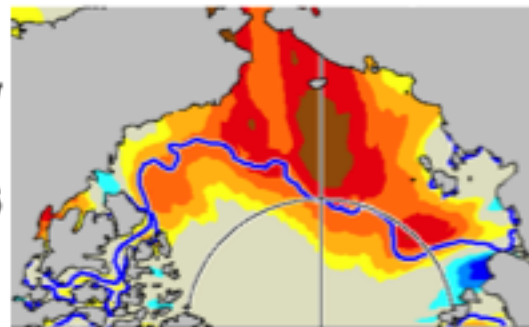
2008



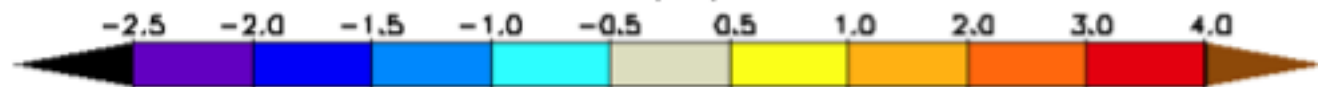
2009



August  
Anomaly  
relative to  
1982-2006  
mean

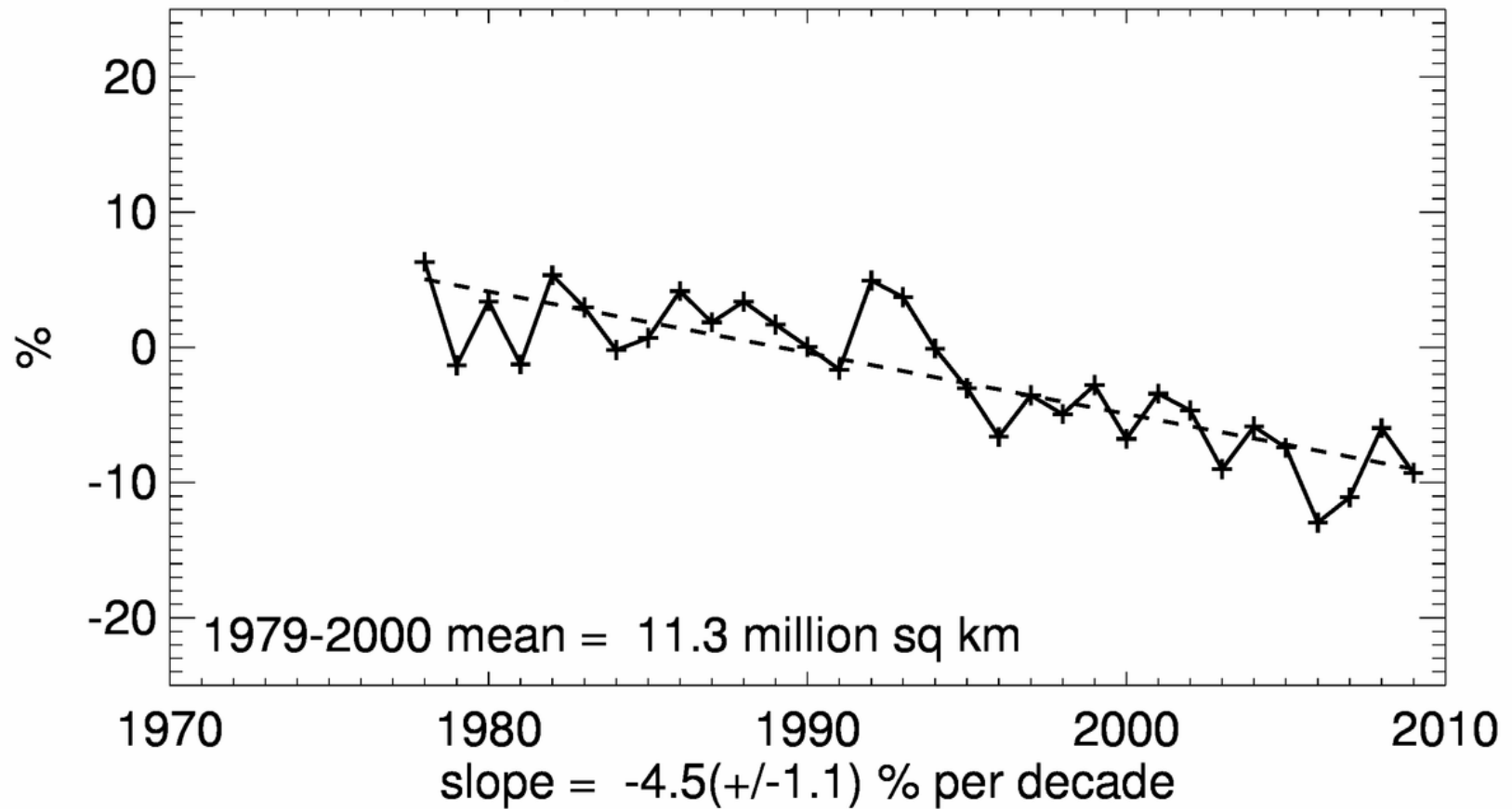


T (°C)

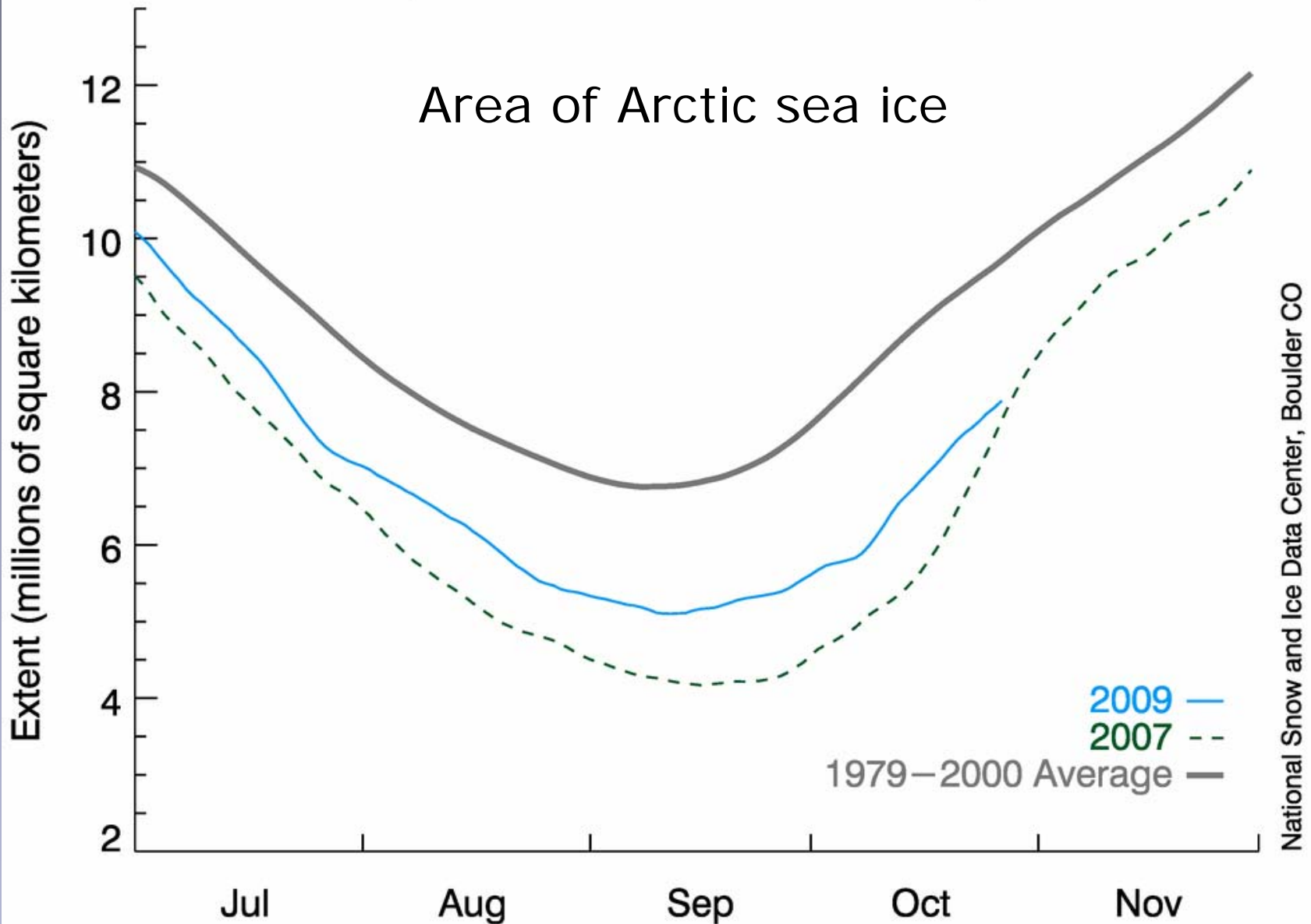


# Area of sea ice in the Arctic Ocean

## Northern Hemisphere Extent Anomalies Nov 2009



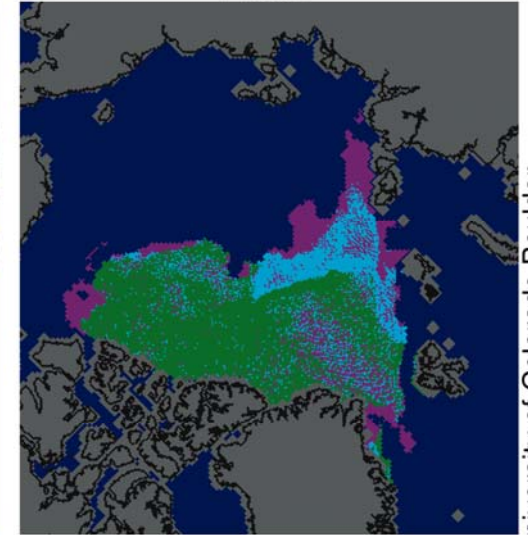
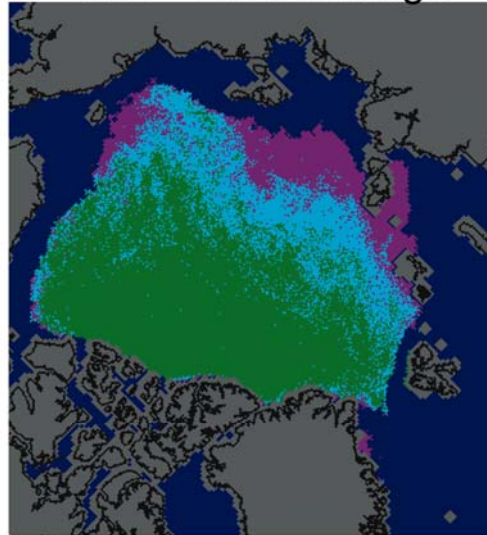
# Arctic Sea Ice Extent (Area of ocean with at least 15% sea ice)



# Arctic sea ice age at the end of the melt season

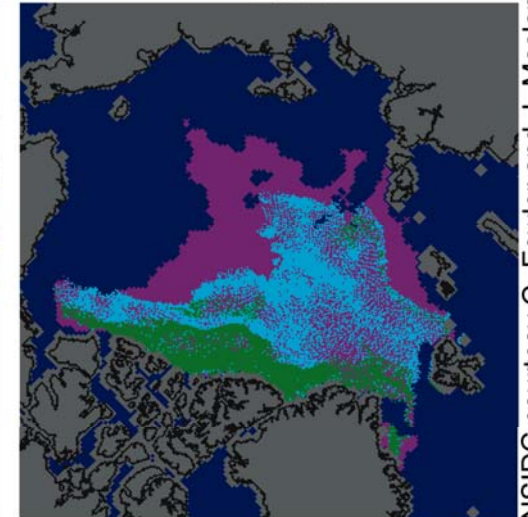
1981 - 2000 average

2007



2008

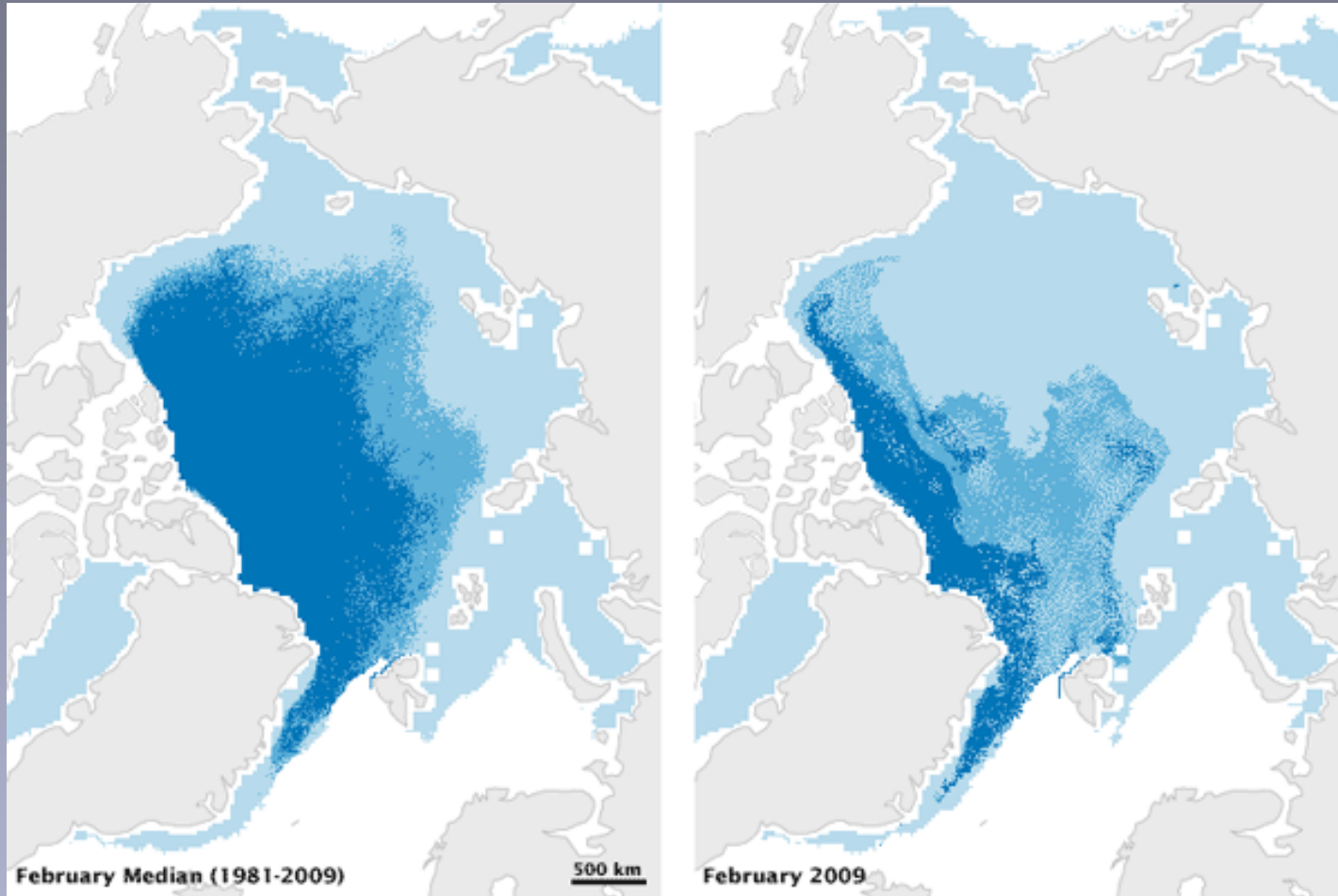
2009



■ First-year ice (<1 year old) ■ Second-year ice (1-2 years old) ■ Older ice (>2 years old) ■ Open water ■ Land

Green is  
old ice  
(multi-season)

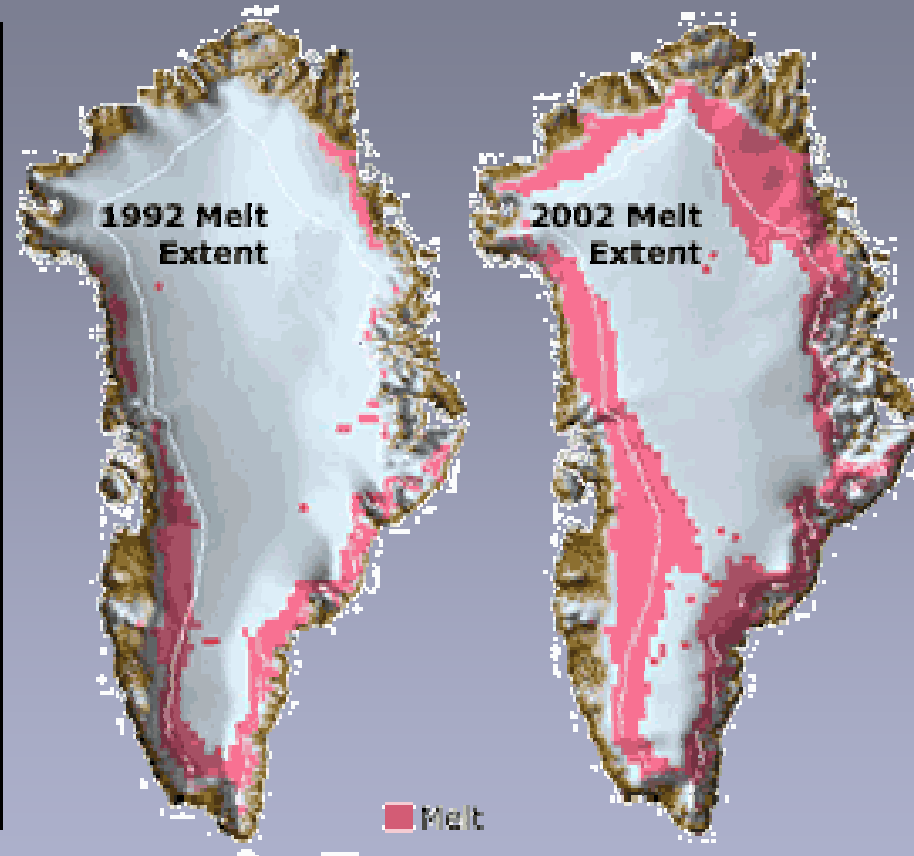
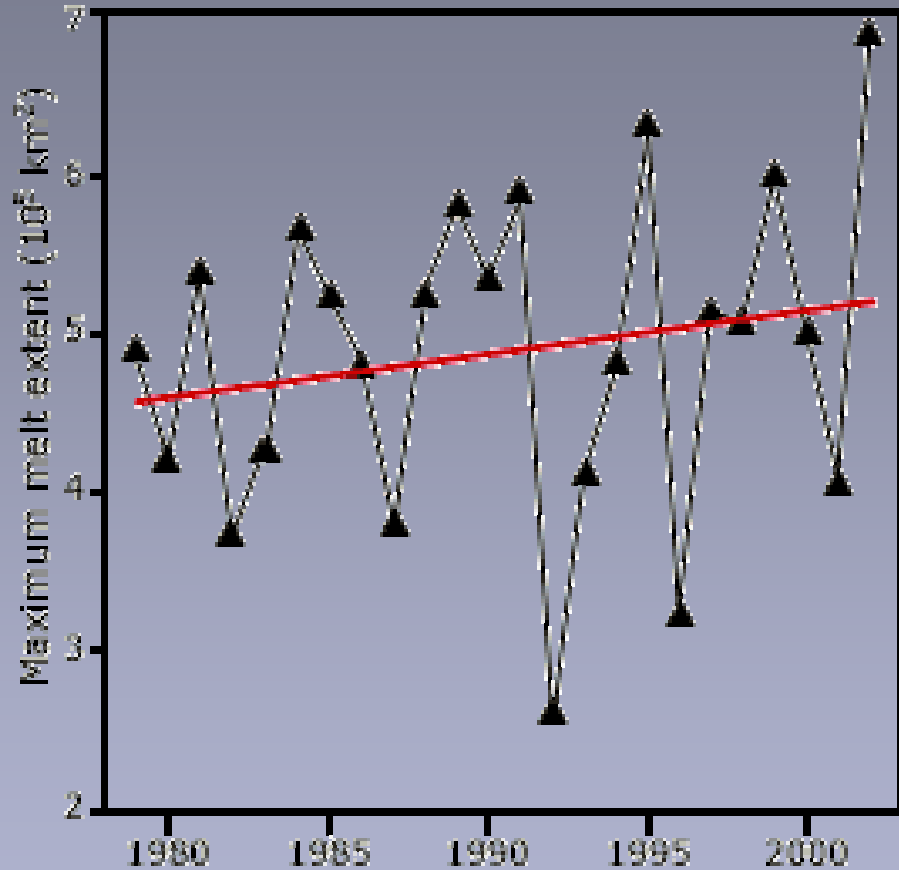
# Thickness of sea ice in the Arctic Ocean



Median 1981-2000

February 2009

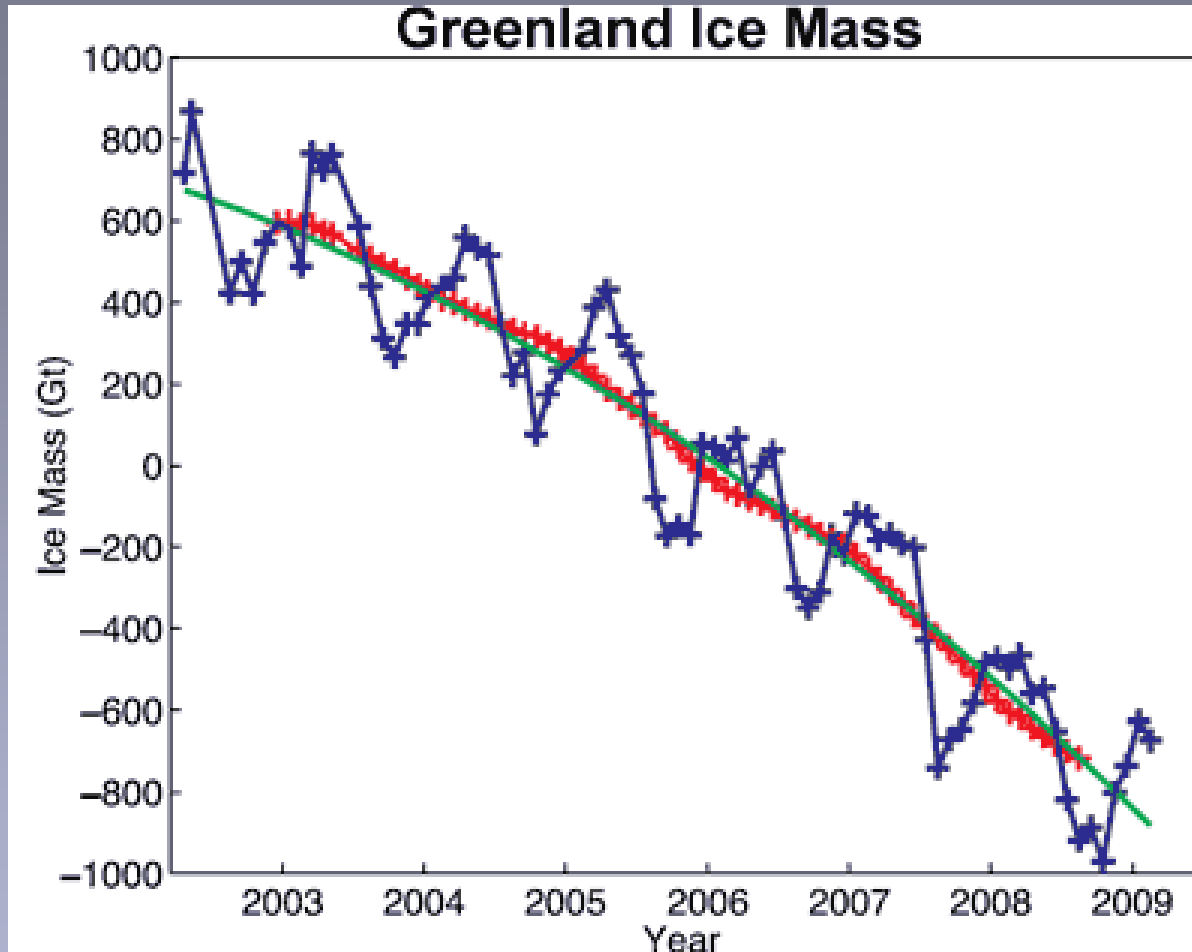
# Melting of the Greenland ice cap



1992

2002

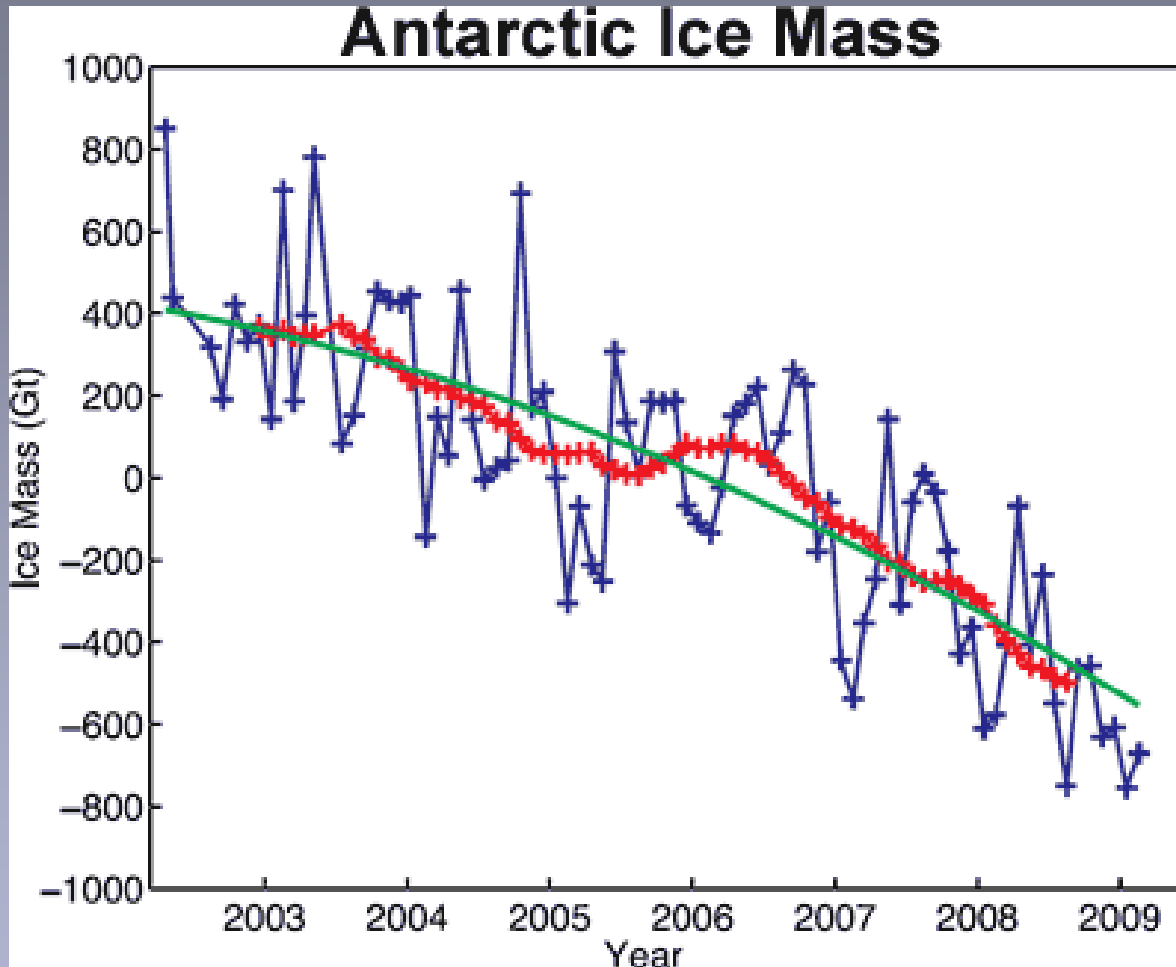
# Mass of Greenland ice cap



Rapidly accelerating

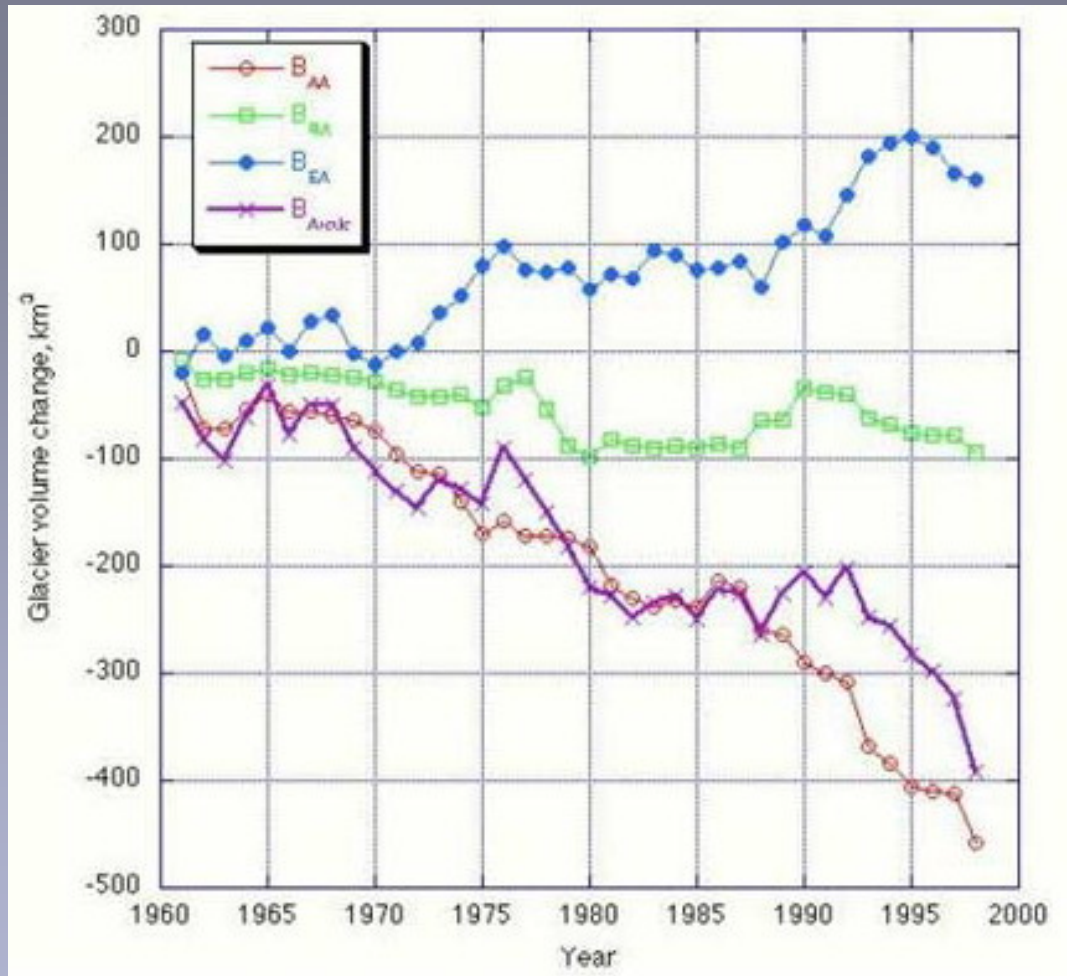


# Mass of the Antarctic ice cap



Rapidly accelerating

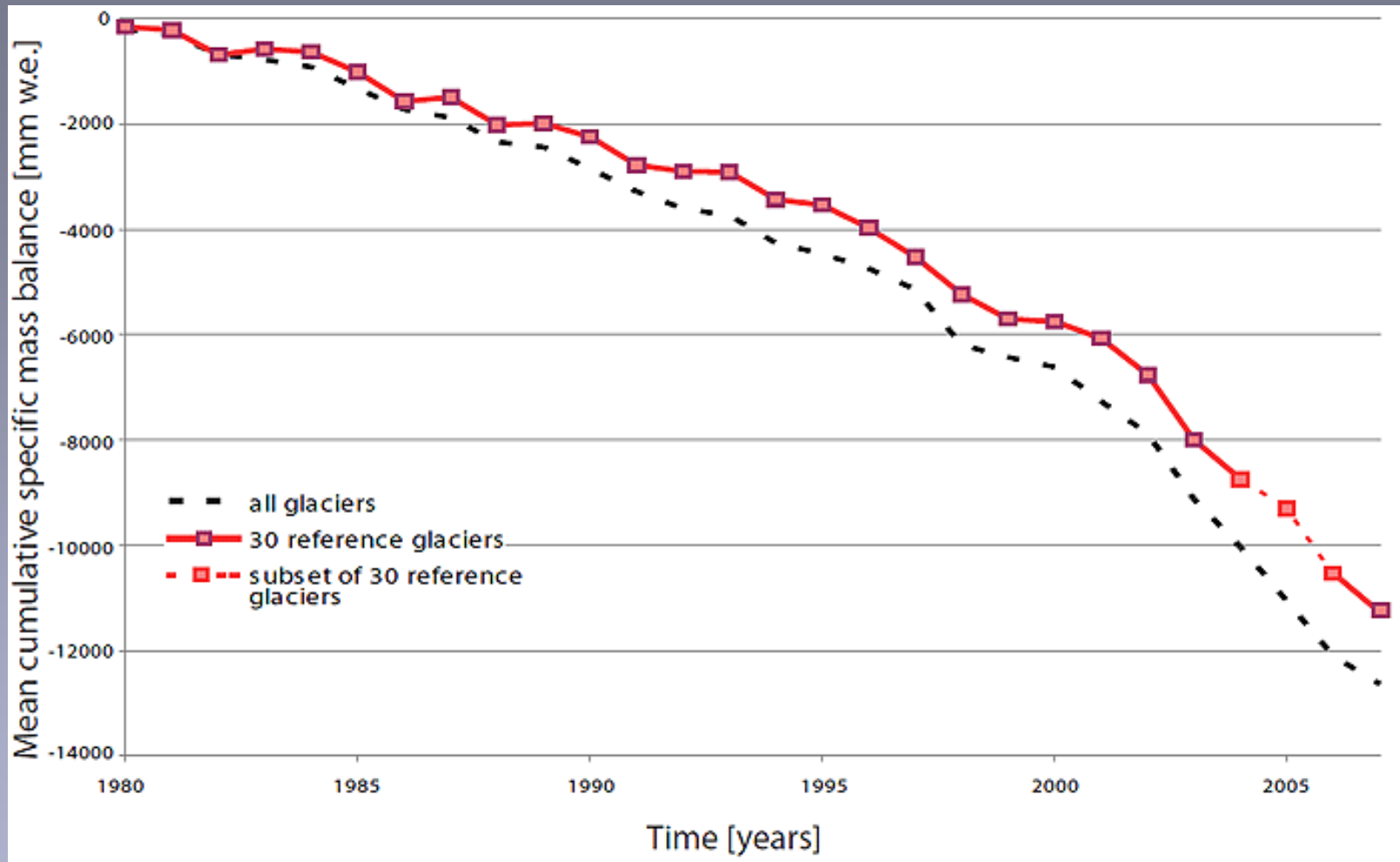
# Glacier ice volume change



Eurasia  
(Siberia)

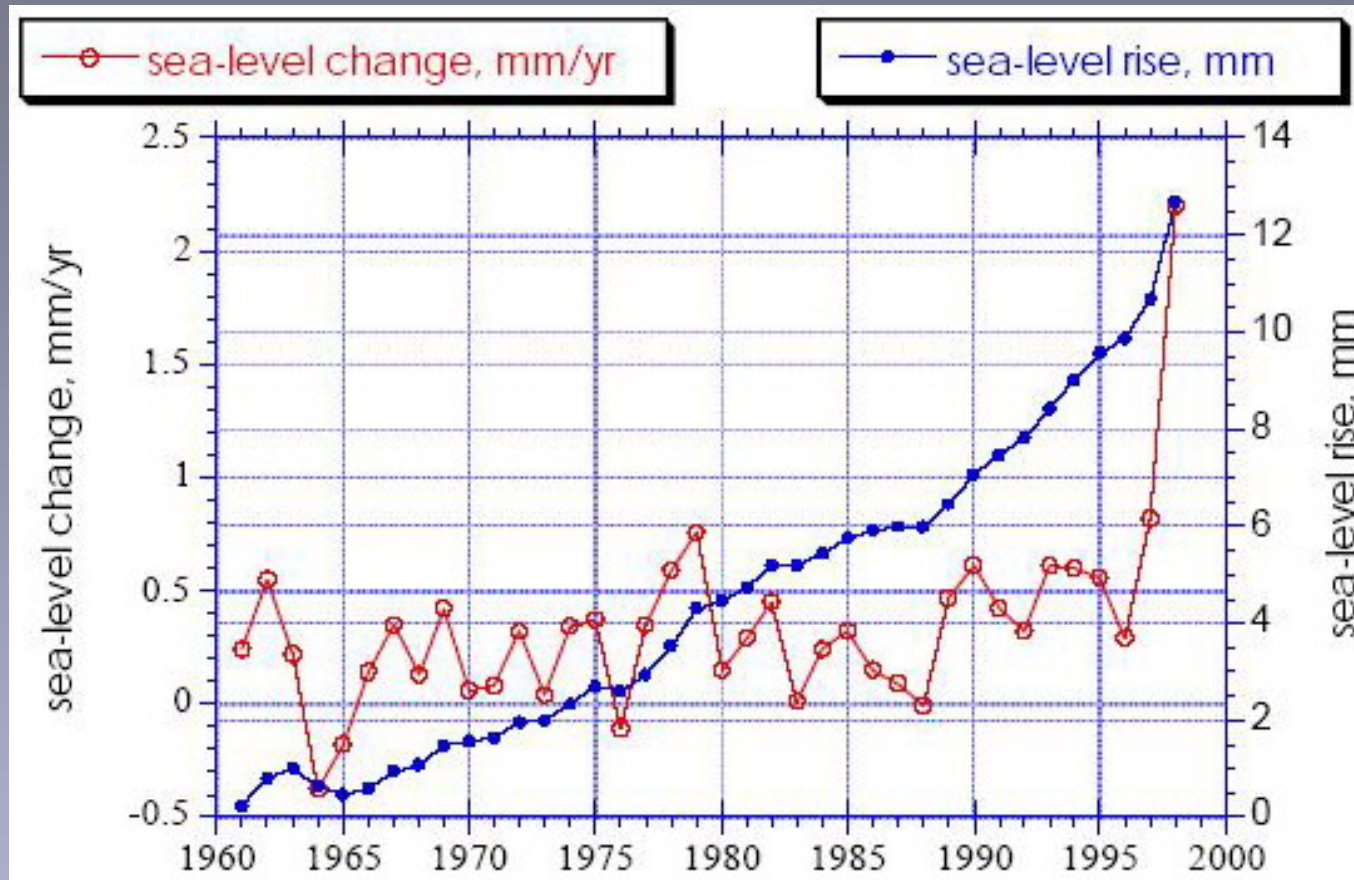
Everywhere  
else

# Mass of glaciers worldwide



30 reference glaciers & all glaciers

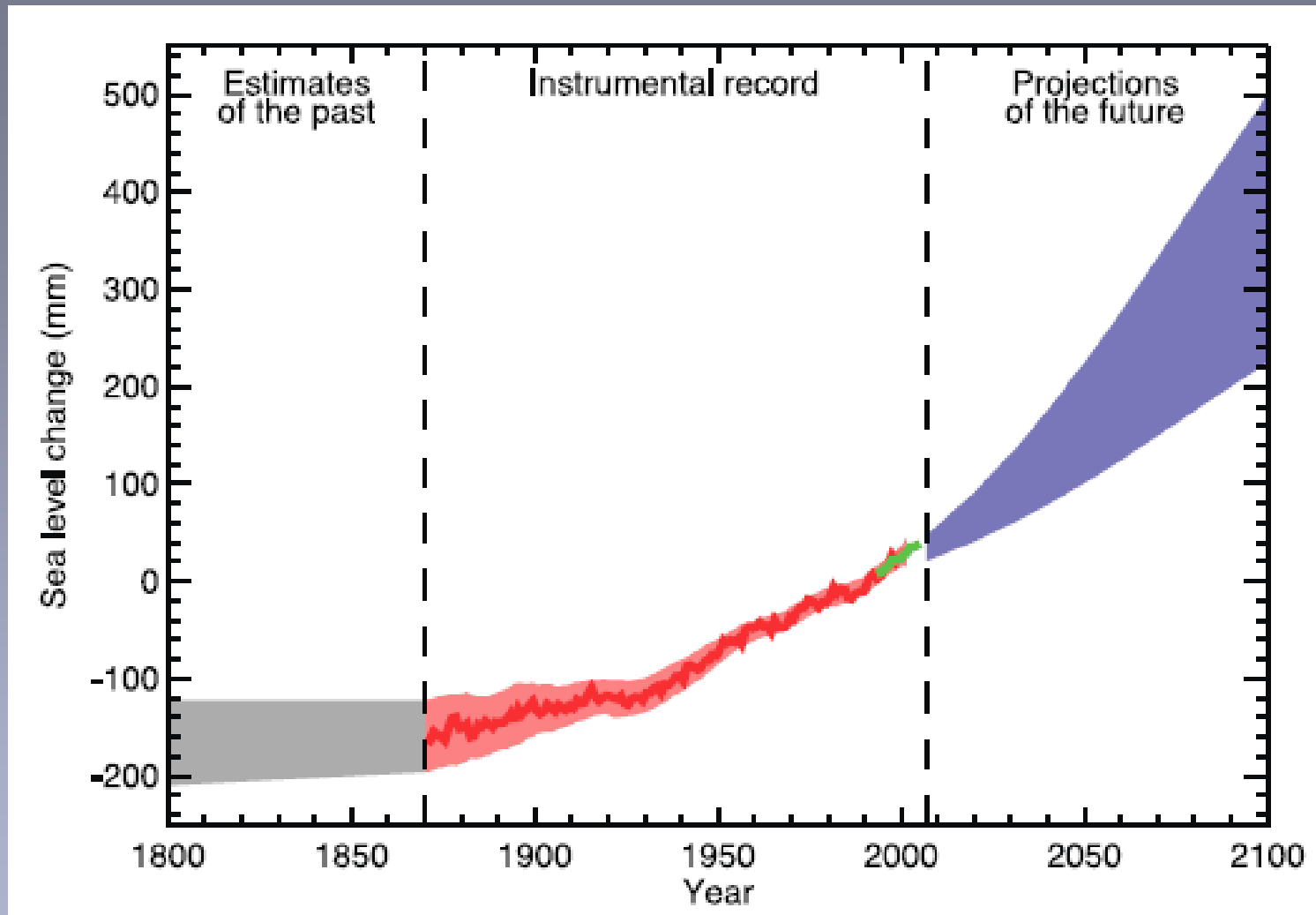
# Acceleration of sea-level rise



Two main factors:

melting glaciers, heating of ocean water

# Observed and projected sea-level rise



Observations from  
tide gauges

Projected

# Global climate change

The question becomes,

*If this doesn't convince you, what would?*

# To summarize: Global climate change

The important points:

Global warming is REAL

HUMANS have caused this episode of global warming

Action MUST be taken ... quickly

The potential effects are many and negative

The solutions will not be painless

The consequences of inaction will be worse

Most solutions REQUIRE changing habits

We're all in this together

# Interview with a former health-insurance executive

Bill Moyers Journal  
PBS July 2009

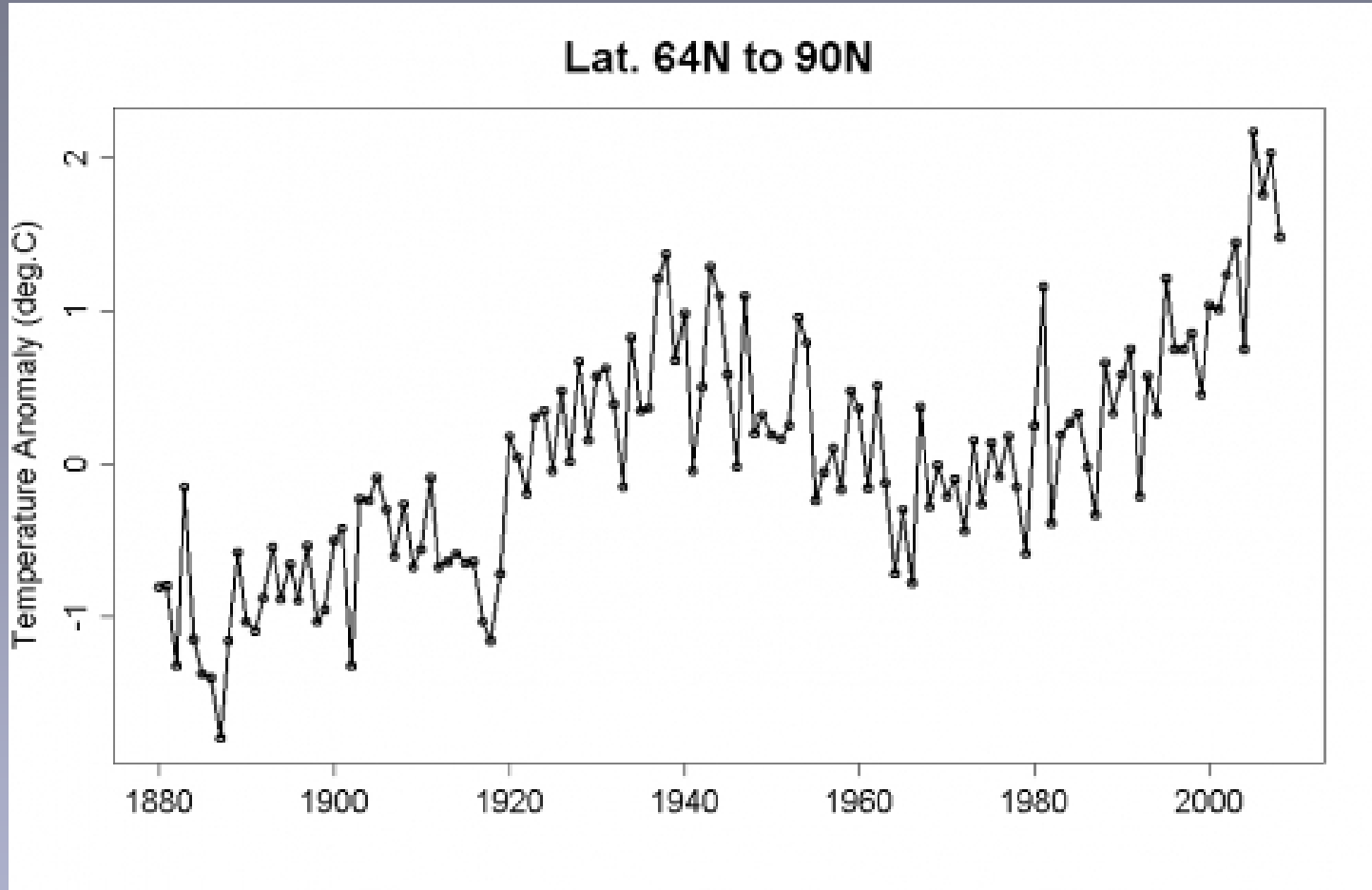
Wendell Potter tells Bill Moyers why he left his successful career as the head of Public Relations for CIGNA, one of the nation's largest health insurers.

"I didn't intend to [speak out], until it became really clear to me that the industry is resorting to the same tactics they've used over the years, and particularly back in the early '90s, when they were leading the effort to kill the Clinton plan."





# Temperature anomaly, high latitude North



2000-2009 is even warmer