

Keen's Global Warming Quiz



*Warm up your clickers for some
amazing and (in)convenient questions*

slightly revised version 25 Oct. 2008

In YOUR opinion, Global Warming is...

- A. the Worst crisis ever to face humanity
- B. a Big problem, but there's bigger issues
- C. a Minor inconvenience that's overblown
- D. Nothing - it doesn't exist
- E. a Good thing

"Climate Change is more important than cleaning up dog-mess"

- Al Gore, 21 April 2008

Wacky Weather

When did **most** of the following events occur?

1. Alaskan glaciers melt at the rate of 1 mile per year
2. Alaska bakes at 100 degrees north of the Arctic Circle
3. North Dakota bakes at 120 degrees
4. Hurricane hits Boston with 180 mph winds
5. Hurricane kills half the population of a large southern city
6. Hurricane strikes San Diego
7. Half a dozen hurricanes hit the East Coast of the US
8. A dozen tornadoes strike Los Angeles
9. A major US city hit by a hurricane, tornado & earthquake in the same year
10. U.S. warmest year ever; 20 states set new all time heat records
11. Greenland warms - Farmers raise crops and brew beer

- A. Before 1958
- B. Past fifty years
- C. Predicted in the next 50 years
- D. Only in the movies

Wacky Weather

When did most of the following events occur?

1. Alaskan glaciers melt at the rate of 1 mile per year **1900**
2. Alaska bakes at 100 degrees north of the Arctic Circle **1915**
3. North Dakota bakes at 120 degrees **1936**
4. Hurricane hits Boston with 180 mph winds **1938**
5. Hurricane kills half the population of a large southern city **Galveston 1900**
6. Hurricane strikes San Diego **1858**
7. Half a dozen hurricanes hit the East Coast of the US **1954-1955**
8. A dozen tornadoes strike Los Angeles **1983**
9. A major US city hit by a hurricane, tornado & earthquake **Charleston 1886**
10. U.S. warmest year ever; 20 states set new all time heat records **1934**
11. Greenland warms - Farmers raise crops and brew beer **1000**

A. Before 1957 (ten of the eleven events)

B. Past fifty years (one event)

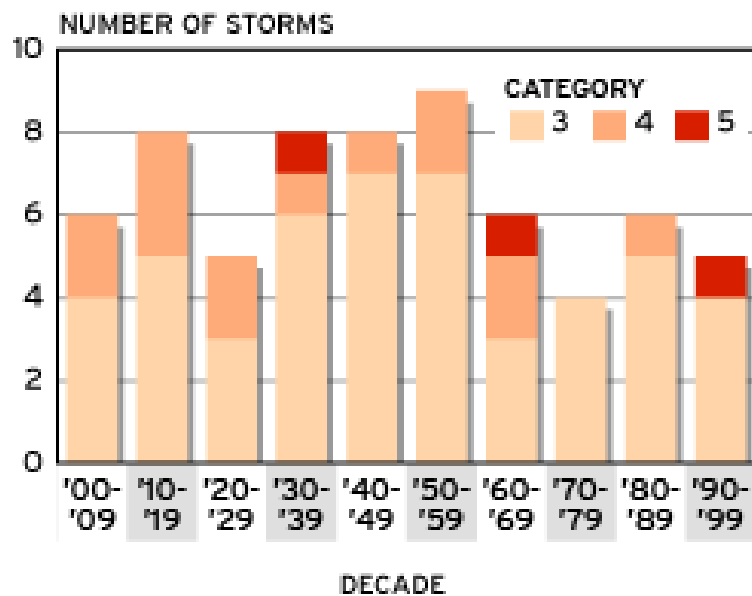
C. Predicted in the next 50 years (probably most will happen again)

D. Only in the movies (reality exceeds fiction !)

North Carolina hit by 6 hurricanes in 2 years

Major U.S. hurricanes

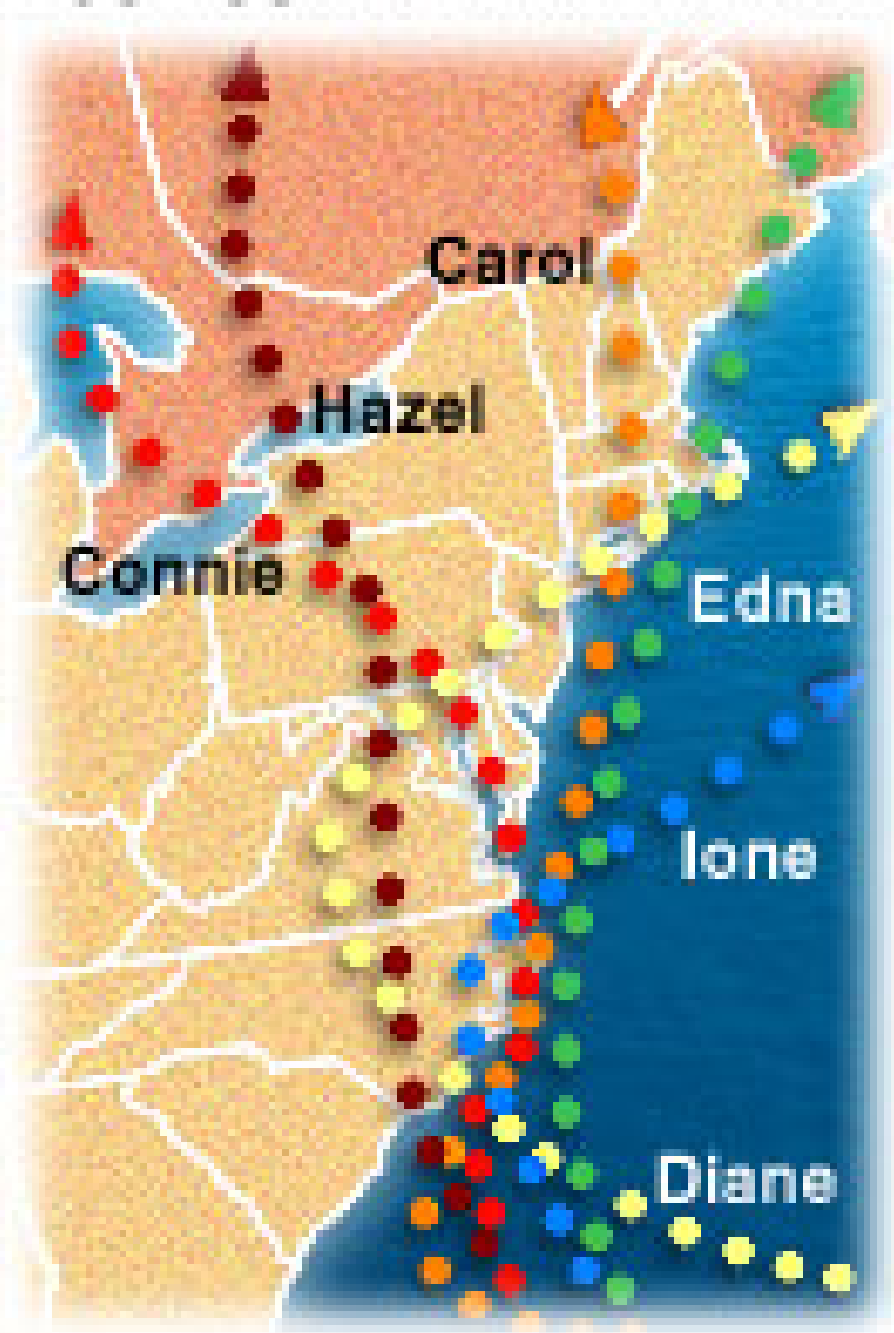
Chart shows the number of category 3, 4 and 5 storms that hit the mainland United States from 1900 to 1999.

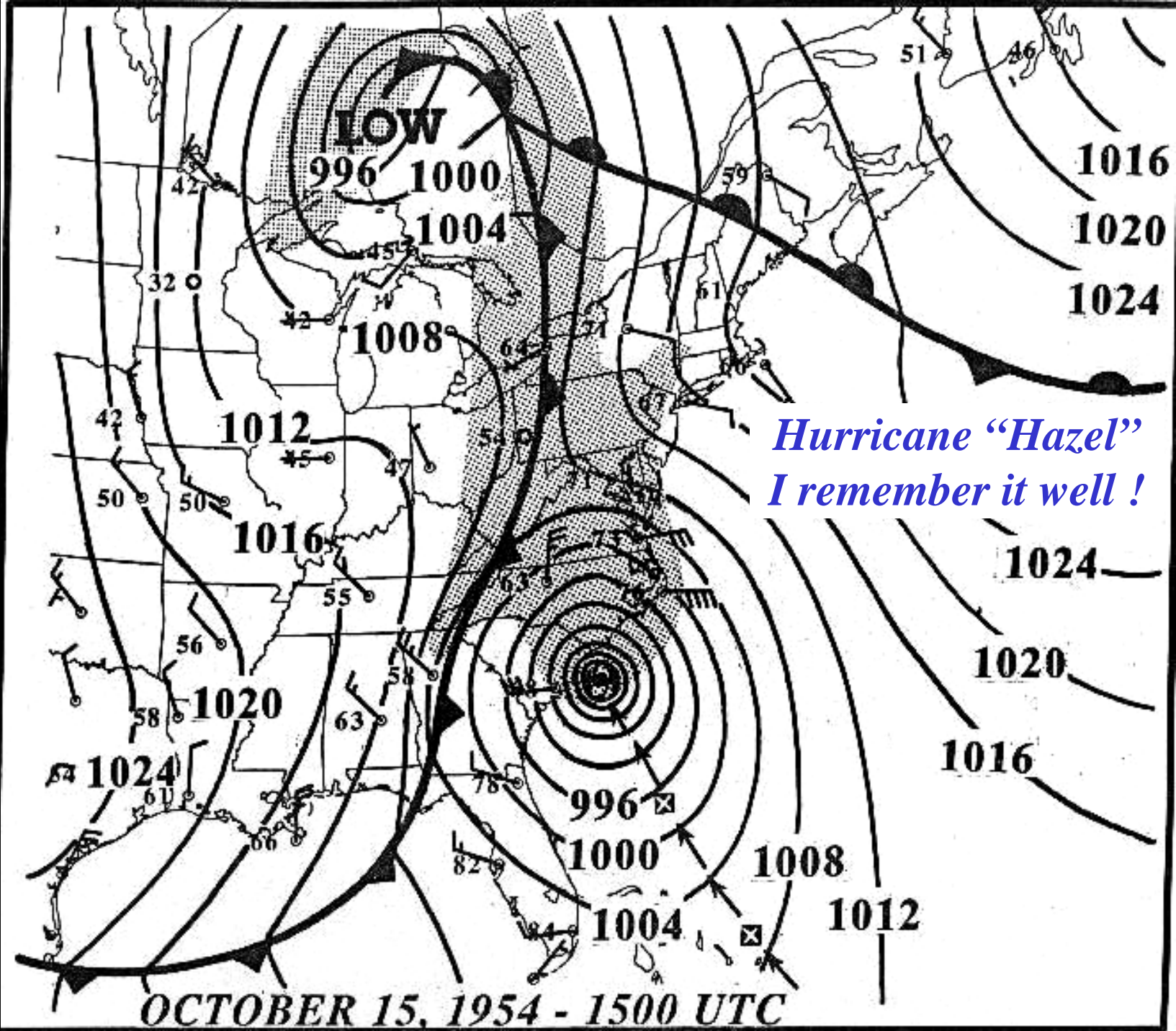


SOURCE: NOAA

MSNBC

1954-55 hurricane tracks





*Hurricane "Hazel"
I remember it well !*

OCTOBER 15, 1954 - 1500 UTC

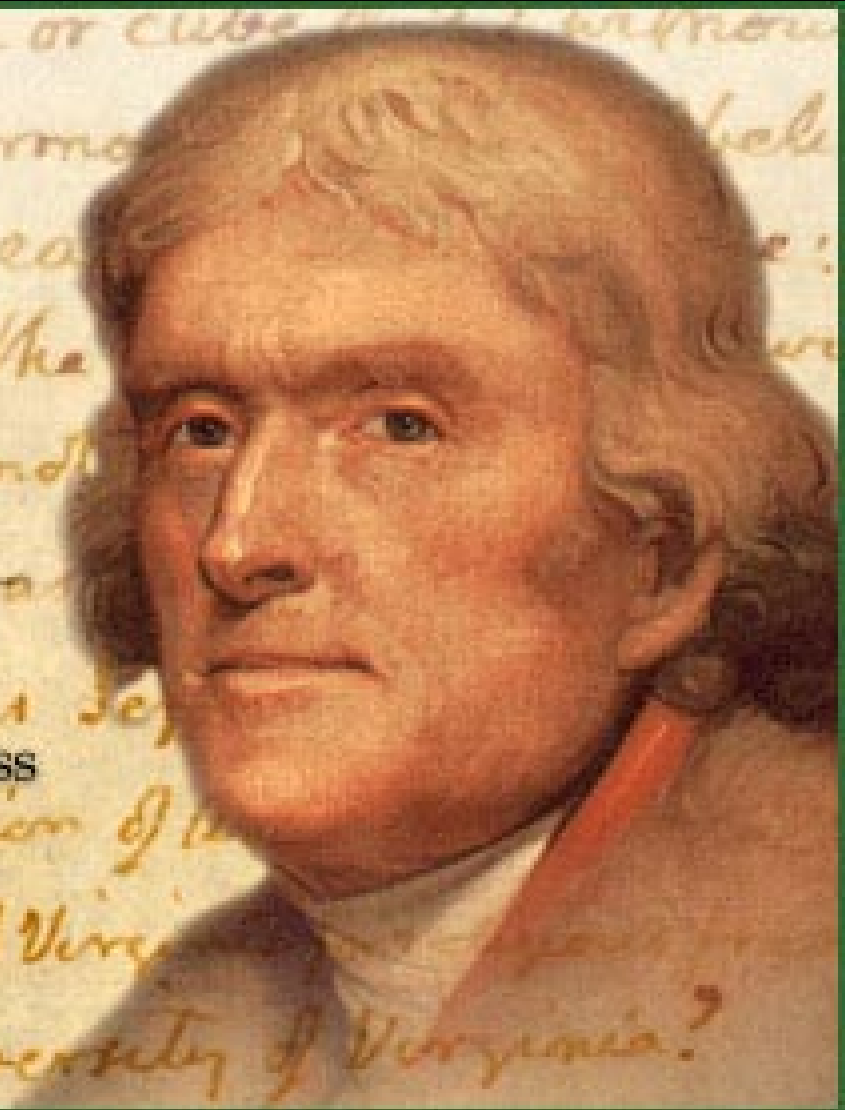
Who was the first president
(or wannabe) to talk about
Climate Warming?

- A. Thomas Jefferson
- B. William McKinley
- C. John F. Kennedy
- D. Jimmy Carter
- E. Al Gore

The Thomas Jefferson Papers

at the Library of Congress

author of the Declaration of Independence
of the Statute of Virginia
Father of the University of Virginia?



Jefferson's weather log

July

Philadelphia.

	H. min.		H. min.
1.	9-0. A.M.	81½	8-0. A.M.
	7-0. P.M.	82.	9-15.
2.	6-0. A.M.	78.	2-0. P.M.
	9-40. A.M.	78.	4-45.
	9-0. P.M.	74.	6-30.
3.	5-30. A.M.	71½	9-30.
	1-30. P.M.	76.	11. 5-30 A.M.
	8-10.	74.	8-0.
4.	6-0. A.M.	68.	9-40. P.M.
	9-0.	72½	12. 7-0. A.M.
	1-0. P.M.	76.	9-0.
	9-0.	73½	8-50. P.M.
5.	6-0. A.M.	71	

Jefferson's weather log,
Philadelphia, July 1776

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(or wannabe) to talk about
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**“A change in our climate however is taking place very
sensibly.**

**Both heats and colds are become much more moderate within
the memory even of the middle-aged.
Snows are less frequent and less deep.”**

**—Thomas Jefferson,
*Notes on the State of Virginia, 1781***

"a considerable change of climate, inexplicable at present to us, must have taken place in the Circumpolar Regions, by which the severity of the cold that has for centuries past enclosed the seas in the high northern latitudes in an impenetrable barrier of ice has been during the last two years, greatly abated."

**—President of the Royal Society, London, to the Admiralty,
20 November, 1817.**

“The temperature of the winter season, in northern latitudes, has suffered a material change, and become warmer in modern, than it was in ancient times. ... Indeed I know not whether any person, in this age, has ever questioned the fact.”

—Noah Webster, 1843

“The Arctic ocean is warming up, icebergs are growing scarcer and in some places the seals are finding the water too hot. Reports all point to a radical change in climate conditions and hitherto unheard-of temperatures in the Arctic zone. expeditions report that scarcely any ice has been met with as far north as 81 degrees 29 minutes. Great masses of ice have been replaced by moraines of earth and stones, while at many points well known glaciers have entirely disappeared.”

—US Weather Bureau, 1922

There’s nothing new about climate change and “global warming”

What was the most expensive/devastating natural event in US history ?

- A. Mt. St. Helens eruption 1980
- B. California earthquakes 1989 & 1994
- C. Hurricanes Katrina 2005 & Andrew 1992
- D. el Niño 1998
- E. Drought 1930's
- X. Mississippi River floods 1993
- Y. Forest fires 2002 & 2004

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- D. el Niño 1998
- E. Drought 1930's**
- X. Mississippi River floods 1993
- Y. Forest fires 2002 & 2004

Destructive climate events are not new, either!

Global Sea Ice

Arctic

Antarctic



Sea Ice coverage varies from year to year. Satellite observations of the ice began in 1979. In 2007, which ice coverage record was set ?

- A. Most Arctic sea ice
- B. Least Arctic sea ice
- C. Most Antarctic sea ice
- D. Least Antarctic sea ice
- E. No records were set

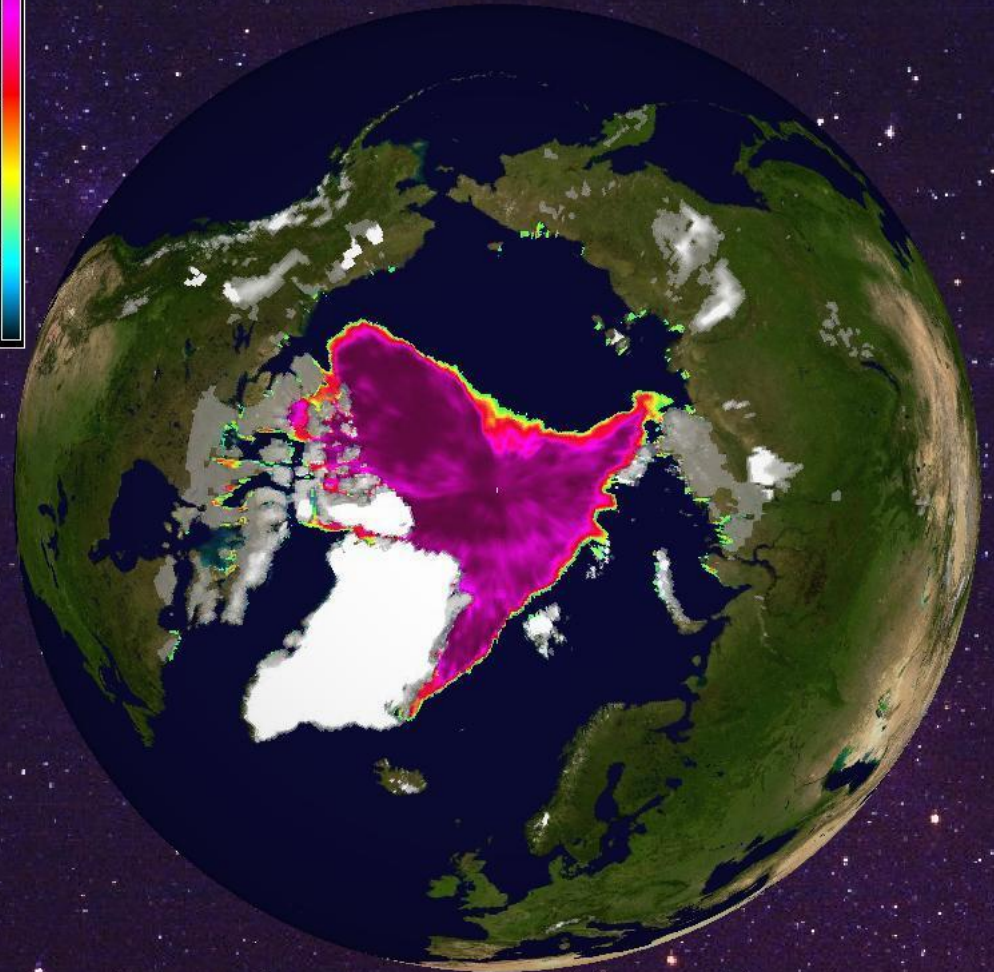
Arctic

Average

2007



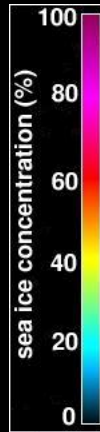
Monday October 01 02:41:24 PM CDT



Antarctic

Average

2007



Monday October 01 02:41:25 PM CDT



Sea Ice coverage varies from year to year. Satellite observations of the ice began in 1979. In 2007, which ice coverage record was set ?

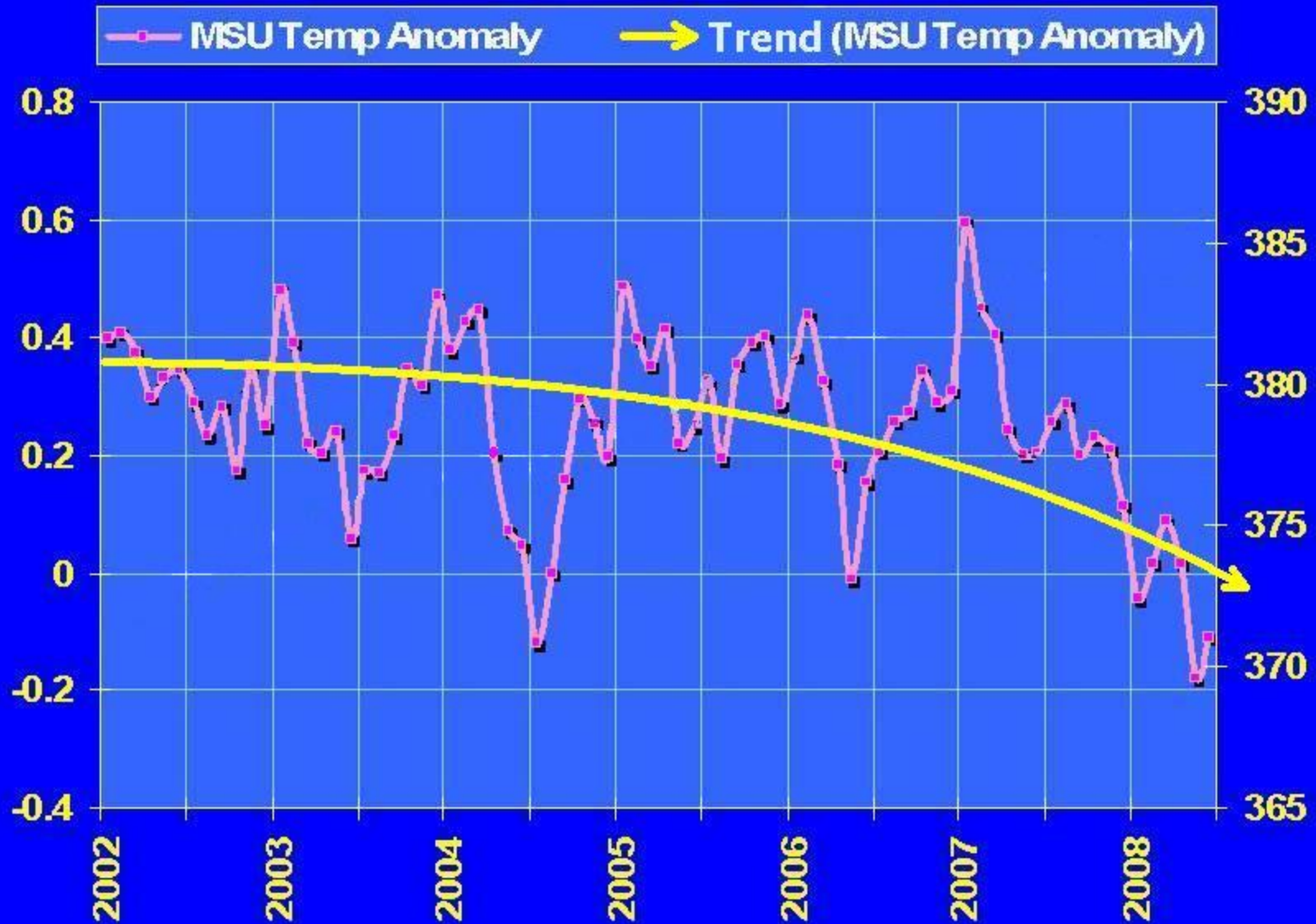
- A. Most Arctic sea ice
- B. Least Arctic sea ice
- C. Most Antarctic sea ice
- D. Least Antarctic sea ice
- E. No records were set

Did you see "C" reported in the news ?

The global temperature for 2007
was:

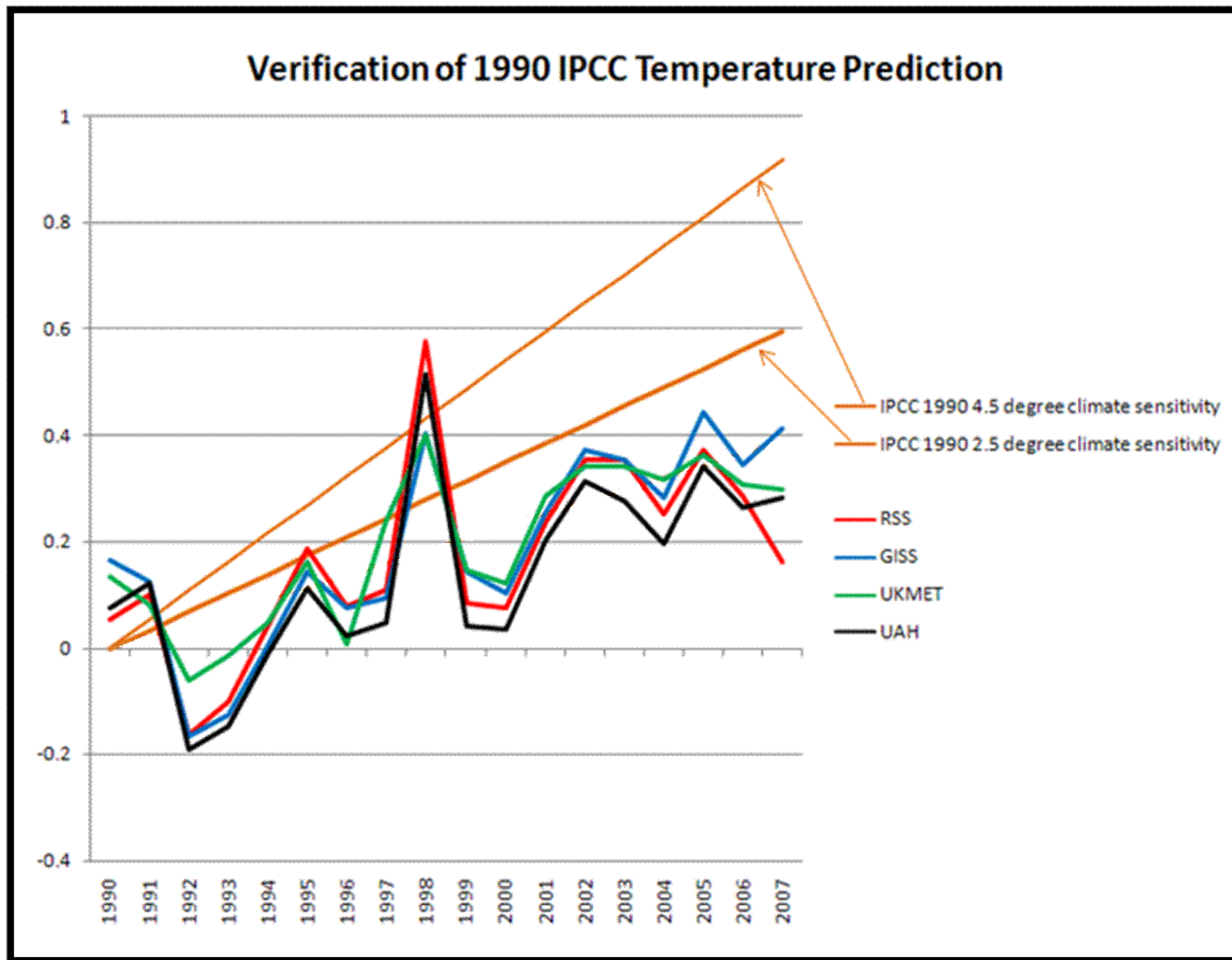
- A. the warmest in a decade
- B. the warmest in a century
- C. the warmest in 1,000 years
- D. the coldest in a decade
- E. the coldest of the millennium

Monthly Global Average Temperature Anomalies 2002-2008



Earth has cooled since 1998.

In defiance of the predictions by the UN-IPCC



The global temperature for 2007 was:

A. the warmest in a decade

B. the warmest in a century

C. the warmest in 1,000 years

D. the coldest in a decade

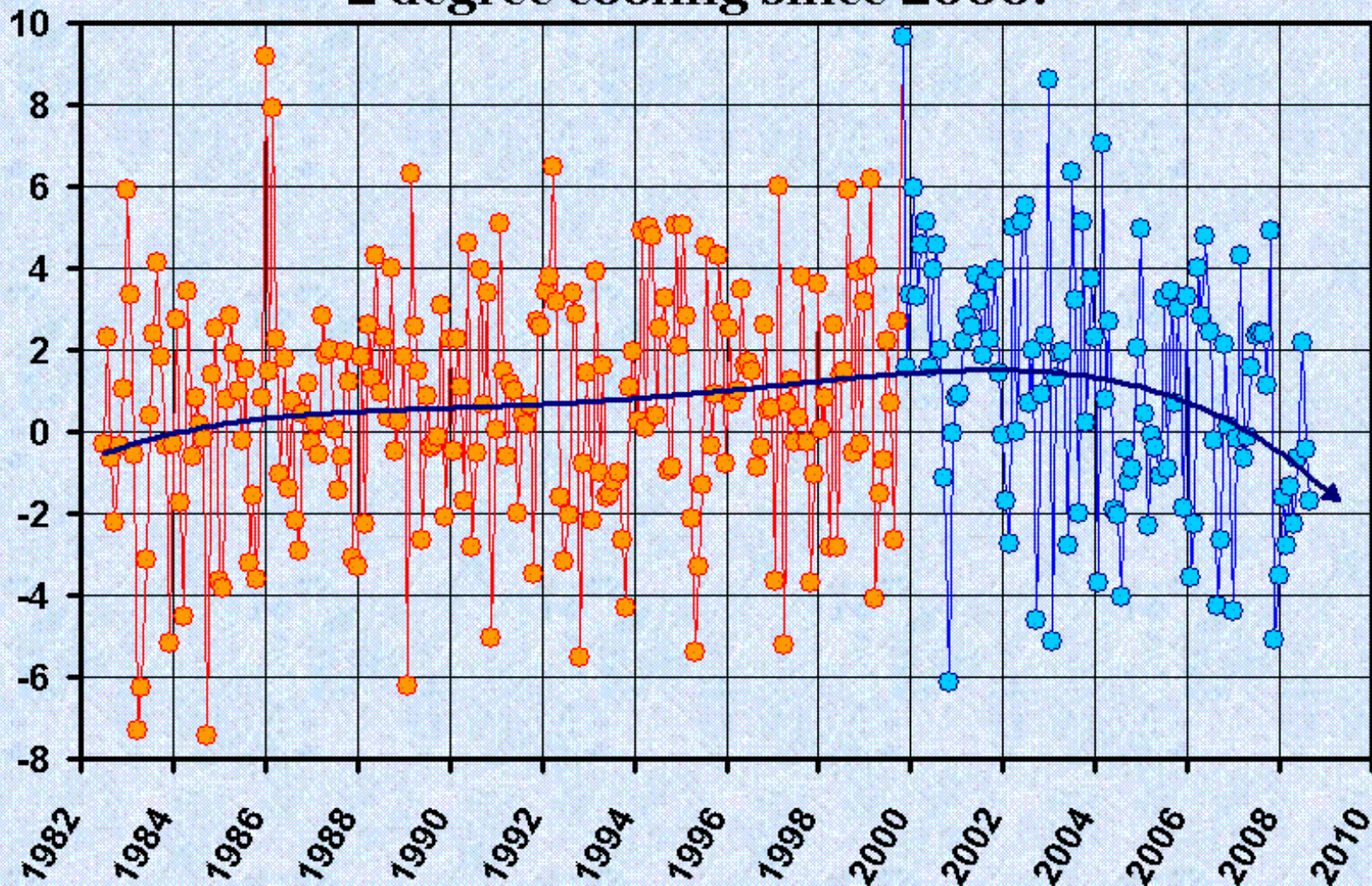
E. the coldest of the millennium (so far!)



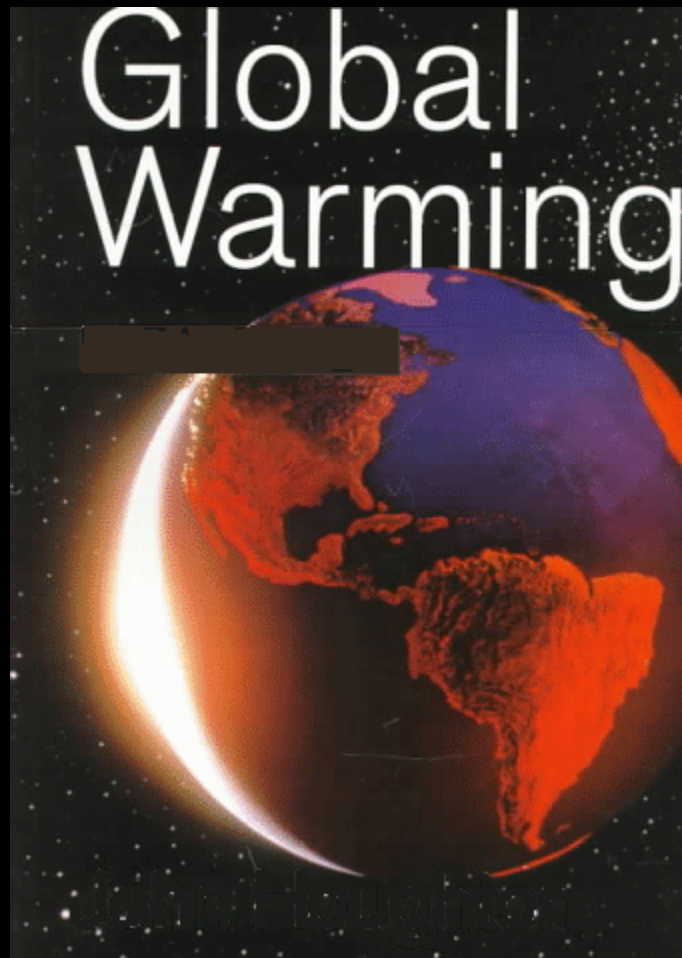
How about at my NWS
co-op weather station ?

After two decades of slow warming, temperatures have cooled 2 degrees since 2000

Coal Creek Canyon, Colorado, Monthly Temperature Departures. Degrees F, 1982 to 2008
2 degree cooling since 2000.



Which is why



is now called



In YOUR opinion, Global Warming is...

- A. the Worst crisis ever to face humanity
- B. a Big problem, but there's bigger issues
- C. a Minor inconvenience that's overblown
- D. Nothing - it doesn't exist
- E. a Good thing

My opinion, based on real observations of the climate: somewhere between C and D.

However, if you insist it is a problem, what should we do about "Global Warming" ?

A. Nothing, it's not happening.

B. Let the market solve the problem (efficiency is cheaper).

C. Encourage (tax credits, etc.) tech solutions - more efficient energy, etc.

D. Mandate lower emissions via taxes, fines, carbon credits, etc. (Kyoto treaty)

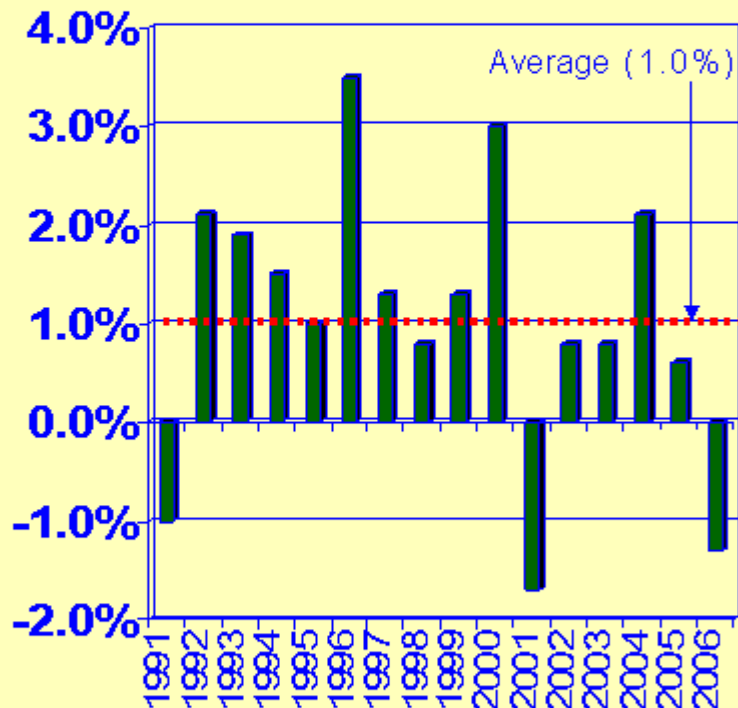
E. Return to a hunter-gatherer economy.

Global CO₂ emissions have been increasing for years. In 2006, which country had the largest DECREASE of CO₂ emissions?

- A. USA
- B. China
- C. Russia
- D. Germany
- E. Brazil

Percent Change in Energy-Related Carbon Dioxide Emissions (1991-2006)

Annual Percent Change in CO₂ Emissions*



Long-term growth in energy CO₂ emissions is influenced by:

- Economic growth
 - Energy intensity of economy
 - Includes structural shifts as well as efficiency gains
 - Carbon intensity of energy supply
- Short-term, year-to-year variations are affected by:
- Weather
 - Economic fluctuations
 - Fuel mix, which is influenced by the relative prices of fuels

Source: Energy Information Administration, preliminary estimate for 2006.

Energy intensity (energy consumed per \$ real GDP) fell by over 4.0 percent, as total energy demand declined 0.9 percent while the economy grew by 3.3 percent

Global CO₂ emissions have been increasing globally for years. In 2006, which country had the largest DECREASE of CO₂ emissions?

- A. USA
- B. China
- C. Russia
- D. Germany
- E. Brazil



Some political
hot air.



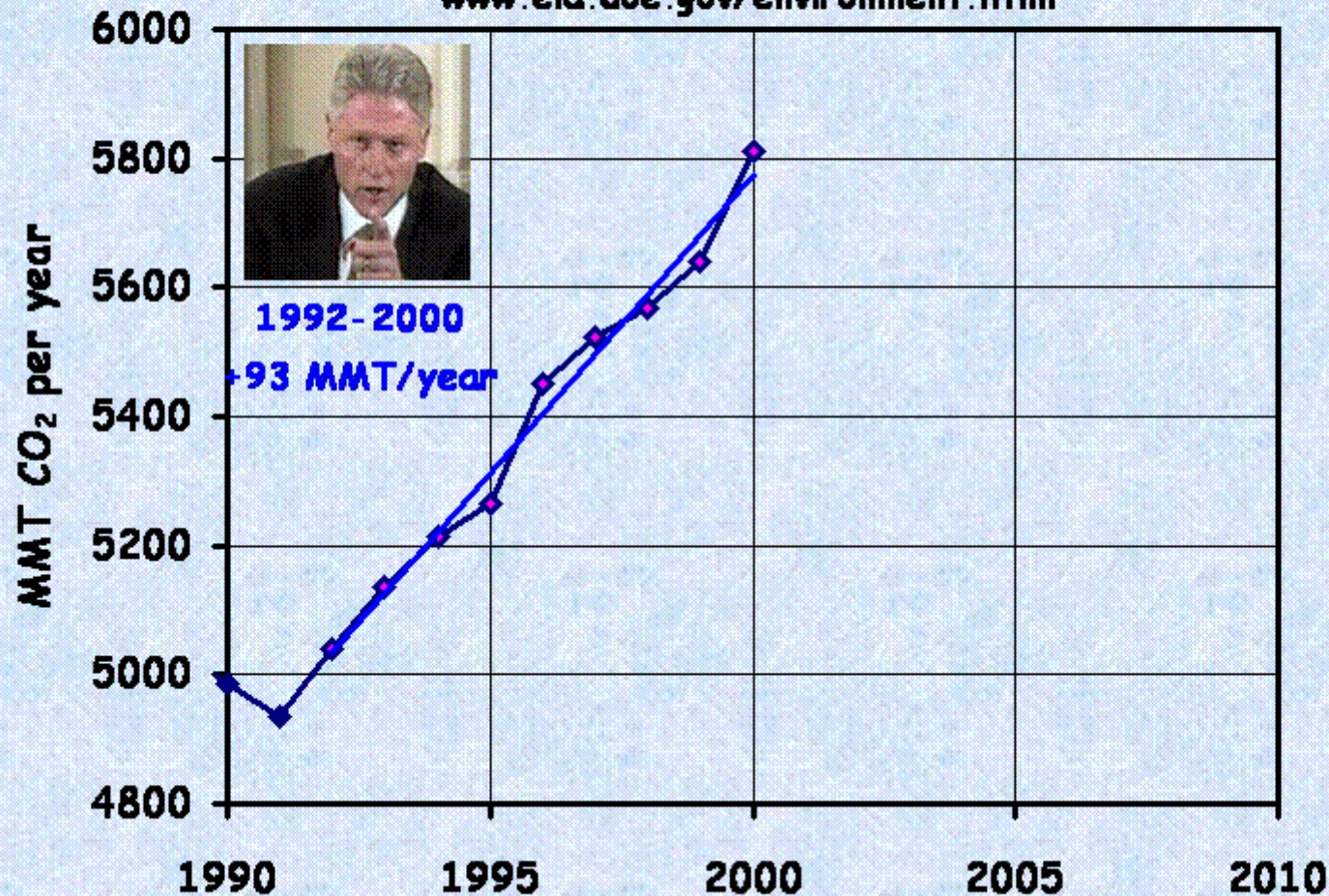
US CO₂ emissions have increased most years since the invention of the steam engine. Since 1950, which administration has overseen the smallest increase of greenhouse gas (mostly CO₂) emissions ?

- A. John F. Kennedy
- B. James E. Carter
- C. Ronald W. Reagan
- D. Bill J. Clinton
- E. George W. Bush

US CO₂ Emissions

Million Metric Tons CO₂ per year

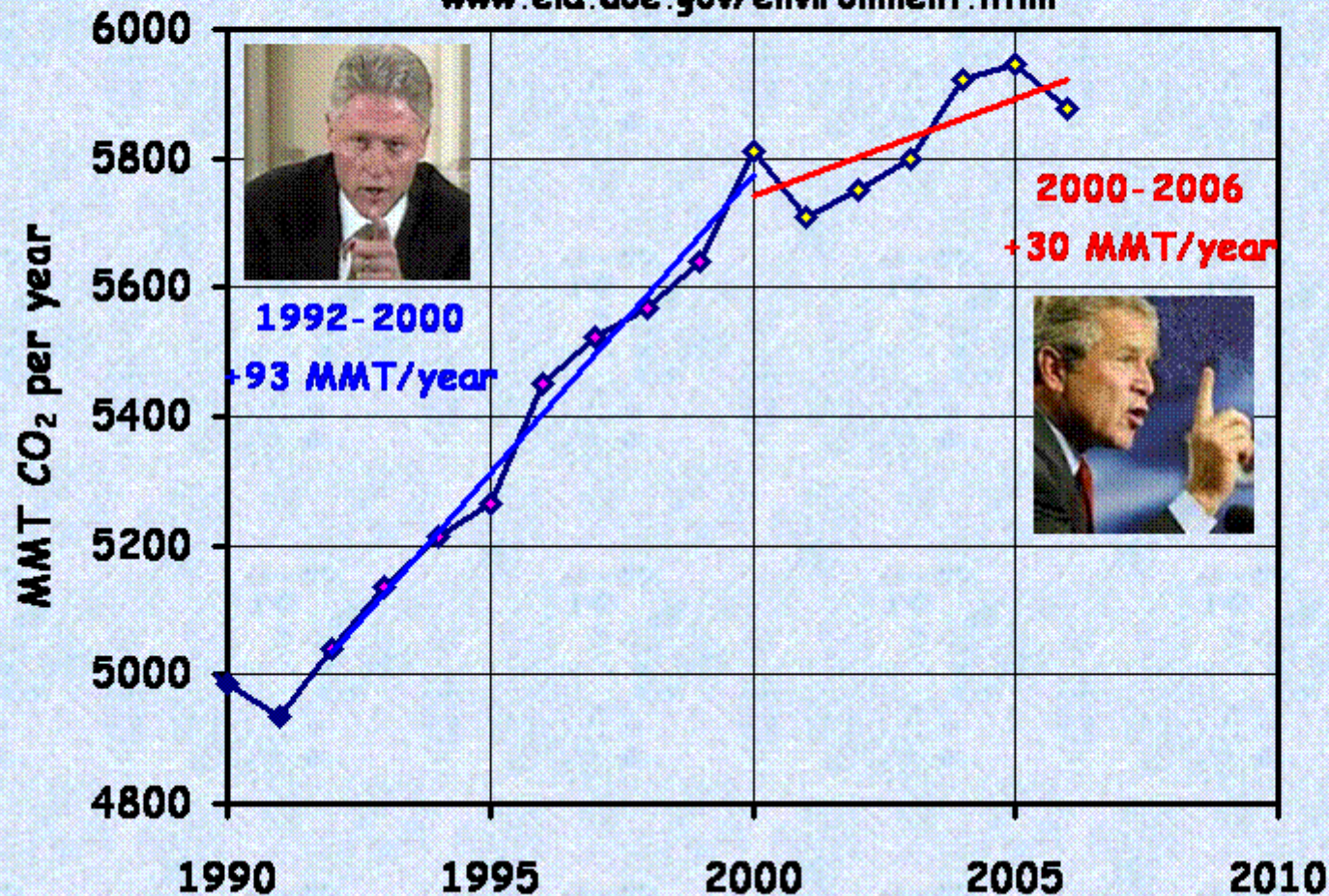
www.eia.doe.gov/environment.html



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U.S. CO₂ Emissions

Annual Growth Rates

1949 to 2006

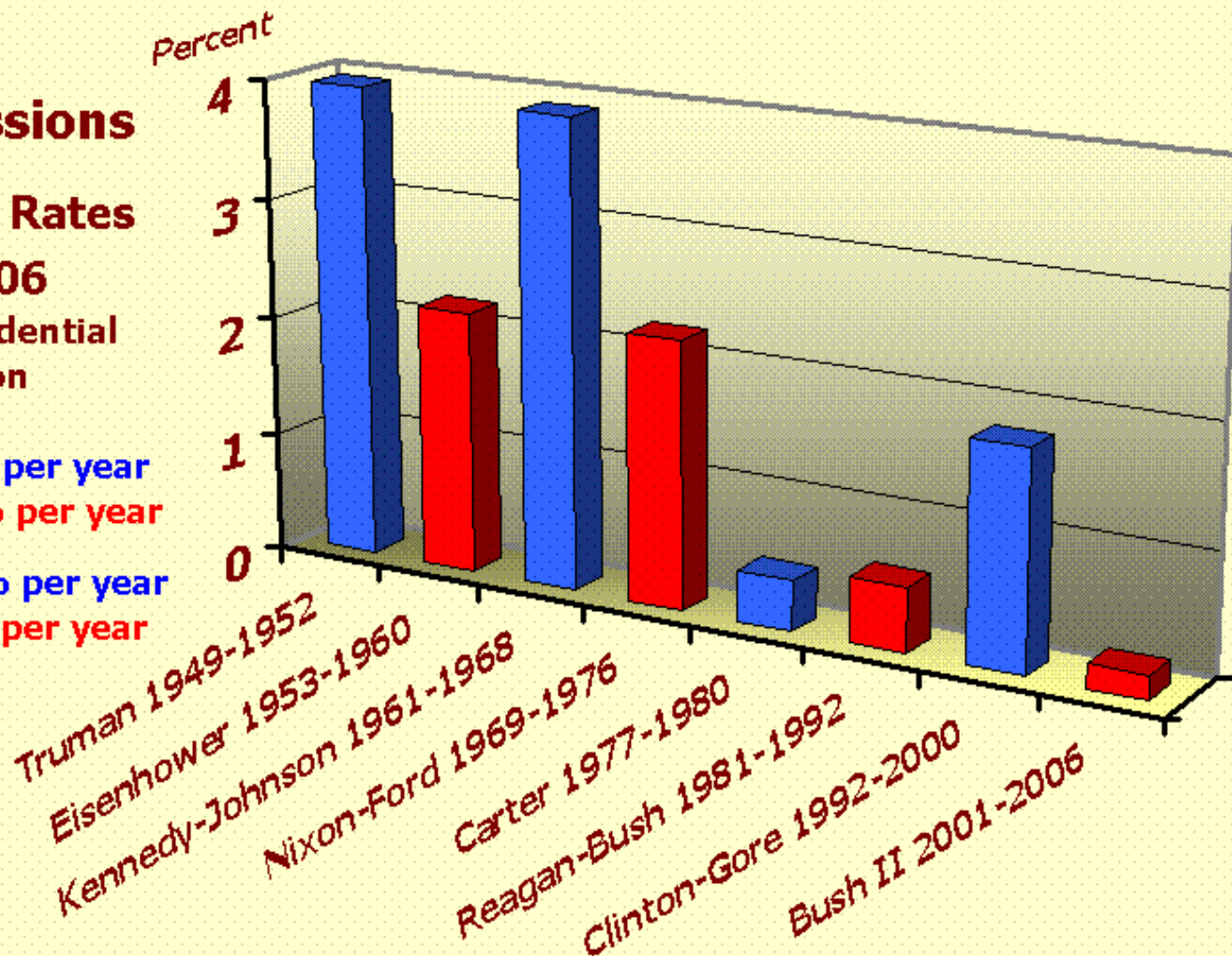
averaged by presidential administration

Democrats: +2.6% per year

Republicans: +1.3% per year

Clinton-Gore: +1.8% per year

G.W. Bush: +0.2% per year



Is Kyoto working ?

Between 1997 and 2004 (the most recent year for which we have complete statistics), carbon dioxide emissions rose as follows:

Worldwide Emissions increased 18.0 %

Countries that ratified the protocol increased 21.1 %

Non-ratifiers of the protocol increased 10.0 %

U.S. (a non-ratifier) increased 6.6 %

75 % of Kyoto signers had more CO_2 growth than the U.S.

U.S. emissions have risen only 0.2 % per year since 2000.

Randall Haven, "Kyoto Schmyoto", American Thinker, December 11, 2007
http://www.americanthinker.com/blog/2007/12/kyoto_schmyoto.html

What should we do about "Global Warming" ?

- A. Nothing, it's not happening.
- B. Let the market solve the problem.
- C. Tech solutions - more efficient energy, etc.
- D. Mandate lower emissions (Kyoto treaty)
- E. Return to a hunter-gatherer economy.

For reducing carbon emissions, countries doing B or C (like the U.S.) are doing much better than Kyoto ratifiers (D).

My humble opinion: A. Nothing
(but B and C make sense for other reasons besides climate, and are already working)

Current U.S. policy...

"My Administration's climate change policy will be science-based, encourage research breakthroughs that lead to technological innovation, and take advantage of the power of markets"
(G.W. Bush)

www.whitehouse.gov/ceq/global-change.html

U.S. carbon emission growth rate has slowed to 0.2 % per year since 2000.

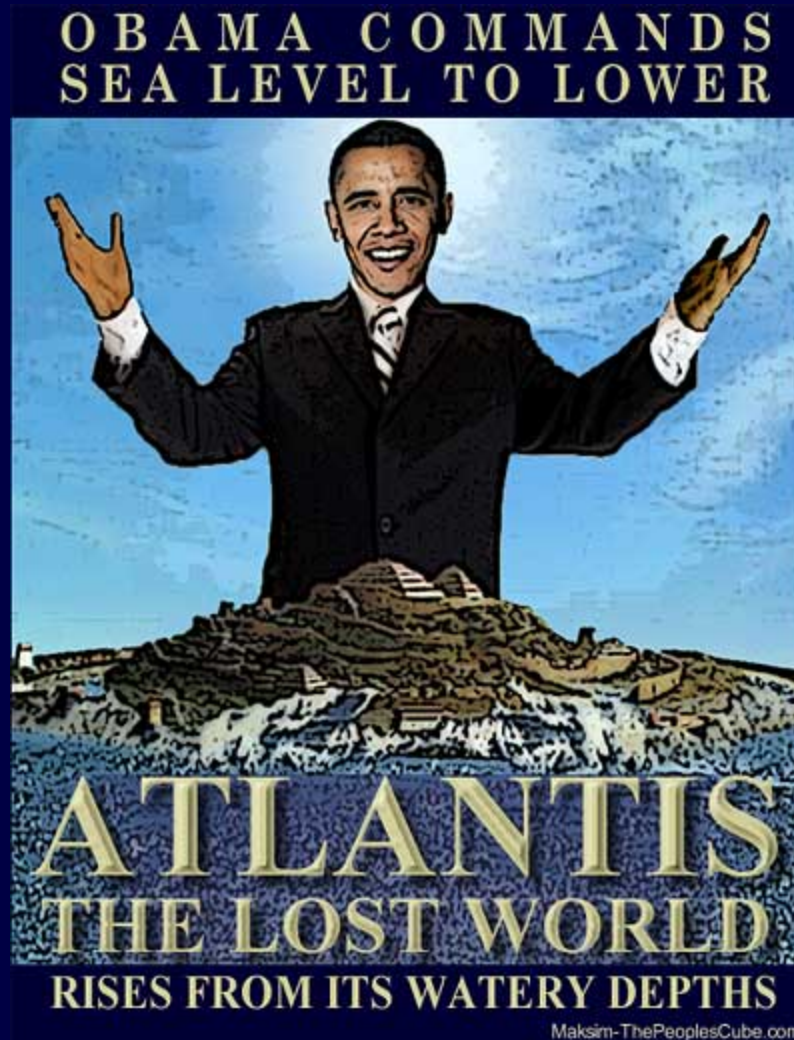
Previous administration's policy:

While in office: make no effort to ratify Kyoto, as carbon emissions increased 18 percent.

While out of office: become a millionaire from movies and \$100,000 speeches criticizing George Bush for making no effort to ratify Kyoto



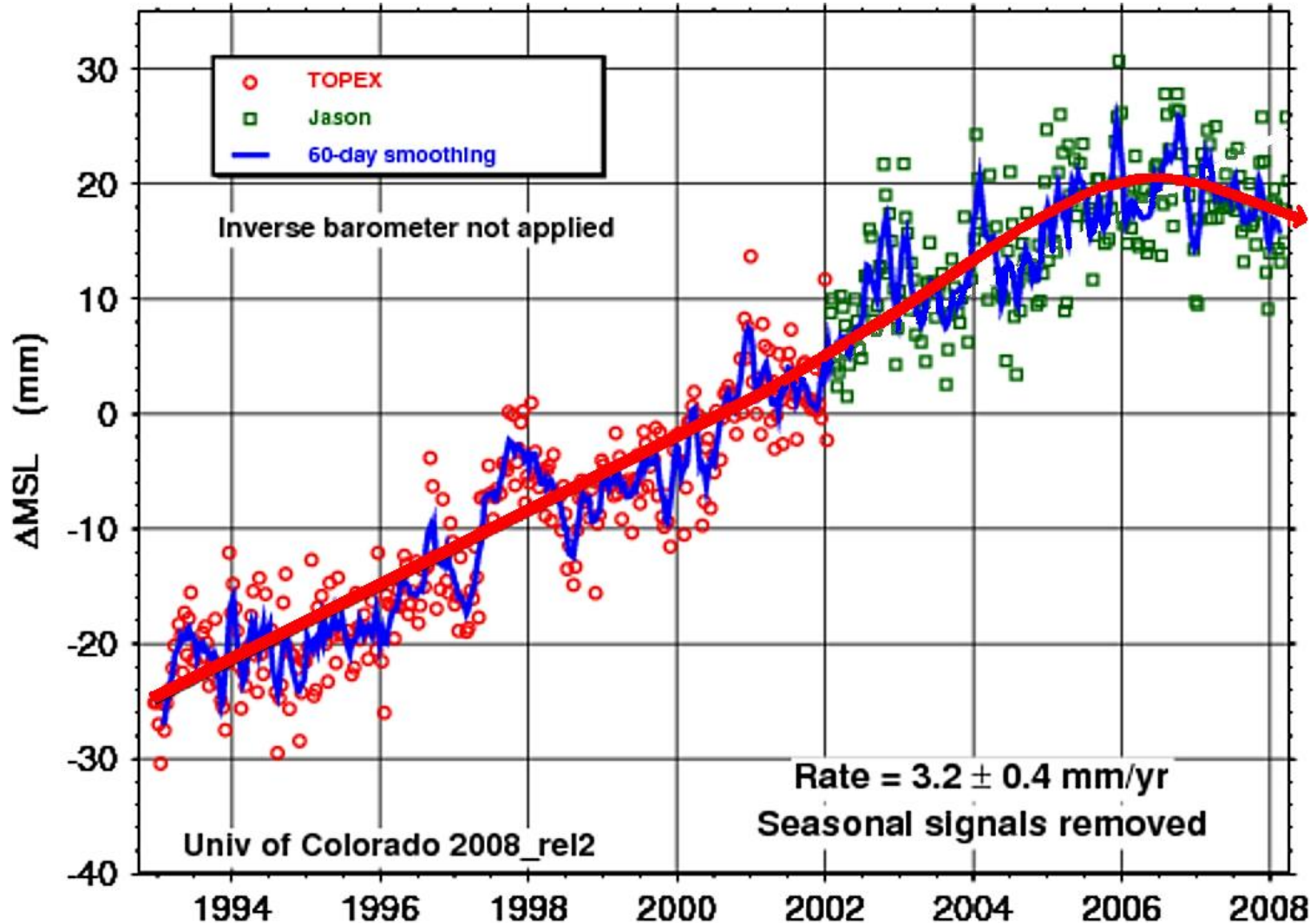
Can this guy lower the seas ?



“I am absolutely certain that generations from now, we will be able to look back and tell our children that this was the moment when the rise of the oceans began to slow and our planet began to heal.”

- Barack Obama, June 3, 2008

No need to. This guy already has ...



an inconvenient truth

A GLOBAL **WARNING**

What about the
Charismatic Megafauna ?

"Polar bears drown, drown
As the seas get higher... "
Paul Shanklin, "Ball of Fire"

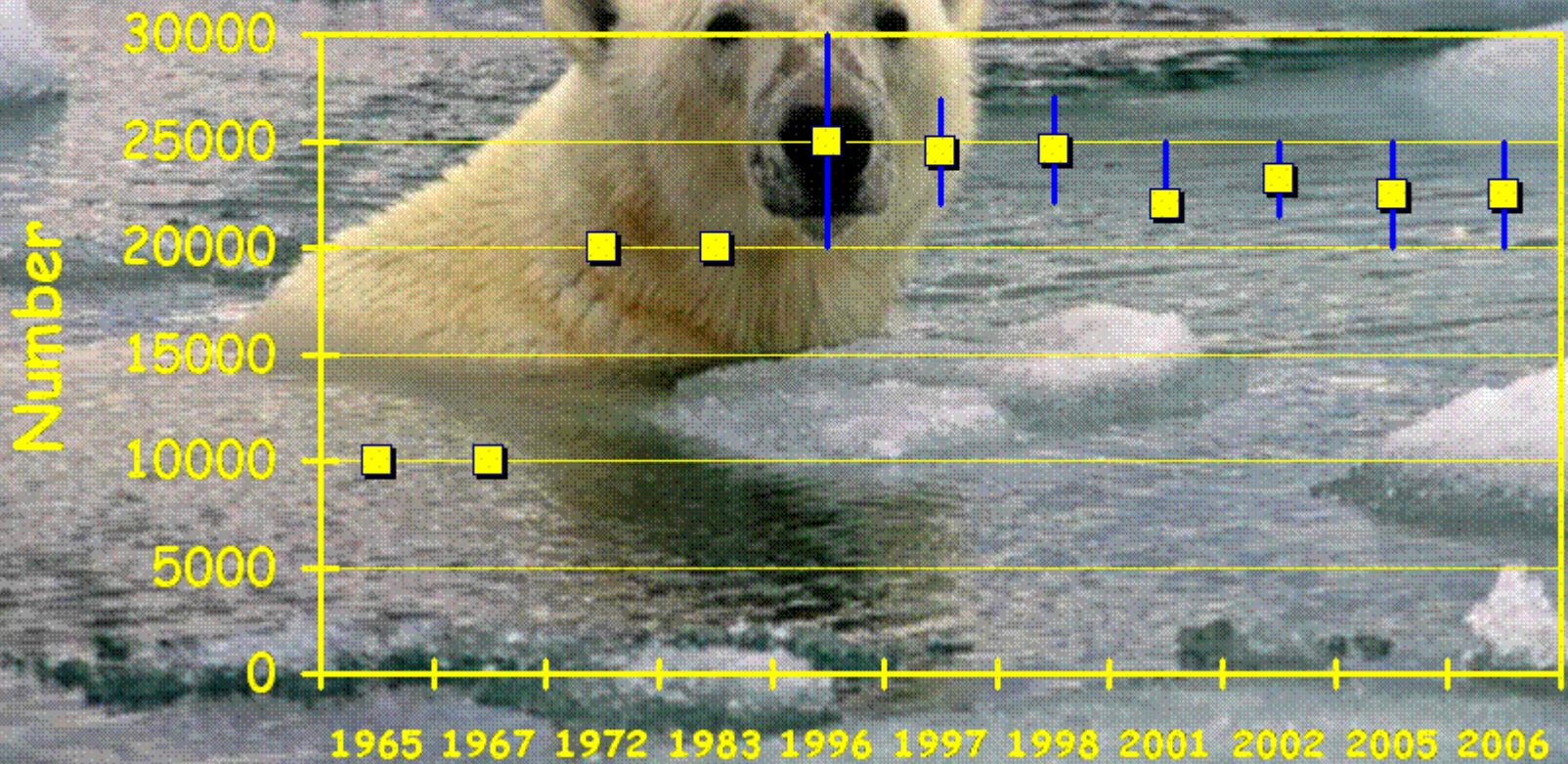
by far the most terrifying film you will ever see.

Are polar bears drowning ?

No (well, maybe a few that can't swim are).


Worldwide Polar Bear Population Estimates, 1965 to 2006

Stable at 20 to 25 thousand since 1972



Ursus Maritimus (Sea Bear) enjoys swimming.
They are doing just fine, just as they did with
warm climates and thin ice 70 and 250 and 1000
and 8,000 years ago, thank you!



A bright sun with a human-like face in a blue sky above a grassy hill with a green dome structure.

Enjoy the warm climate
while it lasts, and
please make enough CO_2
to feed a tree.

Have a nice day.

Background info,
more graphs,
& references

More correlations

Years	1993-2000	2001-2007
Temperature	rose	fell
Sea Level	rose	stopped rising
CO₂ emissions	+1.8 % per year	+0.2 % per year
GDP growth per year	3.5%	3.1%
Carbon efficiency improvement	+1.7 % per year	+2.9 % per year
Unemployment	5.2 %	5.2 %
# years between major terrorist attacks	2	7 +
# times Phillies in World Series	1	1 (2008 actually)

The decreases in temperatures,
emissions growth, and sea level
since 2000 came at no expense to the
economy.

Sources:

Significant Terrorist Incidents, 1961-2003: A Brief Chronology

<http://www.state.gov/r/pa/ho/pubs/fs/5902.htm>

events with 10+ US fatalities

Unemployment

<ftp://ftp.bls.gov/pub/special.requests/lf/aat1.txt>

UPDATE: Monday, October 1, 2007 - Record SH sea ice maximum and NH sea ice minimum

Just when you thought this season's cryosphere couldn't be more strange The Southern Hemisphere sea ice area narrowly surpassed the previous historic maximum (2001) of 16.03 million sq. km to 16.17 million sq. km. The observed sea ice record in the Southern Hemisphere (1979-present) is not as long as the Northern Hemisphere. Prior to the satellite era, direct observations of the SH sea ice edge were sporadic.

The NH sea ice area reached an historic minimum on September 16, 2007 (2.92 million sq. km), representing a 27% drop in sea ice coverage compared to the previous (2005) record NH ice minimum.

<http://arctic.atmos.uiuc.edu/cryosphere/>

U.S. Energy-Related Carbon Dioxide Emissions Declined in 2006

- U.S. energy-related CO₂ emissions declined in absolute terms – from 5,955 million metric tons (MMT CO₂) in 2005 to 5,877 MMT CO₂ in 2006, a 1.3 percent decrease
- Emissions from natural gas and petroleum fell 1.7 percent and 1.5 percent, respectively, while coal emissions declined 0.9 percent
- Energy intensity (energy consumed per \$ real GDP) fell by over 4.0 percent, as total energy demand declined 0.9 percent while the economy grew by 3.3 percent
- The total carbon intensity of the economy (CO₂ per \$ real GDP) fell by 4.5 percent, as the carbon intensity of the energy supply (CO₂ per Btu of energy) fell in addition to the decline in the energy intensity
- The 2006 decline in carbon intensity is the largest since 1990 and the 4th largest since 1949

Note: Historically, Energy Intensity has fallen (improved) about 1 percent per year. In 2006 it fell 4 percent.



Historical Growth Rates for U.S. Carbon Intensity

Decade	Overall Change in Intensity (Percent)		Average Annual Change in Intensity (Percent)	
	Carbon Dioxide	Total GHG	Carbon Dioxide	Total GHG
History				
1950-1960	-12.9	—	-1.4	—
1960-1970	-3.3	—	-0.3	—
1970-1980	-17.8	—	-1.9	—
1980-1990	-25.6	—	-2.7	—
1990-2000	-15.0	-17.7	-1.6	-1.9
2000-2006	-22.3	—	-2.3	-2.4

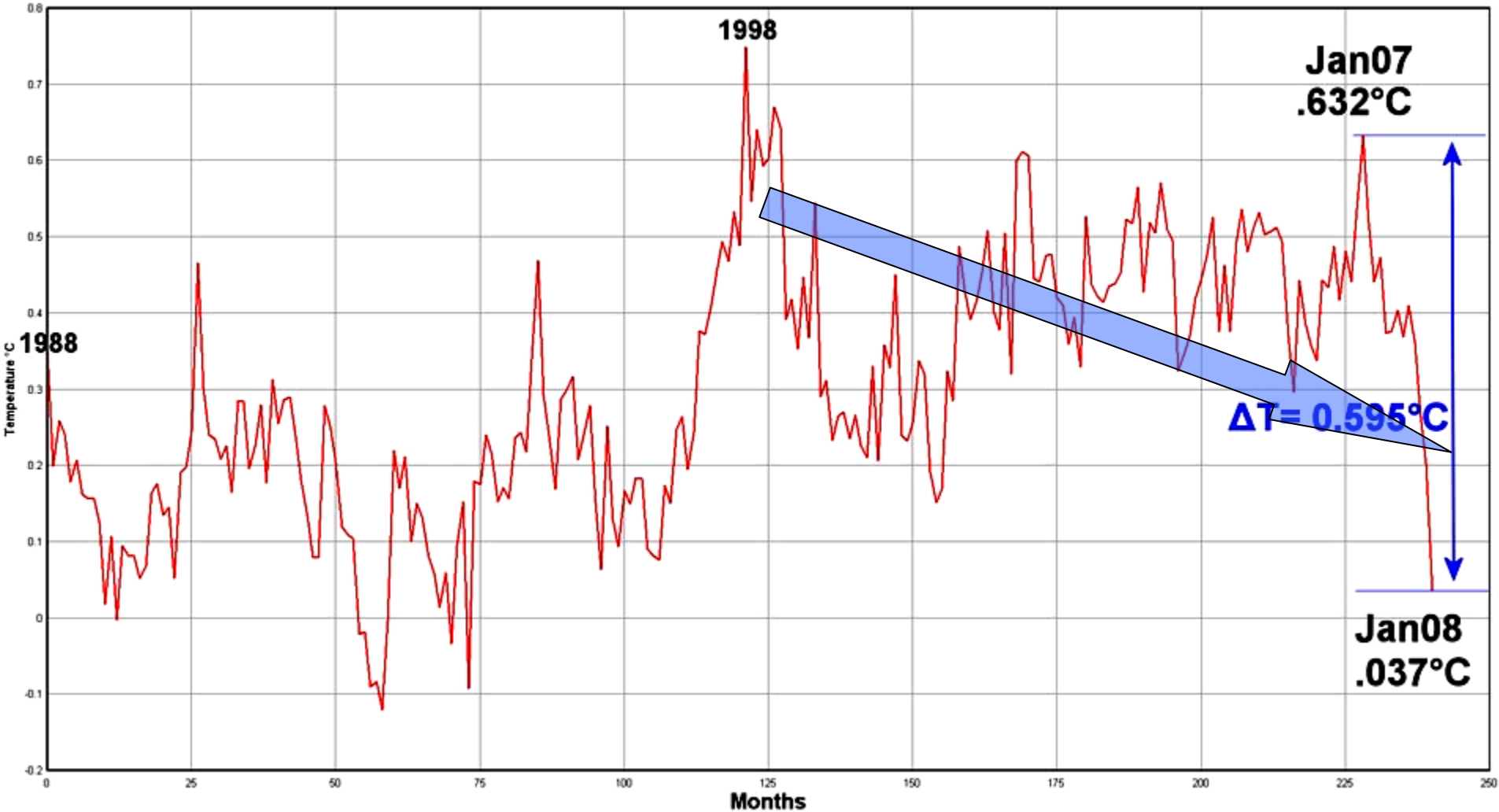
Source: Energy Information Administration, *Annual Energy Review 2005*, DOE/EIA-0384(2005) (Washington, DC, August 2006), and estimates presented in historical carbon dioxide emissions data series.

**Carbon Intensity is the amount of CO₂ produced per real dollar of GDP.
 Negative change means less CO₂, bigger negative change is better.
 As Carbon slows, the Economy grows !**

The past twenty years

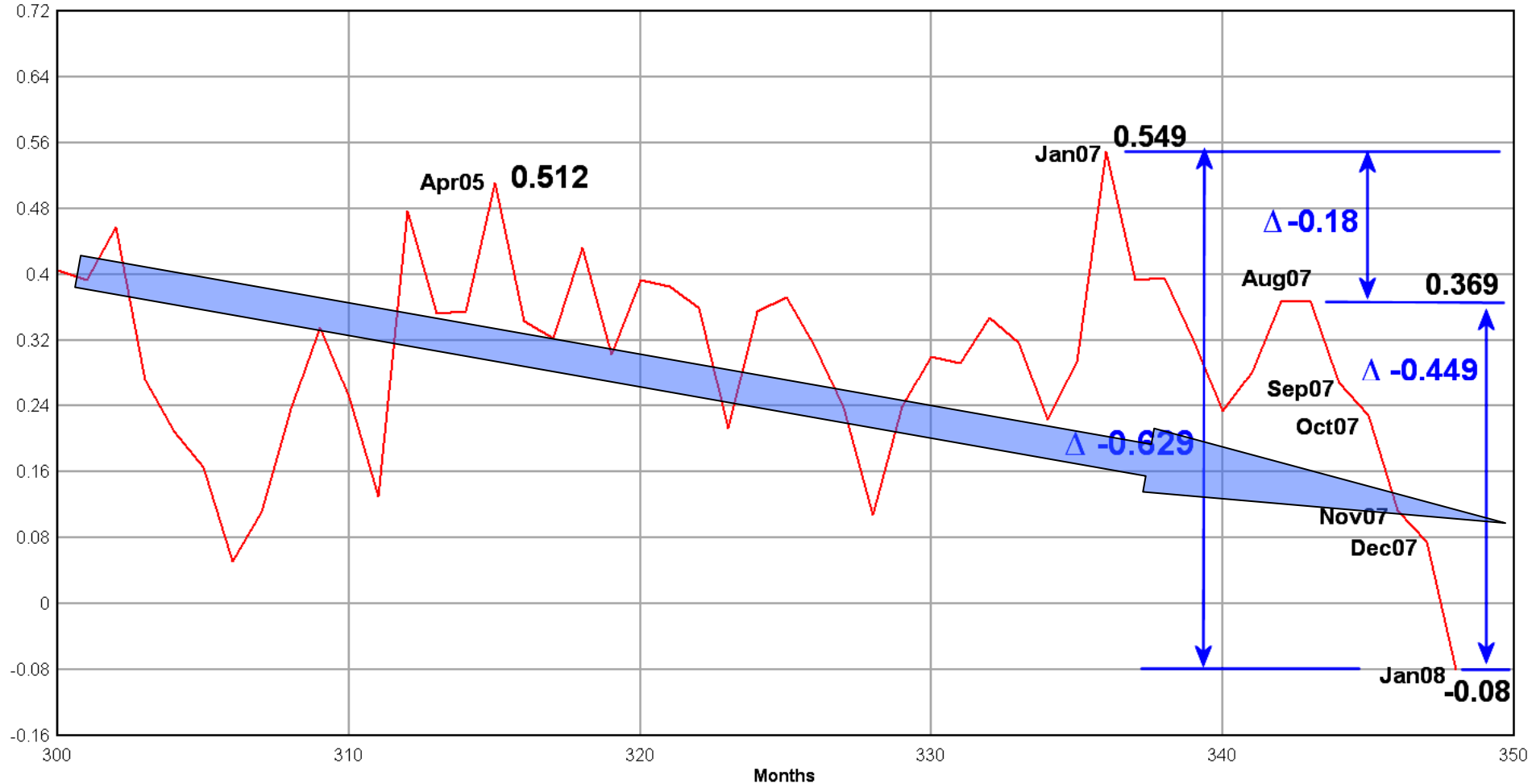
HadCRUT

HadCRUT Global Temperature Anomaly
1968-2008

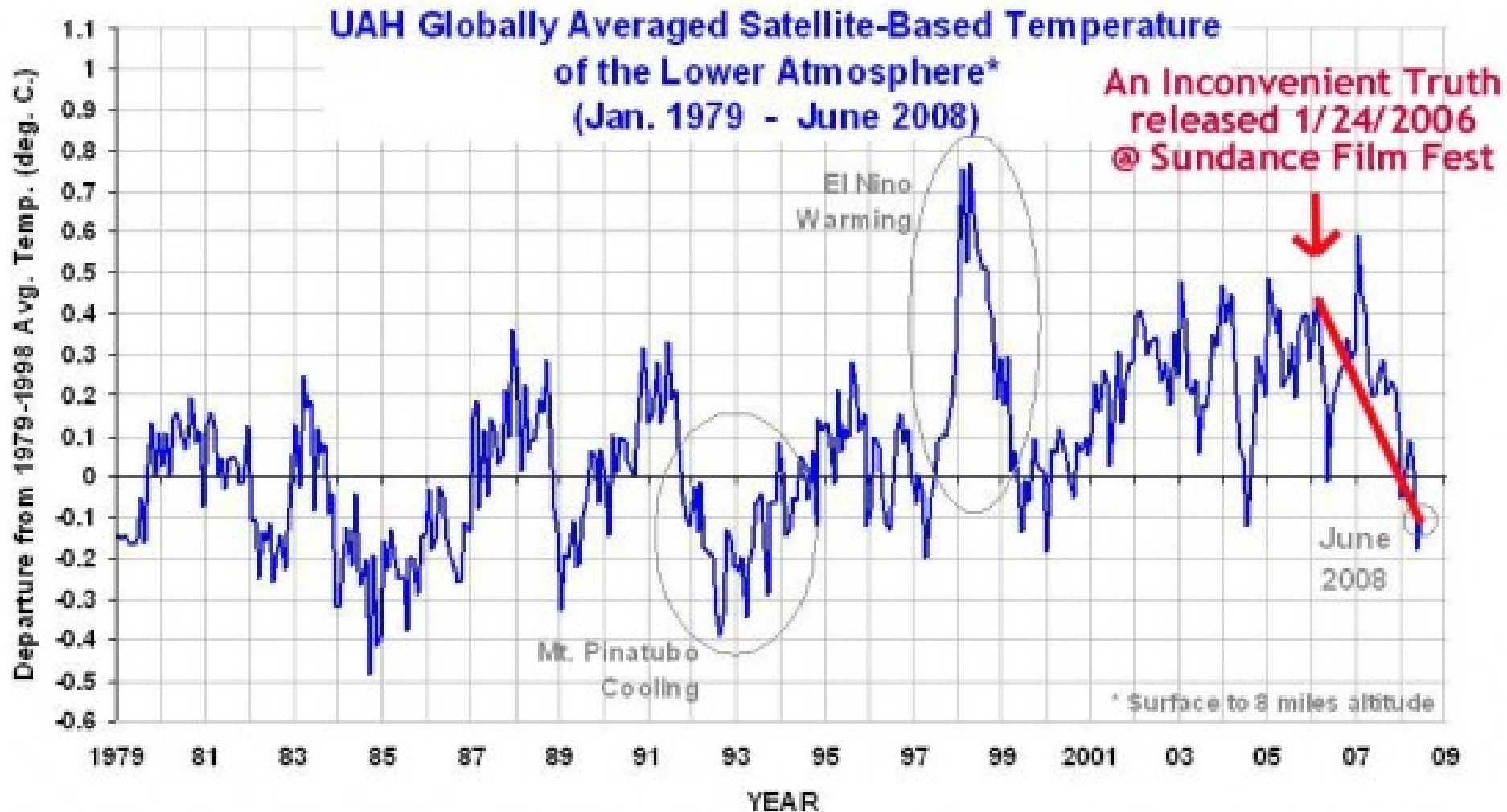


The past four years: Global Cooling

RSS MSU Monthly Anomaly -70S to 82.5N (essentially Global)

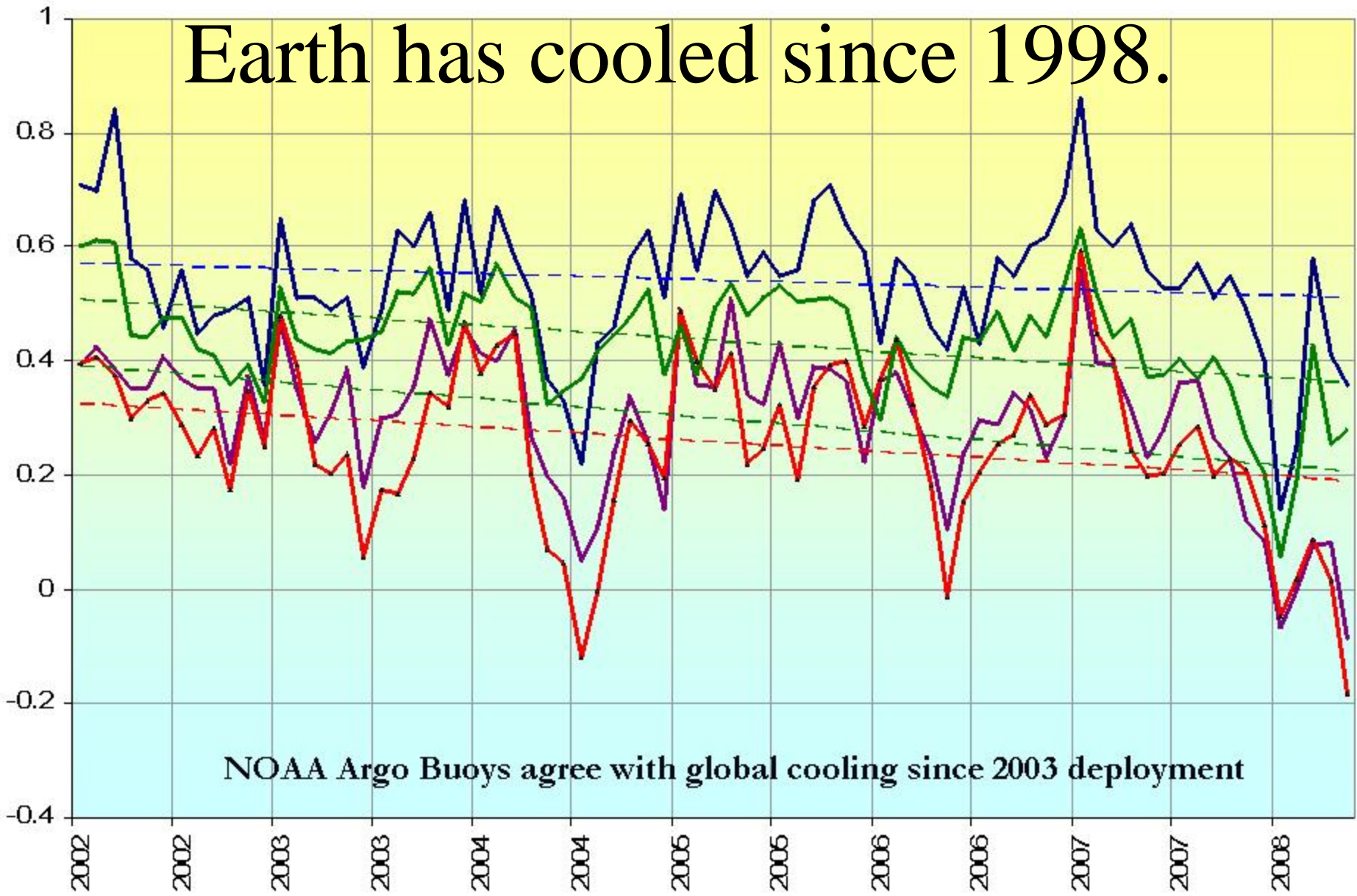


The past 20 years of global temperatures (satellite)



— NASA GISS — RSS MSU — UAH MSU — Hadley
- - - Linear (NASA GISS) - - - Linear (RSS MSU) - - - Linear (UAH MSU) - - - Linear (Hadley)

Earth has cooled since 1998.



NOAA Argo Buoys agree with global cooling since 2003 deployment