

Lecture 1: Wednesday, January 23, 2008  
index card

Student information on index card

Name:

Email:

Year:

Major (if chosen):

Why are you taking the course?

Write 1–2 sentences or questions about global warming

Reading

“The Rough Guide to Climate Change”

Articles and excerpts mentioned in class

The articles and excerpts can be found on the class web site

<http://www.physics.rutgers.edu/~karin/140>

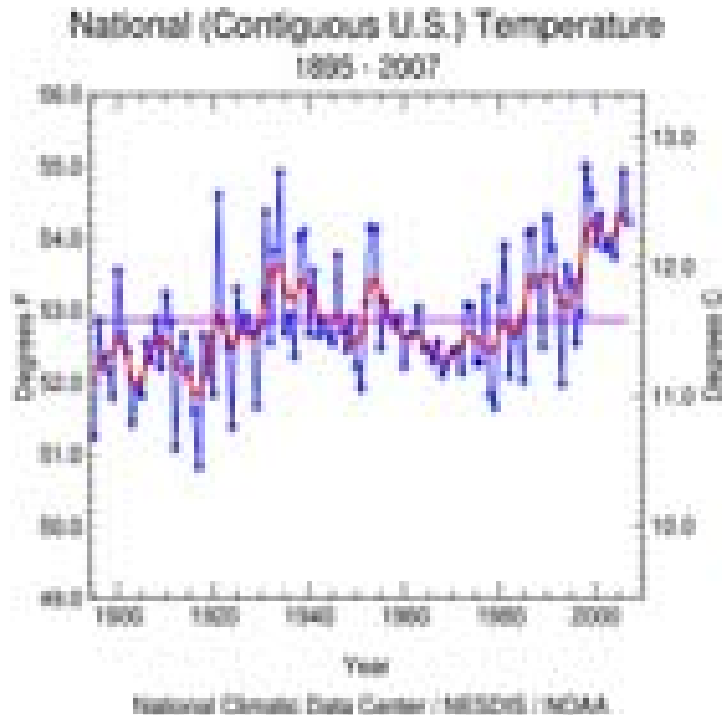
Special permission?

Email Ms. Julia Sotory [jsotory@physics.rutgers.edu](mailto:jsotory@physics.rutgers.edu)

1936 Dallas-Ft. Worth Turnpike near Dallas



# NOAA: 2007 a Top Ten Warm Year for U.S. and Globe



## U.S. Temperatures

The average U.S. temperature for 2007 was 54.2°F; 1.4°F warmer than the 20th century mean of 52.8°F

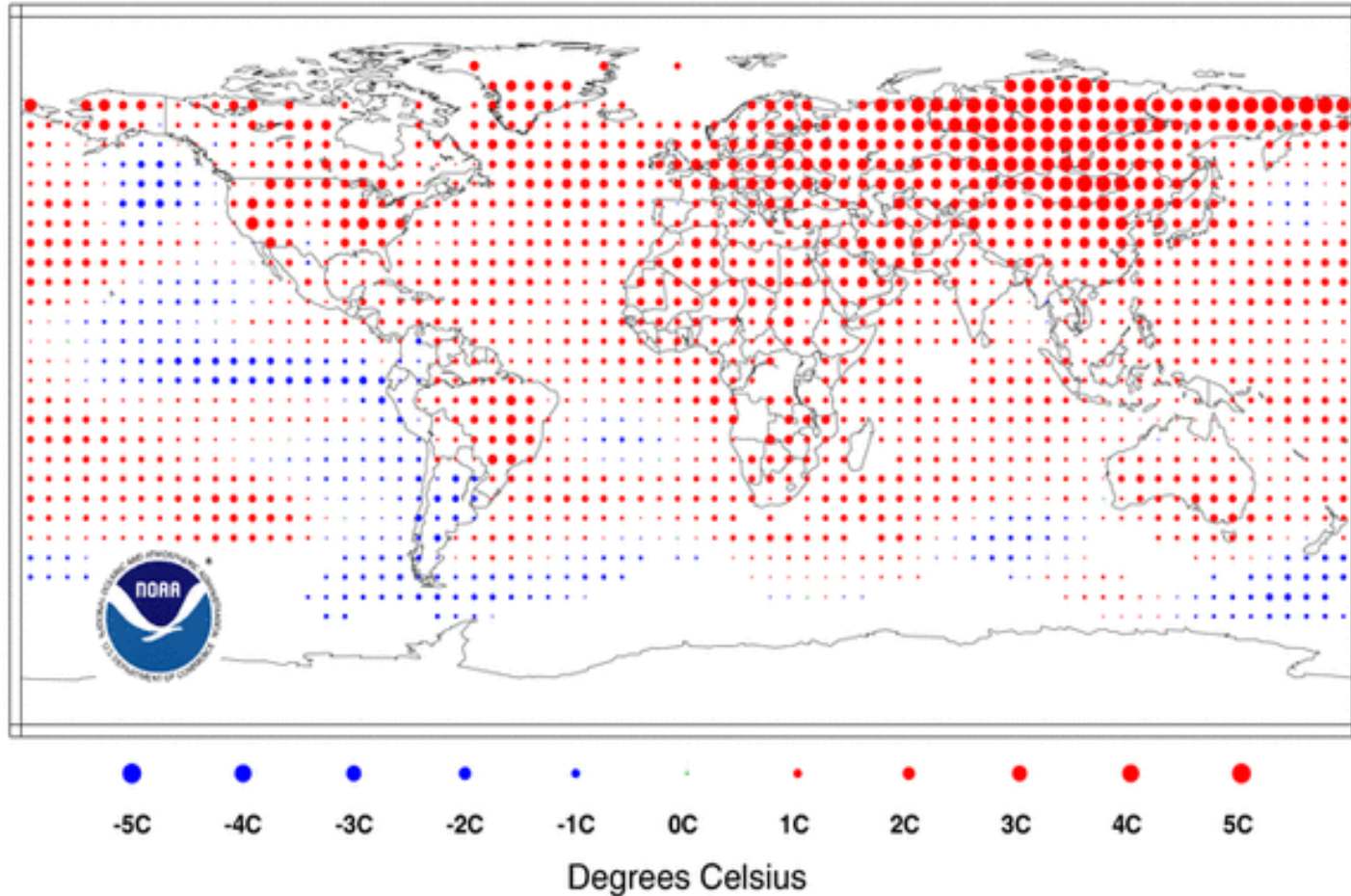
The year 2007 was the 10th warmest year for the contiguous U.S. since national records began in 1895, according to preliminary data from NOAA's National Climatic Data Center in Asheville, N.C. The year was marked by exceptional drought in the U.S. Southeast and the West, which helped fuel another extremely active wildfire season. The year also brought outbreaks of cold air, and killer heat waves and floods. Meanwhile, the global surface temperature for 2007 was the fifth warmest since records began in 1880.

<http://www.ncdc.noaa.gov/oa/climate/research/2007/ann/ann07.html>

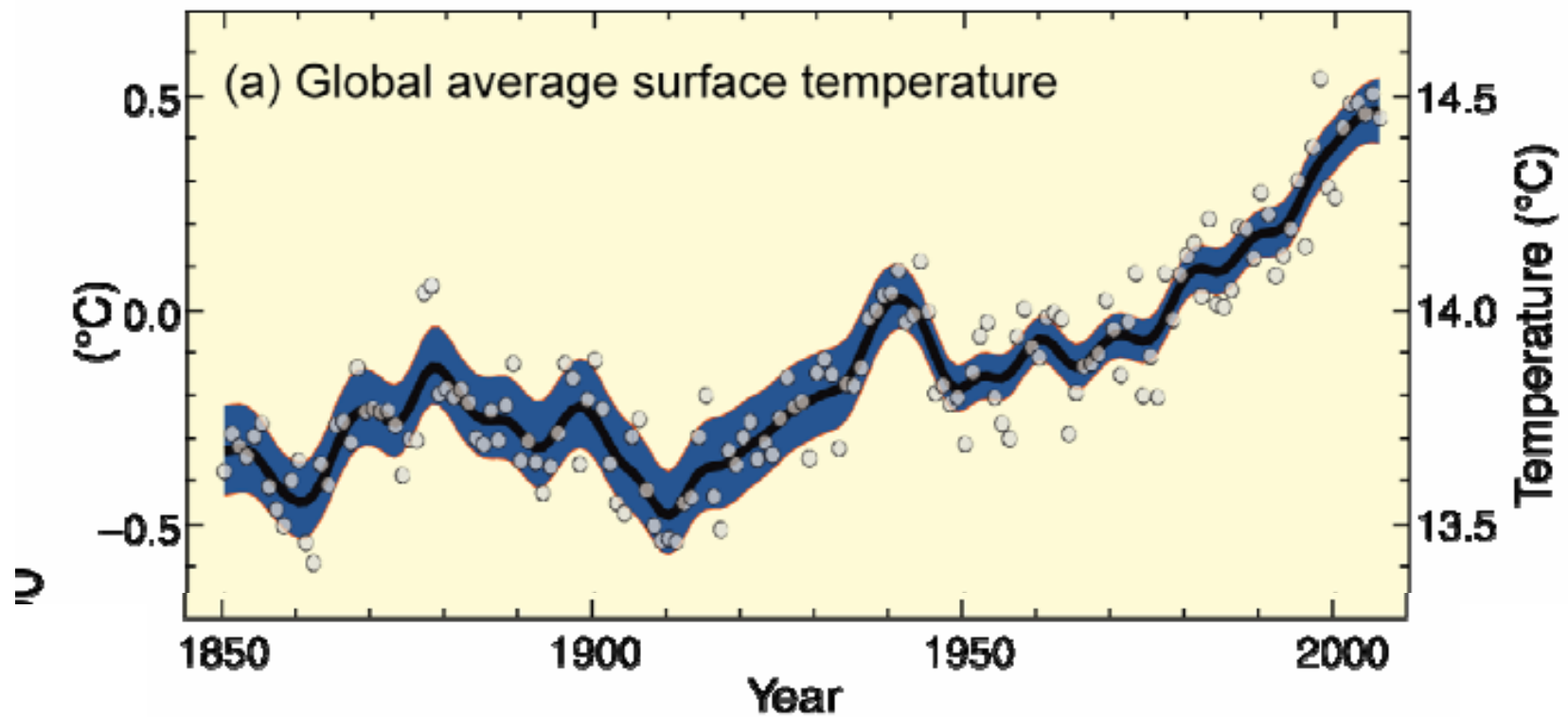
# Temperature Anomalies Jan-Dec 2007

(with respect to a 1961-1990 base period)

National Climatic Data Center/NESDIS/NOAA

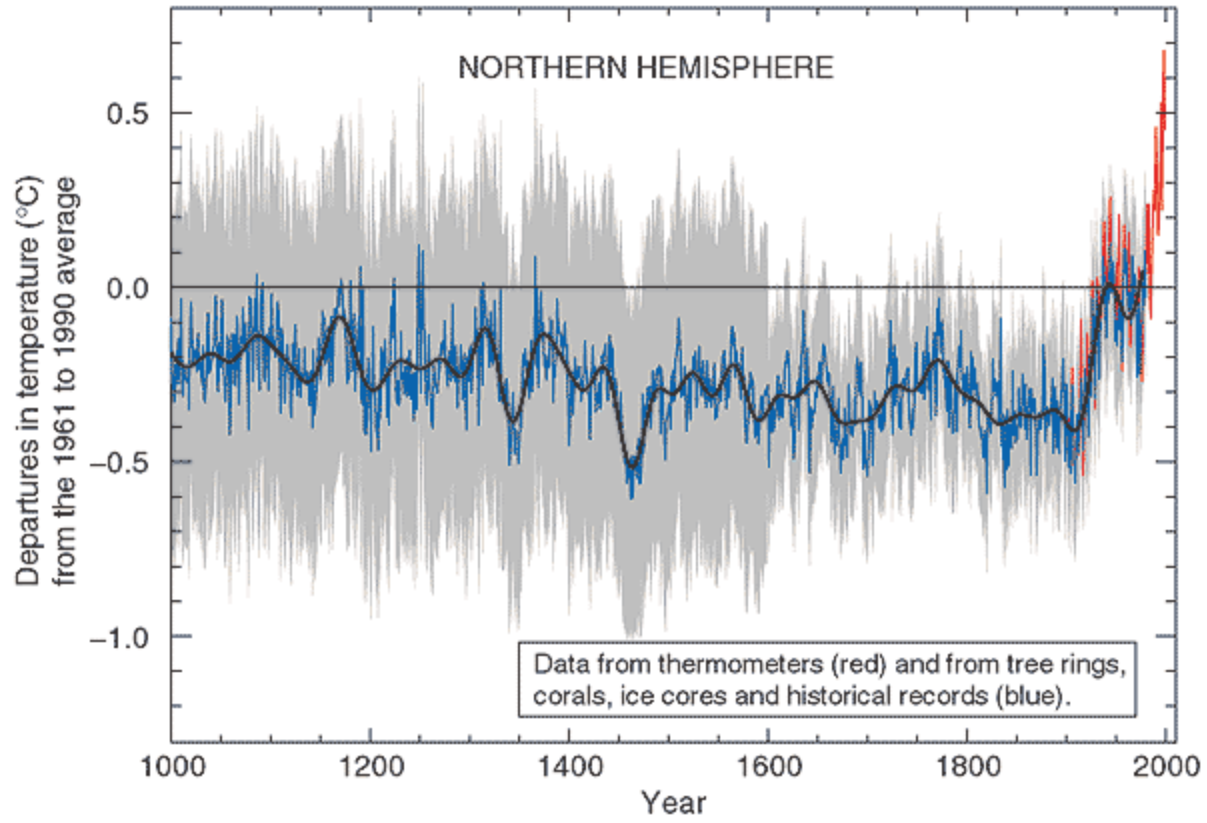


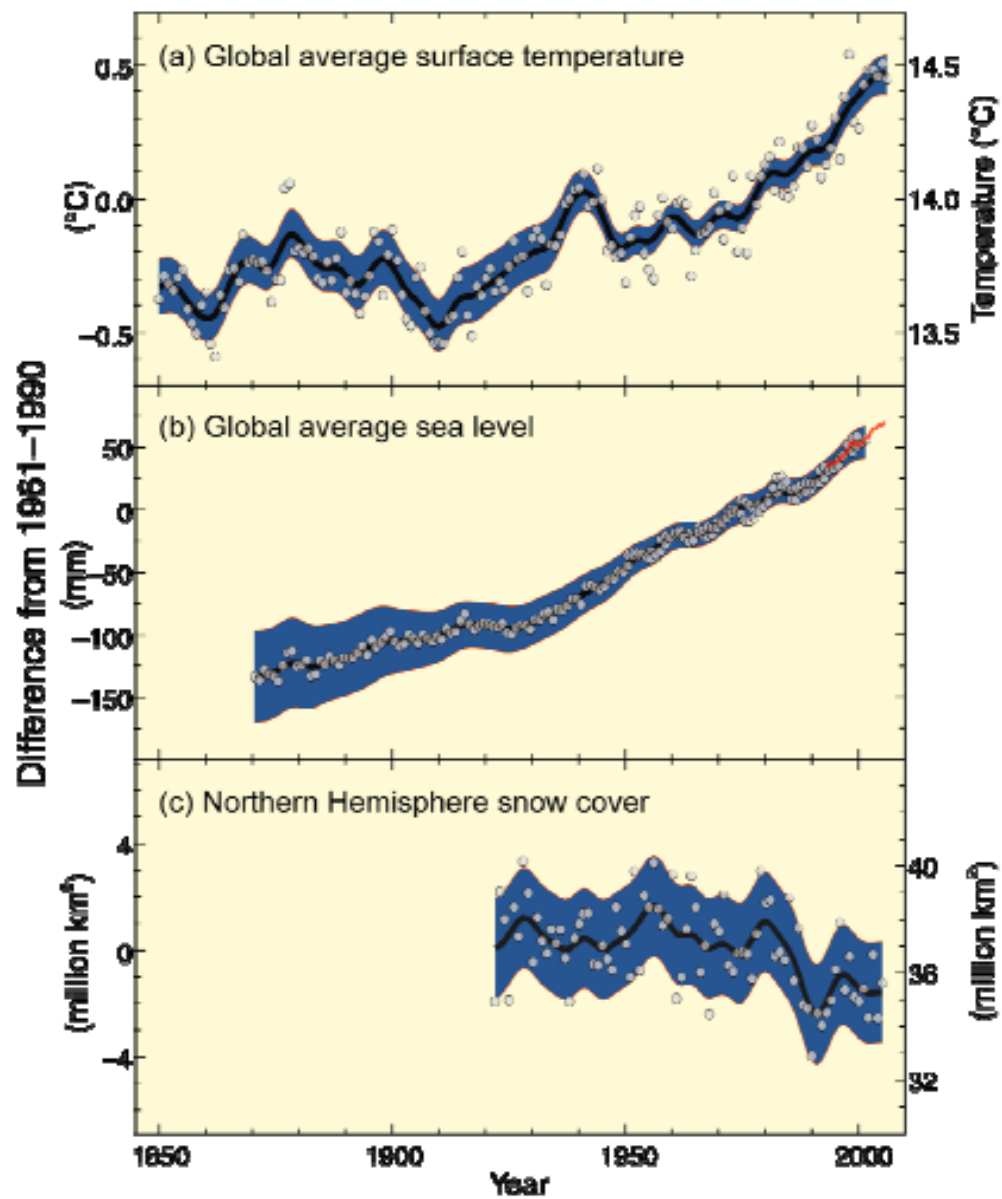
From <http://www.ncdc.noaa.gov/oa/climate/research/2007/ann/global.html>

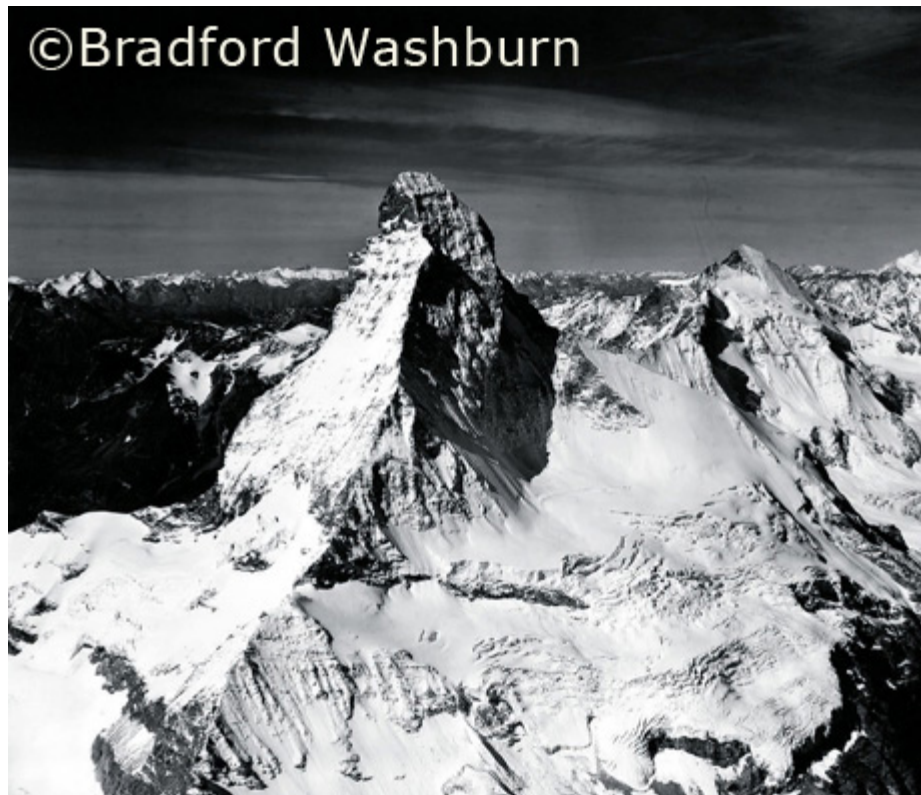


From 2007 report by the Intergovernmental Panel on Climate Change\*  
\*shared Nobel Peace Prize, 2007

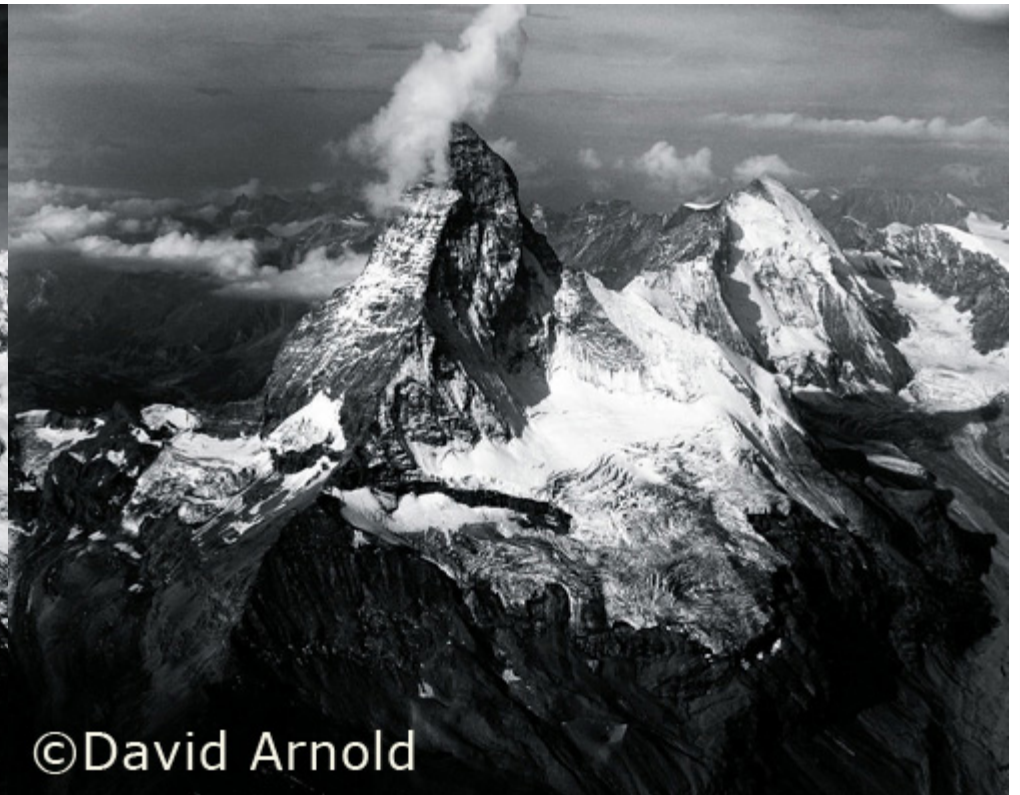
(b) the past 1,000 years







©Bradford Washburn



©David Arnold

The Matterhorn, icon of the Alps, straddles the Swiss-Italian border. Washburn's photograph, taken in August 1960, shows a thick mantle of snow and ice, largely melted by 2005 (below). In 2003, permafrost on the upper slopes melted for the first time, releasing a series of massive rock slides, says Arnold: 70 climbers had to be evacuated by helicopter, one of the biggest mass rescues in mountaineering history. (from "A Melting World," Harvard Magazine May-June 2006).

September 21, 2007

## **Scientists Report Severe Retreat of Arctic Ice**

By ANDREW C. REVKIN

The cap of floating sea ice on the Arctic Ocean, which retreats under summer's warmth, this year shrank more than one million square miles -- or six Californias -- below the average minimum area reached in recent decades, scientists reported Thursday.

The minimum ice area for this year, 1.59 million square miles, appeared to be reached Sunday. The ice is now spreading again under the influence of the deep Arctic chill that settles in as the sun drops below the horizon at the North Pole for six months, starting Friday.

The findings were reported by the National Snow and Ice Data Center in Boulder, Colo., and posted online at [www.nsidc.org](http://www.nsidc.org).

While satellite tracking of polar sea ice has been done only since 1979, several ice experts who have studied Russian and Alaskan records going back many decades said the ice retreat this year was probably unmatched in the 20th century, including during a warm period in the 1930s. "I do not think that there was anything like we observe today" in the 1930s or 1940s, said Igor Polyakov, an ice expert at the University of Alaska, Fairbanks.

The ice retreat has been particularly striking this year. The Alaskan side of the Arctic Ocean has stretches of thousands of square miles of open water; the fabled Northwest Passage through the islands of northern Canada was free of ice for weeks; and the sea route between the Atlantic and Pacific Oceans north of Russia was nearly clear a week ago, with one small clot of ice around a group of Siberian islands.



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May 1, 2007

## Arctic Sea Ice Melting Faster, a Study Finds

By [ANDREW C. REVKIN](#)

Climate scientists may have significantly underestimated the power of [global warming](#) from human-generated heat-trapping gases to shrink the cap of sea ice floating on the Arctic Ocean, according to a new study of polar trends.

The study, published online today in Geophysical Research Letters, concluded that an open-water Arctic in summers could be more likely in this century than had been estimated in the latest international review of climate research released in February by the United Nations Intergovernmental [Panel on Climate Change](#).

“There are huge changes going on,” said Julienne Stroeve, a lead author of the new study and a researcher at the [National Snow and Ice Data Center](#) in Boulder, Colo. “Just with warm waters entering the Arctic, combined with warming air temperatures, this is wreaking havoc on the sea ice, really.”

The intergovernmental panel concluded that if emissions of heat-trapping gases like carbon dioxide were not significantly reduced, the region could end up bereft of floating ice in summers sometime between 2050 and the early decades of the next century.

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September 8, 2007

## Warming Is Seen as Wiping Out Most Polar Bears

By [JOHN M. BRODER](#) and [ANDREW C. REVKIN](#)

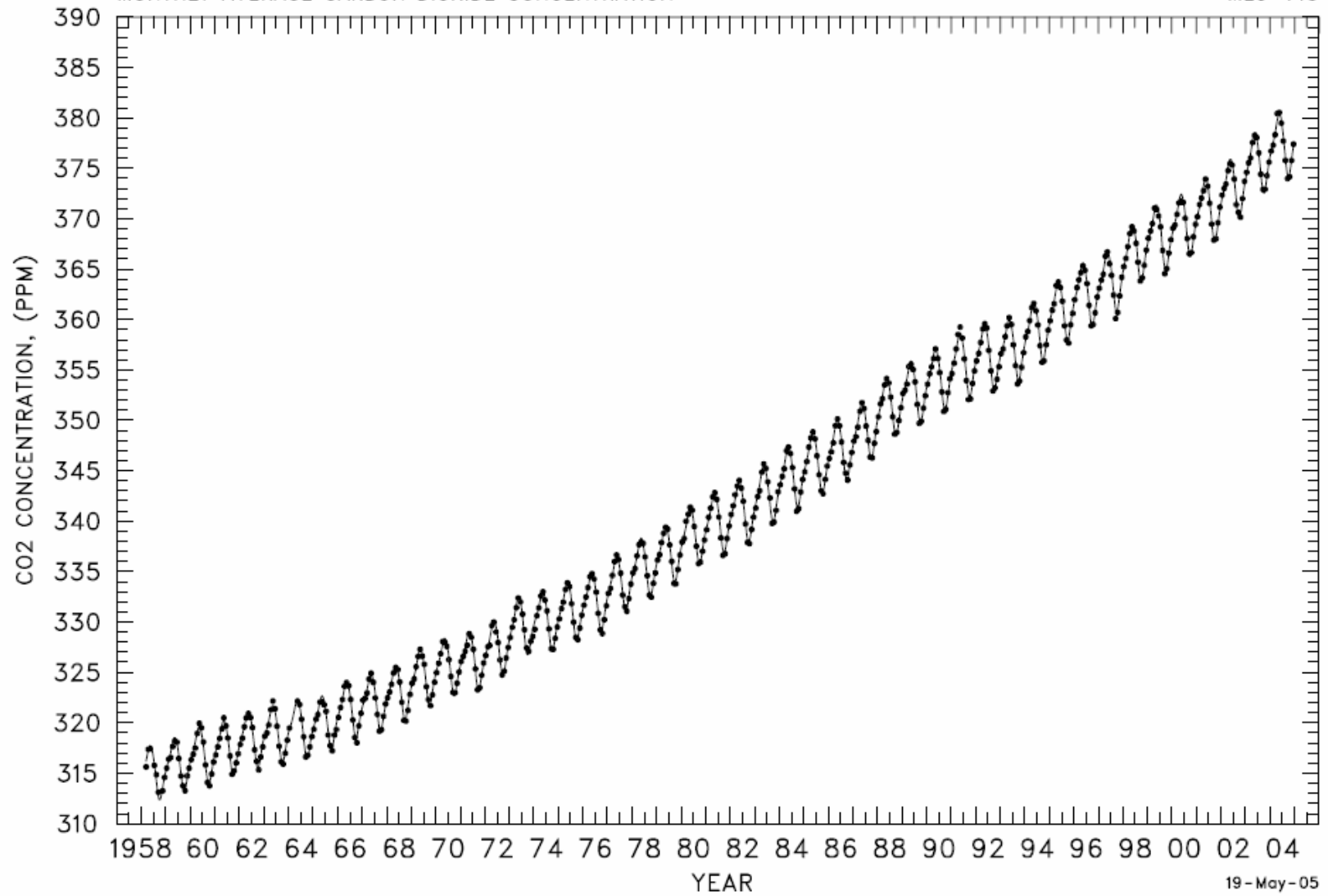
WASHINGTON, Sept. 7 — Two-thirds of the world's polar bears will disappear by 2050, even under moderate projections for shrinking summer sea ice caused by greenhouse gases in the atmosphere, government scientists reported on Friday.

The finding is part of a yearlong review of the effects of climate and ice changes on polar bears to help determine whether they should be protected under the Endangered Species Act. Scientists estimate the current polar bear population at 22,000.

The report, which the [United States Geological Survey](#) released here, offers stark prospects for polar bears as the world grows warmer.

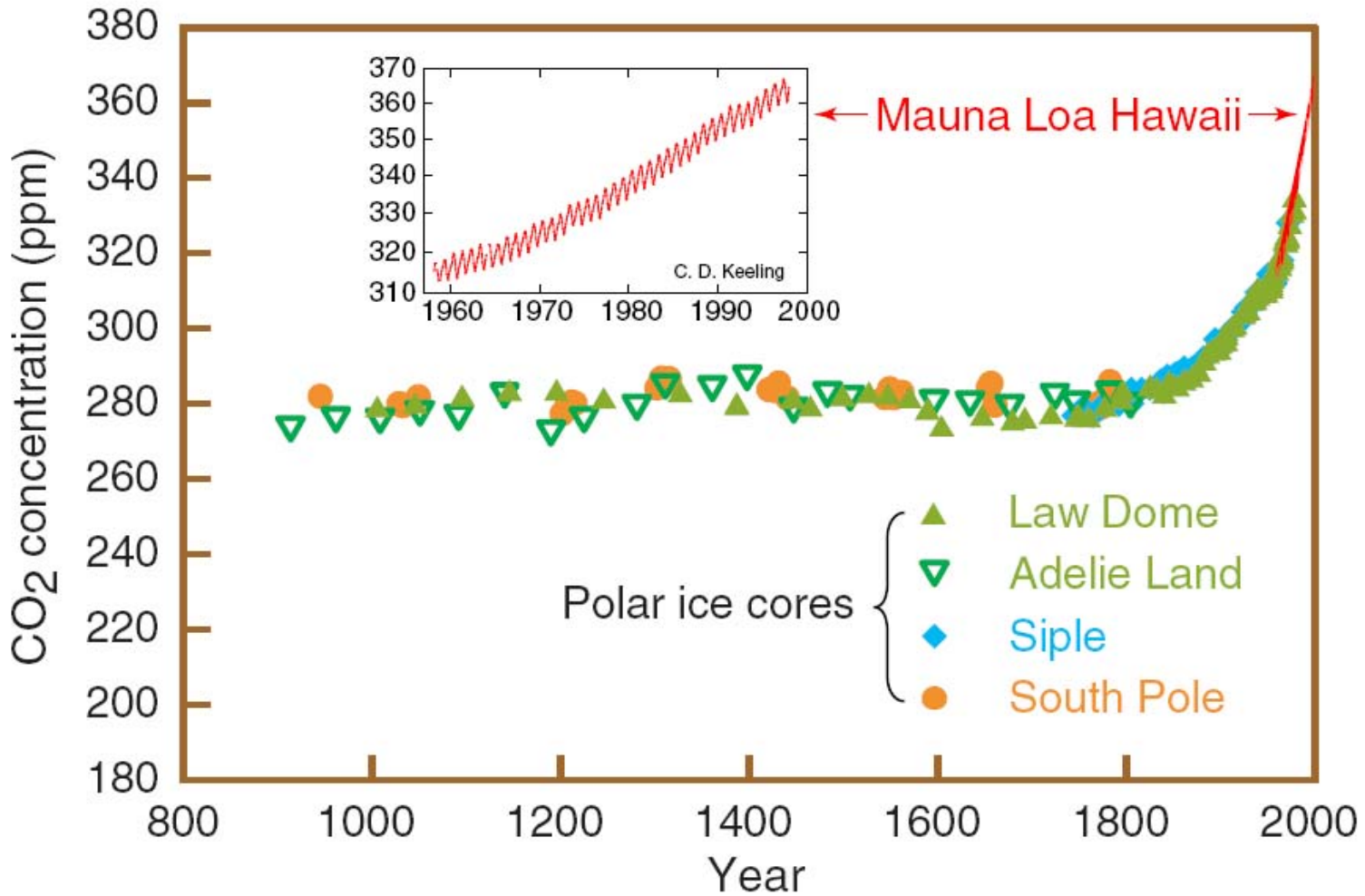
MAUNA LOA OBSERVATORY, HAWAII  
MONTHLY AVERAGE CARBON DIOXIDE CONCENTRATION

MLO-145



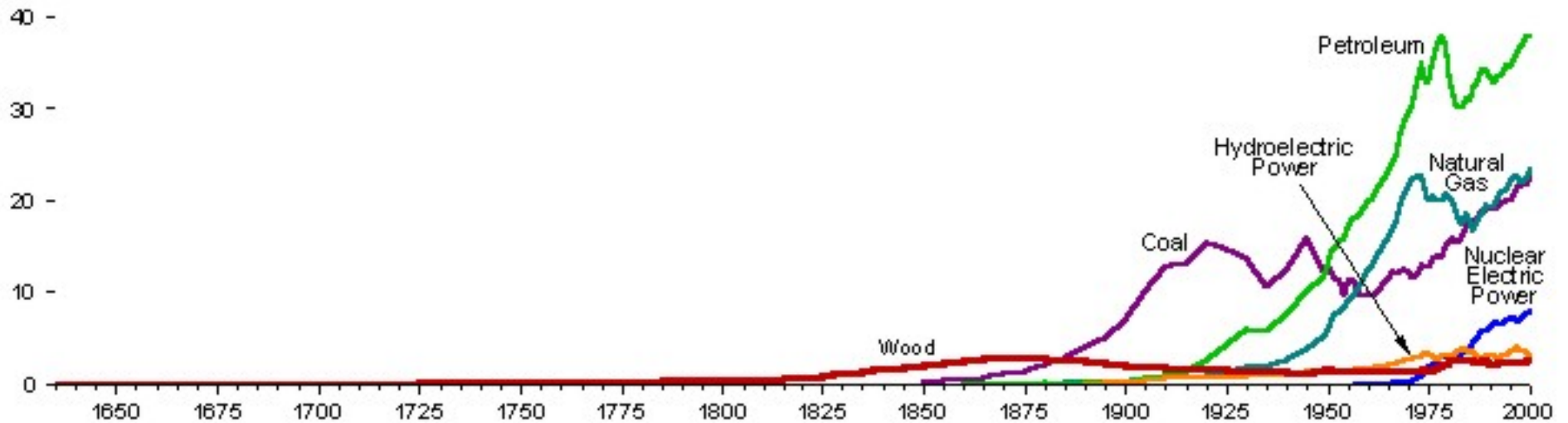
19-May-05

# ATMOSPHERIC CARBON DIOXIDE IS INCREASING

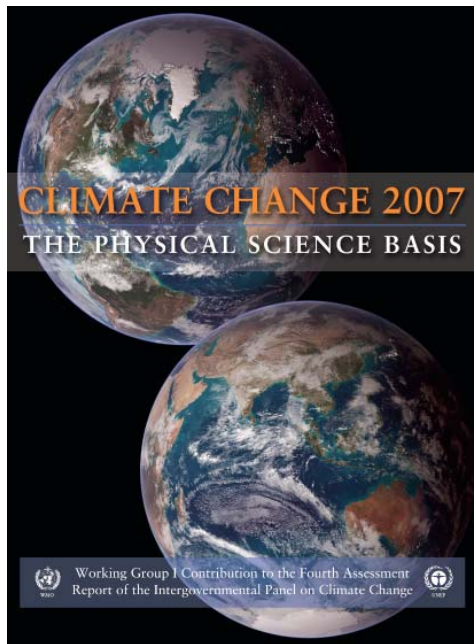


Global carbon dioxide concentration over the last thousand years

# Dependence on fossil fuels: U.S. historical data



from [www.eia.doe.gov](http://www.eia.doe.gov)



Recognizing the problem of potential global climate change, the World Meteorological Organization (WMO) and the United Nations Environment Programme (UNEP) established the Intergovernmental Panel on Climate Change (IPCC) in 1988. It is open to all members of the UN and WMO.

The role of the IPCC is to assess on a comprehensive, objective, open and transparent basis the scientific, technical and socio-economic information relevant to understanding the scientific basis of risk of human-induced climate change, its potential impacts and options for adaptation and mitigation. The IPCC does not carry out research nor does it monitor climate related data or other relevant parameters. It bases its assessment mainly on peer reviewed and published scientific/technical literature. Its role, organisation, participation and general procedures are laid down in the "[Principles Governing IPCC Work](#)"

## Kyoto Protocol Highlights

[NPR.org](http://NPR.org), February 16, 2005 · A brief overview of the provisions of the Kyoto climate treaty:

- Negotiated in 1997; entered into force on Feb. 16, 2005, 90 days after nations accounting for 55 percent of total carbon emissions ratified the agreement. Major industrialized nations that have signed but have not ratified the protocol include the United States and Australia; they are not bound by the agreement.
- Sets mandatory targets on emissions of six gases that contribute to global warming: Carbon dioxide (CO<sub>2</sub>), methane (CH<sub>4</sub>), nitrous oxide (N<sub>2</sub>O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) and sulfur hexafluoride (SF<sub>6</sub>).
- Most industrialized nations are required to cut emissions below 1990 levels, although some will be allowed to increase emissions by up to 10 percent over 1990 levels. In general, developing nations have no obligation to cut emissions now, but may be asked to make future cuts. Overall, the protocol's goal is to reduce carbon emissions by 5 percent below 1990 levels by 2008-2012, with further reductions to be negotiated in the future.
- Countries have flexibility in deciding how they will meet their targets. Many are moving toward emissions-trading systems, in which nations set caps on greenhouse gas emissions that decline over time. Companies that are over their allocation can either install new technology or buy permits to pollute from companies that have allocations to spare. The idea is create incentives for reducing emissions.
- Countries can also compensate for their emissions by helping developing nations develop less polluting energy sources. Ultimately, they may also be given credit for creating carbon "sinks" -- such as forests -- that soak up and store carbon.

December 3, 2007

## Climate Talks Take on Added Urgency After Report

By PETER GELLING and [ANDREW C. REVKIN](#)

JAKARTA, Indonesia, Dec. 2 — Thousands of government officials, industry lobbyists, environmental campaigners and observers are arriving on the Indonesian island of Bali for two weeks of talks starting Monday that are aimed at breathing new life into the troubled 15-year-old global climate treaty.



Saturday, Dec. 15, 2007

### Who Won and Lost at Bali

By Bryan Walsh/Nusa Dua

In the nearly a decade since the U.S. rejected the landmark climate change agreement known as the Kyoto Protocol, the U.S. has become accustomed to being attacked at U.N. environmental gatherings. But the pounding it took in the tortured all-night negotiations that capped the UN climate change conference in Bali was unprecedented. Not only did developing nations big and small from India to Papua New Guinea openly chastise the U.S. for its last-minute refusal to endorse the new agreement dubbed the Bali Roadmap, but — with the exception of a confused statement from Japan — not one of the allies that had generally stood with the U.S. the past two weeks — Australia, Russia, Canada — rose in its defense.

# Bush Will Continue to Oppose Kyoto Pact on Global Warming

New York Times, June 12, 2001



# Schwarzenegger Orders Cuts in Emissions

New York Times, January 10, 2007

May 30, 2006

## The Greener Guys; A Few Companies Take Special Steps to Curb Emissions

By JAD MOUAWAD

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"There is a lot that companies can do, especially in the area of energy efficiency," said Ashok Gupta, an economist at the Natural Resources Defense Council, an environmental group in New York.

Not surprisingly, the biggest strides have been achieved by corporations with operations outside the United States. I.B.M. and DuPont, for example, have long had programs to curb their energy use. In doing so, they have managed to cut manufacturing costs while decreasing their emissions.

At DuPont, the savings from energy projects has totaled \$2 billion over the last decade and a half. I.B.M. saved \$115 million since 1998 by avoiding 1.3 million tons of carbon emissions, or the equivalent of taking 51,600 cars off the road, according to the climate change program at the World Wildlife Fund.

Other companies, like 3M, Advanced Micro Devices and the Gap, have pledged voluntary reductions in their emissions. Wal-Mart, the world's biggest retailer, announced a sweeping set of environmental goals last October, including doubling its truck fleet's efficiency and improving energy efficiency at its stores.

Johnson & Johnson decided in the late 1990's to meet the Kyoto requirements globally. From 1990 to 2005, the company reduced carbon emissions by 11.5 percent. Meanwhile, sales grew by 350 percent.

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November 30, 2007

## Study Details How U.S. Could Cut 28% of Greenhouse Gases

By [MATTHEW L. WALD](#)

The United States could shave as much as 28 percent off the amount of greenhouse gases it emits at fairly modest cost and with only small technology innovations, according to a new report.

A large share of the reductions could come from steps that would more than pay for themselves in lower energy bills for industries and individual consumers, the report said, adding that people should take those steps out of good sense regardless of how worried they might be about [climate change](#). But that is unlikely to happen under present circumstances, said the authors, who are energy experts at McKinsey & Company, the consulting firm.



2003 Honda Civic Hybrid

# A lot is at stake: the emotional component of the public debate

In the course, I encourage free and open dialogue.

Please email me with links, cartoons, advertising supporting a variety of viewpoints!

Two attention-getting TV advertisements:

Carbon Dioxide: We Call It Life (Competitive Enterprise Institute, a non-profit public policy organization dedicated to advancing the principles of free enterprise and limited government, receives funding from Exxon Mobil)

Train (Environmental Defense, a national nonprofit organization dedicated to protecting the environmental rights of all people, including future generations)

Movie trailer (Al Gore, co-winner of Nobel Peace Prize 2007\*)  
An Inconvenient Truth

Links to videos are on the reading page