Global Warming: Man or Myth?

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How can the climate record be determined before humans were able to make direct measurements?

- Sediments (pollen, shells, etc.)
- Ice (Sintering: trapped gases)
- Corals
- Trees
Oxygen Isotope Data ($^{16}$O vs. $^{18}$O)

- $^{18}$O is heavier – it has two more neutrons
- Evaporation leaves behind $^{18}$O in ocean
- More $^{16}$O falls onto ice and freezes
- $\delta^{18}$O - change in normal concentration ratio
- $+\delta^{18}$O means more $^{18}$O than normal
- $-\delta^{18}$O means less $^{18}$O than normal
Oxygen Isotope Data ($^{16}$O vs. $^{18}$O)

Later phase:
- Ice sheet growth
- > 7°C additional cooling of deep water

Early phase:
- > 6°C cooling of deep water

Some Antarctic ice present

No known ice

Deep-water $\delta^{18}$O value (‰)

Myr ago
Shells in the ocean and corals “capture” oxygen and provide a fossil record.

Warmer ocean waters are $O_{18}$ enriched ($+\delta^{18}O$).

Warming trend seen in Pacific and Indian Ocean coral data.
Dendroclimatology (Tree-Rings)

Unusually narrow rings means low temperature and/or precipitation
Global Land-Ocean Temperature Index

Temperature Anomaly (°C)

-0.4
-0.2
0
0.2
0.4
0.6

1880 1900 1920 1940 1960 1980 2000

Anomalies based on 1951 – 1980 values.
Graph includes satellite and ground observations
Modern Climate T Trend

Global Temperature
(meteorological stations)

Anomalies based on 1951 – 1980 values.
Graph includes just surface stations
In order, Earth's most abundant greenhouse gases are:

1. water vapor
2. carbon dioxide
3. methane
4. nitrous oxide
5. ozone
6. CFCs

Ranked by their contribution to the greenhouse effect:

1. water vapor: 36–70%
2. carbon dioxide: 9–26%
3. methane: 4–9%
4. ozone: 3–7%
Are Greenhouse Gases Increasing?

A) CO₂
- Ice core measurements
- Instrumental measurements

B) CH₄
- Ice core measurements
- Instrumental measurements
Is This Increase Natural or Human?

- **$\text{CO}_2$ (ppm)**
  - Year range: 1600 to 2000
  - Natural glacial-interglacial range: 180 to 380 ppm

- **$\text{CH}_4$ (ppb)**
  - Year range: 1600 to 2000
  - Natural glacial-interglacial range: 250 to 1750 ppb
Carbon in the air is made up of $^{12}\text{C}$ (99%), $^{13}\text{C}$ (1%), and $^{14}\text{C}$ (1 per trillion).

Plants prefer $^{12}\text{C}$ over $^{13}\text{C}$. The $^{13}\text{C} /^{12}\text{C}$ ratio is 2% lower than atmospheric $^{13}\text{C} /^{12}\text{C}$ ratio.

Fossil fuels are derived from ancient plants so they have the same low $^{13}\text{C} /^{12}\text{C}$ ratio.

Fossil fuel emissions DECREASE the $^{13}\text{C} /^{12}\text{C}$ ratio.

Volcano and ocean carbon emissions INCREASE $^{13}\text{C} /^{12}\text{C}$ ratios.

Since the Industrial Revolution, $^{13}\text{C} /^{12}\text{C}$ has been decreasing.

$^{14}\text{C}$ is radioactive and is measured in tree ring data. Measured decreases of $^{14}\text{C} /^{12}\text{C}$ since the Industrial Revolution show that $^{12}\text{C}$ is increasing and not from volcanoes or deep oceans – only from fossil fuels.
The Smoking Gun for Humans?

Atmospheric radioactivity (c)

RADIOACTIVITY
HIGH
LOW

YEAR
1800 1850 1900 1950 2000

Radiocarbon-dead source

Atmospheric carbon isotope ratio (d)

CARBON-13 TO CARBON-12 RATIO
HIGH
LOW

YEAR
1800 1850 1900 1950 2000

Organic matter-derived source
The Smoking Gun for Humans?

![Graph showing CO₂ carbon emissions](image)

- **Fossil Fuel Burning & Cement Production**: Positive emission indicating a significant increase.
- **Land-use Change (Deforestation)**: Small positive emission, showing some increase.
- **Land-Based Sink**: Negative emission indicating removal from the atmosphere.
- **Net Oceanic Sink**: Negative emission indicating removal from the atmosphere.

The graph illustrates the net effect of various sources and sinks on CO₂ carbon emissions, highlighting the significant contribution from fossil fuel burning and the role of land-based and oceanic sinks in mitigating these emissions.
Where Does This Carbon Go?

- Atmosphere: 55%
- Biosphere: 15–20%
- Shallow ocean: 25–30%
Tectonic Time-Scale: MILLIONS of Years

Last 57 million years of global cooling due to India-Asia collision
Orbital Time-Scale: 40,000 – 100,000 Years

- Tilt of the Earth varies $22.2^\circ – 24.5^\circ$ every 41,000 years (Currently $23.5^\circ$)
- Shape of Earth’s orbit varies every 100,000 years (Currently low eccentricity)
Current estimates suggest that only 0.1° C of the 0.7° C of warming since the late 1800s is due to solar irradiance.

Since direct satellite measurements (1980 – present) solar contribution to the observed rapid warming is negligible.
Volcanoes and El Niño events influence climate on a 1 – 2 year scale.
- Air pollution blocked sunlight
- Clean air legislation reduces pollution worldwide
- Masked the true global warming at the time. (And still doing so today!)
When one considers monthly mean temperature anomalies from 1998 to 2008 it might “appear” that there is a flat line or global cooling. Keep in mind two important points: 1) 1998 was a strong El Niño year which caused a very warm signal and 2008 had a strong La Nina which caused a very cool signal. 2) These are ANOMOLIES not actual temperatures. These are values compared to 1979 to 1998 means. One will notice that MOST of the time between 1998 and 2008 the anomalies are POSITIVE which means most of the time the planet was warmer than 1979-1998 means. GISS and HadCRU both show a warming trend of 0.16 degrees C per decade from 1979 to February 2008. RSS shows a warming trend of 0.18 per decade over the same period, while UAH shows a warming trend of 0.14. One cannot cherry pick the endpoints to make the graph that they “want to see.” The global warming critics choose 1998-2008 because they know that using these endpoints makes the trend look flat or negative! If one were to choose 1985 and 1998 as endpoints the global warming would look like it was “going through the roof!” Recall the slide shown previously and repeated next.
Anomalies based on 1951 – 1980 values.
Graph includes satellite and ground observations
FAQ 2.1, Figure 2. Summary of the principal components of the radiative forcing of climate change. All these radiative forcings result from one or more factors that affect climate and are associated with human activities or natural processes as discussed in the text. The values represent the forcings in 2005 relative to the start of the industrial era (about 1750). Human activities cause significant changes in long-lived gases, ozone, water vapour, surface albedo, aerosols and contrails. The only increase in natural forcing of any significance between 1750 and 2005 occurred in solar irradiance. Positive forcings lead to warming of climate and negative forcings lead to a cooling. The thin black line attached to each coloured bar represents the range of uncertainty for the respective value. (Figure adapted from Figure 2.20 of this report.)
How is Temperature Changing?

It is the RATE OF WARMING that is important!

Global Mean Temperature

<table>
<thead>
<tr>
<th>Period</th>
<th>Rate (°C per decade)</th>
</tr>
</thead>
<tbody>
<tr>
<td>25</td>
<td>0.177±0.052</td>
</tr>
<tr>
<td>50</td>
<td>0.128±0.026</td>
</tr>
<tr>
<td>100</td>
<td>0.074±0.018</td>
</tr>
<tr>
<td>150</td>
<td>0.045±0.012</td>
</tr>
</tbody>
</table>
More Widespread Droughts with Isolated Floods

FAQ 3.2, Figure 1. The most important spatial pattern (top) of the monthly Palmer Drought Severity Index (PDSI) for 1900 to 2002. The PDSI is a prominent index of drought and measures the cumulative deficit (relative to local mean conditions) in surface land moisture by incorporating previous precipitation and estimates of moisture drawn into the atmosphere (based on atmospheric temperature) into a hydrological accounting system. The lower panel shows how the sign and strength of this pattern has changed since 1900. Red and orange areas are drier (wetter) than average and blue and green areas are wetter (drier) than average when the values shown in the lower plot are positive (negative). The smooth black curve shows decadal variations. The time series approximately corresponds to a trend, and this pattern and its variations account for 67% of the linear trend of PDSI from 1900 to 2002 over the global land area. It therefore features widespread increasing African drought especially in the Sahel, for instance. Note also the wetter areas, especially in eastern North and South America and northern Eurasia. Adapted from Dai et al. (2004a).
YES!

- Concentration of CO₂ has reached a record high relative to more than the past 500,000 years and has done so at an exceptionally fast rate.

- Most of the warming in the past 50 years is attributable to human activities.

- CO₂ concentrations are known accurately for the past 650,000 years. During that time, they varied between 180 ppm and 300 ppm. Now CO₂ is 379 ppm which took about 100 years to increase. For comparison, it took over 5,000 years for an 80 ppm rise after the last ice age.

- Higher values than today have only occurred over many millions of years.

- Although large climate changes have occurred in the past, there is no evidence that they took place at a faster rate than the present warming.

- If projections of a 5°C warming in this century are realized, Earth will have experienced the same amount of global warming as it did at the end of the last ice age.

- There is no evidence that this rate is matched to a comparable global temperature increase over the last 50 million years!
Sea level gradually rose in the 20th century and is currently rising at an increased rate, after a period of little change between AD 0 and AD 1900.

Sea level is predicted to rise at an even greater rate in this century, 20th century estimates of 1.7 mm per year.
Will There Be More Hurricanes?

- Natural 20 to 30 year cycle of Atlantic Ocean hurricanes (current “active” cycle began in 1995)

- Warmer SSTs have likely contributed to more INTENSE hurricanes and will continue to do so

- Jury is still out on hurricane frequency but latest research hints at increased frequency
What if Humans Decrease Emissions?

- Some concentrations decline almost immediately while others still increase for centuries.

- About 45% of CO$_2$ is removed by oceans and the biosphere but 20% remains for thousands of years.

- Therefore, CO$_2$ concentrations will continue to increase in the long term even if they are reduced today.

- Only a complete shut-off of CO$_2$ emissions would result in a long-term stabilization at a constant level.

- Cutting CO$_2$ emissions by 50% today will only stabilize the levels for the next 10 years.
There are VERY FEW scientists who debate that humans are causing the current climate change.

**Intergovernmental Panel on Climate Change (IPCC)**

The IPCC is a scientific intergovernmental body set up by the World Meteorological Organization (WMO) and by the United Nations Environment Programme (UNEP). Its constituency is made of:

**The governments:** the IPCC is open to all member countries of WMO and UNEP. Governments participate in plenary Sessions of the IPCC where main decisions about the IPCC work programme are taken and reports are accepted, adopted and approved. They also participate the review of IPCC Reports.

**The scientists:** hundreds of scientists all over the world contribute to the work of the IPCC as authors, contributors and reviewers.

Its **role** is to assess on a comprehensive, objective, open and transparent basis the latest scientific, technical and socio-economic literature produced worldwide relevant to the understanding of the risk of human-induced climate change, its observed and projected impacts and options for adaptation and mitigation.
The IPCC 4th Assessment Report is coming out
A picture of climate change
the current state of understanding
What About All of Those Scientists Who Say Global Warming is Hype?

Home

Global Warming Petition

We urge the United States government to reject the global warming agreement that was written in Kyoto, Japan in December, 1997, and any other similar proposals. The proposed limits on greenhouse gases would harm the environment, hinder the advance of science and technology, and damage the health and welfare of mankind.

There is no convincing scientific evidence that human release of carbon dioxide, methane, or other greenhouse gases is causing or will, in the foreseeable future, cause catastrophic heating of the Earth’s atmosphere and disruption of the Earth’s climate. Moreover, there is substantial scientific evidence that increases in atmospheric carbon dioxide produce many beneficial effects upon the natural plant and animal environments of the Earth.

This petition has been signed by over 31,000 American scientists.

Click here to sign a mail-in copy of this petition. It cannot be signed by Internet.

Letter from Frederick Seitz

President of Global Warming Petition
The National Academy of Sciences press release:

*The petition project was a deliberate attempt to mislead scientists and to rally them in an attempt to undermine support for the Kyoto Protocol. The petition was not based on a review of the science of global climate change, nor were its signers experts in the field of climate science.*

When questioned in 1998, OISM's Arthur Robinson admitted that only 2,100 signers of the Oregon Petition had identified themselves as physicists, geophysicists, climatologists, or meteorologists, "and of those the greatest number are physicists." This grouping of fields concealed the fact that only a few dozen, at most, of the signatories were drawn from the core disciplines of climate science - such as meteorology, oceanography, and glaciology - and almost none were climate specialists. The names of the signers are available on the OISM's website, but without listing any institutional affiliations or even city of residence, making it very difficult to determine their credentials or even whether they exist at all.

OISM has refused to release info on the number of mailings it made.


