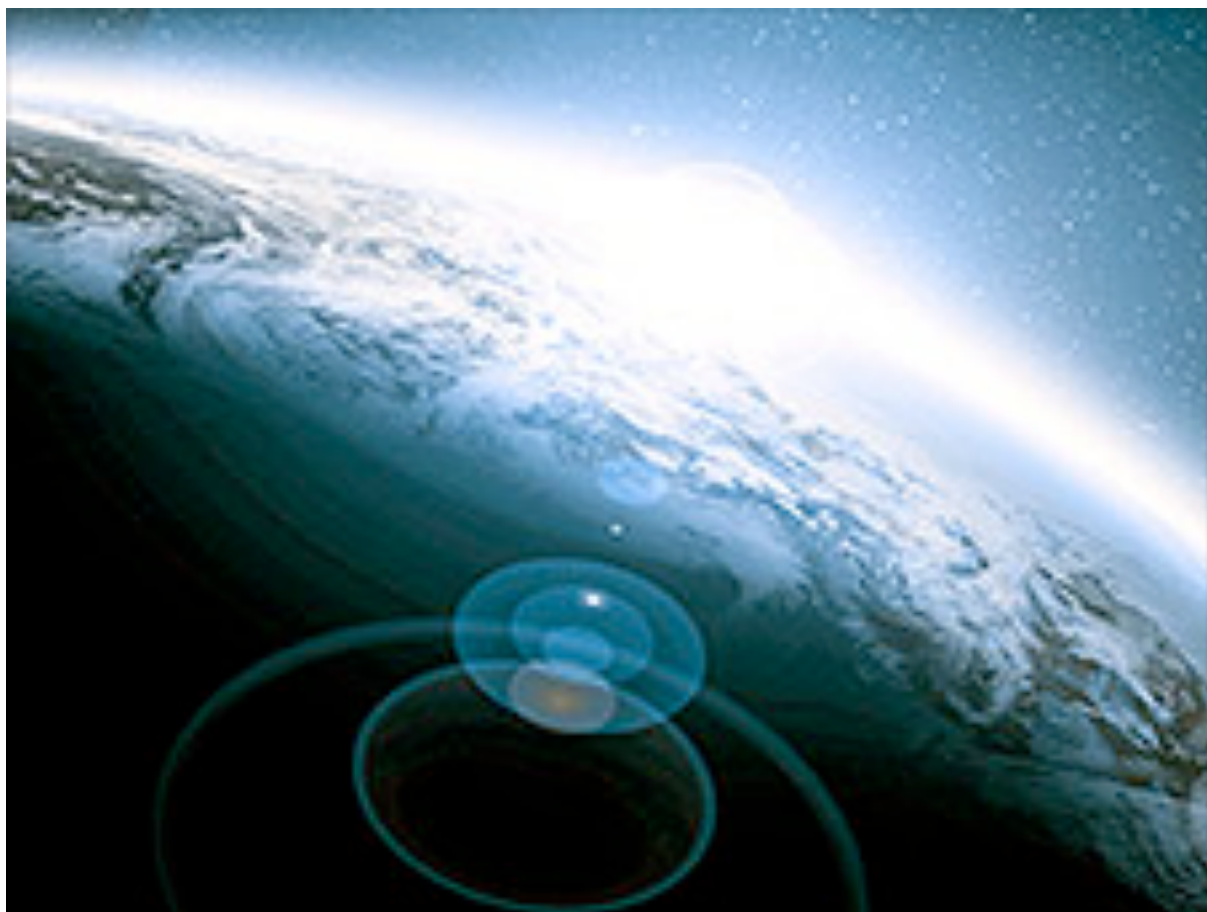




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## A journey through the Earth's climate history

**As world leaders prepare to meet in Copenhagen to discuss climate change - how did the Earth's climate arrive at its current state and how do scientists delve into the secrets of our planet's past?**



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[Take an animated journey through the Earth's climate history](#)

The layers of ice laid down each year in Antarctica and Greenland store a record of the Earth's climate. Bubbles of air trapped in the ice as it froze can be analysed to give details on temperature at the time it froze, and on atmospheric concentrations of gases.

The oldest ice core so far extracted belongs to the European Project for Ice Coring in Antarctica (Epica). It allows scientists to look back 800,000 years.

Over time, the Earth's orbit around the Sun varies slightly. This changes the amount of solar energy reaching the Earth's surface, alternately warming and cooling the planet's surface.

In a warming phase, greenhouse gases such as carbon dioxide are released from the ice and amplify the warming - increasing the natural greenhouse effect. They are stored again when an ice age starts.



Ancient ice reveals clues on the climate's past

## CLIMATE CHANGE GLOSSARY

Select a term from the dropdown:

**Climate change** - A pattern of change affecting global or regional climate as measured by yardsticks such as average temperature and rainfall, or an alteration in frequency of extreme weather conditions. This variation may be caused by both natural processes and human activity.

Global warming is one aspect of climate change.

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So over this period, we see temperature and carbon dioxide concentrations changing in step, in cycles lasting about 100,000 years.

About 10,000 years ago, the Earth emerged from its most recent ice age. Agriculture developed, and the extra food supported a growing global population.

The last 1,000 years saw development of international trade - and eventually, in the 1700s, the birth of the Industrial Revolution. This ran largely on coal and later, oil.

The human population was also growing, reaching one billion around the start of the 19th Century.

By this time, a growing network of weather stations was taking daily measurements of temperature, a record that increases in precision as time goes on.

In the 20th Century, fuel use, industry, land clearance and agriculture all increased atmospheric concentrations of CO<sub>2</sub> and other greenhouse gases.

The temperature curve for the last 100 years shows two distinct periods of warming with an intervening period of cooling around 1940, probably caused by increased industrial emissions of aerosols, tiny particles that reflect sunlight.

In the second half of the century, highly accurate measurements, taken initially in Hawaii and Antarctica, proved that carbon dioxide concentrations were steadily rising in a regular manner. Other greenhouse gases such as methane showed similar trends.

The Intergovernmental Panel on Climate Change (IPCC) concludes it is more than 90% probable that the warming seen in the second half of the 20th Century is mainly driven by human emissions of greenhouse gases.

### Sources and resources

The data, [for the animation](#) , on temperature and carbon dioxide for the 800,000 year time period is taken from the European Project for Ice Coring in Antarctica, [Epica](#). The data can be downloaded using the link on the right and was compiled by Dr Robert Mulvaney of the [British Antarctic Survey](#).

For the time period covering the last 1,500 years the CO2 record is from the Law Dome ice core, again in Antarctica. McFarling Meure et al, 2006 is the source. For the past 60 or so years the CO2 source is the readings taken at [Mauna Loa by the NOAA](#).

Temperature for the last 1,500 years is taken from [Mann, M.E., Zhang, Z., Hughes, M.K., Bradley, R.S., Miller, S.K., Rutherford, S., Proxy-Based Reconstructions of Hemispheric and Global Surface Temperature Variations over the Past Two Millennia, Proc. Natl. Acad. Sci., 105, 13252-13257, 2008.](#)

For the final time period covered, the temperature data is sourced to the [Met Office Hadley Centre and Climatic Research Unit](#) at the University of East Anglia.

The illustration showing the extent of ice cover over North America 20,000 years ago is credited to [Ehlers and Gibbard](#).

Population figures are sourced to the [US Census Bureau](#) and the [UN](#). Figures on per capita GDP are from [Angus Maddison](#).

More information on the Earth's past climate can be found at the [NOAA's palaeoclimatology page](#) and from the [IPCC's 2007 report](#).

#### DATA DOWNLOAD

Download the climate data below

[CO2 and temperature data for the last 800,000 years \[Excel, 84.5kb\]](#)

[CO2 and temperature data from 1850 \[Excel, 53.5kb\]](#)