

### What do we mean by climate change?

Climate change means any significant change in climate, like temperature or rainfall, over a 30 year period or more. If the climate is changing, then the 30 year average temperature, or rainfall, or number of sunny days, is changing.

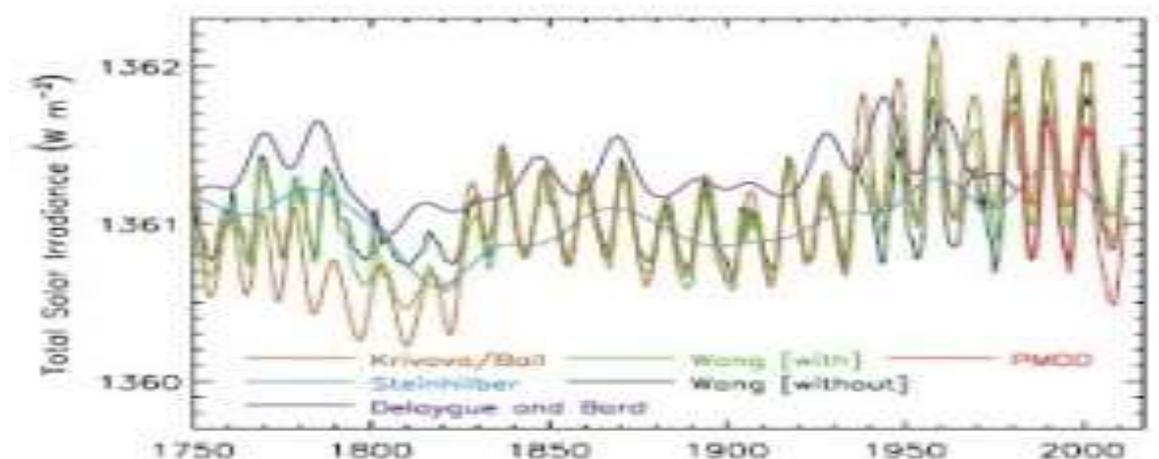
It's easy to mix up climate and weather.

Here's a simple way to think about it: climate is what we expect (e.g. cold winters) and weather is what we get (e.g. rain).

Weather is what is happening in the atmosphere at any one time: how warm, windy, sunny or humid it is. Climate is the description of the average weather we might expect at a given time, usually taken for several decades or longer to average out year to year variability. Variability might be due to a particularly hot summer or very cold winter.

The world's climate has been getting warmer since 1900. However, this overall warming has not occurred evenly across the world's surface and different places, because of their location and geography, are affected in different ways.

### Does the sun cause climate change?



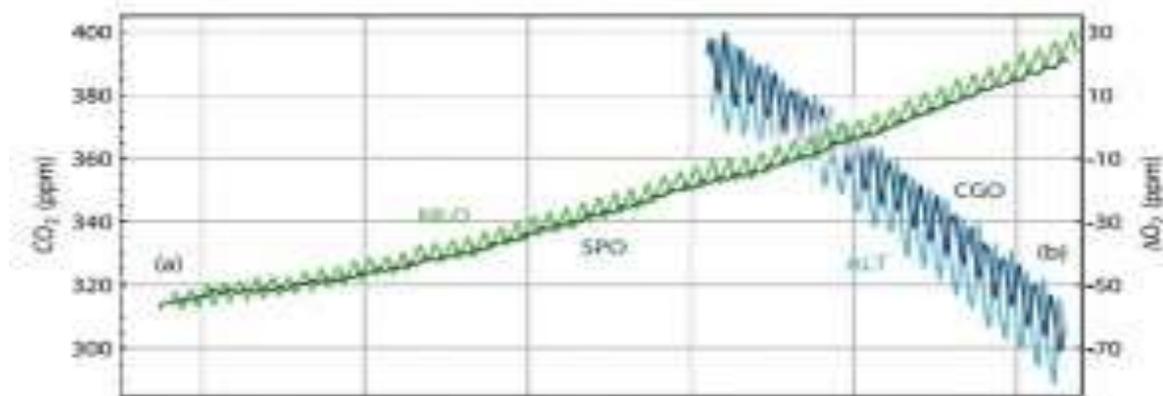
*Changes in the amount of energy the Earth has received from the Sun over the last 150 years.*

It's true that changes in solar activity does affect global temperatures. Changes in the energy output of the Sun, and the Earth's orbit around the Sun, do have an effect on the Earth's climate.

Ice ages have come and gone in regular cycles for nearly three million years. There is strong evidence that these are linked to regular variations in the Earth's orbit around the Sun, the so-called Milankovitch cycles. These cycles change the amount of the Sun's energy received by different places on the Earth's surface.

However, over the last 50 years, increased greenhouse gas concentrations have had a much greater effect than changes in the Sun's energy.

## How has the greenhouse effect changed?



The figure shows the amount of Carbon Dioxide in the atmosphere at Hawaii (light green line) and at the South Pole (dark green line). There is an annual cycle in carbon dioxide as vegetation takes up carbon in the spring and releases it in the Autumn. As more fossil fuels have been burnt in the Northern Hemisphere, the increase in atmospheric CO<sub>2</sub> has been greater in Hawaii than at the South Pole.

Naturally occurring gases in our atmosphere, such as carbon dioxide and methane, provide an insulating effect without which the earth would be a frozen planet. However, levels of greenhouse gases in the atmosphere have increased, preventing more heat escaping to Space and leading to 'global warming'.

Any increases in the levels of greenhouse gases in the atmosphere mean that less heat escapes to Space and global temperatures increase – an effect known as 'global warming'. Over the past 150 years in the industrial era, human activities have increased the emissions of three principal greenhouse gases: carbon dioxide, methane and nitrous oxide. These gases accumulate in the atmosphere, causing concentrations to increase with time.

Carbon dioxide (CO<sub>2</sub>) has increased from our use of fossil fuels which we burn for use in transportation, energy generation, building heating and cooling. Deforestation also releases CO<sub>2</sub> and reduces its uptake by plants. Methane (CH<sub>4</sub>) has more than doubled as a result of human activities related to agriculture, natural gas distribution and landfills. However, increases in methane concentrations are slowing down because the growth of emissions has decreased over the last two decades.

Nitrous oxide (N<sub>2</sub>O) is also emitted by human activities such as fertilizer use and fossil fuel burning.