

Ten Common Misconceptions about Climate and Climate Change

Misconception	Target Conception	Relevant Science Concepts
Global warming is caused by the ozone hole because the hole lets in more radiation. (Ozone hole created by chemicals like hair spray.)	Global warming is caused by increased greenhouse gases in the atmosphere. These gases include carbon dioxide and water vapor, which trap infrared radiation from the warmed surface of the Earth.	The ozone layer protects the planet from the sun's harmful radiation. A depletion of ozone allows more UV light to reach the surface, but is not an important factor leading to increased temperature on Earth. Banning CFCs from spray cans has caused the ozone hole to stop growing.
Climate is simply long-term weather and therefore can't be predicted.	Climate is the statistical analysis of weather.	There are significant differences between weather and climate processes and how they are studied and forecast. Weather is the atmospheric conditions at any given time or place. Climate is understood as the atmospheric conditions averaged over a long period of time and over a large area.
The atmosphere is large and small amounts of carbon dioxide or a few degrees of temperature change can't make much difference.	Small changes in the atmosphere's composition or temperature can have a large effect.	Relatively small increases in amounts of greenhouse gases can magnify the greenhouse effect. Greenhouse gases trap heat. Several types of human activities lead to significant emissions of greenhouse gases, such as burning fossil fuels.
Weather anomalies can be used as evidence for or against climate change.	Weather involves phenomena that last a short period of time. Climate can be thought of as the average weather for a region. There is a link between climate change and weather, but any particular weather "event" cannot "prove" that climate change is happening.	An important source of evidence for climate change comes from observations that <i>average</i> weather has changed for a region.
Carbon is destroyed when fossil fuels are burned and CO ₂ is released in to the atmosphere. Carbon released from combustion doesn't have an impact on the climate system.	Carbon stored by plants and fossilized into oil or coal does not disappear when it burns.	Burning is a chemical process that follows the law of conservation of matter. The process of combustion combines oxygen with carbon, releasing the greenhouse gas, CO ₂ . The observed increase in global average temperatures since the latter part of the 20 th century is very likely due to documented increases in human-induced greenhouse gas concentrations, primarily from the burning of fossil fuels.

<p>The only greenhouse gas emitted by human activities is carbon dioxide from burning fossil fuels.</p>	<p>The principal greenhouse gases that enter the atmosphere because of human activities are carbon dioxide (CO₂), methane (CH₄), nitrous oxide (N₂O), and fluorinated gases.</p>	<p>The atmosphere is mixture of gases with small but important quantities of liquid and solid particles. Gases in the atmosphere temporarily trap infrared radiation from the warmed surface of the Earth. This “greenhouse effect” allows liquid water to exist on Earth but human activities are enhancing the effect. Some greenhouse gases such as carbon dioxide occur naturally and are emitted to the atmosphere through natural processes and human activities. Other greenhouse gases (e.g., fluorinated gases) are created and emitted solely through human activities.</p>
<p>The Earth gets closer to the sun in summer and is farther away in winter.</p>	<p>The tilt of Earth’s axis is the “reason for the seasons”.</p>	<p>The Earth receives energy in the form of short wavelength electromagnetic radiation from the sun. The tilt of the Earth on its axis causes solar energy to fall more directly on different parts of the Earth during different times of the year, resulting in seasonal changes.</p>
<p>Plants gain their mass from water and nutrients through roots.</p>	<p>Plants acquire mass from carbon dioxide through the process of photosynthesis.</p>	<p>Gas has mass, takes up space, and is affected by energy. The atmosphere is a mixture of gases with small, but important quantities of liquid and solid particles. Plants are part of the carbon cycle which influences climate in a variety of ways.</p>
<p>Fossil fuels have been around since the origins of the Earth.</p>	<p>Fossil fuels are “buried solar energy” originally captured by living organisms.</p>	<p>Oil, natural gas and coal come from energy captured long ago from the sun by organisms, but more recently in earth’s history than the origin of the Earth.</p>
<p>The carbon cycle and water cycle are linked. Water carries carbon about the cycle.</p>	<p>The cycling of each type of matter (nitrogen, carbon, water) are independent, though they may affect each other. Human activities have the effect of transferring carbon stored in plants and fossil fuels to the atmosphere.</p>	<p>CO₂, an important greenhouse gas, is removed from the atmosphere in the ocean and other parts of the earth system through biologic and geologic processes. The atmosphere plays an important role in the carbon and water cycles. It is a reservoir of carbon, storing carbon released from natural and fossil fuel burning, and transferring carbon to the plants through photosynthesis..</p>

References:

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<http://cires.colorado.edu/education/outreach/climateCommunication/CC%20Misconceptions%20Handout.pdf>

Common Misconceptions about Polar Weather and Climate

<http://beyondpenguins.nsd.org/issue/column.php?date=June2008&departmentid=professional&columnid=professional!misconceptions>

Climate Misconceptions: A Top 10 List

<http://beyondpenguins.nsd.edu/issue/column.php?date=June2010&departmentid=professional&columnid=professional!misconceptions>

Greenhouse Gas Overview

<http://www.epa.gov/climatechange/emissions/index.html>

Realities vs. Misconceptions from the PEW Center on Global Climate Change

Misconception	Reality
Recent global warming is caused by the sun.	The output of energy from the sun has been monitored by satellites for thirty years and has not increased during this period of rapid global warming.
Climate has changed many times in the distant past, before humans began burning coal and oil, so the current warming cannot be caused by humans burning coal, oil, and natural gas.	There are several drivers that cause climate to change, and some of the key drivers have both natural and human sources. Recent increases in global temperatures result mostly from higher levels of heat-trapping gases in the atmosphere, which have been increasing because of human activities.
The last few years have been cooler, so global warming can't be real; or, Global warming stopped in 1998; or, The world has been cooling for the past decade.	The climate is defined by long-term averages in global temperatures and other climate metrics, and those are still increasing.
There is no scientific consensus on the existence or causes of global climate change.	A recent poll of earth scientists demonstrated that there is strong agreement that emissions of heat-trapping gases from the burning of fossil fuels make a significant contribution to global warming.
Scientists predicted global cooling in the 1970s.	When the next ice age might occur became a topic of debate during the 1970s, but there was no consensus on the topic and most of the debate was already focused on global warming.
Atmospheric water vapor is the heat-trapping gas that is primarily responsible for global warming.	Water vapor is increasing in the atmosphere in response to rising CO ₂ concentrations, amplifying the warming effect of manmade CO ₂ emissions.

Full explanations of the science explanation at:

<http://www.pewclimate.org/science-impacts/realities-vs-misconceptions>