

WEATHER & CLIMATE CHANGE FAQs

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SIMPLE ANSWERS TO COMMON QUESTIONS ABOUT CLIMATE CHANGE AND WEATHER

The impacts of climate change are being felt across the U.S. in the form of changing weather patterns and extreme events such as storms, drought and heat waves. We asked TV weathercasters to send us viewers' most commonly asked questions about global warming and weather; here are straightforward, scientific answers from Dr. Gerald Meehl, Senior Scientist at the National Center for Atmospheric Research in Boulder, Colorado. Dr. Meehl is co-coordinator of a recent comprehensive scientific assessment report on changes in weather and climate extremes prepared by the National Oceanic and Atmospheric Administration and released by the White House in 2008.

Q: What causes global warming? How much has it caused the Earth to warm?

A: Global warming is caused by the buildup of heat-trapping gases in the atmosphere. These gases come primarily from the burning of coal, oil and natural gas, with additional contributions from the cutting and burning of forests. The human-induced increase in these gases has caused the Earth to warm by about 1.5°F over the past century.

Q: How sure are we that global warming is real?

A: We are certain that global warming is real. Measurements from thermometers and satellites unequivocally show that climate is warming. The melting of glaciers and sea ice, rising sea levels, and other changes provide additional evidence of climate change. Long-term records of past climate show that the warming of the past 50 years is clearly unusual in a long-term context and could not have occurred without human influence.

Q: Is climate change already affecting weather? How can global warming impact events like storms, droughts and heat waves?

A: Climate change is increasing the frequency and intensity of some types of extreme weather. For example, warming has caused more rain to come in heavy downpours. There are longer dry periods between rainfalls. This, coupled with more evaporation due to higher temperatures, intensifies drought. Heat waves are becoming more frequent and intense, while cold extremes have decreased.



Q: If forecasts can't accurately predict weather two weeks in advance and sometimes two days in advance, how can we trust that scientists can say what's going to happen two decades or two centuries from now?

A: Weather and climate are not the same thing. Weather is short-term and fluid, and is thus inherently unpredictable beyond a few days; climate is long-term average weather and is controlled by larger forces, such as the composition of the atmosphere, and is thus more predictable on longer timescales. Weather is individual, day-to-day atmospheric events; climate is the statistical average of those events.

Q: Doesn't the Earth's temperature vary naturally over thousands of years? Could climate change be caused by the sun or natural variability, rather than by humans?

A: It is true that natural forces cause Earth's temperature to fluctuate on long timescales due to slow changes in the planet's orbit and tilt. Such forces were responsible for the ice ages. Natural forces sometimes cause temperatures to change on short timescales. For example, major volcanic eruptions can cause short-term cooling lasting two to three years. However, recent climate changes are inconsistent with trends caused by natural forces. Though some of the warming in the first half of the 20th century was likely due to an increase in solar output, recent changes due to such naturally occurring factors are inconsistent with observed warming. In fact, without human influences, Earth's climate actually would have cooled slightly over the past 50 years. Many independent lines of evidence (from basic physics to the patterns of temperature change through the layers of the atmosphere) have shown that the warming of the past 50 years is primarily due to the human-caused increase in heat-trapping gases.

Q: Is sea level rising? What will happen if it keeps rising?

A: Global sea level rose by about 8 inches over the past 100 years, with the rate of rise increasing over the past few decades. Global warming has been causing sea level to rise in two ways. First, ocean water expands as it warms, taking up more space. Second, warming leads to the melting of land-based ice, which raises sea level by adding water to the oceans. With ongoing increases in global temperatures, sea level will continue to rise gradually, inundating more coastlines around the world. How much and how fast it rises depends primarily on the level of heat-trapping emissions from human activities and how quickly the polar ice sheets melt as a result.

RESOURCES AND ADDITIONAL INFORMATION

For more information, further questions and more detailed answers, please visit www.weatherandclimate.net. For more questions and answers about the science of climate change, please see the Intergovernmental Panel on Climate Change's FAQ page, at <http://ipcc-wg1.ucar.edu/index.html>. For links to and fact sheets about U.S. government assessment reports on climate change, please see www.climate-extremes.com.

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Funding for this card was provided by the William & Flora Hewlett Foundation, the Mertz Gilmore Foundation and the Rockefeller Brothers Fund

