

# Climate Change: How do We Know?

Earth's climate has changed throughout history. Just in the last 650,000 years there have been seven cycles of glacial advance and retreat, with the abrupt end of the last ice age about 11,700 years ago marking the beginning of the modern climate era — and of human civilization. Most of these climate changes are attributed to very small variations in Earth's orbit that change the amount of solar energy our planet receives.

The current warming trend is of particular significance because it is surely the result of human activity since the mid-20<sup>th</sup> century. It is undeniable that human activities have warmed the atmosphere, ocean, and land and that widespread and rapid changes in the atmosphere, ocean, cryosphere, and biosphere have occurred.

Earth-orbiting satellites and other technological advances have enabled scientists to see the big picture, collecting many different types of information about our planet and its climate on a global scale.

**The evidence for rapid climate change is compelling:**

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## Global Temperature Rise



- The planet's average surface temperature has risen about 2.12 degrees Fahrenheit (1.18 degrees Celsius) since the late 19th century.

## Warming Ocean



- The ocean has absorbed much of this increased heat.
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## Shrinking Ice Sheets



- The Greenland and Antarctic ice sheets have decreased in mass.
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## Sea Level Rise



- *Image: Republic of Maldives: Vulnerable to sea level rise*

## Extreme Events



- The number of record high temperature events in the United States has been increasing, while the number of record low temperature events has been decreasing, since 1950.

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