Climate Change

by Sophia

WHAT'S COVERED

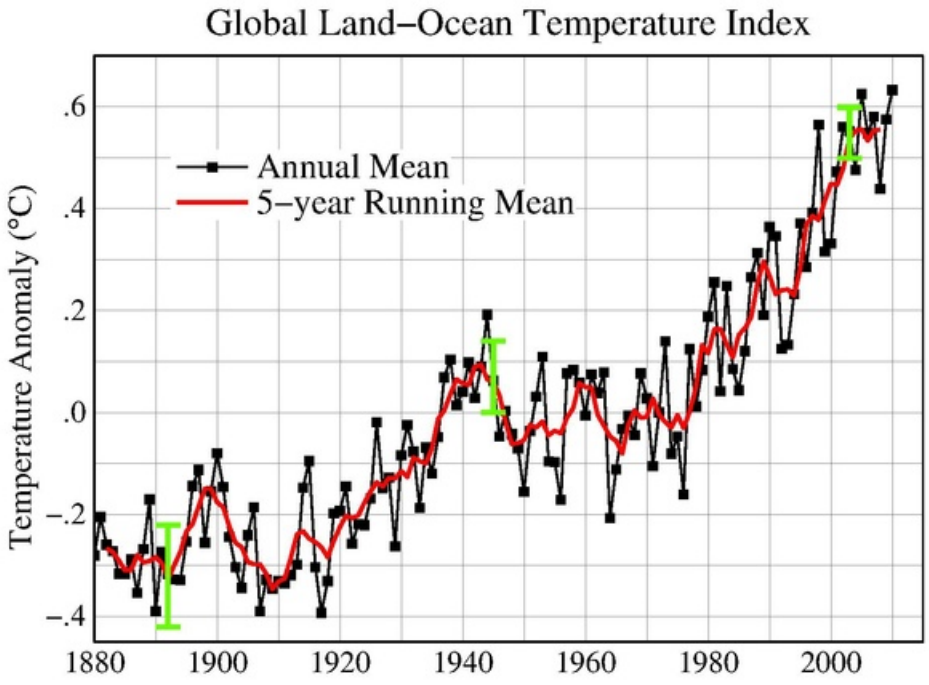
In this lesson, we will cover the topic of climate change. We will discuss the history of Earth's climate and scientific observations about how it is changing. We will also discuss Earth's natural cycles and their significance to climate change. We will also explore how Earth's climate and atmosphere function in relation to climate change. Specifically, this lesson will cover the following:

1. Evidence of Climate Change

The observations of scientists from year to year are consistently supporting theories of global warming and climate change.

1a. Rising Global Temperatures

A significant observation in the context of climate change is the record of global land and ocean temperatures since 1880, as shown in the graph below. We can see that, overall, there has been a significant rise in global temperature.



1b. Melting Glaciers

Another example is the melting and shrinking of glaciers and ice caps as a result of global temperature rise.

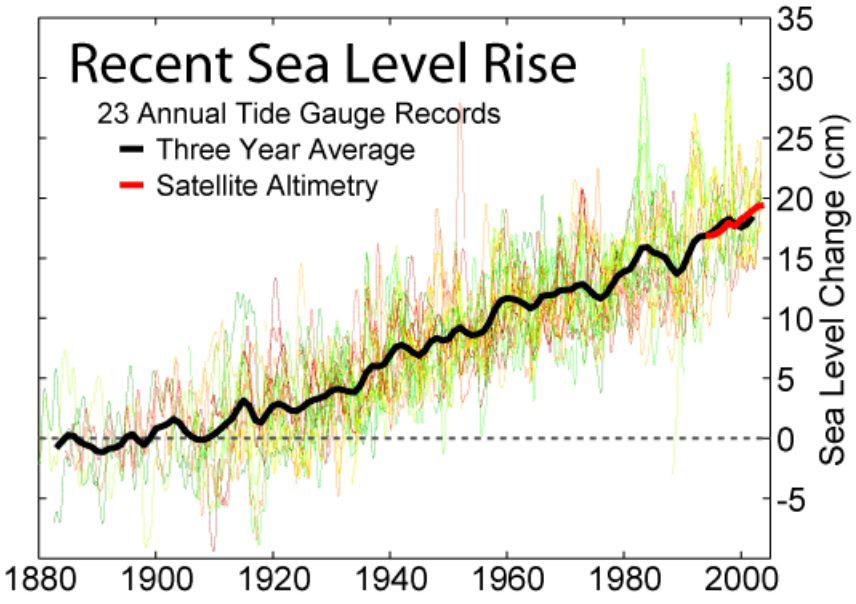
Date	Changes in Glacier in Iceland
This is a photograph of a prominent glacier in Iceland with a large lake at its base in 1977.	

By 2004, it had receded quite a bit. More of the rock outcropping is present on the right, and the lake at its base is shrinking.

By 2011, the glacier had begun receding up the hill, leaving large fissures in the rock. The lake at its base had completely dried up.

1c. Rising Sea Level

Another clue to climate change and global temperature rise is the rise in sea levels worldwide. As the planet heats up, its ice caps and glaciers, as seen in the previous photo, are melting. The result is that more fresh water is joining the seawater in our oceans, and the average sea level is rising. Since 1880, sea levels have risen by almost 20 cm worldwide.



2. Earth's Natural Cycles and Climate Change

Earth naturally cycles between warmer and colder periods of climate. Periodic ice ages are examples of such changes. Climate change itself is a normal process, one that usually lasts thousands of years as it slowly shifts to its new average temperature, thus allowing species to adapt to the shift in temperature.

The significance of the current climate change is the speed at which it is changing. According to current scientific understanding, the recent rise in temperature, of about 1.53 °F over the last 130 years, is the quickest transition in Earth's history. Scientists expect that the average global temperature will continue to rise by approximately 2.5–10 °F over the next 100 years. Where we fall in that range will mostly depend on human activities and choices.

THINK ABOUT IT

To give context to the changes a few degrees can cause, think about this: at the end of the last Ice Age, the entire United States was covered in thousands of feet of ice, yet the average global temperature was only five degrees colder than it is now.

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3. Earth's Climate

Earth's climate is determined by the following:

- Energy from sunlight
- Amount of land cover versus water cover
- Amount of cloud cover or atmospheric moisture present
- Thickness of the ozone layer
- Atmospheric concentrations of greenhouse gases and aerosols

In the past, climate change was caused by changes in the amount of energy from Sun hitting Earth as the distance and position from the sun changed. However, the current shifting climate is the result of increased concentrations of greenhouse gases in the atmosphere, generated by human activity. This happens because greenhouse gases, like carbon dioxide and methane, absorb radiation from Sun as it bounces off Earth and reflect it back toward the atmosphere in the form of heat, instead of letting the radiation reflect into space. This results in general atmospheric warming.

DID YOU KNOW

Greenhouse gases got their name because this process is very similar to the function of a greenhouse used for growing plants.

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4. Earth's Atmosphere

Our atmosphere is made up of 78% nitrogen, 21% oxygen, 0.93% argon, 0.03% carbon dioxide, and 0.07% other types of gases, such as methane. At the beginning of Earth's life, there were dramatic changes in its atmospheric makeup. In a relatively short period of time, it went from having 0% to 20% oxygen.

Nowadays, even though carbon dioxide and methane make up a minuscule part of the atmosphere, even small changes can have a huge impact. As carbon dioxide concentrations rise, so does global warming. However, it is not the most potent of greenhouse gases, despite its bad reputation. Methane is actually 30 times more potent than carbon dioxide because of its molecular structure. It will be important to manage greenhouse gases in respect to their potency as well as their quantity.

SUMMARY

In this lesson, we learned about the history of Earth's climate and scientific observations supporting **climate change**, including **rising global temperatures**, **melting glaciers**, and **rising sea levels**. We learned about **Earth's natural cycles** between warmer and colder periods of climate and how the significance of the current climate change is the speed at which it is changing. Lastly, we learned how **Earth's climate and atmosphere** function in relation to climate change.

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