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CLIMATE CHANGE

Course - Third Class

By

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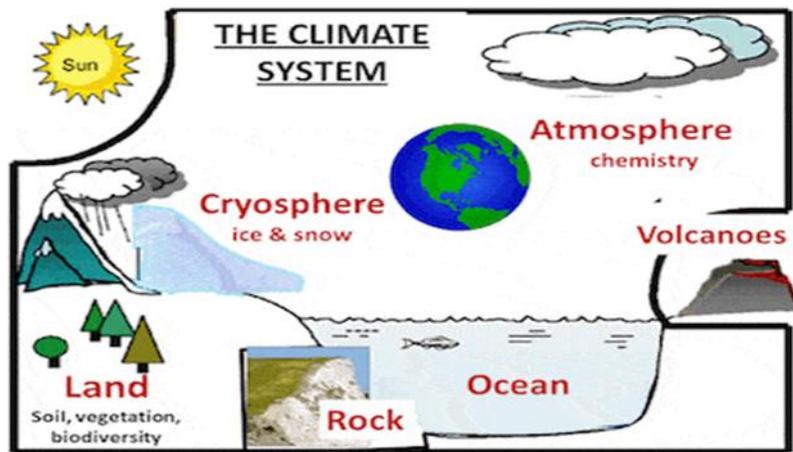
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What is Climate Change?

Climate change refers to significant, long-term changes in the global climate.

The global climate is the connected system of sun, earth and oceans, wind, rain and snow, forests, deserts and savannas, and everything people do, too. The climate of a place, say New York, can be described as its rainfall, changing temperatures during the year and so on. But the global climate is more than the “average” of the climates of specific places.

A description of the global climate includes how, for example, the rising temperature of the Pacific feeds typhoons which blow harder, drop more rain and cause more damage, but also shifts global ocean currents that melt Antarctica ice which slowly makes sea level rise until New York will be under water. It is this systemic connectedness that makes global climate change so important and so complicated.



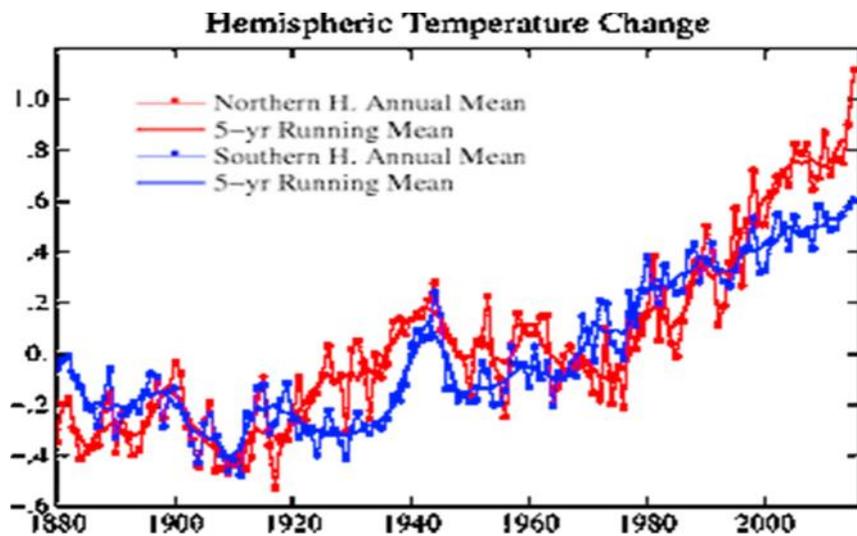
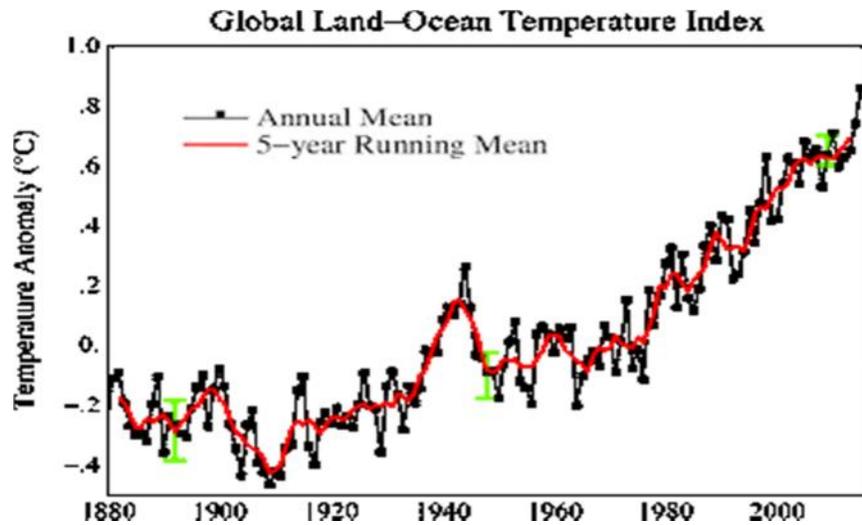
What is Global Warming?

Global warming is the slow increase in the average temperature of the earth's atmosphere because an increased amount of the energy (heat) striking the earth from the sun is being trapped in the atmosphere and not radiated out into space.

The earth's atmosphere has always acted like a greenhouse to capture the sun's heat, ensuring that the earth has enjoyed temperatures that permitted the emergence of life forms as we know them, including humans. Without our atmospheric greenhouse the earth would be very cold. Global warming, however, is the equivalent of a greenhouse with high efficiency reflective glass installed the wrong way around.

Ironically, the best evidence of this may come from a terrible cooling event that took place some 1,500 years ago. Two massive volcanic eruptions, one year after another placed so much black dust into the upper atmosphere that little sunlight could penetrate. Temperatures plummeted. Crops failed. People died of starvation and the Black Death started its march. As the dust slowly fell to earth, the sun was again able to warm the world and life returned to normal.

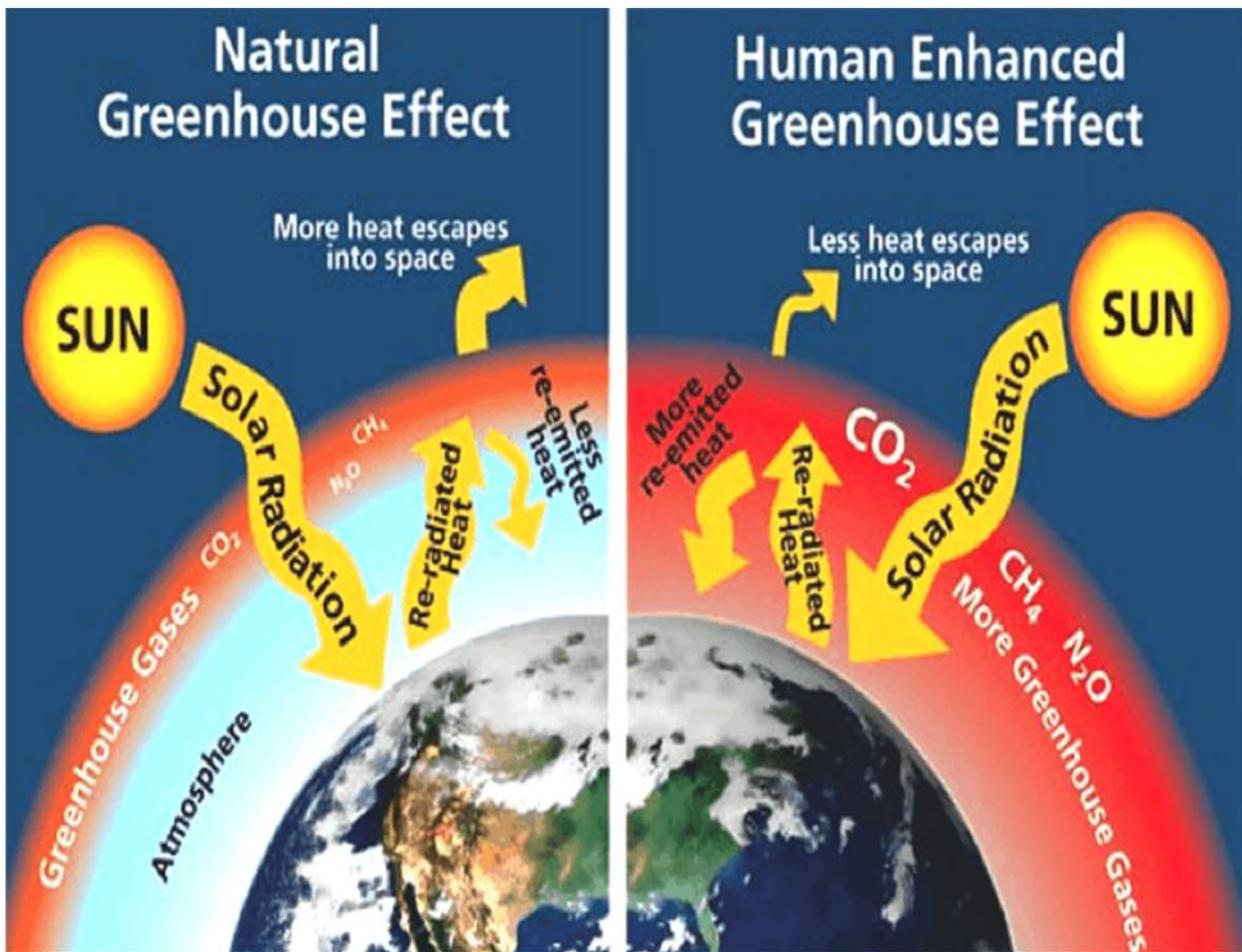
Today, we have the opposite problem. Today, the problem is not that too little sun warmth is reaching the earth, but that too much is being trapped in our atmosphere. So much heat is being kept inside greenhouse earth that the temperature of the earth is going up faster than at any previous time in history. NASA provides an excellent course module on the science of global warming.



Global Warming and Climate Change

Global climate change is a huge topic, and a difficult one to make students fully grasp the importance of. In this lecture, start with the oxygen catastrophe and Earth's first ice age as an illustration of how changing the atmosphere can completely alter the climate of the Earth (and the life it supports). A set of data and graphs, taken from NASA's global warming key indicators website is shown to give a sense of the evidence behind our understanding of climate change. Finally, try to cover all of the major impacts that climate change is having, or is expected to have. A student notes outline is also available for this lecture.

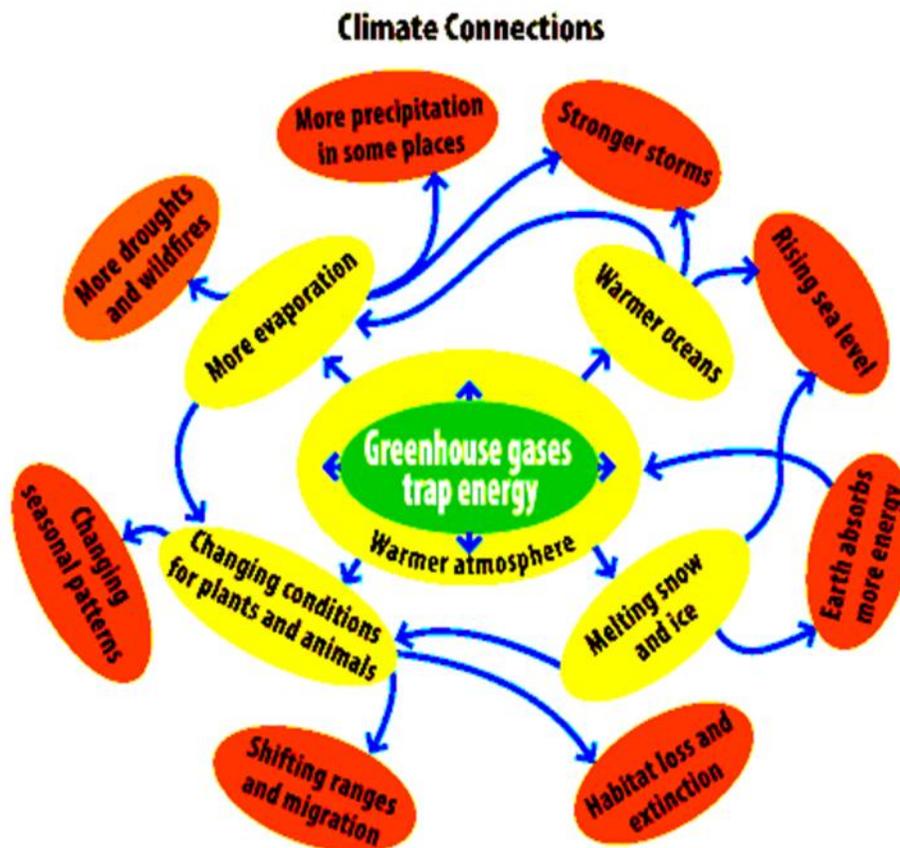
Essential concepts: Global warming, global climate change, hurricanes, El Nino, La Nina, carbon dioxide, greenhouse gases, methane, greenhouse effect, weather, climate, atmosphere, stratosphere, troposphere, IPCC, proxies, average temperature, Hurricane Katrina, great ocean conveyor, glaciers, ice caps, sea ice, water cycle, hydrologic cycle, stratoshield.



How does Global Warming drive Climate Change?

Heat is energy and when you add energy to any system changes occur.

Because all systems in the global climate system are connected, adding heat energy causes the global climate as a whole to change. Much of the world is covered with ocean which heats up. When the ocean heats up, more water evaporates into clouds. Where storms like hurricanes and typhoons are forming, the result is more energy-intensive storms. A warmer atmosphere makes glaciers and mountain snow packs, the Polar ice cap, and the great ice shield jutting off of Antarctica melt raising sea levels.



Changes in temperature change the great patterns of wind that bring the monsoons in Asia and rain and snow around the world, making drought and unpredictable weather more common. This is why scientists have stopped focusing just on global warming and now focus on the larger topic of climate change.