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Climate Change : Greenhouse Effect

What Is - The Greenhouse Effect?

Seen from space, our atmosphere is but a tiny layer of gas around a huge bulky planet. But it is this gaseous outer ring and its misleadingly called greenhouse effect that makes life on Earth possible – and that could destroy life as we know it.

The Greenhouse Effect (click image to download)

Global warming causes and effects at a glance

The sun is the Earth's primary energy source, a burning star so hot that we can feel its heat from over 150 million kilometers away. Its rays enter our atmosphere and shower upon on our planet. About one third of this solar energy is reflected back into the universe by shimmering glaciers, water and other bright surfaces. Two thirds, however, are absorbed by the Earth, warming land, oceans, and atmosphere.

Much of this heat radiates back out into space, but some of it is being stored in the atmosphere. This is process is what is called the greenhouse effect. Without it, the Earth's average temperature would be a chilling -18 degrees Celsius, even despite the sun's constant energy supply. In a world like this life on Earth would probably have never emerged from the sea. Thanks to the greenhouse effect, however, heat emitted from the Earth is trapped in the atmosphere, providing us with a comfortable average temperature of 14 degrees.

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Sunrays enter the glass roof and walls of a greenhouse. But once they heat up the ground, which in turn heats up the air inside the greenhouse, the glass panels trap that warm air and temperatures increase. But our planet has no glass walls; the only thing that comes close to acting as such is our atmosphere. But unfortunately, in here, processes are way more complicated.

Only about half of all solar energy that reaches the Earth is infrared radiation and causes immediate warming when passing the atmosphere. The other half is of a higher frequency, and only translates into heat

once it hits Earth and is later reflected back into space as waves of infrared radiation.

Like a radiator in space

This transformation of solar radiation in to infrared radiation is crucial, because infrared radiation can be absorbed by the atmosphere. So, in a cold and clear night, parts of this infrared radiation that would normally dissipate into space get caught up in the Earth's atmosphere. And like a radiator in the middle of room, our atmosphere radiates this heat into al directions.

Picture Gallery (click the image to start)

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Parts of this heat are finally sent out in the frozen nothingness of space, parts of it are sent back to Earth where they step up global temperatures. Just how much warmer it gets down here depends on how much energy is absorbed up there– and this, in turn, depends on the atmosphere's composition.

The switch from carbon dioxide to oxygen

Nitrogen, oxygen, and argon make up 98 percent of the Earth's atmosphere. But they do not absorb significant amounts of infrared radiation, and thus do not contribute to the greenhouse effect. It is the more exotic components like water vapour, carbon dioxide, ozone, methane, nitrous oxide, and chlorofluorocarbons that absorb heat and thus increase atmospheric temperatures.

Studies indicate that until some 2.7 billion years ago, there was so mucl carbon dioxide (CO_2) and methane in our atmosphere that average temperatures on Earth were as high as 70 degrees. But bacteria and plants slowly turned CO_2 into oxygen and the concentration of CO_2 in our current atmosphere dropped to just about 0.038 percent or 383 parts per million (ppm), a unit of measurement used for very low concentrations of gases that has become a kind of currency in climate change debates.

Minuscule changes – global impact

But while we are still far from seeing major concentrations of CO_2 in our atmosphere, slight changes already alter the way our celestial heating system works. Measurements of carbon dioxide amounts from Mauna Loa Observatory in Hawaii show that CO_2 has increased from about 313 ppm in 1960 to about 375 ppm in 2005. That means for every million particles in our atmosphere, there are now 62 CO_2-particles more than in 1960. Even if this does not seem like much, scientists say this increase – most probably caused by human activities – is mainly responsible for rising global temperatures throughout the last decades.

Even if the term “greenhouse effect” is somewhat of a misnomer, it still might be a useful handle from which the public can grasp an otherwise intricate natural process. Most people can relate to how hot and stuffy a greenhouse can get. Now that Earth started to heat up, we realize that our own global greenhouse has no window that we can open to catch some fresh air.

editor: Thilo Kunzemann

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