



Easing off the (Greenhouse) Gas

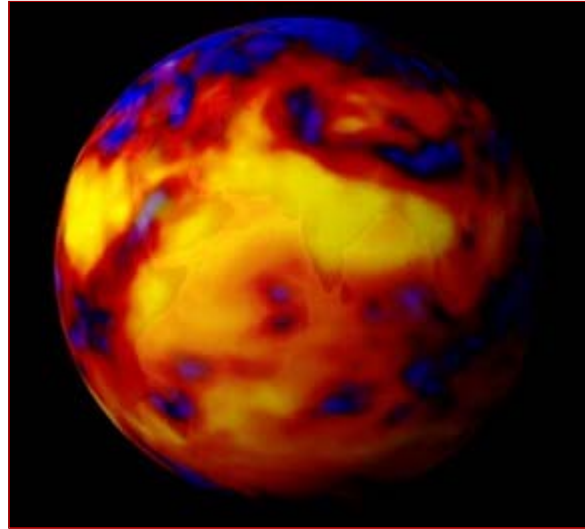


Greenhouse gases are still accumulating in Earth's atmosphere, but more slowly than before, say NASA-funded researchers.

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January 15, 2002: A new NASA-funded study shows that the rate of growth of greenhouse gas emissions has slowed since its peak in 1980, due in part to international cooperation that led to reduced chlorofluorocarbon use, slower growth of methane, and a steady rate of carbon dioxide emissions.

Researchers have shown that global warming in recent decades has probably been caused by carbon dioxide (CO₂), and other greenhouse gases including chlorofluorocarbons (CFCs), methane, tropospheric ozone, and black carbon (soot) particles.



Overall, the growth of emissions has slowed over the past 20 years, with the CFC phase-out being the most important factor, according to the study.

Above: This false-color Terra satellite image of Earth shows infrared heat escaping to space. Greenhouse gases trap such heat and warm our planet. [\[more information\]](#)

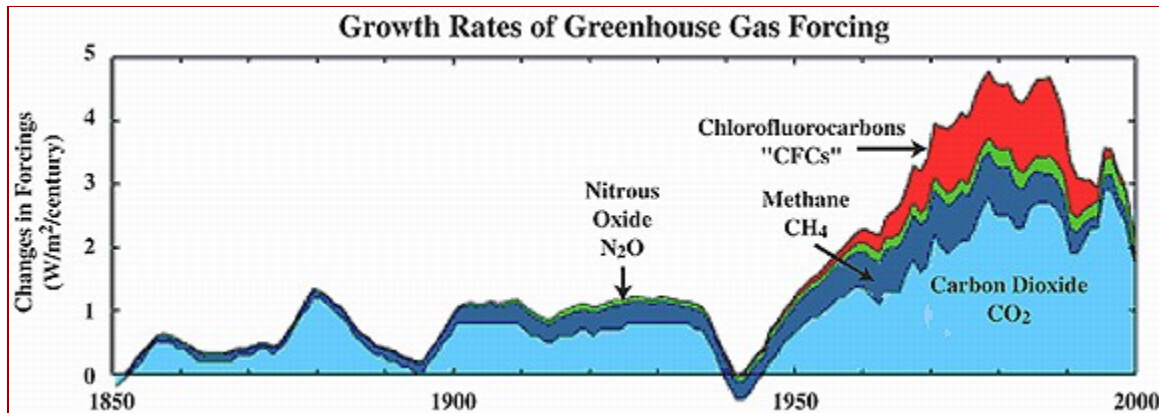
"The decrease is due in large part to cooperative international actions of the Montreal Protocol for the phase-out of ozone-depleting gases," explains James Hansen an author of the report from NASA's Goddard Institute for Space Studies. "But it is also due in part to slower growth of methane and carbon dioxide, for reasons that aren't well understood and need more study."



Although [methane](#) is much less abundant than carbon dioxide in Earth's atmosphere, the total warming effect of methane is substantial -- about half as large as that of CO₂. And when methane increases it also causes a rise in tropospheric ozone levels. Tropospheric ozone is a principal ingredient in "smog," which is harmful to human health and reduces agricultural productivity. The rate of methane growth has slowed during the past decade, and it may be possible to halt its growth entirely and eventually reduce atmospheric amounts, suggest Hansen and co-author Makiko Sato of Columbia University.

Another warming agent deserving special attention, according to the authors, is soot. Soot is a product of incomplete combustion. Diesel powered trucks and buses are primary sources of airborne soot in the United States. Even larger amounts of soot occur in developing countries.

Above: While the concentration of greenhouse gases in the atmosphere is still increasing, the rate of that increase has slowed since the 1980s. [[more information](#)]



The study also suggests that reduction of methane emissions and soot could yield a major near term success story in the battle against global warming, thus providing time to work on technologies to reduce future carbon dioxide emissions. Currently, technologies are within reach to reduce other global air pollutants, like methane, in ways that are cheaper and faster than reducing CO₂.

Though reducing these climate-forcing agents is important, scientists caution that limiting CO₂ will still be needed to slow climate change over the next 50 years.

Hansen emphasizes that CO₂ emissions are the single largest climate forcing, and warns that they need to be slowed soon and eventually curtailed more strongly to stabilize atmospheric conditions and stop global warming. Over the next few decades, Hansen said, it is important to limit emissions of forcing agents other than CO₂, to buy time until CO₂ emissions can be better managed.

Below: Carbon dioxide isn't the only factor in global warming. Aerosols, such as the smoke shown here, and gases such as methane and CFCs also play a part.



If fossil fuel use continues at today's rates for the next 50 years and if growth of methane and air pollution is halted, the warming in 50 years will be about 0.7°C (1.3°F). That's significant, according to Hansen, but it is less than half the warming in the "business-as-usual" scenarios that yield the specter of imminent disaster."

The climate warming projected by the Goddard Institute study is about half as large as typical increases cited by the report of Intergovernmental Panel on Climate Change (IPCC). This is because the IPCC considers a large range of forcings and models. The warming in the GISS model is similar to the lowest of the IPCC results, despite the

fact that the GISS model has a relatively high sensitivity to forcings.

The slowing increase of greenhouse emissions revealed by this study provides some encouraging evidence that hard-won environmental measures are indeed having a positive effect on climate change. But the study also serves to remind us that greenhouse gases are still on the rise. Continued efforts to curb emissions will be needed, say Institute scientists, if we hope to bring climate change under control.

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These research findings appeared in the December 18 issue of the Proceedings of the National Academy of Sciences. Hansen co-authored the paper with Makiko Sato of Columbia University, New York.

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Source: [NASA press release](#)

Responsible NASA official: [John M. Horack](#)

Production Editor: [Dr. Tony Phillips](#)

Curator: [Bryan Walls](#)

Media Relations: [Steve Roy](#)

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Web Links

[U.S. Environmental Protection Agency global warming homepage](#) -- Includes facts and figures about climate change.

[IPCC \(Intergovernmental Panel on Climate Change\)](#) -- The homepage of the international delegation of scientists charged with the task of investigating the evidence on climate change and producing reports for world leaders and the public.

Right: Greenhouse gases allow visible light to reach the Earth's surface, but then trap the resulting long-wavelength heat radiation that would otherwise escape to space. Learn more from "[The Greenhouse Effect, Greenhouse Gases, and Global Warming](#)"

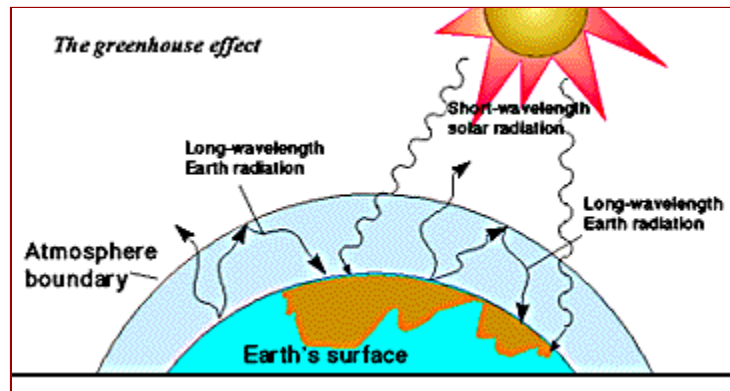
[Goddard Institute for Space Physics](#) -- home page

[Changing Our Weather One Smokestack at a Time](#) -- from earthobservatory.nasa.gov

[A Greener Planetary Greenhouse](#) -- *Science@NASA article:* In recent years Earth-orbiting satellites have seen plants growing more vigorously than usual over northern parts of our planet.

[Climate Forcings in the Industrial Era](#)

[The Eastern U.S. Keeps Its Cool](#) -- *Science@NASA article:* While surface temperatures across most of the globe are on the rise, the eastern U.S. appears to be slowly cooling. Scientists say the



trend could be a result of increasing cloud cover triggered by warming Pacific waters.

Earth's Fidgeting Climate -- *Science@NASA article*: Is human activity warming the Earth or do recent signs of climate change signal natural variations? In this feature article, scientists discuss the vexing ambiguities of our planet's complex and unwieldy climate.

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