

GREENHOUSE EFFECT Not a creation of demented minds

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THE Earth's atmosphere is a window for radiation streaming in from the Sun and for infrared radiation flowing out from the Earth. About 60 percent of solar radiation, mostly in the visible part of the electromagnetic spectrum, gets through to the surface and heats the Earth. The Earth emits, in turn, infrared radiation. But the opacity of the atmosphere to infrared radiation reduces the heat loss and makes the surface warmer than it would be if the radiation could escape freely. This kind of trapping of infrared radiation by transparent glasses warms an actual greenhouse, and hence it earned the moniker "greenhouse effect."

Water vapor plays the major role in the greenhouse effect, with carbon dioxide playing a minor role. Other lesser players are methane, nitrous oxide, and fluorinated gases. These gases are known as greenhouse gases. They have a lifespan ranging from a few years to thousands of years, long enough to become well-mixed in the atmosphere. Once mixed, their concentration is roughly the same all over the world, regardless of the source of the emissions. With the right concentration of these gases in the atmosphere, greenhouse effect will be comparatively gentle and the Earth will be comfortably warm.

What will happen if the atmosphere has no greenhouse gases? There will be no atmospheric blanket insulating the ground from space. Thus, all the infrared radiation will escape into space. Thermodynamic calculations show that a consequence of this will be a lowering of the ground temperature to -18 degrees Centigrade. The Earth would be an inhospitable planet, too cold to sustain life. This is called "no-greenhouse effect."

The amount of energy a planet receives from the Sun must be precisely balanced with the amount of energy it



returns to space. The greenhouse effect cannot change the amount of incoming solar radiation and thus cannot change the amount of energy the planet returns to space. So how can the greenhouse effect make a planet warmer while the overall energy balance remains unchanged?

The greenhouse effect does not generate heat; it makes the planet warmer by limiting the loss of heat to space. We cannot regulate the amount of water vapor in the atmosphere needed for a mild greenhouse effect as its source is the oceans. We can, however, control the concentration of carbon dioxide which plays the major role amongst the minor players in determining the temperature of the Earth. If it is high, Earth will return less energy than it received from the Sun. Consequently, the surface will rapidly heat up from its comfortable level leading to what is known as Global Warming. If the concentration is low, Earth will return more energy, and the planet will cool down.

It is obvious that neither too little nor too much carbon dioxide is beneficial for the Earth. The greenhouse effect is the only reason why our planet is not frozen over. While it makes the Earth livable, greenhouse effect is also responsible for increasing the surface tempera-

ture of Earth.

The oceans are a major reservoir for carbon dioxide, storing 60 percent more than the atmosphere. As the Earth's temperature rises, the ocean's ability to dissolve and hold carbon dioxide will decline. They will then release into the atmosphere much of the absorbed carbon dioxide, thereby boosting the greenhouse effect.

Greenhouse effect is on the ascendancy, brazenly staring us in the face. Science does not lie and the facts are in front of us. So are the global dangers posed by greenhouse effect. Sea levels are rising at an alarming rate; bizarre and violent weather patterns have grown in numbers in recent years.

According to former U.S. Vice-President Al Gore, "We are facing a global climate crisis. It is deepening." Anti-environmentalists, in contrast, believe greenhouse effect is "phony science" and "only God can change the climate, and the idea that manmade pollution could affect the seasons is arrogance." These scientifically challenged people perhaps think that some demented scientists with ulterior motives created an illusion of greenhouse effect by manipulating scientific data.

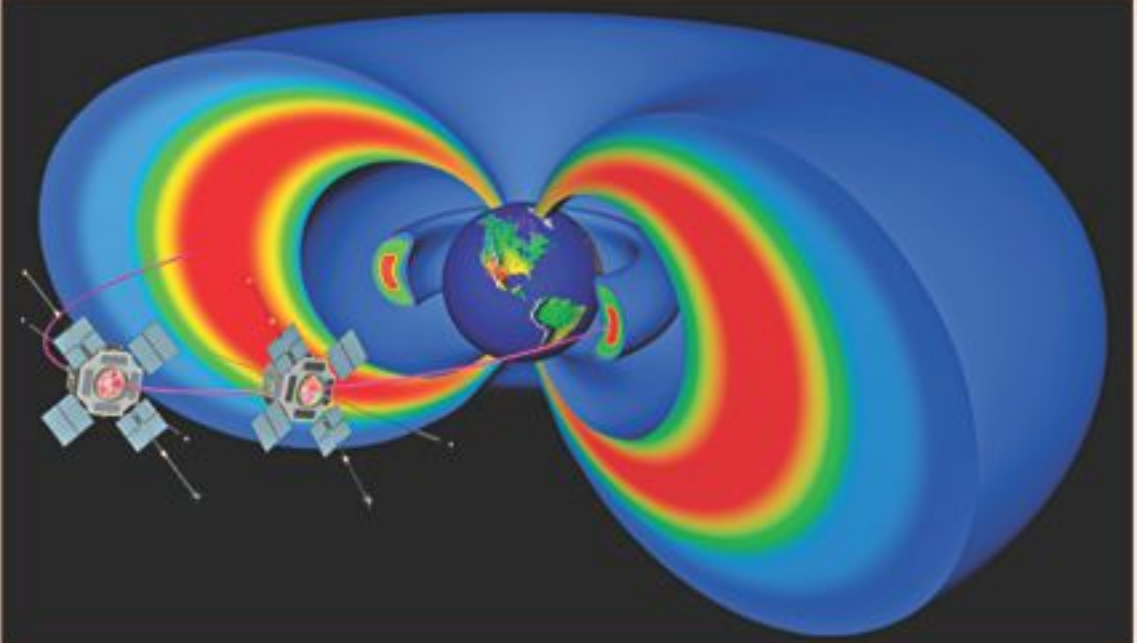
We are probably within a few decades of time beyond which the continued degradation of the environment will become an irreversible process. There is still time for the fabled late-starting hare to catch up with the tortoise. We have to make everyone aware that continued inaction on our part in dealing with the problem is unconscionable for our generation, and suicidal for the next. American environmentalist Wendell Berry points out: "To cherish what remains of the Earth and to foster its renewal is our only legitimate hope of survival."

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ET CALL

NUMBER POWER

Extraterrestrial chorus heard



The Van Allen probes recently recorded "chorus" waves, electromagnetic disturbances that ripple through the belts.

Is it alien birds singing alongside crickets? Or the sound of radio waves sweeping through Earth's magnetosphere? A recently released recording is a little bit of both.

The soundtrack captures "chorus" waves, electromagnetic disturbances that ripple through belts of charged particles that surround Earth. The chorus becomes audible to the human ear when translated into sound waves, as heard in a recording made by space physicists at the University of Iowa.

Ham radio operators have known about this chorus for decades, but scientists now have a lot more data on it thanks to a pair of satellites known as the Van Allen probes. NASA launched them in August to fly through and study Earth's two main radiation belts, called the Van Allen belts – an inner one made mostly of protons and an outer one made mostly of electrons. The electronics on most spacecraft get fried if they spend too much time in these belts, but the Van Allen probes are built with components that won't fritz out when charged particles hit them.

Already scientists are uncovering surprises from the mission, some of which they reported December 4 at a meeting of the American Geophysical Union. The radiation belts turn out to be much more active than anyone had suspected, having shifted their location and intensity each time the probes swept through on their nine-hour orbits.

Source: Science News

Climate skeptics swayed by consensus

CONSERVATIVES are less likely to accept the reality of human-caused climate science when presented with supporting scientific evidence. But tell them that 99 out of 100 climate scientists agree on the subject, and conservatives will be more likely to accept that humans are altering the climate, according to a new pilot study.

The findings, presented today (Dec. 7) at the annual meeting of the American Geophysical Union, suggest that scientists shouldn't break out the graphs and tables when talking climate with conservatives. Instead, climate advocates should emphasize how much of the scientific community agrees on the subject.

Conservatives sceptical

In general, those with more conservative views tend to be more skeptical about climate change.

"People with very strong free-market support had very high skepticism of climate change," said John Cook, a cognitive psychology doctoral candidate at the University of Queensland. Such individuals also tend to distrust scientists and scientific processes such as peer review, he added.

But conservatives haven't always doubted climate change. Global warming only became a polarizing issue after the 1997 Kyoto Protocol negotiations, a United Nations treaty that set targets for countries to reduce their greenhouse gas emissions.

Since then, Republicans and Democrats have been sharply divided on the issue: a recent Pew Research Poll found that 85 percent



of Democrats believe in climate change while less than half of Republicans do. And a study by the Union of Concerned Scientists found that conservative media outlets like FOX News and the Wall Street Journal routinely present misleading information on the state of climate science, while free-market organizations such as the Heartland Institute have planned anti-climate change educational programs.

But efforts to convince conservatives of the threat of global warming have mostly fallen flat. When scientists explain the evidence to conservatives, only 3 percent alter their positions, Cook told LiveScience.

Changing minds

Cook and his colleagues wanted to see what actually would change conservative minds. He asked a group of 225 people to fill out a survey, in which they rated their belief in human-caused climate change on a scale of 1 to 5. The survey also asked respondents to rate their belief in a free versus regulated market, as well as their distrust of

climate scientists.

Cook identified those individuals with strong free-market beliefs as conservatives. (Past studies have shown that holding free-market beliefs correlates strongly with identifying as a Republican and with holding socially conservative views on gay marriage, abortion and other hot-button issues)

Then, one group read a statement presenting evidence for climate change, while others read statements emphasizing the scientific consensus. A third, control group got the original survey, but without any climate statements.

None of the statements moved the needle very much, on average, but those who waded through facts about climate change reported more skepticism than those who read no statements about climate change at all.

"The evidence group had a slight backfire effect," Cook said.

But those reading about the scientific consensus were more convinced about the reality of climate change than were controls.

Cook has no idea why conservatives should be moved by the consensus of scientists, whom they tend to distrust, but one possibility may be that conservatives place greater value on authority, on average, than do liberals.

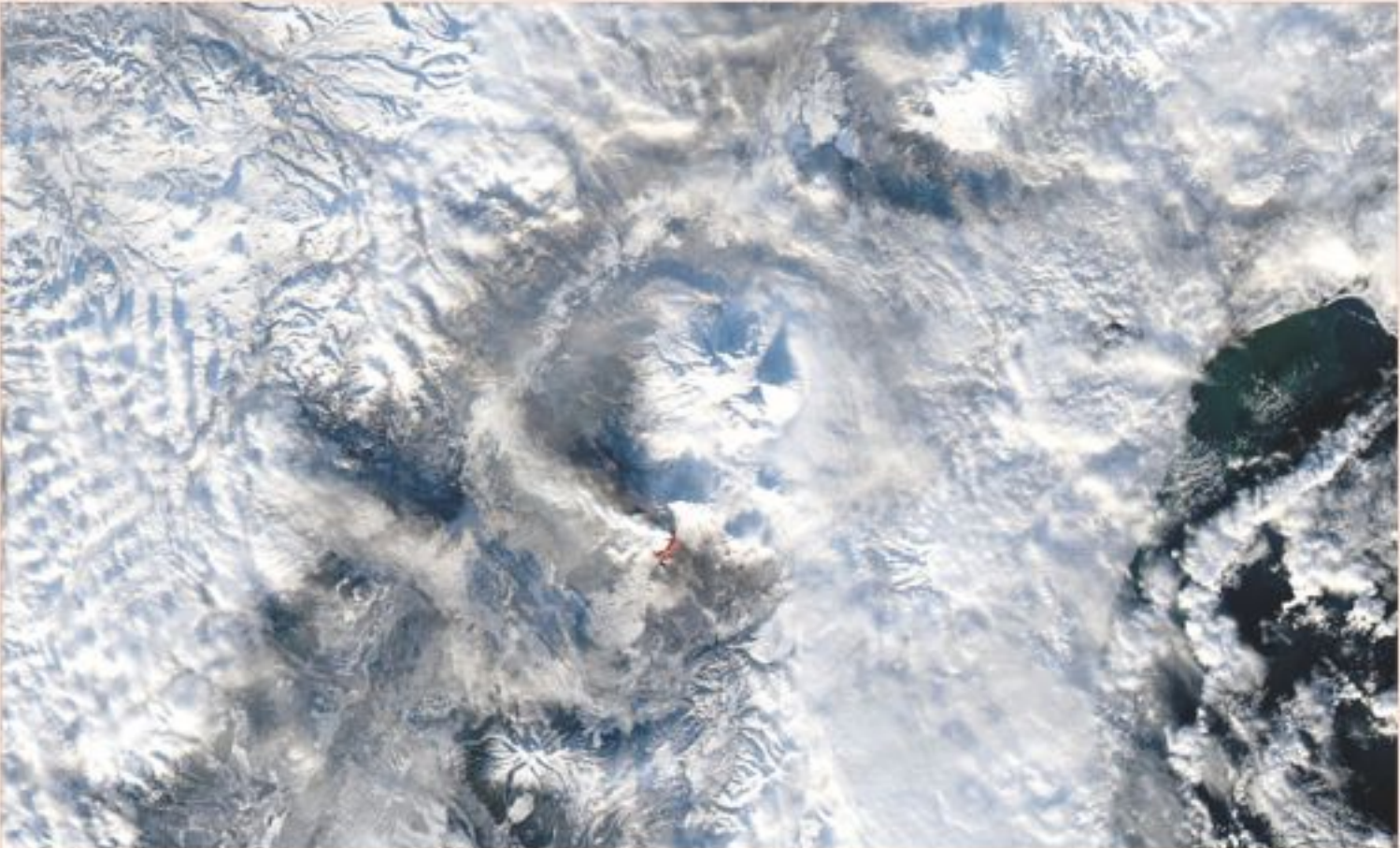
"It's quite counter-intuitive and not what I expected," Cook said. He plans to investigate why this contradiction exists in follow-up studies.

Source: Live Science

DISGORGING

DID YOU KNOW?

Low-level eruption



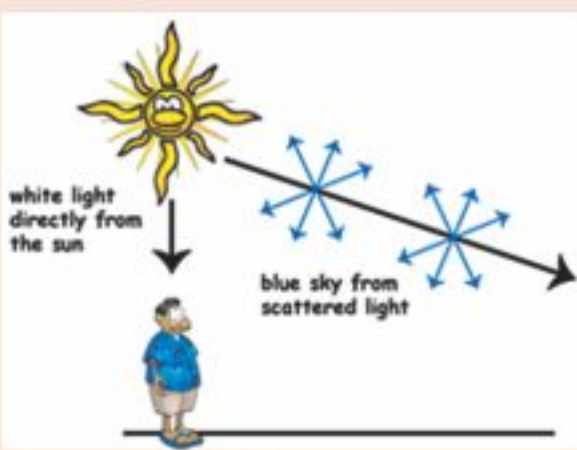
Gases billow from the snow-surrounded maw of Russia's Plosky Tolbachik volcano on the remote Kamchatka peninsula. NASA's Aqua/MODIS satellite captured this bird's-eye view on Dec. 7, 2012.

SOURCE: NASA

Why is the sky blue?

It is easy to see that the sky is blue. Have you ever wondered why? A lot of other smart people have, too. And it took a long time to figure it out!

Sunlight reaches Earth's atmosphere and is scattered in all directions by all the gases and particles in the air. Blue light is scattered in all directions by the tiny molecules of air in Earth's



Source: NASA

atmosphere. Blue is scattered more than other colors because it travels as shorter, smaller waves. This is why we see a blue sky most of the time.

Closer to the horizon, the sky fades to a lighter blue or white. The sunlight reaching us from low in the sky has passed through even more air than the sunlight reaching us from overhead.

GALACTIC POWERHOUSE

Hypergiant enigma solved?

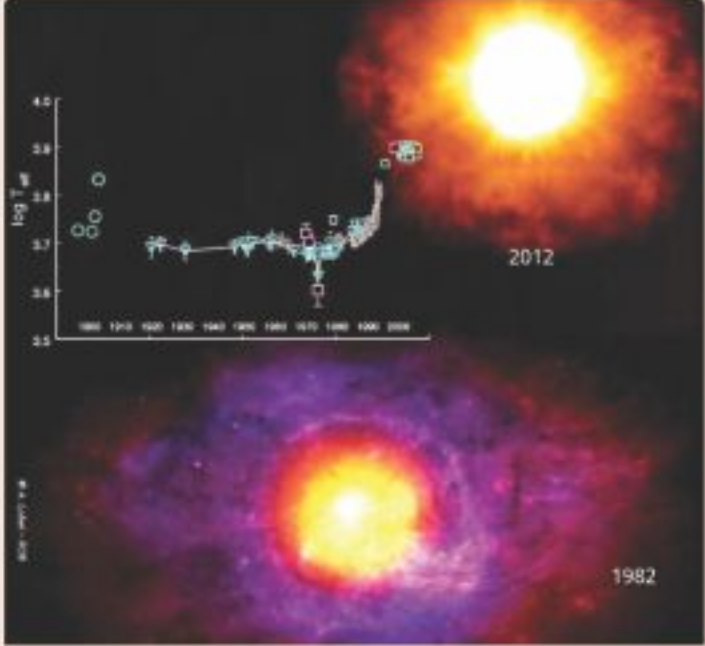
A European research team has published the results of a 30-year study of an extraordinary hypergiant star. They have found that the surface temperature of the super-luminous star HR 8752 increased by about 3000 degrees in less than three decades, while it went through an extremely rare stage called the 'Yellow Evolutionary Void'. The discovery marks an important step closer to unravelling the evolution of the most massive stars.

A team of astronomers from six European countries, including the Royal Observatory of Belgium (ROB), has investigated the hypergiant star HR 8752 for 30 years while it traversed the 'Yellow Evolutionary Void'. The 'Void' is a short stage in the lives of the most massive stars when they become very unstable. The team finds that the surface temperature of HR 8752 rose surprisingly fast from 5000 to 8000 degrees in less than 30 years. The research results were very recently published in the journal Astronomy and Astrophysics. The discovery is an important step forward to resolve the enigma of the hypergiants, the most luminous and massive stars of the Galaxy.

Hypergiants can shine millions of times brighter than the Sun, and they often have a diameter several hundred times greater. HR 8752 is a quarter million times more luminous than the Sun. The powerhouse is therefore visible with normal binoculars at large distance from Earth in the Northern constellation of Cassiopeia. There are currently only 12 hypergiants known in our Galaxy.

The 'Yellow Evolutionary Void' is a unique stage in the short life of a hypergiant when its temperature and luminosity can quickly change.

Source: Science Daily



With this discovery a crucial 'missing link' in the evolution of hypergiant stars has been found.

NYASASAURUS

Oldest dinosaur?

WHAT may be the most ancient dinosaur ever found – or at least a very close relative to the oldest currently known examples – could push the appearance of the awesome beasts back to 243 million years ago.

Paleontologist Rex Parrington of the University of Cambridge in England discovered the fossil in the early 1930s, preserved in a rock formation known as the Manda Beds in Tanzania's Ruhuhu Valley. Now, a team of scientists has taken a fresh look at Nyasasaurus parringtoni. It lived during the Anisian age of the Middle Triassic period, about 10 million to 15 million years earlier than the oldest confirmed dinosaurs. The finding suggests dinosaurs evolved and diversified over a longer time frame than scientists thought, the team reports online December 4 in Biology Letters.

So far only fragments of the creature's backbone and upper arm bone have been found, but these bear telltale features of dinosaurs, such as rapid bone growth. More fragments are needed to determine whether the fossil is in fact the oldest dinosaur or a member of the nearest sister group.

At 2 to 3 meters long and no more than 1 meter tall, Nyasasaurus was hardly a king of the beasts. It would have been slightly larger than a golden retriever but with a very long tail, says Sterling Nesbitt, a paleontologist at the University of Washington in Seattle. Nesbitt and colleagues estimate that the creature weighed about 20 to 60 kilograms.

The team examined the fossil's structure and microscopic anatomy and then compared it with members of known animal family trees. Computer analyses showed that Nyasasaurus was either part of the dinosaur lineage or an as-yet-unknown group that's even closer than dinosaurs' nearest currently known relatives, silesaurids.

Source: Science News



The creature is either the oldest known dinosaur yet discovered or a close relative to the oldest currently known specimen.