Earth Hasn't Been This Warm Since the Pliocene 3 Million Years Ago

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March 21, 2001 - It was only six months ago that Presidential campaigner George Bush pledged to regulate power plant emissions of carbon dioxide in order to help reduce global warming. But this month as president, he has now reversed himself saying there is a national energy crisis. At the same time, a study was published in the journal Nature confirming unequivocally that greenhouse gases are increasing. Scientists at London's Imperial College compared 1997 infrared reflections of carbon dioxide, methane and ozone from Earth's surface and found less was escaping into space compared to satellite data in 1970. Atmospheric physicist John Harries said, "We're absolutely sure; there's no ambiguity. This shows the greenhouse effect is operating, and what we are seeing can only be due to the increase in the gases."

Pliocene, 3 Million Years Ago

Carbon Dioxide Levels During Pliocene Compared to Global Warming 2001

The last time the earth was warmer than it is to day was at least 3 million years ago in the middle of the Pliocene epoch. Then there was large warming at mid and high latitudes with cooler, stable tropical temperatures. The cause for Pliocene warming is still not understood, but its suspected there was a combination of ocean heat transport combined with an increase in carbon dioxide. However, the carbon dioxide levels then were not much different than today.

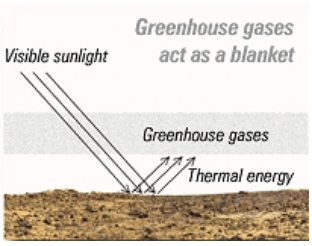
- Carbon Dioxide in Warm Pliocene 3 Million Years Ago Appx. 380 ppm.
- Carbon Dioxide in Global Warming 2001 Appx. 315 ppm.

As carbon dioxide and other greenhouse gases keep increasing today, the earth is expected to keep warming up over the next one hundred years anywhere between 3 to 10.5 degrees Fahrenheit. We might gain some insights about what could happen by looking at what we know about the middle Pliocene. Many ocean and land-based core drills contain well-dated Pliocene sediments which help.

The NASA Goddard Institute for Space Studies in New York has looked at deep sea cores and pollen records and fed information into a computer to produce a

global climate simulation that compares the Pliocene with where we are now and where we could be headed.

Today scientists think the earth is warming because of the thick layer of greenhouse gases building up in the lower atmosphere, chiefly carbon dioxide from increased industrial emissions.



The GISS model does not support the idea that Pliocene warming was caused by carbon dioxide increase. What caused the warming is not clear, but deep ocean cores indicate that water might have played a major role in warming the Pliocene. The deep sea cores indicate sea surface temperatures were very high three million years ago and were linked to the North Atlantic deep water circulation which increased during the middle Pliocene.

GISS Report About Global Climate Model of Pliocene

Quoting from a GISS report about its Pliocene research:

> "In our experiments we have found both consistencies and inconsistencies between model and data-generated paleoclimate estimates. Temperature estimates show the greatest consistency, with both model and data indicating significantly warmer temperatures at high latitudes and diminished warming nearer to the equator.
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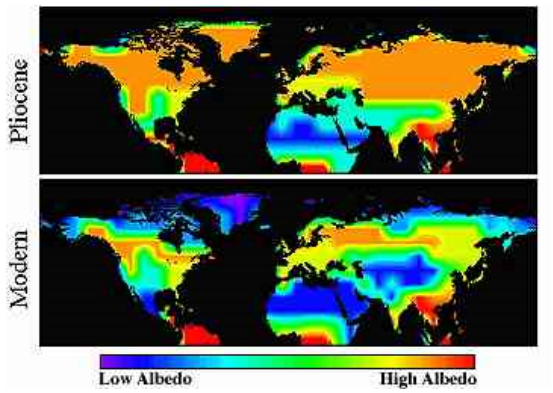
> "The continental temperatures agree well with estimates from palynological studies, especially in the circum-North Atlantic region. This is not unexpected since that region is strongly influenced by the dramatically warmer North Atlantic surface sea temperatures. The global climate change model (GCM) also yields temperature increases up to 10 degrees Centigrade along the Arctic coasts and shows greatest warming in the winter.



Pliocene and modern vegetation global albedo distribution.
Graph courtesy of NASA GISS, New York City, N. Y.

> "Although the original temperature increase is driven by warmer sea surface temperatures, much of the continental interior warming is generated by an ice-albedo feedback, as reduced snow cover in the warmer climate reflects less solar radiation away from the surface during winter months. Further warming at high latitudes comes from the increased levels of atmospheric water vapor (greenhouse gas) which results from the warm, ice-free ocean conditions.

"Despite the generally warmer climatic conditions, some areas show overall cooling. Notably, East Africa cools by 2 to 3 degrees Centigrade due to increased low-level cloud cover, which reflects large amounts of incoming solar radiation back to space. Very few paleo observations are available for some remote parts of Africa, but our simulation is consistent with the single palynological record that exists for that region.

"The most common discrepancy seems to be an underestimation by the model of wetter conditions, as interpreted from pollen records, throughout the Northern Hemisphere. For example, the model predicts lower effective moisture (precipitation minus evaporation) in western North America, but geologic records indicate wetter conditions during the Pliocene. The root of the difference seems to lie in the northern summer season where the model's ground hydrology responds to the warmer ground temperatures by drying out."

Concerns About 21st Century Global Warming Hotter? Or colder?

Investigators have found evidence that minor increases in carbon dioxide up to 380 ppm did occur in the Pliocene. That raises the question about whether some kind of climate feedback was associated with small increases in CO2 that lead to larger changes in ocean circulation.

If so, what will ocean circulations do this time? Just as the Pliocene heated, it was also a transition into cooling and the spread of glaciers over all of North America. The last glacial period ended ten thousand years ago. Since then, the world has heated up 10 degrees F., the same amount that the GISS computers say the world could heat up in just the next 100 years. There is no precedent in any ice cores, tree rings, pollen or other physical evidence of such extreme heating in such a short time period.

"If the 10 degree F. projection happened, the consequences could be disastrous with more unpredictable weather patterns and extremes," warns Drew Shindell, Ph.D., atmospheric physicist at NASA's GISS.

Websites:

http://www.giss.nasa.gov/research/paleo/pliocene/page2.html#simulations

Credits