Science News

Cirrus Disappearance: Warming Might Thin Heat-trapping Clouds

ScienceDaily (Nov. 5, 2007) — The widely accepted (albeit unproven) theory that manmade global warming will accelerate itself by creating more heat-trapping clouds is challenged this month in new research from The University of Alabama in Huntsville.

Cirrus clouds. (Credit: NOAA Central Library, Photo by Albert E. Theberge Junior)

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Instead of creating more clouds, individual tropical warming cycles that served as proxies for global warming saw a decrease in the coverage of heat-trapping cirrus clouds, says Dr. Roy Spencer, a principal research scientist in UAHuntsville's Earth System Science Center.

That was not what he expected to find.

"All leading climate models forecast that as the atmosphere warms there should be an increase in high altitude cirrus clouds, which would amplify any warming caused by manmade greenhouse gases," he said. "That amplification is a positive feedback. What we found in month-to-month fluctuations of the tropical climate system was a strongly negative feedback. As the tropical atmosphere warms, cirrus clouds decrease. That allows more infrared heat to escape from the atmosphere to outer space."

"While low clouds have a predominantly cooling effect due to their shading of sunlight, most cirrus clouds have a net warming effect on the Earth," Spencer said. With high altitude ice clouds their infrared heat trapping exceeds their solar shading effect.

In the tropics most cirrus-type clouds flow out of the upper cirrus cloudiness to follow warming.

"To give an idea of how strong this enhanced cooling mechanism is, if it was operating on global warming, it would reduce estimates of future warming by over 75 percent," Spencer said. "The big question that no one can answer right now is whether this enhanced cooling mechanism applies to global warming."

The only way to see how these new findings impact global warming forecasts is to include them in computerized climate models.

"The role of clouds in global warming is widely agreed to be pretty uncertain," Spencer said. "Right now, all climate models predict that clouds will amplify warming. I'm betting that if the climate models' 'clouds' were made to behave the way we see these clouds behave in nature, it would substantially reduce the amount of climate change the models predict for the coming decades."

The UAHuntsville research team used 30- to 60-day tropical temperature fluctuations - known as "intraseasonal oscillations" - as proxies for global warming.

"Fifteen years ago, when we first started monitoring global temperatures with satellites, we noticed these big temperature fluctuations in the tropics," Spencer said. "What amounts to a decade of global warming routinely occurs in just a few weeks in the tropical atmosphere. Then, as if by flipping a switch, the rapid warming is replaced by strong cooling. It now looks like the change in cirrus cloud coverage is the major reason for this switch from warming to cooling."

The team analyzed six years of data from four instruments aboard three NASA and NOAA satellites. The researchers tracked precipitation amounts, air and sea surface temperatures, high and low altitude cloud cover, reflected sunlight, and infrared energy escaping out to space.

When they tracked the daily evolution of a composite of fifteen of the strongest intraseasonal oscillations they found that although rainfall and air temperatures would be rising, the amount of infrared energy being trapped by the cloudy areas would start to decrease rapidly as the air warmed. This unexpected behavior was traced to the decrease in cirrus cloud cover.

The new results raise questions about some current theories regarding precipitation, clouds and the efficiency with which weather systems convert water vapor into rainfall. These are significant issues in the global warming debate.

"Global warming theory says warming will generally be

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"Until we understand how precipitation systems change with warming, I don't believe we can know how much of our current warming is manmade. Without that knowledge, we can't predict future climate change with any degree of certainty."

Spencer and his colleagues expect these new findings to be controversial.

"I know some climate modelers will say that these results are interesting but that they probably don't apply to long-term global warming," he said. "But this represents a fundamental natural cooling process in the atmosphere. Let's see if climate models can get this part right before we rely on their long term projections."

The results of this research were published recently in the American Geophysical Union's "Geophysical Research Letters" on-line edition. The paper was co-authored by UAHuntsville's Dr. John R. Christy and Dr. W. Danny Braswell, and Dr. Justin Hnilo of Lawrence Livermore National Laboratory, Livermore, CA.

Adapted from materials provided by University Of Alabama In Huntsville.

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