Global Warming Models Come Under Physicist's Scrutiny

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Two University of Rochester studies published in the latest issue of Geophysical Research Letters underline **how uncertain and complex the understanding of global climate can be**. Both reports emphasize some of the shortcomings in current weather models that scientists use to determine the effect of carbon dioxide on the Earth's average temperature.

The first paper compares temperature data from several altitudes above the Earth's surface with what the top three internationally used global weather models predict happens at these altitudes when carbon dioxide is introduced. David Douglass, professor of physics at the University, used data gathered from satellites, radio-born weather balloons and other sources recorded over the last 20 years. He shows that these global weather models predict that as carbon dioxide increases, it should affect the temperatures of higher elevations more than it does at ground level. Douglass's analysis suggests that while the models do roughly match ground temperatures as carbon dioxide increased over the last 20 years, the mid- to high-tropospheric levels of the atmosphere actually cooled.

"The models are relatively accurate at predicting the temperatures at the Earth's surface, "says Douglass, "but when you go a few miles up, they diverge dramatically. The models are really challenged to explain these results."

Though the study doesn't suggest what might be causing the discrepancy, it clearly shows an area of disagreement that today's global models need to address in order to increase their accuracy, especially in the time of such hot-button issues as carbon dioxide's effect on global warming.

Douglass's second paper in the same journal adds weight to the veracity of satellite temperature readings over the last two decades. Ever since satellites have been equipped to read the Earth's temperature from orbit, there has been a roughly one-degree disparity between the satellite results and those observed directly from measurements taken at the surface itself. The cause of the disparity has been a source of contention over the last 20 years. In the earlier years, many scientists assumed that the problem was due to satellite error, but newer satellites continue to reinforce the earlier measurements. The Earth seems about a degree cooler when measured by the satellites than it does when measured at ground or sea level. Douglass has turned to a third independent source for additional temperature data, which includes temperatures recorded by weather balloons.

"Weather balloons might seem like an odd way to measure the temperature of the surface of the Earth until you realize that the first temperature reading is taken before the balloon has launched," says Douglass.

The number of weather balloon readings is not as extensive as the number of conventional surface readings, but they do align much more closely with the satellite readings than those of the surface readings. Lending more weight to the satellite temperatures would mean revising downward the global temperature, which would have implications for the global warming outlook. Both the satellite and balloon data sets do suggest that the overall temperature is increasing, but the increase is significantly less than the one-degree increase noted by surface thermometers.

The Rochester study also shows that the disparity between surface and satellite temperatures seems to exist mostly over the oceans, suggesting that the difference between the method of taking the Earth's temperature over water may contribute to the disparity. Douglass notes that surface temperature of the Earth's oceans is taken from the surface water itself, rather than the air as weather balloons do, and that this may account for the difference.

Source: University of Rochester

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