Global Warming: The Satellite Saga Continues

By Roy Spencer

Published 12/03/2004

Dr. Roy W. Spencer
Principal Research Scientist, University of Alabama
Email Author
Biographical

The results of two research studies announced this week address the infamous discrepancy between satellite and surface thermometer trends over the last 25 years. The original satellite dataset produced by the University of Alabama in Huntsville (UAH) now has a warming trend of 0.08 deg. C/decade since 1979, while the surface thermometer trend is two to three times this value. Climate models, in contrast, claim that any surface warming as a result of global warming should be amplified with height, not reduced. This has led to varying levels of concern in the climate community that the theory contained in the climate models might be in error.

TCS

related articles
- On Creeping Collectivization
- The *New York Times* Whiffs on Air Pollution
- Camelot's Congenial Climate
- What's Going on with the Arctic?
- Waiting for Putin

MORE BY ISSUE >>>

articles by author
- From Garden State to Greenhouse State
- How Might Hurricanes Change with Global Warming?
- Charley, Frances, Ivan, and Global Warming
- Gaia or God?
- The Economic Hardship Act

MORE BY AUTHOR >>>

As background, a study published earlier this year by Fu et al. (1) attempted to estimate the amount of tropospheric warming by a simple linear combination of the stratospheric and tropospheric channels of the Microwave Sounding Units (MSUs) flying on NOAA polar-orbiting weather satellites. (The troposphere exists from the surface up to a height of around 8-12 miles, the stratosphere overlays it.) Since the tropospheric channel has about 15% influence from the stratosphere -- which has cooled strongly since 1979 -- the tropospheric temperature can only be estimated through removal of the stratospheric component. Fu et al. used radiosonde (weather balloon) data to arrive at an optimum combination of the two channels that, when applied to the satellite observed temperature trends, resulted in a tropospheric warming trend that was larger than that estimated by UAH with a different technique.

In the first article announced this week, Fu & Johansen (2) estimate the stratospheric contribution to the satellite instrument's tropospheric channel through a slightly different method than in their original article. They used previously published radiosonde estimates of temperature trends through the lower and middle stratosphere to estimate the error in their method, as well as the amount of stratospheric cooling contained in the tropospheric channel. While we would prefer to leave detailed comments for a journal article, a couple of general points can be made. For the period they examined (1979-2001), our (UAH) lower tropospheric temperature trend is +0.06 deg. C/decade, while their estimate of the (whole) tropospheric trend is +0.09 deg C/decade. You might notice that the difference between these two trends is small, considering the probable error bounds on these estimates and the fact that the two techniques measure somewhat different layers. Also, their method depends on belief in the radiosonde-measured trends in the lower stratosphere, even though we know there are larger errors at those altitudes than in the troposphere -- and most published radiosonde trends for the troposphere show little or no global warming (!) As is often the case, the press release that described the new study made claims that were, in my view, exaggerated. Nevertheless, given the importance of the global warming issue, this line of research is probably worthwhile as it provides an alternative way of interpreting the satellite data.

The other study (3), published by Simon Tett and Peter Thorne at the UK's Hadley Centre, takes issue with the original Fu et al. method. Tett and Thorne claim that when the technique is applied to variety of radiosonde, reanalysis, and global model simulation datasets in the tropics, it leads to results which are more variable than the UAH technique produces. It also mentions the dependence of the method on the characteristics of the radiosonde data that are assumed.

What all this means in terms of observed and predicted global temperature trends remains to be seen. As part of the requirements of the Bush administration's Climate Change Science Plan, a variety of scientists are now sifting through the satellite, thermometer, and radiosonde data, and will report in the coming year on their findings.

References

1. Fu, Q., C.M. Johanson, S.G. Warren, and D.J. Seidel, 2004: Contribution of stratospheric cooling to satellite inferred tropospheric temperature trends. Nature, Vol. 429, p. 55-58.

2. Fu, Q., and C.M. Johanson, 2004. Stratospheric influences on MSU-derived tropospheric temperature trends: A direct error analysis. Journal of Climate, to be published December 15, 2004

3. Tett, S., and P. Thorne, 2004: Tropospheric temperature series from satellites. December 2, 2004, at Nature online (subscription required).

DISCUSS THIS ARTICLE ON OUR FEEDBACK FORUM