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Warming debate highlights poor data

An unusual truce has been reached in the turbulent field of climate science. Scientists who have spent 15 years arguing over a discrepancy in certain data on global warming now say they all agree: the data are inadequate.

The lowest layer of Earth's atmosphere is indeed warming, but uncertainties in the data are as large as the trends the scientists are looking for, says Peter Thorne, a researcher with the UK Met Office. "The fact that the uncertainty has increased is actually a step forward," he says.

Thorne is one of the lead authors on a new report commissioned by the US Climate Change Science Program (CCSP), the government entity responsible for research on climate change. The report will be released for public review in the next few months, but three papers published online last week by *Science* preview some of its findings.

The papers advance a debate that began in 1990, when an analysis of satellite observations suggested that temperature trends in the troposphere, the lowest layer of the atmosphere, were inconsistent with the picture of global warming emerging from measurements made at the surface¹. This finding became ammunition for sceptics arguing against evidence for global warming.

But the three new papers add important new results, says Carl Mears of Remote Sensing Systems in Santa Rosa, California, and a co-author of one of the reports. "We are converging," he says. "We are definitely getting closer."

Along with colleague Frank Wentz, Mears reanalysed raw satellite data, including those used in the original 1990 study. Their analysis² suggests that the troposphere is warming at a rate of 0.19 °C per decade — far faster than the estimate of 0.09 °C reported by a group at the University of Alabama in Huntsville, who did the original study.

But recently the Alabama team issued its own revised data set, reporting a warming of 0.12 °C per decade. The group has adopted a new way to adjust the satellite data for the time of day the observations were taken. The change comes in response to a problem pointed out during a meeting of authors for the forthcoming CCSP report.

"What we all show is that the troposphere is warming. The question is by how much," says climatologist John Christy of the Alabama team. "When we are talking about precisions of just a few hundredths of a degree per decade, we're not quite there with our observing systems."

The second *Science* paper points out problems in the temperature record taken by weather balloons, in part because different manufacturers' instruments heat up by different amounts during the day³. The third paper reviews predictions from 19 different climate models and concludes that the differences between the models' predictions and observations are most likely to be the result of errors in the observations and in how they had been analysed⁴.

Together, the reports conclude that the observed tropospheric temperature trends are consistent with a warming world. Yet climate experts acknowledge that the papers are just another data set to argue over, as happened with an earlier analysis published in *Nature*⁵ that failed to lay the argument to rest.

"I don't think this will be the last word," says climate researcher Phil Jones from the University of East Anglia. ■

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5. Fu, Q., Johanson, C. M., Warren, S. G. & Seidel, D. J. *Nature* **429**, 55–58 (2004).