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# Scientists Trace Extreme Heat in Australia to Climate Change

By JUSTIN GILLIS SEPT. 29, 2014

The savage heat waves that struck Australia last year were almost certainly a direct consequence of greenhouse gases released by human activity, researchers said Monday. It is perhaps the most definitive statement climate scientists have made tying a specific weather event to global warming.

Five groups of researchers, using distinct methods, analyzed the heat that baked Australia for much of 2013 and continued into 2014, briefly shutting down the Australian Open tennis tournament in January when the temperature climbed to 111 degrees Fahrenheit.

All five research groups came to the conclusion that last year's heat waves could not have been as severe without the long-term climatic warming caused by human emissions.

"When we look at the heat across the whole of Australia and the whole 12 months of 2013, we can say that this was virtually impossible without climate change," said David Karoly, a climate scientist at the University of Melbourne who led some of the research.

The findings relied on computer analyses of what the climate would have been like in the absence of human-caused greenhouse emissions, a type of research widely acknowledged to be imperfect, and which often produces conflicting findings from different groups. But scientists said the results in this case were strengthened by the unanimity of the papers, written by veteran research teams scattered around the world.

"The evidence in those papers is very strong," said Martin P. Hoerling, an American scientist with the National Oceanic and Atmospheric Administration

who has often been skeptical of claimed links between weather events and global warming.

In other results published Monday, three research groups analyzed the drought afflicting California but could not come to a unanimous conclusion about whether the odds had been increased by human activity. One paper found that they had been; the two others found no clear evidence of that.

Researchers generally agreed, however, that regardless of the causes, the effects of the California drought had been worsened by global warming. That is because whatever rain does fall in California tends to evaporate faster in the hotter climate, leading to drier conditions.

Two dozen papers analyzing weather extremes from 2013 were published on Monday in the Bulletin of the American Meteorological Society. This look back at the prior year has become an annual event, as scientists increasingly try to answer the question many people ask after every extreme weather event: Did climate change have anything to do with it?

For several events in 2013, they were able to rule out such a link. Even though the overall global warming trend has been definitively linked to human emissions in scores of papers, the new reports show that the frequent impulse to attribute specific weather events to human activity is not always well grounded.

For instance, one research group found that the type of extreme rainfall that struck parts of Colorado last September had become less likely, not more likely, in the warming climate. Another group, analyzing the heavy rains and floods that struck parts of Central Europe in June 2013, found no evidence that these could be attributed to global warming, even though such claims were made at the time.

Myles R. Allen, a researcher at Oxford whose group conducted the study on the European rains, noted in an interview that the science of attributing specific events to human emissions was still contentious and difficult, so any answers given today must be regarded as provisional.

His group has found a measure of human influence on several weather events over the years. But with the science still emerging, he cautioned against the tendency to cite global warming as a cause of almost any kind of severe weather.

“If we don’t have evidence, I don’t think we should hint darkly all the time that human influence must be to blame somehow,” Dr. Allen said.

The new batch of reports analyzed extreme heat in 2013 not only in Australia,

but also in Europe, China, Japan and the Korean Peninsula, with the researchers concluding in every case that global warming had made the occurrence of the heat extremes more likely.

In the Australian case, computer analyses of a hypothetical climate without human-caused emissions were simply unable to produce a year as extreme as 2013, and other analytical methods yielded similar answers.

But computer simulations that factored in those emissions and the warming they are causing showed an increasing likelihood of extraordinary heat waves in Australia.

The Australia finding is likely to add to an intense political debate in that country. The newly elected prime minister, Tony Abbott, has repealed a law intended to reduce emissions, and his government appointed a climate skeptic to lead a separate review of the country's renewable energy targets.

Yet scientists say that Australia, an arid land to begin with, may be among the primary victims if global warming is allowed to continue unchecked.

In addition to the Colorado and Central European rains, the 2013 events for which scientists were able to rule out a human contribution included a blizzard in South Dakota, heavy snowfall in the Pyrenees in Europe and a cyclone that swept across northwestern Europe in late October.

The new reports come as scientists, responding to popular demand, are trying to speed up their analysis of extreme weather events and the role of greenhouse gases.

It used to take them years to come to a clear view of any particular event; now, papers are being published within several months. By sometime next year, researchers hope to reduce that to a matter of days, with three groups of researchers around the world training their sights on extreme events as soon as they occur, then putting out reports while the public is still discussing the aftermath.

“We want to get to this place where we can answer the question when the media are asking it,” said Heidi Cullen, a scientist with Climate Central, a news and research organization in Princeton, N.J., who is helping to lead the effort. “We want to give the first, best answer we can possibly give.”

A version of this article appears in print on September 30, 2014, on page A1 of the New York edition with the headline: Scientists Trace Extreme Heat in Australia to Climate Change.

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