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250 YEARS OF GLOBAL WARMING
Berkeley Earth Releases New Analysis

According to a new Berkeley Earth study released today, the average temperature of the Earth's land has risen by 1.5 °C over the past 250 years. The good match between the new temperature record and historical carbon dioxide records suggests that the most straightforward explanation for this warming is human greenhouse gas emissions.

Together with their most recent results and papers, Berkeley Earth also released their raw data and analysis programs. They will be available online at BerkeleyEarth.org on July 30.

The new analysis from Berkeley Earth goes all the way back to 1753, about 100 years earlier than previous groups' analyses. The limited land coverage prior to 1850 results in larger uncertainties in the behavior of the record; despite these, the behavior is significant.

Robert Rohde, Lead Scientist for Berkeley Earth and the person who carried out most of the analysis, noted that "Sudden drops in the early temperature record (1753 to 1850) correspond to known volcanic events." Volcanoes spew particles into the air, which then reflect sunlight and cool the earth for a few years. In the Berkeley Earth temperature plot (see figure below), sudden dips in temperature caused by large volcanic explosions are evident back to the late 1700s.

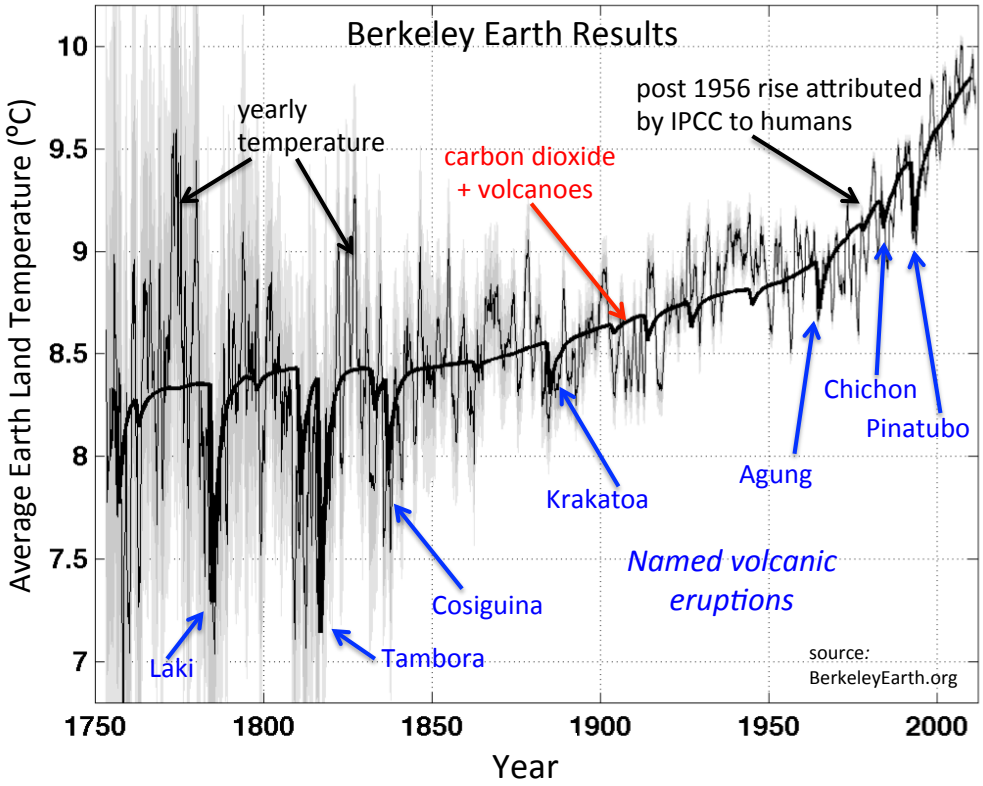

Figure: The temperature of the Earth's land surface, as determined from over 36,000 temperature stations around the globe. The data is well fit by a simple model containing only known volcanic eruptions and carbon dioxide (dark line). No contribution from solar variability was necessary to make a good match. The rapid but short (decadal) variations are believed to be due to changes in ocean flows, such as El Nino and the Gulf Stream.

Berkeley Earth compared the shape of the gradual rise over 250 years to simple math functions (exponentials, polynomials) and to solar activity (known through historical records of sunspot numbers), and even to rising functions such as world population.

Richard Muller, Founder and Scientific Director of Berkeley Earth, notes "Much to my surprise, by far the best match was to the record of atmospheric carbon dioxide, measured from atmospheric samples and air trapped in polar ice." He emphasizes that the match between the data and the theory doesn't prove that carbon dioxide is responsible for the warming, but the good fit makes it the strongest contender. "To be considered seriously, any alternative explanation must match the data at least as well as does carbon dioxide."

In its 2007 report the IPCC concluded only that "most" of the warming of the past 50 years could be attributed to humans. It was possible, according to the IPCC, that increased solar activity could have contributed to warming prior to 1956. Berkeley Earth analyzed about 5 times more station records than were used in previous analyses, and this expanded data base along with its new statistical approach allowed Berkeley Earth to go about 100 years farther back in time than previous studies. By doing so, the Berkeley Earth team was able to conclude that over 250 years, the contribution of solar activity to global warming is negligible.

Some of the scientists on the Berkeley Earth team admit surprise that the new analysis has shown such clear agreement between global land-temperature rise and human-caused greenhouse gases. "I was not expecting this," says Richard Muller, "but as a scientist, I feel it is my duty to let the evidence change my mind."

Elizabeth Muller, co-Founder and Executive Director of Berkeley Earth, says that "One of our goals at Berkeley Earth is complete transparency – we believe that everyone should be able to access raw climate data and do their own analysis. Scientists have a duty to be 'properly skeptical', and we are trying to lower the barriers to entry into the field."

Robert Rohde created an online feature that allows people to look up temperature records by location. "If you want to know what the temperature change has been in your city, your state, or even your country, you can now find this online at BerkeleyEarth.org" says Rohde. He adds, "We hope people will have a lot of fun interacting with the data." This feature should be available to the public by Monday July 30.

A previous Berkeley Earth study, released in October 2011, found that the land-surface temperature had risen by about 0.9 °C over the past 50 years (which was consistent with previous analyses) and directly addressed scientific concerns raised by skeptics, including the urban heat island effect, poor station quality, and the risk of data selection bias.

The Berkeley Earth team values the simplicity of its analysis, which does not depend on the large complex global climate models that have been criticized by climate skeptics for their hidden assumptions and adjustable parameters. The conclusion that the warming is due to humans is based simply on the close agreement between the shape of the observed temperature rise and the known greenhouse gas increase.

Elizabeth adds, "The current data does not include ocean temperatures; these will be added in the next phase of the Berkeley Earth studies. Another next step for our team is to think about the implications of our findings."

More information about Berkeley Earth is available at www.BerkeleyEarth.org.

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