



IEAGHG Information Paper: 2016-IP7; Update on CO₂ Emissions and Global Temperatures

The National Oceanographic and Atmospheric Administration (NOAA) in the USA Information Centre is a Government Agency. Its mission is to understand and predict changes in climate, weather, oceans, and coasts, to share that knowledge and information with others, and to conserve and manage coastal and marine ecosystems and resources.

One of the NOAA activities is the operation of the Mauna Loa Observatory (MLO) in Hawaii¹. This observatory is regarded as the premier atmospheric research facility for monitoring and collecting data related to atmospheric change. The observatory has been continuously monitoring and collecting data since the 1950's. The undisturbed air, remote location, and minimal influences of vegetation and human activity at MLO are ideal for monitoring constituents in the atmosphere that can cause climate change. Data from the MLO on CO₂ concentrations in the atmosphere can be found on-line <http://esrl.noaa.gov/gmd/ccgg/trends/>. On 6th May 2015, NOAA made headlines by reporting that CO₂ emissions in the atmosphere had reached 400ppm². This was a significant milestone and marked the fact that burning fossil fuels have caused global carbon dioxide concentrations to rise more than 120 parts per million since pre-industrial times.

The NOAA have recently reported³ that:

- The annual growth rate of atmospheric carbon dioxide measured at NOAA's Mauna Loa Observatory in Hawaii jumped by 3.05 parts per million during 2015, the largest year-to-year increase in 56 years of research.
- Also in another first, 2015 was the fourth consecutive year that CO₂ grew more than 2 ppm,

CO₂ Levels were independently measured by NOAA's Earth System Research Laboratory and by the Scripps Institution of Oceanography.

Whilst in February 2016, the average global atmospheric CO₂ level stood at 402.59 ppm. The last time the Earth experienced such a sustained CO₂ increase was between 17,000 and 11,000 years ago, when CO₂ levels increased by 80 ppm. Today's rate of increase is 200 times faster according to NOAA experts.

The NOAA attribute the big increase in CO₂ as partially due to the current El Niño weather pattern⁴, as forests, plant life and other terrestrial systems responded to changes in weather, precipitation and drought. The largest previous increase occurred in 1998, also a strong El Niño year.

They also conclude that continued high emissions from fossil fuel consumption are driving the underlying growth rate over the past several years.

¹ The observatory is part of the National Oceanic and Atmospheric Administration (NOAA) - Earth System Research Laboratory (ESRL) - Global Monitoring Division (GMD) <http://www.esrl.noaa.gov/gmd/obop/mlo/>

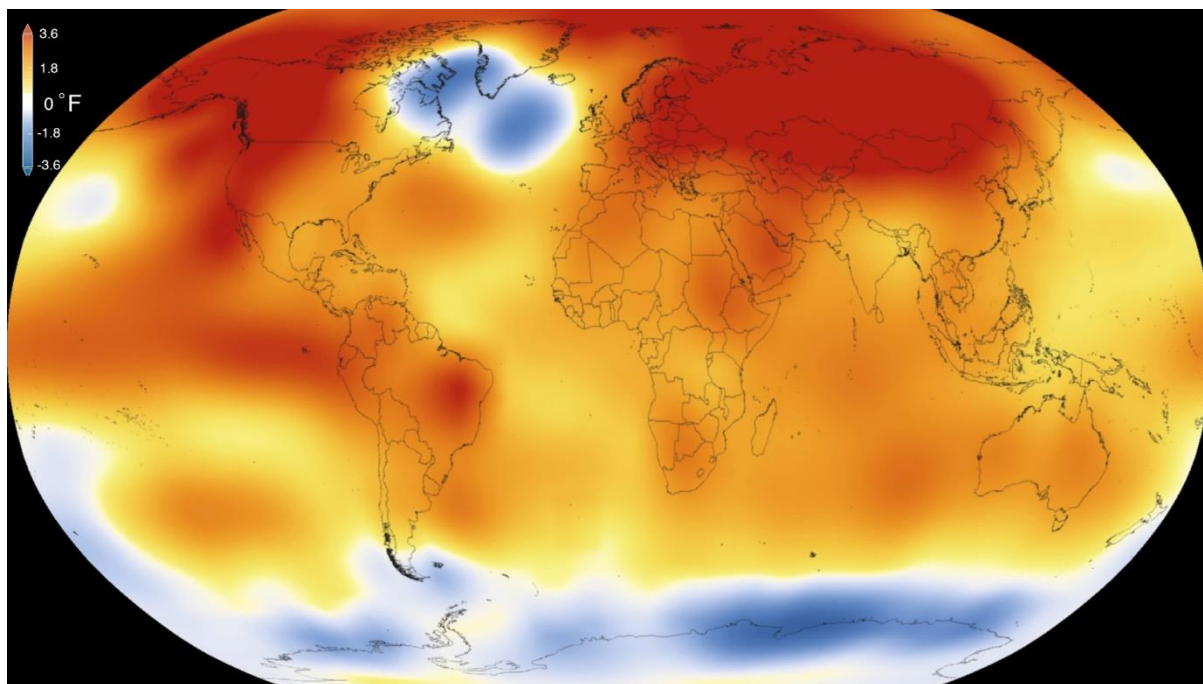
² <http://research.noaa.gov/News/NewsArchive/LatestNews/TabId/684/ArtMID/1768/ArticleID/11153/Greenhouse-gas-benchmark-reached-.aspx>

³ <http://www.noaa.gov/record-annual-increase-carbon-dioxide-observed-mauna-loa-2015>

⁴ El Niño is the warm phase of the El Niño Southern Oscillation (commonly called ENSO) and is associated with a band of warm ocean water that develops in the central and east-central equatorial Pacific (between approximately the International Date Line and 120°W), including off the Pacific coast of South America. El Niño Southern Oscillation refers to the cycle of warm and cold temperatures, as measured by sea surface temperature, SST, of the tropical central and eastern Pacific Ocean. El Niño is accompanied by high air pressure in the western Pacific and low air pressure in the eastern Pacific.



Coupled to this CO₂ emission increase the NOAA and NASA have shown us that the Earth's 2015 surface temperatures were the warmest since modern record keeping began in 1880. Not only that, but the record-breaking year continues a long-term warming trend, 15 of the 16 warmest years on record have now occurred since 2001, see below. Most of the warming that has occurred has been in the in the past 35 years, with 15 of the 16 warmest years on record occurring since 2001. Last year was the first time the global average temperatures were 1 degree Celsius or more above the 1880-1899 average.



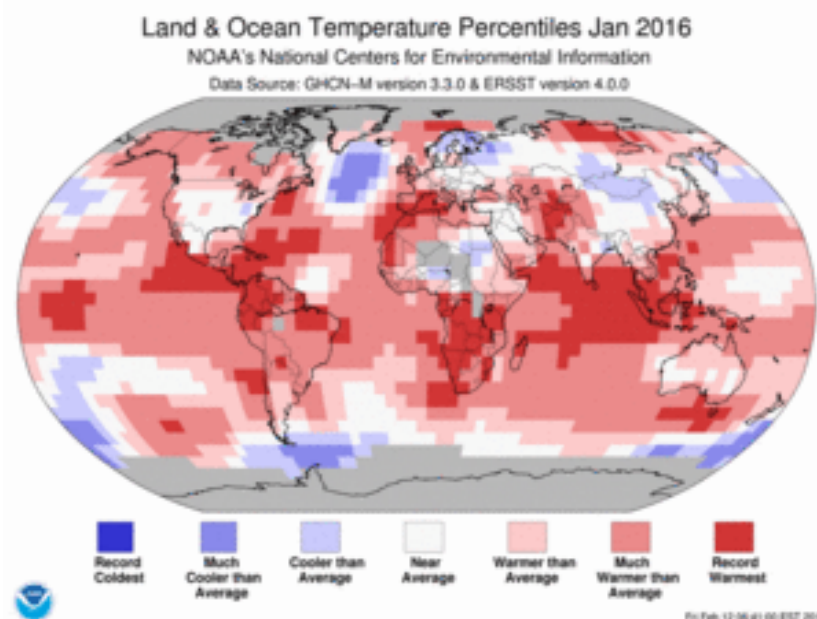
This visualization illustrates Earth's long-term warming trend, showing temperature changes from 1880 to 2015 as a rolling five-year average. Orange colours represent temperatures that are warmer than the 1951-80 baseline average, and blues represent temperatures cooler than the baseline. Credits: GSFC Scientific Visualization Studio

Phenomena such as El Niño or La Niña, which warm or cool the tropical Pacific Ocean, can contribute to short-term variations in global average temperature. A warming El Niño was in effect for most of 2015. But NOAA consider that last year's temperatures had an assist from El Niño, but it is the cumulative effect of the long-term trend that has resulted in the record warming that we are seeing in 2015

Weather dynamics often affect regional temperatures, so not every region on Earth experienced record average temperatures last year. For example, NASA and NOAA found that the 2015 annual mean temperature for the contiguous 48 United States was the second warmest on record. On 3 March, it was reported that the average temperature of the world's Northern Hemisphere breached the 2 degrees Celsius above "normal" mark for the first time in recorded history⁵.

The NOAA has since reported than January 2016 was the hottest January on record and to add to that the previous three months have been the most unusually warm three-month period on record as well, according to new findings from NASA. See: <https://www.ncdc.noaa.gov/sotc/global/201601> for more detail

⁵ <http://neurope.eu/article/average-temperatures-across-northern-hemisphere-breach-2-degrees-celsius-limit/>



The NOAA report that: *“The January 2016 globally-averaged temperature across land and ocean surfaces was 1.04°C above the 20th century average of 12.0°C (53.6°F), the highest for January in the 137-year period of record, breaking the previous record of 2007 by 0.16°C (0.29°F). This departure from average is the second highest among all months in the historical record, second only to December 2015, which was 1.11°C (2.00°F) above average. These two months are the only two to-date to surpass a monthly temperature departure of 1°C. January 2016 also marks the ninth consecutive month that the monthly temperature record has been broken and the 14th consecutive month (since December 2014) that the monthly global temperature ranked among the three warmest for its respective month.*

For February the pattern continues and NOAA reported that:

The globally averaged temperature over land and ocean surfaces for February 2015 was the second highest since record keeping began in 1880. Both the year-to-date (January–February) and seasonal (December–February) globally averaged temperatures were record high. See:

<https://www.ncdc.noaa.gov/sotc/summary-info/global/201502>.

In Summary

The NOAA data and data sets are excellent tools for informing us on the impacts of human induced climate change. Unfortunately it seems that 2015 and now 2016 are setting the sort of records that should cause serious concerns for politicians and individuals alike of the effect of human induced climate change. This data to me compelling and beyond reasonable doubt. Climate Change is real, it's our fault and we need to do something about it urgently.

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16/03/2016