

After record 2015, a dire warning for our climate future



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Tuesday, March 22, 2016, 4:19 PM - Just in time for World Meteorological Day 2016, 2015 is flagged for the numerous climate records that were shattered during the year, and a widely-debated study led by climate scientist James Hansen is warning that we may be on the verge of an era of dangerous sea level rise and superstorms due to climate change.

"Hotter, drier, wetter. Face the future."

REVELATIONS 16:8-9

And the fourth angel poured out his vial upon the sun; and power was given unto him to scorch men with fire. And men were scorched with great heat, and blasphemed the name of God, which hath power over these plagues: and they repented not to give him glory.

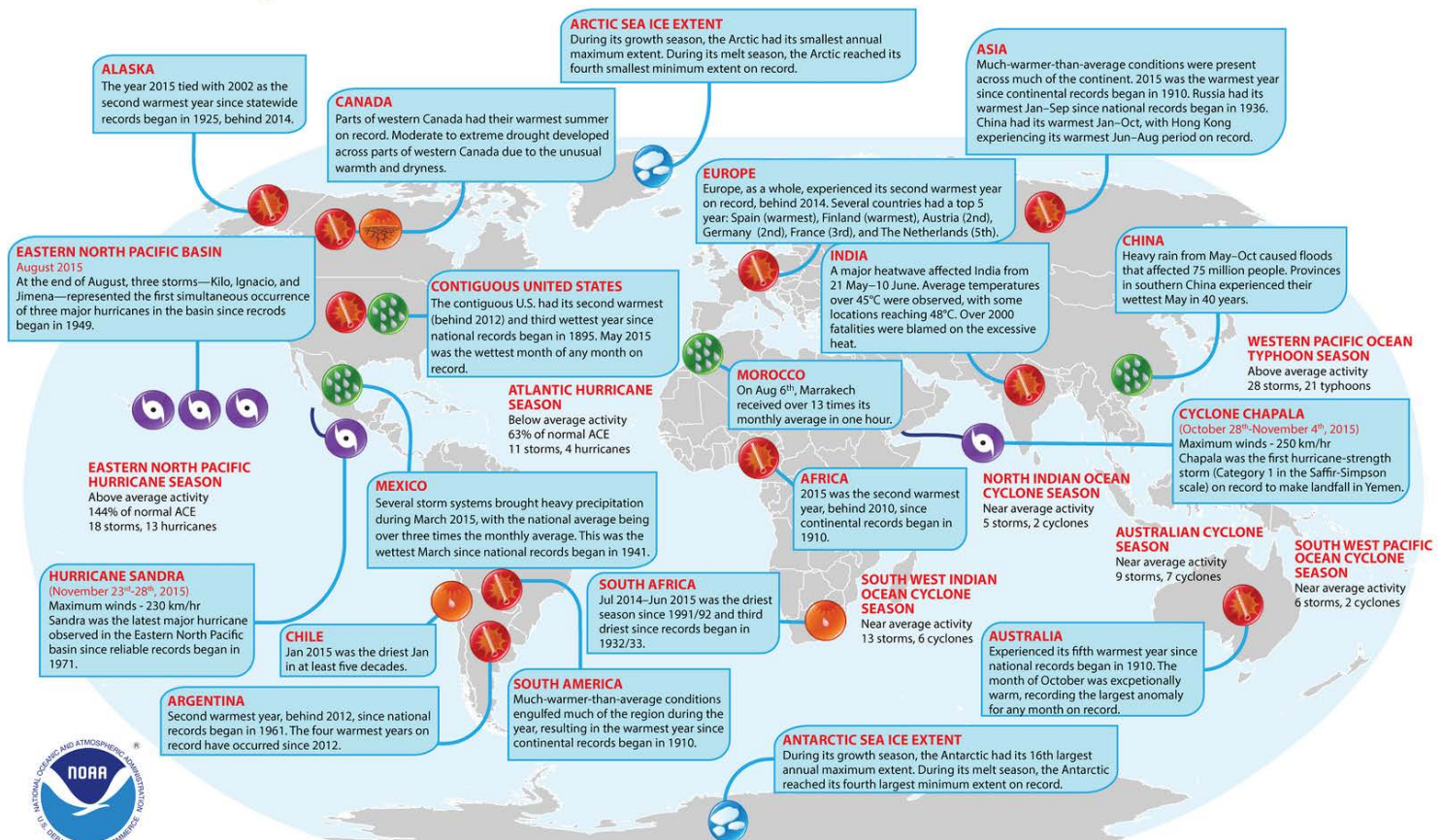
In their latest Status of the Climate report, the World Meteorological Organization (WMO) is setting the tone for this year's World Meteorological Day, which is on Wednesday, March 23.

"The future is happening now," Petteri Taalas, the WMO Secretary-General, said in a press release on Monday. "The alarming rate of change we are now witnessing in our climate as a result of greenhouse gas emissions is unprecedented in modern records."

To punctuate those statements, the report lays the cards on the table, one by one.

- The global average temperature for the year was about 0.76°C above the 1961–1990 average*, the highest on record so far. This is approximately 1°C above the 1850–1900 average, which is halfway towards the current target set by the Paris Climate Agreement
- Global ocean heat content was record high through both the upper 700 m and 2,000 m levels
- Arctic sea ice winter maximum for 2015 was the lowest on record, and the September minimum was the fourth lowest on record
- Intense heat waves were experienced in India and Pakistan, and in western and central Europe. Asia and South America had their hottest year on record. Northwestern United States and western Canada had their most intense wildfire seasons ever
- While global precipitation was near average across the year, it fell in many extremes, with some 24-hour totals exceeding the normal monthly rainfall amount for the region
- Southern Africa, northern South America, Central America and the Caribbean were affected by severe droughts, with southern Africa experiencing the most severe drought the region has seen since 1933

Selected Significant Climate Anomalies and Events in 2015



Please Note: Material provided in this map was compiled from NOAA's NCEI State of the Climate Reports and the WMO Provisional Status of the Climate in 2015. For more information please visit: <http://www.nccdc.noaa.gov/sotc>

Credit: NOAA National Climate Data Center

Besides the effects of human-enhanced climate change, El Niño played its roll as well, according to the report, causing the central and eastern equatorial Pacific Ocean to be much warmer than normal for the year. This excess heat helped to spawn tropical cyclones like Pam, which devastated Vanuatu as the equivalent of a

Category 5 hurricane, and Patricia, which was classified as the strongest hurricane ever recorded in either the eastern North Pacific or Atlantic hurricane basins. Regions of western and central South America, as well as the southern United States and Mexico, were wetter than normal, while the record-tying pattern was also behind the devastating forest fires that ravaged Indonesia last year.

"Today the Earth is already 1°C hotter than at the start of the twentieth century," Mr. Taalas said in the statement. "We are halfway to the critical 2°C threshold. National climate change plans adopted so far may not be enough to avoid a temperature rise of 3°C, but we can avert the worst-case scenarios with urgent and far-reaching measures to cut carbon dioxide emissions."

**While NASA uses the 1951-1980 average for comparison and NOAA currently uses the 1981-2010 average, the WMO uses the 1961-1990 average for their comparisons. The average used for comparison produces different values for each list of records, however each record shows the same trend in global temperatures due to climate change.*

Even a 2°C threshold may be dangerous

Leading up to the [Paris Conference on Climate Change](#) last year, a movement surfaced among several island nations to push for a 1.5°C warming limit on climate change, rather than the standard 2°C that had been the focus thus far. The idea behind this movement was that sea level rise from a 2°C rise in global temperatures would still be very dangerous for these island nations, and conference participants decided to take a serious look at this new limit, and agreed to make serious efforts to reach it.

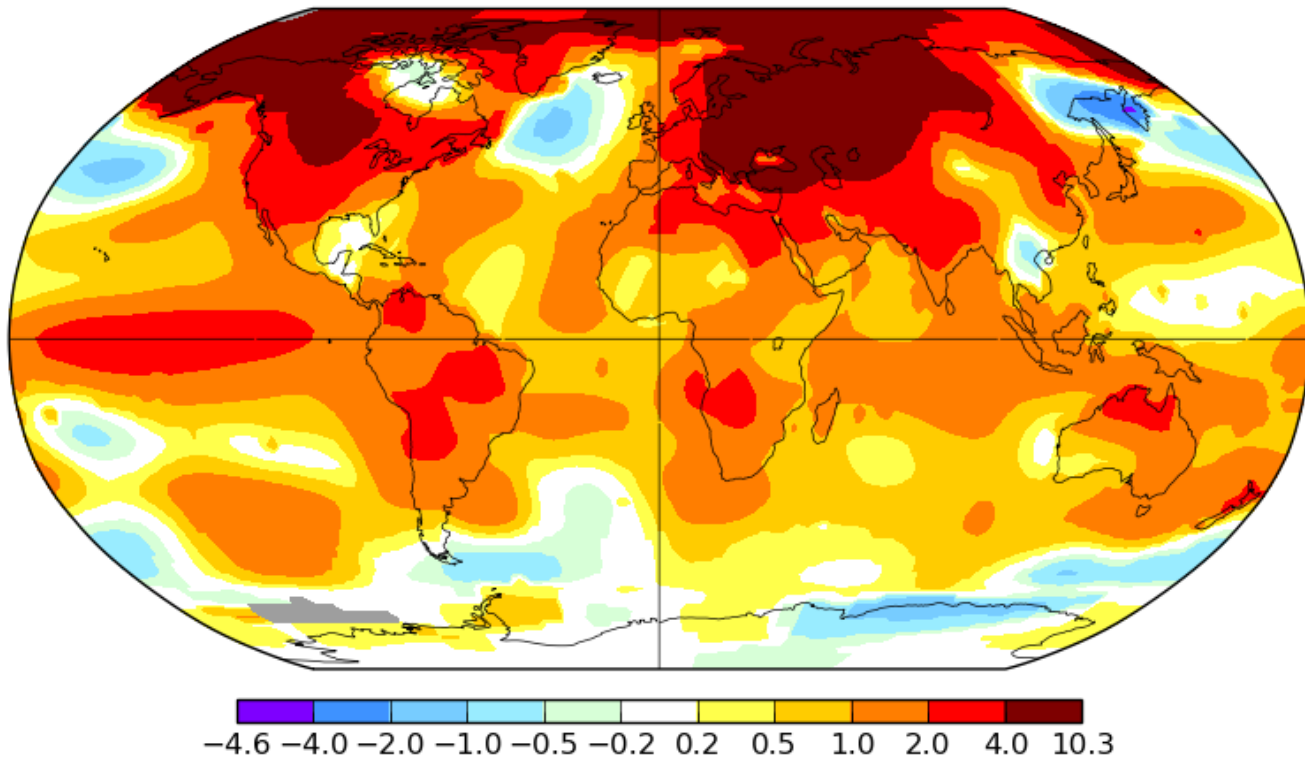
While nothing has come of this yet, a newly published study led by climate scientist James Hansen is warning that a 2°C rise for the globe represents a danger for *everyone*.

The report, titled *Ice melt, sea level rise and superstorms: evidence from paleoclimate data, climate modeling, and modern observations that 2°C global warming could be dangerous*, has been openly debated since it appeared online in July 2015, and was officially accepted by the European Geosciences Union's *Journal of Atmospheric Chemistry and Physics* for publication on Tuesday.

In the paper, Hansen and his colleagues examined the climate towards the end of the Eemian interglacial period (which took place 130,000-115,000 years ago). Due to natural increases in greenhouse gases in the atmosphere, this period had an estimated global temperature that was slightly warmer than current times, and sea level heights towards the end of the period that were between 6-9 metres above where they currently are. The researchers found that some of the extreme events which have been preserved in the geological record from that time are best explained by extreme superstorms. One example, the massive boulders sitting on the beach in Eleuthera, Bahamas. Thought by some to be the result of a massive tsunami, Hansen and his colleagues concluded that a more likely scenario was that these boulders were dredged up from the ocean floor and flung up onto land by colossal waves produced by a string of ancient megastorms.

What is the source of these megastorms? As Hansen explains in the video below, we may be witness to it now, as we observe the ice melt from Greenland and Antarctica, and the potential impacts this may have on ocean circulations - specifically the Atlantic meridional overturning circulation (AMOC) and the Southern Ocean meridional overturning circulation (SMOC).

As the following NASA map of February 2016 temperatures anomalies shows, while warmer-than-normal conditions prevail over most of the globe, there are conspicuous colder-than-normal spots south of Greenland, off the coast of eastern Siberia and in coastal waters surrounding Antarctica.



Credit: NASA Goddard Space Flight Center

The northern cold spots are particularly noticeable, given that they are colder than normal even during [the warmest northern winter on record](#). The cold regions off of East Antarctica and the Antarctic Peninsula are occurring during the southern summer, but still stand out. Based on this, we may be seeing the same conditions that developed in the late Eemian period, although forced to happen much more rapidly now due to human-enhanced climate change. If the evidence of higher sea levels and severe superstorms during the Eemian period holds true, this could represent a grave danger for our future.

"There is a possibility, a real danger, that we will hand young people and future generations a climate system that is practically out of their control," the researchers concluded.

Although now published, there is still some debate surrounding this study, even from fellow climate scientists. This is normal in the scientific community, as Hansen noted in the video above, since "skepticism is the lifeblood of science."

In an email to The Weather Network, climate scientist Michael E. Mann, the director of Penn State's Earth System Science Center, brought up a few persistent issues that he has with the now-published paper.

Although Hansen has written previously about the possibility of an exponential rate of melting for Greenland's glaciers, according to Mann, the use of that kind of melt rate in this new study is not supported by current observations from Greenland.

This new study hints at large scale cooling of the North Atlantic and beyond from a slowdown or collapse of the AMOC, however, a paper published roughly a year ago by Mann and his colleagues, which also [discussed the potential impacts of Greenland meltwater on the AMOC](#), showed only localized regions of cooling in the North Atlantic.

"My view is that their model's AMOC is probably too sensitive to changes in freshwater because their ocean model is too coarse in resolution to capture key wind-driven current systems like the Gulf Stream, which would persist even if the AMOC were to slowdown or collapse," Mann said.

These issues do not mean that Mann completely dismisses either the study or its implications, though, and neither should we. In his discussion of the work, he pointed out a very important aspect of it.

"Recent work suggests that the West Antarctic ice sheet may be more sensitive to warming than originally estimated, and that ice sheet could potentially collapse fairly rapidly, adding substantially (i.e. 10-14 feet) to sea level rise," he said, confirming that higher rates of melting are possible for these ice sheets.

"Just how quickly that can play out is subject to quite a bit of uncertainty and debate, but we shouldn't rule out the low probability/high cost scenarios," he added, "and [this study] is a useful contribution in depicting just such a scenario, even if all of the details might not be quite right."

Sources: [WMO](#) | [WMO \(pdf\)](#) | [Hansen et al.](#) | [NASA Goddard](#)