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## **Global Temperature Report: March 2020**

Global climate trend since Dec. 1 1978: +0.135 C per decade

### **March Temperatures (preliminary)**

Global composite temp.: +0.48 C (+0.86 °F) above seasonal average

Northern Hemisphere: +0.61 C (+1.10 °F) above seasonal average

Southern Hemisphere: +0.34 C (+0.61 °F) above seasonal average

Tropics: +0.63 C (+1.13°F) above seasonal average

### **February Temperatures (Final)**

Global composite temp.: +0.76 C (+1.40 °F) above seasonal average

Northern Hemisphere: +0.96 C (+1.73 °F) above seasonal average

Southern Hemisphere: +0.55 C (+0.99 °F) above seasonal average

Tropics: +0.76 C (+1.40°F) above seasonal average

### **Notes on data released April 2, 2020 (v6.0)**

Seasonally-adjusted temperatures for virtually all regions of the globe dropped relative to those of February. The global average departure for March of +0.48 °C (+0.86°F) was down 0.28°C (0.50°F) from last month. Though month-to-month changes such as this are not rare (there have been 20 occasions with month-to-month changes greater than 0.25 °C) we suggest that the drop is due in part to the cooling of the central Pacific Ocean. Recall that

in the latter months of 2019, a weak, warm El Niño-like event occurred which aided in warming up the atmosphere for a few months but that impact appears to be fading.

The region with the coolest departure from average was the north polar cap (60°N to pole) with an anomaly of -0.72°C (-1.30 °F). This region is characterized by high variability with departures exceeding 2°C (3.6 °F) at times, but this is the coolest departure since December 2004 (-1.07 C, -1.93 °F) and coolest March since 1994. Note that this region has experienced the warmest 42-year trend of any region in the globe (+0.25 °C/decade), which is why a negative departure of this magnitude hasn't occurred in several years.

Bucking the decline in seasonally-adjusted temperatures from February, the conterminous U.S. experienced an increase to +1.09°C (+1.96°F) versus February. Alaska was near average, so that the 49-state mean temperature departure was almost the same as the 48-state value at +1.06°C (+1.91°F). The warmest March in the 49-state average was in 2012 (+1.76°C +3.17°F). [We don't include Hawaii in the US results because its land area is less than that of a satellite grid square, so it would have virtually no impact on the overall national results.]

Globally, locations with sustained much-warmer-than-average temperatures for the month were found in the northern mid-latitudes, especially over the entire north Pacific Ocean extending westward through western Russia. The warmest grid was sited, unusually over the north Pacific Ocean south of the Aleutian chain at +5.1°C (+9.2F). Usually, the extreme temperatures occur over land. The southeastern US, Argentina and southeastern Pacific Ocean were also warm.

The coldest departures for the season occurred, as they did in the previous two months, over northern North America and Greenland. The coldest grid landed in northern Greenland with a departure of -5.4°C (-9.7°F). Other cooler than average areas were off the US west coast, Eastern Antarctica, and northern India and Pakistan.

For the second month in a row, the lower stratosphere (+0.32°C) was warmer than it has been since 1993 when the Mt. Pinatubo volcanic eruption in 1991 warmed the stratosphere for several months. The extra warmth may be related to the aerosols from the earlier Australian fires that found their way into the stratosphere. Once there, they act to warm the air through absorption of solar energy and by acting as a sponge to absorb radiative thermal energy emitted from below. To the extent that these aerosols are warming the stratosphere and that they are present due to the fires caused mainly by humans (authorities estimate at least 80%, most through carelessness), then we can say humans have likely caused a detectable impact on the climate of the stratosphere.

**Spoiler Alert first published March 2019:** As noted over the past several months in this report, the drifting of satellites NOAA-18 and NOAA-19, whose temperature errors were somewhat compensating each other, will be addressed in this updated version of data

released from March 2019 onward. As we normally do in these situations we have decided to terminate ingestion of NOAA-18 observations as of 1 Jan 2017 because the corrections for its significant drift were no longer applicable. We have also applied the drift corrections for NOAA-19 now that it has started to drift far enough from its previous rather stable orbit. These actions will eliminate extra warming from NOAA-18 and extra cooling from NOAA-19. The net effect is to introduce slight changes from 2009 forward (when NOAA-19 began) with the largest impact on annual, global anomalies in 2017 of 0.02 °C. The 2018 global anomaly changed by only 0.003°C, from +0.228°C to +0.225°C. These changes reduce the global trend by -0.0007 °C/decade (i.e. 7 ten-thousandths of a degree) and therefore does not affect the conclusions one might draw from the dataset. The v6.0 methodology is unchanged as we normally stop ingesting satellites as they age and apply the v6.0 diurnal corrections as they drift.

**To-Do List:** There has been a delay in our ability to utilize and merge the new generation of microwave sensors (ATMS) on the NPP and JPSS satellites. As of now, the calibration equations applied by the agency have changed at least twice, so that the data stream contains inhomogeneities which obviously impact the type of measurements we seek. We are hoping this is resolved soon with a dataset that is built with a single, consistent set of calibration equations. In addition, the current non-drifting satellite operated by the Europeans, MetOP-B, has not yet been adjusted or “neutralized” for its seasonal peculiarities related to its unique equatorial crossing time (0930). While these MetOP-B peculiarities do not affect the long-term global trend, they do introduce error within a particular year in specific locations over land.

As part of an ongoing joint project between UAH, NOAA and NASA, Christy and Dr. Roy Spencer, an ESSC principal scientist, use data gathered by advanced microwave sounding units on NOAA, NASA and European satellites to produce temperature readings for almost all regions of the Earth. This includes remote desert, ocean and rain forest areas where reliable climate data are not otherwise available. Research Associate Rob Junod assists in the preparation of these reports.

The satellite-based instruments measure the temperature of the atmosphere from the surface up to an altitude of about eight kilometers above sea level. Once the monthly temperature data are collected and processed, they are placed in a "public" computer file for immediate access by atmospheric scientists in the U.S. and abroad.

The complete version 6 lower troposphere dataset is available here:

[http://www.nsstc.uah.edu/data/msu/v6.0/tlt/uahncdc\\_lt\\_6.0.txt](http://www.nsstc.uah.edu/data/msu/v6.0/tlt/uahncdc_lt_6.0.txt)

Archived color maps of local temperature anomalies are available on-line at:

<http://nsstc.uah.edu/climate/>

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