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Global Temperature Report: November 2018 – 40 Years and Counting

Global climate trend since Dec. 1 1978: +0.13 C per decade

November Temperatures (preliminary)

Global composite temp.: +0.28 C (+0.50 °F) above seasonal average

Northern Hemisphere.: +0.27 C (+0.49°F) above seasonal average

Southern Hemisphere.: +0.29 C (+0.52 °F) above seasonal average

Tropics.: +0.50 C (+0.90 °F) above seasonal average

October Temperatures (final v6.0)

Global composite temp.: +0.22 C (+0.40 °F) above seasonal average

Northern Hemisphere.: +0.31 C (+0.56°F) above seasonal average

Southern Hemisphere.: +0.12 C (+0.22 °F) above seasonal average

Tropics.: +0.34 C (+0.61 °F) above seasonal average

Notes on data released December 1, 2018 (v6.0) – 40 Years of Satellite Data now complete.

The global average bulk-layer atmospheric temperature rose slightly in November to +0.28°C (+0.50°F) led by warming in the tropics. Once again the greatest contrast in temperatures occurred in the high northern latitudes with the warmest seasonally-adjusted temperature over the east coast of Sweden (+4.5°C, +8.1°F) and the coolest over the upper Peninsula of Michigan at -3.2 °C (-5.8°F).

This marks the 480th month of continuous deep-layer temperature monitoring by microwave instruments. That's 40 years of providing temperatures from polar orbiting, operational satellites since the first full month of December 1978. The first publication of our methods came in the March 1990 issue of *Science Magazine* and since then we and others have published dozens of papers both on improving the methodology and on understanding the science of the climate system.

Scandinavia and Alaska were well above normal this month contrasting with the eastern US, eastern Canada and northern Russia being much below average. The conterminous US was well below average (-1.12 °C, -2.02 °F) the coolest seasonally adjusted temperature since Feb 2010 and the coolest Nov since 2000.

The evidence for an approaching warm phase of El Niño continues to get stronger according to NOAA, as the equatorial Pacific sea temperatures, both surface and deeper down, are now well above average. A good portion of the extra heat should make its way to the atmosphere in the coming months. As this occurs, we should see considerable tropical warming in the atmospheric layer the satellites monitor. The tropical air has already warmed to +0.50 °C above average, about what it was before the major 2015-16 El Niño at this time of year, but NOAA is not expecting such a huge event this time. We already see large regions in the Pacific with above average atmospheric temperatures on either side of the Equator – the normal signal of an El Niño.

Spoiler Alert (Repeated from October Report): Well, the time is once again approaching when new changes are required for the currently operating satellites as their performance changes with age. NOAA-18 has been operating for 13 years and is now past its time frame for accurate diurnal adjustments based on initial drifting, meaning the adjustments are adding spurious warming to the time series. On the other hand, NOAA-19 has also drifted so far that it too is introducing an error, but given its direction of drift, these errors are of the opposite sign. The two satellites are almost compensating for each other, but not to our satisfaction. In addition, the current non-drifting satellite operated by the Europeans, MetOP-B, has not yet been adjusted or "neutralized" for it's seasonal peculiarities related to the diurnal cycle. 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. So, all in all, we anticipate generating new adjustments for NOAA-18 and NOAA-19 to account for their behavior of late and shall also modify MetOP-B to account for it's unique seasonal cycle. This will be part of a coordinated plan to eventually merge NOAA's new microwave sensor (ATMS) carried on Suomi NPP and the new NOAA series JPSS. We are hoping that NOAA-19 will be the last spacecraft for which drifting adjustments will be required as the newer satellites (MetOP, NPP, JPSS) have on-board propulsion to keep them in stable orbits. With so many new items to test and then incorporate, we are waiting until we are confident that these adjustments/additions are

appropriately stable before moving to the next version. In the meantime, we shall continue to produce v6.0.

As part of an ongoing joint project between UAH, NOAA and NASA, Christy, Dr. Roy Spencer, an ESSC principal scientist, Dr. W. Daniel Braswell (UAH Research Scientist), and PhD candidate Robert Junod use data gathered by advanced microwave sounding units on NOAA, NASA and European satellites to get accurate 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.

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

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

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

Neither Christy nor Spencer receives any research support from oil, coal or industrial companies or organizations, or from any private or special interest groups. All of their climate research funding comes from federal and state grants or contracts.

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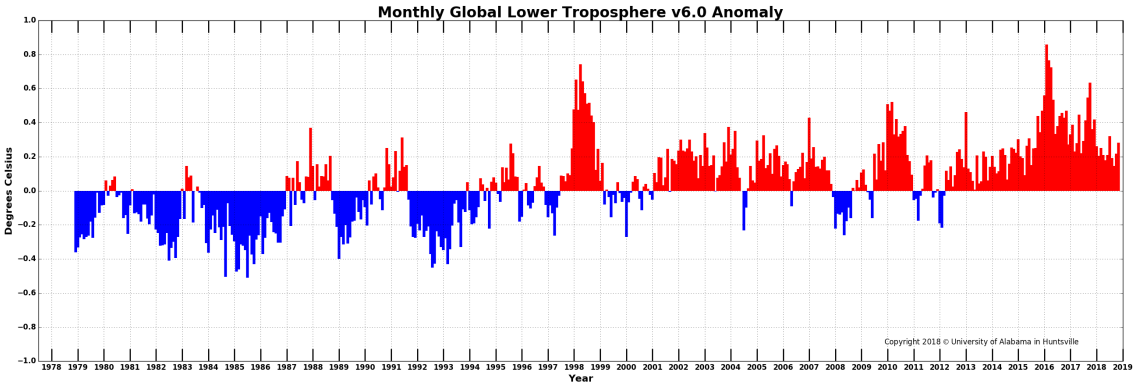
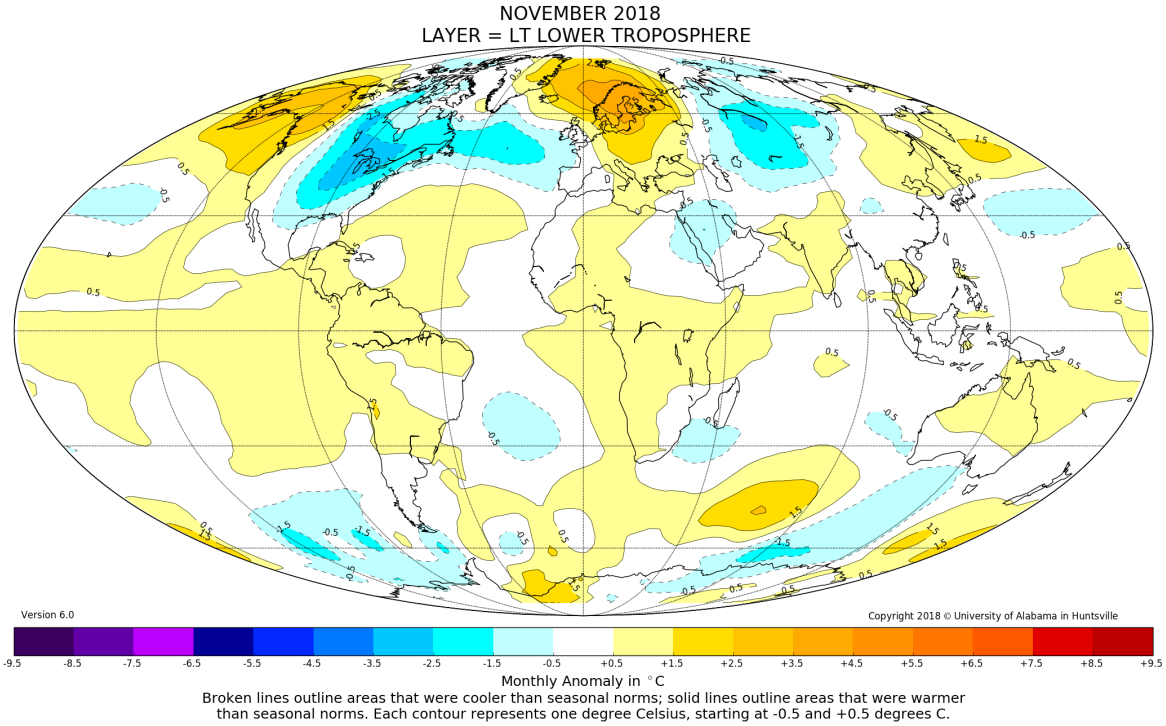


December 1978 to November 2018



Broken lines outline areas that were cooler than seasonal norms; solid lines outline areas that were warmer than seasonal norms. Each contour represents one degree Celsius, starting at -0.5 and +0.5 degrees C.