02 Dec 2023

Vol. 34, No. 8

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Global Temperature Report: November 2023

Global climate trend since Dec. 1 1978: +0.14 C per decade [see note at end]

November Temperatures (preliminary)

Global composite temp: +0.91 C (+1.64°F) above the seasonal average

Northern Hemisphere: +1.01 C (+1.82°F) above seasonal average

Southern Hemisphere: +0.82 C (+1.48°F) above seasonal average

Tropics: +1.03 C (+1.85°F) above seasonal average

October Temperatures (Final)

Global composite temp: +0.93 C (+1.67°F) above the seasonal average

Northern Hemisphere: +1.02 C (+1.84°F) above seasonal average

Southern Hemisphere: +0.83 C (+1.49°F) above seasonal average

Tropics: +1.00 C (+1.80°F) above seasonal average

Notes on data released December 2, 2023 (v6.0, with 1991-2020 reference base)

[Please note that we provide these data out of our own initiative, and are only able to produce these updates at times convenient to our working schedules.]

The global atmospheric temperature anomaly remained at essentially the same level in November as in October coming in at +0.91°C (+1.64°F) above the 30-year average, setting another individual monthly anomaly record for the 45-year satellite era. This marks four months in a row that the previous monthly temperature record was superseded as the current El Niño

came on in force earlier than is typical. Though the tropics this month were warmer than any other November, the early-year records for months of Jan to Apr still are hotter or are tied with the November record for the largest departures from average in this equatorial belt. But that could change as the next few months unfold.

In terms of absolute temperature, November's global value of 264.32K was cooler than each of the last six months (July hit 266.06K) simply because those months are naturally warmer as the global temperature is warmest in July and coolest in January. The tropics have a different pattern with the warmest month being April and coolest in July on average, so that the current November tropical warmth of 274.32K (anomaly of +1.03 K) is slightly cooler than the warmest month of 274.79 (April 1998), but is warmest for 2023 so far. These warmer-than-average (and record) global atmospheric temperatures are expected to continue with the ongoing El Niño event through at least the boreal winter in 2024 since the tropical Pacific seawater temperatures are still warmer than average, especially for this time of year, though the tropical water temperatures appeared to have leveled off in the past three months. See NOAA's excellent updates here. https://www.cpc.ncep.noaa.gov/products/analysis_monitoring/lanina/enso_evolution-status-fcsts-web.pdf.

A continuing and interesting question at this point is, "When will this El Niño's warming influence peak?" Since it began 4-5 months earlier than usual, will it peak earlier as well, or will it continue to maintain its strength until the typical peak in Feb-Apr? We will have to wait and see.

The planet's warmest spot in November occurred over northern Kazakhstan at +4.4 °C (+7.9°F) which was the center of a large warm region extending from NW Africa to Siberia. Warmer than average conditions were pervasive in the tropical belt with additional exceptionally warm regions in central South America, southern Africa, western Canada and the far south Indian Ocean.

With a reading of -2.9°C (-5.3°F), the coolest departure from average could be found off the coast of eastern Antarctica. Cooler than average regions were few and far between but included northern Europe, southeastern Canada and portions of Antarctica and the South Pacific.

The conterminous US was above average at +0.65°C (+1.17°F), with modestly warm temperatures over most of the land. Alaska was a little warmer than the lower 48, so with Alaska, the 49-state average was +0.75 °C (+1.35°F). [We don't include Hawaii in the US results because its land area is less than that of one satellite grid square, so it would have virtually no impact on the overall national results.]

A note about the global temperature trend. For several years now, the trend has been extremely close to +0.135 °C/decade. This past July, the threshold of 0.135 was crossed at +0.1352 °C/decade. The global trend is now +0.14 °C/decade by rounding up.

*In the July 2023 GTR we reported the February 2016 anomaly as +0.70 °C. As the intercalibrations between satellites are recalculated with each month's new data, there is the

possibility of tiny changes in the base annual cycle (< 0.01 °C), and thus the anomalies calculated therefrom. This is the reason for the February 2016 value being +0.71 °C this month.

Background notes.

New Reference Base Jan 2021 and forward. As noted in the Jan 2021 GTR, the situation comes around every 10 years when the reference period or "30-year normal" that we use to calculate the departures is redefined. With that, we have averaged the absolute temperatures over the period 1991-2020, in accordance with the World Meteorological Organization's guidelines, and use this as the new base period. This allows the anomalies to relate more closely to the experience of the average person, i.e. the climate of the last 30 years. Due to the rising trend of global and regional temperatures, the new normals are a little warmer than before, i.e. the global average temperature for Januaries for 1991-2020 is 0.14 °C warmer than the average for Januaries during 1981-2010. So, the new departures from this now warmer average will appear to be cooler, but this is an artifact of simply applying a new base period. It is important to remember that changes over time periods, such as a trend value or the relative difference of one year to the next, will not change. Think about it this way, all we've done is to take the *entire* time series and shifted it down a little.

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. Drs. Danny Braswell and Rob Junod assist 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

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 or funding 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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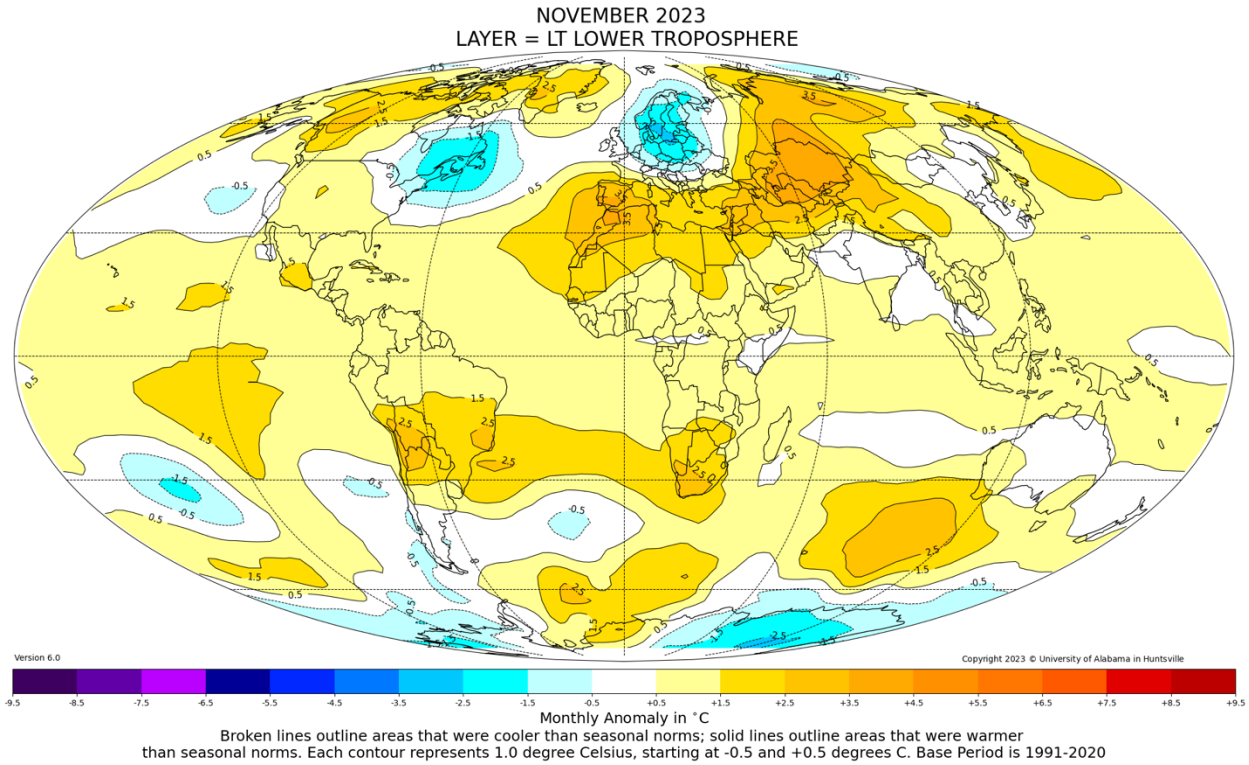

Figure. Lower tropospheric temperature anomalies for November 2023

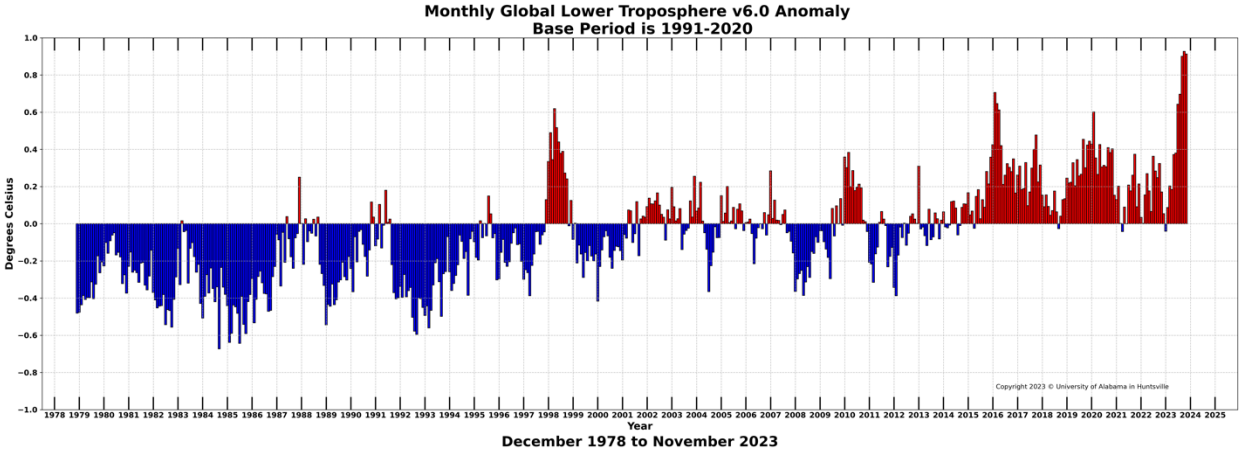

Figure. Bar chart of global monthly lower tropospheric temperature anomalies.