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Global Temperature Report: October 2023

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

October Temperatures (preliminary)

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

September Temperatures (final)

Global composite temp: +0.90 C (+1.62°F) above the seasonal average

Northern Hemisphere: +0.94 C (+1.69°F) above seasonal average

Southern Hemisphere: +0.86 C (+1.55°F) above seasonal average

Tropics: +0.93 C (+1.67°F) above seasonal average

Notes on data released November 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 increased slightly in October from the record value observed in September to +0.93°C (+1.67°F) above the 30-year average, setting a new anomaly record for the 45-year satellite era. This marks three months in a row that the previous monthly temperature record was superseded as the current El Niño came on in force earlier than is typical,

warming up the atmosphere in these mid-year (and already warm) months. Though the tropics this month were warmer than any other October, the early-year months of Jan-Apr still hold the records for the largest departures from average in this equatorial belt. Besides the global record for departure from average, this month produced record departures for all months for several regional areas such as the global oceans, NH land, SH oceans, tropical land, and more.

In terms of absolute temperature, October's global value of 264.87K was cooler than the last three 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 October tropical warmth of 274.23K (anomaly of +1.00 K) is slightly cooler than the warmest month of 274.79 (April 1998). These very warm 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 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 the El Niño and its 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 October occurred over western Bolivia at +4.1 °C (+7.5°F) which was the center of a large warm region in central South America. Warmer than average conditions were pervasive in the tropical belt with exceptionally warm regions in southern Europe, northern North America, and the far south Atlantic.

With a reading of -2.5°C (-4.6°F), the coolest departure from average could be found off the coast of the Antarctic Peninsula. Cooler than average regions were few and far between but included Scandinavia, Japan and additional portions of Antarctica.

The conterminous US was above average at +0.99°C (+1.78°F), with the Southwest being the warmest area. Alaska was warmer than the lower 48, so with Alaska, the 49-state average was +1.12 °C (+2.02°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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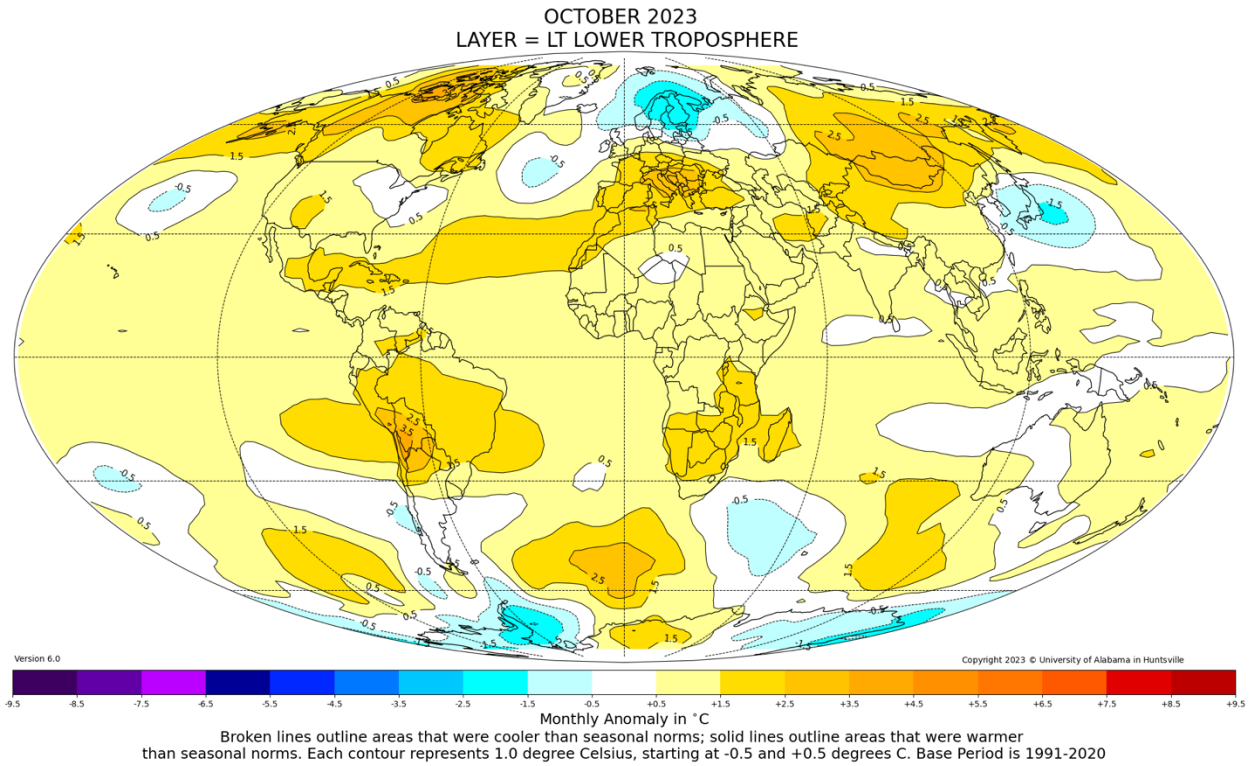

Figure. Lower tropospheric temperature anomalies for October 2023

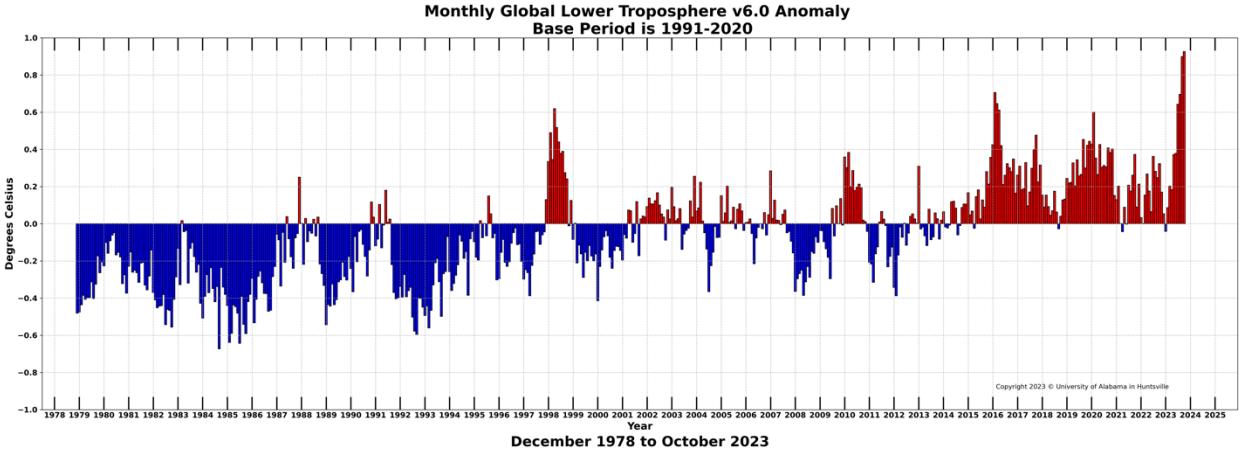

Figure. Bar chart of global monthly lower tropospheric temperature anomalies.