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For Additional Information:
Dr. John Christy, (256) 961-7763
christy@nsstc.uah.edu
Dr. Roy Spencer, (256) 961-7960
spencer@nsstc.uah.edu

Global Temperature Report: May 2023

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

May Temperatures (preliminary)

Global composite temp: +0.37 C (+0.67°F) above the seasonal average

Northern Hemisphere: +0.30 C (+0.54°F) above seasonal average

Southern Hemisphere: +0.44 C (+0.79°F) above seasonal average

Tropics: +0.38 C (+0.68°F) above seasonal average

April Temperatures (final)

Global composite temp: +0.18 C (+0.32°F) above the seasonal average

Northern Hemisphere: +0.11 C (+0.20 °F) above seasonal average

Southern Hemisphere: +0.25 C (+0.45 °F) above seasonal average

Tropics: -0.03 °C (-0.05°F) below seasonal average

Notes on data released June 13, 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 in May jumped 0.18°C from April due to a rapid warming in the tropical belt. In the tropics, the April departure from average of -0.03°C rose to +0.39°C – one of the largest positive changes in tropical temperatures in the past 45 years. Two larger jumps occurred from Dec to Jan in major El Niño events of 1982-83 (+0.45°C) and

1997-98 (+0.54°C). While month-to-month shifts have a large natural variability component, this rise is consistent with the clear onset of El Niño or warm tropical Pacific conditions that began a couple of months ago.

What is unusual is that this jump occurred in May rather than during northern winter, and since the global atmosphere is naturally warmest in NH summer, one of the next couple of months could produce the warmest "absolute" temperature we've measured by satellite. At present the warmest absolute monthly temperature has been 265.80 K in July 1998. The current month's temperature for May 2023 is 264.82 K with July coming up with a "normal" temperature of 265.42 K. So, if the July anomaly is greater than +0.38 K then we will have a record hot global temperature.

The atmosphere takes about 2 to 5 months to reflect major changes in the tropical sea water temperatures, so we can expect generally rising air temperature anomalies from now through the boreal winter in 2024 since the tropical Pacific sea water temperatures are warming rapidly. The sea is expected to warm as NOAA has declared an El Niño Watch, indicating high confidence that a warm phase tropical Pacific event is in the near future. The latest on the evolution of La Niña and its anticipated diminishment in 2023 is provided by NOAA here:
https://www.cpc.ncep.noaa.gov/products/analysis_monitoring/lanina/enso_evolution-status-fcsts-web.pdf.

The planet's warmest spot in May occurred over the Northwest Territories in Canada with a departure from average of +5.8 °C (+10.5 °F). Warmer than average temperatures were felt over Canada, North Atlantic, NW Russia and the North Pacific. Africa and South America, particularly Argentina, with large regions over all southern oceans were especially warm.

With a reading of -2.9°C (-5.3°F) the coolest departure from average could be found over West Antarctica. Other cool regions were found from Australia southward. In the Northern Hemisphere it was cool from Hawaii northeastward to eastern North America, in the Mediterranean, central Asia and parts of the northern polar area.

The conterminous US was above average in the north and cooler than average in the south with an overall mean of a 48-state average of +0.57°C (+1.03°F). Alaska was essentially the same as that of the lower 48, so that with Alaska, the 49-state average was +0.56°C (+1.01°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.]

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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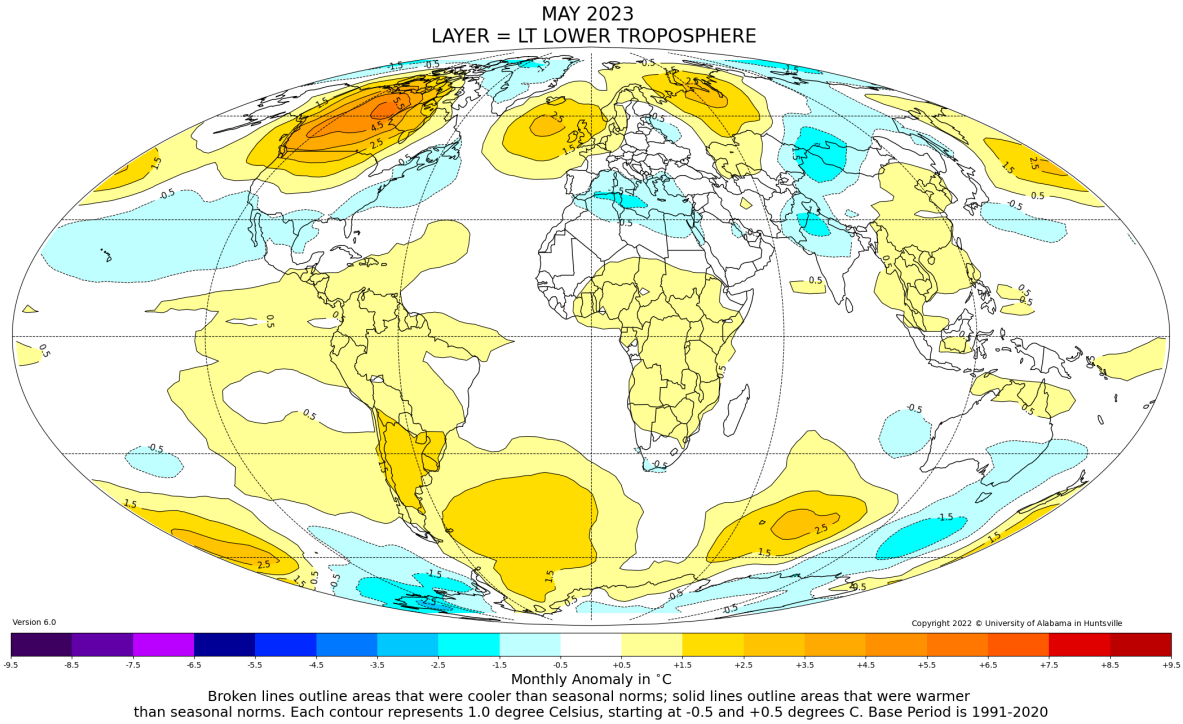

Figure. Lower tropospheric temperature anomalies for May 2023

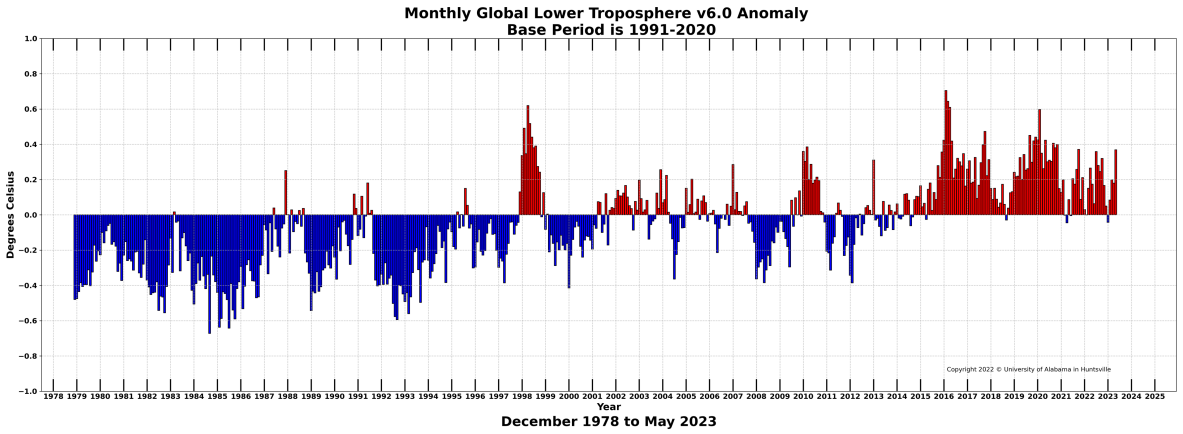

Figure. Bar chart of global monthly lower tropospheric temperature anomalies.