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Global Temperature Report: Mar 2023

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

March Temperatures (preliminary)

Global composite temp: +0.20 C (+0.36°F) above the seasonal average

Northern Hemisphere: +0.23 C (+0.41 °F) above seasonal average

Southern Hemisphere: +0.16 C +0.29 °F) above seasonal average

Tropics: -0.14 °C (-0.25°F) below seasonal average

February Temperatures (Final)

Global composite temp: +0.08 C (+0.14°F) above the seasonal average

Northern Hemisphere: +0.17 C (+0.31 °F) above seasonal average

Southern Hemisphere: -0.00 C (-0.00 °F) at seasonal average

Tropics: -0.11 °C (-0.20°F) below seasonal average

Notes on data released April 3, 2023 (v6.0, with 1991-2020 reference base)

The global atmospheric temperature in March increased again to +0.20 °C (0.36 °F) above the 30-year average. The tropics remained somewhat cool but the mid-latitudes of both hemispheres experienced an atmospheric warmer than in February. As noted last month, we are likely seeing the demise of the 3-year La Niña with this warming.

As noted last month, one key indicator of El Niño/La Niña status is the tropical ocean heat content which has now risen higher than seen in the past two years. As well, the surface water temperatures in the central tropical Pacific are now at or above normal. Indeed, most of the projections are calling for a warm-phase El Niño to arrive next winter. It is therefore possible to see a relatively wide swing from the cool tropical temperatures of the last three years to values much warmer. Additionally, while this long La Niña impacted tropical temperatures as expected, the rest of the planet, in particular the NH midlatitudes, remained fairly warm. So, going into a new El Niño may offer the opportunity for temperatures to rival those of the record high temperatures induced by the major El Niño seven years ago. 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 March occurred over SW Kazakhstan with a departure from average of +4.6 °C (+8.2 °F). A lengthy band of warmer-than-average temperatures stretched from the Canary Islands ENE through Kazakhstan to Northern Japan and even continued ENE to Greenland (see map). The southern Indian Ocean and far South Pacific were also warm.

With a reading of -5.1°C (-9.1°F) the coolest departure from average could be found over NW Utah in the US. This pocket of cold air settled over areas from California (with well-above-average snowfall) to central Canada. Cooler than average temperatures were also centered over the Norwegian Sea, offshore regions of far south Chile, over India and the subtropical North Pacific.

Due to the cold air over the western states the conterminous US averaged a substantial -1.44 °C (-2.60 °F) below average. A pattern with very cold air over the NW half of the country often leads to significant Eastern and Southeastern storminess which the nation has indeed experienced this spring. Alaska was a bit warmer than average, so adding in Alaska, the 49-state average rose to -1.14 °C -2.01°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/

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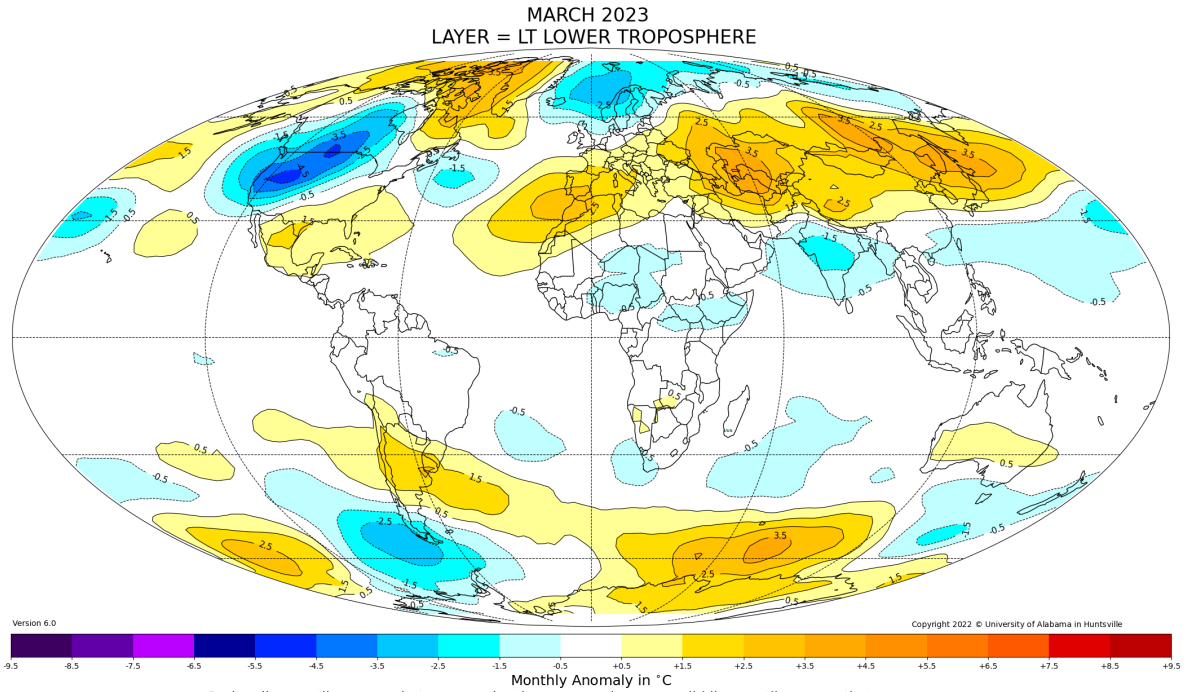

Figure. Lower tropospheric temperature anomalies for March 2023

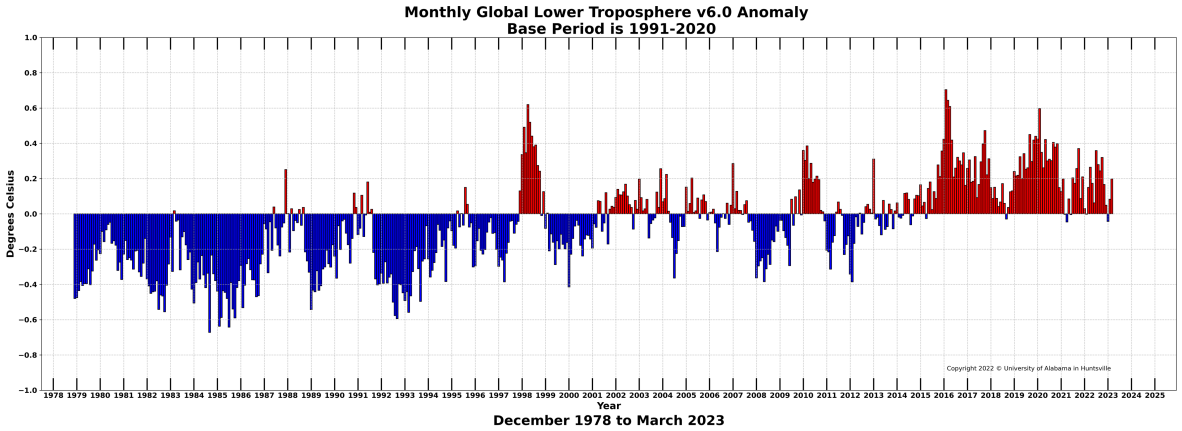

Figure. Bar chart of global monthly lower tropospheric temperature anomalies.