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Global Temperature Report: December 2024 with Version 6.1

Global climate trend since Dec. 1 1978: +0.15 C per decade

December Temperatures v6.1 (preliminary)

Global composite temp: +0.62 C (+1.12°F) above the seasonal average

Northern Hemisphere: +0.76 C (+1.37 °F) above seasonal average

Southern Hemisphere: +0.48 C (+0.86°F) above seasonal average

Tropics: +0.53 C (+0.95°F) above seasonal average

November Temperatures v6.1 (final)

Global composite temp: +0.64 C (+1.15°F) above the seasonal average

Northern Hemisphere: +0.88 C (+1.58 °F) above seasonal average

Southern Hemisphere: +0.41 C (+0.74°F) above seasonal average

Tropics: +0.53 C (+0.95°F) above seasonal average

Notes on data released January 4, 2025 Updated New Version 6.1

[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.]

December 2024 was very similar to November with a slight decrease in the NH temperature and a slight increase in the SH temperature, leaving the global average at +0.62 °C (+1.12 °F), only +0.02 °C cooler than the month before. For the calendar year, 2024 came in with a record high

temperature of +0.77 °C (+1.39 °F) which was considerably above 2023's record value of +0.43 °C (+0.77 °F). The El Niño of 2023-24 was the main cause of the excessive warmth, but the peak warmth of April 2024 faded irregularly and slowly so that the year as a whole was very warm. Note too that the warmest 12-month period was also experienced with +0.80 °C (+1.44 °F) for Oct 2023-Sep 2024. As well, the April 2024 global value of +0.94 °C (+1.69 °F) was the single warmest departure from the 30-year average for any month.

The annual map of anomalies indicates exceptional warmth in 2024 over central South America, NE Canada, Eastern Europe, and Himalayas, while most of the rest of the globe experienced modestly warmer-than-average values. The map of temperature trends from Dec 1978 to Dec 2024 indicates broad warming with the most rapid pace over most continental regions except areas around Antarctica.

As mentioned in the past few reports, the El Niño of 2023-24 has faded and cool La Niña conditions are becoming more evident, especially through December. If past experience holds, we should see further declines in the atmospheric temperature above the tropics in the months ahead. To see the latest on NOAA's La Niña Watch see: https://www.cpc.ncep.noaa.gov/products/analysis_monitoring/lanina/enso_evolution-status-fcsts-web.pdf.

The planet's warmest atmospheric temperature departure in December occurred over South central China with a value of +4.6 °C (+8.3 °F). Warm areas included the subtropical Pacific (North and South), Northeast Russia eastward to Canada and the western US.

With a reading of -2.3 °C (-4.1°F), the coolest departure from average was found over NW Greenland. This cooler-than-average region extended eastward to the Barents Sea. Patches of cooler temperatures were found over the subtropical North Atlantic, South Atlantic/Indian Oceans, Japan and Uzbekistan.

The conterminous US in December averaged +1.42 °C (+2.56°F). The warmth was. It was even warmer in Alaska, so the 49-state December average came in at +1.70 °C (+3.06°F). For the calendar year 2024, the conterminous US averaged +0.85 °C (+1.53 °F) and with Alaska almost the same at +0.81 °C (+1.46 °F), both regions being the warmest in 2024 over the satellite record. [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.]

Background notes.

New v6.1 due to termination of NOAA-19 inclusion in 2021 and adding METOP-C.

https://www.drroyspencer.com/2024/11/uah-global-temperature-update-for-october-2024-truncation-of-the-noaa-19-satellite-record/

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, but we are renewing our efforts as Dr. Braswell is now focused on this task. The delay is due to the incredibly slow rate at which the data may be accessed. 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. We have now added MetOP-C to replace the truncated data from NOAA-19.

Dr. 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. Dr. Danny Braswell has reconstituted the code which converts the satellite radiances to temperature values and Dr. Rob Junod assists with visuals 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 nine 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 6.1 lower troposphere dataset is available here:

http://www.nsstc.uah.edu/data/msu/v6.1/tlt/uahncdc_lt_6.1.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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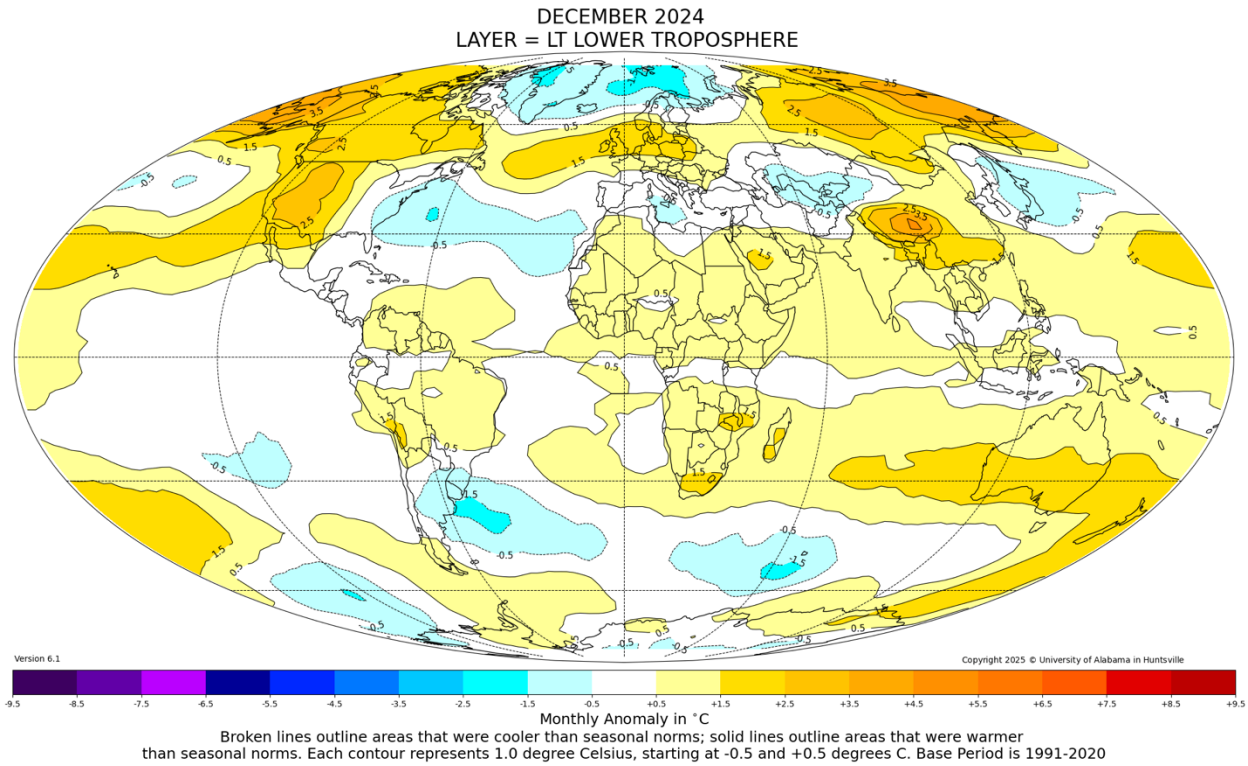

Figure. Lower tropospheric temperature anomalies for December 2024. Contour interval 0.1°C.

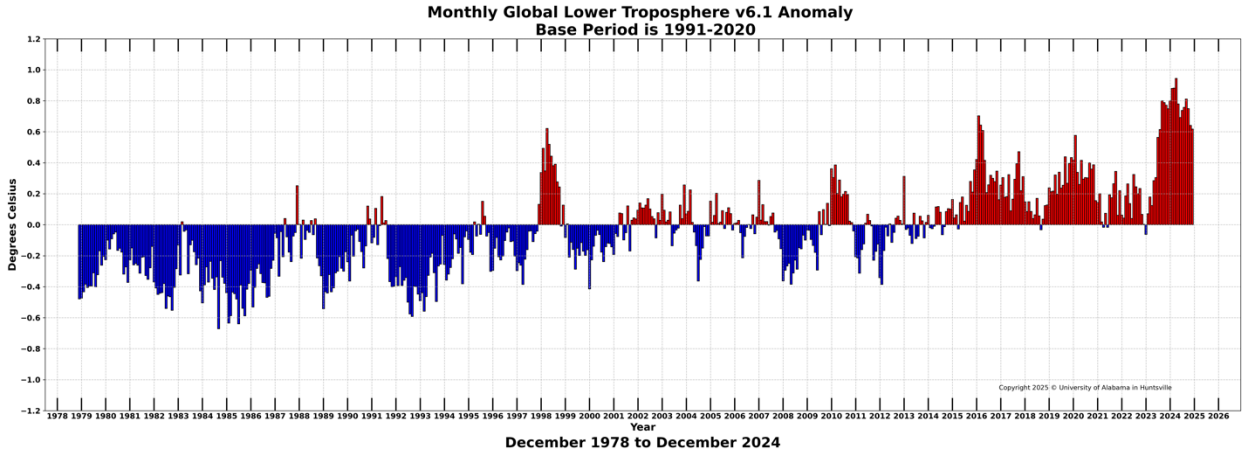

Figure. Bar chart of global monthly lower tropospheric temperature anomalies.

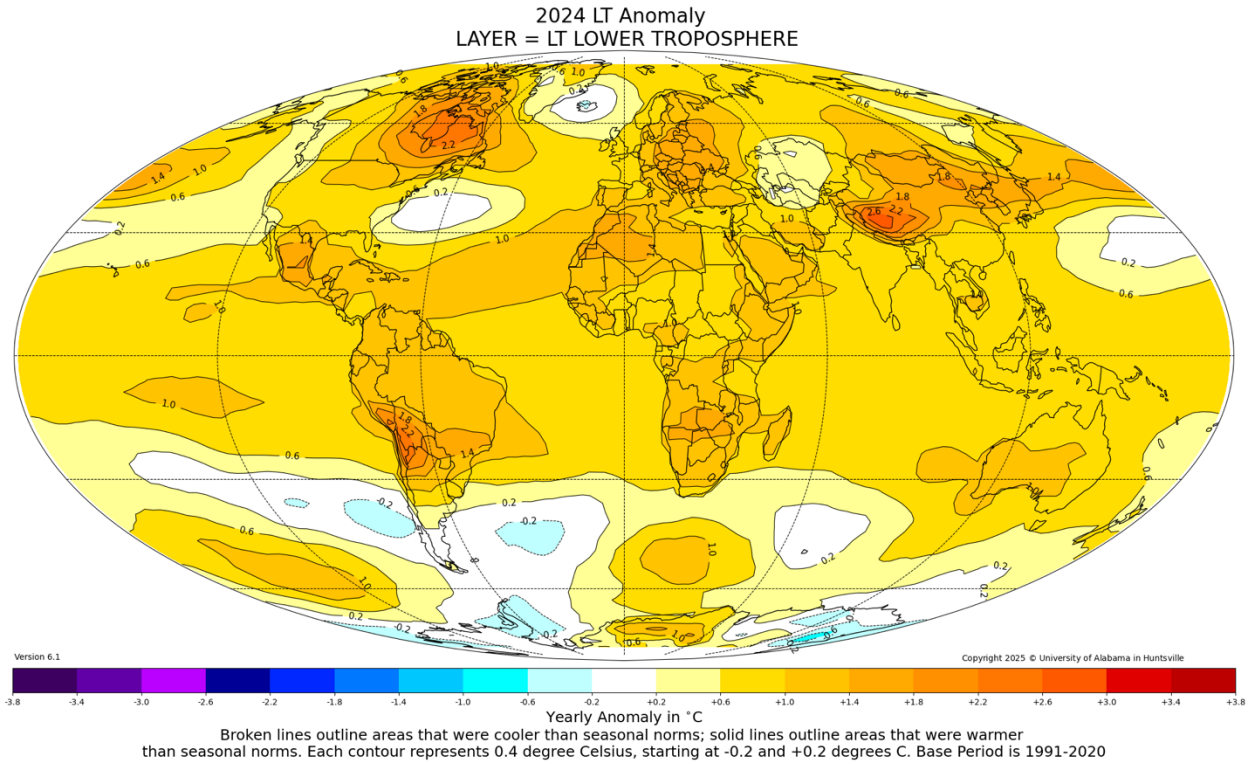

Figure. Lower tropospheric temperature anomalies for 2024. Contour interval 0.04 °C.

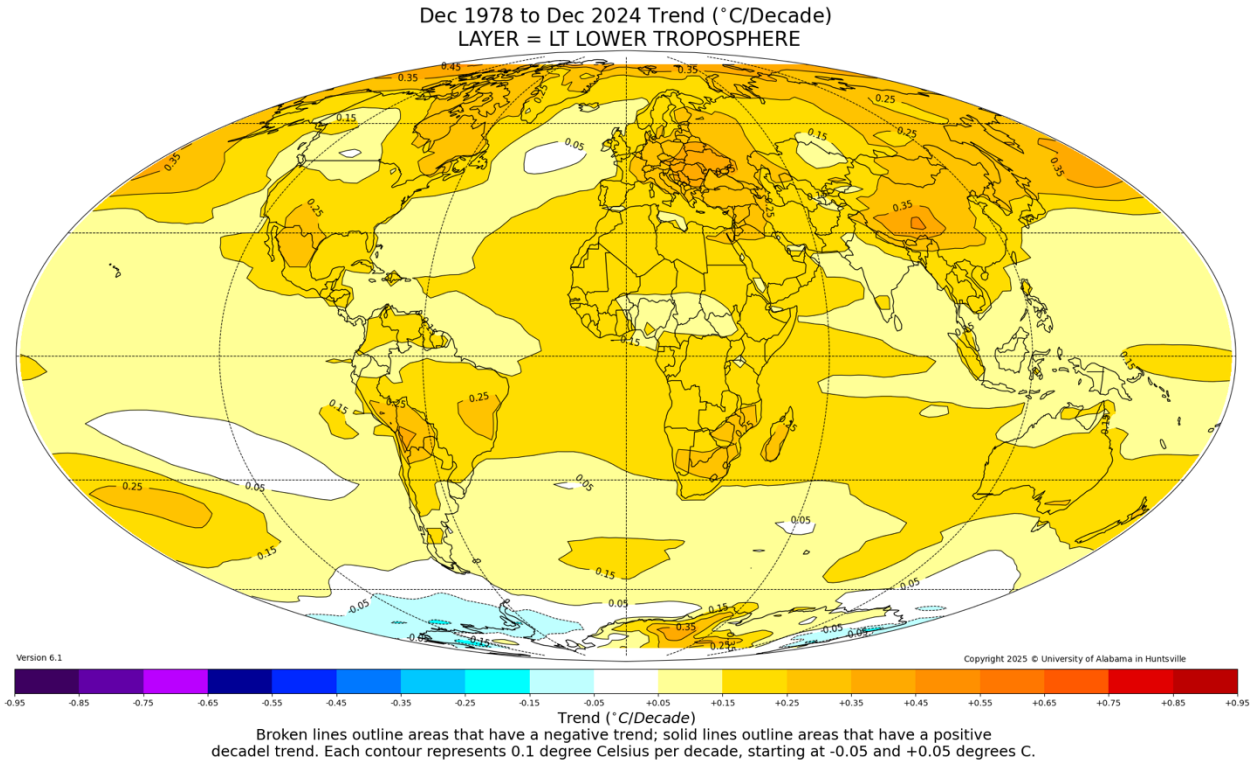

Figure. Trend values (°C/decade) for Dec 1978 to Dec 2024. Contour interval 0.10 °C/decade.