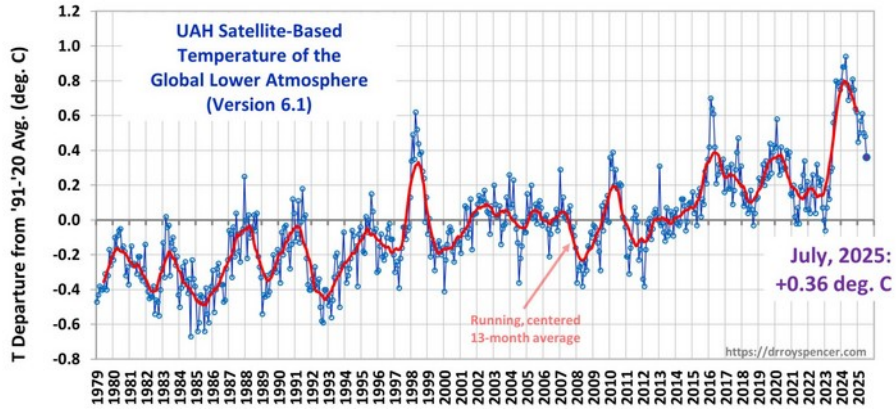
Why was 2024 the warmest year since satellite records began?

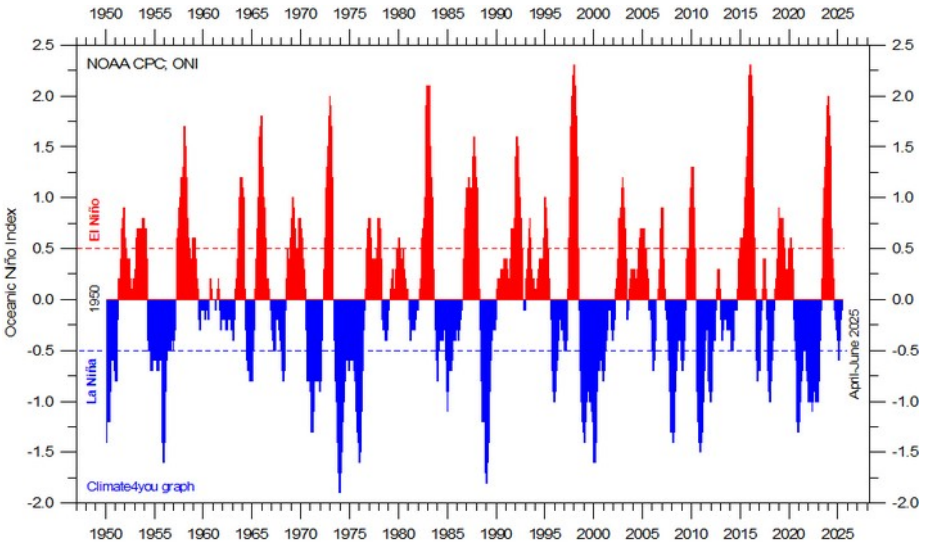
By Dr.-Ing. Bernd Fleischmann, August 4, 2025, www.klima-wahrheiten.de

Satellites have been recording global near-surface temperatures since the end of 1978. The University of Alabama in Huntsville (UAH) evaluates the satellite measurements, and Roy Spencer presents them on the website https://www.drroyspencer.com/ :



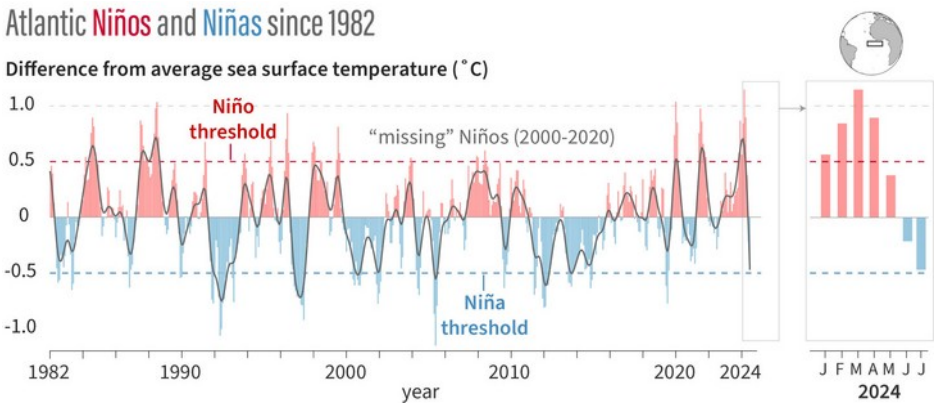
The zero line is the average from 1991 to 2020. The blue line connects the monthly averages, and the red line is the 13-month moving average. At the end of 2023, this average significantly exceeded the 1998 average for the first time. What are the reasons for the temperature increase, especially in 2023, and the strong year-to-year variation?

1. El Niño Southern Oscillation (ENSO)



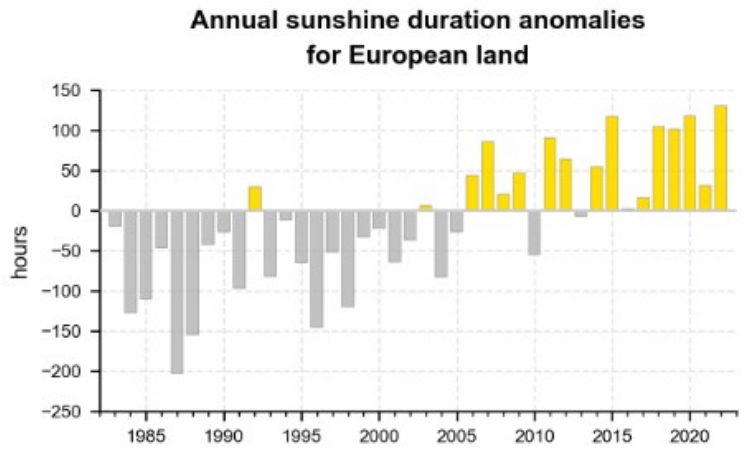
El Niño (Spanish for "Christ Child," because the effect is strongest around Christmas) is the term used to describe the phenomenon of wind reversal in the central equatorial Pacific, which inhibits the rise of cold deep water off the coast of South America and therefore significantly increases temperatures there – with global repercussions. The opposite effect is called La Niña, and together they form the Southern Oscillation (ENSO). Red areas indicate higher than average sea temperatures (graphic from https://www.climate4you.com/SeaTemperatures.htm): The strong El Niños of 1997/98, 2015/16, and 2023/24 can be seen in the global temperature curve as strong temperature increases. In July 2025, ENSO was in its neutral stage, and **global temperatures fell to the level of July 1998.**

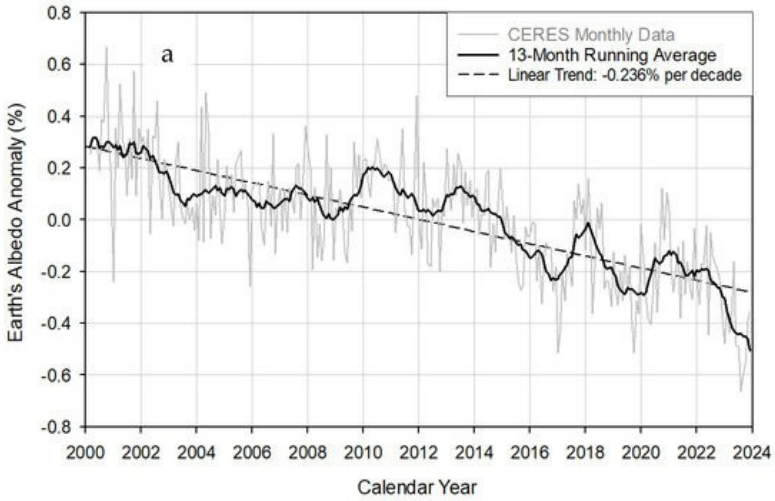
2. Atlantic Niño

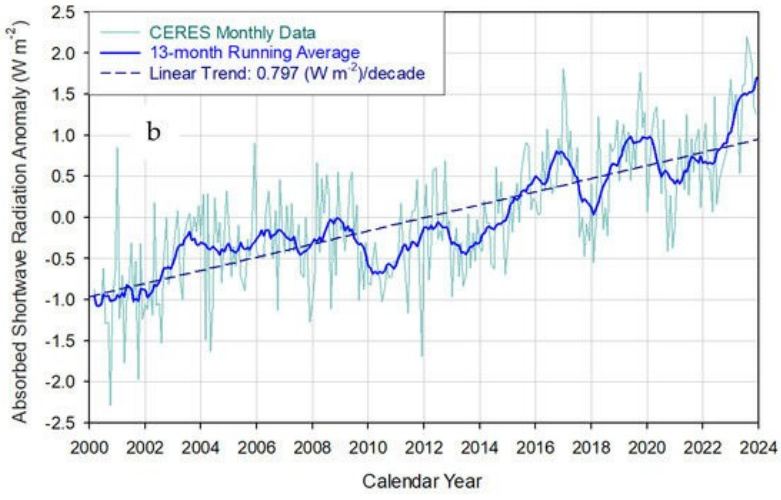


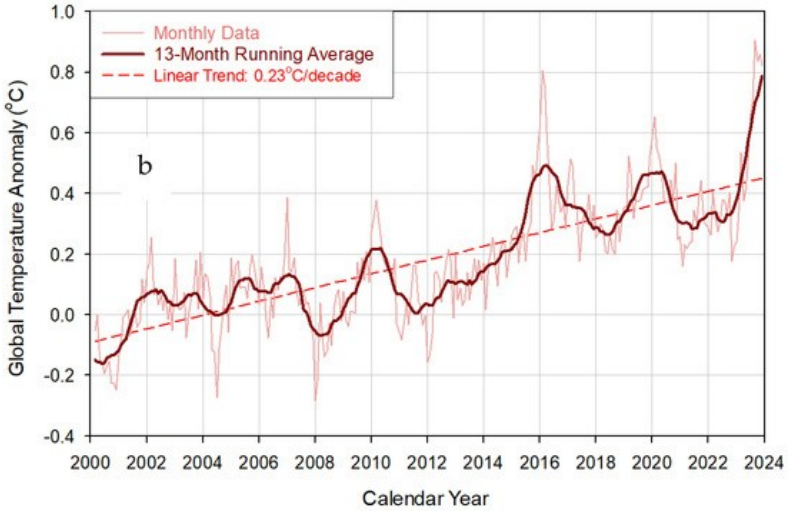
A similar phenomenon is occurring in the Atlantic as in the Pacific. The usual easterly trade winds are occasionally weakened or even replaced by westerly winds. These also prevent the rise of cold deep water, this time off the equatorial west coast of Africa. The Atlantic Niño of 2024 was the strongest on record. On the right: the detail from January to July 2024 (graphic from https://www.climate.gov/media/16295): The maximum was in March 2024. Similar to 1998, it intensified the global effect of the Pacific El Niño and extended the high temperatures by several months.

3. The decline in global cloud cover









Cloud cover has been decreasing globally since the mid-1980s. At the same time, the number of hours of sunshine has increased, by more than 200 hours per year in Europe, as shown by the analysis from the EU's Copernicus Service (https://climate.copernicus.eu/esotc/2022/clouds-and-sunshine-duration).

The global decline in cloud cover and its consequences have been documented in many publications, including this one: https://www.mdpi.com/2673-7418/4/3/17 #.

In part a of Figure 1 (left), it shows the change in global solar radiation reflection since 2000, with a decreasing trend due to the reduction in cloud cover, which was partly due to air pollution control measures, and since 2020 mainly due to cleaner marine diesel.

Part b shows the solar radiation absorbed by the Earth's surface, which increased significantly, particularly in 2023 and 2024.

Since 2000, the absorbed energy (more precisely, the power density) has increased by 2.7 W/m². This is as much as all alleged anthropogenic influences from 1750 to 2019 (IPCC Climate Change 2021: The Physical Science Basis, page 959). 2.7 W/m² is an increase of 1.1 % of the absorbed power density which translates into a temperature increase of about 0.8 °C. This is **sufficient to explain most of the temperature increase since 2000.**

The third graph, from Figure 5 of the cited publication, shows the global temperature trend during the same period as the average of six different analyses. The agreement with the above curve is very good. Deviations arise primarily from ENSO events (e. g. La Niña in 2000, 2008 and 2012, El Niño in 2010, 2016 and 2024) and the Atlantic Niño.

Summary:

The increase in global mean temperature in recent decades is primarily due to the **reduction in global cloud cover**. This has increased solar radiation, particularly in Europe. Ocean cycles such as the Pacific El Niño and the Atlantic Niño have an **additional influence**. **The impact of carbon dioxide emissions on global temperature must therefore be very small**.