25 December 2024
Tokyo Climate Center
Japan Meteorological Agency

Global temperature for 2024 to be the highest since 1891 (Preliminary)

The annual anomaly of the global average surface temperature for the year 2024 (i.e., the combined average of the near-surface air temperature over land and the sea surface temperature) is estimated at +0.62°C* above the 1991 – 2020 average, likely to be the warmest on record. The past ten years (2015 to 2024) are likely to be the ten warmest years for the 134-year period since 1891 (Figure 1).

The monthly average surface temperatures for January to June in 2024 were ranked the warmest on record for each respective month. The seasonal average surface temperatures for the boreal winter (December to February) and spring (March to May) were also the highest record since 1891 for the season.

On a longer time scale, the annual global average surface temperature has been rising at a rate of about 0.77°C per century, which is thought to be attributed to global warming due to increase in anthropogenic greenhouse gas concentrations including carbon dioxide. In addition, the global averaged surface temperature is affected by inter-annual to decadal natural fluctuations intrinsic to the earth's climate.

High temperature deviations are seen over wide areas of the world (Figure 2).

The final report on the global temperature for 2024 is scheduled to be provided on th e Tokyo Climate Center website (https://www.data.jma.go.jp/tcc/tcc/products/gwp/temp/ann_wld.html) early in February 2025.

* Note that this figure (hence its rank in the record) is still subject to change, because, as of this announcement, it remains a preliminary result based on temperature observations for the period from January to November in 2024.

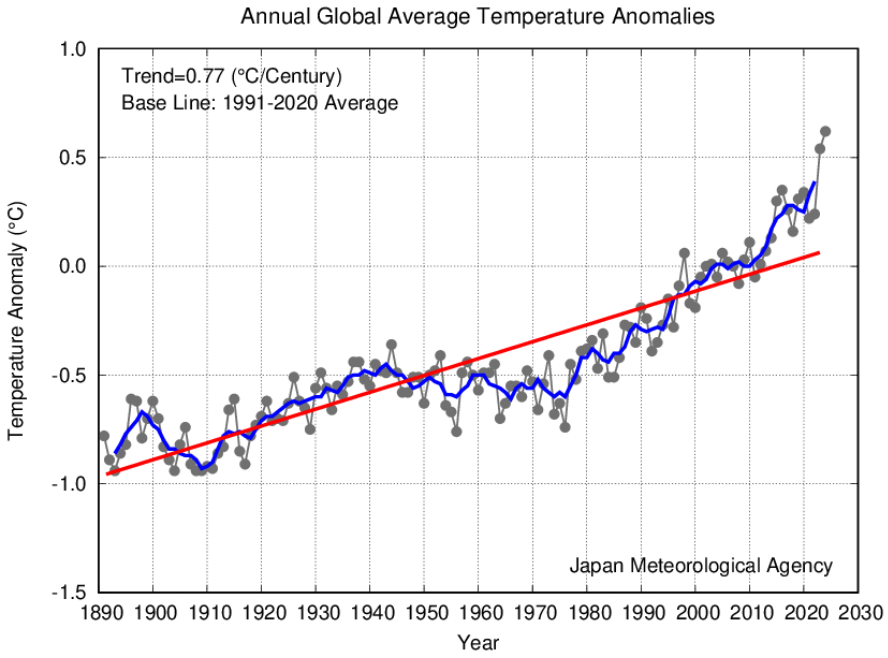

Figure 1 Long-term change in annual mean surface temperature anomalies over the globe (Preliminary value for 2024, based on January – November)

Anomalies are derived from the 1991 – 2020 average baseline. The thin black line indicates surface temperature anomalies for each year, while the blue and red lines indicate the related five-year running mean and the long-term linear trend, respectively.

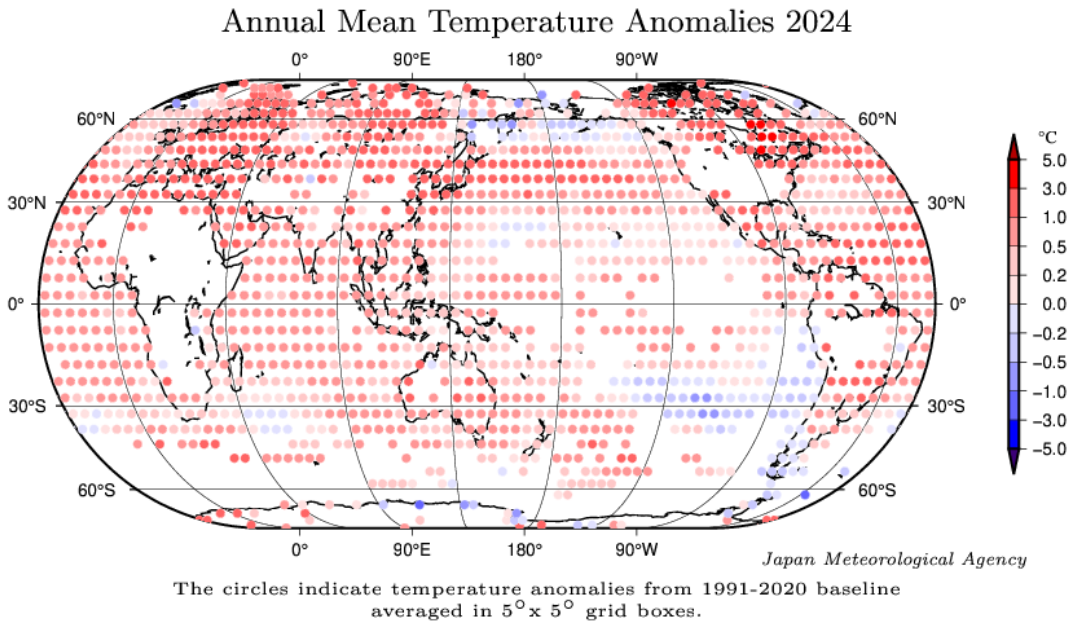

Figure 2 Annual mean temperature anomalies in 2024 (Preliminary value based on January – November)

The circles indicate anomalies of surface temperature averaged in 5° x 5° grid boxes. The annual mean global temperature anomaly is determined by averaging the anomalies, derived from the 1991 – 2020 average baseline, of all grid boxes weighted with the grid box area.

Ranking of annual global average temperatures

Rank	Year	Temperature Anomaly w.r.t. 1991 – 2020 average
1	**2024**	**+0.62***
2	2023	+0.54
3	2016	+0.35
4	2020	+0.34
5	2019	+0.31
6	2015	+0.30
7	2017	+0.26
8	2022	+0.24
9	2021	+0.22
10	2018	+0.16

* Preliminary value for 2024, based on January – November