22 December 2023
Tokyo Climate Center
Japan Meteorological Agency

Global temperature for 2023 to be the highest since 1891 (Preliminary)

The annual anomaly of the global average surface temperature for the year 2023 (i.e., the combined average of the near-surface air temperature over land and the sea surface temperature) is estimated at +0.53°C* above the 1991 – 2020 average, likely to be the warmest on record. The past ten years (2014 to 2023) are likely to be the ten warmest years for the 133-year period since 1891 (Figure 1).

The monthly average air temperatures for May to November in 2023 were ranked the warmest on record for each respective month. The seasonal average air temperature for the boreal summer (June to August) and autumn (September to November) were also the highest recorded since 1891 for the season.

On a longer time scale, the annual global average surface temperature has been rising at a rate of about 0.76°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 2023 is scheduled to be published early in February 2024.

* 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 of January to November in 2023.

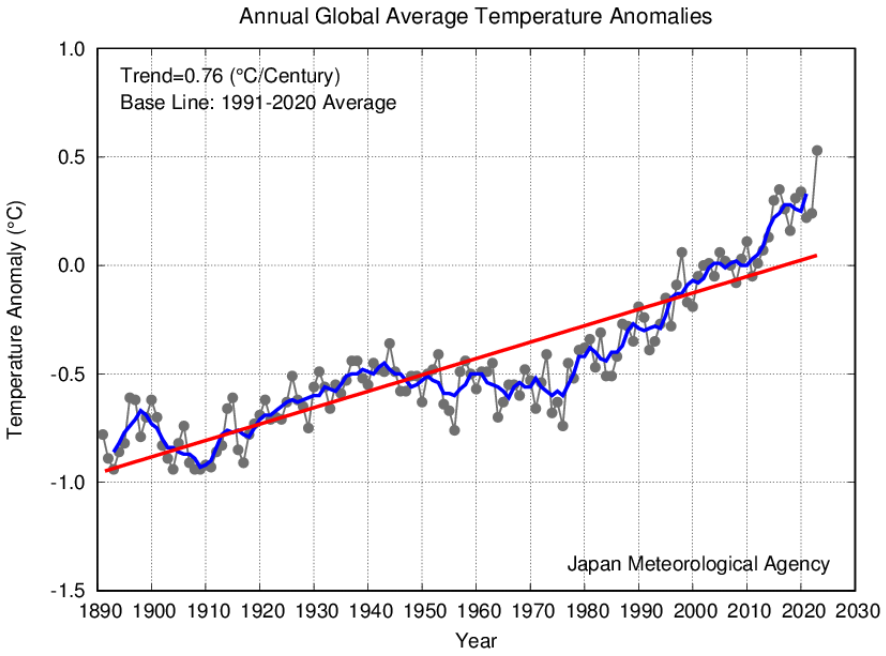

Figure 1 Long-term change in annual mean surface temperature anomalies over the globe (Preliminary value)

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.

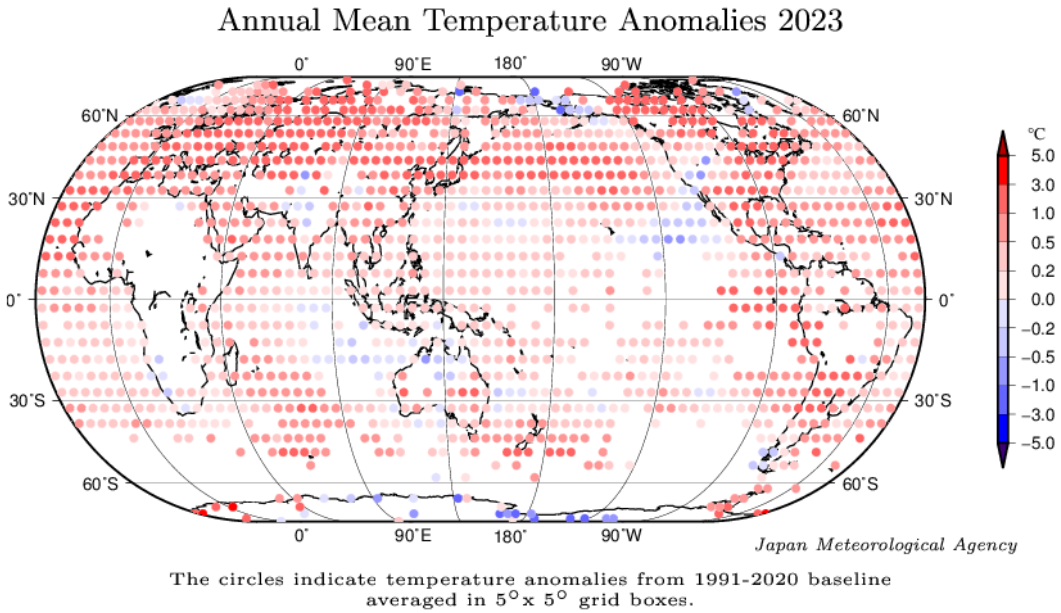

Figure 2 Annual mean temperature anomalies in 2023 (Preliminary value)

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	**2023**	**+0.53***
2	2016	+0.35
3	2020	+0.34
4	2019	+0.31
5	2015	+0.30
6	2017	+0.26
7	2022	+0.24
8	2021	+0.22
9	2018	+0.16
10	2014	+0.13

* 2023 is preliminary value