

## Global temperature for 2016 to be the highest since 1891 (Preliminary)

The annual anomaly of the global average surface temperature for the year 2016 (i.e. the combined average of the near-surface air temperature over land and the sea surface temperature) is estimated at  $+0.46^{\circ}\text{C}^*$  above the 1981-2010 average, likely to become the warmest record for the 126-year period since 1891 (Figure 1).

\* Note that this figure (hence its rank in the record, either) is still subject to change, because at the moment of this announcement it is only a preliminary result that was calculated based on temperature observations for the period of January to November in 2016.

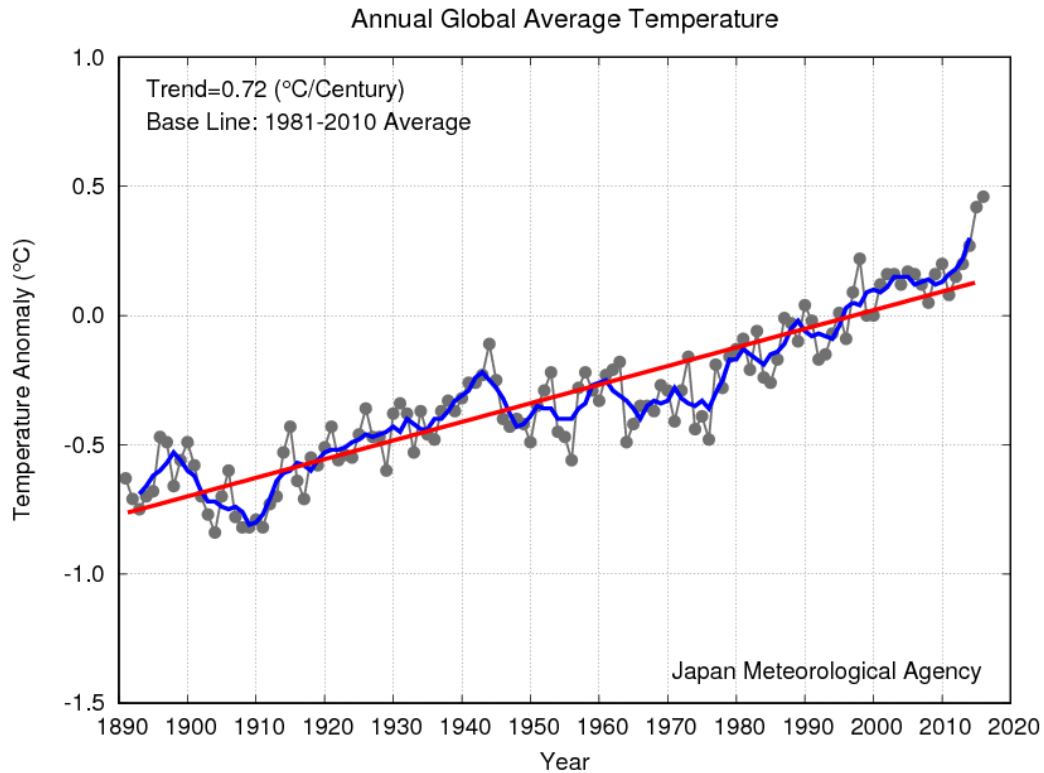
In 2016, the monthly average air temperatures for January, February, March, April, June and July, and the seasonal average air temperatures for the boreal winter, spring, and summer were also the highest recorded since 1891.

Warm temperature deviations are especially seen over wide area of Eurasia, North America, the Indian Ocean, and the Tropical Pacific (Figure 2).

On a longer time scale, the annual global average surface temperature has been rising at a rate of about  $0.72^{\circ}\text{C}$  per century.

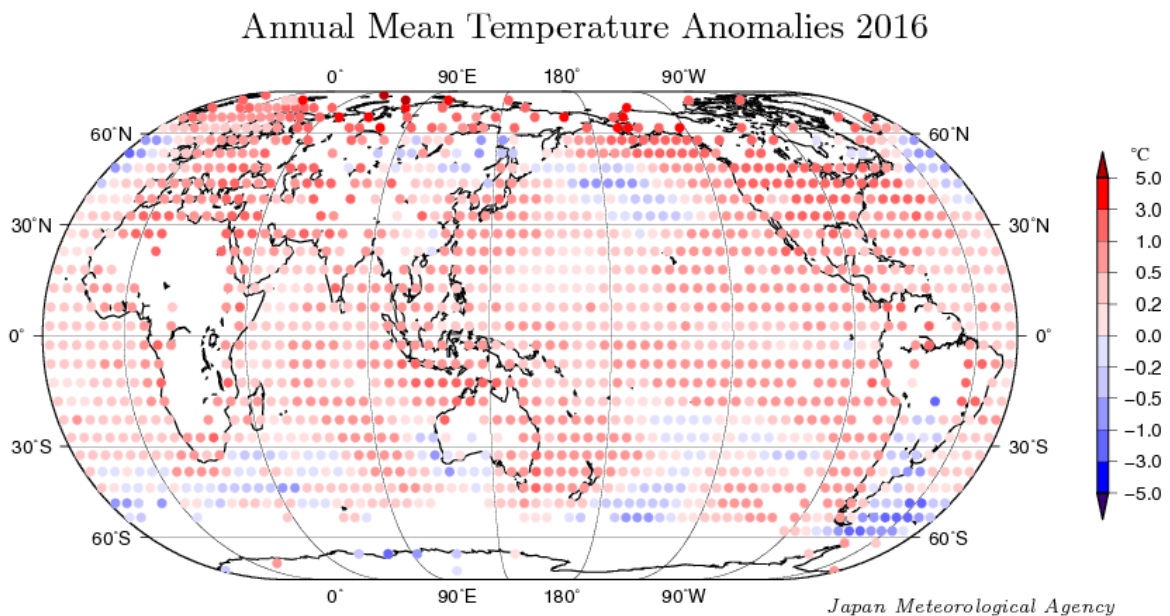
Ten of the 11 warmest years on record since 1891 have occurred during this century. The recent high temperatures are thought to be affected by the global warming trend due to increase in anthropogenic greenhouse gas concentrations including carbon dioxide. Moreover the global averaged surface temperature is affected by inter-annual to decadal natural fluctuations intrinsic to the earth's climate, and the highest temperature for 2016 is thought to be due to El Niño event which had persisted from the boreal summer 2014 to spring 2016.

The final report on the global temperature for the year 2016 is scheduled to be published early in February 2017.



**Figure 1 Long-term change in annual mean surface temperature anomalies over the globe**

The black line with filled circles indicates anomalies of surface temperature in each year. The blue line indicates five-year running mean, and the red line indicates a long-term linear trend. Anomalies are represented as deviations from the 1981-2010 average.



The circles indicate temperature anomalies from 1981-2010 baseline averaged in 5° x 5° grid boxes.

**Figure 2 Annual mean temperature anomalies in 2016**

The circles indicate anomalies of surface temperature averaged in 5° x 5° grid boxes. Anomalies are deviations from the 1981-2010 average.

### Ranking of annual global average temperatures

Rank	Year	Temperature Anomaly w.r.t. 1981-2010 average
1	<b>2016</b>	<b>+0.46 (Preliminary value)</b>
2	2015	+0.42
3	2014	+0.27
4	1998	+0.22
5	2013	+0.20
	2010	+0.20
7	2005	+0.17
8	2009	+0.16
	2006	+0.16
	2003	+0.16
	2002	+0.16