



Department  
of Energy &  
Climate Change

# Central England and global surface temperature

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### Data summary

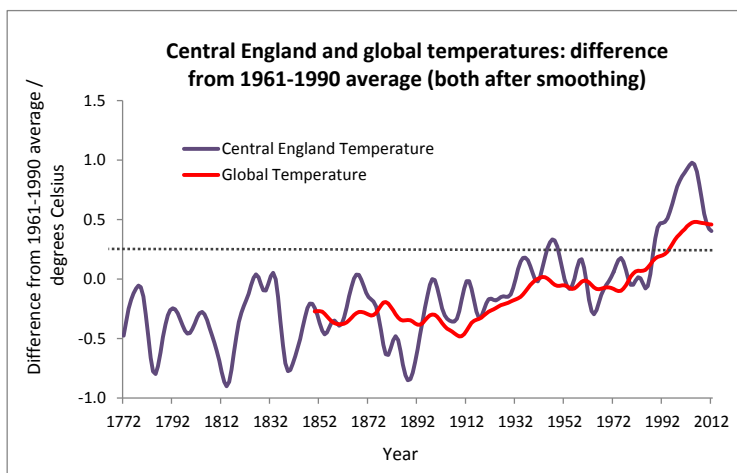
The year 2010 was the coldest since 1986 with the December of 2010 being the coldest month since 1890, but globally 2010 is the warmest year on the Hadley Centre Climate Research Unit (HadCRUT4) record.

The spring of 2011 was the warmest such season on the long standing Central England Temperature (CET) record and autumn of that year (and the complete year itself) was the second warmest on the CET record.

During the 20th century, the annual mean central England temperature increased by about 1.0 °C. The last decade was exceptionally warm in central England, on average about 0.7 °C warmer than the 1961-1990 average.

Average global temperatures are now about 0.9 °C warmer than they were 100 years ago. Studies have shown that most of the observed warming, since the middle of the twentieth century, was very likely caused by human activities. The IPCC's Fourth Assessment Report, published in 2007, concluded that global temperatures will rise further by between 1.1 and 6.4 °C by the end of the 21st century.

The period 2000-2009 is the warmest decade in the modern-day instrumental record with a mean temperature anomaly of 0.46 °C above the 1961-1990 long term average.



Year	Difference from 1961-1990 average (degrees Celsius)	
	Central England Temperature	Global Temperature
1990	0.44	0.19
1995	0.57	0.26
2000	0.86	0.40
2005	0.97	0.48
2010	0.46	0.47
2011	0.42	0.46
2012	0.40	0.46

## Data sources

The surface temperature data for central England come from Central England Temperature (CET) dataset and the surface global temperature come from Hadley Centre Climate Research Unit (HadCRUT4) dataset.

The CET dataset is the longest instrumental record of temperature in the world. The mean monthly series begins in 1659, and the mean daily series in 1772. Both series are kept up to date by the Climate Data Monitoring section of the Hadley Centre, Met Office. The Met Office has also been compiling maximum, minimum and mean daily central England temperatures data files since January 1878.

In 2012 the Met Office introduced a revised gridded dataset of global historical surface temperature anomalies, HadCRUT4, replacing HadCRUT3. This is a blend of the CRUTEM4 land-surface air temperature dataset and the HadSST3 sea-surface temperature dataset. Data are available for each month since January 1850. The dataset is a collaborative product of the Met Office Hadley Centre and the Climatic Research Unit at the University of East Anglia.

CET and HadCRUT4 datasets are available on the Met Office website at the links below:

<http://www.metoffice.gov.uk/hadobs/hadcet/>

<http://www.metoffice.gov.uk/hadobs/hadcrut4/>

## Background information on data collection and processing

### *Central England temperature*



The CET daily, monthly and seasonal temperatures are representative of a roughly triangular area of the United Kingdom enclosed by Lancashire, London and Bristol. Manley (1953, 1974) compiled most of the monthly series, covering 1659 to 1973. These data were updated to 1991 by Parker et al (1992), when they calculated the daily series. Both series are now kept up to date by the Climate Data Monitoring section of the Hadley Centre, Met Office. Since 1974 the data have been adjusted by 0.1-0.3 degree C to allow for urban warming.

The Met Office has also been compiling maximum, minimum and mean daily central England temperatures data files since January 1878. The following stations are used by the Met Office to compile the CET data:

Rothamsted, Malvern, Squires Gate and Ringway. In November 2004, the weather station Stonyhurst replaced Ringway and revised urban warming and bias adjustments have now been applied to the Stonyhurst data after a period of reduced reliability from the station in the summer months.

### *Global temperature*

Air temperatures over the land are measured at around 2200 land stations every month. Over the oceans, observations of sea surface temperature (SST) are made (around 100,000 each month) by volunteer observing ships, research vessels and moored and drifting buoys. The

available data for each month are turned into anomalies (difference from the average temperature between 1961 and 1990 for that station or location), and averaged onto regular 5 degree grids for both the land and the ocean. The anomaly in a grid box is equal to the mean of the anomalies from all stations or SST observations in that grid box.

The 'gridded' anomalies for land and ocean are then combined to calculate an average for the northern hemisphere and the southern hemisphere separately. The global average is simply the mean of the northern and southern hemisphere values. This stops the global average from being dominated by the northern hemisphere, where there are more observations.

### *Data smoothing*

Both the central England and global temperature data are smoothed to highlight the decadal variability in the records. This is made by applying a 21-point binomial filter to the annual data. The filter is a weighted moving average of the data, with weights centred on the year of interest.

More information about the smoothing process, with an example showing how the smoothed value is calculated, is available on the Met Office website at the link below:

<http://www.metoffice.gov.uk/hadobs/hadcrut3/smoothing.html>

## References

- [Parker, D.E., T.P. Legg, and C.K. Folland. 1992. A new daily Central England Temperature Series, 1772-1991. \*Int. J. Clim.\*, \*\*Vol 12\*\*, pp 317-342](#)
- [Morice, C. P., J. J. Kennedy, N. A. Rayner, and P. D. Jones \(2012\), Quantifying uncertainties in global and regional temperature change using an ensemble of observational estimates: The HadCRUT4 dataset, \*J. Geophys. Res.\*, 117, D08101, doi:10.1029/2011JD017187.](#)

## Further information

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