11,000 year data series

This series is a compilation of temperature records from around the globe of the last 11,000 years.

It takes 73 different temperature records from around the globe on both land and in the ocean to estimate the global average temperature. The largest source of error in this reconstruction is comparing the dates in each different record. The way that time is reconstructed in all of the records is different and makes different assumptions. Therefore, in order to make sure that when you average all of the records together you are averaging the same time period at each point you must be sure that the time scale for all your records match. Failing that, one must make sure that you understand what the effect of having slightly different time scales is - this is what is reflected in the errors.

Original reference:

Shaun A. Marcott, Jeremy D. Shakun, Peter U. Clark, Alan C. Mix (2013) A Reconstruction of Regional and Global Temperature for the Past 11,300 Years. Science 339, 1198 doi: 10.1126/science.1228

Data downloaded from Science website

2000 year series

This record is from 200-1980.

It is an estimate of the global yearly average temperature. It calculates the global average by averaging together a selection of different temperature reconstructions from various regions across the globe.

The temperature records are reconstructed by interpreting a number of different recorders of the climate. These recorders include:

- the sediments at the bottom of lakes,
- the chemical composition of ice,
- the size of tree rings.

Uncertainties in the record arise from both the uncertainties in the individual temperature records, for example how well do tree-rings record the temperature in the Northern Hemisphere?, and the uncertainties in the how well the individual, regional, records represent the global temperature.

The Southern Hemisphere temperature is far more uncertain than the Northern Hemisphere due to the lack of data in this region. This is because much of the Southern Hemisphere is ocean, where it is very difficult to estimate what the temperature is.

The data are a 40 year smoothed series (as used in Fig 2. of Mann and Jones 2003)

Original reference:

Mann, M.E. and P.D. Jones, 2003, Global Surface Temperatures over the Past Two Millennia, Geophysical Research Letters, Vol. 30, No. 15, 1820, August 2003. doi: 10.1029/2003GL017814.

Data downloaded from:
ftp://ftp.ncdc.noaa.gov/pub/data/paleo/contributions_by_author/mann2003b/mann2003b.txt

500 year series

These records are from 1500-2000.

It is an estimate of the global yearly average temperature. It calculates the global average by averaging together a selection of different temperature reconstructions from various regions across the globe.

The temperature records are reconstructed by interpreting a number of different recorders of the climate. These recorders include:

- the sediments at the bottom of lakes,
- the chemical composition of ice,
- the size of tree rings.

Uncertainties in the record arise from both the uncertainties in the individual temperature records, for example how well do tree-rings record the temperature in the Northern Hemisphere?, and the uncertainties in the how well the individual, regional, records represent the global temperature.

The Southern Hemisphere temperature is far more uncertain than the Northern Hemisphere due to the lack of data in this region. This is because much of the Southern Hemisphere is ocean, where it is very difficult to estimate the temperature.

The data are a 20 year smoothed series (as used in Fig 3. of Mann et al. 2008) and for the instrumental record the HadCRUT series

Original reference:

Michael E. Mann, Zhihua Zhang, Malcolm K. Hughes, Raymond S. Bradley, Sonya K. Miller, Scott Rutherford and Fenbiao Ni (2008): Proxy-based reconstructions of hemispheric and global surface temperature variations over the past two millennia PNAS 105,(3) 13252–13257

downloaded from:
http://www.meteo.psu.edu/holocene/public_html/supplements/MultiproxyMeans07/

HadCRUT data downloaded from
http://www.metoffice.gov.uk/hadobs/hadcrut4/data/current/download.html

200 Year Series

These time series are for 1850-2015.

They come from the HadCRUT4 data set.

The data compiled in HadCRUT4 use observations of the temperature over land and sea. Obviously, during the early part of the record there are many regions which have no temperature observations. A lot of work goes into deducing how to estimate the global temperature from the data that are available

Other sources of uncertainty in this record include:

- How the way that observations of the temperature have changed. For example the temperature of the sea used to be taken by throwing a bucket over the side of a ship, filling it with water and measuring the temperature of that water.

In the 1800's they used canvas buckets; more recently they use rubber ones. Because the rubber buckets of water cool down less than canvas ones, this can affect the measured temperature of the water.

- Whether an observing station has moved.

- how the land around observing stations has changed. Urban areas are hotter than rural ones. If a weather station was in the country but gets incorporated into a town, that station may record an increase in temperature. This increase, however, is not due to the climate but due to the changing land use. If we want to measure how the climate is changing we must therefore correct this.

Data downloaded from
http://www.metoffice.gov.uk/hadobs/hadcrut4/data/current/download.html

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