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Global Climate Datasets

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CRUTEM & HadCRUT
Global temperature

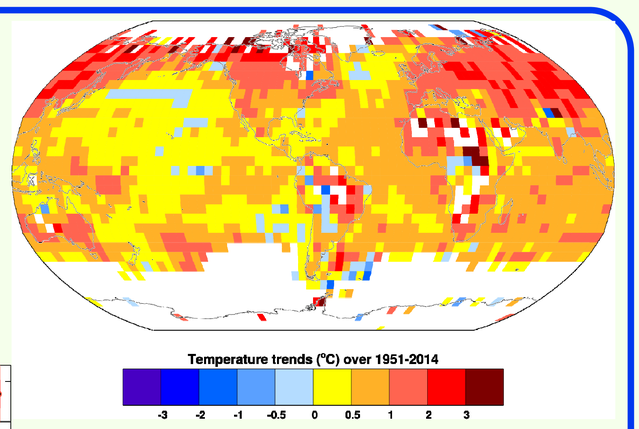
Dataset Description

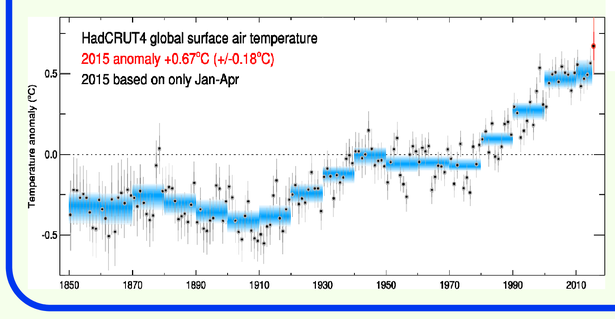
CRUTEM is derived from near-surface land air temperatures recorded at weather stations across all continents of Earth. It has been developed and maintained by the Climatic Research Unit (CRU) since the early 1980s, funded mostly by the US Dept of Energy. It is combined with sea surface temperatures from the Met Office Hadley Centre to produce the HadCRUT global dataset of temperatures across Earth's surface. These are monthly temperature anomalies on a 5° latitude-longitude grid. The current version, HadCRUT4, combines CRUTEM4 and HadSST3.

This is one of the most notable global temperature datasets, used widely by the World Meteorological Organisation (WMO), the Intergovernmental Panel on Climate Change (IPCC) and many scientific studies that monitor global warming and attribute changes to natural and anthropogenic causes. One reason for its widespread use is that it has a detailed analysis of errors and uncertainties at multiple time and space scales (from grid cells to global mean).

Results from CRUTEM4

The map shows the nearly ubiquitous warming of annual temperatures since 1951, with greater warming over land than sea, greater warming at northern high latitudes, and notably less warming in the Pacific than the other oceans.



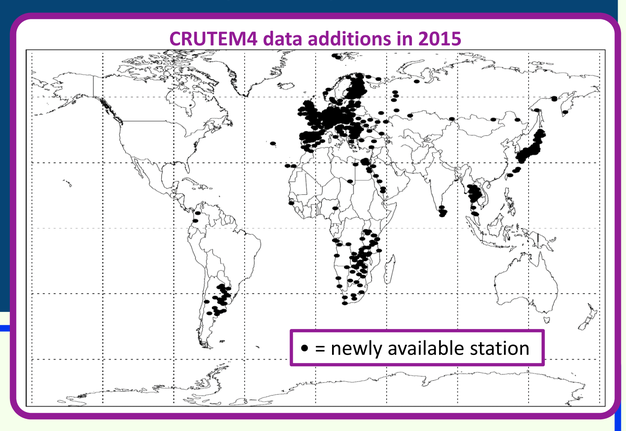


The global temperature timeseries shows the decadal and annual temperatures with their respective uncertainty ranges (blue shading: decadal; grey lines: annual). 2015 has greater uncertainty because it has only 4 months' data.

Updating CRUTEM

Routine monthly updating of CRUTEM (and HadCRUT) uses data from CLIMAT and Monthly Climatic Data for the World (MCDW) in a semi-automated process by the Met Office. Non-routine work by CRU each year is essential to maintain and improve data coverage, taking advantage of newly available data and incorporating those that are not distributed via CLIMAT and MCDW. Jones et al. (2012) describes this work and data sources (US, Russia, Canada, etc.). In 2015, 13 additional datasets were assimilated including: • Argentina • Australia (ACORN) • Japan • Europe (ECA&D) • Ex-colonial territories • Sri Lanka (WMSSC)

The process for incorporating additional data:
- Find matches with existing data using meta-data (ID, location etc.)
- Compare with existing data, investigate periods of disagreement
- Assess quality, determine first reliable year
- Merge new data and calculate normals



CRUTEM: future plans

New data to be incorporated includes:
- World Weather Records (WWR) volume for the 2001-2010 decade
- Data from International Surface Temperature Initiative (ISTI) for sparse regions/periods
- Updates from New Zealand (NIWA), Nordic regions (NORDHOM), South America (LACA&D)

Planned improvements to the dataset construction:
- New approaches to address possible biases due to underrepresentation of high latitudes
- Improved version control and data dissemination

Disseminating CRUTEM & HadCRUT

These global land-only and land-and-sea datasets are among the most widely used datasets in climate science. The scientific papers that describe them are highly cited (the 8 main papers from 1982 to 2012 have been cited a total of more than 3500 times).

The data, including the underlying "raw" station data, are free to download from the website below. We also disseminate them via a Google Earth interface, providing easy access to weather station monthly temperature data and their locations, the grid-cell monthly temperature anomalies, and seasonal and annual timeseries graphs of all these data.

www.cru.uea.ac.uk/cru/data/temperature

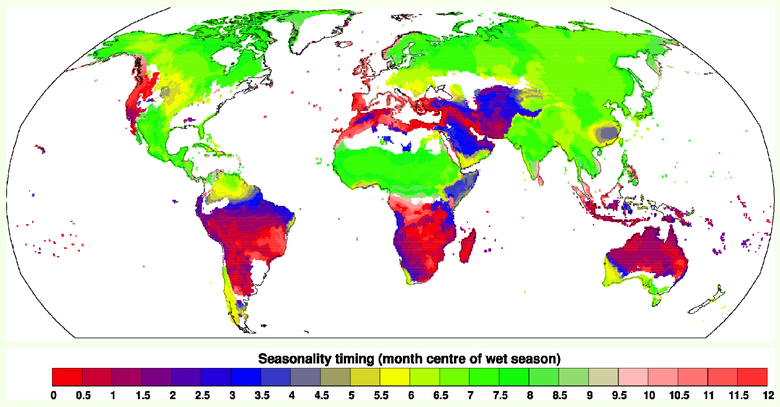
CRU TS
High-resolution land, multiple variables

Dataset Description

CRU TS is a high-resolution (0.5° latitude-longitude grid) dataset of monthly climate variables over the land-surface of the Earth, developed and maintained by CRU. Actual rather than anomaly values are provided, by combining monthly anomalies with a mean climatology that includes the effects of changing elevation. Spatial interpolation from weather station observations is used to achieve spatially complete data, with the number of nearby stations used as an indicator of data reliability.

CRU TS has diverse uses, from analysing variability in precipitation, humidity and cloud cover, to evaluating climate models and providing the historical variations in climate for driving models of the land surface, water resources, vegetation and crop yields. Derived variables (e.g. potential evapotranspiration) are also provided.

Results from CRU TS3



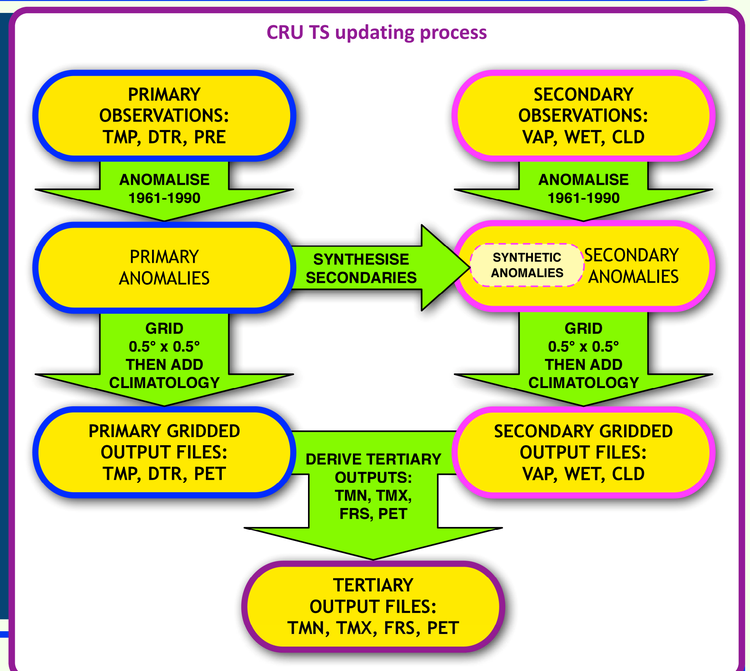
The map shows precipitation seasonality (timing of the centre of the wet season; areas that are too dry or too uniformly wet to define a wet season are left white). It varies dramatically, with the summer monsoons (green in NH, red/blue in SH) contrasting with 'Mediterranean' climates (including the sharp transition in SW Africa) and wet winters where the mid-latitude storm tracks meet the land.

The current version, CRU TS3.22, covers 1901-2013 for these variables:
- Mean, minimum and maximum temperature
- Diurnal temperature range • Precipitation • Number of wet days
- Number of frost days • Vapour pressure • Cloud cover • Potential evapotranspiration

Updating CRU TS

CRU TS is updated annually, incorporating yearly updates from CLIMAT, MCDW and Australian Bureau of Meteorology. Other data are added as time allows or as new compilations become available (e.g. New Zealand, Canada, southern Africa). The flow chart summarises the update process for the three classes of climate variables.

National and other regional averages are updated, together with station counts as a reliability indicator.



CRU TS: future plans

New data that could be included in future updates includes:
- Better coordination with CRUTEM temperature updates (WWR, ISTI including min and max)
- Precipitation and other variables from various national and regional compilations
- Early 20th century precipitation from ex-colonial territories (e.g. East Africa)

Planned improvements to the processing and dissemination of data:
- Improved gridding algorithm, using angular distance weighting
- Dissemination of gridded data and station data via a Google Earth interface
- Additional indices to be derived from CRU TS data, such as scPDSI drought index, heating and cooling degree days
- Improved assessment of data reliability and quantifying errors

Disseminating CRU TS

Since first being published in 1999, the 4 papers that describe the ongoing development of the CRU TS datasets have been cited a total of more than 4500 times (an average of 270 per year).

The data, including the underlying station temperature and precipitation, are free to download from the British Atmospheric Data Centre (BADC/CEDA), linked from the website below.

www.cru.uea.ac.uk/cru/data/hrg

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www.cru.uea.ac.uk/data