

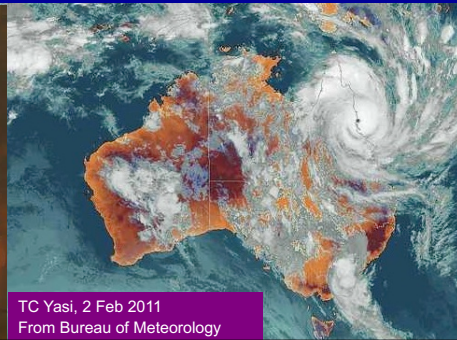
Data and Indices for Extremes

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Source: Hannah Phillips, Labertouche



Overview

- Data quality issues for extremes
- Metrics and indices for extremes
- ETCCDI indices

Weather and climate extremes

Review of previous lecture

- Language used in climate science is not very precise
 - High impact (but not really extreme)
 - Exceedance over a relatively low threshold
eg 10th, 90th percentile of daily temperature or precipitation
 - Rare events (long return period)
 - Unprecedented events (in the available record)
- Range from very small scale (tornadoes, hail storms) to large scale (drought, heat waves)
- Extremes in one location may be normal in another



Weather and climate extremes

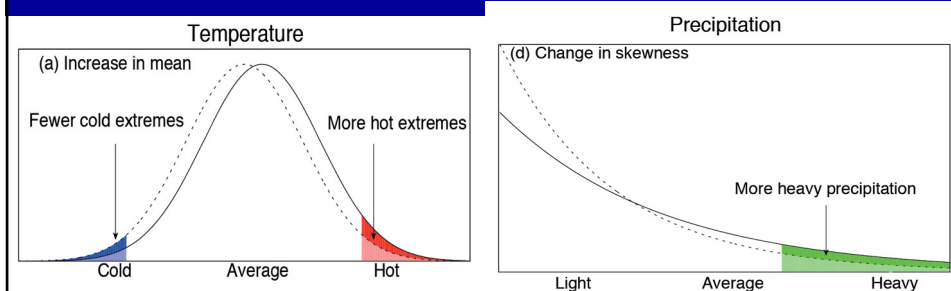
Definitions from IPCC SREX

Extreme event - the occurrence of a value of a weather variable above (or below) a threshold value near the upper (or lower) ends of the range of its observed values in a specific region.

Return period - An estimate of the average time interval between occurrences of an event (e.g., flood or extreme rainfall) of a defined size or intensity.



Weather and climate extremes

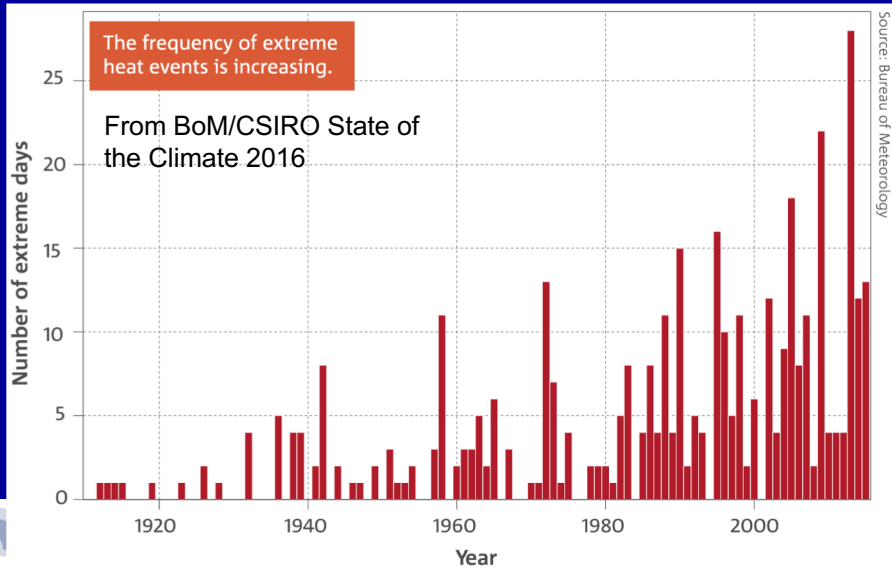


IPCC AR5 Fig 1.8 (2013)

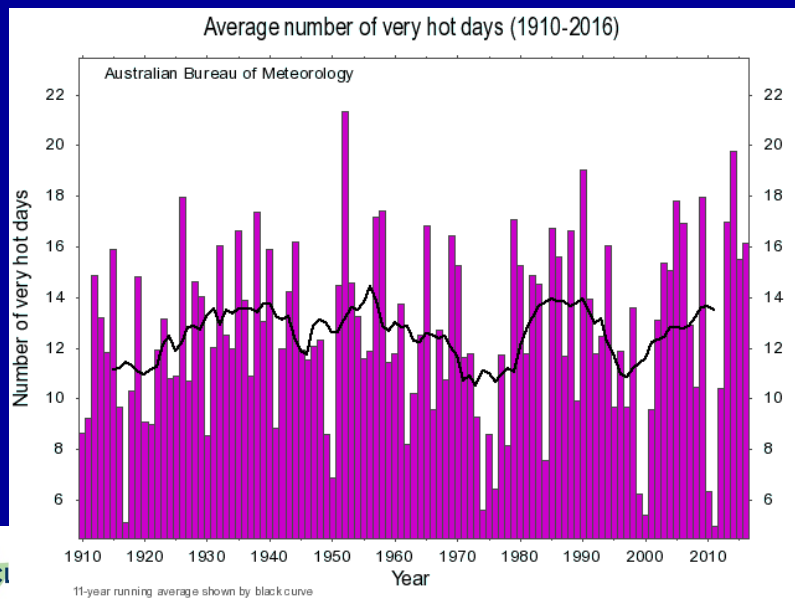
Data quality for extremes

- Given that extremes are in the tails of the distribution, small changes in the mean can lead to much larger fractional changes in the extremes
- Shifts in station location, instrument type or exposure of the instrument can lead to changes in observed extremes
- Important to consider type of data; station or gridded observations, reanalysis or model-based, as this will affect representation of extremes
- Time scale of dataset: daily, sub-daily
- Spatial scale and spatial homogeneity

Indices for extremes: What does this show?



<http://www.bom.gov.au/climate/change/index.shtml#tabs=Tracker&tracker=extremes-timeseries>



Indices for extremes

- Indices for specific extremes:
Forest Fire Danger Index (FFDI)
Extreme Heat Index (EHI), etc
- Indices of temperature and rainfall extremes from daily data (ETCCDI),
- Station-based or gridded, from observations
- Calculated from gridded daily data from models or reanalyses



Indices for extremes

- Number or percentage of days above a threshold
- Absolute threshold: sensitive to differences in mean, different locations or seasons or models compared with observations
- Percentile threshold: better for combining different regions or seasons or comparing models and obs; but can have hot extremes in winter and cold extremes in summer
- Hottest/coldest/wettest day in a year/month

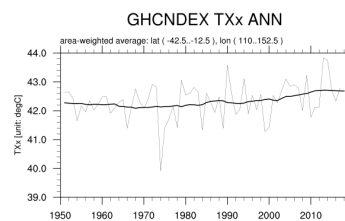
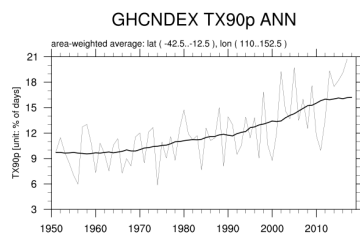


ETCCDI Indices for extremes

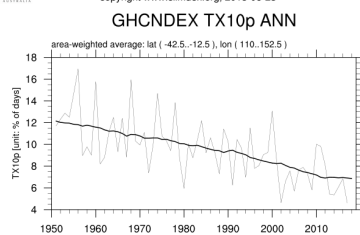
- Absolute threshold: SU = days TX>25C, very heavy rain days R20mm
- Percentile threshold: warm/cool days/nights TX10p, TX90p, TN10p, TN90p,
- Hottest/coldest/wettest day: TXx, TXn, TNx, TNn, Rx1d, (Rx5d)
- www.climdex.org
- BoM <http://www.bom.gov.au/climate/change/index.shtml#tabs=Tracker&tracker=extremes-timeseries>



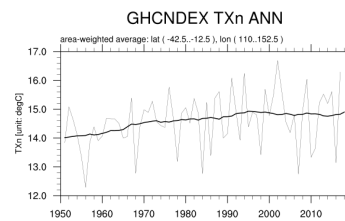
ETCCDI Indices for extremes



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Summary

- Care must be taken with using observational or model data for extremes
- Changes in station location or instrument type can have large impacts on extremes
- A range of indices/metrics for extremes exist and need care with interpretation, as they show different aspects of variations of extremes