Introduction to Indices

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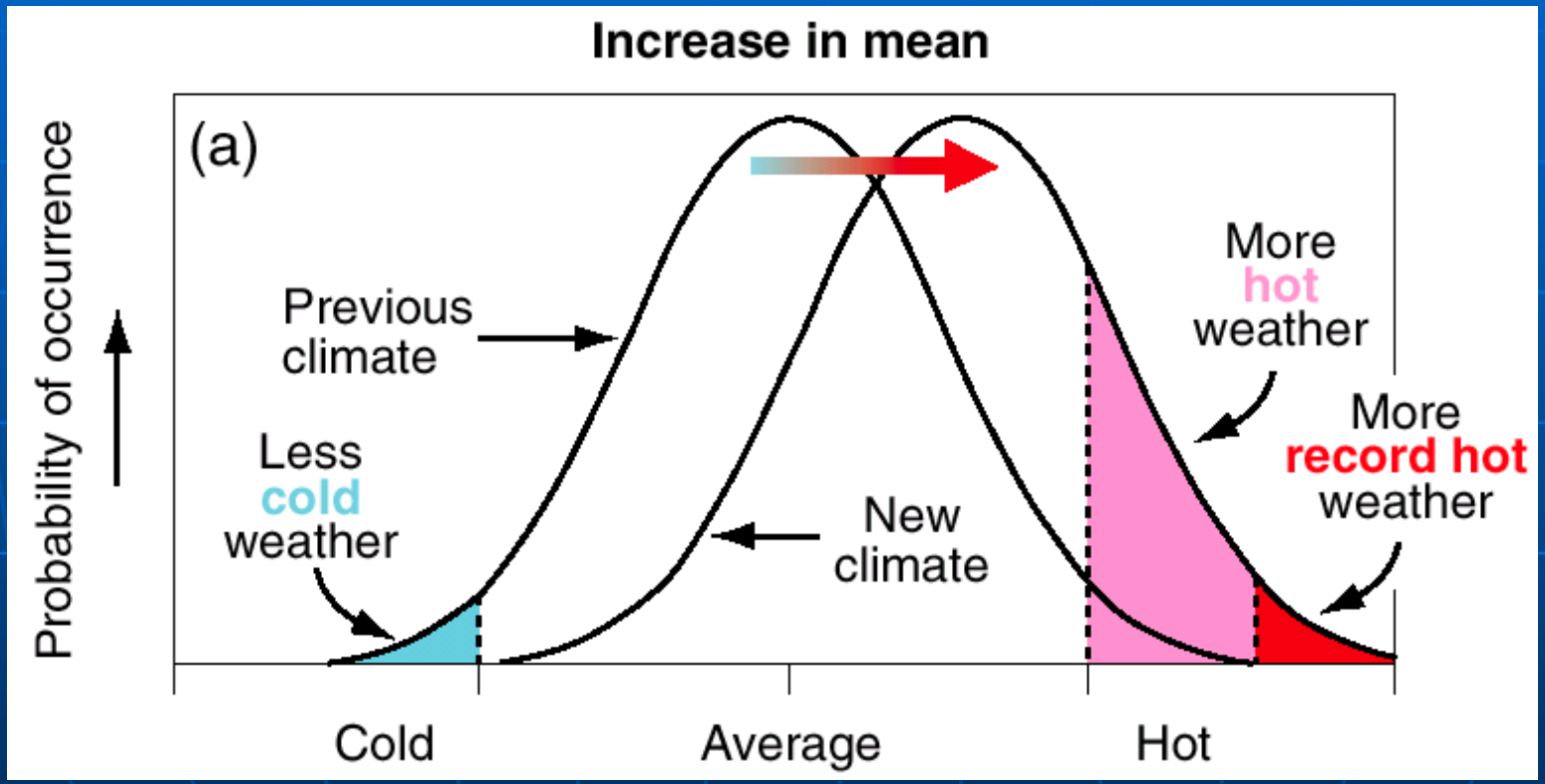
Indices versus Data

- Indices are information derived from data
- Proxy for data
- More readily released than data
  - Indices generally not of economic value – only research value
  - More on this later
- Are not reproducible without the data
  - A key component of science

Indices derived from Daily Data

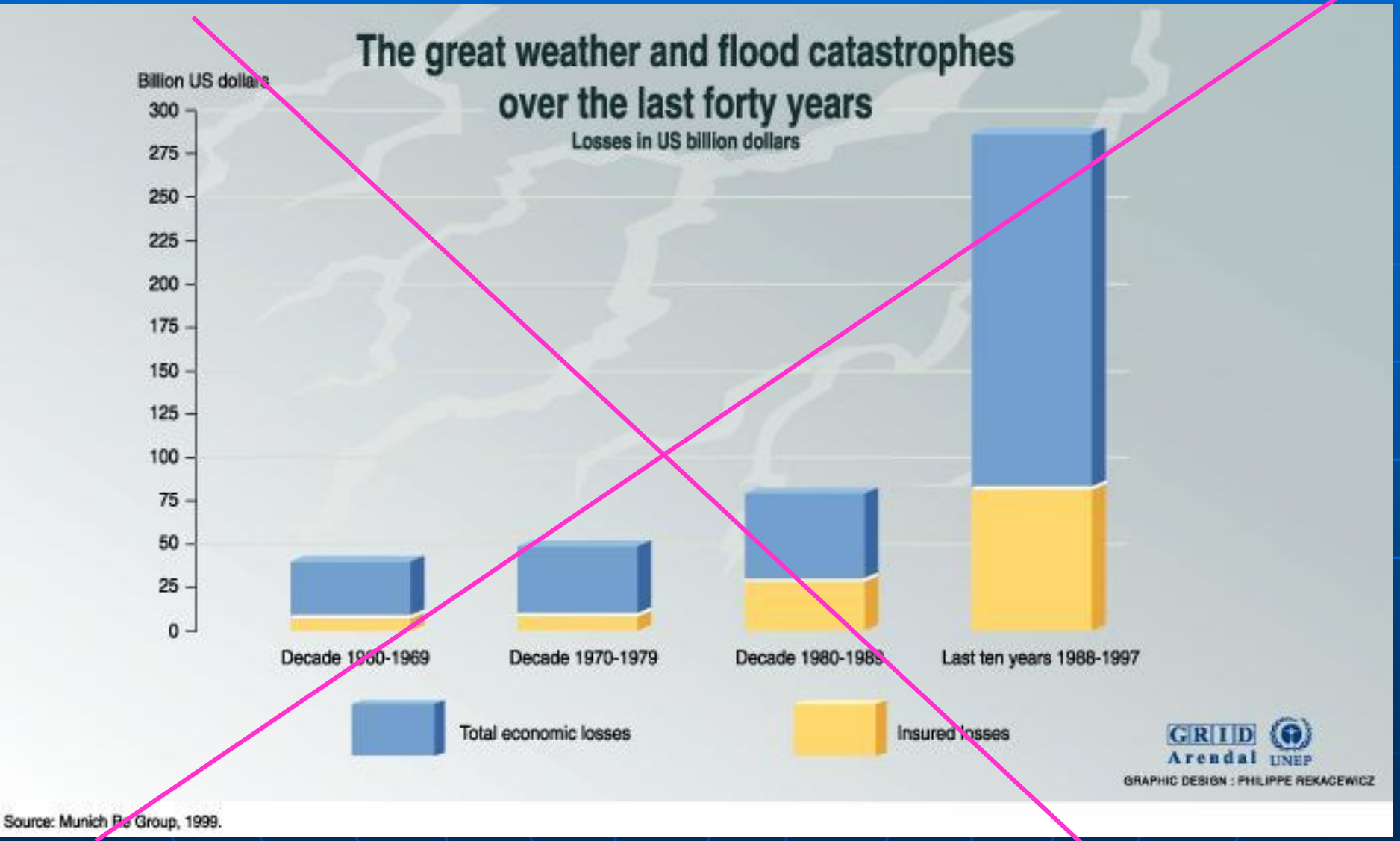
- Useful in a wide variety of climate change analyses
  - Observational
  - Model – observations comparisons
- Especially analyses of extremes

Changes in Means versus Extremes



IPCC-TAR (Ch.2, Folland and Karl)

Many different ways to calculate indices


The great weather and flood catastrophes over the last forty years
Losses in US billion dollars
Billion US dollars
300
275
250
225
200
175
150
125
100
75
50
25
0
Decade 1960-1969
Decade 1970-1979
Decade 1980-1988
Last ten years 1988-1997
Total economic losses
Insured losses
GRID Arendal
UNEP
GRAPHIC DESIGN : PHILIPPE REKACEWICZ
Source: Munich Re Group, 1999.

What types of extremes?

- Trends in extreme events characterised by the size of their societal or economic impacts

NO

- Trends in "very rare" extreme events analysed by the parameters of extreme value distributions

NO

- Trends in observational series of phenomena with a daily time scale and typical return period < 1 year (as indicators of extremes)

YES

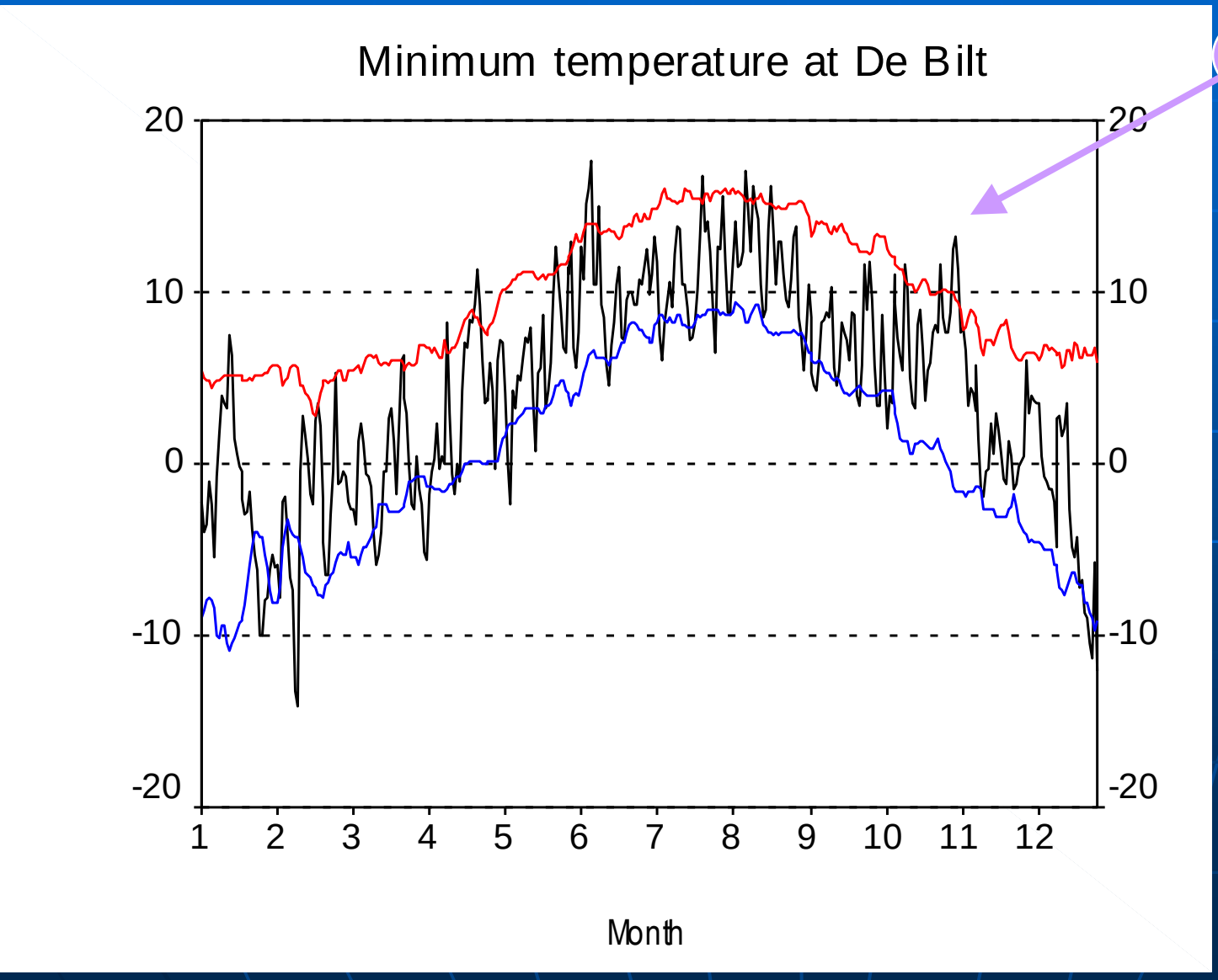
Approach

- Focus on counts of days crossing a threshold; either absolute/fixed thresholds or percentile/variable thresholds relative to local climate
- Standardisation enables comparisons between results obtained in different parts of the world

Motivation for choice of "extremes"

- The detection probability of trends depends on the return period of the extreme event and the length of the observational series
- For extremes in daily series with typical length ~50 yrs, the optimal return period is 10-30 days rather than 10-30 years

After: Jones et al. (Climatic Change, 1999)
Yan et al. (…, 2002, IMPROVE- issue)



"warm nights"

upper 10-ptile 1961-1990

the year 1996

lower 10-ptile 1961-1990

Indices we're using

- Most are throughout the year
  - "Warm nights" just as likely in winter as in summer
- Some are absolute thresholds that make physical sense
  - $T < 0^{o}$, $T > 30^{o}$, $P > 20$ mm
  - These are seasonal and regional

Data Exchange versus Information Exchange

- Ideal from a science point of view:
  - Everyone has full access to all observations
- Reality:
  - Many institutional obstacles to data exchange
    - Vary country by country, region by region

Science Issues

- Global climate change analyses
  - Don't need to know it was, for example, 30.5°C July 12th 1986
  - Only how the climate changed
- Hence, indices can substitute for data in many analyses
  - But then the analyses aren't reproducible
    - Reproducibility is a cornerstone of science

RClimDex Indices

- Lucie will present this part

http://docs.lib.noaa.gov/rescue/data_rescue_home.html