World Meteorological Organization

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Climate extremes, current status of knowledge and operational needs and challenges

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Major scientific assessments of climate extremes

- IPCC Special Report (2011): 'Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation' (SREX)
- IPCC 5th Assessment Report (AR5) due for release late 2013/early 2014

Some terminology

- Detection: determining what changes have (and have not) occurred
- Attribution: determining the extent to which observed changes have a particular cause (e.g. increased levels of greenhouse gases)
- Projection: predictions of what is likely to happen in the future, based on certain scenarios of ongoing greenhouse gas emissions etc.

‘Virtually certain’, ‘very likely’, ‘likely’, ‘medium confidence’ and ‘low confidence’ also all have specific definitions.

Key findings: detection and attribution (1)

- Very likely that cold extremes have decreased at global scale; medium confidence for increases in warm extremes/heatwaves.
- Low/medium confidence in changes of temperature extremes at the continental scale for Africa.
- Likely that greenhouse gas emissions are contributing to observed changes in temperature extremes
- Extreme rainfall increasing in more parts of the world than decreasing, but big regional variations; low confidence in Africa

Key findings: detection and attribution (2)

- Likely that there has been a southward shift in Southern Hemisphere storm tracks
- Findings on drought mostly inconclusive, but evidence of increases in southern Africa
- Low confidence in changes in tropical cyclone frequency or intensity
- Low confidence in changes in flood occurrence

Key findings: projections

- Continued increases in warm temperature extremes and decreases in cold extremes
- Globally, 1 in 20 year extreme temperature event now expected to become 1 in 2 year event by 2100; in eastern and southern Africa, 1 in 1 year or more frequent
- Weak increases projected in 1 in 20 year extreme precipitation events
- Drought incidence projected to increase in southern Africa, low confidence elsewhere

WMO bodies relevant to extremes

WMO (through CCl) sponsors or co-sponsors two groups in this field:

- The Expert Team on Climate Change Detection and Indices (ET-CCDI)
- The Task Team on Definition of Extreme Climate and Weather Events (TT – DECWE)

What does ET-CCDI do?

- Development of consistent indices for monitoring climate change and variability
- Organising and sponsoring regional climate workshops for generation of indices
- Sponsoring and disseminating software (e.g. RHtests for homogenisation, RClimDex for index calculation) and other technical information

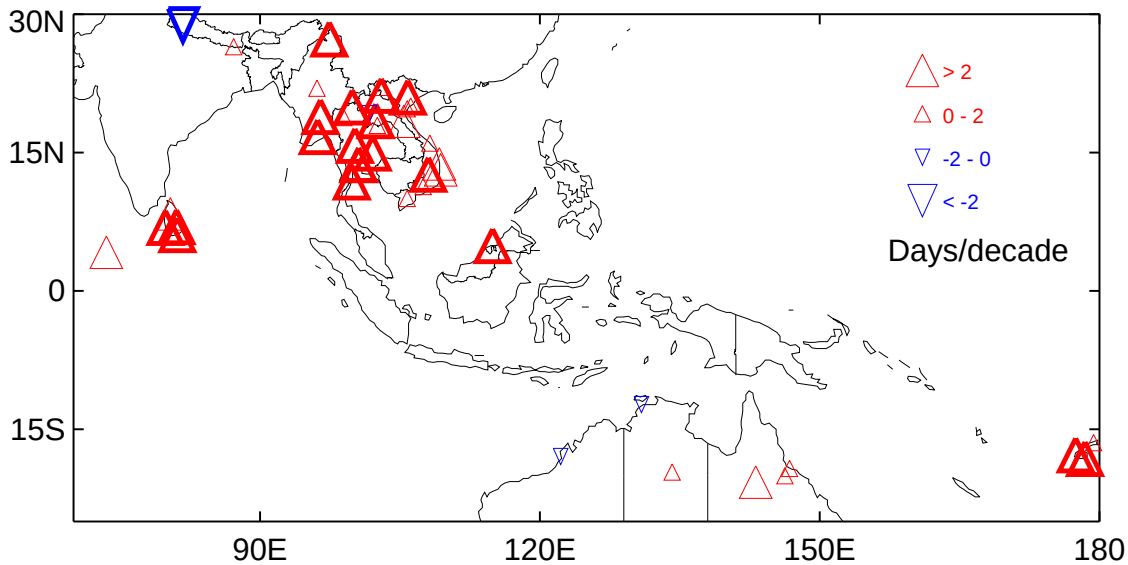
Some common indices defined by ETCCDI

- TX90p – number of days with maximum temperature above the 90th percentile
- TNn – lowest minimum temperature in a month/season/year
- R95pTOT – proportion of total annual precipitation derived from days above the 95th percentile
- CDD – longest period of consecutive dry days

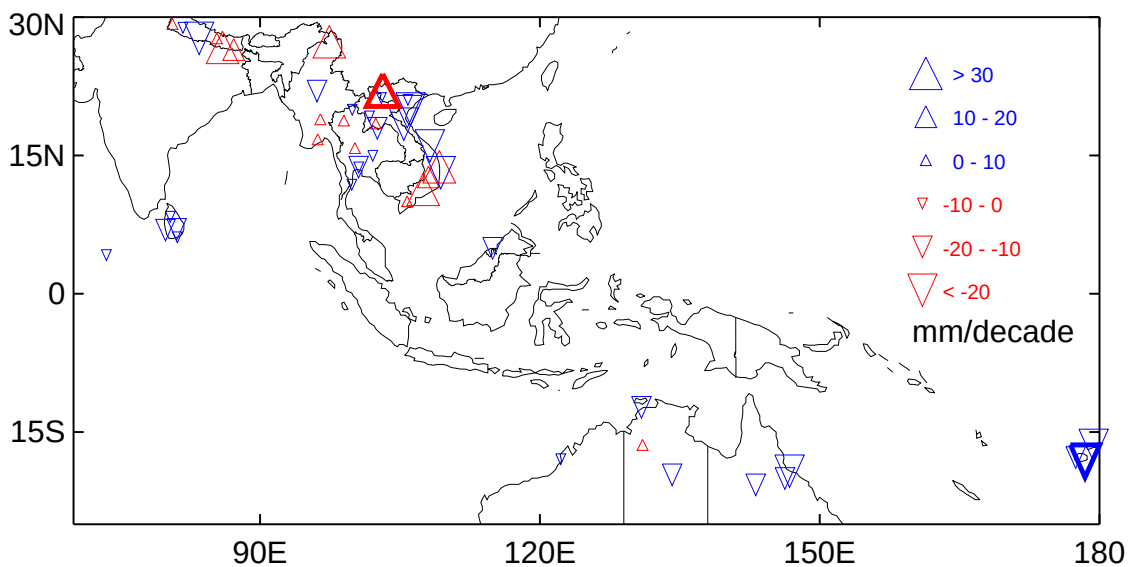
The workshop concept

- Countries from a region gather at a regional workshop, bringing their station time series
- Data sets are analysed/homogenised on a common basis
- Time series of indices are produced and analysed but countries retain ownership of underlying data
- Results normally published in a peer-reviewed paper

Some examples of workshop results



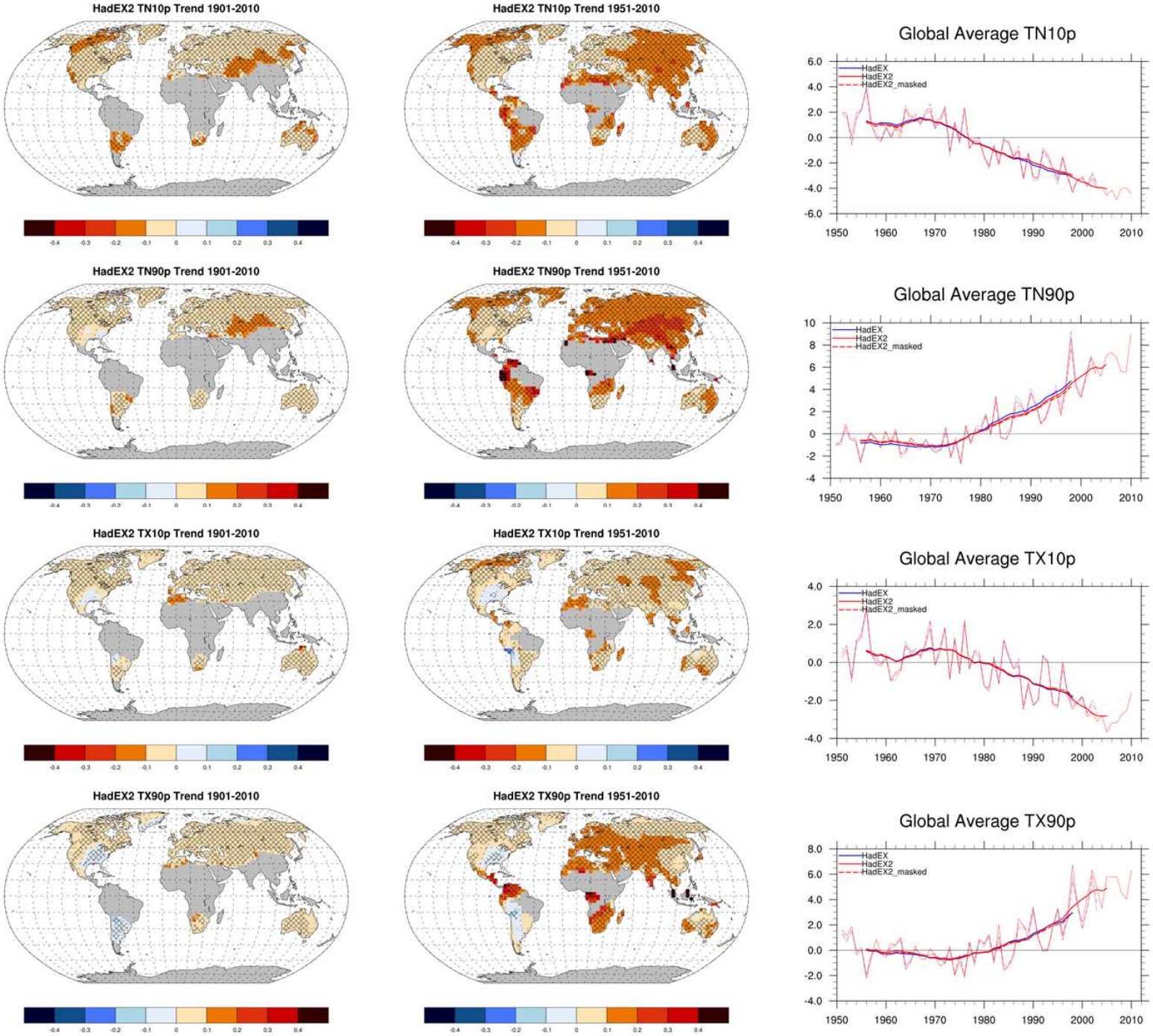
Minima above 90th percentile



Maximum 5-day precipitation

Source: Caesar et al. (2011), IJC

Global temperature extremes from the HadEX2 dataset

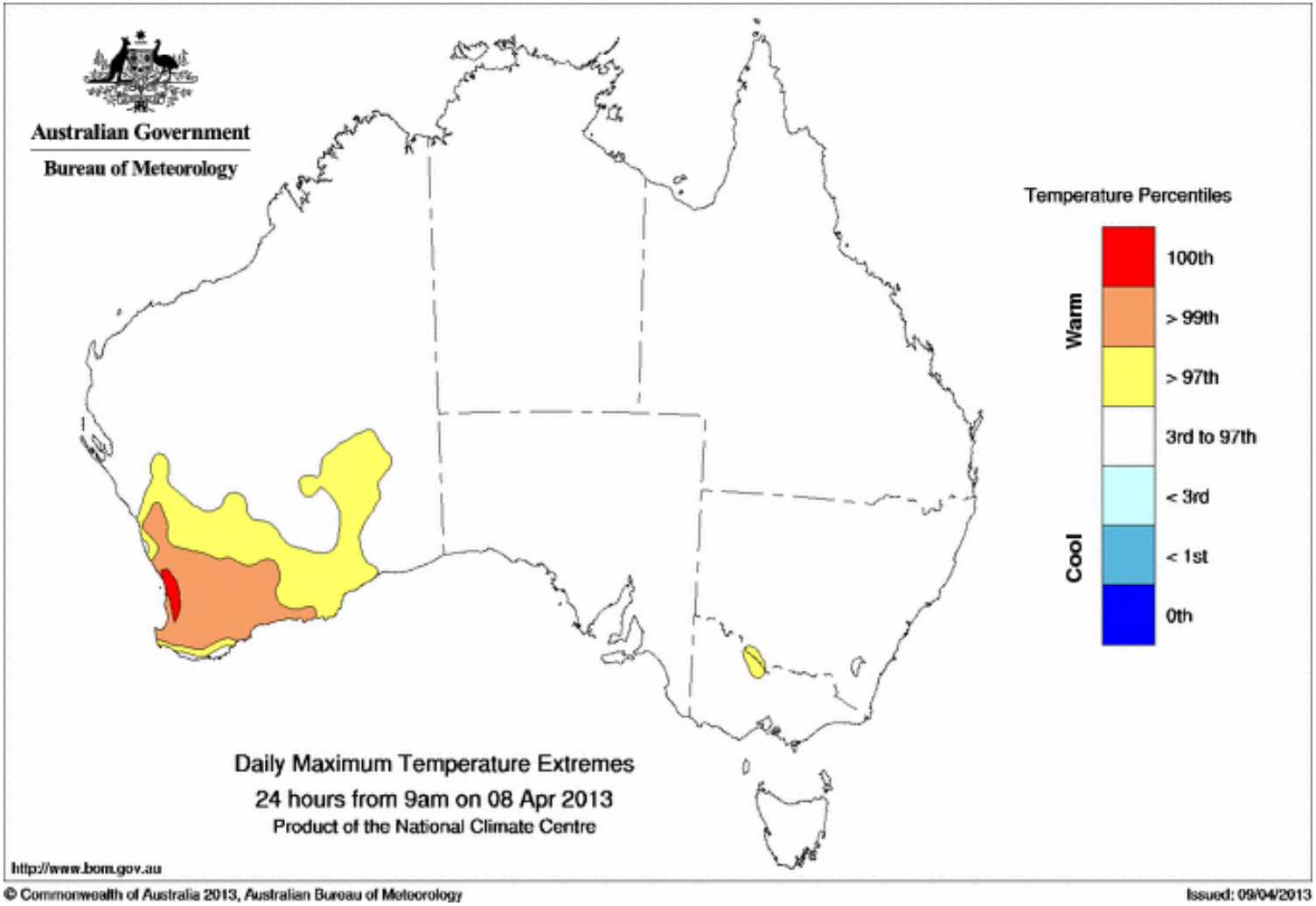


Source: Donat et al. (2013), JGR

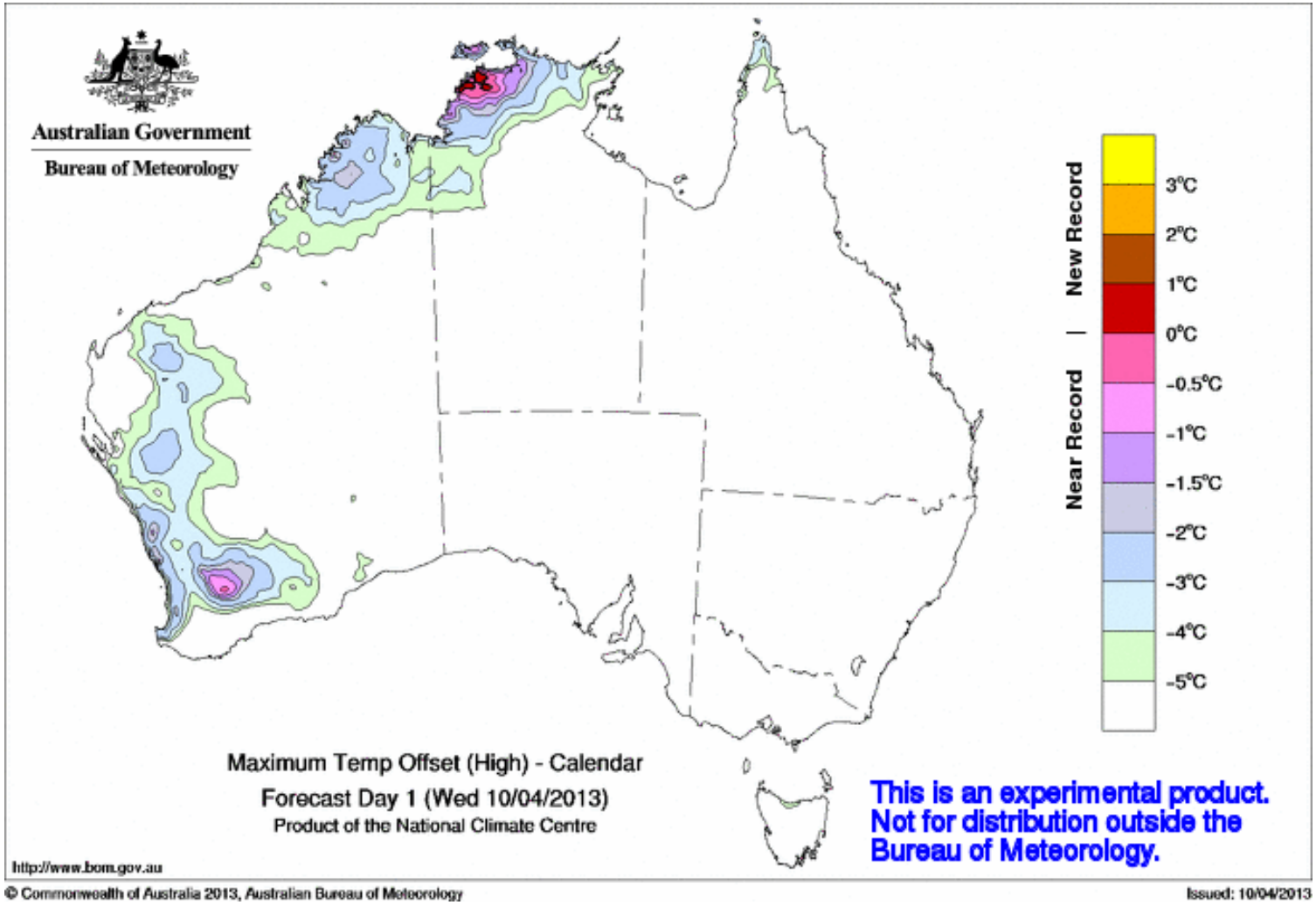
Current status of Task Team on Definition of Extreme Climate and Weather Events

- Task Team still in early stages of operation
- Major goal is to develop consistent definitions of regional (as opposed to site-specific) extreme events
- Aiming to support global communication of significant information (e.g. through portals giving easy access to national/regional information)

An example of real-time extremes monitoring



This can also feed into prediction tools…



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Some challenges in near real-time extremes monitoring

- Data availability for global/regional analyses
- Availability and quality control of data in a timely manner
- Consistency of regional analyses
- Knowledge of historical extremes
- Homogeneity of recent data with historical extremes
- NMHS capacity to monitor and interpret extreme events

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Thank you for your attention