

Contribution to Prediction and Attribution of Extreme Events:

the Expert Team on Climate Change Detection and Indices (ETCCDI)

Xuebin Zhang

Climate Research Division
Science and Technology Branch

Albert Klein Tank

KNMI



Outline

- ETCCDI in brief
- Collaboration with other groups
- ETCCDI indices
- Regional workshops
- Status of ETCCDI workplan
- Key challenges

ETCCDI: Anthropogenic, extremes

- Key science questions
 - Impact and adaptation relevant variables/events
 - Past changes and causes
 - Future prediction and projections and uncertainty in the projections
- Range of expertise covered by the members
 - Detection and attribution (CLIVAR members)
 - Long-term climate data (CCI members)
 - Long-term marine data (JCOMM members)



Collaboration with others

- Well integrated with CCI
 - Expert Teams on climate monitoring, data rescue, sector specific indices (water resources and agriculture)
 - Much of activities funded by/through CCI
- IDAG: International ad-hoc Detection and Attribution Group (NOAA/DOE funded since 1995)
- JCOMM, position paper on marine indices, extension of land indices to ocean
- GEWEX, extremes in precipitation, drought

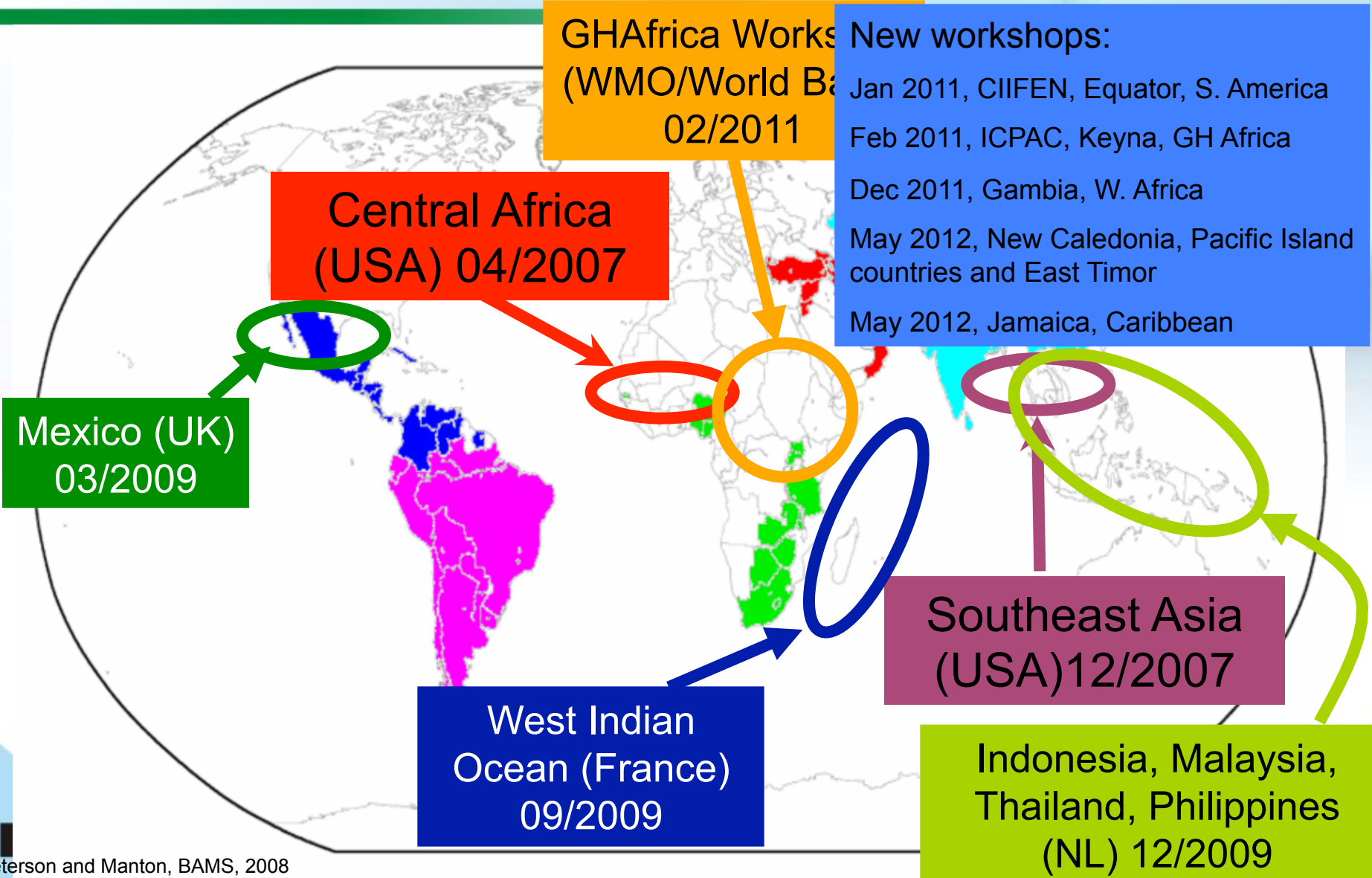
Indices as important basis for research on climate extremes

- Internationally coordinated, software provided
- Simple, straight forward, reliable, and consistent across different regions
- Frequency, amplitude, persistence of extreme events that can be monitored with daily precipitation and temperature
- For both observations and model simulations
- Used in trend analysis, detection and attribution, projection
- Recent review (Zhang et al. WIREs 2011) suggests modification to some indices

Capacity building and regional workshops

- Workshops supported by various funders including WMO (CCI and CLIVAR), US, Australia, UK, world bank etc.
- Practice and goals:
 - Free software + hands-on training + post workshop follow-ups
 - build capacity to analyze observed changes in extremes
 - improve information services on extremes
 - publish peer-reviewed papers from each workshop
 - contribute to worldwide database of derived indices
- Workshop papers done in time for TAR, AR4 and SREX, and AR5 as well

WMO ETCCDI Workshops 2002-2012 (complemented by APN)



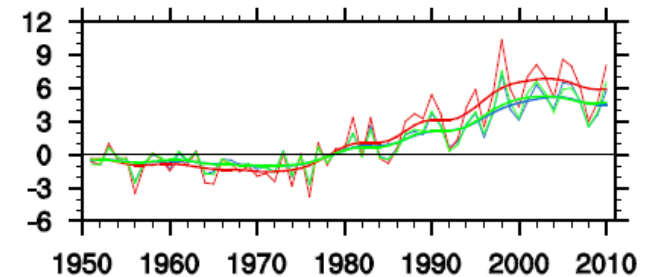
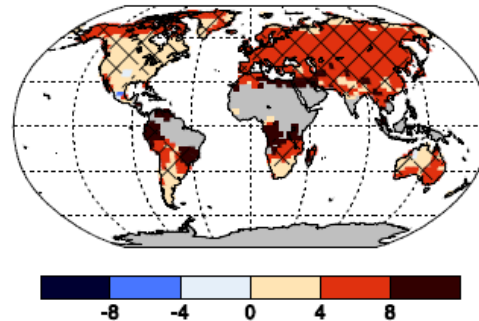
Detection and attribution

- Closely linked with IDAG
- New detection work uses CMIP5 models
- Event attribution is an emerging area of research
 - After-the-fact attribution of climate events (e.g. European heat wave, UK flood. Russian heatwave) by IDAG and others
 - Predictive event attribution (estimate of fractional attributable risk due to El Nino, or anthropogenic forcing etc.)
 - ETCCDI is undecided which way to take but has done some work with the second approach.

Indices from observations

- HadEX2 to be released July
- Slightly better coverage than HadEX
- Workshop data being ingested
- Data paper in preparation to meet AR5 deadline
- A separate dataset based on GHCN data
- Offers near real time update for monitoring

(c) warm nights



(d) warm days

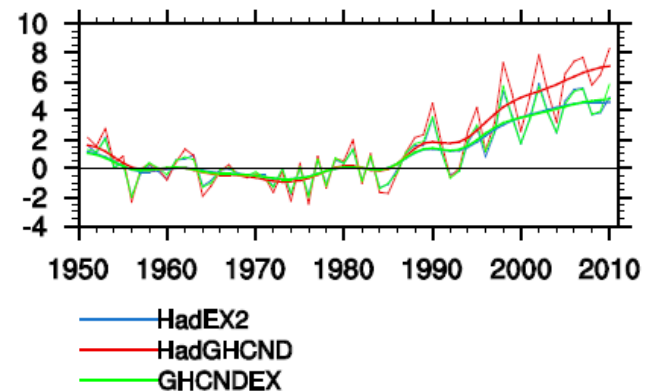
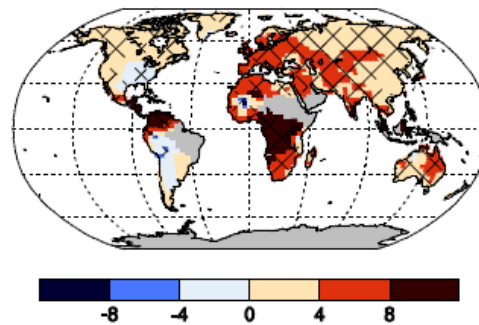
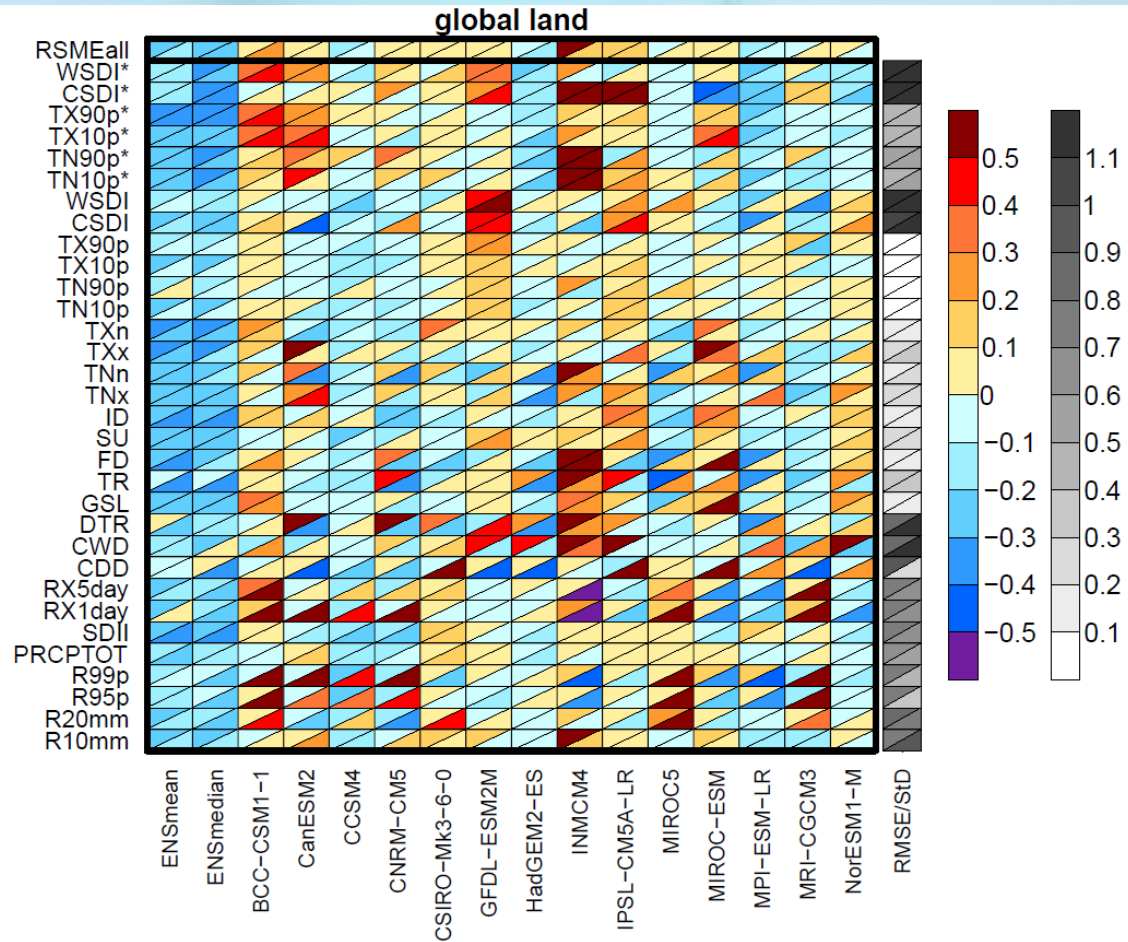


Figure 2.41: Maps show observed trends (days per decade) in the frequency of extreme temperatures, over the period 1951 to 2010, for: (a) cool nights (10th percentile), (b) cool days (10th percentile), (c) warm nights (90th percentile) and (d) warm days (90th percentile). Trends were calculated only for grid boxes that had at least 30 years of data during this

Indices from CMIP3/CMIP5 models

- One run per model (14 CMIP5 models and 18 CMIP3 models) analyzed
- Model evaluation paper in preparation to meet AR5 deadline
- Indices for all CMIP5 runs being calculated
- Indices from CMIP5 to be released through CCCma and ESG in July



Sillmann et al. 2012 in preparation

Key challenges (1 of 2)

- Manage expectations:
 - Linking WCRP science on extremes to CCI adaptation and climate service needs
 - High expectation on capacity building and climate service
 - Small team, limited capacity
- Keep the team focused, as well as open for new directions
 - Maintain and enhance traditional indices work as demands grow
 - Consider new areas such as climate events attribution
- Positioned to develop broadened indices
 - Heat wave related indices (Blair Treiw)
 - Drought indices
 - Marine indices



Key challenges (2 of 2)

- Data issue:
 - Many daily data not openly exchanged
 - Models may not adequately simulate extreme
 - There is a scale mismatch between station data and model data
- Detection and attribution
 - Still low s/n for most extremes (daily temperature is an exception) to detect external influence
 - Event attribution in operational model
 - Prediction for near-term (10-20 yr) and projection for long-term (50+yr) of extremes at impact/adaptation relevant scales
- Engineering applications of non-stationary in extreme
- Understanding processes generating extremes



Linking WCRP science on climate extremes to CCI climate service mandate

- Organize regional workshops, work with IDAG on detection and attribution
- Work closely with CCI's other ETs to support climate service
- Increase involvement of expert statisticians in formulating questions on extremes (Recent BIRS workshop as an example, International Meetings on Statistical Climatology)
- Contribute to IPCC AR5 (indices data from observations and models, analyses, D&A, IPCC report authorship)
- Maintain and update indices for both observations and CMIP5 simulations



Thank you!