Regional Approaches to Climate Change Detection and Assessments

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Outline

- Climate Data Management
  - Data Rescue
- Climate Indices
- Climate Monitoring and Watches
- Regional Climate Outlook Forums
- Regional Climate Centres
- Sand & Dust Storm Warning and Assessment System
- Global Framework for Climate Services
Climate Data Management Systems

• THE AIM
  – Managing Climate records using state modern data management systems
  – Ensuring easy access, and Data Import-export,
  – Providing quality control function

• THE CHALLENGE
  – Bridging IT gap in Developing Countries, LDCs and SIDS

• A capacity building package includes:
  – Four weeks training
  – Provision of CDMS
  – Provision of computer ready to operate

• More than 80 CDMSs installed around the world, largely through Voluntary Cooperation Programme (VCP) by WMO Members
Climate Data Rescue (DARE)

- Long-term, high-quality and reliable climate data are key information required in undertaking robust and consistent assessments in order to better understand, detect, predict and respond to global climate variability and change.
- The benefit areas of DARE include regional climate studies and predictions, calibration of satellite data, generation of climate quality reanalysis data, translating climate proxy evidences into instrumental terms, etc.
The MEditerranean climate DAData REscue (MEDARE) Initiative

- MEDARE, born under the auspices of the WMO, has the main objective to develop, consolidate and promote climate data and metadata rescue activities across the Greater Mediterranean Region (GMR).
- Participating countries: Algeria, Andorra, Armenia, Bosnia-Herzegovina, Bulgaria, Croatia, Cyprus, Egypt, France, Greece, Israel, Italy, Jordan, Libya, FYROM, Malta, Montenegro, Morocco, Romania, Serbia, Slovenia, Spain, Syria, Turkey.
- Two regional workshops (2007, 2010)

http://www.omm.urv.cat/MEDARE/index.html
Climate Monitoring

• Regional Workshops on climate watches to promote using climate monitoring for early warning on climate anomalies and related extreme events

• Goals:
  – Support NMHSs to make best use of existing climate monitoring infrastructure global, regional and national to issue climate watches and assist users in taking early actions against high-impact climate anomalies and related extremes;
  – Raise awareness on gaps in observing networks and climate data at regional level which impede the development of high quality and timely climate watches;
Climate Watches

• A natural evolution of meteorological alerts, to expand the time scale of the alerts to include information on climate anomalies for the week, month or a season and also to provide information on their persistence and evolution with time.

• Purpose:
  – To monitor climate anomalies and related extremes
  – To produce and disseminate climate advisories (climate alert bulletins) on significant ongoing or foreseen climate anomalies
  – To heighten awareness among relevant users to initiate preparedness measures
  – To interact with the users prior, during and after the Alert episode
Climate Watch System Regional Workshops

Map showing locations of workshops in different regions:
- Region IV: North America, Central America, and the Caribbean, 2008
- Region VI: Europe, 2010
- Region II: Asia, 2009
- Region V: South-West Pacific
Climate Change Detection and Indices

- WMO CCI/WCRP-CLIVAR/JCOMM Expert Team on Climate Change Detection and Indices (ETCCDI)
- Provide International Coordination for Climate change detection and climate indices
- Provide Guidance for NMHSs on analysing climate extremes based on simple indices
- Develop tools and material including software to calculate indices
- Organize training workshops
- Publications and contribution to IPCC ARs
ETCCDI Workshop Software

- Indices formulations coordinated by the ETCCDI
  - Workshop results will be able to fit together seamlessly
- Workshop suitable software (RClimDex) produced on behalf of the ET by Xuebin Zhang of Environment Canada
  - http://ccma.seos.uvic.ca/ETCCDI/
  - Uses the free “R” statistical package
Typical ETCCDI Workshop Agenda (Recipe)

- Introductions to the issues and people
- Data quality control testing
- Testing data homogeneity
- Calculating indices
- Making sense out of the results
  - Country reports
  - Regional evaluation
- Post workshop planning
  - Who will write the articles, can indices be shared, etc.
ETCCDI Workshop for Southwest Asia

- Southwest Asia – October 4-9, 2004, Alanya, Turkey.
- Scientists from 12 countries (Armenia, Azerbaijan, Bahrain, Georgia, Iran, Iraq, Jordan, Kuwait, Oman, Qatar, Syria, Turkey) participated.
- Daily data at 75 stations analysed (~50 yrs up to 2003)
<table>
<thead>
<tr>
<th>ID</th>
<th>Indicator name</th>
<th>Definitions</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>FD0</td>
<td>Freer days</td>
<td>Annual count when TN (daily min) &lt; 0°C</td>
<td>days</td>
</tr>
<tr>
<td>SJ25</td>
<td>Summer days</td>
<td>Annual count when TX (daily max) &gt; 25°C</td>
<td>days</td>
</tr>
<tr>
<td>ID0</td>
<td>Ice days</td>
<td>Annual count when TX (daily max) &lt; 0°C</td>
<td>days</td>
</tr>
<tr>
<td>TR20</td>
<td>Tropical nights</td>
<td>Annual count when TN (daily min) &gt; 20°C</td>
<td>days</td>
</tr>
<tr>
<td>GSL</td>
<td>Growing season length</td>
<td>Annual (1 Jan to 31 Dec in NH, 1 Jul to 30 Jun in SH) count between first span of at least 6 days with TG &gt; 5°C and first span after 1 Jul (1 Jan in SH) of 6 days with TG &lt; 5°C</td>
<td>days</td>
</tr>
<tr>
<td>TXk</td>
<td>Max Tmax</td>
<td>Monthly max value of daily max temperature</td>
<td>ºC</td>
</tr>
<tr>
<td>TNx</td>
<td>Max Tmin</td>
<td>Monthly max value of daily min temperature</td>
<td>ºC</td>
</tr>
<tr>
<td>TXn</td>
<td>Min Tmax</td>
<td>Monthly min value of daily max temperature</td>
<td>ºC</td>
</tr>
<tr>
<td>TNn</td>
<td>Min Tmin</td>
<td>Monthly min value of daily min temperature</td>
<td>ºC</td>
</tr>
<tr>
<td>TN10p</td>
<td>Cool nights</td>
<td>Percentage of days when TN &lt; 10th percentile</td>
<td>days</td>
</tr>
<tr>
<td>TX10p</td>
<td>Cool days</td>
<td>Percentage of days when TX &lt; 10th percentile</td>
<td>days</td>
</tr>
<tr>
<td>TN90p</td>
<td>Warm nights</td>
<td>Percentage of days when TN &gt; 90th percentile</td>
<td>days</td>
</tr>
<tr>
<td>TX90p</td>
<td>Warm days</td>
<td>Percentage of days when TX &gt; 90th percentile</td>
<td>days</td>
</tr>
<tr>
<td>WSDI</td>
<td>Warm spell duration indicator</td>
<td>Annual count of days with at least 6 consecutive days when TX &gt; 90th percentile</td>
<td>days</td>
</tr>
<tr>
<td>CSDI</td>
<td>Cold spell duration indicator</td>
<td>Annual count of days with at least 6 consecutive days when TN &lt; 10th percentile</td>
<td>days</td>
</tr>
<tr>
<td>DTR</td>
<td>Diurnal temperature range</td>
<td>Monthly mean difference between TX and TN</td>
<td>ºC</td>
</tr>
<tr>
<td>RX1day</td>
<td>Max 1-day precipitation</td>
<td>Monthly max 1-day precipitation</td>
<td>mm</td>
</tr>
<tr>
<td>RX5day</td>
<td>Max 5-day precipitation</td>
<td>Monthly max consecutive 5-day precipitation</td>
<td>mm</td>
</tr>
<tr>
<td>SDII</td>
<td>Simple daily intensity index</td>
<td>Annual total precipitation divided by the number of wet days (defined as PR ≥ 1.0 mm)</td>
<td>mm day⁻¹</td>
</tr>
<tr>
<td>R10</td>
<td>No. of heavy precipitation days</td>
<td>Annual count of days when PR ≥ 10 mm</td>
<td>days</td>
</tr>
<tr>
<td>R20</td>
<td>No. of very heavy precipitation days</td>
<td>Annual count of days when PR ≥ 20 mm</td>
<td>days</td>
</tr>
<tr>
<td>Rnn</td>
<td>No. of days above nn mm</td>
<td>Annual count of days when PR ≥ nn mm. nn is user defined threshold</td>
<td>days</td>
</tr>
<tr>
<td>CDD</td>
<td>Consecutive dry days</td>
<td>Max number of consecutive days with RR &lt; 1mm</td>
<td>days</td>
</tr>
<tr>
<td>CWD</td>
<td>Consecutive wet days</td>
<td>Max number of consecutive days with RR &gt; 1 mm</td>
<td>days</td>
</tr>
<tr>
<td>R95p</td>
<td>Very wet days</td>
<td>Annual total PRCP when PR &gt; 95th percentile</td>
<td>mm</td>
</tr>
<tr>
<td>R99p</td>
<td>Extremely wet days</td>
<td>Annual total PRCP when PR &gt; 99th percentile</td>
<td>mm</td>
</tr>
<tr>
<td>PRCPTOT</td>
<td>Annual total wet-day precipitation</td>
<td>Annual total PRCP in wet days (PR ≥ 1 mm)</td>
<td>mm</td>
</tr>
</tbody>
</table>
Regional Climate Centres (RCCs)

- WMO RCCs/RCC Networks, initiated by RAs and designated by WMO through its CBS and CCI, perform well-defined regional-scale climate functions

- Mandatory Functions:
  - Operational Activities for LRF; Operational Activities for Climate Monitoring; Operational Data Services to support operational LRF and climate monitoring; Training in the use of operational RCC products and services

- Highly Recommended Functions:
  - Climate prediction and projection; Non-operational data services; Coordination functions; Training and capacity building; Research and development

- RCCs/RCC Networks will be complementary to and supportive of NMHSs, who will deliver all Warnings and national-scale products
RCC Implementation Status

- RA II (Asia): Beijing and Tokyo designated as WMO RCCs in June 2009; Pilot Phase RCC in Russia; India, Iran, and Saudi Arabia pursuing RCC implementation
- RA VI (Europe): Pilot phase of RCC Network in operation (3 Nodes: France-Russia; Germany; The Netherlands).
- RA I (Africa): Decides to work towards the establishment of six RCCs (ACMAD, AGRHYMET, ICPAC, SADC-CSC, Central Africa, North Africa); Pilot phase RCCs commenced at ACMAD and ICPAC.
- RA III (South America): Decides to work towards the establishment of three RCCs (CIIFEN, Brazil, Argentina)
- RA IV (North and Central America and the Caribbean): CIMH pursuing RCC designation
Designated RCCs
Pilot RCCs
Pilot RCC Networks
Pilot RCCs by 2012
Pilot RCC Networks by 2012
Pilot RCCs in development
Regional Climate Outlook Forums (RCOFs)

- A key component of WMO Climate Information and Prediction Services (CLIPS) project activities.
- First established in October 1996 at the Workshop on Reducing Climate-Related Vulnerability in Southern Africa (Victoria Falls, Zimbabwe).
- RCOF Concept was pioneered in Africa and spread worldwide.
- WMO and a number of national, regional and international organizations (e.g., NOAA, IRI, Meteo France, World Bank, etc.) have supported their growth and expansion.
Regional Climate Outlook Forums worldwide
Climate Change and RCOFs

- RCOFs worldwide have been set up so far with the main focus on seasonal prediction.
- However, the same RCOF mechanisms can be effectively expanded to cater to the needs of developing and disseminating regional climate change information products.
- Such initiatives are already being taken up by some RCOFs.
- Regional assessments of observed and projected climate change, including the development of downscaled climate change scenario products for impact assessments, can be included in the product portfolio of RCOFs.
Consensus Process in RCOFs (Climate Change)

Observations
- Baselines, Model Validation
- Climate Trends

Assessment (conversation)

Background
- Average climate
- Climate Sensitivity

Scenarios
- Global Projections
- Regional Projections
- Downscaling, Uncertainties

Regional Climate Change Scenarios

Products
WMO Sand and Dust Storm Warning and Assessment System (SDS-WAS)

- SDS-WAS: A Federated System of Regional Nodes: Modelling, Research, Observations and Users
- To enhance the ability of countries to deliver:
  - timely and quality forecasts of SDS
  - observations of dust aerosols
  - Provide information and knowledge to users
- through
  - an international partnership of research and transfer of experimental products to operations

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Global Framework for Climate Services (GFCS)

Users, Government, private sector, research, agriculture, water, health, construction, disaster reduction, environment, tourism, transport, etc.

- User Interface
- Climate Services Information System
- Observations and Monitoring
- Research, Modeling and Prediction

Capacity Building
Concluding Remarks

- In many regions, there is limited use of climate information. It is important to find ways for all countries to cope with climate variability and change through improved access to climate information and prediction/projection products and the use of risk management techniques.

- Climate adaptation and Climate-related risk management require multi-disciplinary/international collaborations and cross-disciplinary/international exchange of information.

- WMO is looking forward to GFCS as a major step forward in systematically providing climate information for decision making at various levels of climate-sensitive sectors.
Thank You

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