Reports of COMSATS Thematic Group on
“Climate Change and Environmental Protection”

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I. Broad Objectives of TG-CCEP

• To achieve South-South cooperation by creating linkages among the organizations working in the “climate and environmental sciences” in the developing countries:
  – Joint Research Projects
  – Experts Exchange
  – Knowledge Sharing
  – Capacity Building
    • Short-term (Training Course, Visiting Scientist Program)
    • Long-term (Post graduate Studies; PhD and Master Programs)
  – Sharing of Facilities and Resources
II. Activities of TG-CCEP (2012-2013)

1. International workshop
   - 2012 CTWF International Workshop

2. First ITRG-CCEP project officially launched
   - Formally approval of Chinese MOST international collaboration project (2011DFG23450)

3. New International Collaboration Established
   - Proposal on “Mountain Meteorology and Extreme Weather hazards at CIIT”

4. Joint Research Activities

5. Capacity Building
1. International Workshops - CTWF 2012

11th CAS-TWAS-WMO FORUM: International Workshop on “Terrestrial Ecosystems under the Changing Climate” was held on September 2-5, 2012 in Beijing, China.

Attendees: about 70 participants, including 22 international representatives coming from 9 developing countries and 3 developed countries.
The main objective of the workshop was to investigate the changes in terrestrial ecosystem as well as its interaction with climate change, focused on two aspects: (i) Ecosystem structure, functioning, and biodiversity; and (ii) Biophysical and biogeochemical processes in terrestrial ecosystem.
The workshop had totally 37 presentations, covers various topics from the ecosystem research network, observation and simulation of ecosystem structure, functioning and biodiversity, development and application from mathematical theoretical ecological model to comprehensive earth system model, vegetation-atmosphere carbon and nitrogen cycling, etc.
2. First ITRG-CCEP project

- International S&T Cooperation Program of China

- **Program title:**
  “Characteristics and mechanism of the extreme climate events under the climate change background”

- **Domestic participants:**
  - International Center for Climate and Environment Sciences (ICCES)
  - National Meteorological Information Center, China
  - Research Institution of Meteorological Science, Yunnan Province

- **International partnership**
  - COMSATS member countries
2. First ITRG-CCEP project

- **Project Progress Timeline:**
  - November 2010: Thematic group discussion
  - July 2011: First research proposal drafted by ICCES and submitted to MOST, CHINA, with COMSATS’ help in identifying potential research collaborators
  - November 2011: Submission of the modified version of proposal, with project been preliminarily approved by MOST
  - January 2012: Project been formally approved by MOST
  - April 2012: Budget been approved by MOST, with 3 years project initiated from May, 2012

- **Total budget and duration**
  - 1 million CNY
  - 1 May, 2012 – 30 April, 2015
2. First ITRG-CCEP project

"Characteristics and Mechanism of the Extreme Climate Events under the Climate Change Background"

1. GCISC/Pakistan
2. HiCCDRC/Kathmandu University/Nepal
3. IROST/Iran
4. CIIT
5. Sudan Meteorological Authority
6. Zimbabwe Meteorological Service
7. SPARCO/Pakistan
8. Pakistan Meteorological Department

Member of COMSATS’ ITRG-CCEP

Other Collaborators:
1. HAll/Thailand
2. JGSEE/Thailand
3. African countries? (Ghana)
4. South American countries? And more….
3. New International Collaboration Established

- The concept paper on the “Establishment of Research Group on Mountain Meteorology and Extreme Weather hazards at CIIT” has been proposed by CIIT, with support from ICCES and other international partners;

- The new collaboration between ICCES and KMUTT (King Mongkut’s University of Technology Thonburi), Thailand has been established, with the visit of Prof. Prugchan Wongwises to ICCES during October 15-17, 2012. And the Research Network on Seasonal Forecast in Thailand is being formed.

- Under the framework of ITRG, the joint research plan between ICCES and Iran, under the leadership by Mahmoud Molanejad- IROST, with participation from Atmospheric Science and Meteorological Research Center, and Soil Conservation & Watershed Management Research Institute, has been proposed.
3. New International Collaboration Established

- The joint research plan titled “Analytical and Simulation studies of Extreme Weather Events in Nigeria” has been proposed.

- At CIIT, a group on Climate Change entitled “CLIMATE CHANGE AND ECOSYSTEMS” has also been proposed. The group will be linked with the thematic group on “Climate Change and Environmental Protection” at ICCES, China in due course. Based on the expertise available at CIIT, the group is expected to explore the risks and hazards arising from the interactions between ecological systems and the changing climate. Apart from linking relevant strengths in the natural and social sciences within CIIT, the group will extend its collaboration to other relevant groups around the world.
4. Joint Research Activities

- Establishment of Data Center and its applications for climate research at COMSATS member countries
- Transferring of IAP seasonal climate prediction system
• **Climate Data Bank**

- Daily air temperature (maximum and minimum) and daily rainfall data of 25 stations in Nepal around 1980 to 2007 has been collected by HiCCDRC, Nepal. Moreover, extreme rainfall events of Nepal from 1960 to 2000 have also been identified.

- Monthly meteorological data over 47 stations in Thailand during 1961-2010 has been collected by HAll, Thailand, and preliminary analysis on the rainfall patterns over Thailand during 50 years have been conducted.

- Around 50 synoptic stations with 30=< years monthly meteorological data in Iran has been collected by ASMRC, Iran.

- Rain gauge measured data from Nigeria Meteorological Agency (NIMET) for six synoptic stations with variant climatic patterns namely; **Lagos**; Station Number (65201), Period 1910-2010, **Kano**; Station Number (65046) Period 1910-2010, **Maiduguri**; Station Number (65082) Period 1915-2010, **Owerri**; Station Number (65252), Period 1974-2010, **Ilorin**; Station Number (65101), period 1916-2010 and **Calabar**; Station Number (65264), Period 1910-2010 has been collected.
Map of Nepal showing stations (25, black dots) from where air temperature and precipitation data are available.
### Selected extreme events over Nepal

<table>
<thead>
<tr>
<th>Date</th>
<th>Recorded rainfall (mm)</th>
<th>Region /Stations</th>
</tr>
</thead>
<tbody>
<tr>
<td>1960 29 July</td>
<td>503</td>
<td>Musikot</td>
</tr>
<tr>
<td>1968 25 August</td>
<td>505</td>
<td>Gumthang</td>
</tr>
<tr>
<td>1974 28 July</td>
<td>405</td>
<td>Barahakshetra</td>
</tr>
<tr>
<td>1978 15 July</td>
<td>322</td>
<td>Hariharpur Gadhi</td>
</tr>
<tr>
<td>15 July</td>
<td>301</td>
<td>Tiger Tops</td>
</tr>
<tr>
<td>16 July</td>
<td>304</td>
<td>Ramauli Bairiya</td>
</tr>
<tr>
<td>19 July</td>
<td>376</td>
<td>Hetauda</td>
</tr>
<tr>
<td>1997 10 August</td>
<td>319.2</td>
<td>Sitapur</td>
</tr>
<tr>
<td>1998 3 August</td>
<td>362</td>
<td>Bardhaghat</td>
</tr>
<tr>
<td>3 August</td>
<td>407.0</td>
<td>Padari</td>
</tr>
<tr>
<td>3 August</td>
<td>495.0</td>
<td>Parasi</td>
</tr>
<tr>
<td>1999 6 October</td>
<td>203</td>
<td>Katai</td>
</tr>
<tr>
<td>11 July</td>
<td>310.0</td>
<td>Dumkibas</td>
</tr>
<tr>
<td>2000 24 April</td>
<td>240.7</td>
<td>Jajarkot</td>
</tr>
<tr>
<td>8 June</td>
<td>236.2</td>
<td>Koilabas</td>
</tr>
<tr>
<td>3 August</td>
<td>319.3</td>
<td>Daman</td>
</tr>
<tr>
<td>3 June</td>
<td>339.5</td>
<td>Janakpur Airport</td>
</tr>
</tbody>
</table>
Climate Data bank - Thailand

TMD
Precipitation Data
1961-2010
(48 stations)
Main rainfall pattern for June-July-August over Thailand during 1961-2010 with 48 stations

EOF 1 (19.6%)
EOF 2 (13.3%)
EOF 3 (7.0%)
Daily Precipitation from RClimdex

Precipitation (mm/day)
1961-2010

Station: 300202
MAE SARIANG
Climate Data bank - Iran

More than 300 synoptic meteorological stations
4. Joint Research Activities

- Establishment of Data Center and its applications for climate research at COMSATS member countries

- Transferring of IAP seasonal climate prediction system (IAP DCP-II)
## Details of IAP DCP II

<table>
<thead>
<tr>
<th>Prediction system</th>
<th>IAP DCP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Climate model</td>
<td>IAP 2 layers AGCM (horizontal resolution: 2.0° x 2.5° in latitude and longitude)</td>
</tr>
<tr>
<td>Atmospheric initial conditions</td>
<td>Wind, geopotential height, and relative humidity, taken from NCEP real-time analysis</td>
</tr>
<tr>
<td>Sea surface temperature</td>
<td>Combination of the observed Feb. SSTA and the predicted SSTA by IAP ENSO Prediction System</td>
</tr>
<tr>
<td>Hindcast period</td>
<td>29-year ensemble hindcast during 1982–2010</td>
</tr>
<tr>
<td>Ensemble size</td>
<td>28 members (from February 1st~28th)</td>
</tr>
<tr>
<td>Ensemble scheme</td>
<td>Arithmetic average</td>
</tr>
<tr>
<td>Duration of forecast</td>
<td>March to August</td>
</tr>
</tbody>
</table>
Transferring of IAP Seasonal Prediction

- Predict the climate anomalies (Rainfall, Temperature, wind, etc) several months (1-12 months) in advance
- Growing demand for reliable seasonal forecasts

- **Verification** is needed by using local station observation data
- **Localization**
  - Install at super-computing system with different Computing environment at host institutions
  - Selection of physical processes parameterization
- **Bias correction system over specific country**
Implementation of IAP Seasonal Prediction System at Thailand

- Transferred IAP ENSO prediction system to HAIi cluster
- Transferred IAP DCP II for seasonal prediction system from IAP to HAIi cluster
  - IAP ACGM 2 Layer
  - Bias correction based on observed TMD monthly rainfall data between 1982-2010 using 2 different techniques
    - EOF technique
    - SVD technique
- Adapted the system to focus on Thailand precipitation
  - Experimented changing initial condition
  - Experimented predicting monthly precipitation
Predicted Anomaly Precipitation JJA 2012
Before and After Bias Correction

Bias corrections using observed data from Thai Meteorological Department, 96 stations during 29 years from 1982 to 2010 of June to August, based on the EOF and SVD analysis.
5、Capacity Building

**Visiting program**

- 2 young scientists from Thailand worked at ICCES for 3 and 5 months respectively
- 3 young scientists from Brazil has been visiting ICCES
- 1 Russia scientists has been visiting ICCES
- 1 Postdoc from Thailand is now working at ICCES
- 1 young scientist from CIIT Pakistan have been applying to pursue doctoral degree at ICCES
III. Plan for Group Activities of TG-CCEP during 2013-2014 (After the 16th council meeting)

1. International training workshop on Extreme Events
2. 2013 CTWF workshop on Operational Oceanography
3. Capacity Building
## 1、International Training Workshop

### Basic Information:

1. **Date**: July 14-23, 2013
2. **Venue**: Beijing, China
3. **Theme**: Extreme weather and climate events: detection, monitoring, prediction and risk management for developing countries
4. **Organized by**: International Center for Climate and Environment Sciences

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Chinese Academy of Sciences (CAS)

The Academy of Sciences for the Developing World (TWAS)

The Commission on Science and Technology for Sustainable Development in the South (COMSATS)

International S&T Cooperation Program of China (2011DFG23450)
1、Training Workshop – General Information

Topics:
- Observation of extreme events and its detection
- Monitoring and prediction of extreme events
- Risk management of extreme events

Scientific Committee

Qingcun Zeng (ICCES/IAP, CAS)
Jinghua Cao (Bureau of international cooperation, CAS)
Tajammul Hussain (COMSATS, Pakistan)
Jiang Zhu (IAP, CAS)
Zhaohui Lin (ICCES/IAP, CAS)
Royol Chitradon (HAI, Thailand)
Ziniu Xiao (CMA Training Center, CMA)
Zhengyi Hu (University of CAS)
1、Training Workshop – General Information

**Lecturers:**

Dr. Guoyu REN (Observations & Data Analysis)
National Climate Center, China

Dr. Quanxi SHAO (Extreme Value Detection)
CSIRO Mathematics, Informatics and Statistics, Australia

Dr. Fumin REN (Detection of Extreme Events)
Chinese Academy of Meteorological Sciences, China

Dr. Peng ZHANG (Satellite Monitoring)
National Satellite Meteorological Center, China

Dr. Lifeng LUO (Modeling and Predictability)
Michigan State University, USA

Dr. Jason LEVY (Risk Management)
Virginia Commonwealth University, USA
1、Training Workshop – General Information

**Financial Support:**

Financial support (Including international travel and local expenses) is available for eligible candidates from developing countries.

**Important Dates:**

Deadline for Application Submission: *May 31, 2013*

Notice of Acceptance: *June 5, 2013*
1、Training Workshop – General Information

- Participants from COMSATS member countries are welcome, and COMSATS and ICCES will provide financial support for selected young scientists.

- Please recommend candidates from Africa, South America to join with us.

- Please register in the workshop webpage and submit the application form for financial support.
Basic Information:

1. Date: September 9-12, 2013,
2. Venue: Beijing, China
3. Theme: Operational Oceanography for developing countries
4. Organized by: International Center for Climate and Environment Sciences

Topics:

- Demands, Current Services and Challenges
- Capability Building
- Ocean Observations
- Modelling and Data Assimilation
- Operational Forecast: from short-range to ENSO
2、CTWF workshop - overview

Scientific committee:

- Prof. Qingcun Zeng (Chairman), Institute of Atmospheric Physics/CAS;
- Prof. Jiang Zhu, Institute of Atmospheric Physics/CAS;
- Prof. Clemente Tanajura, UFBA, Brazil;
- Prof. Mauro Cirano, UFBA, Brazil;
- Prof. Hui Wang, National Marine Environmental Forecast Center, China;
- Dr. Bjorn Backeberg, Nansen-Tutu Centre for Marine Environmental Research, Department of Oceanography, University of Cape Town;
- Prof Michael J. Roberts, Oceans and Coasts, Department of Environment Affairs, South Africa;
- Dr. M. Ravichandran, INCOIS, India;
- Dr. Francis Pavanathara, INCOIS, India.
2、CTWF workshop - overview

Meeting Date: September 9-12, 2013

Important Dates:
Deadline for Early Registration: July 5, 2013
Deadline for Abstracts Submission: July 10, 2013
Notice of Abstract Acceptance: July 20, 2013
3、Capacity Building

- **Short-term visiting scholarship to ICCES**
  - 1 Application from Nigeria
  - 1 from Pakistan

- **Master/PhD program by University of CAS**
  - Currently 2 applicants from CIIT are applying for pursuing doctoral degree in ICCES

- **Postdoc fellowship by TWAS-CAS joint program**

From 2013, ICCES can provide the opportunity for 10 young scientists and/or students from developing countries to continue their degree study or conduct collaborative research at ICCES.
COMMENTS & QUESTIONS?

Thank You!