Taiwan Climate Change Projection and Information Platform Project (TCCIP)

Outline

1. Why TCCIP was launched?
2. What has TCCIP done for Users?
3. TCCIP Phase II (2013-2015)
Why TCCIP was launched

– The role of TCCIP

Typhoon with extreme rainfall

The increase of extreme events is evident in recent 10 years.
More and More Extreme Events in Taiwan?

Typhoon Fanapi (2010)

Typhoon Megi (2010)

Urban flooding

Debris flow

What is TCCIP

A scientific project of climate change research
Tailored for Taiwan.

- Downscale global CC projection data (AR4) to Taiwan area.
- Local CC and it’s impact research (EX: flood and drought).
- Taiwan CC information application and data services.
- Phase 1: 2010~2012.
- Funded by Ministry of Science and Technology, Taiwan (~3 million USDS).
- Interdisciplinary cooperated: 2 research institutes, 2 governmental departments, 3 universities are included.
Structure of TCCIP Phase I

Taiwan Climate Change and Information Platform Project

Ministry of Science and Technology (MoST)

Research Center for Environmental Changes (RCEC), Academia Sinica

University (NTU, NTNU, NCKU,...)

Central Weather Bureau (CWB)

Organized and Implemented by NCDR

Research & Development

International Cooperation

KAKUSHIN program, Japan
High-resolution (20km) Climate Simulation
(Climate Projection for IPCC AR4)
Present: 1979-2003
Near Future: 2015-2039
End-of-century: 2075-2099

IPCC CMIP data

Application

Disaster Reduction
Land Use Planning
Water Resources Management
Agriculture
Environment & Ecosystem
Public Health

Framework of TCCIP Phase I (2010~2012)

IPCC, Kakushin Program

Observation

GCM Climate projection

Team 1: Climatology Analysis

Team 2: Downscaling

Team 3: Impact Assessment

Information and Application Platform

Governmental Agencies, Researchers, and General users
The Role of TCCIP in Taiwan

- National Develop Council
  National Adaptation Policy Framework
- Ministry of Science and Technology
  Adaptation Technology Project

TCCIP

Suggestion for Policy maker

Technology Integration
- Projection data generation for Climate Change
- Modules developing

Water Resource Agency
Water-Related Disaster Impacts and Adaptation

What has TCCIP done for Users?
What we have done

The first time to gather more than 1400 stations for long term rainfall record and to make it homogeneous and Gridded in Taiwan

High Resolution (5Km x 5Km) projection data based on Statistical downscaling in Taiwan

Projection data of extreme event based on Dynamic downscaling in Taiwan

Module creation for connection between Meteorology and Hydrology study on Climate Change

For Climate research

Observation

Data scattered in different institutes

Before TCCIP
• Data scattered in different institutes
• Only Station data is available, no gridded data.

After TCCIP
Data from different institutes is integrated, and quality controlled.(more than 1400 stations)
High-resolution (1Km X 1Km, 5 Km X 5Km) gridded data for more local impact application is derived.
Digitalization and Homogenization for long-term station records

- 7 millions records around) to Key in:
  - Hourly rainfall for all stations
  - Daily variables for all stations (About 23 variables)

Statistical Downscaling

Model Median Future Change in Precipitation (%)
**Dynamical Downscaling**  
**ECHAM5-WRF & MRI-WRF**

Downscaling using WRF model  
Driven by 20 km MRI/JMA AGCM  
\[ \Delta x = 5 \text{ km} \]  
380x400 grids  
36 vertical layers  
20-layer buffer zone

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**Impact Assessment**

The flood impact of future extreme typhoon event

- **Before TCCIP**
  - Without dynamic downscaling projection data and well-developed modules, impact of future extreme typhoon event is difficult to be assessed.

- **After TCCIP**
  - An innovative module was created to connect RCM and flood simulation (SOBEK model) under climate change in Taiwan
  - With dynamic downscaling data, the flood characteristics of future extreme typhoon event were studied.
The loss assessment of future extreme typhoon event

**Before TCCIP**
- Without dynamic downscaling projection data and well-done modules, the assessment of future flood loss is quite tough.

**After TCCIP**
- Taiwan typhoon Loss Assessment System (TLAS)
- An innovative module was created to connect meteorology, flood simulation and TLAS under climate change in Taiwan.
- With dynamic downscaling data, the flood loss of future extreme typhoon event were examined.

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Application and Data service

**Workshop of Data Service and Communication**
- Workshop for Application of Science report 2011 and Project on data
  1. Communicate with people from government agencies
  2. More than 200 people to take part in

**Data Service and Communication**
- People who apply projection data are mainly come from the field of disaster prevention.
- The government agencies and research institutes are the users that TCCIP plan to serve for the first stage.

**Before TCCIP**
- Application of climate projection is still under construction.
- Data for climate change study distributed in many places.

**After TCCIP**
- Science report 2011 tailoring for Taiwan is published by MoST to give the guidance for application concerning climate change.
- Multiple tunnels for communication—
  1. Workshop on Data application and communication is held by TCCIP for governmental agencies.
  2. Information platform
- Data for climate change can be provided systematically.
TCCIP Phase II (2013-2015)

Structure of TCCIP Phase II

Research & Development
- Ministry of Science and Technology (MoST)
- Central Weather Bureau (CWB)
- Water Resources Agency, Taiwan Agricultural Research Institute, Public health agencies...
- Research Center for Environmental Changes (RCEC), Academia Sinica

International Cooperation
- IPCC CMIP data
  - SOUSEI program, Japan
    - High-resolution (20km) Climate Simulation
  - High-Resolution AGCM
    - (GFDL HiRAM, NCAR CAMS)
- CORDEX-EA data

Application
- Climate Change Adaptation Policy Framework fields
  - Disaster management
  - Public Health
  - Coastal management
  - Agriculture
  - Water Resources management
  - Land use
  - Energy
  - Infrastructure

- Organize and implement
- Integrate research strengths
- Nurturing the potential

Strengthen
Extend
Framework of TCCIP Phase II

Team 1
Observation and model output analysis

Team 2
Downscaled projection production

Team 3
- Researches on data applications for users
- Uncertainty analysis

Team 4
Information service, communication, results promotion

Major objectives of TCCIP Phase II (2013-2015)

Team 1
Developing Phenomenon/Performance Metrics for climate study

Team 2
Producing statistical and dynamic downscaling data sets (AR5)

Team 3
Extending cooperation fields with agriculture, and public health.

Team 4
- Continuing communications and services within scientific societies.
- Developing translation and dissemination of climate change knowledge.
- Conducting “Climate Change in Taiwan: Scientific Report 2015”.
Rainfall in Mei-Yu season

Extreme rainfall is difficult to be simulated by GCMs

Phenomenon Metric

Local phenomenon vs large-scale cir.

Performance Metric

850 hPa wind vector & vorticity

Statistical Downscaling

Change rate of Projected rainfall (End of Century, Medium)

TCCIP 臺灣氣候變遷推估與資訊平台
Disaster impact

Coastal Inundation

Dynamic Downscaling (baseline)

Storm track

Dengue fever (A1B)

Agriculture (based on Dynamic downscaling)
Communication with Users

(IPCC WGI AR5 Introduction Lectures)

- Two months (2013/12/02) after the release of final draft of WGI AR5
- Webcast and Video taping available on TCCIP website
- Chinese version of WGI AR5 SPM provided for participants

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150 participants

Workshop for users who have experience in using TCCIP Products
Translation and Dissemination of Climate Change Knowledge

The objective is to convert the climate change jargons, often difficult and complicated for the non-expert policymakers or public, into understandable information.

Promotion Product: Printed or Electronic

Translation of IPCC Report  Video  ARS Intro website

Establishment of a Knowledge bank

Info collection  Info filtering, organizing, translation  Systematic display of info and knowledge

Translation and Dissemination of Climate Change Knowledge

The objective is to convert the climate change jargons, often difficult and complicated for the non-expert policymakers or public, into understandable information.

Preliminary results: translation of IPCC reports

IPCC SREX: Summary for Policymakers  WGI AR5 Summary for Policymakers
Thanks for your attention!