SDMIP: Statistical Downscaling Method Intercomparison Project

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2017/08/21
Provider-centered vs. User-centered

Coffee Types
- Capuccino
- Flat White
- Mocha
- Espresso
- Breve
- Machiatto
- Americano
- Caramel Machiatto
- Expresso con Panna

User-centered

Choose your coffee

Strong
- No milk
- With milk
- Espresso
- Macchiato

Smooth & Creamy
- Wet milk
- Frothy milk
- Latte
- Cappuccino

With chocolate
- Mocha
Standard Climate Change Scenario ???
Provider gives climate data and users use it without considering climate characteristics sensitive to their applications.

Q1. Can one GCM or downscaling method be perfect for all different applications?

Q2. If answered “no”, which downscaling method and GCMs are appropriate for a specific application?

Q3. Is there any user-centered climate service?
Uncertainty in Climate Change Research

Global Climate Change

Regional Downscaling

Uncertainty = f (RCP Scenarios, GCMs, targeting period Locations, Variables, Process)

Watershed-scale Hydrology Modeling

Ranges by several Models (processes)
How reliable are projections of future climate change scenarios?

- How decisions can be utilized when opposite signals are projected in the same watershed?

- Even though MME-based projection shows same projection, what kind of additional information should be provided for decision-making?

### Scenarios Inflow % Change

<table>
<thead>
<tr>
<th>Scenarios</th>
<th>Inflow (mm)</th>
<th>% change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Historical</td>
<td>988.5</td>
<td></td>
</tr>
<tr>
<td>RCP8.5: GFDL-ESM2G</td>
<td>1198.0</td>
<td>21.2</td>
</tr>
<tr>
<td>RCP8.5: inmcm4</td>
<td>953.7</td>
<td>-3.5</td>
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Even though we have same future projection.

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<td>9.1</td>
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Even though we have same future projection.
APCC’s User-centered Downscaling Platform

GCM #1 → Downscaling #1 → Application #1
GCM #2 → Downscaling #1 → Application #2
GCM #3 → Downscaling #2 → Application #3
GCM #4 → Downscaling #2 → Application #4
... → Downscaling #D → Application #U

Provide Climate Data, Tools, Guideline

User’s Knowledge (local, process)
<table>
<thead>
<tr>
<th>Evaluation Procedures</th>
<th>User-selected GCMs</th>
<th>Downscaling</th>
<th>Climate Change Indices</th>
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<tbody>
<tr>
<td>1. Data download</td>
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<tr>
<td>2. Evaluate observed data</td>
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<tr>
<td>3. Downscaling using different methods</td>
<td>All GCMs</td>
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<tr>
<td>4. Raw GCM analysis for excluding worst GCMs</td>
<td>All DS methods</td>
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<td></td>
</tr>
<tr>
<td>5. Evaluating reproducibility of climate change indices (Historical period)</td>
<td>User-selected GCMs</td>
<td></td>
<td>All Indices (27)</td>
</tr>
<tr>
<td>6. Comparison of future changes in climate indices before and after downscaling</td>
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<tr>
<td>7. Evaluating spatial reproducibility</td>
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<tr>
<td>8. Calculating weight factor for GCMs and Uncertainty ranges covered by increasing number of GCMs</td>
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<td></td>
<td></td>
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<tr>
<td>9. Impact Assessment Modeling</td>
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4. Raw GCM analysis for excluding worst GCMs

- **Temporal evaluation**
  
  30 year monthly average (Obs)

  ![Graphs showing observed and modeled monthly averages over 30 years for different months.](Diagram1)

- **Spatial evaluation**

  ![Maps showing observed and modeled spatial distributions.](Diagram2)
5. Evaluating reproducibility of climate change indices (Historical period)

- Annual total precipitation amount (mm)
6. Comparison of future changes in climate indices before and after downscaling

- **Raw GCM**
  - Historical MME
  - RCP8.5 (2040~2069) MME
  - 10%

- **Downscaling Method #1**
  - Historical MME
  - RCP8.5 (2040~2069) MME
  - 11%

- **Downscaling Method #2**
  - Historical MME
  - RCP8.5 (2040~2069) MME
  - 15%
7. Evaluating spatial reproducibility

- Downscaling method #1
- Downscaling method #2

Graph showing precipitation with lines for observed and downscaling methods.
8. Calculating weight factor for GCMs

1. Mean difference (default)

2. Variation difference (default)

3. User-selected climate index
Participants for user-centered downscaling platform

- APCC collects appropriate climate data and provide tools for data analysis
- Downscaling experts and users are involved based on their knowledge

APCC collects appropriate climate data and provide tools for data analysis. Downscaling experts and users are involved based on their knowledge.
Overall Climate Change Adaptation Procedure

- National CMIP5 Data (ADSS)
  - Download CMIP5 data
  - Clipping on your area
  - Extracting point values
  - Bias correction

- Tools and Software (rcmip5)
  - User input (Observed weather station data)
  - Downscaling experts

- Adaptation & Mitigation models

- Impact & Vulnerability Assessment
  - Exposure
  - Sensitivity
  - Potential impact
  - Adaptive capacity
  - Vulnerability

Site-specific local knowledge & Developed Countries
Acknowledgement

Mr. Daein Kang: organizing the training program

Ms. Eunjeong Lee: preparing climate change scenario data

Mr. Sangmyeong Oh: preparing seasonal forecast data

Mr. Soonjo Yoon: developing real-time climate indices service

Mr. Junhyuk Lee: developing AIMS user interface

Dr. Jaepil Cho: developing platform idea, rAnalysis, rDrought, rSQM, rSForecast

Dr. Wonil Cho: publishing R packages to CRAN, developing rAnalysis

Dr. HyungIl Eum: developing rSDQDM

Mr. Imgoook Jung: developing rAnalysis

Dr. Sewoon Hwang: consulting C.Change evaluation procedures
Thank You!

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