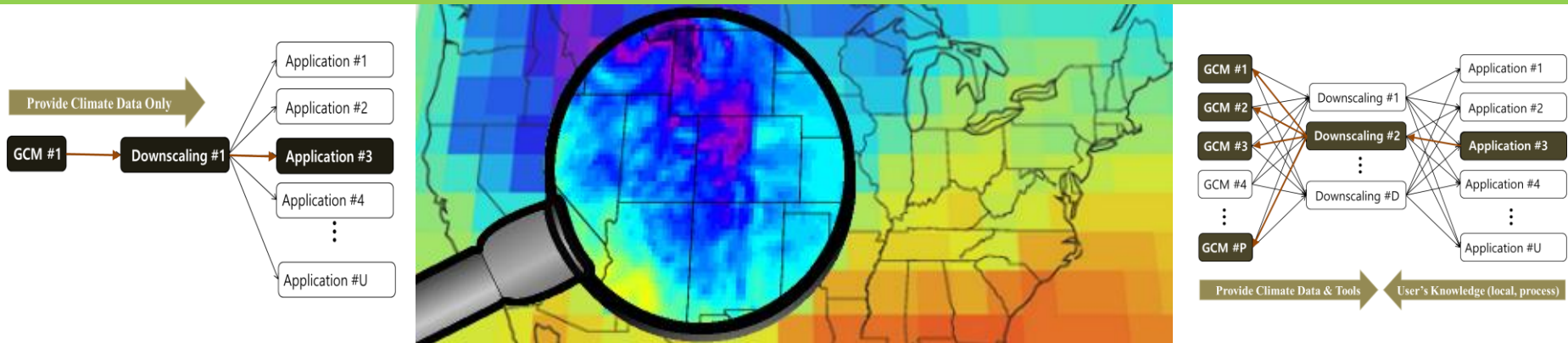


User-centered Downscaling Platform & Climate Change Impact Assessment



Jaepil Cho

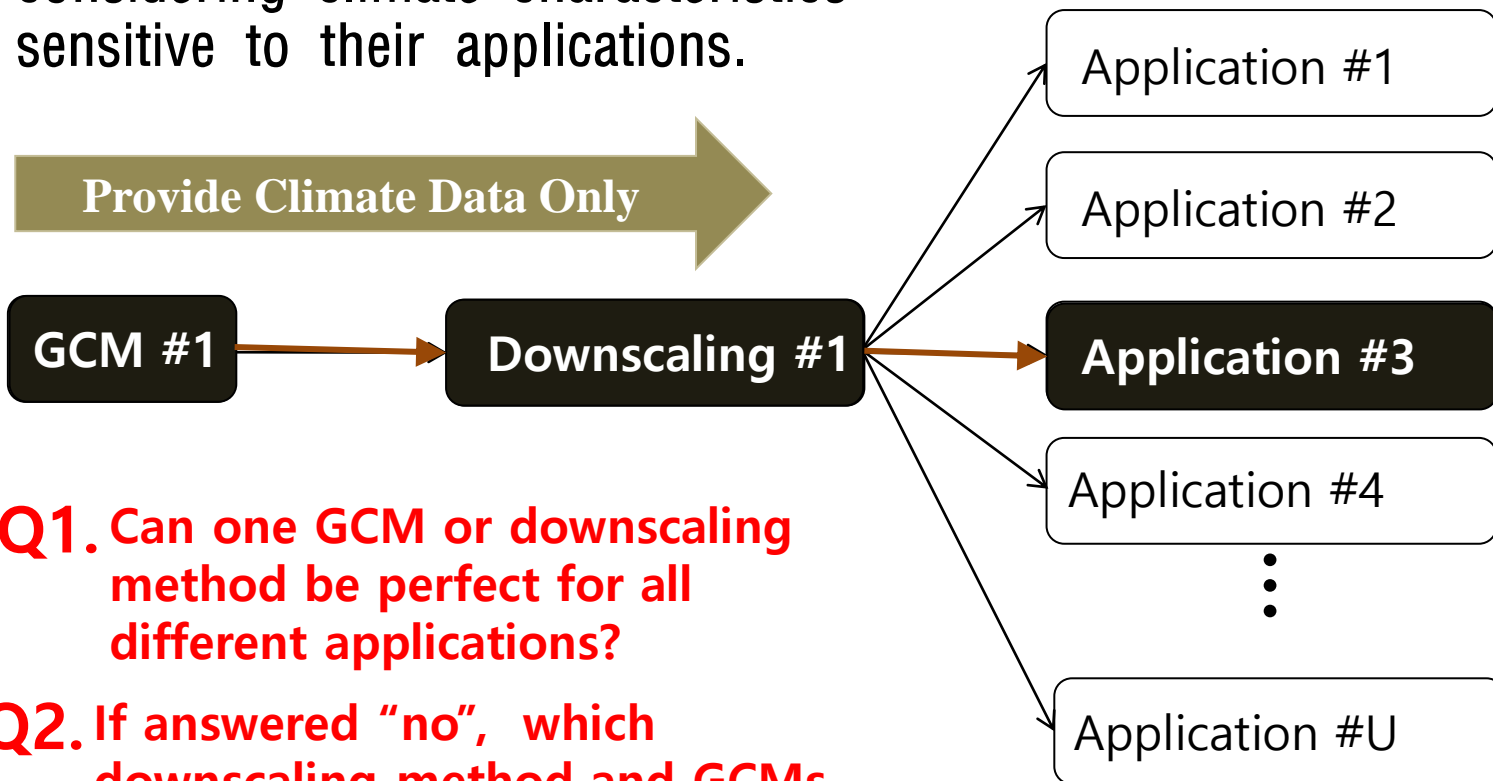
2018/10/17

User-centered Downscaling Platform: AIMS



Provider-centered Climate Data Service

- ❖ 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?

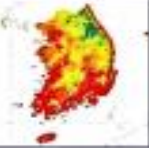
Standard Climate Change Scenario ???




- 영역 : 전지구
- 해상도 : 135km
- 영국 해들리센터 모델 (Ha GEM2-AO)

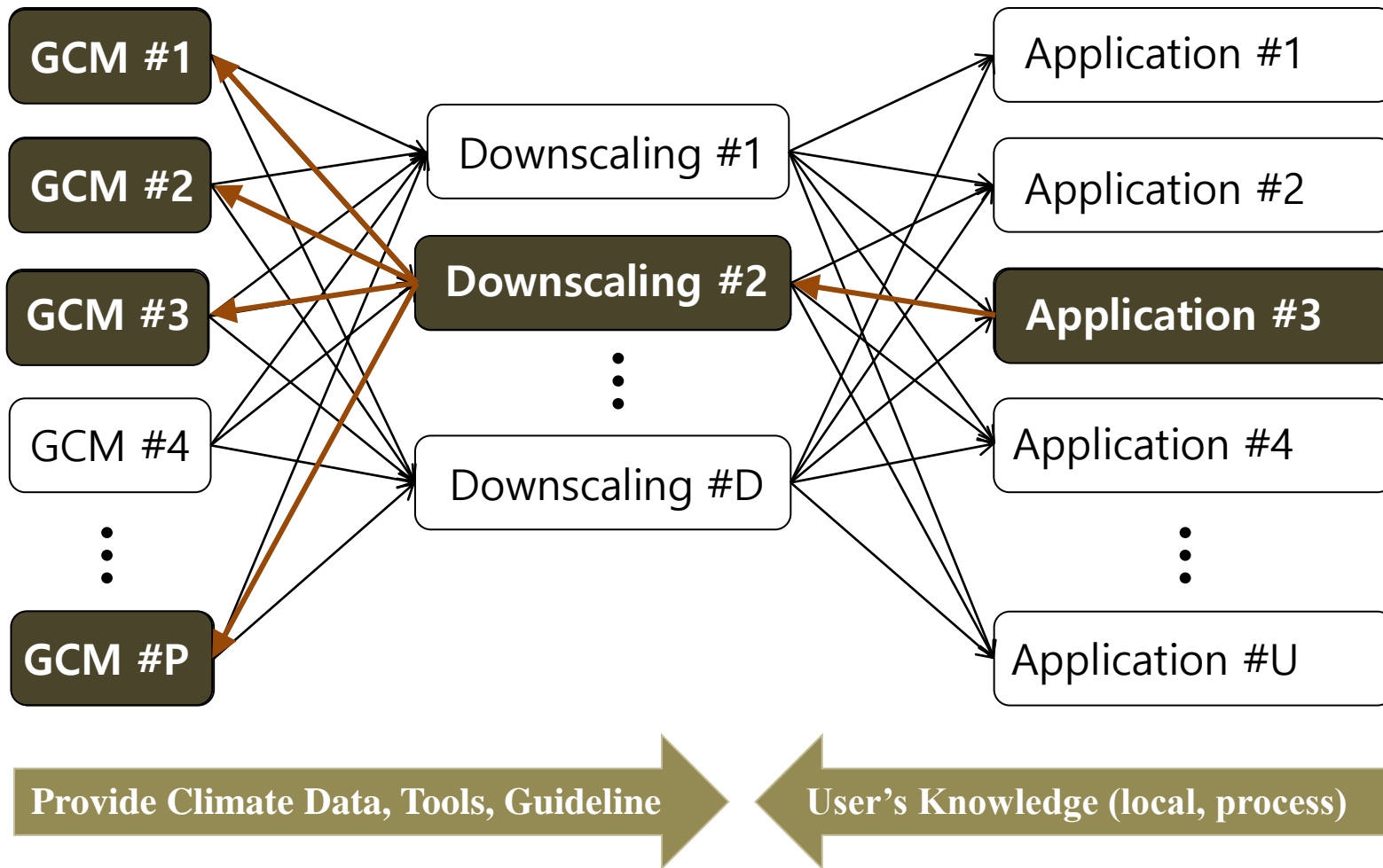


- 영역 : 한반도
- 해상도 : 12.5km
- 영국 해들리센터 지역기후모델 (HadGEM3-RA)



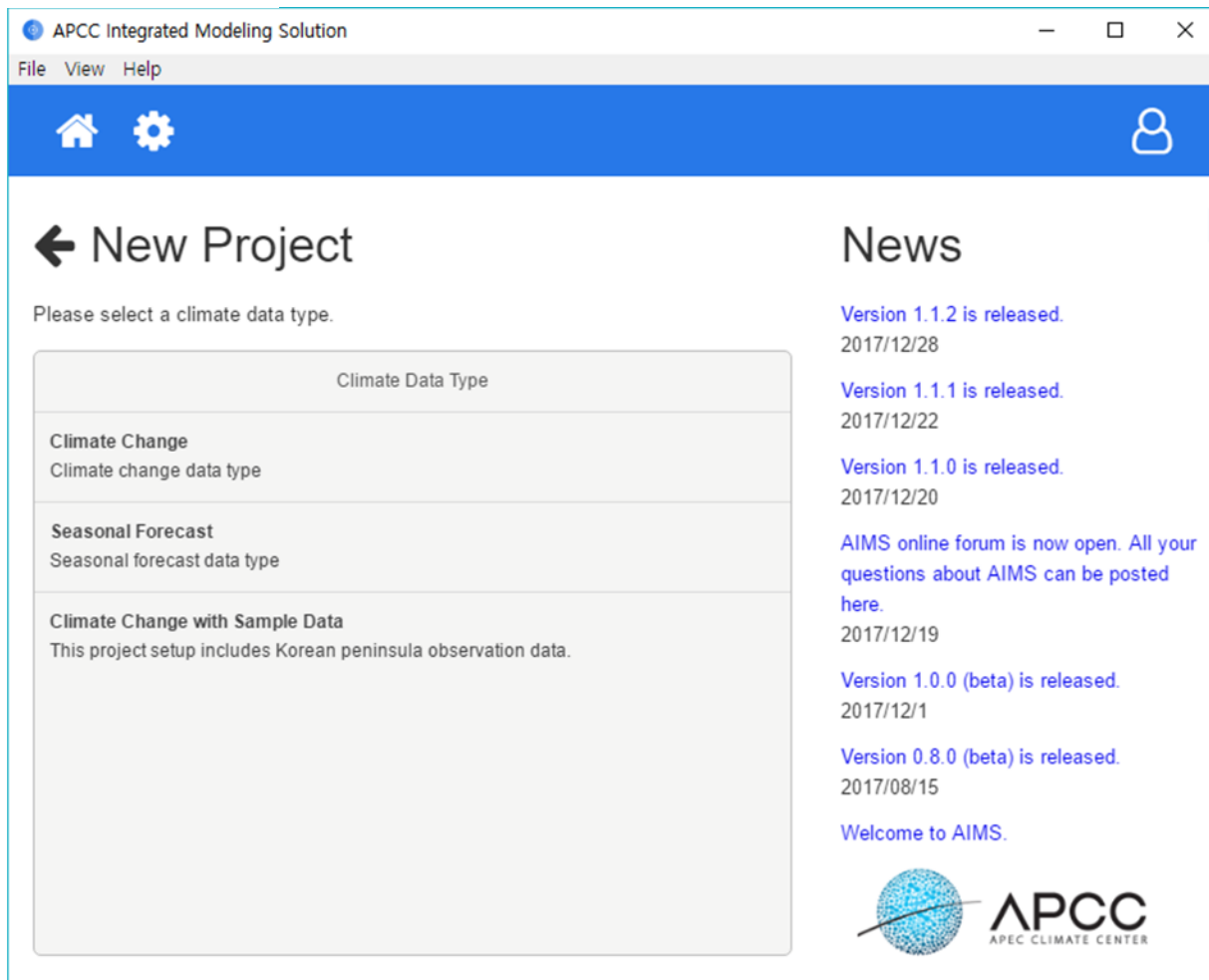
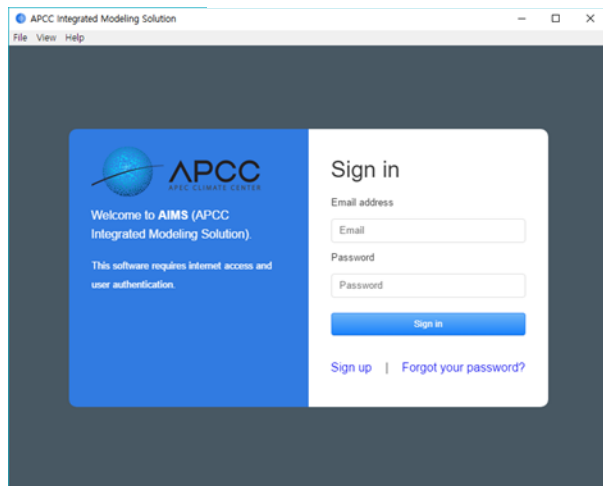
- 영역 : 남한
- 해상도 : 1km
- 공주대 통계 모델 (PRIDE)

APCC's User-centered Downscaling Platform



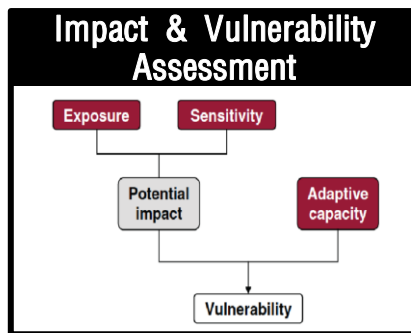
APCC Integrated Modeling Solution (AIMS)

- Download: aims.apcc21.org
- User interface: Version 1.0

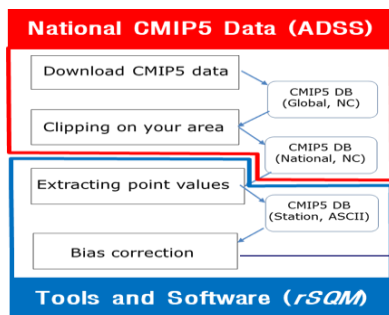


Framework of APCC Integrated Modeling Solution (AIMS)

- ✓ Climate data (MME)
- ✓ Downscaling (multiple)
- ✓ User's guide

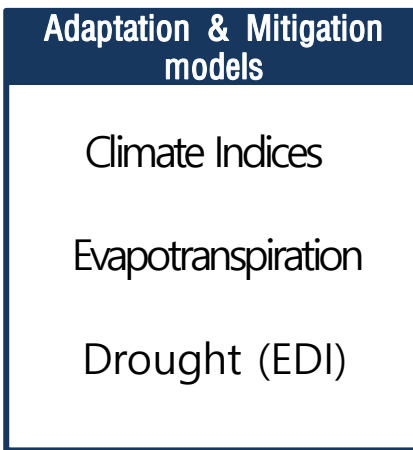
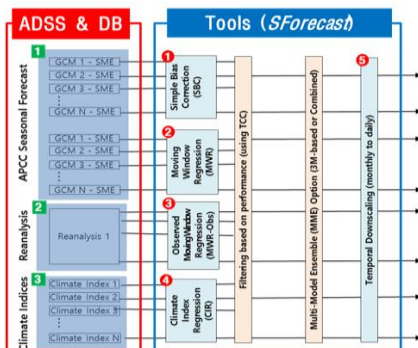


Climate Change

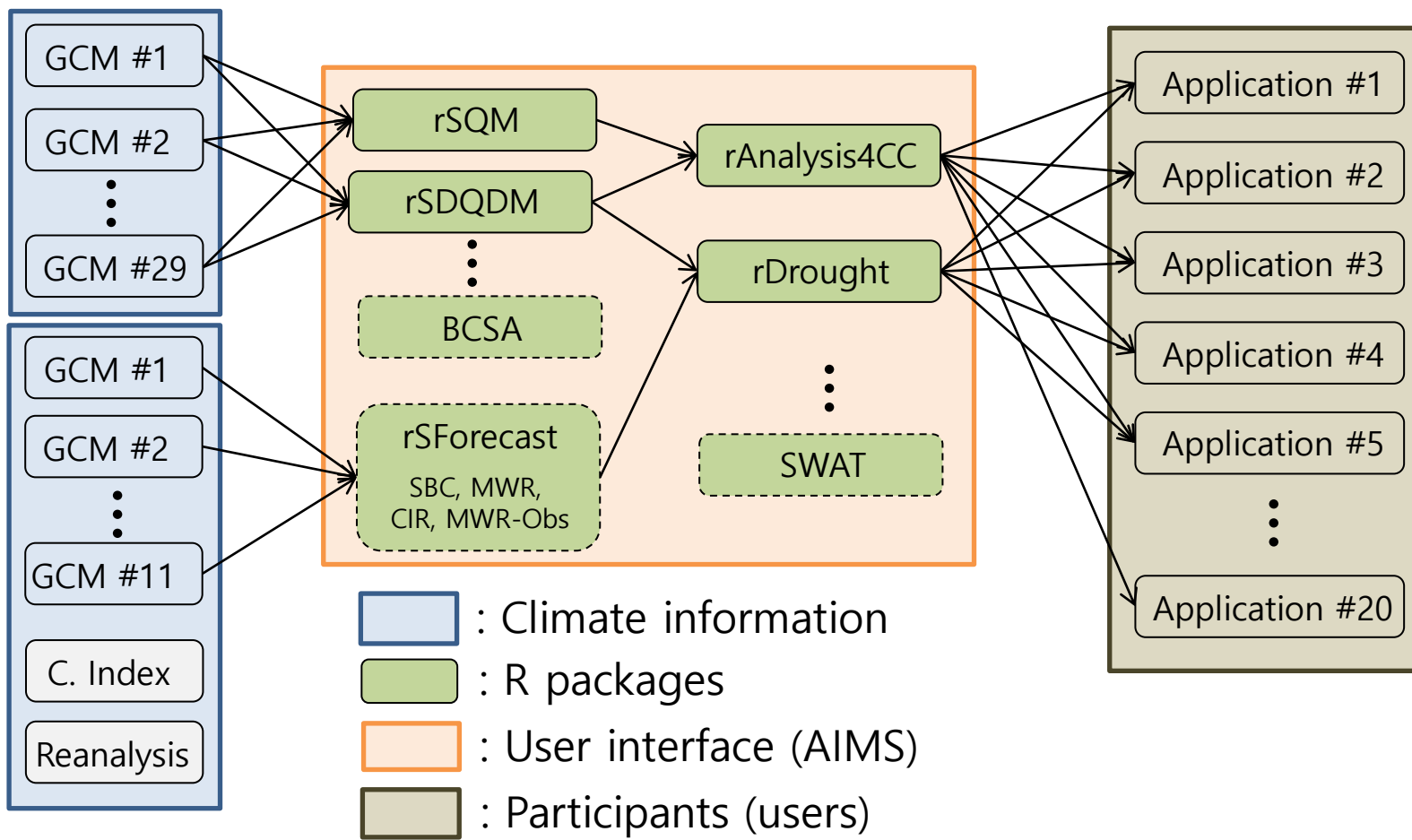


Tools and Software (*rSQM*)

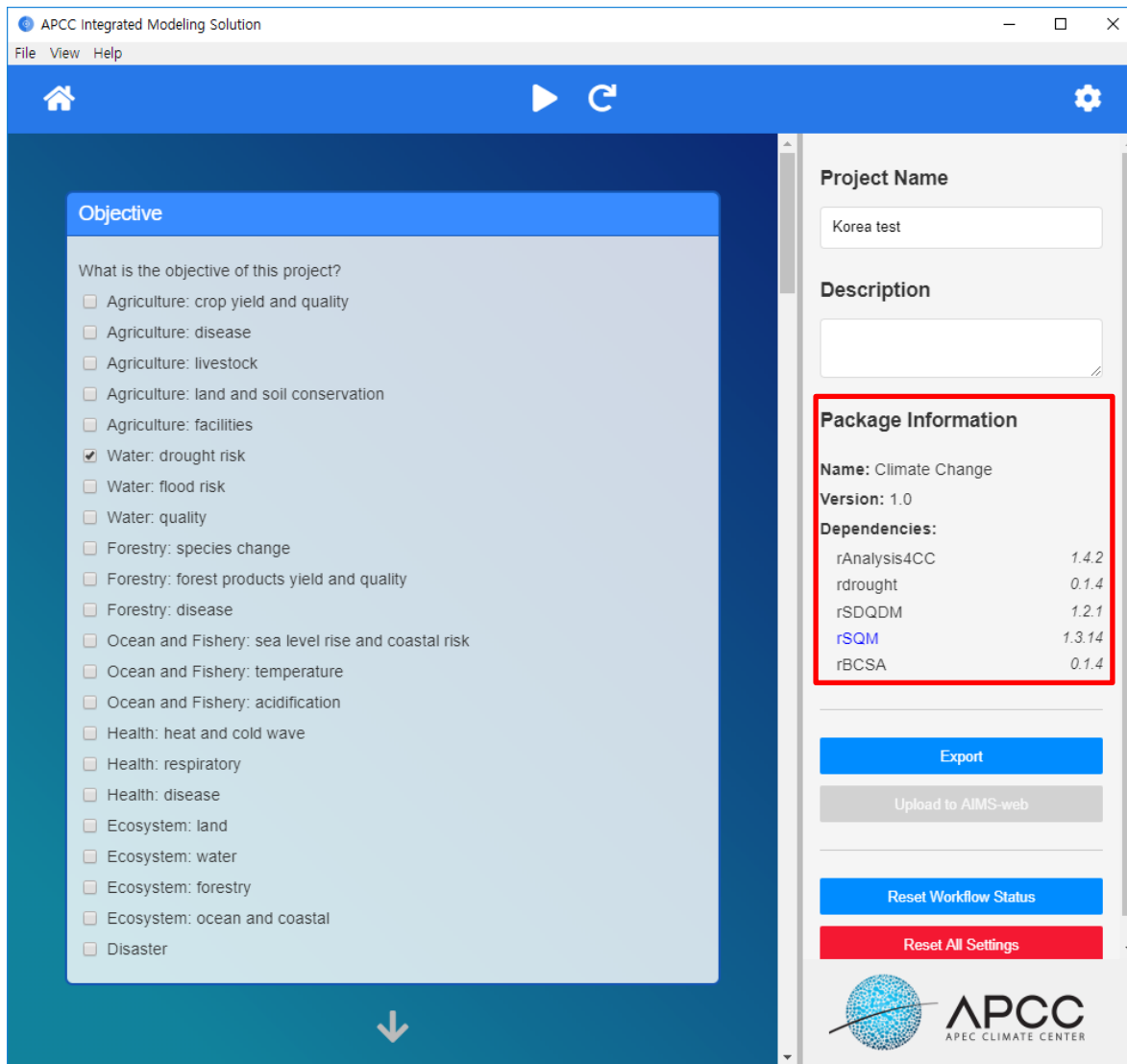
Seasonal Forecast



Components of AIMS



Independent R packages



The screenshot shows the 'APCC Integrated Modeling Solution' window. On the left, under the 'Objective' section, there is a list of project objectives with checkboxes. The 'Water: drought risk' option is selected. On the right, the 'Project Name' is 'Korea test' and the 'Description' field is empty. The 'Package Information' section is highlighted with a red box and contains the following details:

Package Information	
Name:	Climate Change
Version:	1.0
Dependencies:	
rAnalysis4CC	1.4.2
rdrought	0.1.4
rSDQDM	1.2.1
rSQM	1.3.14
rBCSA	0.1.4

Below the package information, there are buttons for 'Export', 'Upload to AIMS-web', 'Reset Workflow Status', and 'Reset All Settings'. The APCC logo is visible at the bottom right of the interface.

R packages

- from CRAN
- from Zip file

rSQM packages

- <https://cran.r-project.org/web/packages/rSQM/index.html>

rSQM: Statistical Downscaling Toolkit for Climate Change Scenario using Non Parametric Quantile Mapping

Conducts statistical downscaling of daily CMIP5 (Coupled Model Intercomparison Project 5) climate change scenario data at a station level using empirical quantile mapping method by Jaepil Cho et al. (2016) <[doi:10.1002/ird.2035](https://doi.org/10.1002/ird.2035)>.

Version: 1.2.42
Depends: R (\geq 3.3.3)
Imports: [ncdf4](#), [zoo](#), [stringr](#), [EcoHydRology](#), [dplyr](#), [gsubfn](#), [yaml](#), [mise](#), [reshape2](#), [qmap](#), [ggplot2](#)
Suggests: [knitr](#), [rmarkdown](#), [testthat](#)
Published: 2017-09-25
Author: Jaepil Cho [aut], Wonil Cho [aut, cre], Imgook Jung [aut]
Maintainer: Wonil Cho <climate.service@apcc21.org>
License: [GPL-2](#) | [GPL-3](#) [expanded from: GPL (\geq 2)]
NeedsCompilation: no
CRAN checks: [rSQM results](#)

Down loads:

Reference manual: [rSQM.pdf](#)
Vignettes: [Vignette Title](#)
Package source: [rSQM_1.2.42.tar.gz](#)
Windows binaries: r-devel: [rSQM_1.2.42.zip](#), r-release: [rSQM_1.2.42.zip](#), r-oldrel: [rSQM_1.2.42.zip](#)
OS X El Capitan binaries: r-release: [rSQM_1.2.42.tgz](#)
OS X Mavericks binaries: r-oldrel: not available

Linking:

Please use the canonical form <https://CRAN.R-project.org/package=rSQM> to link to this page.

Guideline (procedure) for use of downscaled climate change scenario data

1. Raw GCM analysis for excluding worst GCMs



Selection of GCMs

2. Analysis of reproducibility and signal changes using climate extreme indices

2.1 Evaluating reproducibility of climate extreme indices for the historical period

2.2 Comparing signal changes in climate extreme indices before and after downscaling



Selection of downscaling technique

3. Evaluating reproducibility of spatial correlations among stations using variogram

4. Estimating multi-model ensemble (MME) mean and providing uncertainty ranges according to number of GCMs

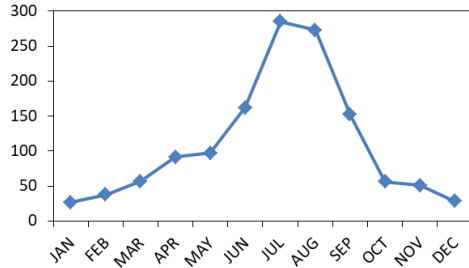


User-centered climate change projections

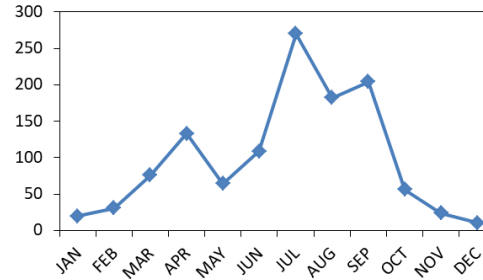
4. Raw GCM analysis for excluding worst GCMs

❖ Temporal evaluation

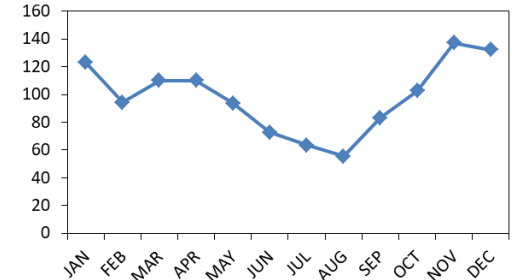
30 year monthly average(Obs)



GCM1

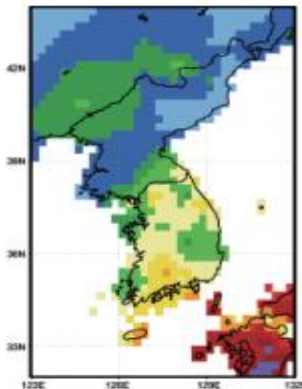


GCM2

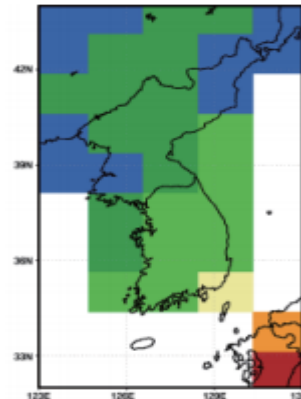


❖ Spatial evaluation

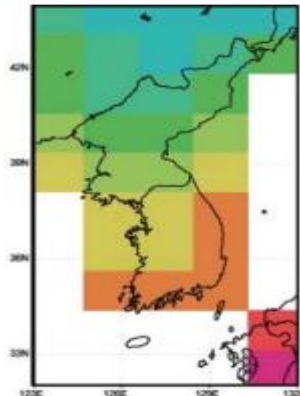
Observed



GCM1



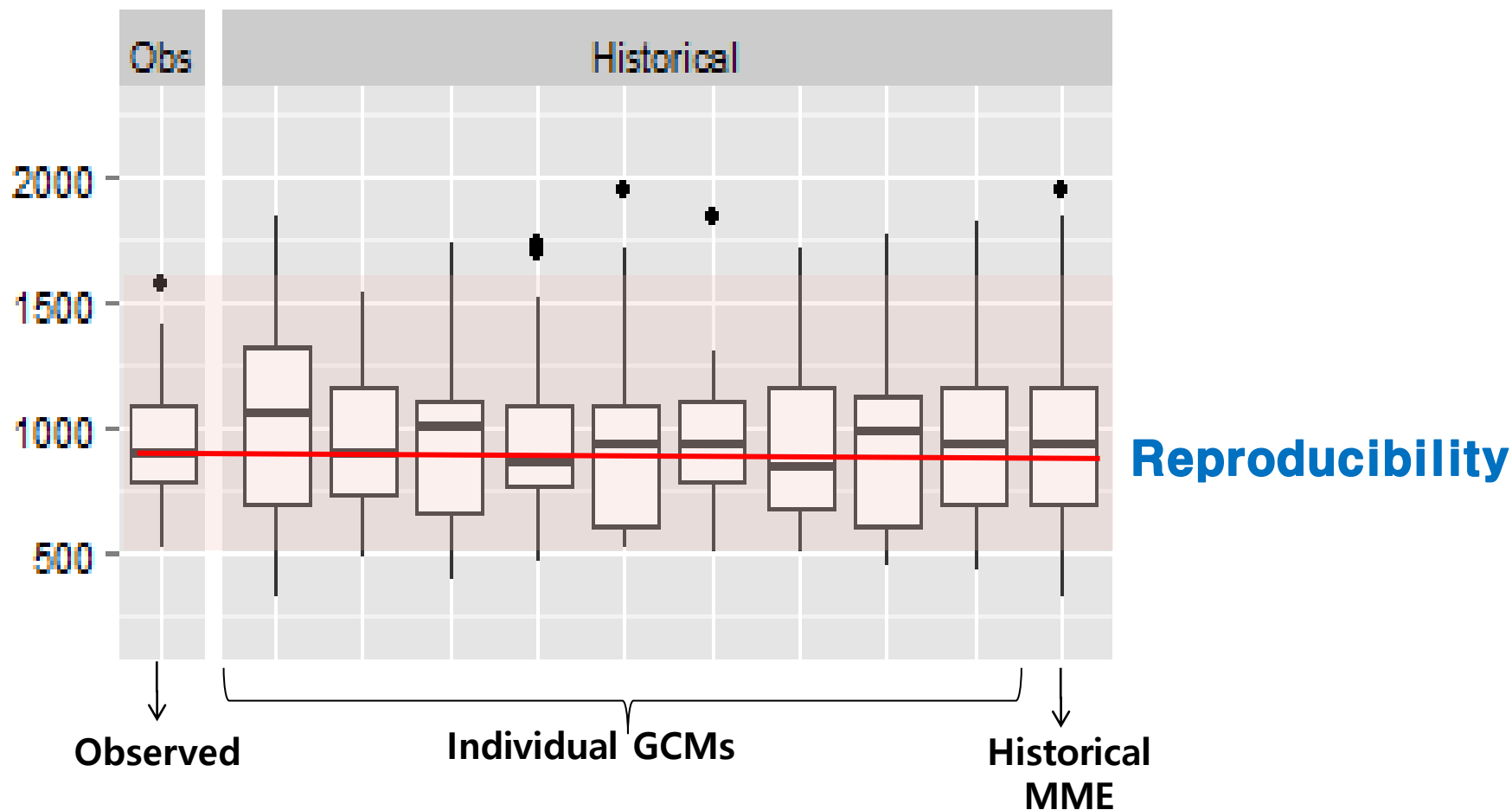
GCM2



공간
재현성
평가

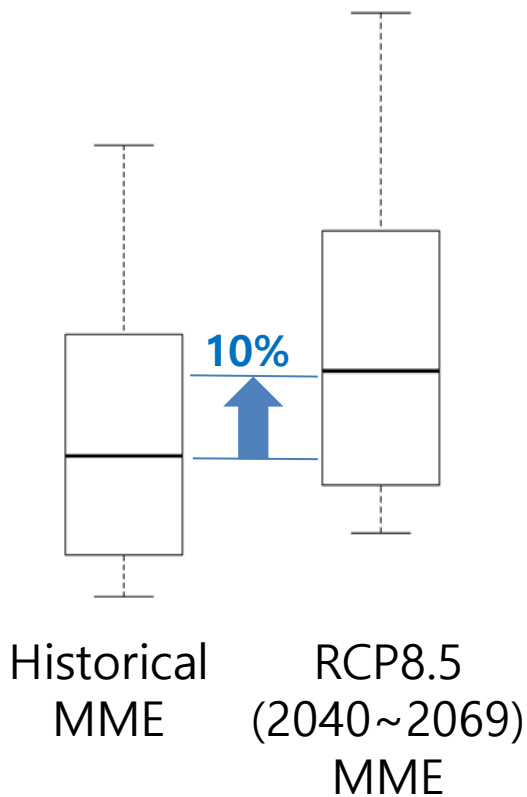
5. Evaluating reproducibility of climate change indices (Historical period)

- Annual total precipitation amount (mm)

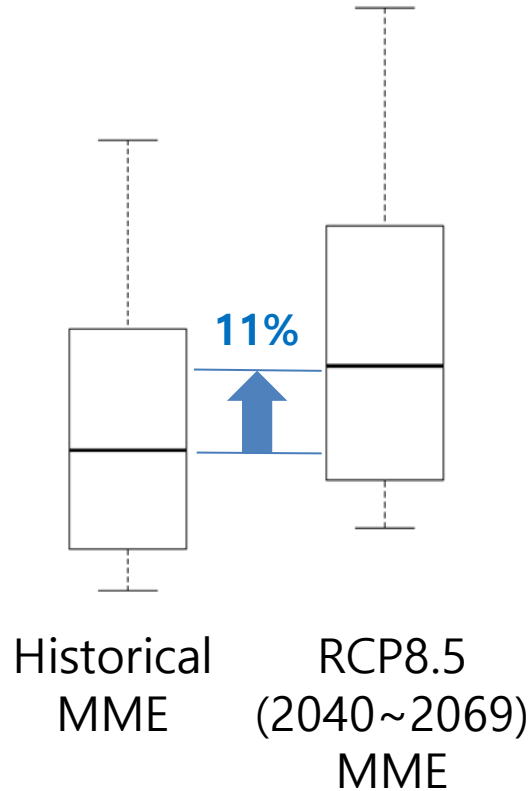


6. Comparison of future changes in climate indices before and after downscaling

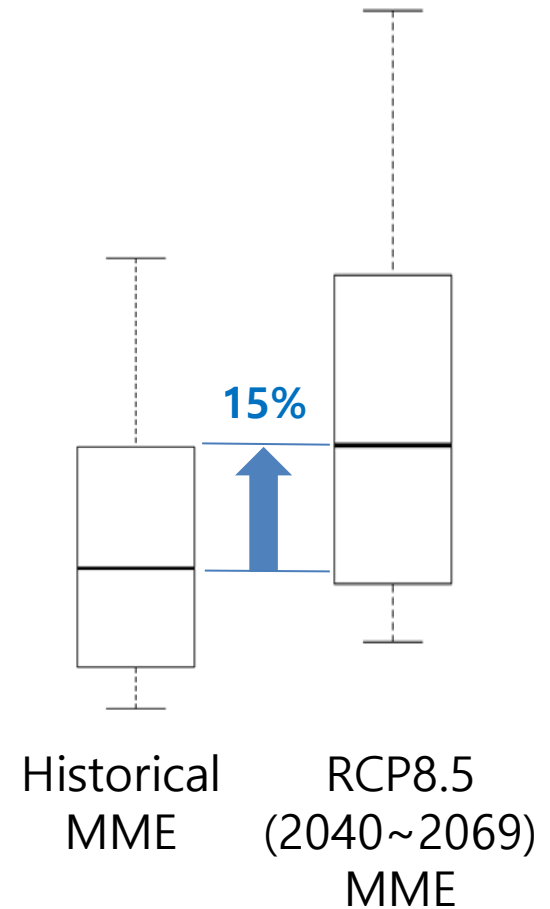
Raw GCM



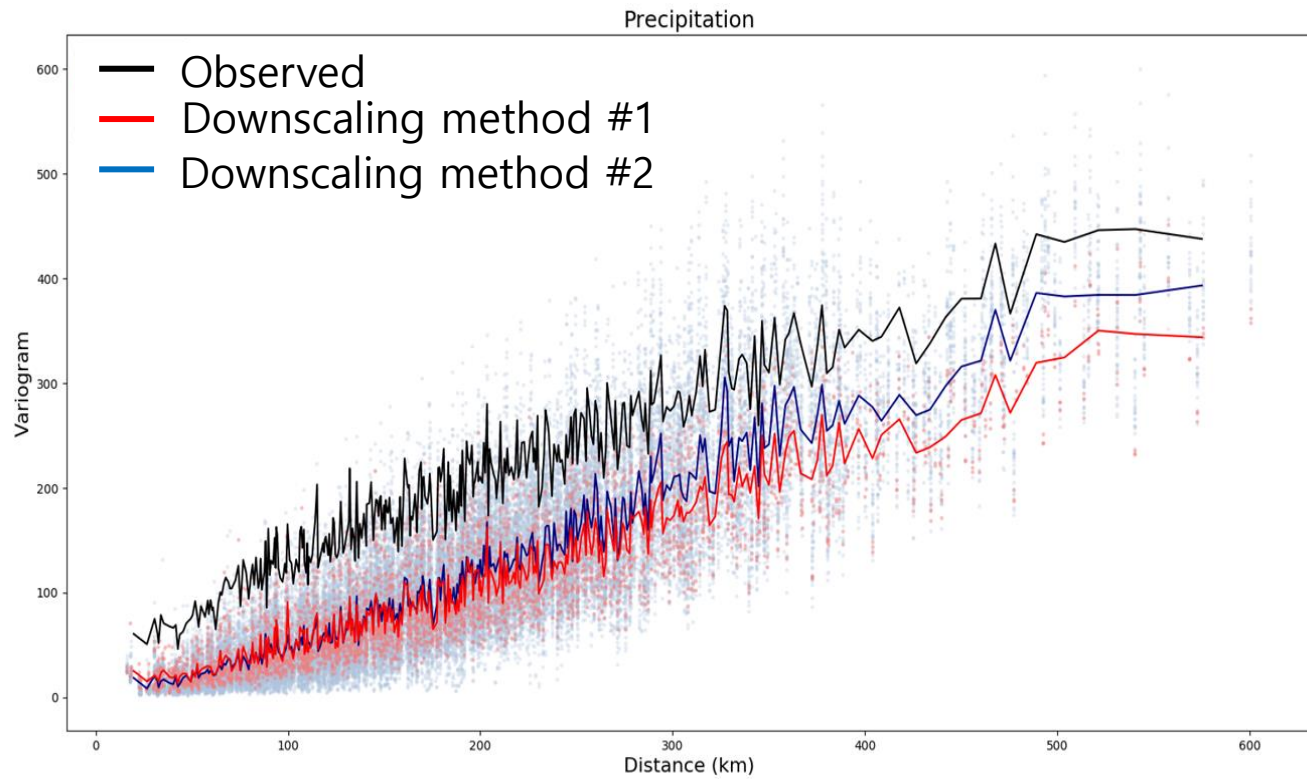
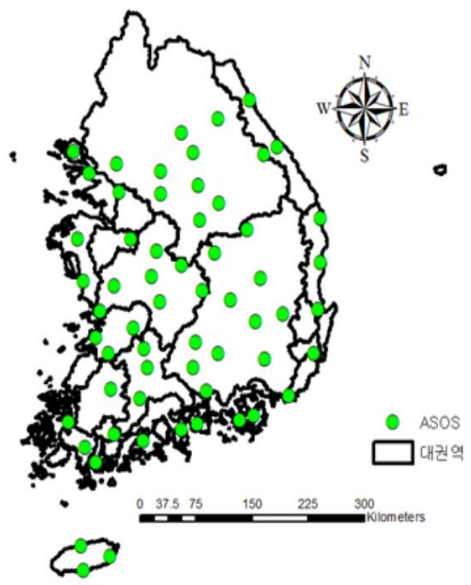
Downscaling Method #1



Downscaling Method #2



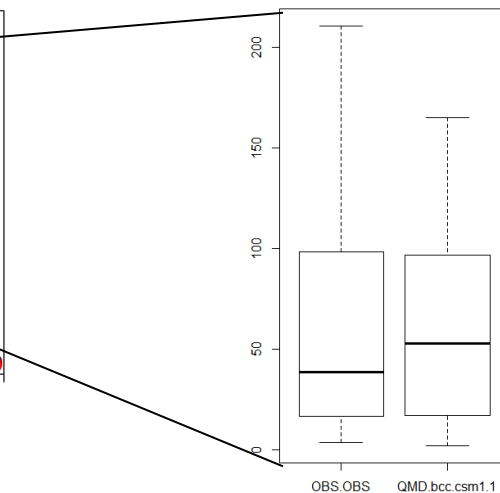
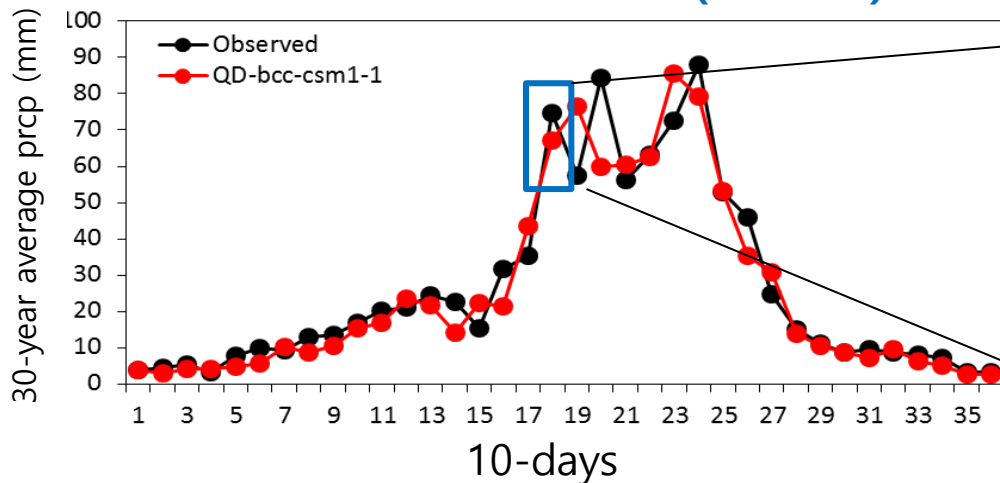
7. Evaluating spatial reproducibility



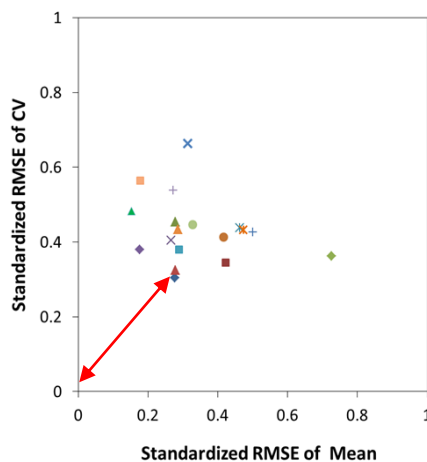
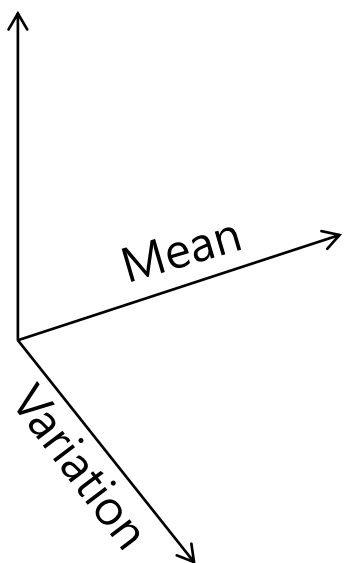
8. Calculating weight factor for GCMs

1. Mean difference (default)

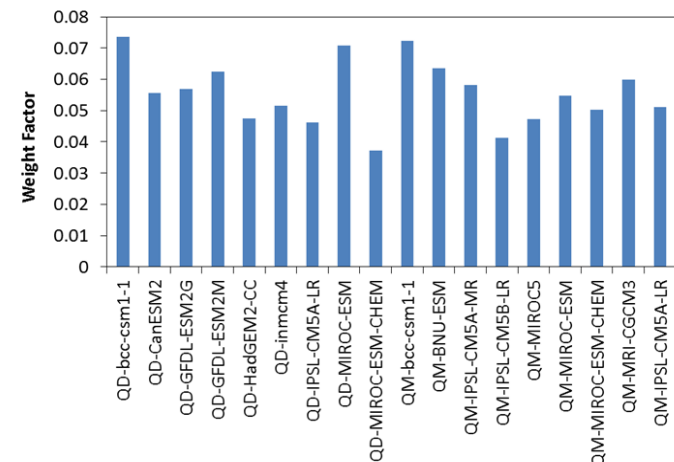
2. Variation difference (default)



3. User-selected climate index



- ◆ QD-bcc-csm1-1
- QD-CanESM2
- ▲ QD-GFDL-ESM2G
- × QD-GFDL-ESM2M
- × QD-HadGEM2-CC
- QD-inmcm4
- + QD-IPSL-CM5A-LR
- ▲ QD-MIROC-ESM
- ◆ QD-MIROC-ESM-CHEM
- ◆ QM-bcc-csm1-1
- QM-BNU-ESM
- ▲ QM-IPSL-CM5A-MR
- × QM-IPSL-CM5B-LR
- × QM-MIROC5
- QM-MIROC-ESM
- + QM-MIROC-ESM-CHEM
- ▲ QM-MRI-CGCM3
- QM-IPSL-CM5A-LR





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Thank You!