

CLIK hands-on (part IV):

Multi Model Downscaling using CLIK

(<http://clik.apcc21.org>)

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Downscaling procedure in CLIK

Station data

- Point (uploaded)

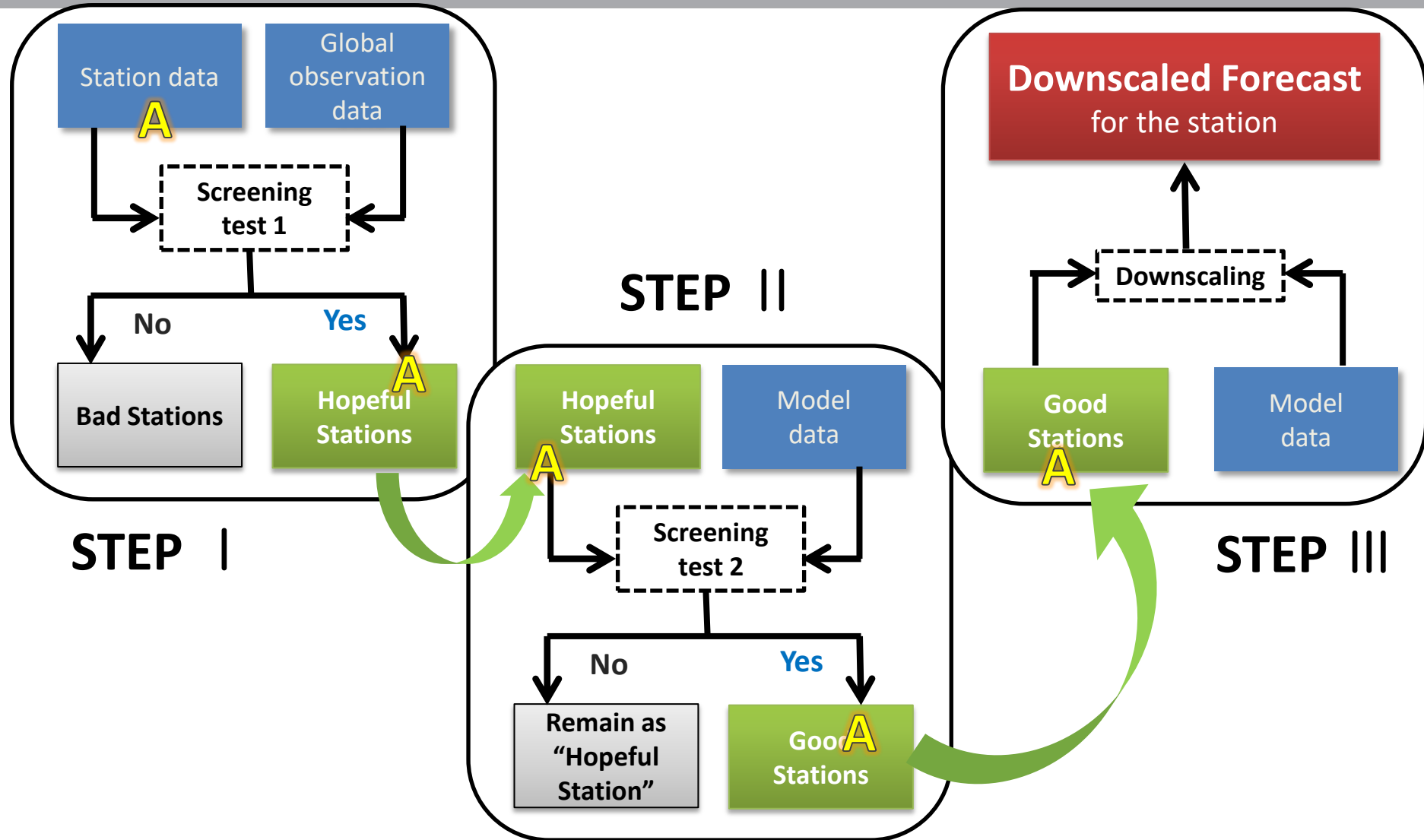
Global observation data

- Grid (built-in)
- Reanalysis: NCEP2; atmospheric variables
- Satellite: CAMS OPI; precipitation

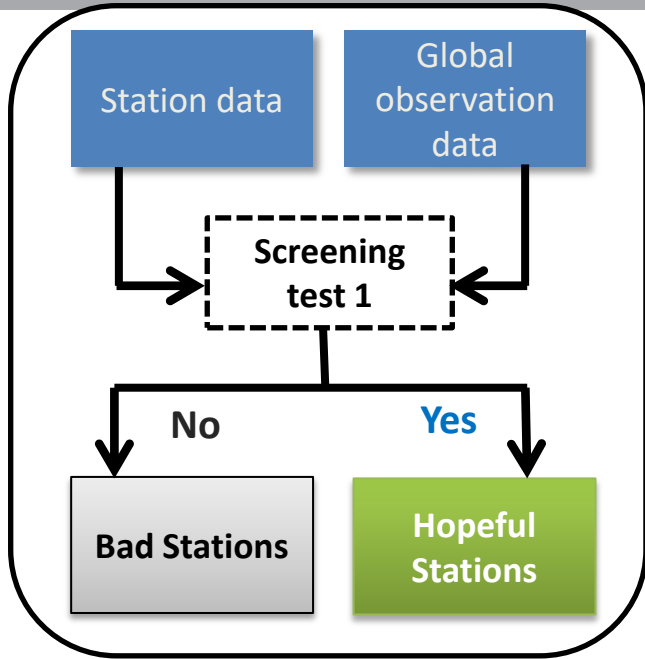
Model data

- Grid (built-in)
- Hindcast by dynamical models

Downscaling procedure in CLIK



Downscaling procedure in CLIK

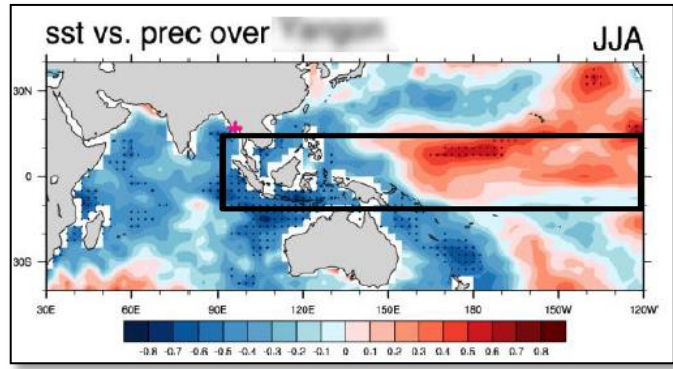


Screening test 1:

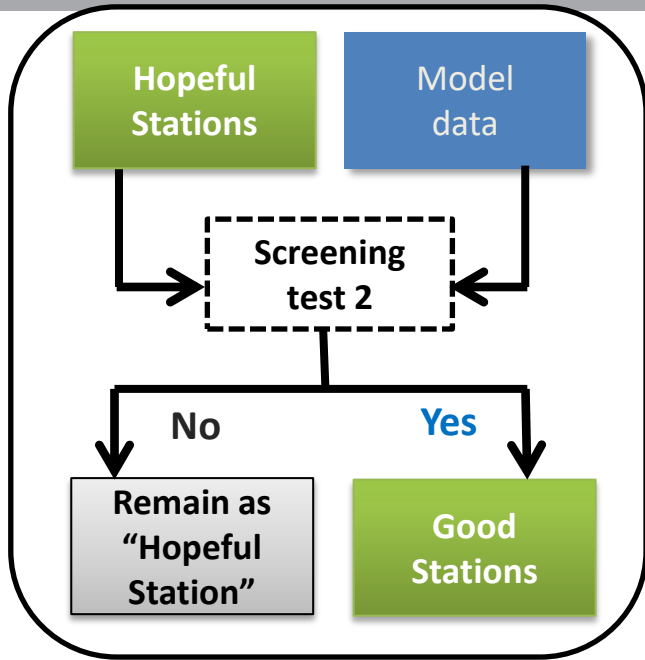
- ✓ Do the station data and the global map from observation data have a relationship based on “**significance level**”?
- ✓ Does the station data have relationship with the large-scale climate pattern?

Correlation map of **global observation vs. station**

STEP 1



Downscaling procedure in CLIK



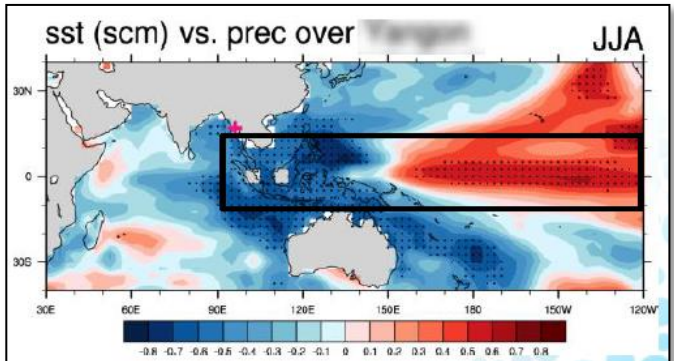
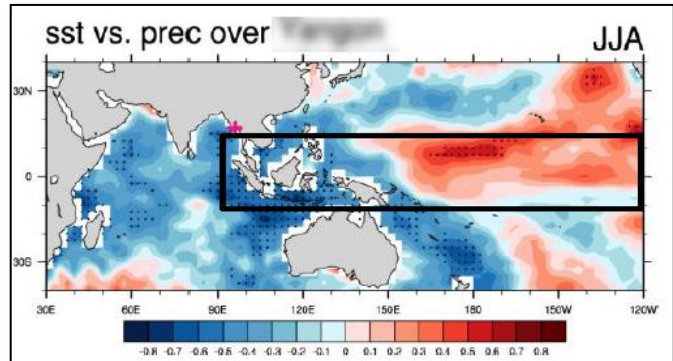
Screening test 2:

- ✓ Can the dynamical models reproduce the relationship between the global observation and hopeful station data?
- ✓ Screen based on the **“minimum pattern correlation”**.

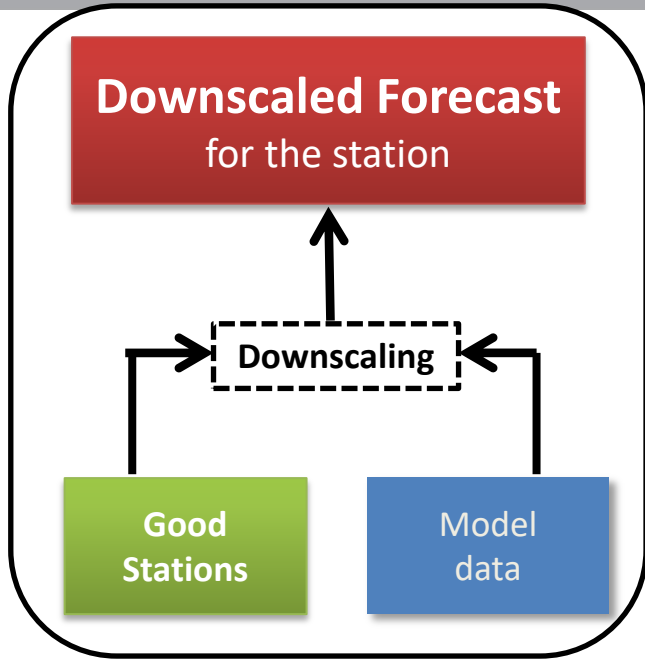
Correlation map of **global observation** vs. station

Correlation map of **model data** vs. station

STEP II



Downscaling procedure in CLIK



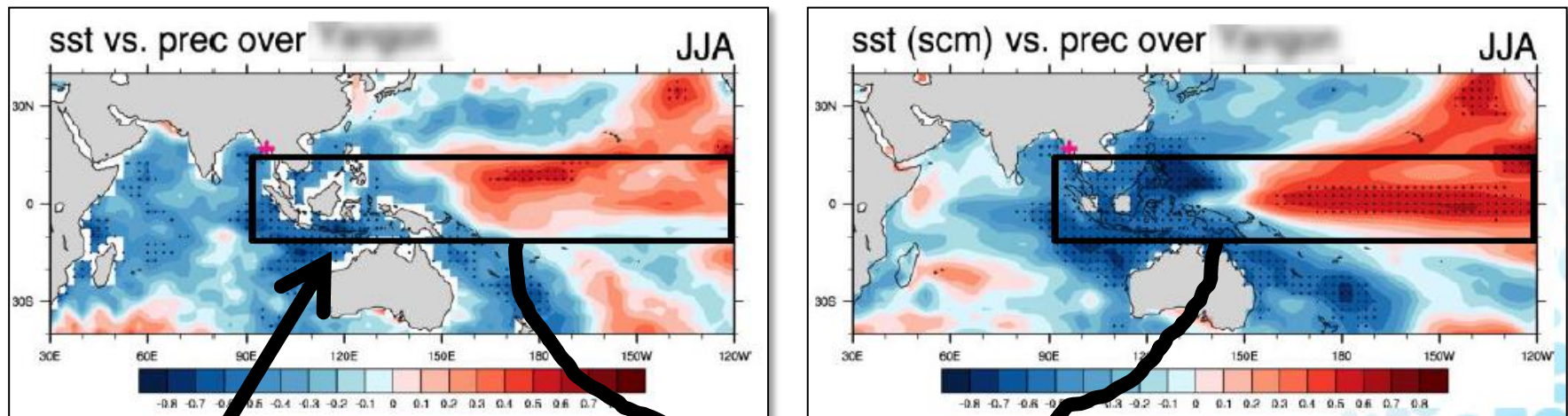
Downscaling process:

- ✓ Based on the **linear regression model**
- ✓ $y = a + bx$

STEP III

Downscaling procedure in CLIK

Relationship between precipitation over a station & ...



- The station data has relationship with the global observational SST over some areas.
- Dynamical models can reproduce the relationship between observation and station data.
- We hope a successful downscaling by CLIK system...



Precipitation over Daegu for OND 2018?

Produce a downscaled forecast : precipitation over Daegu for OND 2018

clik Climate Information Toolkit **MME** **Downscale** **My Page** [Logout](#) [Edit](#)

Select Dataset / Station

Dataset Name	Countries	Total Stations	Period(prec)	Period(temp)	Public
MCDW(Monthly Climatic Data for th...	The World	6463	1998 ~ 2014	1998 ~ 2014	PUBLIC
Korea 60 Stations	Korea, Republic of	60	1973 ~ 2008	1973 ~ 2006	PUBLIC
GHCN		3707	1950 ~ 2009	N/A	PUBLIC

Create Edit Remove

2 Shift + drag

3 Add Remove

Station ID	Name	Precipitation	Temperature
108	Seoul	1973/1 ~ 2008/5	1973/1 ~ 2006/12

4 NEXT

Produce a downscaled forecast : precipitation over Daegu for OND 2018

Job description
Daegu / 2018 OND / PREC / SST

Predictand
Season: Year 2018, Season OND, Variable: Precipitation, Temperature

Predictor
Variable: PREC, SLP, U200, T850, U850, V200, Z500, V850, SST
Models: APCC, NASA, POAMA, CMCC, NCEP, MSC, PNU
Training Period: Form 1983, To 2007, 25 Years
Method: Linear Regression
Advanced Options: Significance Level 5%, Minimum Pattern Score 0.3

Domain
Latitude: -25 ~ 15, Longitude: 180 ~ 300
Map showing domain over the Pacific Ocean with a red pin at Daegu and a blue box for the forecast area. Lat: -25, Lon: 180, Area: 23. 5000km scale bar.

Run with new selections

A. Set options

Job description
Seoul / 2018 OND /
TEMP / SST
(up to you)

Produce a downscaled forecast : precipitation over Daegu for OND 2018

A. Set options

Predictand: season
2018 OND

Job description

Daegu / 2018 OND / PREC / SST

Predictand

Season: Year 2018, Season OND

Variable: Precipitation, Temperature

Predictor

Variable

PREC, T850, Z500
 SLP, U850, V850
 U200, V200, SST

Models

APCC, CMCC, MSC
 NASA, NCEP, PNU
 POAMA

Training Period

Form 1983, To 2007, 25 Years

Method

Linear Regression

Advanced Options

Significance Level: 5 %
Minimum Pattern Score: 0.3

Domain

Latitude: -25 ~ 15, Longitude: 180 ~ 300

Apply

Lat: -25, Lon: 180, Area: 23

5000km

Run with new selections

Produce a downscaled forecast : precipitation over Daegu for OND 2018

Job description
Daegu / 2018 OND / PREC / SST

Predictand
Season: 2018, OND
Variable
 Precipitation Temperature

Predictor
Variable
 PREC T850 Z500
 SLP U850 V850
 U200 V200 SST
Models
 APCC CMCC MSC
 NASA NCEP PNU
 POAMA
Training Period
Form: 1983 To: 2007 25 Years
Method
 Linear Regression
Advanced Options
Significance Level: 5 %
Minimum Pattern Score: 0.3

Domain
Latitude: -25 ~ 15 Longitude: 180 ~ 300
Apply

Lat: -25
Lon: 180
Area: 23

5000km

Run with new selections

A. Set options

Predictand: variable
Temperature

Produce a downscaled forecast : precipitation over Daegu for OND 2018

Job description

Daegu / 2018 OND / PREC / SST

Predictand

Year: 2018 Season: OND Variable: Precipitation Temperature

Predictor

Latitude: -25 ~ 15 Longitude: 180 ~ 300

Variable

PREC T850 Z500
 SLP U850 V850
 U200 V200 SST

Models

APCC CMCC MSC
 NASA NCEP PNU
 POAMA

Training Period

Form: 1983 To: 2007 25 Years

Method

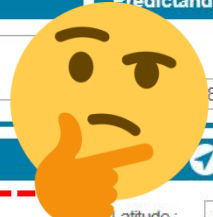
Linear Regression

Advanced Options

Significance Level: 5 %
Minimum Pattern Score: 0.3

Lat: -25
Lon: 180
Area: 23

5000km



A. Set options

Predictor: variable

SST

Produce a downscaled forecast : precipitation over Daegu for OND 2018

A. Set options

Job description

Daegu / 2018 OND / PREC / SST

Predictand

Season: Year Season Variable: Precipitation Temperature

Predictor

Variable

PREC T850 Z500
 SLP U850 V850
 U200 V200 SST

Models

APCC CMCC MSC
 NASA NCEP PNU
 POAMA

Training Period

Form To 25 Years

Method

Linear Regression

Advanced Options

Significance Level %
Minimum Pattern Score

Domain

Latitude: ~ Longitude: ~

5000km

Predictor: Models
APCC + MSC
+ NASA +
NCEP + PNU

Produce a downscaled forecast : precipitation over Daegu for OND 2018

A. Set options

Job description
Daegu / 2018 OND / PREC / SST

Predictand
Season: Year Season
Variable: Precipitation Temperature

Predictor
Variable
 PREC T850 Z500
 SLP U850 V850
 U200 V200 SST
Models
 APCC CMCC MSC
 NASA NCEP PNU
 POAMA
Training Period
Form To
Method
 Linear Regression
Advanced Options
Significance Level %
Minimum Pattern Score

Domain
Latitude: ~ Longitude: ~

Lat: -25 Lon: 180 Area: 23

Predictor: Training Period
**Common period
of selected
models**

Produce a downscaled forecast : precipitation over Daegu for OND 2018

A. Set options

Predictor: Method
Linear Regression

Job description

Daegu / 2018 OND / PREC / SST

Predictand

Season: 2018, OND
Variable: Precipitation, Temperature

Predictor

Variable

PREC, T850, Z500
 SLP, U850, V850
 U200, V200, SST

Models

APCC, CMCC, MSC
 NASA, NCEP, PNU
 POAMA

Training Period

Form: 1983, To: 2007, 25 Years

Method

Linear Regression

Advanced Options

Significance Level: 5 %
Minimum Pattern Score: 0.3

Domain

Latitude: -25 ~ 15, Longitude: 180 ~ 300

Apply

5000km

Run with new selections

Produce a downscaled forecast : precipitation over Daegu for OND 2018

A. Set options

Job description

Daegu / 2018 OND / PREC / SST

Predictand

Season: Year Season Variable: Precipitation Temperature

Predictor

Variable
 PREC T850 Z500
 SLP U850 V850
 U200 V200 SST

Models
 APCC CMCC MSC
 NASA NCEP PNU
 POAMA

Training Period
Form To 25 Years

Method
 Linear Regression

Advanced Options
Significance Level %
Minimum Pattern Score

Domain

Latitude: ~ Longitude: ~

Lat: -25
Lon: 180
Area: 23

Predictor: Advanced Options
Significance Level: 5%
Minimum Pattern Score: 0.1

Produce a downscaled forecast : precipitation over Daegu for OND 2018

Job description

Daegu / 2018 OND / PREC / SST

Predictor

Variable

PREC T850 Z500
 SLP U850 V850
 U200 V200 SST

Models

APCC CMCC MSC
 NASA NCEP PNU
 POAMA

Training Period

Form 1983 To 2007 25 Years

Method

Linear Regression

Advanced Options

Significance Level 5 %

Minimum Pattern Score 0.3

CLIK downscaling

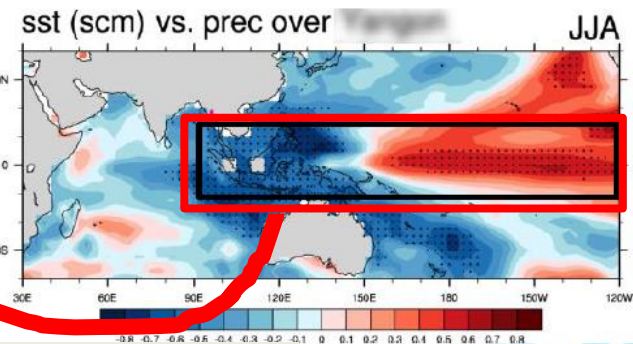
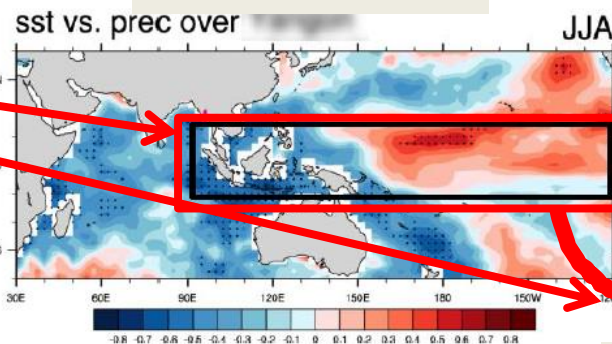
➡ A way to localize existing coarse climate information

CLIK downscaling is mainly based on station to Large Scale Meteorological Field (LSMF) relationship. ($Y = a * X + b$) By utilizing the simulated LSMF (X, predictor), CLIK estimates seasonal mean precipitation/temperature (Y, predictand) at specific station.

Empirical relationship: LSMP (OBS) ~ local station rainfall

LSMP (MME) → Local station rainfall

Screening test 1



Screening test 2

ons
1

Produce a downscaled forecast : precipitation over Daegu for OND 2018

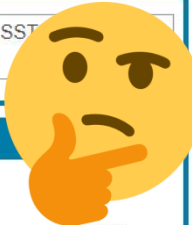
Job description
Daegu / 2018 OND / PREC / SST

Predictand
Season: Year 2018, Season OND, Variable: Precipitation, Temperature

Predictor
Variable: PREC, SLP, U200, T850, U850, V200, Z500, V850, SST
Models: APCC, NASA, POAMA, CMCC, NCEP, MSC, PNU
Training Period: Form 1983, To 2007, 25 Years
Method: Linear Regression
Advanced Options: Significance Level 5%, Minimum Pattern Score 0.3

Domain
Latitude: -25 ~ 15, Longitude: 180 ~ 300
Apply

Run with new selections



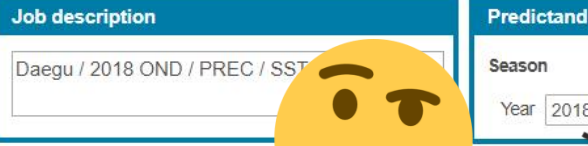
A. Set options

Predictor: Domain
The northwestern North Pacific

Produce a downscaled forecast : precipitation over Daegu for OND 2018

Job description

Daegu / 2018 OND / PREC / SST



Predictand

Season: Year Season Variable: Precipitation Temperature

Predictor

Variable:
 PREC T850 Z500
 SLP U850 V850
 U200 V200 SST

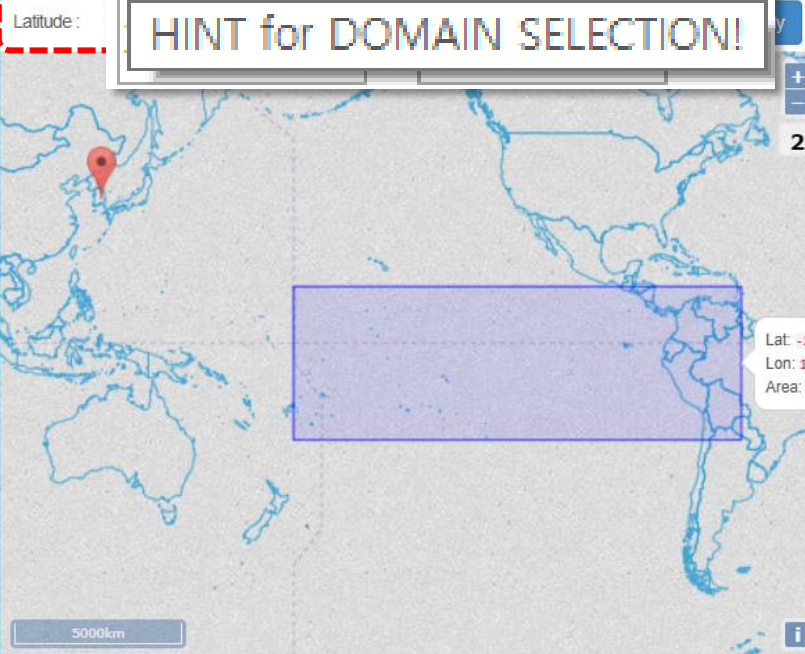
Models:
 APCC CMCC MSC
 NASA NCEP PNU
 POAMA

Training Period:
Form To 25 Years

Method:
 Linear Regression

Advanced Options:
Significance Level %
Minimum Pattern Score

Domain

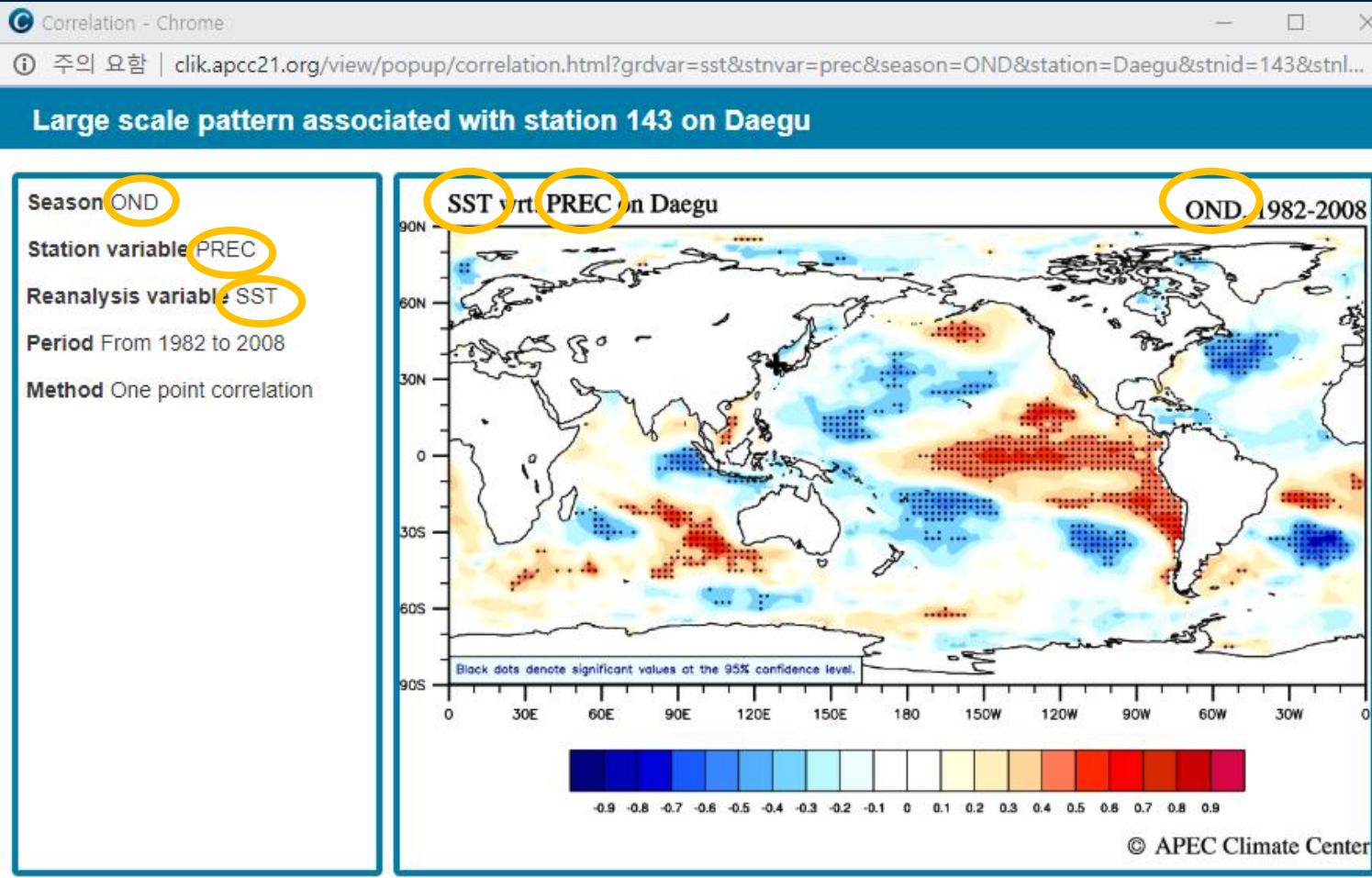


Run with new selections

A. Set options

Predictor: Domain
The northwestern North Pacific

Produce a downscaled forecast : precipitation over Daegu for OND 2018



otions

omain
orth Pacific

Produce a downscaled forecast : precipitation over Daegu for OND 2018

A. Set options

Job description
Daegu / 2018 OND / PREC / SST

Predictand
Season: Year 2018, Season OND, Variable: Precipitation, Temperature

Predictor
Variable
 PREC, T850, Z500
 SLP, U850, V850
 U200, V200, SST
Models
 APCC, CMCC, MSC
 NASA, NCEP, PNU
 POAMA
Training Period
Form 1983, To 2007, 25 Years
Method
 Linear Regression
Advanced Options
Significance Level: 5 %
Minimum Pattern Score: 0.3

Domain
Latitude: -25 ~ 15, Longitude: 180 ~ 300
Apply

Lat: -25
Lon: 180
Area: 23

5000km

Run with new selections



Predictor: Domain
The northwestern North Pacific

Produce a downscaled forecast : precipitation over Daegu for OND 2018

1

Dataset Name	Countries	Total Stations	Period(prec)	Period(temp)	Public
MCDW(Monthly Climatic Data for th...	The World	6463	1998 ~ 2014	1998 ~ 2014	PUBLIC
Korea 60 Stations	Korea, Republic of	60	1973 ~ 2008	1973 ~ 2006	PUBLIC
GHCN		3707	1950 ~ 2009	N/A	PUBLIC

2

Shift + drag

3

Station ID	Name	Precipitation	Temperature
108	Seoul	1973/1 ~ 2008/5	1973/1 ~ 2006/12

4 NEXT

Let's try!

Produce a downscaled forecast : precipitation over Daegu for OND 2018

Let's try!

Job description
Daegu / 2018 OND / PREC / SST

Predictand
Season: 2018, OND
Variable: Precipitation, Temperature

Predictor
Variable: PREC, SLP, U200, T850, U850, V200, Z500, V850, SST
Models: APCC, NASA, POAMA, CMCC, NCEP, MSC, PNU
Training Period: Form 1983, To 2007, 25 Years
Method: Linear Regression
Advanced Options: Significance Level 5%, Minimum Pattern Score 0.3

Domain
Latitude: -25 ~ 15, Longitude: 180 ~ 300
Map showing domain over the Pacific Ocean with a red pin at Daegu and a blue box for the domain. Info: Lat: -25, Lon: 180, Area: 23. Scale: 5000km.

Job description:

Daegu / 2018 OND / TEM
P / SST

Predictand:

2018 OND, Temperature

Predictor:

SST

APCC+MSC+NASA+NCEP+
PNU+POAMA

25N-50N, 120E-200E

Run with new selections



Produce a downscaled forecast : precipitation over Daegu for OND 2018

B. Check results

My Page

Jobs System Status

Last Updated At : 17:42:45 (auto refresh at about every 60 seconds) Auto Refresh

10 records per page Search:

JOB ID	TYPE	STATE	DESCRIPTION	CREATED	UPDATED	RESULT DATA
8347	Downscale	success	Seoul / 2018 OND / TEMP / SST	2018-10-12 17:42:31	2018-10-12 17:42:49	download
6908	MME	success	-	2018-08-01 10:47:11	2018-08-01 10:48:59	download
6290	MME	success	-	2018-02-27 13:24:08	2018-02-27 13:45:09	download
5410	Downscale	fail	-	2017-05-14 13:57:01	2017-05-14 14:11:55	
5409	Downscale	fail	-	2017-05-14 13:54:27	2017-05-14 13:54:58	
5322	MME	success	-	2016-12-08 13:25:34	2016-12-08 13:58:03	download
5321	MME	success	-	2016-12-08 13:23:33	2016-12-08 13:53:12	download
5318	MME	success	-	2016-12-08 12:34:23	2016-12-08 12:39:05	download
3860	Downscale	fail	-	2016-05-13 14:48:12	2016-05-13 14:48:27	
3858	Downscale	fail	-	2016-05-13 14:38:37	2016-05-13 14:45:28	

Showing 1 to 10 of 27 entries

Previous **1** 2 3 Next

Produce a downscaled forecast : precipitation over Daegu for OND 2018

B. Check results

My Page

Jobs
System Status

Last Updated At : 21:57:47 (auto refresh at about every 60 seconds) Auto Refresh

10 records per page Search:

JOB ID	Details			
8357	JOB ID	8356	CREATE	2018-10-15 18:15:57
8356	Downscale ID	7462	UPDATE	2018-10-15 18:16:32
8355	PREDICTAND		PREDICTOR	
8354	YEAR/SEASON	2018 / 10	TRAINING PERIOD	1983 / 2007
8353	PREDICTAND	PREC	VARIABLE	SST
8352	DATASET	Korea 60 Stations [ID:2]	MODELS	APCC, MSC, NASA, NCEP, PNU, POAMA
8351	STATION	1 Stations	REGION	Lat -25~15/ Lon 180~300
8350	SIGNIFICANCE LEVEL		5%	
8346	MINIMUM PATTERN SCORE		0.3	
8345	DESCRIPTION Daegu / 2018 OND / PREC / SST			
FEEDBACK				

Showing 1 to 10

Edit View result

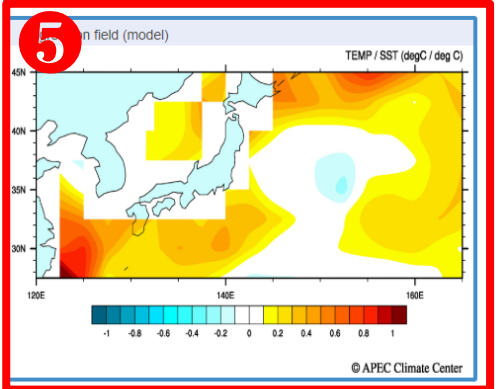
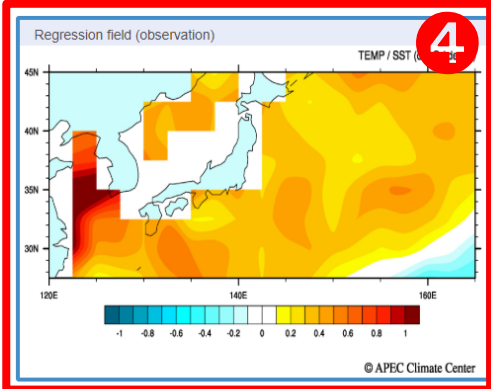
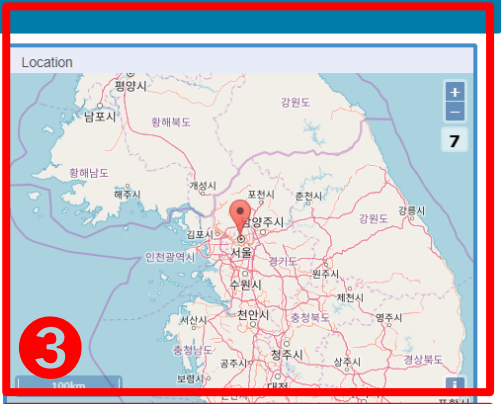
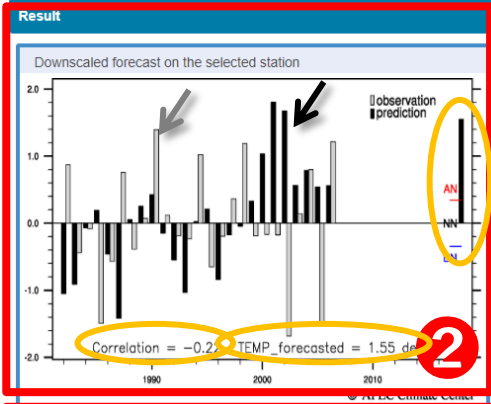


Produce a downscaled forecast : precipitation over Daegu for OND 2018

C. Check results.

Details	
PREDICTAND	PREDICTOR
YEAR/SEASON	2018 / 10
PREDICTAND	PREC
DATASET	Korea 60 Stations
REGION	1 Stations
SIGNIFICANCE LEVEL	5%
MINIMUM PATTERN SCORE	0.3
TRAINING PERIOD	1982 / 2007
VARIABLE	SST
MODELS	APCC MSC NASA NCEP PNU
REGION	Lat : -25 ~ 15 , Lon : 180 ~ 300

Selected Stations					
Station ID	Result	Name	Data period for PREC	Data period for TEMP	Correlation
143	Good	Daegu	1973/1 ~ 2008/5	1973/1 ~ 2006/12	0.181182



1. Job summary
2. Historical time series of hindcast and station data, Correlation coefficient, Deterministic forecast, Tercile category of the forecast
3. Location of station
4. Relationship pattern between the predictor (sst, observation) and the station data (precipitation) over the selected area
5. Relationship pattern between the predictor (sst, model) and the station data (precipitation) over the selected area

Edit New downscale

Exercise

Make your own seasonal climate outlook for OND 2018!

Clik Climate Information Toolkit

MME **Downscale** My Page **2018 / OND** Logout Edit

Job description

Predictand
Season: Year Season
Variable: Precipitation Temperature

Predictor

Variable

- PREC
- T850
- Z500
- SLP
- U850
- V850
- U200
- V200
- SST

Models

Select Variable

Training Period

Form To

Method

Linear Regression

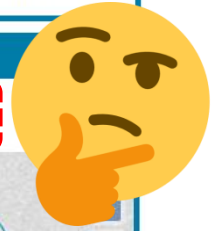
Advanced Options

Significance Level %
Minimum Pattern Score

Domain

Latitude: ~ Longitude: ~

5000km





Thank you!