2022년 10월 27-28일
APEC기후센터 기후정보서비스 사용자워크숍

APCC 기후서비스 통합플랫폼 II
상세화 예측 실습
Why downscaled forecast?

1960-2017, temperature

- Seoul
- Daegu
- Busan

http://cliks.apcc21.org
Why downscaled forecast?

2022 JUN PREC
APCC PMME FORECAST

2020 JUN PREC
관측

data.kma.go.kr
Target station: Daegu
Data Processing

Step 1. Prepare input data

Metadata

DAEGU_META.txt

Observation data

DAEGU_PREC.txt
DAEGU_TEMP.txt

Station information

Station data itself

기상자료개방포털 (data.kam.go.kr)
Data Processing

Step 1. Prepare input data

Metadata
- DAEGU_META.txt

Observation data
- DAEGU_PREC.txt
- DAEGU_TEMP.txt

- Use notepad.
- Data should be delimited by comma (,), space ( ), tab (    ), or colon (:).

comma
Data Processing

Step 1. Prepare input data

- Use notepad.
- Copy and paste the data from EXCEL to Notepad.
- One year per row.
- Data should be delimited by comma (,), space ( ), tab ( ), or colon (:).
**Data Processing**

**Step 2. Upload data to CLIK**

![Image of CLIK interface](http://cliks.apcc21.org)

### Select dataset

<table>
<thead>
<tr>
<th>Dataset Name</th>
<th>Countries</th>
<th>Total Stations</th>
<th>Period (prec)</th>
<th>Period (temp)</th>
<th>Public</th>
</tr>
</thead>
<tbody>
<tr>
<td>GHCN</td>
<td>GHCN</td>
<td>3697</td>
<td>1950 – 2009</td>
<td></td>
<td>PUBLIC</td>
</tr>
<tr>
<td>Asia Region (prec)</td>
<td>Asia</td>
<td>4918</td>
<td>1961 – 2004</td>
<td></td>
<td>PUBLIC</td>
</tr>
<tr>
<td>Iran stations</td>
<td>Islamic Republic of Iran</td>
<td>31</td>
<td>1951 – 2017</td>
<td>1951 – 2017</td>
<td>PUBLIC</td>
</tr>
<tr>
<td>Kurdistan stations</td>
<td>Islamic Republic of Iran</td>
<td>7</td>
<td>1960 – 2021</td>
<td>1960 – 2021</td>
<td>PUBLIC</td>
</tr>
</tbody>
</table>

Showing 1 to 5 of 5 entries

Select station

![Map of stations](http://cliks.apcc21.org)
Data Processing

Step 2. Upload data to CLIK
### Data Processing

#### Step 2. Upload data to CLIK

**Select observation dataset**

<table>
<thead>
<tr>
<th>Dataset Name</th>
<th>Countries</th>
<th>Total Stations</th>
<th>Period (prec)</th>
<th>Period (temp)</th>
<th>Public</th>
</tr>
</thead>
<tbody>
<tr>
<td>GHCN</td>
<td>GHCN</td>
<td>3697</td>
<td>1950 – 2009</td>
<td></td>
<td>PUBLIC</td>
</tr>
<tr>
<td>Asia Region (prec)</td>
<td>Asia</td>
<td>4918</td>
<td>1961 – 2004</td>
<td></td>
<td>PUBLIC</td>
</tr>
<tr>
<td>Iran stations</td>
<td>Islamic Republic of Iran</td>
<td>31</td>
<td>1951 – 2017</td>
<td>1951 – 2017</td>
<td>PUBLIC</td>
</tr>
<tr>
<td>Kurdistan stations</td>
<td>Islamic Republic of Iran</td>
<td>7</td>
<td>1960 – 2021</td>
<td>1960 – 2021</td>
<td>PUBLIC</td>
</tr>
<tr>
<td><strong>Daegu</strong></td>
<td></td>
<td>0</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Showing 1 to 6 of 6 entries
Data Processing

Step 2. Upload data to CLIK

1. Metadata
   - Dataset
   - Station ID, Country, Name, WMO ID, Latitude, Longitude, Undefined
   - Search: No data available in table
   - Showing 0 to 0 of 0 entries

2. Observation data
   - Year, Variable, Unit, JAN, FEB, MAR, APR, MAY, JUN, JUL, AUG, SEP, OCT, NOV, DEC
   - Search: No data available in table
   - Showing 0 to 0 of 0 entries
Data Processing

Step 2. Upload data to CLIK

1. Metadata

- Show 10 entries
- Station ID
- Country
- Name
- WMO ID
- Latitude
- Longitude
- Undefined

No data available in table

Showing 0 to 0 of 0 entries

Import
Export
Insert
Modify
Remove
Remove All

- Country: Republic of Korea
- Station information file: Browse file

Upload

No data available in table

Show 10 entries
Year JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC
Data Processing

Step 2. Upload data to CLIK

1. Metadata

- Show 10 entries

<table>
<thead>
<tr>
<th>Station ID</th>
<th>Country</th>
<th>Name</th>
<th>WMO ID</th>
<th>Latitude</th>
<th>Longitude</th>
<th>Undefined</th>
</tr>
</thead>
<tbody>
<tr>
<td>111</td>
<td>South</td>
<td>Seoul</td>
<td></td>
<td>37.55</td>
<td>126.95</td>
<td></td>
</tr>
</tbody>
</table>

No data available in table

Showing 0 to 0 of 0 entries

Import | Export | Insert | Modify | Remove | Remove All

Browse file:

- Country
- Station information file (example)

Data

- Show 10 entries

<table>
<thead>
<tr>
<th>Year</th>
<th>Variable</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>2023</td>
<td>Temperature</td>
<td>°C</td>
</tr>
</tbody>
</table>

No data available in table

Search:
### Metadata

<table>
<thead>
<tr>
<th>Station ID</th>
<th>Country</th>
<th>Name</th>
<th>WMO ID</th>
<th>Latitude</th>
<th>Longitude</th>
<th>Undefined</th>
</tr>
</thead>
<tbody>
<tr>
<td>143</td>
<td>Republic of Korea</td>
<td>Daegu</td>
<td>-</td>
<td>35.878</td>
<td>128.653</td>
<td>-999</td>
</tr>
</tbody>
</table>

Showing 1 to 1 of 1 entries

Country:
- Republic of Korea

Station information file (example):
- Browse file

Upload

Data

<table>
<thead>
<tr>
<th>Year</th>
<th>Variable</th>
<th>Unit</th>
<th>JAN</th>
<th>FEB</th>
<th>MAR</th>
<th>APR</th>
<th>MAY</th>
<th>JUN</th>
<th>JUL</th>
<th>AUG</th>
<th>SEP</th>
<th>OCT</th>
<th>NOV</th>
<th>DEC</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>-----</td>
<td>-----</td>
<td>-----</td>
<td>-----</td>
<td>-----</td>
<td>-----</td>
<td>-----</td>
</tr>
</tbody>
</table>

No data available in table
Data Processing

Step 2. Upload data to CLIK

1. Metadata

2. Observation data

Import observed data
Data Processing

Step 2. Upload data to CLIK

- Observation data

[Image of the CLIK website interface with highlighted options for importing and exporting observed data, and a browser file button for selecting a data file.]
Data Processing

Step 2. Upload data to CLIK

1. Metadata

2. Observation data
Data Processing

Step 2. Upload data to CLIK

### Select observation dataset

<table>
<thead>
<tr>
<th>Dataset Name</th>
<th>Countries</th>
<th>Total Stations</th>
<th>Period(prec)</th>
<th>Period(temp)</th>
<th>Public</th>
</tr>
</thead>
<tbody>
<tr>
<td>GHCN</td>
<td>GHCN</td>
<td>3697</td>
<td>1950 ~ 2009</td>
<td></td>
<td>PUBLIC</td>
</tr>
<tr>
<td>Asia Region (prec)</td>
<td>Asia</td>
<td>4918</td>
<td>1961 ~ 2004</td>
<td></td>
<td>PUBLIC</td>
</tr>
<tr>
<td>Iran stations</td>
<td>Islamic Republic of Iran</td>
<td>31</td>
<td>1951 ~ 2017</td>
<td>1951 ~ 2017</td>
<td>PUBLIC</td>
</tr>
<tr>
<td>Kurdistan stations</td>
<td>Islamic Republic of Iran</td>
<td>7</td>
<td>1960 ~ 2021</td>
<td>1960 ~ 2021</td>
<td>PUBLIC</td>
</tr>
<tr>
<td>Daegu</td>
<td>Republic of Korea</td>
<td>1</td>
<td>1973 ~ 2019</td>
<td>1973 ~ 2018</td>
<td>PUBLIC</td>
</tr>
</tbody>
</table>
Data Processing

Step 2. Upload data to CLIK

1. Select dataset
2. Select a station on the map
3. Add the station
4. Select the station by clicking a radio button
5. Get started downscaling job
Precipitation over Daegu for OND 2020?
Downscaling procedure in CLIK:
Precipitation over Daegu for OND 2020

지점자료
• Point (uploaded)

전지구 재분석 자료
• Grid (built-in)
• Reanalysis, CAMS OPI, and OISST

모델 예측 자료
• Grid (built-in)
• Hindcast of dynamical models

CORRELATION & REGRESSION

1973 \hspace{1cm} 1979 \hspace{1cm} 1983 \hspace{1cm} 1982

1979 \hspace{1cm} 1983 \hspace{1cm} 2006

1983 \hspace{1cm} 2011 \hspace{1cm} 2014

2019

http://cliks.apcc21.org
Correlation does not imply causation!

Data sources: National Vital Statistics Reports and U.S. Department of Agriculture and Dept. of Energy
Correlation does not imply causation!
Correlation does not imply causation!

REGRESSION

y = ax + b

대구강수 (y) vs 적도중앙/동태평양 해수면 온도 (x)

2020OND 대구강수 예측값

2020OND 해수면 온도 예측값

http://cliks.apcc21.org
Downscaling procedure in CLIK:
Precipitation over Daegu for OND 2020

1. 재분석자료와 지점자료의 상관관계
   해수면온도 대구의 강수
   - Success!

2. 모델자료와 지점자료의 상관관계 계산
   해수면온도 대구의 강수
   - Success!

3. PATTERN CORRELATION

Station → Screening test 1 → Bad Station
Station → Screening test 2 → Hopeful Station
Station → Screening test 3 → Hopeful Station
Station → Downscaling → Good Station
Downscaling procedure in CLIK:
Precipitation over Daegu for OND 2020

\[ y = ax + b \]

대구강수 (y)

해수면온도

모델의
열대중앙/동태평양
해수면온도 (x)

2020OND 해수면온도 예측값

2020OND 대구강수 예측값

再분석자료와
지점자료의
상관관계

해수면온도
대구의
강수

success!

fail!

fail!

fail!

success!

PATTERN
CORRELATION

Downscaling

Downscaling

Good Station

Hopeful Station

Downscaling

http://cliks.apcc21.org
다구강수 & 열대중앙/동태평양해수면온도

(test1) 과거 대구강수가 과거 열대중앙/동태평양해수면온도와 상관관계가 있고,

(test2) 과거 대구강수가 모델이 예측했던 과거 열대중앙/동태평양해수면온도와 상관관계가 있으며,

(test3) 그 상관관계의 모습이 유사하다면,

Successful downscaling...?
Precipitation over Daegu for OND 2020?
Produce a downscaled forecast:
Precipitation over Daegu for OND 2020
Produce a downscaled forecast:
Precipitation over Daegu for OND 2020

Predictand: 2020 OND / Precipitation
Predictor: sst / all models (except for CWB, HMC) / 열대중앙동태평양
Produce a downscaled forecast:
Precipitation over Daegu for OND 2020

Predictand: 2020 OND / Precipitation
Predictor: sst / all models (except for CWB, HMC) / 열대중앙동태평양
Produce a downscaled forecast:
Precipitation over Daegu for OND 2020

Acknowledgement for APCC MME / Individual model
When you use the APCC MME and/or individual model data in any documents or publications, please acknowledge us by including the following text, “The authors acknowledge the APCC MME Producing Centers for making their hindcast/forecast data available for analysis, the APEC Climate Center for collecting and archiving the data, as well as for producing APCC MME predictions.”

Acknowledgement for Clipped CMIP5
When you use other APCC data products in any documents or publications, please acknowledge us by including following text, “The authors acknowledge the APEC Climate Center for providing the Clipped CMIP5”. Note that you may have to insert citations or references for these datasets, following the original 'how to cite this datasets' directions posted on the original website for these datasets.

Job type | Submission date | End date | Status
---|---|---|---

Downscaling
Download

Request ID: 69365482db073e000066910ef
Dataset: Korea 101 Stations
Station ID: 143
Country: Republic of Korea
Station name: Daegu
Season: 2022-10
Predictand variable: prec
Predictor variables: ssp
Models: APCC, SCOPS, BOM, ACCESS-S2, CMCC, SPS3.5, CWB, TCOLB11Tv1.1, ECCH_CCM3.1, INERIS, IMA, KMA, GLOSEA6GC3.2, METFR_SYS58, NASA, GEOS-S2S-2.1, NCEP_CFSv2, USAH, GLOSEA6
Training period: 1993 ~ 2010
Latitude: 15 ~ 40
Longitude: 120 ~ 165
Produce a downscaled forecast:
Precipitation over Daegu for OND 2020

1. Job summary

2. Historical time series of downscaled prediction/observation data, correlation coefficient between them, deterministic forecast, and tercile category of the forecast

3. Location of station

4. Regressed predictor (SST; observation) field onto the predictand (precipitation) over the selected domain

5. Regressed predictor (SST; model) field onto the predictand (precipitation) over the selected domain
Produce a downscaled forecast:
Precipitation over Daegu for OND 2020

- SCM
- Below-normal prec
- Good
- Cor. Coeff: 0.30
Produce a downscaled forecast:
Precipitation over Daegu for OND 2020

- APCC
- Below-normal prec
- Good
- Cor. Coeff: 0.32
Produce a downscaled forecast: Precipitation over Daegu for OND 2020

- NCEP
- Below-normal prec
- Good
- Cor. Coeff: 0.38
Exercise
Make your own seasonal climate outlook for NDJ 2022!
Thank you!