CLIK(CLimate Information toolKit)

APEC Climate Center

Climate Service Platform

Tutorial

(cliks.apcc21.org)

November 2021

APCC
APEC CLIMATE CENTER

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I Easy-to-follow guide for CLIK platform

1 Easy-to-follow sign up your account

(1) Sign up your account for CLIK platform

A. Go to the homepage

Launch your web browser and enter the cliks.apcc21.org address in the address bar to navigate to the website.

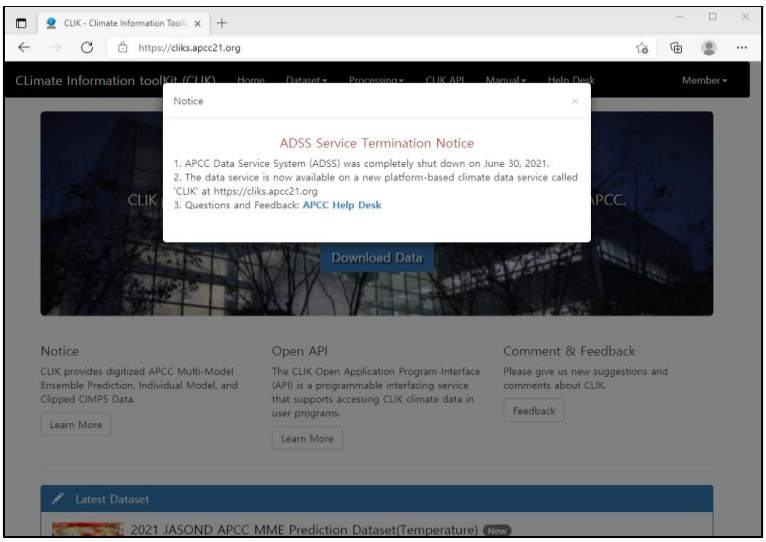

Figure 1 CLIK platform website

B. Go to member registration page

Select the *Member* button in the upper right corner and then select the *Register* button to navigate to the membership registration page.

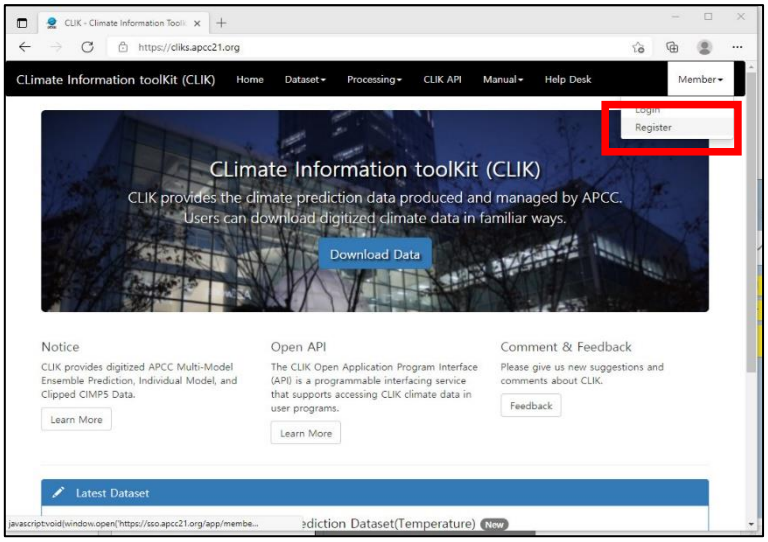

Figure 2 Member – Register page

C. Membership registration: step (1)

Enter your *First Name*, *Last Name*, and *Email* address to verify whether you have previously signed up.

Figure 3 APCC SSO registration page (1)

D. Membership registration: step (2)

After reviewing your registration information, click the *Apply* button to proceed with the registration.

Figure 4 APCC SSO registration page (2)

E. Membership registration: step (3)

Check Register Info, set your *ID* (ID) and enter the relevant personal information (fields marked with * are mandatory).

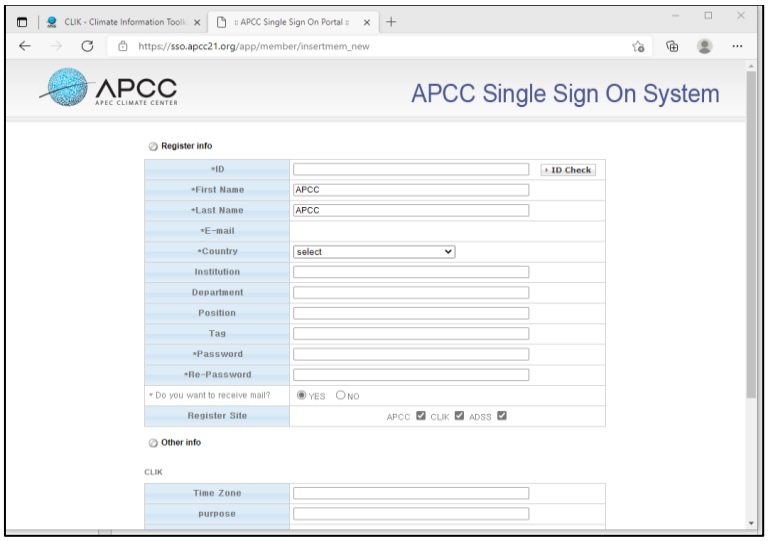

Figure 5 APCC SSO registration page (3)

F. Email authentication and verification of account

A confirmation email will be sent to your registered email address. You can proceed with account activation through the link attached to the authentication email. Once your

account has been activated, you can use all of the APCC's services. If you have not received the email, we recommend checking the spam folder.

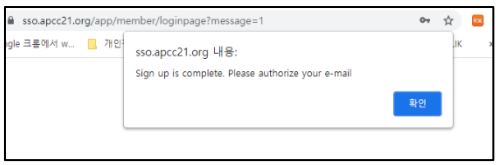

Figure 6 Account registration complete popup message

G. Log in with your registered *ID*

Go back to the CLIK platform homepage and select the *Login* button.

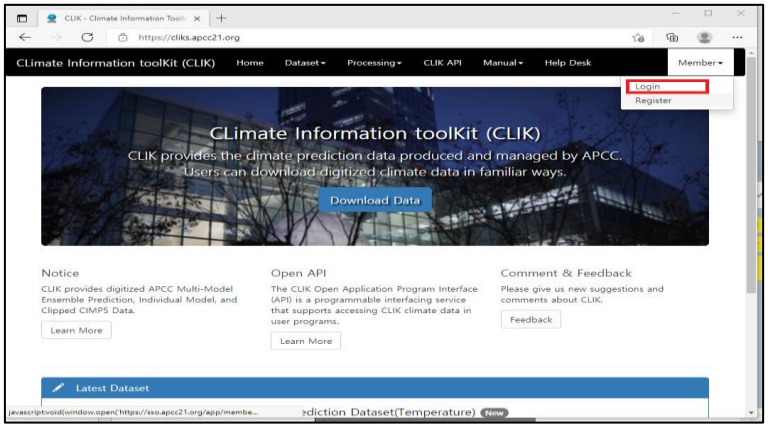

Figure 7 CLIK platform login (1)

Enter your *ID* and *Password* to complete member login.

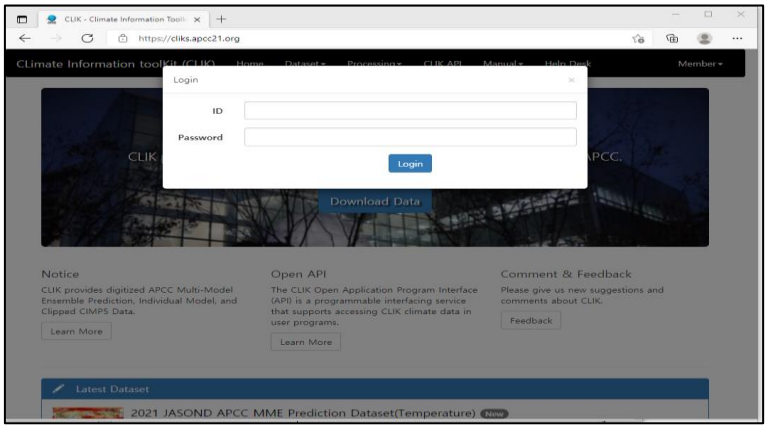

Figure 8 CLIK platform login (2)

2 Easy-to-follow download APCC Multi-Model Ensemble data

(1) Download MME 3-month climate data

A. Log in

You should be registered as a member before using this service, and log in after completing the membership registration.

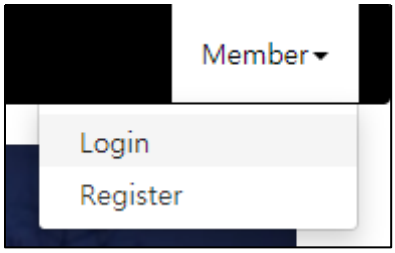

Figure 9 Login

Enter your *ID* and *Password* to complete the login.

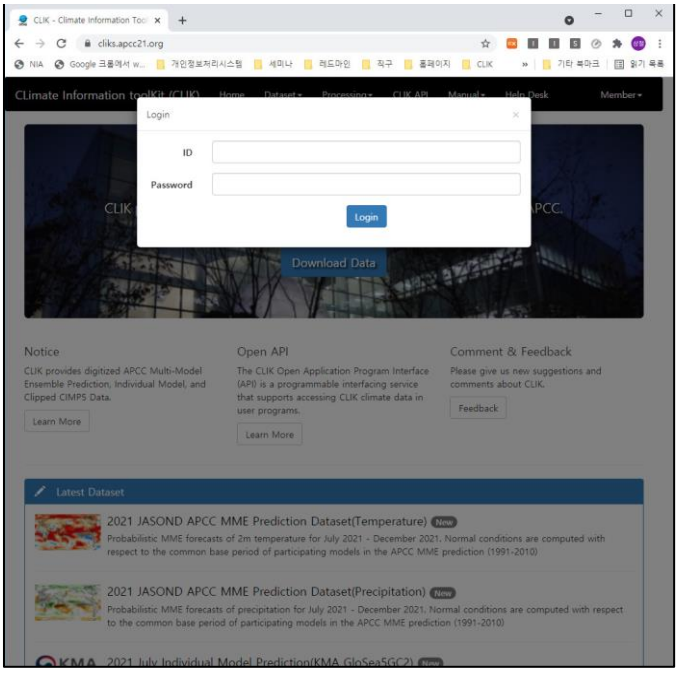

Figure 10 Enter user *ID* and *Password*

B. Select '*Dataset* > *MME-3MON*' menu

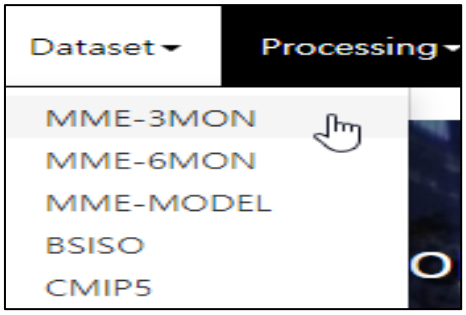

Figure 11 Select *MME-3MON* menu

C. Select data option

For the MME 3-month data download, the data type is selected as Forecast (prediction data) and the prediction method is selected as the probabilistic forecasting method, GAUS. Then, select the temperature at 2 meters (t2m) variable and set the period as monthly mean. The options on the actual screen are set as illustrated in Figure 12.

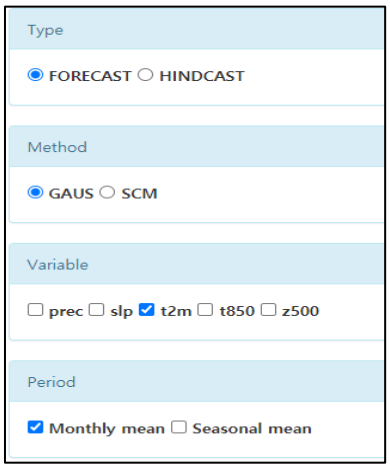

Figure 12 Select data option

D. Select year/month of the data (select 2021)

Select the appropriate year and season for the data. In this example, select the full year of 2021. To select all months of the year, select the Arabic number of the year (Figure 13).

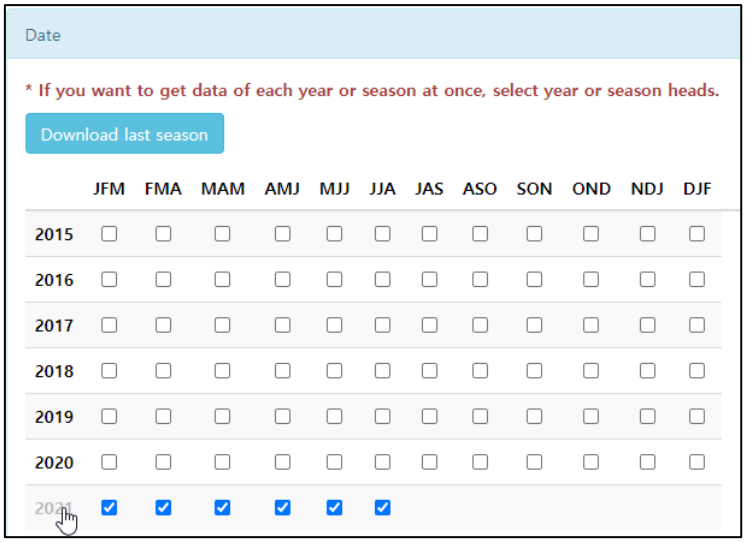

Figure 13 Select *Year* and *Month*

E. Request

After reviewing the above conditions, create a user job through the *Request* button.

Figure 14 Request data

F. Confirm the job creation

A job is created in the upper right corner of the screen, and the user-requested '*Job ID*' will appear, which automatically disappears after moving the page or after a certain period of time.

Figure 15 Confirm the Job creation

G. Select *My Jobs* menu

You can check the status of user-requested jobs in the *My Jobs* menu.

Figure 16 *My Jobs* Menu

H. Job progress check, download request

Figure 17 Job progress check, Download request via *Download* button

(2) MME 3-Month climate data download result

The MME 3-month climate data would have been downloaded in the form of a zip file (Figure 18).

Figure 18 Climate data download

Figure 19 Extract climate data from downloaded file

3 Easy-to-follow download individual model data

(1) Download APCC SCOPS individual model data

A. Log in

You should be registered as a member before using this service, and log in after completing membership registration.

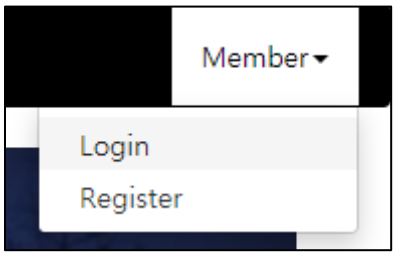

Figure 20 Login

Enter your *ID* and *Password* to complete the login.

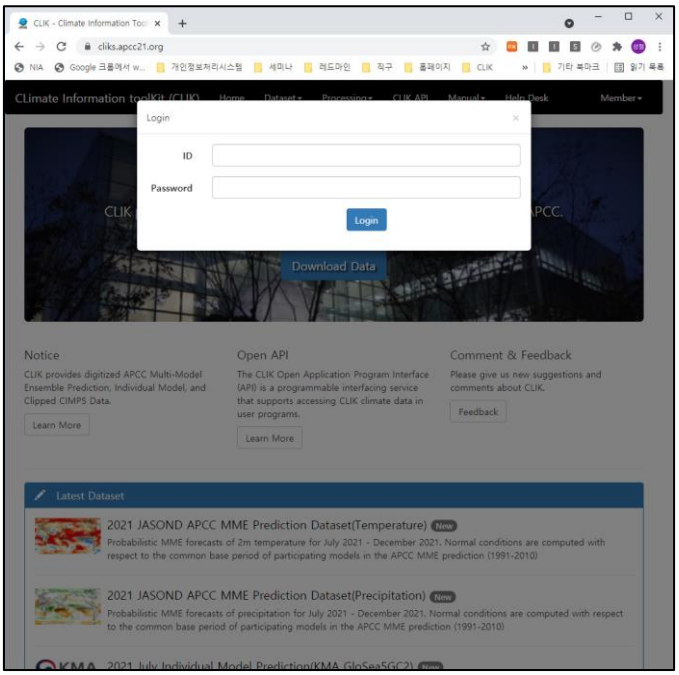

Figure 21 Enter user *ID* and *Password*

B. Select '*Dataset* > *MME-MODEL*' menu

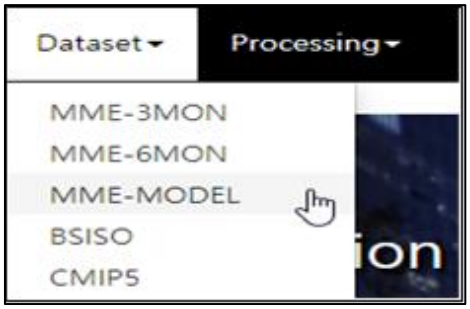

Figure 22 Select *MME-MODEL* Menu

C. Select data option

In order to download APCC SCOPS climate model data, select the data type as Forecast and select the Institute as APCC. After selecting the model name as SCOPS, select the precipitation (prec) and temperature at 2 meters (t2m) variables. The options on the actual screen are set as illustrated in Figure 23.

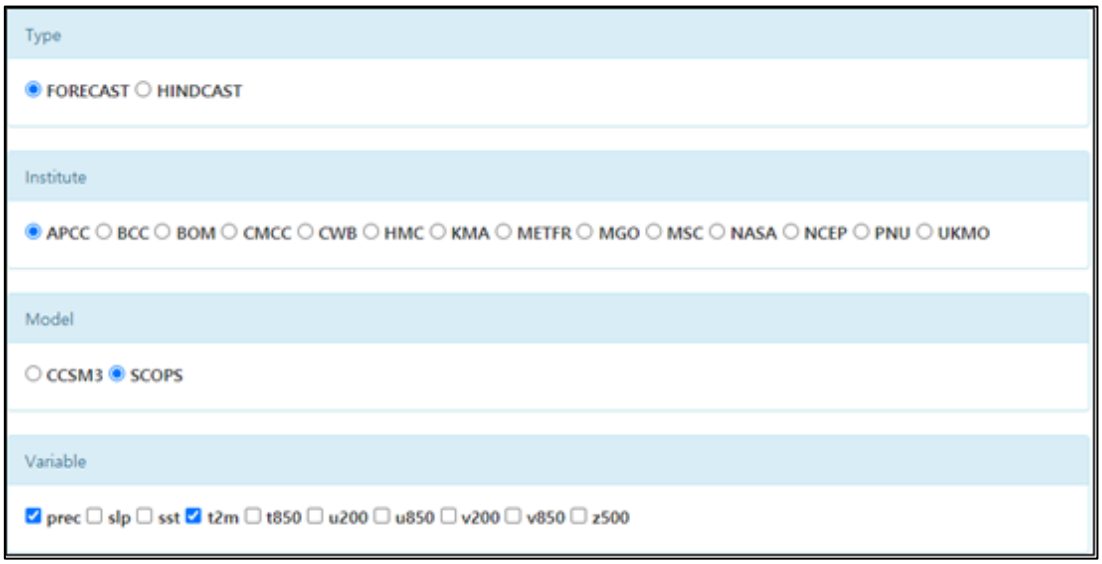

Figure 23 Select data option

D. Select year/month of the data (select 2021)

For the year and month of the data, select the full year of 2021. To select all months of the year, select the Arabic number of the year (Figure 24).

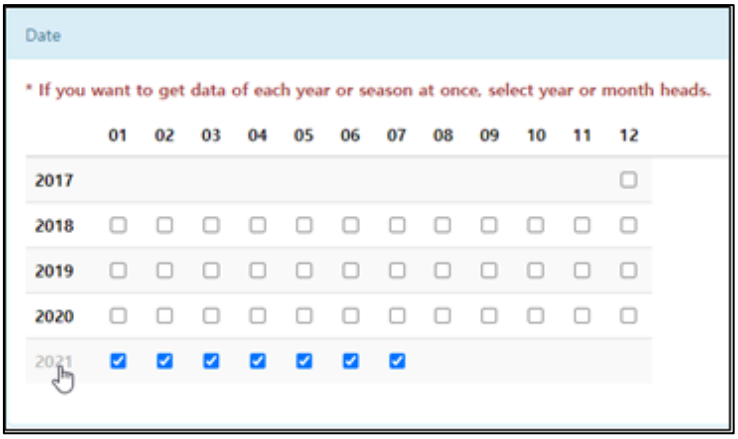

Figure 24 Select Year and Month

E. Request

After reviewing the above conditions, create a user job through the *Request* button.

Figure 25 Data Request

F. Confirm the job creation

A job is created in the upper right corner of the screen, and the user-requested *'Job ID'* will appear, which automatically disappears after moving the page or after a certain period of time.

Figure 26 Confirm the Job creation

G. Select *My Jobs* menu

You can check the status of user-requested jobs in the *My Jobs* menu.

Figure 27 *My Jobs* Menu

H. Job progress check, download request

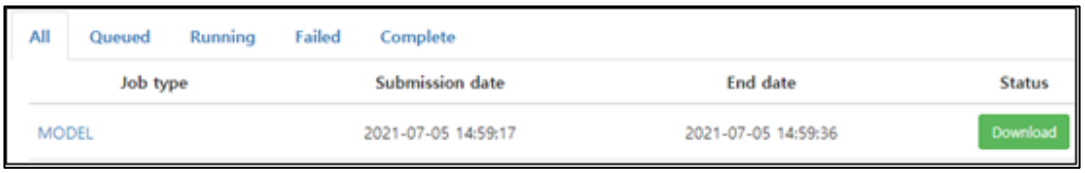

Figure 28 Job progress check, download request via *Download* button

(2) APCC SCOPS individual model data download result

The APCC SCOPS model data would have been downloaded in the form of a zip file (Figure 29).

Figure 29 Climate data download

Figure 30 Extract data from downloaded file

4 Easy-to-follow create your seasonal prediction

(1) Creating and confirming seasonal forecast data

A. Log in

You can use the *Prediction* menu only when you log in. You should be registered as a member before using this service, and log in after completing the membership registration.

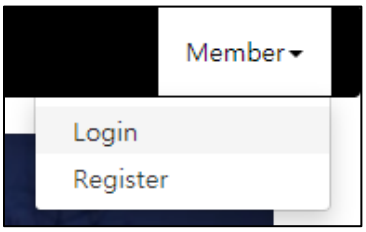

Figure 31 Login

Enter your *ID* and *Password* to complete the login.

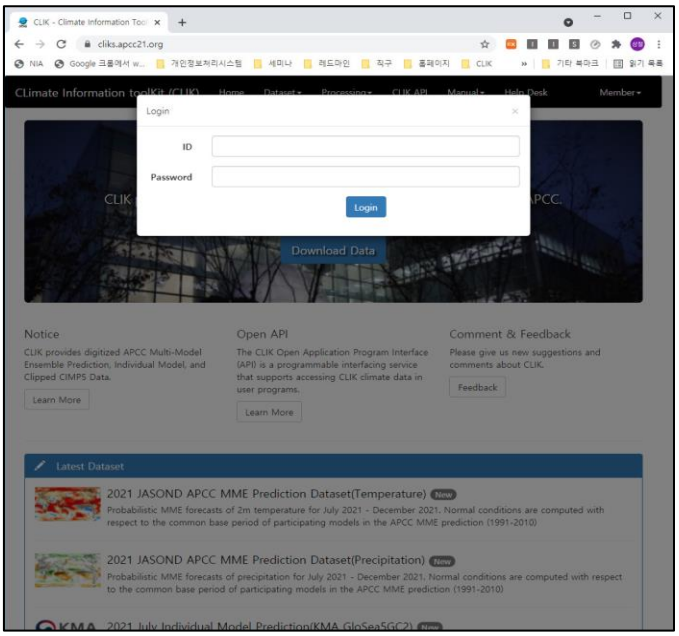

Figure 32 Enter user *ID* and *Password*

B. Select '*Processing* > *Prediction*' menu

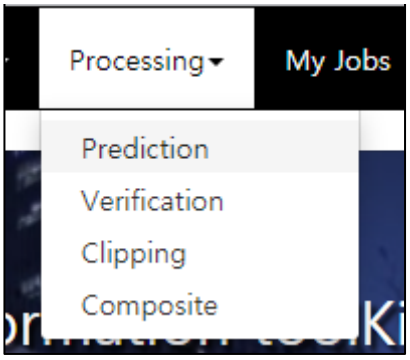

Figure 33 Select *Prediction* menu

C. Select your seasonal prediction option

To produce seasonal forecast data through the predictive method, the lead time is selected as 3 months, and the year and season are selected as 2021 and July (the selected month plus the two-following month, JAS, July-August-September season in this case). Deterministic is selected for the prediction method, and the user selects the desired climate model (APCC_SCOPS in the current example, Figure 36). The options on the actual screen are set as illustrated in Figure 34.

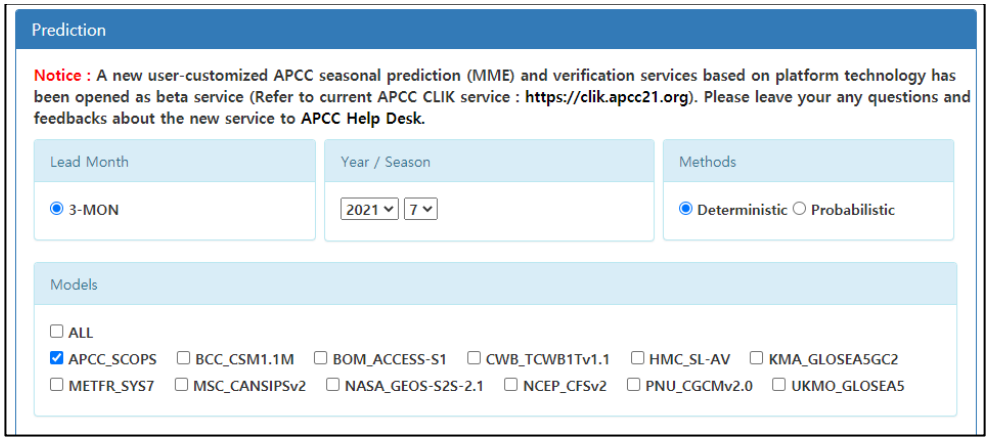

Figure 34 Select your seasonal prediction options

D. If there is a seasonal prediction result

If the results for the seasonal prediction selected by the user already exist, the results are immediately displayed on the screen. Refer to subsection (3) Seasonal prediction data creation and confirmation of result.

E. When no seasonal prediction result exists

An Error is generated when there is no result for the preferences selected by the user. This reinitializes the job creation process.

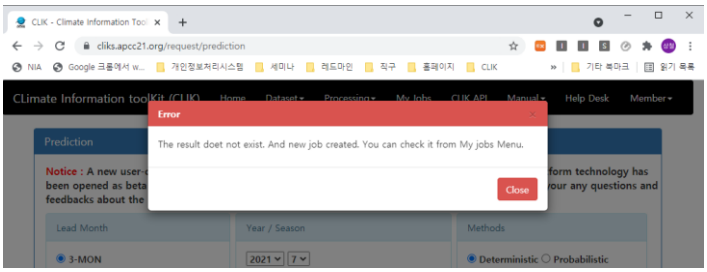

Figure 35 An Error due to no result according to user's specifications

You can review the status of the current job in the *My Jobs* menu.

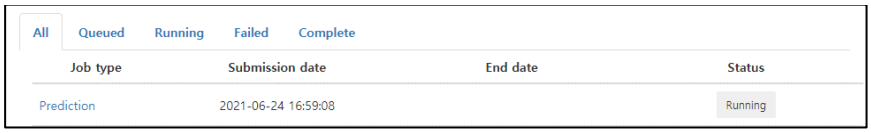

Figure 36 Check the progress of the created job

When the seasonal prediction task is completed, the *Download* button and *View* button will be generated (Figure 39).

Figure 37 *Download* and *View* button are activated

When the seasonal prediction task is completed, you will receive a job completion notification to your email address.

Figure 38 Notification of a job completion

(2) Seasonal prediction data creation and confirmation of result

A. Result based on your option selection

The seasonal prediction results will be generated according to the options selected by the user. If the seasonal forecast result was previously generated, it will be displayed on the screen. If there is no result, you should review and reattempt the seasonal prediction data creation process.

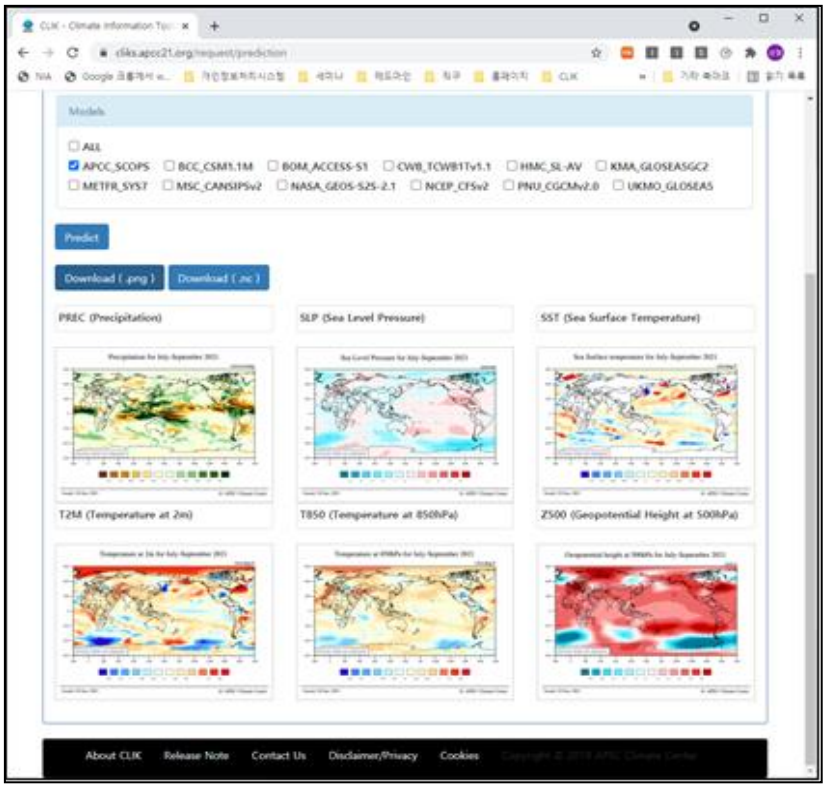

Figure 39 Seasonal Prediction result

Downloading the seasonal prediction image (Figure 39), using the *Download* (.png) button, generates the below screen (Figure 40).

Figure 40 Downloaded image file

Downloading the NetCDF file for the same result using the *Download* (.nc) generates the below screen (Figure 41).

Figure 41 Downloaded NetCDF (.nc) file

Using the *Download* button in the *My Jobs* menu will have both an image file and a NetCDF file included in the download.

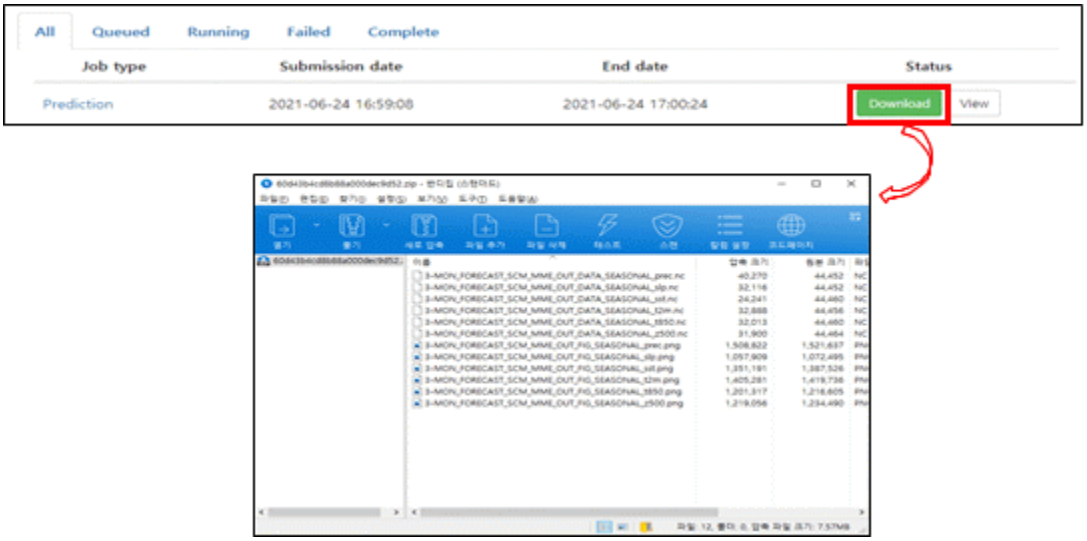

Figure 42 Downloaded file using *Download* button in *My Jobs* page

5 Easy-to-follow generate the verification

(1) Creating and confirming verification data

A. Log in

The *Verification* menu can be used only when you log in. You should be registered as a member before using this service, and log in after completing the membership registration.

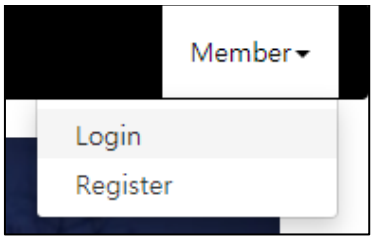

Figure 43 Login

Enter your *ID* and *Password*.

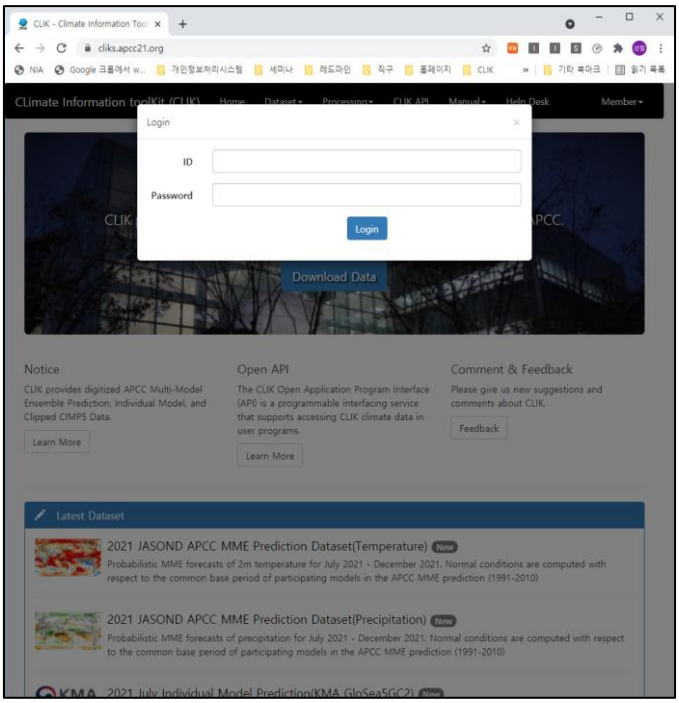

Figure 44 Enter user *ID* and *Password*

B. Select '*Processing* > *Verification*' menu

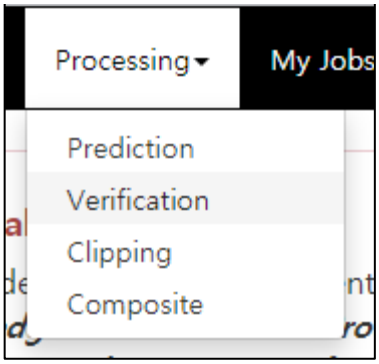

Figure 45 Verification Menu

C. Select your verification option

To produce verification data for deterministic prediction, the lead time is selected as 3 months, and the year and season are selected as 2021 and July (JAS, July-August-September). In the example (Figure 46), ACC (Anomaly Correlation Coefficient) was selected as the verification method, precipitation (prec) as the climate variable, and APCC SCOPS as the climate model. The options on the actual screen are set as illustrated in Figure 46.

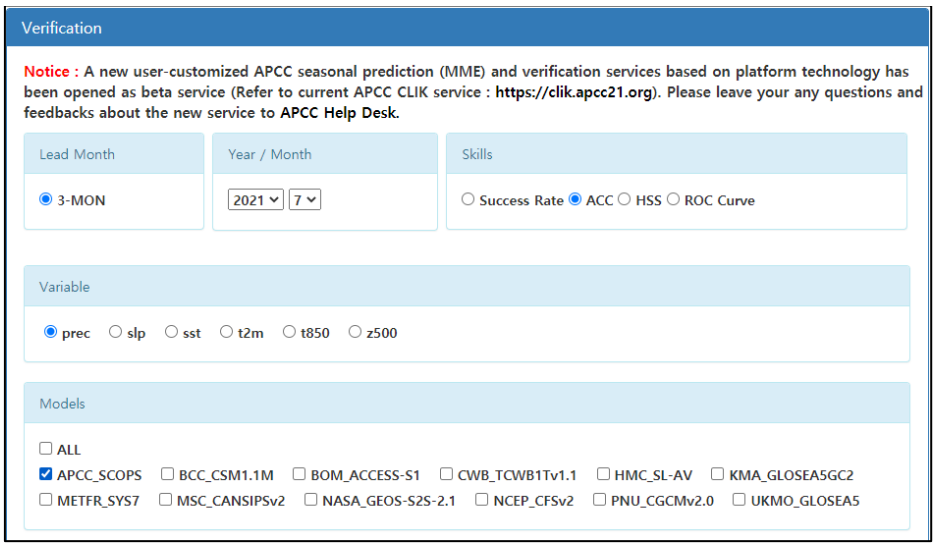

Figure 46 Selected options

D. If there is a verification result

If the verification result selected by the user already exists, the result is immediately displayed on the screen. Refer to subsection (3) Verification data creation and confirmation of result.

E. If there is no verification result

An Error is generated if there is no result for the preferences selected by the user. This reinitializes the job creation process.

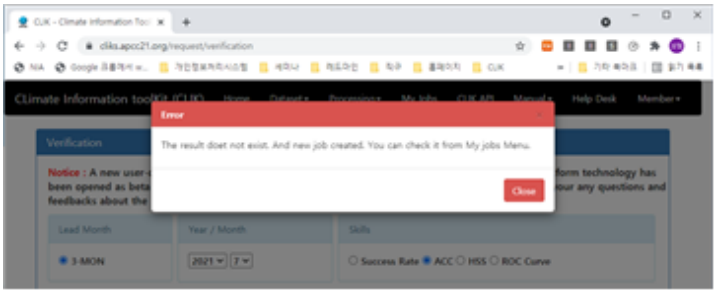

Figure 47 An error due to no result according to the user's specifications

You can review the status of the current job in the *My Jobs* menu.

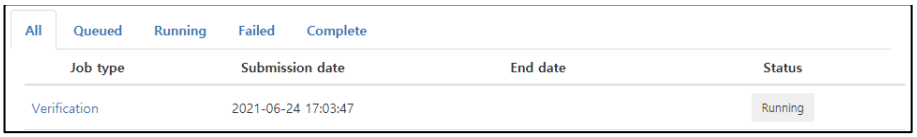

Figure 48 Check my job status

When the verification data creation process is completed, the *Download* button and *View* button will be generated (Figure 49).

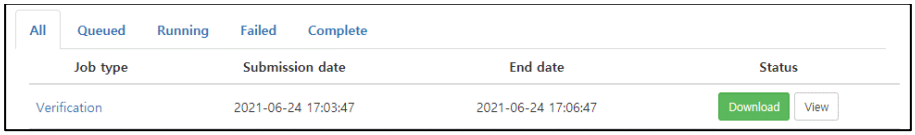

Figure 49 *Download* and *View* button are activated

When the verification data creation process is completed, you will receive a job completion notification to your email address.

Figure 50 Notification of a job completion

(2) Verification data creation and confirmation of result

A. Result based on your option selection

The verification result will be generated according to the options selected by the user. If the verification data has already been generated, it will immediately be displayed on your screen. If there is no result, you should review and reattempt the verification data creation process.

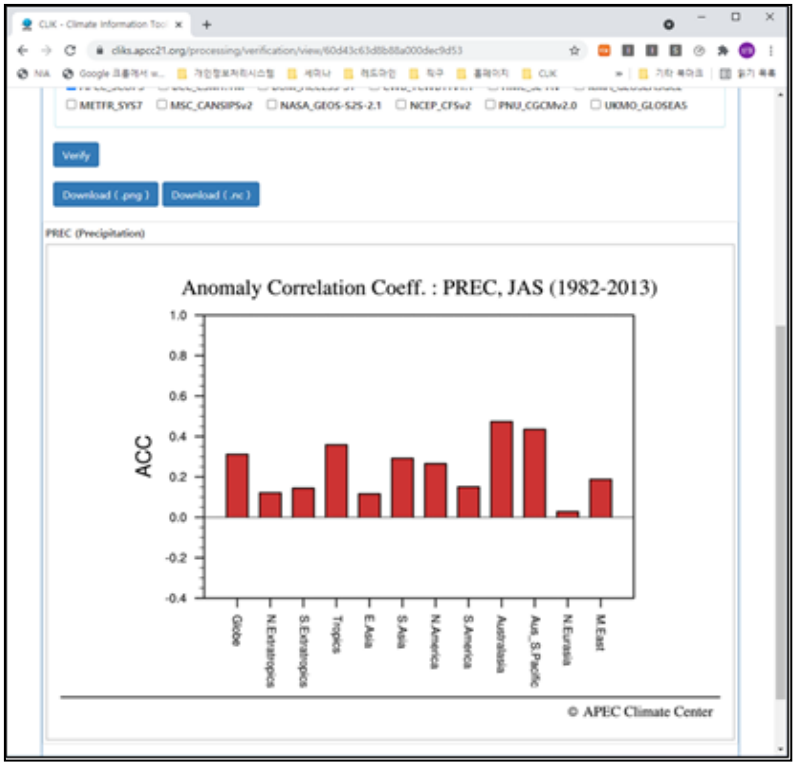

Figure 51 Verification result

Downloading the Verification image (Figure 51), using the *Download* (.png) button, generates the below screen (Figure 52).

Figure 52 Downloaded image file

Downloading the NetCDF file for the same result using the *Download* (.nc) button generates the below screen (Figure 53).

Figure 53 Downloaded NetCDF (.nc) file

Using the *Download* button in the *My Jobs* menu will have both an image file and a NetCDF file included in the download.

Figure 54 Download result using *Download* button in *My Jobs* page

6 Easy-to-follow process the data clipping

(1) The extraction of MME data in East Asia

A. Select the *Clipping* menu

From the *Processing* menu, select *Clipping* to go to the data clipping service page.

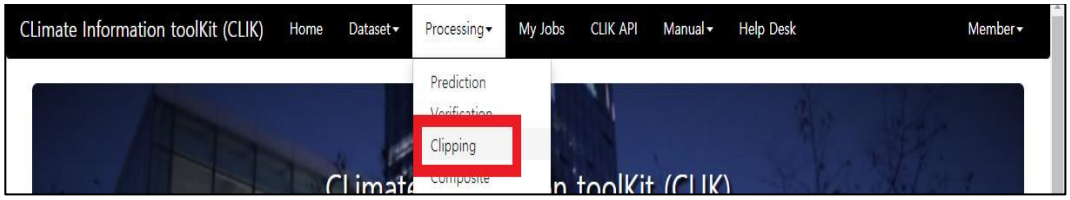

Figure 55 Processing – *Clipping* Menu

B. Select options (*Variable*, *Lead Month*, *Method*, *Issued*, *Region*)

In this example, to extract MME data for East Asia, specify precipitation, 3-month lead time, and monthly prediction data (*Determinstic_Monthly*). In addition, please check that issued date and region are set to April 2021 and East Asia, respectively. The options on the actual screen are illustrated in Figure 56.

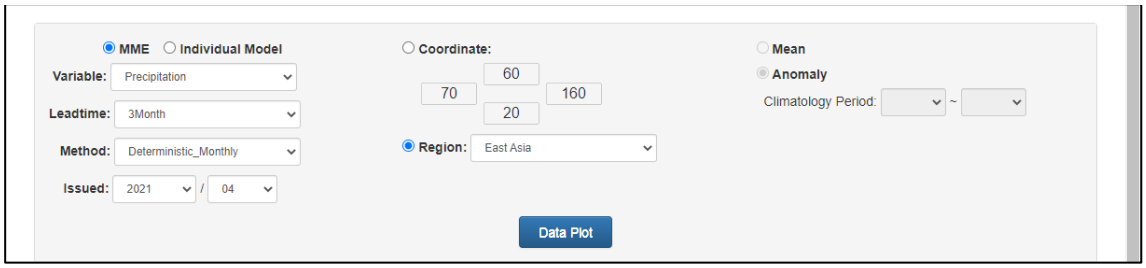

Figure 56 Select clipping Option

C. Check clipping results

If you select the *Data Plot* button on the Clipping options screen (Figure 56), you can view the 3-month MME data extracted for the East Asia region, starting April 2021.

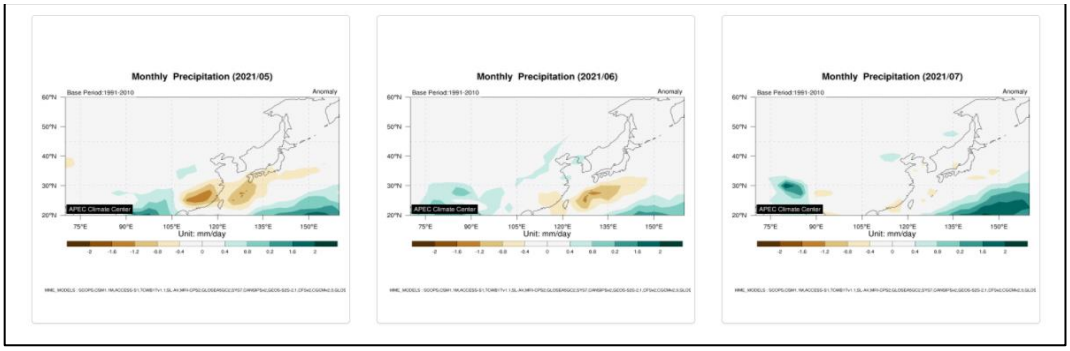

Figure 57 Data extracted for the East-Asia region (3-month MME)

D. Download image result

If you click on the plot, you will be able to open the original file. Right-click on this image and select Save Image to save the result as a .png file.

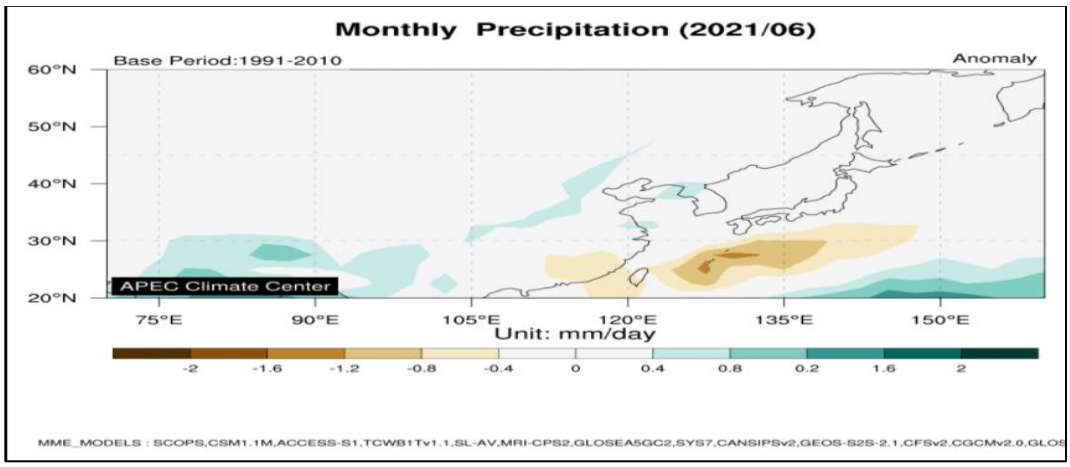

Figure 58 Check original size of image by clicking thumb nail image

E. Download the CSV file result

In the *Data Clipping* (rectangle) menu (Figure 59), select Forecast and click the *Clipped data download* button to download the result in the desired file format (.nc or .csv).

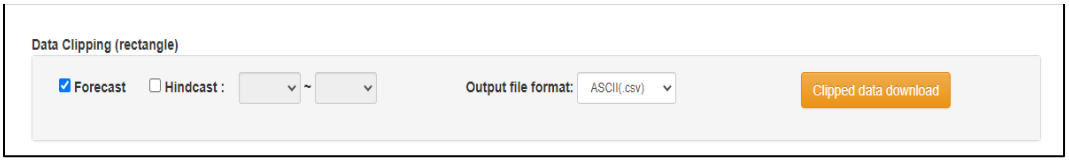

Figure 59 Clipped Data download option

(2) Results of MME data extraction in East Asia

If you extract the downloaded zip file, you can view the original file.

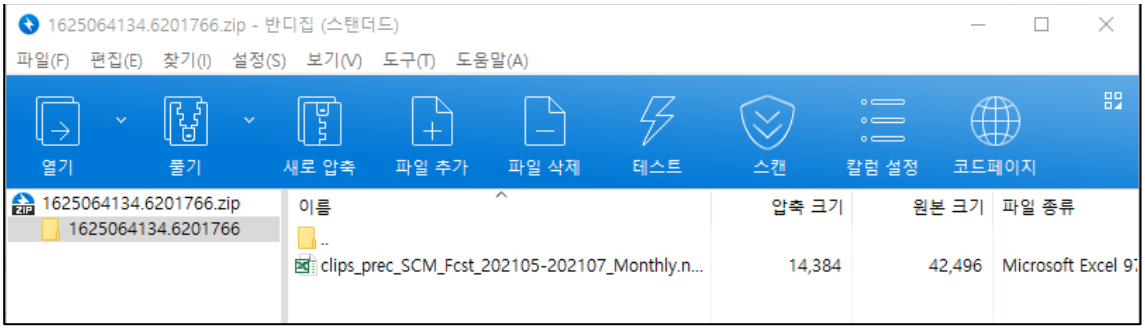

Figure 60 .csv file download

For .csv files, you can view and organize the values in Microsoft Excel.

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
1		70	72.5	75	77.5	80	82.5	85	87.5	90	92.5	95	97.5	100	102.5
2	20	0.214015	0.282205	0.24512	0.181	0.18661	0.050589	-0.05067	0.036958	0.723055	1.589888	1.644037	1.719968	1.386974	0.941289
3	22.5	0.082166	0.14465	0.189482	0.166454	0.123714	0.071883	-0.02319	0.027404	0.322259	0.75038	0.731825	1.18326	1.105244	1.061142
4	25	-0.00091	0.070552	0.147118	0.165609	0.147879	0.118462	0.023399	0.073223	0.043925	-0.13166	0.72887	0.711905	0.639909	0.832807
5	27.5	-0.0102	0.006874	0.041772	0.11746	0.16934	0.15434	0.402536	0.627039	0.424652	0.415816	0.314407	0.401739	0.556152	0.639285
6	30	0.023447	0.019108	-0.00226	0.015065	0.137068	0.194124	0.031357	0.022937	0.042592	0.115211	-0.02451	-0.06561	0.272639	0.184069
7	32.5	-0.10698	-0.00854	-0.0296	-0.07746	-0.09915	-0.10907	-0.07615	-0.09859	-0.11953	-0.09367	0.037292	0.019828	0.186165	0.165452
8	35	-0.31692	-0.21655	-0.22207	-0.08927	-0.11592	-0.11175	-0.11832	-0.13798	-0.1498	-0.1214	-0.0729	-0.02128	0.061103	0.245123
9	37.5	-0.57044	-0.51832	-0.10497	-0.03403	-0.11425	-0.11489	-0.13757	-0.15862	-0.12375	-0.07598	-0.05015	-0.01739	0.063789	0.153944
10	40	-0.3804	-0.34662	-0.16119	-0.12874	-0.09276	-0.07614	-0.06392	-0.06376	-0.05342	-0.03041	-0.03658	-0.02868	-0.03523	-0.01576
11	42.5	-0.35556	-0.3153	-0.21503	-0.02866	-0.0436	-0.04034	-0.00423	-0.03082	-0.04301	-0.03055	-0.02384	-0.02781	-0.01066	-0.01382
12	45	-0.14081	-0.13323	-0.12658	-0.15416	-0.12154	-0.13477	-0.10351	-0.05879	-0.04788	-0.04041	-0.048	-0.05201	-0.03768	-0.00855
13	47.5	-0.1138	-0.11044	-0.08197	-0.06658	-0.0692	-0.05888	-0.05852	-0.06694	-0.10373	-0.00906	-0.02952	-0.03034	0.01765	0.028853
14	50	-0.07368	-0.05863	-0.05668	-0.04338	-0.04036	-0.08871	-0.1224	-0.05127	0.000341	0.003021	0.016439	0.014967	0.050108	0.034734
15	52.5	-0.06902	-0.02969	-0.01255	-0.01448	-0.00819	-0.00574	-0.02603	-0.08758	-0.00722	0.047863	-0.03824	0.044675	0.06586	0.06664
16	55	-0.05371	0.016556	-0.03302	-0.00099	0.003283	0.011965	-0.00227	-0.03928	-0.05645	-0.03516	-0.0207	0.04635	0.04618	0.040039
17	57.5	-0.07871	-0.04531	-0.02237	-0.03166	-0.01744	0.026666	0.071489	0.059426	0.021291	-0.00516	-0.00841	-0.02562	-0.02255	-0.00378
18	60	-0.09796	-0.05906	-0.00214	0.045011	0.052452	0.093206	0.083685	0.112881	0.164154	0.161363	0.095587	0.069045	0.074809	0.072082
19															
20															
21															
22															

leadtime = 1 | leadtime = 2 | leadtime = 3

Figure 61 View csv using MS Excel

Ⅱ What is the CLIK(CLimate Information toolKits) platform?

1 The CLIK platform

CLIK (CLimate Information toolKits) was developed by the APCC in 2008 to provide online climate prediction information services for countries that do not have climate prediction technology or infrastructure; this includes APCC MME prediction and statistical downscaling services. Recently, it has been redeveloped as the “CLIK platform” (https://cliks.apcc21.org) web service, which applies cloud platform technology to expand the scope and reach of the platform.

Firstly, CLIK provides a data service for climate data produced and collected by the APCC. It includes APCC Multi-Model Ensemble (MME) prediction data, Boreal Summer IntraSeasonal Oscillation (BSISO) Index monitoring and forecast and ERA5 reanalysis data. In addition, a portion of the Coupled Model Intercomparison Project Phase 5 (CMIP5) data is provided by region.

Users can select and download the desired data on the webpage or directly download data using a data transmission protocol, such as wget. In addition, users familiar with programming languages can download and use data through Open API in the program they are developing.

In addition to the climate data service, CLIK currently provides user-customized seasonal forecasting and verification services based on individual climate model data and data processing services such as clipping and composite seasonal prediction data.

(1) Operating environment

CLIK is a multi-hybrid cloud platform-based web service. The service can be accessed by multiple browsers, including Chrome, Safari, Edge, Firefox, and IE (Internet Explorer) 11 or

higher. CLIK is optimized for the latest browsers and is made based on HTML5 and CSS3; some functions may not work properly on outdated browsers. Users of IE version 9 or lower are recommended to use another browser. The Chrome web browser can be downloaded from https://www.google.com/chrome/.

The user can incorporate various applications for optimal use of the CLIK platform (refer to Chapter 4 Appendix of this tutorial).

(2) How to sign up for membership

In order to use the APCC climate information service, you must first sign up for membership through the APCC user integrated information management system (APCC Single Sign-On, SSO). Through membership registration, you can freely use all the services currently provided by the APCC, including the CLIK platform and Help Desk.

Figure 62 User registration through the APCC SSO website

Figure 63 User registration through CLIK platform website

Users can access the APCC CLIK platform homepage (https://cliks.apcc21.org) or SSO (Single Sign-On) homepage (https://sso.apcc21.org) to proceed with membership registration. If an existing member has lost their *ID* and/or *Password*, they can retrieve either through the Get *Password* or Get *ID* functions.

Figure 64 Personal information processing policy and retrieving previously registered information

Firstly, when you click the *Registration* button, a screen appears requesting the user's consent along with an explanation of the personal information processing policy (Figure 64). If you enter your name and email and click the *Apply* button to retrieve previously registered information, you can verify whether you have an existing account according to the email notification.

Figure 65 Review the existing subscription information and list of services

If you have previously subscribed to the service, you can review the existing subscription information and set the integrated ID. At this time, if there are additional services that the user wants to utilize, make the relevant selections and click the *Apply* button to proceed with membership registration.

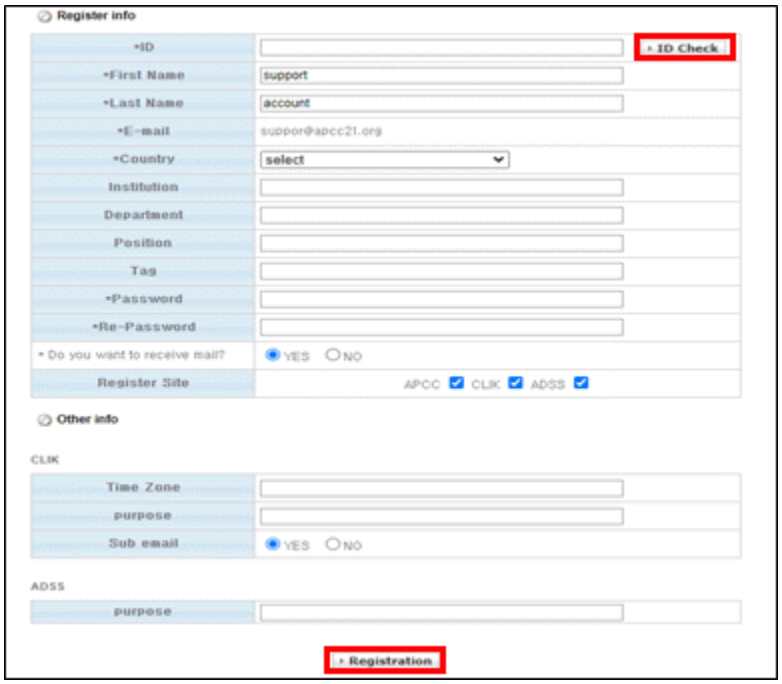

Figure 66 Enter account information

Choose a user *ID* and review whether the *ID* is already in use with the *ID Check* button. Then, register the required (items marked with an *, including name, country, and *Password*) and general information and click the *Registration* button to complete the process.

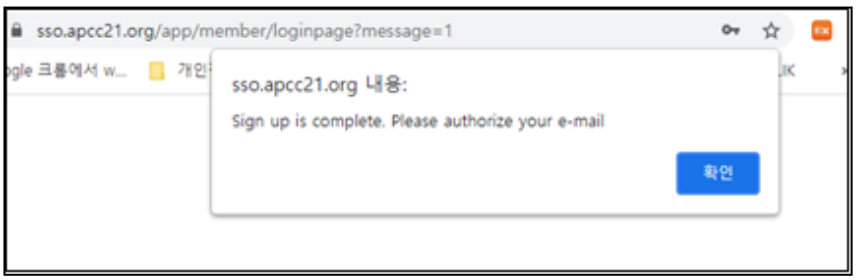

Figure 67 Subscription completed popup message

As shown in Figure 69, upon completion of registration, a verification email will be sent to the registered email address, and account activation will proceed through the link in the verification email. After account activation, you can use all the APCC services. If you do not receive the verification email, we recommend checking your spam folder.

Also, if you have lost your *ID* or *Password*, access the APCC SSO website (https://sso.apcc21.org) and click the '*Get Password*' or '*Get ID*' button in order to view your registered *ID* or have a temporary *Password* issued.

(3) How to contact us

The APCC strives to develop and provide climate information services that meet the urgent needs of the user and ensure the availability and usability of climate information in the Asia-Pacific region. The APCC climate information service is continuously improved based on user requirements and feedback through an online customer support service (http://help.apcc21.org).

To use the online customer support service of the APEC Climate Center, firstly select the *Help Desk* menu from the CLIK platform homepage (Figure 70) and go to the APCC Help Desk homepage, or directly by visiting http://help.apcc21.org.

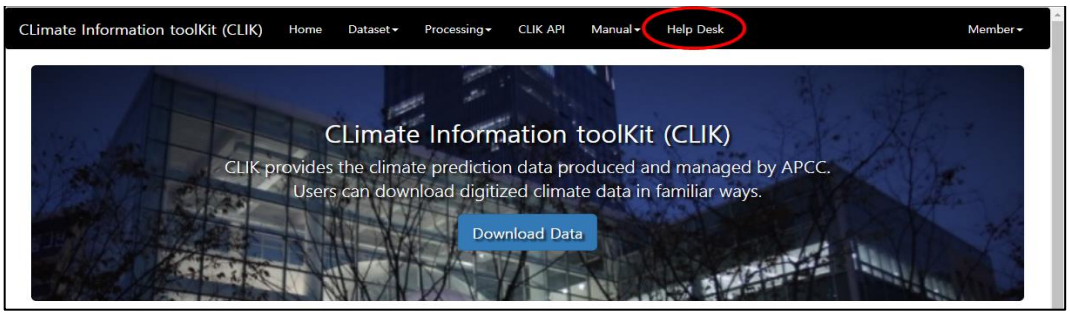

Figure 68 Inquiries through the CLIK platform website (*Help Desk*)

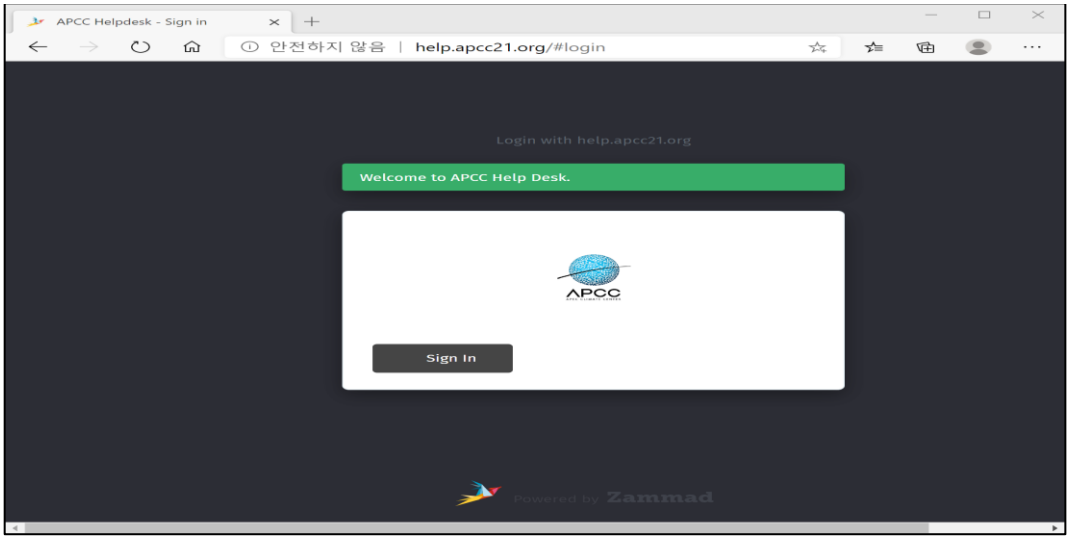

Figure 69 APCC online *Help Desk*

If you select the *Sign In* button on the initial screen of the APCC online customer support service, you will be directed to the APCC SSO homepage, and users can log in and use the service with their APCC SSO ID.

The APCC online customer support service allows users to issue tickets for comments and questions. You can issue a ticket by selecting the *Create Ticket* button in the center of the screen or the + button in the lower-left corner of the screen (Figure 70).

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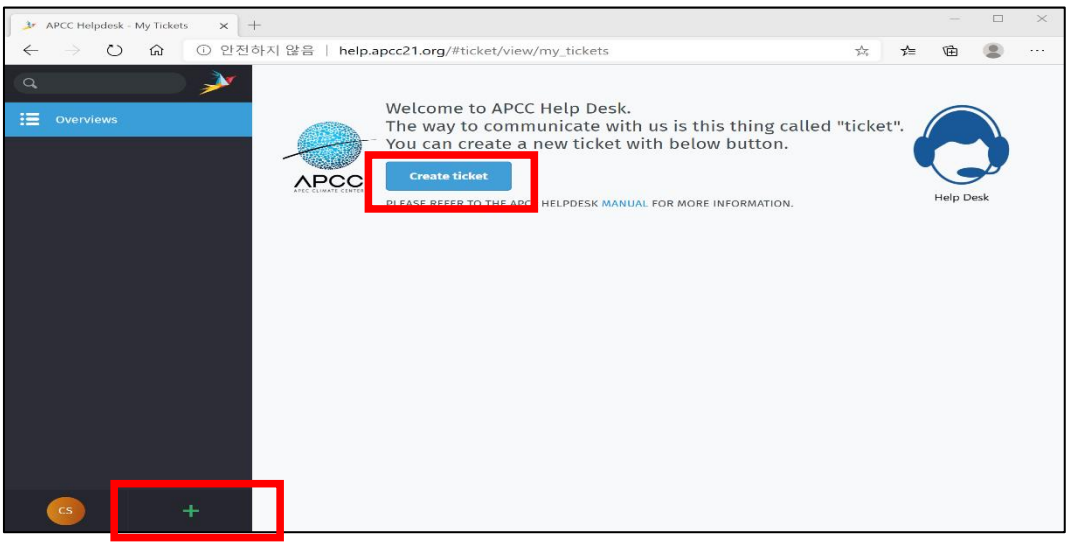

Figure 70 APCC Help Desk login

If you go to the ticket creation screen by clicking the *Create Ticket* button or the + button on the screen above, you will be taken to the new ticket issuance screen. You can contact the APCC staff by writing the title of the ticket in Title and the contents of the ticket in Text. The Select attachment link in the center of the screen allows you to attach any file related to the inquiry.

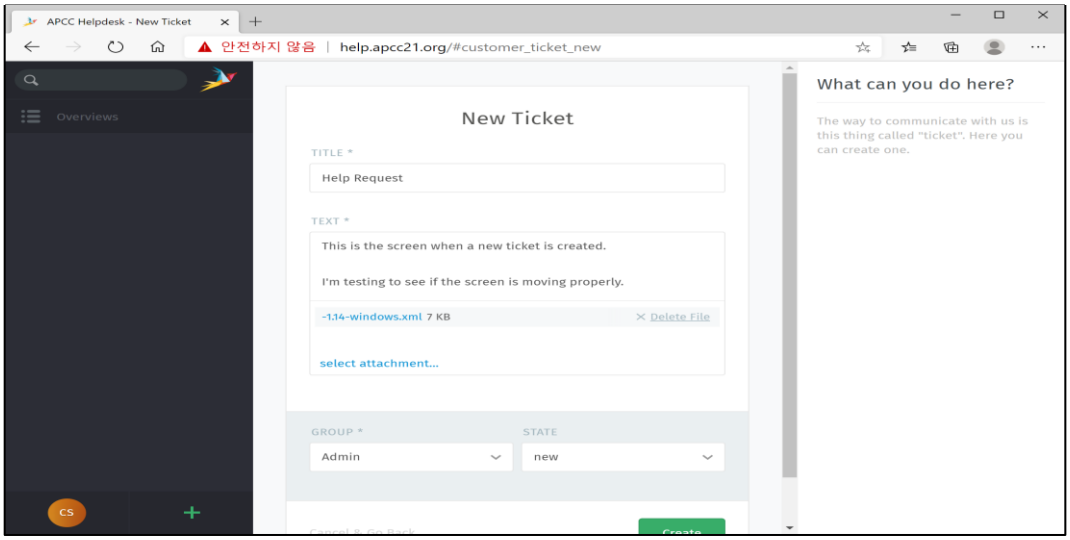

Figure 71 APCC Help Desk: *New Ticket*

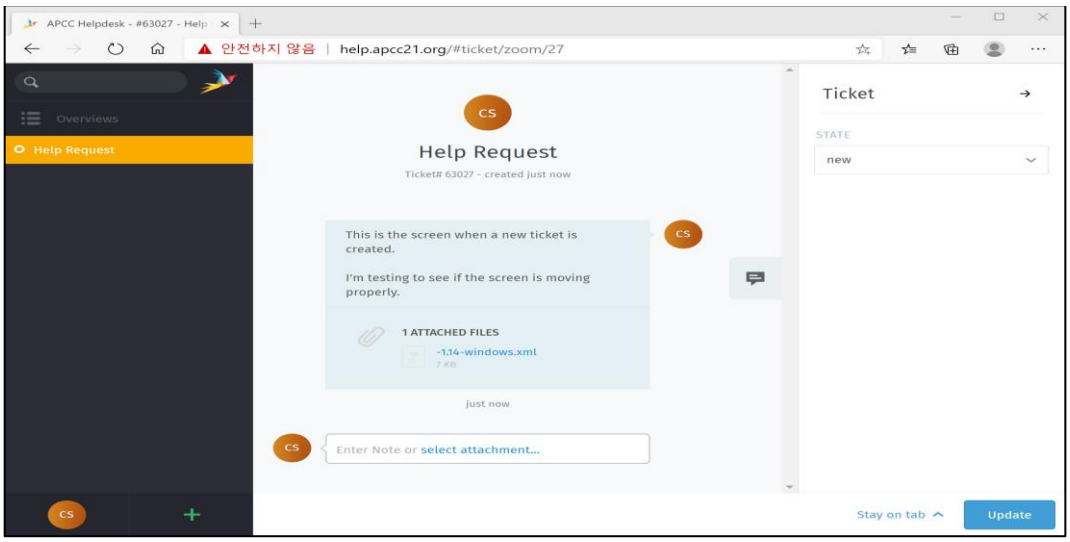

Figure 72 APCC Help Desk: Ticket contents

The generated ticket is organized in the form of a chat format on the online customer support service page. On the main screen, inquiries from customers and responses from APCC staff are presented in a chat interface. The customer can set the state of the ticket. New tickets default to a new state. The state of a ticket can be set in the following three forms: '*New*' meaning newly allocated, '*Open*' meaning that a ticket has been issued and processing is in progress, and '*Close*' meaning resolved. The customer or APCC staff who issued the ticket can change the state of the ticket during processing.

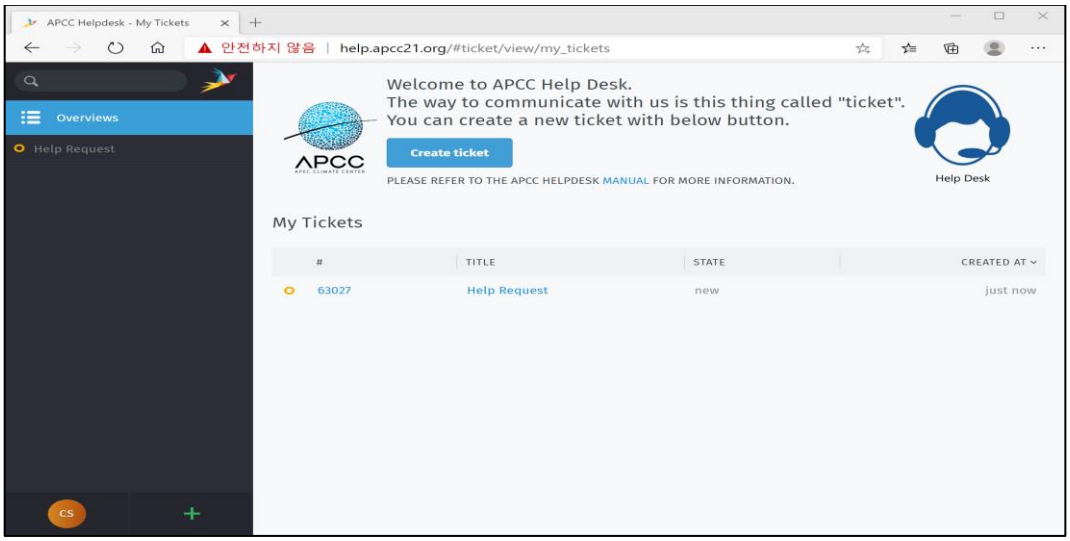

Figure 73 APCC Help Desk: *Overview*

Users can also select the *Overviews* button in the upper left corner to view the state of recently issued tickets. At the bottom of Overviews, the user can view the recently issued tickets, and by selecting the number or title of My Tickets in the center of the screen, you can also view the details of the issued ticket.

2 The purpose of the CLIK platform

The APCC develops and provides various climate information services based on user needs to promote the use of climate information in the Asia-Pacific region. MME seasonal prediction and verification results are provided through the APCC homepage or ADSS (APCC Data Service System) where climate data can be found in digital format for easy download and utilization. Since 2008, we have been developing CLIK (CLimate Information toolKits), a user-customized seasonal prediction and detailing service, CLIPs (CLimate Information Processing system), a service for processing climate data, and OpenWPS, a service that extracts masking information based on geospatial information.

Although improvements are continuously made to expand the convenience and utilization of APCC climate information services that provide, process, predict, and verify information, the service is limited by the traditional IT environment due to a lack of scalability, efficiency, compatibility, and stability. For example, ADSS, an existing climate data service, is a traditionally structured service based on FTP that was limited by its data selection and download specifications.

Accordingly, the APCC is gradually integrating climate information services that promote efficiency and provide relevant functions that reflect the needs of our users. The APCC developed a data-oriented service platform to replace the existing climate data provision service (ADSS) in 2019. In 2020, we established a customized seasonal prediction and verification information production service including a climate data processing service for step-by-step integration. In 2021, statistical downscaling and most of the climate information services provided by the APCC were integrated with CLIK, including data extraction using masking information. Unlike the existing purpose-oriented climate information service system, this is an effort towards innovative system transformation that can increase system resource operation efficiency and reduce budgets. By using cloud technology, we can integrate scattered APCC climate information services and meet the increasing climate information demand.

Ⅲ Menu structure on the CLIK platform

1 CLIK platform menu

(1) Main menu structure on the CLIK platform

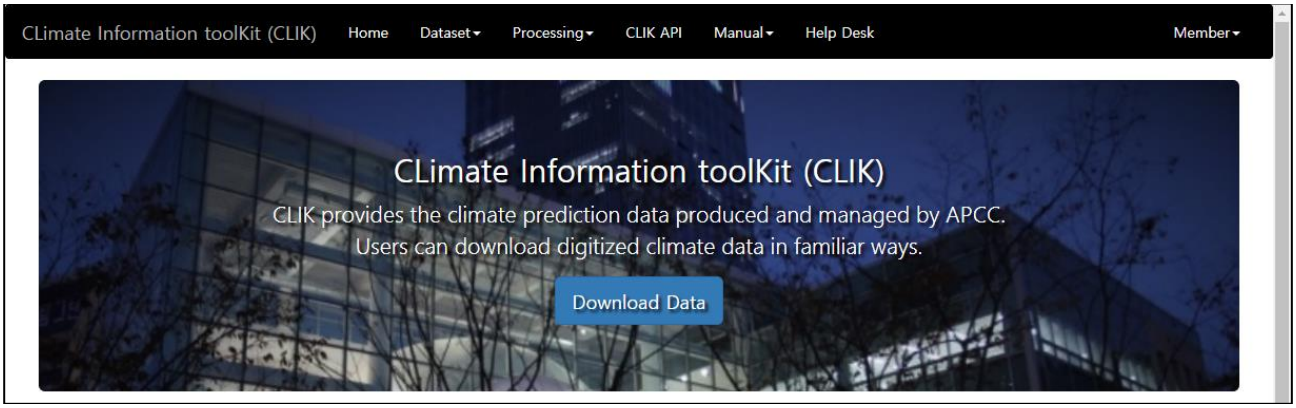

Figure 74 Menu structure of the CLIK platform

The CLIK platform (https://cliks.apcc21.org) menu consists of *Home, Dataset, Processing, CLIK API, Manual, Help Desk,* and *Member* tabs (Figure 74).

A. Home

This tab is located in the upper left corner of the homepage menu. If you press the *Home* button on any screen, you will go to the homepage.

B. Dataset

CLIK provides APCC seasonal prediction data Multi-Model Ensemble (MME), individual model data, monitoring, and forecast data of the Boreal Summer Integral Oscillation (BSISO), ERA5 reanalysis data (ECMWF) as well as some of the Coupled Model Intercomparison Project Phase 5 (CMIP5) data by region. Each dataset service is divided into *Overview* and *Download*. The *Overview* tab explains the data and the *Download* tab allows users to select and request the data they want.

C. Processing

The *Processing* menu consists of user-customized seasonal prediction and verification services and data processing services, such as clipping and composite.

D. CLIK Platform API

This resource explains how users insert data download codes into programs using the Open API service and provides usable examples.

E. Manual

A manual explaining the climate service CLIK platform is provided in two languages: Korean and English.

F. Help Desk

A link to the APCC Online Customer Support Service is provided. For more information, please refer to II.1.(4) How to contact us.

2 Detailed function guide of CLIK platform

(1) Dataset

A. MME-3MON

The *MME-3MON* menu provides 3-month seasonal prediction MME data. Please refer to the *Overview* page for a detailed explanation of the data.

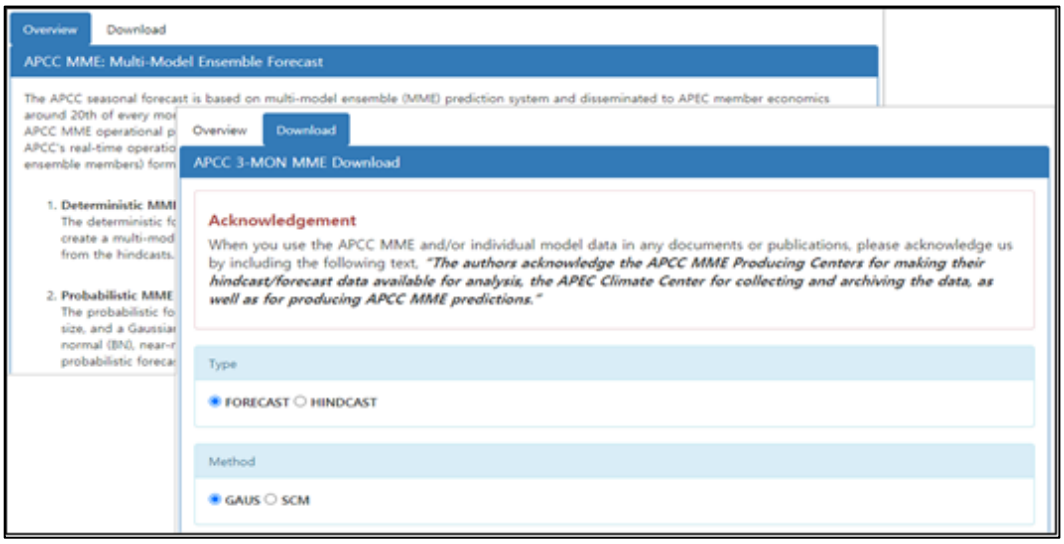

Figure 75 MME dataset page

Users can request data in the *Download* tab in the following ways.

- Type: Select data type

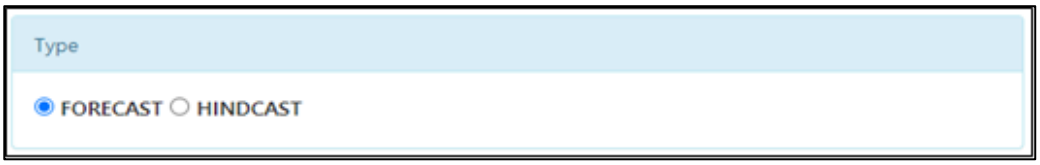

Figure 76 Select data type

- Methods: Select MME prediction method
  - SCM (Deterministic MME, Simple Composite Method)

- GAUS (Probabilistic MME, GAUSSIAN approximation)

Figure 77 Type of prediction method

• Variable: Select variables (see the *Overview* tab for more details)

Figure 78 Select MME variable

• Period: Select data period (Seasonal mean is the average of monthly means)

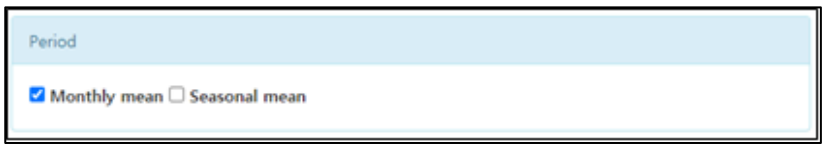

Figure 79 Select MME period

• Date: Select the period of the data to be downloaded (you can also select a complete year or season by clicking on the row or column heading)

- "*Download last season*" button in the Forecast: Download the entire dataset for the last season according to the selected preferences (zip compressed).
- "*Download last year*" button in the HINDCAST: Download the entire dataset for the previous year according to the selected preferences (zip compressed).

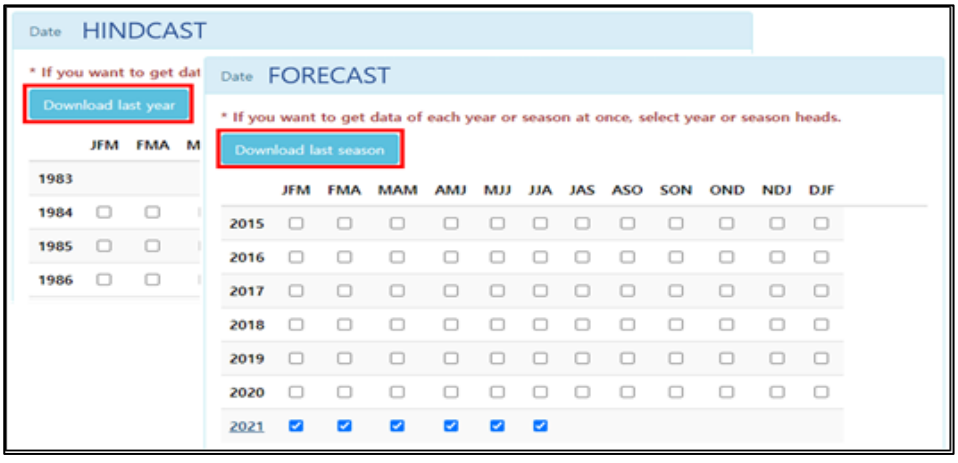

Figure 80 Download last year and season

• Select the "*Request*" or "*Create script*" button.

Figure 81 Data Request

If you select the "*Request*" button (Figure 81), a job for downloading data will be registered. If the user is not logged in, the "*Request*" button is disabled as shown in the image below.

Figure 82 Request button deactivated without login

The "Create Script" button immediately downloads a wget script file (based on the Linux system) that allows you to download data directly from the user's local server or personal computer.

```
# You can set verifying the certificate or not.
#certificate_option="--no-check-certificate"
certificate_option=""

#--------------------------------------------------------------------------------
# This script was written using bash.
# You can modify using the other shell(csh, ksh, windows command, and so on), other commands and options.
# If you want curl command, you can change command to 'curl' instead of 'wget'.
# But you need to change some options. Please check details at manuals of wget, curl.
#--------------------------------------------------------------------------------
echo `date '+%F %T'` Now start to download."

#--------------------------------------------------------------------------------
# Each file of the same variable has the same file name.
# So please set(change) the folder to save file, or set file path to use '-O' option
#--------------------------------------------------------------------------------

wget ${certificate_option} https://download.apcc21.org/MME/3-MON/FORECAST/GAUS/JAN/JFM/2021/prec.nc -O 3-MON_FORECAST_GAUS_JAN_JFM_2021_prec.nc
wget ${certificate_option} https://download.apcc21.org/MME/3-MON/FORECAST/GAUS/JAN/JFM/2021/slp.nc -O 3-MON_FORECAST_GAUS_JAN_JFM_2021_slp.nc
wget ${certificate_option} https://download.apcc21.org/MME/3-MON/FORECAST/GAUS/JAN/JFM/2021/t2m.nc -O 3-MON_FORECAST_GAUS_JAN_JFM_2021_t2m.nc
wget ${certificate_option} https://download.apcc21.org/MME/3-MON/FORECAST/GAUS/JAN/JFM/2021/t850.nc -O 3-MON_FORECAST_GAUS_JAN_JFM_2021_t850.nc
wget ${certificate_option} https://download.apcc21.org/MME/3-MON/FORECAST/GAUS/JAN/JFM/2021/z500.nc -O 3-MON_FORECAST_GAUS_JAN_JFM_2021_z500.nc
```

Figure 83 Download script using wget command

In order to download data using the script, the user needs to modify the script to suit their coding environment.

• certificate_option: Sets "--no-check-certificate" when the certificate used for HTTPS communication does not need to be validated by the user's server or personal computer.

• The "-O" option allows you to specify the location and file name to be saved.

● The URL of the data to be downloaded is organized as shown in Table 1. Refer to the variables below to specify the corresponding URL values in square brackets ("[ ]").

- Lead Month: 3-MON (6-MON for 6-month prediction data)
- Month: an abbreviation for each month, such as JAN, FEB, etc.
- Season: A value representing the season, such as JFM (Jan Feb Mar), FMA (Feb Mar Apr), etc.

Figure 84 MME Download URL

Period	URL
Monthly Mean	https://download.apcc21.org/MME/ [Lead Month] / [Type] / [Method] / [Month] / [Year] / [Variable].nc
Seasonal Mean	https://download.apcc21.org/MME/ [Lead Month] / [Type] / [Method] / [Month] / [Season] / [Year] / [Variable].nc

※ 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."***

· **B. MME-6MON**

· The *MME-6MON* menu provides 6-month seasonal prediction MME data. The download procedure for the 6-month MME prediction data is similar to that of the 3-month MME prediction data.

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· C. MME-MODEL

· The *MME-MODEL* menu provides MME individual model data. For a description of the data, refer to the *Overview* tab. Users can request data from the *Download* tab as follows:

- Type: Select the data type

Figure 85 Select data type

- Year: If the data type is HINDCAST, select the data production year.

Figure 86 Select HINDCAST year

- Institute: Choose a model provider

Figure 87 Select MME model provider

- Model: Choose a climate model name

Figure 88 Select a climate model name

- Variable: Select a variable (see the *Overview* tab for more details)

Figure 89 Select a variable

- Date: Select the period of data to be downloaded (if you select the year or month headings in the table, you can select the complete year or month)

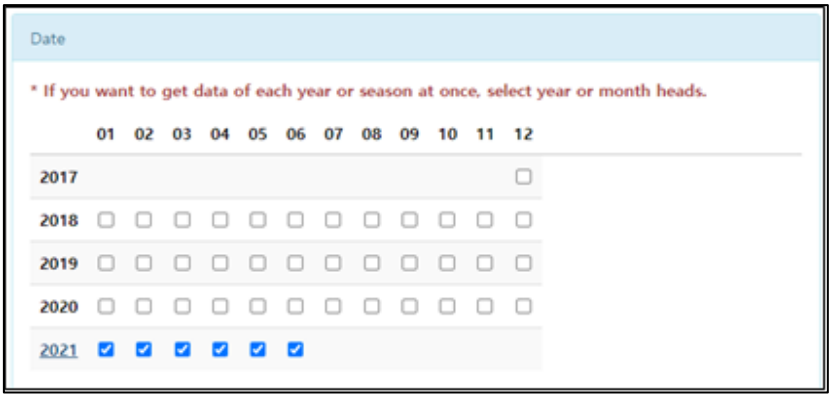


Figure 90 Select date of data

- Select the "*Request*" or "*Create script*" button (Figure 92)

Figure 91 Request climate data

When the "*Request*" button is selected, a job for downloading data is registered. If the user is not logged in, the "*Request*" button is disabled as shown in the figure below.

Figure 92 Request button deactivated without login

The "Create Script" button immediately downloads a wget script file (based on the Linux system) that allows you to download data directly from the user's local server or personal computer.

Figure 93 Model data download using wget script

In order to download data using the script, the user needs to modify the script to suit their coding environment

- userid, *Password*: Enter your *ID* and *Password*.
- cookie_option: If you do not want to save cookies on the website, you can leave the cookie_option blank. If cookies are not saved, user authentication is required every time a data file is downloaded, which may delay the transfer of the data.
- certificate_option: Sets "--no-check-certificate" when the certificate used for HTTPS communication does not need to be validated by the user's server or personal computer.
- "-O" option: You can specify the location and file name to be saved.

- The URL of the data to be downloaded is organized as shown in Table 2. Refer to the variables below to specify the corresponding URL values in square brackets ("[ ]").

- Month: an abbreviation for each month, such as JAN or FEB.

Figure 94 MME Model Download URL

	URL
FORECAST	https://sdownload.apcc21.org/MODEL/FORECAST/ [Institute]_[Model] / [Month] / [Year] / [Variable].nc
HINDCAST	https://sdownload.apcc21.org/MODEL/ HINDCAST[Hindcast Year] / [Institute]_[Model] / [Month] / [Year] / [Variable].nc

※ 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."***

D. BSISO

APCC intraseasonal forecast BSISO data will be produced between May and October, with some data updated daily. BSISO data is divided into FORECAST and MONITORING. Users can request a download of forecast data in the *Download* tab.

- Type: Select the data type

Figure 95 Select the data type

- Institute: Choose a model provider (FORECAST)

Figure 96 Select an institute

Model: Choose a model name (FORECAST)

Figure 97 Select a model

- Date: Select download period (year, month; FORECAST)

Figure 98 Select download period (year, month)

- Select the relevant files

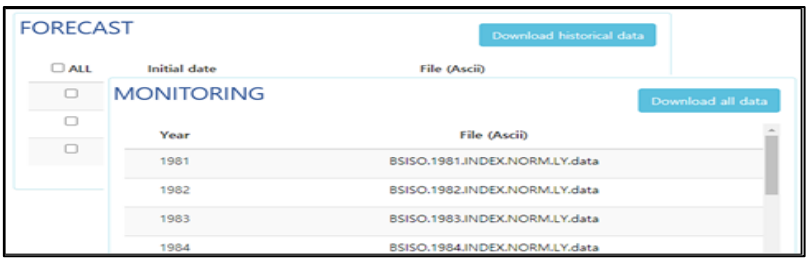


Figure 99 Select download file

- Select the "*All*" checkbox of FORECAST: Select all files in the list
- Select a file name: Download the file immediately
- "*Download historical data*" button on FORECAST: Download the entire FORECAST material of the selected model immediately (zip compressed)
- MONITORING data includes one year of data in one file
- MONITORING's "*Download all data*" button: Download all MONITORING data immediately

• Select the "*Request*" or "*Create script*" button

Figure 100 Request data

When the "*Request*" button is selected, a job for downloading data is registered. If the user is not logged in, the "*Request*" button is disabled as shown in the picture below.

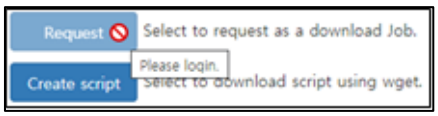


Figure 101 *Request* button is unavailable without login

The "*Create Script*" button immediately downloads a wget script file (based on the Linux system) that allows you to download data directly from the user's local server or personal computer.

```
# You can set verifying the certificate or not.
#certificate_option="--no-check-certificate"
certificate_option=""

#------------------------------------------------------------------------------
# This script was written using bash.
# You can modify using the other shell(csh, ksh, windows command, and so on), other commands and options.
# If you want curl command, you can change command to 'curl' instead of 'wget'.
# But you need to change some options. Please check details at manuals of wget, curl.
#------------------------------------------------------------------------------
echo `date '+%F %T'` Now start to download."

#------------------------------------------------------------------------------
# Each file of the same variable has the same file name.
# So please set(change) the folder to save file, or set file path to use '-O' option
#------------------------------------------------------------------------------

wget ${certificate_option} https://download.apcc21.org/BSISO/FCST/BOM/ACCESS-S1/2020/20201017_BOMC_BSISO.20d.INDEX.LY
-O FCST_BOM_ACCESS-S1_2020_20201017_BOMC_BSISO.20d.INDEX.LY
wget ${certificate_option} https://download.apcc21.org/BSISO/FCST/BOM/ACCESS-S1/2020/20201016_BOMC_BSISO.20d.INDEX.LY
-O FCST_BOM_ACCESS-S1_2020_20201016_BOMC_BSISO.20d.INDEX.LY
wget ${certificate_option} https://download.apcc21.org/BSISO/FCST/BOM/ACCESS-S1/2020/20201015_BOMC_BSISO.20d.INDEX.LY
-O FCST_BOM_ACCESS-S1_2020_20201015_BOMC_BSISO.20d.INDEX.LY
```

Figure 102 BSISO data download script using wget command

E. CMIP5

On the CMIP5 page, you can request CMIP5 data according to region. If you hover over the CODE of each region with your mouse pointer, you can view the details of the region. If the area of the region is vast, the codes will be divided into states or provinces as follows:

- United States of America
- Russia
- China
- Canada

- Choose a country or state to download

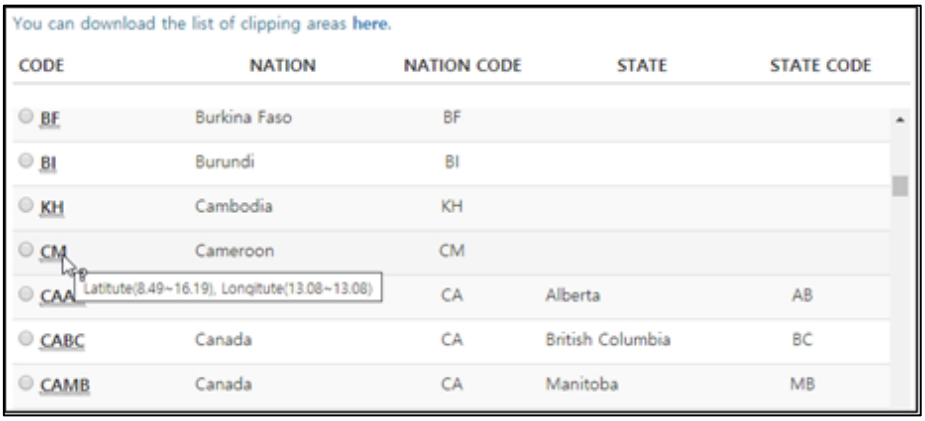


Figure 103 List of countries of CMIP5 data

- Select the "*Request*" or "*Create script*" button

Figure 104 Request data

If you select the "*Request*" button, a job for downloading data is registered. If the user is not logged in, the "*Request*" button is disabled.

Figure 105 Request button is unavailable without login

The "*Create script*" button immediately downloads a wget script file (based on the Linux system) that allows you to download data directly from the user's local server or personal computer.

CMIP5 data can be downloaded without user authentication, thus no user or cookie settings are required. The download URL of the data consists of the string illustrated in Table 3. In the table, the values in brackets ("[ ]") are CODE values from the CMIP5 data country list.

Figure 106 CIMP5 download URL

URL
http://download.apcc21.org/CMIP5/cmip5_daily_[CODE].zip

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

F. ERA5

The ERA5 page guides you on how to download ERA5 reanalysis data from the ECMWF. The ERA5 data of CLIK was collected from Copernicus Climate Change Service Data Store (CDS) by APCC. For more information about ERA5, please refer to the Overview tab in the figure below and CDS homepage (https://cds.climate.copernicus.eu).

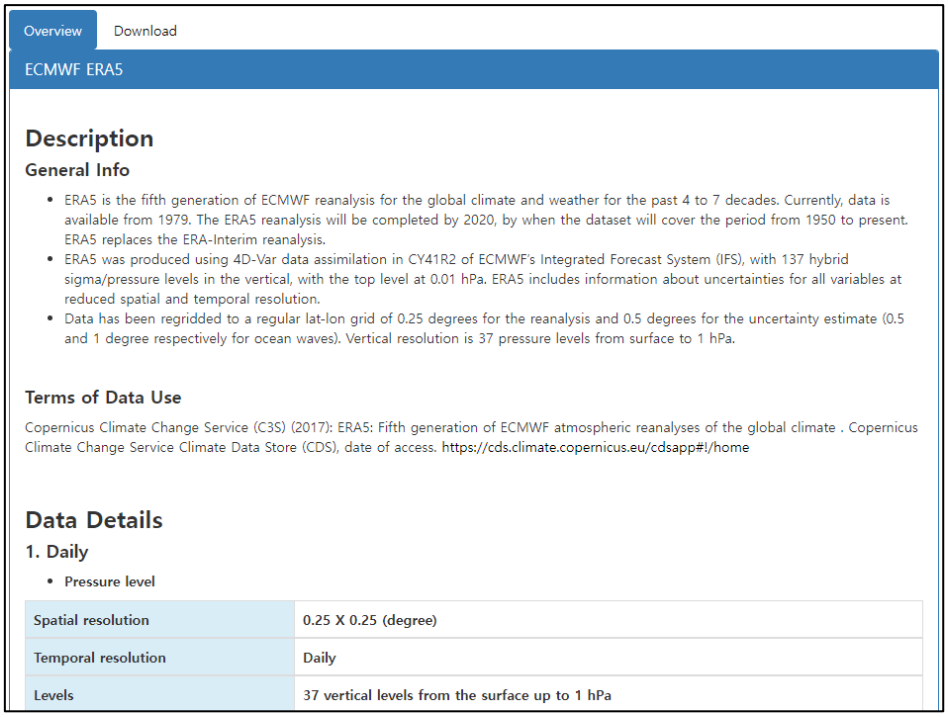


Figure 107 The ERA5 Overview

CLIK classified the ERA data into time resolution (daily, hourly, monthly) and level (pressure, single). The daily data is actually 6-hourly (4 times a day). Variables provided for each temporal resolution and level can be checked in the Overview tab.

CLIK provides *wget* and *CLIK API* services to download the ERA5. Users can use *wget* to download data as shown in the figure below. Please check in the path of the data on the Data Structure tab.

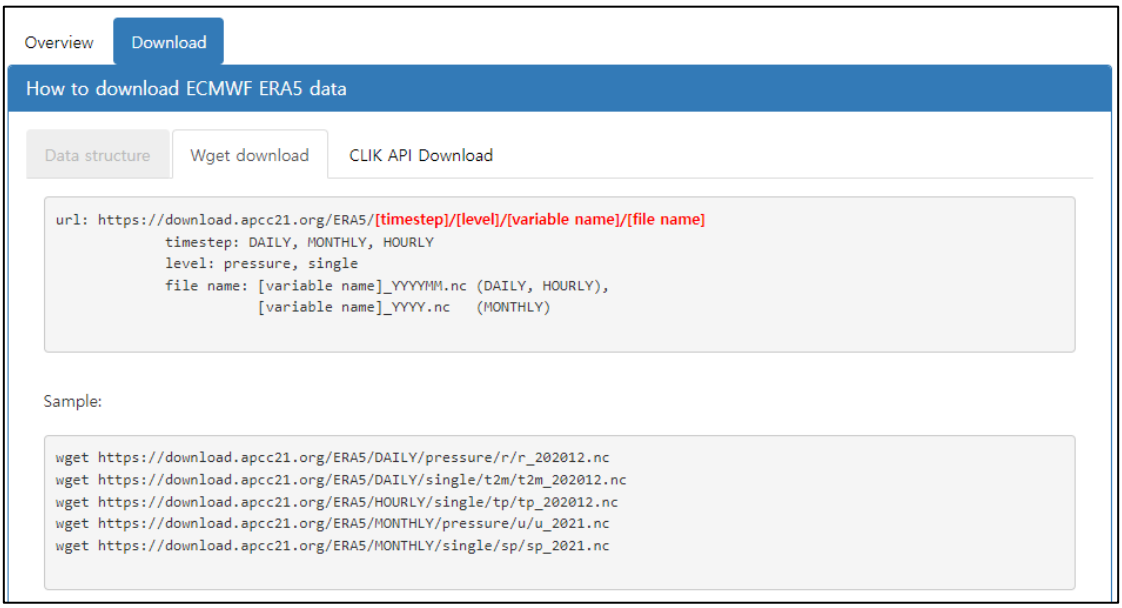


Figure 108 *wget* usage for ERA5 download

In addition, users can download ERA5 data using CLIK API as shown in the following figure. If you select each Sample tab, you can check the sample code for each temporal resolution.

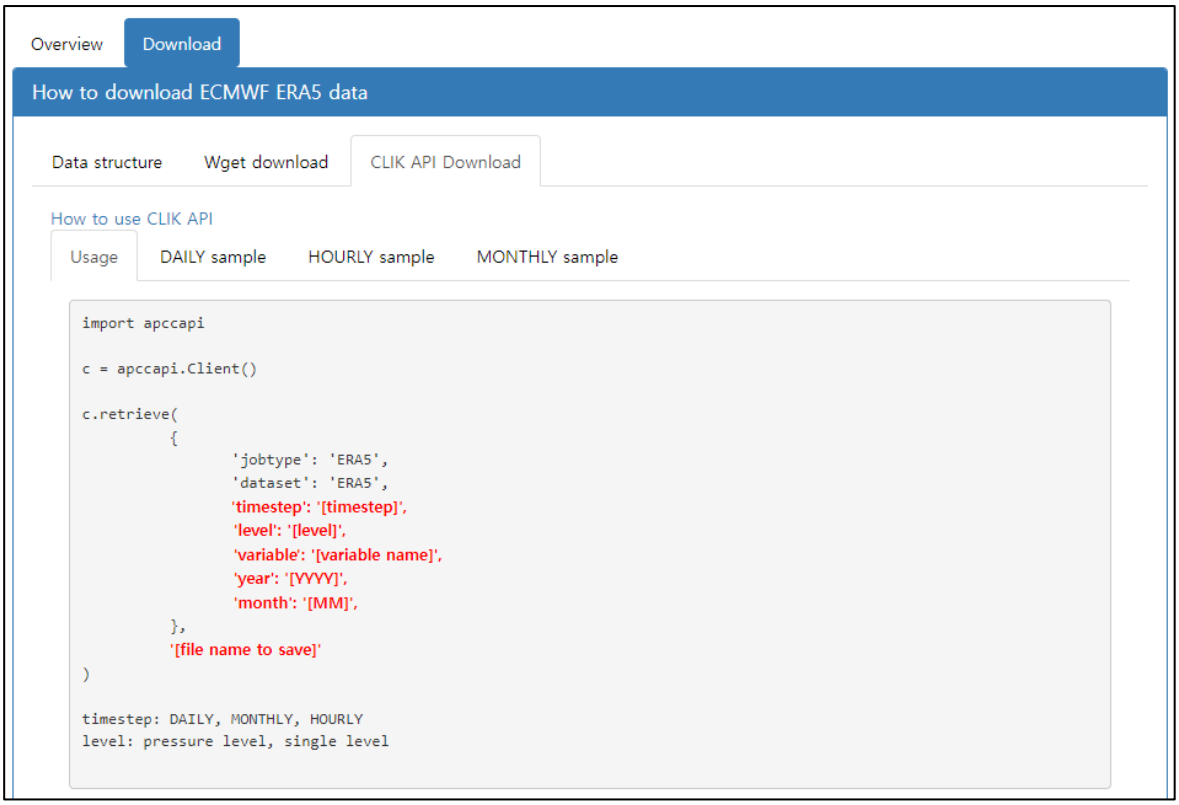


Figure 109 *CLIK API* usage for ERA5 download

(2) Processing

A. Prediction

The *Prediction* menu of the CLIK platform was developed based on the seasonal prediction system provided by the APCC. Users can select any preferences to obtain user-customized seasonal prediction results.

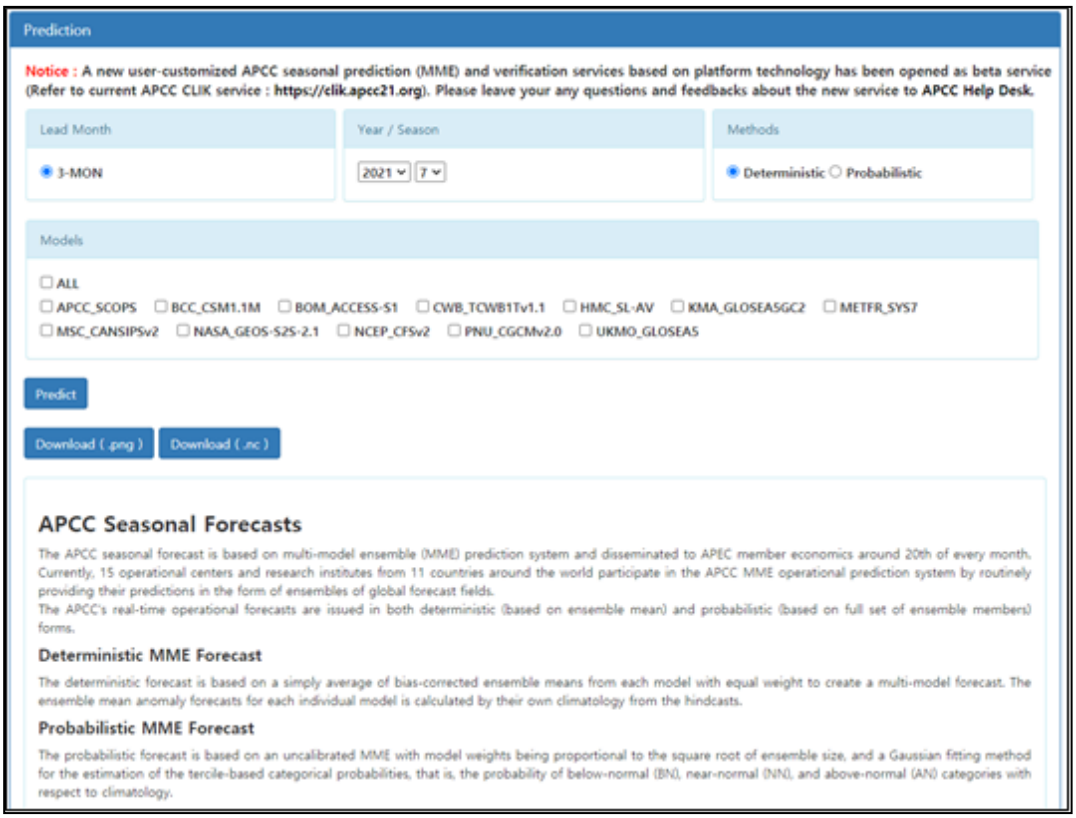


Figure 110 *Prediction* page

The Prediction service is only available when the user is logged in. If you do not log in, the button is disabled as shown in the figure below.

Figure 111 Menu deactivated without login

The picture below shows the state in which the logged in user can use the Prediction function.

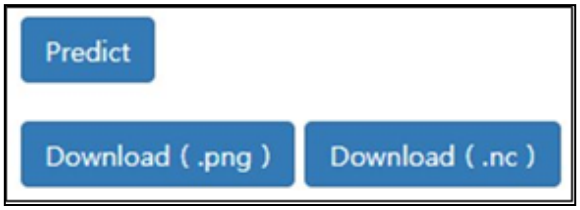


Figure 112 Menu activated with login

Year / Season: Select the year and season for prediction.

Figure 113 Select Year and Season

Methods: Choose the method of prediction, i.e., Deterministic or Probabilistic prediction as provided by the CLIK platform.

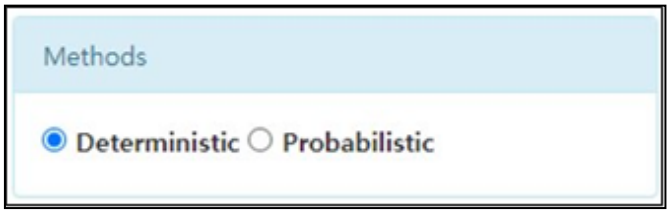


Figure 114 Select Method

Models: Select the appropriate model. The list of models is updated according to the year and month, and the list of models change depending on the results updated every month.

Figure 115 List of prediction models

Predict: The *Predict* button generates prediction results with the conditions selected by the user. If there is a result of the same condition, it is immediately expressed; if there is no result based on the conditions selected by the user, the result is generated as a selection condition.

Figure 116 Seasonal prediction using *Predict* button

If there is a result image: The result has been previously generated by another user with the same model preferences. In this case, the results are displayed on the screen immediately without creating a separate task. The CLIK platform does not manage the results based on the user ID, thus results are immediately accessible if they have already been created.

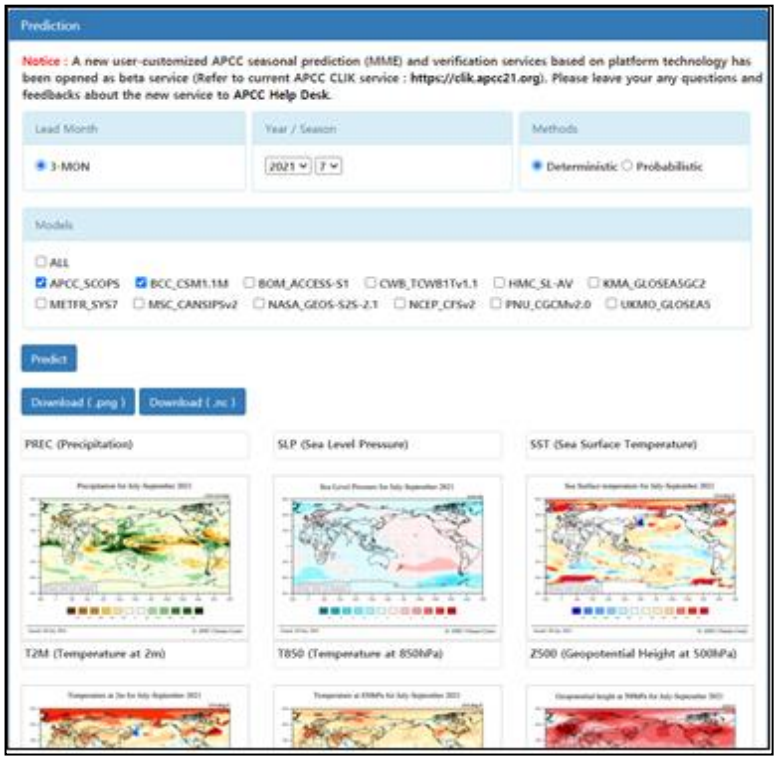


Figure 117 A result screen of Seasonal prediction

You can enlarge any image by clicking on the relevant panel, as in the image below (Figure 115).

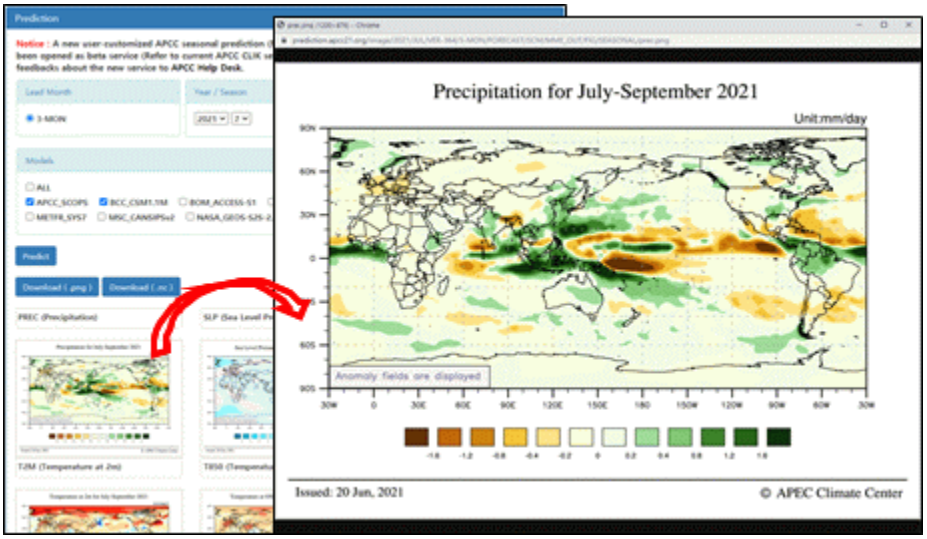


Figure 118 Enlargement of image when clicking on a result panel

If there is no result image: If there is no result that meets the user specifications, the job creation operation is performed. Image creation can be performed through the job queue, and the progress can be viewed on the *My Jobs* page. When the job is completed, a notification will be sent to your email address.

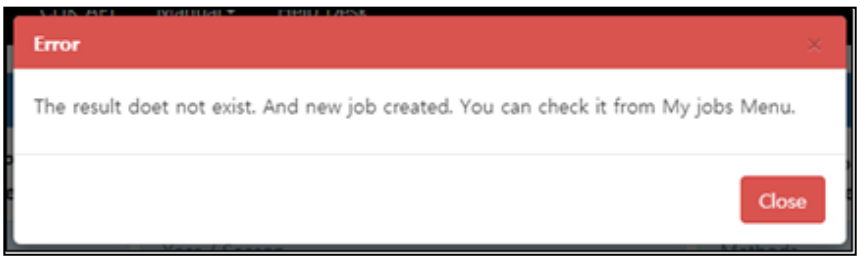


Figure 119 No result message

File download: File downloads are provided in two formats: image format (*.png) and NetCDF (*.nc) file.

Figure 120 *Download* buttons for .png and .nc files, respectively

B. Verification

This is the *Verification* menu of the CLIK platform and is based on the APCC verification system. Users can specify any preferences to obtain the desired verification results.

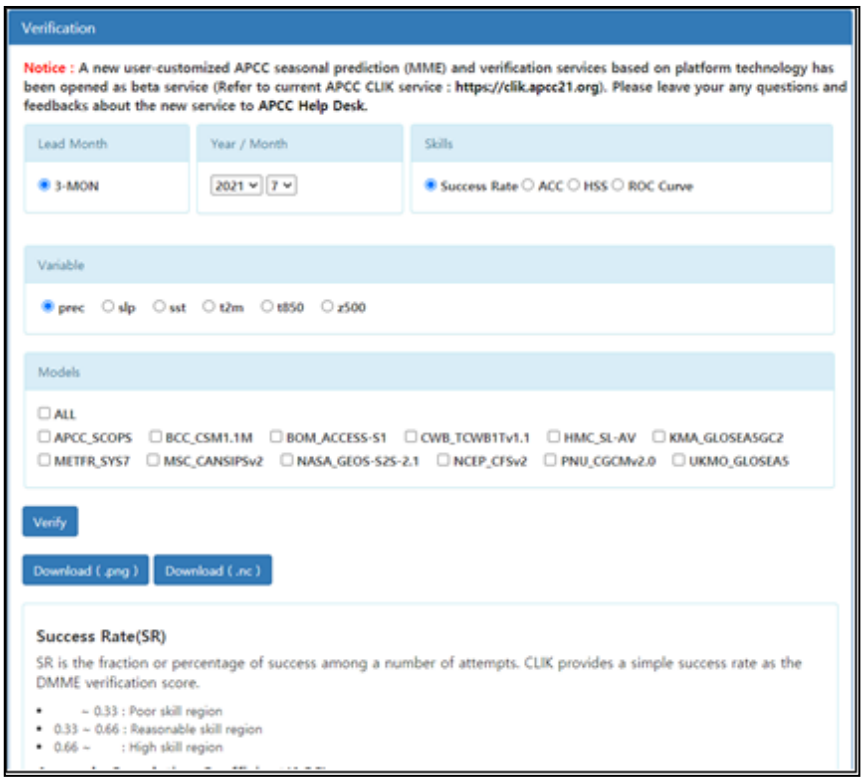


Figure 121 *Verification* page

The Verification service, like Prediction, requires the user to be logged in. If you are not logged in, the button is inactive (Figure 119).

Figure 122 Left: Before login, Right: After login

Year / Month: Select the relevant year and month.

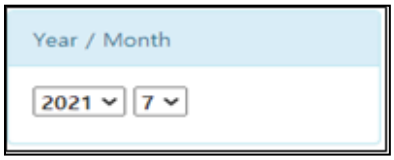


Figure 123 Select the year and month

Skills: Select one of the four verification methods provided on the CLIK platform.

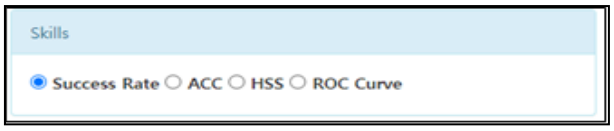


Figure 124 Select skills

Variable: In the *Verification* menu, you can select one of six variables provided by the CLIK platform.

Figure 125 Select Variable

Models: Select the appropriate model. The list of models is updated according to the year and month, and the list of models changes depending on the results updated every month.

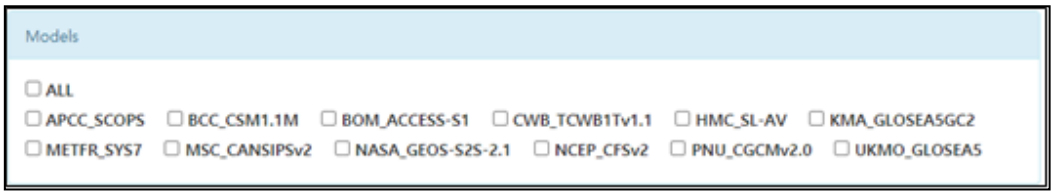


Figure 126 List of verification models

Verify: The *Verify* button generates Verification results with the conditions selected by the user. If a result of the same conditions already exists, it is immediately expressed; if there is no result of the conditions selected by the user, the result is generated as a selection condition.

Figure 127 Verification result when clicking *Verify* button

If there is a result image: The result has been previously generated by another user with the same model preferences. In this case, the results are displayed on the screen immediately without creating a separate task. The CLIK platform does not manage the results based on the user ID, thus results are immediately accessible if they have already been created.

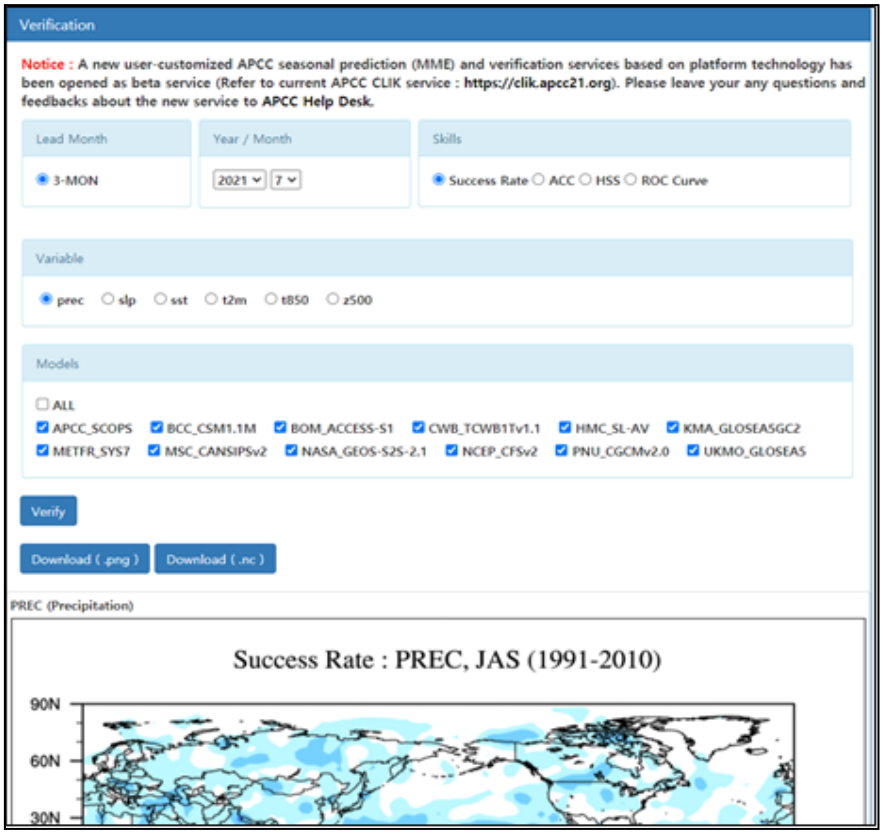


Figure 128 Result of verification

You can enlarge the image by clicking on the panel generated in the Verification result (Figure 126).

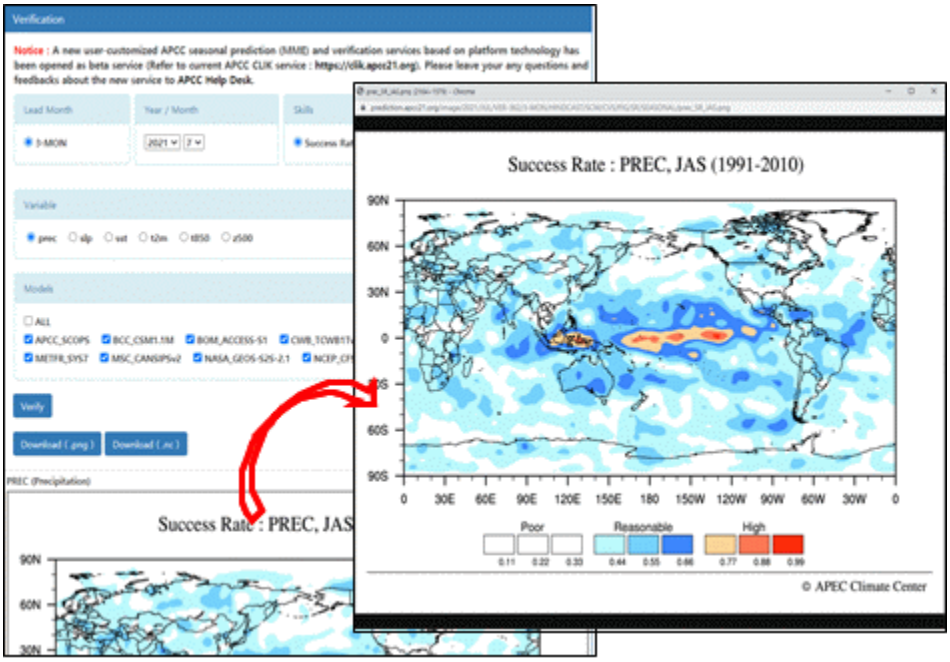


Figure 129 Verification original image pop-up

If there is no result image: If there is no result that meets the conditions selected by the user, the creation operation is performed. Image creation can be performed through the job queue, and the progress can be viewed through the *My Jobs* page. When the job is completed, a notification will be sent to your email address.

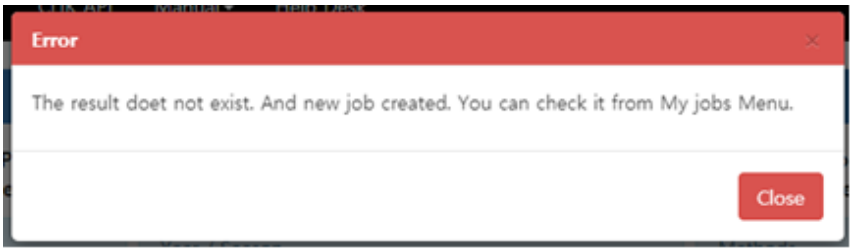


Figure 130 No result message

File download: File downloads are provided in two formats: image format (*.png) and NetCDF (*.nc) file.

Figure 131 *Download* buttons for .png and .nc files, respectively

C. Clipping

The layout of the first page of the data clipping service is illustrated in the image below.

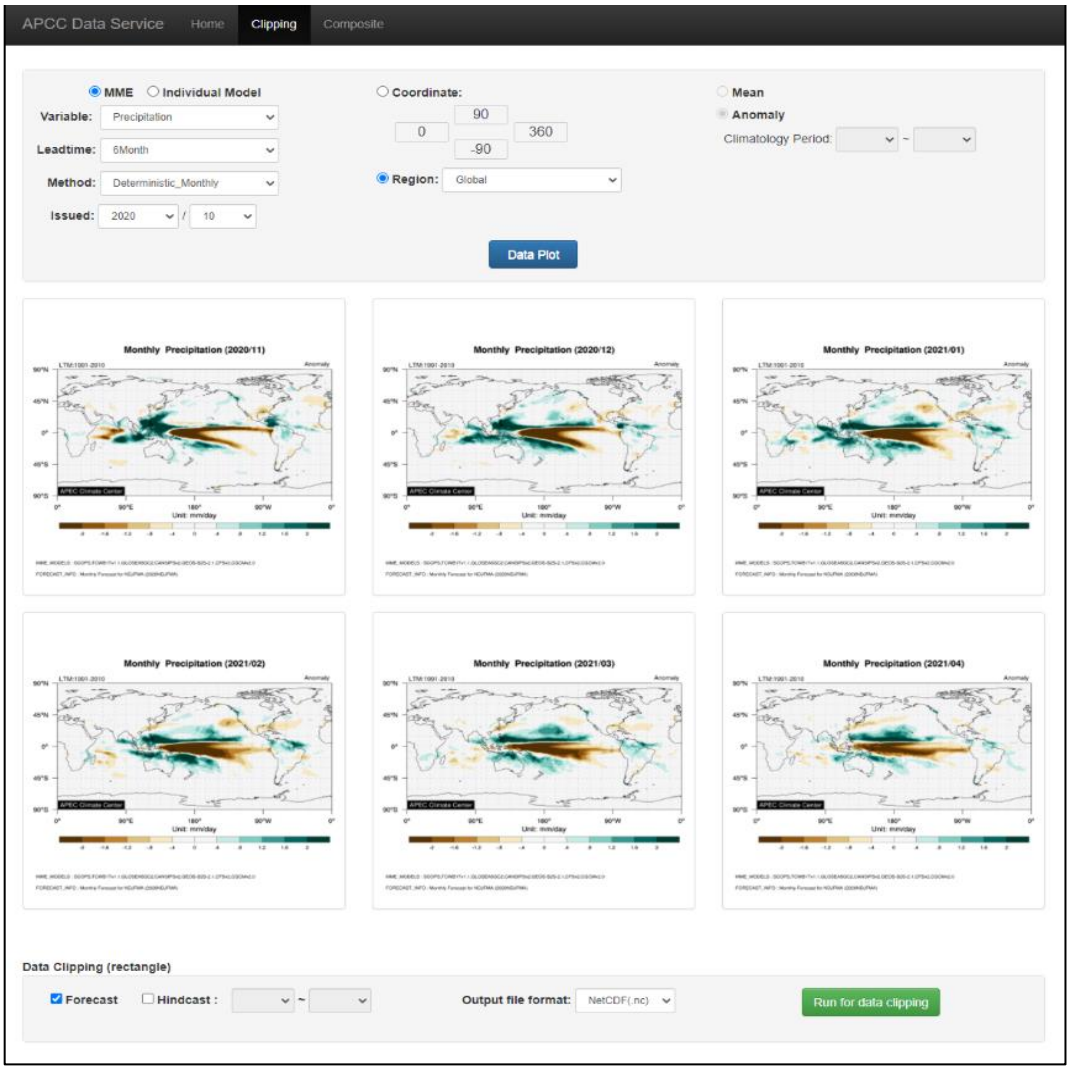


Figure 132 Initial screen of clipping service

The user interface of the data clipping service is as follows:

- MME / Individual Model: Users can select multi-model ensemble predictions produced by APCC or individual models produced by each model provider.

- Variable: You can select each variable included in each model.

- Leadtime: The MME provides 3 months and 6 months prediction results. You can choose the preferred period.

- Method: It provides deterministic and probabilistic MME methods, and both seasonal and monthly results can be requested.

- Issued: MME seasonal forecast data is officially issued around the 20th of every month. For example, if you select October 2020, you will see the prediction data for November 2020.
- Coordinate: You can set the desired area by providing the appropriate latitude/longitude coordinates.
- Region: You can select a predefined representative area. Among others, you can choose Global, Australia, Australia_S.Pacific, East Asia, Middle East, North America, Russia, South America, and South Asia.
- Mean / Anomaly: You can select either the Mean or the Anomaly value.

After completing the above settings, click the *Data Plot* button in the center of the screen. The following result screen should appear:

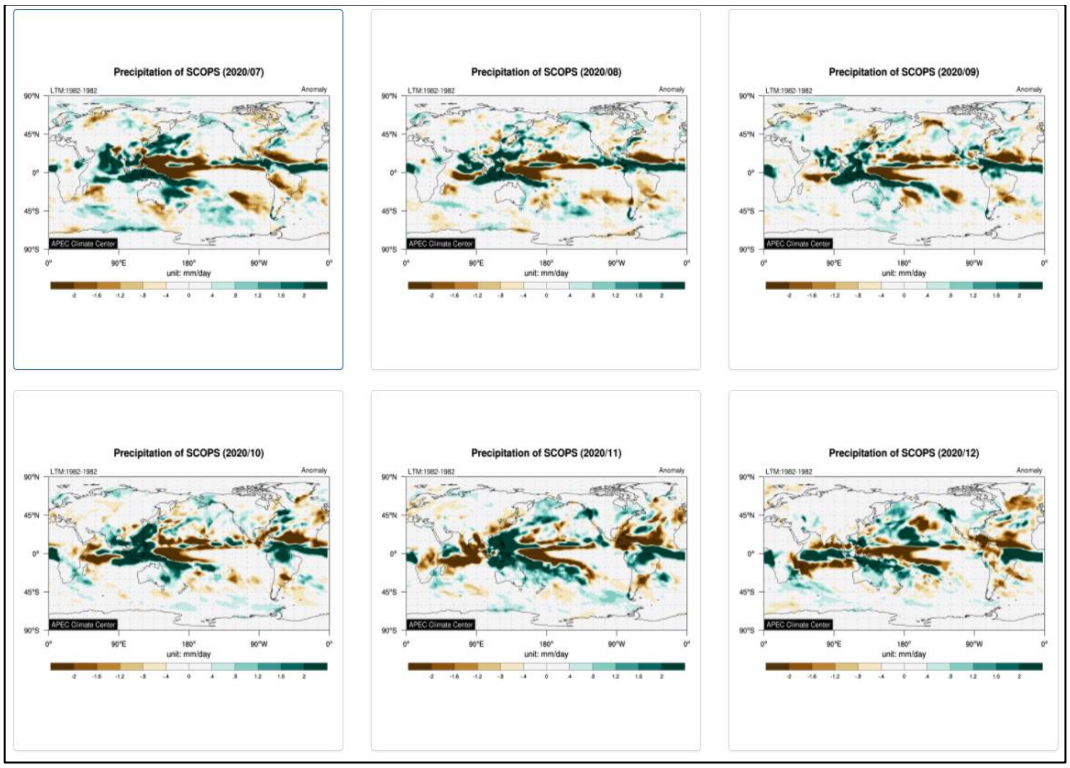


Figure 133 Precipitation (6-month anomaly) of SCOPS model

If the user wants to see the result screen in detail, clicking on any image panel will enlarge the result (Figure 131).

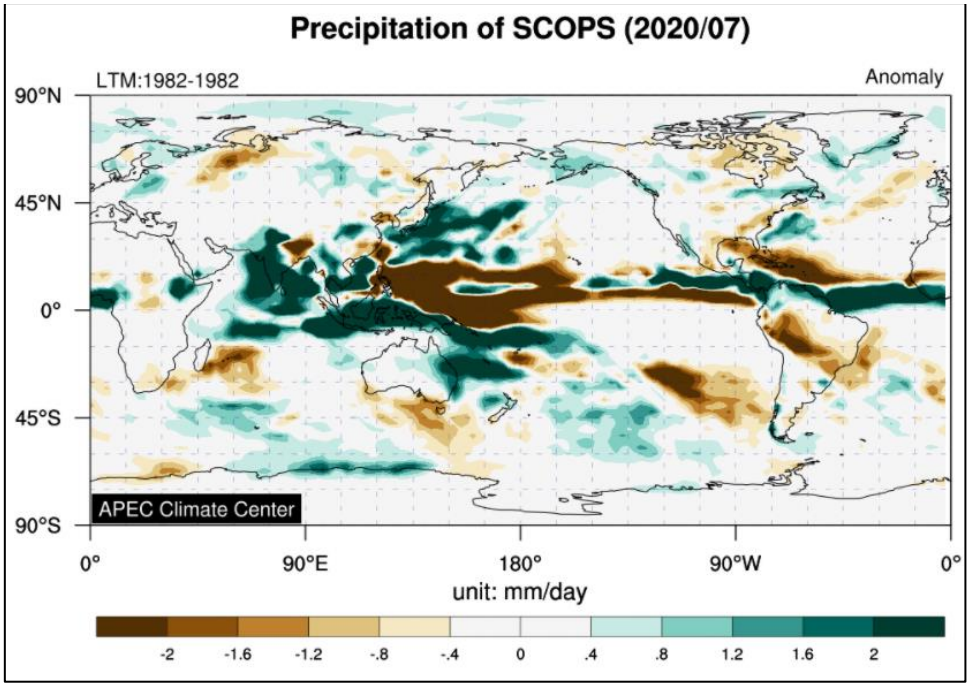


Figure 134 Original result image

The data clipping service allows users to download clipped results based on, among others, specific variables, dates, regions, or Anomaly. As shown in the figure below, you can download Forecast or Hindcast data in two formats: *.nc and *.csv.

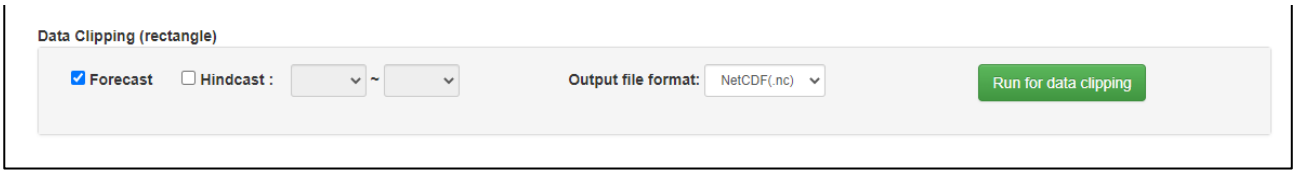


Figure 135 Request nc file generation

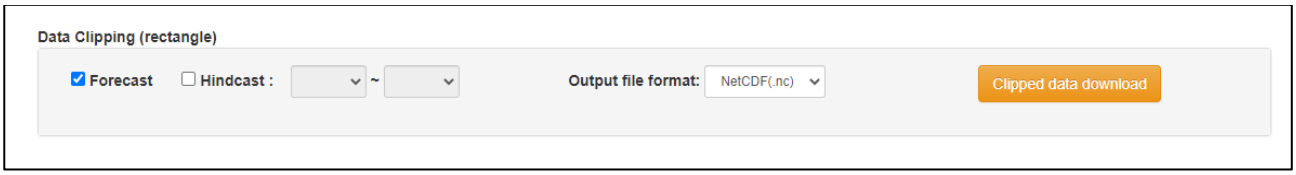


Figure 136 Download nc file

D. Composite

The *Composite* menu provides a function to synthesize prediction/observation data according to year and month. Users can select the desired year and month and then enter the conditions in their requirements cart to derive composite results.

In the *Composite* menu, the user can check the condition setting screen at the bottom. The menu configuration of the condition confirmation screen is as follows:

Variable: You can select variables in the prediction data.

Forecast Length: You can choose between 3 months and 6 months of MME data.

Target Month/Year, LeadTime: You can select the month/year and lead time that you want to be synthesized and specified in your requirements cart.

Add / Reset: You can specify the desired conditions in your requirements cart through the *Add / Reset* button.

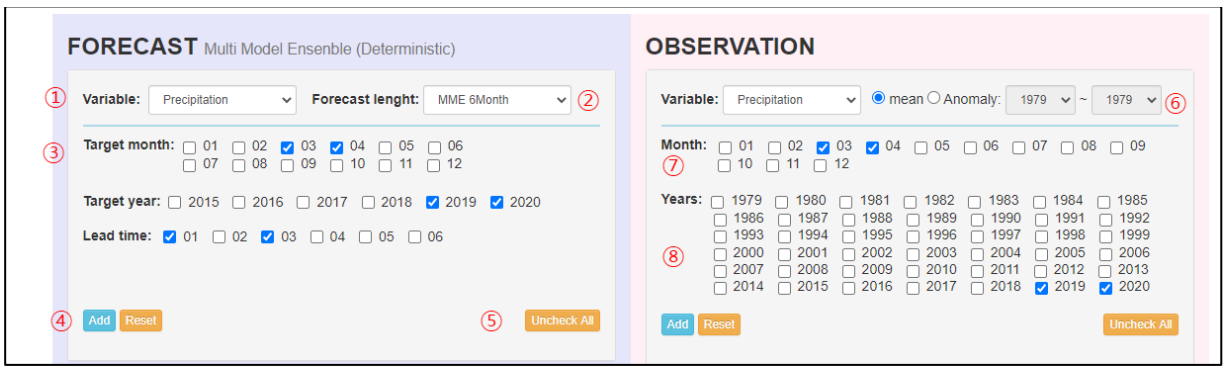


Figure 137 Option selection interface of prediction data and observation data

In the data composite service, the user can analyze climate data according to various conditions by using seasonal prediction and observation data. Users can add or delete conditions, change conditions, and compare result values.

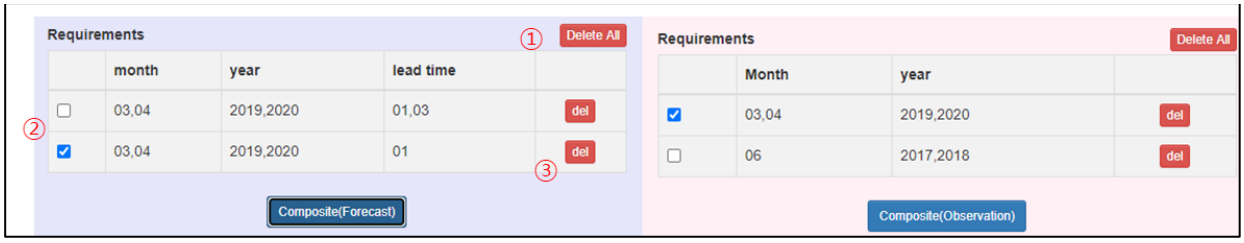


Figure 138 Requirements cart

When the user enters the desired comparison value into the requirements cart and clicks the *Composite* button at the bottom of the cart, the composite map results are immediately displayed (Figure 136). The results can be downloaded in three formats: NetCDF (.nc), ASCII (.xls), and image files (.png).

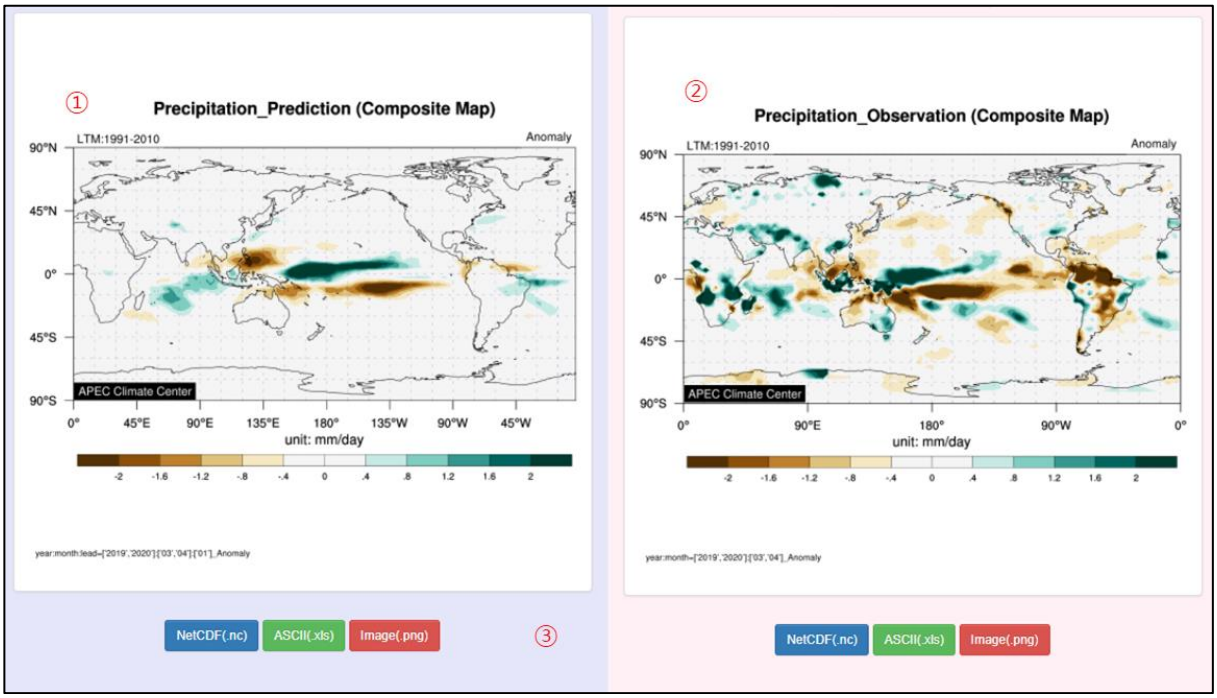


Figure 139 Composite map result

E. AIMS (APCC Integrated Modeling Solution)

AIMS is a tool for producing statistical downscailing/assessment information on climate change scenarios and seasonal predictions. The purpose of this project is to provide users with easy-to-use climate change scenario detailing tools, including many features in one program.

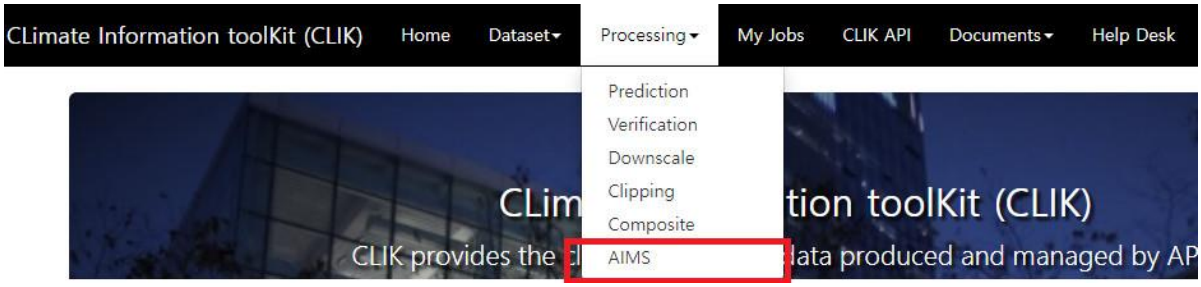


Figure 140 AIMS menu screen

AIMS can be utilized after installing the Stand-Alone program on a user PC with a Microsoft Windows operating system, rather than a web application using a web browser. The Processing – AIMS menu on the Climate Services platform provides an introduction to AIMS and links to download AIMS client programs/manuals/sample data.

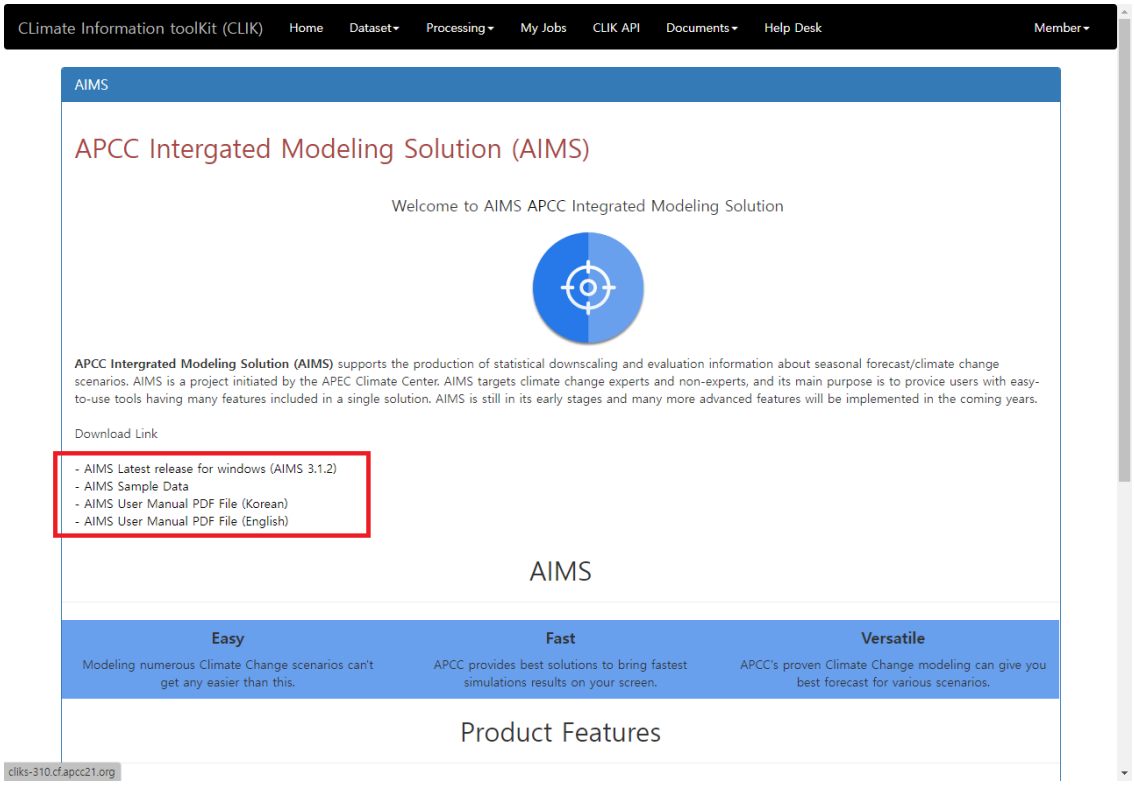


Figure 141 Initial screen of AIMS page

AIMS runs on Windows 7 or higher 64-bit Windows systems and requires 8GB or more of memory and 100GB or more of storage space. Detailed information and functional descriptions are provided in the manual provided on the AIMS page.

(3) My Jobs

A. Message queue

If you request to download data from the *Download* tab of the *Dataset* menu and the *Processing* menu, you can check your Job *ID* at the upper right corner as shown in Figure 136. The Job *ID* notification message disappears soon after printing. Most user requests on the CLIK platform are managed as jobs, and the jobs of all users are processed sequentially. The number of job processing units is limited per user.

Figure 142 Notification of Job submission

· The user can check the requested job list and progress in the *My Jobs* menu.

When "*Auto Refresh*" is selected at the top, the job list is automatically updated every 30 seconds.

The job list shows the type, input time, end time, and progress.

The job is classified into four states: *Queued*, *Running*, *Failed*, and *Completed*.

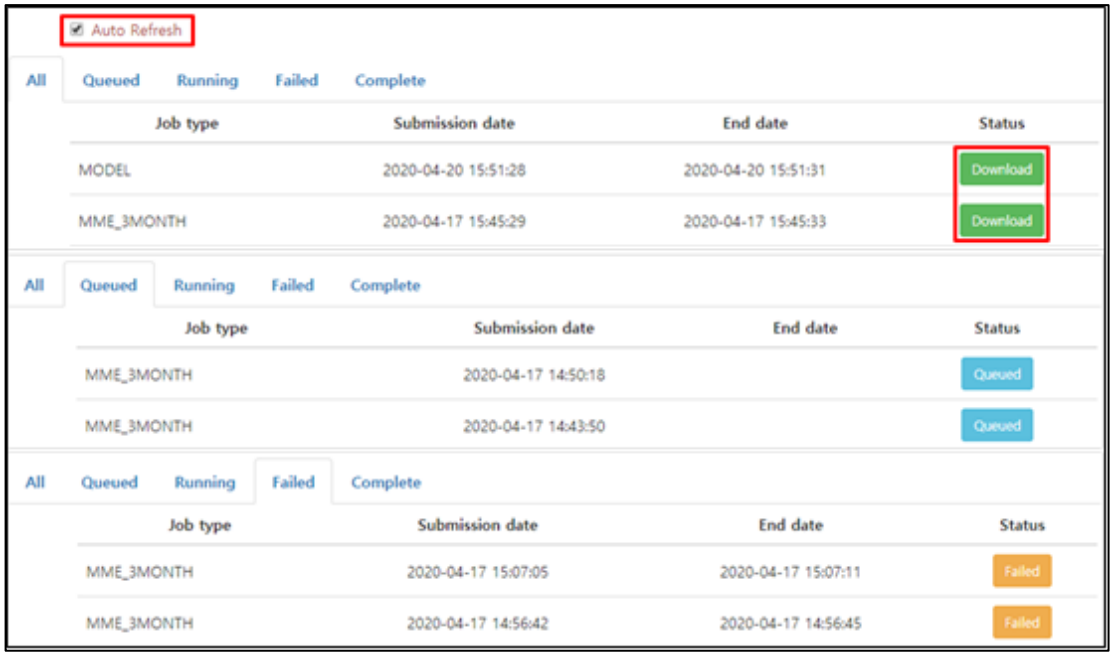


Figure 143 Job List

· When the job is successfully completed, the status of the job is changed to Download, and when the "*Download*" button is selected, the result data is downloaded.

· You can check the details of the job by selecting a job type (e.g., MME_3MONTH, MODEL, Prediction, and Verification) in the list without selecting "*Auto Refresh*". In the case of failed jobs, the cause of the error will be specified.

Figure 144 Details of the Job

(4) CLIK API

The CLIK Open API (Application Program Interface) is a service that allows users to incorporate programming platforms. You can use the API to add your own programming code and download data according to your own preferences. The CLIK platform currently provides API clients that can use APIs in two languages: Python and Java. This tutorial introduces how Python language is integrated in the API.

A. Setting an API key

The API Key is essential when using the API and can be set as follows:

· If you do not have a user account, sign up in the "*Registration*" menu.

· After logging in, select the "*Get Key*" button in the "*Members Info*" menu.

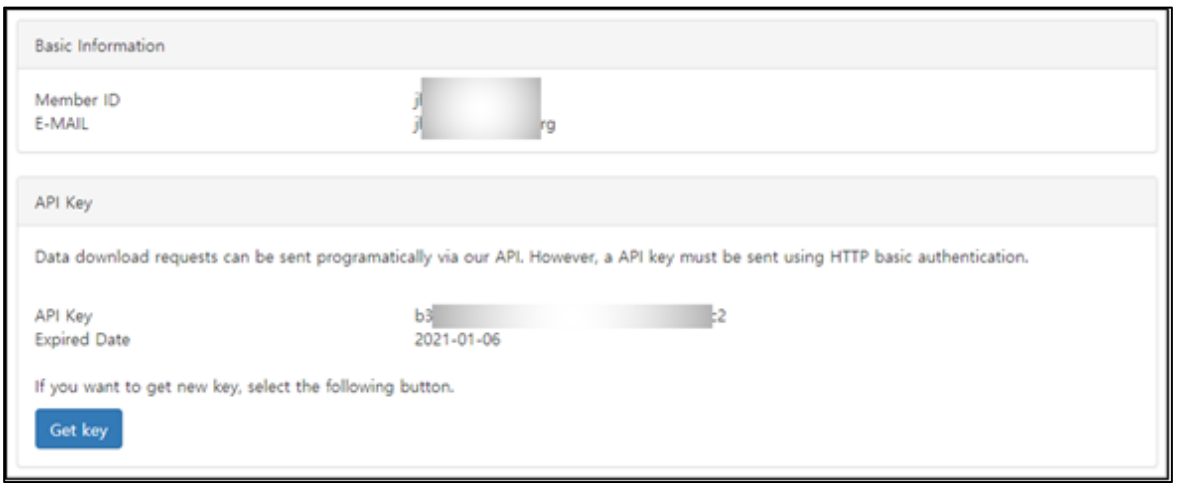


Figure 145 Issue user API Key

• Specify the following in the $HOME/apccapi.properties file (refer to the appendix for setting $HOME).

```
key=810050f2-727e-5ed3-a871-b7a881a04d34
request_url=https://request.apcc21.org/apccdata
status_url=https://request.apcc21.org/status
```

Figure 146 apccapi.properties

B. Install API client

CLIK provides API client script in Python language. You can install the API client in the following ways:

· Download the API client from the *CLIK API* page or download it directly using wget

· Install the API client into your working folder as follows:

```
$ wget http://download.apcc21.org/pythonapi -O apccapi.tar.gz
$ tar xvf apccapi.tar.gz
```

Figure 147 API client download and install

C. Use API client

After installing the API client, the user can call the API to request data.

Users can download MME data for 3 months and 6 months using Python. You can specify type, method, and variable, as in the following examples:

```
#!/usr/bin/env python
import apccapi
c = apccapi.Client()
c.retrieve(
  {
      'jobtype': 'MME',
      'dataset': 'MME_3MONTH',
      'type': 'FORECAST',
      'method': 'SCM',
      'variable': ['prec', 't2m'],
      'period': ['Monthly mean'],
      'yearmonth': ['201909', '201910']
  },
  'mme3.zip'
)
```

Figure 148 Python example: MME (3-Month)

```
#!/usr/bin/env python
import apccapi
c = apccapi.Client()
c.retrieve(
  {
      'jobtype': 'MME',
      'dataset': 'MME_6MONTH',
      'type': 'HINDCAST',
      'method': 'GAUS',
      'variable': ['prec', 't2m'],
      'period': ['Monthly mean', 'Seasonal mean'],
      'yearmonth': ['201909']
  },
  'mme6.zip'
)
```

Figure 149 Python example: MME (6-Month)

Users can download MME model data using Python. You can specify type, institute, model, and variable, as in the example that follows:

```
#!/usr/bin/env python
import apccapi
c = apccapi.Client()
c.retrieve(
  {
      'jobtype': 'MODEL',
      'dataset': 'MODEL',
      'type': 'FORECAST',
      'institute': 'APCC',
      'model': 'SCOPS',
      'variable': ['prec', 't2m'],
      'yearmonth': ['201909']
  },
  'model.zip'
)
```

Figure 150 Python example: Model

Users can download CMIP5 data using Python, as in the below example. The code value in the example can be found on the *Dataset download* page.

```
#!/usr/bin/env python
import apccapi
c = apccapi.Client()
c.retrieve(
  {
      'jobtype': 'CMIP5',
      'dataset': 'CMIP5',
      'code': 'AD',
  },
  'cmip5.zip'
)
```

Figure 151 Python example: CMIP5

IV Appendix

1 Installation and setup of essential applications for the platform

Installation of Python programming language is required to use the API of the CLIK platform. In order to utilize Python in a Windows PC environment, applications that provide a virtual environment of Python, such as Python core or Anaconda, are needed. Python code can be executed even if only one of the two programs, Python or Anaconda, is installed. Please refer to the installation process below. If you are experienced in using Python language, we recommend installing Anaconda, for a simplified configuration of the virtual environment.

(1) Python

A. Download Python

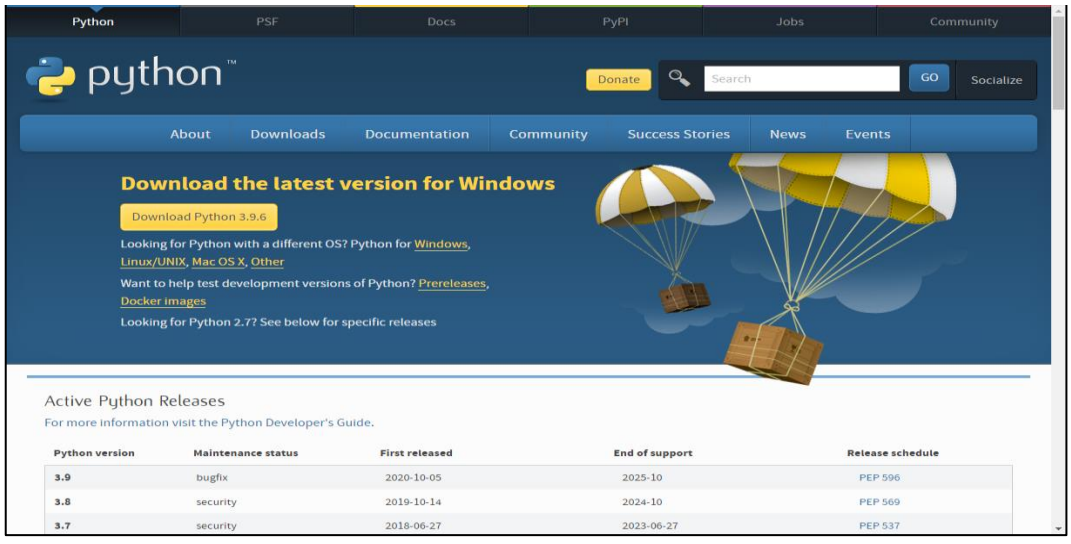


Figure 152 Python Official download website

From the official Python website (http://www.python.org/downloads), download the appropriate file for your operating system. The *Download Python* button should direct you to the latest version. Otherwise, use a download link for the desired version at the bottom of the page.

B. Install Python

If you select "Install Now" after running the installer, the installation will proceed immediately. The "Add Python 3.9 to PATH" option must be selected for full functionality.

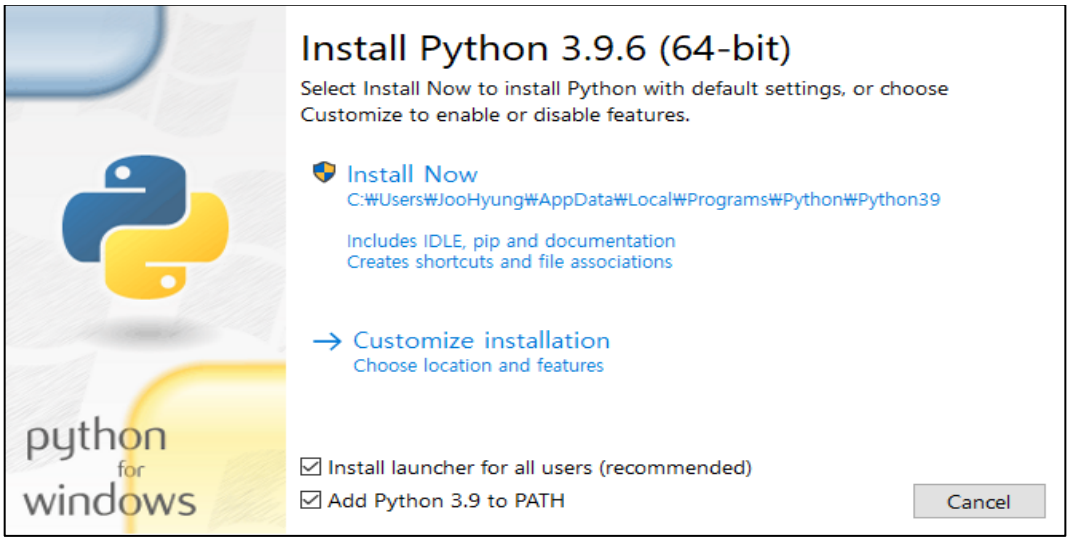


Figure 153 Python installation screen

If Python is installed normally, you can find it in the program menu as shown in the following figure. [Start → All programs → Python 3.9]

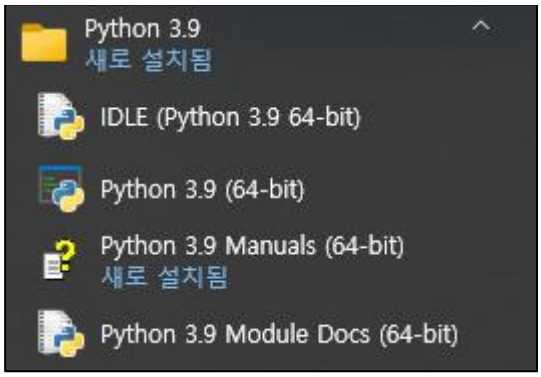


Figure 154 Verify Python installation

(2) Anaconda

A. Download Anaconda

To install Anaconda, visit the official website at:

https://www.anaconda.com/products/individual

Currently, Anaconda offers four editions: Individual, Commercial, Team, and Enterprise. In this tutorial, we use the Individual Edition. On the download page, the Download link will direct you to an Anaconda version suited for your operating system.

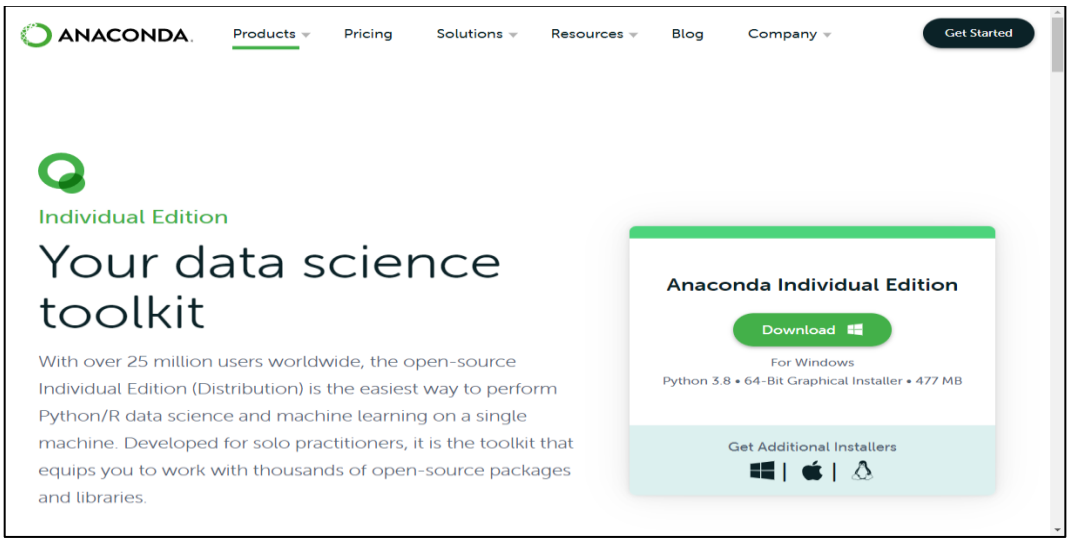
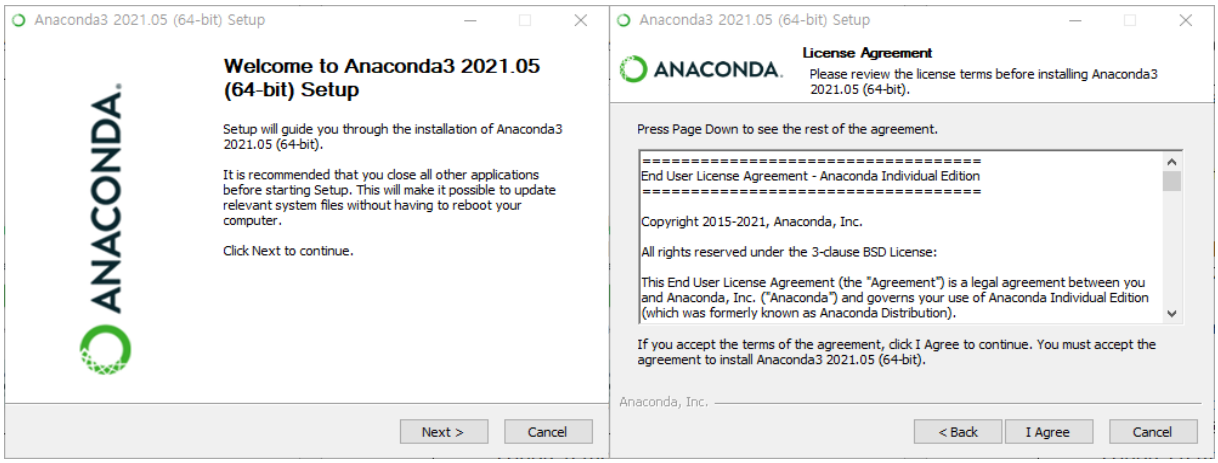
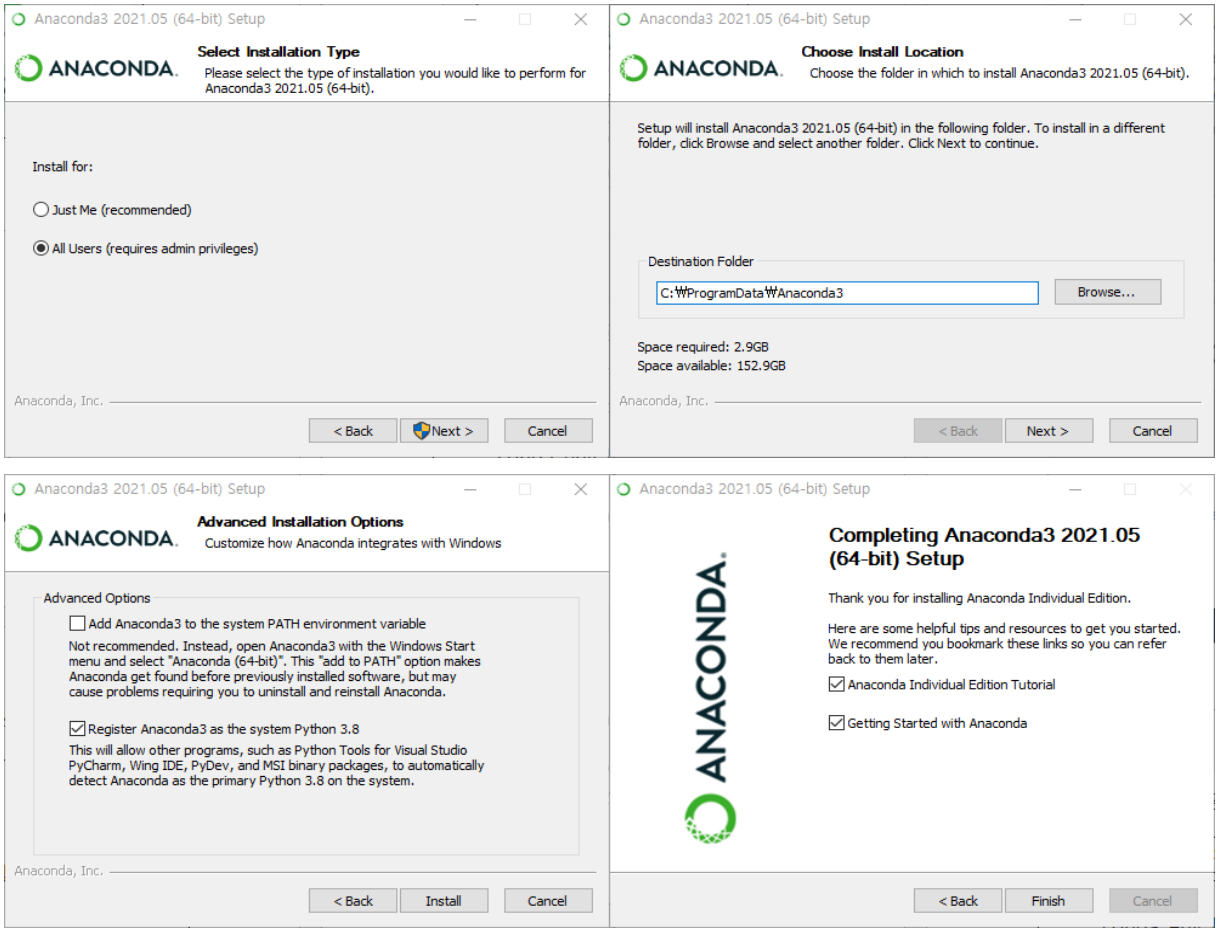


Figure 155 Anaconda download page

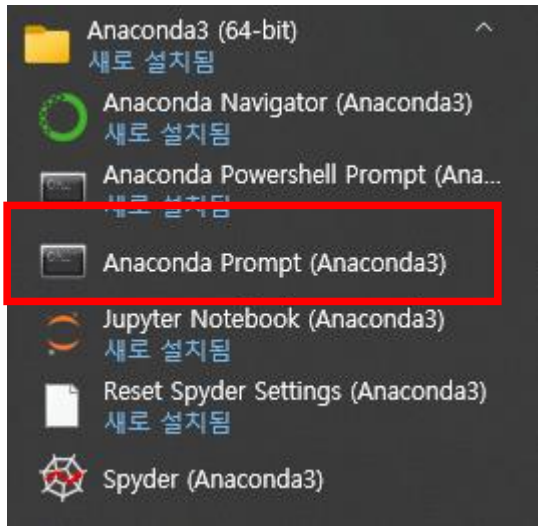
B. Install Anaconda

Run the Anaconda installation file and proceed with the installation process as shown in the figure below.



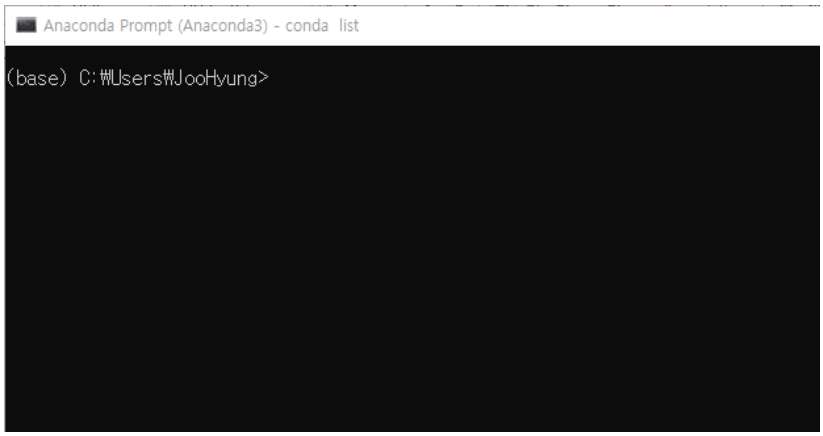


Once the installation is complete, run Anaconda Prompt from Start-All Programs-Anaconda3 (64-bit or 32-bit, depending on your operating system) as shown below.



If you can see that the shell has changed to base when Prompt is executed, as shown in

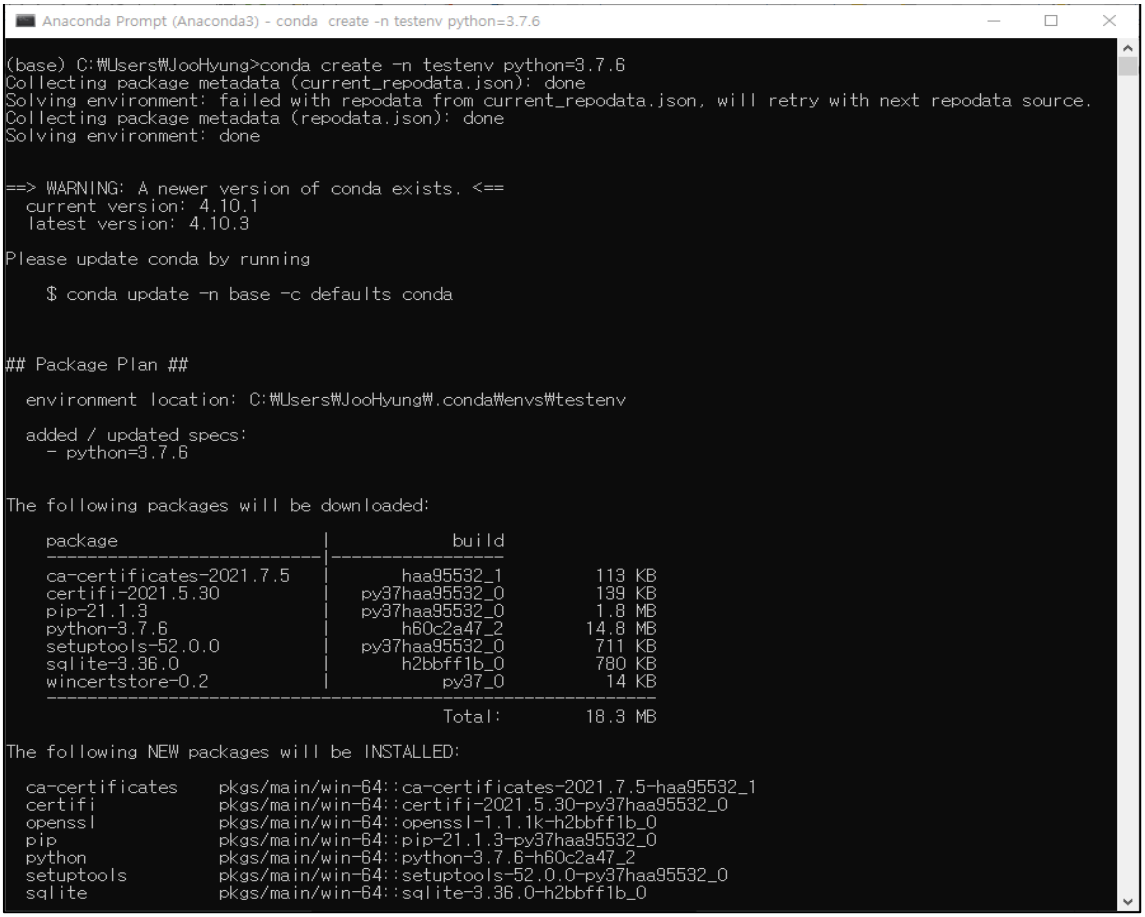
the figure below, Anaconda has been installed properly.



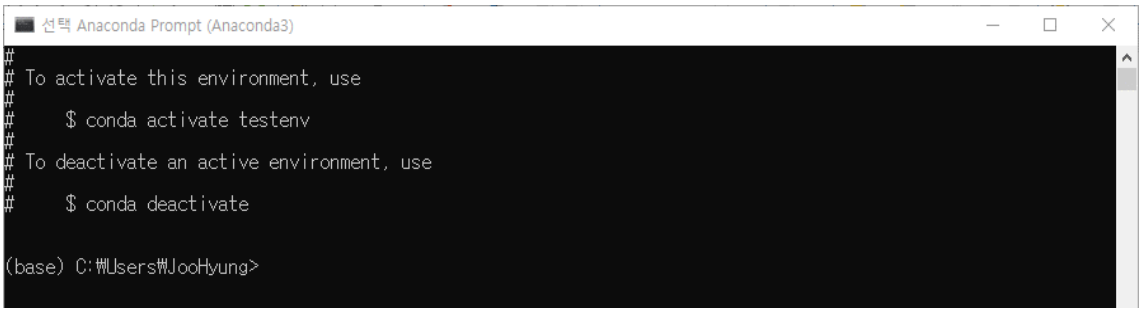
C. Create and set up Anaconda virtual environment

```
conda create -n testenv python=3.7.6
```

Run the above command on Anaconda Prompt. The command creates a virtual environment named testenv and sets Python's version to 3.7.6 (an internet connection is required). If you run the command, the necessary packages are automatically downloaded and installed in the virtual environment as shown in the figure below.



After the virtual environment setting is automatically finished, the completion screen is displayed as shown in the image below.



Enter the following command in Anaconda Prompt

```
conda activate testenv
```

The above command activates the virtual environment called testenv. After executing the

command, the front part of Shell Prompt will be changed to a virtual environment called testenv as shown below.

C. Summary of Anaconda command

Summary of Python Conda Command
Conda Repo Site : https://repo.anaconda.com/archive/

> ***conda env list***
list all virtual environments of Conda

> ***conda create -n test python=3***
Create an anaconda virtual environment, use Python 3 version, and create a virtual environment called test

> ***conda activate test***
Enable Conda virtual environment (requires confirmation of shell prompt change)

> ***conda deactivate***
Disable Virtual Environment (requires confirmation of shell prompt change)

> ***conda install tensorflow-gpu***
Install the Conda package, run it while the virtual environment is activated, and install the tensorflow using gpu among typical machine learning packages.

> ***conda env remove -n test***
Delete the virtual environment

> ***conda create --clone test -n test1***
Copy the virtual environment
> conda create --clone [virtual environment name to be duplicated] -n [new virtual environment name]

> ***conda --version***
Check the installed Anaconda version

> ***conda info***

Retrieve the installed Anaconda information

> ***conda list***
View the list of packages installed in the virtual environment

> ***conda install -n test1 tensorflow***
> conda install -n [virtual environment name][Package name]
Installs the package in a virtual environment other than the currently active virtual environment

> ***conda update tensorflow***
Update installed packages
> conda update [package name]

> ***conda remove -n test tensorflow***
Delete installed packages
> conda remove -n [Virtual Environment Name][Package Name]

D. miniconda

Anaconda has a number of packages that are installed together, including various scientific packages. It also includes applications such as Spyder and Jupiter Notebook, which account for a large amount of disk space.

For users who do not need these complimentary applications or packages, there is an alternative, Miniconda, that allows you to build a minimal environment.

Miniconda is the minimum open-source installer for Conda and is a small bootstrap version of Anaconda that includes Conda, Python, and major packages (including dependency packages). You can also install more than 720 Conda packages from the Anaconda repository using the conda install command.

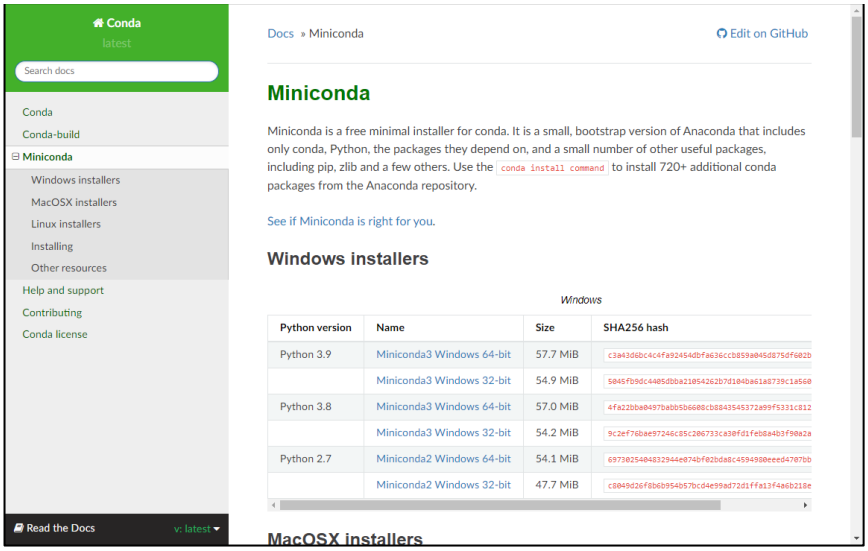


Figure 156 Miniconda download page

Users who are familiar with the CLI (Command Line Interface) but are concerned about excessive disk capacity or waste of resources, please use Miniconda instead of Anaconda. The installation and usage procedures are similar to that of Anaconda. Please refer to the following link for installation: https://docs.conda.io/en/latest/miniconda.html.

(3) Spyder (Python IDE)

Spyder (Scientific Python Development Environment) is an open-source cross-platform integrated development environment for scientific programming in Python language. Spyder provides functions as an IDE that allows you to write Python files and execute them in units of files, and to review the status of variables in memory.

Since Spyder is included in the Anaconda package, please refer back to Anaconda Installation in Section 2 of this chapter for the relevant download and installation procedures.

A. Using the CLIK API client with Spyder

In Chapter 3, Section 4 CLIK API of this document, assuming that the API setup has been completed, we will explain the process of downloading MME data using Spyder.

In the *apccapi.properties* file, enter and save the key issued from the CLIK platform website

as shown below. There is no separate *apccapi.properties* file provided, but write the script directly as below or refer to the CLIK platform website. The file name is apccapi, and the extension is properties.

```
key=810050f2-727e-5ed3-a871-b7a881a04d34
request_url=https://request.apcc21.org/apccdata
status_url=https://request.apcc21.org/status
```

Figure 157 apccapi.properties

Copy the *apccapi.properties* file to an appropriate location. In this document, we set it to *C:₩Home₩*. Please remember the location where you copied the file.

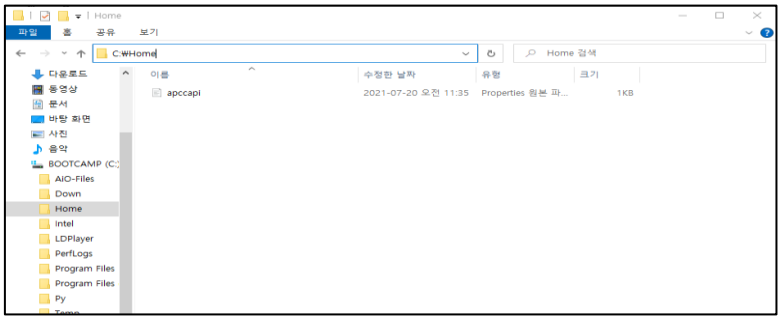


Figure 158 apccapi.properties copy example

Open Settings in Windows and select the *System* menu.

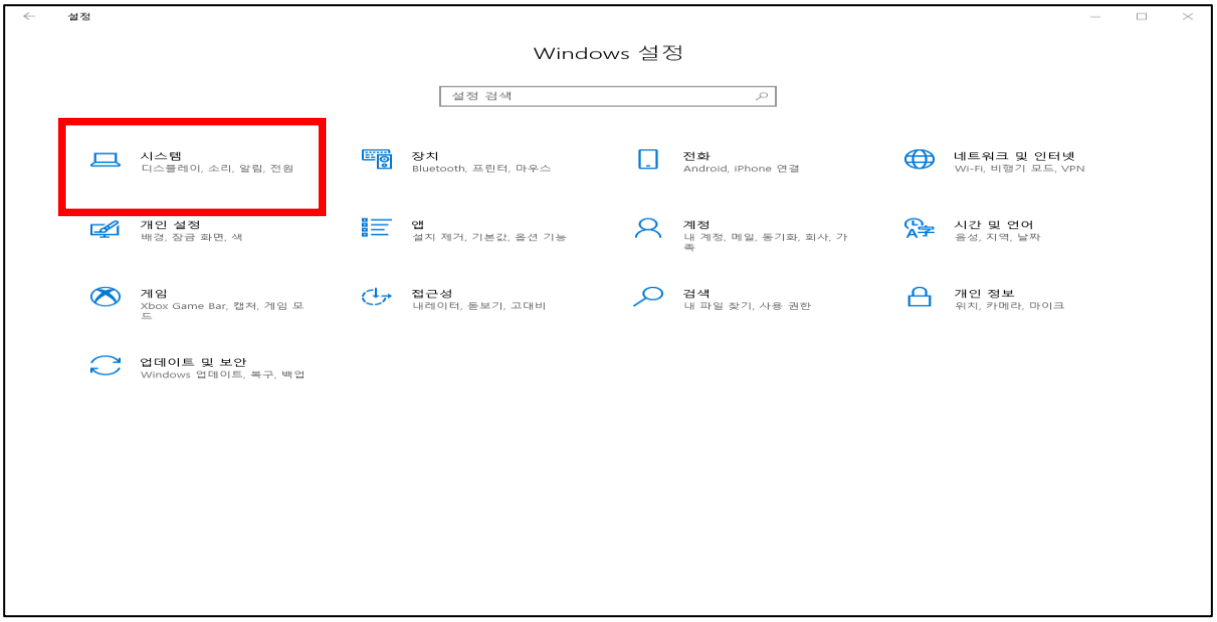


Figure 159 Windows control panel - system

Select '*Advanced System Settings*' from the relevant settings on the page that appears after selecting '*Information*' from the left-hand menu.

Figure 160 Information – Advanced System Settings

When the system property pop-up box appears, select the *'Environment Variables (N)'* at the bottom of the *Advanced* tab to edit the environment variable.

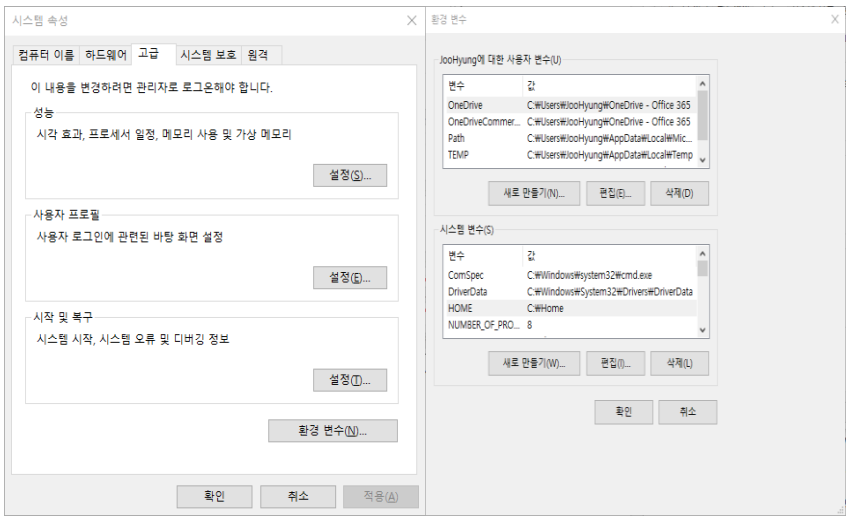


Figure 161 System property – environment variable (N)

Create a new system variable '*Home*' as shown in the figure below and specify the path where the apccapi.properties file is located.

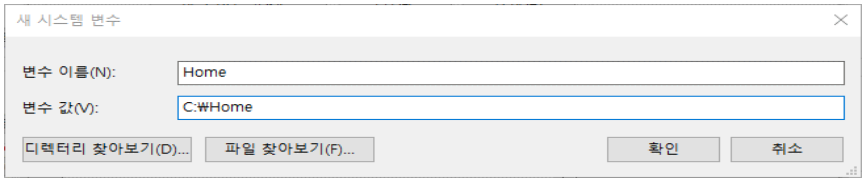


Figure 162 New system variable

Run the Spyder program installed with Anaconda.

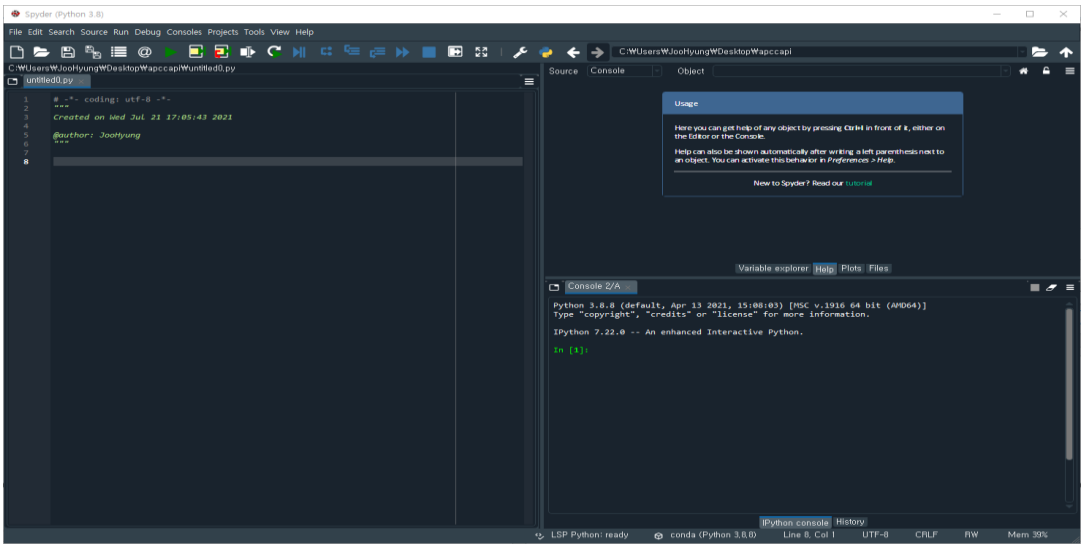


Figure 163 Anaconda – Spyder launch

Download the API client provided from the CLIK platform homepage and decompress it to an appropriate location. You can call an API to request APCC climate data with a simple Python script. The source code example below demonstrates writing and running run.py using Spyder. The run.py source code must be located in the same directory as the CLIK API client program (*api.py*).

```
import api as apccapi

c = apccapi.Client()
c.retrieve(
        {
                'jobtype': 'MME',
                'dataset': 'MME_3MONTH',
                'type': 'FORECAST',
                'method': 'SCM',
                'variable': ['prec', 't2m'],
                'period': ['Monthly mean'],
```

```
                'yearmonth': ['201909']
        },
        'mme3.zip'
)
```

Figure 164 run.py source code

Users can download 3/6-month MME data using the above Python source code. Options, such as type, method, and variable can be found on the *Dataset download* page.

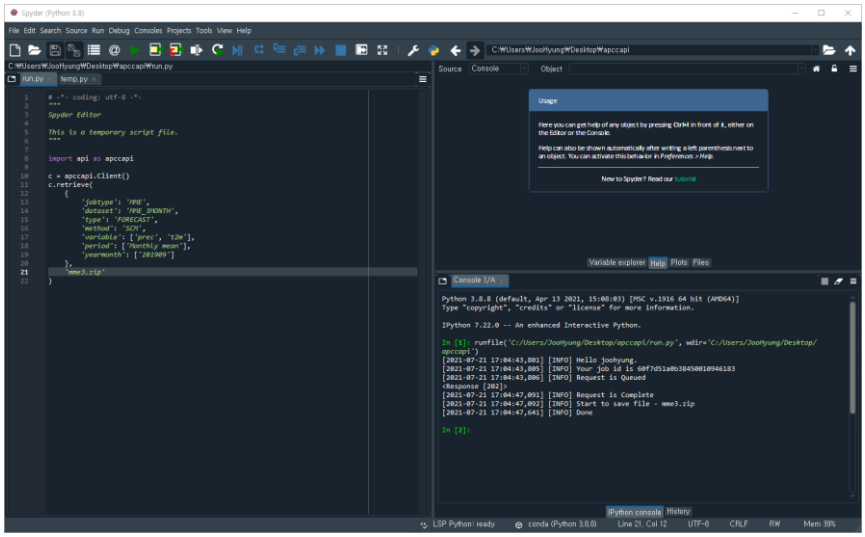


Figure 165 run.py result

The result of executing run.py using Spyder editor is shown above. Users can view the mme3.zip at the same path where run.py was created. In this example, the mme3 file is compressed with a set of climate data requested by the user in Python.

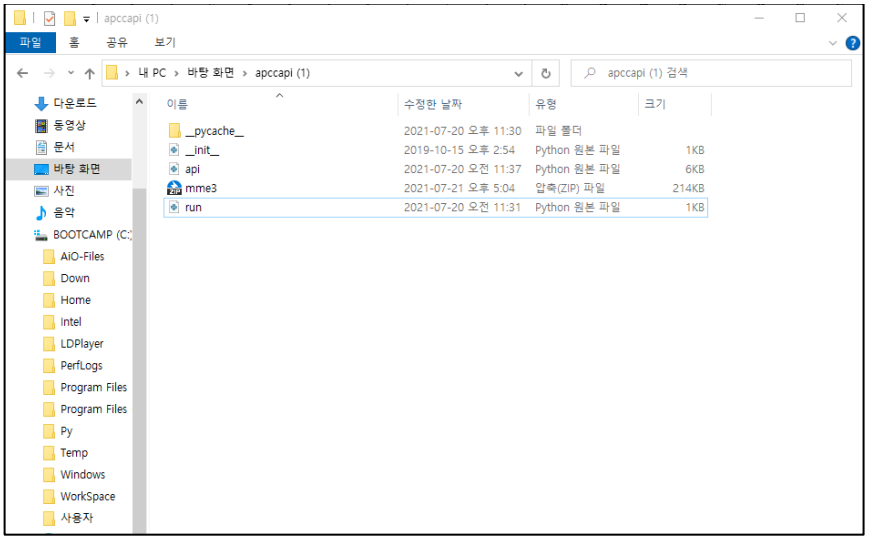
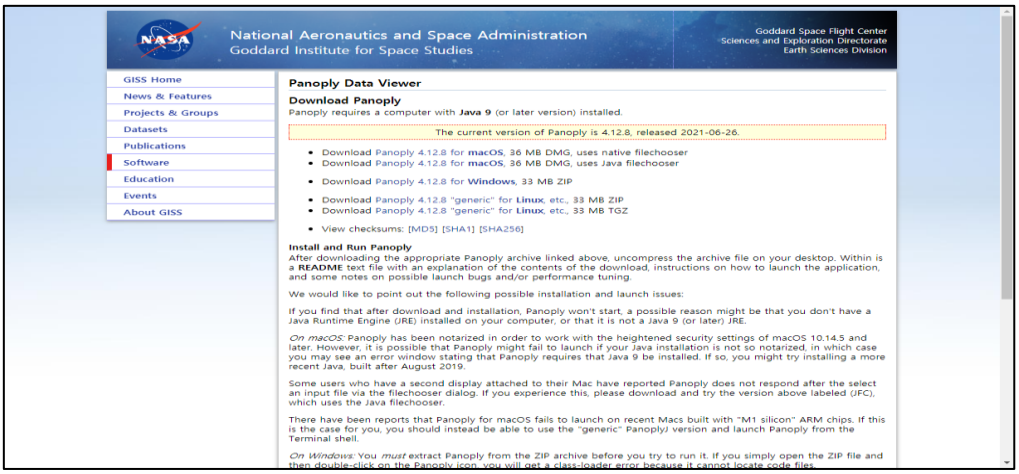


Figure 166 Download result using CLIK API

(3) Panoply Data Viewer

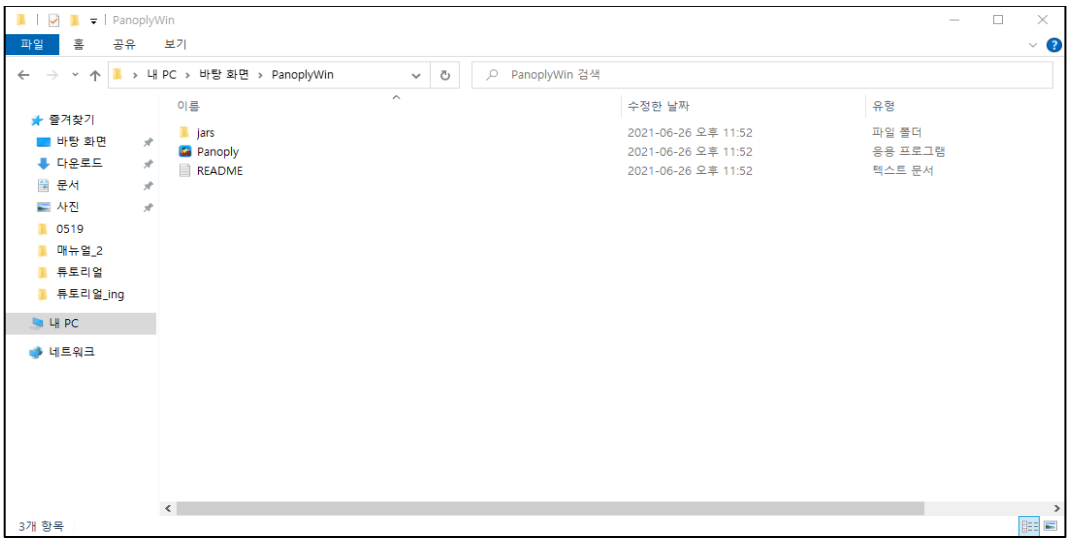
A. Download Panoply Data Viewer

To check NetCDF (.nc) files, we will use NASA's Panoply Data Viewer. As shown in the figure below, go to the download page via the Get Panel – Download Panel link at https://www.giss.nasa.gov/tools/panoply/ where you can download the Panel Data Viewer suitable for your operating system.



B. Install Panoply Data Viewer

The Panoply Data Viewer can be decompressed and executed without a separate installation process. If you run the Panoply.exe file in the decompressed folder, you can run the Panoply Data Viewer immediately.

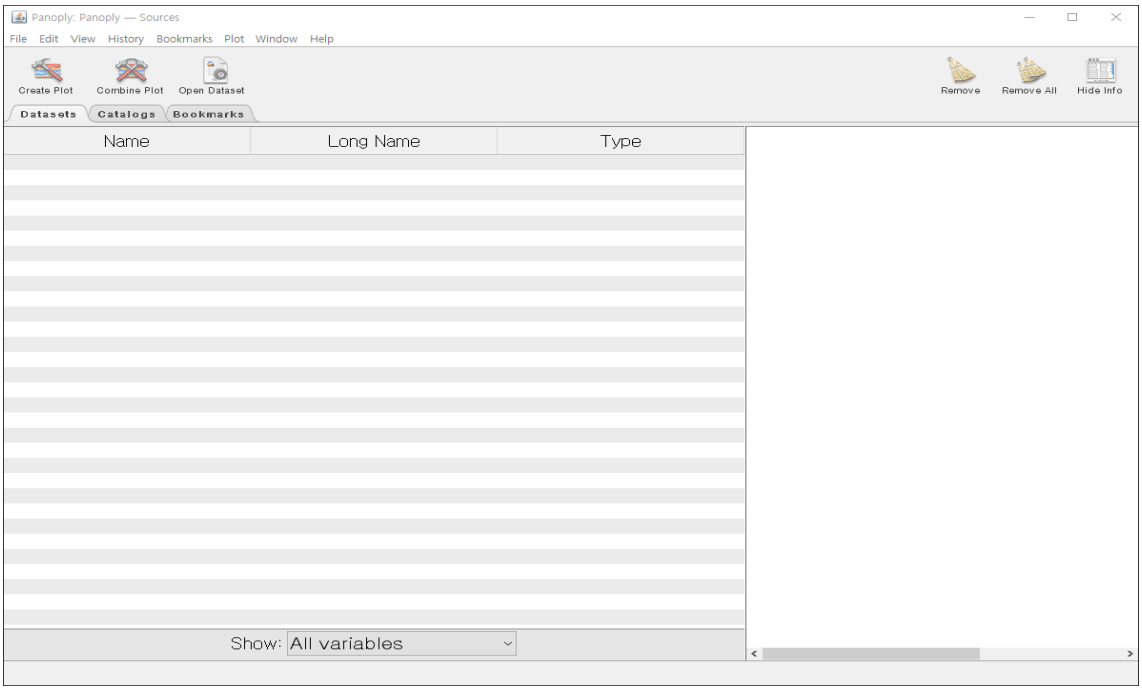


Please note that the Panoply Data Viewer requires Java Runtime Environment (JRE) 9.0 or higher. If the JRE is not installed on your PC, please follow the link below and run the Panoply Data Viewer again.

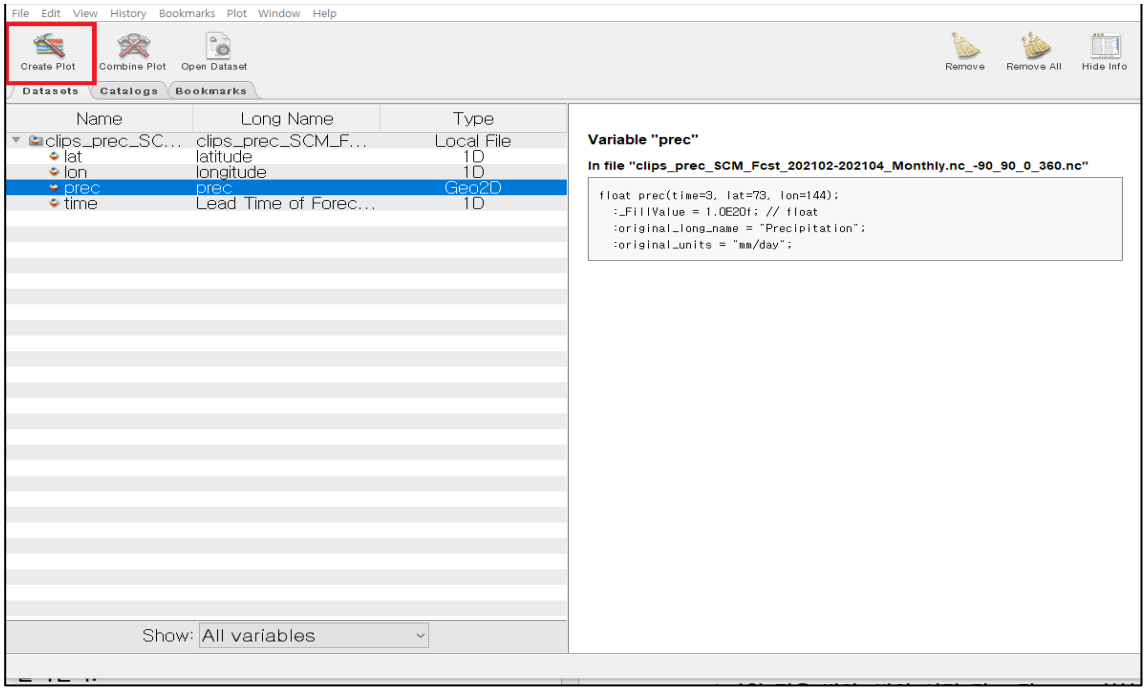
Java Runtime Environment Download link:
https://www.oracle.com/kr/java/technologies/javase/javase9-archive-downloads.html

C. Execute Panoply Data Viewer

If you download and run Panoply Data Viewer normally, the prompt window should look similar to the figure below.



If you select the NetCDF (.nc) file downloaded by selecting File – Open, you can view the details of the file as shown in the figure below.



After selecting the variable to be displayed, as shown in the figure above (precipitation, in this example), click the *Create Plot* button in the upper left corner to display the data of the .nc file as shown in the figure below.