An introduction to ITACS

- Interactive Tool for Analysis of Climate System -

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Contents

- Introduction
  - What's ITACS?
  - Standard operation
  - Advanced operation

General introduction

More time to diagnose the climate system, less time to manipulate the data!

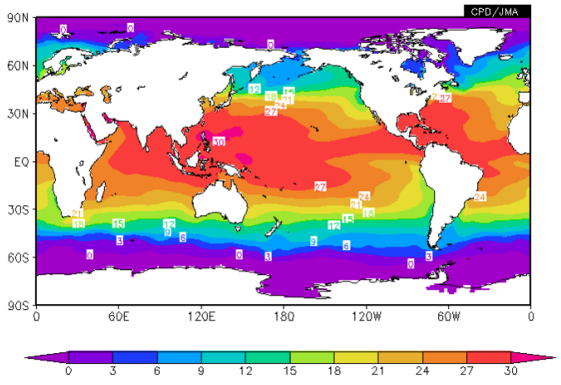
- "ITACS" is a shortening of

  Interactive Tool for Analysis of Climate System.
- It's a web-based application for analyzing and monitoring climate.
- It's available on web browsers. No additional software or plug-ins are required.
- Various datasets are available.

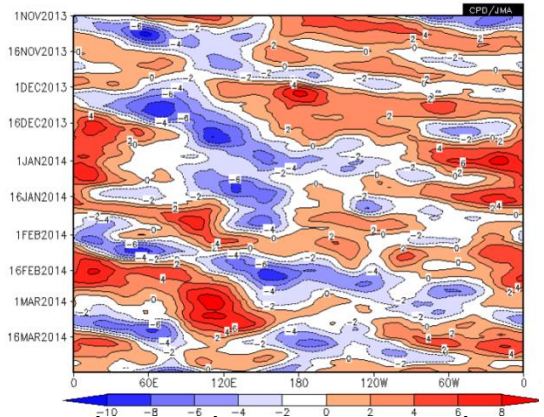
>> It's a very convenient and useful tool and it will strongly help you to understand climate systems.

What can be done using ITACS?

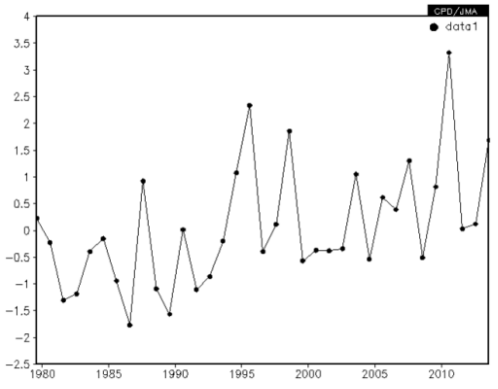
- Various types of charts are available.



2D map

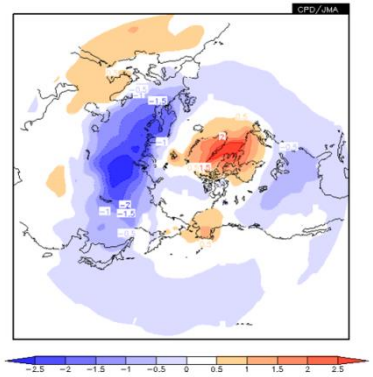


Time-longitude cross section diagram

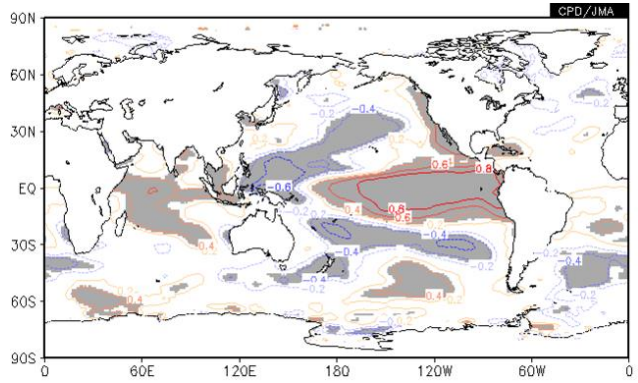


Time series graph

- Various statistical analyses are built in.



EOF analysis



Correlation analysis

Available data

- Atmospheric analysis data
  - **JRA55** since 1958
    - Japanese 55-year Reanalysis

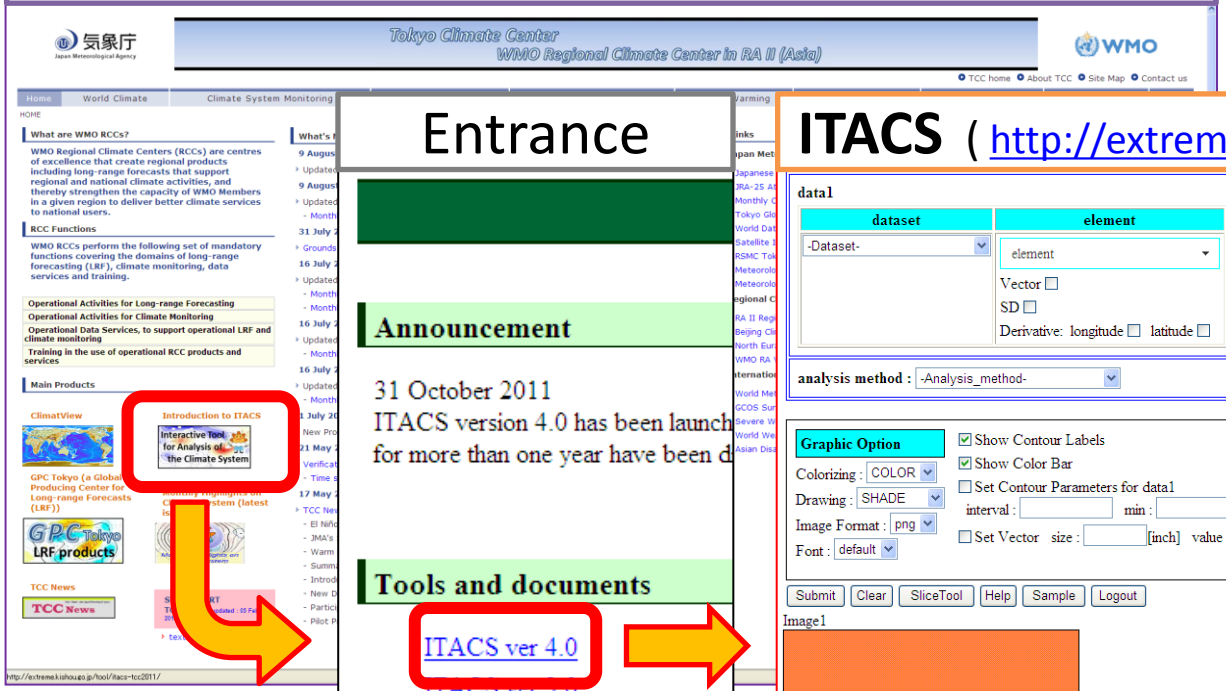
  - Outgoing longwave radiation data provided by NOAA since 1974
- Oceanic analysis data
  - Sea surface temperature data by COBE-SST since 1891
  - Oceanic condition analyzed by MOVE/MRI.COM-G since 1958
- Forecast data (experimental product)
  - The latest two forecasts of JMA's 1-month model
- Others
  - Indices, CLIMAT messages and data input by individual users

(See for details)
JRA project http://jra.kishou.go.jp/
COBE-SST http://ds.data.jma.go.jp/tcc/tcc/products/elnino/cobesst_doc.html
http://ds.data.jma.go.jp/tcc/tcc/library/MRCS_SV12/index_e.htm
MOVE/MRI.COM-G http://ds.data.jma.go.jp/tcc/tcc/products/elnino/move_mricom_doc.html

How to access

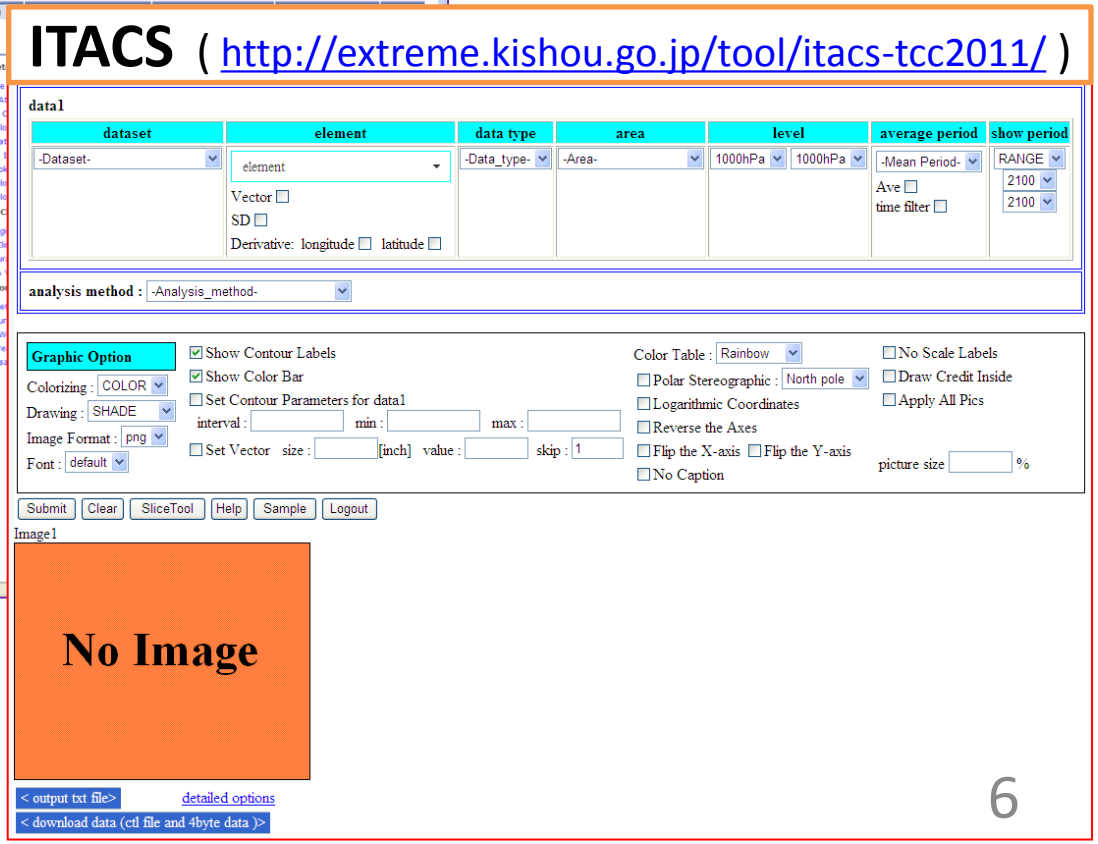
- Registered users can access ITACS from the Tokyo Climate Center (TCC) website.

TCC website (http://ds.data.jma.go.jp/tcc/tcc/index.html)

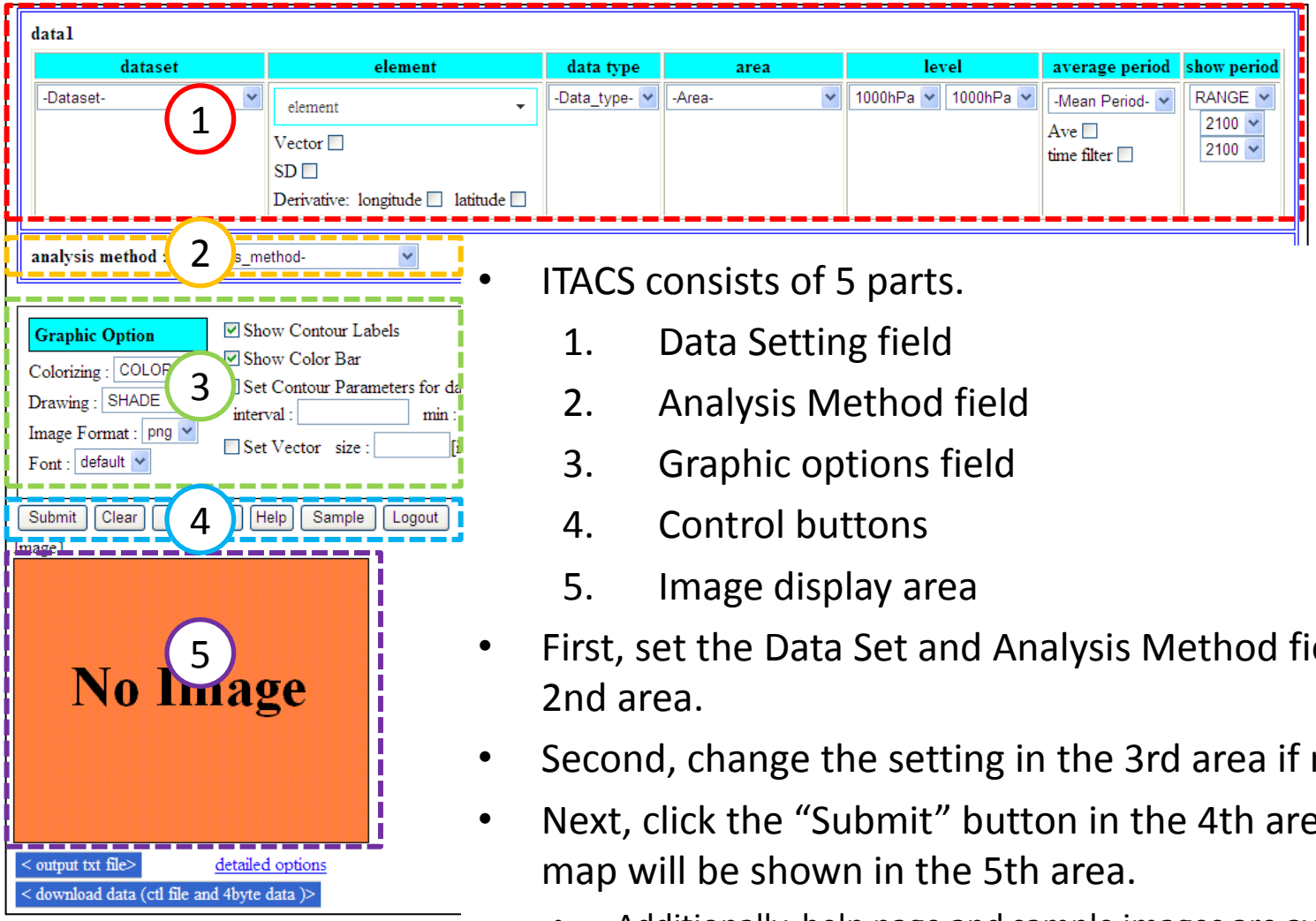


Entrance

ITACS (http://extreme.kishou.go.jp/tool/itacs-tcc2011/)



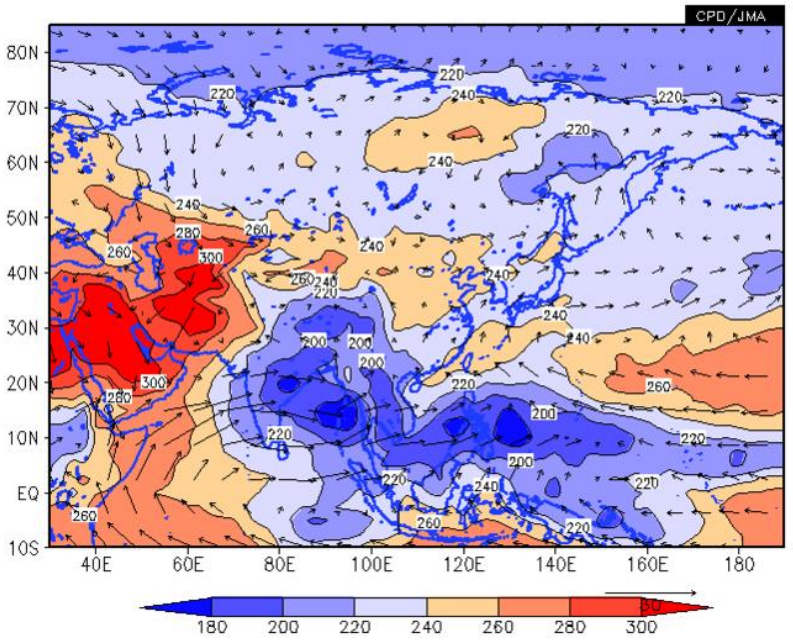
Basic Operation



- ITACS consists of 5 parts.
  1. Data Setting field
  2. Analysis Method field
  3. Graphic options field
  4. Control buttons
  5. Image display area
- First, set the Data Set and Analysis Method fields in the 1st and 2nd area.
- Second, change the setting in the 3rd area if necessary.
- Next, click the “Submit” button in the 4th area, and a created map will be shown in the 5th area.
  - Additionally, help page and sample images are available by the buttons in the 4th field.

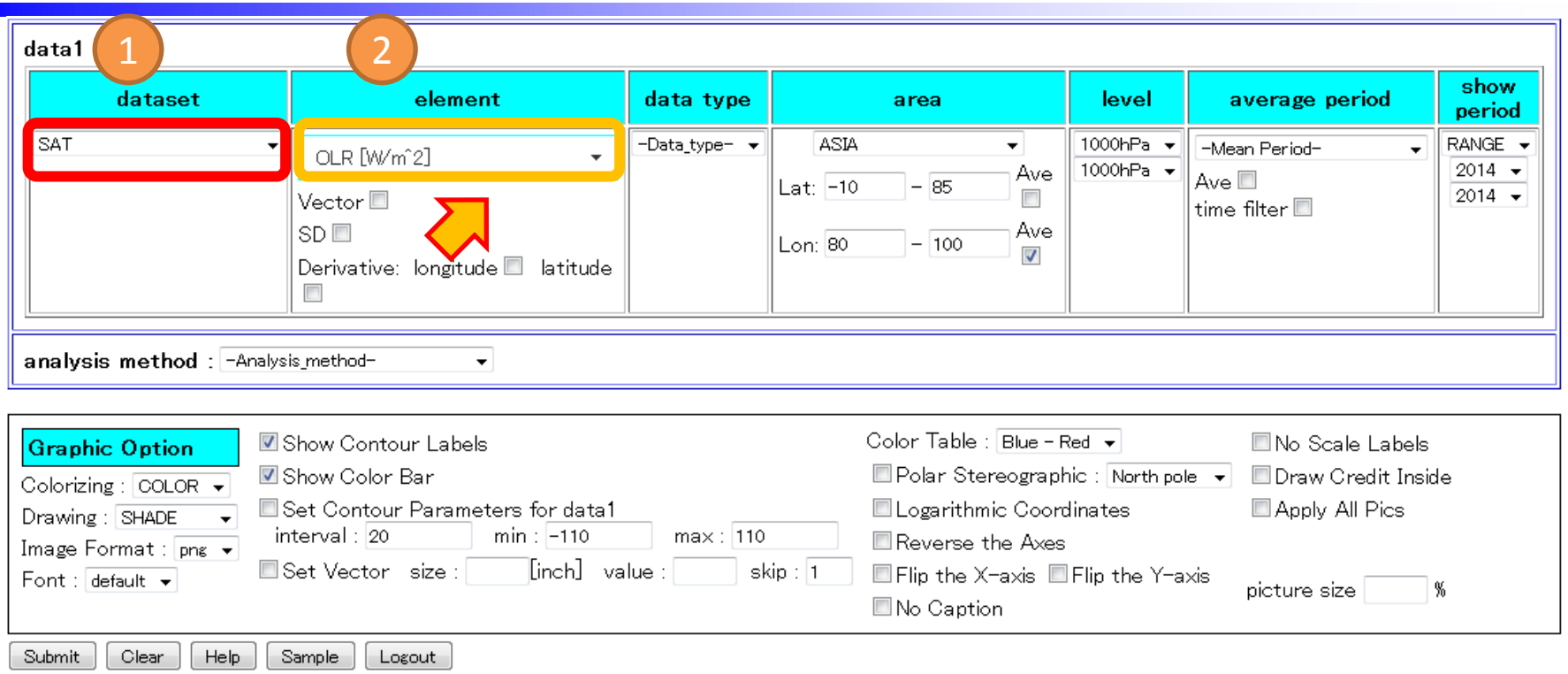
2D map(1)

- The most basic chart is a 2D map.
- At first, learn the basic operations of ITACS by creating a 2D map of Satellite data (OLR) and low-level wind field.
  - The settings of this sample are as follows.
    - Dataset : SATellite data and JRA-55
    - Element : ORL and (u, v)
    - Data type : Analysis value
    - Area : Asia
    - Level : Surface and 850hPa
    - Averaged period : Monthly
    - Show period : July 2014



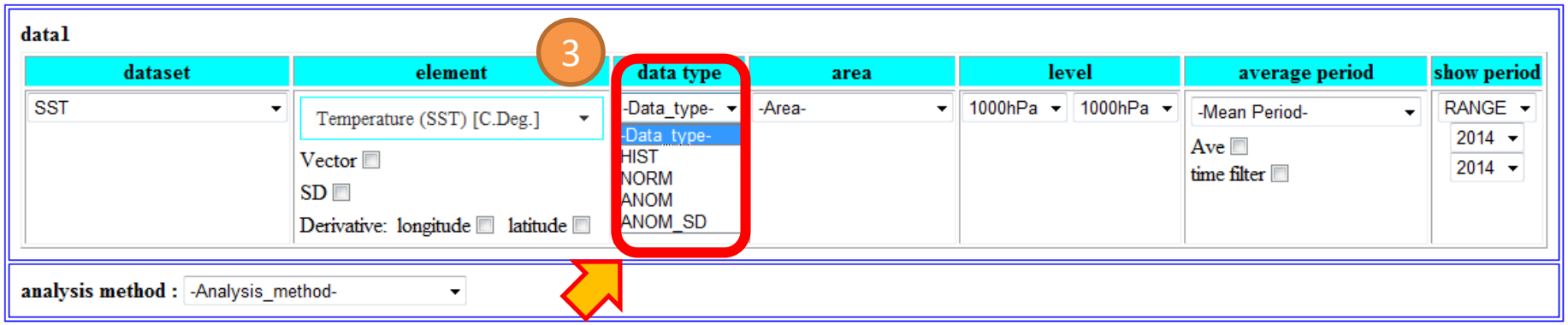
OLR and low level wind field(hist) for july 2014

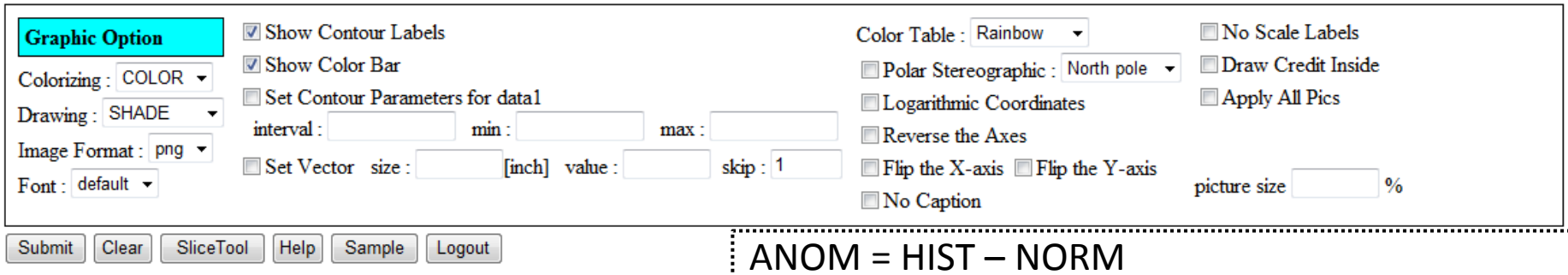
2D map (2)



1. Select “dataset” “SAT”.
   - Various datasets are available:
     CLIMAT, INDEX, JRA-JCDAS, K1EM, OCEAN-DATA, SAT, SST and USER-INPUT
2. Select “element” “OLR”.
   - Available choices corresponding to the selected dataset will be shown in a pop-up menu.

2D map (3)



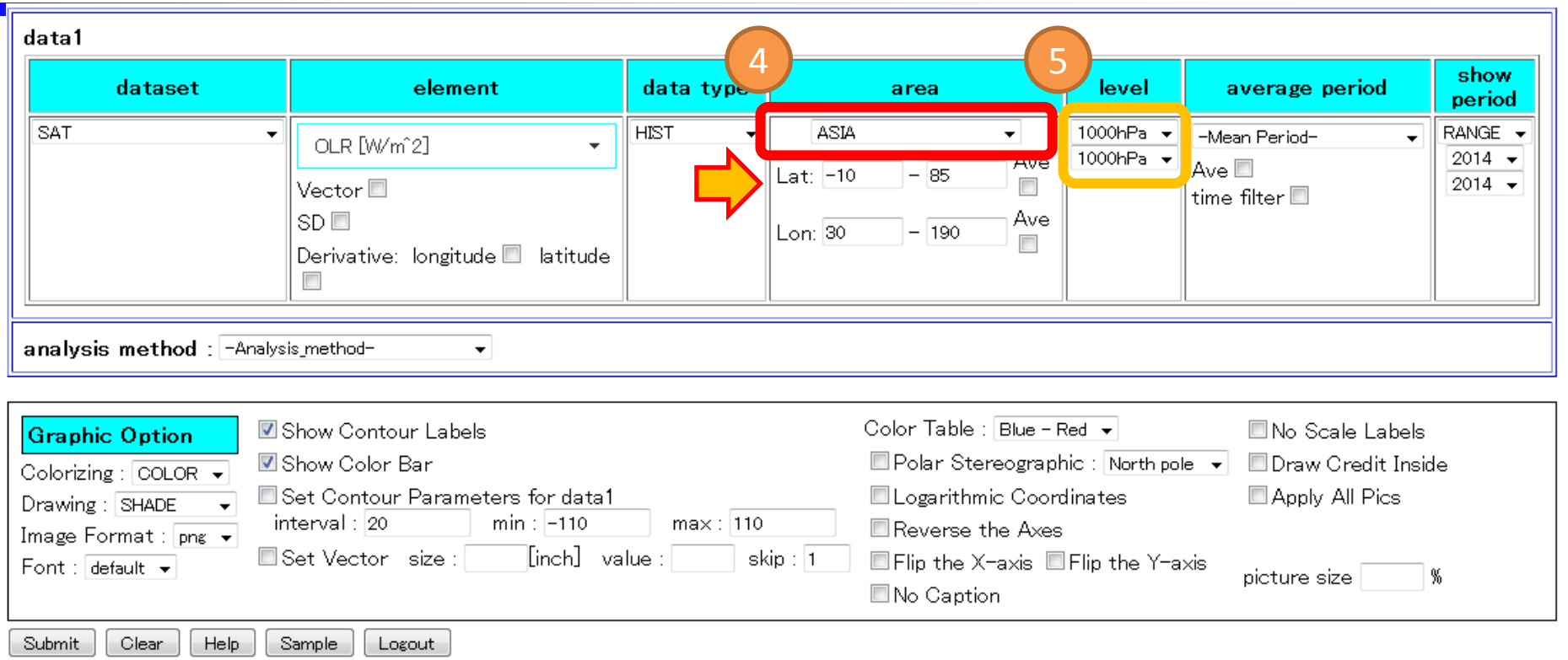


3. Select “data type” “HIST”. Available options are:
   - HIST : Historical actual analysis or observation data.
   - NORM : Climatological normal data averaged from 1981 to 2010.
   - ANOM : Anomaly data.
   - ANOM_SD : Anomaly data normalized by their standard deviations.

ANOM = HIST – NORM
- It means a difference from the climatological normal.

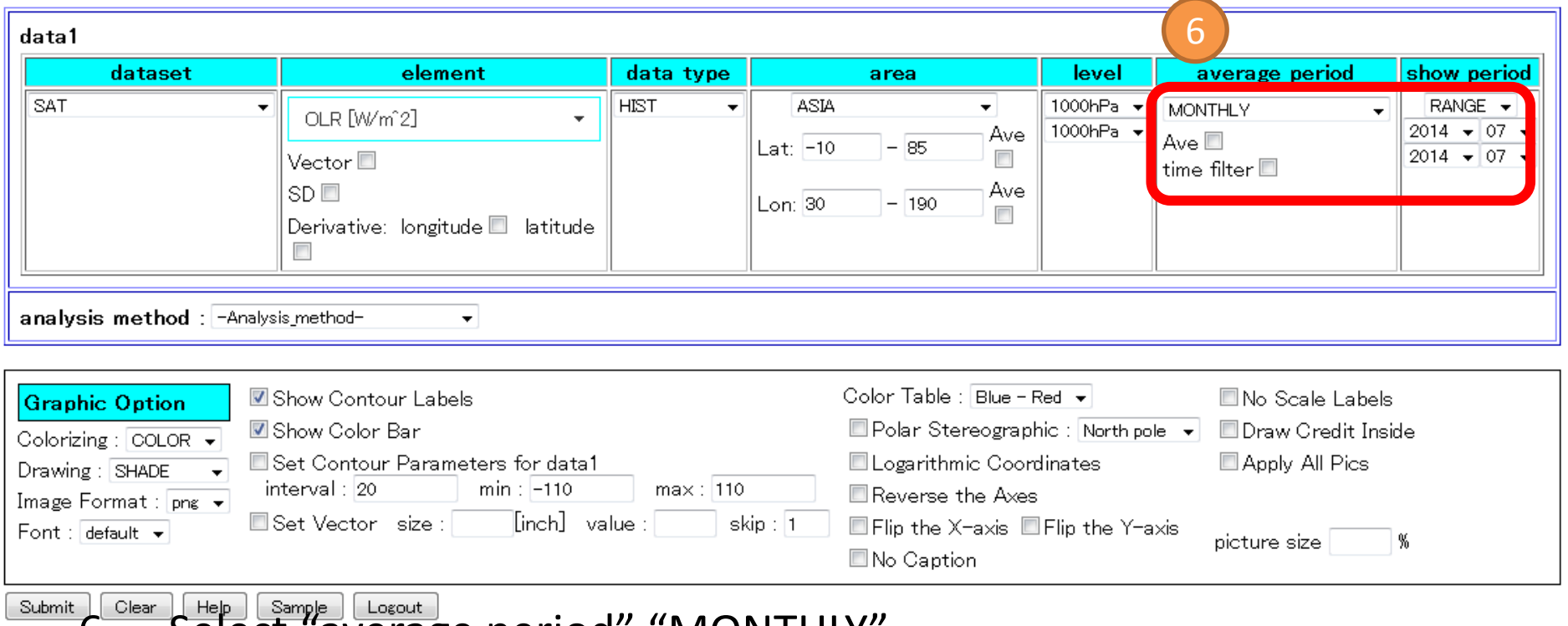
ANOM_SD = ANOM / SD
- It means an abnormal level.

2D map (4)



4. Select “area” “Asia”.
   - After your selection, setting boxes will appear in the “area” field and you can adjust the area more precisely.
5. Select “level” “1000hPa”.
   - Options in the “level” menu will change depending on your selection of “element”.

2D map (5)

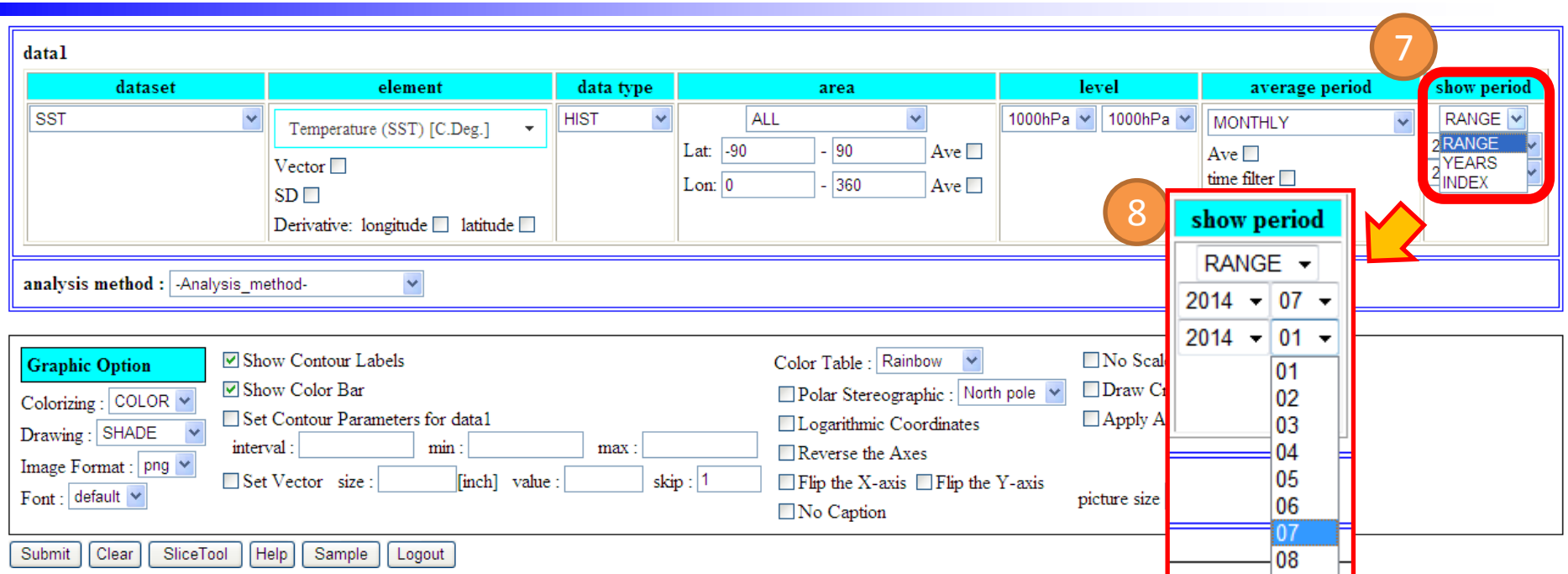


6. Select "average period" "MONTHLY".
   - There are two styles for range selection in this option as shown below. As for this option, detailed explanation will be shown later.

   i. To select a consecutive period:
      ANNUAL, MONTHLY, DAILY and PENTAD DAY

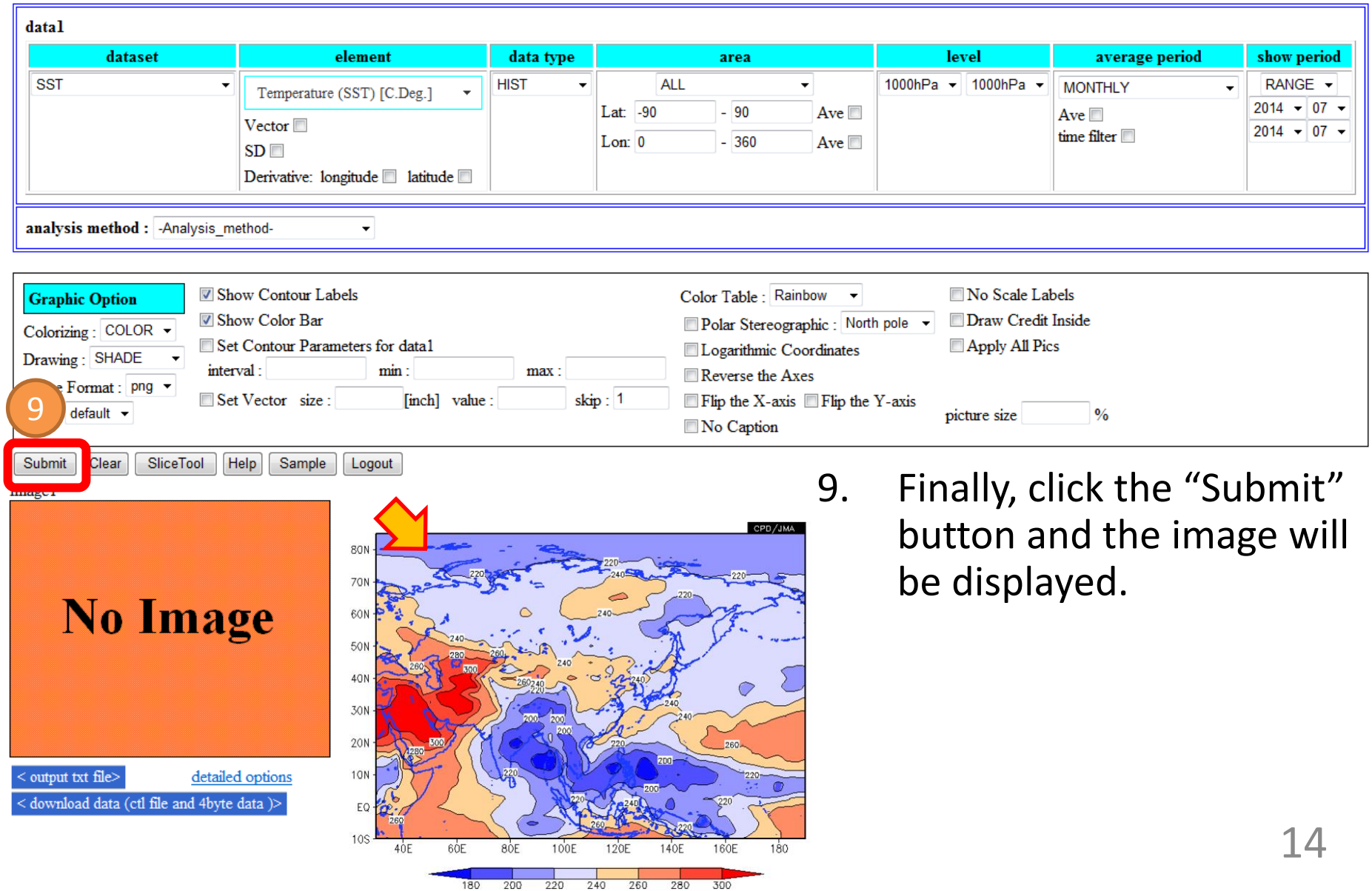
   ii. To select a specific period to be repeated each year:
      Year average, Year average day and Year average pentad day

2D map (6)



7. Select “show period” “RANGE”.
8. Select the year and month “2014 07”, for both upper and lower boxes. Available options are:
   - RANGE : Setting the beginning and end point of the target period.
   - YEARS : Setting individual years.
   - INDEX : Setting a SST index border to pick up years. (e.g. NINO.3)

2D map (7)



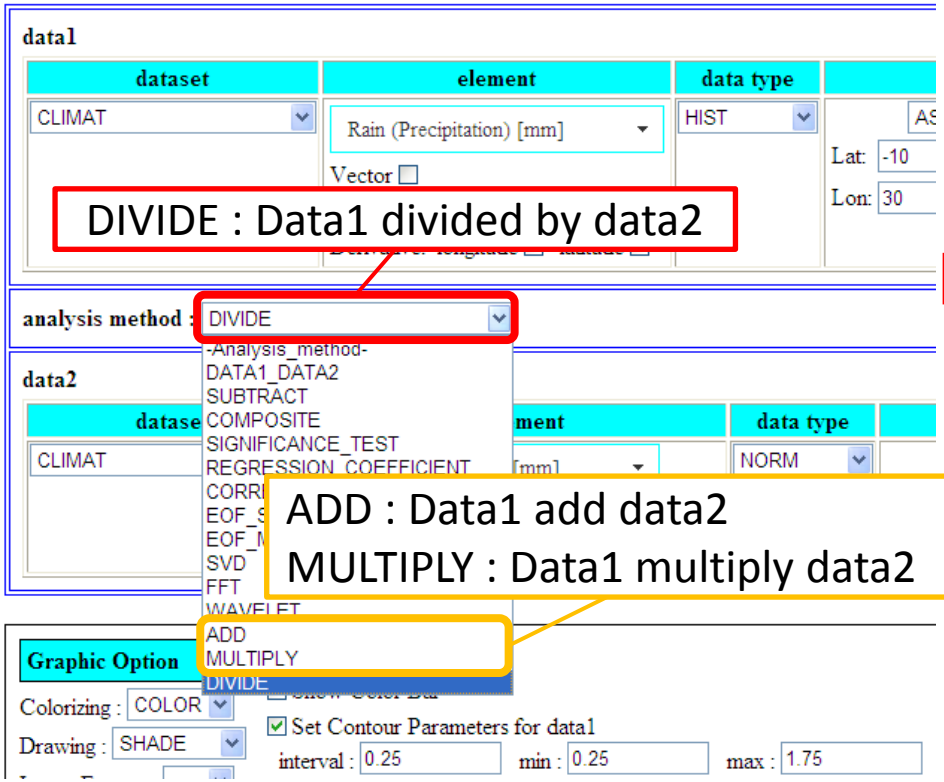
9. Finally, click the “Submit” button and the image will be displayed.

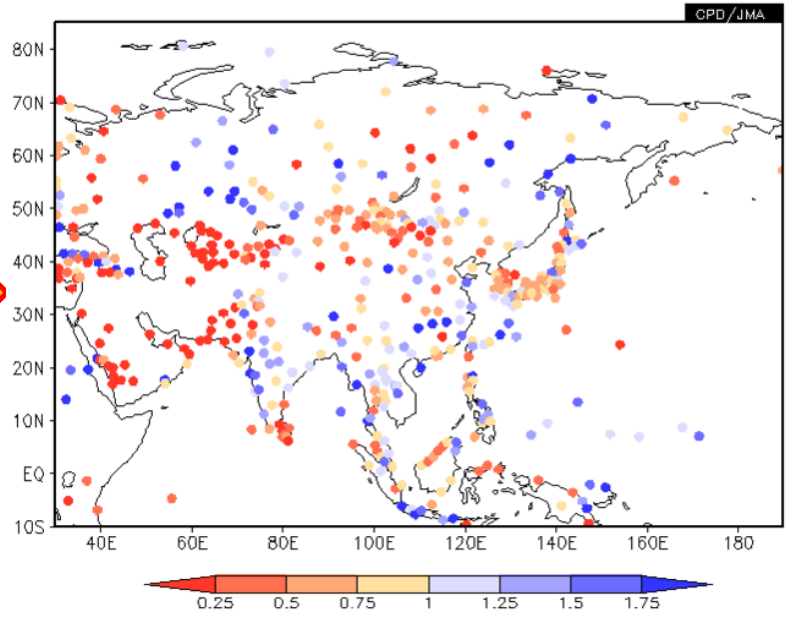
Working for multiple data

- Use the “DATA1_DATA2” option to overlay two kinds of items on one map at the same time.
  - Contours are overlaid on a shaded map.
- Use the “SUBTRACT” option to map the difference of two data.
  - This function is used to show time variation or the difference between two levels.
- Use the “COMPOSITE” option to create a composite map based on a set condition.
  - This function is used to pick out the character of the focused event.

ADD, MULTIPLY and DIVIDE function

- "ADD", "MULTIPLY" and "DIVIDE" functions are used to do simple calculation for two items of data.
- For example, precipitation ratio can be mapped by CLIMAT data and "DIVIDE" function.
  - By "DIVIDE" function, the value of data1 divided by data2 are mapped.





Precipitation ratios which actual data divided by normal data are calculated by CLIMAT messages in July 2014.

Advanced operations

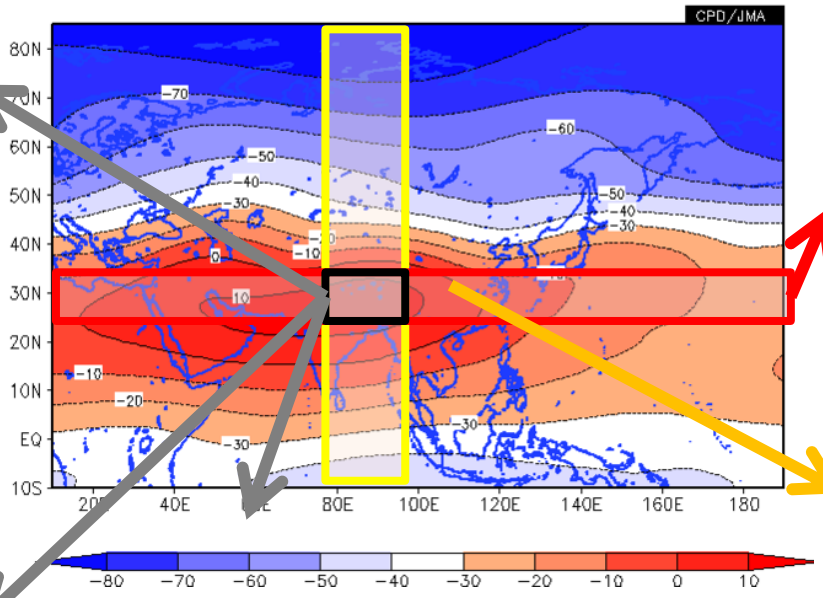
- Many types of charts can be created by the basic.
- You can create not only simple 2D maps, but also various types of maps, graphs and diagrams as follows.
  - Line graph
    - Time, vertical, longitude and latitude profile.
  - Cross section diagram
    - Time-spatial, height-longitude and height-latitude diagram.

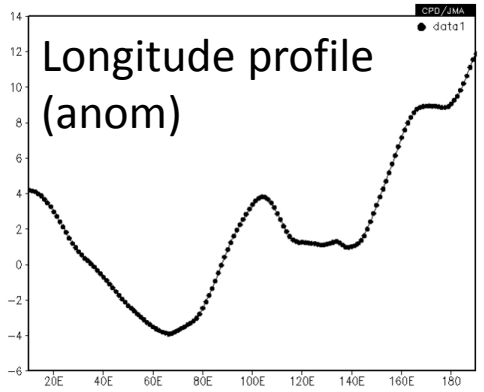
Line graph

- Time series graph is used to understand time development simply.
- Vertical, latitude and longitude profile is used to understand spatial structure simply.

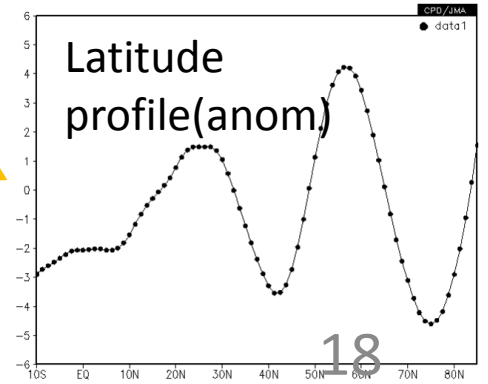
Daily time series(hist)

200hPa stream function anomalies in Aug 2014.

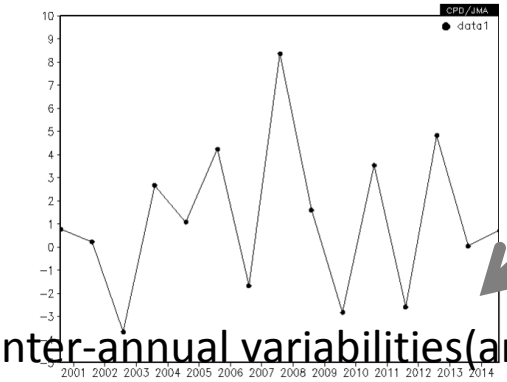




Longitude profile (anom)



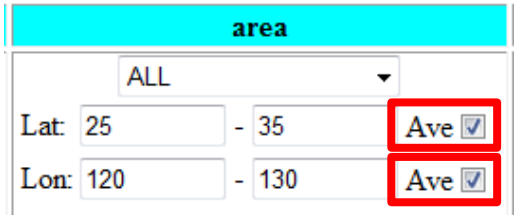
Latitude profile(anom)



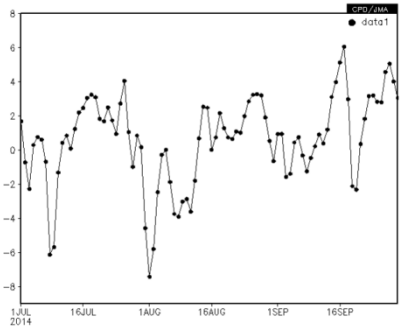
Inter-annual variabilities(anom)

Time series graph

- Annual, monthly, pentad day or daily time series
  - Set the area as 1D variable, and select a consecutive style option (listed as “ALL CAPS”) in “average period”.
  - You can see the time development of the element.
- Inter-annual time series
  - Set the area as 1D variable by checking “Ave” boxes, and select a repeated style option (listed as “year average xxx”) in “average period”.
  - You can see the annual trend and compare the focused year with the other years.



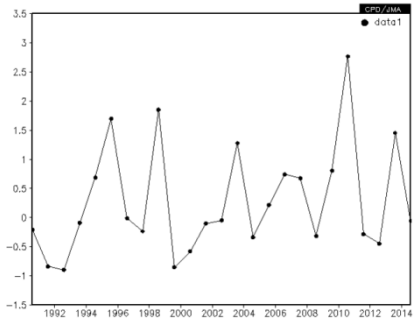
Lat/longitude is averaged and converted to 1D value by “Ave”.



Daily time series of 500hPa height normalized anomaly averaged over the area (25N - 35N, 120E - 130E) from July to September in 2014.

Daily time series

The positive anomaly has continued except for April and there are short cycle variations.



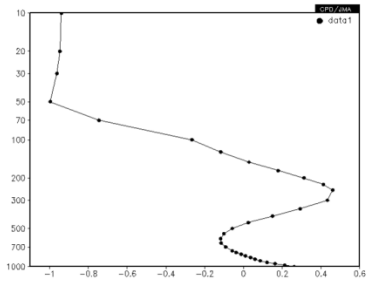
Inter-annual time series of 500hPa height normalized anomaly averaged over the area (25N-35N, 120E - 130E) in August from 1990 to 2014.

Inter-annual time series

2014 is almost normal.

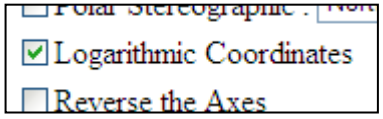
Vertical and lat/longitude profile

- Vertical profile
  - Set the area as 1D variable, and select bottom and top level.
    - Using “Logarithmic Coordinates” option is recommended.
  - You can see vertical structure of the focused event.
- Latitude profile and longitude profile
  - Check either longitude’s “Ave” box or latitude’s “Ave” box and select a specific level.
  - You can see the meridional or zonal structure of the element.

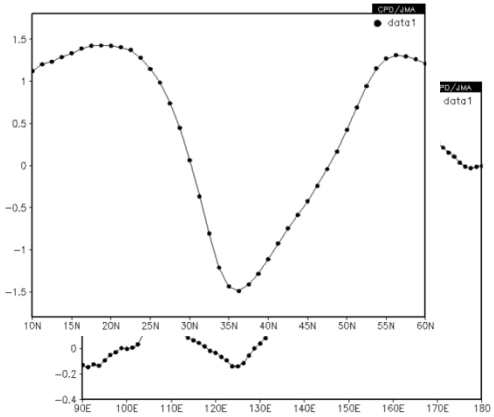


<u>Vertical profile</u>
The positive anomaly is dominated at the middle and upper troposhere.

Height normalized anomaly averaged over the area (25N-35N, 120E-130E) in August 2014.



“Logarithmic Coordinates” option is recommended.

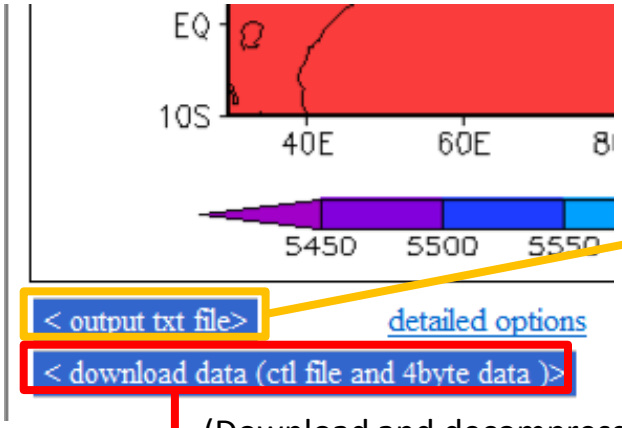


<u>Lat/longitude profile</u>
The high pressure is mainly predominant around 30N.

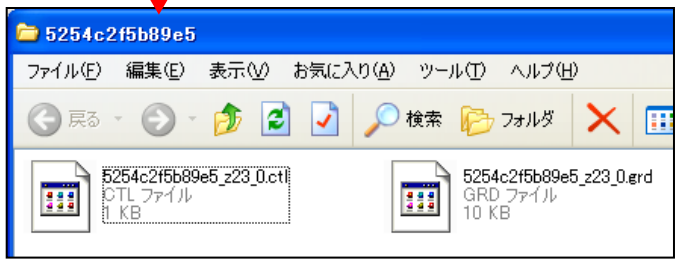
500hPa height normalized anomaly in August 2014.
(Upper) Latitude profile averaged from 120E to 130E.
(Lower) Longitude profile averaged from 25N to 35N.

Data download

- Users can download the data used to create a map.
- A plain text file and GrADS format files (control file and data file) are available.



(Download and decompress)




```
data_set : JRA-55
element : z37
dset work/5474474999e0e_z37_0.grd
title
undef 9.999e+20
xdef 129 linear 30 1.25
ydef 77 linear -10 1.25
zdef 1 linear 500 1
tdef 1 linear 00Z01JUL2014 1mo
vars 1
z37  1  99  &#947; (Geopotential Height) [gpm]
endvars

Default file number is: 1
X is varying   Lon = 30 to 190   X = 1 to 129
Y is varying   Lat = -10 to 85   Y = 1 to 77
Z is fixed     Lev = 500  Z = 1
T is fixed     Time = 00Z01JUL2014  T = 1
E is fixed     Ens = 1  E = 1

ni = 129 nj = 77 nk = 1 nt = 1
5882.167969 5881.230469 5880.917969 5879.667969 5879.355469 5878.417969
5880.292969 5880.292969 5879.355469 5878.417969 5878.417969 5876.855469
5879.355469 5878.730469 5877.792969 5877.792969 5876.855469 5876.230469
5877.792969 5877.167969 5876.855469 5876.855469 5875.917969 5875.292969
5876.855469 5876.230469 5876.230469 5875.917969 5875.292969 5874.667969
5876.230469 5875.917969 5875.917969 5875.292969 5875.292969 5874.667969
```

The plain text data are shown.
In addition to the data, map information such as area and elements are written following GrADS control file format.

A zip format compression file is downloaded.
A GrADS fomat data file and a control file are included in the zip file.

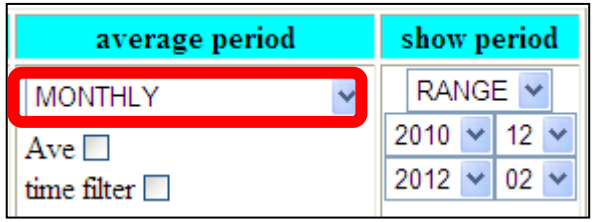
(GrADS official website; http://grads.iges.org/grads/head.html)
(GrADS tutorial on TCC; http://ds.data.jma.go.jp/tcc/tcc/products/model/tips/tutorial.html)

[Tips] Average period (1)

- There are two styles for range selection in “average period”.

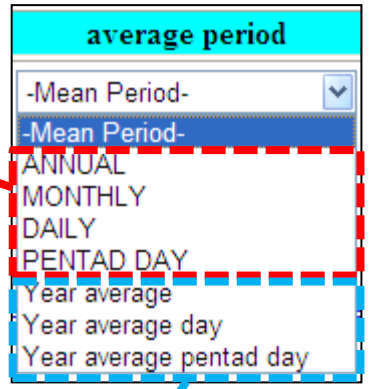
< Consecutive style (listed as “ALL CAPS”) >

– Use this style to select a **consecutive** period:
ANNUAL, MONTHLY, DAILY and PENTAD DAY



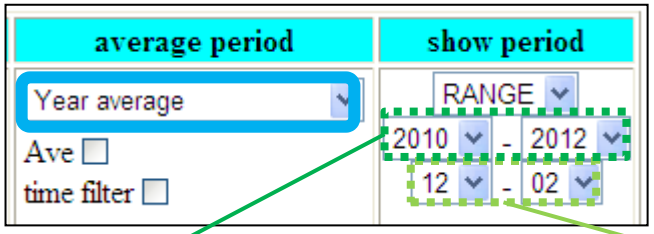
<Calendar>
2010 : J F M A M J J A S O N D
2011 : J F M A M J J A S O N D
2012 : J F M A M J J A S O N D

Red framed months (15months) are selected.



< Repeated style (listed as “Year average *xxx*”) >

– Use this style to select a specific period to be **repeated** each year:
Year average, Year average day and Year average pentad day



<Calendar> (*italic type means next year*)
2010 : J F M A M J J A S O N D *J F*
2011 : J F M A M J J A S O N D *J F*
2012 : J F M A M J J A S O N D *J F*

Blue framed DJFs (3DJFs) are selected.

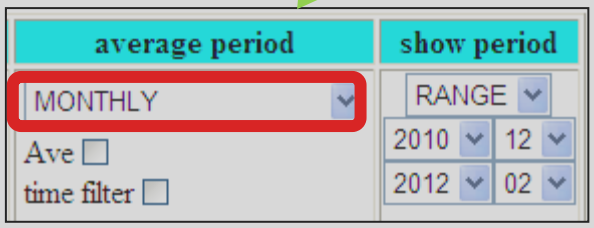
Set **target years**. Enter start and end point of your range.

Set **target period**. The period input here is always averaged for each year. The **start point** of it corresponds to the **target year**.

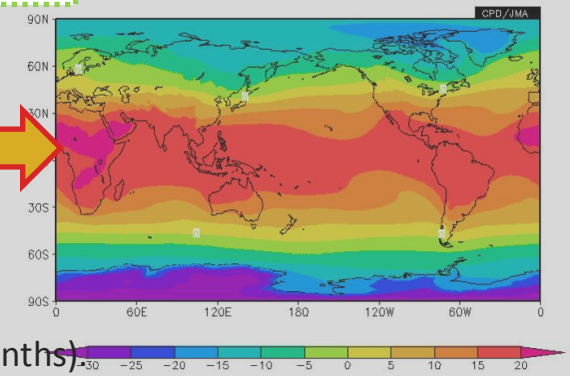
[Tips] Average period (2)

- For example, the repeated style must be used to create a map focusing a specific season of multiple years.
  - Additionally, take care not to confuse the relation between the target years and target period.

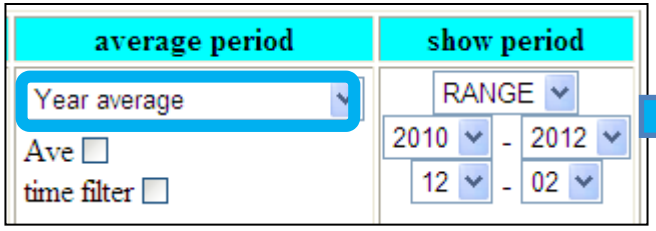
Seasonal average of multiple years cannot be mapped by this setting.



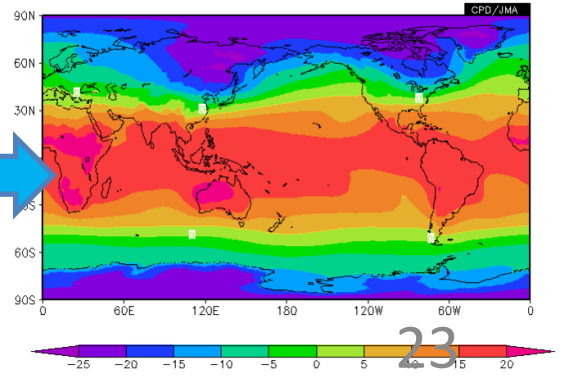
<Calendar>
2010 : J F M A M J J A S O N D
2011 : J F M A M J J A S O N D
2012 : J F M A M J J A S O N D



Temperature at 850hPa averaged from December 2010 to February 2012 (15months).



<Calendar> (*italic type means next year*)
2010 : J F M A M J J A S O N D *J F*
2011 : J F M A M J J A S O N D *J F*
2012 : J F M A M J J A S O N D *J F*



Temperature at 850hPa averaged of DJF from 2010 to 2012 (3DJFs).