

# ITACS

Climate Prediction Division, JMA

# menu

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# What's ITACS

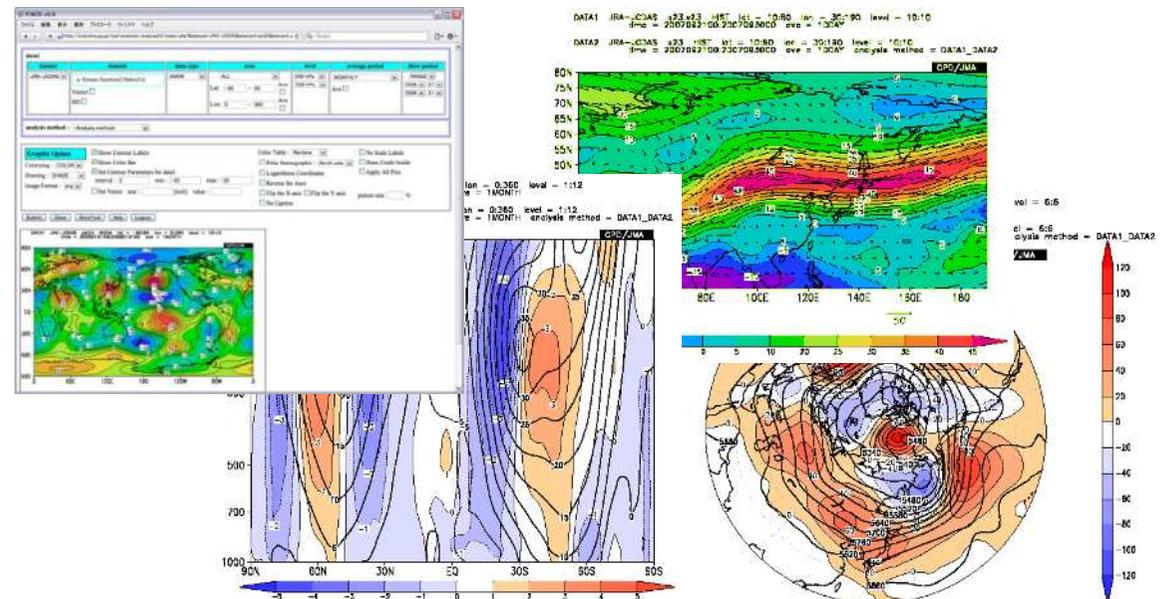
ITACS is the Interactive Tool for Analysis of Climate System since 2007.

Aim:

Analyzing the causes of climate events and monitoring current climate status.

System:

Web interface + programs(Ruby, Gphys...) + GrADS + data files on the web server



# data

- CLIMAT
  - Monthly world climate data derived from CLIMAT messages via the GTS line from WMO Members around the world.
- INDEX
  - El Nino Monitoring Indices consisting of monthly mean Sea Surface Temperature produced by COBE-SST.
- JRA-JCDAS
  - Atmospheric circulation data produced by JMA's Climate Data Assimilation System (JCDAS), which is consistent quality with Japanese 25-year reanalysis (JRA-25).
- MOVE-G
  - Oceanic assimilation produced by the system operated by JMA.
- SAT
  - Outgoing Longwave Radiation (OLR), which is derived from observations by NOAA's polar orbital satellites, and provided by Climate Prediction Center (CPC) in the National Centers for Environmental Prediction (NCEP) of the National Oceanic and Atmospheric Administration (NOAA).
- SST
  - Sea Surface Temperature produced by the system operated by JMA (COBE-SST).

# Application to use

The screenshot shows the Tokyo Climate Center (WMO Regional Climate Center) homepage. The page is organized into several sections:

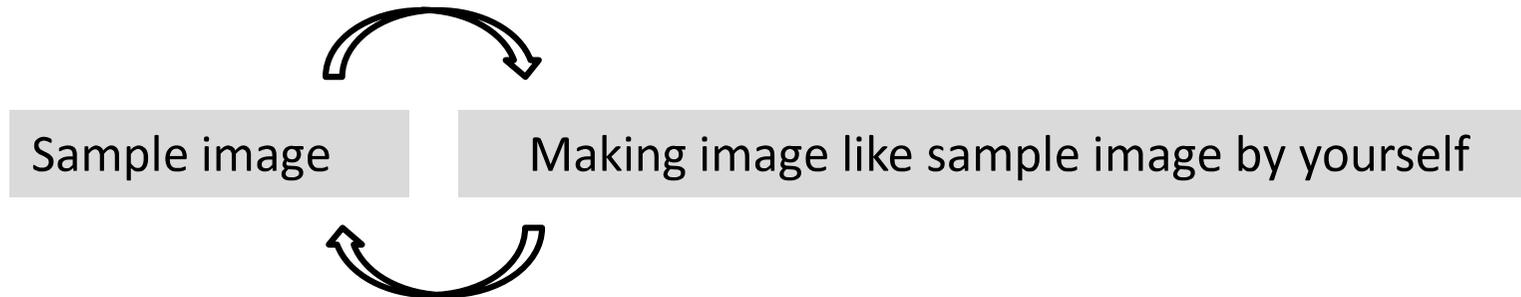
- Header:** Japan Meteorological Agency logo and the title "Tokyo Climate Center (WMO Regional Climate Center)".
- Navigation:** A menu bar with links: Home, World Climate, Climate System Monitoring, El Niño Monitoring, NWP Model Prediction, Global Warming, Climate in Japan, Training Module, and Press release.
- HOME:** A sub-section header.
- RCC Functions and Main Products:** A list of services including Operational Activities for LRF, Climate Monitoring, and Training.
- What's New:** A list of recent updates, including "New Release: Monthly Highlights on Climate System (July 2011)", "Updated Information: Global Average Surface Temperature Anomalies", and "Updated Information: World Climate - Monthly Report (July 2011)".
- Links:** A list of external links, including "RA II Regional Climate Center (RCC) Network Homepage", "WMO DDB", and "Tropical Cyclone Advisory : Tokyo Typhoon Center".
- Highlighted Banner:** A red box highlights a banner for "Introduction to ITACS Interactive Tool for Analysis of the Climate System".

There is banner link about application to use ITACS in the TCC homepage:

<http://ds.data.jma.go.jp/tcc/tcc/index.html>

# Exercise

Now, let's access and use ITACS. Using it will help you to understand ITACS.



↓ If we have enough time after every exercises...

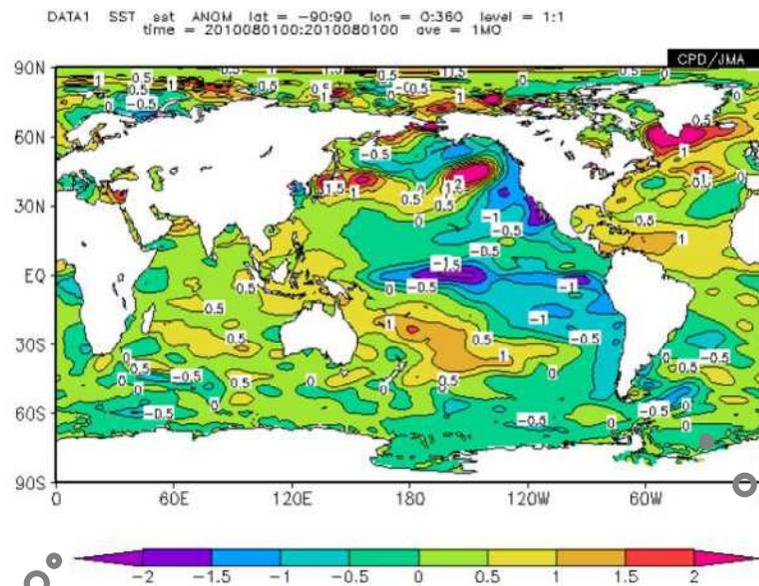
Let's try to change sample image as you like (self study)

Let's start exercise. Please access to following site:

<http://extreme.kishou.go.jp/tool/itacs-tcc2011/>

# Appendix) Self study

Let's try to draw maps as you like if you know basic use of ITACS.  
For example, you can make a map around your country...

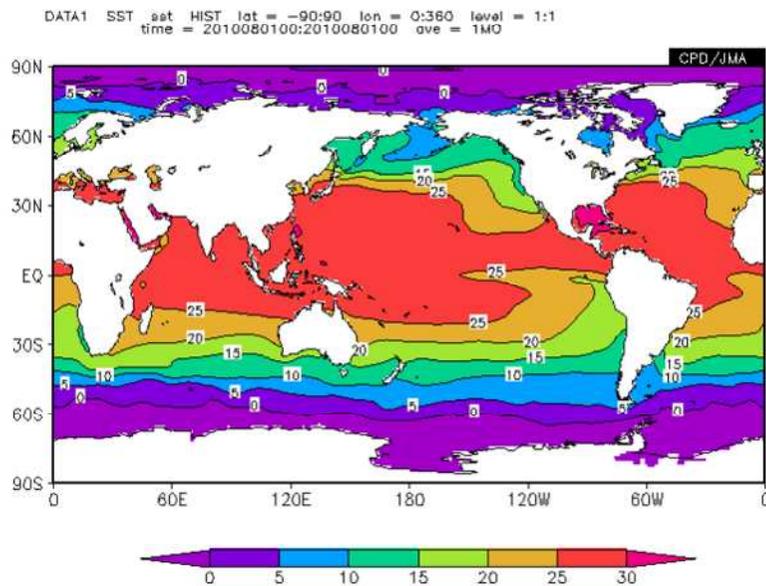


Season  
Summer or winter

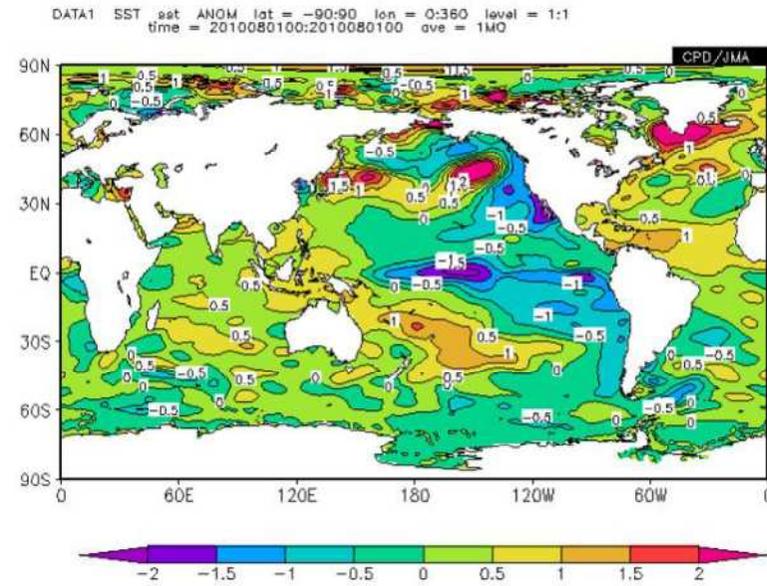
area



# Sea surface temperature(SST)



Sea Surface Temperature in August 2010



Sea Surface Temperature anomaly in August 2010

This is tutorial for making a map of Sea Surface Temperature(SST) and its anomaly. Let's know basic use of ITACS.

ITACSの基本的な使用方法を、SSTの実況値及び平年偏差の描画、カラーバーの変更方法などを通じて、学びます。

# Sea surface temperature(SST)

dataset	element	data type	area	level	average period	show period
-Dataset- <input type="button" value="v"/>	element Vector <input type="checkbox"/> SD <input type="checkbox"/>	-Data_type- <input type="button" value="v"/>	-Area- <input type="button" value="v"/>	1000hPa <input type="button" value="v"/> 1000hPa <input type="button" value="v"/>	-Mean Period- <input type="button" value="v"/> Ave <input type="checkbox"/> time filter <input type="checkbox"/>	RANGE <input type="button" value="v"/> 1900 <input type="button" value="v"/> 1900 <input type="button" value="v"/>

analysis method : -Analysis\_method-

Graphic Option			
Colorizing : COLOR <input type="button" value="v"/>	<input checked="" type="checkbox"/> Show Contour Labels	Color Table : Rainbow <input type="button" value="v"/>	<input type="checkbox"/> No Scale Labels
Drawing : SHADE <input type="button" value="v"/>	<input checked="" type="checkbox"/> Show Color Bar	<input type="checkbox"/> Polar Stereographic : North pole <input type="button" value="v"/>	<input type="checkbox"/> Draw Credit Inside
Image Format : png <input type="button" value="v"/>	<input type="checkbox"/> Set Contour Parameters for data1	<input type="checkbox"/> Logarithmic Coordinates	<input type="checkbox"/> Apply All Pics
Font : default <input type="button" value="v"/>	interval : <input type="text"/> min : <input type="text"/> max : <input type="text"/>	<input type="checkbox"/> Reverse the Axes	picture size <input type="text"/> %
	<input type="checkbox"/> Set Vector size : <input type="text"/> [inch] value : <input type="text"/>	<input type="checkbox"/> Flip the X-axis <input type="checkbox"/> Flip the Y-axis	
		<input type="checkbox"/> No Caption	

Submit Clear SliceTool Help Logout

This is default screen of ITACS. Click “Clear” button if you need default screen.  
“Help” button gives you help page.

# Sea surface temperature(SST)

data1							
dataset	element	data type	area	level		average period	show period
SST	element Sea Surface Data	-Data_type-	-Area-	1000hPa	1000hPa	-Mean Period- Ave <input type="checkbox"/> time filter <input type="checkbox"/>	RANGE 1900 1900

analysis method : -Analysis\_method-

---

Graphic Option	
Colorizing : COLOR	<input checked="" type="checkbox"/> Show Contour Labels
Drawing : SHADE	<input checked="" type="checkbox"/> Show Color Bar
Image Format : png	<input type="checkbox"/> Set Contour Parameters for data1
Font : default	interval : <input type="text"/> min : <input type="text"/> max : <input type="text"/>
	<input type="checkbox"/> Set Vector size : <input type="text"/> [inch] value : <input type="text"/>
	Color Table : Rainbow
	<input type="checkbox"/> Polar Stereographic : North pole
	<input type="checkbox"/> Logarithmic Coordinates
	<input type="checkbox"/> Reverse the Axes
	<input type="checkbox"/> Flip the X-axis <input type="checkbox"/> Flip the Y-axis
	<input type="checkbox"/> No Caption
	<input type="checkbox"/> No Scale Labels
	<input type="checkbox"/> Draw Credit Inside
	<input type="checkbox"/> Apply All Pics
	picture size <input type="text"/> %

Submit Clear SliceTool Help Logout

First, select “dataset” - “SST” and its “element” - “Temperature”.

# Sea surface temperature(SST)

data1

dataset	element	data type	area	level	average period	show period
SST	Temperature (SST) [C.Deg.] Vector <input type="checkbox"/> SD <input type="checkbox"/>	HIST -Data type- HIST NORM ANOM ANOM_SD	-Area-	1000hPa 1000hPa	-Mean Period- Ave <input type="checkbox"/> time filter <input type="checkbox"/>	RANGE 1900 1900

analysis method : -Analysis\_method-

**Graphic Option**

Colorizing : COLOR  
Drawing : SHADE  
Image Format : png  
Font : default

Show Contour Labels  
 Show Color Bar  
 Set Contour P interval :  
 Set Vector s

Color Table : Rainbow  
 Polar Stereographic : North pole  
 No Scale Labels  
 Draw Credit Inside

Submit Clear SliceTool Help Logo

HIST: analyzed or observed data  
NORM: climatic normal data  
ANOM: anomaly data  
ANOM\_SD: anomaly data normalized by their standard deviations

Note:  
"HIST" minus "NORM" is "ANOM"  
"ANOM" divided by  $\sigma$  is "ANOM\_SD"

Secondly, select "data type" - "HIST"(historical data).  
Please note there are some data type.

# Sea surface temperature(SST)

dataset	element	data type	area	level	average period	show period
SST	Temperature (SST) [C.Deg.]	HIST	ALL	1000hPa	MONTHLY	RANGE
	Vector <input type="checkbox"/> SD <input type="checkbox"/>		Lat: -90 - 90 Ave <input type="checkbox"/> Lon: 0 - 360 Ave <input type="checkbox"/>	1000hPa	Ave <input type="checkbox"/> time filter <input type="checkbox"/>	2010 08 2010 08

analysis method : -Analysis\_method-

Graphic Option		Color Table :			
<input checked="" type="checkbox"/> Show Contour Labels		Rainbow		<input type="checkbox"/> No Scale Labels	
<input checked="" type="checkbox"/> Show Color Bar		<input type="checkbox"/> Polar Stereographic :	North pole	<input type="checkbox"/> Draw Credit Inside	
<input type="checkbox"/> Set Contour Parameters for data1		<input type="checkbox"/> Logarithmic Coordinates		<input type="checkbox"/> Apply All Pics	

Coloring : COLOR  
Drawing : SHADE  
Image F  
Font : d

Submit

Most datasets have temporal mean resolution of "Annual", "Monthly", "Pentad day" and "Daily".

"Year average" means "Year average monthly" (For example, for showing values for DJF1979, DJF1980, DJF1981...,)

Next, select "area", "average period" and "show period".

# Sea surface temperature(SST)

**Graphic Option**

Colorizing : COLOR  
Drawing : SHADE  
Image Format : png  
Font : default

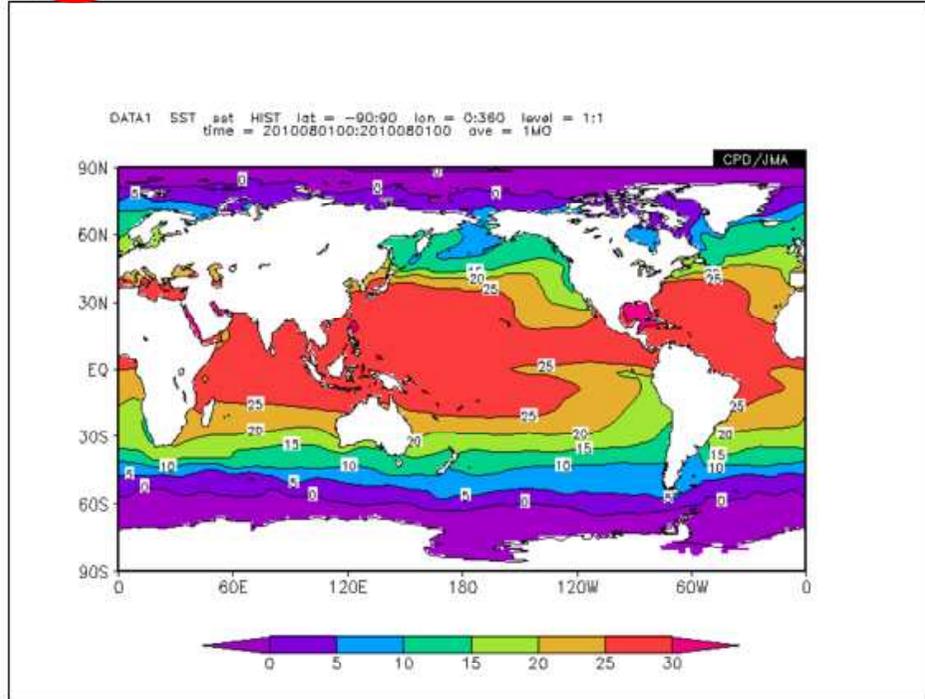
Show Contour Labels  
 Show Color Bar  
 Set Contour Parameters for data1  
interval :      min :      max :  
 Set Vector size :      [inch] value :

Color Table : Rainbow  
 Polar Stereographic : North pole  
 Logarithmic Coordinates  
 Reverse the Axes  
 Flip the X-axis  
 Flip the Y-axis  
 No Scale Labels  
 Draw Credit Inside  
 Apply All Pics

picture size 70 %

**Submit** Clear SliceTool Help Logout

Left click



Finally, click “Submit” button. A map of Sea Surface Temperature(SST) will be made.

# Sea surface temperature(SST) anomaly

dataset	element	data type	area	level	average period	show period
SST	Temperature (SST) [C.Deg.]	ANOM	ALL	1000hPa	MONTHLY	RANGE
	Vector <input type="checkbox"/>		Lat: -90 - 90 Ave <input type="checkbox"/>	1000hPa	Ave <input type="checkbox"/>	2010 08
	SD <input type="checkbox"/>		Top: 0 360 Ave <input type="checkbox"/>		time filter <input type="checkbox"/>	2010 08

analysis method : -Analysis\_method-

Change data type

**Graphic Option**

Colorizing : COLOR  
Drawing : SHADE  
Image Format : png  
Font : default

Show Contour Labels  
 Show Color Bar  
 Set Contour Parameters for data1  
interval : min :  
 Set Vector size :

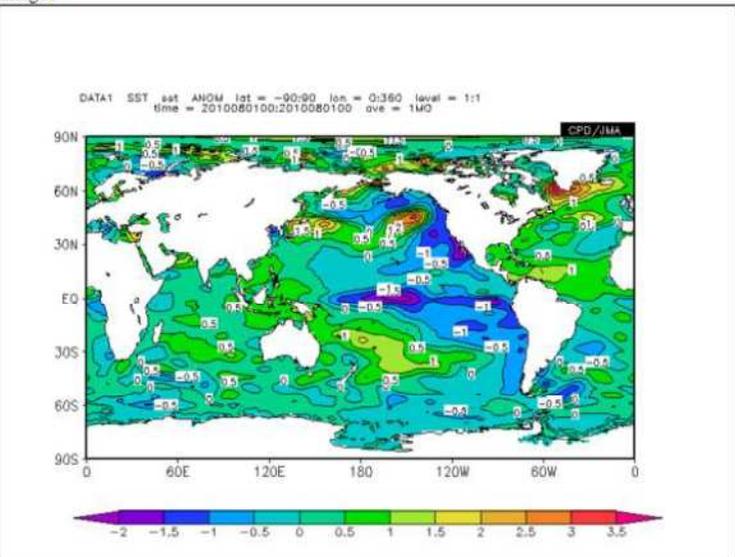
Color Table : Rainbow  
 Polar Stereographic : North pole

No Scale Labels  
 Draw Credit Inside  
 Apply All Pics

picture size 70 %

Submit Clean SliceTool Help Logout

Image1



Let's change "data type" – "ANOM" to make map of SST anomaly and click "Submit".

# Sea surface temperature(SST) anomaly

data1

dataset	element	data type	area	level	average period	show period
SST	Temperature (SST) [C.Deg.]	ANOM	ALL Lat: -90 - 90 Ave <input type="checkbox"/> Lon: 0 - 360 Ave <input type="checkbox"/>	1000hPa 1000hPa	MONTHLY Ave <input type="checkbox"/> time filter <input type="checkbox"/>	RANGE 2010 08 2010 08

analysis method : -Analysis\_method-

**Graphic Option**

- Show Contour Labels
- Show Color Bar
- Set Contour Parameters for data1
  - interval : 0.5
  - min : -2
  - max : 2
- Set Vector size : [inch] value :

Colorizing : COLOR  
Drawing : SHADE  
Image Format : png  
Font : default

Submit Clear SliceTool Help Logout

Image1

DATA1 SST\_sst ANOM lat = -90:90 lon = 0:360 level = 1:1  
time = 2010080100:2010080100 ave = 1MO

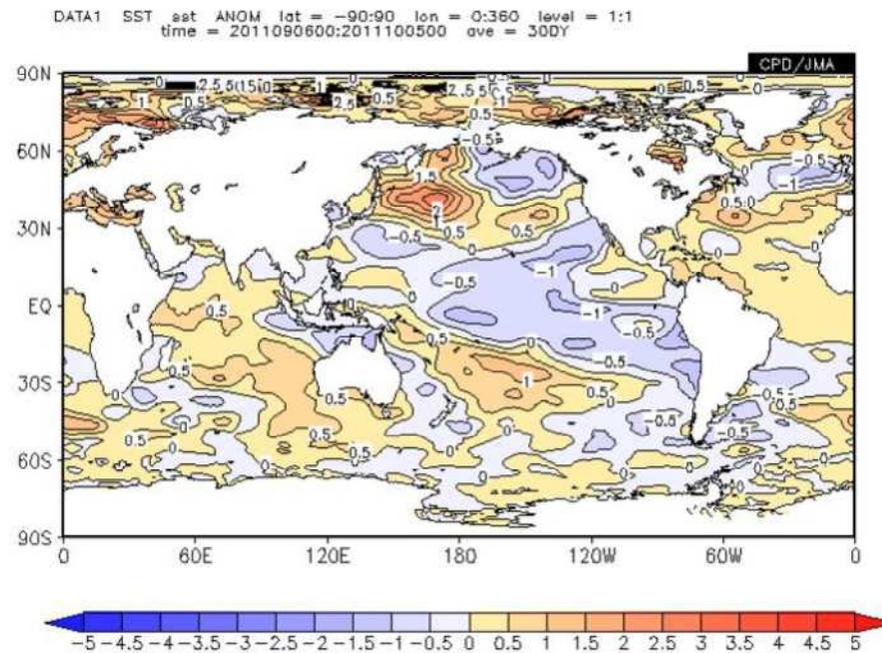
CPD/JMA

color bar

Left click

If you want to change the range of colors in the color bar, please use “Graphic Options”. Check “Set Contour Parameters for data1” and input parameters for interval, min and max of values.

# Average of SST anomaly



Average of SST anomaly between 6 September and 5 October

Let's know how to figure out the average of daily data.

日別値の平均を描画する方法を学びます。

# Average of SST anomaly

data1

dataset	element	data type	area	level	average period	show period
SST	Temperature (SST) [C.Deg.] Vector <input type="checkbox"/> SD <input type="checkbox"/>	ANOM	ALL Lat: -90 - 90 Ave <input type="checkbox"/> Lon: 0 - 360 Ave <input type="checkbox"/>	1000hPa 1000hPa	-Mean Period- Ave <input type="checkbox"/> time filter <input type="checkbox"/>	RANGE 1900 1900

analysis method : -Analysis\_method-

First, select “dataset” - “SST” and its “element” - “Temperature”.  
And, select “data type” - “ANOM”(anomaly data) and “area” – “ALL”.

# Average of SST anomaly

	data type	area	level	average period	show period
Deg.]	ANOM	ALL Lat: -90 - 90 Ave <input type="checkbox"/> Lon: 0 - 360 Ave <input type="checkbox"/>	1000hPa 1000hPa	DAILY Ave <input checked="" type="checkbox"/> time filter <input type="checkbox"/>	RANGE 2011 09 06 2011 10 05

Check

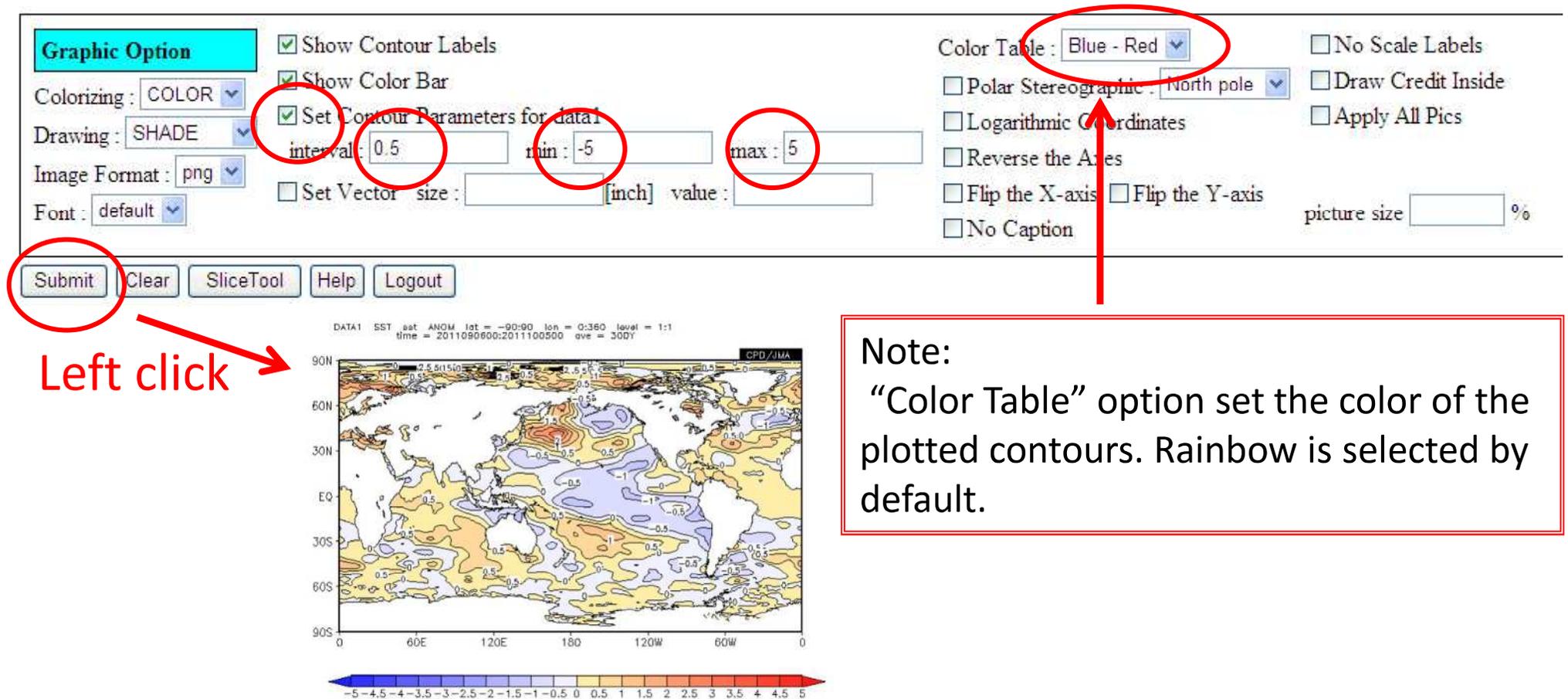
“Ave” gives average of data.

Note:

ITACS figures out the monthly data if you select “MONTHLY” in the “average period”.

Next, please select “average period” – “DAILY” and check “Ave” – “ON(checked)”.  
And, select “show period”(2011.09.06 – 2011.10.05).

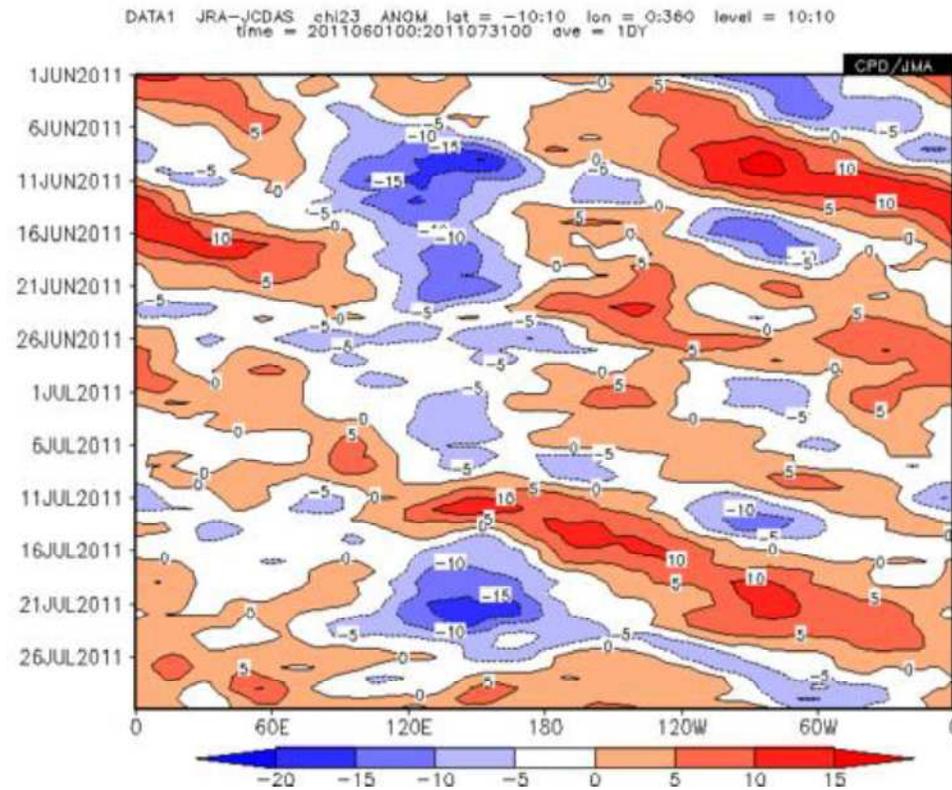
# Average of SST anomaly



Note:  
“Color Table” option set the color of the plotted contours. Rainbow is selected by default.

Finally, please select “Set Contour Parameters” of Graphic Option. Let’s change “Color Table” if you want to set the color of the plotted contours. And, click “Submit”.

# Time-longitude cross section of 200-hPa velocity potential



Time-longitude cross section of 200-hPa velocity potential

Let's know how to draw time-longitude cross section of data.

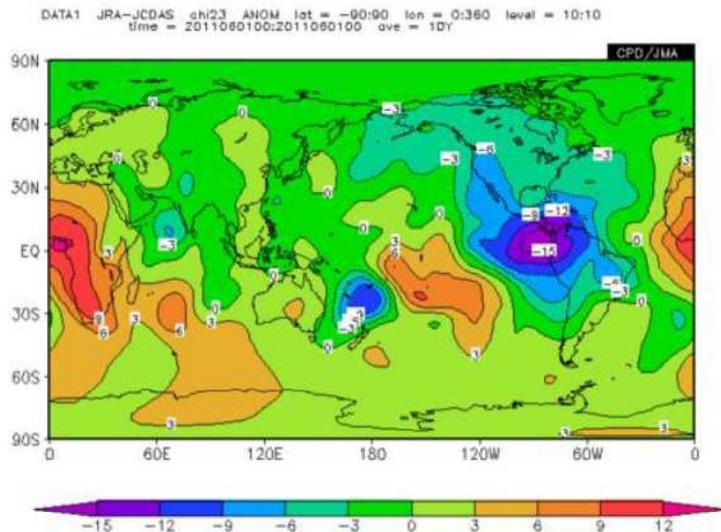
経度-時間断面図を描画する方法を学びます。

# Time-longitude cross section of 200-hPa velocity potential

data1

dataset	element	data type	area	level	average period	show period
JRA-JCDAS	X (Velocity Potential) [ $10^6\text{m}^2/\text{s}$ ] Vector <input type="checkbox"/> SD <input type="checkbox"/>	ANOM	ALL Lat: -90 - 90 Ave <input type="checkbox"/> Lon: 0 - 360 Ave <input type="checkbox"/>	200hPa 200hPa	DAILY Ave <input type="checkbox"/> time filter <input type="checkbox"/>	RANGE 2011 06 01 2011 06 01

analysis method : -Analysis\_method-



## **(data1)**

Dataset: JRA-JCDAS

Element: X (Velocity Potential)

Data type: ANOM

Area: ALL

Level:

200hPa

200hPa

Average period: DAILY

Show period: 2011.06.01

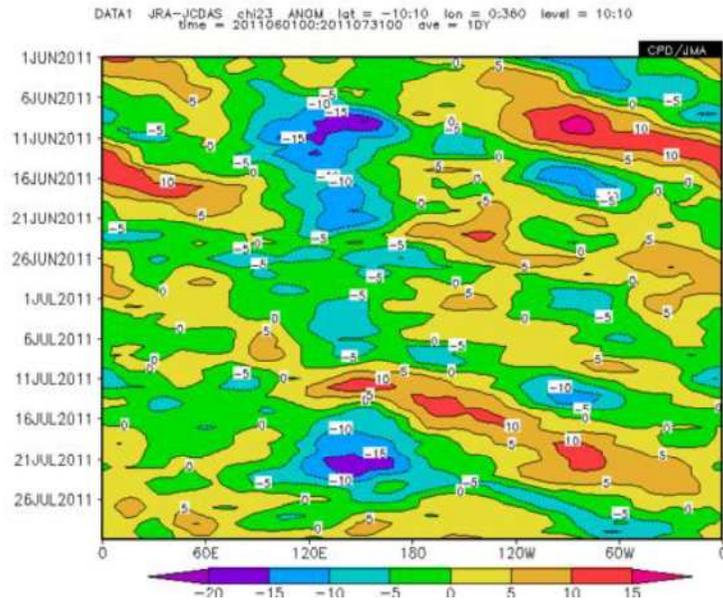
First, please make a map of 200-hPa velocity potential anomaly on 1st June 2011 as mentioned above.

# Time-longitude cross section of 200-hPa velocity potential

dataset	element	data type	area	level	average period	show period
JRA-JCDAS	X (Velocity Potential) [10 <sup>6</sup> m <sup>2</sup> /s]	ANOM	ALL Lat: -10 10 Ave <input checked="" type="checkbox"/> Lon: 0 -360 Ave <input type="checkbox"/>	200hPa 200hPa	DAILY Ave <input type="checkbox"/> time filter <input type="checkbox"/>	RANGE 2011 06 01 2011 07 31

analysis method : -Analysis\_method-

Check



In the case of drawing a time-longitude cross section diagram, check "Ave" box of latitude(Lat) off.

**(data1)**

Lat: "-10" – "10"

Show period: 2011.06.01 – 2011.07.31

Secondly, input latitude and check "Ave" box off. And select "show period".  
Could you draw a map like sample?

# Time-longitude cross section of 200-hPa velocity potential

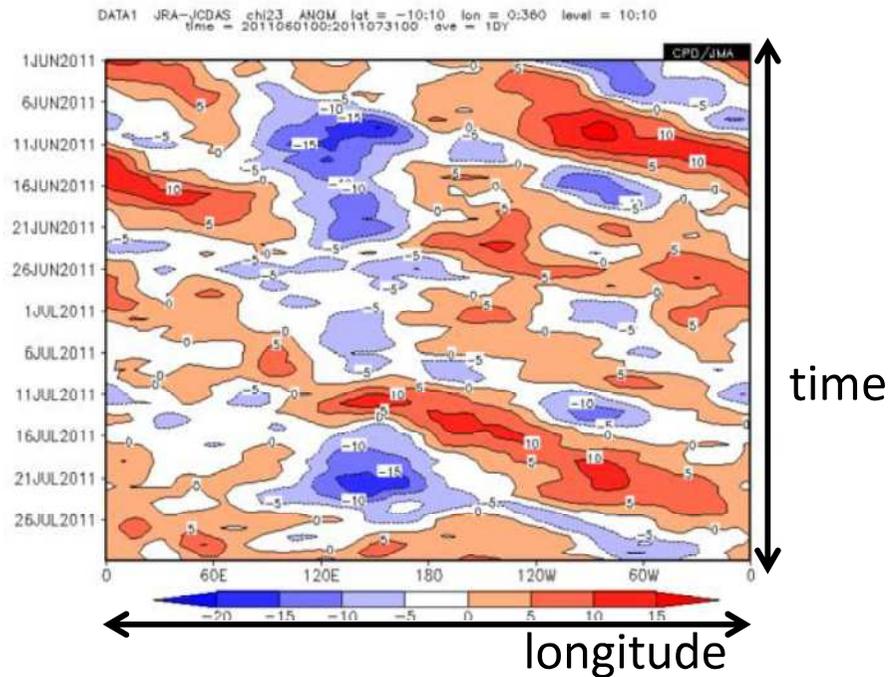
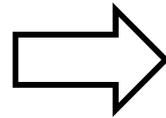
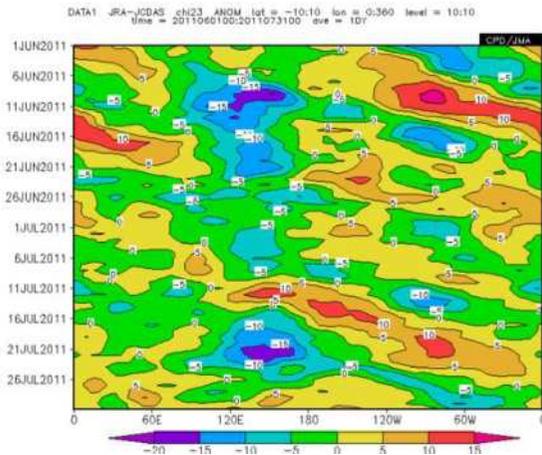
**Graphic Option**

Colorizing : COLOR  
Drawing : SHADE  
Image Format : png  
Font : default

Show Contour Labels  
 Show Color Bar  
 Set Contour Parameters for data1  
interval :      min :      max :  
 Set Vector size :      [inch] value :     

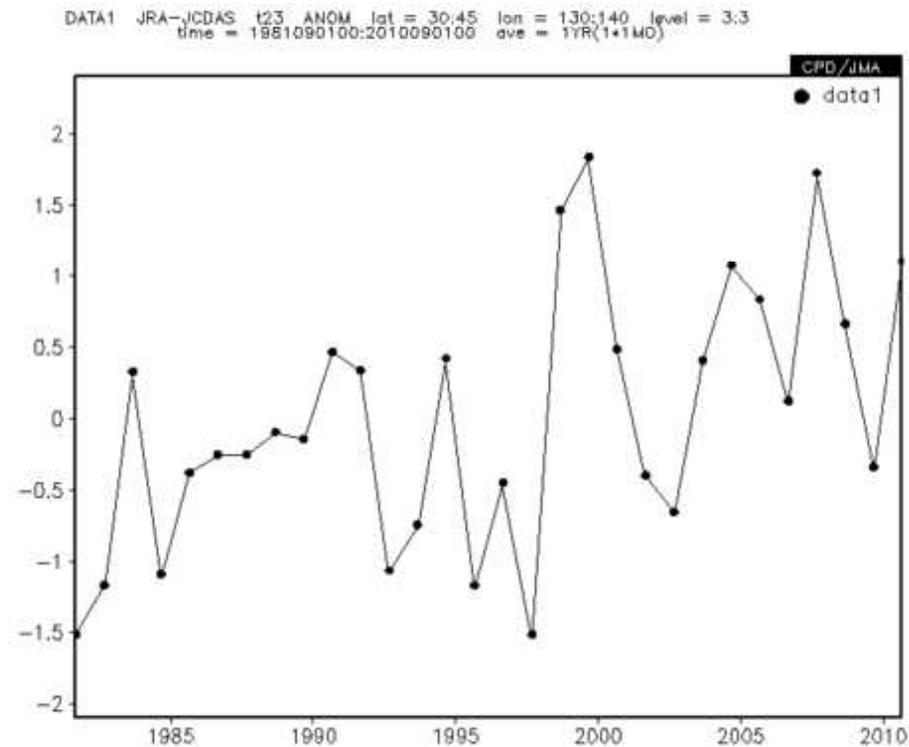
Color Table : Blue - Red  
 Polar Stereographic : North pole  
 Logarithmic Coordinates  
 Reverse the Axes  
 Flip the X-axis  Flip the Y-axis  
 No Scale Labels  
 Draw Credit Inside  
 Apply All Pics  
picture size 70 %

Submit Clear SliceTool Help Logout



Finally, let's select "Color Table" – "Blue - Red" and click "submit" button.

# Interannual variation of monthly mean 850-hPa air temperature



Interannual variation of monthly mean 850-hPa air temperature around Japan

Let's try to draw line graph.

折れ線グラフを描画する方法を学びます。

# Interannual variation of monthly mean 850-hPa air temperature

data1

dataset	element	data type	area	level	average period	show period
JRA-JCDAS	T (Temperature) [C.Deg]	ANOM	ALL	850hPa 850hPa	-Mean Period-	RANGE

analysis method : -Analysis\_method-

Dataset: JRA-JCDAS  
Element: T(Temperature)  
Data type: ANOM(anomaly data)  
Area: ALL  
Level: 850hPa / 850hPa

First, please set parameters as mentioned above.

# Interannual variation of monthly mean 850-hPa air temperature

data1

dataset	element	data type	area	level	average period	show period
JRA-JCDAS	T (Temperature) [C.Deg] Vector <input type="checkbox"/> SD <input type="checkbox"/>	ANOM	ALL Lat: 30 - 45 Ave <input checked="" type="checkbox"/> Lon: 130 - 140 Ave <input checked="" type="checkbox"/>	850hPa 850hPa	-Mean Period- Ave <input type="checkbox"/> time filter <input type="checkbox"/>	RANGE 1979 1979

analysis method : -Analysis\_method-

**Check**

Lat: "30"- "45" Ave: checked  
Lon: "130"- "140" Ave: checked

Checking both "AVE" box off gives average data of area.

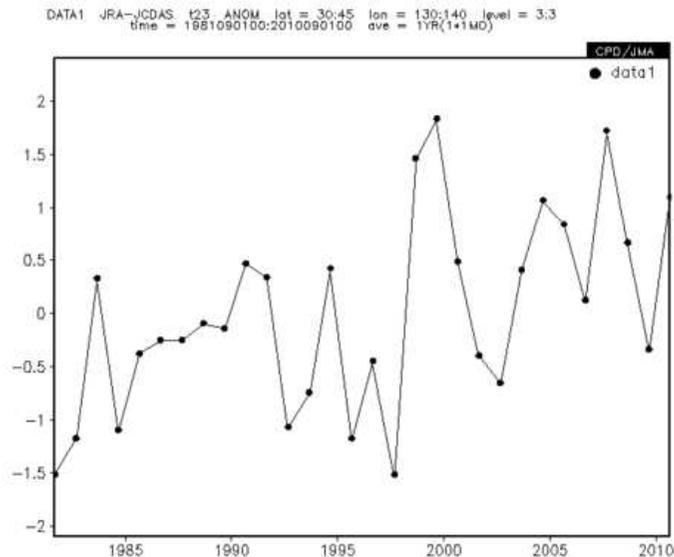
Secondly, input latitude and longitude. And check both "Ave" box off.

# Interannual variation of monthly mean 850-hPa air temperature

data1

dataset	element	data type	area	level	average period	show period
JRA-JCDAS	T (Temperature) [C.Deg] Vector <input type="checkbox"/> SD <input type="checkbox"/>	ANOM	ALL Lat: 30 - 45 Ave <input checked="" type="checkbox"/> Lon: 130 - 140 Ave <input checked="" type="checkbox"/>	850hPa 850hPa	Year average	RANGE 1981 - 2010 09 - 09

analysis method : -Analysis\_method-

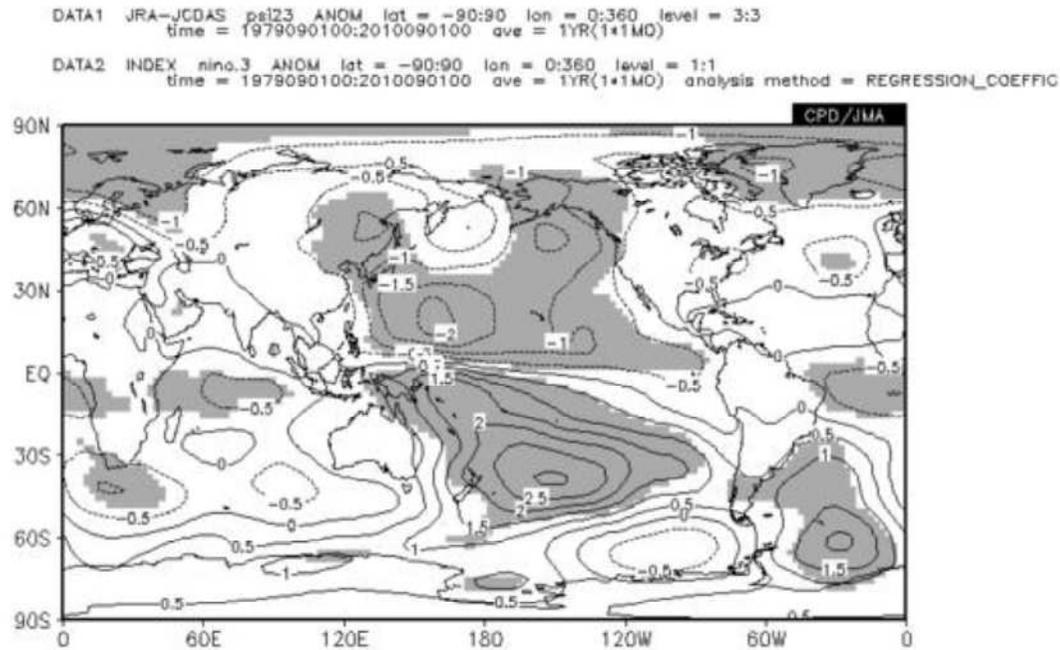


"Year average" means "Year average monthly".  
This example gives us temperature in September  
between 1981 and 2010.

Average period: "Year average"  
Show period:  
"1981" – "2010"  
"09" – "09"

Finally, select "average period" – "Year average" and "show period" as mentioned above. And let's click "Submit" button.

# Regression Analysis : NINO.3 SST and 850hPa Stream Function



## Regression Analysis : NINO.3 SST and 850hPa Stream Function

Let's know regression analysis. In shaded area of a map, stream function has a close connection with SST of NINO.3.

\*NINO.3: 5S-5N, 150-90W

NINO.3海域の海面水温と流線関数で回帰分析する方法を学びます。

# Regression Analysis : NINO.3 SST and 850hPa Stream Function

**data1**

dataset	element	data type	area	level	average period	show period
JRA-JCDAS	$\psi$ (Stream Function) [10 <sup>6</sup> m <sup>2</sup> /s] Vector <input type="checkbox"/> SD <input type="checkbox"/>	ANOM	ALL Lat: -90 - 90 Ave <input type="checkbox"/> Lon: 0 - 360 Ave <input type="checkbox"/>	850hPa 850hPa	Year average Ave <input type="checkbox"/> time filter <input type="checkbox"/>	RANGE 1979 - 2010 09 - 09

**analysis method :** REGRESSION\_COEFFICIENT

**data2**

dataset	element	data type	average period	lag	significance
INDEX	NINO.3 SD <input type="checkbox"/>	ANOM	Year average Ave <input type="checkbox"/> time filter <input type="checkbox"/>	0 YEAR	95%(two side)

(data1)

Dataset: JRA-JCDAS  
 Element:  $\Psi$ (Stream function)  
 Data type: ANOM(anomaly data)  
 Area: ALL  
 Level: 850hPa / 850hPa  
 average period: Year average  
 show period: 1979-2010 / 09-09

(analysis method)

REGRESSION\_COEFFICIENT

(data2)

Dataset: INDEX  
 Element: NINO.3  
 Data type: ANOM(anomaly data)  
 Significance: 95%

Let's try to set parameters as mentioned above and click submit button. A map like sample will be made.

Hint: (Graphic option) Drawing: CONTOUR

# Correlation Analysis

data1

dataset	element	data type	area	level	average period	show period
JRA-JCDAS	$\psi$ (Stream Function) [ $10^6 m^2/s$ ]	ANOM	ALL Lat: -90 - 90 Ave <input type="checkbox"/> Lon: 0 - 360 Ave <input type="checkbox"/>	850hPa 850hPa	Year average Ave <input type="checkbox"/> time filter <input type="checkbox"/>	RANGE 1979 - 2010 09 - 09

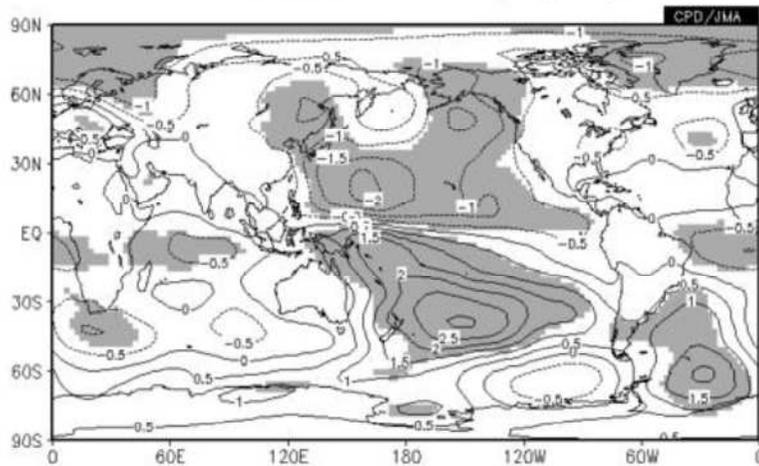
analysis method: CORRELATION\_COEFFICIENT

data2

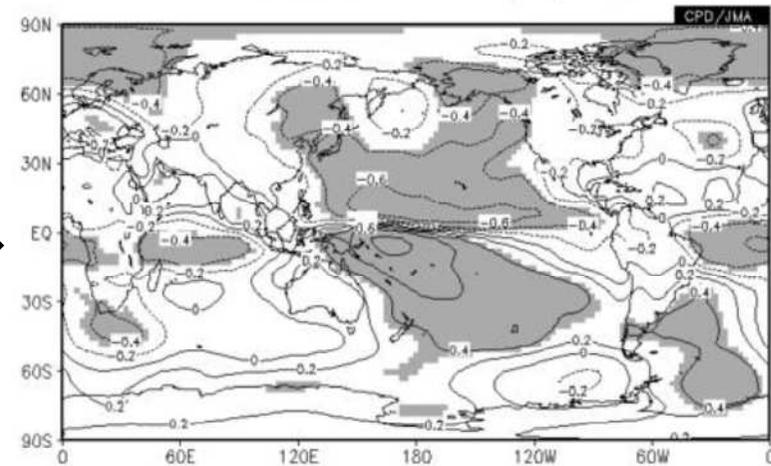
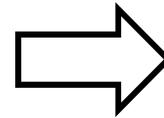
dataset	element	data type	average period	lag	significance
INDEX		ANOM	Year average	0 YEAR	95%(two side)

DATA1 JRA-JCDAS psi23 ANOM lat = -90:90 lon = 0:360 level = 3:3 time = 1979090100:2010090100 ave = 1YR(1+1MO)

DATA2 INDEX nino.3 ANOM lat = -90:90 lon = 0:360 level = 1:1 time = 1979090100:2010090100 ave = 1YR(1+1MO) analysis method = CORRELATION\_COEFFICIENT



Regression Analysis



Correlation Analysis

Next, let's try correlation analysis.

Please change "analysis method" – "CORRELATION..." and click "submit" button.

# Correlation and Regression

## Correlation

- The **strength** of the linear relationship between two variables
- Correlation coefficient must be between -1 and 1

## Regression

- The **slope** of the linear relationship between two variables

$r < 0$  : Negative correlation  
 $r = 0$  : No correlation  
 $r > 0$  : Positive correlation

Regression Coef.

$$y = a x + b + e$$

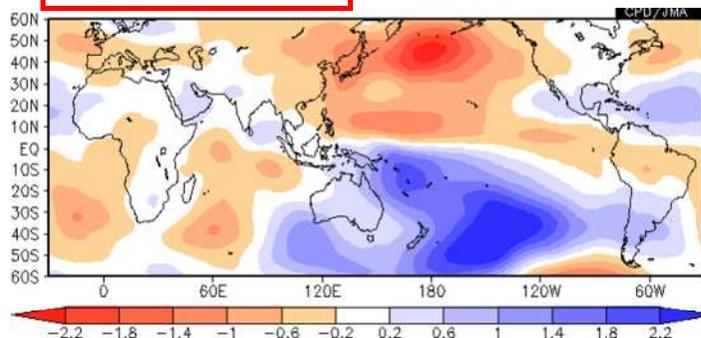
Residual

Intercept

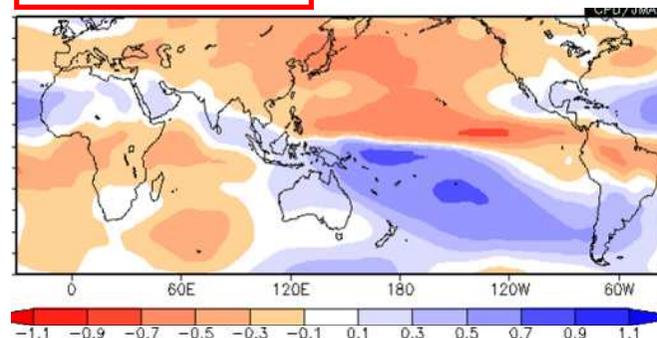
$y$ : Fields to be regressed e.g. Stream function  
 $x$ : Explanatory variable e.g. Nino3-SST

## Relationship between Nino-3 SST and Stream function (850hPa)

### Composite



### Correlation



### Regression

