

# Introduction and basic operation of iTacs

- iTacs: Interactive Tool for Analysis of Climate System -

Shoji Notsuhara

Tokyo Climate Center

Japan Meteorological Agency

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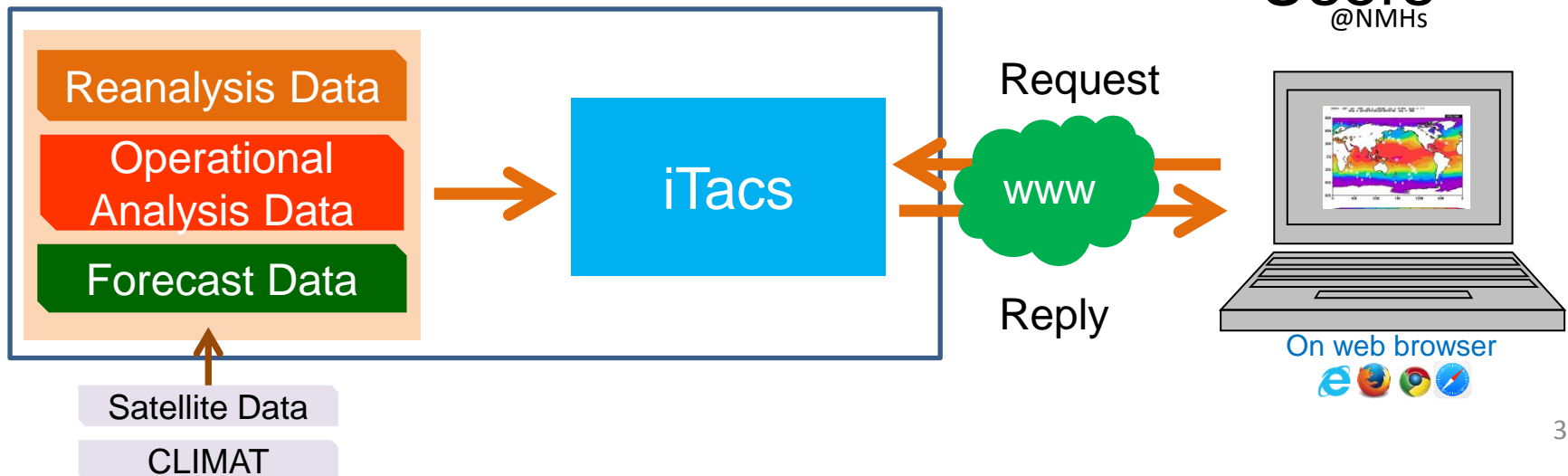
Implement regression analysis

# What's iTacs?

*Less time to manipulate the data ,  
more time to diagnose the climate system!*

- A web-based application for analyzing and monitoring climate.
- Available on web browsers. No additional software or plug-ins are required.
- Persons at National Meteorological and Hydrological Services can use iTacs (ID and Password are needed) .

JMA



# What's iTacs?

What can be done by using iTacs?

- Various datasets are available.
- Various types of charts can be drawn.
- Various statistical analyses can be performed.

# Available data

- Atmospheric analysis data
  - JRA-55 since 1958
  - 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-G2 since 1958
- Forecast data
  - Outputs of JMA's one-month prediction model
- Others
  - Major SST Indices, CLIMAT reports, and user-input data (CSV format)

(See for details)

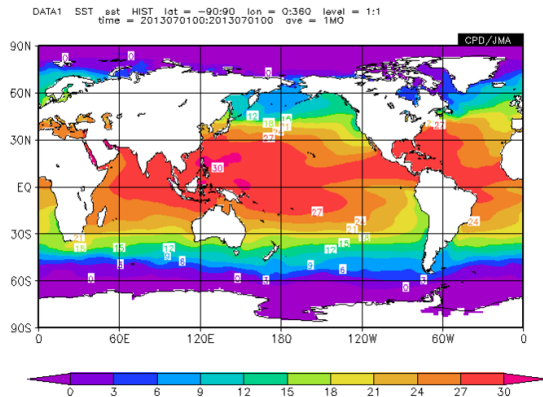
JRA project [http://jra.kishou.go.jp/JRA-55/index\\_en.html](http://jra.kishou.go.jp/JRA-55/index_en.html)

COBE-SST [http://ds.data.jma.go.jp/tcc/tcc/products/el\\_nino/cobesst\\_doc.html](http://ds.data.jma.go.jp/tcc/tcc/products/el_nino/cobesst_doc.html) / [http://ds.data.jma.go.jp/tcc/tcc/library/MRCS\\_SV12/index\\_e.htm](http://ds.data.jma.go.jp/tcc/tcc/library/MRCS_SV12/index_e.htm)

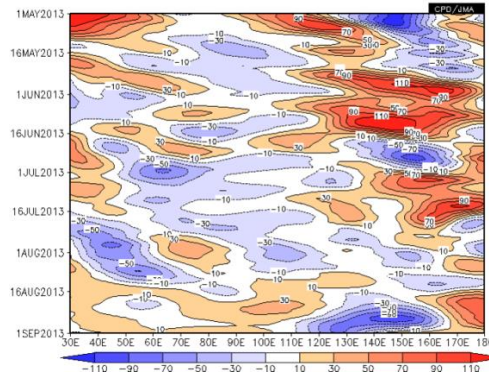
MOVE/MRI.COM-G2 [http://ds.data.jma.go.jp/tcc/tcc/products/el\\_nino/move\\_mricom-g2\\_doc.html](http://ds.data.jma.go.jp/tcc/tcc/products/el_nino/move_mricom-g2_doc.html)

# Samples of charts

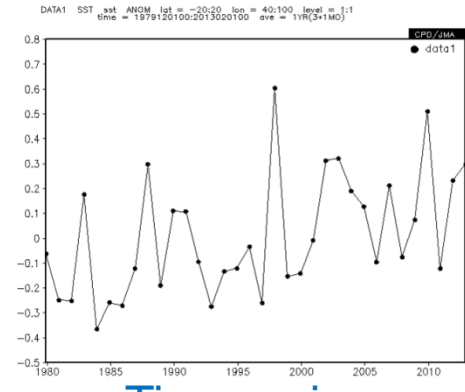
- Various types of charts can be drawn.



Latitude-longitude map

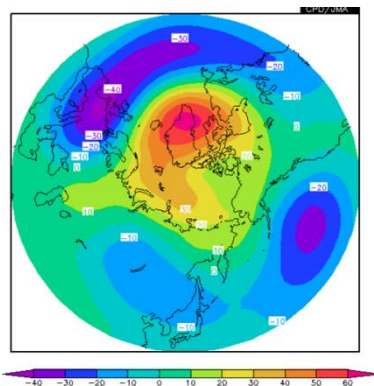


Time-longitude cross section

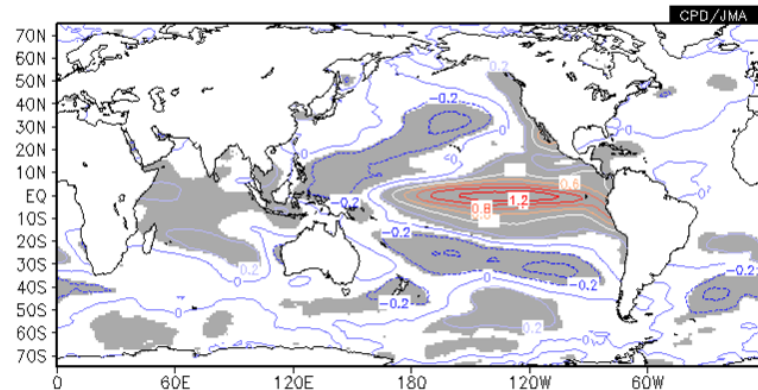


Time series

- Various statistical analyses can be performed.



EOF analysis



Regression analysis

*iTacs is a very convenient and useful tool and it will strongly help you to understand climate systems.*

*Let's exercise basic operation of iTacs!*

In November 2015, new version:iTacs ver.5 has been released.  
So we exercise using iTacs ver.5.

# 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 (Interactive Tool for Analysis)

## Announcement

- ▶ 14 October 2015 - iTacs version 5.0
- ▶ 28 February 2014 - iTacs version 4.0

## iTacs version 5.0

### Tools

▶ iTacs v5.0

### Tutorial Manual

- ▶ Sea surface temperature (SST)
- ▶ Daily mean SST anomalies
- ▶ 850-hPa stream function
- ▶ 850-hPa stream function and
- ▶ Difference of monthly mean SST anomalies
- ▶ 500-hPa height and anomalies

iTacs ( <http://extreme.kishou.go.jp/tool/itacs-tcc2015/> )

## iTacs Login

User Name:

Password:

Login

Tokyo Climate Center

Analysis Dataset Forecast Dataset

### Analysis Dataset

Select parameters Graphic Options

Data 1

Dataset	Element	Data type	Area	Level	Time unit	Showing period
JRA-55	Pressure Levels	HST	ASA	500hPa	MONTHLY	RANGE
	T (Temperature) [C]		Lat: 10 : 85 Ave		Ave Year-to-year	2014
			Lon: 80 : 190 Ave		Time filter	2014

Vector  SD  
 Derivative:  lon  lat

Analysis method: [Analysis method]

Use parameter code

Analysis Data Submit



# Basic operation (1)

Select Analysis or Forecast dataset

Setting Data parameters

Setting Graphic Options

Data Submit

Draw map

Data download

User Information: Logout, Reload, Help  
User ID: XXXX

Analysis Dataset | Forecast Dataset

Select parameters | Graphic Options

**Data1**

Dataset	Element	Data type	Area	Level	Time unit	Showing period
SST	Sea Surface Data Temperature (SST) [C]	HIST	ALL Lat: -90 - 90 Ave <input type="checkbox"/> Lon: 0 - 360 Ave <input type="checkbox"/>	1	MONTHLY Ave <input type="checkbox"/> Year-to-year <input checked="" type="checkbox"/>	RANGE 2011 - 2013 Time filter: 3 - 5

Vector  SD  
Derivative:  lon  lat

Analysis method: -Analysis method-

Use parameter code

Analysis Data Submit

**Parameters for data setting**  
-Dataset, Element, Data type

**Chronological parameters**  
-Time unit, Showing period

**Geophysical parameters**  
-Area, Level

**Analysis method setting**  
-DATA1\_DATA2, SUBTRACT, REGRESSION\_ANALYSIS etc.

In some cases, Data2 setting needed.

**Data1**

Dataset	Element	Data type	Area	Level	Time unit	Showing period
SST	Sea Surface Data Temperature (SST) [C]	HIST	ALL Lat: -90 - 90 Ave <input type="checkbox"/> Lon: 0 - 360 Ave <input type="checkbox"/>	1	MONTHLY Ave <input type="checkbox"/> Year-to-year <input checked="" type="checkbox"/>	RANGE 2011 - 2013 Time filter: 3 - 5

Vector  SD  
Derivative:  lon  lat

Analysis method: DATA1\_DATA2

**Data2**

Dataset	Element	Data type	Area	Level	Time unit	Showing period
SST	Sea Surface Data Temperature (SST) [C]	HIST	ALL Lat: -90 - 90 Ave <input type="checkbox"/> Lon: 0 - 360 Ave <input type="checkbox"/>	1	MONTHLY Ave <input checked="" type="checkbox"/> Year-to-year <input type="checkbox"/>	RANGE 2015 - 2015 Time filter: 1 - 1

Use parameter code

# Basic operation (2)

Select Analysis or Forecast dataset

Setting Data parameters

Setting Graphic Options

Data Submit

Analysis Data Submit

Draw map

Data download

Select parameters **Graphic Options**

### Graphic Options

Colorizing: COLOR  
Drawing: SHADE  
Image Format: png  
Font: default  
Color Table: Rainbow

Show Contour Labels  
 Show Color Bar  
 Set Contour Parameters for data1  
interval: min: max:  
 Set Contour Parameters for data2  
interval: min: max:  
 Set Vector size: [inch] value: skip: 1

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 %

Detailed Options for Image 1

Select this tab

Graphic Options  
-Contour, Shade  
, Color Bar, Axes

Check here, Detailed Options field are shown

Detailed Options for Image x  
-Graphics, Axis, Map

Detailed Options for Image 1

For image 1: [lower layer] apply apply Default

### About Graphics

contour Style: default Color: rainbow  
label  format: thickness: 1 size: 0.09 skip interval:  
contour line thickness: 3  
levels: color:  
thin contour:   
not to draw: -:

marker type: closed circle  
line style: solid color: black thickness: 6  
grid style: none color: orange  
vector label  vector head size:  
define rainbow color:  
color bar portrait  X: Y: scale: 1.0

> About Axis  
> About Map

For Image 1 apply

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Draw a 2D (latitude-longitude) map

<Exercise 2>

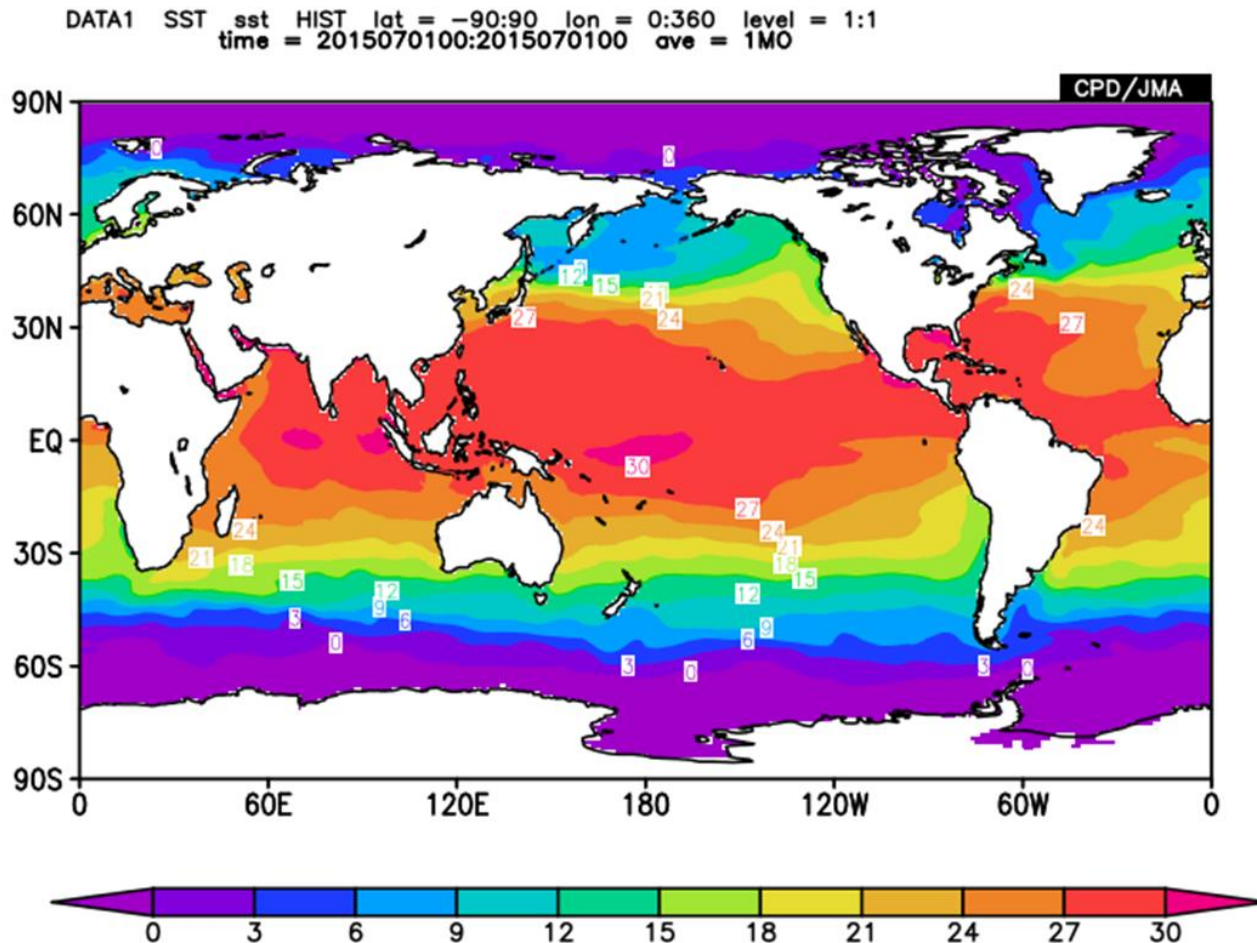
Draw a 1D (time-series) chart

<Exercise 3>

Implement regression analysis

# Latitude-longitude map (1)

- Let's chart monthly sea surface temperature (SST) for July 2015.



# Latitude-longitude map (2)

## Data1

Dataset	Element	Data type	Area	Level	Time unit	Showing period
SST	Sea Surface Data Temperature (SST) [C]	HIST	ALL Lat: -90 - 90 Ave <input type="checkbox"/> Lon: 0 - 360 Ave <input type="checkbox"/>	1	MONTHLY <input type="checkbox"/> Ave <input type="checkbox"/> Year-to-year <input type="checkbox"/> Time filter	RANGE 2015 7 2015 7

Vector  SD  
Derivative:  lon  lat

Analysis method: -Analysis method-

- To set each item in “Data1” as follows.
  - Dataset SST
  - Element Sea Surface Data > Temperature (SST)
  - Data type HIST (meaning historical data)
  - Area ALL
  - Level 1
  - Time unit MONTHLY
  - Showing period “RANGE”; 2015 7; 2015 7

# Latitude-longitude map (3)

1 Dataset

2 Element

Dataset	Element	Data type	Area	Level	Time u
SST	Sea Surface Data	-Data_type-	ALL	Start Lev	-Mean Per
	-element2-		Lat: -90 - 90 Ave <input type="checkbox"/>		<input type="checkbox"/> Ave
	-element2-		- 360 Ave <input type="checkbox"/>		<input type="checkbox"/> Time fil
	Temperature (SST) [C.Deg.]				
	Ice concentration (ice=1 no_ice=0) [fraction]				

Derivative:  lon  lat

Analysis method: [-Analysis method-]

Elements and their units

1. Select "SST" in the "dataset" field.
  - Various datasets are available;  
**CLIMAT, INDEX, JRA-55, K1EM, OCEAN-DATA, SAT, SST, USER-INPUT** etc.
2. Select "element1" "Sea Surface Data " and "element2" "Temperature".
  - Available elements and their units will be shown in a listbox.

# Latitude-longitude map (4)

**Data1**

Dataset	Element	Data type	Area	Level	Time unit
SST	Sea Surface Data	HIST	ALL	1	DAILY
	Temperature (SST) [C]	-Data_type-	lat: -90 - 90 Ave <input type="checkbox"/>		<input checked="" type="checkbox"/> Ave <input type="checkbox"/> Year-to-year
		HIST	lon: 0 - 360 Ave <input type="checkbox"/>		<input type="checkbox"/> Time filter
	<input type="checkbox"/> Vector <input type="checkbox"/> SD	NORM			
	Derivative: <input type="checkbox"/> lon <input type="checkbox"/> lat	ANOM			
		ANOM_SD			

Analysis method: -Analysis method-

### 3. Select "Data type" "HIST".

Available options are as follows:

- **HIST** : Historical actual analysis or observation data.
- **NORM** : Climatological normal data (averaged from 1981 to 2010).
- **ANOM** : Anomaly data (HIST – NORM: difference from the climatological normal)
- **ANOM\_SD** : Anomaly data normalized by their standard deviations.

# Latitude-longitude map (5)

4

5

Data type: HIST

Area: ALL

Lat: -90 - 90 Ave

Lon: 0 - 360 Ave

Level: 1

Time unit: DAILY

Ave  Year-to-year

Time filter

Showing period: RANGE

2015 1 1

2015 1 1

Only "1" level in this case

## 4. Select "Area" "ALL".

- You can set/change the area more precisely with setting boxes.

## 5. Select "Level" "1".

- Options in the "level" menu will change depending on your selection of "element".



# Latitude-longitude map (6)

Element	Data type	Area	Level	Time unit	Showing period
Sea Surface Data	HIST	ALL	1	MONTHLY	RANGE
Temperature (SST) [C]		Lat: -90 - 90 Ave <input type="checkbox"/>		<input type="checkbox"/> Ave <input type="checkbox"/> Year-to-year	2015 7
		Lon: 0 - 360 Ave <input type="checkbox"/>		<input type="checkbox"/> Time filter	2015 7

Vector  SD

## 6. Select “Time unit” “MONTHLY”.

- There are several styles for range selection: **DAILY**, **PENTAD DAY**, **MONTHLY** and **ANNUAL**

## 7. Select “Showing period” “RANGE” and the year and month, “2015 07”, for both upper and lower boxes.

Available options are as follows:

- **RANGE** : Setting the start and end points of the targeted time period.
- **YEARS** : Setting individual years.
- **INDEX** : Setting a SST index border to pick up years. (e.g. NINO.3)

# Latitude-longitude map (7)

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

**Data1**

Dataset	Element	Data type	Area	Level	Time unit	Showing period
SST	Sea Surface Data Temperature (SST) [C]	HIST	ALL Lat: -90 - 90 Ave <input type="checkbox"/> Lon: 0 - 360 Ave <input type="checkbox"/>	1	MONTHLY <input type="checkbox"/> Ave <input type="checkbox"/> Year-to-year <input type="checkbox"/> Time filter	RANGE 2015 7 2015 7

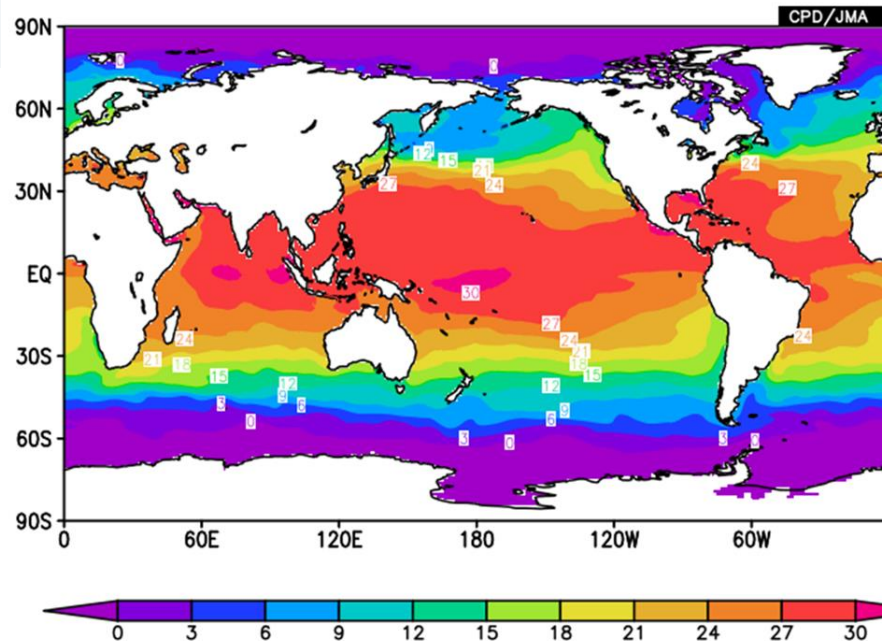
Vector  SD  
Derivative:  lon  lat

Analysis method: -Analysis method-

Use parameter code

Analysis Data Submit

DATA1 SST\_sst HIST lat = -90:90 lon = 0:360 level = 1:1  
time = 2015070100:2015070100 ave = 1M0



Monthly sea surface temperature (SST) for July 2015

# Latitude-longitude map (8)

- You can **change the area** to draw, directly typing latitude/longitude in the “Lat”/”Lon” boxes.

Southern border

Northern border

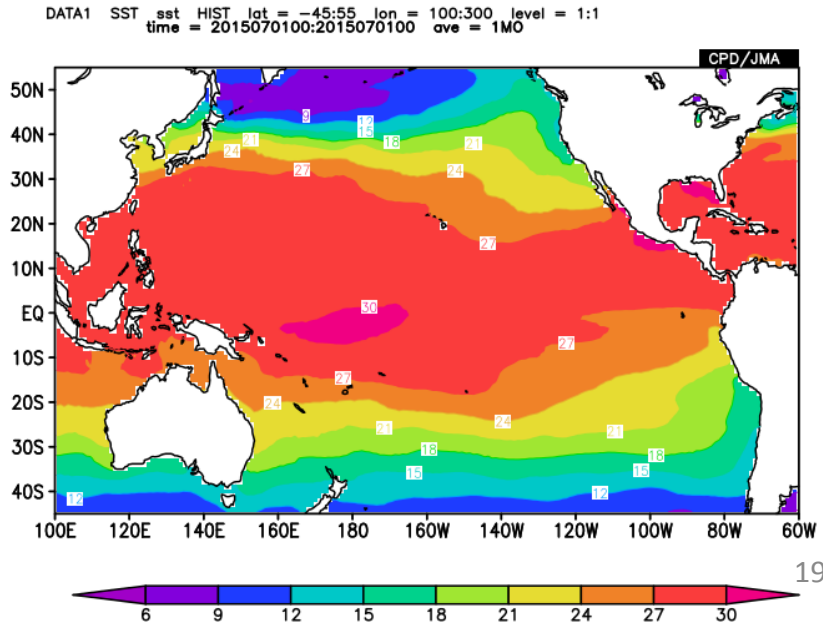
Western border

Eastern border

When you draw the range from 60W to 100E, type “-60” and “100” respectively.

Click!

Analysis Data Submit



# Latitude-longitude map (9)

- You can draw **consecutive months average SST** (e.g., June-July-August 2015).

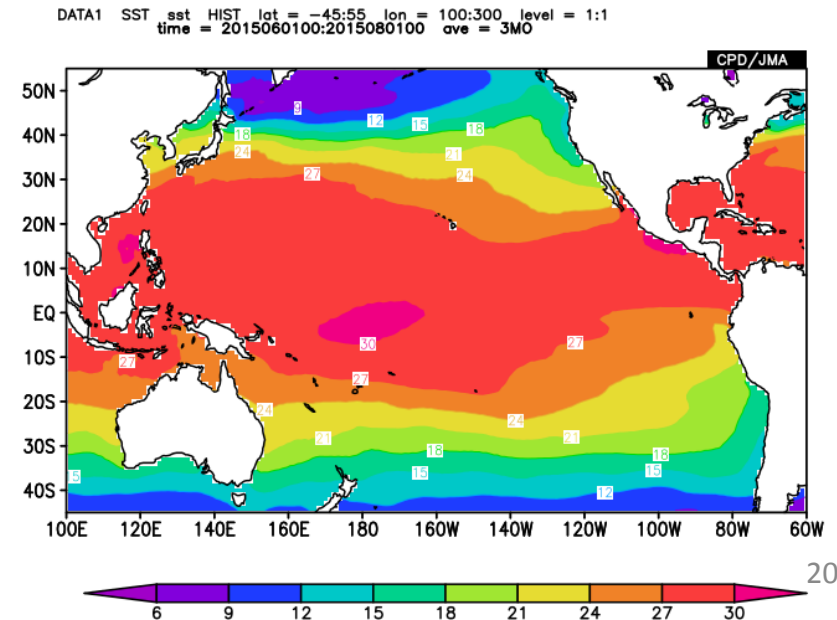
Checking "Ave" for time average

Level	Time unit	Showing period
<input type="checkbox"/>	MONTHLY	RANGE
<input checked="" type="checkbox"/> Ave	<input type="checkbox"/> Year-to-year	2015   6
<input type="checkbox"/> Time filter		2015   8

Upper: start month  
Lower: end month

Click!

Analysis Data Submit



# Latitude-longitude map (10)

- You can draw **anomaly chart**.

nt  
Data type  
Data  
(SST) [c  
ALL  
Lat: -45  
Lon: 100

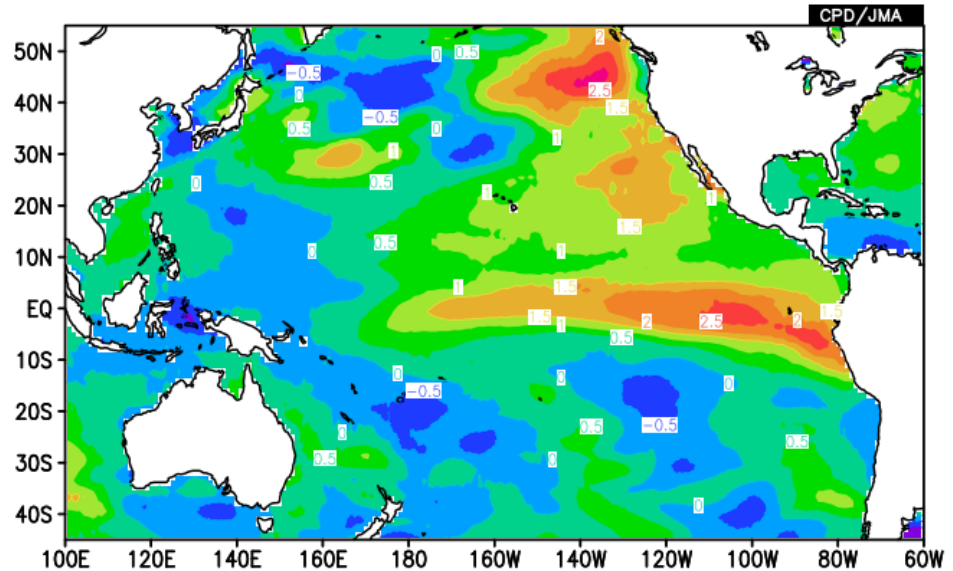
Select "Data type" "ANOM"

Anomaly data (HIST minus NORM: difference from the climatological normal)

Click!

Analysis Data Submit

DATA1 SST\_sst ANOM lat = -45:55 lon = 100:300 level = 1:1  
time = 2015060100:2015080100 ave = 3MO



-1.5 -1 -0.5 0 0.5 1 1.5 2 2.5 3

# Latitude-longitude map (11)

- You can change intervals for contour/shading.

① Click “Graphic Options”

Graphic Options

③ Checking this box

④ Set these boxes as follows

- interval: 0.5
- min: -2.5
- max: 2.5

## Graphic Options

Colorizing: COLOR  Show Contour Labels  Polar Stereoc

Drawing: SHADE  Set Contour Parameters for data1  Logarithmic

Image Format: png  Reverse  Flip the X-axis

Font: default  No Caption

Color Table: Blue - Red  Set Vector size: [ ] [inch] value: [ ] skip: 1

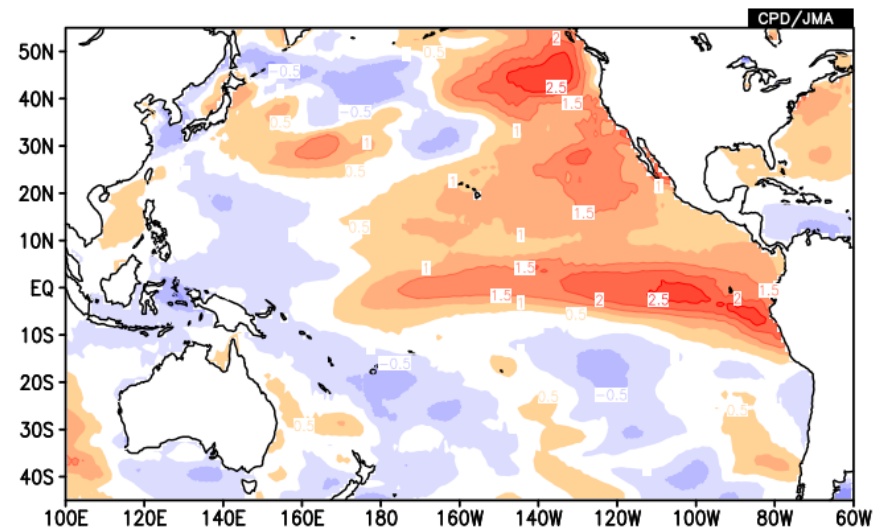
interval: 0.5 min: -2.5 max: 2.5

② Select “Blue - Red”

Click!

Analysis Data Submit

DATA1 SST\_sst ANOM lat = -45:55 lon = 100:300 level = 1:1  
time = 2015060100:2015080100 ave = 3MO



-2.5 -2 -1.5 -1 -0.5 0 0.5 1 1.5 2 2.5

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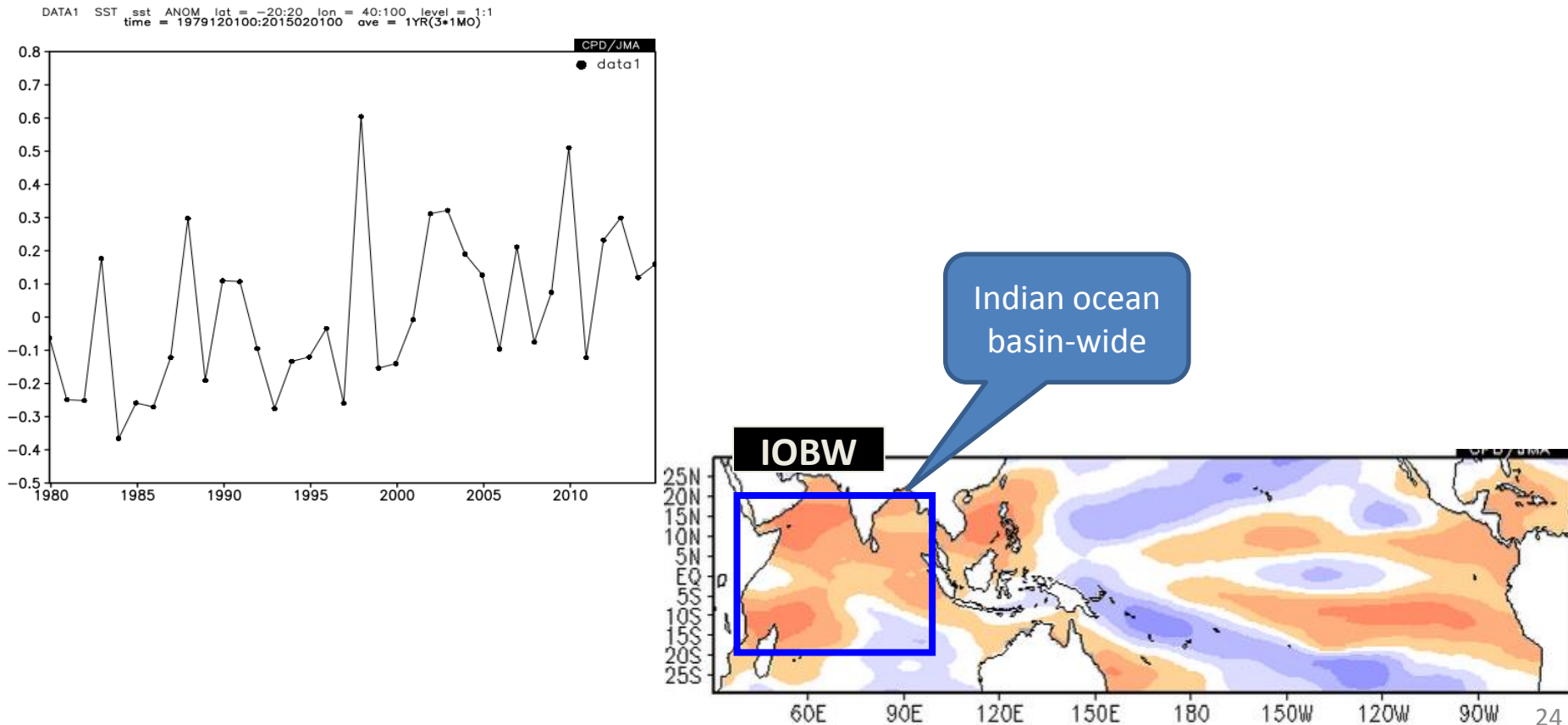
Draw a 1D (time-series) chart

<Exercise 3>

Implement regression analysis

# Time-series chart (1)

- To chart the interannual variation of three-month mean SST anomaly averaged in the tropical Indian Ocean (20S – 20N, 40E – 100E) for December – February from 1979/1980 to 2014/2015.





# Time-series chart (2)

## Data1

Dataset	Element	Data type	Area	Level	Time unit	Showing period
SST	Sea Surface Data Temperature (SST) [C]	ANOM	ALL Lat: -20 - 20 Ave <input checked="" type="checkbox"/> Lon: 40 - 100 Ave <input checked="" type="checkbox"/>	1	MONTHLY <input type="checkbox"/> Ave <input checked="" type="checkbox"/> Year-to-year <input type="checkbox"/> Time filter	RANGE 1979 - 2014 12 - 2

Vector  SD  
Derivative:  lon  lat

Analysis method: -Analysis method-

Please set each item in “data1” as follows.

- Dataset SST
- Element Sea Surface Data > Temperature (SST)
- Data type ANOM (meaning “anomaly”, deviation from climatological normal)
- Area lat: -20 – 20; lon: 40 – 100 checking “Ave”
- Level 1
- Time unit “MONTHLY” checking “Year-to-year”
- Showing period “RANGE”; 1979 – 2014 (year); 12 – 2 (month)

# Time-series chart (3)

The screenshot shows a data analysis interface with the following settings:

- Dataset:** Sea Surface Data
- Element:** Temperature (SST) [C]
- Data type:** ANOM
- Area:** ALL, Lat: -20 to 20, Lon: 40 to 100. Two 'Ave' checkboxes are checked (highlighted by a red box labeled '1').
- Level:** 1
- Time unit:** MONTHLY. 'Year-to-year' is checked (highlighted by a blue box labeled '2').
- Showing period:** RANGE. Year: 1979 - 2014, Month: 12 - 2 (highlighted by a green box labeled '3').

A pink callout box indicates the resulting time range: 1979/12 – 1980/2, ..., 2014/12 – 2015/2.

**Point 1:** Checking “Ave” means averaging of values in the given latitudinal/longitudinal area.

**Point 2:** Checking “Year-to-year” means year-to-year variation for the month(s) identified in “Showing period”.

**Point 3:** Numbers in the middle and bottom boxes indicate the range of year and month, respectively, to draw.

# Time-series chart (4)

## Data1

Dataset	Element	Data type	Area	Level	Time unit	Showing period
SST	Sea Surface Data Temperature (SST) [C]	ANOM	ALL Lat: -20 - 20 Ave <input checked="" type="checkbox"/> Lon: 40 - 100 Ave <input checked="" type="checkbox"/>	1	MONTHLY <input type="checkbox"/> Ave <input checked="" type="checkbox"/> Year-to-year <input type="checkbox"/> Time filter	RANGE 1979 - 2014 12 - 2

Vector  SD  
Derivative:  lon  lat

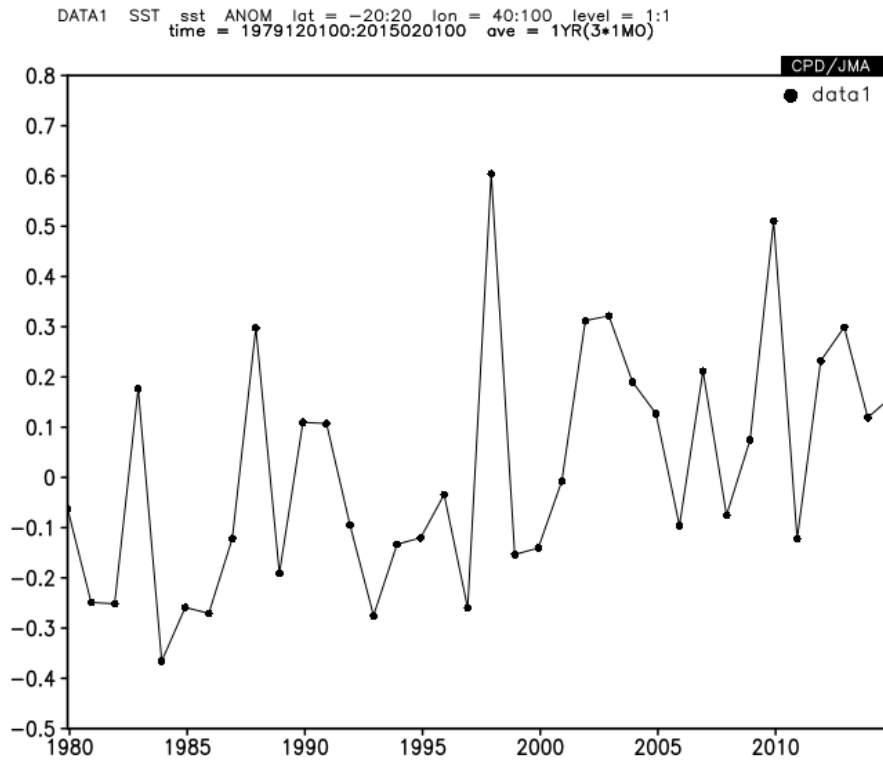
Analysis method: -Analysis method-

Use parameter code

Analysis Data Submit

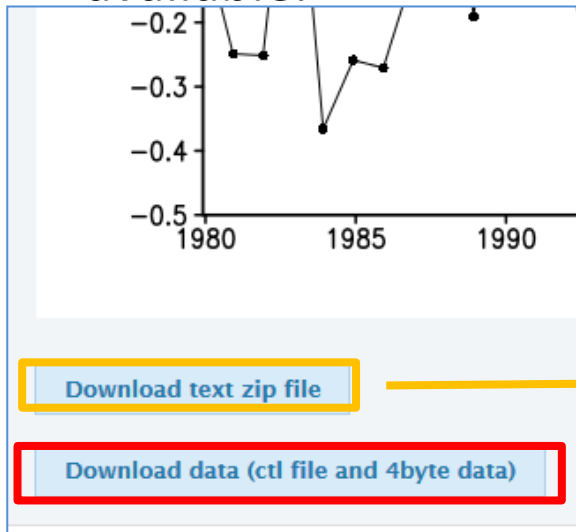


Click!



# 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.



```
Bece9a915f1111308_SST_sst_ANOM_lon-40-180_lat-20-20_level-1-1.SHOW_YEAR_19791201_20150201_01.txt - 2行編集
Data_set : SSTelement : sst0set /mnt/eras/cpd/itacs/itacs5/public/work/Bece9a915f1111308_sst_0_erdtitle undef 9.999e
<0>0def 1 linear 0 1zdef 1 linear 1 1zdef 1 linear 1 1zdef 38 linear 00201IEE1979 12mvars lstat 1 39 temperature
(SST) [C, Deg, JendvarsDefault file number is: 1 X, us fixed lon = 0 Y = 1 Y is fixed Lat = 0 Y = 12 is fixed
Lev = 1 Z = 11 is varying Time = 00201IEE1979 to 00201IEE2014 T = 1 to 36E is fixed Ens = 1 E = Ini = 1 nj
= 1 nk = 1 ml = 38 -0.002204 -0.246819 -0.251415 0.178855 -0.385740 -0.250754 -0.270659 -0.121454 -0.297501 -0.190302
0.109680 0.107377 -0.094663 -0.275179 -0.193111 -0.120413 -0.034117 -0.260056 0.604638 -0.153886 -0.140525 -0.007302
0.312015 0.321583 0.190286 0.126955 -0.096066 0.211444 -0.075222 0.074881 0.510121 -0.122275 0.231797 0.289060
0.119095 0.159692
```

Download and unzip

-Plain text data file  
--Gridded value  
--map information (area, elements)  
written GrADS control file format

-GrADS format data file  
-GrADS control file

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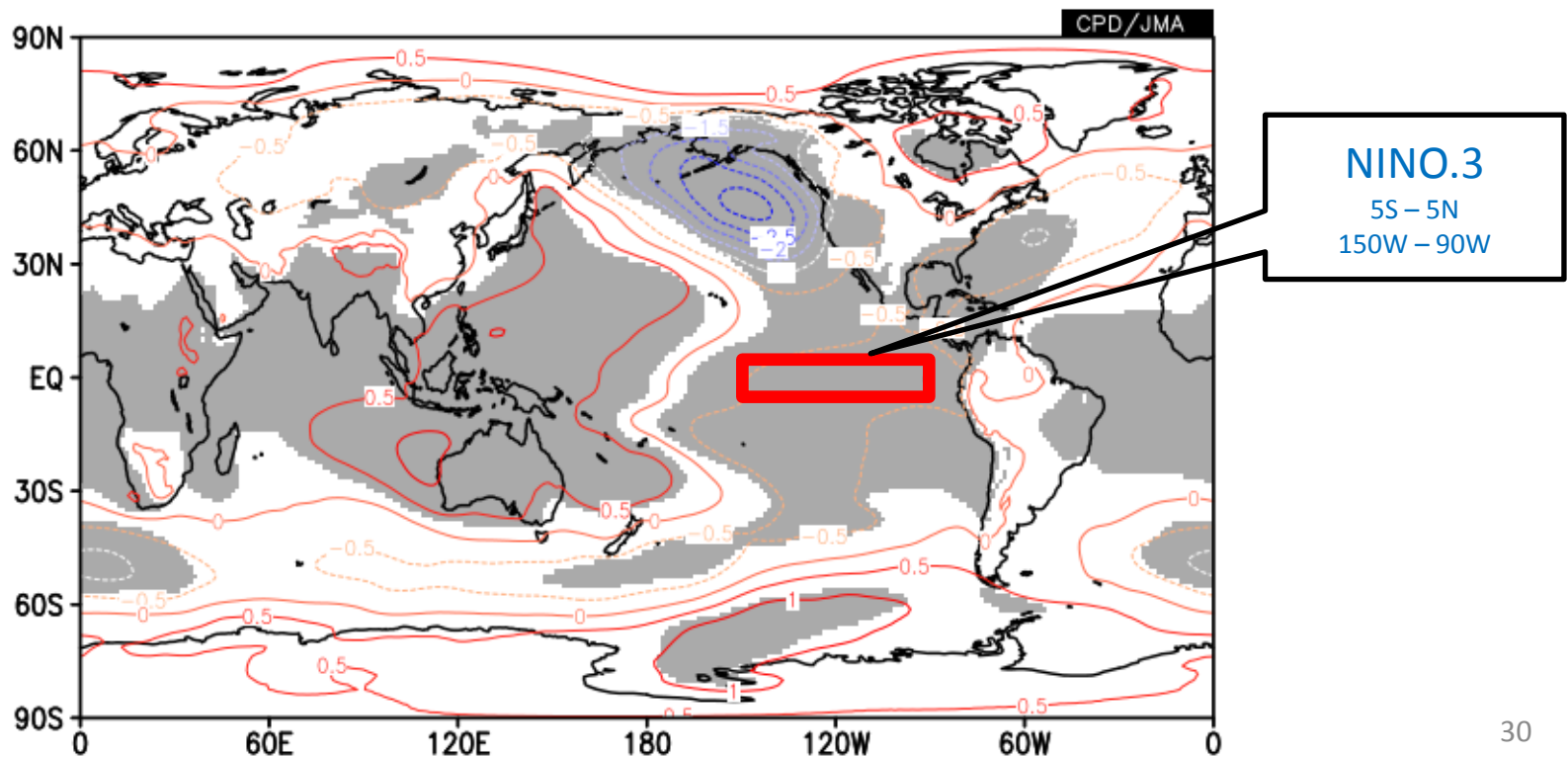
Implement regression analysis

# Regression analysis (1)

- To regress three-month mean sea level pressure (SLP) onto NINO.3 SST index for DJF from 1958/1959 to 2014/2015.

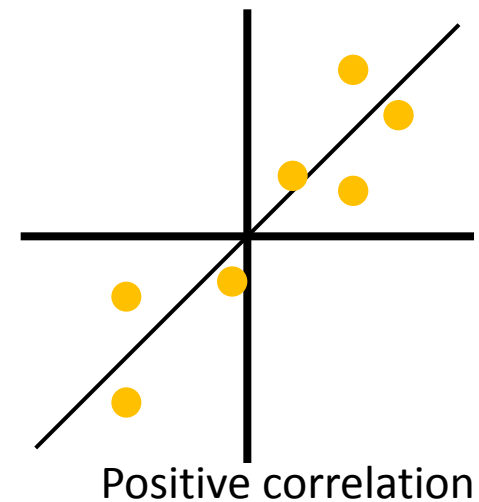
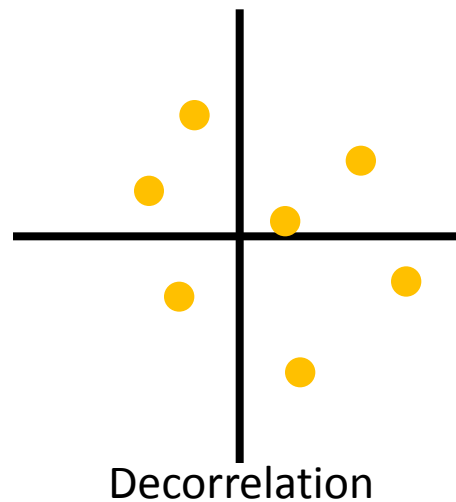
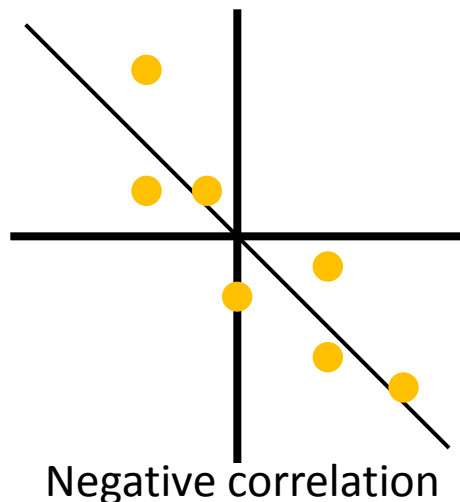
DATA1 JRA-55 slp ANOM lat = -90:90 lon = 0:360 level = 1:1  
time = 1958120100:2015020100 ave = 1YR(3\*1MO)

DATA2 INDEX nino.3 ANOM lat = -90:90 lon = 0:360 level = 1:1  
time = 1958120100:2015020100 ave = 1YR(3\*1MO) analysis method = REGRESSION\_ANALYSIS



# Regression and correlation analysis

- Regression and correlation analysis are often used to examine climatological systems like teleconnections.
- Correlation coefficient means the degree of the correlation, and the regression coefficient means the gradient of the regression line.
  - Correlation coefficient around  $+1$  or  $-1$  means there is a clear linear relation between the targeted data pair, and the coefficient around zero means there is a few (or weak) relation between them.




# Regression analysis (2)

## Setting a response variable

- “Data1” is a **response** variable (SLP in this case).
- Select “JRA-55” in the Dataset box of “Data1”.

Dataset	Element	Data type	Area	Level	Time unit	Showing period
-Dataset- -Dataset- CLIMAT INDEX <b>USER_INPUT</b> JRA-55 K1EM_20151028 K1EM_20151104 MOVE-G2 SAT SST	-element1- -element2-	-Data_type-	ALL Lat: -90 - 90 Ave <input type="checkbox"/> Lon: 0 - 360 Ave <input type="checkbox"/>	Start Level	-Mean Period- <input type="checkbox"/> Ave <input type="checkbox"/> Time filter	RANGE Start year End year

Vector  SD  
Derivative:  lon  lat  
analysis metric





# Regression analysis (3)

- Select “Surface” and “SLP (Sea Level Pressure)” in the element box.

**Data 1**

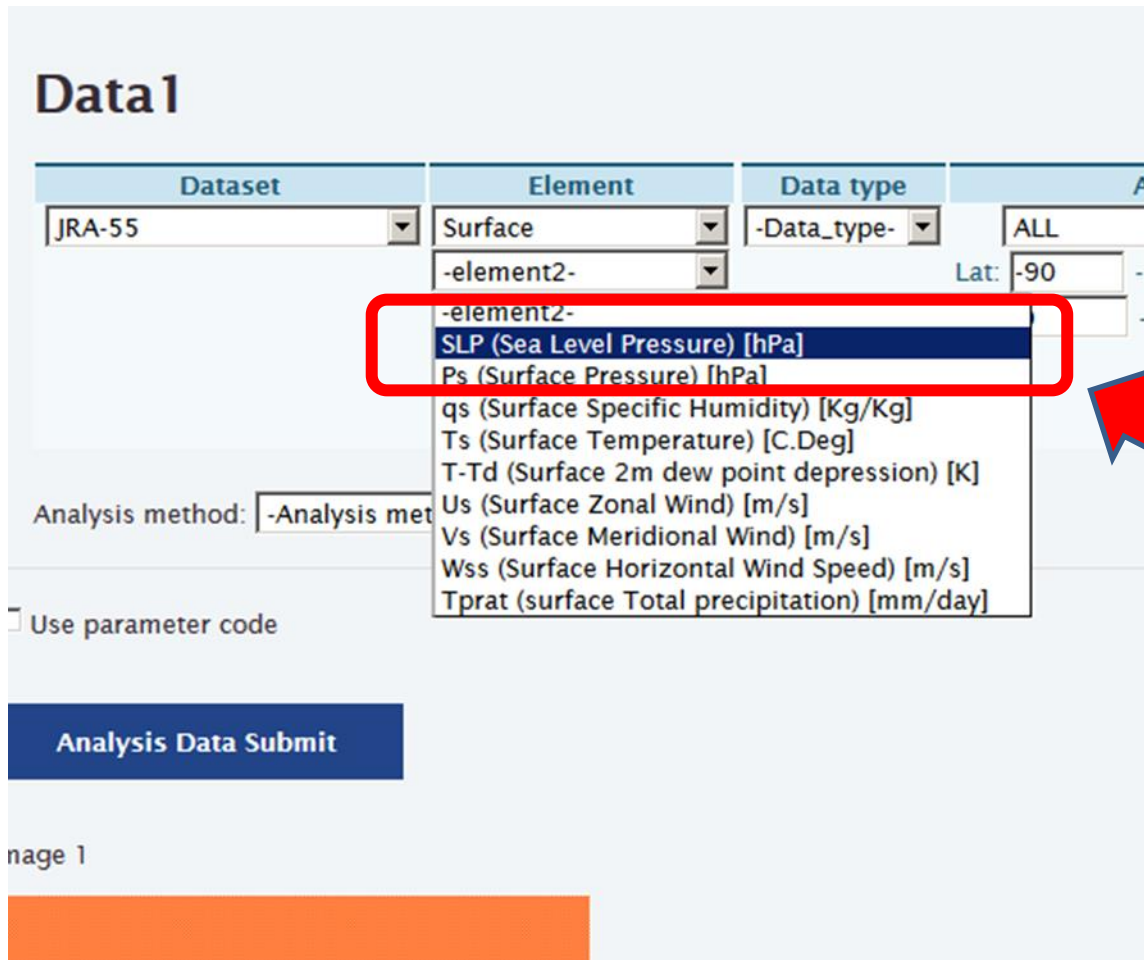
Dataset	Element	Data type	Ar
JRA-55	Surface	-Data_type-	ALL
	-element2-		Lat: -90
	-element2-		

Analysis method: -Analysis met

Use parameter code

**Analysis Data Submit**

Page 1



# Regression analysis (4)

- Set each of the remaining items in Data1 as shown below.
  - Data type HIST
  - Area ALL
  - Level 1
  - Time unit MONTHLY checking “Year-to-year”
  - Showing period 1958 – 2012; 12 – 2

The screenshot shows a configuration panel with the following settings:

Data type	Area	Level	Time unit	Showing period
HIST	ALL	1	MONTHLY	RANGE
	Lat: -90 - 90 Ave <input type="checkbox"/>		<input type="checkbox"/> Ave <input checked="" type="checkbox"/> Year-to-year	1958 - 2014
	Lon: 0 - 360 Ave <input type="checkbox"/>		<input type="checkbox"/> Time filter	12 - 2

“Year-to-year” must be checked to draw a regression map

# Regression analysis (5)

- Select “REGRESSION\_ANALYSIS” in the Analysis method box.

**Data1**

Dataset	Element	Data type	Area	Level	MON
JRA-55	Surface	HIST	ALL	1	MON
	SLP (Sea Level Pressu		Lat: -90 - 90 Ave <input type="checkbox"/>		<input type="checkbox"/> Av
			Lon: 0 - 360 Ave <input type="checkbox"/>		<input type="checkbox"/> Ti

Vector  SD  
Derivative:  lon  lat

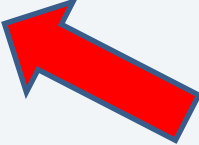
Analysis method: -Analysis method-

Use parameter coc

Analysis Data S

Image 1

- Analysis method-
- DATA1\_DATA2
- SUBTRACT
- COMPOSITE
- SIGNIFICANCE\_TEST
- REGRESSION\_ANALYSIS**
- CORRELATION\_COEFFICIENT
- EOF\_SINGLE
- EOF\_MULTI
- SVD
- FFT
- WAVELET
- ADD
- MULTIPLY
- DIVIDE



# Regression analysis (6)

## Setting an explanatory variable

- You can see “Data2” open.
- “Data2” is an explanatory variable (NINO.3 SST index in this case).

### Data1

Dataset	Element	Data type	Area	Level	Time unit	Showing period
JRA-55	Surface SLP (Sea Level Pressu	HIST	ALL Lat: -90 - 90 Ave <input type="checkbox"/> Lon: 0 - 360 Ave <input type="checkbox"/>	1	MONTHLY <input type="checkbox"/> Ave <input checked="" type="checkbox"/> Year-to-year <input type="checkbox"/> Time filter	RANGE 1958 - 2014 6 - 8

Vector  SD  
Derivative:  lon  lat

Analysis method: REGRESSION\_ANALYSIS

### Data2

Dataset	Element	Data type	Area	Level	Time unit	Lag	Significance
JRA-55	Surface SLP (Sea Level Pressu	HIST	ALL Lat: -90 - 90 Ave <input type="checkbox"/> Lon: 0 - 360 Ave <input type="checkbox"/>	1	MONTHLY <input type="checkbox"/> Ave <input checked="" type="checkbox"/> Year-to-year <input type="checkbox"/> Time filter	0 YEAR	90%(two side)

# Regression analysis (7)

- Select “INDEX” in the Dataset box of Data2.

## Data1

Dataset	Element	Data type	Area	Level	Time unit	Showing period
JRA-55	Surface SLP (Sea Level Press)	HIST	ALL Lat: -90 - 90 Ave <input type="checkbox"/> Lon: 0 - 360 Ave <input type="checkbox"/>	1	MONTHLY <input type="checkbox"/> Ave <input checked="" type="checkbox"/> Year-to-year <input type="checkbox"/> Time filter	RANGE 1958 - 2014 6 - 8

Vector  SD  
Derivative:  lon  lat


Analysis method: REGRESSION\_ANALYSIS

## Data2

Dataset	Element	Data type	Area	Level	Time unit	Lag
JRA-55	Surface SLP (Sea Level Press)	HIST	ALL Lat: -90 - 90 Ave <input type="checkbox"/> Lon: 0 - 360 Ave <input type="checkbox"/>	1	MONTHLY <input type="checkbox"/> Ave <input checked="" type="checkbox"/> Year-to-year <input type="checkbox"/> Time filter	0 YEAR

U

- CMAV15
- INDEX**
- USER\_INPUT
- JAPAN
- JRA-55
- JRA-JCDAS
- K1EM\_20151021
- K1EM\_20151028
- LBM
- MOVE-G2
- OCEAN-DATA\_by\_MOVE-G
- SAT



# Regression analysis (8)

- Select “NINO.3” in the element box.

**Data1**

Dataset	Element	Data type	Area	Level	Time unit	Showir
JRA-55	Surface	HIST	ALL	1	MONTHLY	RAM
	SLP (Sea Level Presst		Lat: -90 - 90 Ave <input type="checkbox"/>		<input type="checkbox"/> Ave <input checked="" type="checkbox"/> Year-to-year	1958
			Lon: 0 - 360 Ave <input type="checkbox"/>		<input type="checkbox"/> Time filter	6

Vector  SD  
Derivative:  lon  lat


Analysis method: REGRESSION\_ANALYSIS

**Data2**

Dataset	Element	Data type	Time unit	Lag	Significance	
INDEX	-element2-	HIST	MONTHLY	0	YEAR	90%(two side)
	element2		<input type="checkbox"/> Ave <input checked="" type="checkbox"/> Year-to-year		<input type="checkbox"/> Time filter	
	NINO.1+2					
	NINO.3					
	NINO.3.4					
	NINO.4					
	NINO.WEST					

Use parameter code

**Analysis Data Submit**



# Regression analysis (9)

- Set each of the remaining items in data2 as shown below.

- data type HIST
- Time unit MONTHLY checking “Year-to-year”
- lag 0; YEAR
- Significance 95% (two side)

SLP (Sea Level Press) Lat: -90 - 90 Ave  Ave  Year-to-year 1958 - 2014  
Lon: 0 - 360 Ave  Time filter 6 - 8

Vector  SD  
Derivative:  lon  lat

Analysis method: REGRESSION\_ANALYSIS

### Data2

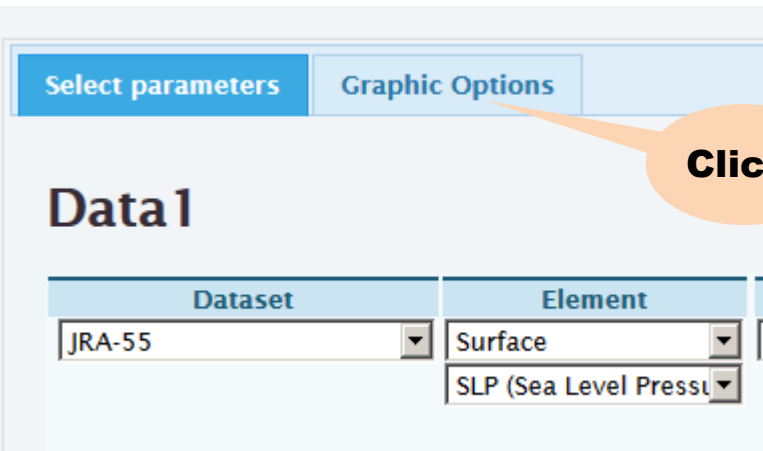
Dataset	Element	Data type	Time unit	Lag	Significance
INDEX	NINO.3	HIST	MONTHLY	0	95%(two side)

SD  
 Ave  Year-to-year  
 Time filter

Select options indicate confidence level as indicated by t-testing

# Regression analysis (10)

- Click “Graphic Options” and select “CONTOUR” in the Drawing box of Graphic Option.



## Graphic Options

Colorizing: COLOR

Drawing: **CONTOUR**

Image Format: SHADE

Font: default

Color Table: SCATTER

Show Contour Labels

Show Color Bar

Set Contour Parameters for data 1

interval: [ ] min: [ ] max: [ ]

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 [ ] %

Set “Drawing” “CONTOUR” to shade the grids exceeding confidence level in gray.

Detailed Options for Image 1



# Regression analysis (11)

- Select “Blue - Red” in the Color Table box to display **negative** and **positive** values with **blue** and **red** contours, respectively.

## Analysis Dataset

Select parameters

Graphic Options

### Graphic Options

Colorizing: COLOR	<input checked="" type="checkbox"/> Show Contour Labels	<input type="checkbox"/> Polar Stereographic: North pole	<input type="checkbox"/> No Scale Labels
Drawing: CONTOUR	<input checked="" type="checkbox"/> Show Color Bar	<input type="checkbox"/> Logarithmic Coordinates	<input type="checkbox"/> Draw Credit Inside
Image Format: png	<input type="checkbox"/> Set Contour Parameters for data1	<input type="checkbox"/> Reverse the Axes	<input type="checkbox"/> Apply All Pics
Font: default	interval: <input type="text"/> min: <input type="text"/> max: <input type="text"/>	<input type="checkbox"/> Flip the X-axis <input type="checkbox"/> Flip the Y-axis	picture size <input type="text"/> %
Color Table: Blue - Red	<input type="checkbox"/> Set Vector size: <input type="text"/> [inch] value: <input type="text"/> skip: 1	<input type="checkbox"/> No Caption	

Detailed Contour Labels

Blue - Red  
Rainbow  
Red - Blue

Blue - Red

“Blue – Red” >> Blue: Lower, Red: Higher

# Regression analysis (12)

- You can draw the following chart.

Click!

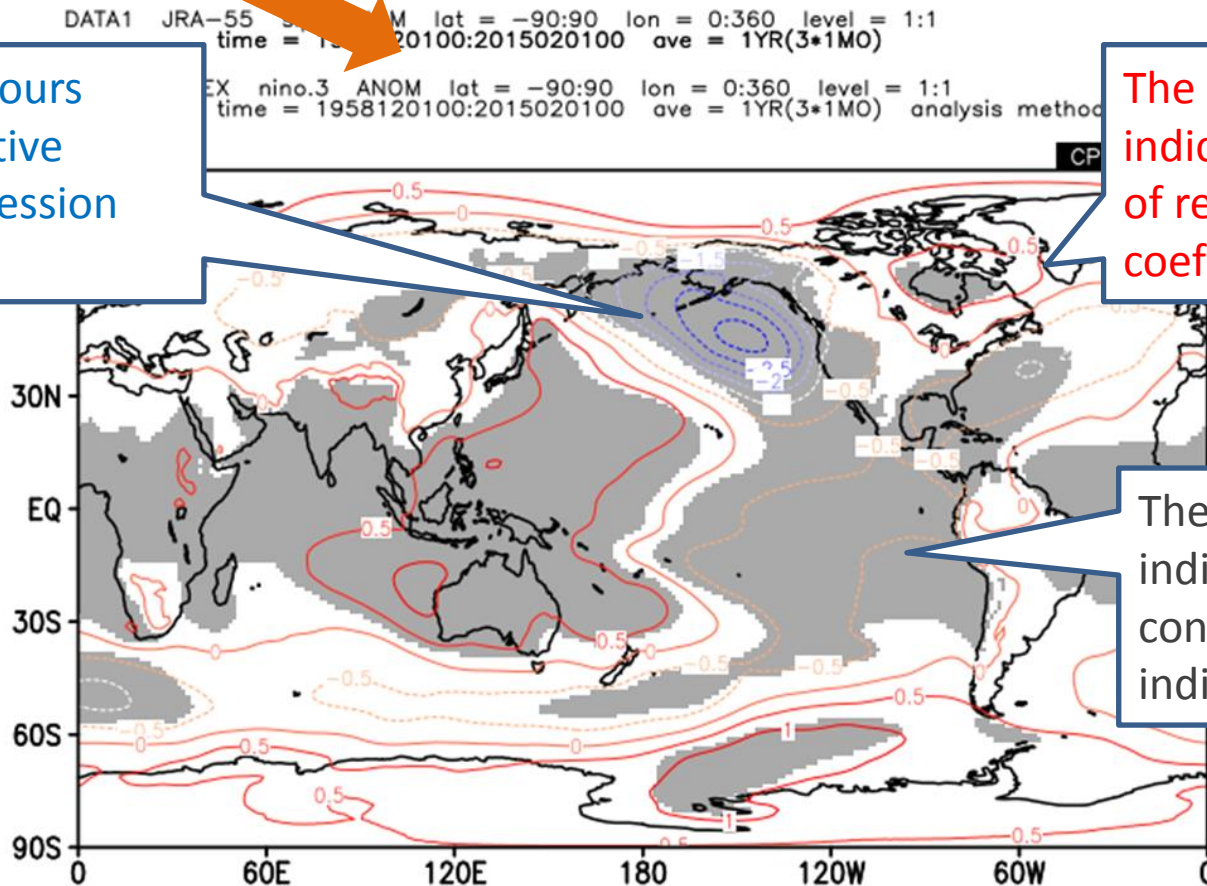
Analysis Data Submit

It may take quite a time.

The blue contours indicate negative values of regression coefficients.

The red contours indicate positive values of regression coefficients.

The gray shading indicates a 95 % confidence level as indicated by t-testing.



*Thank you for your attention.*

*We hope you'll make use of iTacs to monitor and understand climate systems.*

# Supplemental explanation

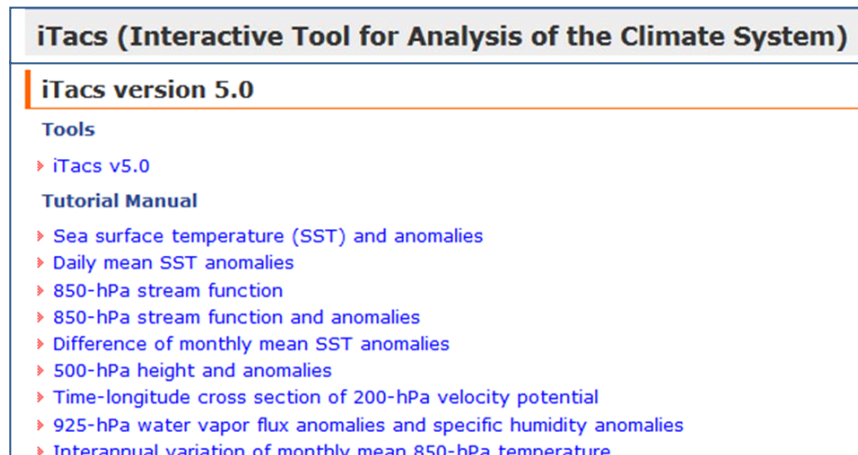
# Improvements in iTacs ver.5

- 30-year re-forecast datasets are added.
- Clearer images can be drawn.
- More efficient connections between client PCs and the web server are provided.

# To learn more about iTacs

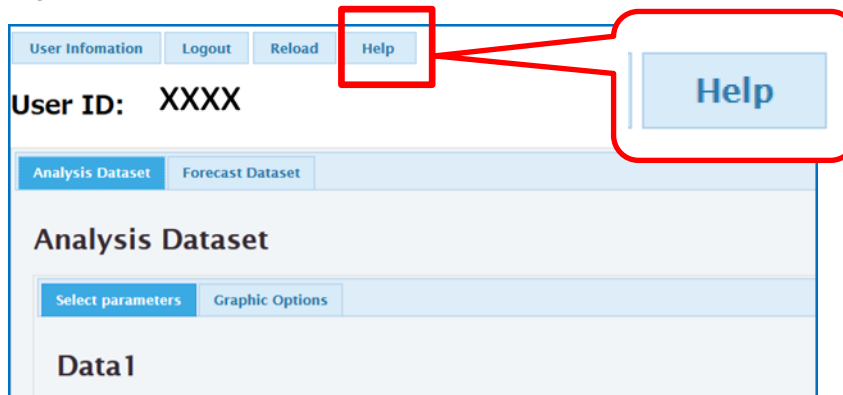
- Sample images and tutorials are available on the iTacs website.

<http://extreme.kishou.go.jp/tool/itacs-tcc2015/>



The screenshot shows the iTacs website interface. At the top, it says "iTacs (Interactive Tool for Analysis of the Climate System)". Below that, it indicates "iTacs version 5.0". There are two main sections: "Tools" and "Tutorial Manual". Under "Tools", there is a link for "iTacs v5.0". Under "Tutorial Manual", there is a list of links for various data analysis options, including Sea surface temperature (SST) and anomalies, Daily mean SST anomalies, 850-hPa stream function, 850-hPa stream function and anomalies, Difference of monthly mean SST anomalies, 500-hPa height and anomalies, Time-longitude cross section of 200-hPa velocity potential, 925-hPa water vapor flux anomalies and specific humidity anomalies, and Interannual variation of monthly mean 850-hPa temperature.

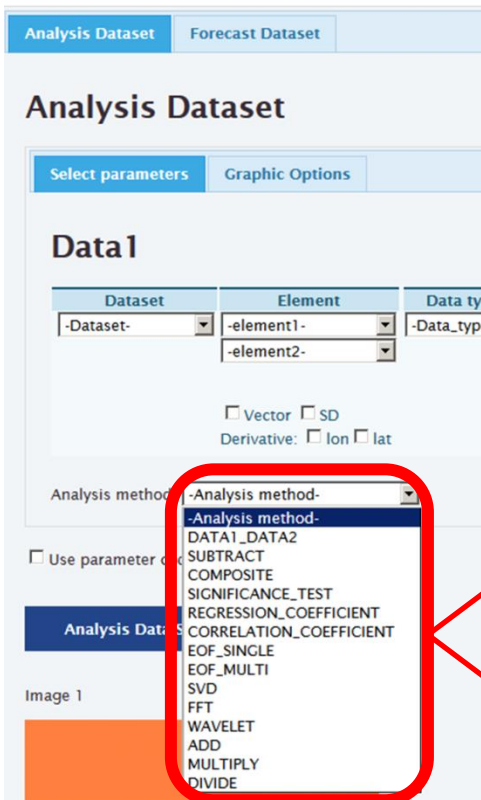
- Online help is also available.



The screenshot shows the iTacs user interface. At the top, there are buttons for "User Information", "Logout", "Reload", and "Help". Below these buttons, it says "User ID: XXXX". There are two tabs: "Analysis Dataset" and "Forecast Dataset". Under "Analysis Dataset", there are two sub-tabs: "Select parameters" and "Graphic Options". Below these sub-tabs, it says "Data1". A red callout box highlights the "Help" button in the top navigation bar, and another red callout box highlights a larger "Help" button in the main content area.

# Analysis method

- iTacs supports various types of statistical analysis.



Method	Outline
DATA1_DATA2	Overlay two items on a map at the same time.
SUBTRACT	Map the difference between two sets of data (DATA1-DATA2).
COMPOSITE	Create a composite map based on a set condition.
SIGNIFICANCE_TEST	Create a composite map of "Data1."
REGRESSION_COEFFICIENT	Create a regression coefficient map. "Data1": dependent variable "Data2": objective (independent) variable
CORRELATION_COEFFICIENT	Create a correlation coefficient map.
EOF_SINGLE	Conduct EOF (empirical orthogonal function) analysis.
EOF_MULTI	Conduct multi-EOF analysis.
SVD	Conduct SVD (singular value decomposition) analysis.
FFT	Conduct FFT (fast Fourier transform) analysis.
WAVELET	Conduct wavelet analysis.
ADD	Map the sum of two data sets (DATA1+DATA2).
MULTIPLE	Map the product of two data sets (DATA1*DATA2).
DIVIDE	Map the division of two data sets (DATA1/DATA2).

# Example of time setting

- Setting for a consecutive period in 2D map

<Calendar>  
 2012 2013  
 J F M A M J J A S O N D J F M A M J J A S O N D

**Check!**

Time unit: MONTHLY  
 Showing period: RANGE  
 Ave  Year-to-year  
 Time filter

Strat month: 12 (2012)  
 End month: 2 (2013)

One 3-month averaged map for 2012/12-2013/2

**Uncheck**

Time unit: MONTHLY  
 Showing period: RANGE  
 Ave  Year-to-year  
 Time filter

Strat month: 12 (2012)  
 End month: 2 (2013)

Three 1-month maps for 2012/12, 2013/1, 2013/2

Control with control buttons

prev next animation stop reset



# Example of time setting

- Setting for a specific period of each year in 2D map

Target years

<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
2013	: J	F	M	A	M	J	J	A	S	O	N	D

Target period

Check “Year-to-year”

Check!

Time unit: MONTHLY

Showing period: RANGE

Ave  Year-to-year

2010 - 2013

3 - 5

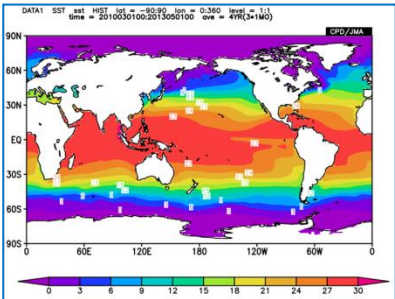
Target years

Target period

Check!



One 4-year-MAM averaged map



2010/3-5  
2011/3-5  
2012/3-5  
2013/3-5 } averaged

Uncheck

Time unit: MONTHLY

Showing period: RANGE

Ave  Year-to-year

2010 - 2013

3 - 5

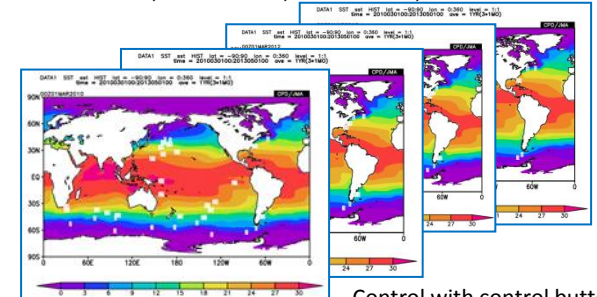
Target years

Target period

Check!



Four MAM averaged maps  
2010/3-5, 2011/3-5, 2012/3-5, 2013/3-5



Control with control buttons

prev next animation stop reset

## Available datasets and elements 1/3

## Atmospheric analysis datasets

Dataset	element1	element2	Remarks
JRA-55	Pressure Levels	$\chi$ (Velocity Potential) [ $10^6\text{m}^2/\text{s}$ ]	37 Levels (1000 - 1 hPa)
		Div (Relative Divergence) [1/s]	
		$\theta_e$ (Equivalent Potential Temperature) [K]	
		$\omega$ (Pressure Vertical Velocity) [Pa/S]	
		$\psi$ (Stream Function) [ $10^6\text{m}^2/\text{s}$ ]	
		$\theta$ (Potential Temperature) [K]	
		q (Specific Humidity) [Kg/Kg]	
		T (Temperature) [C. Deg]	
		T-Td (Dew point depression) [K]	
		U (Zonal Wind) [m/s]	
		V (Meridional Wind) [m/s]	
		Udiv (Zonal Divergence Wind) [m/s]	
		Vdiv (Meridional Divergence Wind) [m/s]	
		$\zeta$ (Relative Vorticity) [1/s]	
		$\gamma$ (Geopotential Height) [gpm]	
		KE (Kinetic energy of high-frequency variation) [ $\text{m}^2/\text{s}^2$ ]	
		EGR (Maximum growth rate in the Eady problem) [1/day]	
		Flux	
	Waf-yc (Calc Meridional Wave Activity Flux) [ $\text{m}^2/\text{s}^2$ ]		
	Waf-zc (Calc Vertical Wave Activity Flux) [ $\text{Pa}^*\text{m}/\text{s}^2$ ]		
	Wvf-x (Zonal Water Vapor Flux) [Kg/Kg*m/s]		
	Wvf-y (Meridional Water Vapor Flux) [Kg/Kg*m/s]		
	U'V' (Momentum Flux by eddies) [ $\text{m}^2/\text{s}^2$ ]		
	V'T' (Heat Flux by eddies) [K*m/s]		
	Surface	SLP (Sea Level Pressure) [hPa]	
		Ps (Surface Pressure) [hPa]	
		qs (Surface Specific Humidity) [Kg/Kg]	
		Ts (Surface Temperature) [C.Deg]	
		T-Td (Surface 2m dew point depression) [K]	
		Us (Surface Zonal Wind) [m/s]	
		Vs (Surface Meridional Wind) [m/s]	
		Tprat (surface Total precipitation) [mm/day]	

## Available datasets and elements 2/3

### Oceanic analysis datasets

Dataset	element1	element2	Remarks
MOVE-G2	d20-OHC	20 degC depth [m]	
		OHC (vertical ave temp over top 300m)	
	Thermohaline-3D	Potential Temperature [degC]	52 Levels (1.0 - 5925.0m)
		Salinity [psu]	
	Thermohaline-2D	Potential Temperature [degC]	
		Salinity at BBL [psu]	
		Sea Surface Height [cm]	
		Short Wave Radiation [W/m2]	
		Long Wave Radiation [W/m2]	
		Latent Heat Flux [W/m2]	
		Sensible Heat Flux [W/m2]	
		Heat Flux w/o Short Wave Radiation [W/m2]	
		Freshwater Flux [cm/s]	
		Salt Flux for Restoring [psu cm/s]	
		Sea Ice Thickness [m]	
		Snow Depth [m]	
		Ice Concentration	
		surface Temperature [degC]	
	Current-3D	Eastward Velocity [cm/s]	52 Levels (1.0 - 5925.0m)
		Northward Velocity [cm/s]	
	Current-2D	Eastward Velocity at BBL [cm/s]	
		Northward Velocity at BBL [cm/s]	
		Eastward Component of Surface Wind Stress [N/m2]	
		Northward Component of Surface Wind Stress [N/m2]	
		Eastward Component of Surface Stress [N/m2]	
		Northward Component of Surface Stress [N/m2]	
		Eastward Velocity of Ice [m/s]	
Northward Velocity of Ice [m/s]			
Ice Concentration in UV-box			
SST	Sea Surface Data	Temperature (SST) [C.deg]	
		Ice Concentration (ice=1 no ice=0) [fraction]	

## Available datasets and elements 3/3

### CLIMAT, ENSO monitoring INDEX, Satellite datasets

Dataset	element1	element2	Remarks
CLIMAT		T (Temperature) [C. Deg]	
		Tx (Maximum Temperature) [C. Deg]	
		Tm (Minimum Temperature) [C. Deg]	
		Rain (Precipitation) [mm]	
INDEX		Nino.1+2	10S-Eq, 90W-80W
		Nino.3	150W-90W, 5S-5N
		Nino.3.4	170W-120W, 5S-5N
		Nino.4	5S-5N, 160E-150W
		Nino WEST	130E-150E, EQ-20N
SAT		OLR [W/m2]	

### Forecast datasets

Dataset	element1	element2	Remarks
1MONTH_ENS_MEAN 1MONTH_HIND K1EM_yyyymmdd *  *Available when the "Analysis Dataset" is selected	Pressure Levels	$\gamma$ (Geopotential Height) [gpm]	10 Levels (1000 - 10 hPa)
		U (Zonal Wind) [m/s]	
		V (Meridional Wind) [m/s]	
		T (Temperature) [C. Deg]	
		T-Td (Dew point depression) [K]	
		$\chi$ (Velocity Potential) [ $10^6\text{m}^2/\text{s}$ ]	
		$\psi$ (Stream Function) [ $10^6\text{m}^2/\text{s}$ ]	
	Surface	SLP (Sea Level Pressure) [hPa]	
		Ts (Surface Temperature) [C. Deg]	
		Rain (Daily Precipitation) [mm/day]	