Seasonal Forecasting

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1. Seasonal Forecasts by JMA

Kind of Forecast 1

Kind of Forecast	Three–month forecast	One–month forecast
Date of Issue	25th of each month *	Every Friday
Contents	▪3-month mean temperature 3-month total precipitation ▪Monthly mean temperature Monthly precipitation ▪Monthly features of expected Weather	• Monthly mean temperature Monthly precipitation Monthly sunshine duration Monthly snowfall • 1st, 2nd, 3rd–4thweek mean temperature • Monthly features of expected Weather
Forecast Method	▪CGCM with ensemble method	▪AGCM with ensemble method

* The dates of issue are up when they fall on Fridays, Saturdays, Sundays or national holidays

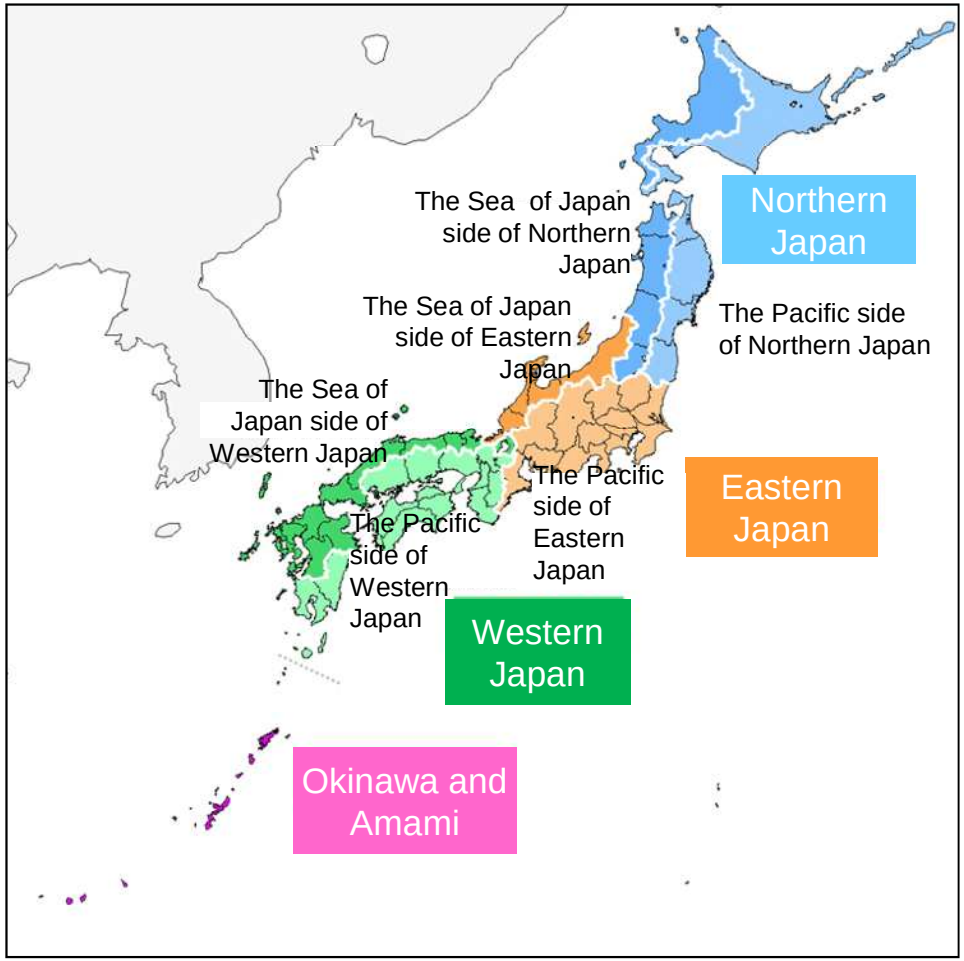
Kind of Forecast 2

Kind of Forecast	Warm season forecast	Cold season forecast
Date of Issue	February 25th *	September 25th *
Contents	•Three-Month (Jun.–Aug.) mean temperature precipitation •Rainy season (Bai-u) precipitation •Seasonal features of expected weather	• Three-month (Dec.–Feb.) mean temperature precipitation snowfall amounts (The Sea of Japan side area) • Seasonal features of expected weather
Forecast Method	・Atmosphere-Ocean Coupled General Climate Model (CGCM) with ensemble method	

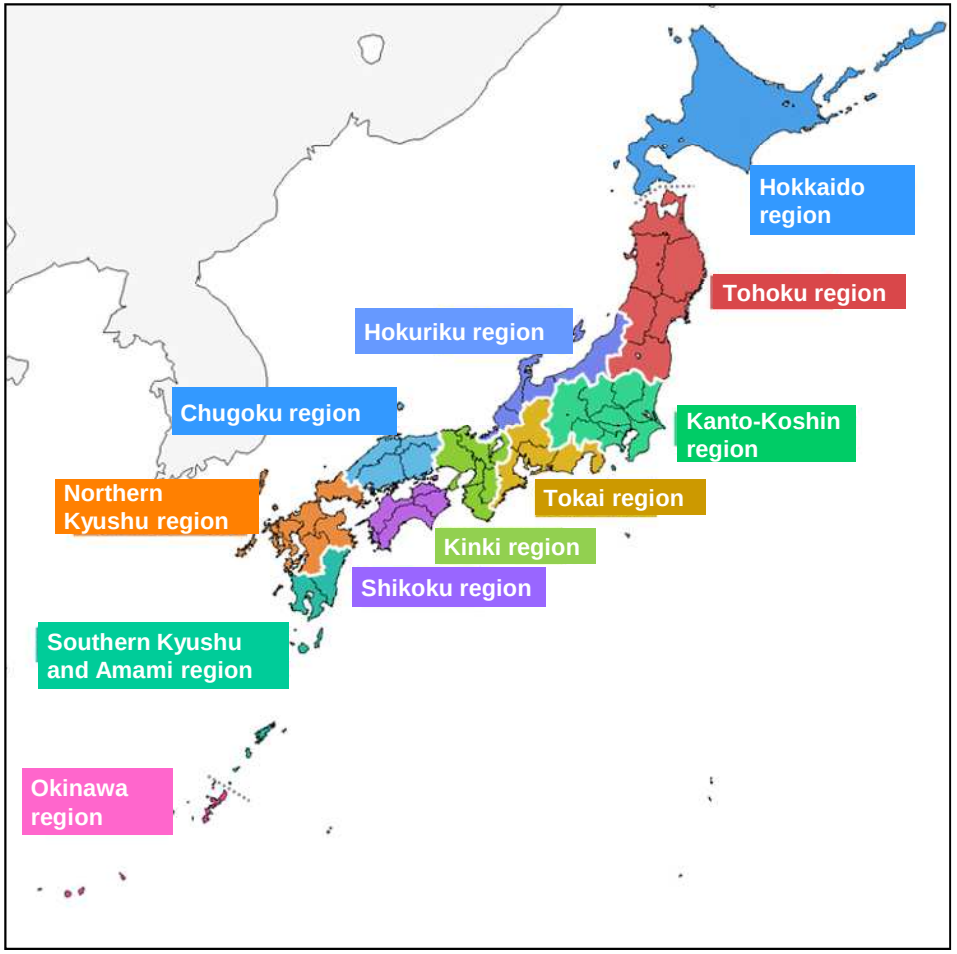
* The dates of issue are up when they fall on Fridays, Saturdays, Sundays or national holidays

Targeted Regions

Regions for general seasonal forecasts



Regions for local seasonal forecasts



- Issued by the JMA headquarters.
- Temperature : four regions.
- Precipitation and sunshine durations : seven regions with consideration for mountaneous climatic characteristics.

- 11 local regions
- Issued by local observatories in the region (in case of Kanto-Koshin region, the JMA headquarters issue)

2. Probabilistic Forecasts

Three Categories

In seasonal forecasts, the probabilities of three categories (above normal, near normal and below normal) are announced.

These categories are defined with 30 observed anomalies against the climatic normals.
Base period is from 1981 to 2010.

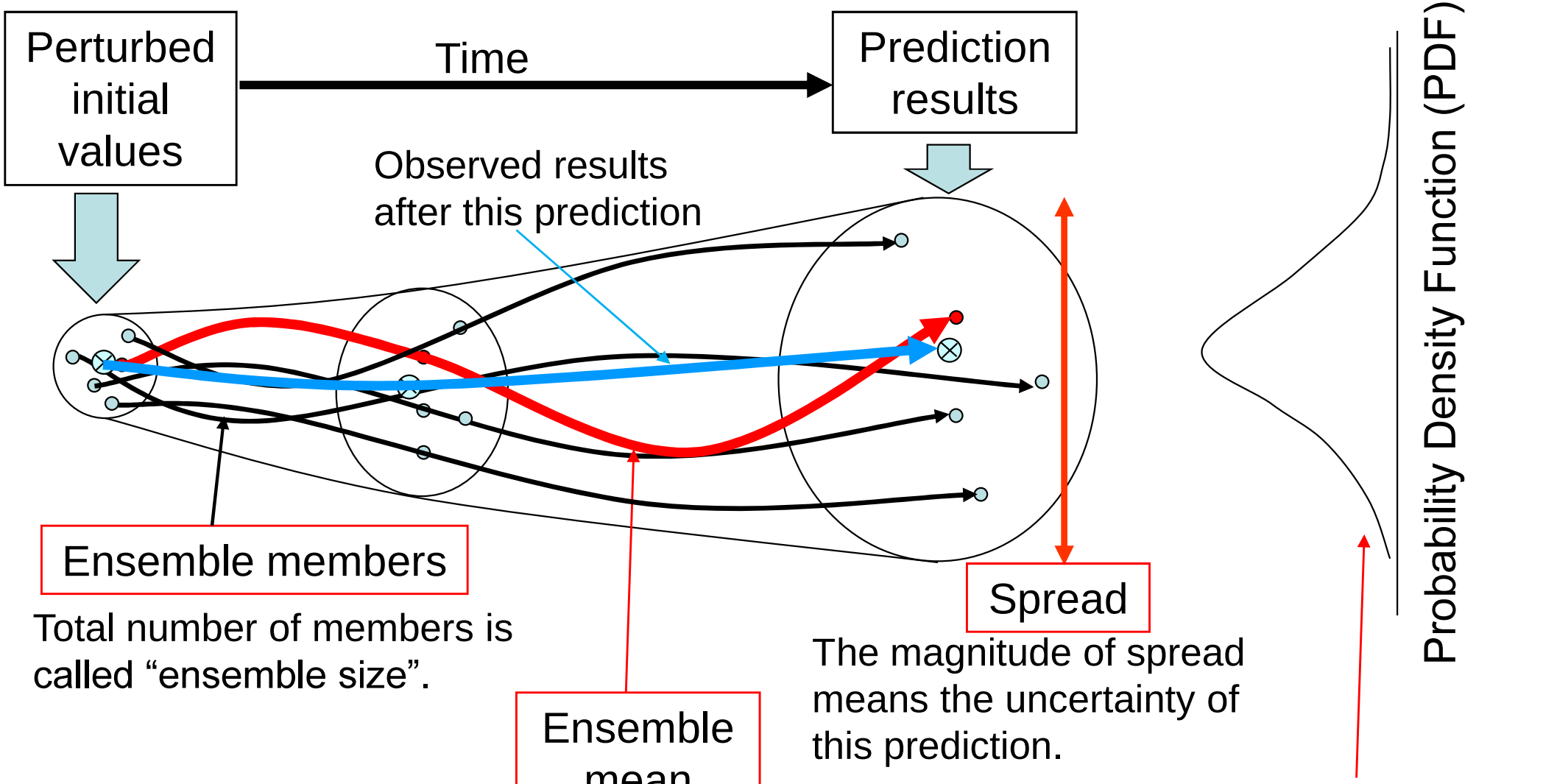
10 lowest values　　10 top values

Climatic frequency of each category is 33%.

Range of “Near Normal” (Unit : ℃）

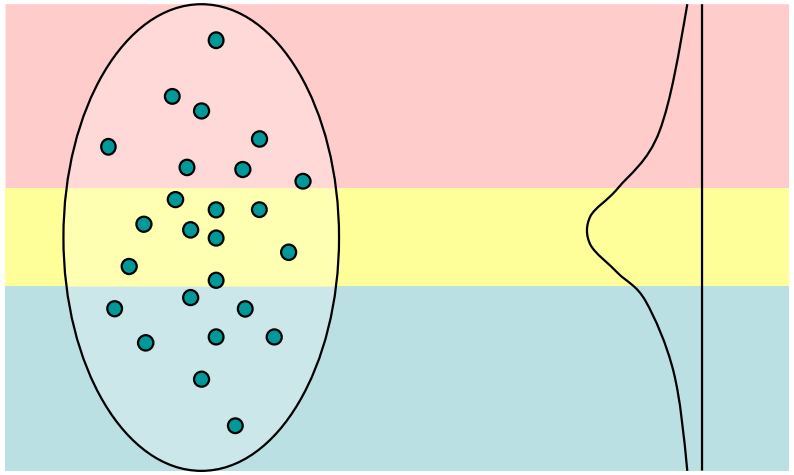
Regions	Dec. – Feb.	Mar. – May	June – Aug.	Sep. – Nov.
Northern Japan	-0.3～+0.4	-0.2～+0.4	-0.4～+0.3	-0.2～+0.4
Eastern Japan	-0.1～+0.4	-0.1～+0.3	-0.1～+0.3	-0.4～+0.5
Western Japan	-0.1～+0.5	-0.2～+0.2	-0.2～+0.3	-0.3～+0.6
Okinawa/Amami	-0.1～+0.2	-0.2～+0.2	-0.1～+0.1	-0.3～+0.2

Ensemble Forecast



Probabilistic Forecast

Example 1 : All members spread equally (randomly).

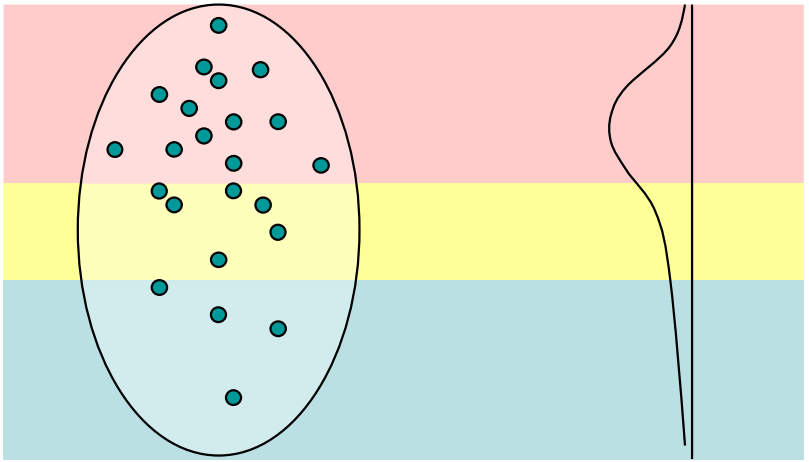


Below Normal	Near Normal	Above Normal
33%	33%	33%

There is no deviation from climatology.

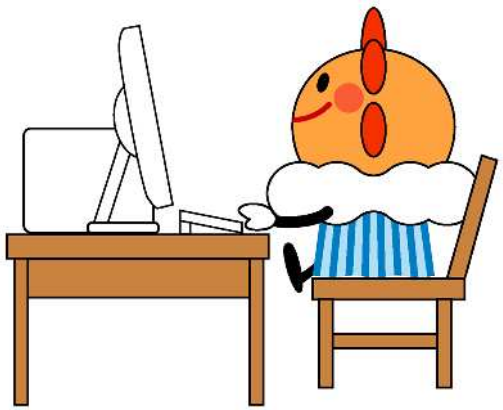
There is no signal!

Example 2 : Many members are deviated to “Above Normal”.



Below Normal	Near Normal	Above Normal
20%	30%	50%

3. How to Make One–month Prediction with JMA's Products on TCC Website



Proceedings 1

a. Understanding the recent climate conditions

- El Niño or La Niña?
- Indian Ocean SST?
- Phase of MJO?
- Convective activity over the Indian Ocean or Maritime Continent?
- Influence of the anomalous convection on the sub-tropical (mid-latitude) atomosphere?
- Position and meandering of the sub-tropical jet or polar front jet?
- Rossby wave propagation along the jet streams?
- Subtropical High? Siberian High? Aleutian Low?

SST

Velocity potential at 200hPa(CHI200)

Stream function at 200hPa and 850hPa (PSI200 and PSI850)

Sea level pressure (SLP)

Temperature at 850hPa (T850)

Geopotential height at 500hPa (Z500)

b. Understanding the predicted results

- How are those conditions predicted to be?

Proceedings 2

c. Considering the climate over your country

- Temperature?
- Precipitation?
- Image of weather?
- Guidances?
- Reliability?

Surface temperature (TS)

RAIN

One-month probabilistic forecasts at station points

Let's make guidance for your country tomorrow!!

d. Decision of probabilities

One-month mean temperature will be above normal.

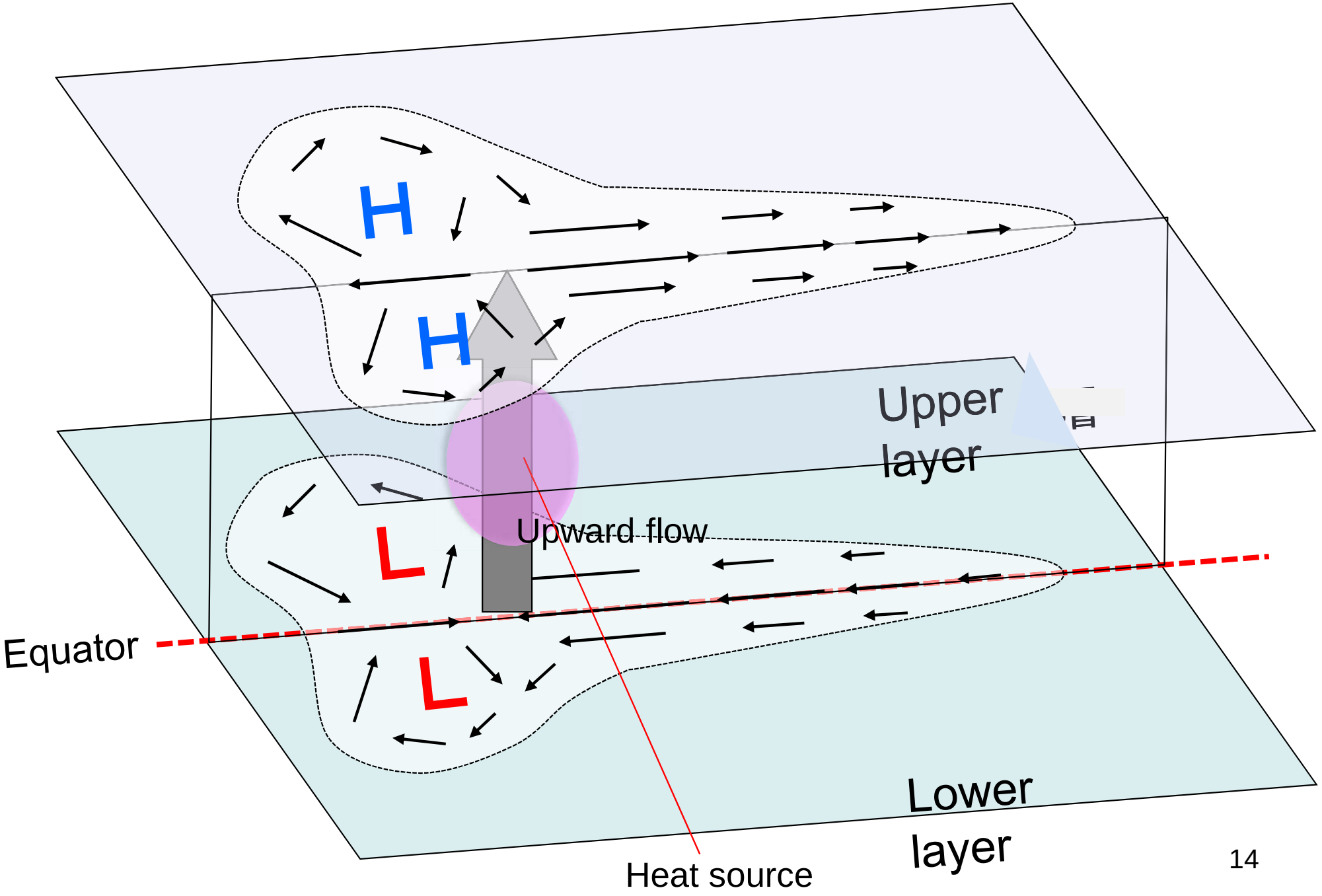
10:10:80
10:20:70
10:30:60
10:40:50
20:30:50
20:40:40
30:30:40

Three categories

10:90
20:80
30:70
40:60

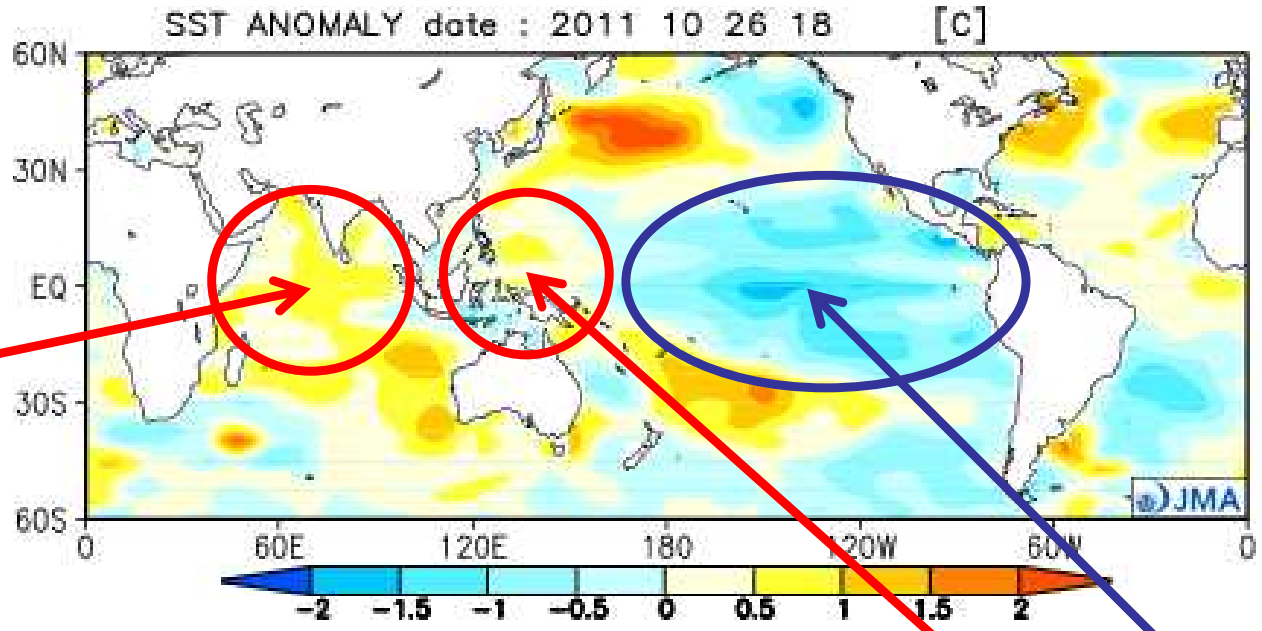
Two categories

Matsuno–Gill Response Model



Recent Climate

SST



Positive

Unlike La Niña!

Positive Negative

La Niña conditions!

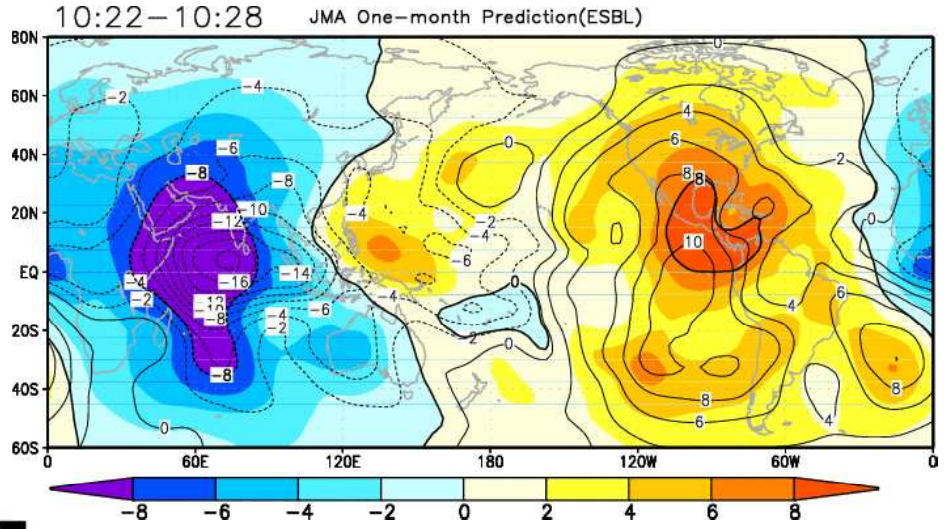
This initial anomalous pattern is used for the integration with AGCM during the targeted period.

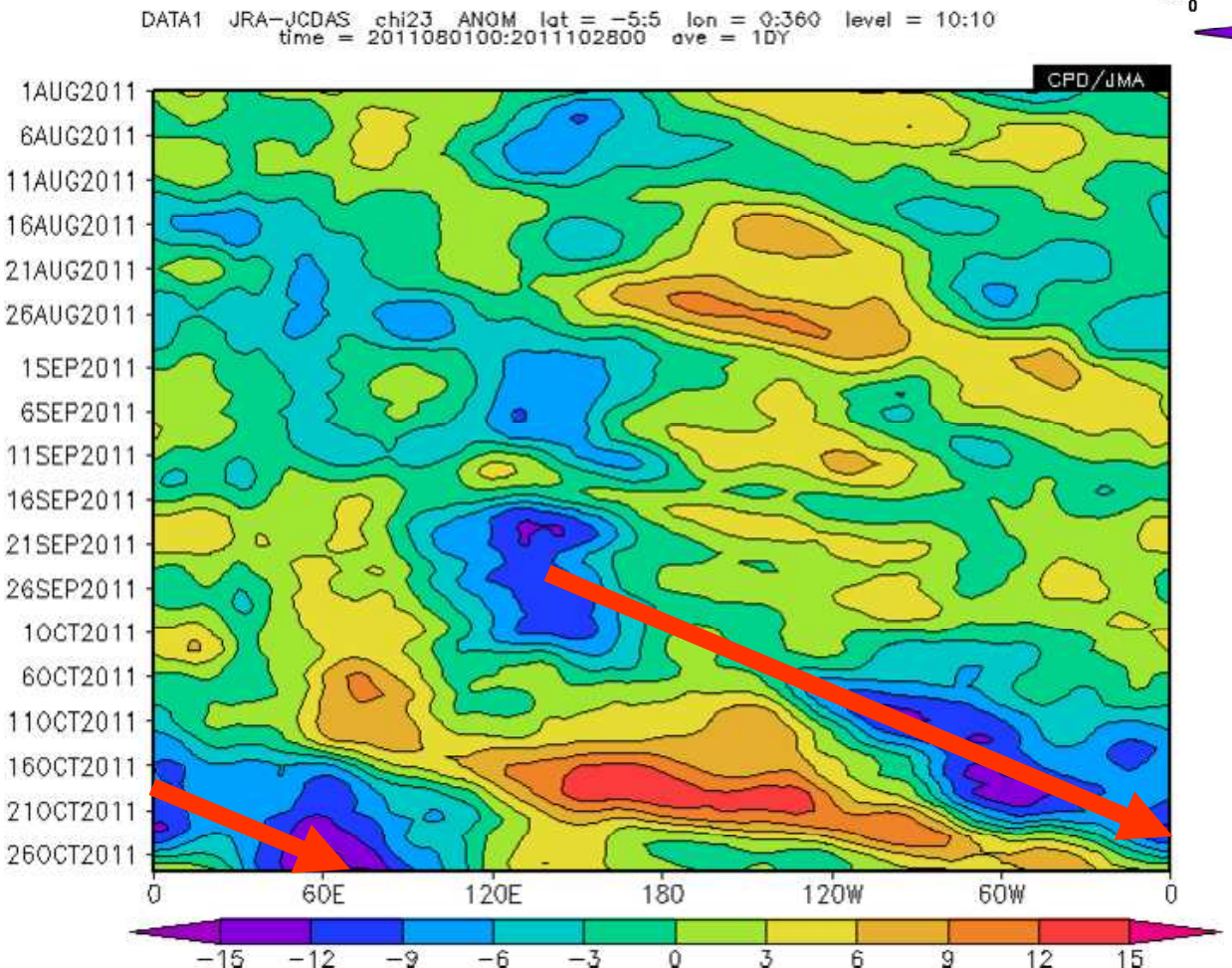
http://ds.data.jma.go.jp/tcc/tcc/products/model/map/1mE/map1/zpcmap.php

Recent Climate

CHI200

Active convection areas move from the Atlantic Ocean to the Indian Ocean.



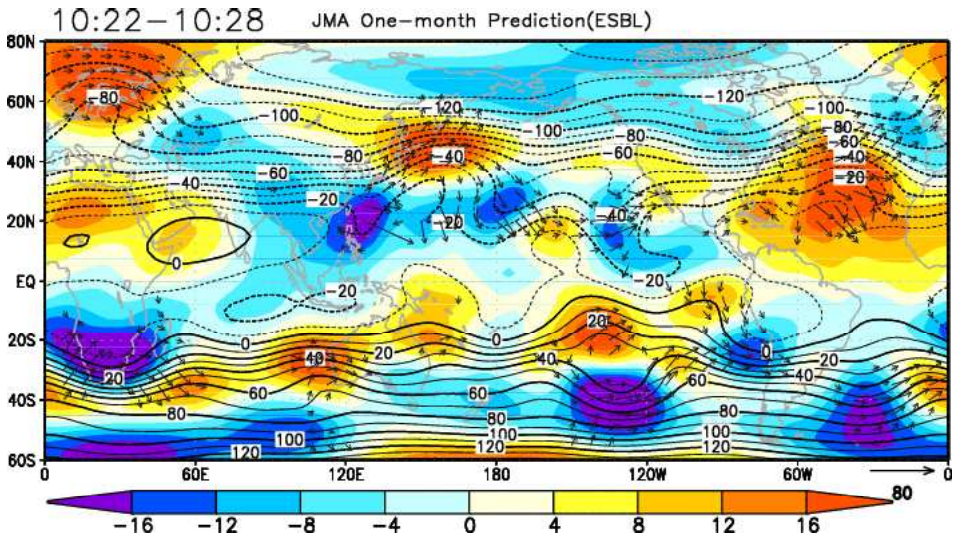


Recent Climate

PSI200

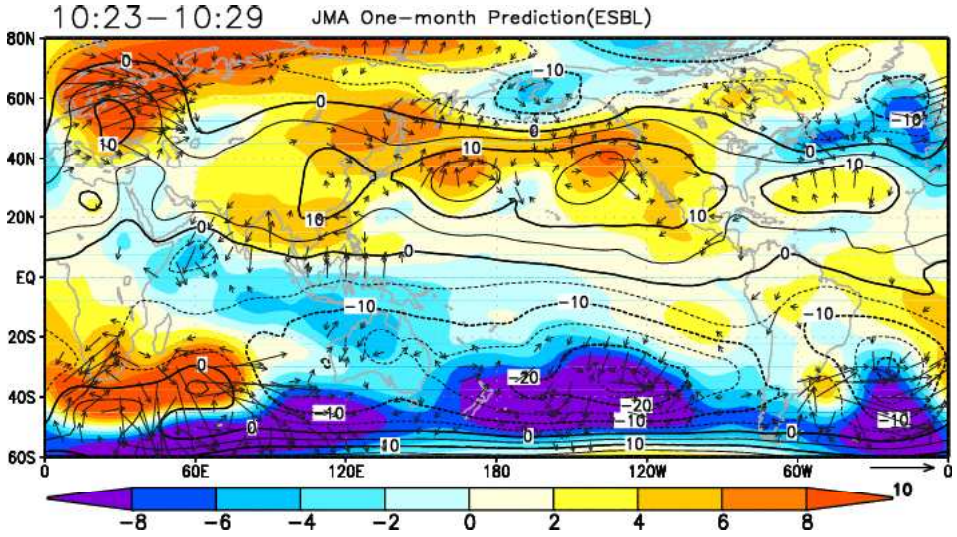
Anti-cyclonic circulation anomalies are seen in the sub-tropical areas of both hemispheres over Africa.

Cyclonic circulation anomaly is appeared around Philippines, which enhances the anti-cyclonic circulation anomaly over Japan.



PSI850

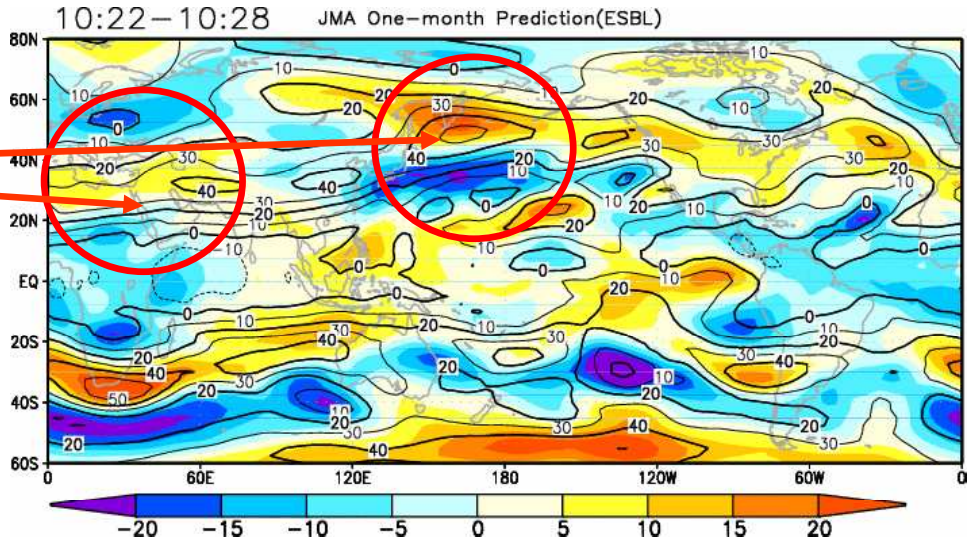
Anti-cyclonic circulations are seen over East Asian and Japan.
On the other hand, cyclonic circulation is seen over Indonesia.



Recent Climate

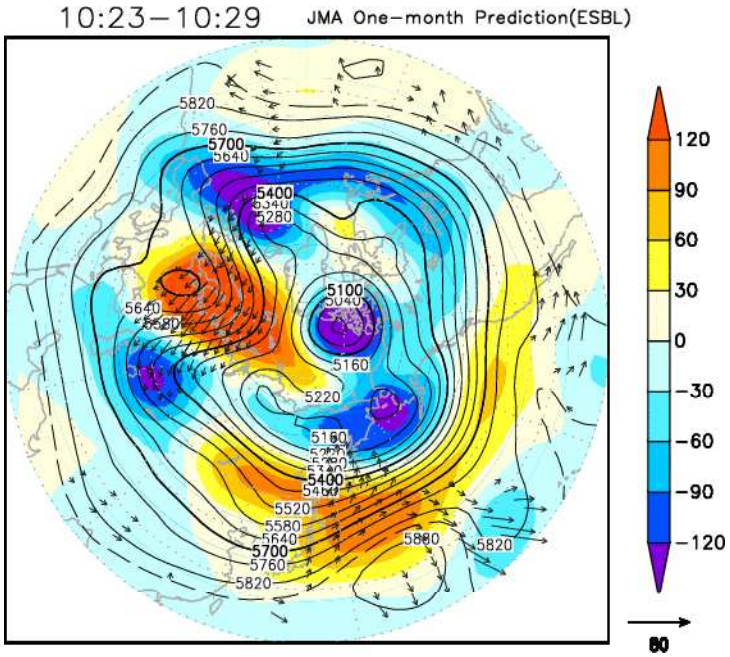
U200

The sub-tropical jet shifts northward.



Z500

Significantly positive anomaly area is appeared over northern part of Europe, which enhances the negative anomaly area over the Caspian Sea along the polar front jet stream (Rossby wave propagation).



How are these phenomena predicted?

Outline of the Latest One-month Forecast

Initial date : October 27th
Issued date : October 28th

The first week : October 29th – November 4th
The second week : November 5th – November 11th
The third & fourth week : November 12th – November 25th
28 days : October 29th – November 25th

In this training seminar, the same predicted data are used.
But prediction period is November 1st – November 28th.

Predicted CHI200

The 1st week (Oct. 29 – Nov. 4)

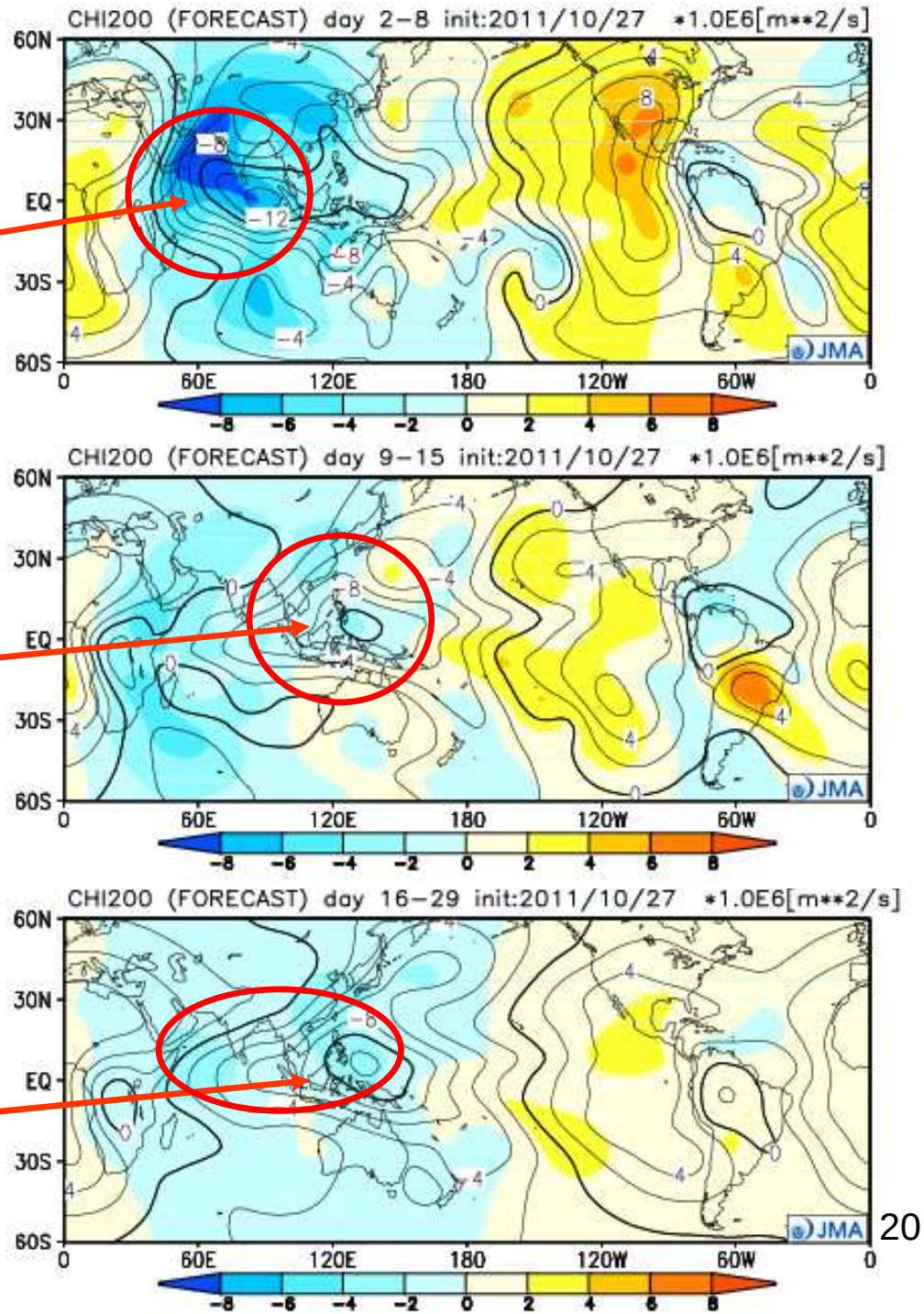
Convection activity is predicted to be stronger than climatic normal over Indian Ocean.

The 2nd week (Nov. 5 – Nov. 11)

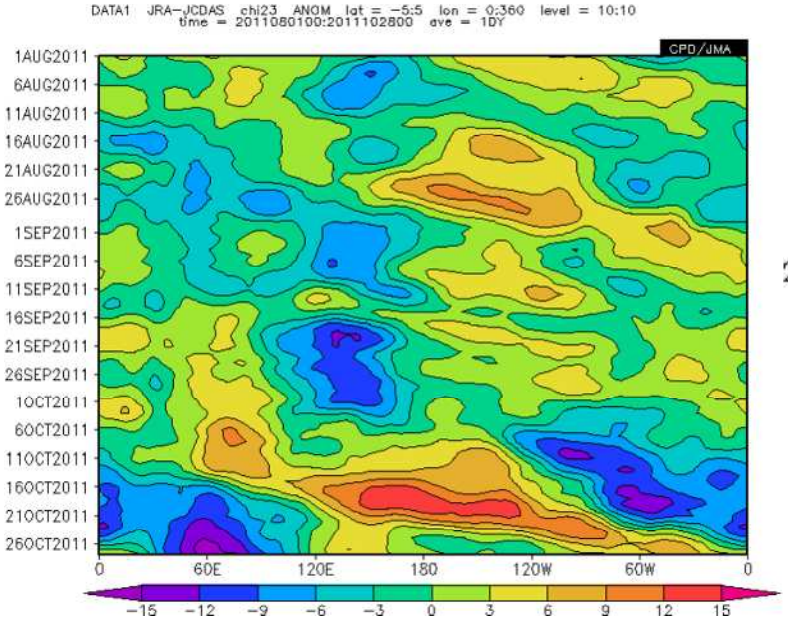
Active convection area is predicted to spread to eastward.

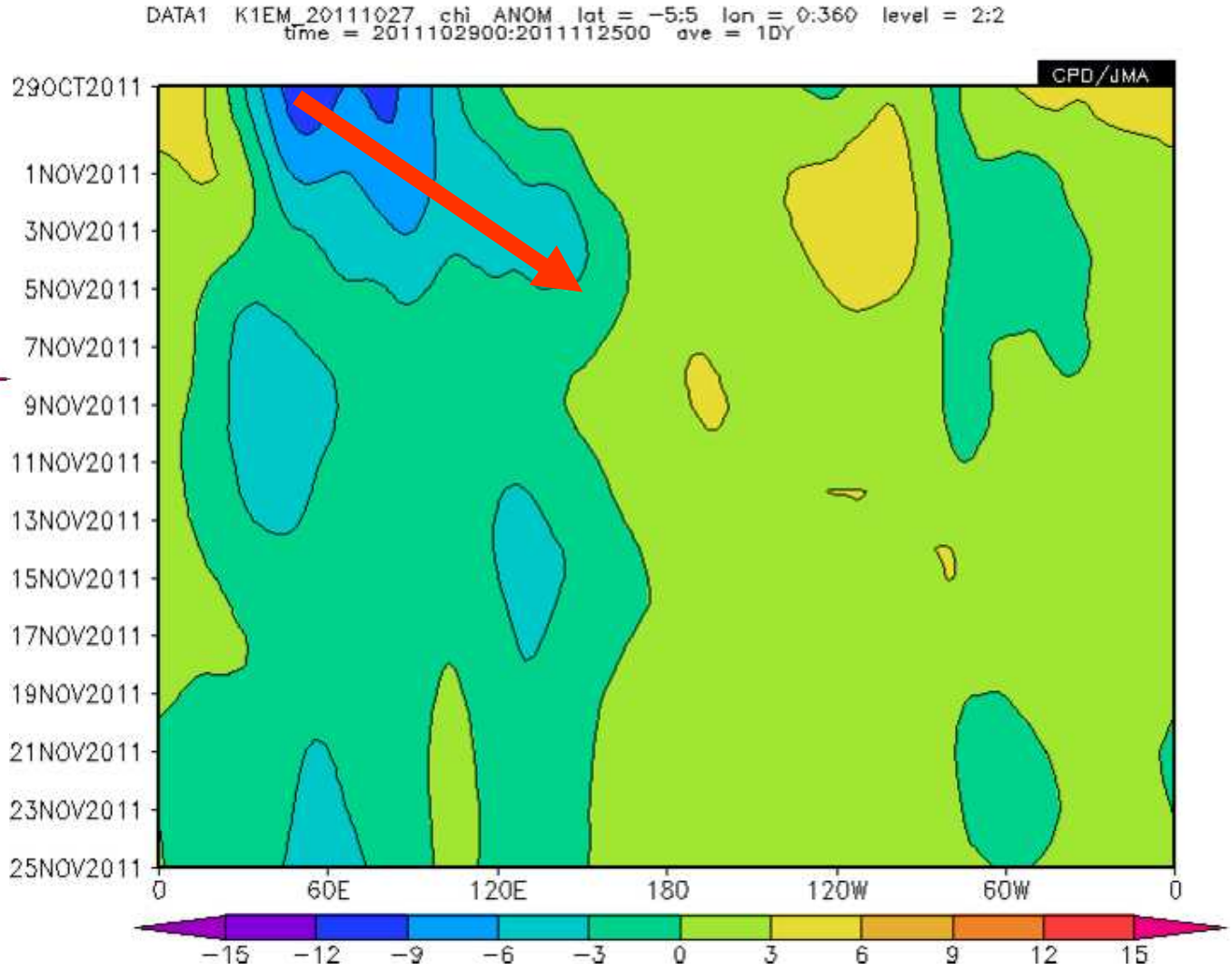
The 3rd – 4th week (Nov. 12 – Nov. 25)

Active convection area is predicted to be steady around the Indian Ocean and maritime continent.



Predicted CHI200



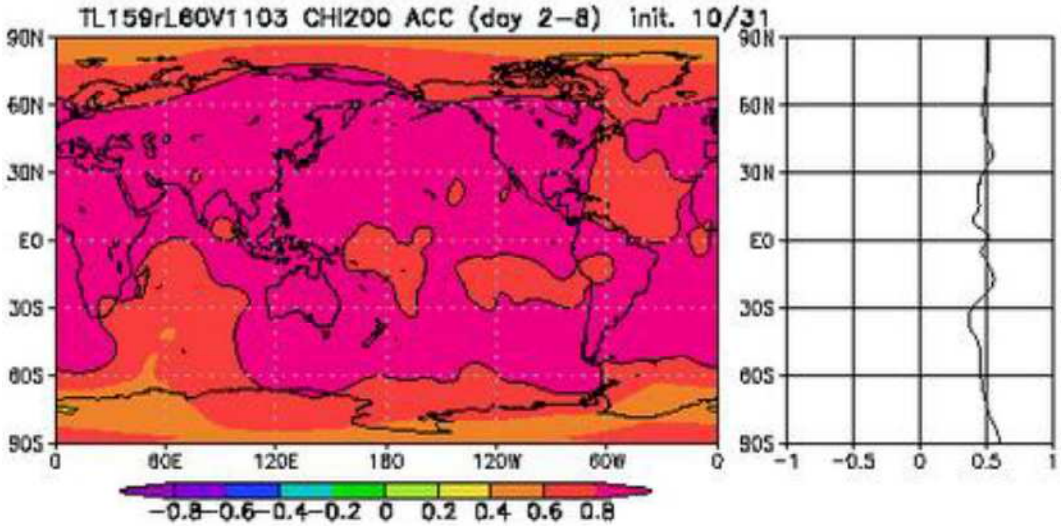


Convection activity area is predicted to spreads to maritime continent area during the 1st week, and be steady over the Indian Ocean and maritime continent after 2nd week.

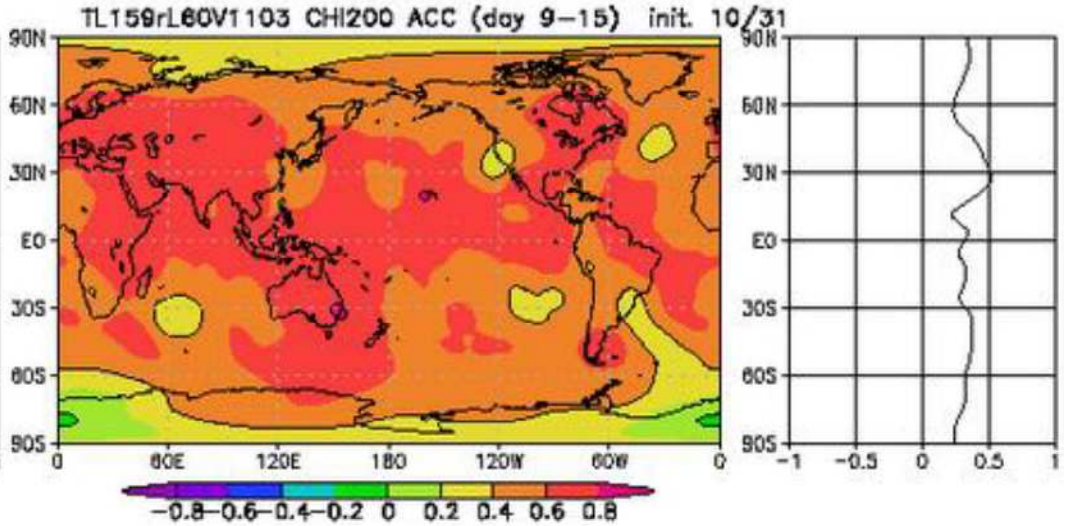
Score of CHI200

These maps show the correlation between hindcast results of the JMA's climate model and observations.

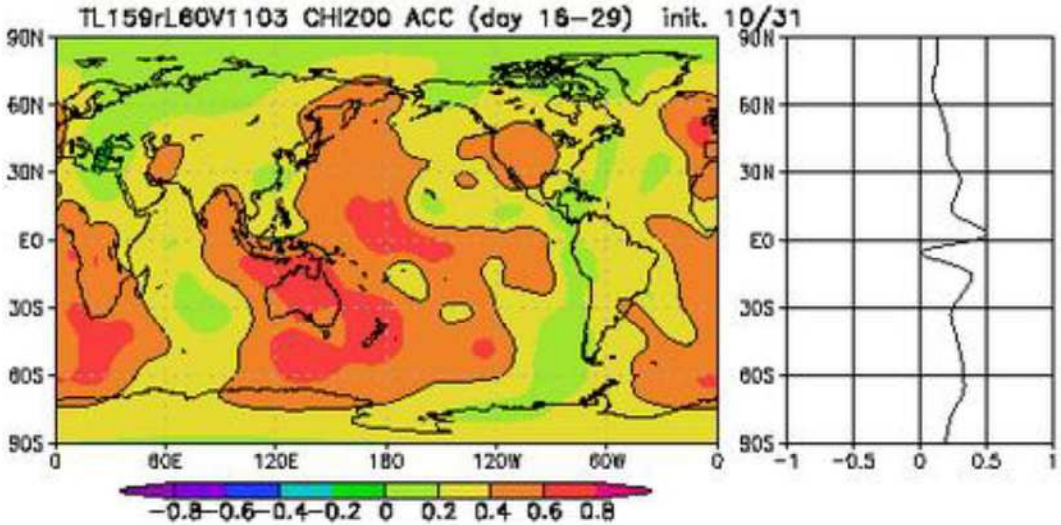
The 1st week



The 2nd week



The 3rd – 4th week



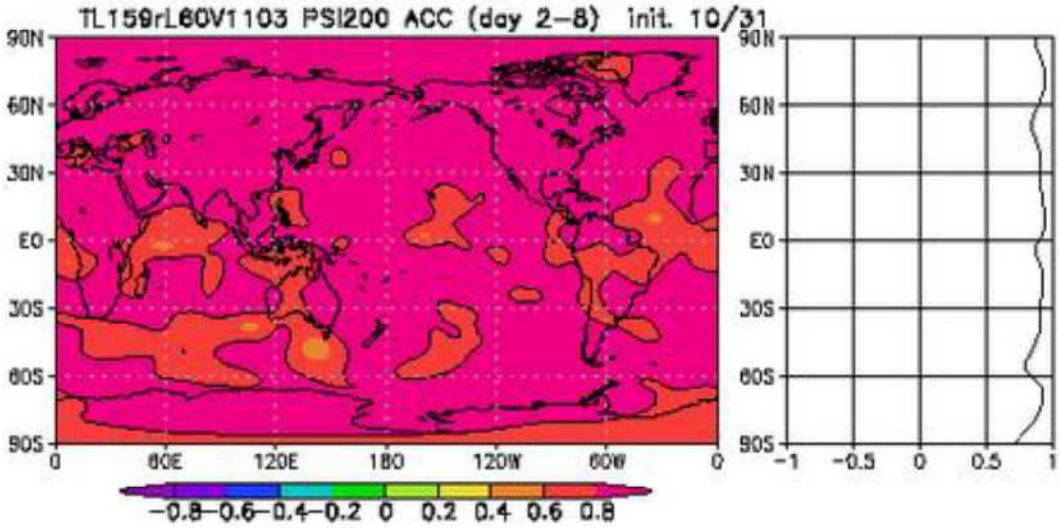
Verification results (score) of the climate model should be considered.

Predicted CHI200 for the 1st week is highly correlated with observations. On the other hand, correlation coefficient decreases as lead time is longer.

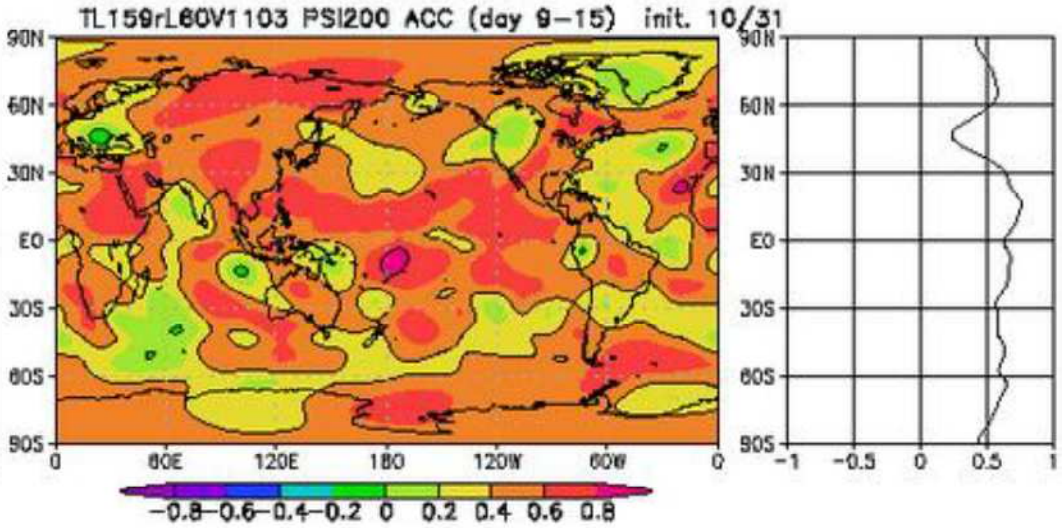
http://ds.data.jma.go.jp/gmd/tcc/tcc/products/model/hindcast/1mE/tro_acor.html

Score of PSI200

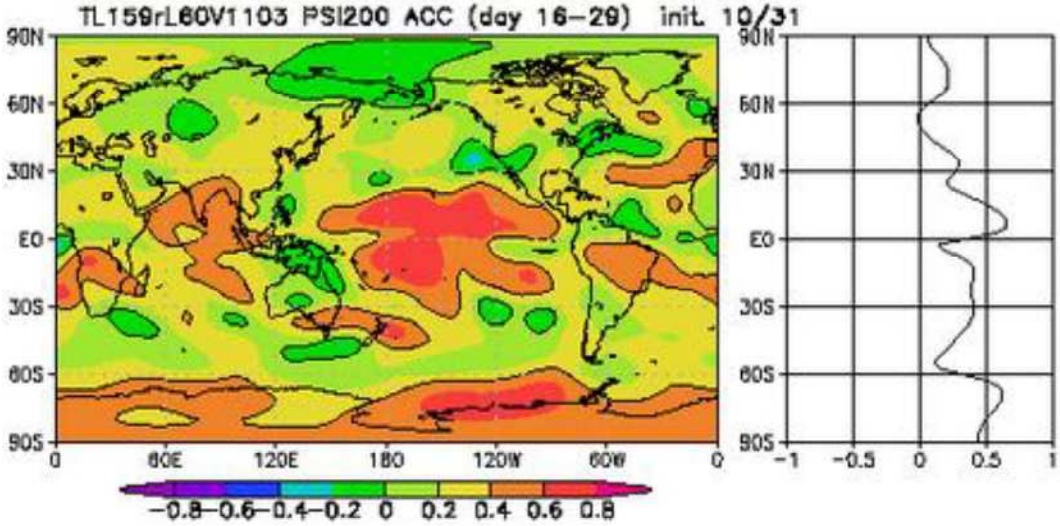
The 1st week



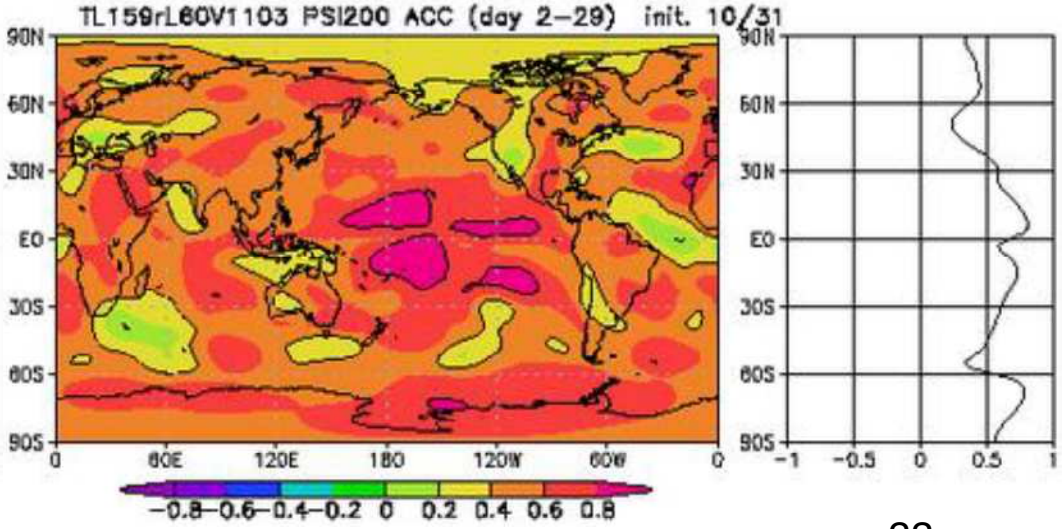
The 2nd week



The 3rd – 4th week



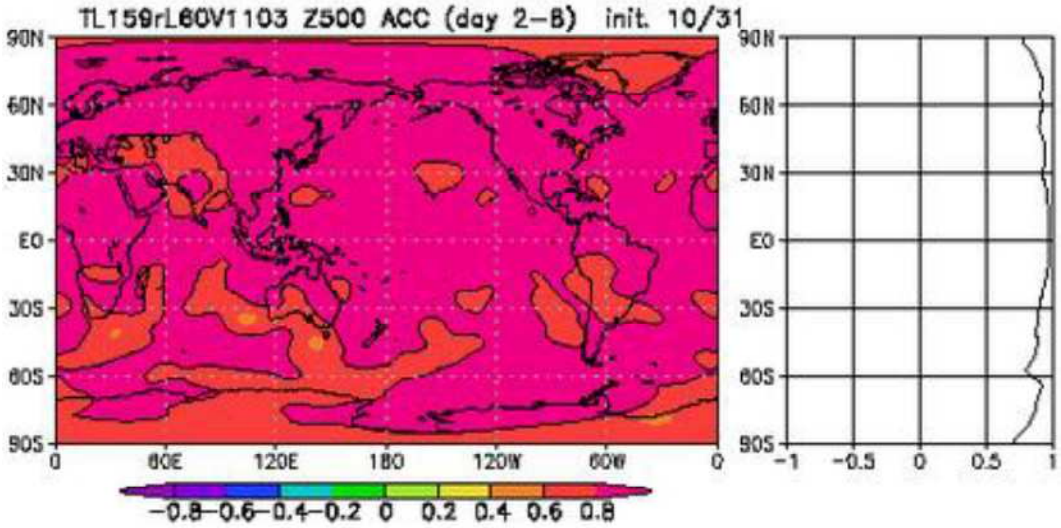
28 days



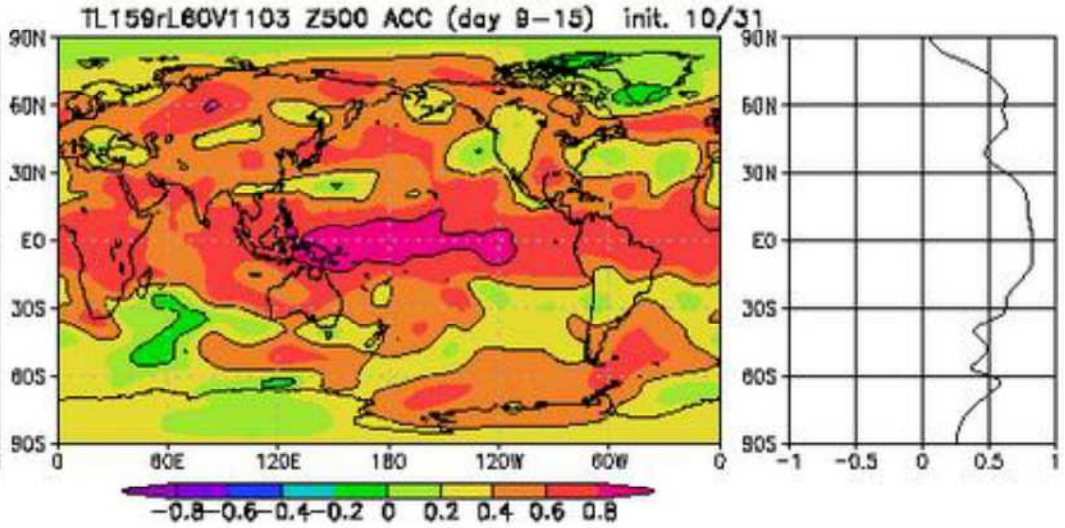
http://ds.data.jma.go.jp/gmd/tcc/tcc/products/model/hindcast/1mE/tro_acor.html

Score of Z500

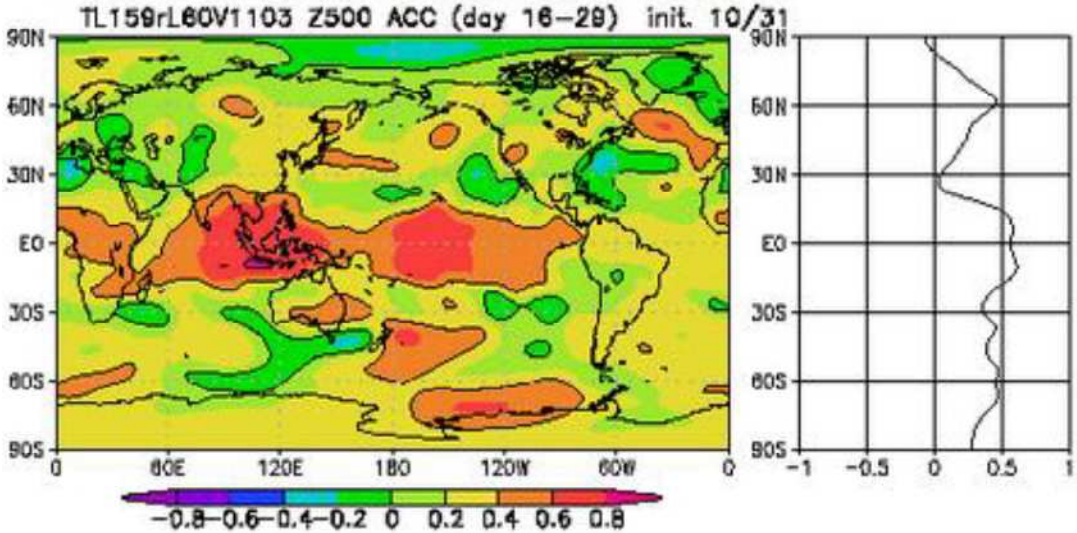
The 1st week



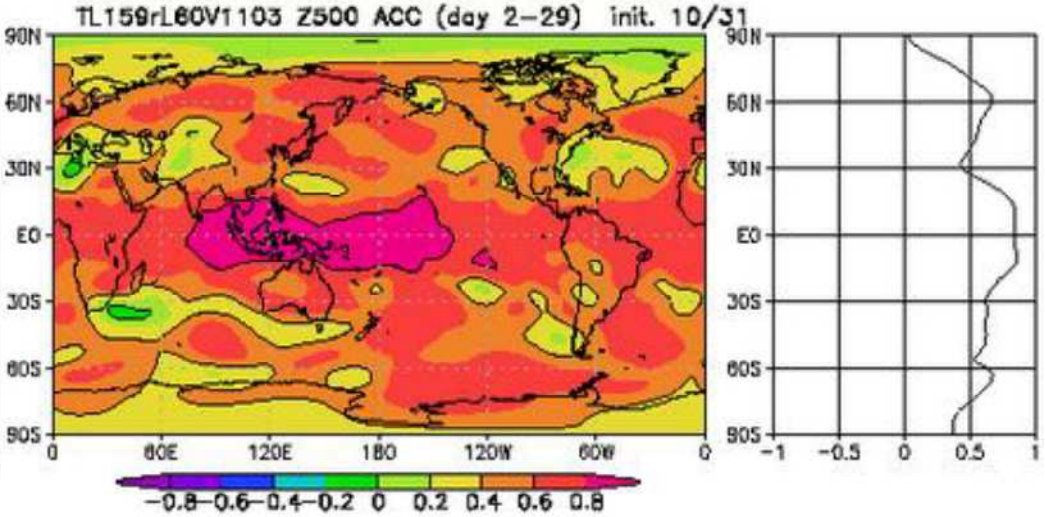
The 2nd week



The 3rd – 4th week



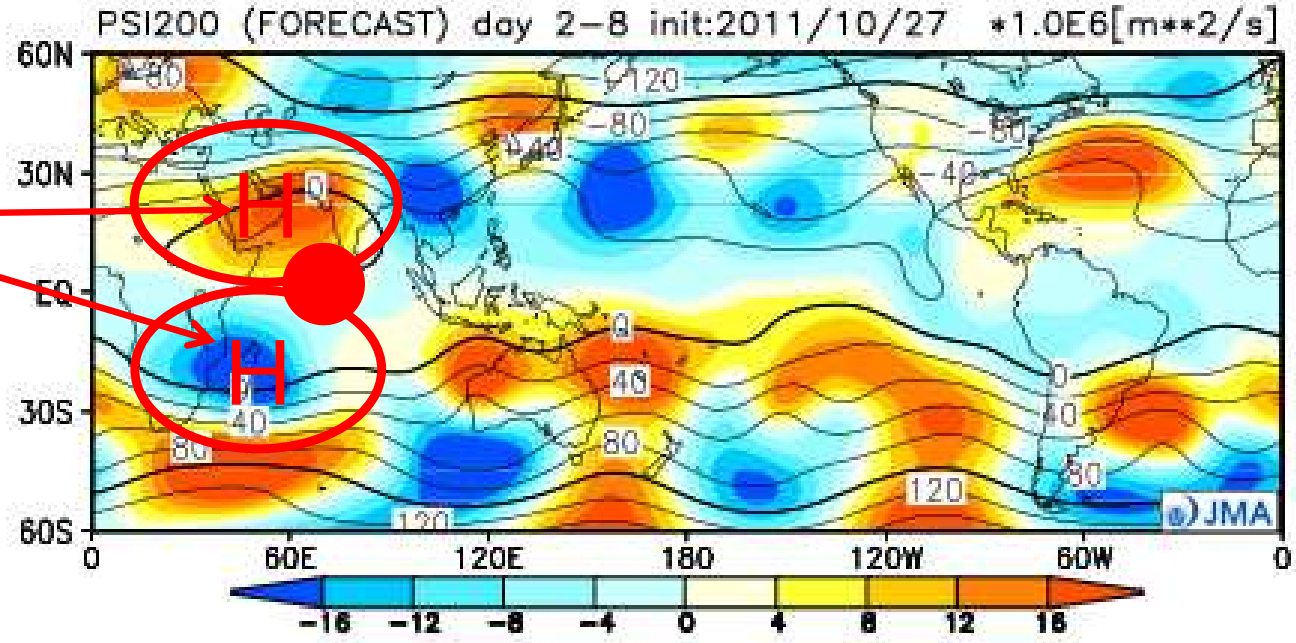
28 days



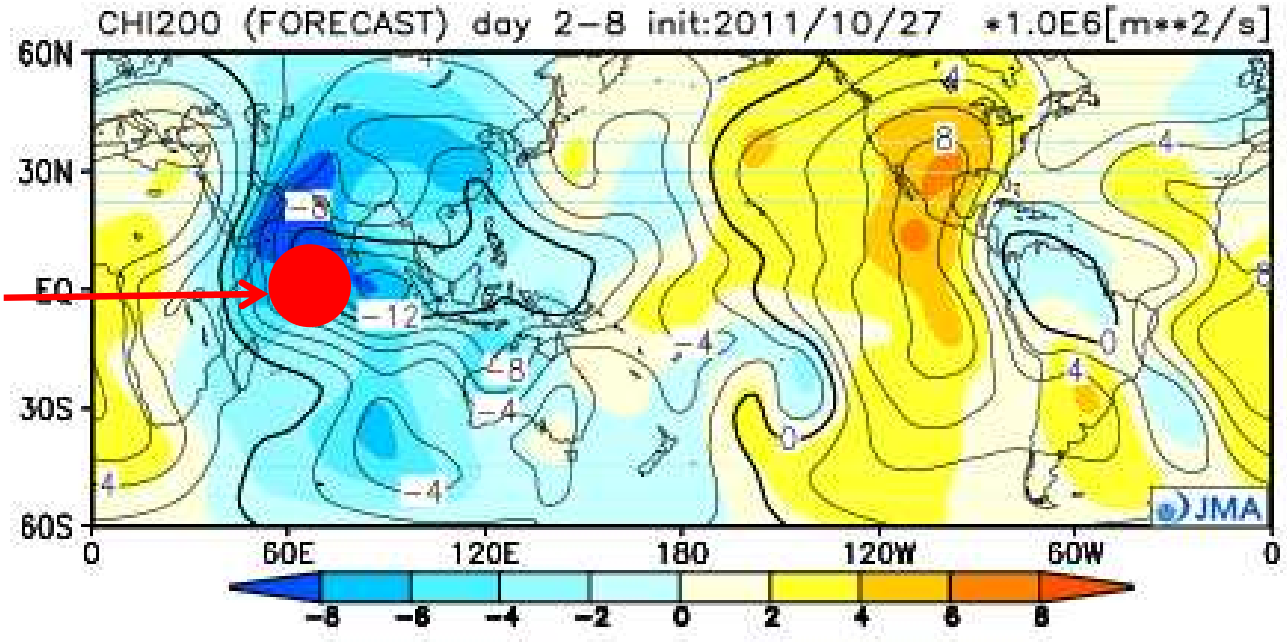
http://ds.data.jma.go.jp/gmd/tcc/tcc/products/model/hindcast/1mE/tro_acor.html

PSI200 & CHI200 (1st week : Oct. 29 – Nov. 4)

Anti-cyclonic circulation anomaly



Heating source

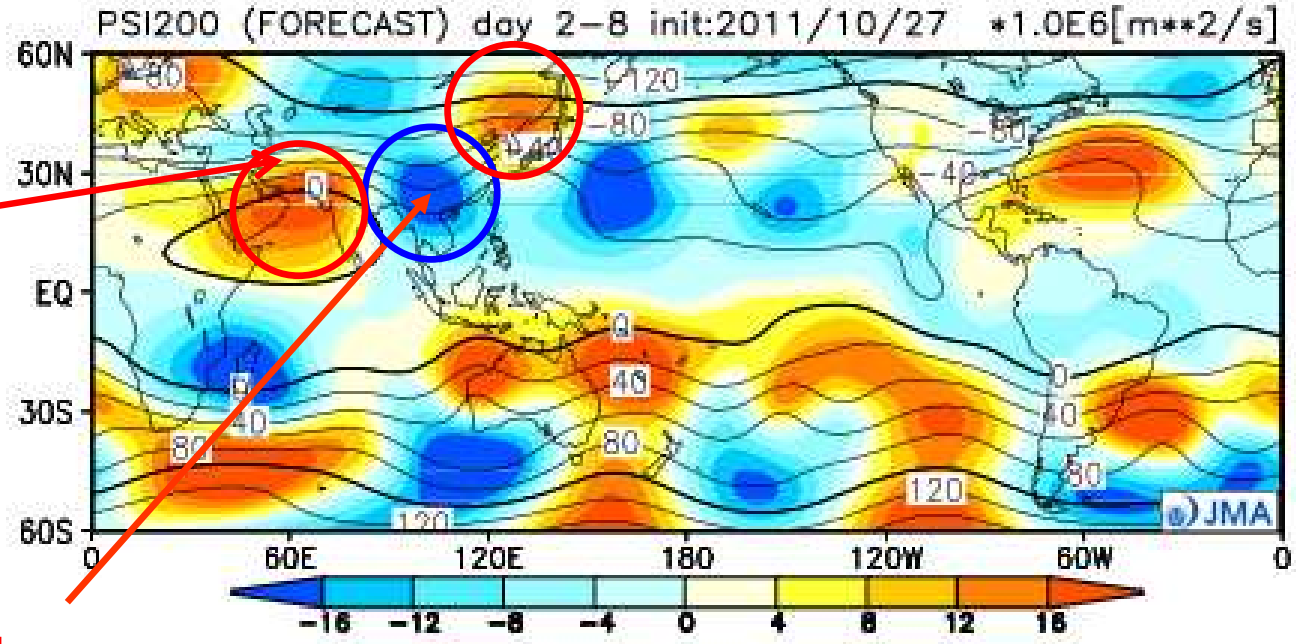


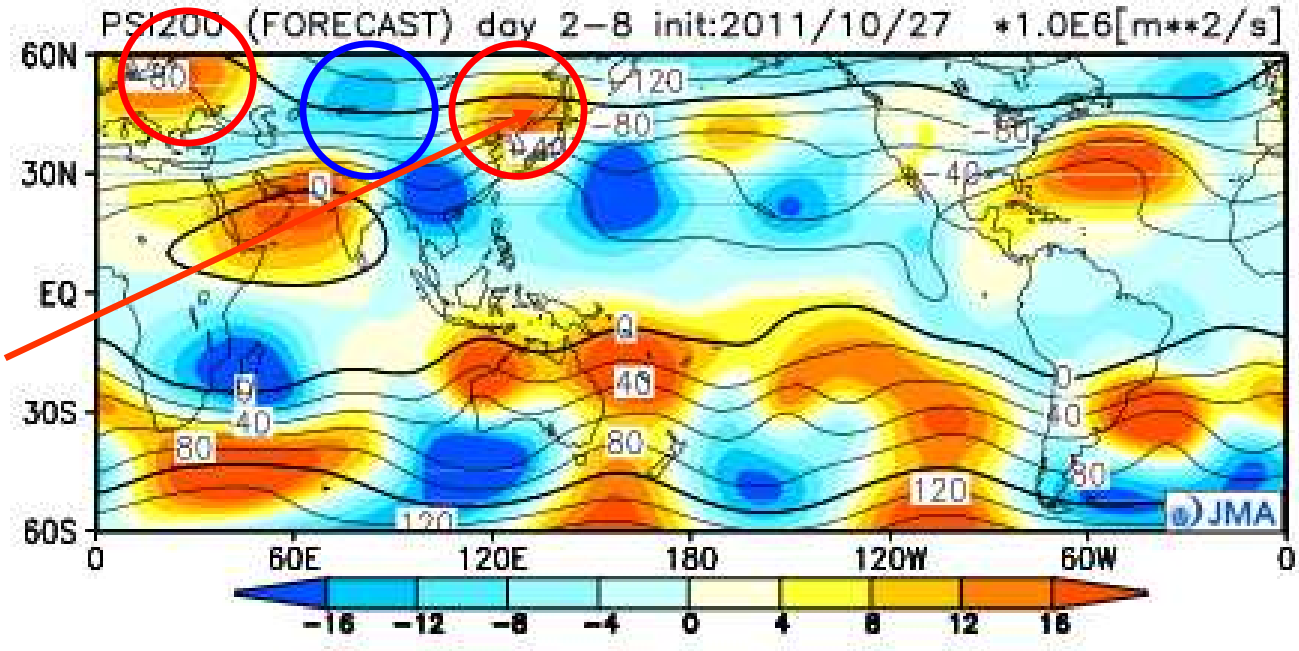
Rossby Wave Propagation

Sub-tropical Jet is predicted to shift northward around here.

It makes sub-tropical jet's meandering and train of Rossby wave downstream.

Train of Rossby wave appears along the polar front jet, too.



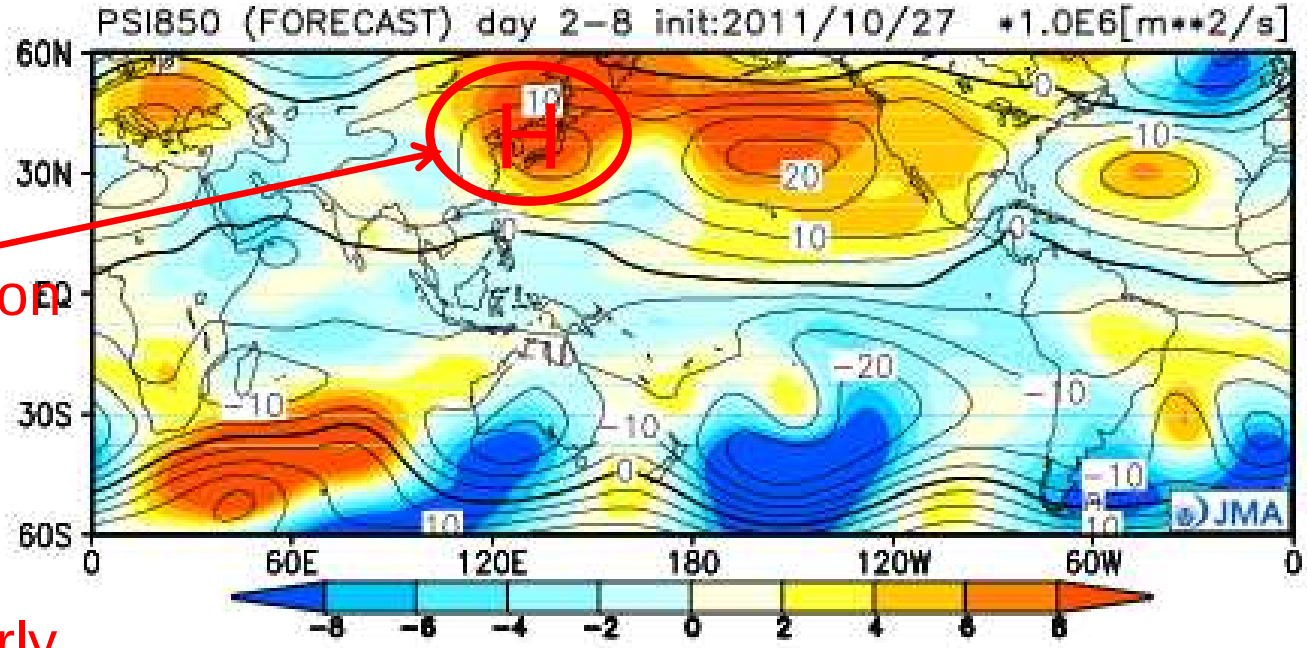


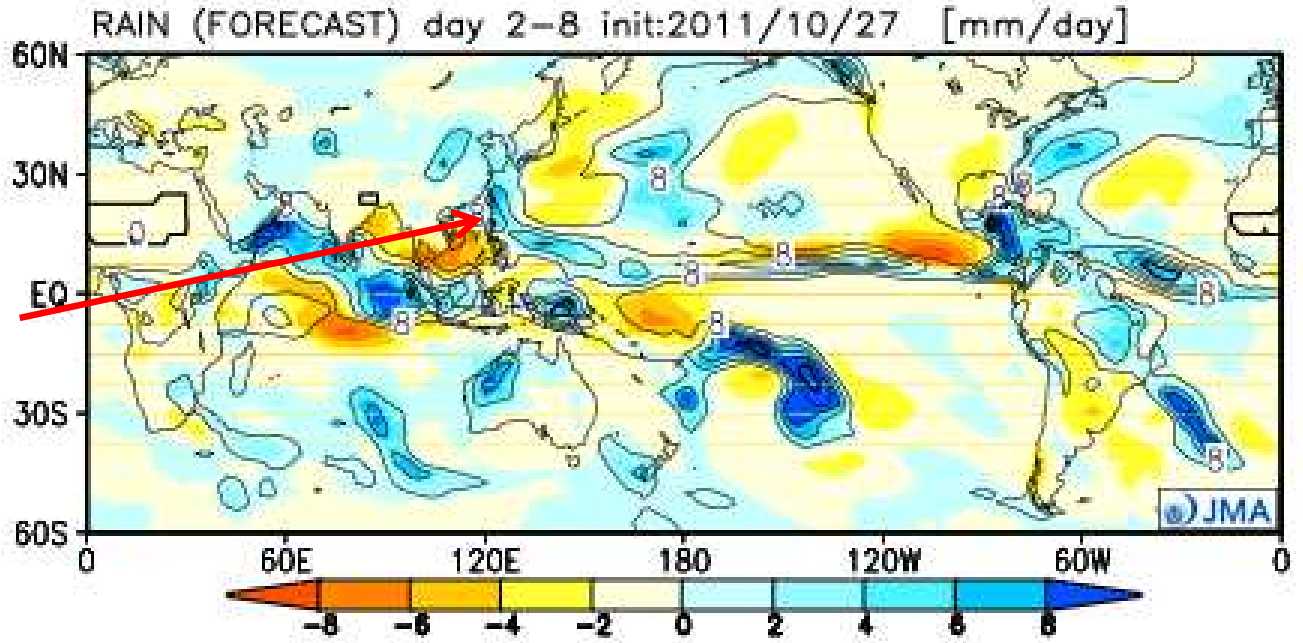
PSI850 & RAIN (1st week : Oct. 29 – Nov. 4)

Anti-cyclonic circulation anomaly (clockwise flow anomaly)

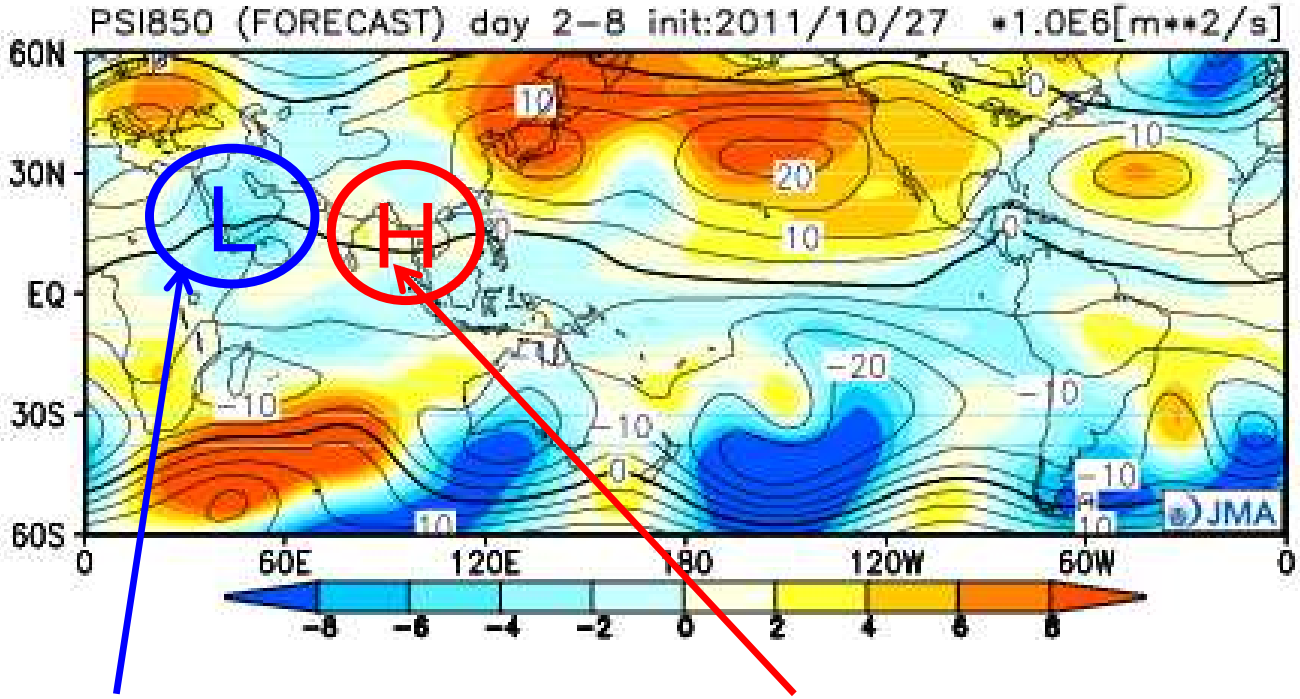
It makes south-easterly moist flow anomaly.

Anomalous positive precipitation





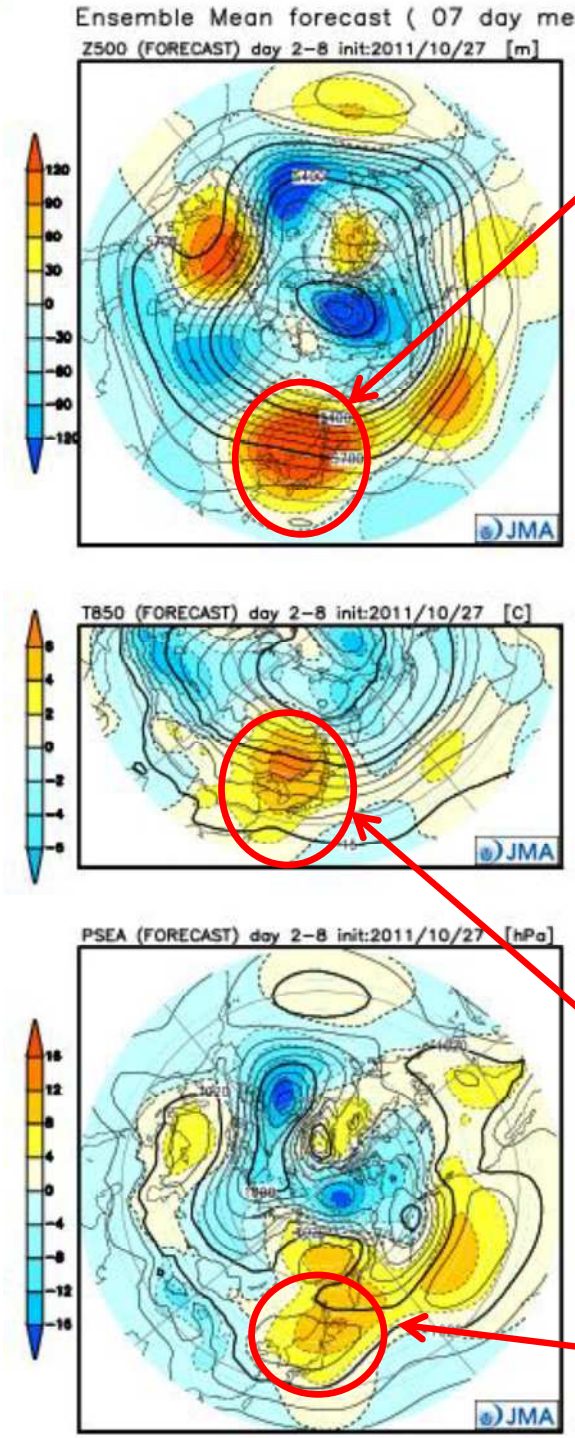
PSI850 (1st week : Oct. 29 – Nov. 4)



Cyclonic circulation anomaly appears due to a heat source over the Indian Ocean.

Anti-cyclonic circulation anomaly appears.

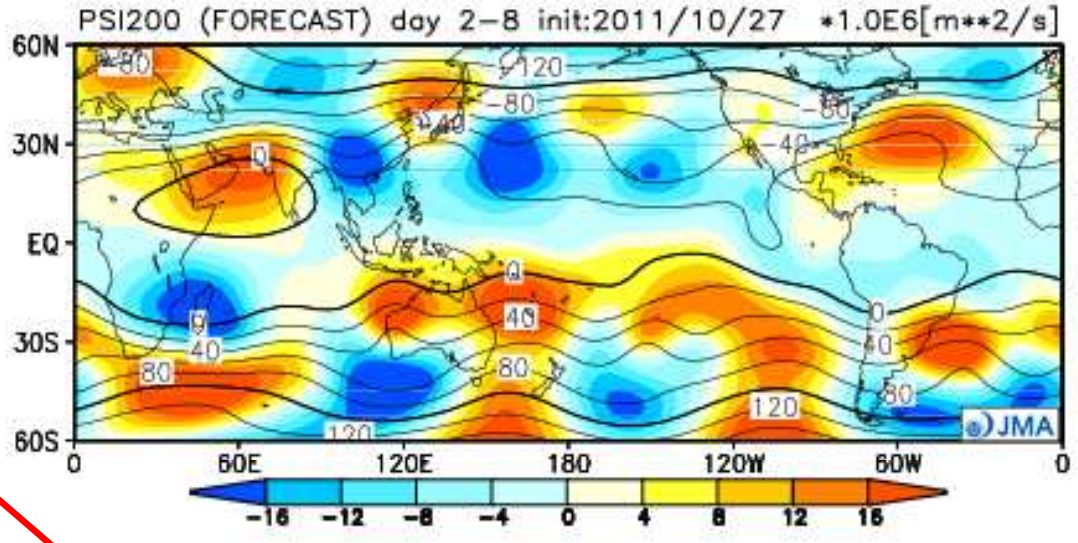
Z500, T850, SLP (1st week : Oct. 29 – Nov. 4)



Geo-potential height at 500hPa is predicted to be significantly higher around Japan.

Rossby wave propagation along the polar front jet

Rossby wave propagation along the sub-tropical jet

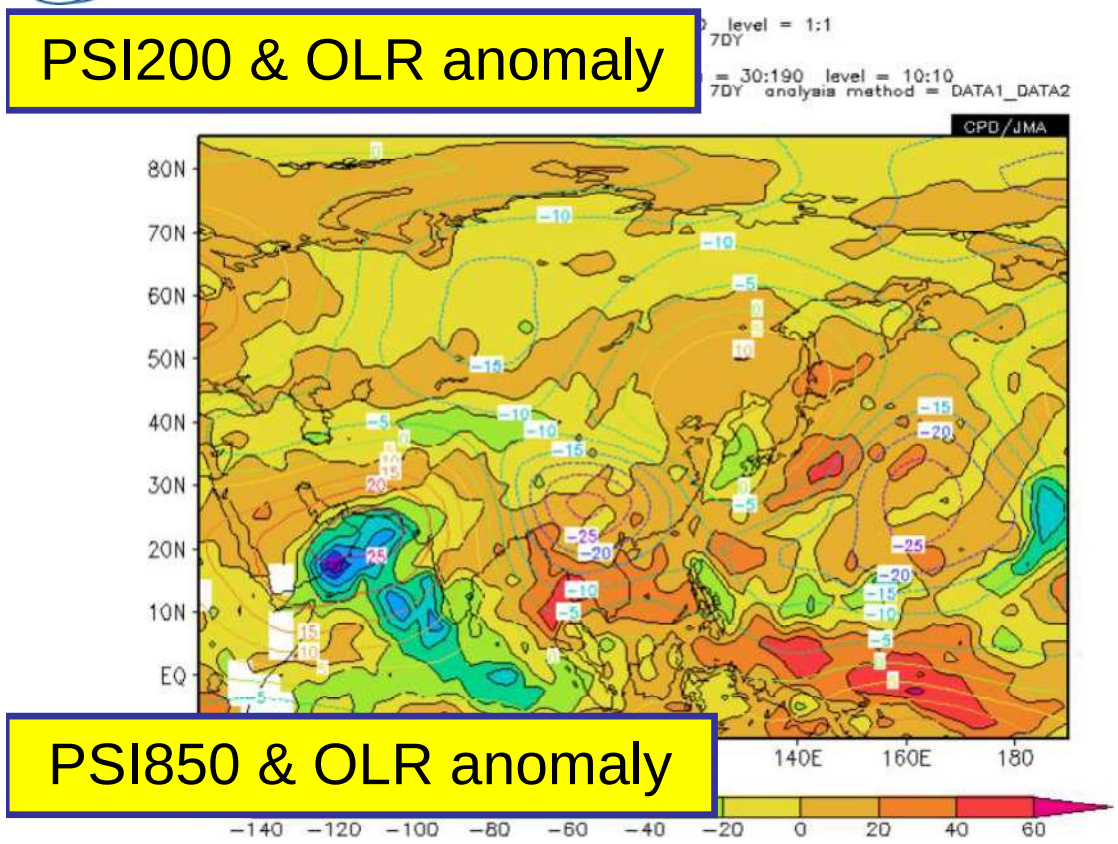


Japan is predicted to be covered with significantly warm air.

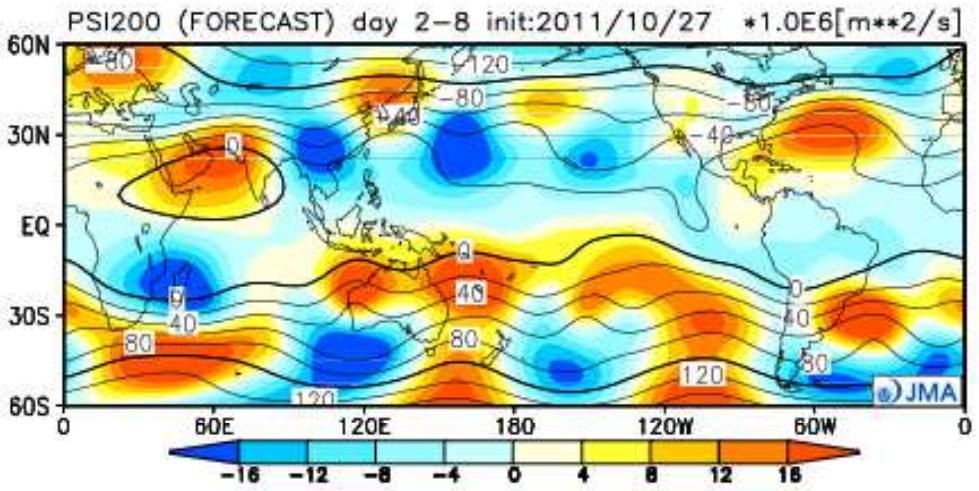
Japan is predicted to be covered with moving highs.

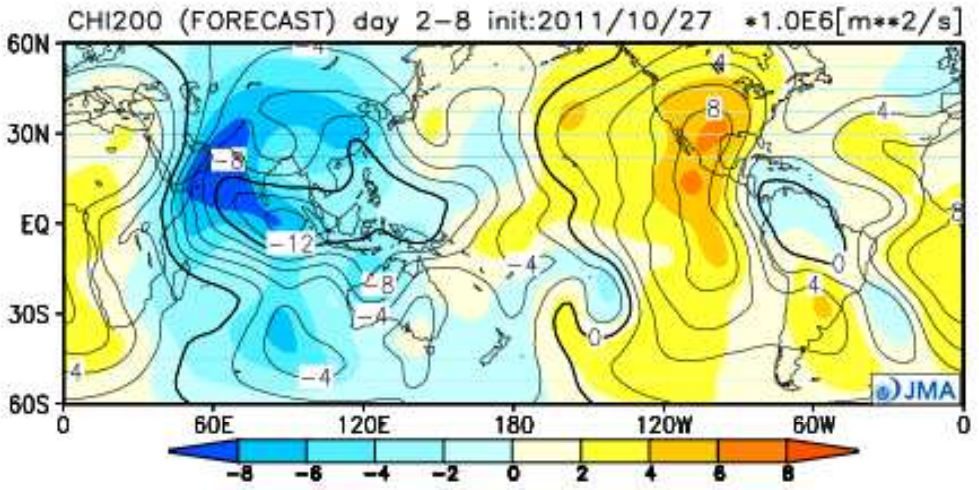
Verification (1st week : Oct. 29 – Nov. 4)

PSI200 & OLR anomaly



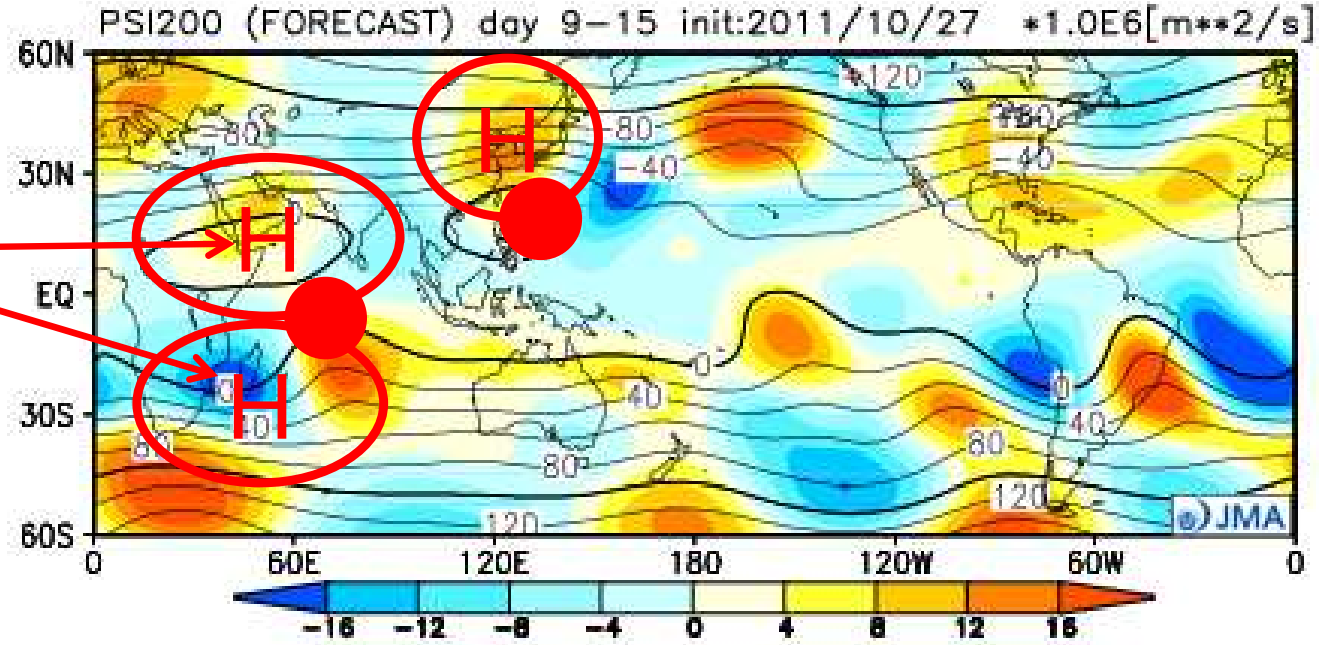
PSI850 & OLR anomaly



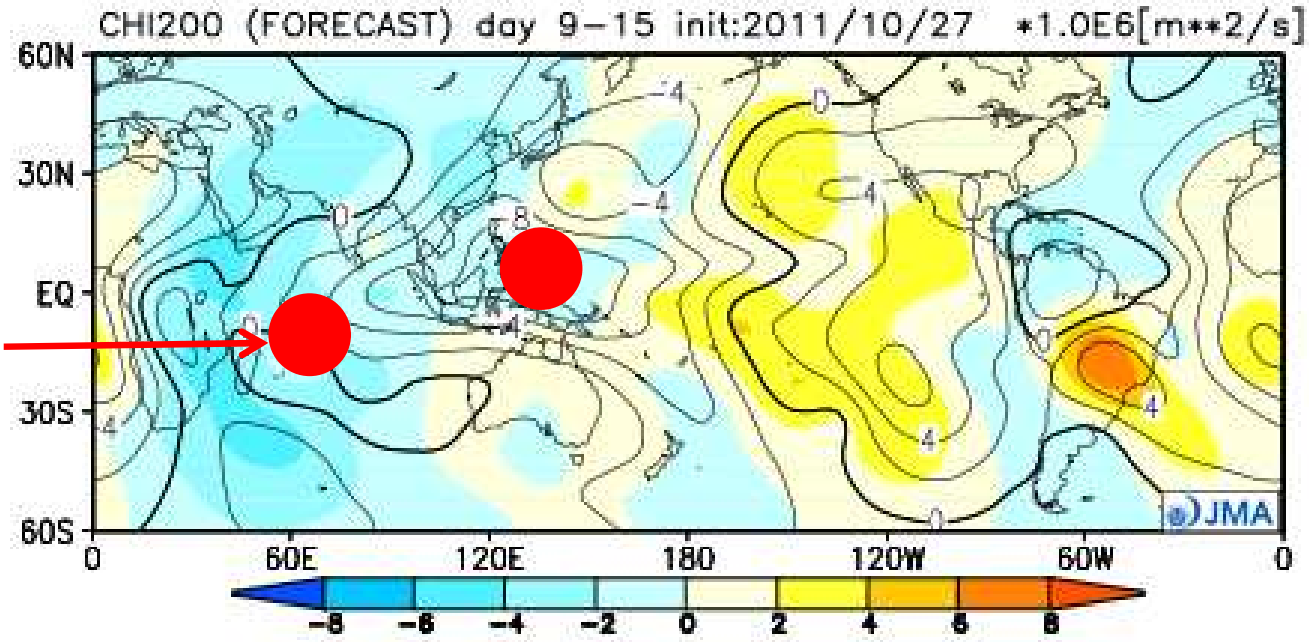


PSI200 & CHI200 (2nd week : Nov. 5 – 11)

Anti-cyclonic circulation anomaly



Heating source

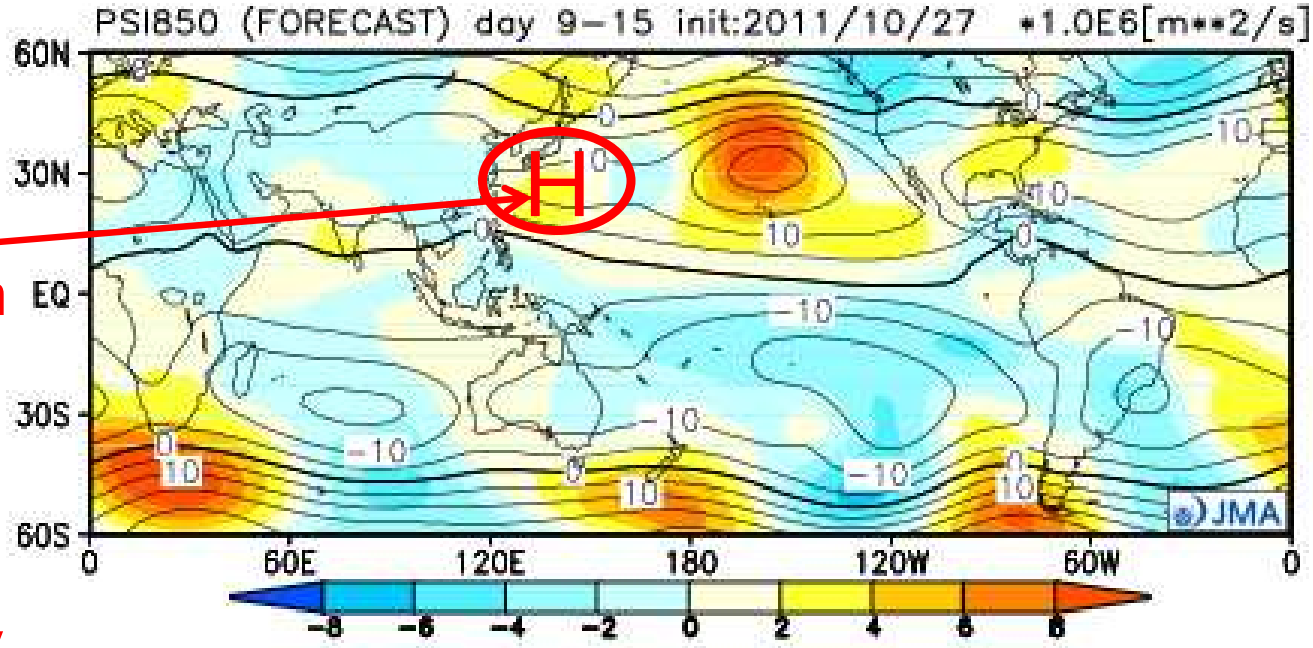


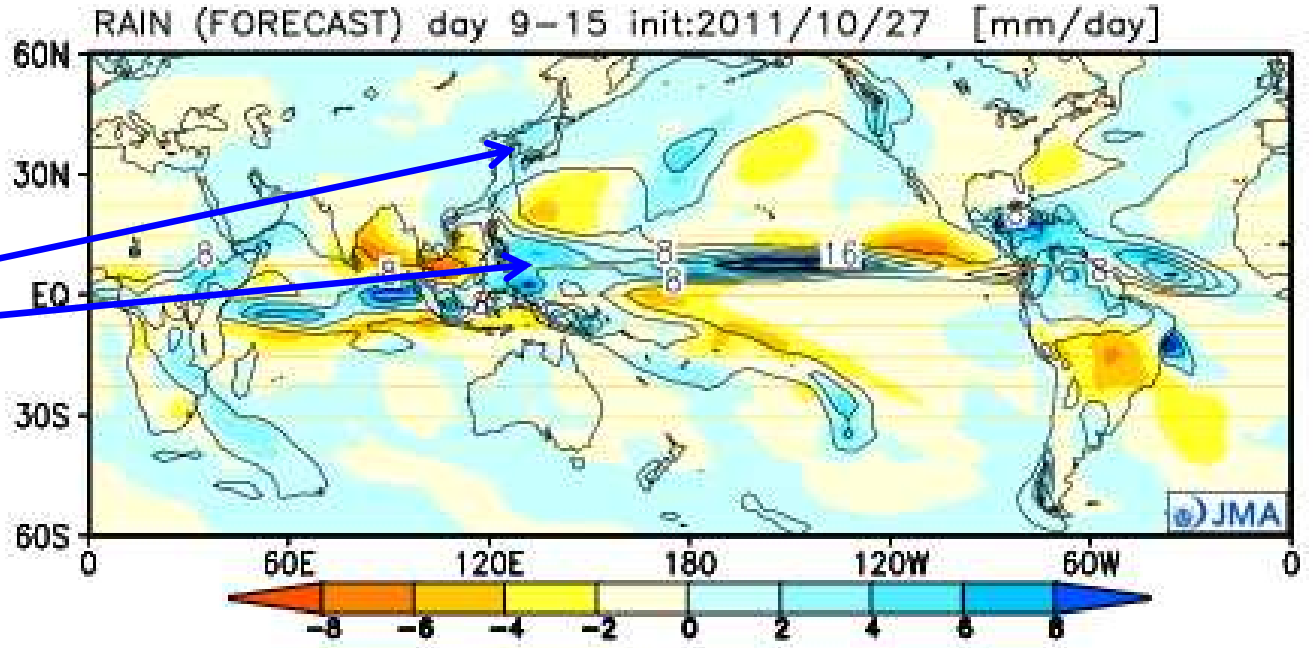
PSI850 & RAIN (2nd week : Nov. 5 – 11)

Anti-cyclonic circulation anomaly (clockwise flow anomaly)

It makes south-easterly moist flow anomaly.

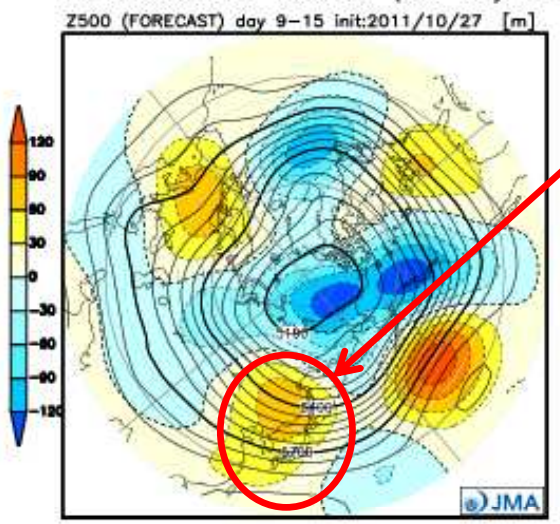
positive precipitation anomaly

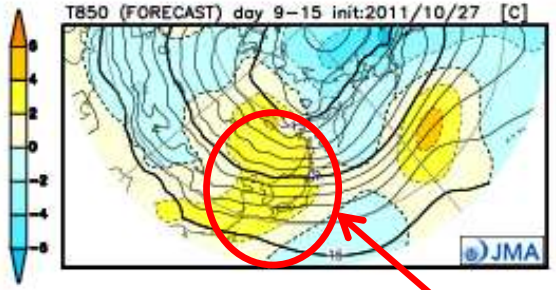


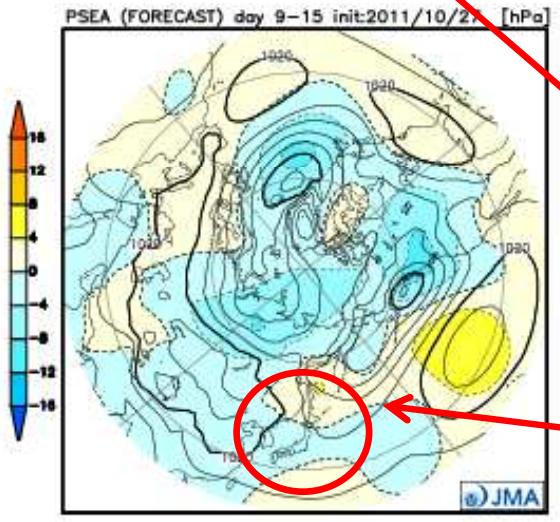


Z500, T850, SLP (2nd week : Nov. 5 – 11)

Ensemble Mean forecast (07 day mean)RTN



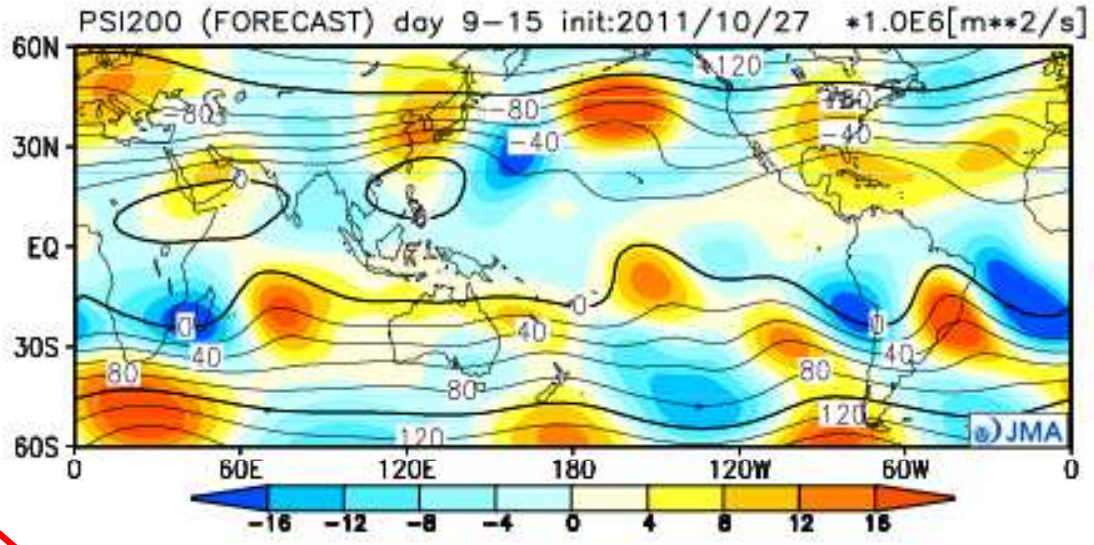




Geo-potential height at 500hPa is also predicted to be significantly higher around Japan.

Rossby wave propagation along the polar front jet

Rossby wave propagation along the sub-tropical jet



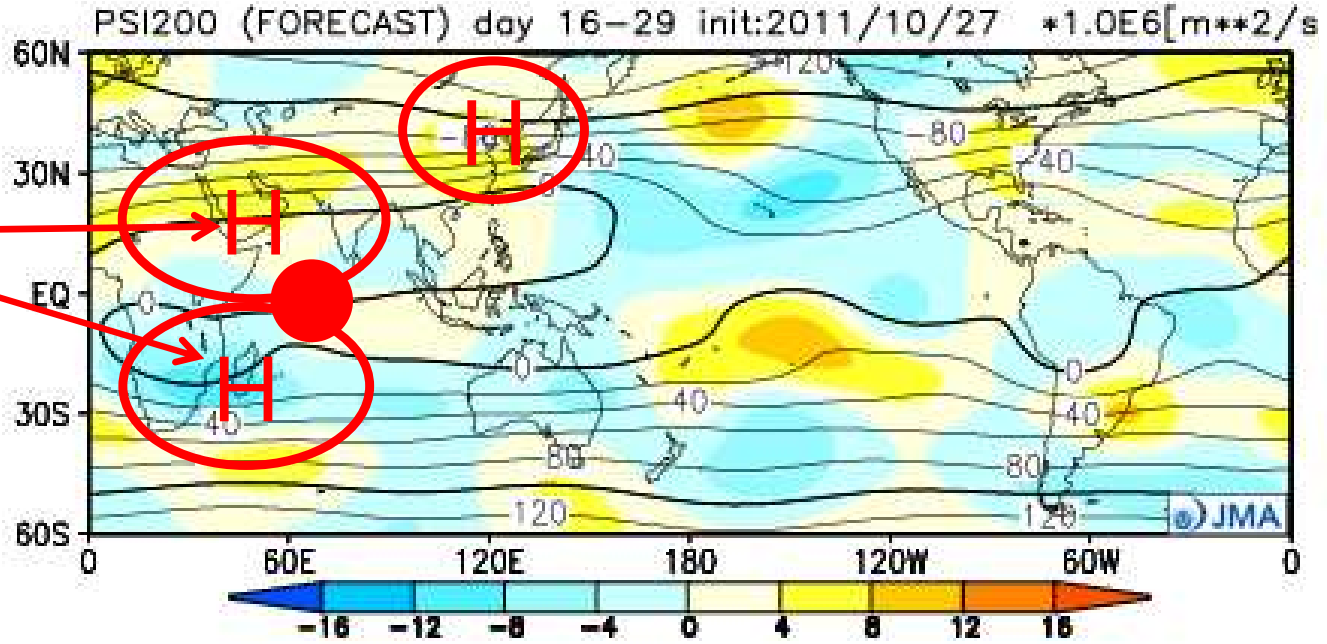
Japan is also predicted to be covered with significantly warm air.

Japan is predicted to be covered with traveling Highs and Lows.

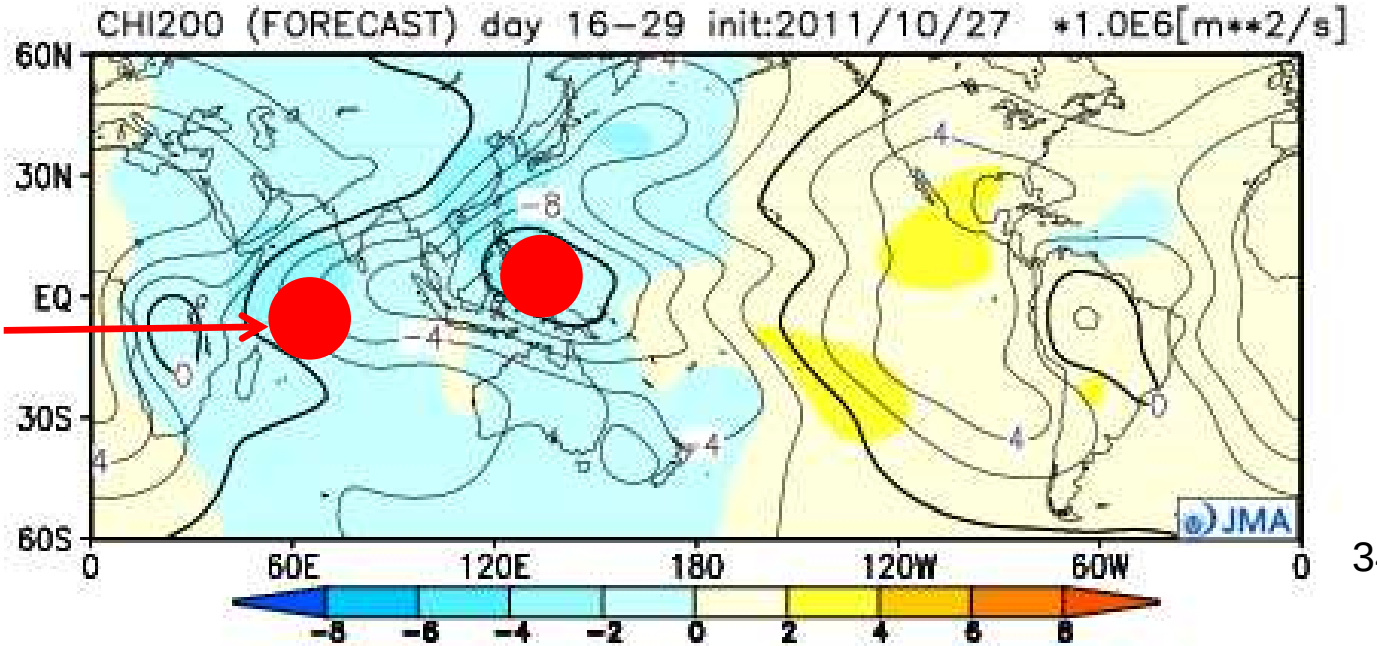
PSI200 & CHI200 (3rd & 4thweek : Nov. 12 – 25)

A great deal of thought should be given to the reliability.

Anti-cyclonic circulation anomaly

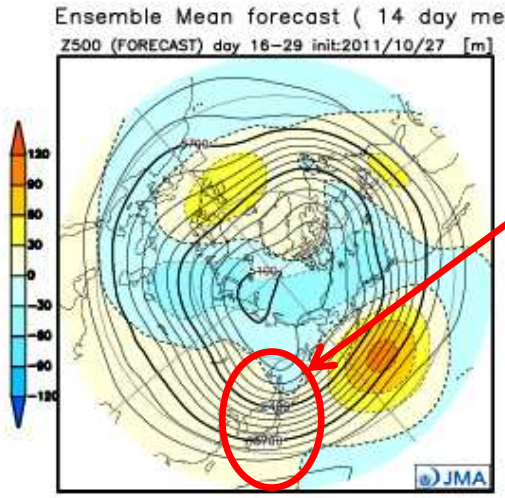


Heating source



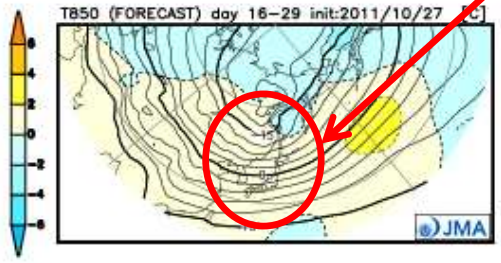
Z500, T850, SLP (3rd & 4th week : Nov. 12 – 25)

A great deal of thought should be given to the reliability.

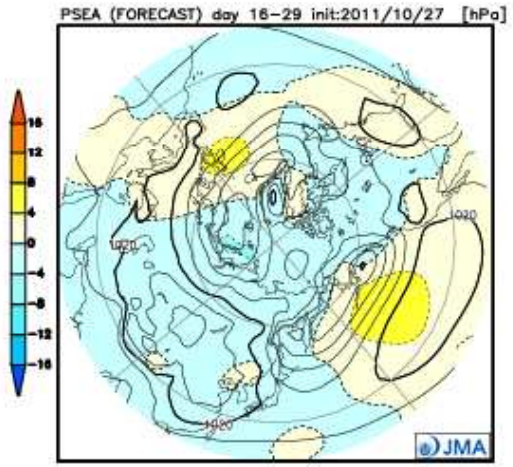


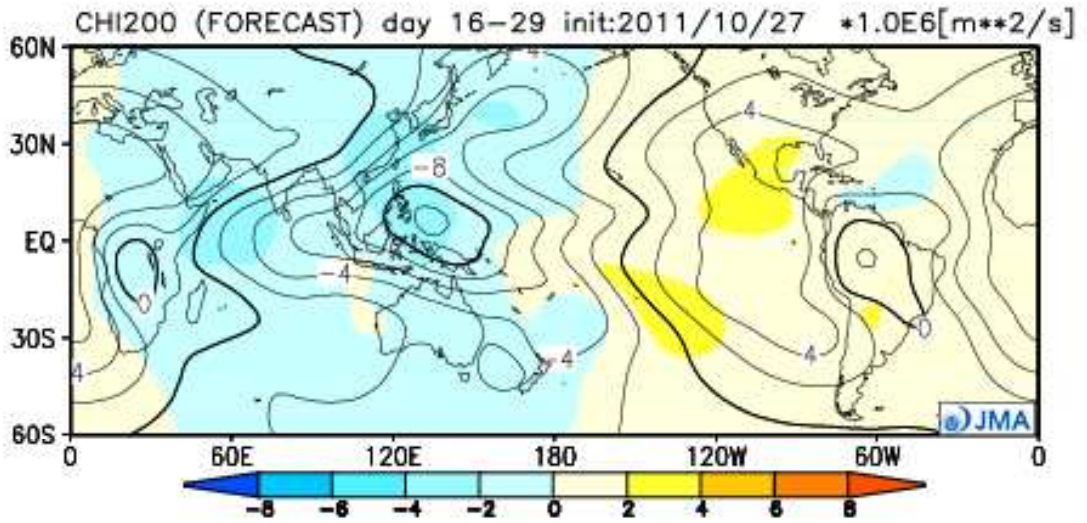
Geo-potential height at 500hPa is predicted to be above normal around Japan.

Japan is predicted to be covered with warm air.



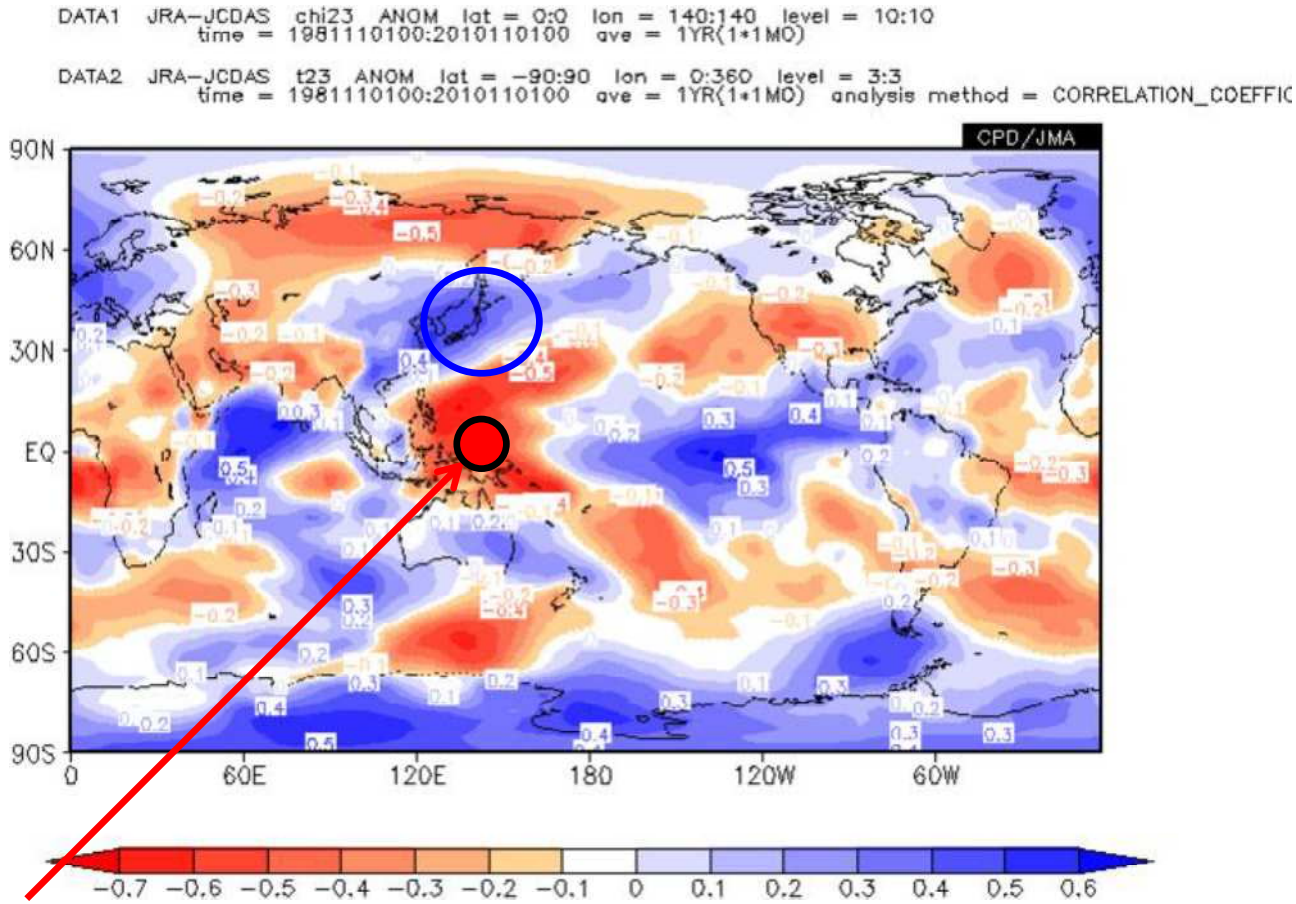
If the convection activity become stronger…
If the position of the convection center moves…





Another Possibility (3rd & 4th week : Nov. 12 – 25)

Correlation coefficient between CHI200(EQ, 140E) and T850



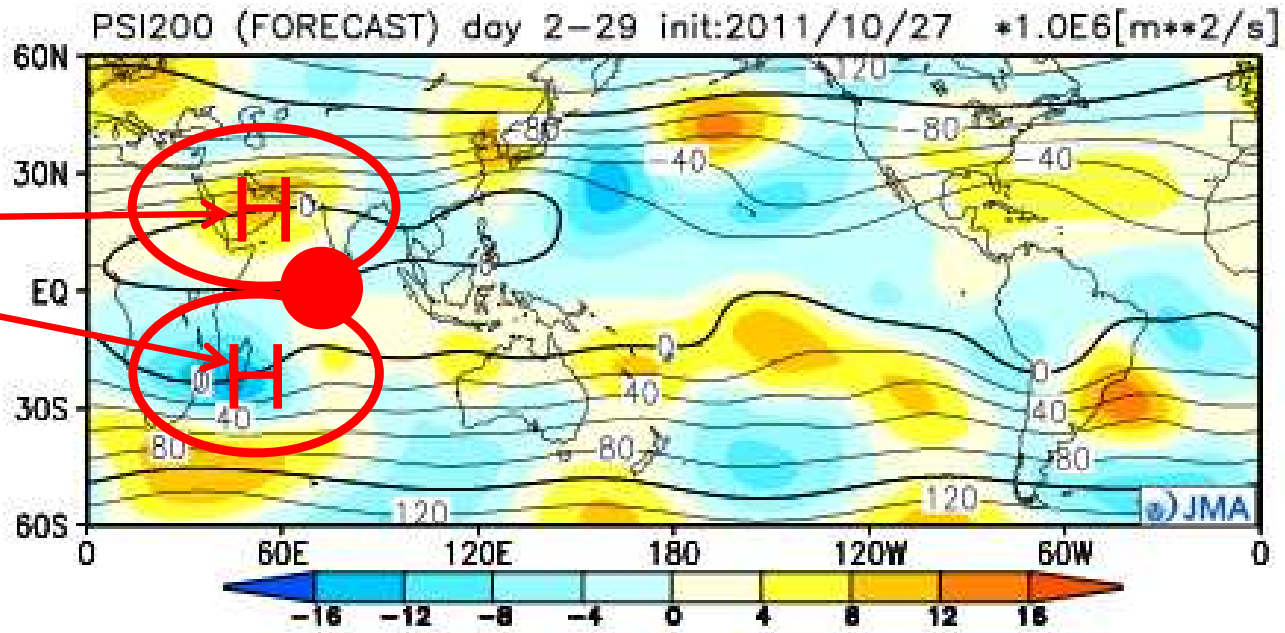
Once a heat source is added around here, temperature over Japan tends to be significantly below normal.

The opposite result

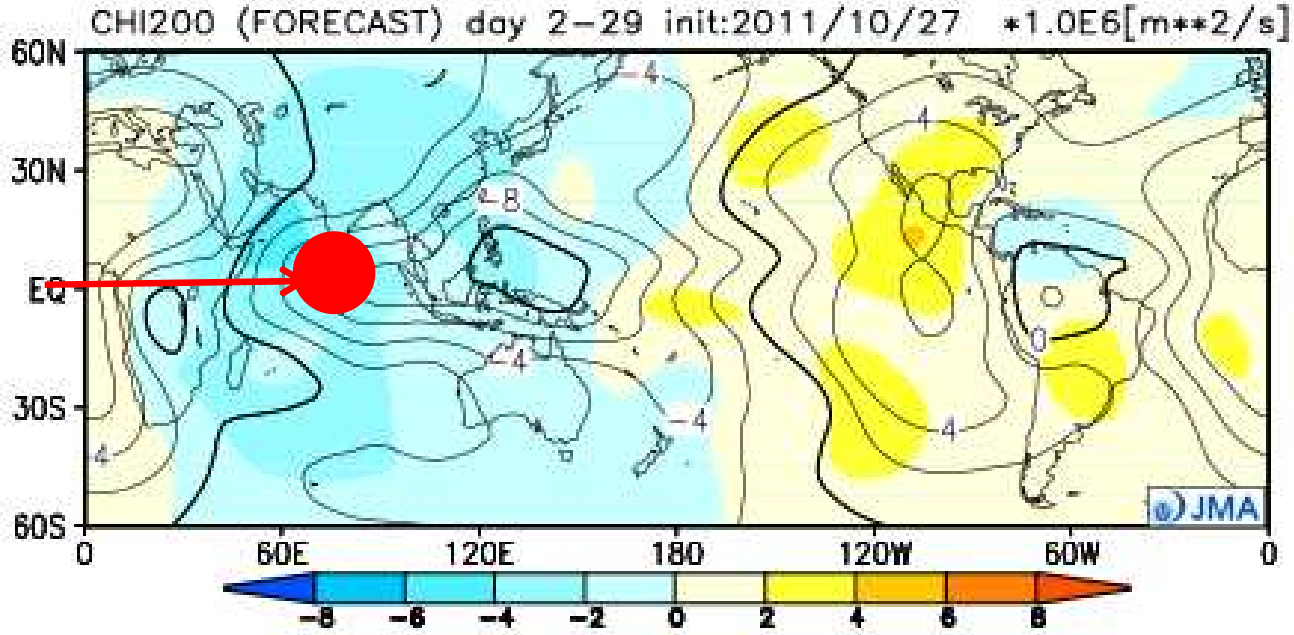
We can't rely on the prediction results directly.

PSI200 & CHI200 (28 days : Oct. 29 – Nov. 25)

Anti-cyclonic circulation anomaly



Heating

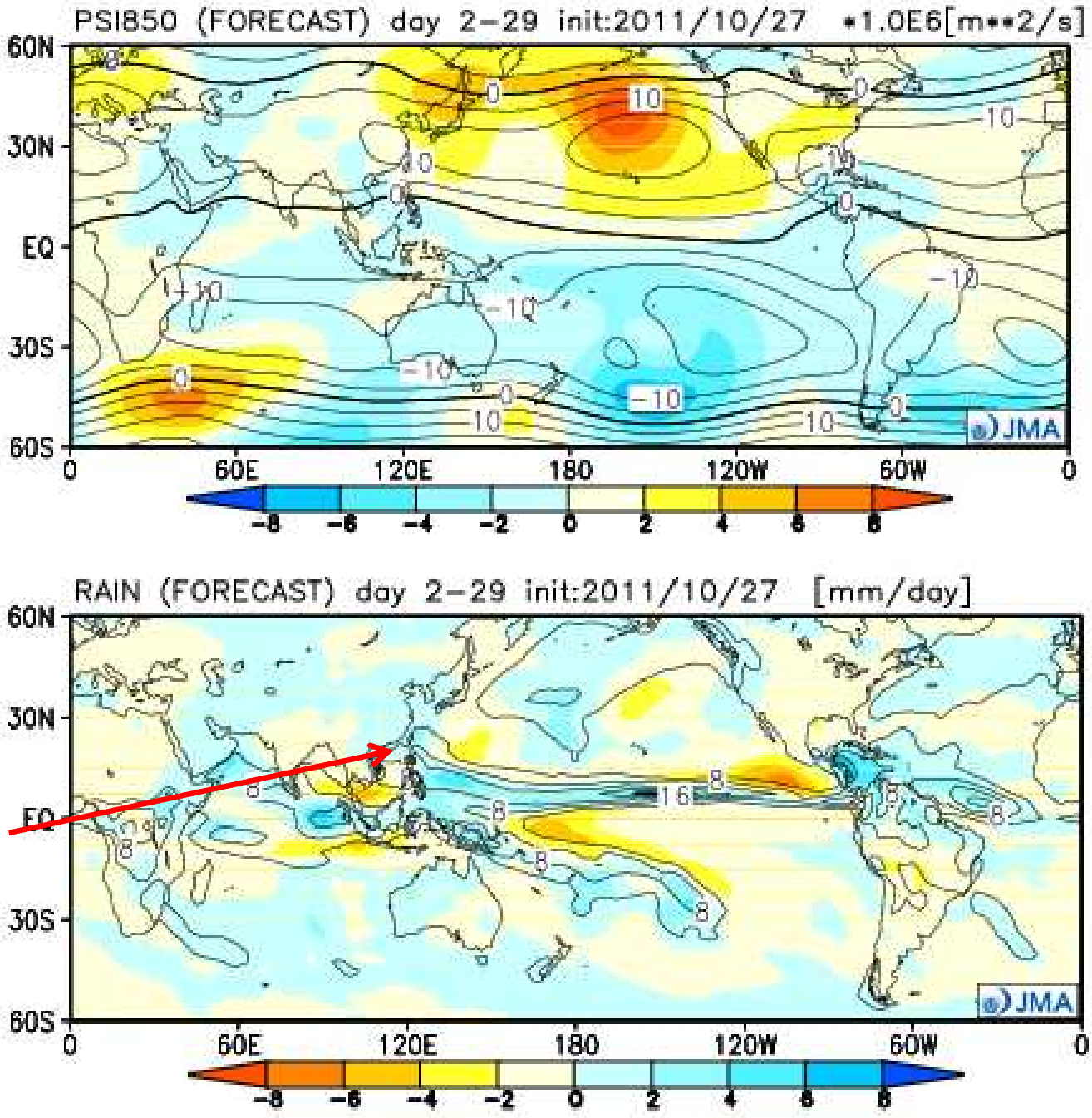


PSI850 & RAIN (28 days : Oct.29th – Nov.25th)

Anti-cyclonic circulati anomaly (clockwise flow anomaly)

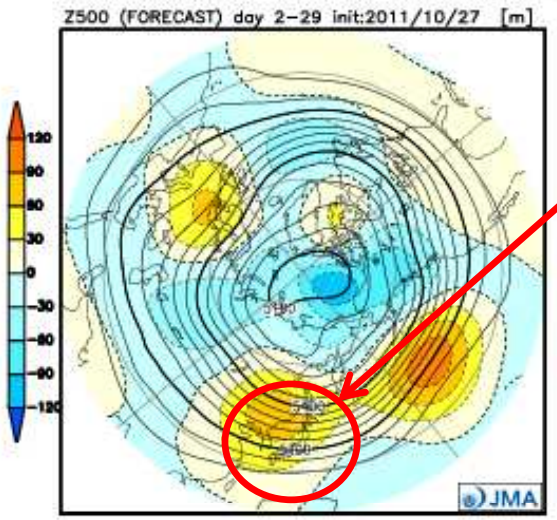
It makes south-easterly moist flow anomaly

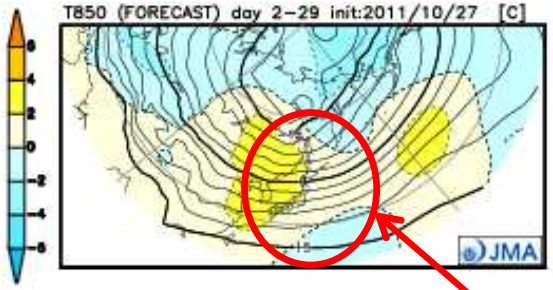
Anomalous positive precipitation

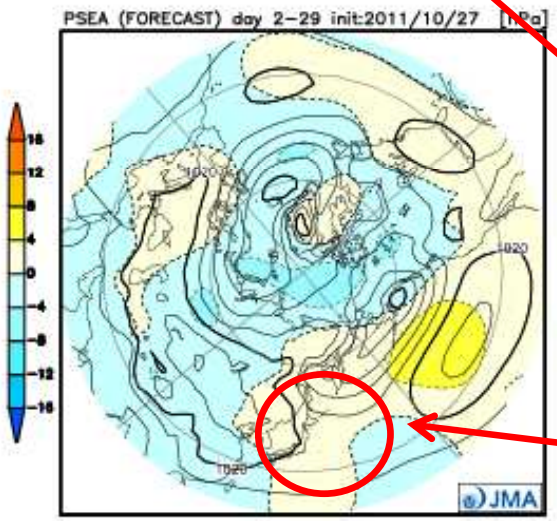


Z500, T850, SLP (28 days : Oct. 29 – Nov. 25)

Ensemble Mean forecast (28 day mean)RTN



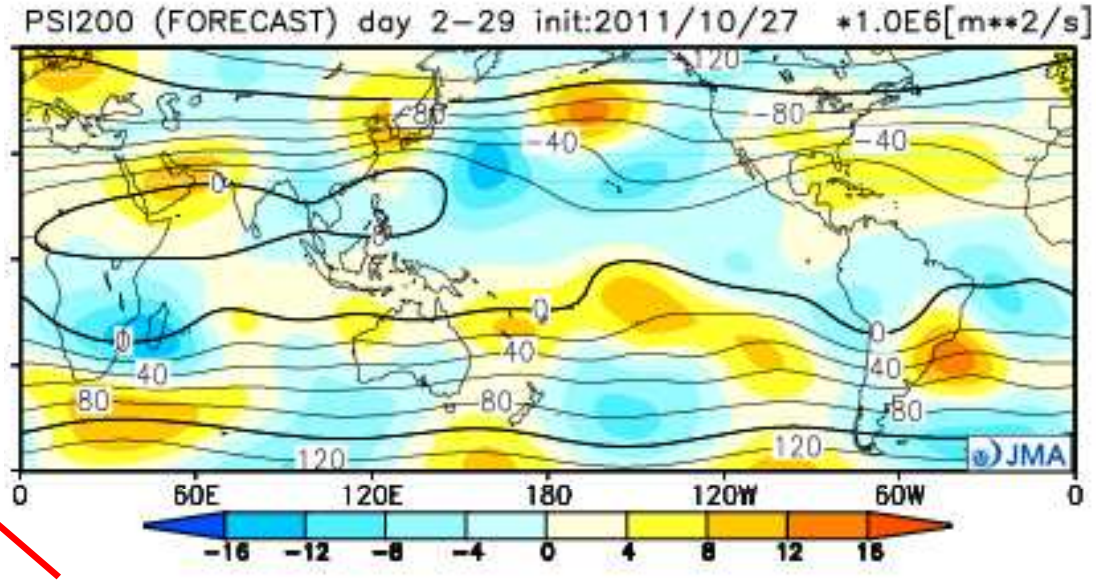




Geo-potential height at 500hPa is predicted to be significantly higher around Japan.

Rossby wave propagation along the polar jet

Rossby wave propagation along the sub-tropical jet



Japan is predicted to be covered with significantly warm air.

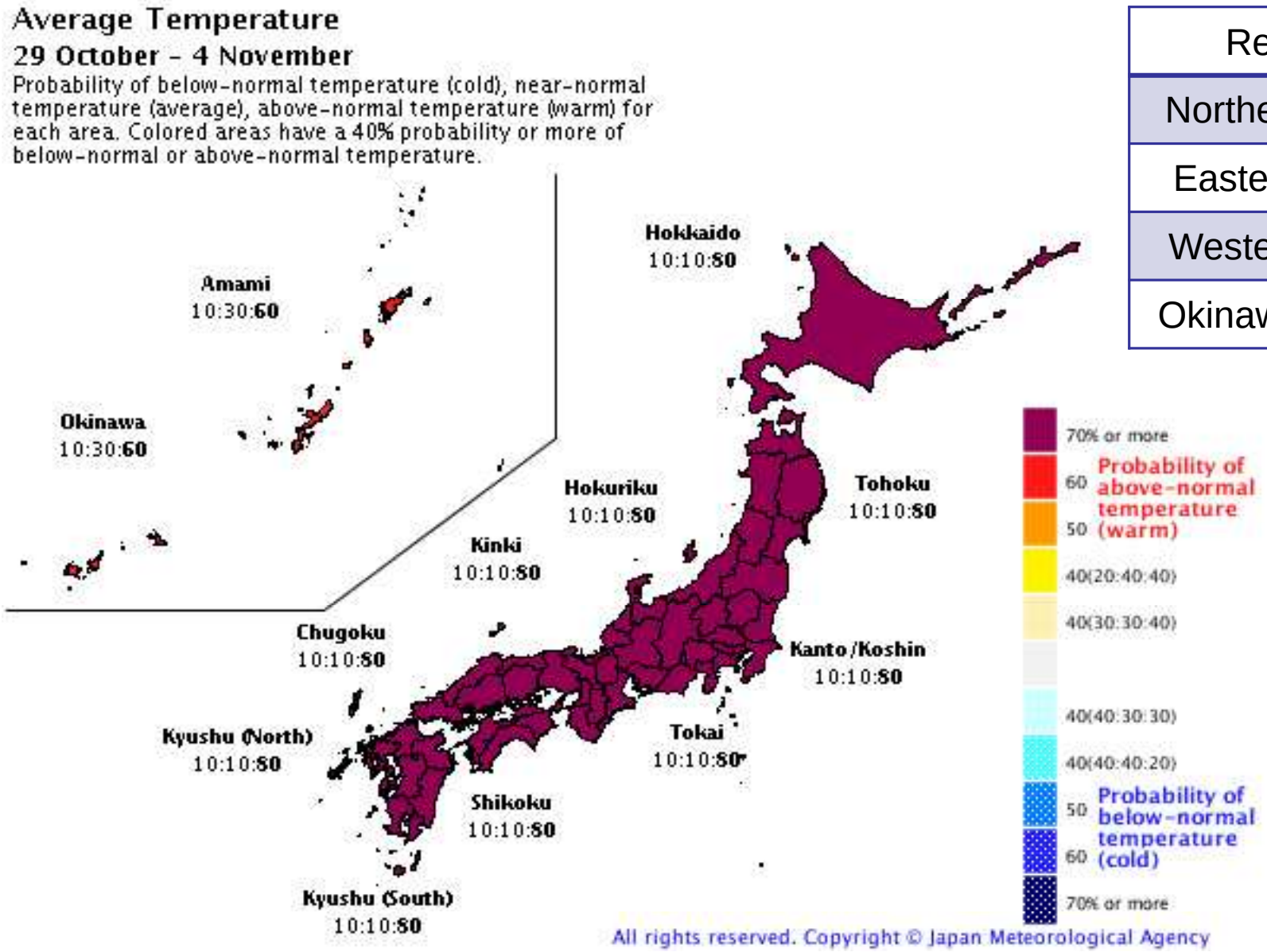
Japan is predicted to be covered with moving Highs mainly.

4. JMA’s Latest One–month Forecast

Issued Forecast (1st week : Oct. 29 – Nov. 4)

JMA's guidance for temperature

Regions	1st week
Northern Japan	0:1:**99**
Eastern Japan	0:1:**99**
Western Japan	0:1:**99**
Okinawa/Amami	0:7:**93**

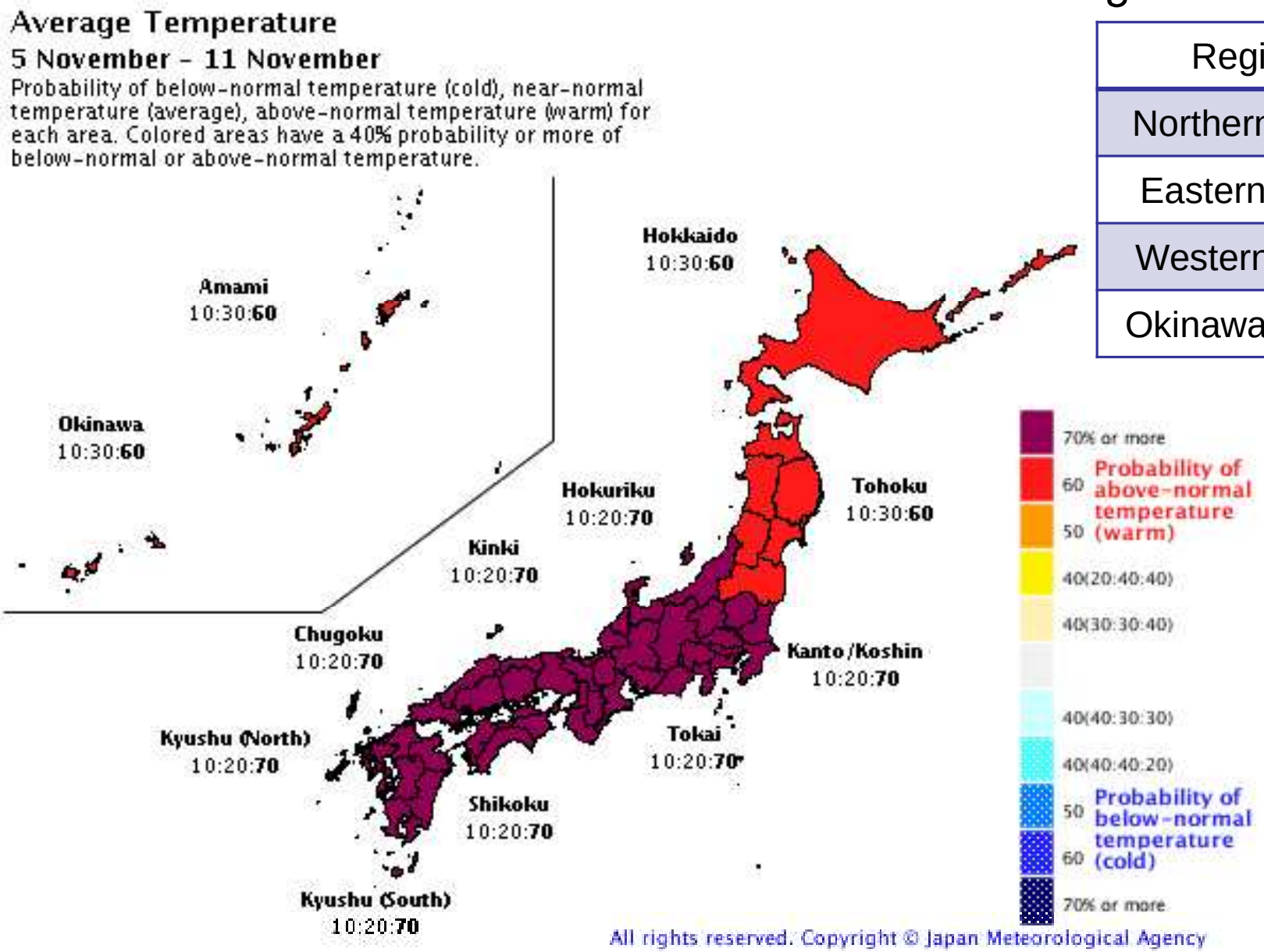


http://www.jma.go.jp/en/longfcst/000_1_01.html

Issued Forecast (2nd week : Nov. 5 – 11)

JMA's guidance for temperature

Regions	2nd week
Northern Japan	9:28:**63**
Eastern Japan	3:20:**77**
Western Japan	2:21:**77**
Okinawa/Amami	6:29:**65**



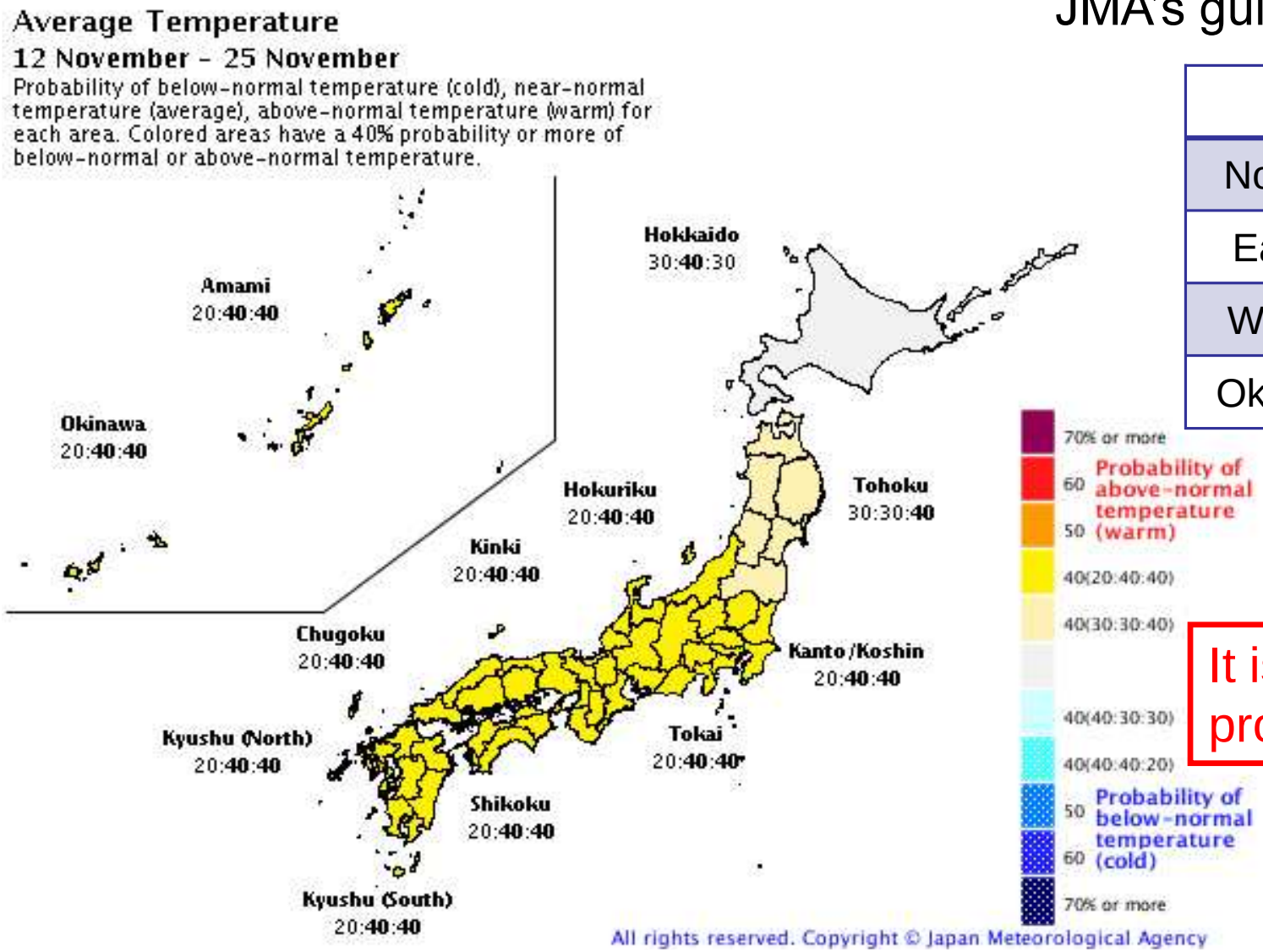
http://www.jma.go.jp/en/longfcst/000_1_02.html

Issued Forecast (3rd & 4th week : Nov. 12 – 25)

A great deal of thought should be given to the reliability.

JMA's guidance for temperature

Regions	3rd – 4th week
Northern Japan	24:**43**:33
Eastern Japan	19:35:**46**
Western Japan	21:35:**44**
Okinawa/Amami	23:37:**40**



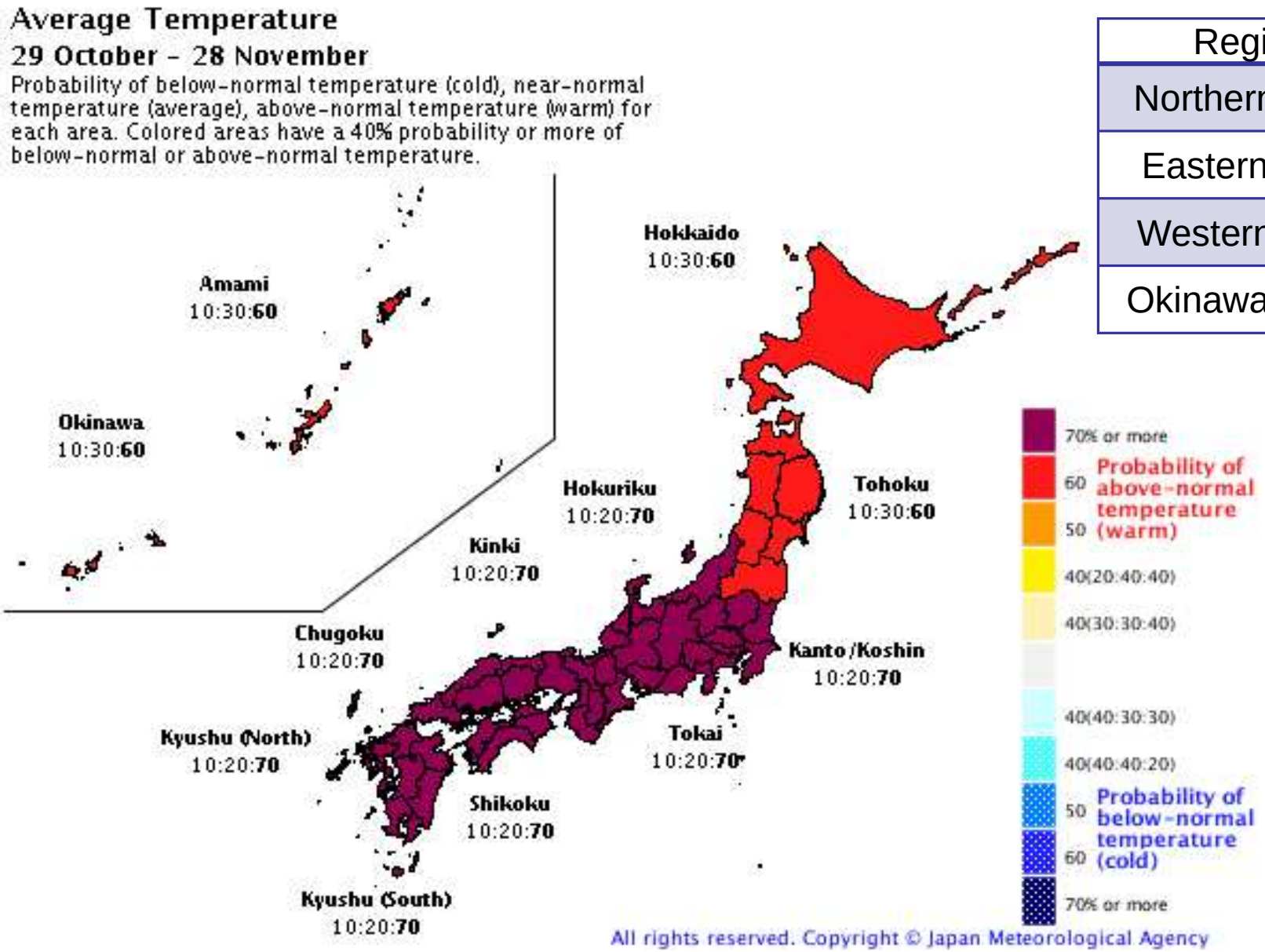
It is difficult to use high probabilities.

http://www.jma.go.jp/en/longfcst/000_1_03.html

Issued Forecast (28 days : Oct. 29 – Nov. 25) (Temperature)

JMA's guidance

Regions	28 days
Northern Japan	6:27:**67**
Eastern Japan	1:14:**85**
Western Japan	1:14:**85**
Okinawa/Amami	3:23:**74**



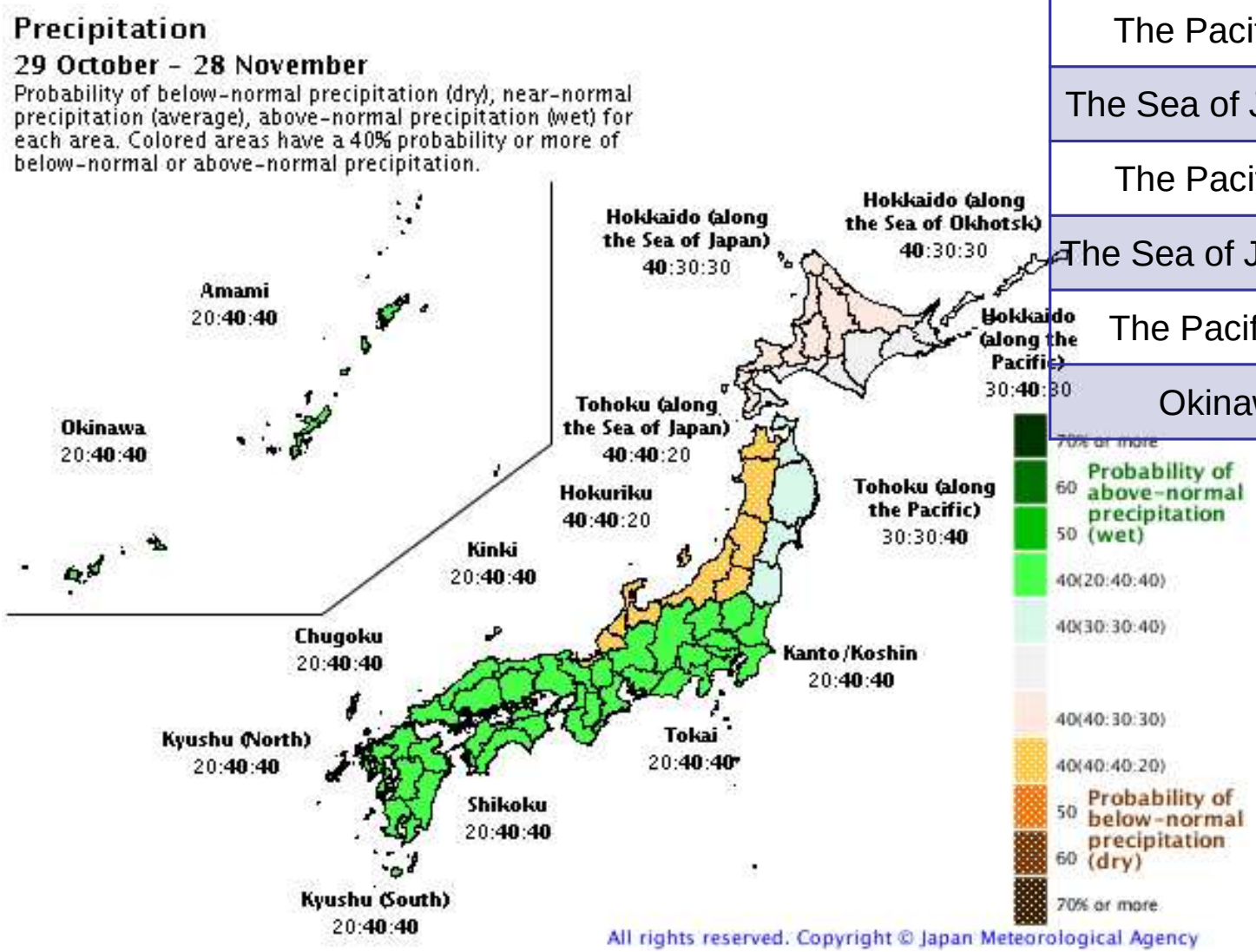
http://www.jma.go.jp/en/longfcst/000_1_00.html

Issued Forecast (28 days : Oct. 29 – Nov. 25)

(Precipitation)

JMA's guidance

Regions	28 days
The Sea of Japan side of NJ	**46**:31:23
The Pacific Side of NJ	23:**44**:33
The Sea of Japan side of EJ	**47**:26:27
The Pacific Side of EJ	21:35:**44**
The Sea of Japan side of WJ	22:34:**44**
The Pacific Side of WJ	13:27:**60**
Okinawa/Amami	15:25:**60**

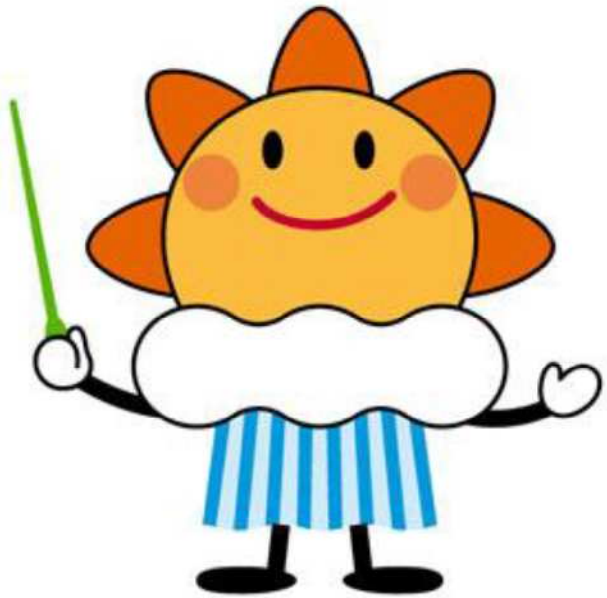


Much precipitation is predicted around the Pacific side regions and southern regions.

http://www.jma.go.jp/en/longfcst/000_0_00.html

END

Thank you for your attention!



JMA's mascot is named Harerun (in the hope of hare, the Japanese word for “fine weather”), and is designed with elements of sun, cloud and rainfall. Harerun holds a green baton in prayer for a disaster-free, peaceful world. The mascot helps to raise public awareness of meteorological services as well as natural disasters and global environmental issues at various events held at the Meteorological Museum and local offices.

ITACS settings 1

Time series of CHI200(5S-5N) JRA-JCDAS

data1

dataset	element	data type	area	level	average period	show period
JRA-JCDAS	X (Velocity Potential) [10^6m^2/s] Vector ☐ SD ☐	ANOM	ALL Lat: -5 - 5 Ave ☑ Lon: 0 - 360 Ave ☐	200hPa 200hPa	DAILY Ave ☐ time filter ☑ Running mean mean priod 5	RANGE 2011 08 01 2011 10 28

analysis method : -Analysis_method-

Graphic Option

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

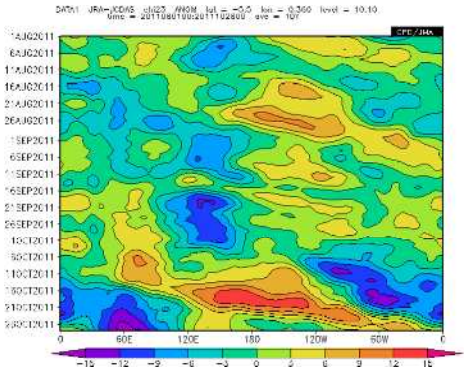
☑ Show Contour Labels
☑ Show Color Bar
☑ Set Contour Parameters for data1
interval : 3 min : -15 max : 15
☐ Set Vector size : [inch] value :

Color Table : Rainbow
☐ Polar Stereographic : North pole
☐ Logarithmic Coordinates
☐ Reverse the Axes
☐ Flip the X-axis ☐ Flip the Y-axis
☐ No Caption

☐ No Scale Labels
☐ Draw Credit Inside
☐ Apply All Pics

picture size %

Submit Clear SliceTool Help Logout



Time series of CHI200(5S-5N) Prediction

data1

dataset	element	data type	area	level	average period	show period
K1EM_20111027	X (Velocity Potential) [10^6m^2/s] Vector ☐ SD ☐	ANOM	ALL Lat: -5 - 5 Ave ☑ Lon: 0 - 360 Ave ☐	200hPa 200hPa	DAILY Ave ☐ time filter ☑ Running mean mean priod 5	RANGE 2011 10 29 2011 11 25

analysis method : -Analysis_method-

Graphic Option

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

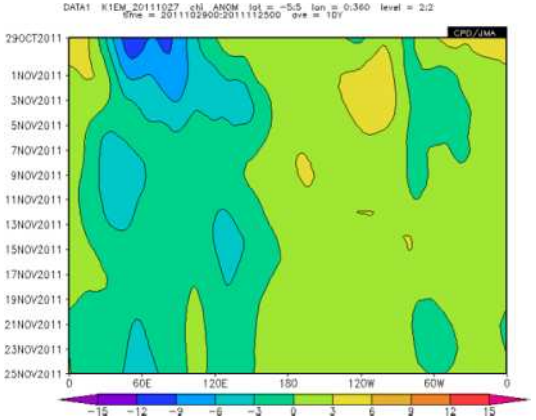
☑ Show Contour Labels
☑ Show Color Bar
☑ Set Contour Parameters for data1
interval : 3 min : -15 max : 15
☐ Set Vector size : [inch] value :

Color Table : Rainbow
☐ Polar Stereographic : North pole
☐ Logarithmic Coordinates
☐ Reverse the Axes
☐ Flip the X-axis ☐ Flip the Y-axis
☐ No Caption

☐ No Scale Labels
☐ Draw Credit Inside
☐ Apply All Pics

picture size %

Submit Clear SliceTool Help Logout



ITACS settings 2

Correlation between CHI200(EQ,140E) and T850

data1

dataset	element	data type	area	level	average period	show period
JRA-JCDAS	X (Velocity Potential) [10^6m^2/s] Vector ☐ SD ☐	HIST	ALL Lat: 0 - 0 Ave ☑ Lon: 140 - 140 Ave ☑	200hPa 200hPa	Year average Ave ☐ time filter ☐	RANGE 1981 - 2010 11 - 11

analysis method : CORRELATION_COEFFICIENT

data2

dataset	element	data type	area	level	average period	lag	sign
JRA-JCDAS	T (Temperature) [C.Deg] SD ☐	HIST	ALL Lat: -90 - 90 Ave ☐ Lon: 0 - 360 Ave ☐	850hPa 850hPa	Year average Ave ☐ time filter ☐	0 YEAR	90%(two side)

Graphic Option

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

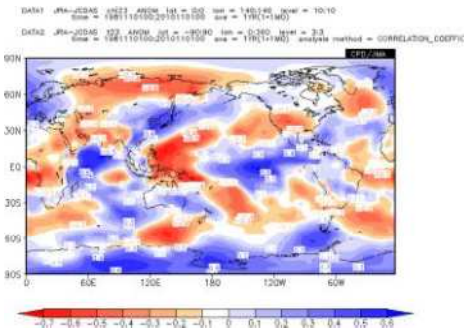
☑ Show Contour Labels
☑ Show Color Bar
☐ Set Contour Parameters for data1
interval : 3 min : -15 max : 15
☐ Set Vector size : [inch] value :

Color Table : Red - Blue
☐ Polar Stereographic : North pole
☐ Logarithmic Coordinates
☐ Reverse the Axes
☐ Flip the X-axis ☐ Flip the Y-axis
☐ No Caption

☐ No Scale Labels
☐ Draw Credit Inside
☐ Apply All Pics

picture size %

Submit Clear SliceTool Help Logout



PSI200 & OLR anomaly

data1

dataset	element	data type	area	level	average period	show period
SAT	OLR [W/m^2] Vector ☐ SD ☐	ANOM	ASIA Lat: -10 - 85 Ave ☐ Lon: 30 - 190 Ave ☐	1000hPa 1000hPa	DAILY Ave ☑ time filter ☐	RANGE 2011 10 29 2011 11 04

analysis method : DATA1_DATA2

data2

dataset	element	data type	area	level	average period	show period
JRA-JCDAS	ψ (Stream Function) [10^6m^2/s] SD ☐	ANOM	ASIA Lat: -10 - 85 Ave ☐ Lon: 30 - 190 Ave ☐	200hPa 200hPa	DAILY Ave ☑ time filter ☐	RANGE 2011 10 29 2011 11 04

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 Contour Parameters for data2
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 Caption

☐ No Scale Labels
☐ Draw Credit Inside
☐ Apply All Pics

picture size %

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