Ex.3

Current status and characteristics of predictions by the model

気象庁
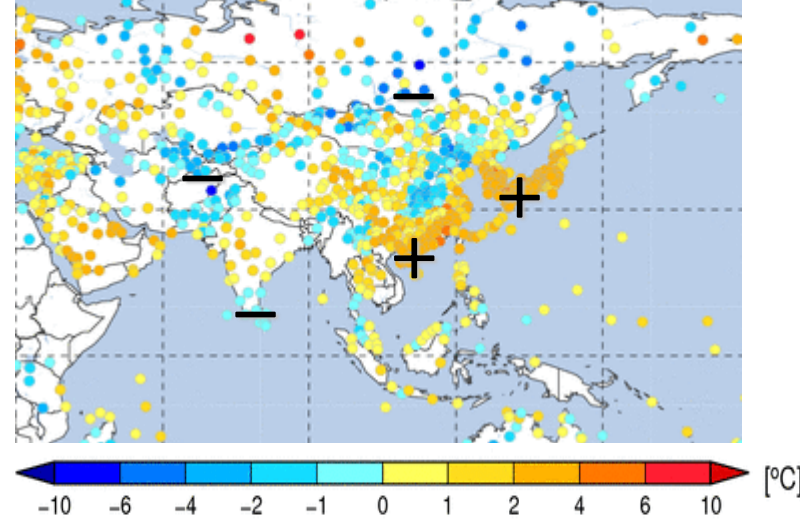Japan Meteorological Agency

Current status

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Recent weekly climate (4 to 10 Nov)

World Climate

**Weekly anomaly**

- ● Temperature
- Above normal from southeast Asia to Japan
- Below normal in northeast Asia, central Asia and southern India
- ● Precipitation
- Above normal in east Asia and southern India
- Below normal over the broad area from south Asia to southeast Asia and northeast Asia

Temperature anomaly

Precipitation anomaly (ratio)

Recent SST anomalies

SST anomalies at the previous day of the initial time.
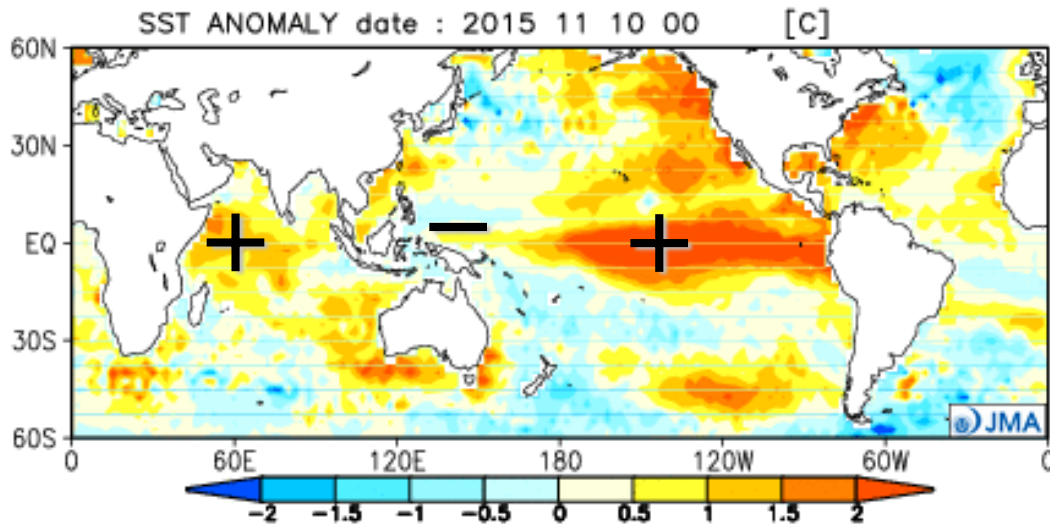
- **El Niño like pattern**
- Positive anomalies from the central to the eastern tropical Pacific and Negative from Maritime continent to the western Pacific
- Positive anomalies over the Indian Ocean

Convective activities around the equator (including MJO)

http://ds.data.jma.go.jp/gmd/tcc/tcc/products/clisys/mjo/moni_mjo.html

Home | World Climate | Climate System Monitoring | El Niño

HOME > Climate System Monitoring > Madden-Julian Oscillation (MJO)

Madden-Julian Oscillation (MJO)

▸ Explanation

Time-Longitude Cross Section

▸ OLR, Velocity Potential, Zonal Wind and SST
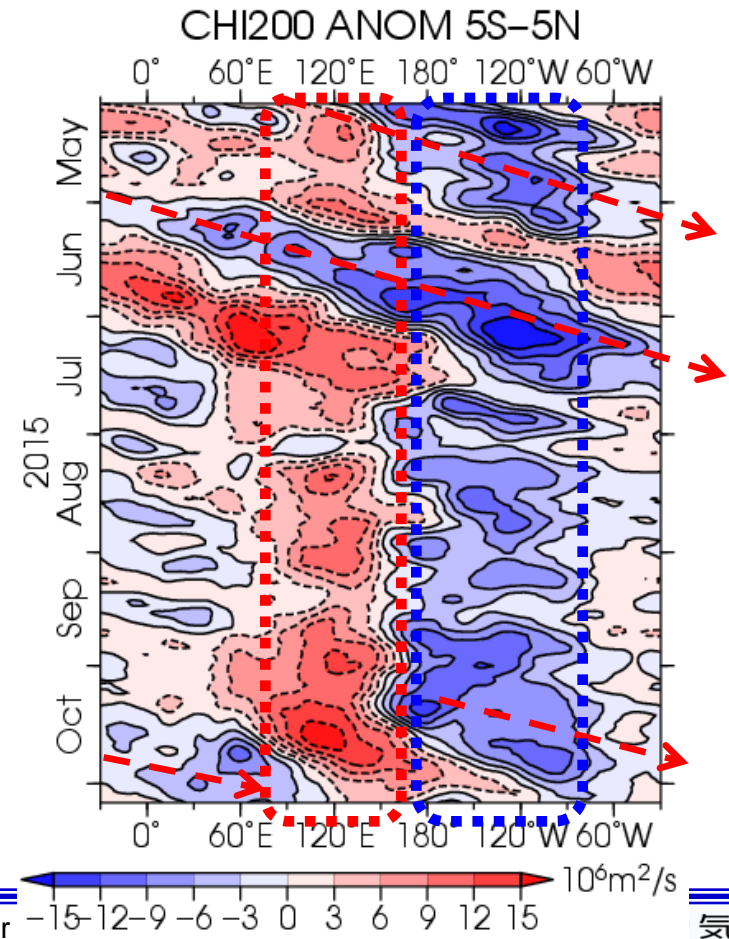
The last month to be shown:
- Last month
- Select → Year 2015 ▾ Month 10 ▾ ⟨ ⟩
Elements: 200-hPa Velocity Potential ▾
- Hist ● Anom ○ Norm
Time Mean: ○ 3-day ● 7-day
Latitudinal Range: Equator (5S-5N mean) ▾

- ● Easterly propagation mode relaying with MJO was unclear from July to early October, but become clear after late October.

- ✓ As of early November, active phase of MJO is propagating over the IO.

- ● In addition, El Niño like pattern is found.

  - – Convection active from the central to the eastern tropical Pacific

  - – Convection inactive from the Indian ocean to the Maritime continent

CHI200 ANOM 5S-5N

$10^6 m^2/s$

-15 -12 -9 -6 -3 0 3 6 9 12 15

Convective activities over the tropics

http://ds.data.jma.go.jp/gmd/tcc/tcc/products/clisys/figures/db_hist_7day_tcc.html
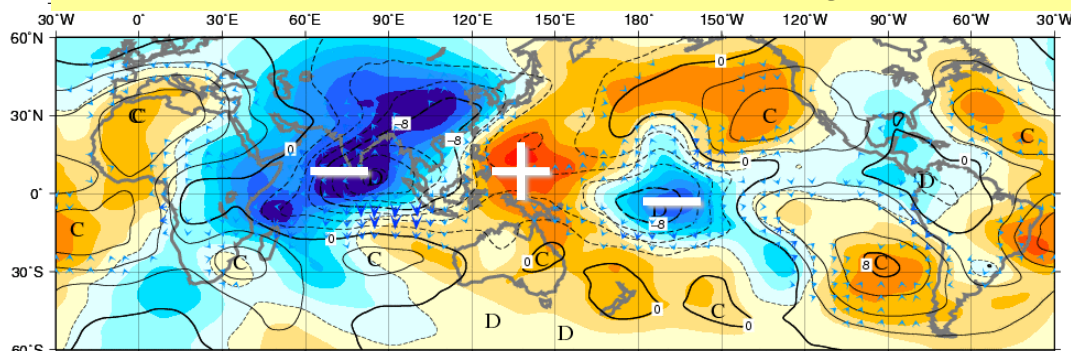
OLR anomalies
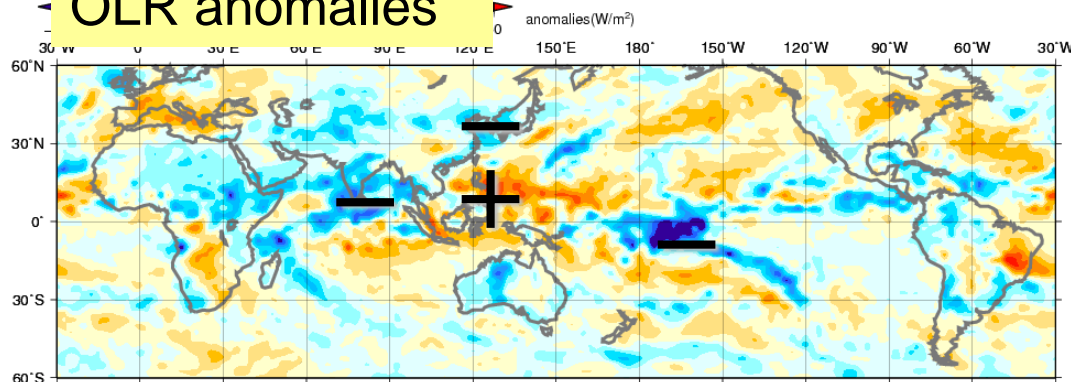
anomalies(W/m²)

Seven day mean outgoing longwave radiation (OLR) anomaly (04Nov.2015–10Nov.2015)
Anomalies are deviations from the 1981–2010 average.
Original data provided by NOAA.
CPD/JMA

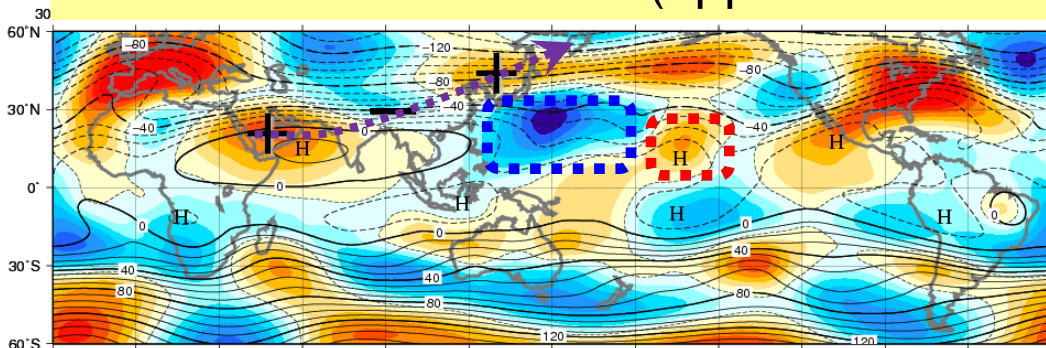## CHI200 anomalies (Upper divergence field)

Seven day mean 200 hPa velocity potential, divergent wind vector and velocity potential anomaly (04Nov.2015–10Nov.2015)
The contours show the velocity potential at intervals of 2x10⁶ m²/s, and the shading shows velocity potential anomalies.
Anomalies are deviations from the 1981–2010 average.
CPD/JMA
→ 10m/s

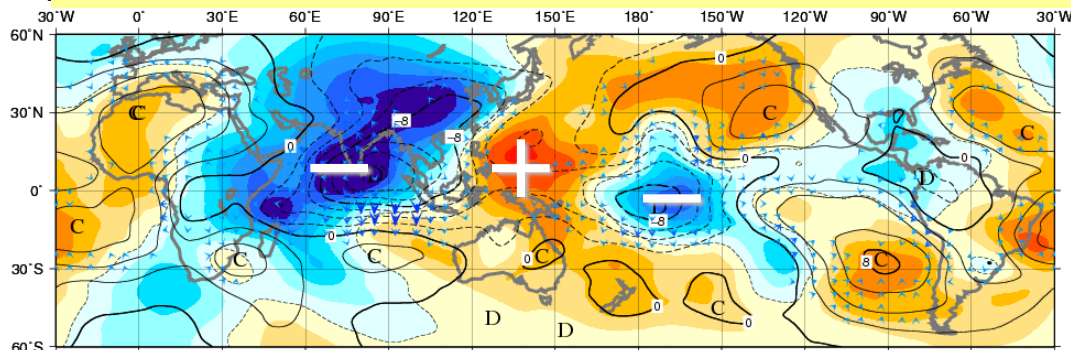- ➢ Both El Niño-like pattern and MJO (active phase in the Indian Ocean)

- ● **Enhanced** convections
  - • Central Pacific, northern Indian Ocean and around Japan
- ● **Suppressed** convections
  - • Western Pacific

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Atmospheric circulation around the tropics

http://ds.data.jma.go.jp/gmd/tcc/tcc/products/clisys/figures/db_hist_7day_tcc.html

200hPa stream function (upper circulation)

Seven day mean 200 hPa stream function and anomaly (04Nov.2015–10Nov.2015)   CPD/JMA
The contours show the stream function at intervals of 10x10⁶ m²/s, and the shading shows stream function anomalies.
Anomalies are deviations from the 1981–2010 average.

CHI200 anomalies (Upper divergence field)

Seven day mean 200 hPa velocity potential, divergent wind vector and velocity potential anomaly (04Nov.2015–10Nov.2015)   CPD/JMA
The contours show the velocity potential at intervals of 2x10⁶ m²/s, and the shading shows velocity potential anomalies.
Anomalies are deviations from the 1981–2010 average.
→ 10m/s

- Wave train relating with enhanced convections in the Indian Ocean
  - Middle East; +
  - South of Tibet; -
  - west of Japan; +
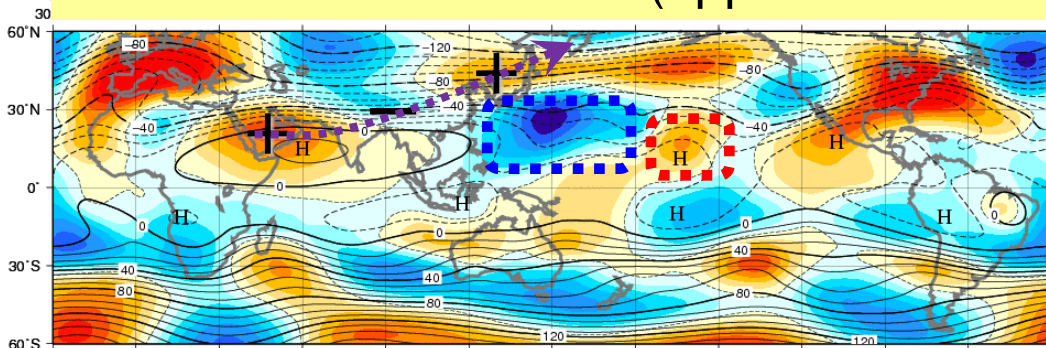
- Matsuno-Gill response in the Pacific
  - Western Pacific; -
  - Central Pacific; +
  (opposite sign in the S.H.)
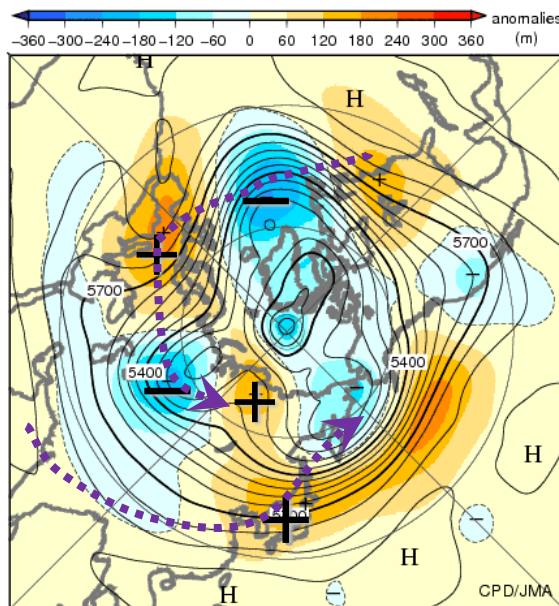
Atmospheric circulation around the tropics

http://ds.data.jma.go.jp/gmd/tcc/tcc/products/clisys/figures/db_hist_7day_tcc.html

200hPa stream function (upper circulation)

Seven day mean 200 hPa stream function and anomaly (04Nov.2015–10Nov.2015)
The contours show the stream function at intervals of 10x10⁶ m²/s, and the shading shows stream function anomalies.
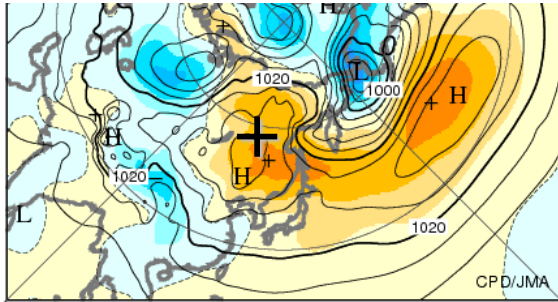Anomalies are deviations from the 1981–2010 average.

500hPa geopotential height

Seven day mean 500 hPa height and anomaly in the Northern Hemisphere (04Nov.2015–10Nov.2015)

- In addition to the wave train along the subtropical jet stream, the wave train along the polar jet stream is found from east of North America to Siberia.
  - West Siberia; -
  - North Siberia; +

- Relating with the wave train along the subtropical jet stream, 500hPa height was above normal around east Asia, which brought warm and wet conditions around Japan through northwardly shifted upper westerlies.
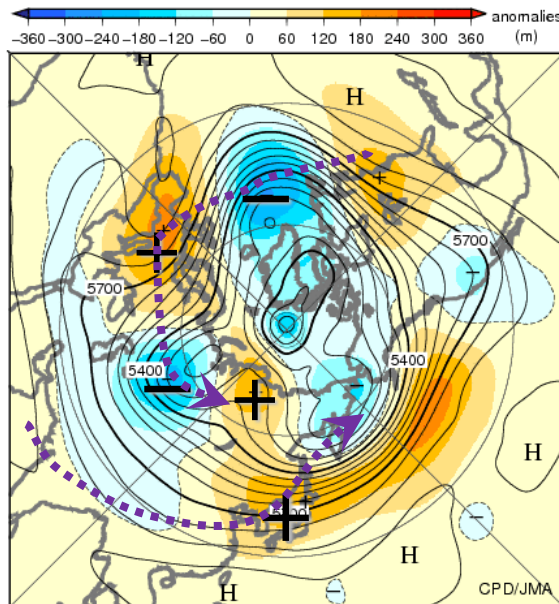
Atmospheric circulation around the tropics

4 to 10 Nov 2015

Sea level Pressure

850 hPa temperature

500hPa geopotential height

Seven day mean 500 hPa height and anomaly in the Northern Hemisphere (04Nov.2015–10Nov.2015)
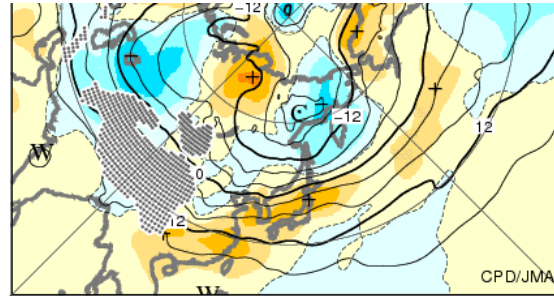
- Cold air accumulation in the west Siberia
- Development of the Siberian high in northeast Asia, relating with the upper ridge

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Characteristics of predictions by the model

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Convective activities over the tropics

http://ds.data.jma.go.jp/gmd/tcc/tcc/products/model/map/1mE/index.html
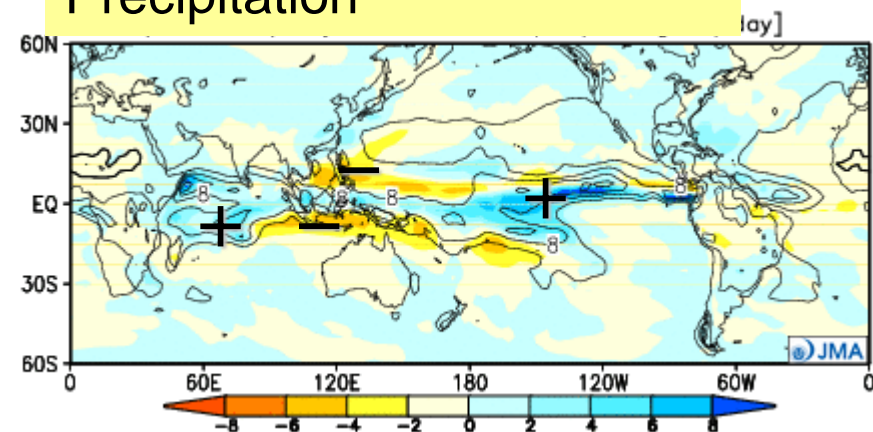
OLR anomalies

CHI200 (velocity potential)
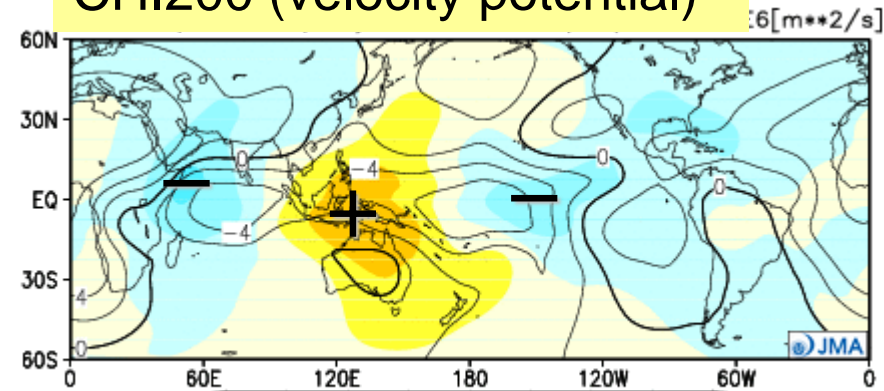
Precipitation

- **Enhanced convections** are predicted in not only eastern tropical Pacific but also western Indian Ocean.
- **Suppressed convections** are predicted from the Maritime continent to the western tropical Pacific.
- These pattern relates with both El Niño SST pattern and MJO

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Convective activities around the equator (including MJO)

Forecast Dataset

Select parameters   Graphic Options

Data1

Dataset	Element	Data type	Area	Level	Initial time	Time
1MONTH_ENS_MEAN ▾	Pressure Levels ▾	ANOM ▾	ALL ▾	200hPa ▾	20151111 ▾	DAILY
	χ (Velocity Potential) ▾		Lat: -5 - 5 Ave ☑	200hPa ▾		☐ Ave
			Lon: 0 - 360 Ave ☐			☐ Time fil

CPD/JMA

CHI200 (velocity potential)

:6[m**2/s]
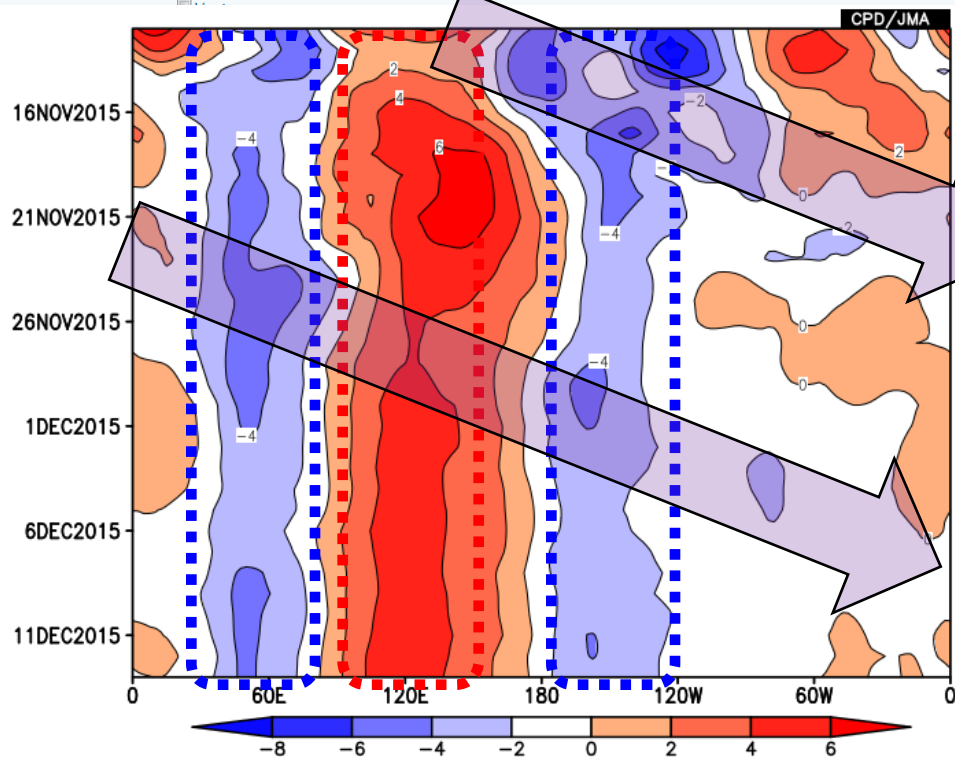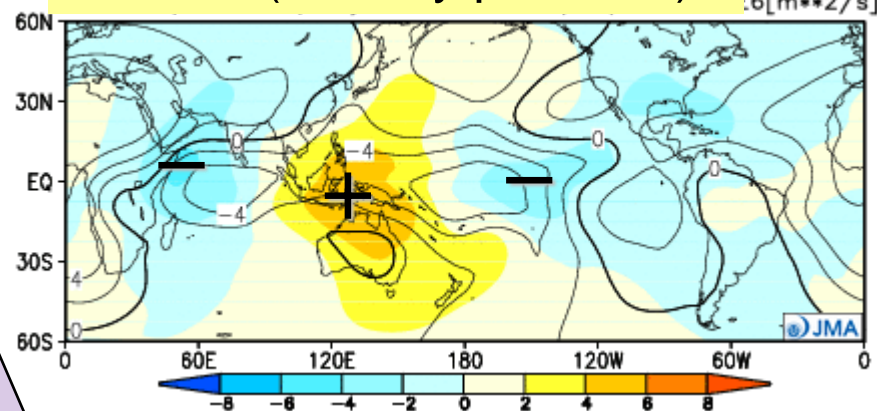
- ● **Eastward propagation** of active convections are found.
- ● But, the passage of active phase is unclear around the Maritime continent.

- ➢ **MJO + El Niño pattern + warm SSTs over the Indian ocean**

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Response of the convections over the tropics   4 weeks mean

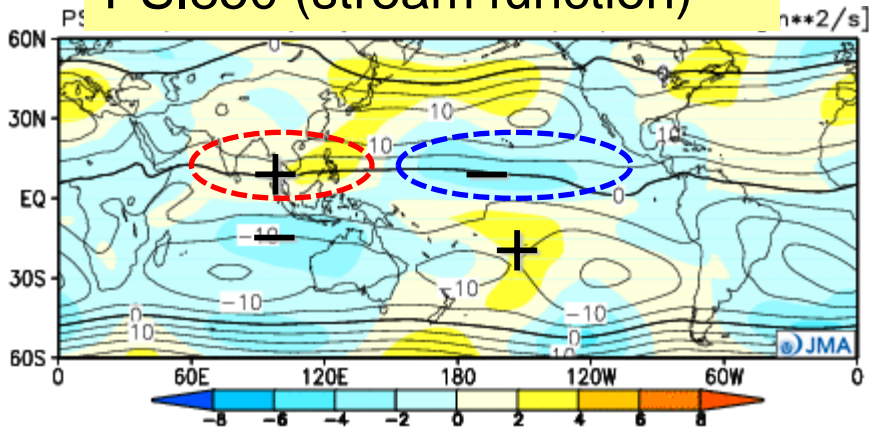http://ds.data.jma.go.jp/gmd/tcc/tcc/products/model/map/1mE/index.html
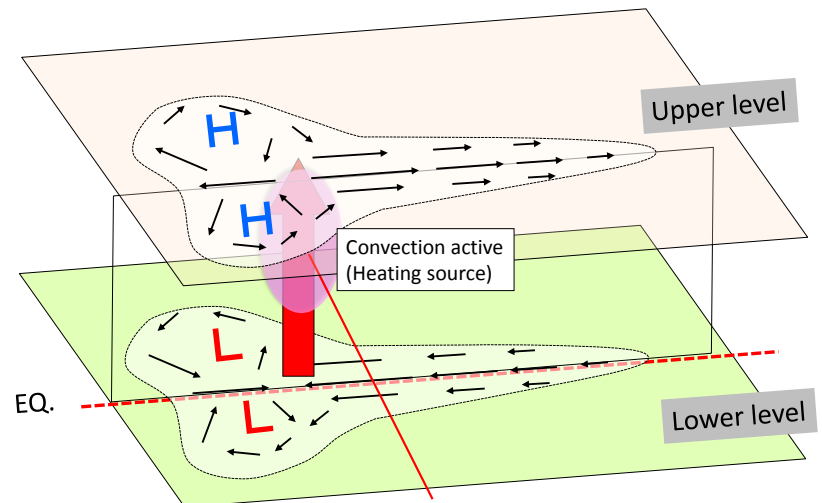
PSI200 (stream function)
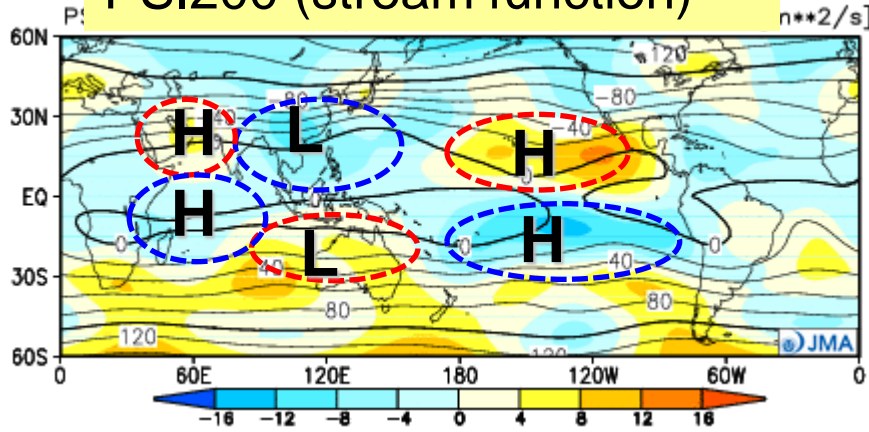
CHI200 (velocity potential)
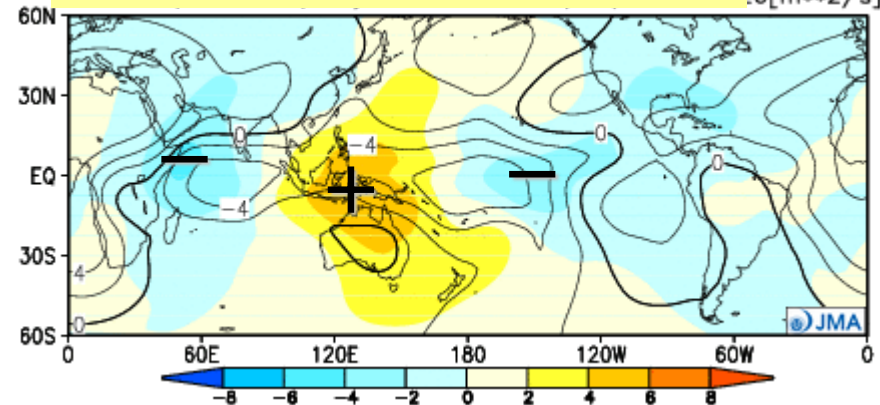
PSI850 (stream function)

Matsuno-Gill response
(Influence of tropical convections on atmospheric circulation)

Upper level

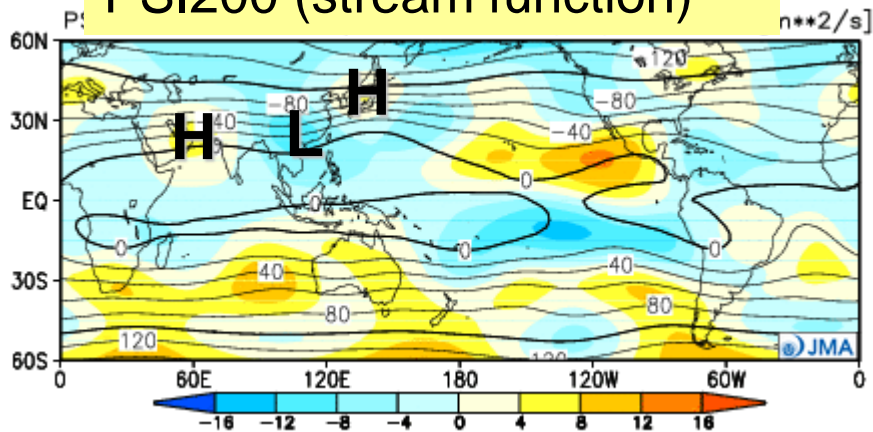Convection active
(Heating source)

EQ.

Lower level

Incase of heating source in EQ.

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Upper air circulation around the tropics

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

PSI200 (stream function)

CHI200 (velocity potential)
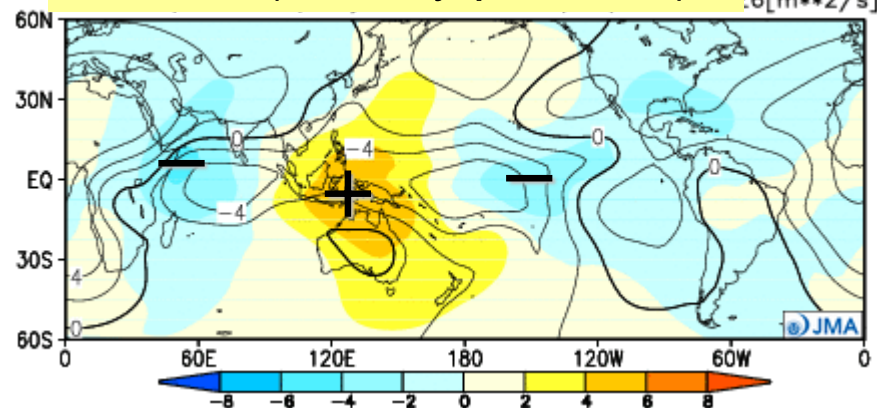
Ts (surface temperature)
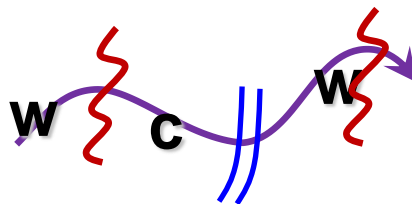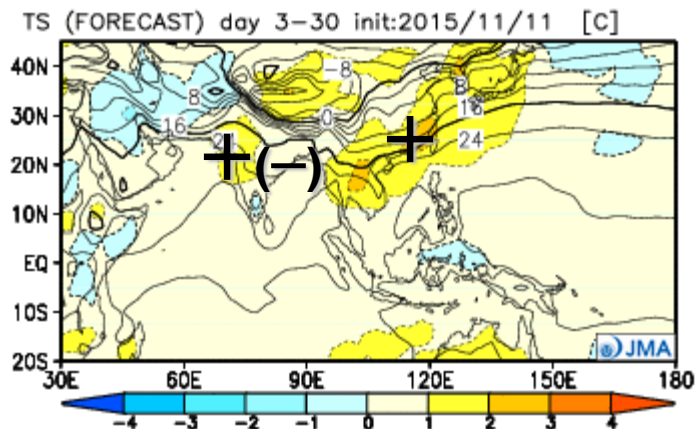
● **Meanderings of the subtropical-jet stream**
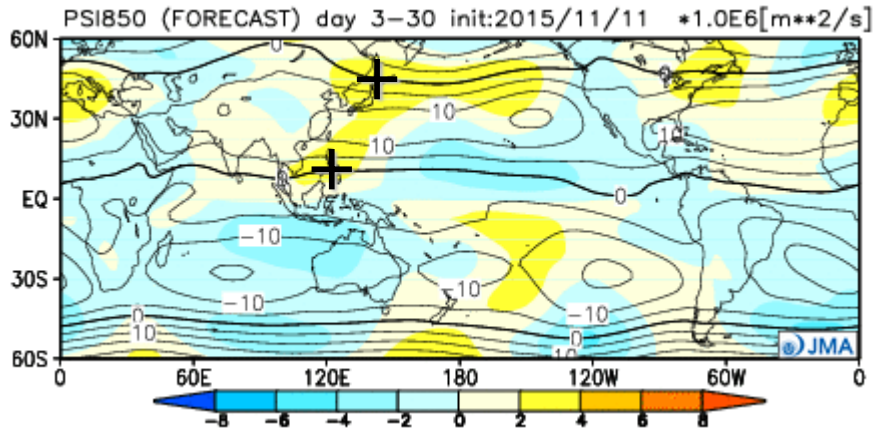
• Middle East; +
• South of Tibet; -
• Around Japan; +

✓ Surface temperature anomalies are generally consistent with the meanderings of the jet.
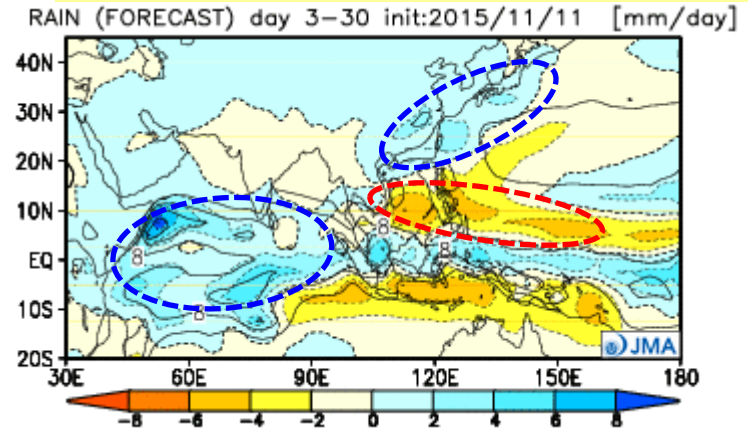
Lower air circulation around the tropics

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

PSI850 (stream function)

PSI850 (FORECAST) day 3-30 init:2015/11/11 *1.0E6[m**2/s]

## Precipitation

RAIN (FORECAST) day 3-30 init:2015/11/11 [mm/day]

- **Lower anti-cyclonic anomalies are predicted around the Philippines,** relating with suppressed convections in the western tropical Pacific.
  This would cause **dry conditions** over the regions, while **wet conditions** along the north side of the anti-cyclone contributed by **southwesterly anomalies** of the lower wind.

- In the tropical Indian Ocean, both warm SSTs and MJO would cause **wet conditions**. Meanwhile, **dry conditions** are predicted around northern part of South Asia, relating with northwest wind anomaly.
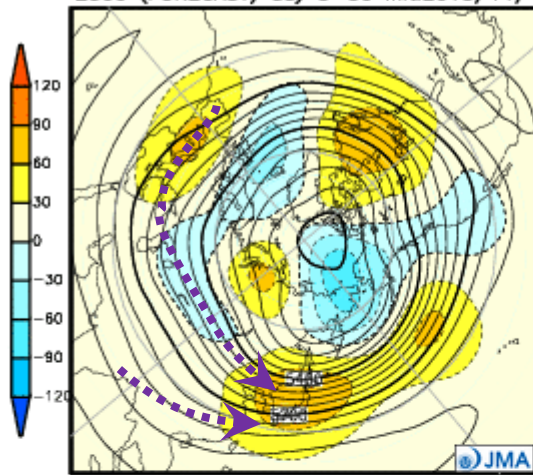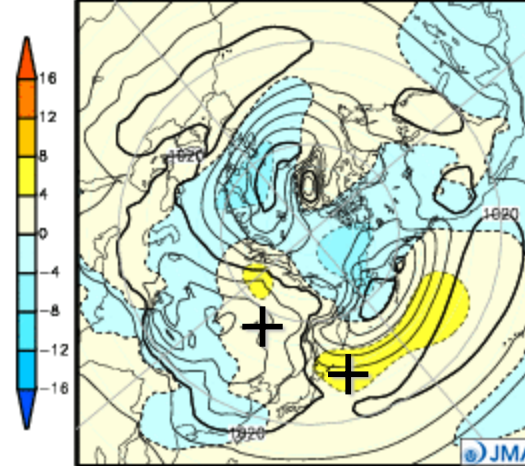

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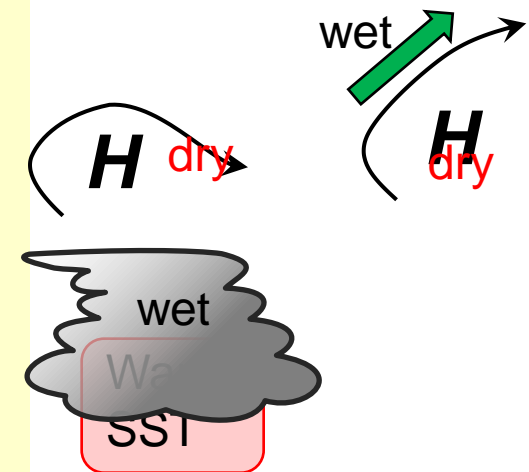
Prediction in the Mid-high latitudes

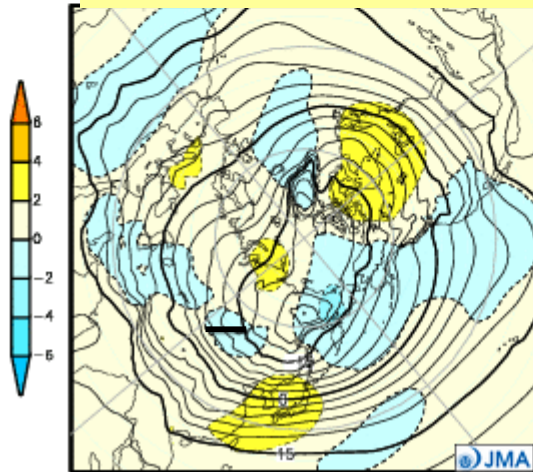http://ds.data.jma.go.jp/gmd/tcc/tcc/products/model/map/1mE/index.html

500hPa height

Sea level pressure

850hPa temperature

- The **Siberian high** is predicted to be enhanced, relating with the upper ridge in the northern Siberia. This would cause the cold tendencies around the region.
- Positive anomalies of 500hPa height around Japan is contributed by the wave trains along the polar jet, in addition to the wave train along the subtropical jet. Therefore, positive anomalies of SLP in east of Japan, which would cause weak northwestern monsoon around Japan.

TCC Training Seminar on one-m

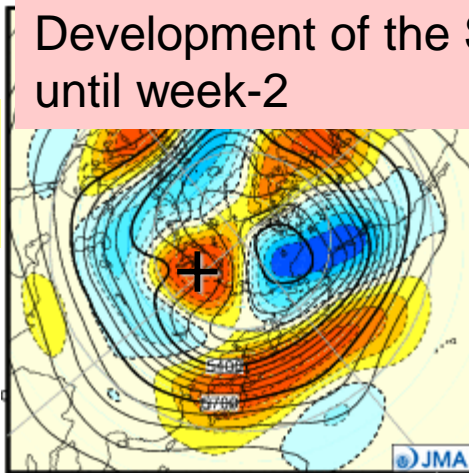# How about the weekly forecast maps (mid-high latitudes)

Week-1 (14-20 Nov)   **Week-2** (21-27 Nov)   **Week-3,4** (28 Nov -11 Dec)

Development of the Siberian high until week-2

Positive-AO like pattern

500hPa height

850hPa temp.

SLP

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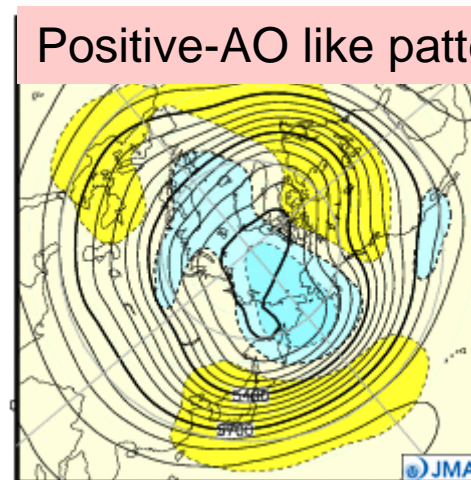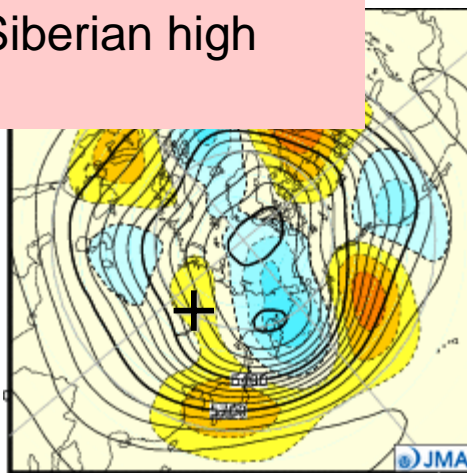
How about the weekly forecast maps (tropics)

Precipitation
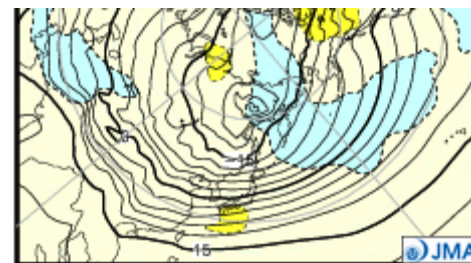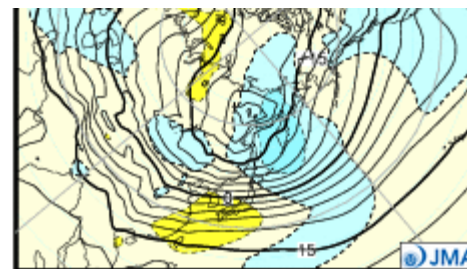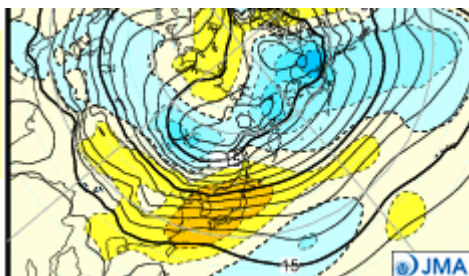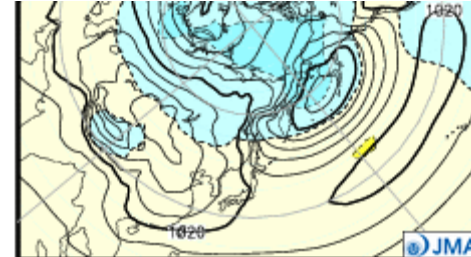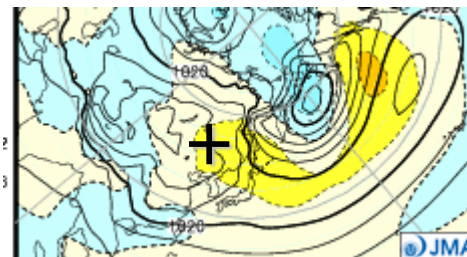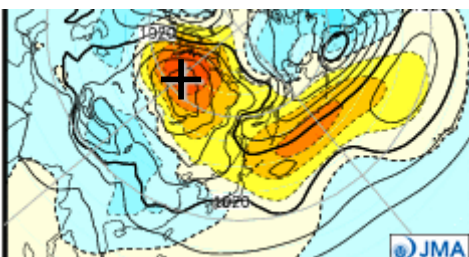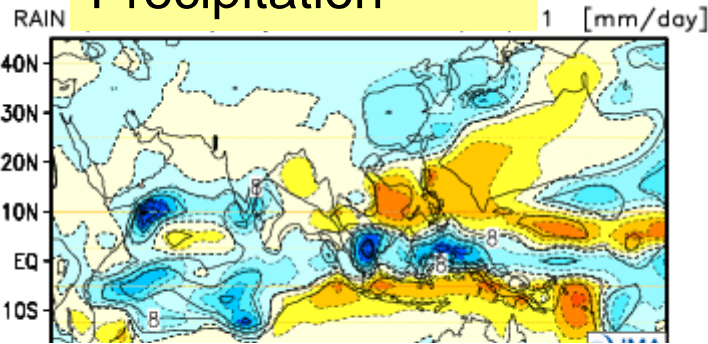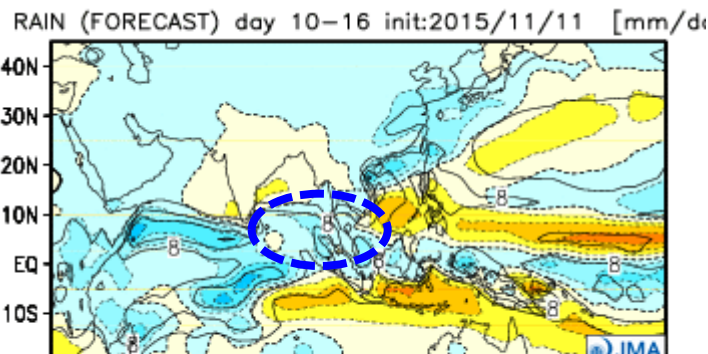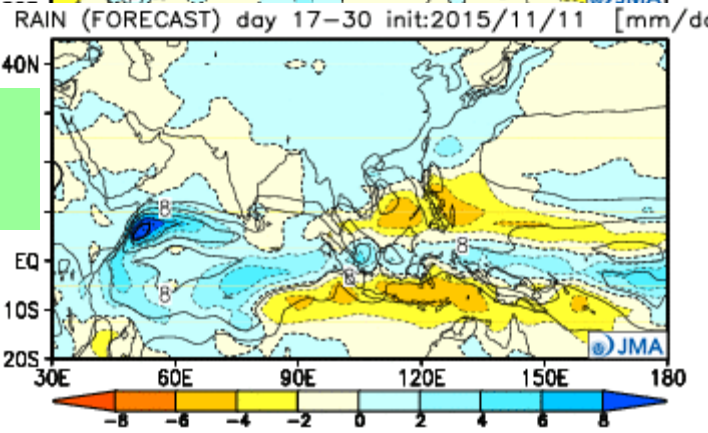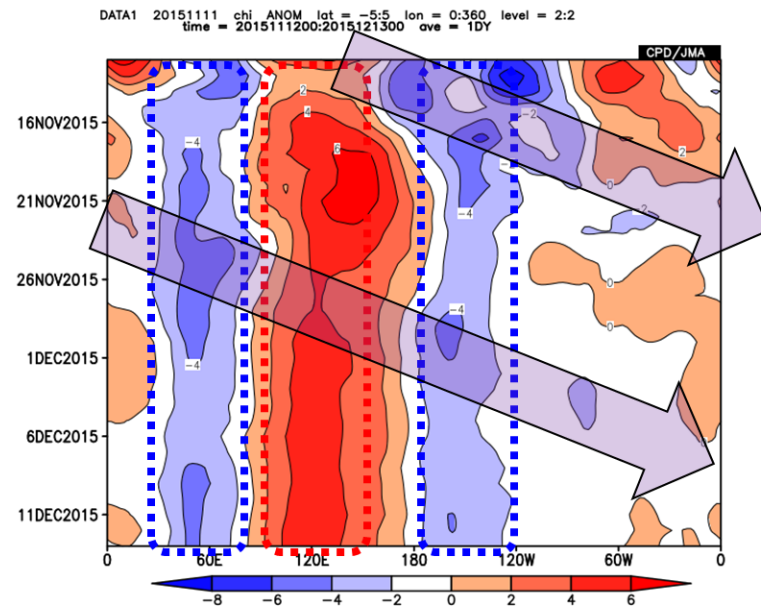
Week-1
(14-20 Nov)

Week-2
(21-27 Nov)

Week-3,4
(28 Nov -11 Dec)

In week-2, area of above normal precipitation **enlarges** in eastern Indian Ocean, relating with the passage of active phase of MJO.
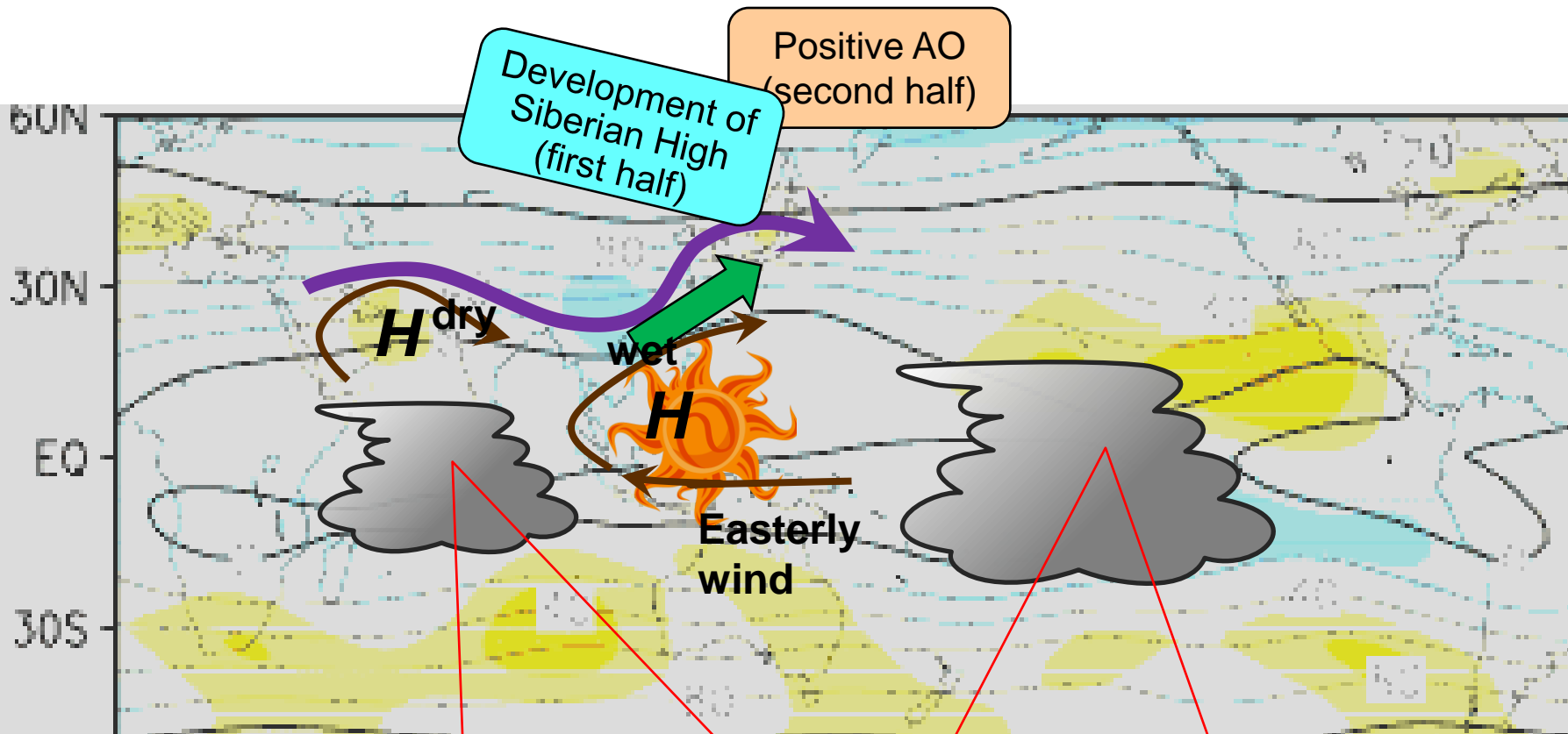
Signals and considerations

- Tropics
  - Convection activities (El Niño + warm SSTs over the Indian Ocean + MJO)
  - Enhanced convections in the western Indian Ocean
    - meanderings of the subtropical jet
  - Suppressed convections over the maritime continent
    - Influences of the lower anticyclonic anomalies

- High latitudes
  - Development of the Siberian high in the first half
  - Positive AO like pattern in second half

How much uncertainties of the above characteristics are considered? >> Subject for forecasters

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Positive AO (second half)

Development of Siberian High (first half)

H **dry**

wet

H

Easterly wind

Enhanced convections, supported by
- SSTs pattern (El Niño, warm over the Indian ocean)
- eastward propagation of the MJO

How much uncertainties are considered the above characteristics? >> Subject for forecasters

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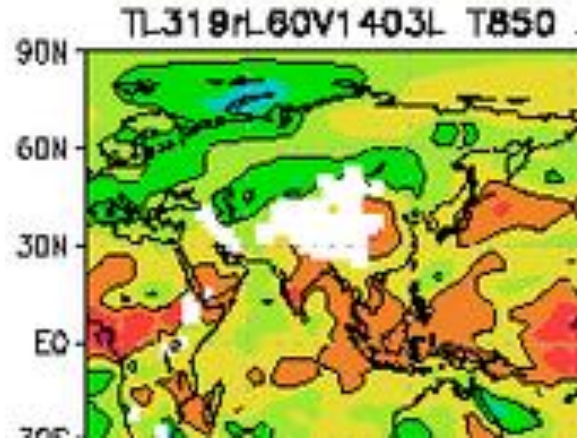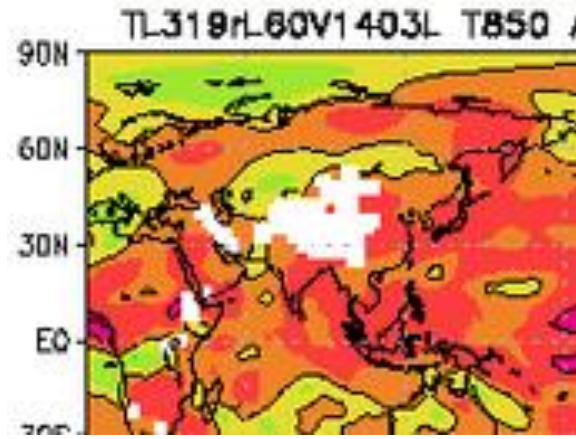# Prediction skill (anomaly correlation by hindacst)

4 weeks mean
(init. 31 Oct)

Week-3,4
(init 31 Oct)

500hPa
height
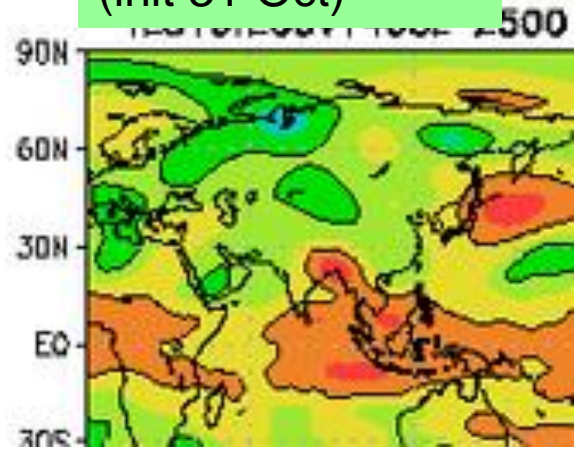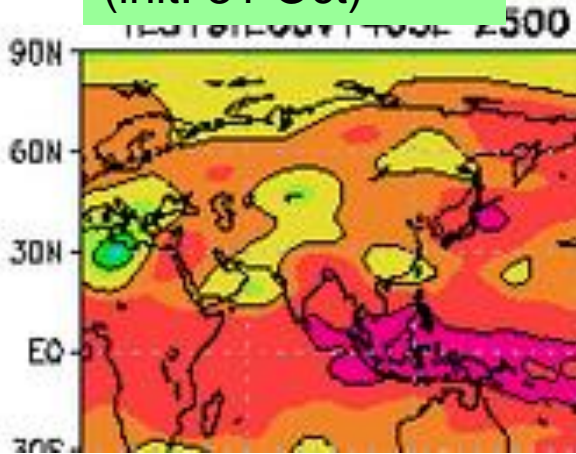
850hPa
Temperature

Estimation of uncertainty by guidance
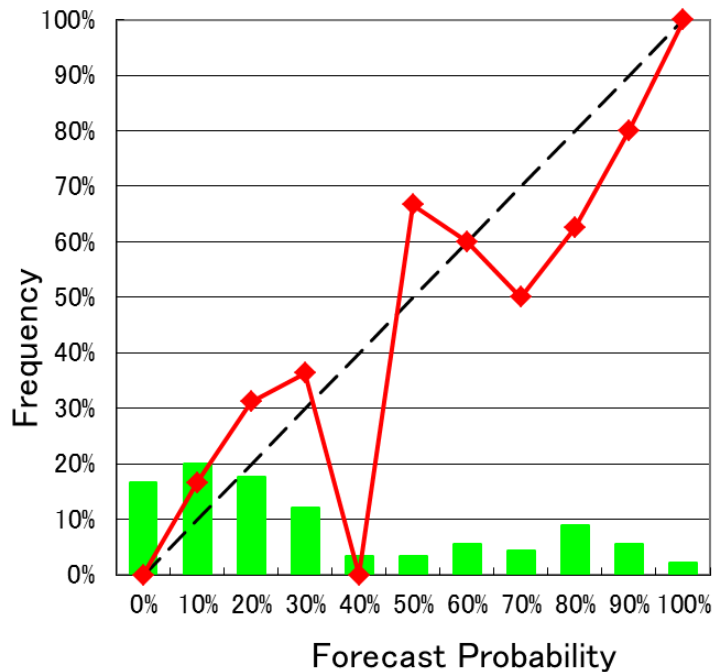
Brier Skill Score

0.220

Single Regression	slope	1.12	0.30
	intercept	−1.43	12.91
	Correlation	0.750	0.246
Multi Regression	slope	1.09	0.22
	intercept	−1.28	
	Correlation	0.771	

How much does the reliability curve fit to 45° line?

How about the scores of the guidance?

◆ Verifications of the guidance may suggests the degree of uncertainties.