Seasonal outlook for summer 2017 over Japan

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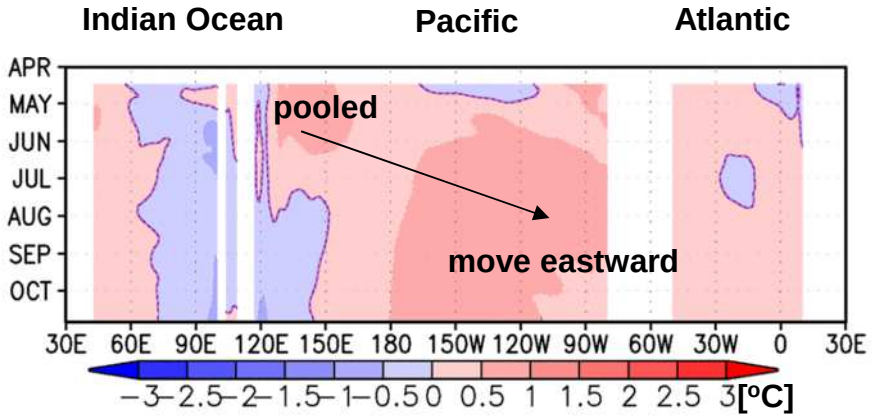
JMA Seasonal EPS (upgraded in June 2015)

Model	CGCM (MRI/JMA-CGCM2) ● Atmospheric component Resolution: Horizontal; about **110 km**, Vertical; **60** vertical levels (**T_L159 L60)** ● Oceanic component Resolution: Horizontal; 1.0º lon.,0.3–0.5º lat. Vertical levels; 52 + bottom boundary layer Sea ice model is employed.
Ensemble size	•Size: **51** (13 BGMs & 4 initial days with 5-day LAF)
Frequency of forecast issuance	Once a month (around 20th of every month)

◆ In this presentation, the latest initial (Apr. 2017) are illustrated.

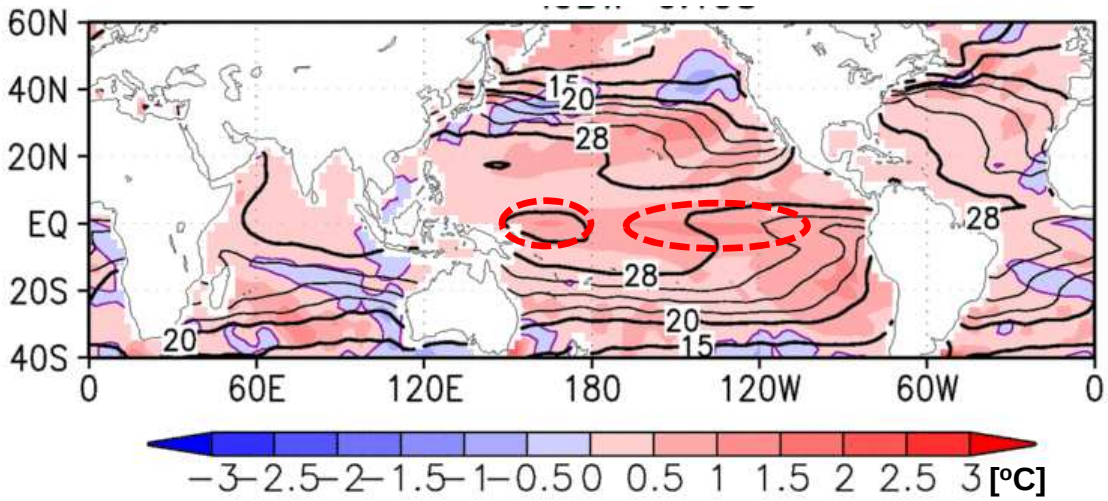
Oceanic conditions in JJA 2017

Ocean Heat Content anomalies (0m～300m) along the equator



- Warm subsurface waters are currently pools in the western Pacific. Those are predicted to move eastward through boreal summer.

SST (contour) and anomalies (shading)



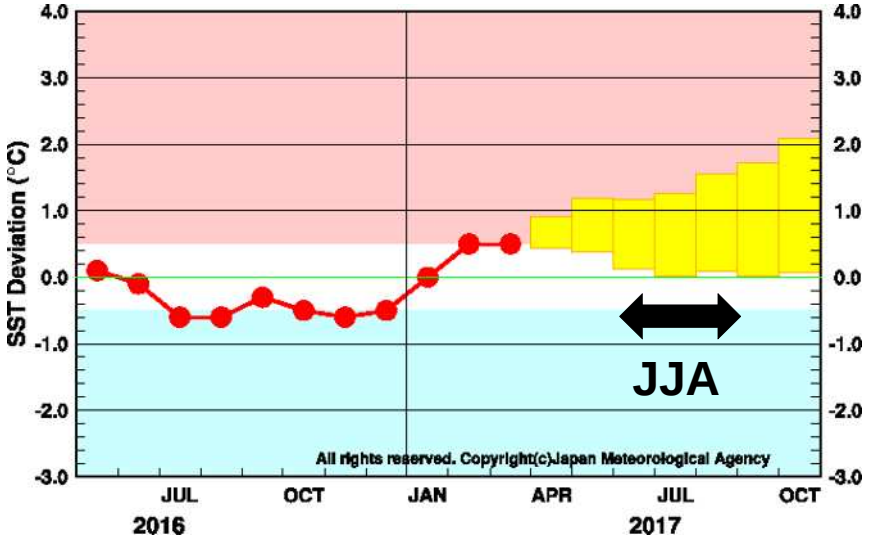
- Positive SST anomalies are predicted in both eastern equatorial Pacific and western eqatorial Pacific.
- Negative SST anomalies are predicted in eastern Indian Ocean.

El Niño like conditions
+ positive IDO like pattern

El Niño Outlook (Last updated: 10 April 2017)

http://ds.data.jma.go.jp/gmd/tcc/tcc/products/elnino/outlook.html

NINO.3-SST index



YEAR	MONTH	mean period		
2017	FEB	DEC2016–APR2017	100	
	MAR	JAN2017–MAY2017	50	50
	APR	FEB2017–JUN2017	60	40
	MAY	MAR2017–JUL2017	70	30
	JUN	APR2017–AUG2017	70	30
	JUL	MAY2017–SEP2017	60	40
	AUG	JUN2017–OCT2017	50	50

El Niño ENSO neutral La Niña

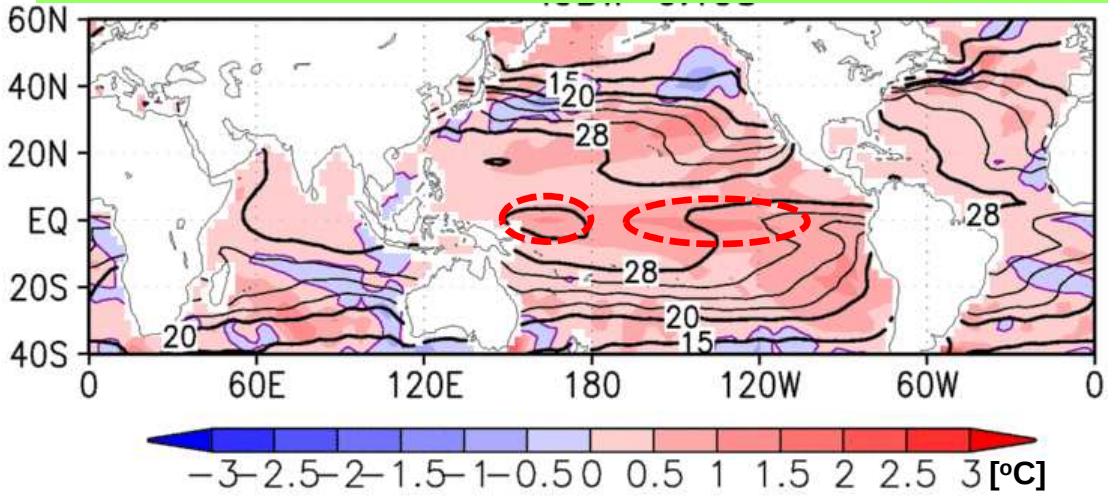
According to the El Niño Outlook issued on 10 April 2017,

- In March 2017, NINO.3 SST index was above normal with a deviation of +0.5℃.
- NINO.3 SST index is predicted to be **border-line of El Niño/Neutral** (50%) during boreal summer, but temporally above normal (70%) during the next few months.

Precipitations for JJA 2017

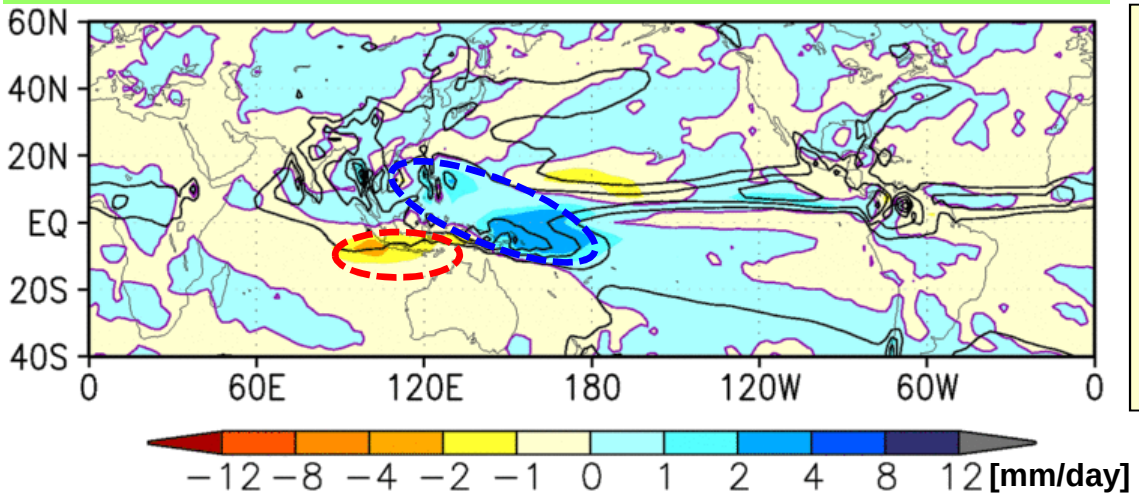
Ensemble mean

SST (contour) and anomalies (shading)



El Niño like conditions
+ positive IDO like pattern

Precipitation (contour) and anomalies (shading)

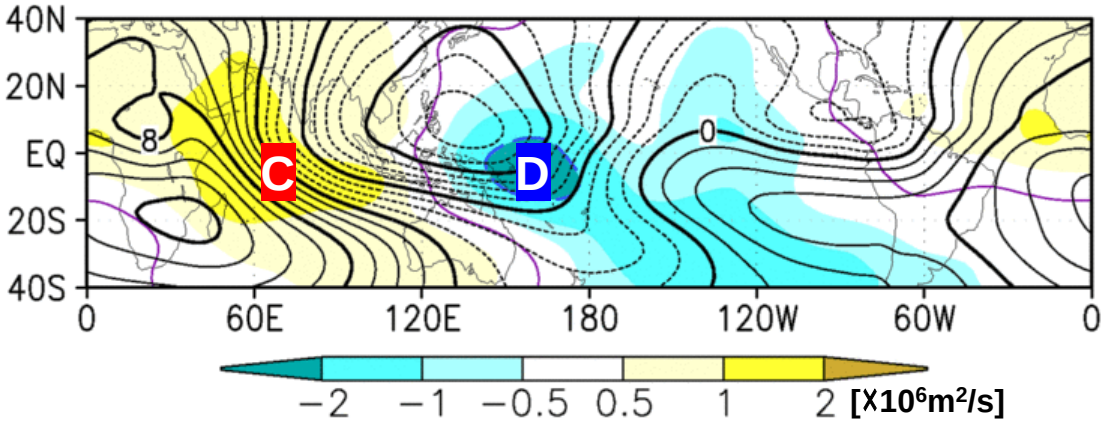


- Positive (wet) anomalies are predicted from Southeast Asia to the western tropical Pacific.
- Negative (dry) anomalies are predicted in the eastern Indian Ocean.

Predicted upper troposphere for JJA 2017

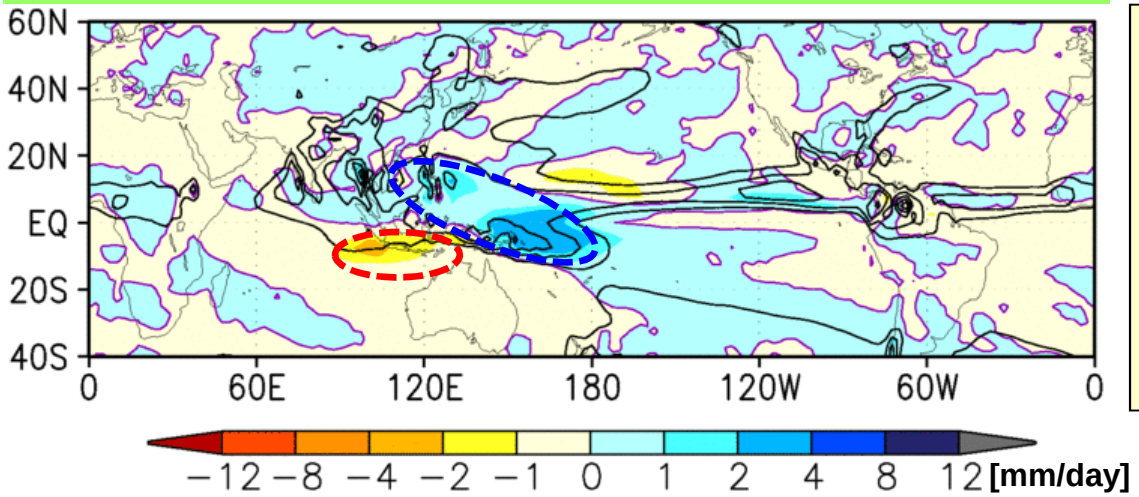
Ensemble mean

Velocity potential at 200hPa (contour) and anomalies (shading)



- **Negative** (more divergent) anomalies are predicted in western tropical Pacific.

Precipitation (contour) and anomalies (shading)

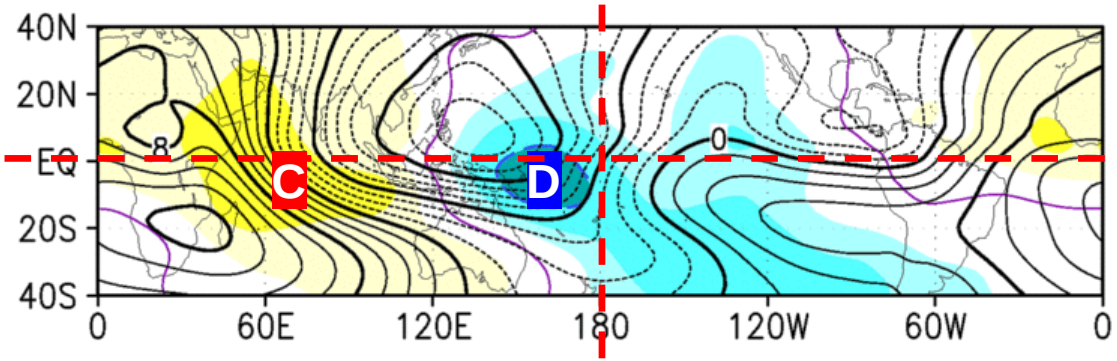


- Positive (wet) anomalies are predicted from Southeast Asia to the western tropical Pacific.
- Negative (dry) anomalies are predicted in the eastern Indian Ocean.

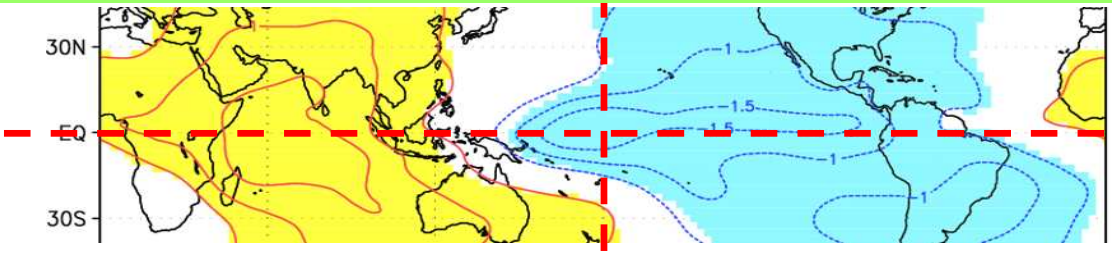
Comparing with typical El Niño

Ensemble mean

Velocity potential at 200hPa (contour) and anomalies (shading)



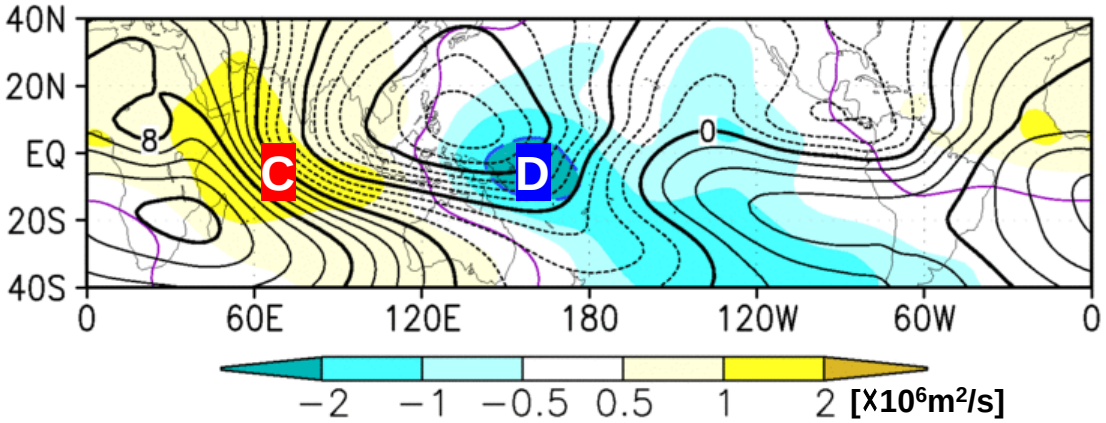
Typical El Niño response in the model climate (JJA)
(Linear regressions of χ200 upon NINO.3-SST
using reforecast of the model with initial of Apr.)



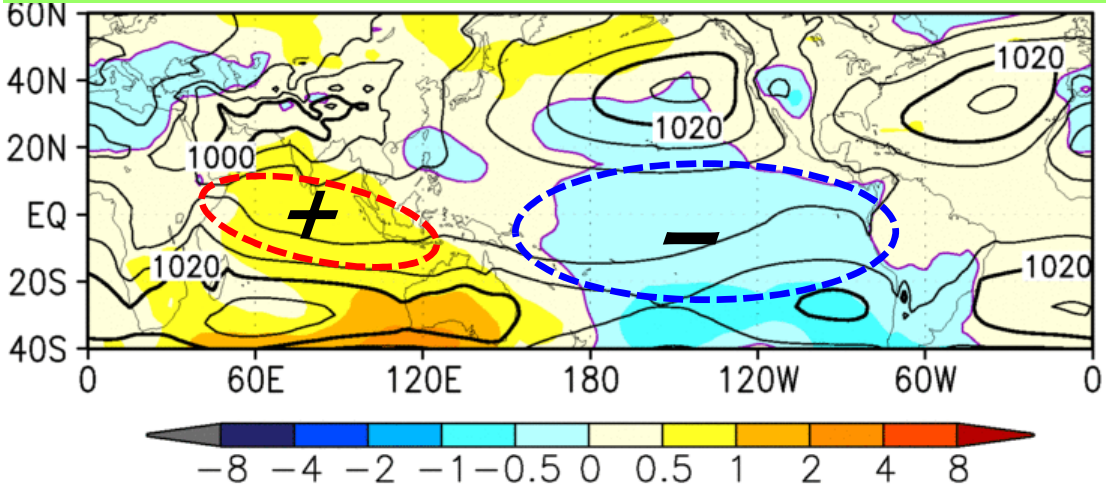
- Predicted upper divergence anomalies shifts westward comparing with the typical El Niño response in the model climate, even if after taking into consideration cold tongue bias.

Predicted lower troposphere for JJA 2017

Velocity potential at 200hPa (contour) and anomalies (shading)



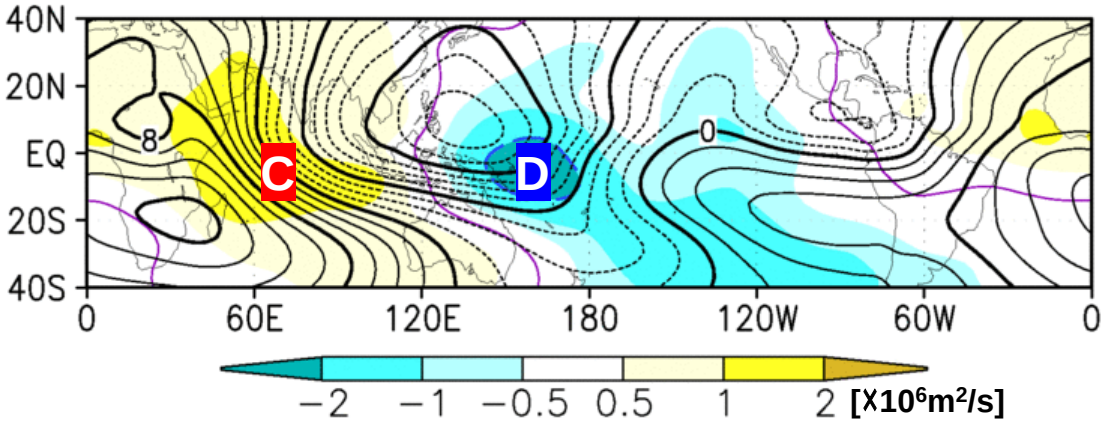
Sea level pressure (contour) and anomalies (shading)



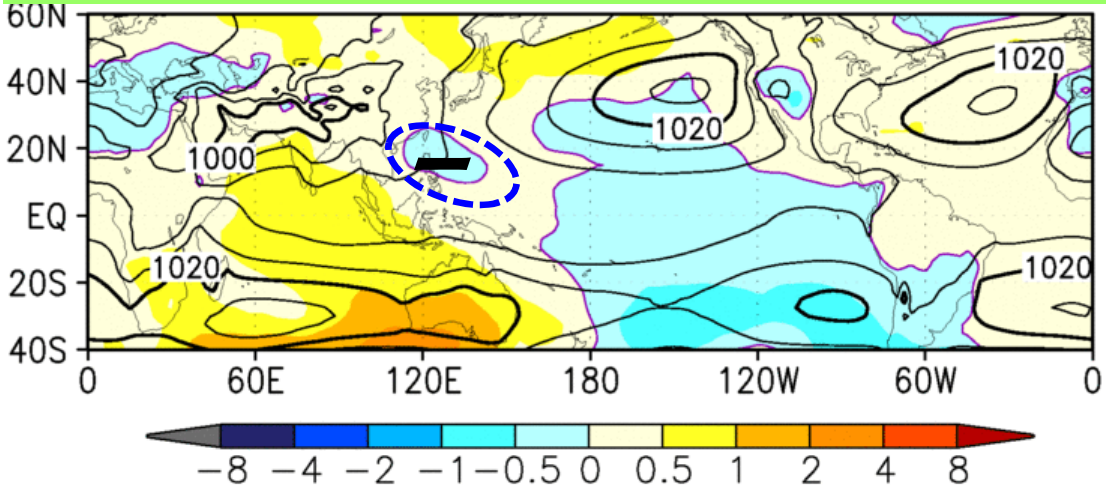
- Negative and Positive anomalies are predicted over tropical Pacific and north Indian Ocean, respectively.

Predicted lower troposphere for JJA 2017

Velocity potential at 200hPa (contour) and anomalies (shading)



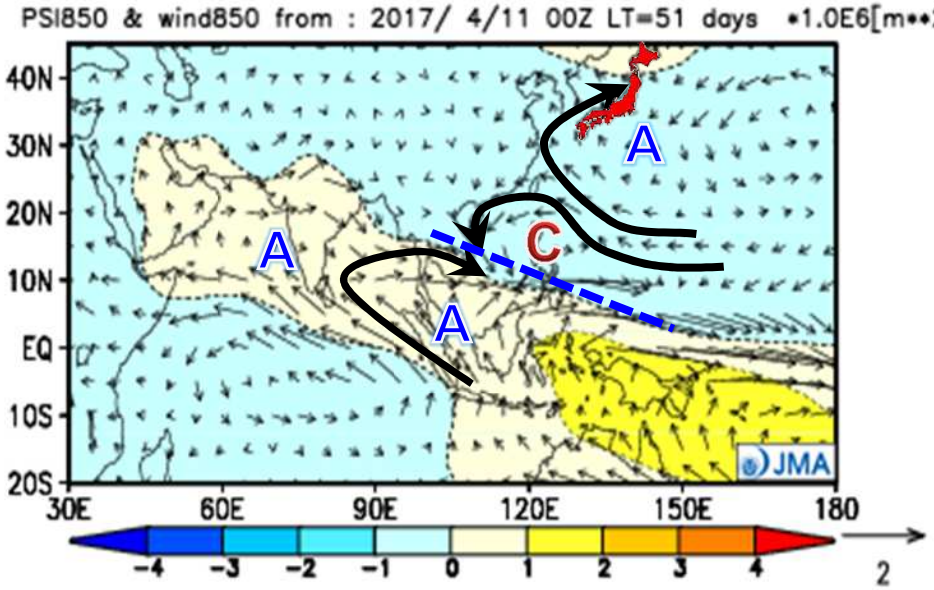
Sea level pressure (contour) and anomalies (shading)



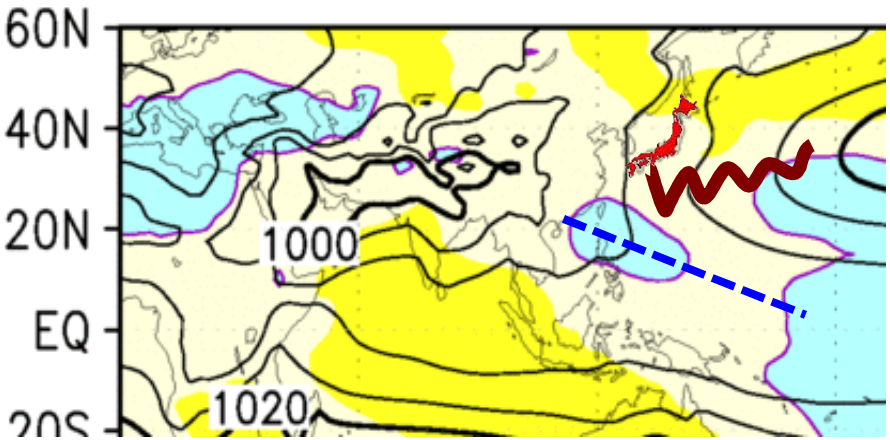
- Negative and Positive anomalies are predicted over tropical Pacific and north Indian Ocean, respectively.
- **Monsoon trough** is predicted to be **stronger-than-normal**, indicating active convections from southeast Asia to western tropical Pacific.

Expected the North Pacific High for JJA 2017

850hPa wind anomalies (vector)
850hPa stream function anomalies (shading)



Sea level pressure anomalies



- **Monsoon trough**: stronger-than-normal
- **North Pacific High**: stronger than normal and expand northward

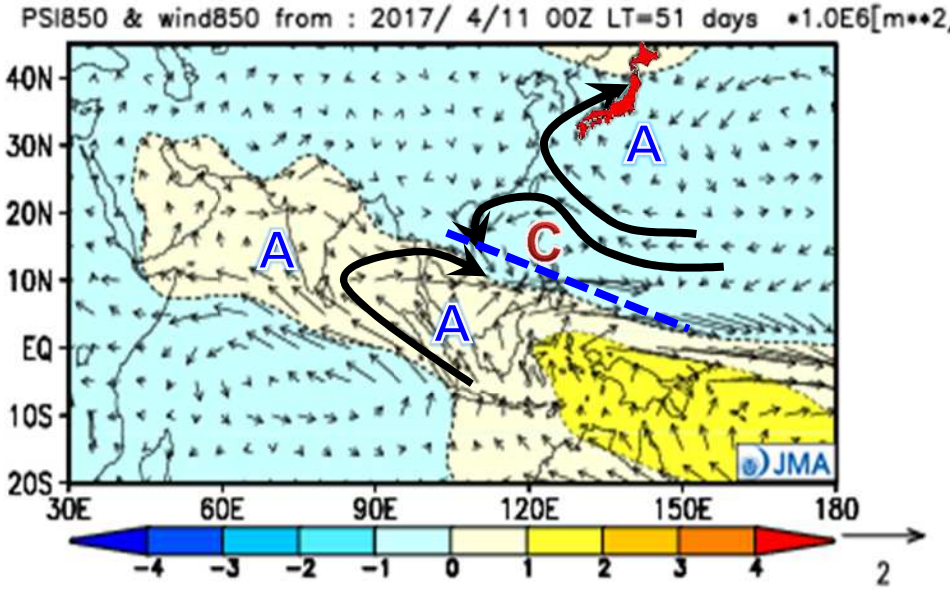
(Baiu)

(Baiu)

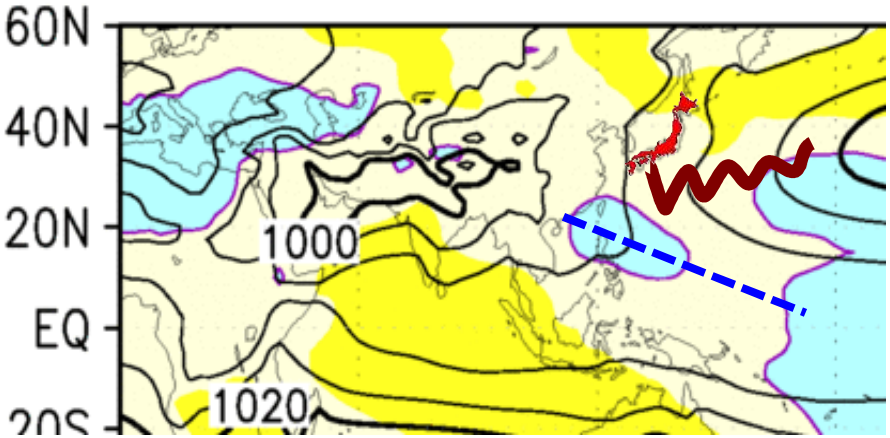
- warmer and wetter tendencies (i.e., active Baiu) due to moist southerly flows along the edge of the High.

Expected the North Pacific High for JJA 2017

850hPa wind anomalies (vector)
850hPa stream function anomalies (shading)



Sea level pressure anomalies



(mid-summer)

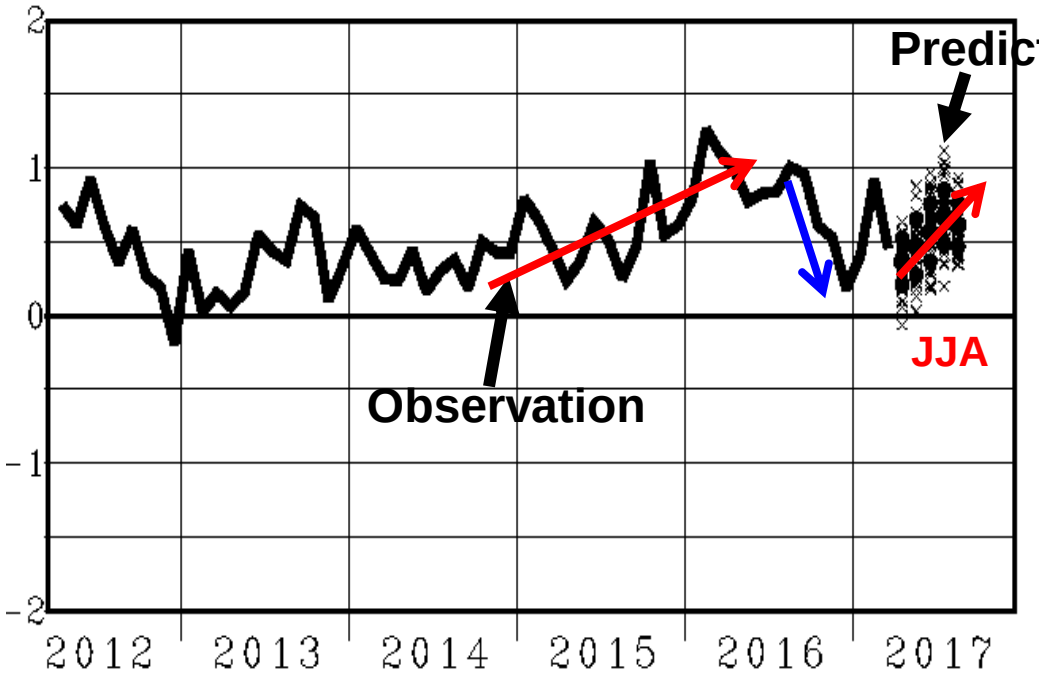
- **Monsoon trough**: stronger-than-normal
- **North Pacific High**: stronger than normal and expand northward

(mid-summer)

- warmer and drier tendencies due to covered by strong North Pacific High

Warm tendencies of overall temperatures

Predicted Tropospheric thickness temp.(300-850hPa) of the N.H. (30°N–90°N)



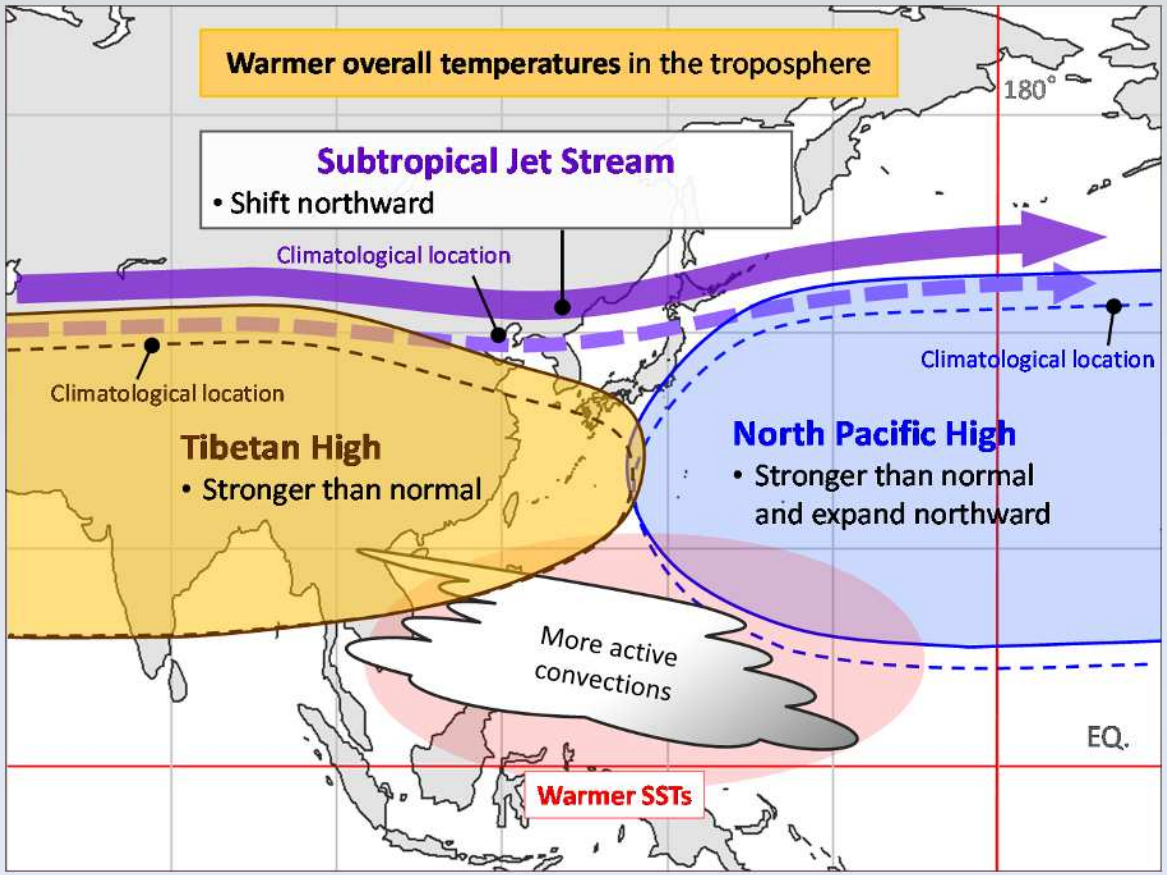
Black line : observed anomalies
Black dots(center) : predictions (ensemble mean)
x : predictions (51 ensemble member)

- **Overall temperatures** in the troposphere are expected to be higher-than-normal in association with the prevailing long-term trend.
- In addition, temperatures are bottom in the second-half of 2016., relating with La Niña tendencies. After that, those have been increased.

➢ These tendencies are likely to increase the chance of above-normal temperatures.

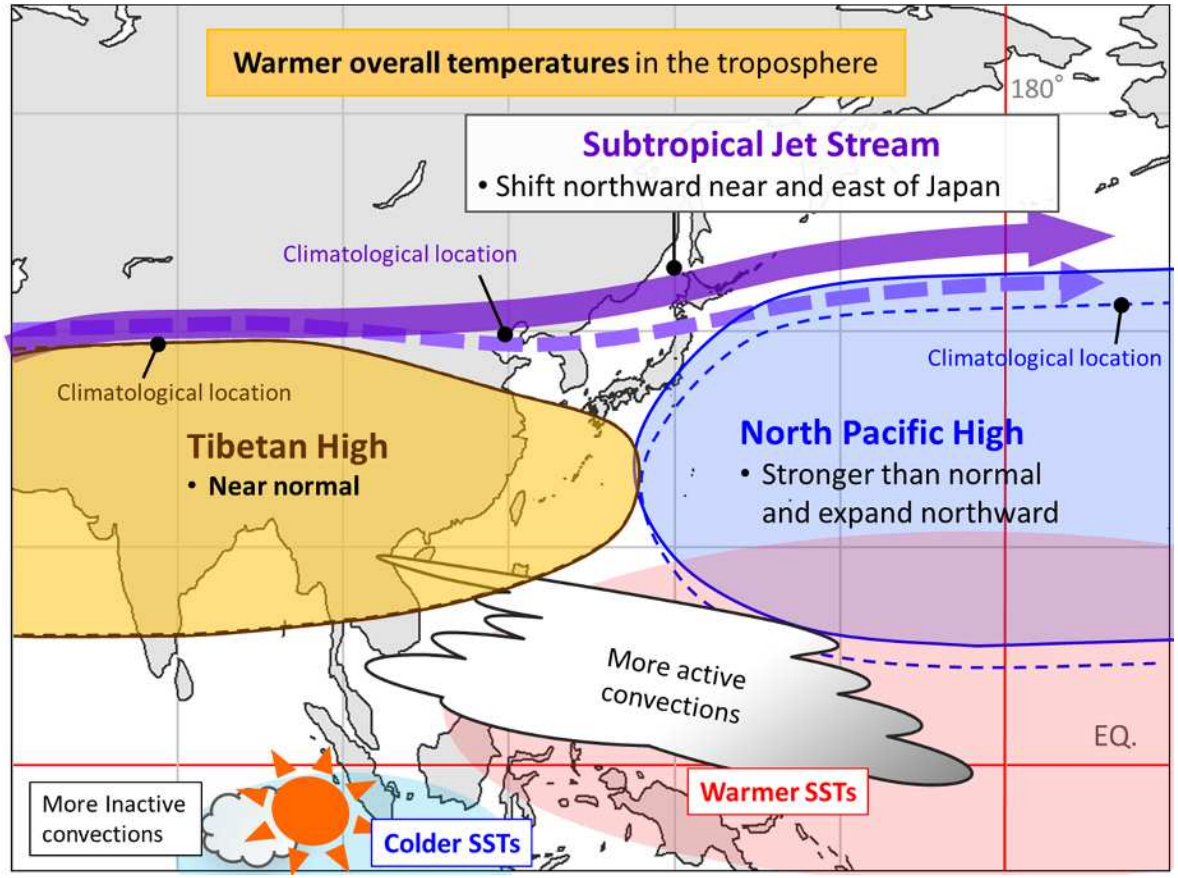
Conceptual diagram
for East Asian circulation in JJA 2017

OLD version



Conceptual diagram
for East Asian circulation in JJA 2017

Latest (initial of Apr.)



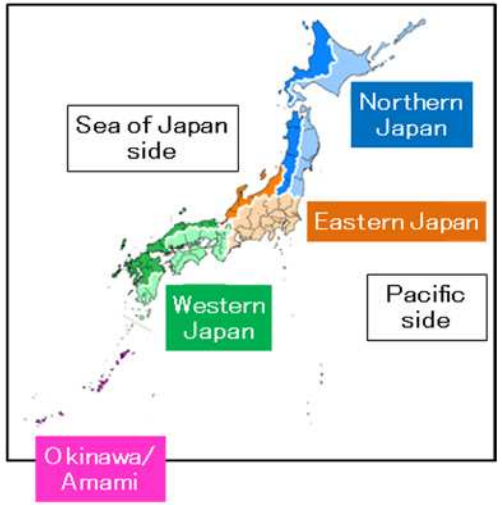
According to the latest initial,

- El Niño like pattern becomes clear.
- Meanwhile, warm SSTs in the western + IOD like SSTs also predicted.

- **Monsoon trough:** stronger-than-normal
- **North Pacific High:** stronger than normal and expand northward

Outlook for summer 2017 over Japan

		Temperature			Precipitation		
	Category	−	0	+	−	0	+
Northern Japan	Sea of Japan side	20	30	**50**	30	**40**	30
	Pacific side				30	**40**	30
Eastern Japan	Sea of Japan side	20	30	**50**	30	**40**	30
	Pacific side				30	**40**	30
Western Japan	Sea of Japan side	20	30	**50**	30	**40**	30
	Pacific side				30	**40**	30
Okinawa/Amami		20	30	**50**	30	30	**40**



(Category −: Below normal, 0 : Near normal, + : above normal)

Probability (%)
50 40 Below normal
40 50 Above normal

Probability (%)
50 40 Below normal
40 50 Above normal

- **Temperatures** are expected to be above-normal all over Japan.
- **Precipitation** is expected to be near normal, but slightly above-normal tendencies in Okinawa/Amami.

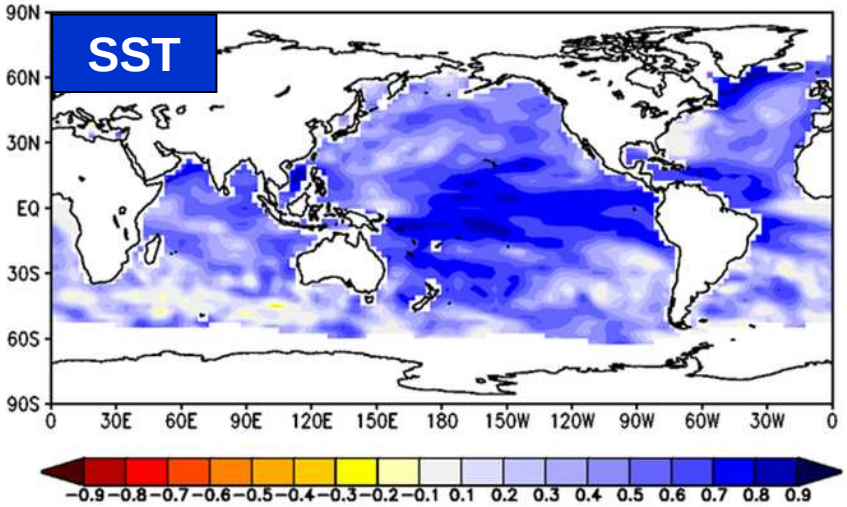
Thank you

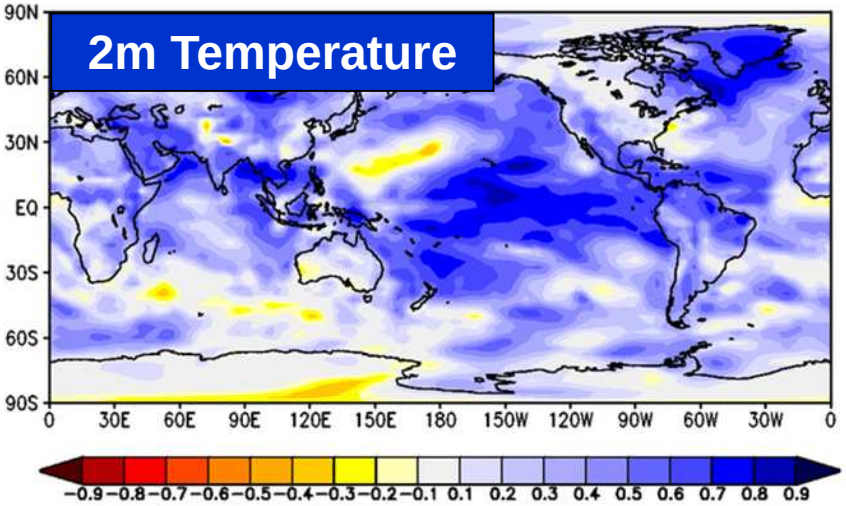
Backup slides

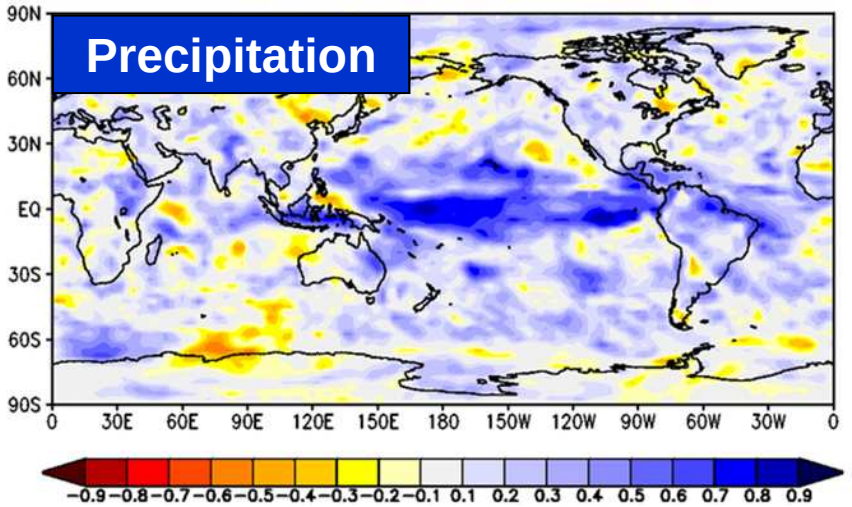
Prediction Skill of JMA Seasonal EPS

Anomaly Correlation of SST and Precipitation for JJA (Initial month: March)

Hindcast experiments for 30 years (1981 – 2010)







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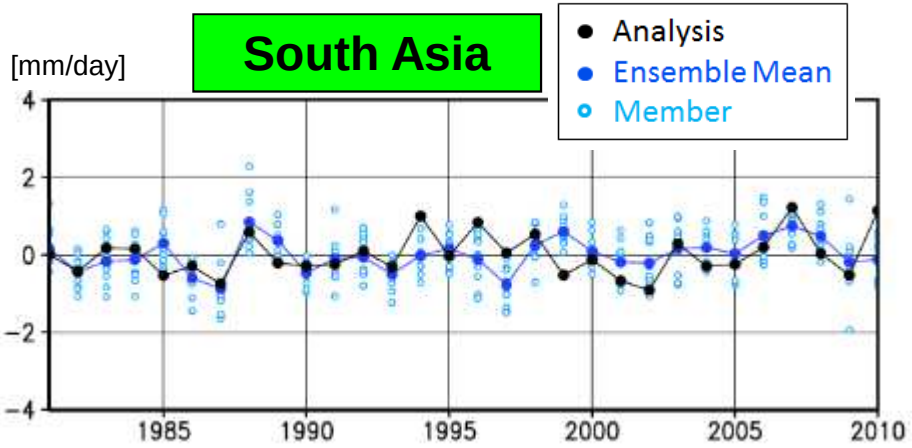
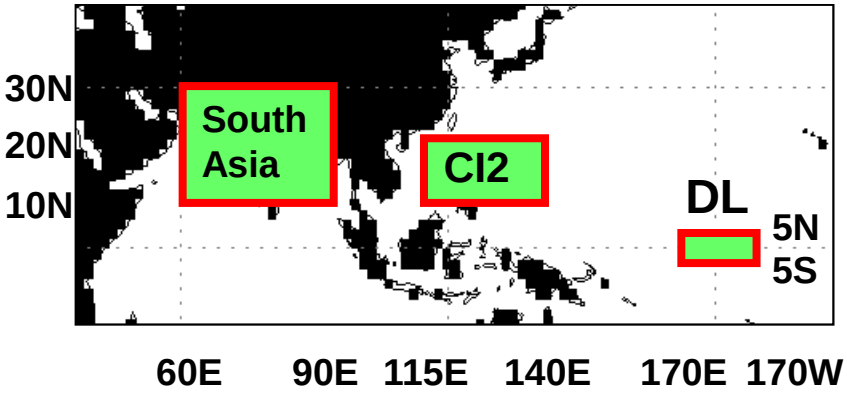
Prediction Skill of JMA Seasonal EPS

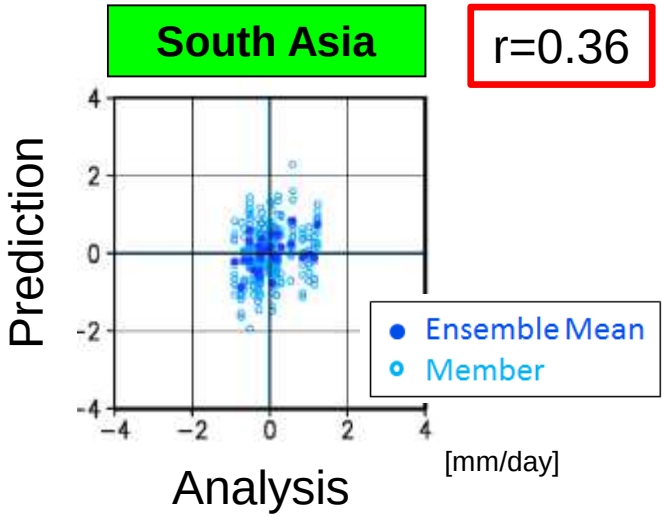
Area-averaged precipitation for JJA (Initial month: March)

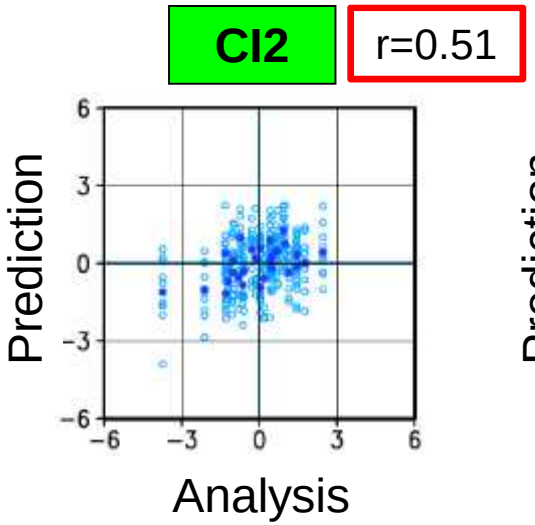
Hindcast experiments for 30 years (1981 – 2010)

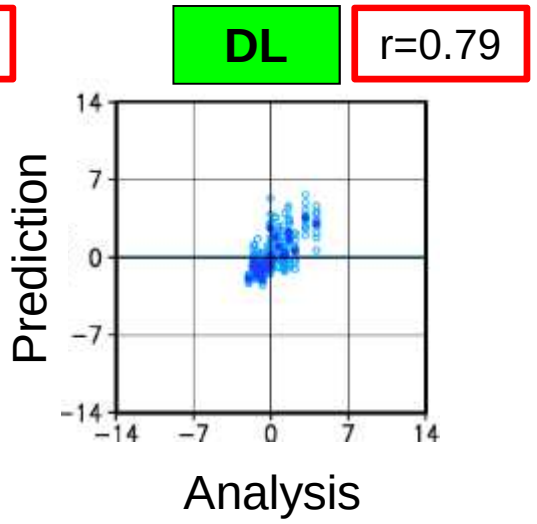
Precipitation Anomaly











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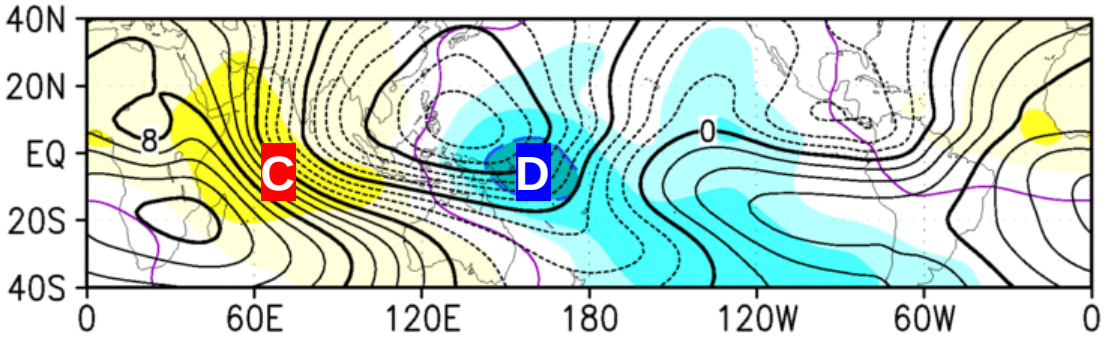
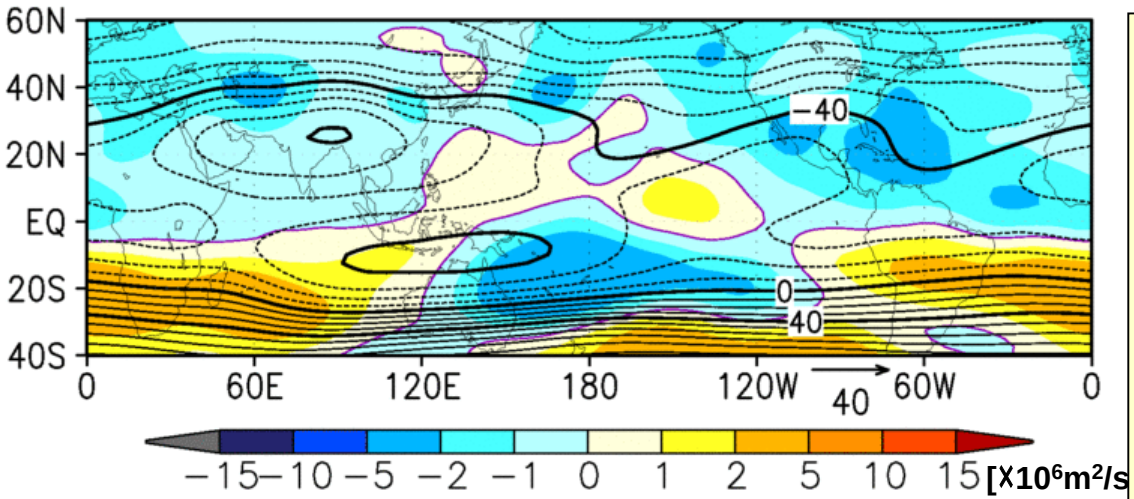
Predicted upper troposphere for JJA 2017

Velocity potential at 200hPa (contour) and anomalies (shading)



Stream function at 200hPa (contour) and anomalies (shading)



- The model predicts weak tendencies of the Tibetan High and southward shifted subtropical jet.
- ➢ The forecaster expects near normal of the Tibetan high and position of the jet stream ,considering uncertainties of IOD and degree of inactive convections over the Indian Ocean.