# Seasonal Outlook for winter 2017/18 over Japan

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# Outline

- Numerical prediction
- Cold season forecast in Japan
- Summary

In this presentation,

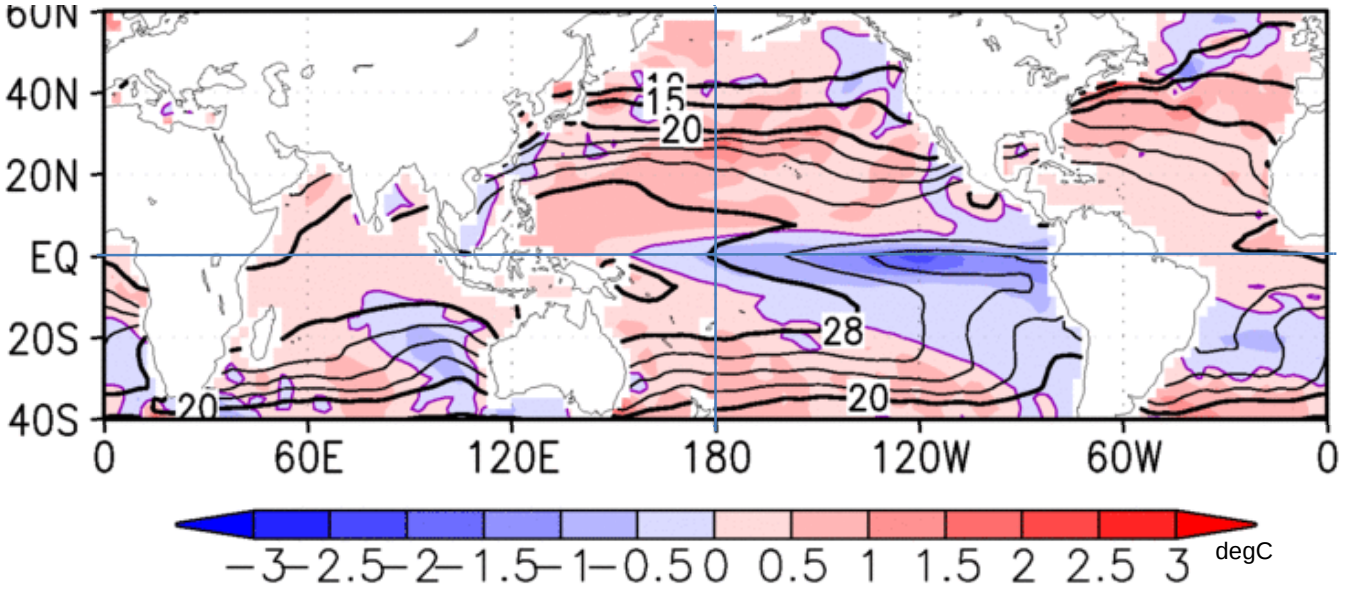
* Base period for normal is 1981-2010.
* Atmospheric analysis data are JRA-55.
* SST data are COBE-SST and OLR data are provided by NOAA.

# Numerical prediction

# Oceanic conditions in DJF 2017/18

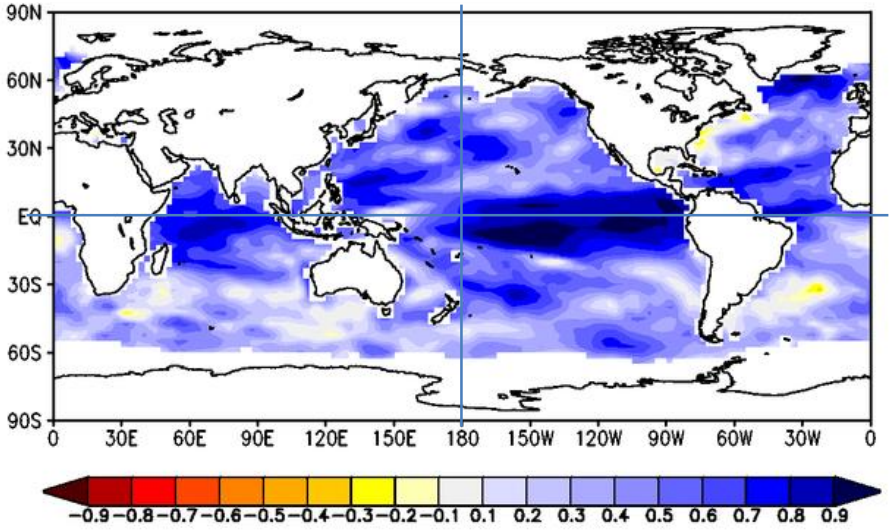
SST(contour) and anomalies(shade)

Initial date : October



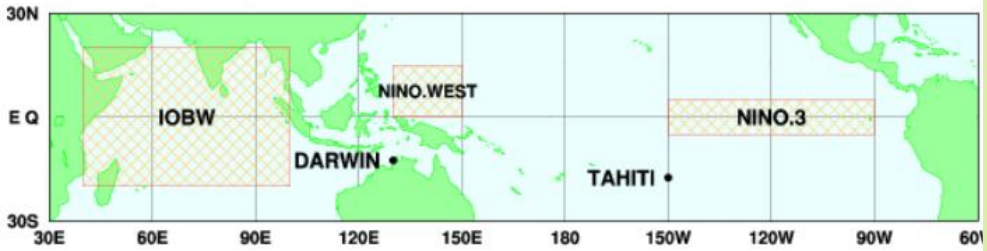

Prediction accuracy
(Anomaly Correlation)

verification result by the 30-year hindcast

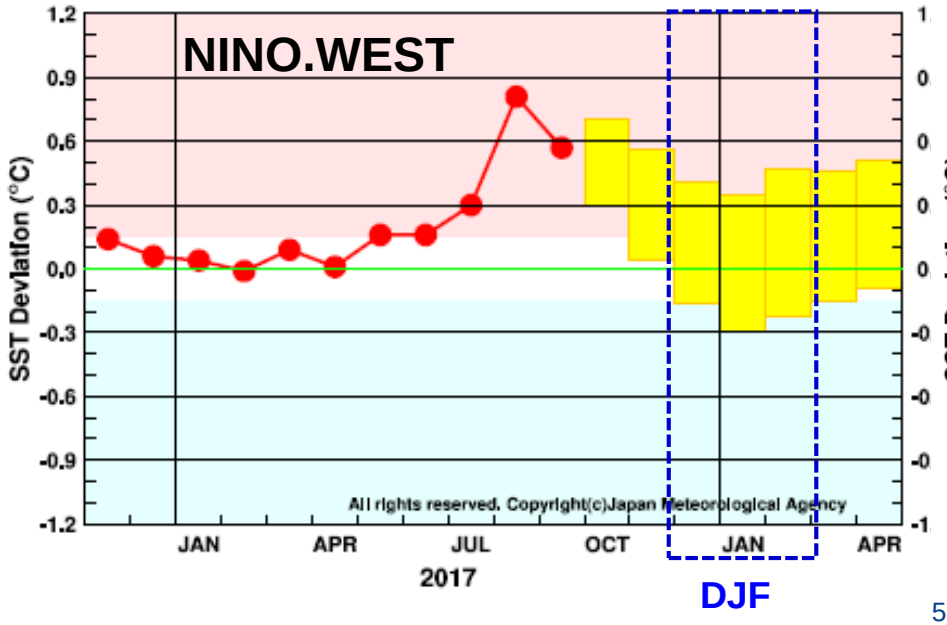


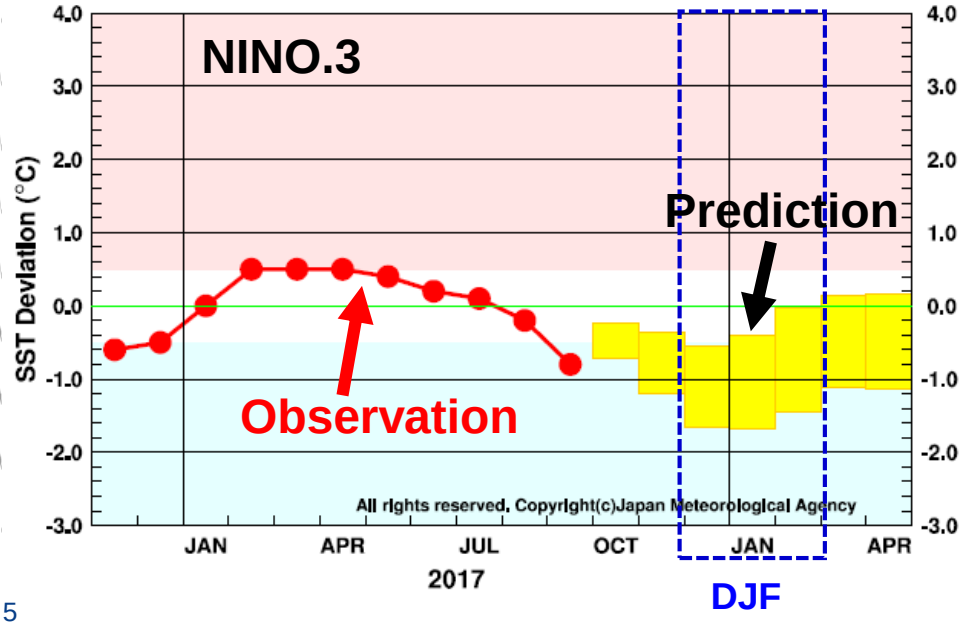

In the tropical region,
prediction reliability is pretty good.

# Oceanic conditions in DJF 2017/18

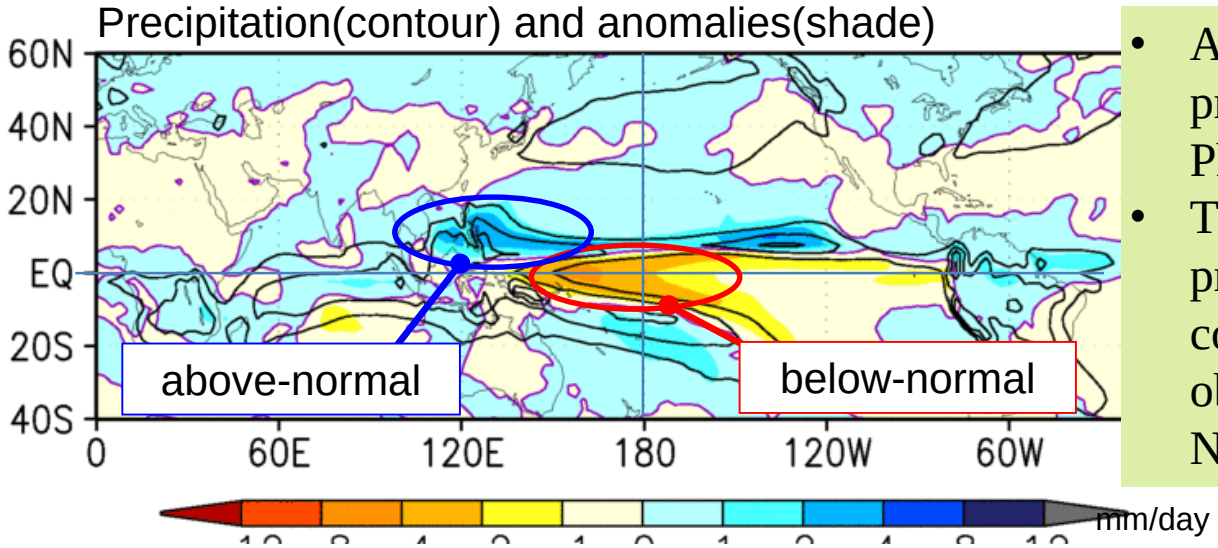



- JMA's CGCM predicts that the NINO.3 Sea Surface Temperature (SST) will be near or below normal and the area-averaged SST in the tropical western Pacific (NINO.WEST) will gradually come close to normal in this winter.
- It is equally likely (50%) that La Niña conditions will develop in this winter, or ENSO-neutral conditions will persist until this winter.

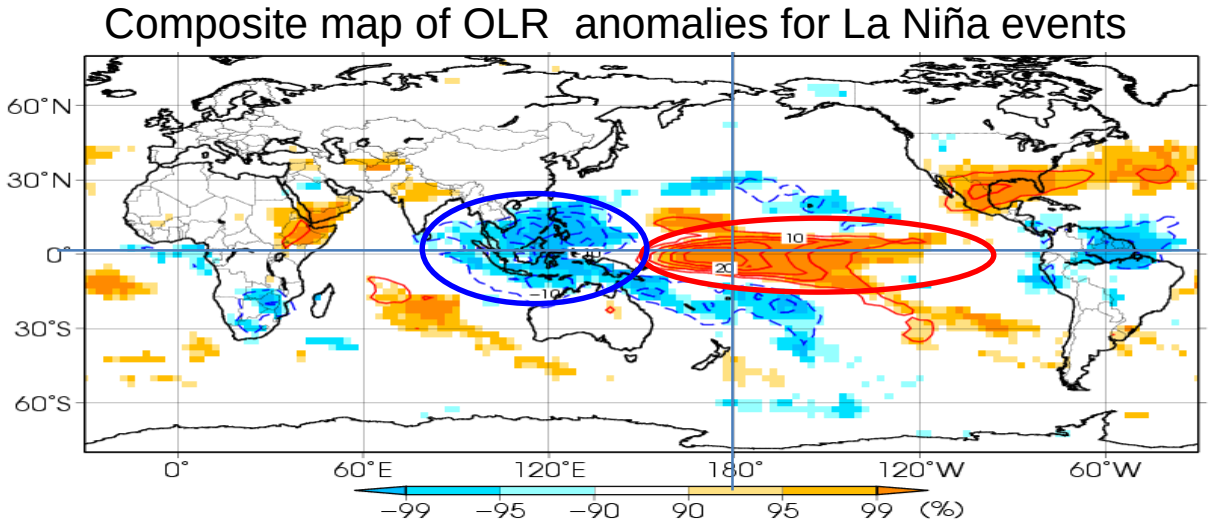


# Global Circulation in DJF 2017/18



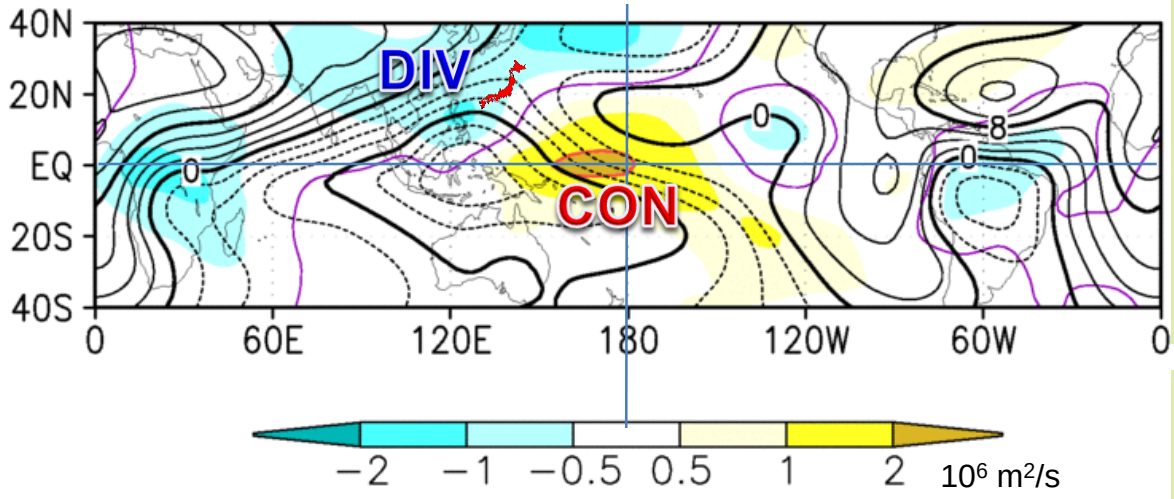

- Above-normal precipitation is predicted around the Philippines.
- The predicted pattern of precipitation anomalies are comparatively similar to those observed during the past La Niña events.



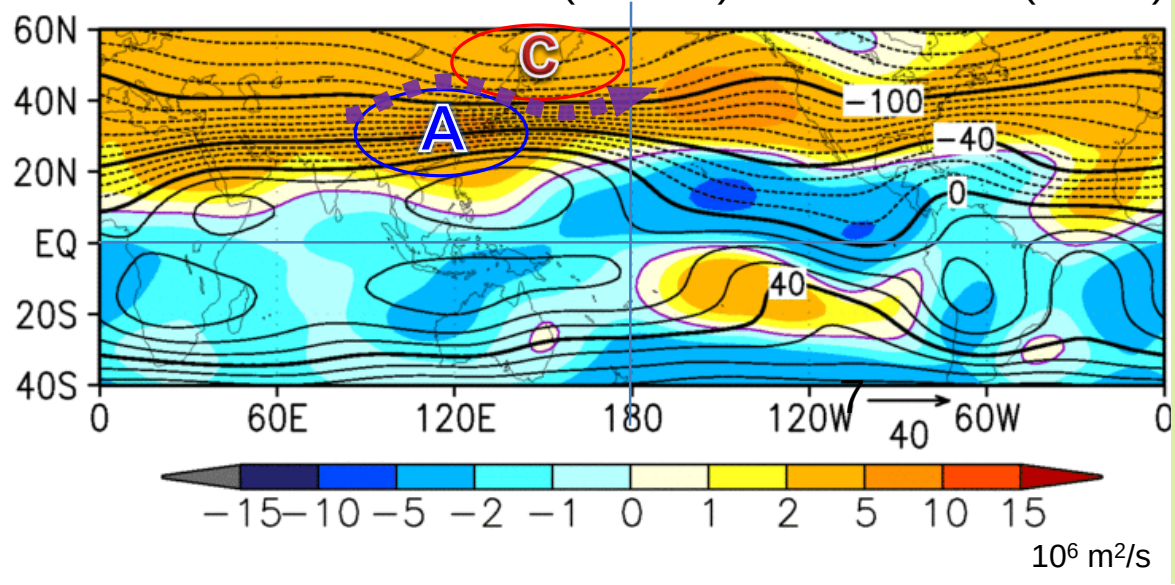

Contours : anomalies at intervals of 5 W/m$^2$.
Shading : the confidence level.
The base period for composite analysis is 1979 - 2012, while that for the three-month means of November-December-January and December-January-February is 1979/80 - 2012/13.

# Global Circulation in DJF 2017/18

200hPa velocity potential(contour) and anomalies(shade)




200hPa stream function(contour) and anomalies(shade)




In the 200-hPa velocity potential field,

- divergence anomalies(**DIV**) are predicted mainly around the Philippines.
- convergence anomalies(**CON**) are predicted around the central Pacific.

In the 200-hPa stream function field,

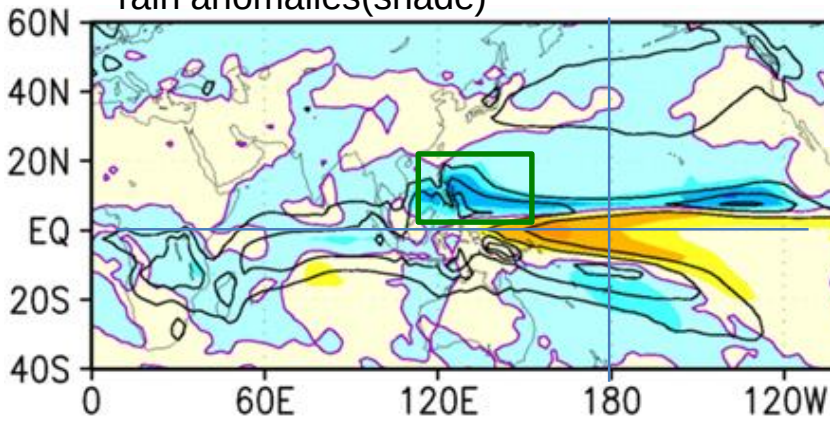
- anticyclonic circulation anomalies(**A**) are predicted over southern China in response to the divergence anomalies around the Philippines.
- the relative cyclonic anomalies(**C**) are predicted around northern Japan, the northeastern side of **A**.
- these **A** and **C** patterns indicate that the subtropical jet stream will shift northward over the Asian continent and shift southward over the sea east of Japan.

# Evaluation of the tropical convection and its effect to the mid-high latitude

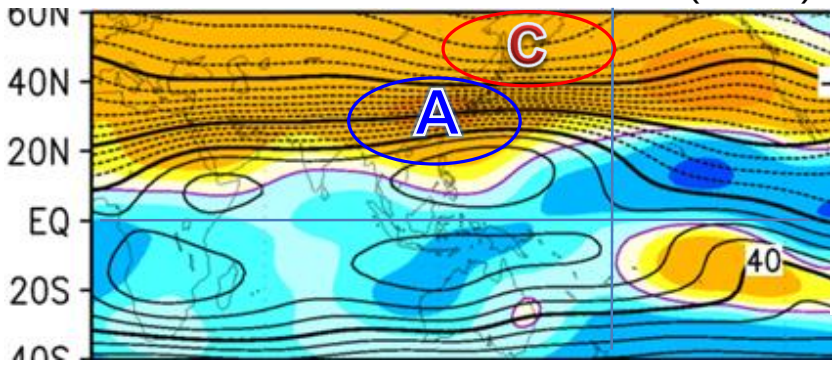
Positive rain anomalies around the Philippines( ▭ ) cause the anticyclonic circulation anomalies over southern China and the cyclonic circulation anomalies in and around northern Japan.

## Prediction

rain anomalies(shade)

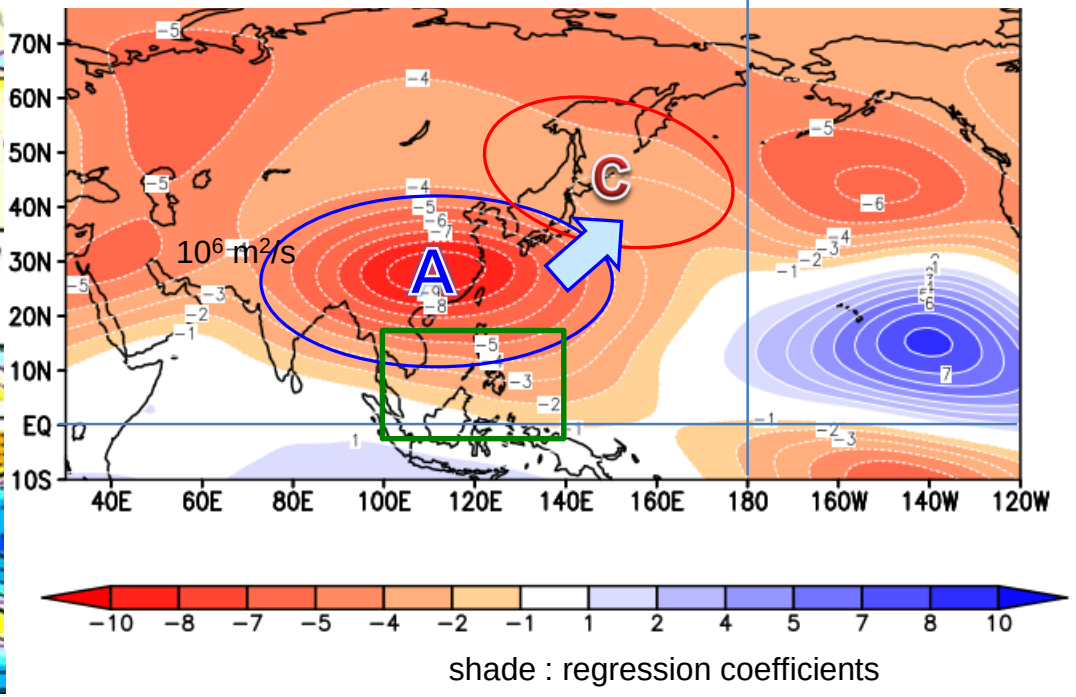



200hPa stream function anomalies(shade)




## Analysis(JRA-55)

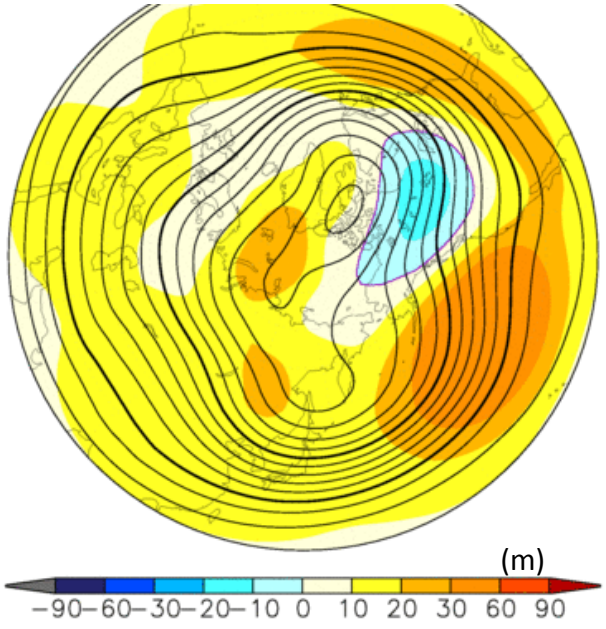
Regression coefficient
between OLR anomalies(100-140E,0-20N) and
200hPa stream function anomalies（DJF : 1980/81-2015/16 ）



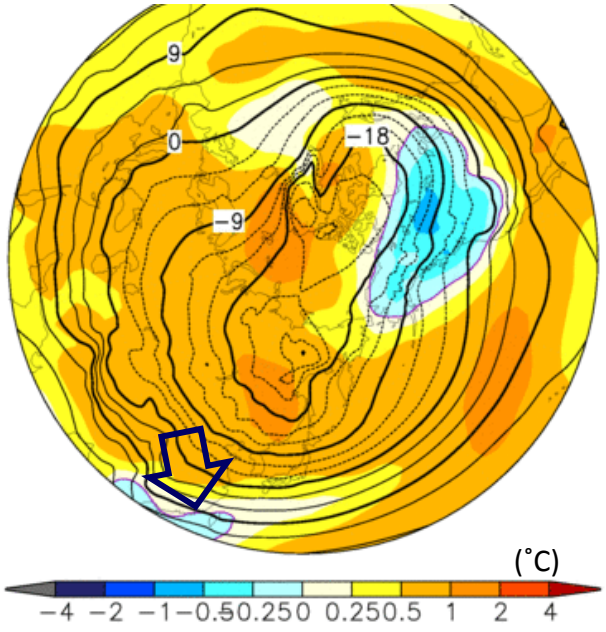

shade : regression coefficients

# Northern Hemisphere circulation in DJF 2017/18

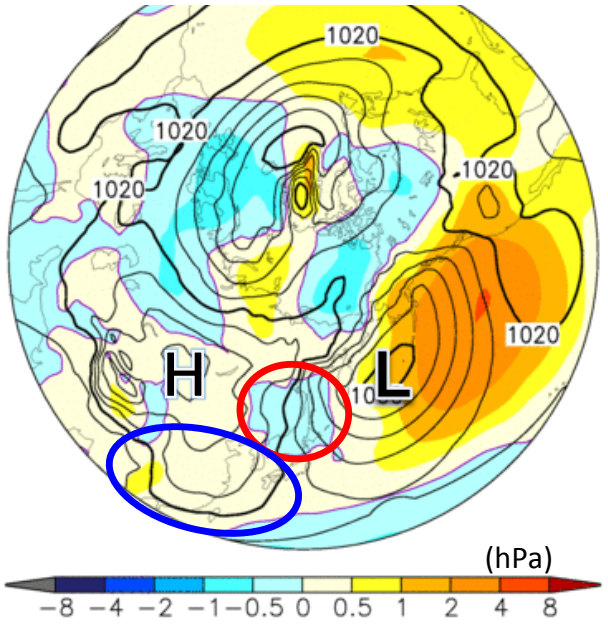
**500-hPa geopotential height**




**850 hPa temperature**



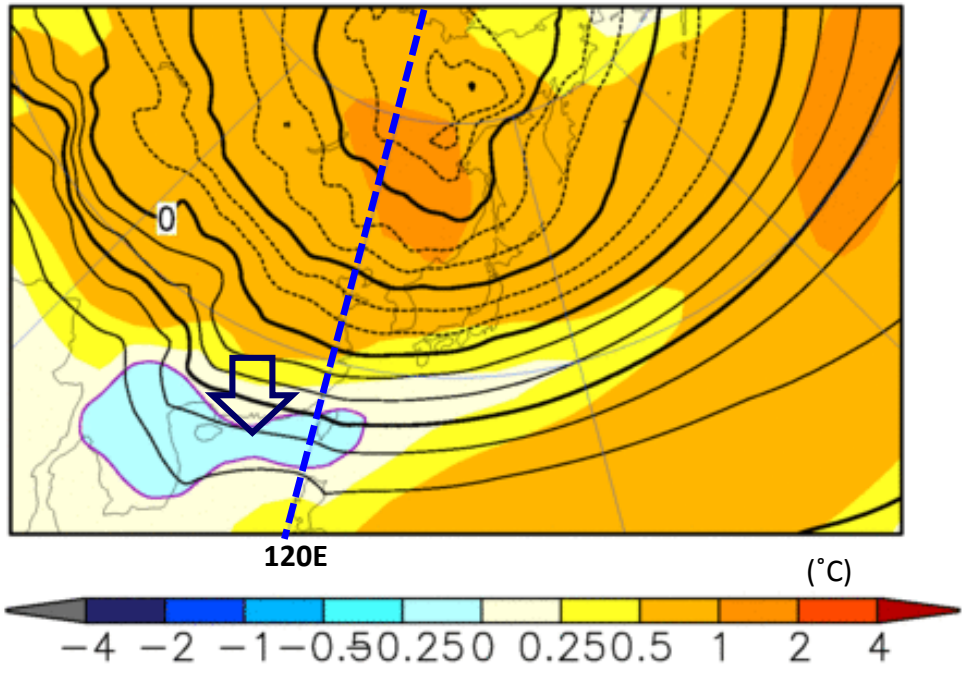

**Sea level pressure**



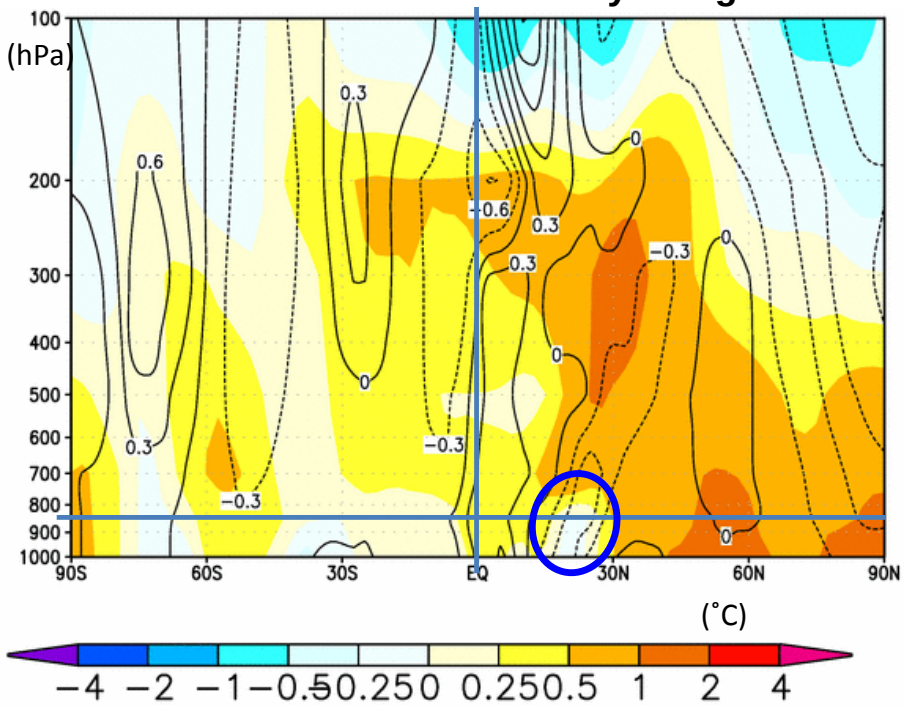

- In the 500-hPa height field, positive anomalies are predicted in East Asia.
- In the 850-hPa temperature field, negative anomalies are predicted for parts of southern East Asia.
- In the sea level pressure field, negative anomalies are predicted in and around northern Japan. Positive anomalies are predicted over the southern eastern part of the Siberian High. Positive anomalies are also predicted over the central part of the Siberian High, but the prediction skill of the model is insufficient for this area.

# Outflow of cold air by Siberian High in DJF 2017/18

**850 hPa temperature anomaly**



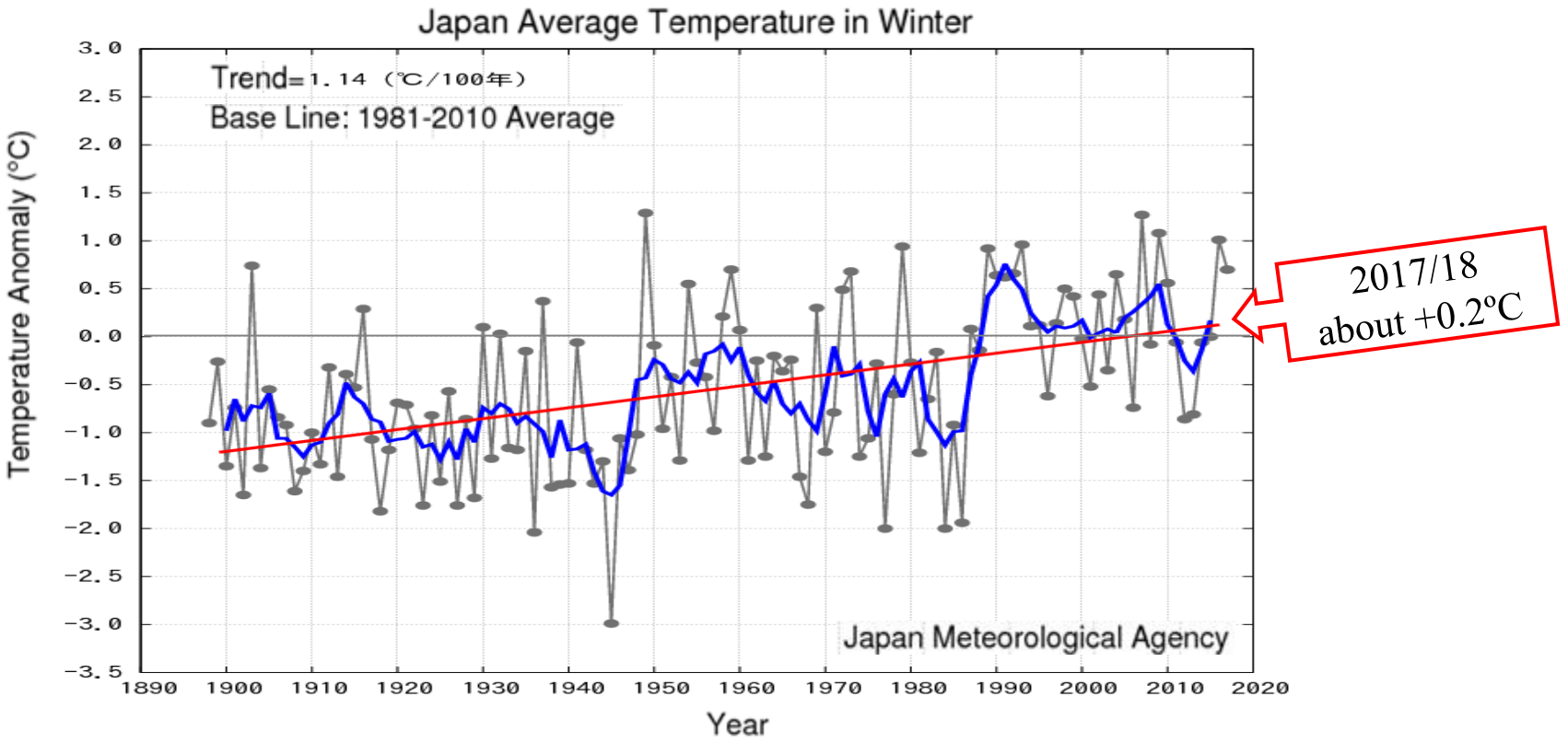

**Height-Latitude Cross Section of temperature and northward-wind anomaly along 120E**




- The left figure shows that negative anomalies are predicted for parts of southern East Asia in the 850-hPa temperature field.
- The right figure shows that southward cold-air flow is predicted around 20N in the lower layer along 120E.

# Recent warming trend in winter

On a longer time scale, the Japan average surface temperatures in winter have risen at a rate of about 1.14ºC per century. If we apply this trend to the coming winter, it will be about +0.2ºC above the baseline(1981-2010).

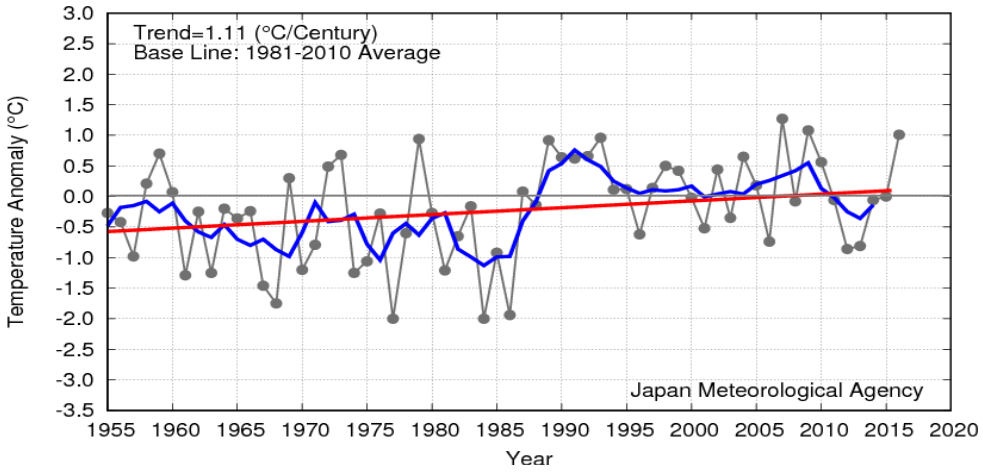



Anomalies are deviation from baseline (1981-2010 Average).
The black thin line indicates surface temperature anomaly of each year.
The blue line indicates their 5-year running mean.
The red line indicates the long-term linear trend.

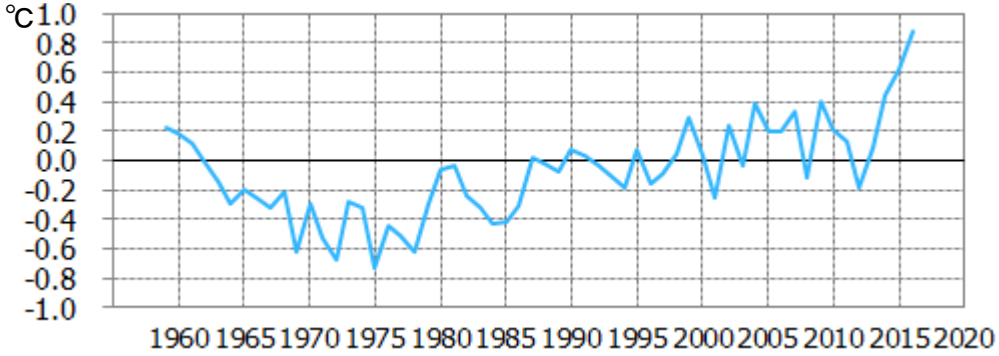
# Tropospheric temperature in DJF 2017/18

- There is a significant positive correlation between the Japan average surface temperature and the tropospheric thickness temperature averaged over the mid-high latitudes of the Northern Hemisphere.
- The tropospheric thickness temperature is predicted to be above normal this winter.

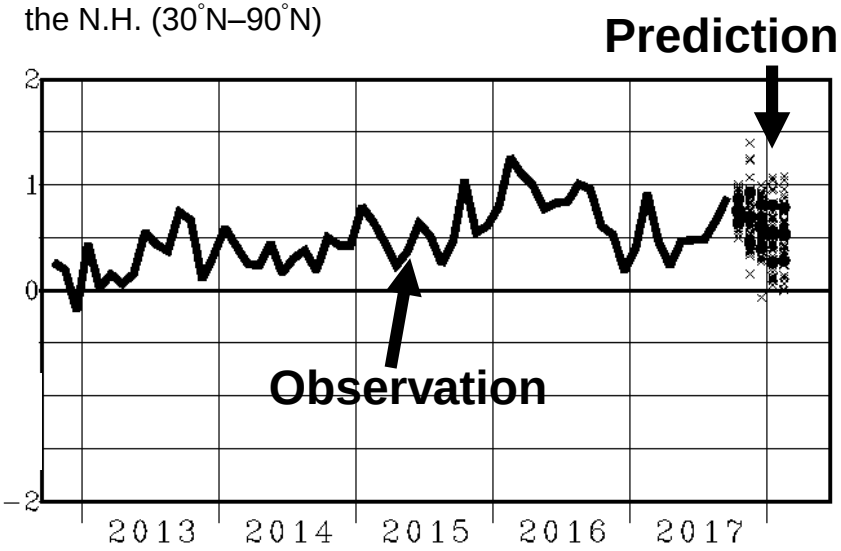
Japan Average Temperature in Winter




Tropospheric thickness temp.(300-850hPa) of the N.H. (30˚N–90˚N) in Winter




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




Black line : observed anomalies

DJF

Black dots(center) : predictions (ensemble mean)

x : predictions (51 ensemble member)

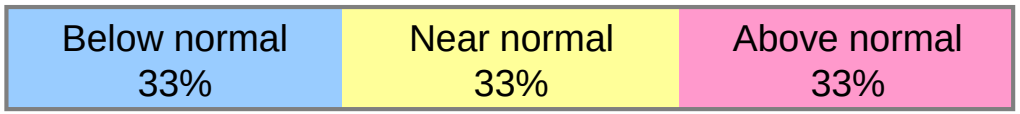
# Recent warming trend in winter

This warmer tropospheric temperature is likely to decrease probabilities of below normal temperatures.

| 3 month mean temp. anomaly (DJF) range of "near normal" (°C) | | | |
|---|---|---|---|
| Northern Japan | -0.3 | ~ | 0.4 |
| Eastern Japan | -0.1 | ~ | 0.4 |
| Western Japan | -0.1 | ~ | 0.5 |
| Okinawa /Amami | -0.1 | ~ | 0.2 |

- Forecasts are given in the three categories of below normal, near normal and above normal. .
- The thresholds of each category are determined so that the climatological chance of occurrence for each category is 33.3% for the period from 1981 to 2010.

**Climatology**

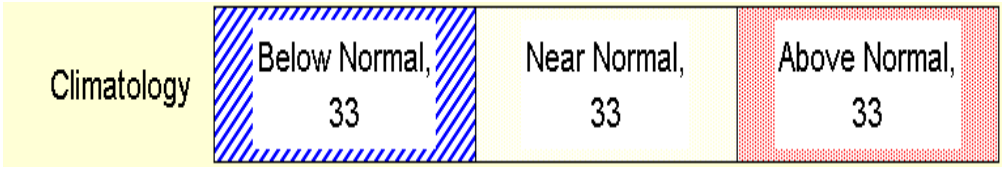


# Cold season forecast in Japan

# Outline of JMA's cold season forecast

## Main forecast elements

Probabilities of 3 categories
( below, near, above normal )
of DJF mean temperature,
precipitation, and snowfall
( only Sea of Japan side )




(Categories are based on 1981-2010)


Geographical subdivisions of Japan

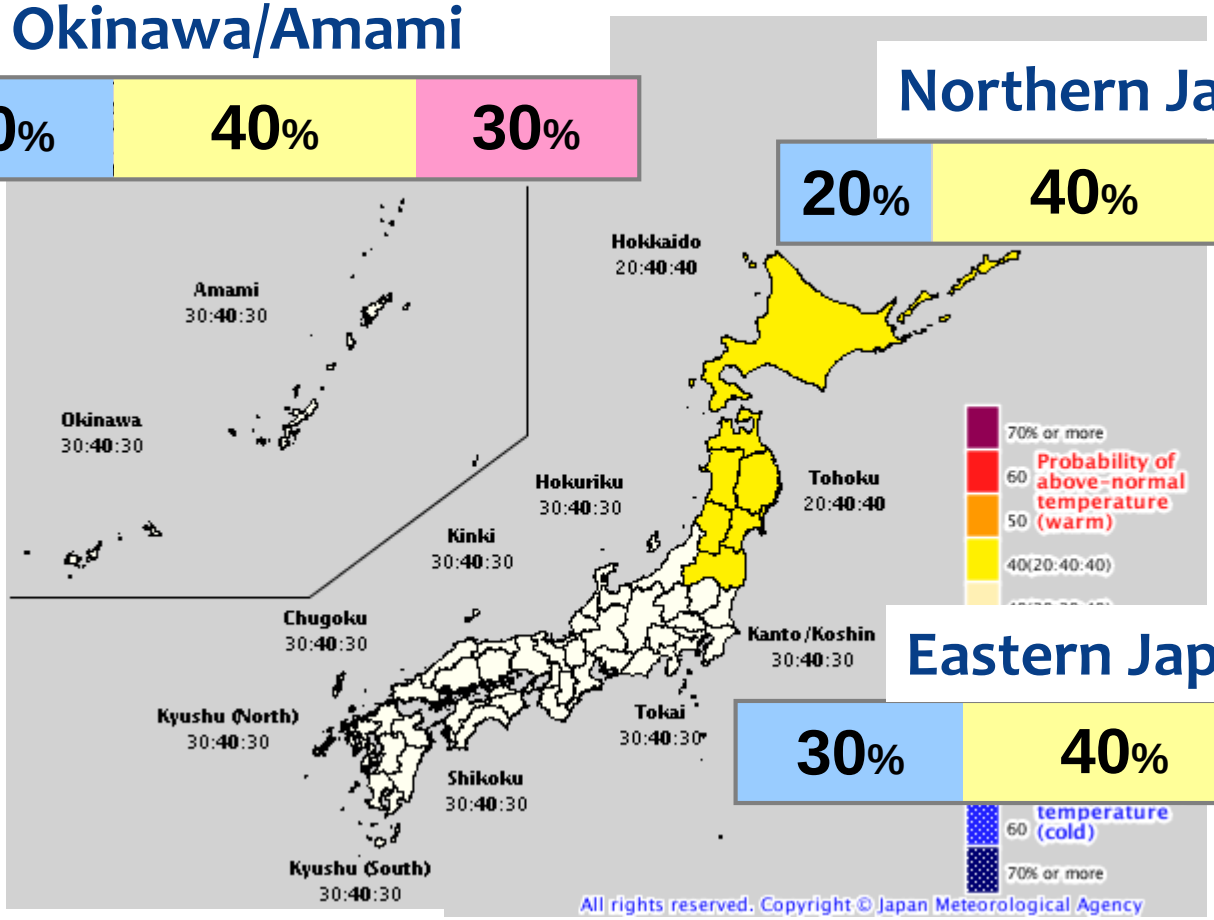
# Probability forecast of seasonal mean temperature for DJF 2017/18 in Japan

## Okinawa/Amami

| 30% | 40% | 30% |
|---|---|---|

## Northern Japan

| 20% | 40% | 40% |
|---|---|---|




## Eastern Japan

| 30% | 40% | 30% |
|---|---|---|

## Western Japan

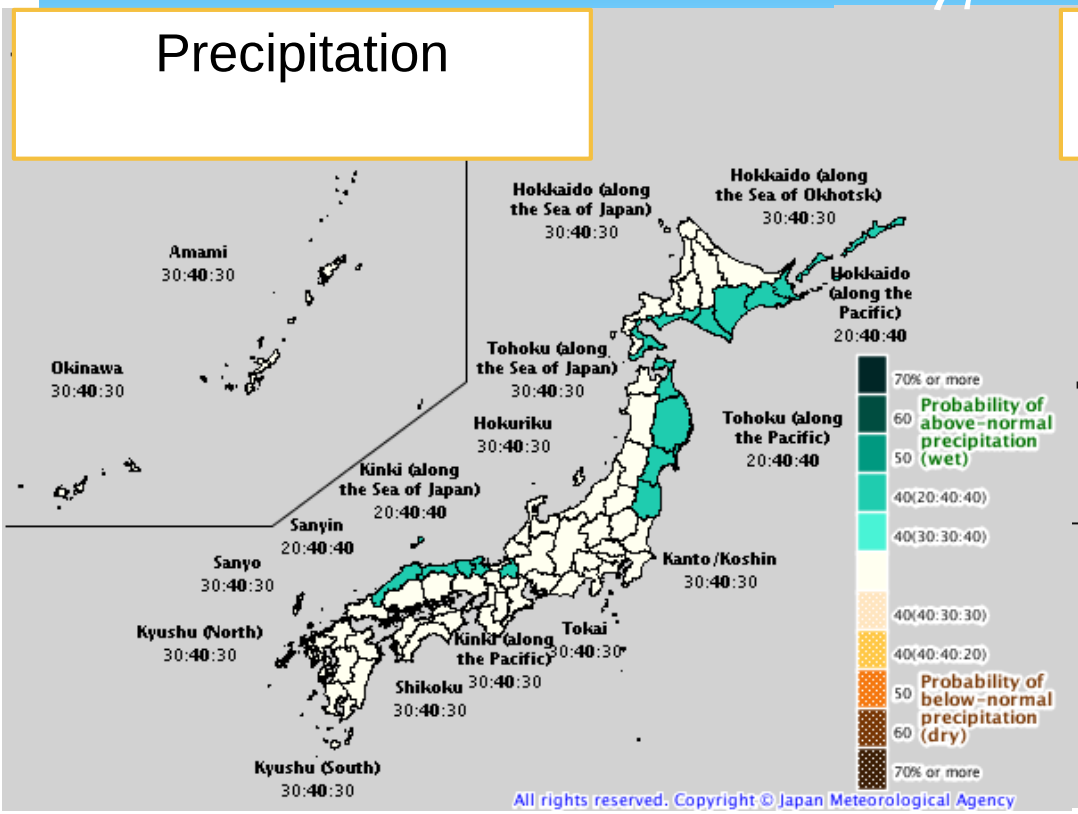
| 30% | 40% | 30% |
|---|---|---|

## Climatology

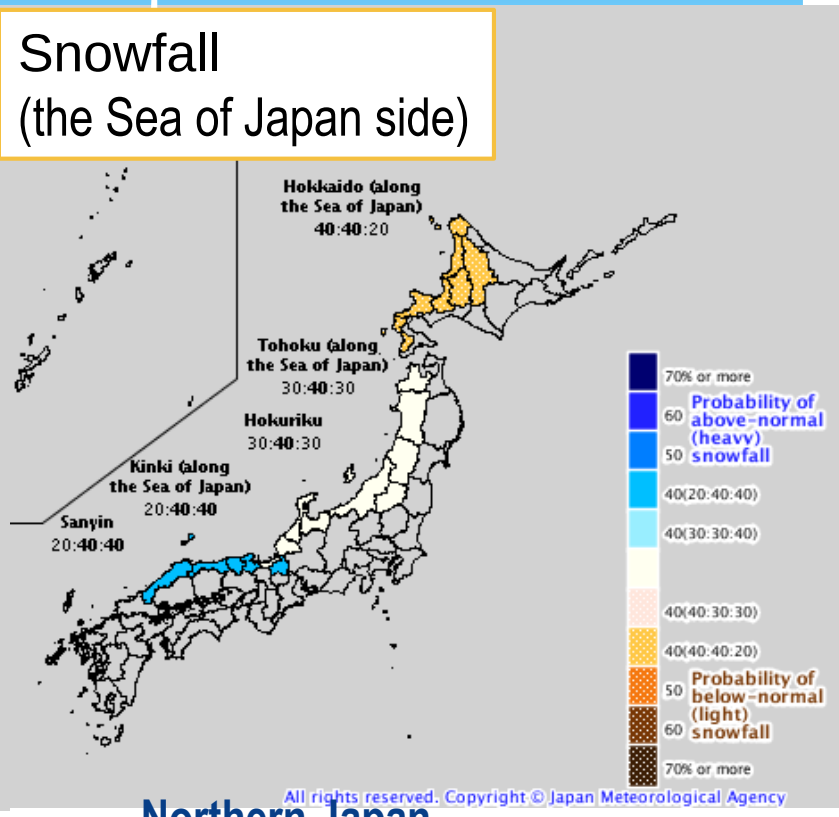
| Below normal 33% | Near normal 33% | Above normal 33% |
|---|---|---|

# Probability forecast of seasonal precipitation/snowfall for DJF 2017/18 in Japan

## Precipitation




## Snowfall (the Sea of Japan side)




### Pacific side of Northern Japan and Sea of Japan side of Western Japan

| 20% | 40% | 40% |
|---|---|---|

### Others

| 30% | 40% | 30% |
|---|---|---|

### Northern Japan

| 40% | 40% | 20% |
|---|---|---|

### Eastern Japan

| 30% | 40% | 30% |
|---|---|---|

### Western Japan

| 20% | 40% | 40% |
|---|---|---|

# Summary

# Summary

- From the numerical prediction, in response to the La Niña-like condition, the subtropical jet stream are predicted to meander northward over the southern China and southward to the east of Japan, suggesting strong winter monsoon activity around Japan.

- Overall temperatures in the troposphere are expected to be above-normal over the Northern Hemisphere in association with the prevailing long-term trend.

- Considering above, it is not likely that temperatures will be lower than normal in any region of Japan.

- Especially in Northern Japan, the coming winter will be near or warmer than normal due to large influences by the low pressure systems in association with the enhanced convective activities around the Philippines.

# Thank you