Cold season outlook for winter 2019/2020 over Japan

Tokyo Climate Center
Japan Meteorological Agency
Shoji Notsuhara

Outline

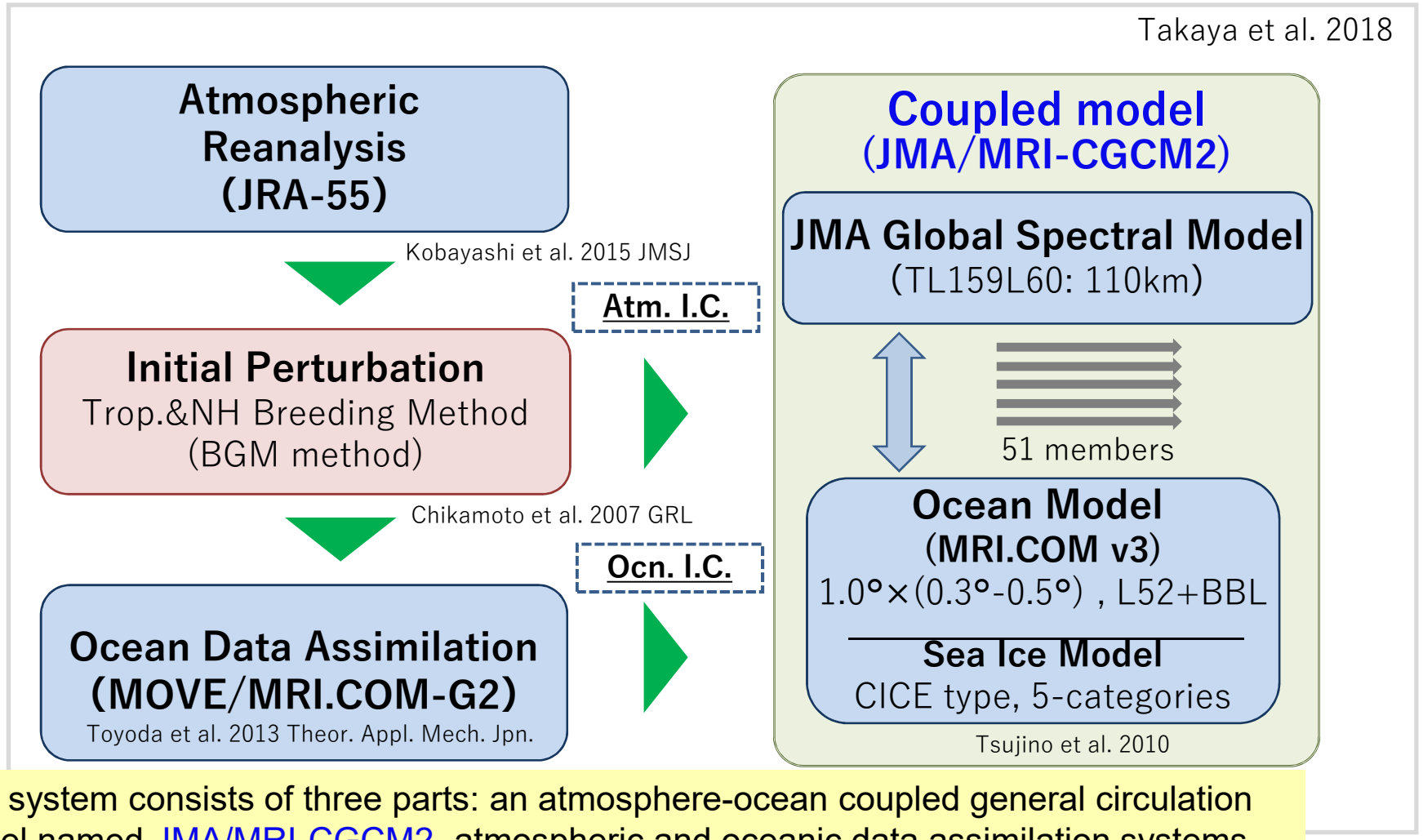
- **JMA's ensemble prediction for winter 2019/2020**
- **Cold season outlook over Japan**

In this presentation,

* Cold season outlook issued on 25th September 2019
* Initial date : 3rd September 2019
* 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.

System components of JMA/MRI-CPS2

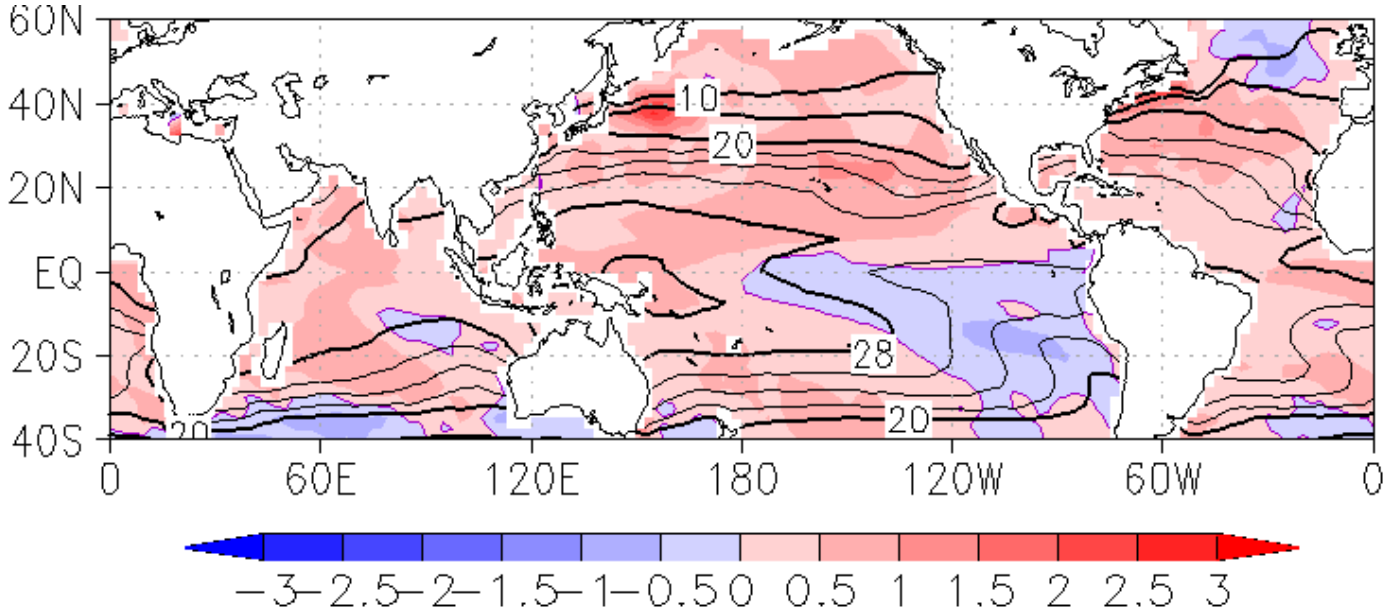
JMA/MRI-CPS2 (Coupled Prediction System 2)



This system consists of three parts: an atmosphere-ocean coupled general circulation model named JMA/MRI-CGCM2, atmospheric and oceanic data assimilation systems, and ensemble generation systems of the atmospheric and oceanic initial conditions. 51-member ensemble integrations are carried out.

Oceanic conditions in DJF 2019/20

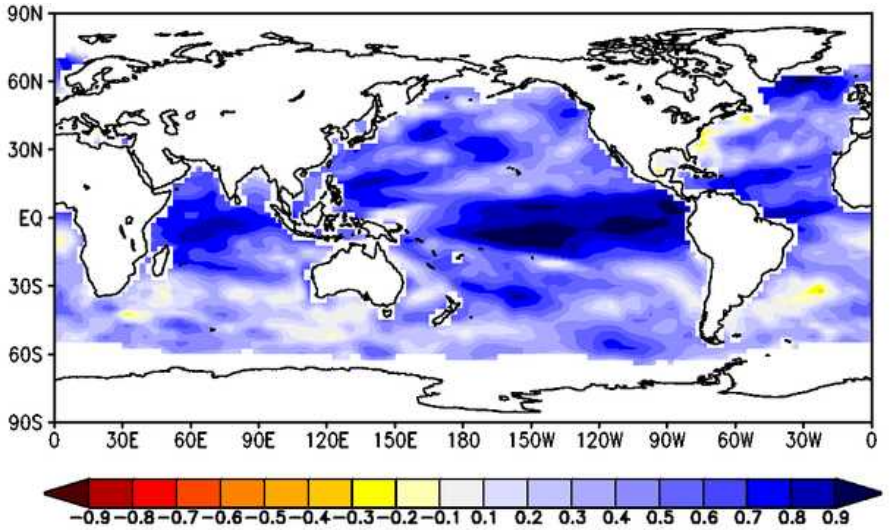
SST (contour) and anomalies (shade)



Prediction accuracy of SST

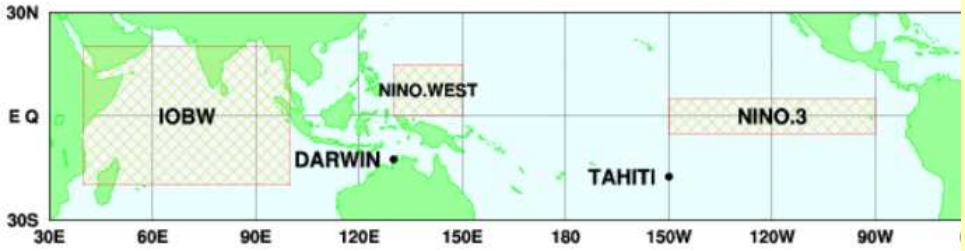
(Anomaly Correlation)

verification result by the 30-year hindcast

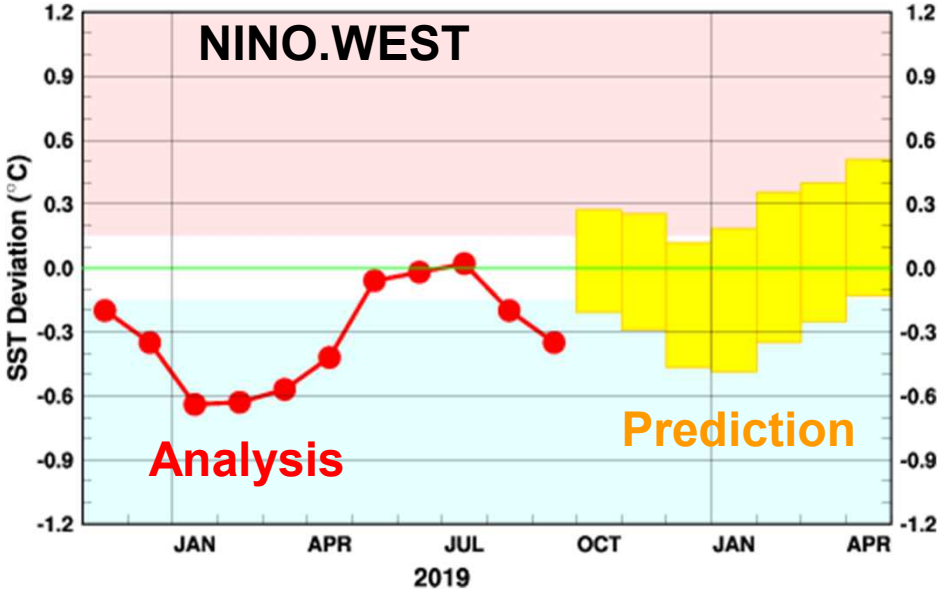


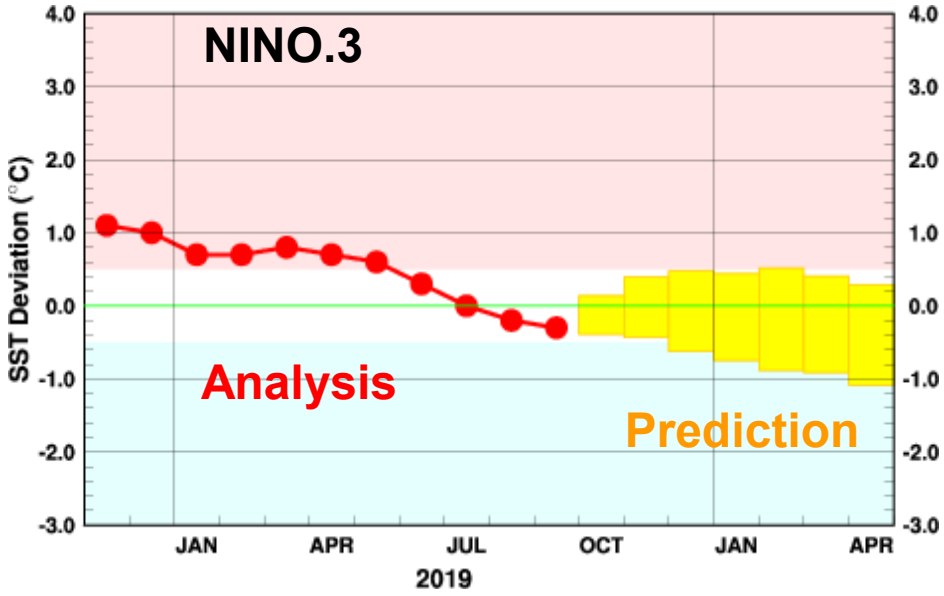
In the tropical region,
prediction reliability is pretty good.

El Niño outlook

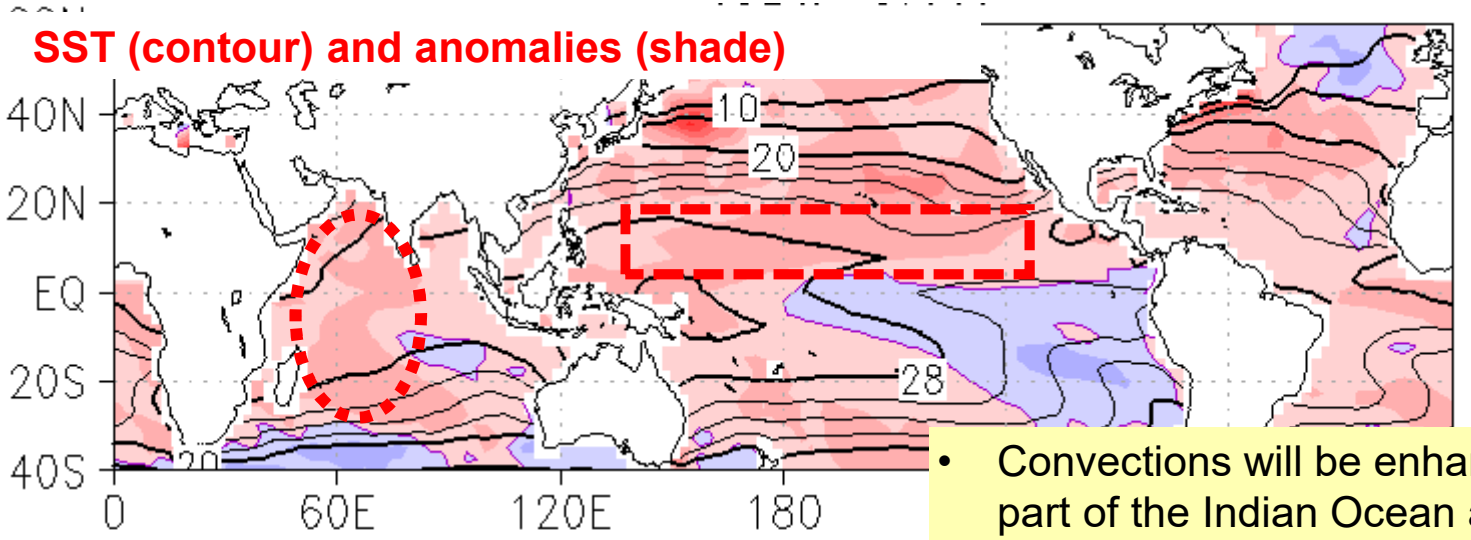


- JMA's coupled prediction system suggests that the NINO.3 SST will be near normal and **ENSO-neutral conditions will continue from this autumn to winter (60%)**.
- The area-averaged SST in the tropical western Pacific (NINO.WEST) region will be near normal from this autumn to winter as well.

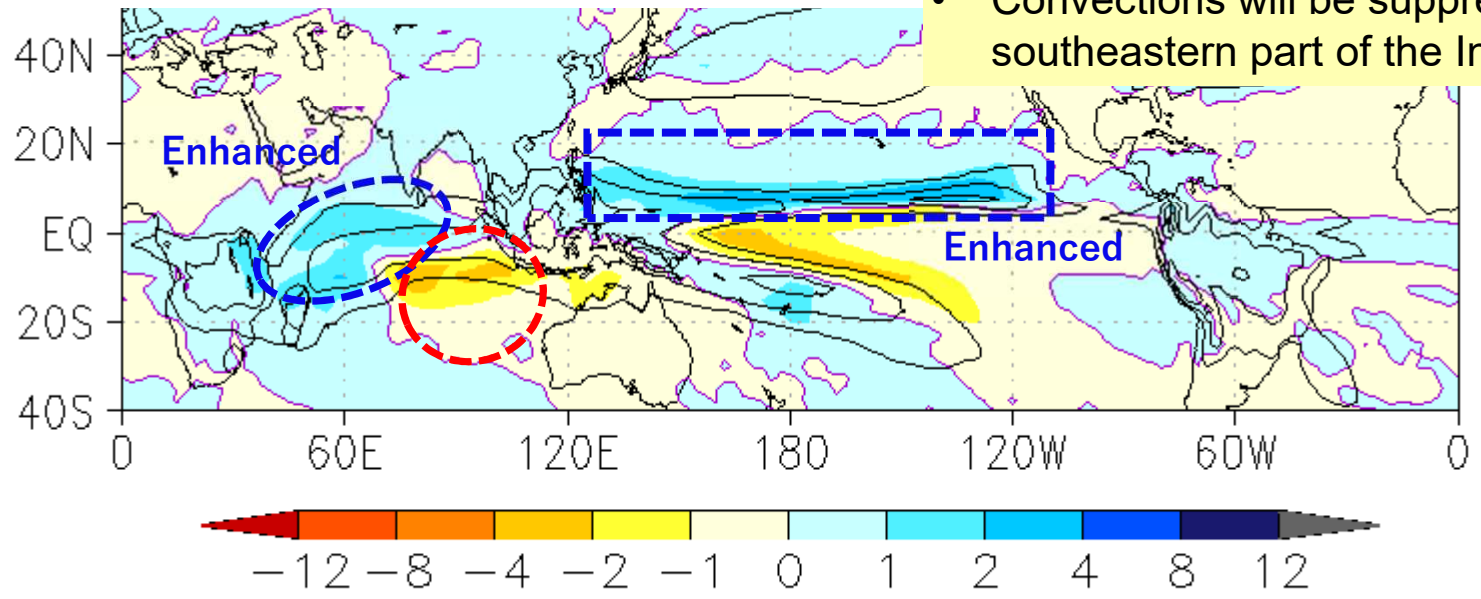




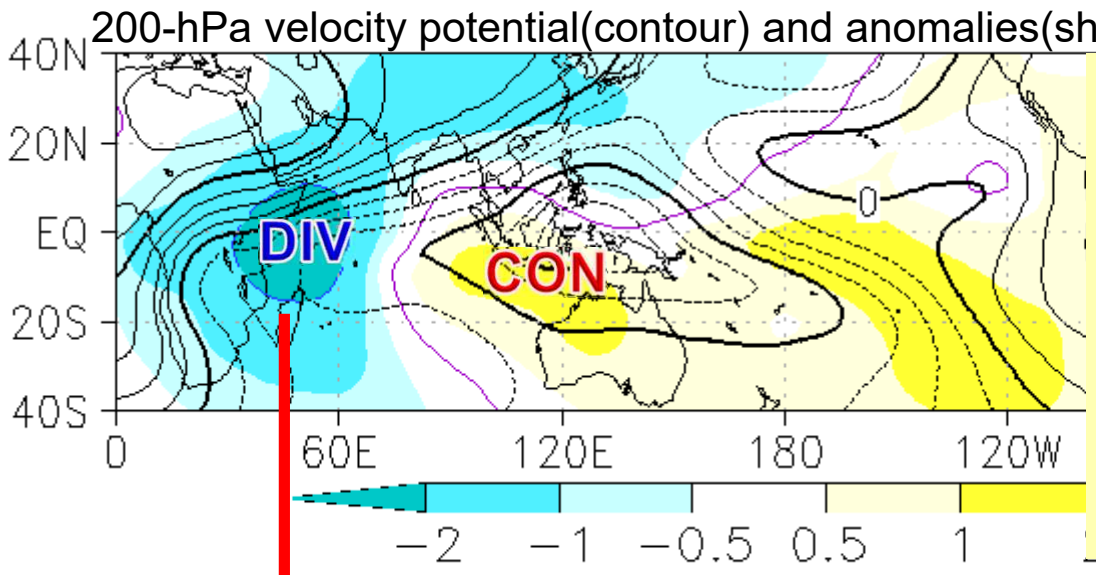
Global circulation in DJF 2019/20



- Convections will be enhanced over the western part of the Indian Ocean and the equatorial Pacific.
- Convections will be suppressed over the southeastern part of the Indian Ocean.

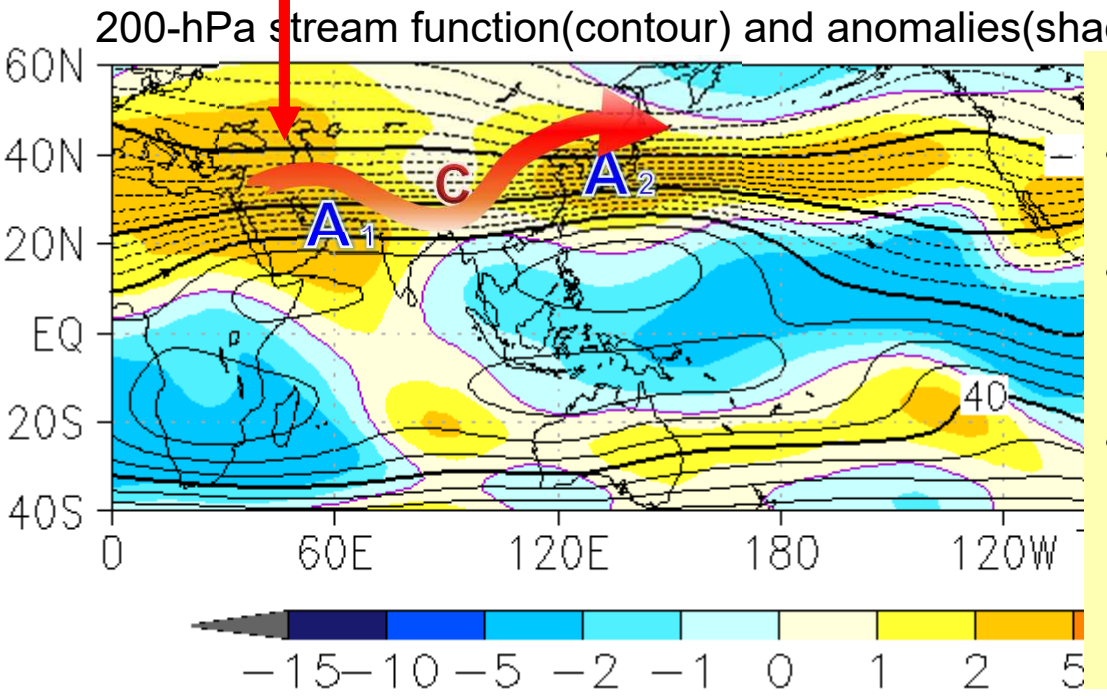


Global circulation in DJF 2019/20 at 200 hPa



In the 200-hPa velocity potential field, reflecting the distribution of the equatorial convections

- divergence anomalies(**DIV**) are predicted around the western part of the Indian Ocean.
- convergence anomalies(**CON**) are predicted around the southeastern part of the Indian Ocean.



In the 200-hPa stream function field,

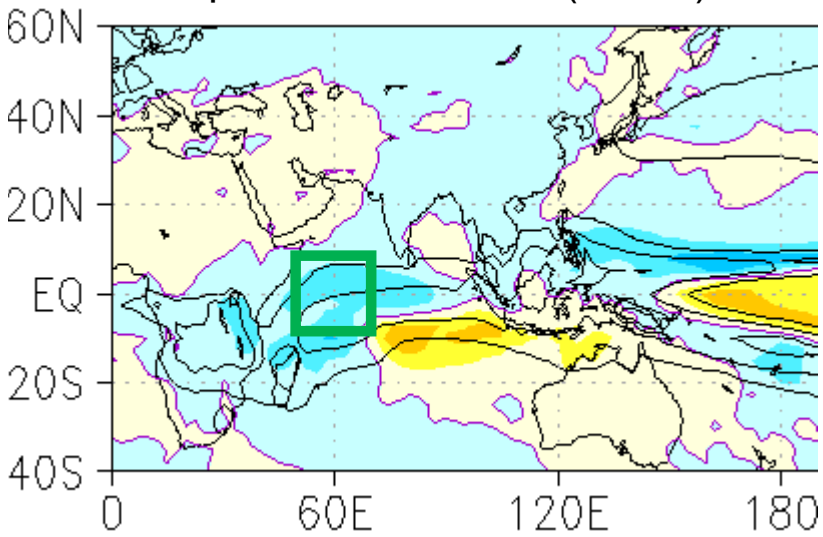
- wave trains are predicted in the mid-latitudes of the Eurasian continent.
- anticyclonic circulation anomalies over the Arabian Peninsula (A_1) are generated in response to DIV.
- anticyclonic anomalies around Japan (A_2) shift the subtropical jet northward around Japan, which suggests weaker winter monsoon around Japan.

Statistical evaluation of the tropical convection and its effect to the mid-latitude

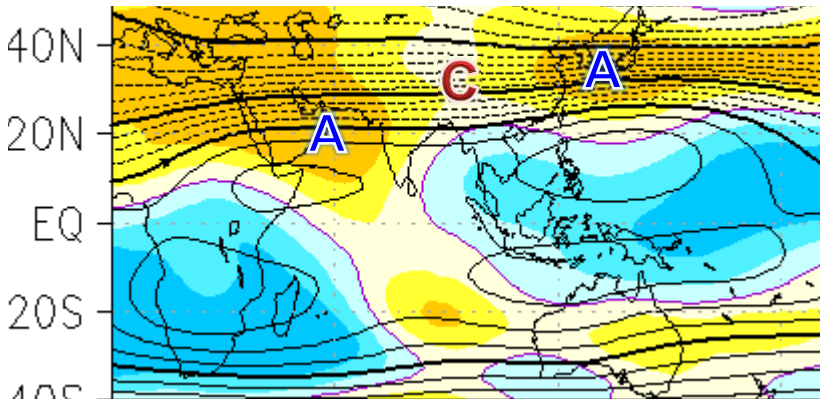
Positive precipitation anomalies over the western part of the Indian Ocean cause the anticyclonic circulation anomalies over the Arabian Peninsula and Japan.

Prediction

Precipitation anomalies (shade)

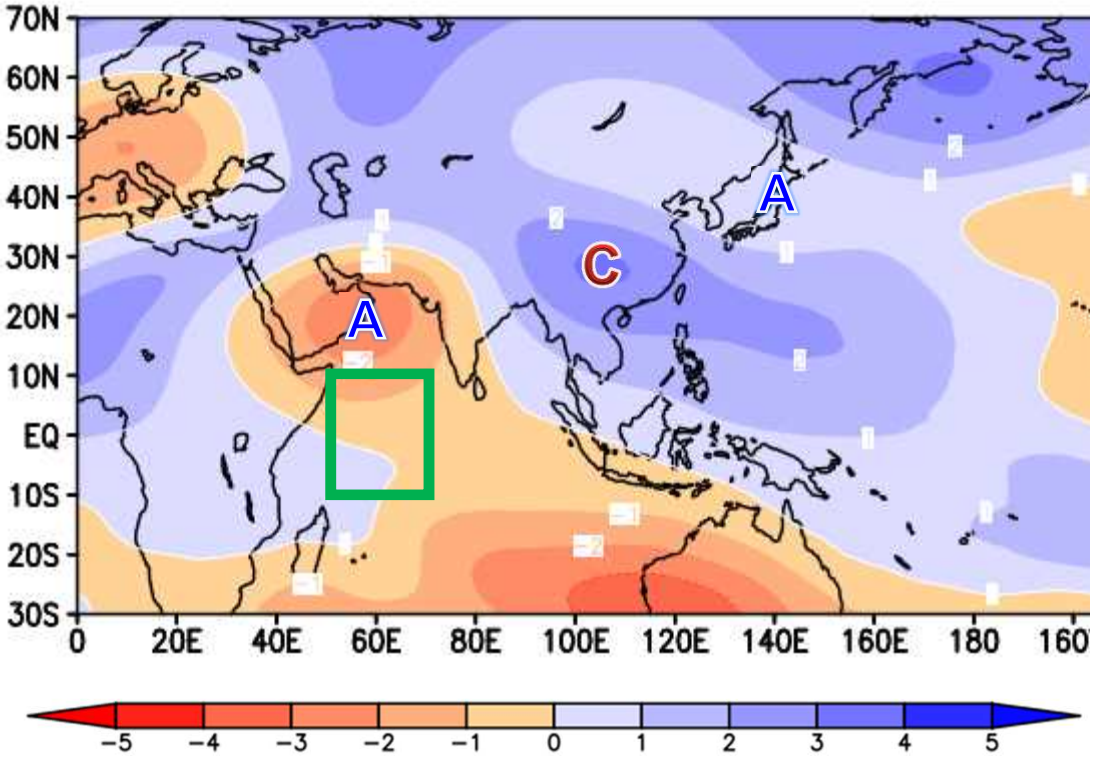


200-hPa stream function anomalies (shade)



Statistic

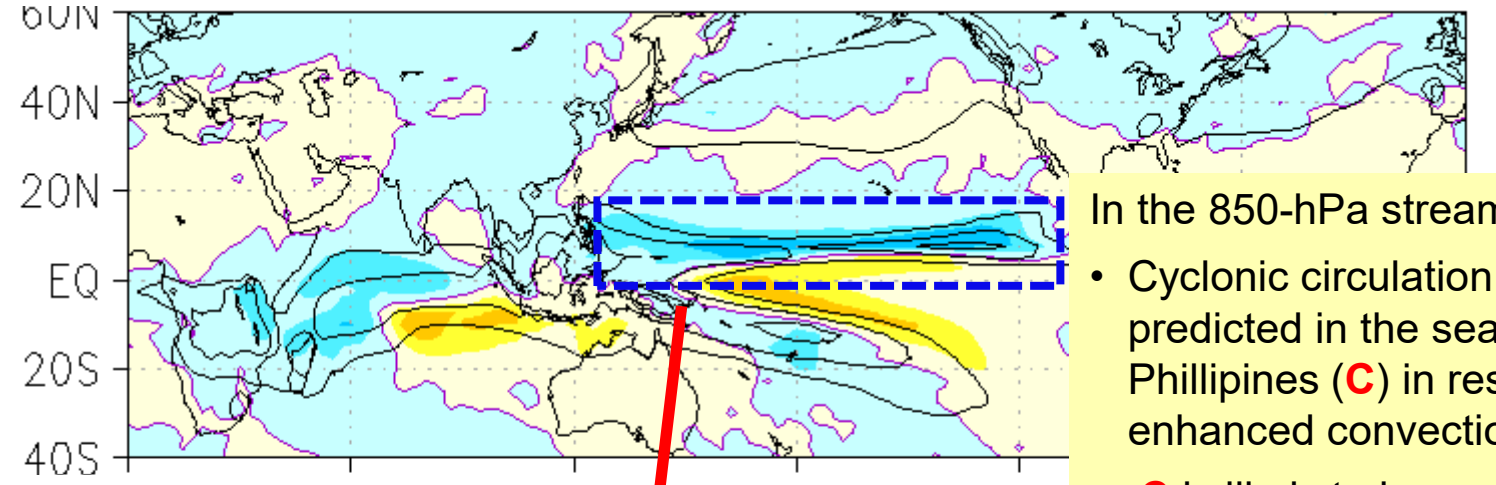
Regression coefficients of 200-hPa stream functions upon OLR anomalies(50-70E,10S-10N)
(DJF : 1979/80-2018/19)



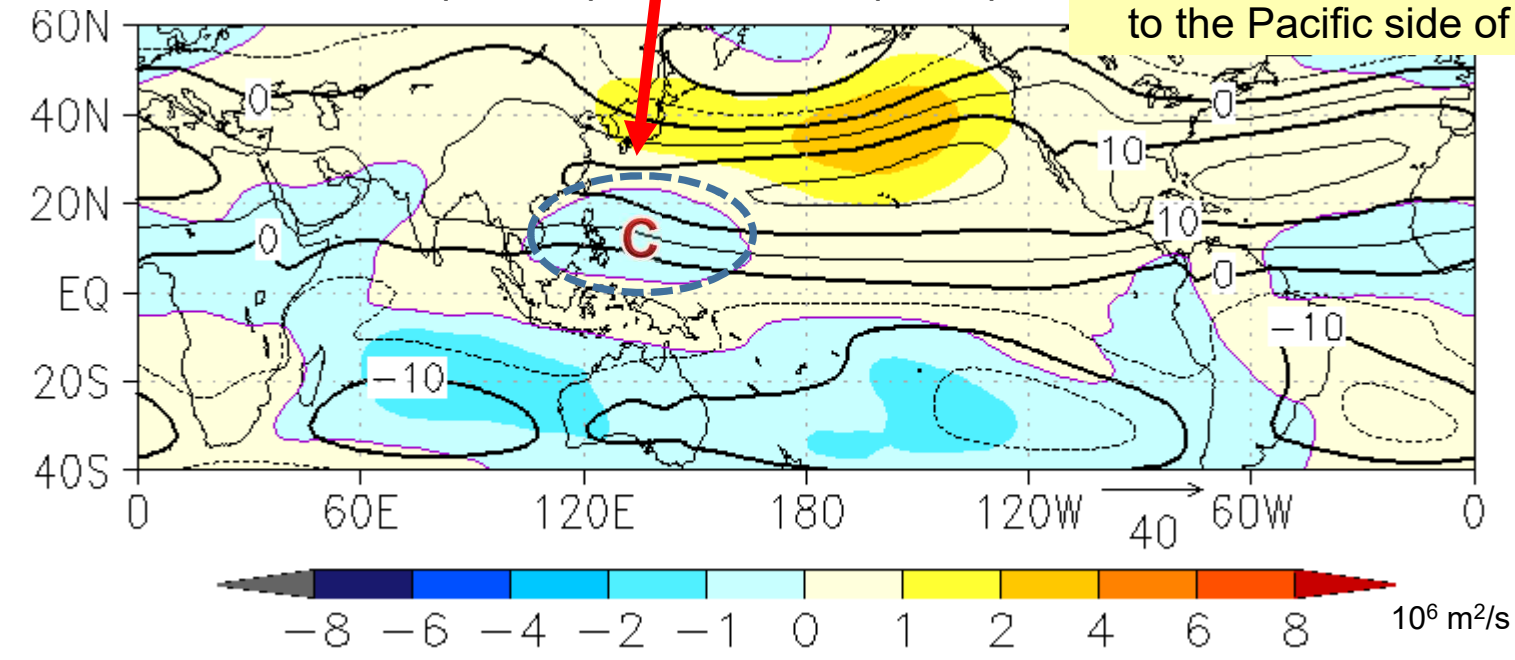
Regression coefficients (shade)

Global circulation in DJF 2019/20 at 850hPa

Precipitation(contour) and anomalies(shade)



850-hPa stream function(contour) and anomalies(shade)

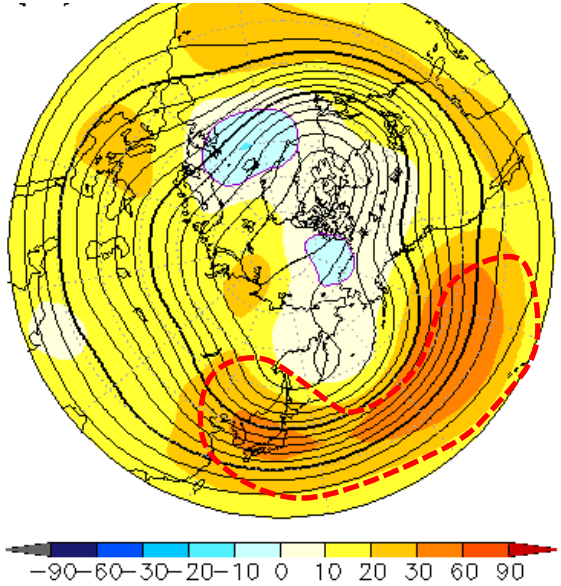


In the 850-hPa stream function field,

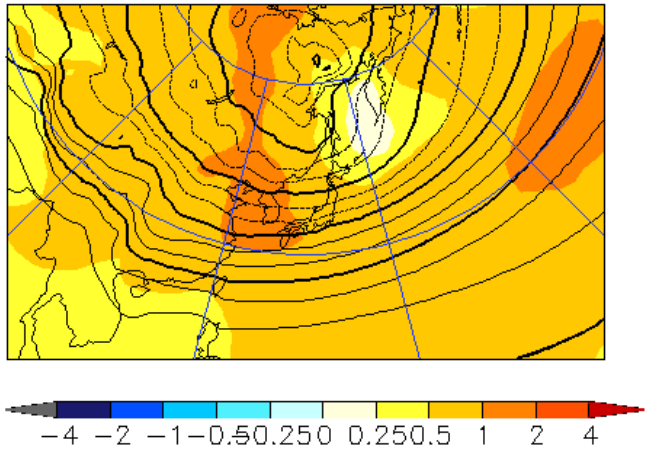
- Cyclonic circulation anomalies are predicted in the sea east of the Phillipines (**C**) in response to the enhanced convection.
- **C** is likely to keep wet air from flowing to the Pacific side of Japan.

Predicted atmospheric field around East Asia

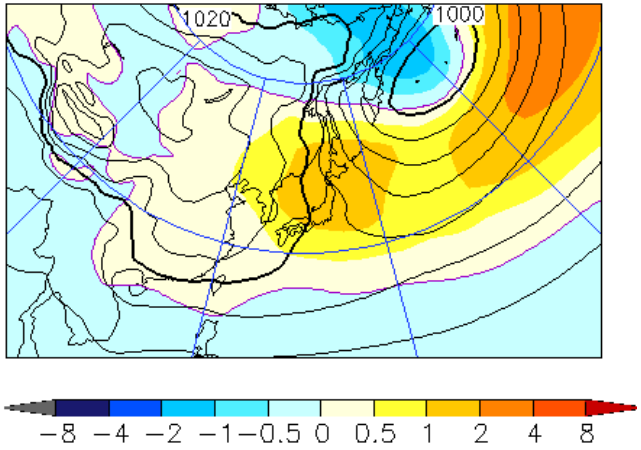
Z500



T850



SLP

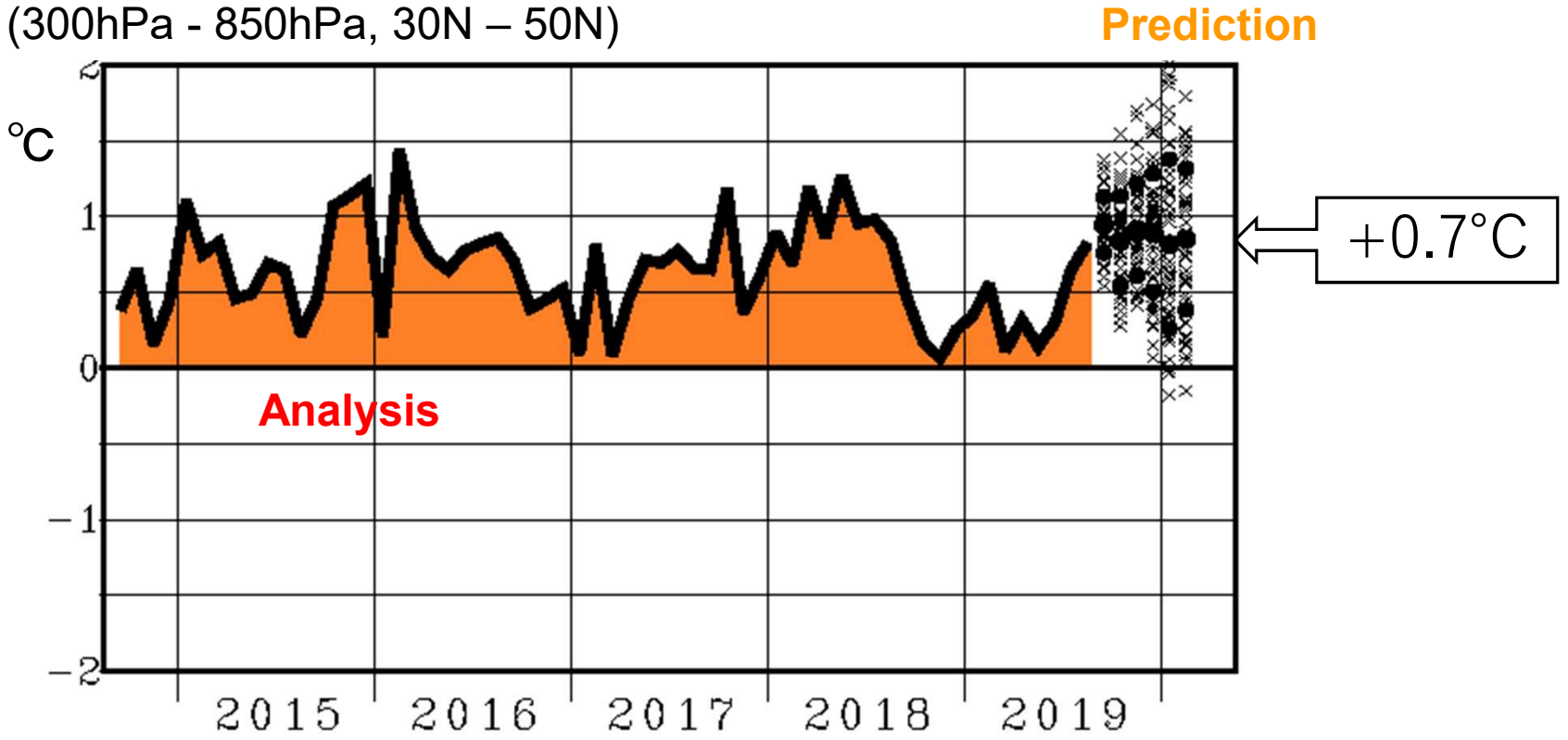


- In the 500-hPa height field, positive anomalies are predicted over East Asia.
- In the 850-hPa temperature field, positive anomalies are predicted over East Asia.
- In the sea level pressure field, significant positive anomalies are predicted around Japan in response to the positive anomalies of the 200-hPa stream function.

- However AO (Arctic Oscillation) activities should be considered as near normal due to insufficient prediction skill of the model.

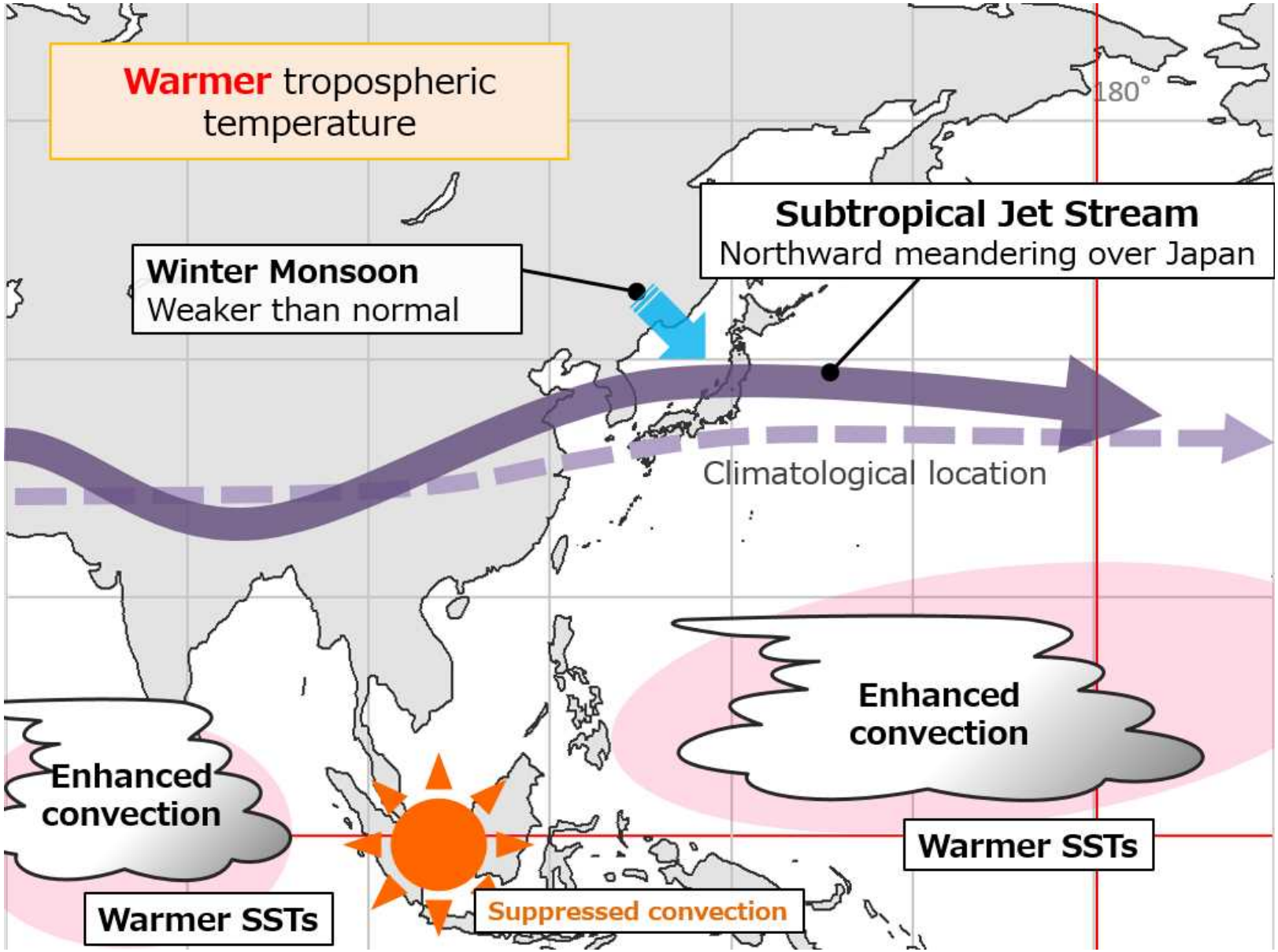
Tropospheric thickness

Zonal mean thickness in the troposphere
(300hPa - 850hPa, 30N – 50N)



Overall temperatures in the troposphere are expected to be around 0.7 ℃ higher than normal in association with the global warming. These tendencies are likely to increase the chance of above-normal temperatures over mid-latitude regions.

Conceptual diagram for East Asian circulation in DJF 2019/20



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)

Climatology

Below normal	Near normal	Above normal
33%	33%	33%

(Categories are based on 1981-2010)

Geographical subdivisions of Japan

13

Probability forecast for DJF 2019/20 in Japan

Temperature

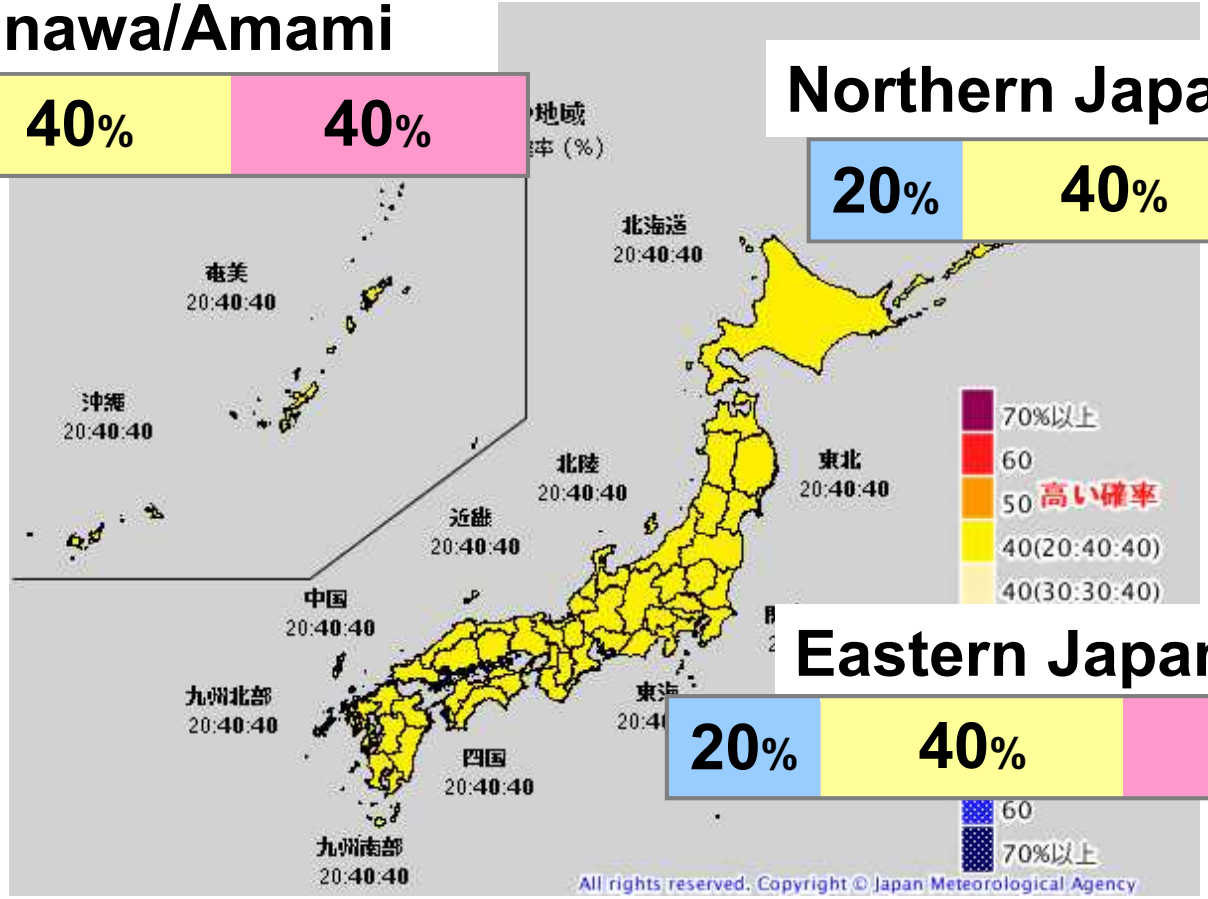
Cold season outlook issued on 25th September 2019

Okinawa/Amami

20%	40%	40%

Northern Japan

20%	40%	40%



Eastern Japan

20%	40%	40%

Western Japan

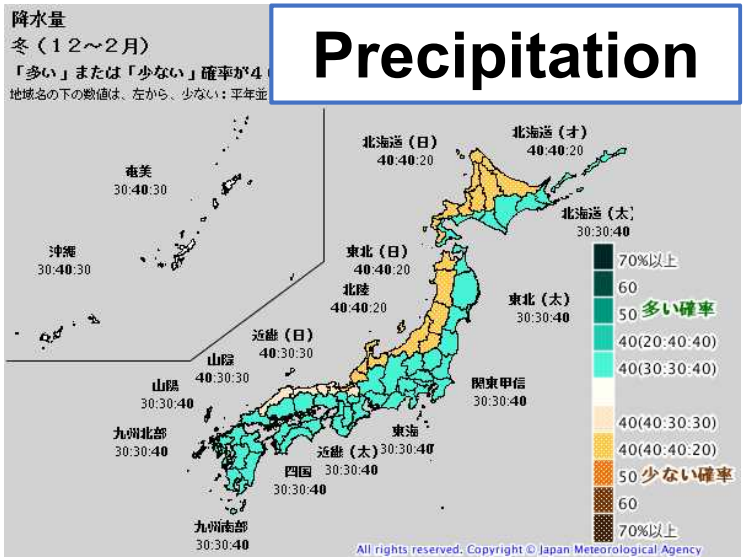
20%	40%	40%

Climatology

Below normal 33%	Near normal 33%	Above normal 33%

Probability forecast for DJF 2019/20 in Japan

Precipitation



Sea of Japan side of Northern and Eastern Japan

40%	40%	20%

Sea of Japan side of Western Japan and Okinawa/Amami

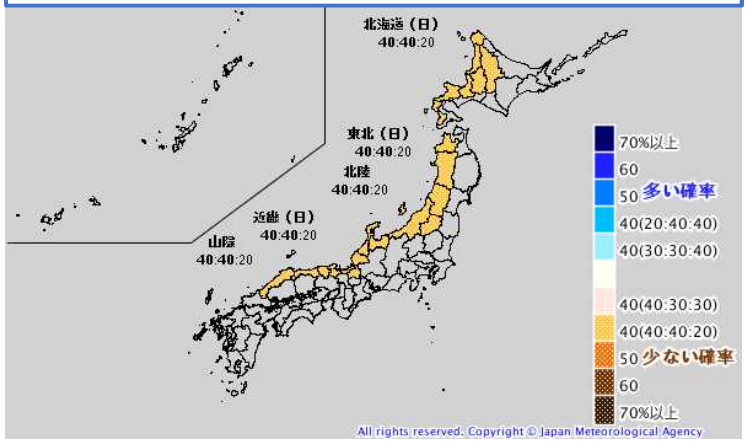
30%	40%	30%

Others

30%	30%	40%

Precipitation amounts are expected to be below normal tendencies due to the weak monsoon in the sea of Japan side of Northern and Eastern Japan.

Snowfall (the Sea of Japan side)



Sea of Japan side of Northern Japan

40%	40%	20%

Sea of Japan side of Eastern Japan

40%	40%	20%

Sea of Japan side of Western Japan

40%	40%	20%

Snowfall are expected to be below normal tendencies in each region of the sea of Japan side.

Summary

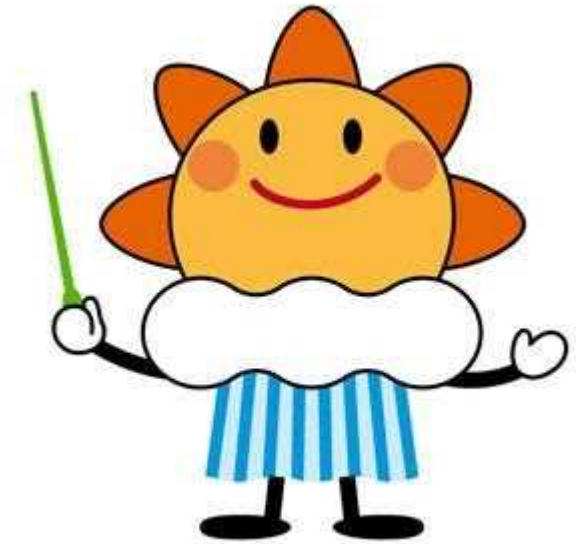
- From the numerical prediction, in response to the SST anomaly patterns, the subtropical jet stream is predicted to meander northward over Japan, suggesting the weaker-than-normal winter monsoon in and around Japan.

- 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 likely that seasonal mean temperatures will be higher-than-normal tendencies in any region of Japan.

- The weak winter monsoon also suggests that seasonal snowfall amounts for the Sea of Japan side will be lower-than-normal tendencies.

Thank you !



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.