ENSO outlook

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El Nino Outlook on the TCC web site will be updated 10 Nov. 2017 (about 6PM). Please check http://ds.data.jma.go.jp/tcc/tcc/products/elnino/outlook.html

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El Niño Outlook (October 2017 - April 2018)

Last Updated: **11 October 2017**
(Next update will be on 10 November 2017)

- **NINO.3 SST became below normal, and other common features of past La Niña events were becoming clear in September.**
- **It is equally likely (50%) that La Niña conditions will develop in boreal autumn or winter, or ENSO-neutral conditions will persist until boreal winter.**

[El Niño / La Niña]

In September 2017, the NINO.3 SST was below normal with a deviation of -0.8°C (Table and Fig.3). SSTs in September were above normal in the western equatorial Pacific, and below normal in the central and eastern parts (Fig.4 and Fig.6). Subsurface temperatures were below normal in the central and eastern equatorial Pacific (Fig.5 and Fig.7). Atmospheric convective activity was below normal near the date line over the equatorial Pacific, and easterly winds in the lower troposphere (trade winds) were stronger than normal over the central equatorial Pacific (Fig.8, Fig.9 and Fig.10). These oceanic and atmospheric conditions indicate that common features of past La Niña events were becoming clear in September.

Cold subsurface waters, which were observed in the central and eastern equatorial Pacific, are likely to move eastward and maintain cooler-than-normal SST conditions in the eastern part. JMA's El Niño prediction model suggests that the NINO.3 SST will be below normal during four or five months in the months ahead, and will gradually come close to normal during boreal winter and spring (Fig.11). In conclusion, it is equally likely (50%) that La Niña conditions will develop in boreal autumn or winter, or ENSO-neutral conditions will persist until boreal winter (Fig.1 and Fig.2).

Outline

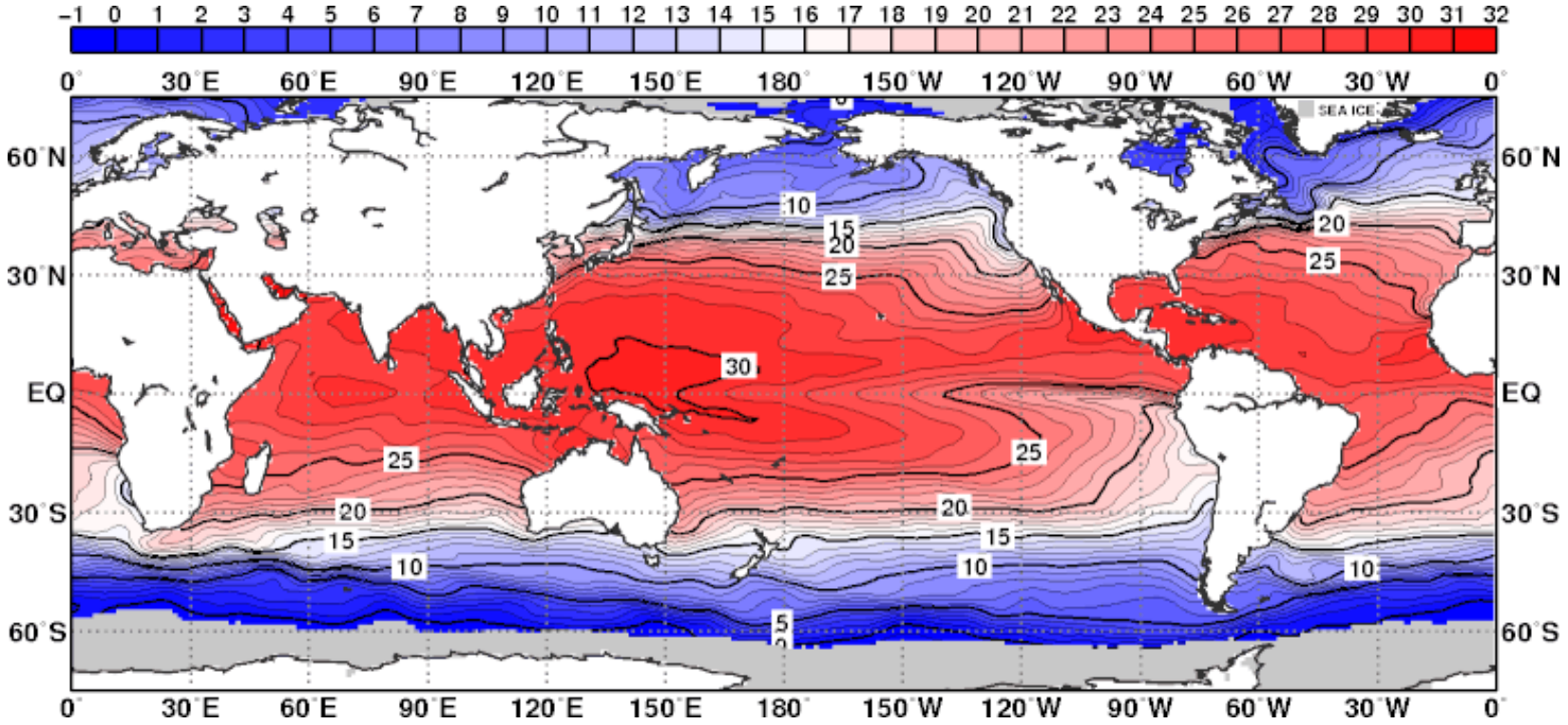
1. JMA's system for ENSO monitoring and prediction
2. Current conditions
3. Outlook
4. Summary

1. JMA's system for ENSO monitoring and prediction

- *SST analysis: COBE-SST*
- *Ocean data assimilation: MOVE-G2*
- *Prediction model: JMA/MRI-CGCM2*

Sea surface temperature: COBE-SST

- **Using only in-situ observations.**
- **Horizontal resolution: 1˚ x 1˚**
- **Optimal interpolation (OI)**
- **Provided as monthly averaged grid point data.**

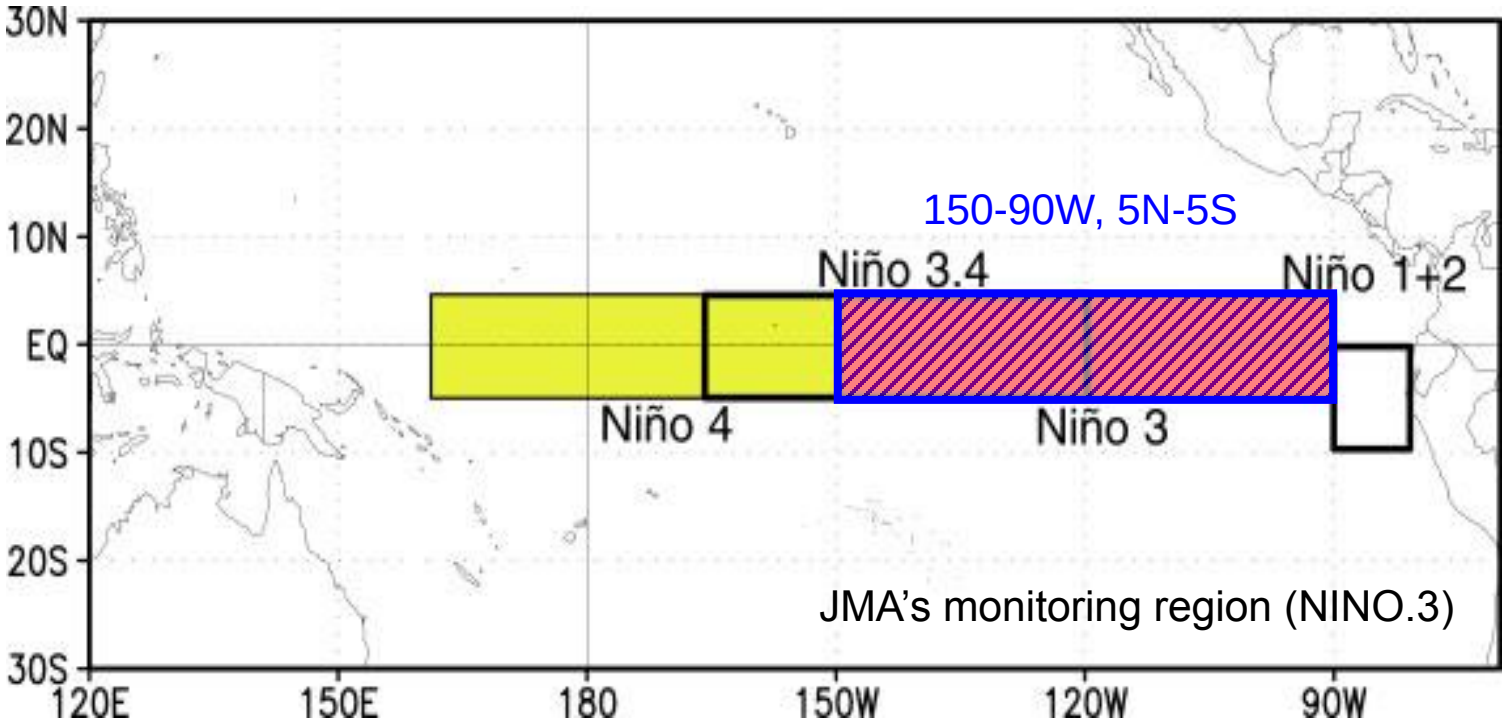


1-month mean sea surface temperature observed in Oct. 2017 when the conditions in the equatorial Pacific Ocean stayed close to normal.

Quantitative definition of El Niño (La Niña) event

Definition of El Niño (La Niña) by JMA

- *5-month running mean of NINO.3 SST deviation stays +0.5ºC or higher (-0.5ºC or lower) for 6 consecutive months or longer.*
- *NINO.3 SST deviation is defined as deviation from the latest 30-year (e.g. 1987-2016 for the year 2017) average.*



Ocean Data Assimilation System: MOVE-G2

Past

Ocean General Circulation Model (MRI.COM)

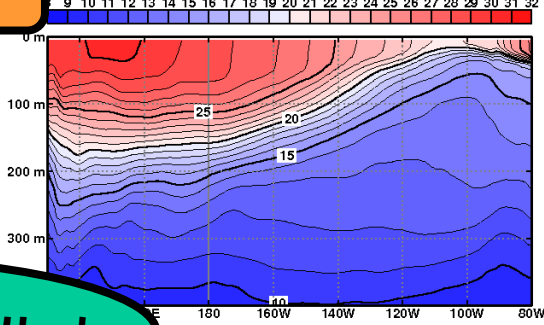
Prediction

Future

IAU (Incremental Analysis Update)

First Guess

Objective Analysis



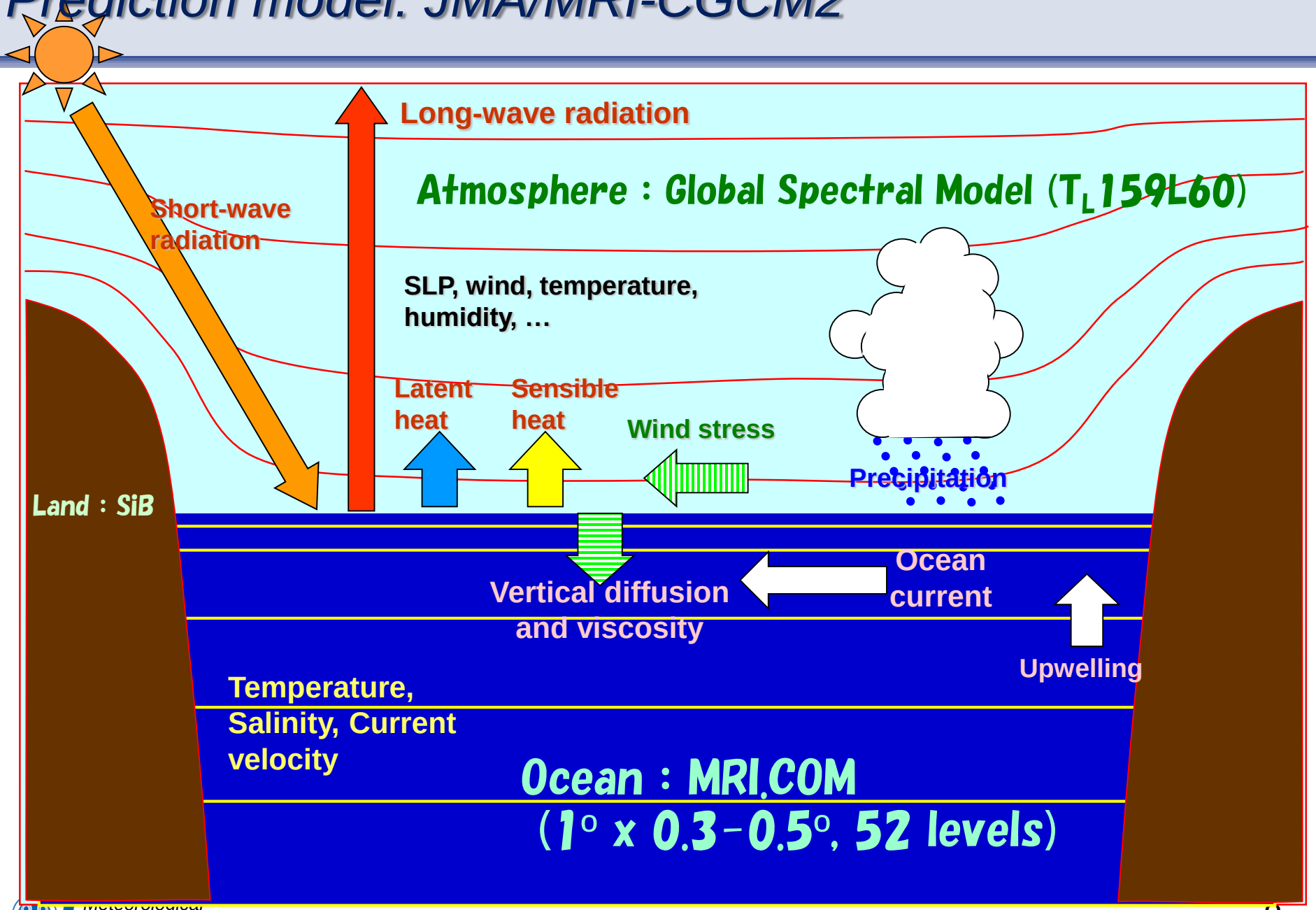
Climatology

Observations
- **Temperature**
- **Salinity**
- **Sea surface height**

3-D Variational Method

3DVAR: An analysis method for seeking for the physically-consistent optimal data field that is expected to have the least deviation from the true value based upon statistical assumptions.

Prediction model: JMA/MRI-CGCM2

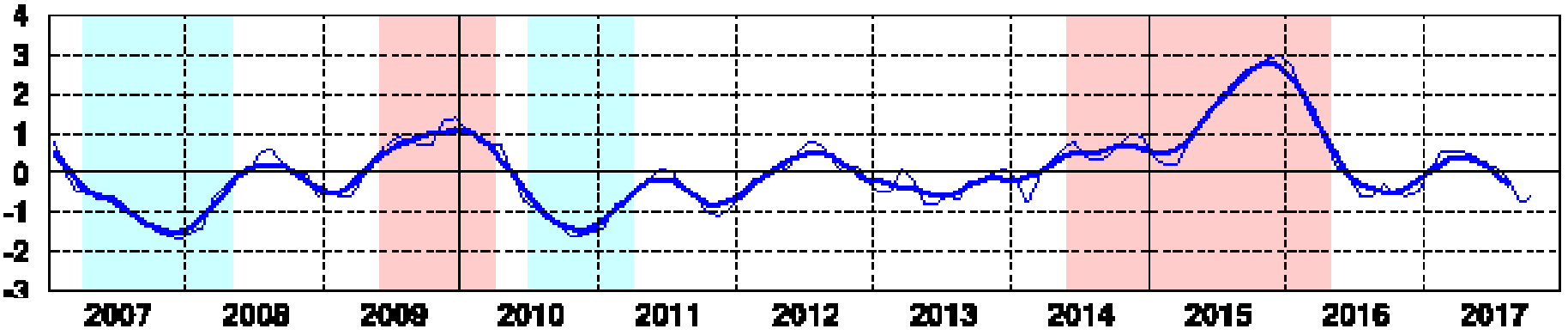


2. Current Conditions

ENSO monitoring indices (NINO.3 SST)

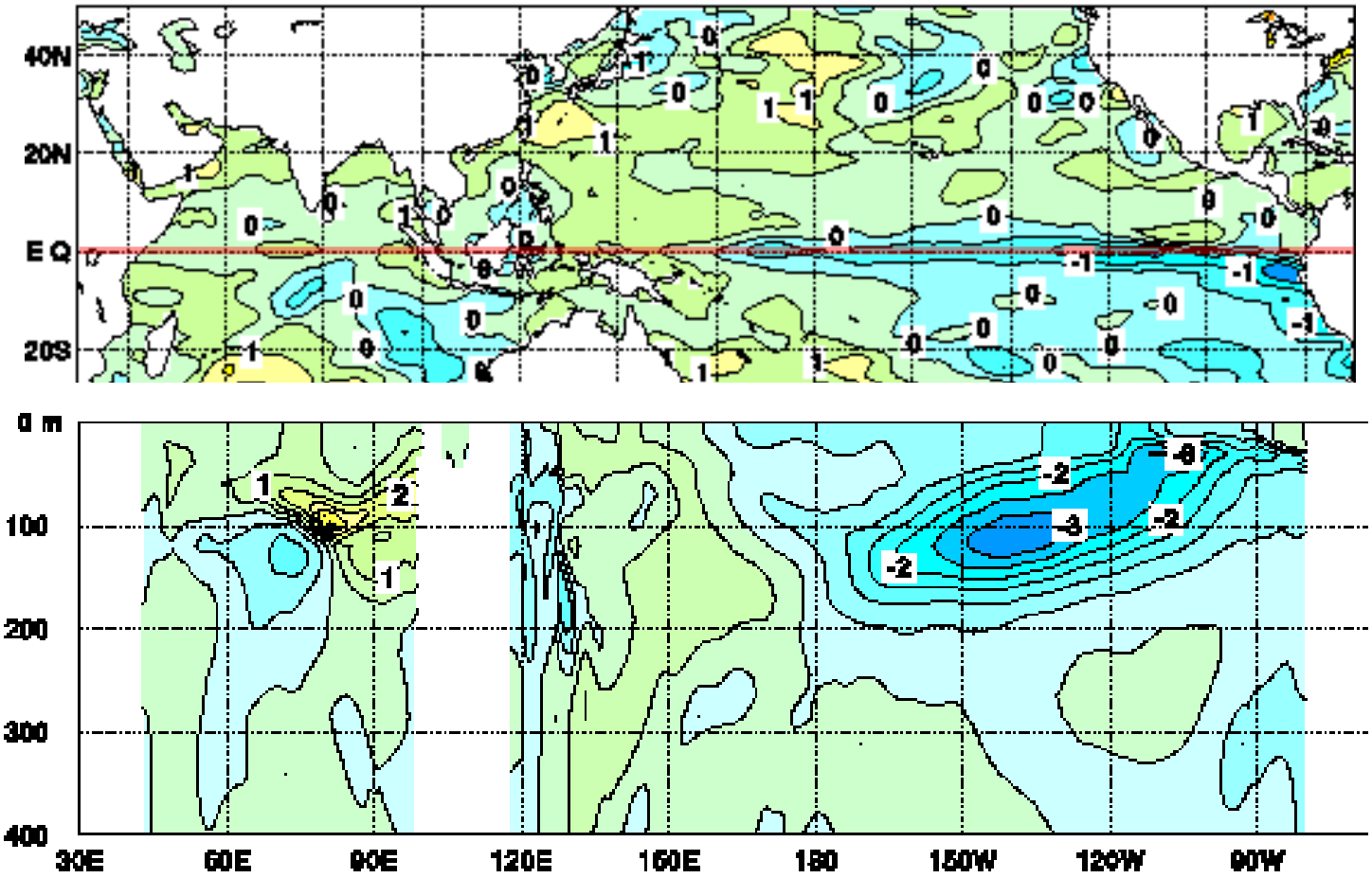
- *The monthly NINO.3 SST deviation in October was -0.6ºC .*
- *The 5-month running mean values for August was -0.3ºC .*

	2016		2017									
	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.
Monthly mean SST (ºC)	24.5	24.7	25.6	26.9	27.6	28.0	27.5	26.7	25.9	24.9	24.2	24.4
SST deviation (ºC)	-0.6	-0.5	0.0	+0.5	+0.5	+0.5	+0.4	+0.2	+0.1	-0.2	-0.8	-0.6
5-month mean (ºC)	-0.4	-0.2	0.0	+0.2	+0.4	+0.4	+0.3	+0.2	-0.1	-0.3	not yet	not yet
SOI	0.0	+0.3	+0.2	0.0	+0.8	-0.4	+0.3	-0.8	+0.9	+0.7	+0.6	+1.1



Oceanic conditions in the tropics 1

- *SSTs were below normal in the central and eastern equatorial Pacific.*
- *Subsurface temperatures were below normal in the central and eastern equatorial Pacific.*



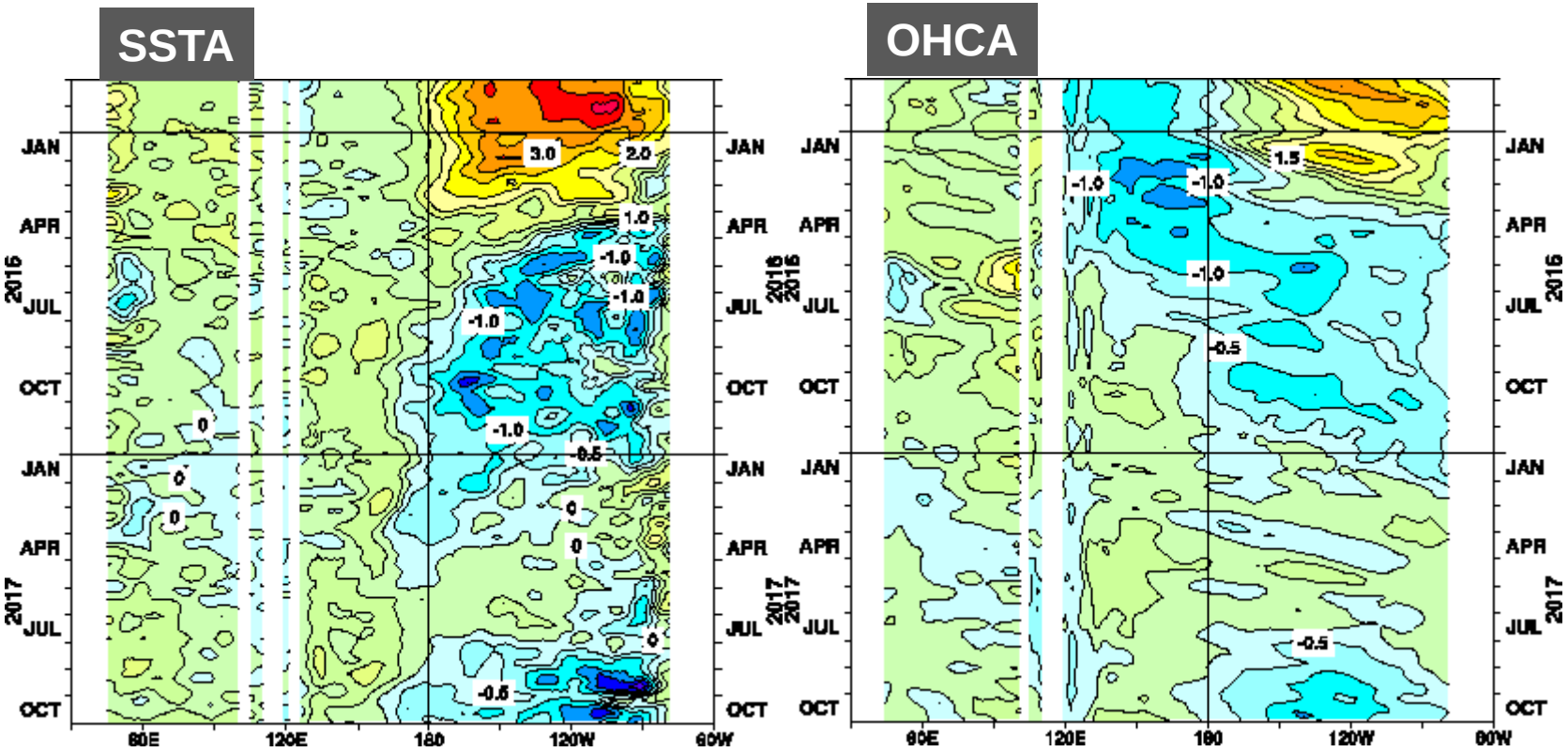
Analyses of the equatorial Pacific Ocean conditions for October, 2017.

(above) SST anomaly

(below) Vertical section of temperature anomaly along the equator

Oceanic conditions in the tropics 2

- *Negative SSTAs strengthened in the eastern equatorial Pacific.*
- *A cool subsurface water appear in the central equatorial Pacific in summer, and thereafter spread in the central and eastern parts.*



Longitude-time section of SSTA(left) and OHCA(right) along the equator from Oct. 2015 to Sep. 2017.
OHC (ocean heat content) is water temperature vertically averaged from the surface to 300m depth.

Atmospheric conditions in tropics

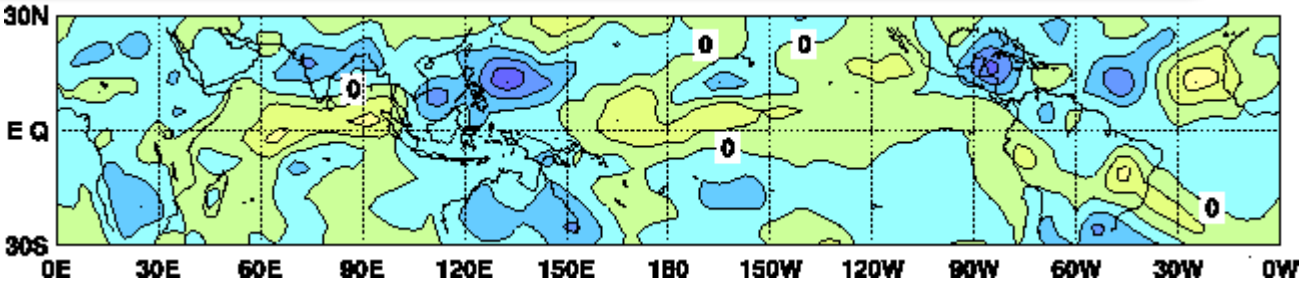
- *Atmospheric convective activities were above normal near Indonesia and Philippines, and below normal near the Date Line.*
- *Easterly winds in the lower troposphere were stronger than normal in the central equatorial Pacific.*

⇒ **La Niña-like conditions continue.**

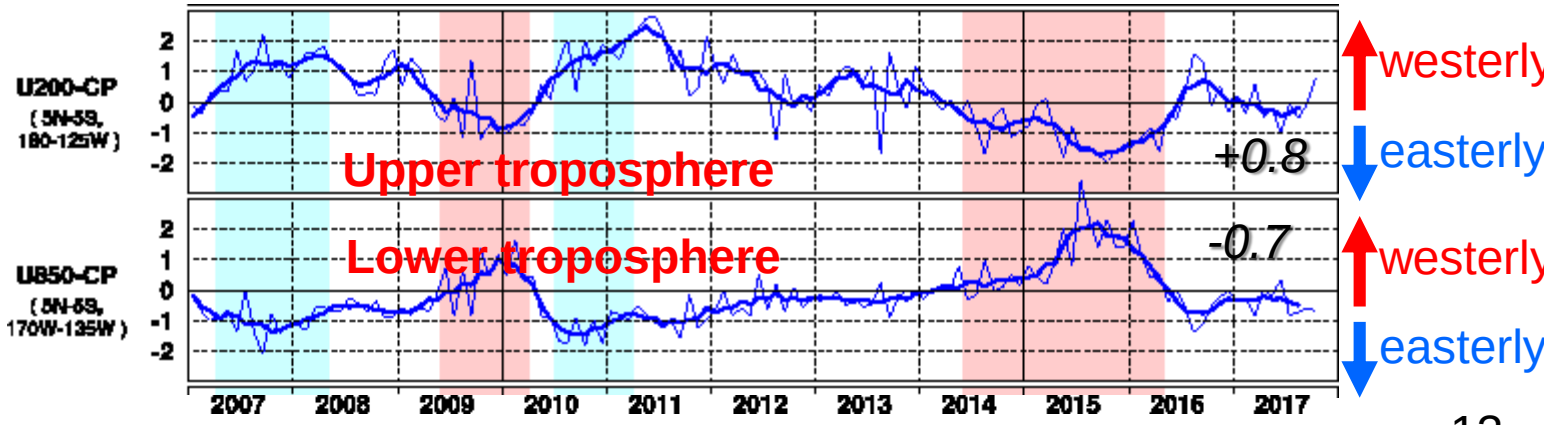
OLR anomalies Oct. 2017

Blue: more active

Yellow: less active



Zonal wind indices in the central equatorial Pacific



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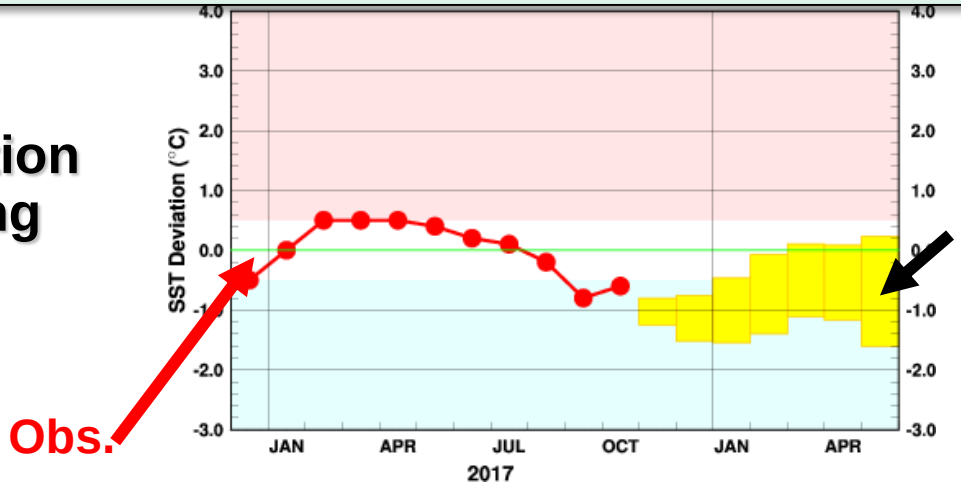
3. Outlook

Model prediction (JMA/MRI-CGCM2)

✓*NINO.3 SST will be below normal during the coming winter.*
✓*Prediction uncertainty is larger for late winter and spring.*

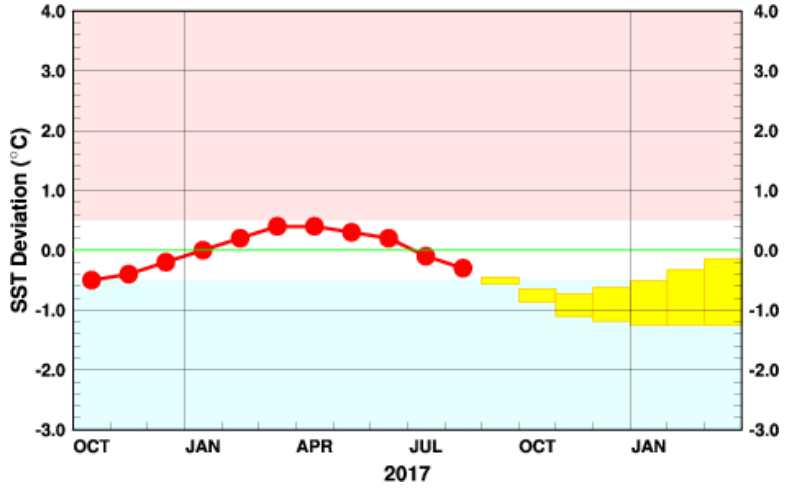
NINO.3 SST deviation from 30-year sliding mean



Obs.

Each box denotes the range where the SST deviation will be included with the probability of 70%.

5-month running mean



ENSO Outlook　Nov 2017 – May 2018

✓*Although it is possible (40%) that La Niña conditions will not develop, it is more likely (60%) that continuation of below-normal NINO.3 SST will meet the definition of La Niña event.*

YEAR	MONTH	mean period		
2017	SEP	JUL2017–NOV2017	30	70
	OCT	AUG2017–DEC2017	30	70
	NOV	**SEP2017–JAN2018**	30	70
	DEC	**OCT2017–FEB2018**	30	70
2018	**JAN**	**NOV2017–MAR2018**	30	70
	FEB	**DEC2017–APR2018**	40	60
	MAR	**JAN2018–MAY2018**	50	50

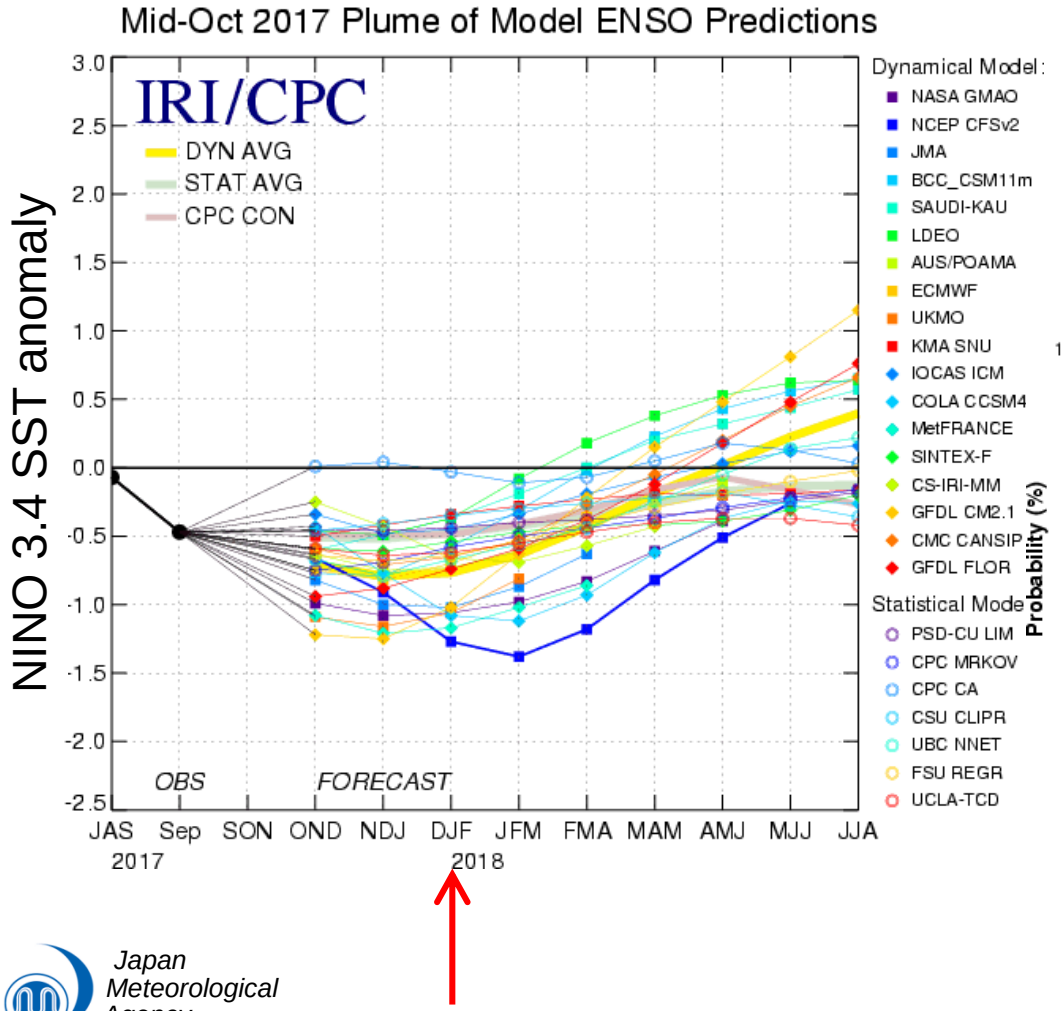
El Niño　ENSO neutral　La Niña

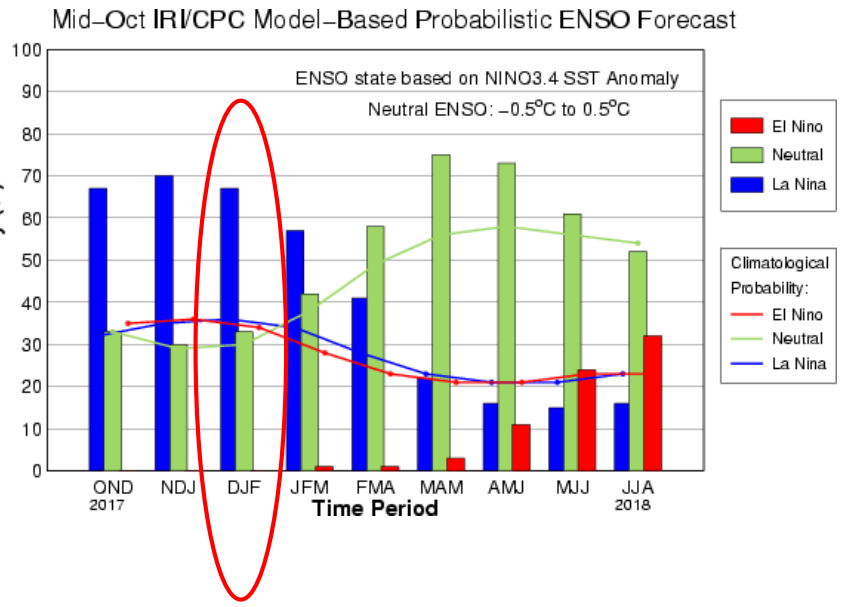
ENSO forecast probabilities based on JMA/MRI-CGCM2.

Red, yellow, and blue bars indicate probabilities that the five-month running mean of NINO.3 SST deviation from the latest sliding 30-year mean is +0.5˚C or above (El Niño), between +0.4˚C and -0.4˚C (ENSO Neutral), and -0.5˚C or below (La Niña), respectively. Labels in lightface indicate the past months, and ones in bold face indicate the current and future months.

Model predictions (compiled by IRI)

✓*For winter (DJF), 60-70% of the models predict La Niña conditions.*





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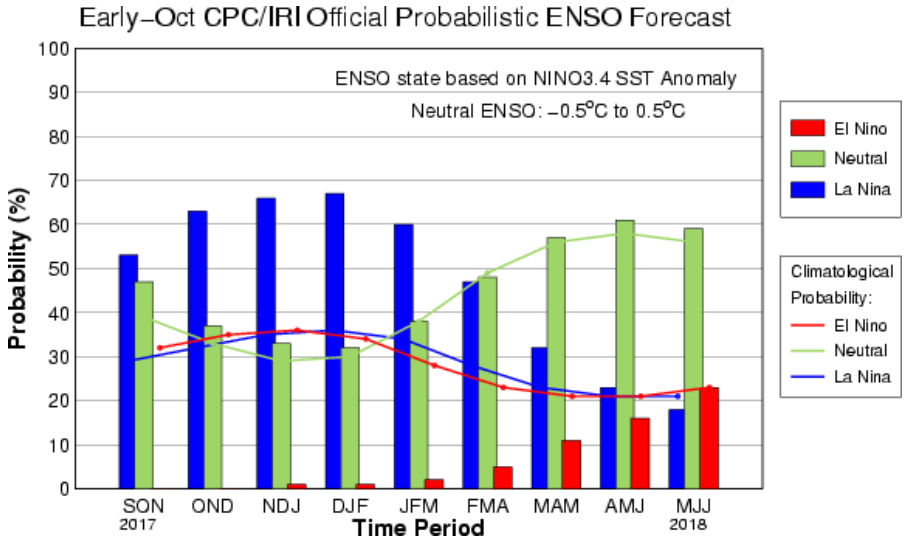
Outlooks from NOAA and BoM(Australia)

✓*NOAA: La Niña conditions are favored (~55-65%) during the Northern Hemisphere fall and winter 2017-18. (12 Oct.)*
✓*BoM: La Niña remains possible, but effect on Australia's climate likely to be less than during recent events. (8 Nov.)*



La Niña WATCH activated on 24 Nov.

4. Summary

Summary

- *In October, La Niña-like conditions persisted in the equatorial Pacific.*
- *Although it is possible (40%) that La Niña conditions will not develop, it is more likely (60%) that continuation of below-normal NINO.3 SST will meet the definition of La Niña event.*

- *Current condition*
  - ✓ Features of La Niña events observed in October:
    - ➢ JMA's monthly ENSO Monitoring Index (NINO.3) : -0.6ºC
    - ➢ Negative SSTA & OHCA in the central and eastern equatorial Pacific
    - ➢ Stronger than normal easterly winds over the central equatorial Pacific
    - ➢ Below normal atmospheric convections near the Date Line
- *Predictions by JMA/MRI-CGCM*
  - ✓ NINO.3 SST will be below normal during the coming winter.
  - ✓ Prediction uncertainty is larger for late winter and spring.

Thank you