



Seasonal Outlook for summer 2010 over Japan

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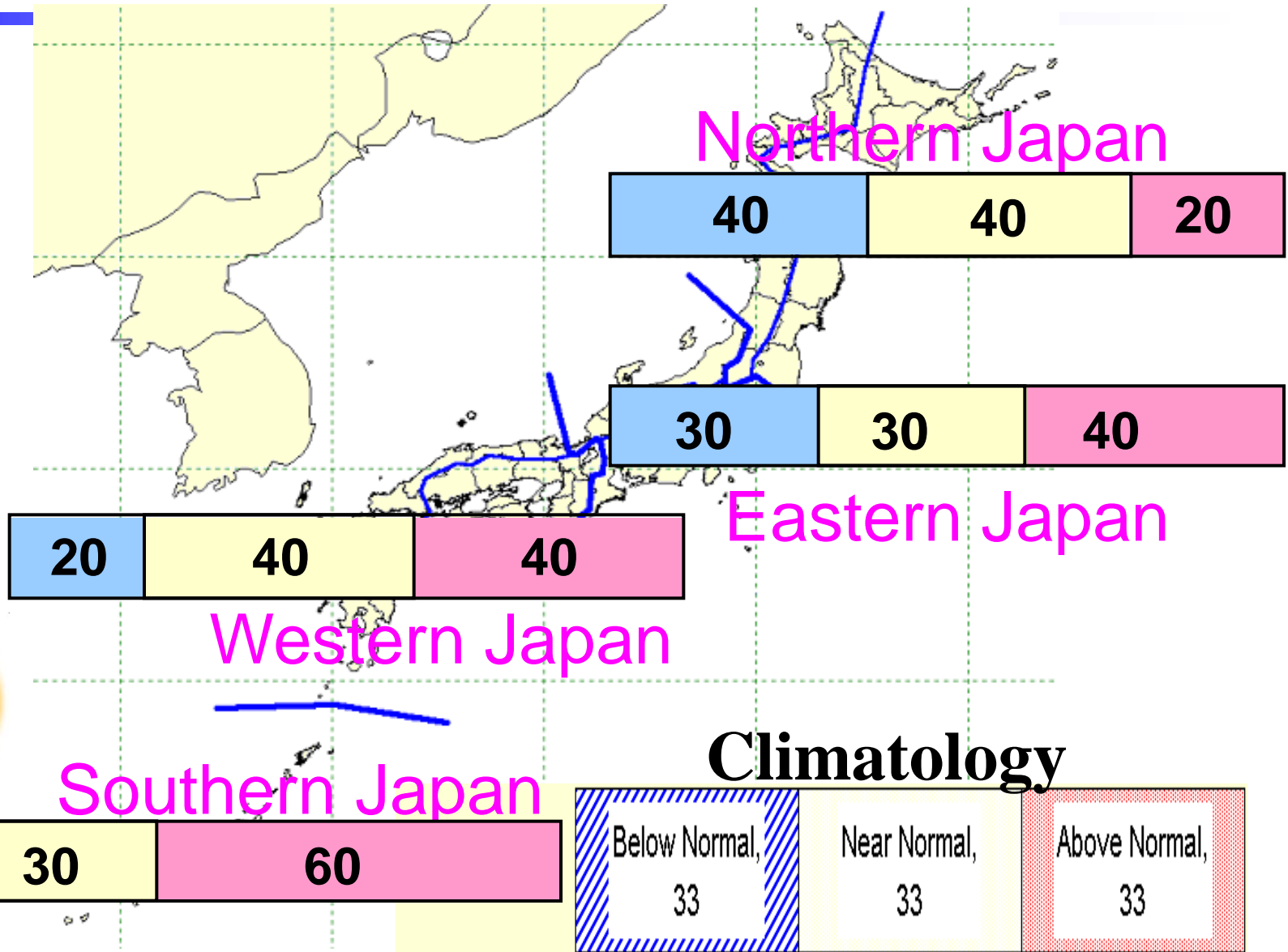


Outline

- Part I Long-term Trends
 - Part II Oceanic Condition and Outlook
 - Part III Numerical Prediction
- Summary

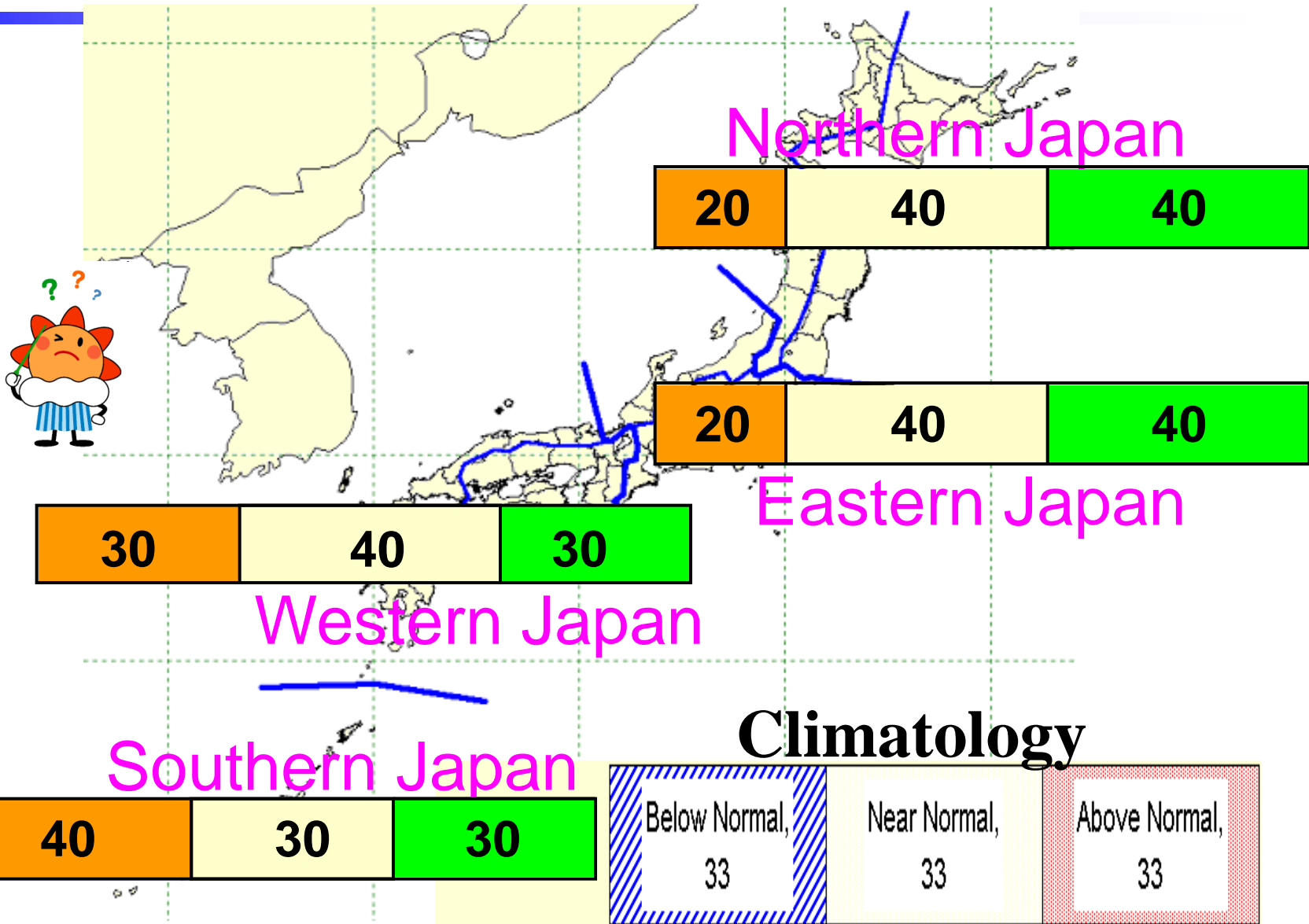


Probability of seasonal mean temperature for summer (June – August) 2010





Probability of seasonal mean precipitation for summer (June – August) 2010





Part I

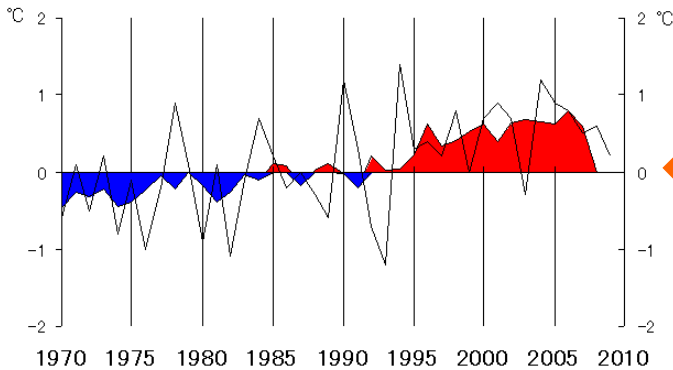
Long-term Trends



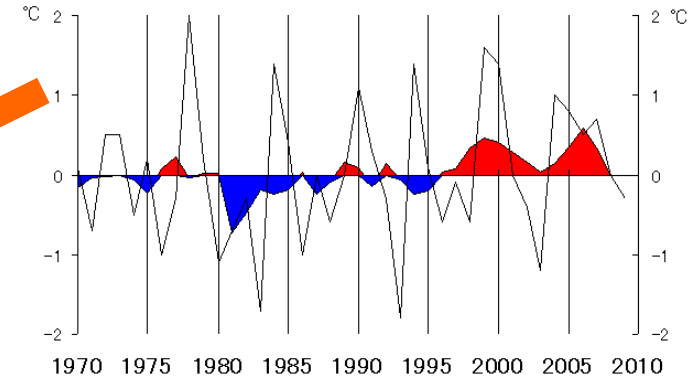
Long-term Trends (1)

Summertime Area-averaged Temperature

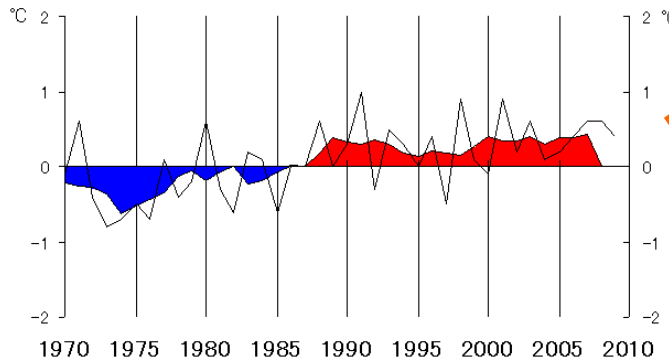
Western Japan



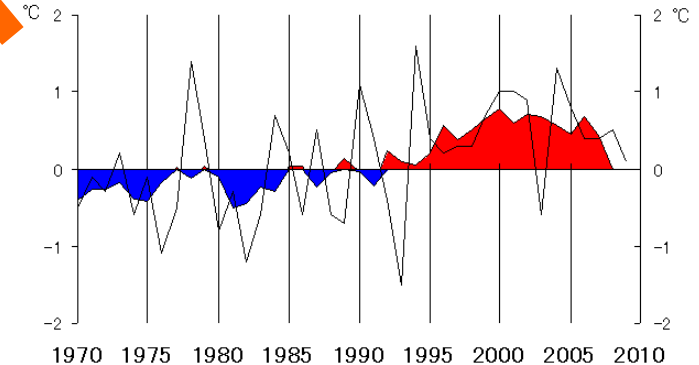
Northern Japan



Southern Japan



Eastern Japan



Long-term upward trends are clear in the summertime temperatures over Japan except for the Northern Japan. In the Northern Japan, it has large interannual variability though it tends to be above normal in recent years.



Part II

Oceanic Condition and Outlook



Outline of the EPS for seasonal forecast



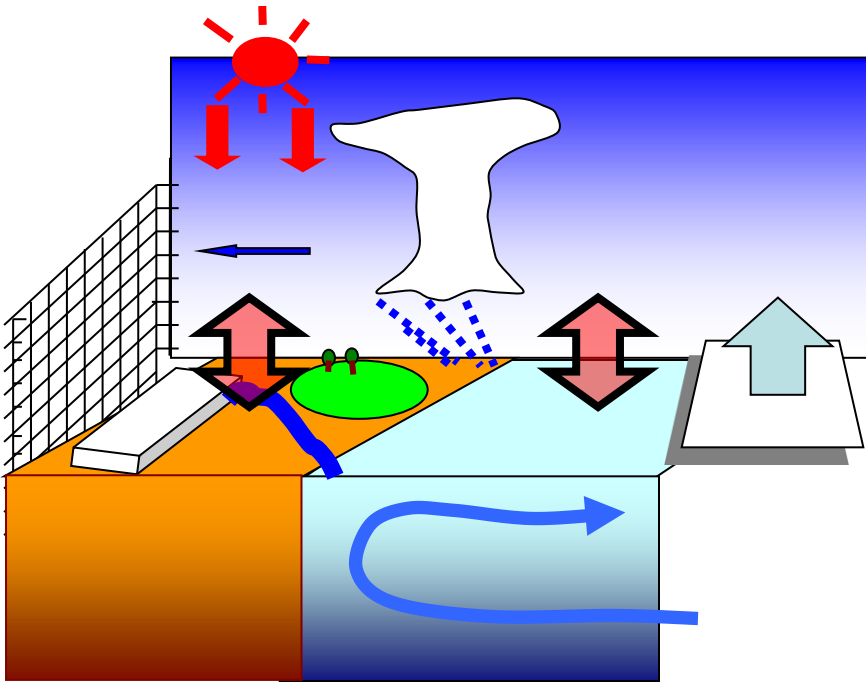
CGCM: JMA/MRI-CGCM

AGCM: JMA-GSM based on JMA/MRI unified model

- TL95: 1.875 deg ~ 180km
- L40: model top = 0.4hPa
- Land: SiB
- Sea ice: climatology
- Initial condition: JRA-25/JCDAS
- Initial perturbation: BGM (TRO, NH)

OGCM: MRI.COM

- 1.0deg in lon. X 0.3-1.0 deg in lat.
- 75N-75S, 0-360E
- L50
- Initial condition: MOVE/MRI-COM-G
- Initial perturbation: driven with BGM (TRO) of AGCM



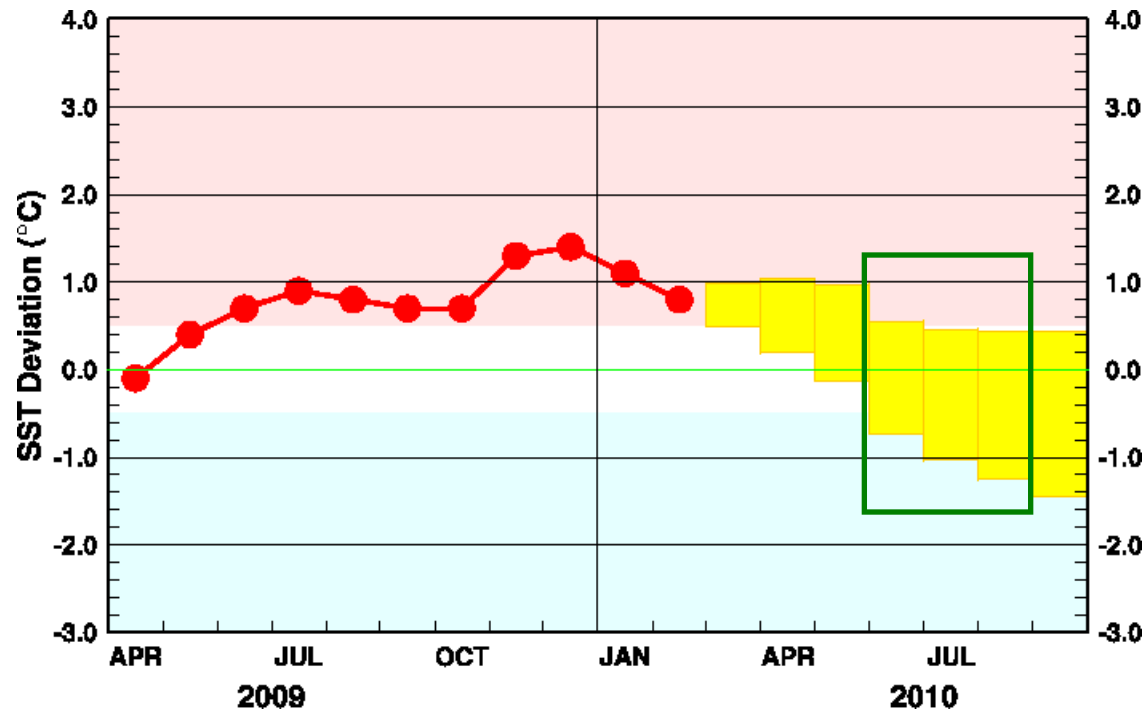
ENSEMBLE: BGM&LAF

- Combination of BGM and LAF
- 9 members for each initial date
- Size: 51 (ENSO forecast: 30)
- Once a month

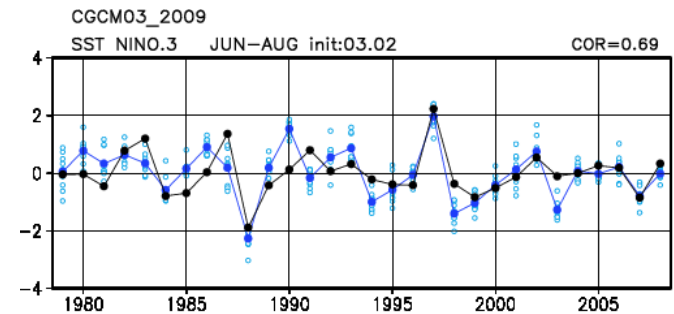


Oceanic Condition and Outlook (1)

NINO.3 SST forecast



Verification for NINO.3 SST



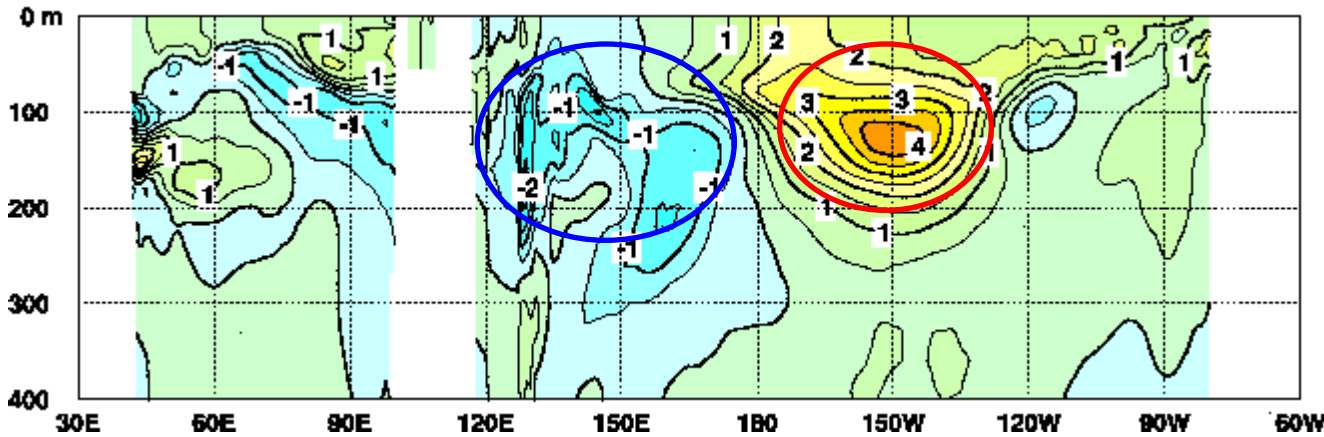
Blue colors denote prediction.

The current El Nino conditions are likely to end in spring.
It is likely to be ENSO neutral conditions in the coming summer.

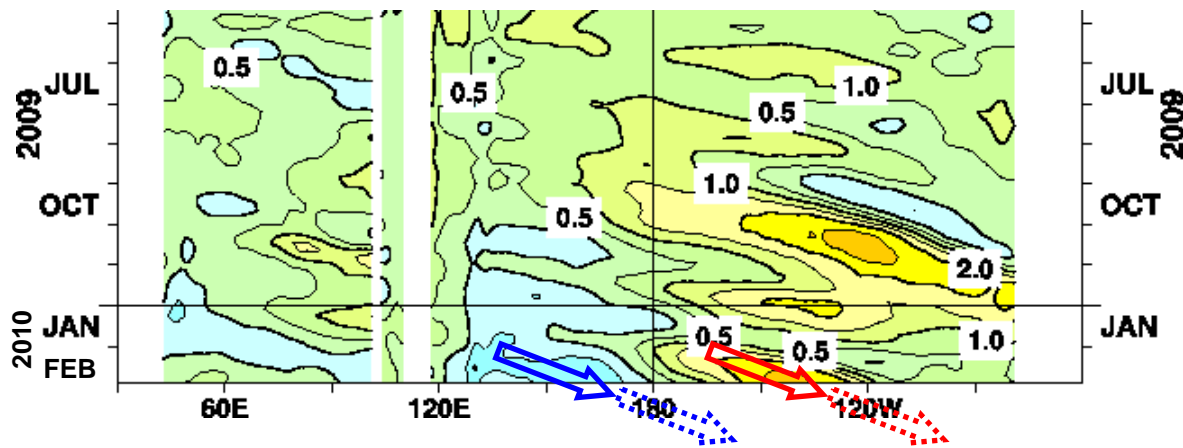


Oceanic Condition and Outlook (2)

Ocean Heat Content along the equator



Depth-longitude cross sections of temperature and anomalies along the equator in the Indian and Pacific Oceans. (Feb. 2010)



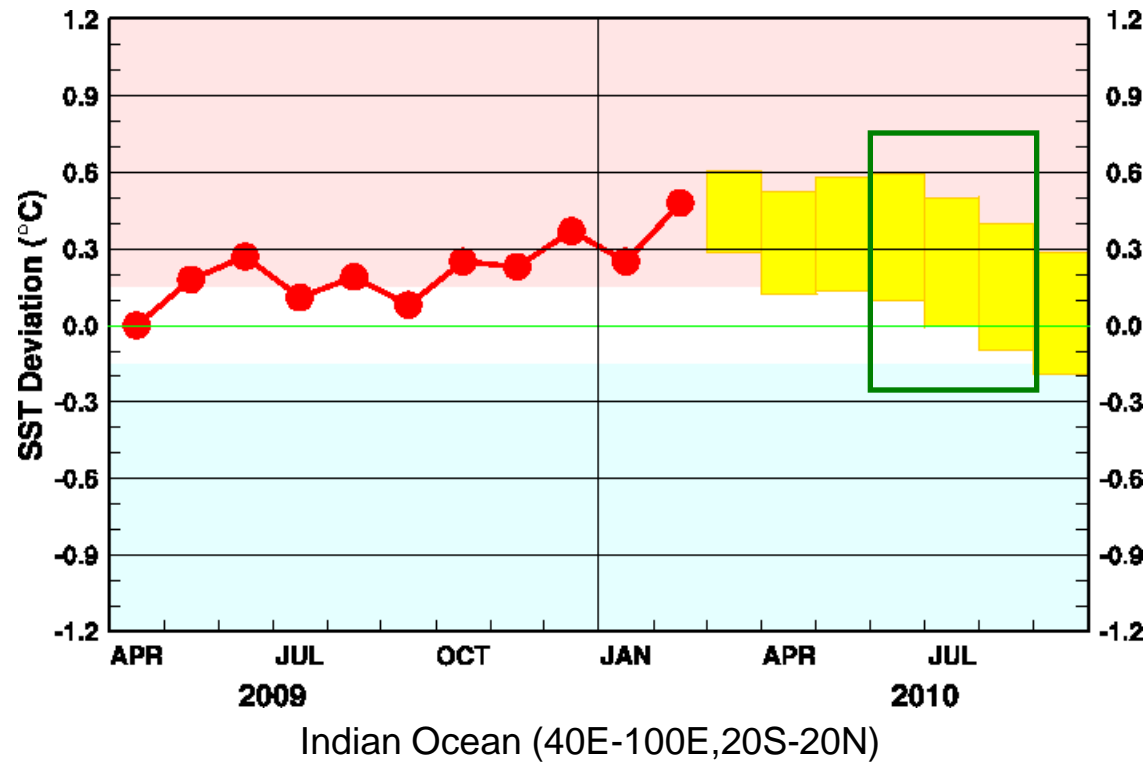
Time-longitude cross section of ocean heat content (OHC; vertically averaged temperature in the top 300 m) anomalies along the equator in the Indian and Pacific Oceans. (Feb. 2010)

Subsurface cool waters are predicted to migrate eastward and contribute to cancelling the positive SST anomalies in the equatorial Pacific in the months ahead.

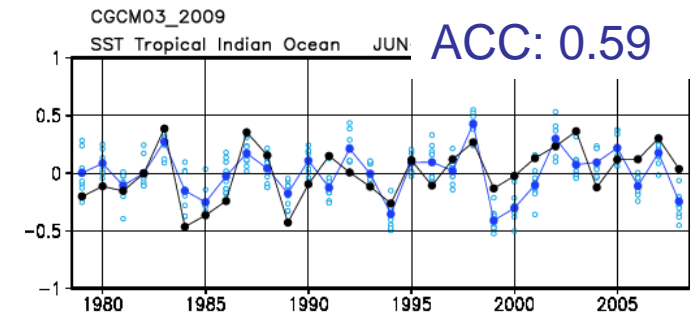


Oceanic Condition and Outlook (3)

Indian Ocean SST forecast



Verification for Indian Ocean SST



Indian Ocean SST will remain above normal in the summer.



Part III

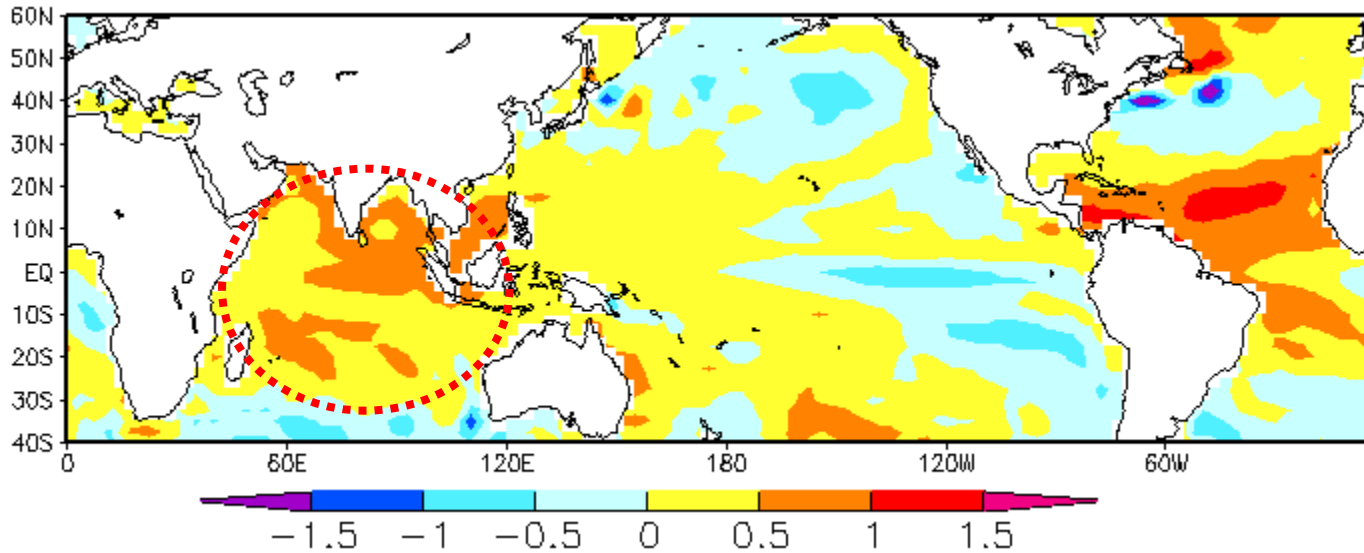
Numerical Prediction

Latest Initial date : March 12, 2010



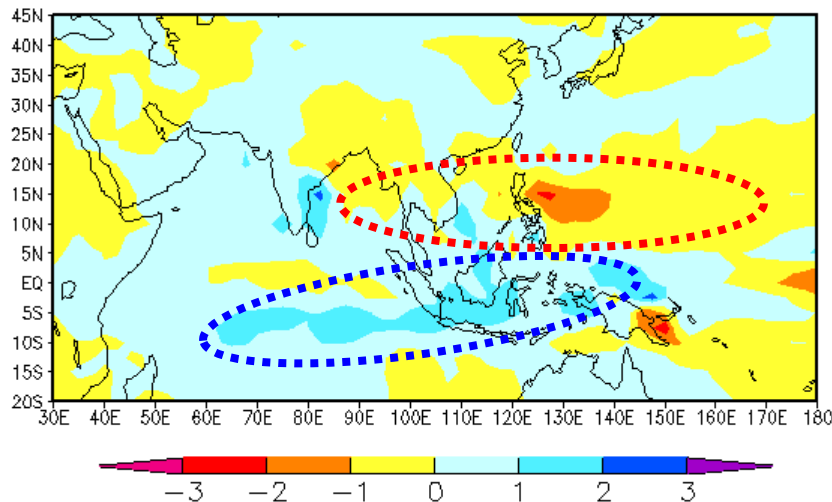
Numerical Prediction (1)

SST and Precipitation

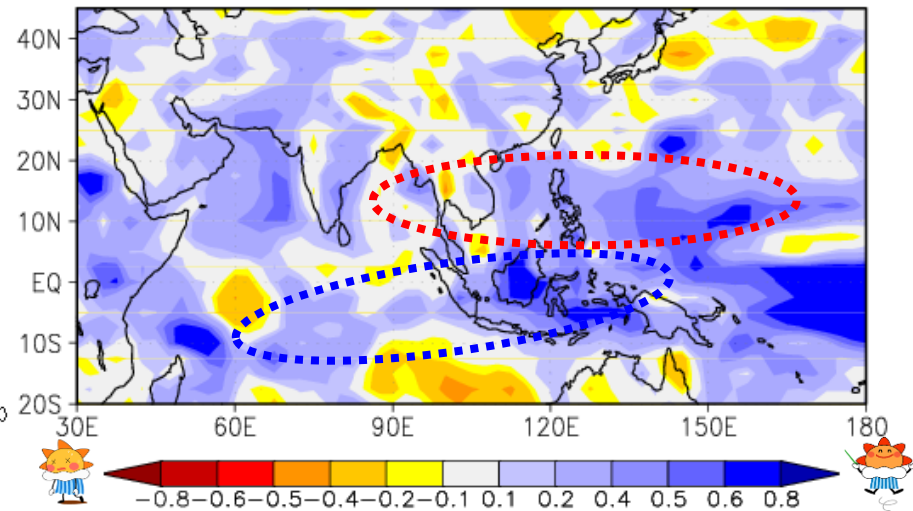


SST Anomalies

Precipitation Anomalies



Anomaly Correlation with GPCP data

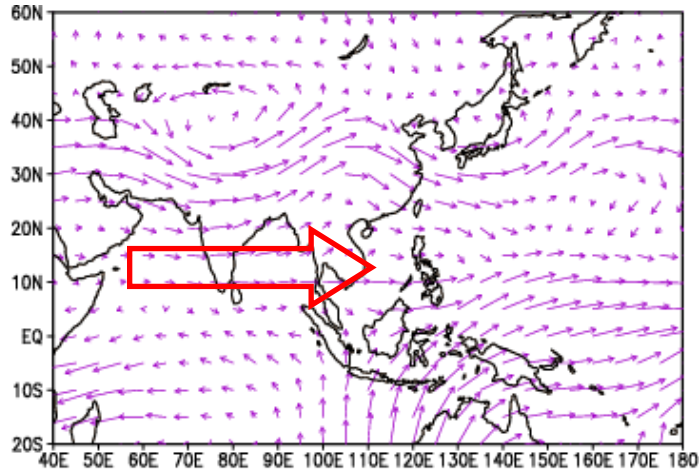




Numerical Prediction (2)

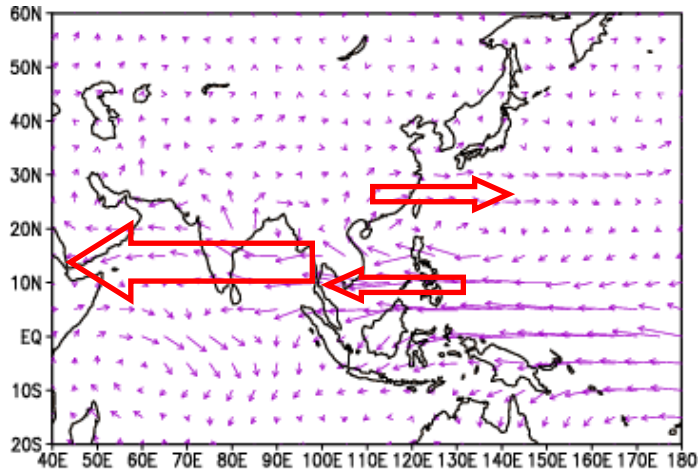
Weak Large-Scale Monsoon Circulation

200hPa Wind Anomalies



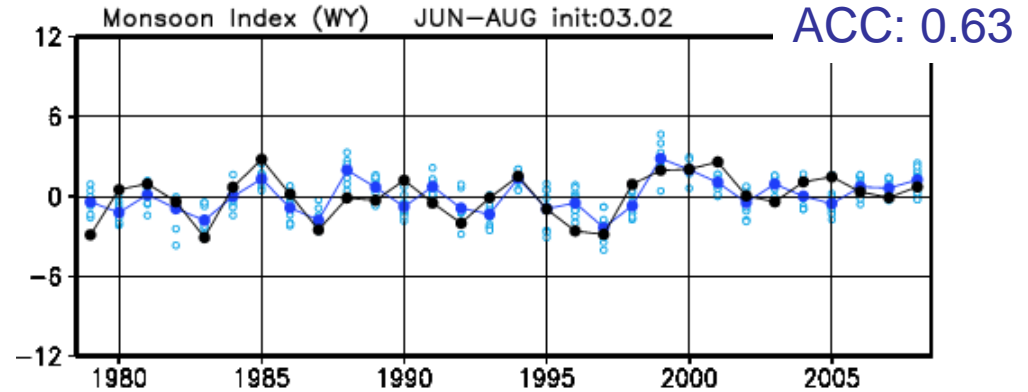
3

850hPa Wind Anomalies



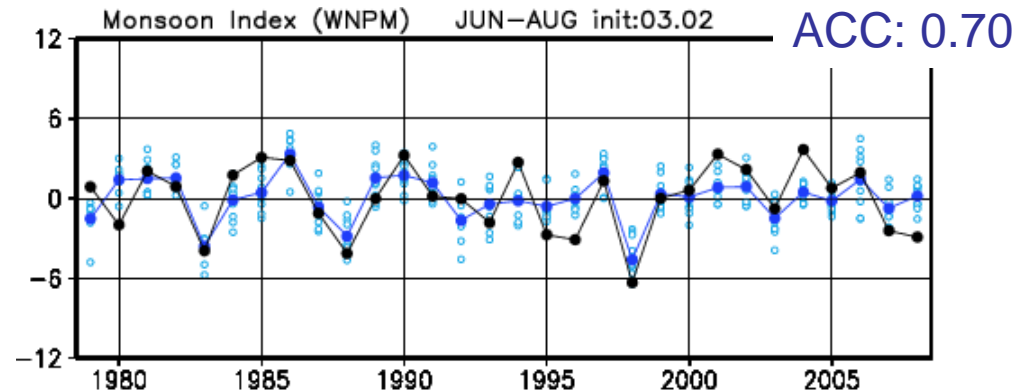
2

Verification for vertical shear index (Webster and Yang, 1992)



Blue colors denote prediction.

Verification for Western North Pacific Monsoon index (Wang et al., 2001)

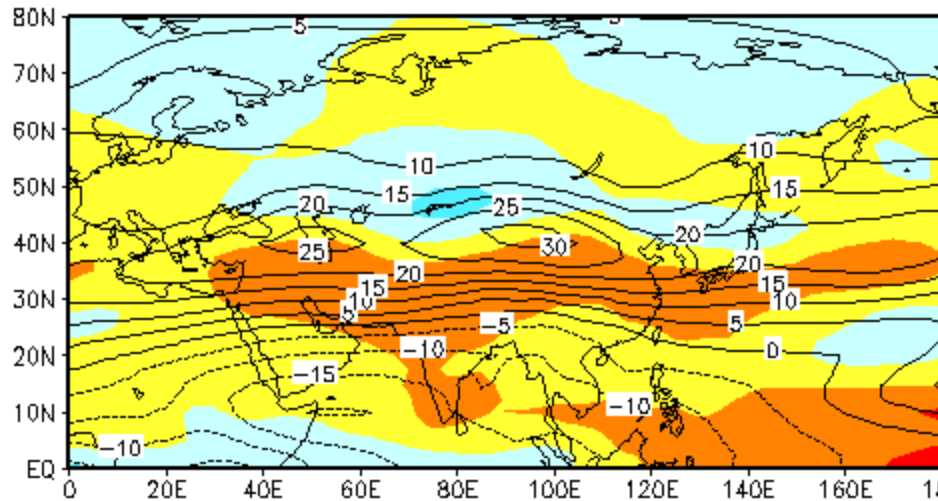




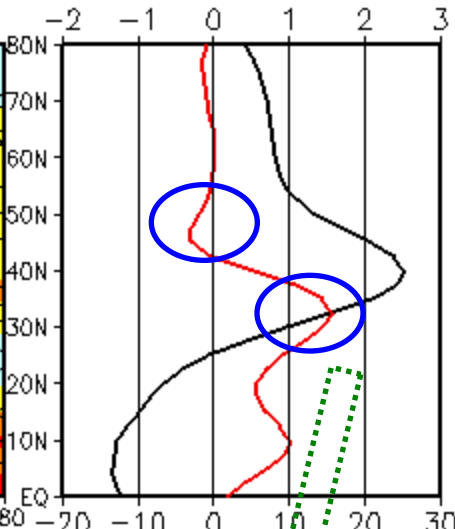
Numerical Prediction (3)

Southward Shift of Subtropical Jet

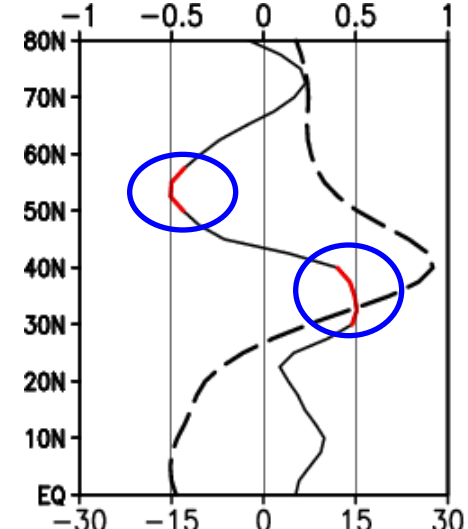
200hPa Wind and Anomalies



Zonal mean wind and Anomalies (40E-160E)



Correlations between Indian Ocean SST and Zonal mean wind



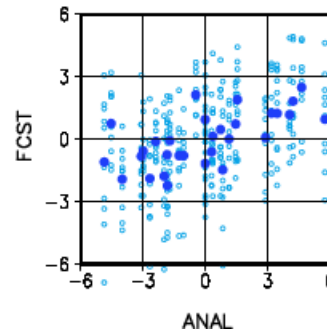
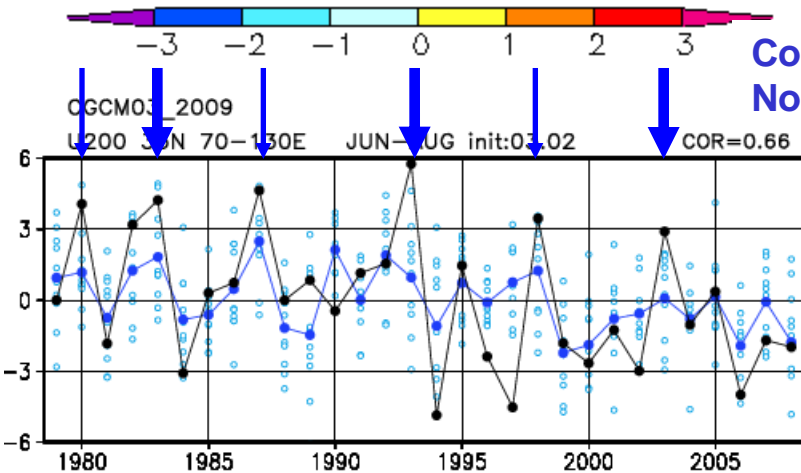
Averaged (40E-160E)

Red line indicate 95% confidence level.

Dashed line indicate normal.

Data Source: JRA-25

Cool summer hit Northern Japan



Verification for zonal wind at 35N

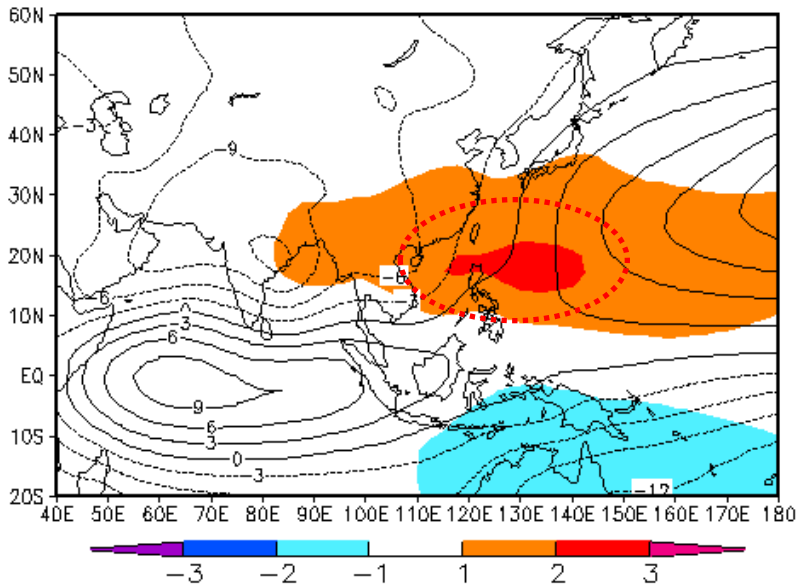




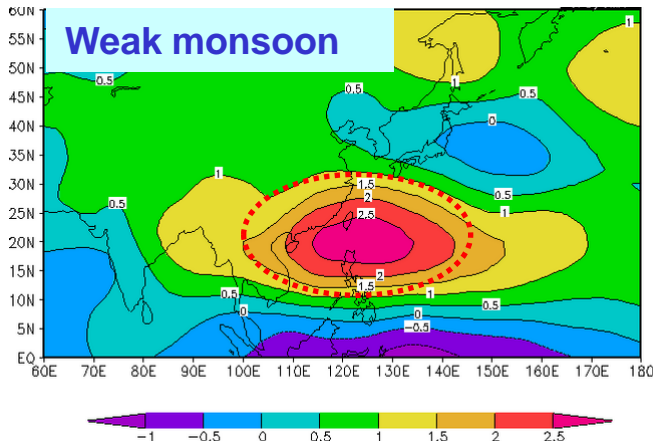
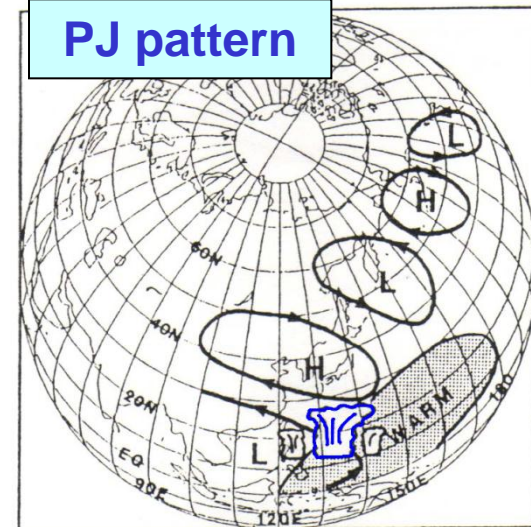
Numerical Prediction (4)

Westward Extension of the North Pacific High

850hPa Stream Function and Anomalies



Nitta (1987)



Composites of 850hPa Stream Function fields for weak monsoon years.

(1980,1983,1993,1996,1998,2007)

Hot summer hit southern Japan in all of those years.

Data Source: JRA-25



Numerical Prediction (5)

MOS products

Summertime Temperature

MOS products	Probability(%)		
	Below Normal	Near Normal	Above Normal
Northern Japan	37	35	28
Eastern Japan	14	36	50
Western Japan	12	17	71
Southern Japan	4	20	76

The numerical guidance are generated using Model Output Statistics (MOS) technique based on hindcast experiments.





Summary

Long-term trends

- Warming trends over Japan except for Northern part.

ENSO outlook

- Neutral conditions in the coming summer.

Numerical Prediction

- Remarkably High SST in Indian Ocean.
- Suppressed convection around the Western North Pacific Region.
- Weak large-scale monsoon circulation.
- Southward shift of subtropical Jet.
 - Deeply related to the climate in the Northern Japan.
- Westward extension of the North Pacific High.
 - Hot and dry summer in the Southern Japan.
- Statistical interpretations predict a relatively cool summer over Northern Japan and a hot summer over Western and Southern Japan with a high probability.

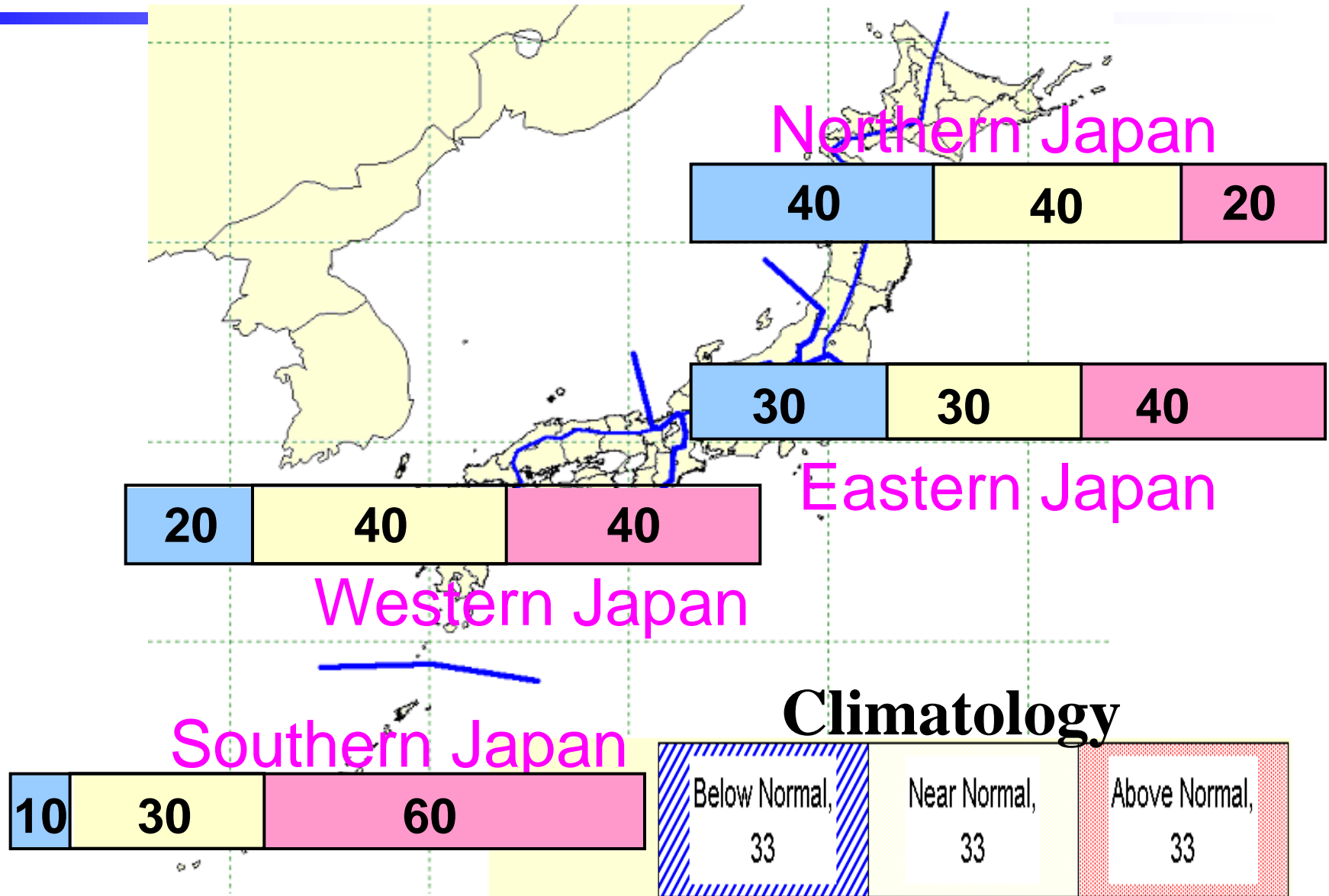


Thank you.





Probability of seasonal mean temperature for summer (June – August) 2010





Numerical Prediction (6)

MOS products

Summertime Precipitation

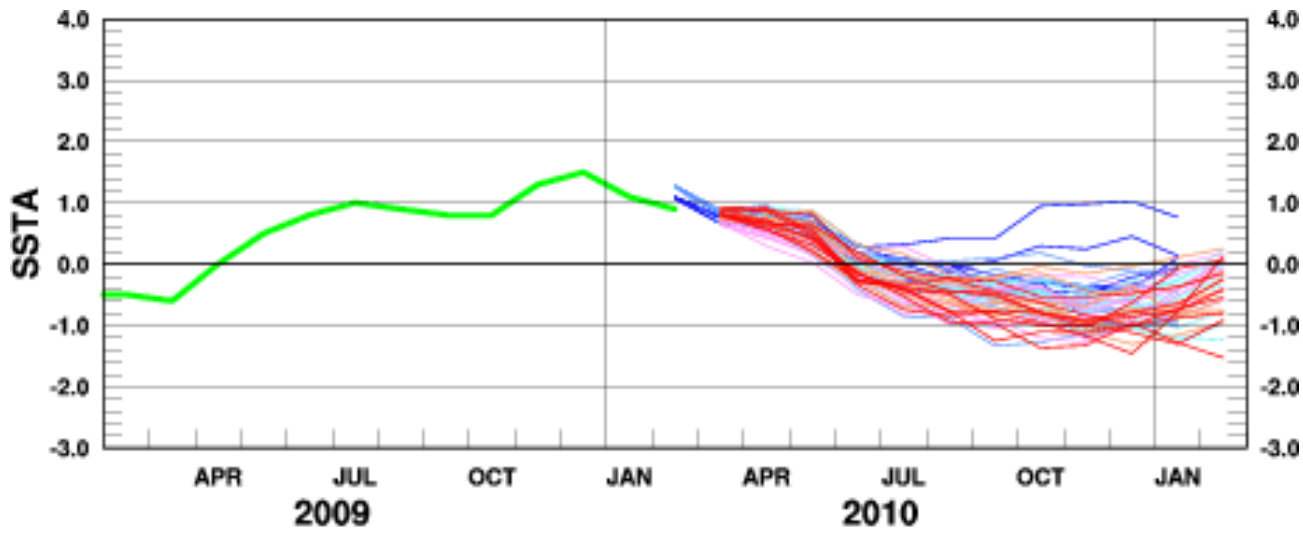
EPS interpretations	Probability(%)		
	Below Normal	Near Normal	Above Normal
Northern Japan	22	28	50
Eastern Japan	23	48	29
Western Japan	40	28	32
Southern Japan	31	32	37

The numerical guidance are generated using Model Output Statistics (MOS) technique based on hindcast experiments.





The tendency to La Niña



- ANAL
- Latest forecasts
- Old 1 forecasts
- Old 2 forecasts
- Old 3 forecasts
- Old 4 forecasts
- Old 5 forecasts

March 12, 2010

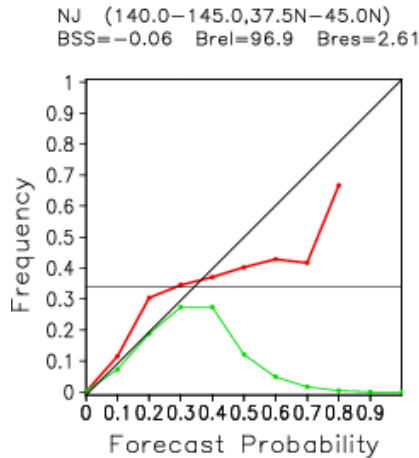


Numerical Prediction (7)

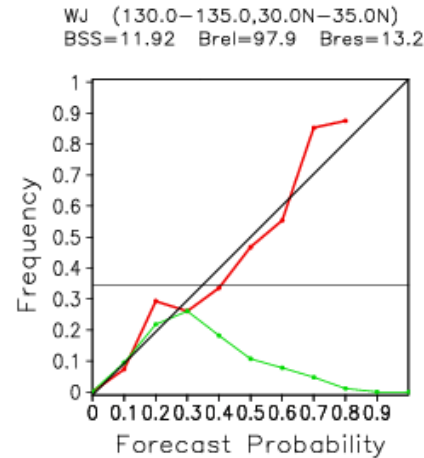
Skill of the Numerical Guidance

Reliability Diagram for temperature

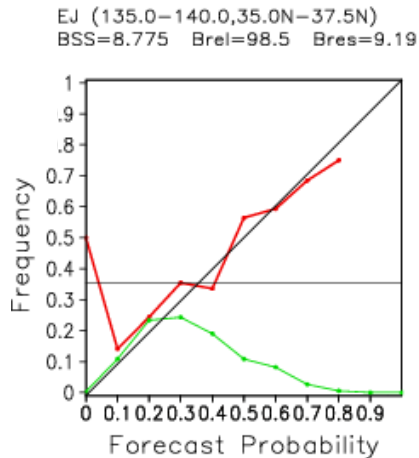
Northern Japan



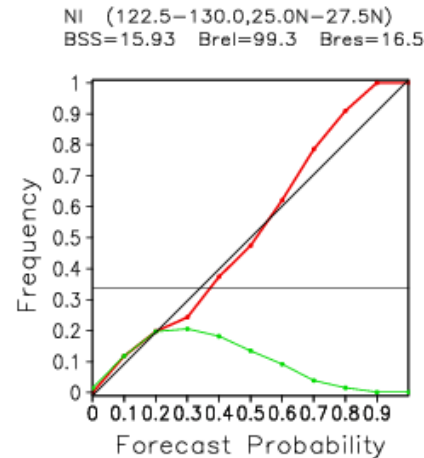
Western Japan



Eastern Japan

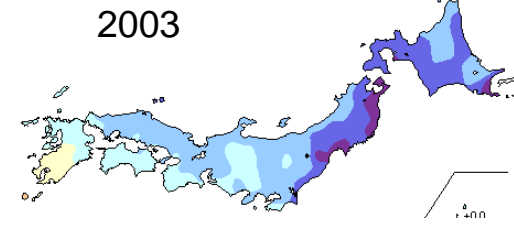
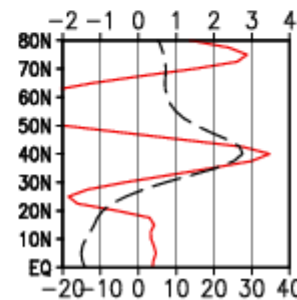
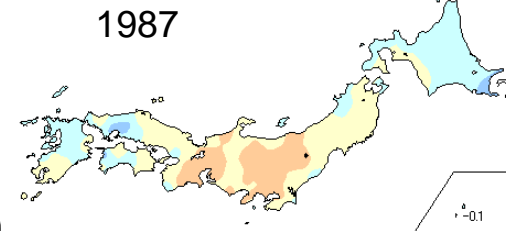
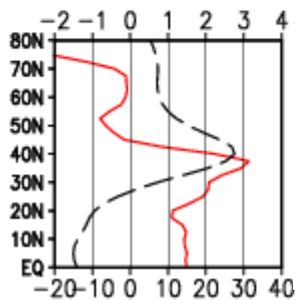
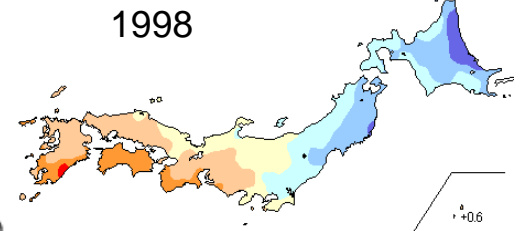
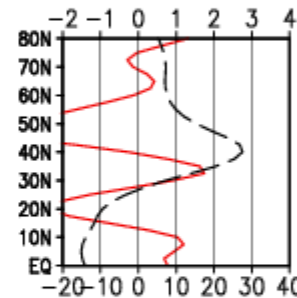
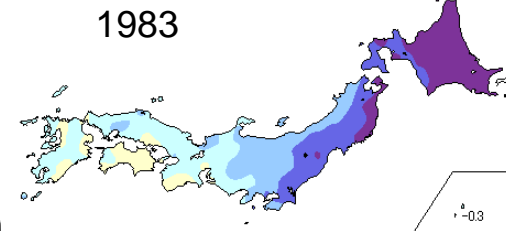
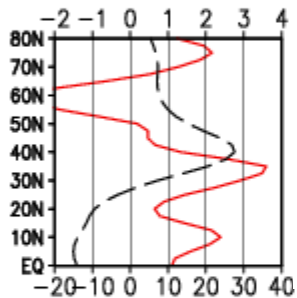
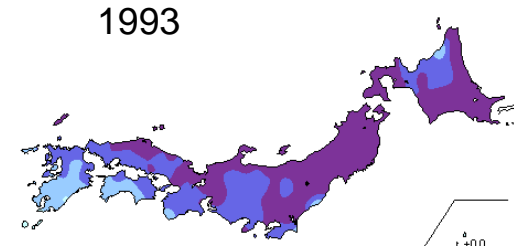
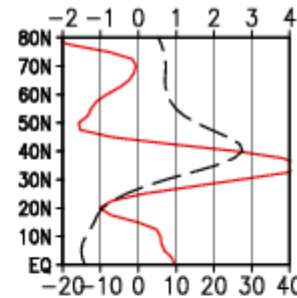
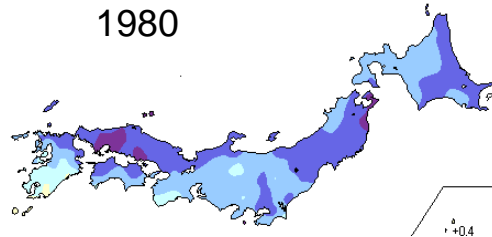
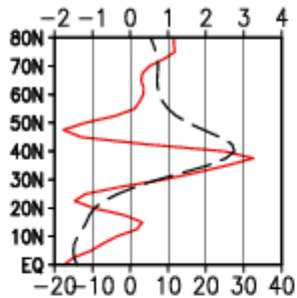


Southern Japan





Southward shift of subtropical Jet cause a cool summer



Zonal mean wind and Anomalies (40E-160E)

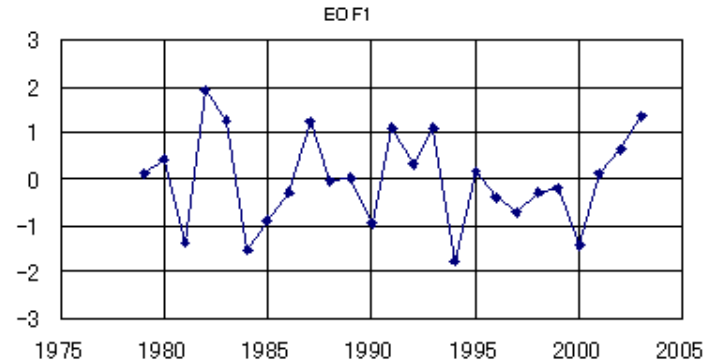
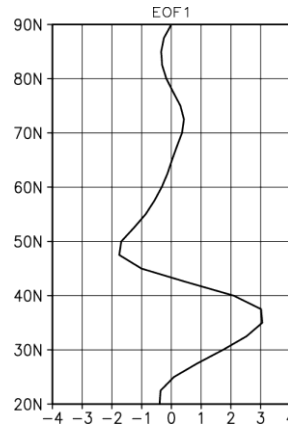
These are typical years when southward shift of the subtropical Jet appeared. The northern Japan became a cool summer in all the years.



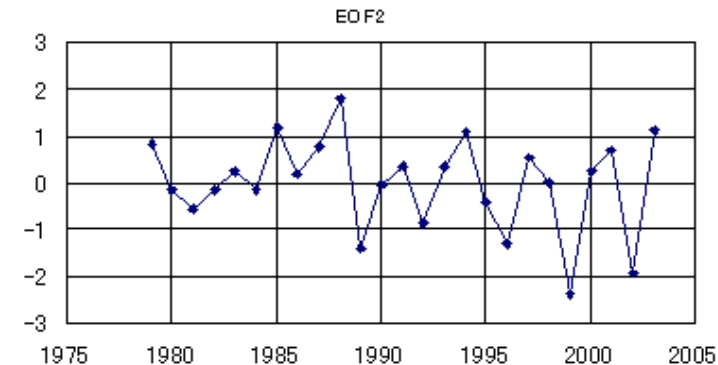
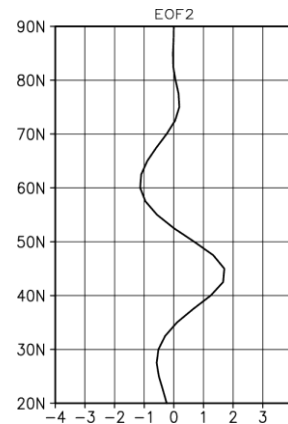


EOF of Zonal Wind

1st mode of Empirical Orthogonal Function



2nd mode of Empirical Orthogonal Function



Southward shift of subtropical Jet is the dominant mode of Zonal mean wind variations.
It is similar to the latest prediction in 200hPa zonal wind.