# Winter Forecast for 2013-2014 GPC Tokyo

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# Outline

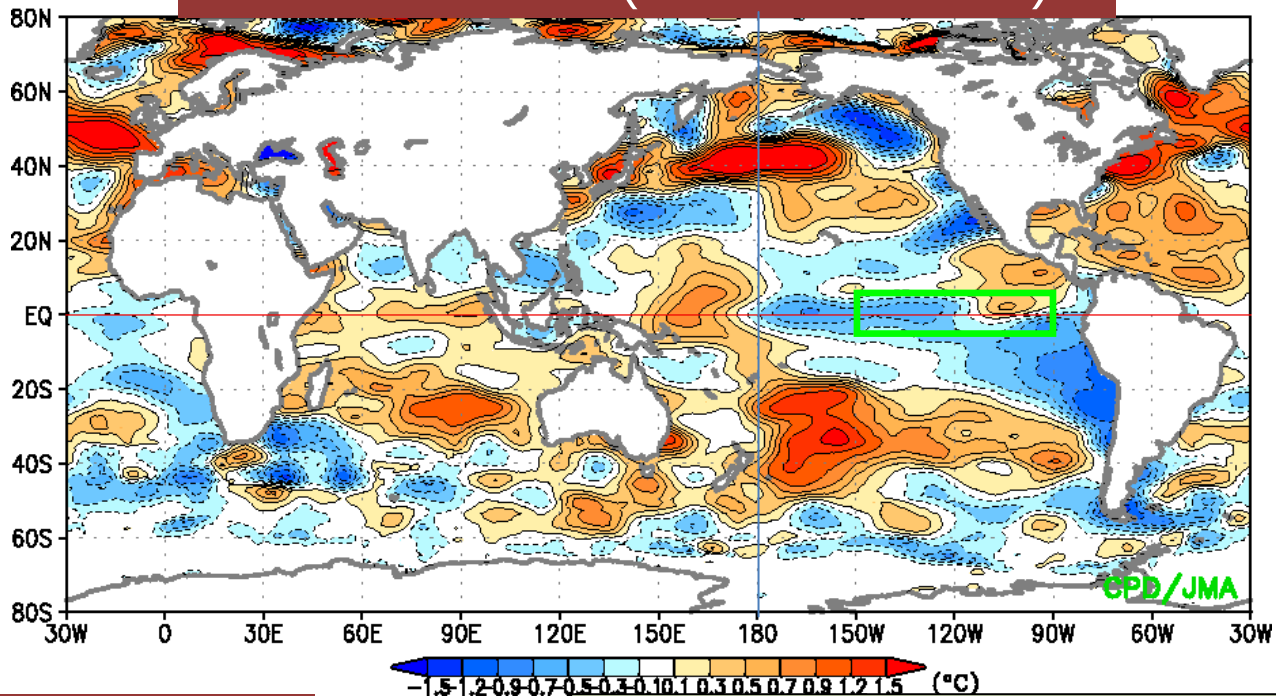
1. Numerical prediction
2. Interannual variation

1. Numerical prediction

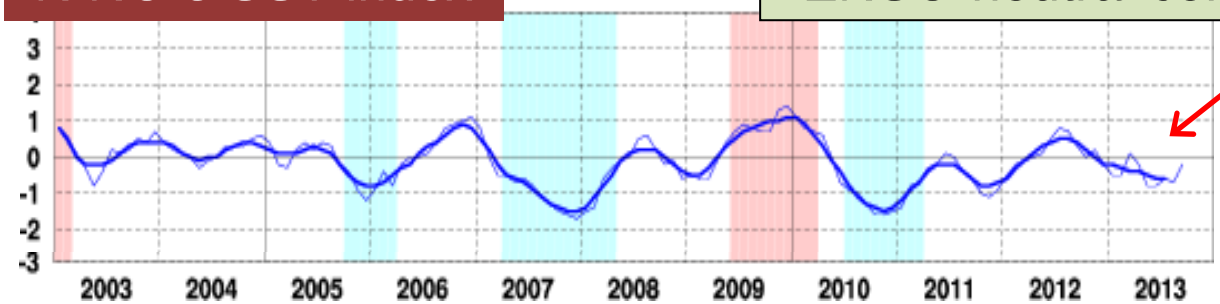
2. Interannual variation

# Current SST conditions (October 2013)

SST anomalies (1 – 20 Oct. 2013)




NINO.3 SST index



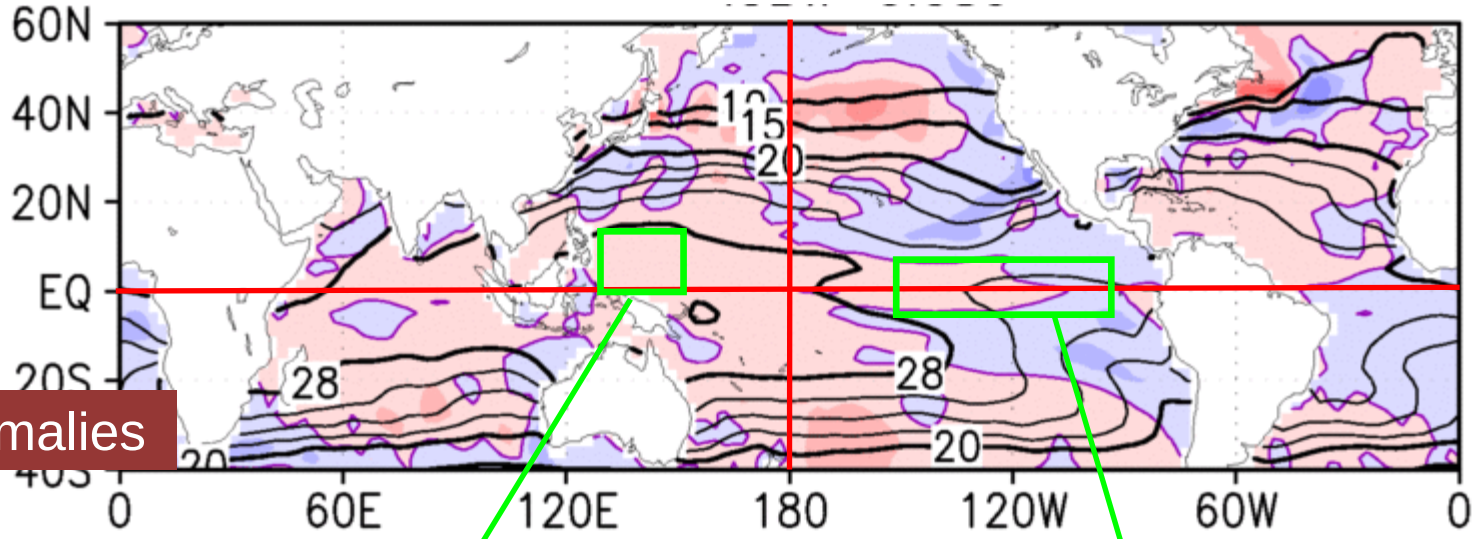

• ENSO-neutral conditions (a little negative)

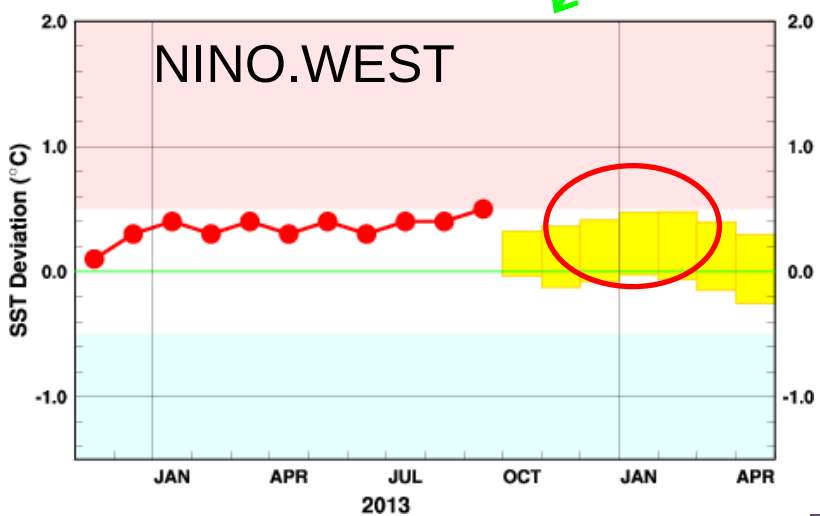
Data: COBE-SST

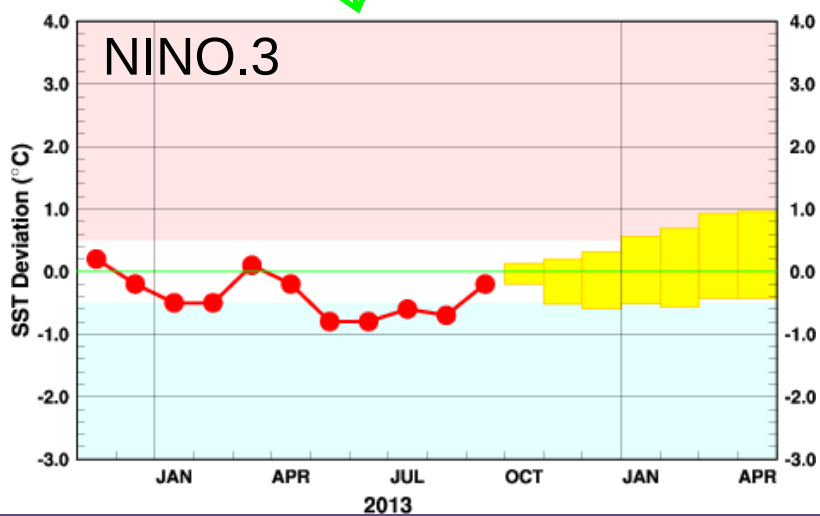
# Predicted SST conditions (DJF 2013/2014)

- ENSO-neutral conditions are likely to persist.

SST anomalies

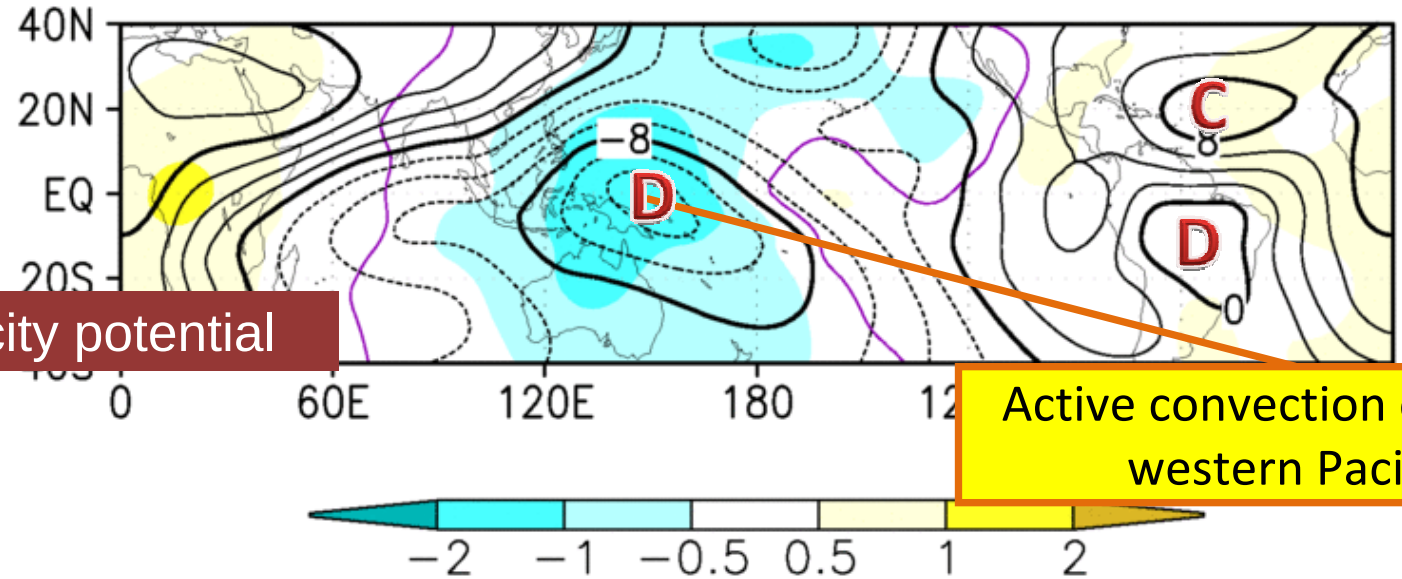


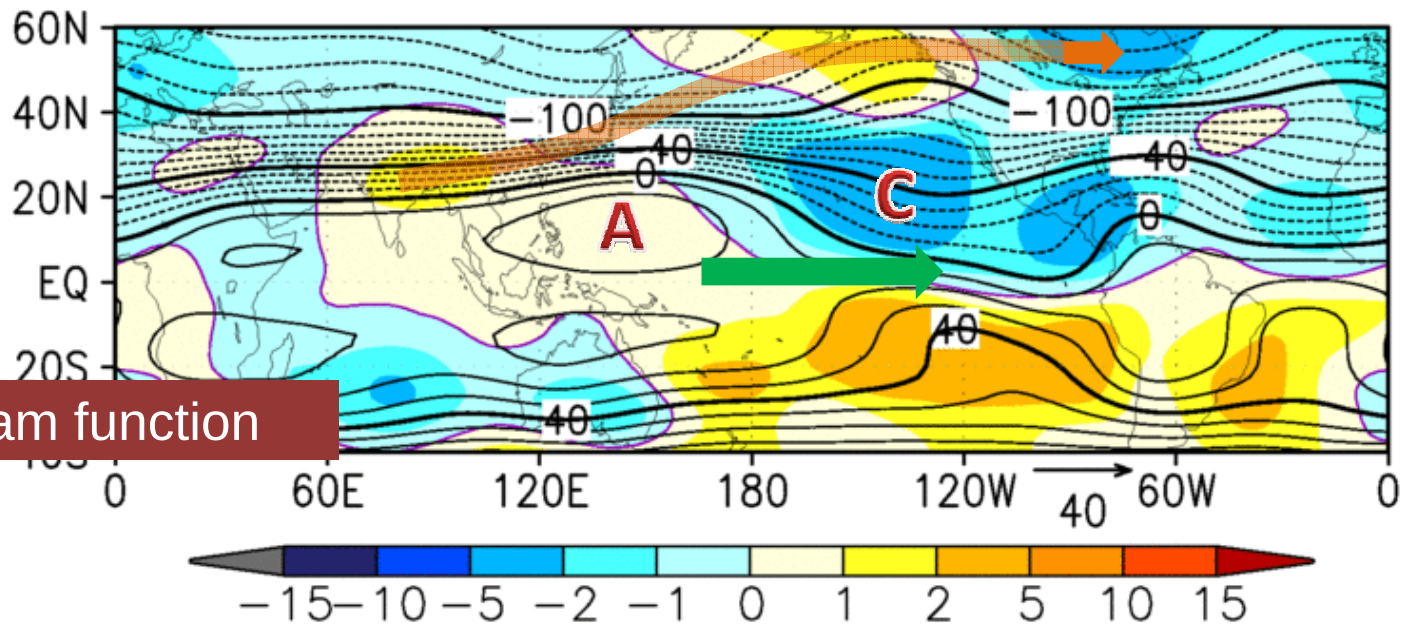

JMA Seasonal EPS prediction products

# Predicted 200-hPa circulations (DJF 2013/2014)



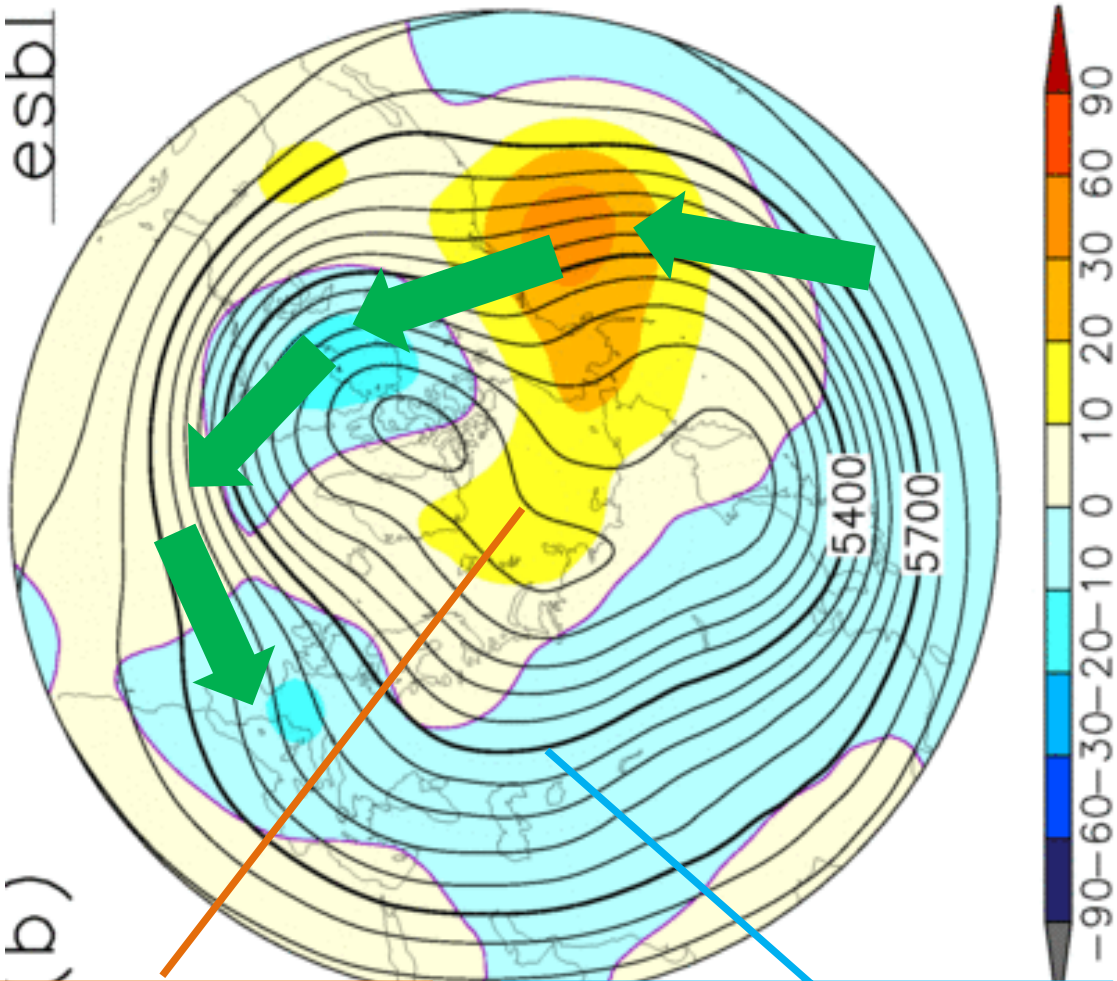

Velocity potential

Active convection over the western Pacific




Stream function

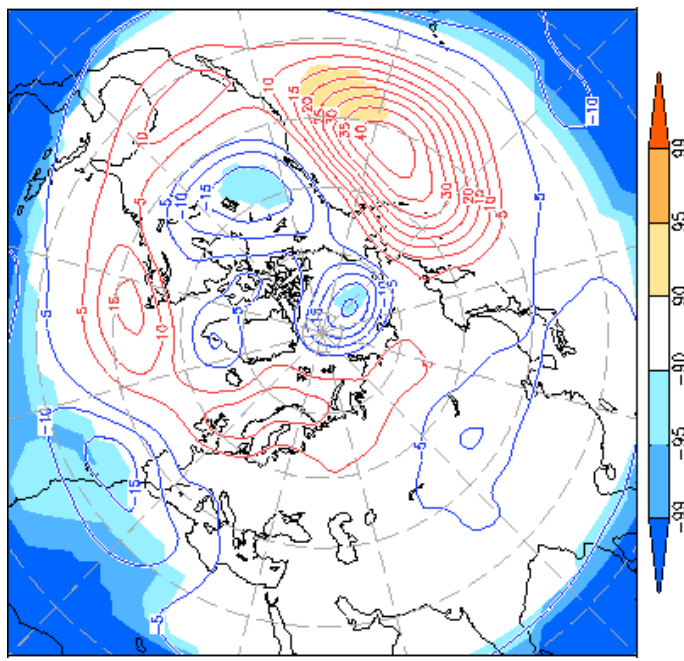
# Predicted 500-hPa height in N.H. (DJF 2013/2014)



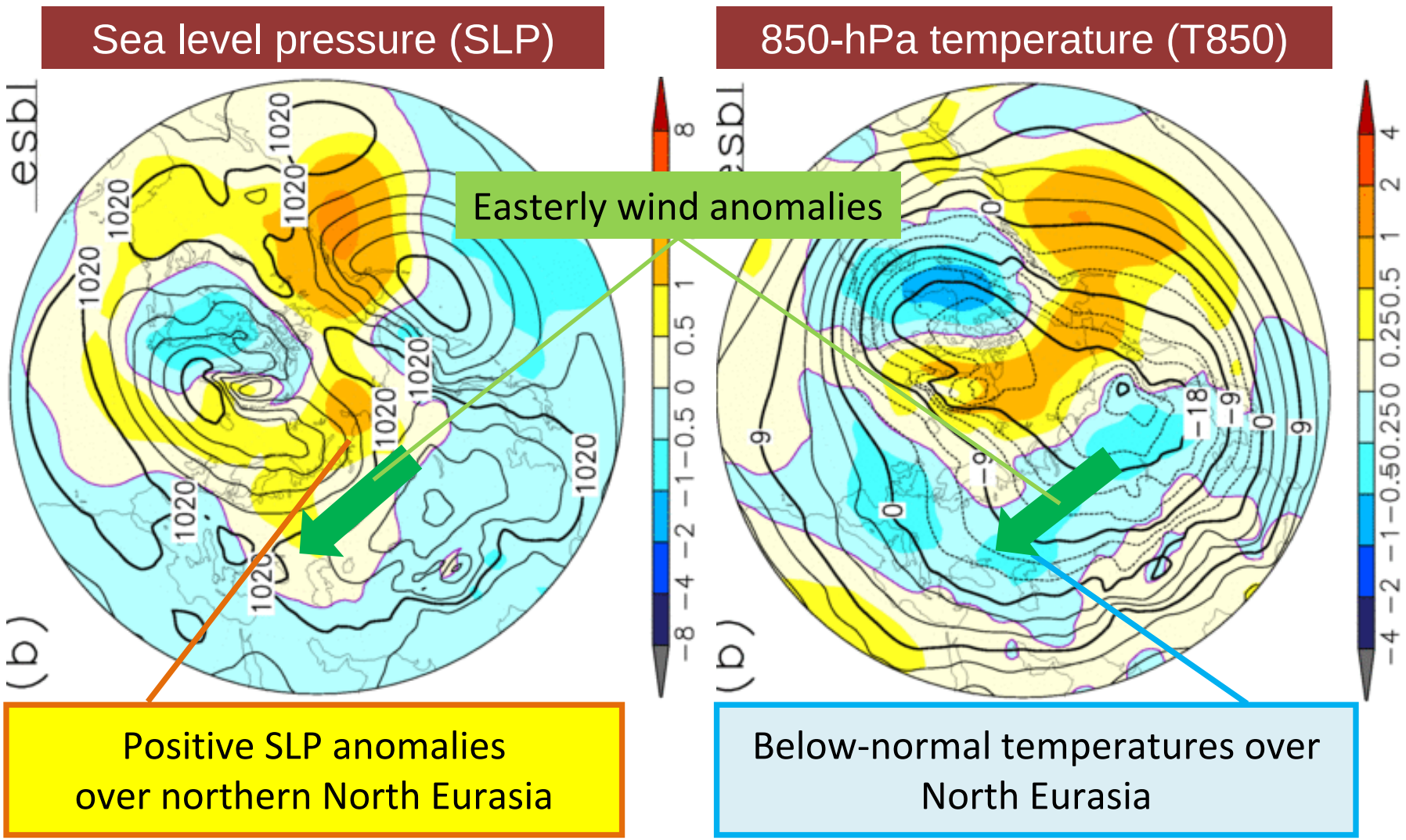

Positive anomalies over the Arctic region

Negative anomalies over North Eurasia except its northern parts

La Nina composite (Z500)

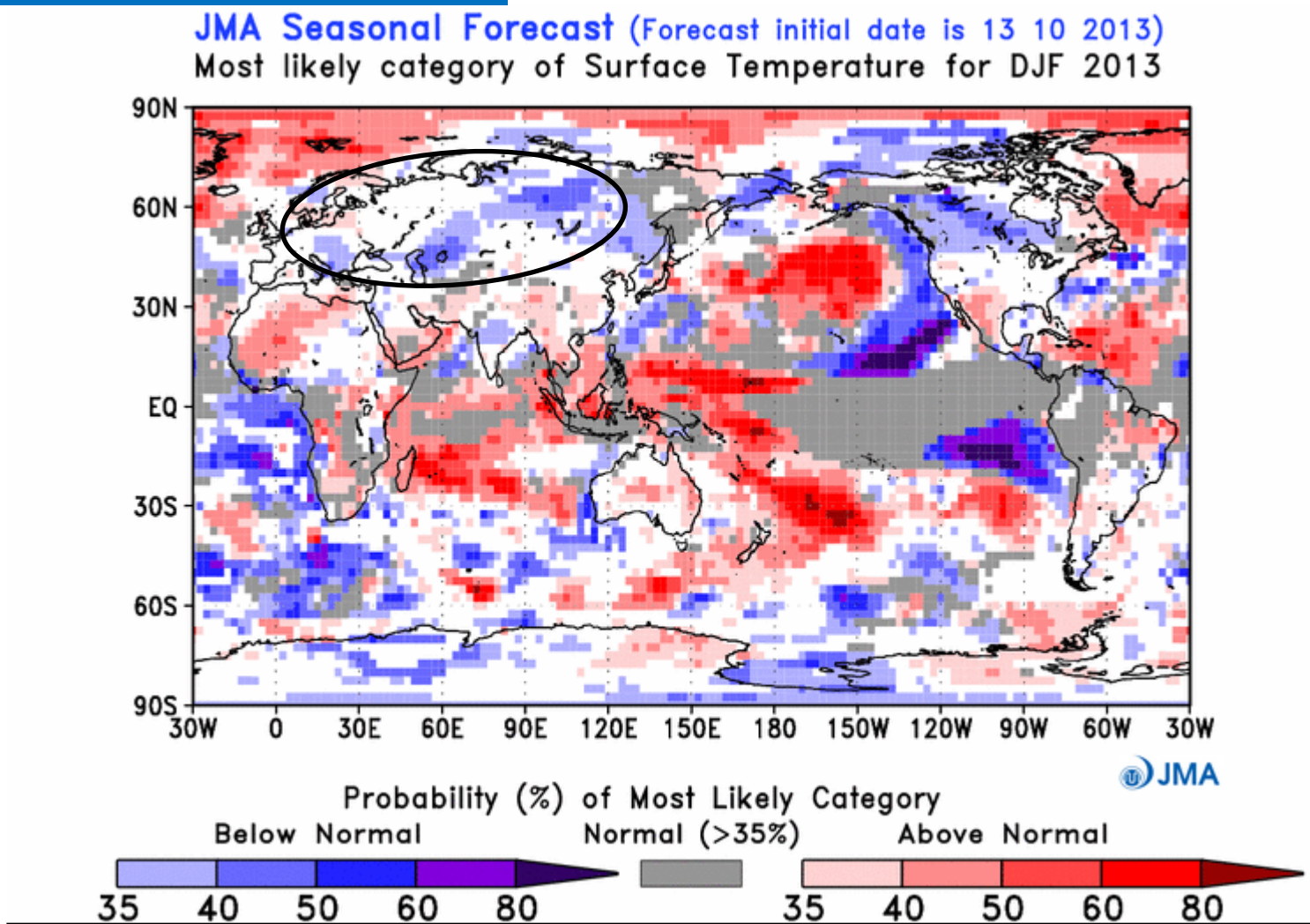


# Predicted SLP and T850 in N.H. (DJF 2013/2014)



# Probability Forecasts (DJF 2013/2014)

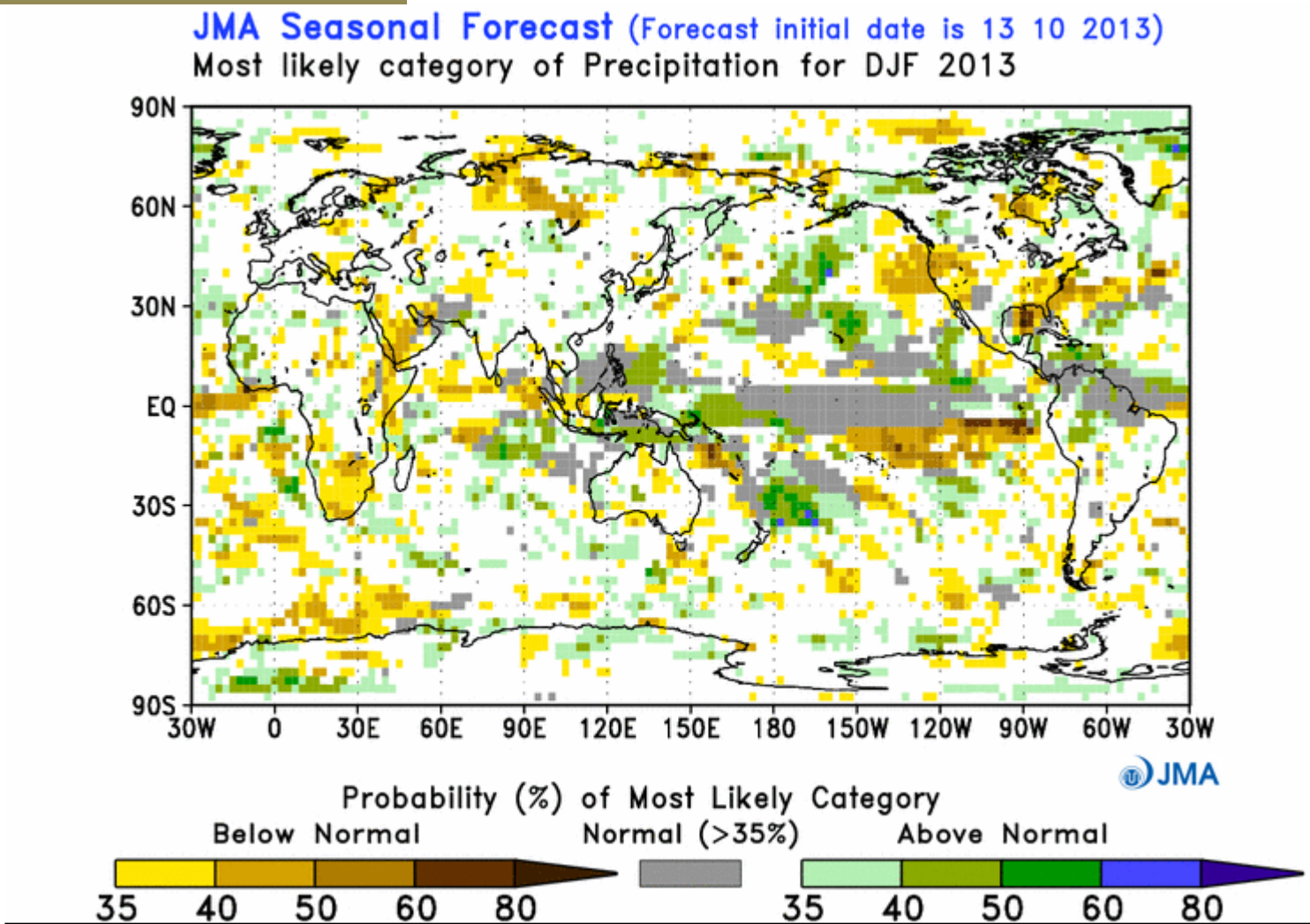
## Surface temperature




http://ds.data.jma.go.jp/tcc/tcc/products/model/probfcst/7mE/fcst/fcst_gl.php

# Probability Forecasts (DJF 2013/2014)

## Precipitation



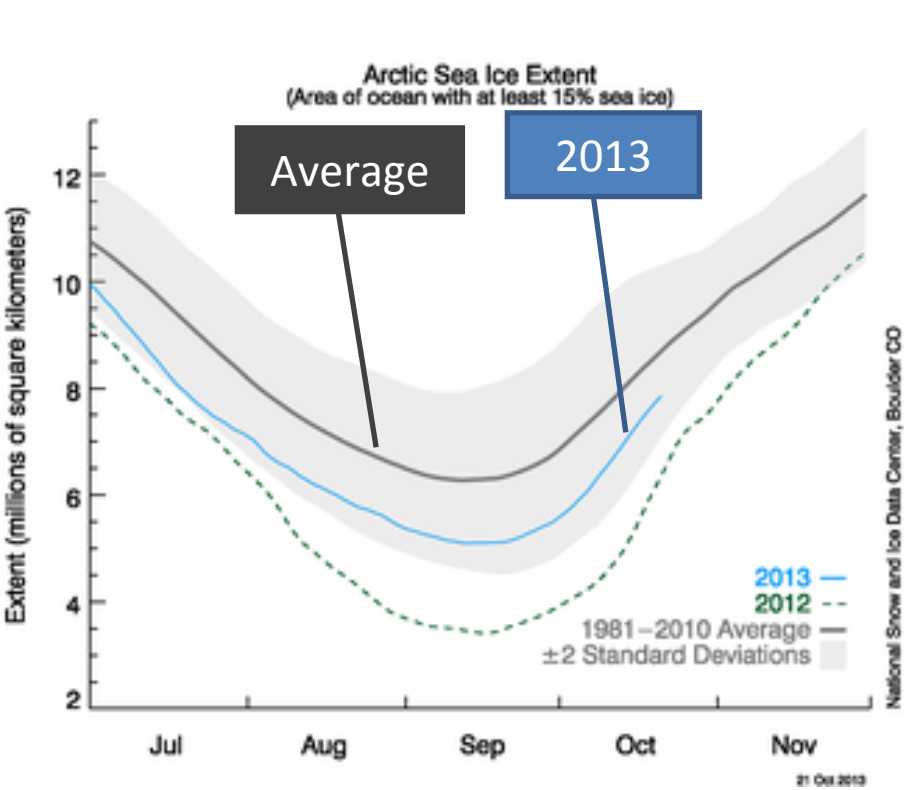

http://ds.data.jma.go.jp/tcc/tcc/products/model/probfcst/7mE/fcst/fcst_gl.php

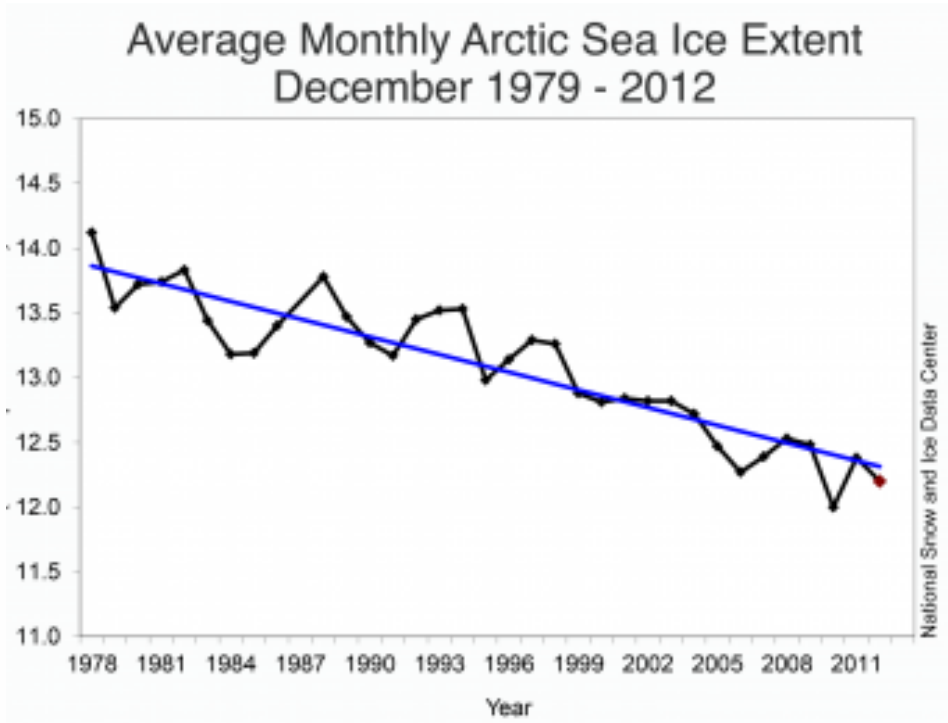
1. Numerical prediction

2. Interannual variation

# Arctic sea ice extent

- The sea-ice extent shows a decline since 1979.
- The current extent is less than normal.



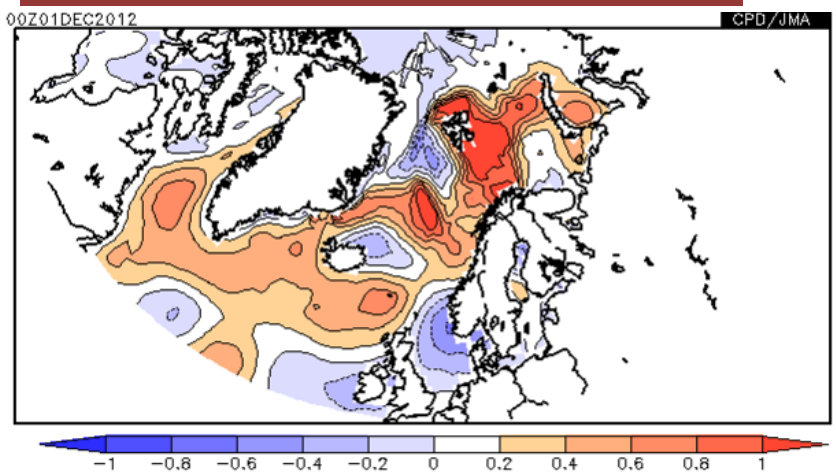




Source: National Snow and Ice Data Center, the USA

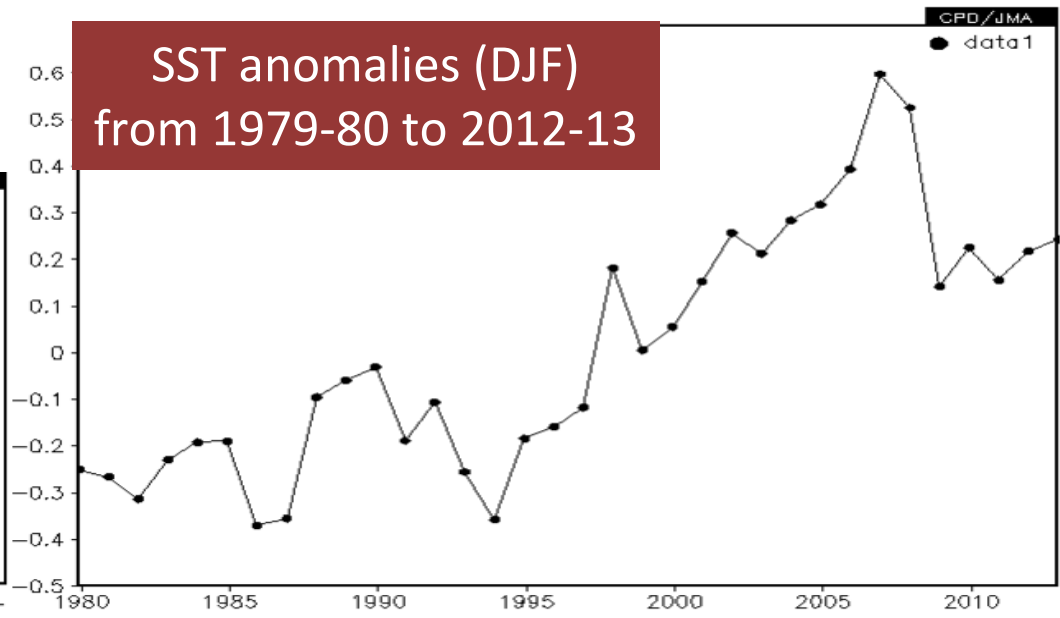
# SSTs in northern North Atlantic (DJF)

• The SSTs show a increasing trend and above-normal conditions in the last decade.

SST anomalies (DJF 2012/2013)




SST anomalies (DJF)
from 1979-80 to 2012-13

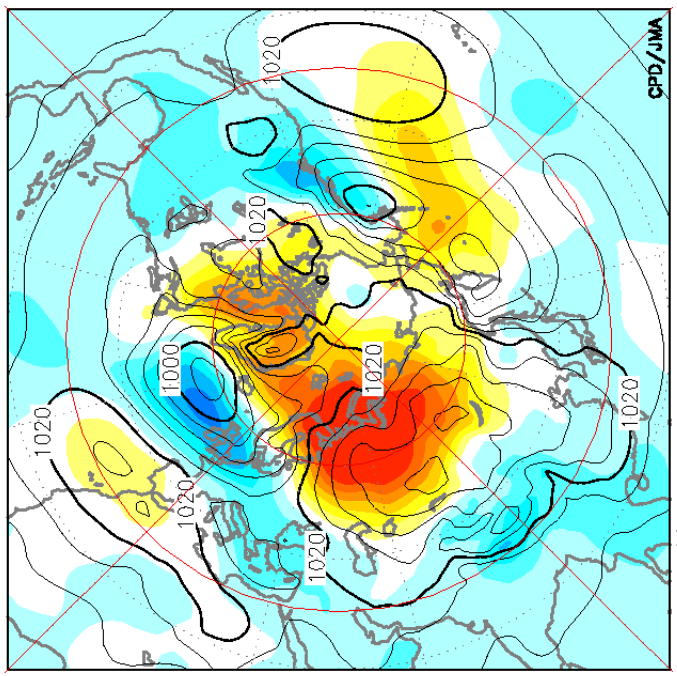



Interannual variation of DJF-mean SST anomalies averaged in the northern Atlantic and the Arctic Sea (50N-90N, 50W-50E) from 1979-1980 to 2012-2013

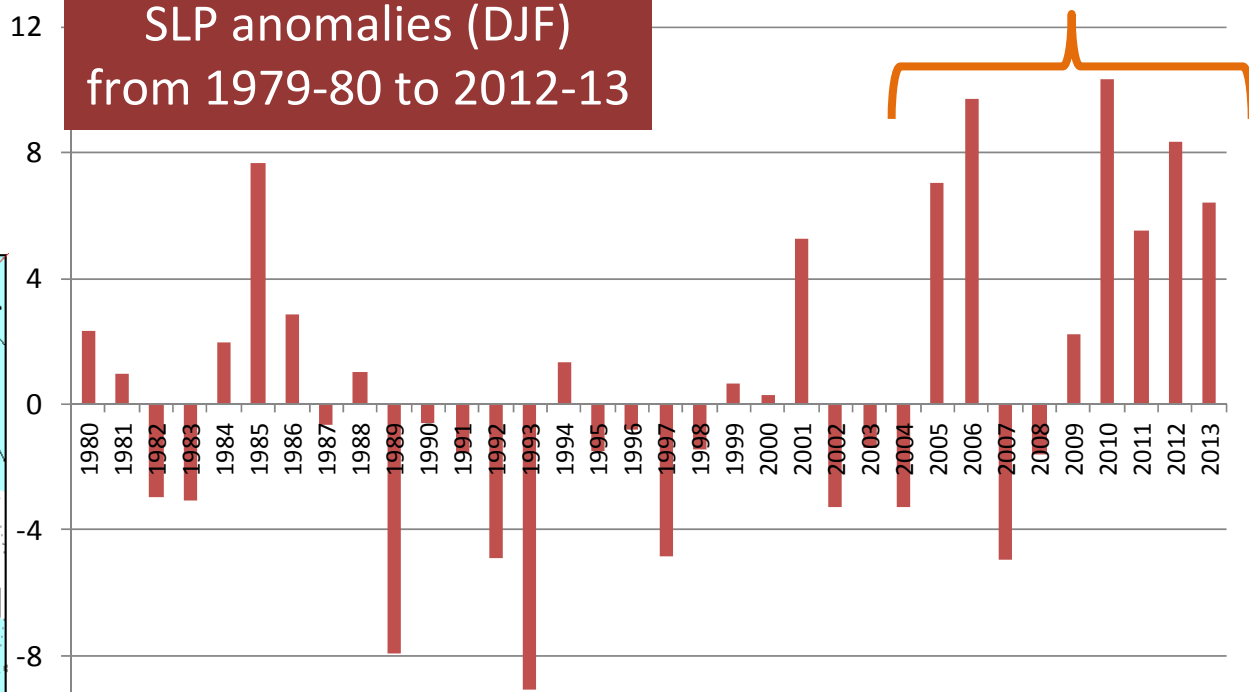
# SLP over northern Eurasia

• The SLP shows a tendency of above-normal conditions in recent years.

SLP and anomaly (Dec. 2012)




SLP anomalies (DJF) from 1979-80 to 2012-13



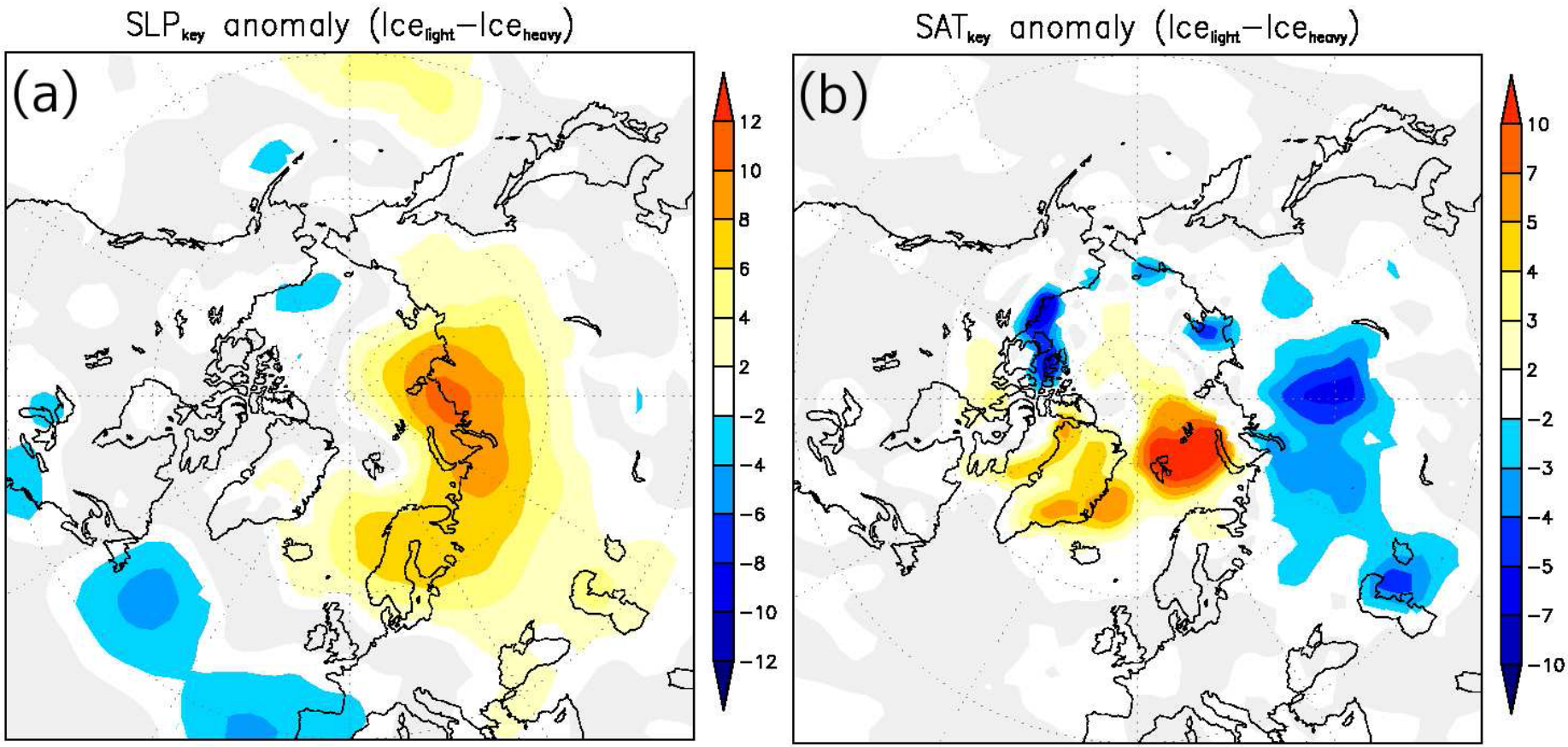

DJF-mean SLP anomalies averaged over northern North Eurasia (60-75N, 45-120E) from 1979/1980 to 2012/2013

Data: JMA-25/JCDAS

# Possible impacts of Arctic sea-ice anomalies

Sea level pressure (SLP)

Surface air temperature (SAT)




Differences of SLP and SAT (DJF) between light-ice years and heavy-ice years

Gray shading indicates areas with less than a 99% confidence level.

Inoue et al. (2012)

# Summary

**<Numerical prediction>**

- ENSO-neutral conditions is likely to persist during winter 2013-2014.
- The predicted patterns are generally similar to those observed in past La Nina winters.
- Surface temperatures in North Eurasia are likely to be below normal due to negative phase of AO and positive SLP over its northern part (not high confidence).

**<Interannual variation>**

- SLP in northern North Eurasia shows a increasing tendency, which may be associated with light sea-ice extent and warm SSTs in the northern North Atlantic and the Arctic Sea.


Thank you
Contact: tcc@met.kishou.go.jp

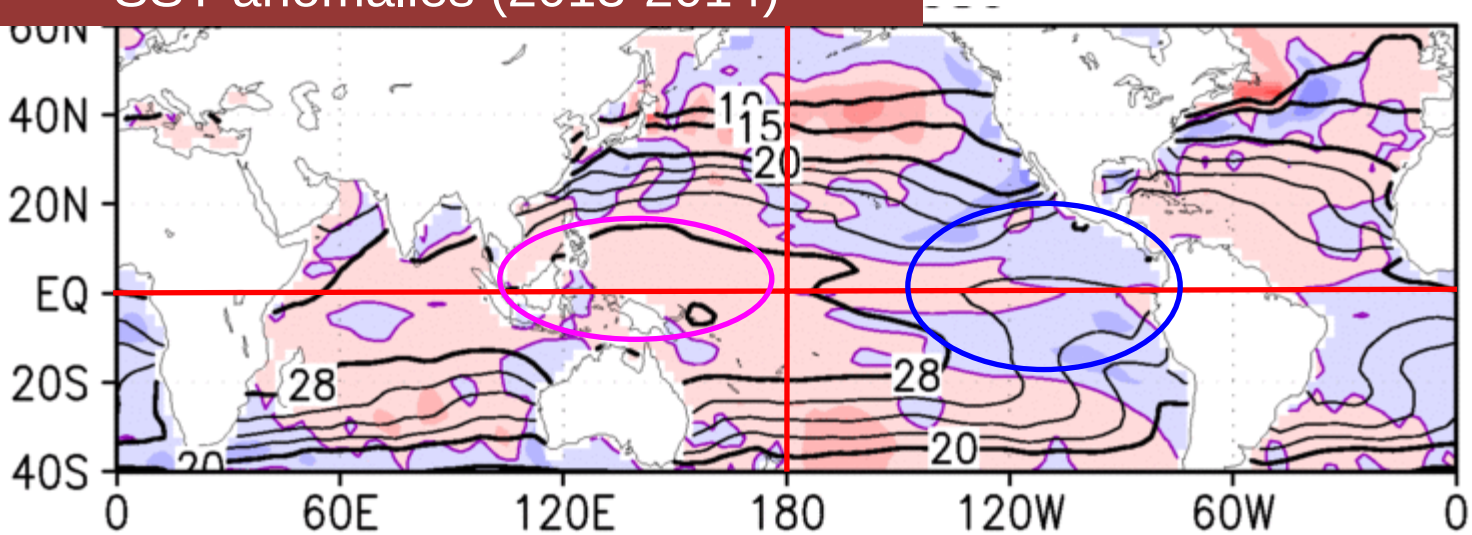
# Supplements

# JMA Seasonal Prediction System

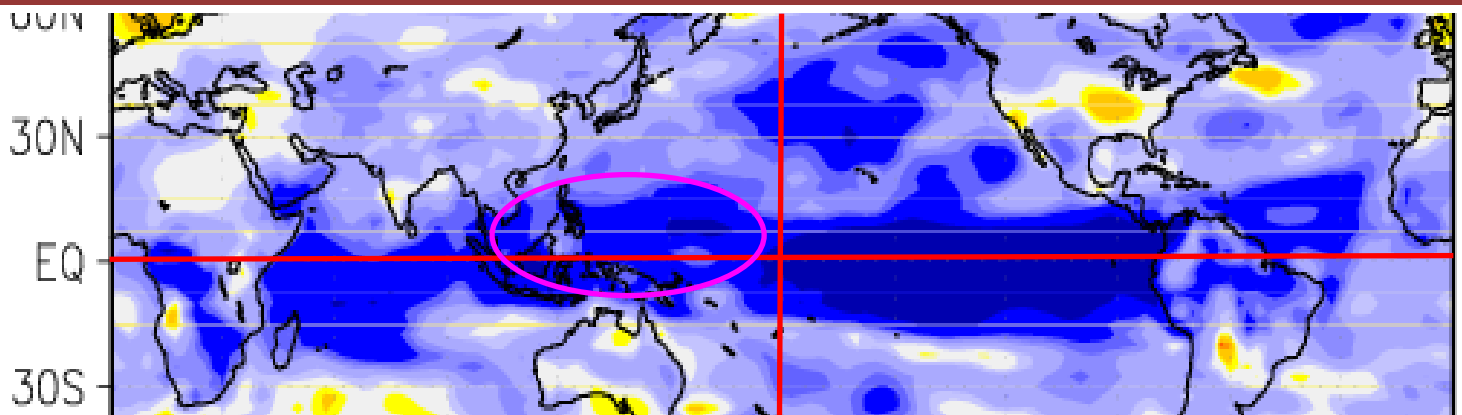
| | |
|---|---|
| Model | CGCM (MRI/JMA-CGCM)<br>(Coupled atmosphere-ocean General Circulation Model) |
| Resolution | •Atmospheric component<br>Resolution: **$T_L$95 L40**<br>•Oceanic component<br>Resolution: Horizontal 1.0º longitude, 0.3º–1.0º<br>Vertical: 50 levels |
| Ensemble method | •Method: Combination of Breeding of Growing Modes (BGM) and Lagged Average Forecast (LAF)<br>•Size: **51** (9 BGMs & 6 days with 5-day LAF) |
| Frequency of forecast issuance | Once a month |
| Hindcast | 1979-2010 (32 years)<br>Verification data: JRA-25/JCDAS, GPCP ver. 2.2 |

# Verification of SST (DJF)

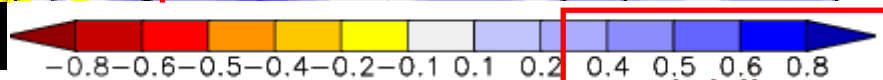
SST anomalies (2013-2014)




Prediction accuracy (based on 30-year hindcasts )




Anomaly correlation coefficients

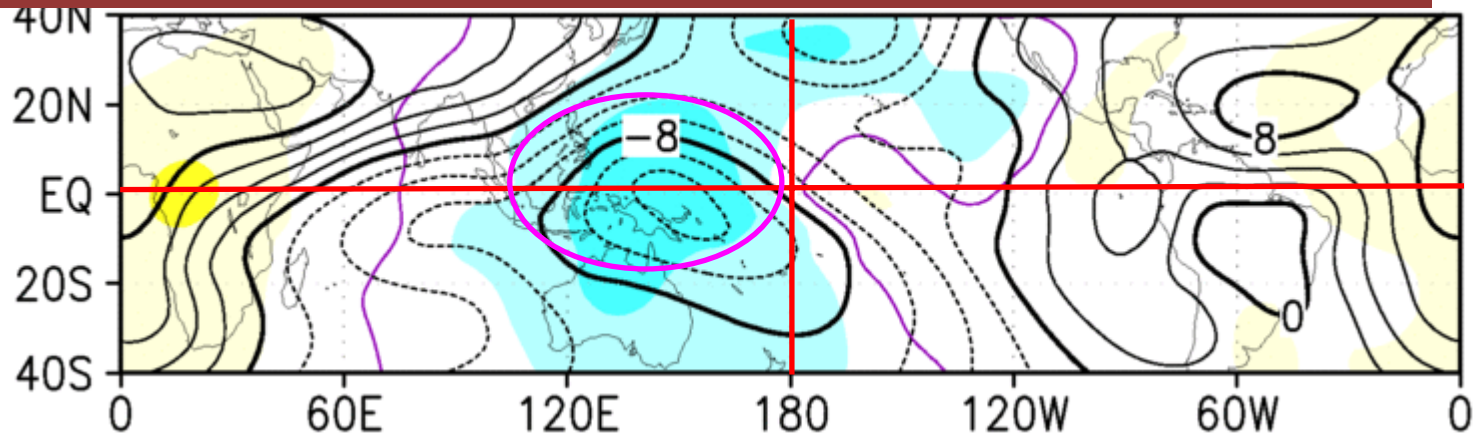



**Good skill**

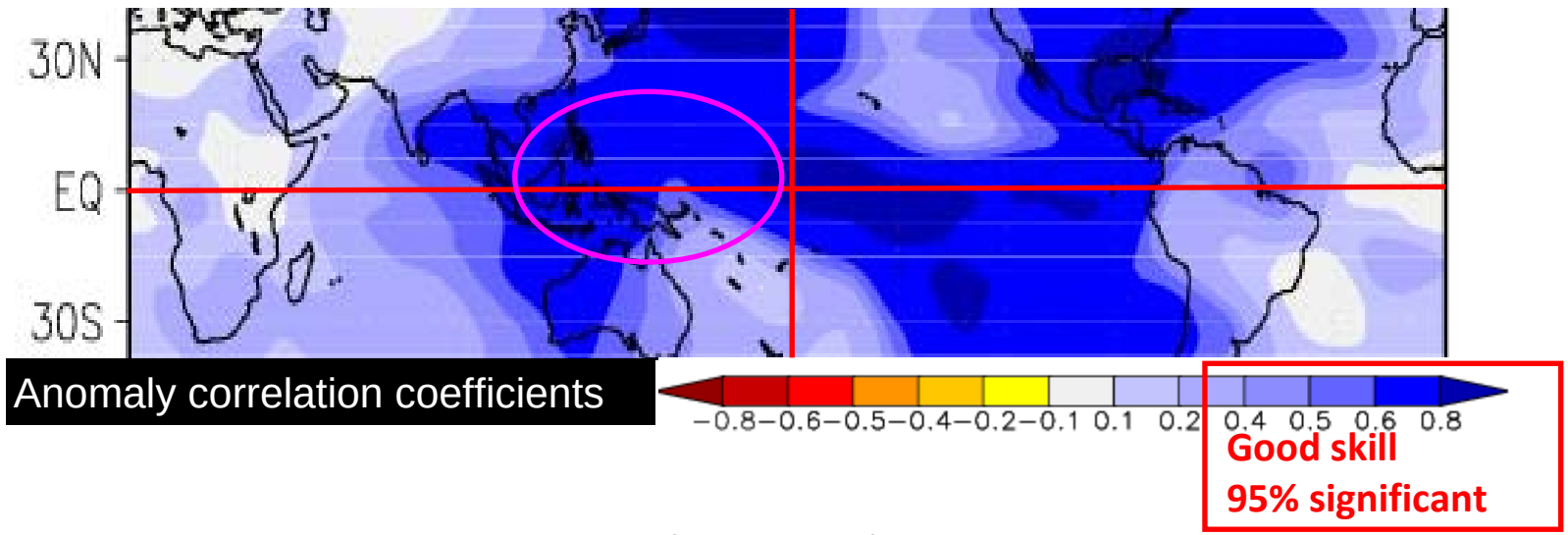
**95% significant**

# Verification of 200-hPa velocity potential (DJF)

## 200hPa velocity potential and anomalies (2013/2014)

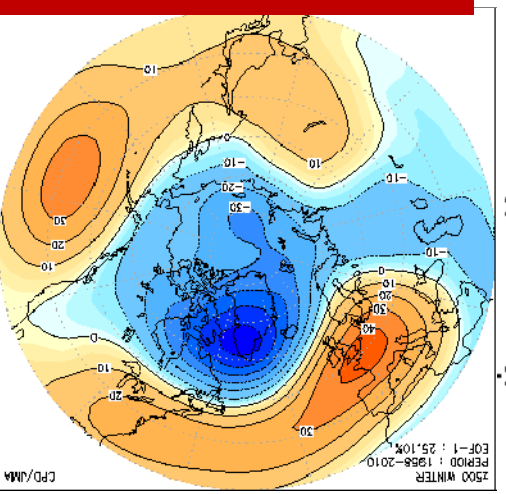



## Prediction accuracy (based on 30-year hindcasts )

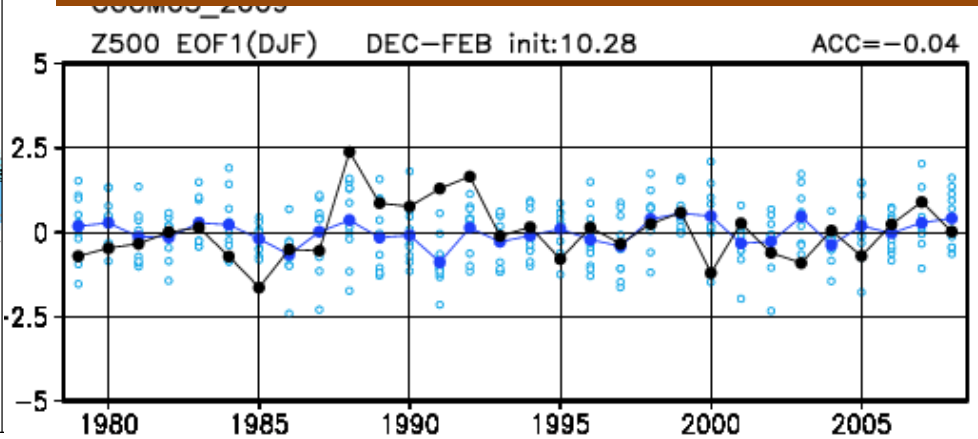


# Verification of major winter circulation patterns

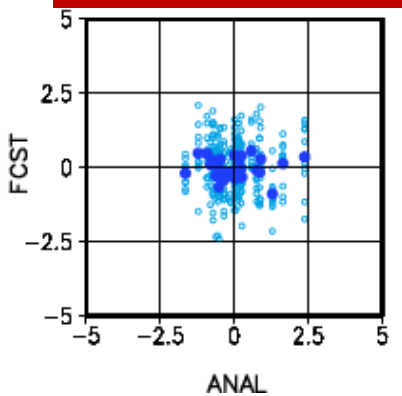
## Z500 EOF-1 (DJF)



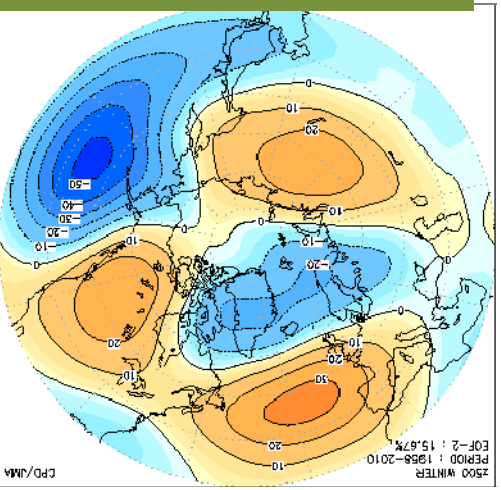
Anomaly Correlation Coefficient (ACC) between hindcast (1-month lead) and observation

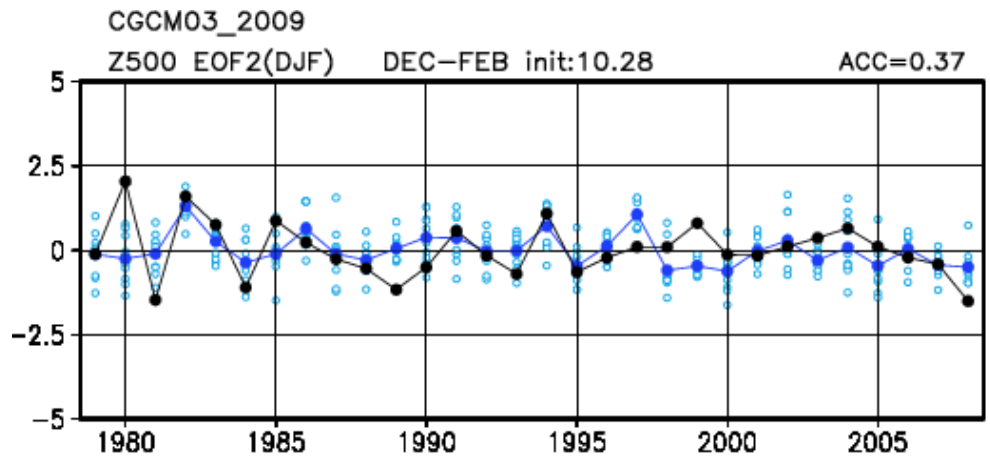



ACC: -0.04

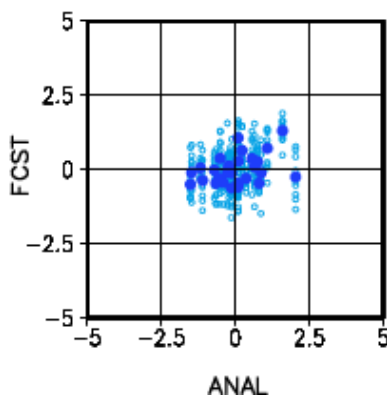



## Z500 EOF-2 (DJF)

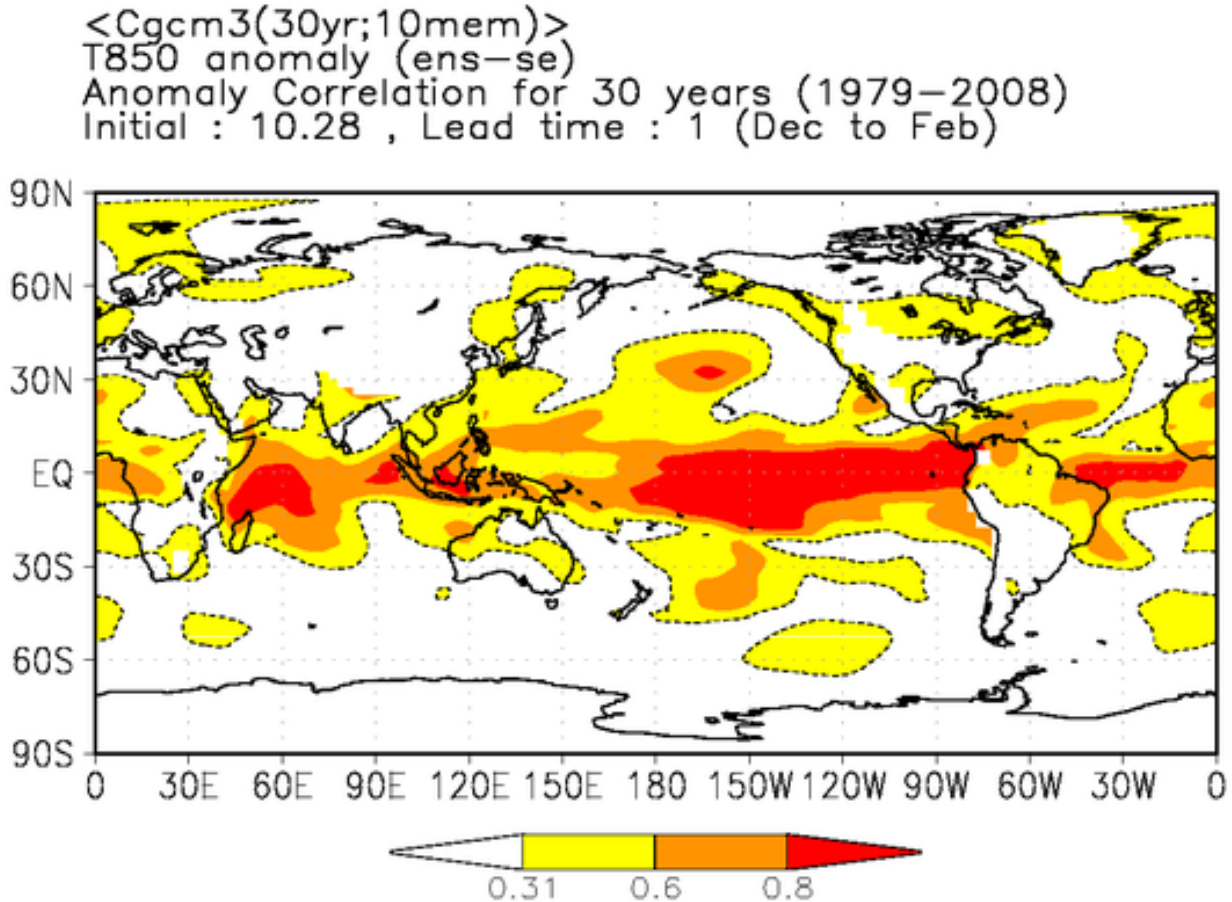





ACC: 0.37



# Verification of 850-hPa temperature (DJF)

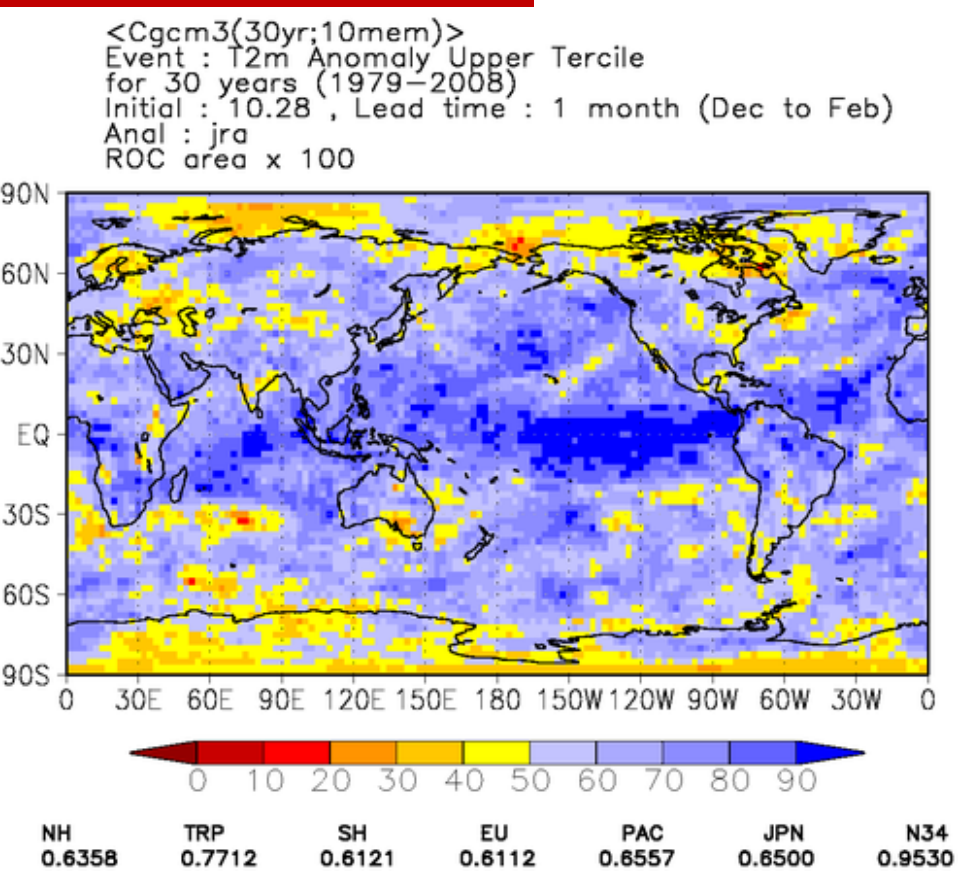



| NH | TRP | SH | EU | PAC | JPN | N34 |
|---|---|---|---|---|---|---|
| 0.234 | 0.571 | 0.162 | 0.211 | 0.240 | 0.264 | 0.924 |

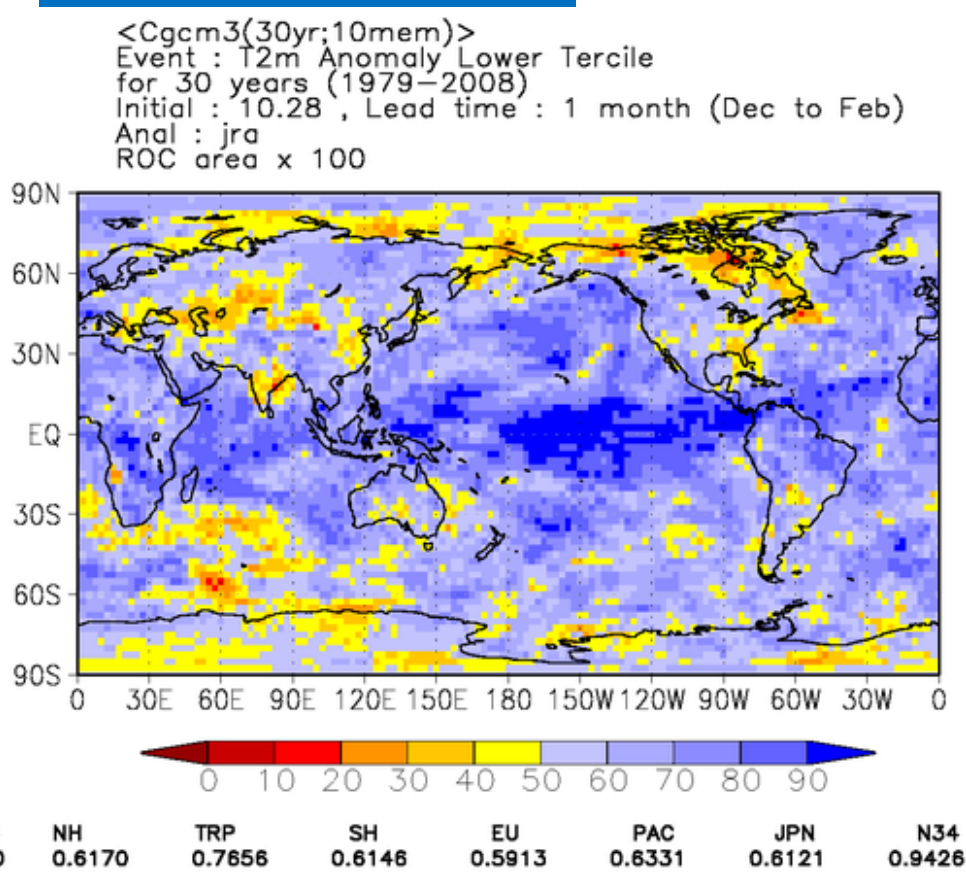
Anomaly correlation coefficients (ACC) between 30-year hindcasts and JRA/JCDAS

# Verification of probabilistic forecasts for surface temperature (DJF)

## Above-normal



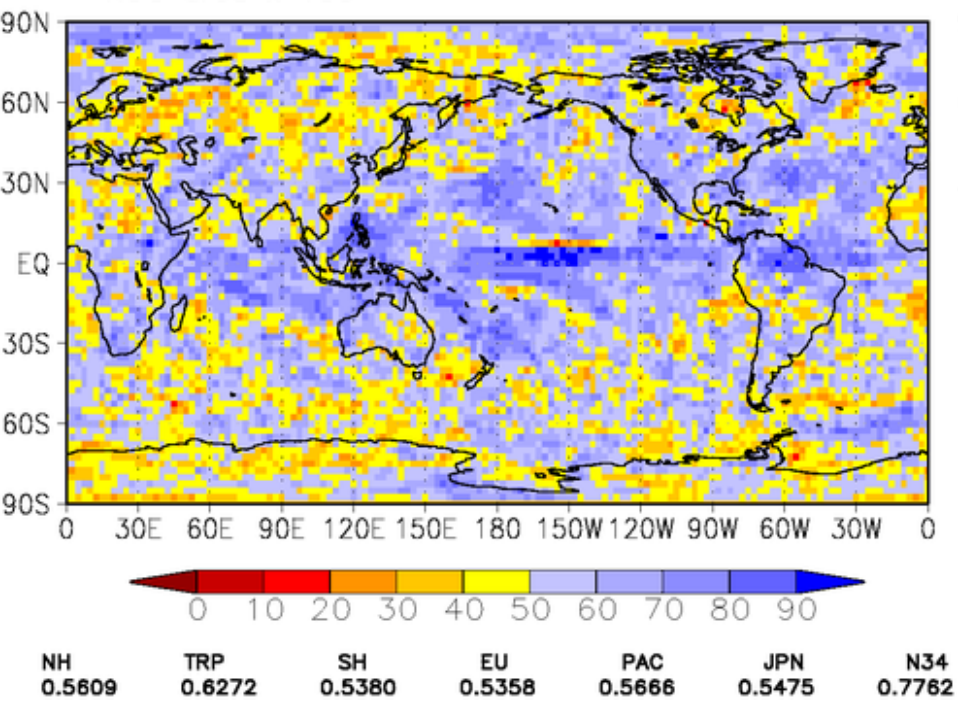

## Below-normal




Relative Operating Characteristics (ROC) areas (Grid point verification)

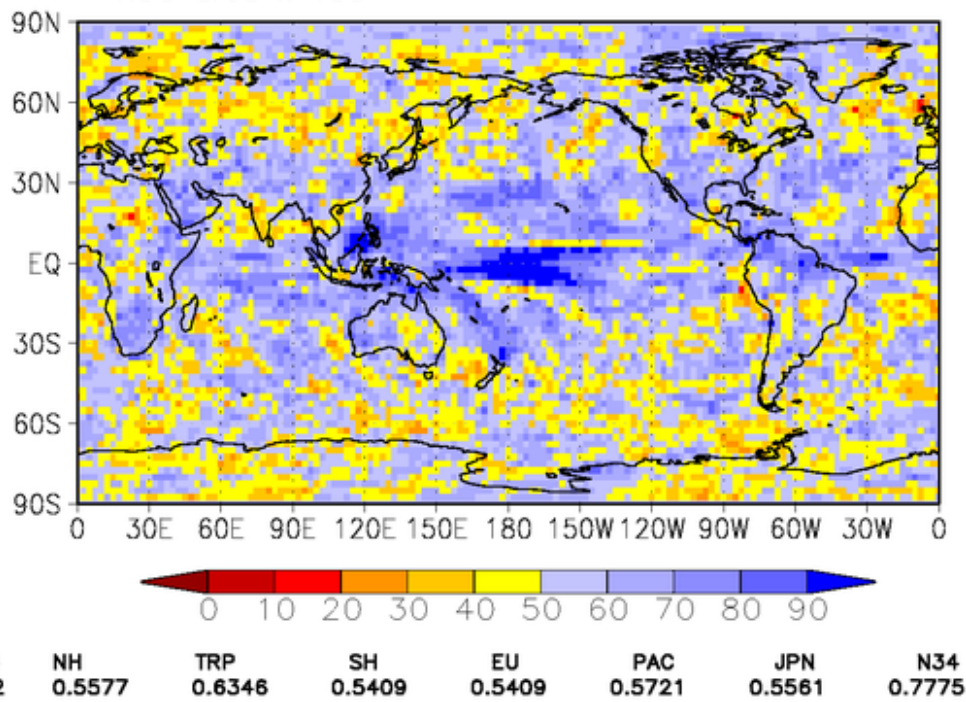
# Verification of probabilistic forecasts for precipitation (DJF)

## Above-normal




| NH | TRP | SH | EU | PAC | JPN | N34 |
|---|---|---|---|---|---|---|
| 0.5609 | 0.6272 | 0.5380 | 0.5358 | 0.5666 | 0.5475 | 0.7762 |

## Below-normal

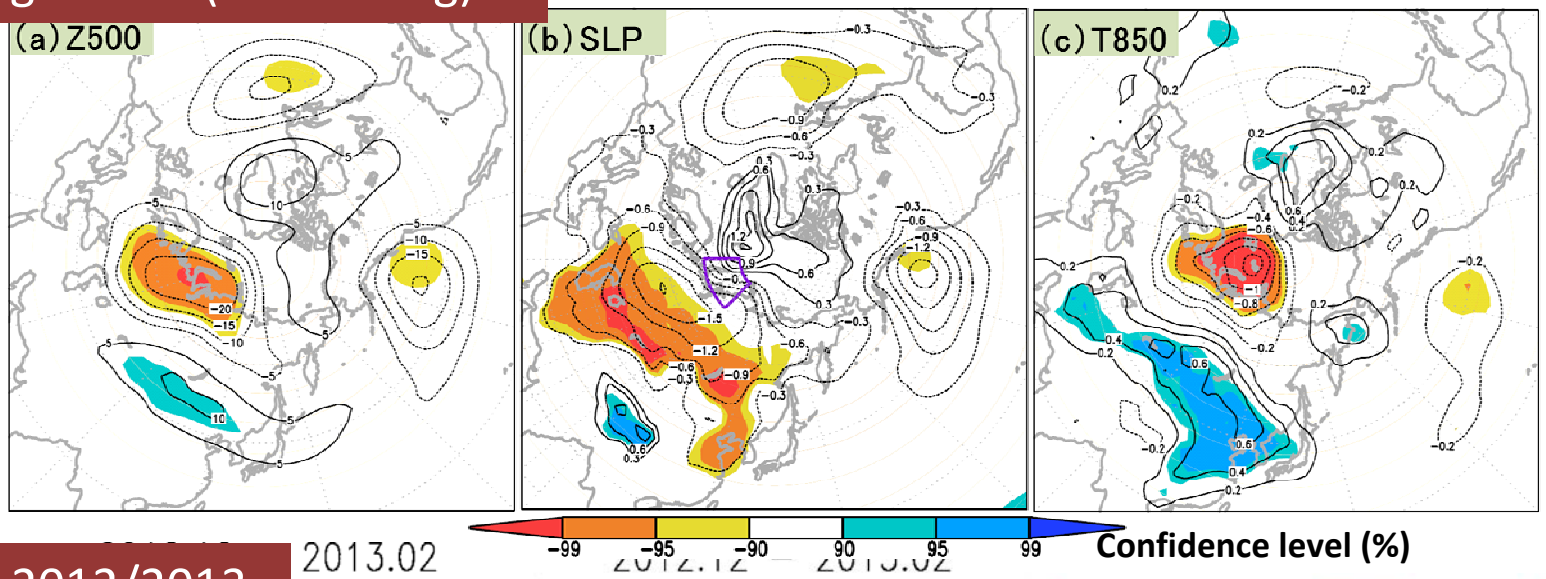



| NH | TRP | SH | EU | PAC | JPN | N34 |
|---|---|---|---|---|---|---|
| 0.5577 | 0.6346 | 0.5409 | 0.5409 | 0.5721 | 0.5561 | 0.7775 |

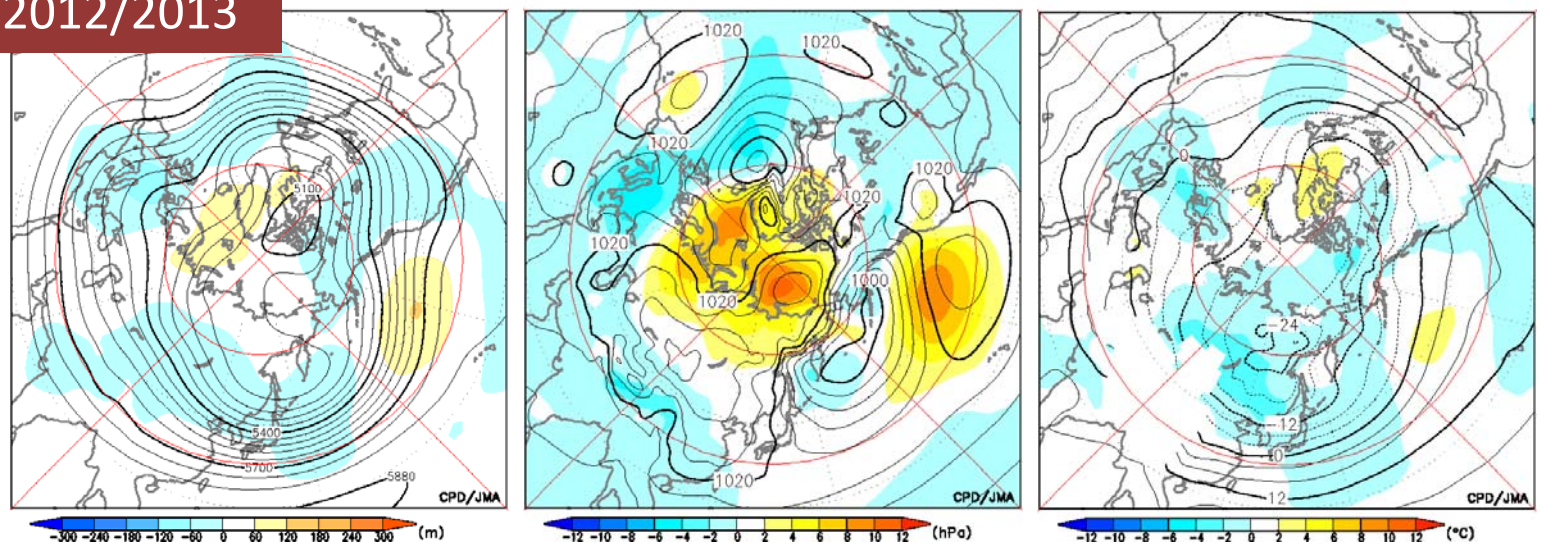
Relative Operating Characteristics (ROC) areas (Grid point verification)

# Regression onto the Barents Sea's Ice (DJF)

Regression (detrending)




DJF 2012/2013

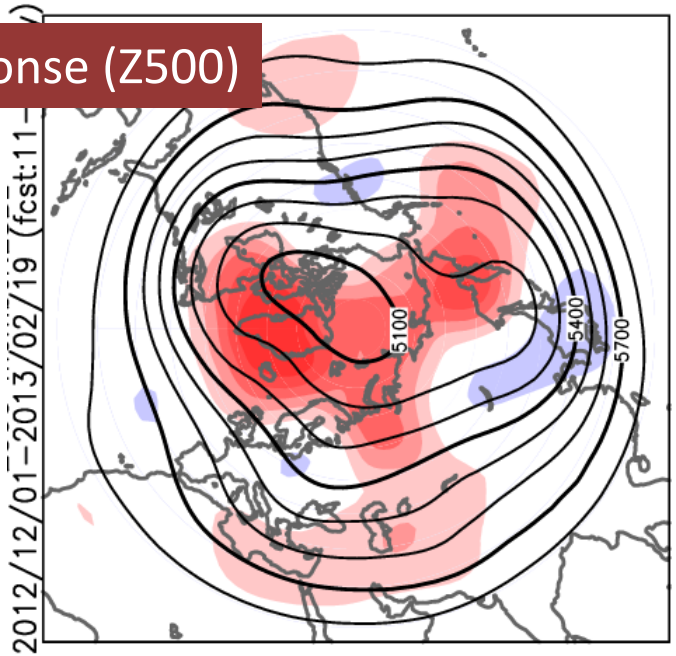



Upper: Sea ice concentration averaged in the Barents Sea (45-90E, 70-80N

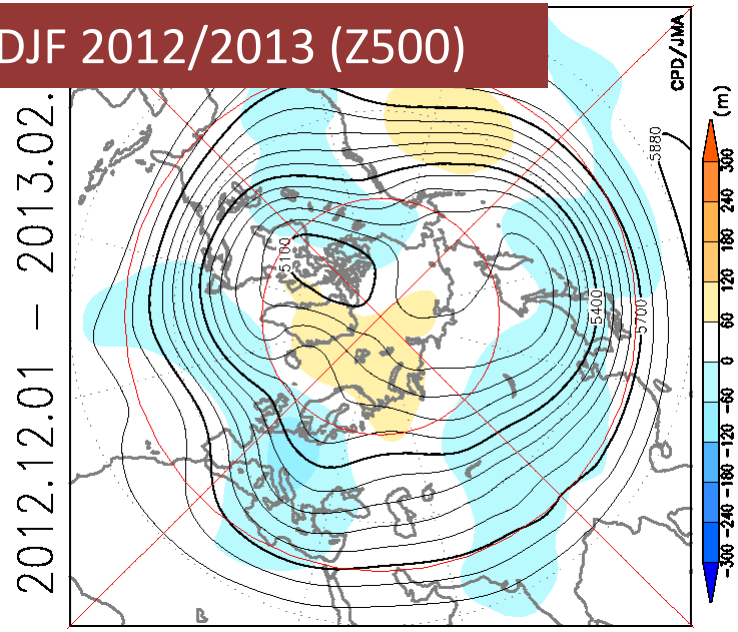
The time period for the statistics is 1979/80 – 2010/11.

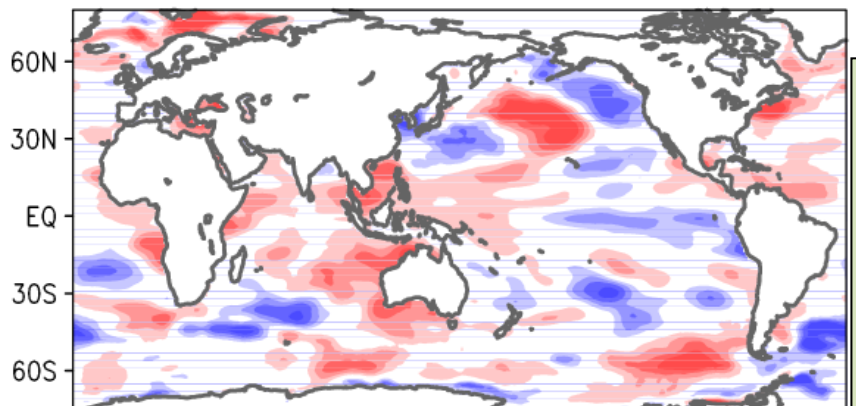
# SST and sea ice impact experiment (last winter)

Response (Z500)




DJF 2012/2013 (Z500)




Averaged anomaly of SST forcing AGCM

−1 −0.75 −0.5 −0.25 0.25 0.5 0.75 1

Top left: AGCM responses in the 500-hPa height field to daily SST and sea ice anomalies (deviations between ensemble-mean responses forced with real SSTs and those done with normal SSTs).

Top right: 500-hPa height and anomalies for winter 2012/2013

Bottom: SST anomalies for winter 2012/2013