Outlook of East Asia Winter Monsoon for 2017/2018

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Outline

1. EAWM System

2. Prediction by BCC_CSM 1.1m, BCC/CMA

3. Statistic Analysis and outlook for EAWM

4. Outlook for temperature and precipitation in China

(I)EAWM system and potential boundary forcing

AO

Blocking

Siberian High

EAT

India-Burma Trough

WPSH
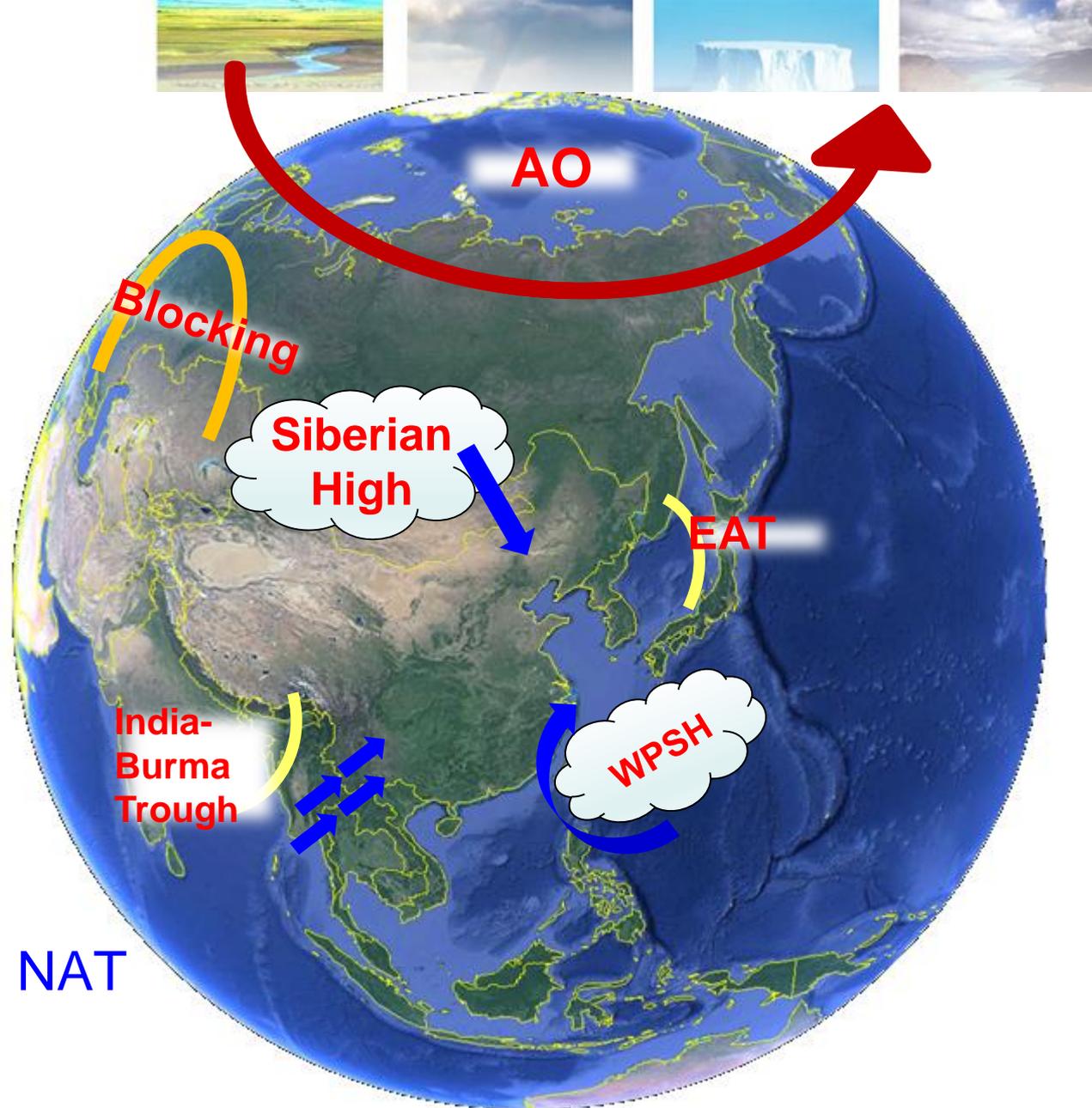
SSTA (ENSO, IO, NAT
Sea Ice
Snow Cover

(II) Prediction by BCC_CSM1.1m

Model prediction Scheme

Model : Climate System model (BCC_CSM1.1m)

Resolution of Atm. : T106 (~110 km) ; Tropical ocean : 30 km.

Initial data :

Atm. : NCEP daily reanalysis (Air Temp., winds, SLP, etc)

Ocean : NCEP_GODAS monthly, Pentad reanalysis

Ensemble members : 24 (15 LAF+9 SV)

Prediction range : 13 months (from 2015.10.1~2016. 10.31)

Hindcast time period : 1991~2010

Operational starting date of the model : Dec., 2014

The second generation dynamical extended range forest（DERF2.0）

The second generation seasonal prediction model

BCC_CSM1.1(m)

Atmosphere
BCC_AGCM2.2

Coupler

Sea Ice
SIS

Ocean
MOM4_L40v2

Land Process
BCC_AVIM1.0
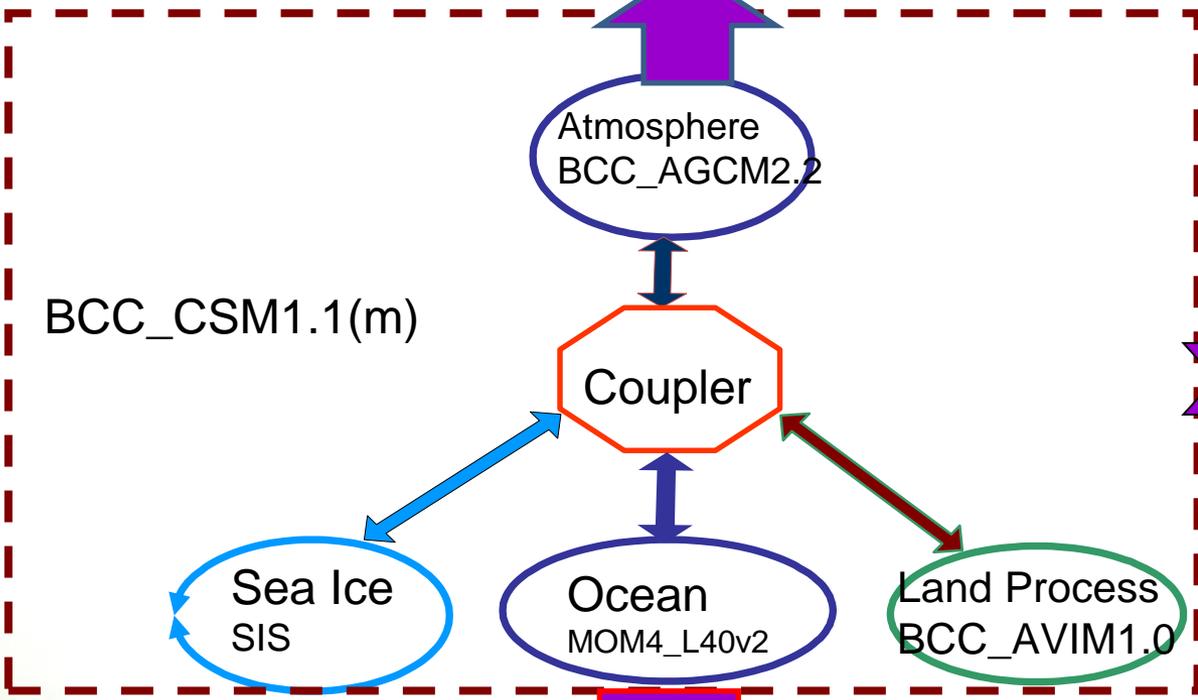
Regional climate model system

500 hPa GH

Hindcast skill

BCC_CSM for DJF (Cli.1991-2010)
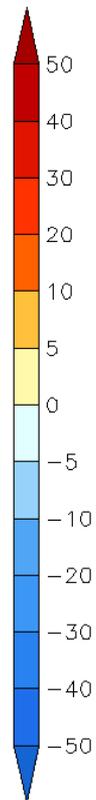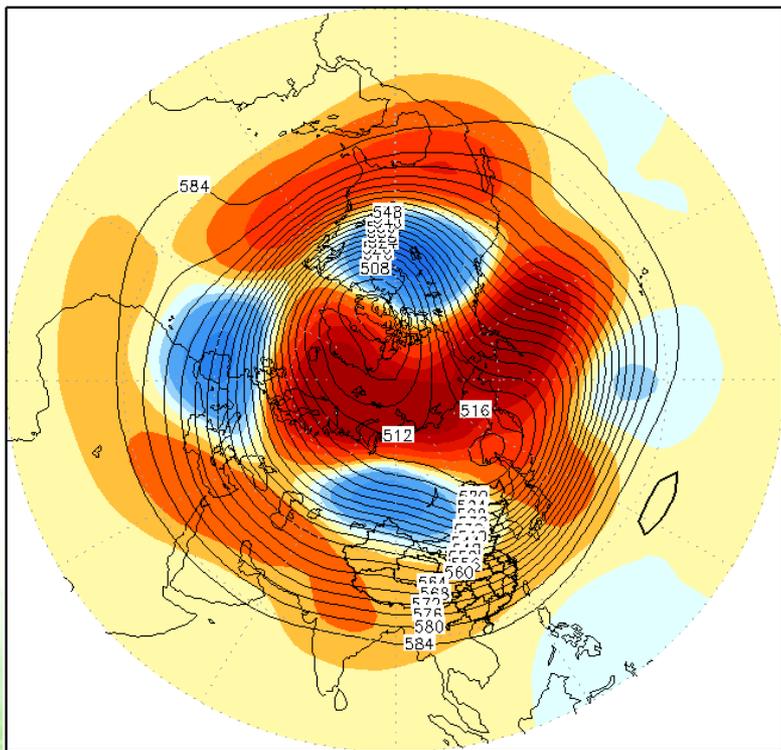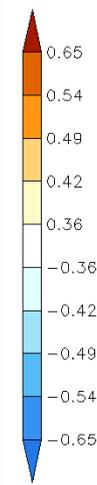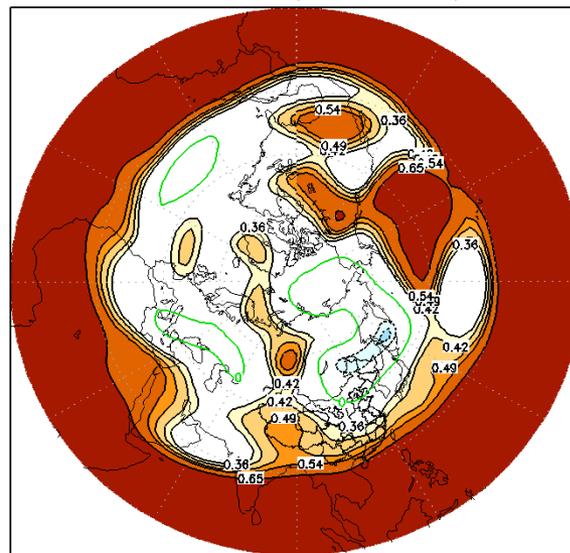
TCC of DJF (1991-2010)

**Zonal wind will dominate Europe and Asia mid-high latitudes
Weak west pacific subtropical high**

SLP

Hindcast skill

BCC_CSM for DJF (Cli.1991-2010)
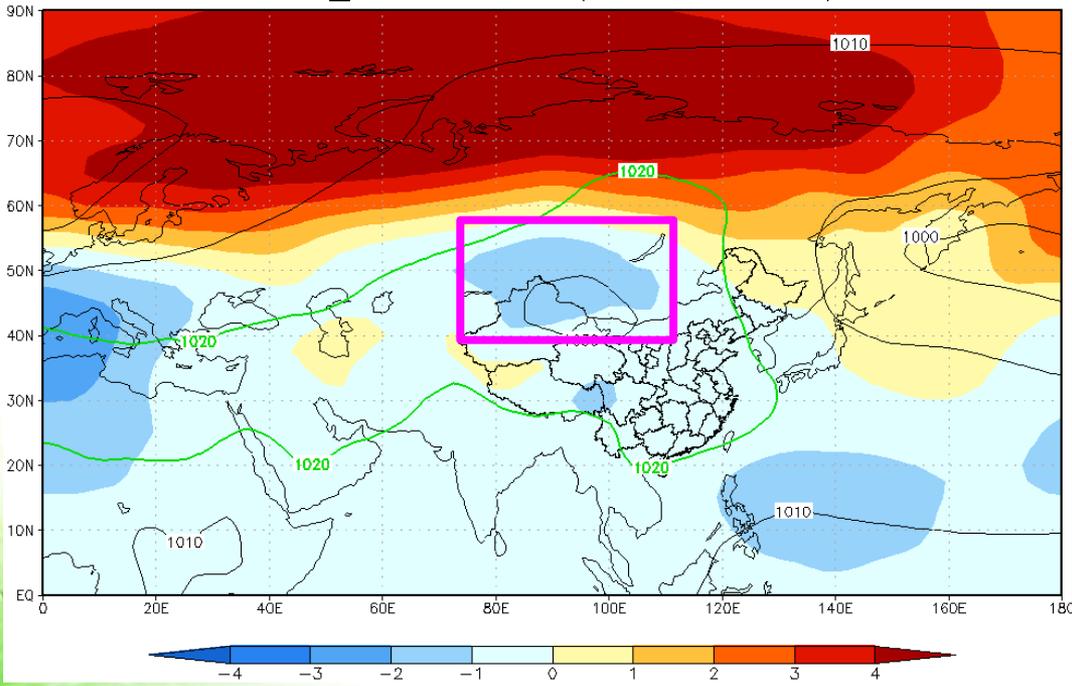
TCC of DJF (1991-2010)
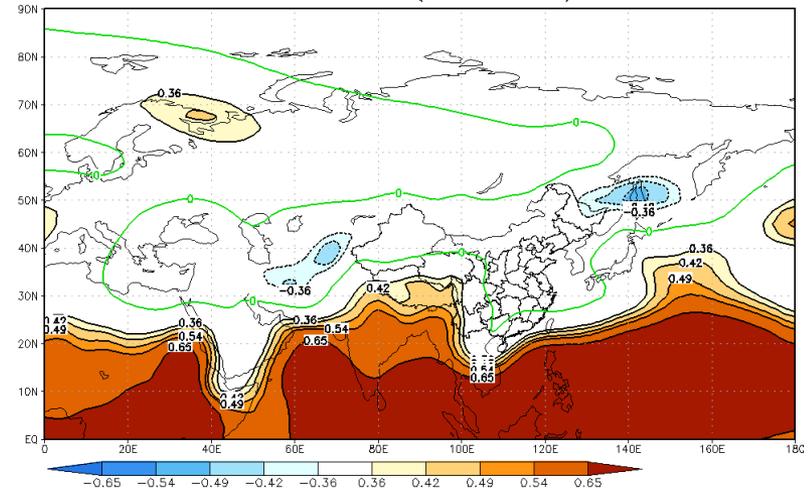
Weaken Siberia High

850hPa wind

Prediction

BCC_CSM for DJF (Cli.1991-2010)
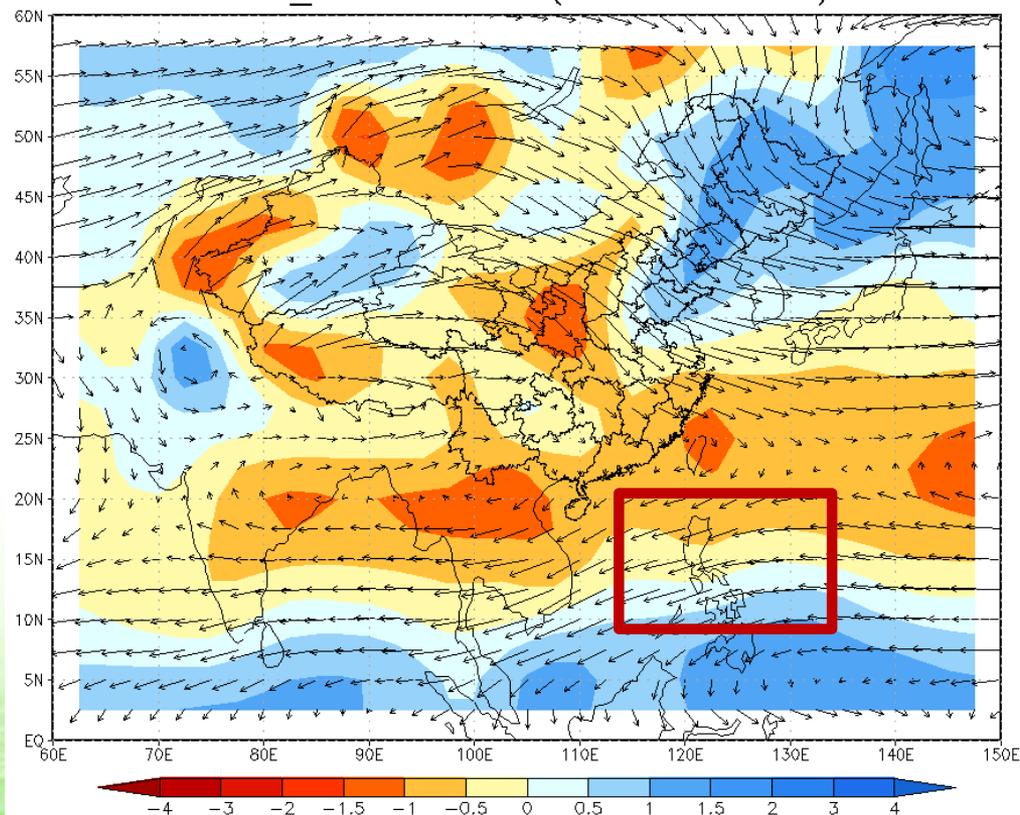
ACC of V850(DJF)
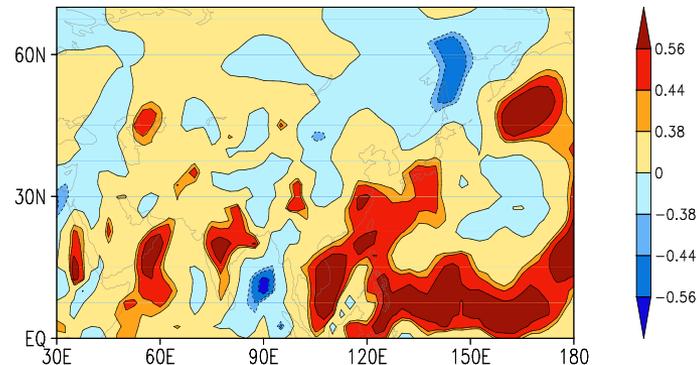
ACC of U850(DJF)
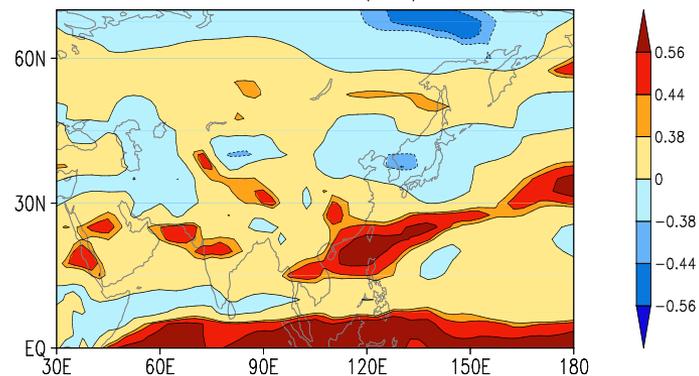
Hindcast skill

Cyclonic anomalies around Phillipines

From BCC_CSM1.1m

Relative higher skill information:

Cold water in Mid&East Tropical Pacific----cyclonic anomalies over the Philippines---- less rainfall over South China

weak EAWM (weak SH, weak EAT) ----warm over most of East Asia

Uncertainties:

AO: near normal
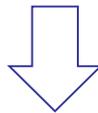
Statistical Analysis

potential boundary forcing：
- ENSO / Cold phase
- Arctic Sea Ice

Possible impact of Tropical SST on SH

SSTA-201709
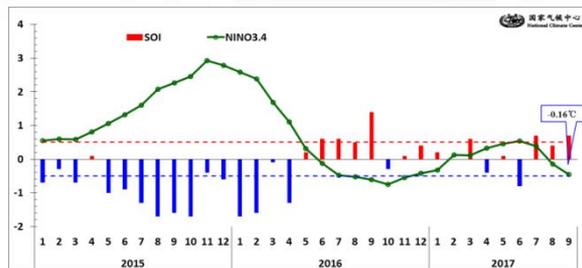
SSTA-SON
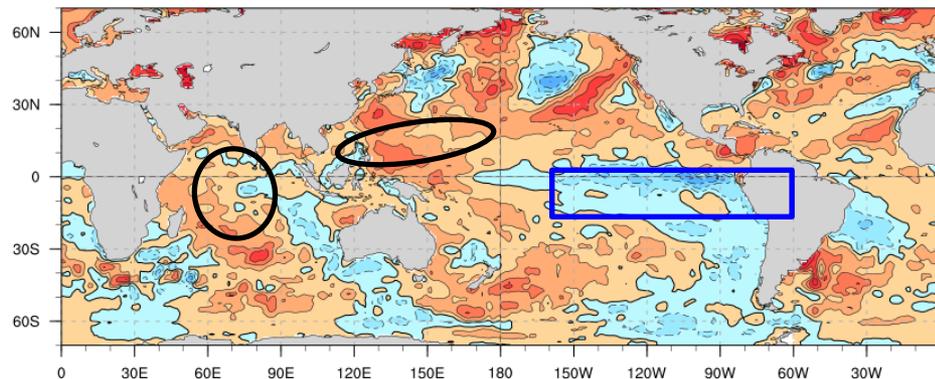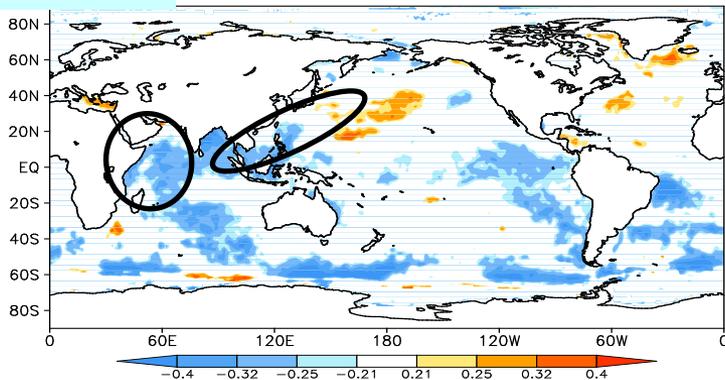
SSTA-DJF
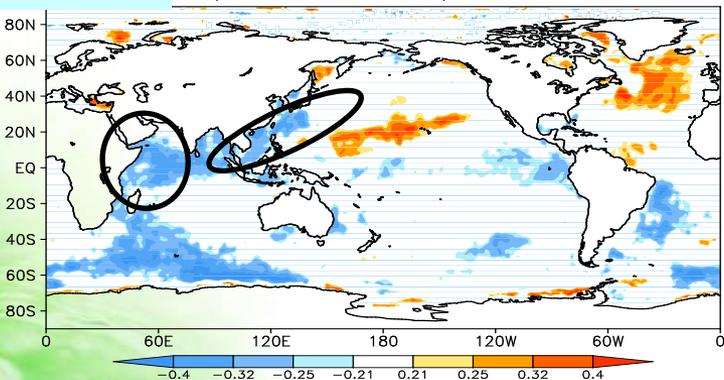
BCC_CSM1.1
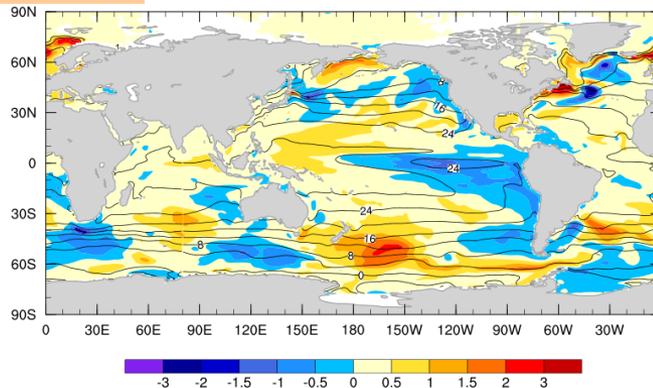
Joint impact of ENSO and AO on Temperature

Correlation of 850hPa wind and Nino3 index
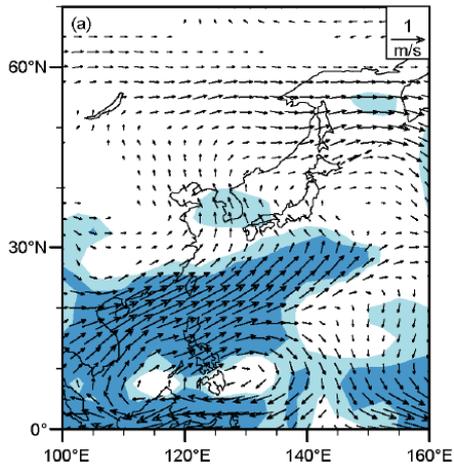
AO+

AO-

All month of DJF

El Nino

La Nina
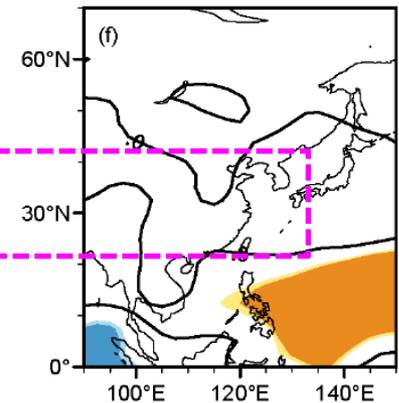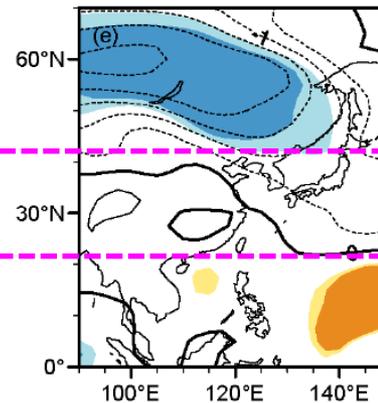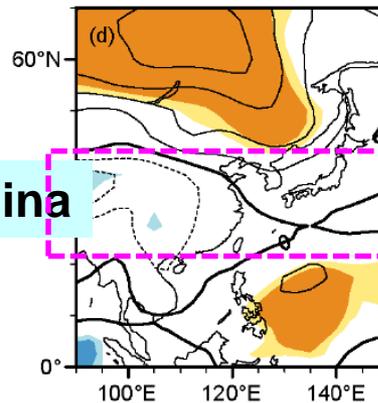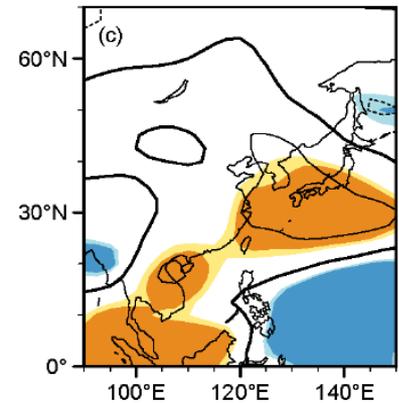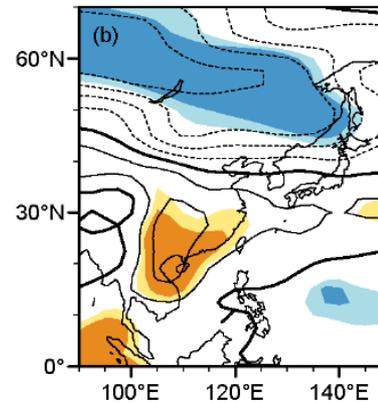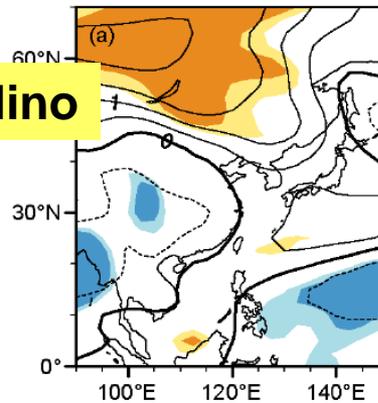
Not significant in mid-latitudes

Possible impact of SIC in BK Sea

SIC anomaly in Sep 2017

Arctic_SIC_Anomaly_2017(SEP)

Average Monthly Arctic Sea Ice Extent
September 1979 - 2017
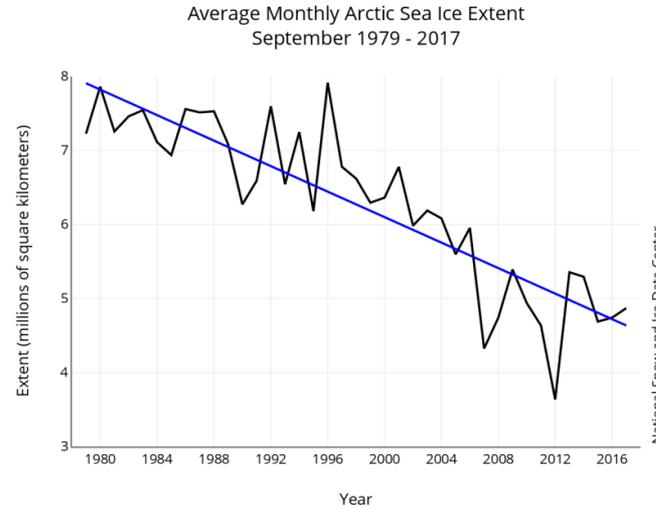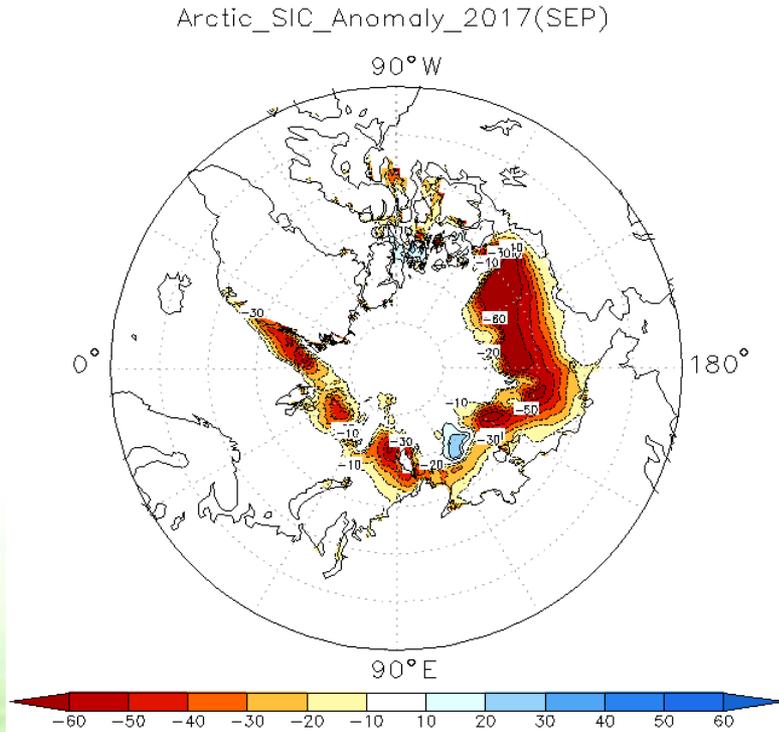
Barents-Kara Sea：
67.5-80.5N，20.5-80.5E

> ➢ Arctic sea ice is below normal, 7th least since 1979;
> ➢ Average Monthly Arctic Sea Ice Extent is slightly above normal after removing trend

September sea ice concentration provides a potential precursor for winter Siberian High. （Wu et al., 2011）

Possible impact of SIC in BK Sea

r = −0.65
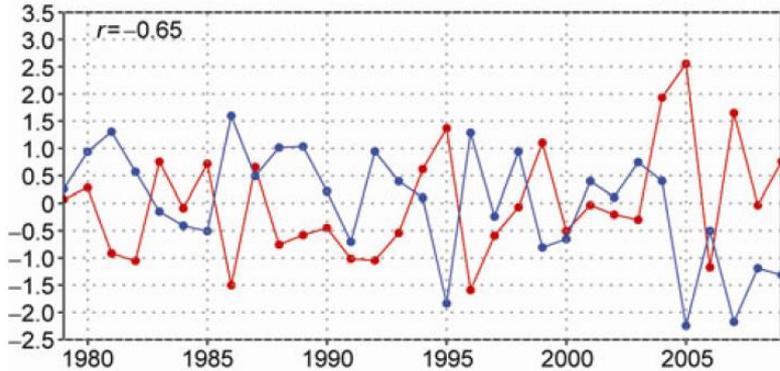
SH in DJF and SIC in Sep (detrend)

How about 2017/18?

Blue: SIC of SEP
Red: SH of DJF

Possible impact of SIC in BK Sea

The possibility of strong SH in 2017/18 winter is low

Statistical prediction of Arctic Oscillation Index

Precursors:

SIC

SST (sep-oct)
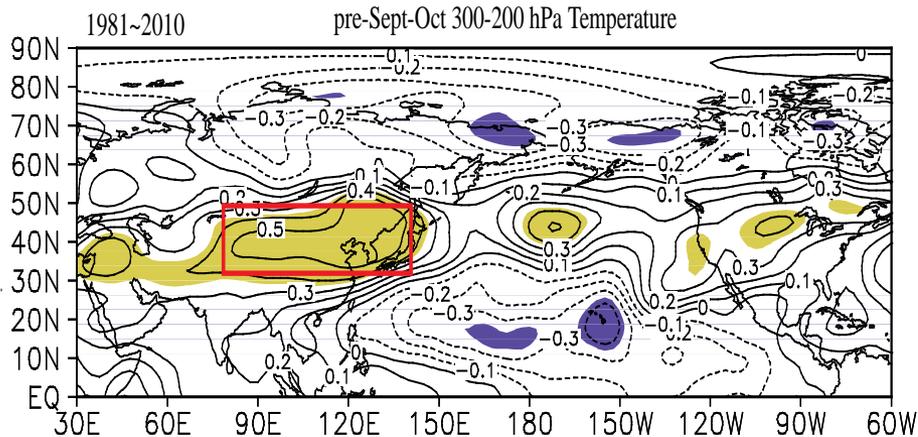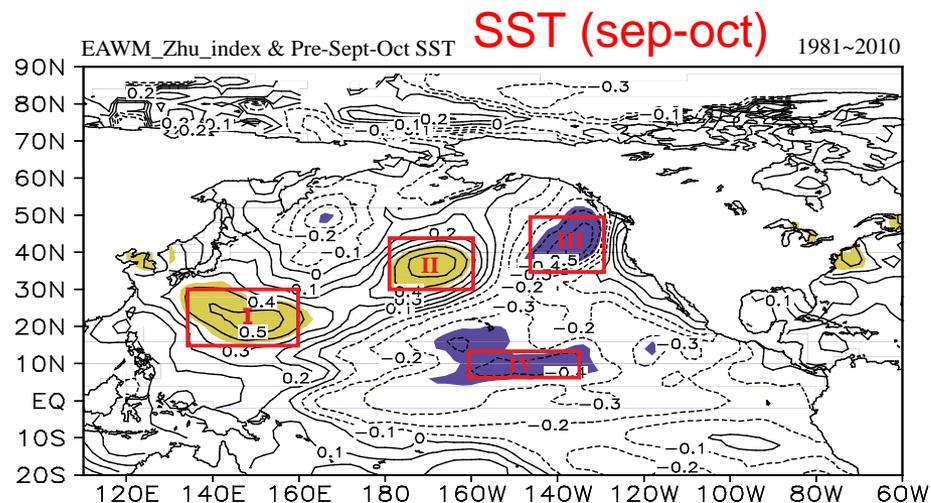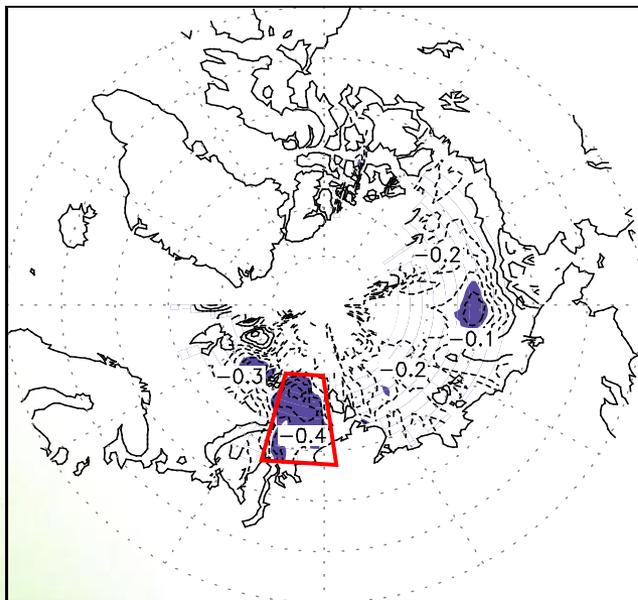
Air Temperature

Statistical Prediction of EAWM Index

Blue: Observation
Red: Prediction   **2017/2018: -0.31**

Weak EAWM in 2017/2018
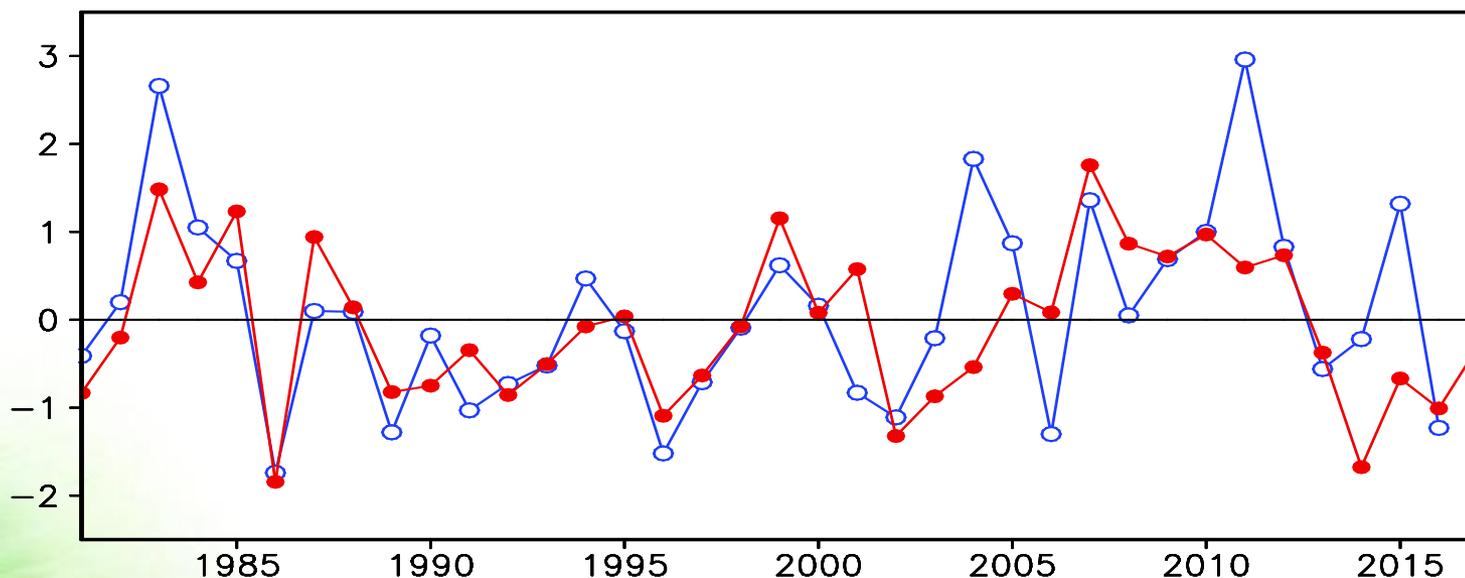
ACC(1981-2000): 0.85
ACC(2001-2011): 0.56

---LIU Ge

Statistic model: AO outlook

(a) Corr. 1950-2010   (b) Corr. 1950-1981   (c) Corr. 1982-2010
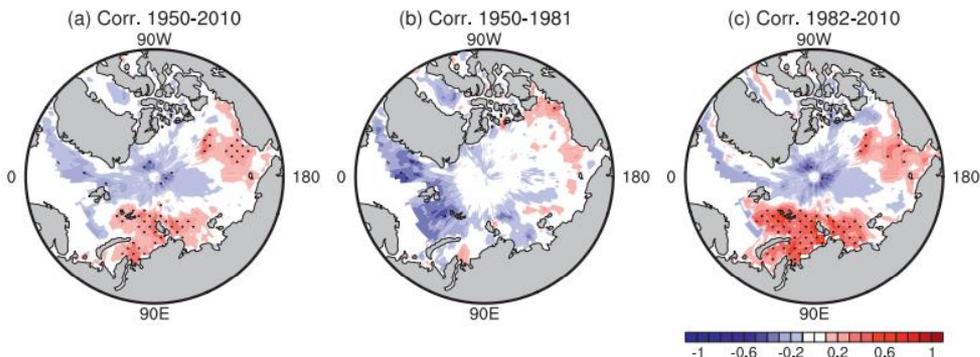
FIG. 1. Correlations of autumn Arctic SIC with winter NAM for the periods (a) 1950–2010, (b) 1950–81, and (c) 1982–2010. The dotted regions have correlations above the 95% confidence level.

r=0.53

观测
交叉检验
2018-预测
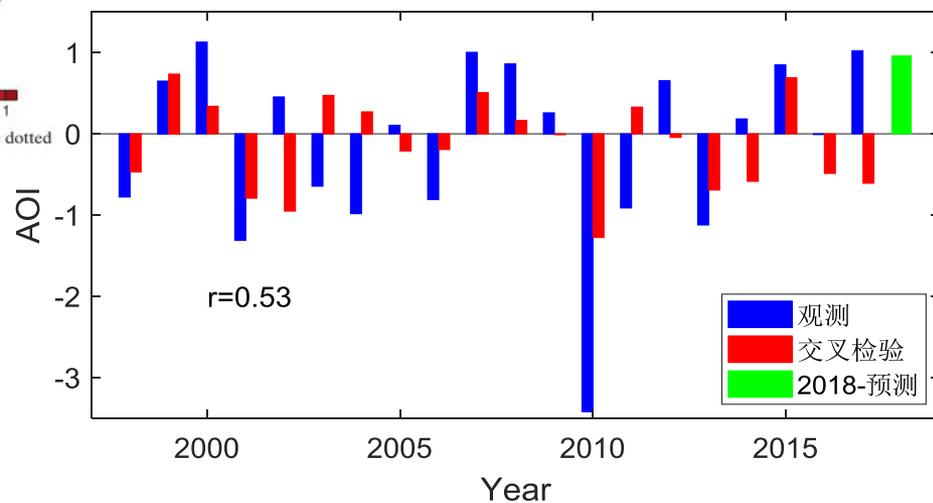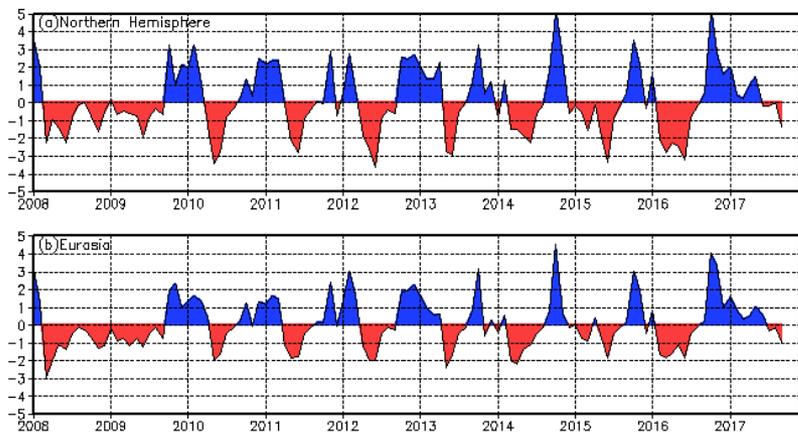
predictors: sea ice in Aug and snow cover over Eurasian in Oct AO outlook: positive phase

Li 2012 JC; Serrano 2014 Nat. Geosci；Liu 2012 PNAS；Guillaume G. 2017 J.Clim

Outlook for Winter Circulation in DJF 2017/2018

- Zonal circulation over East Asia in mid-high latitudes

- AO: weak negative phase

- EAWM: weak

- Siberian High: weak

- Tibetan Plateau height anomaly: positive

- India-Burma Trough: weak

- Low level: cyclonic anomalies around the Philippines, weak WPSH

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4. Outlook for temperature and precipitation in China

Air temperature and precipitation of BCC_CSM1.1

Temp anomaly（0.1℃）
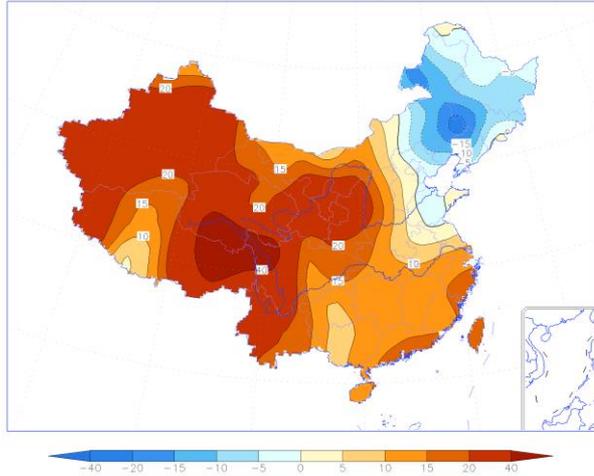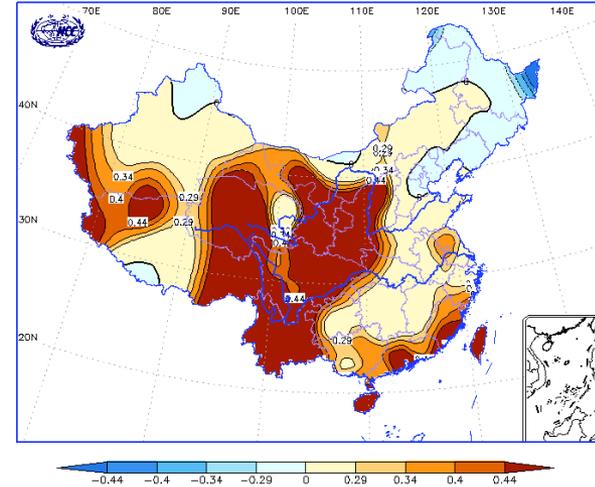
Precipitation Percentage
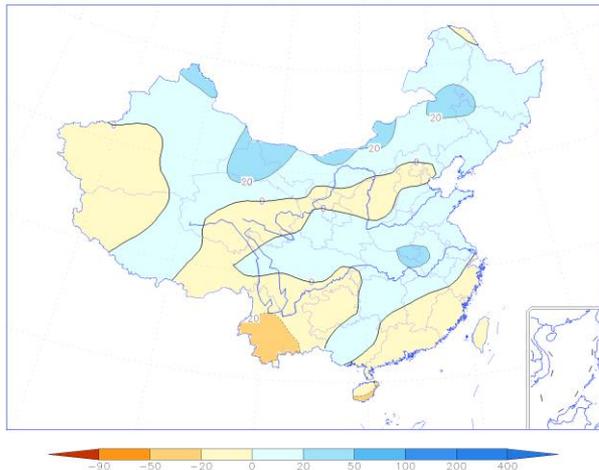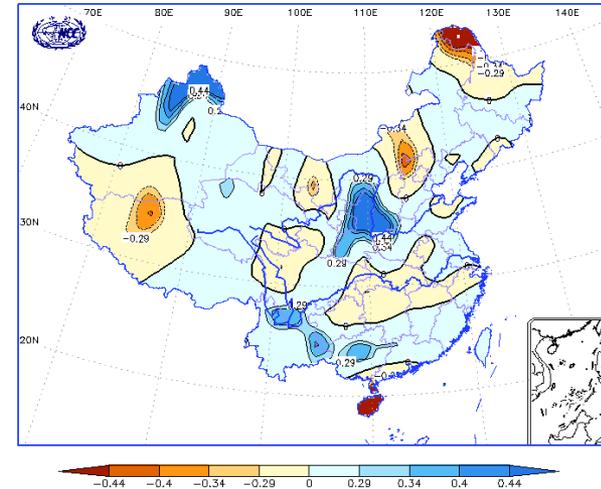
Reforecast Skill

Correlation bewteen EAWM/SH index and t2m of DJF

EAWM
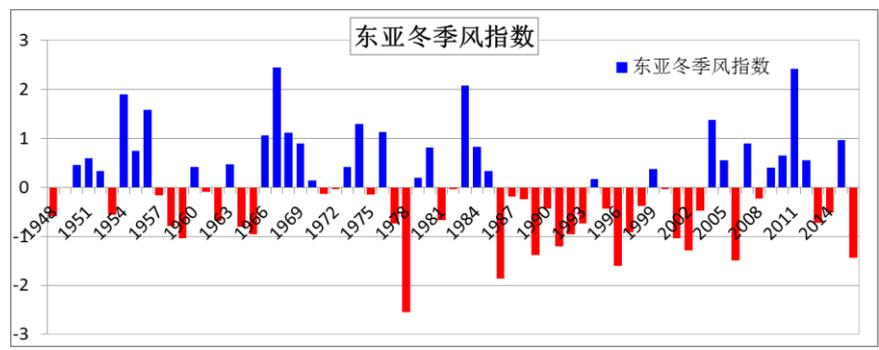
Correlation
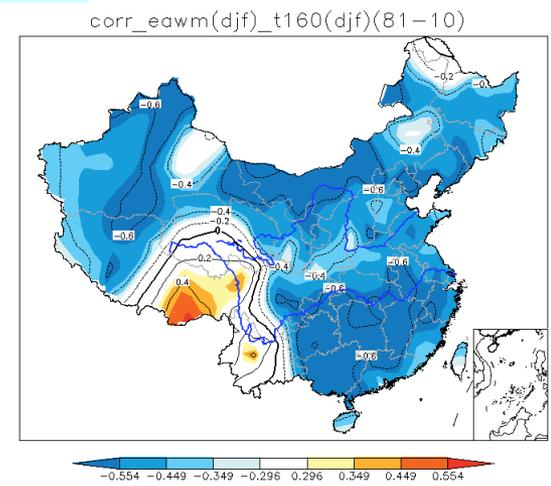
SH
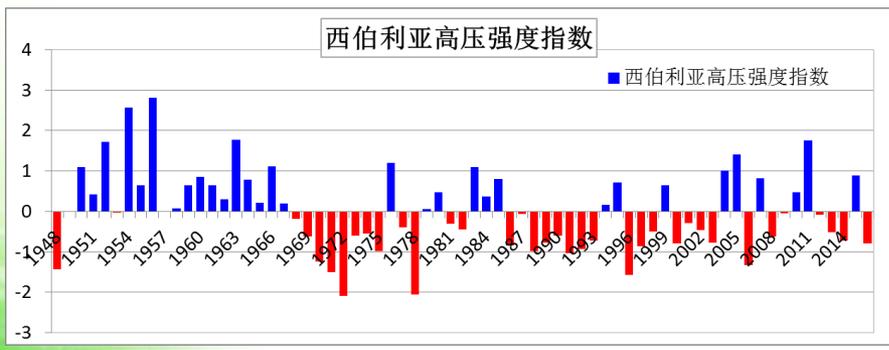
Correlation
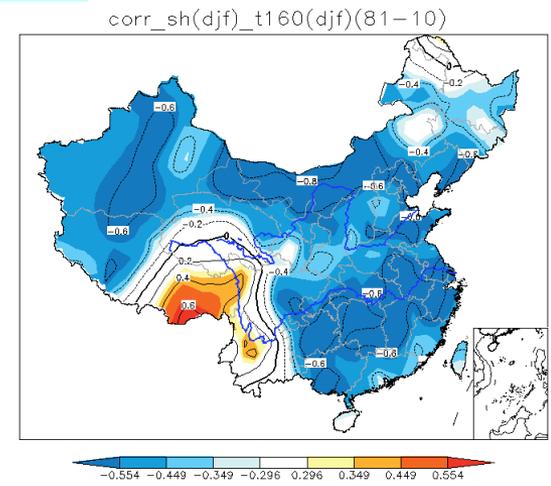
EOF modes of precipitation in winter China

EOF1

EOF1 R160 DJF 1980−2014 Clim81−10 49.9%
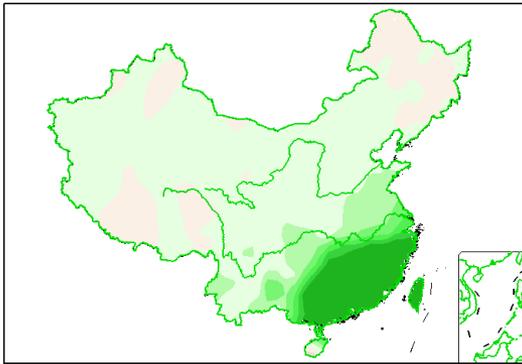
H500-DJF

Cor.(H500−DJF,PC1−R160−DJF) 1980−2013
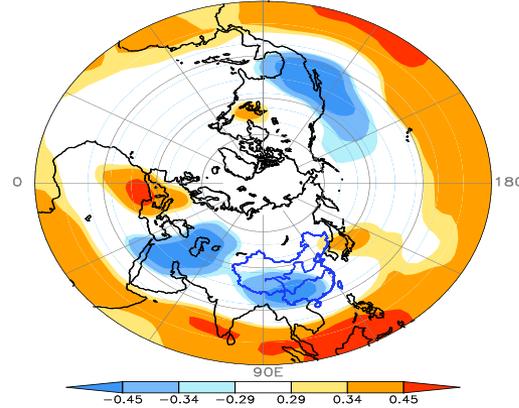
SSTA-DJF

Cor.(SSTA−DJF,PC1−R160−DJF) 1980−2013
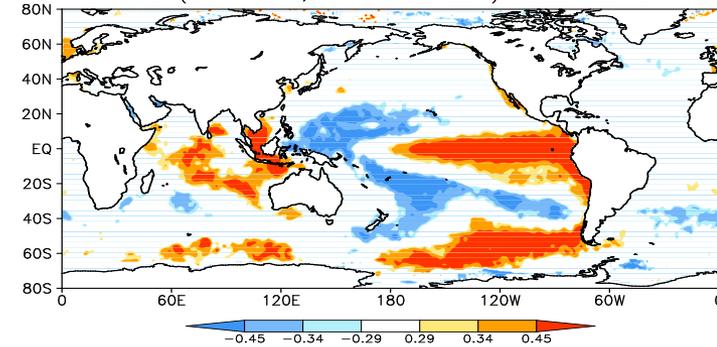
V850-DJF

Cor.(V850−DJF, PC1−R160−DJF) 1950−2013
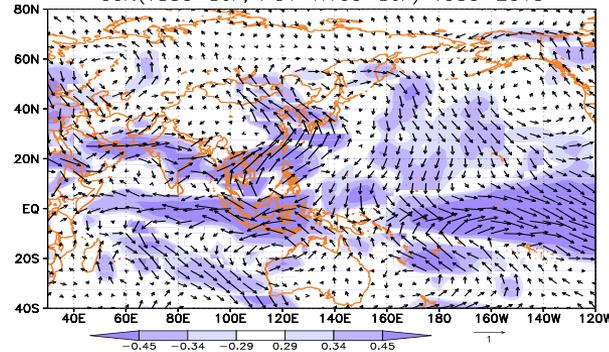
Moving window correlation NINO3.4&Precip

11yr RCOR between Nino3.4 and PREC(SouthChina)
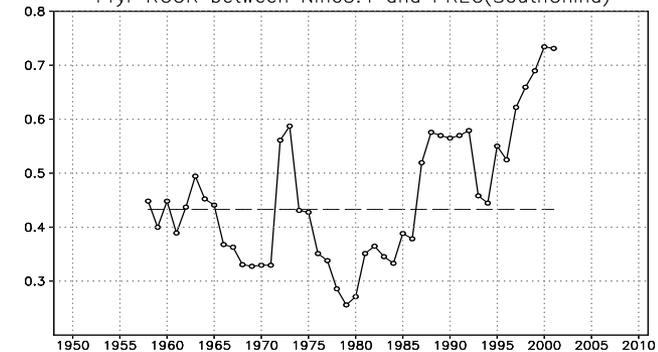
Corr. (IBT, MoistFlux)
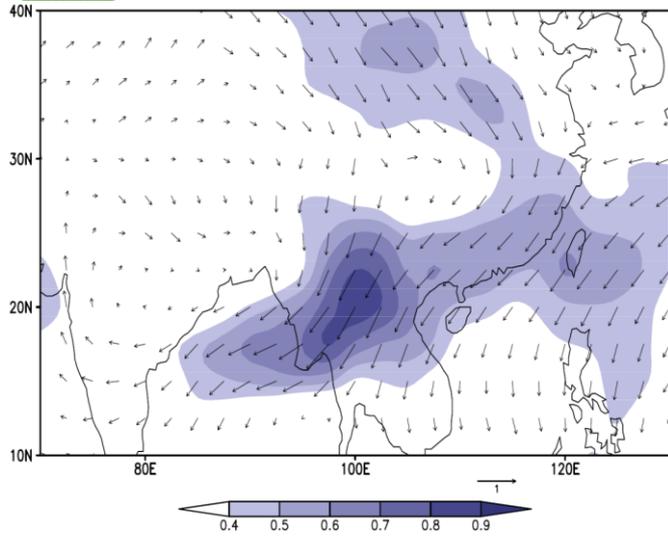
Composite CMAP in DJF during strong IBT years

Corr. (IBT, precip in DJF)

Arkin-Xie Precipitation STD(CMAP)
Surface (mm/day) Composite Anomaly 1979-2000 climo
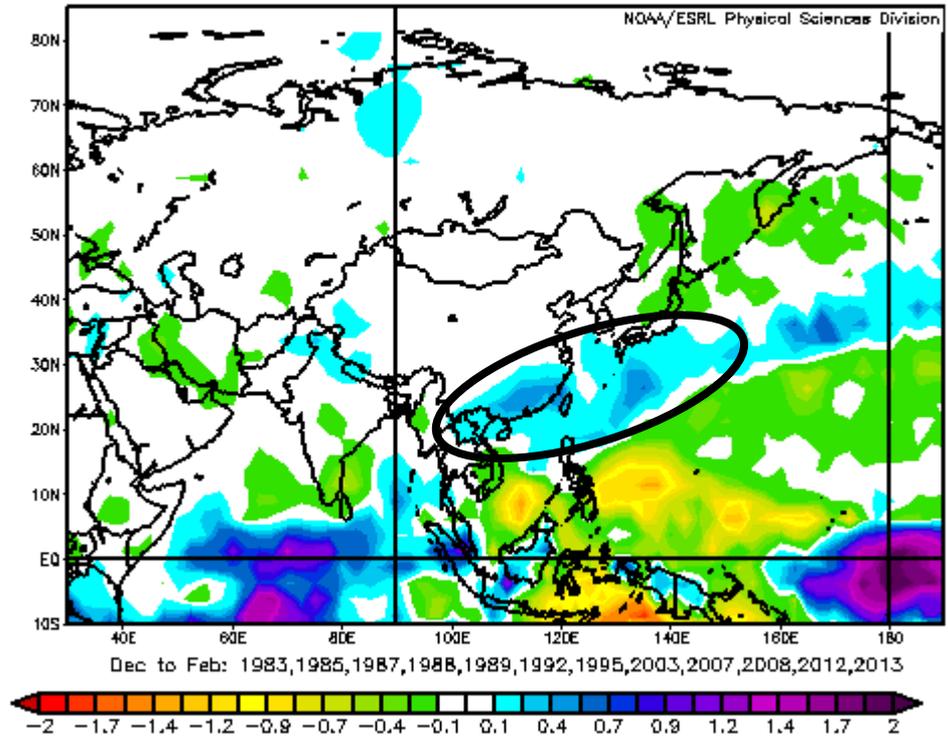
hgt_dif vs precip (1980~2011)

Dec to Feb: 1983,1985,1987,1988,1989,1992,1995,2003,2007,2008,2012,2013
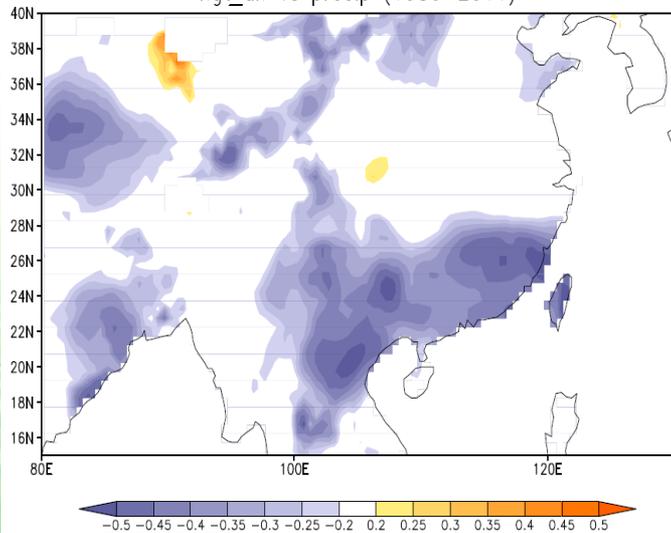
FODAS

The Forecast System On Dynamic- Analogue Combined Skills

Model   : BCC_CSM, EC_SYSTEM4, NCEP_CFS

Forecasting element   : Precipitation and temperature

Start forecasting time : Each Month

Forecasting Period   : Month, and Season

Precipitation data   : CMAP precipitation data sets，1979-

Temperature data   : NCEP reanalysis data sets

Climate indices   : Include 140 indices get from BCC or CPC

SST (ENSO, PDO, Modoki et al.), Tele-corr. (NP, WP, PNA et al.), Monsoon.

Atmosphere circulation (West pacific high)

Dynamic-Analogue Combined Prediction

Data sets

Model data

Real data

Climate Indices

Corr. Ana.

Mainly indices sets closely correlated with the forecast error

Optimal multi indices assemble

Extreme abnormal indices
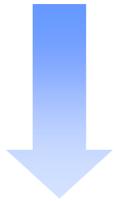
History forecast error sets

History analogy forecast errors

Regional compose

The new forecast result of

BCC_CGC

Season climate forecast

After processing

+

Final forecast product

Temperature&Precipitaion prediction of FODAS

Temp.(°C) Anom. MMEM D&A
Dec to Feb 2017   Issued Oct

Perc. Anom.(%) MMEM D&A
Dec to Feb 2017   Issued Oct
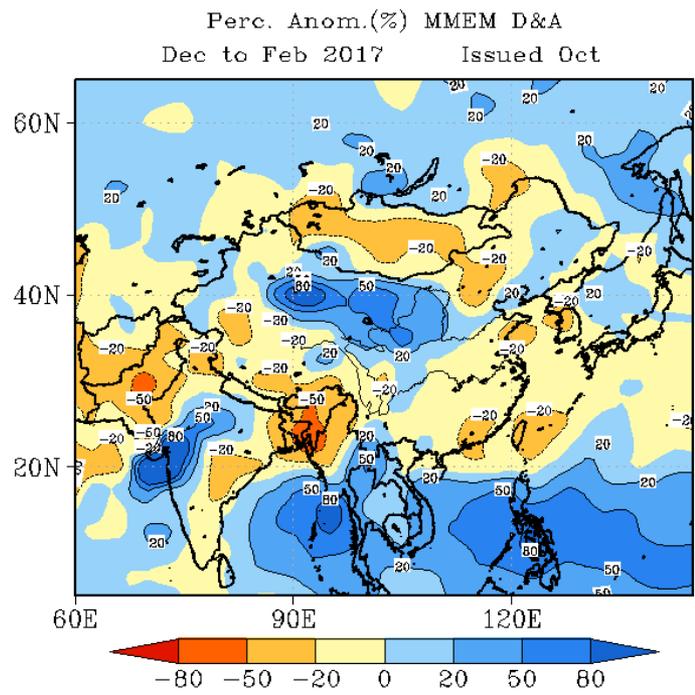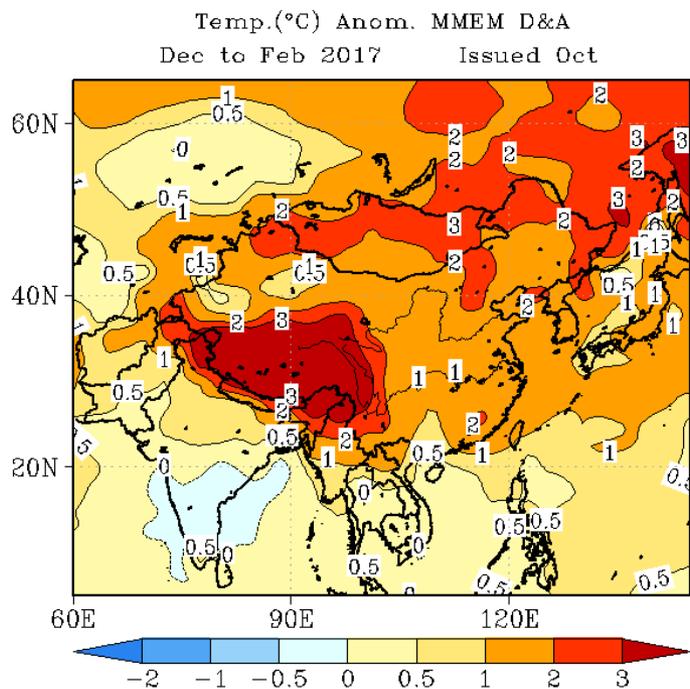
MODES

Multi-mOdel Downsaling Ensemble prediction System
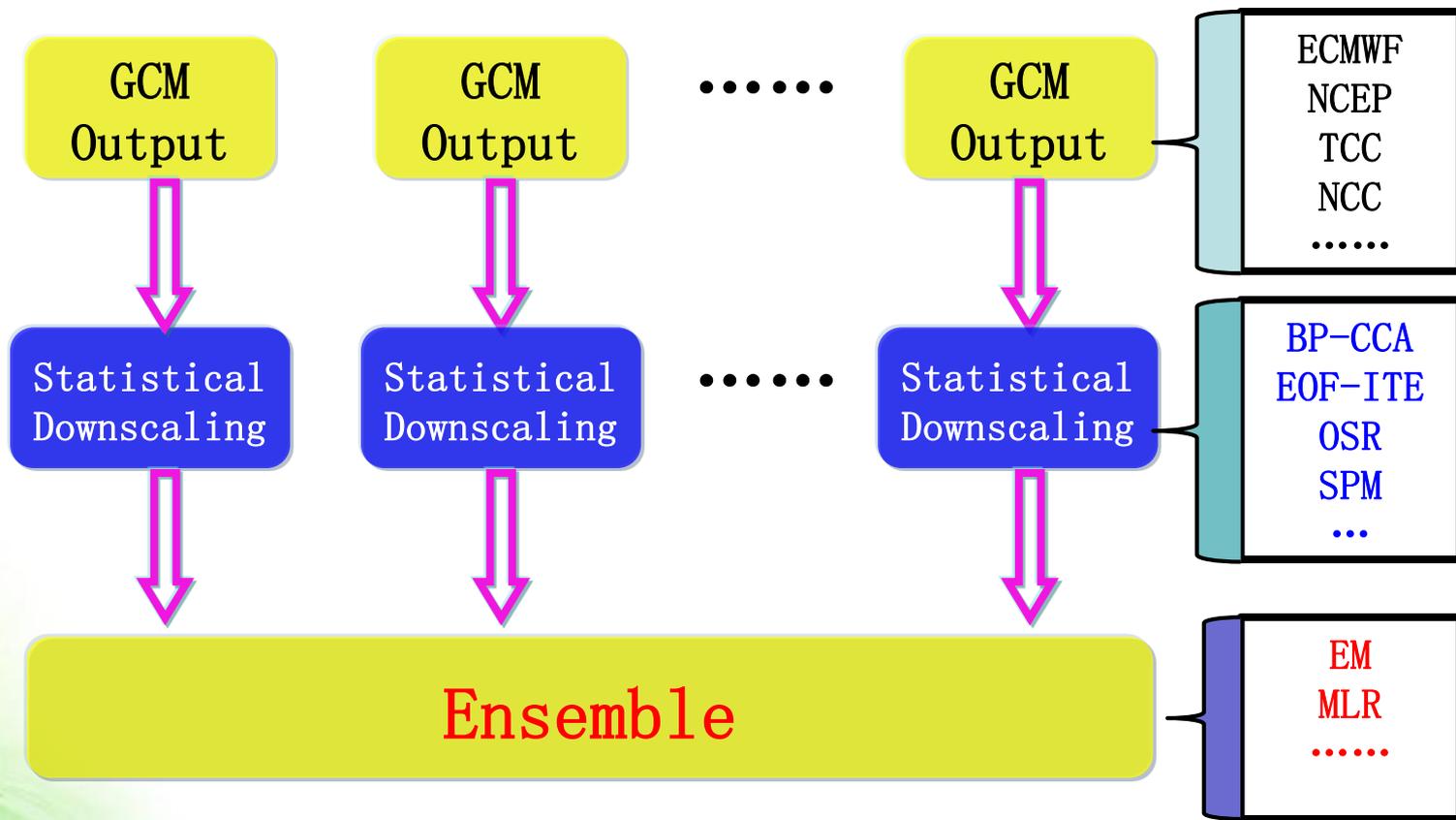
Temperature&Precipitaion prediction of MODES
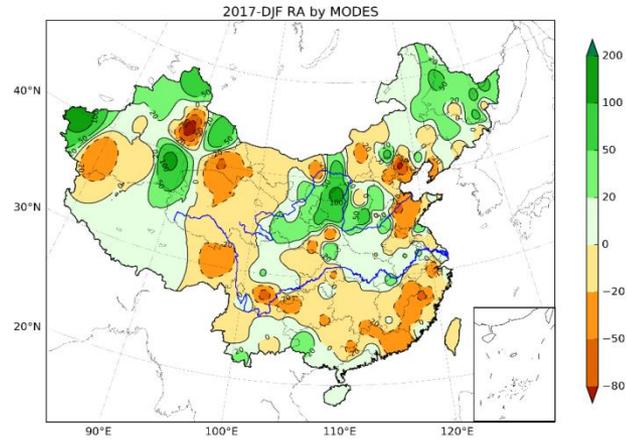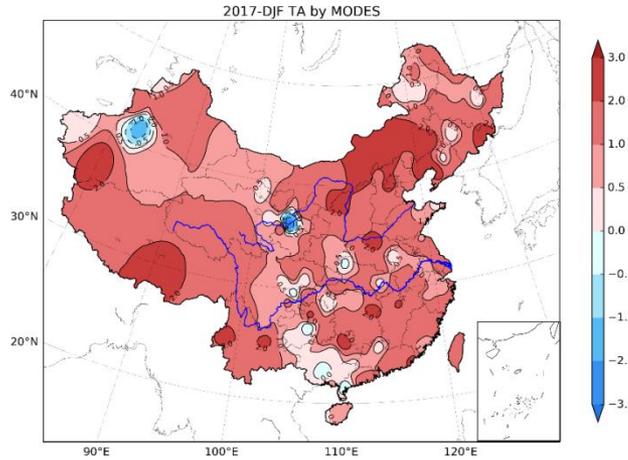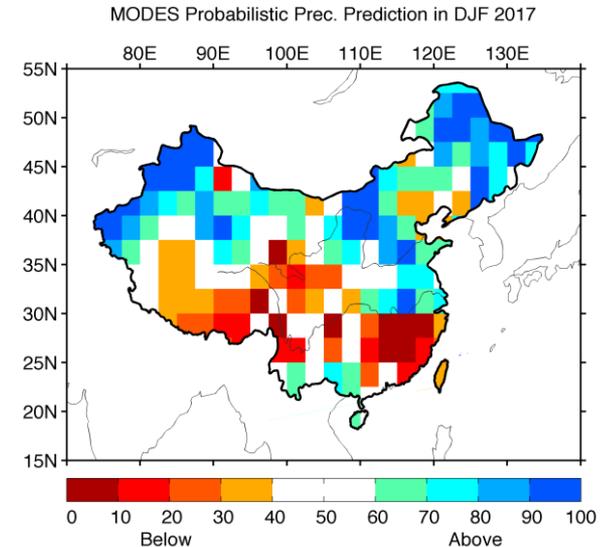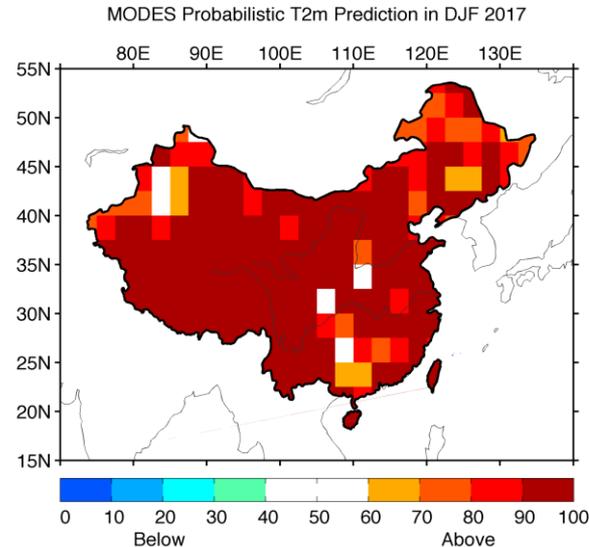
Outlook for 2017/2018 winter

EAWM : weak

Temperature
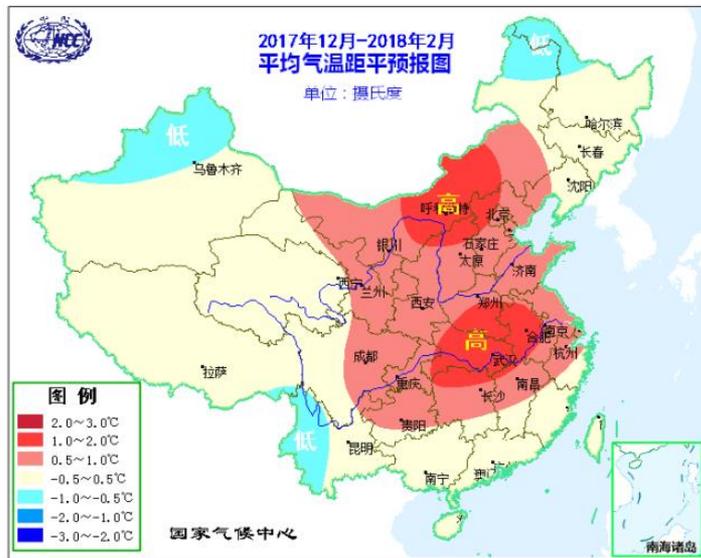
Precipitation
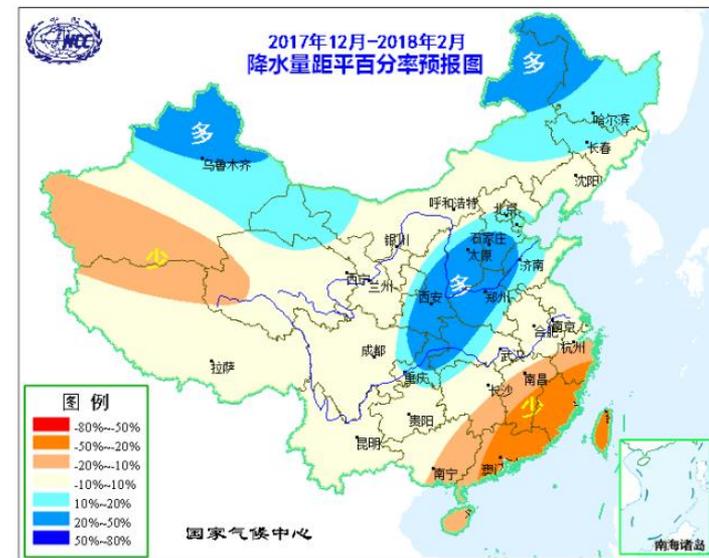
➤ **The temperature of most parts in China will be warmer than climatology, excludes parts of Northeast, Southwest of China and Xinjiang province.**

➤ **The precipitation will be above-normal in parts of Northeast, North, and eastern part of Northwest China, but in other regions it will be near or below normal, especially in the basins of lower reaches of Yangtse river and South China.**

Thank you !