# Seasonal Outlook for winter 2019/2020 over Mongolia

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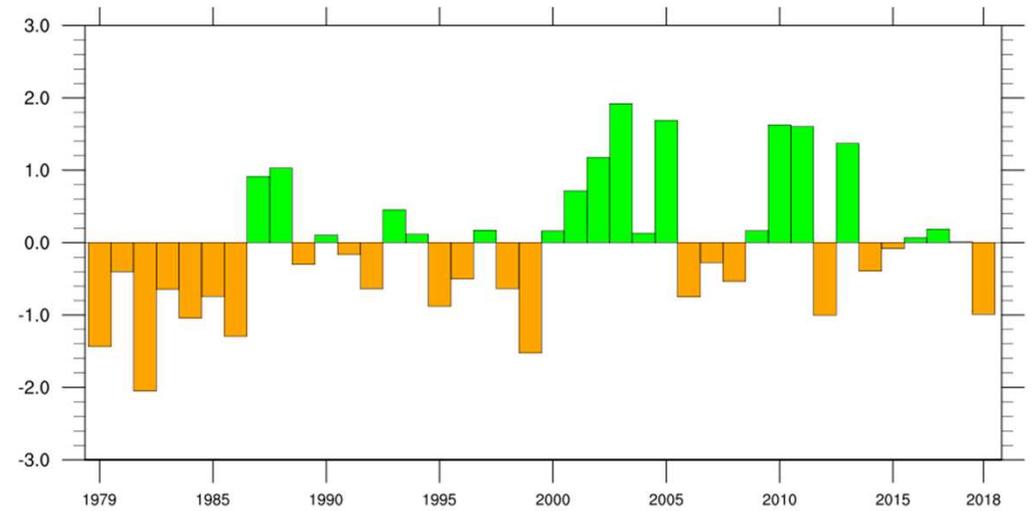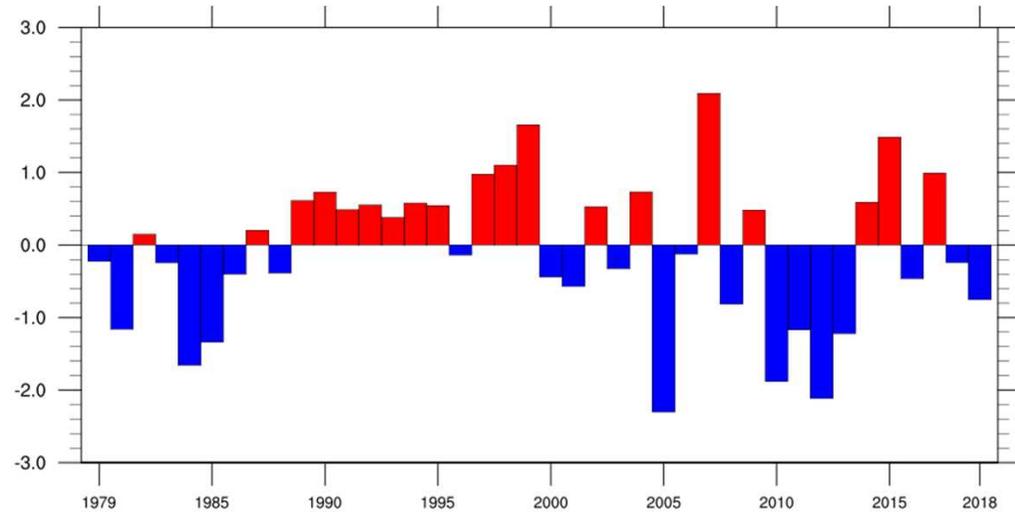
*Information and Research Institute of Meteorology, Hydrology and Environment, NAMEM, MONGOLIA*
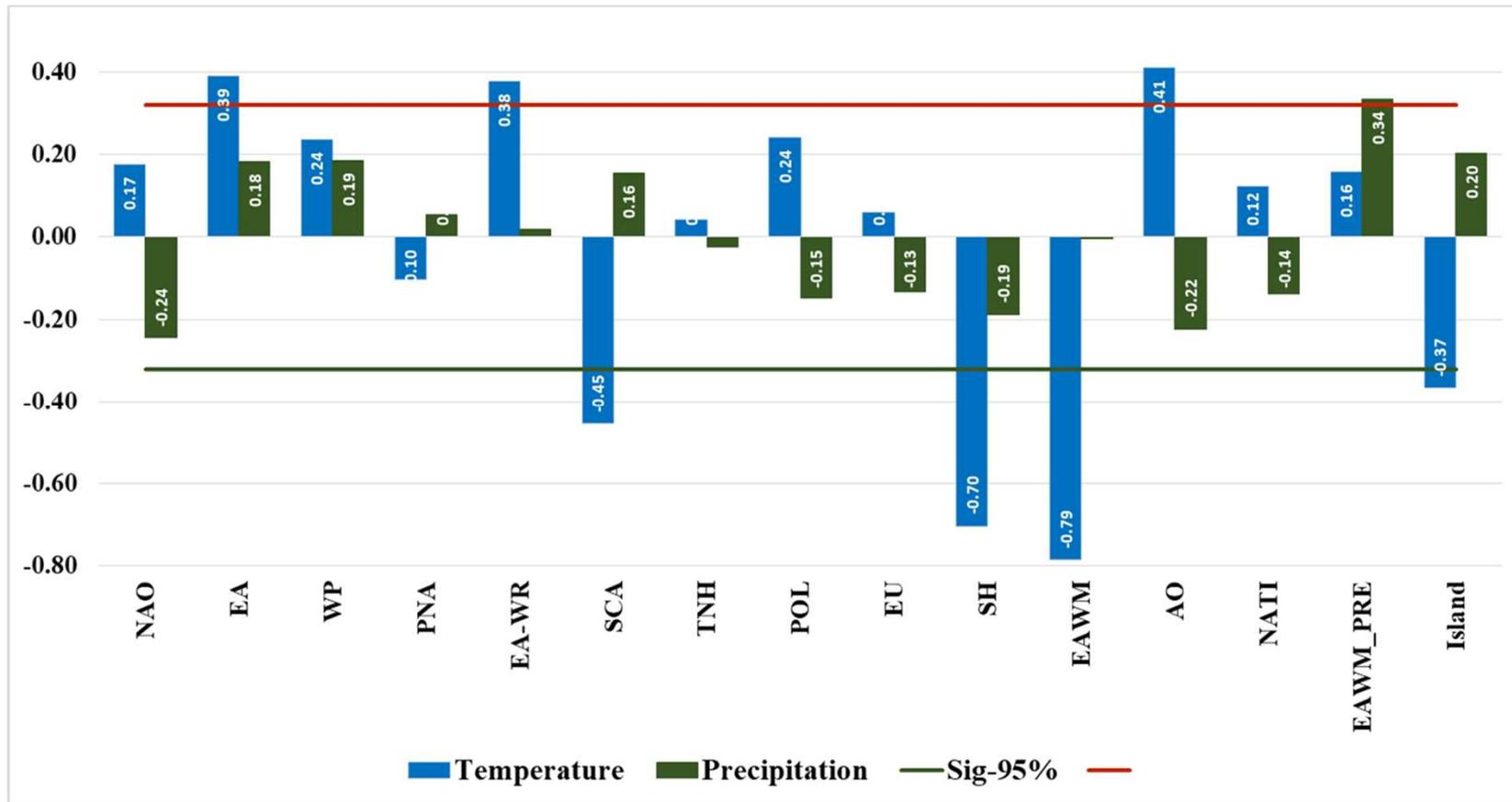
5-7 November 2019, Ulaanbaatar, Mongolia

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- Current condition and trend
- General circulation for coming winter by CGCM
- Arctic impact on SH and EAWM index
- Seasonal outlook
- Summary

# Winter temperature and precipitation time series

# Relationship between winter temperature and teleconnections

# Relationship between winter temperature and teleconnections

| | Reference | Defining variable(s), Level (hPa), and regions | Correlation Temperature | Correlation Precipitation |
|---|---|---|---|---|
| 1 | Ji et al. (1997) | $v$, 1000 hPa, (10°-30°N, 115°-130°E) | 0.18 | 0.33 |
| 2 | Lu and Chan (1999) | $v$, 1000 hPa, (7.5°-20°N, 107.5°-120°E) | 0.03 | 0.32 |
| 3 | Chen and Sun (1999) | $v$, 1000 hPa, (15°-30°N, 115°-130°E) | 0.18 | 0.35 |
| 4 | Chen et al. (2000) | $v$, 10 m, (10°-25°N, 110°-130°E and 25°-40°N, 120°-140°E) | 0.33 | 0.38 |
| 5 | Hu et al.(2000) | $v$, 10 m, (15°-40°N, 115°-130°E) | 0.36 | 0.38 |
| 6 | Yang et al.(2002) | $v$, 850 hPa, (20°-40°N, 100°-140°E) | 0.03 | 0.31 |
| 7 | Wang and Jiang (2004) | $u$, $v$, 850 hPa, (25°-50°N, 115°-145°E) | 0.16 | 0.35 |
| 8 | Jhun and Lee (2004) | $u$, 300 hPa, (27.5°-37.5°N, 110°-170°E) - (50°-60°N, 80°-140°E) | -0.65 | -0.27 |
| 9 | Xu and Ji (1965) | SLP gradient, (30°-40°N, 100°-120°E) - (30°-40°N, 130°-140°E) | -0.21 | -0.21 |
| 10 | Guo (1994) | SLP gradient, (10°-60°N, 110°-160°E) | -0.44 | -0.20 |
| 11 | Shi (1996) | SLP* gradient, (20°-50°N, 110°-160°E) | -0.32 | -0.35 |
| 12 | Wu and Wang (2002a) | SLP* gradient, (20°-70°N, 110°-160°E) | -0.44 | -0.28 |
| 13 | Chan and Li (2004) | SLP gradient, (30°-55°N, 100°-120°E) - (30°-55°N, 150°-170°E) | -0.44 | -0.23 |
| 14 | Wang et al. (2009b) | SLP* gradient, (40°-70°N, 110°-160°E) | -0.58 | -0.09 |
| 15 | Gong et al.(2001) | SLP, (40°-60°N, 70°-120°E) | -0.73 | -0.15 |
| 16 | Sun and Li (1997) | $\Phi$, 500 hPa, (30°-45°N, 125°-145°E) | 0.55 | 0.22 |
| 17 | Cui and Sun (1999) | $\Phi$*, 500 hPa, (35°-40°N, 110°-130°E) | 0.63 | 0.24 |
| 18 | Wang et al.(2009a) | PC1 of $\Phi$*, 500 hPa, (25°-50°N, 100°-180°E) | -0.04 | -0.12 |
| 19 | Lin and Wen (2013) | SLP* (2*(40°-60°N,70°-120°E) - (30°-50°N, 140°-170°E)- (20°S–10°N, 110°–160°E))/2 | -0.62 | -0.12 |
| 20 | Liu S | SLP gradient, (10°-50°N, 110°-150°E) | -0.38 | -0.25 |
| 21 | He and Wang (2012) | SLP (40°-60°N, 80°-125°E)+ $\Phi$500(25°-45°N, 110°-145°E)+ $u$300(25°-40°N,80°-180°E) - (45°-60°N, 60°-160°E) | -0.58 | -0.17 |
| 22 | Zhu (2008) | $u$, 500 hPa, (25°-35°N, 80°-120°E) - (50°-60°N, 80°-120°E) | -0.80 | -0.16 |
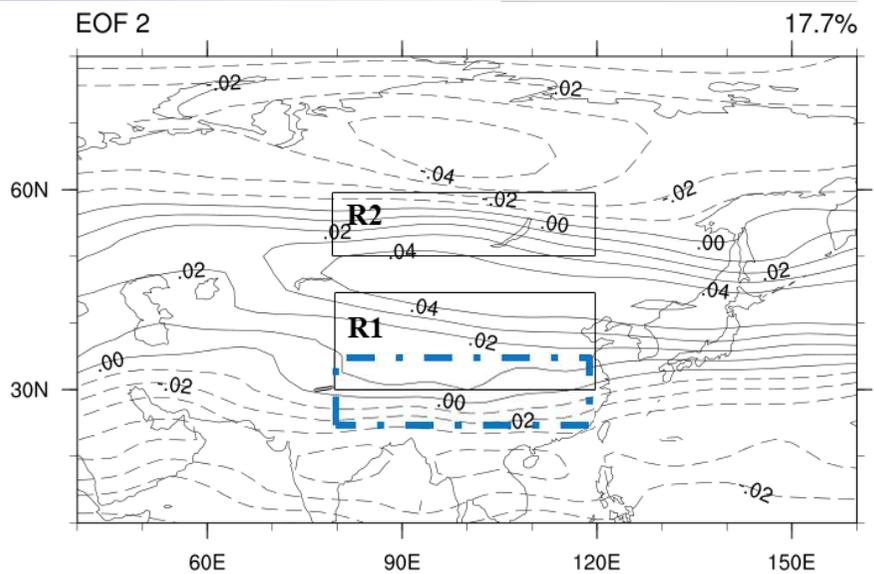


Fig.1 Spatial pattern of second EOF mode for winter mean 500 hPa zonal wind (10°-80°N, 40°-160°E) during 1979-2012 winter.
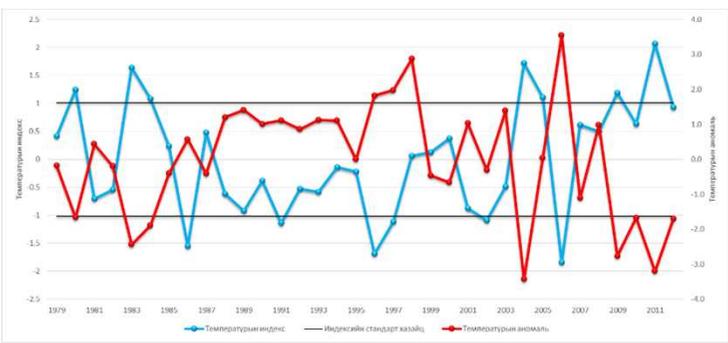


Fig. 2 The time series of the EAWM index and temperature from the winter of 1979 to the winter of 2012.
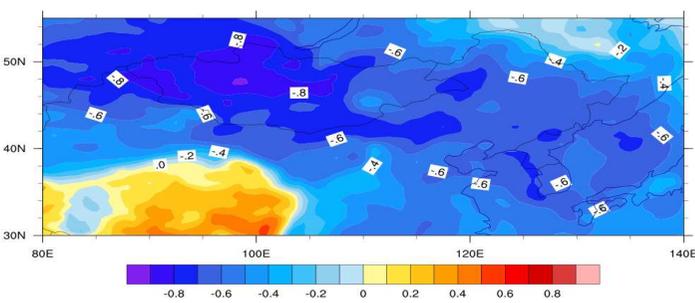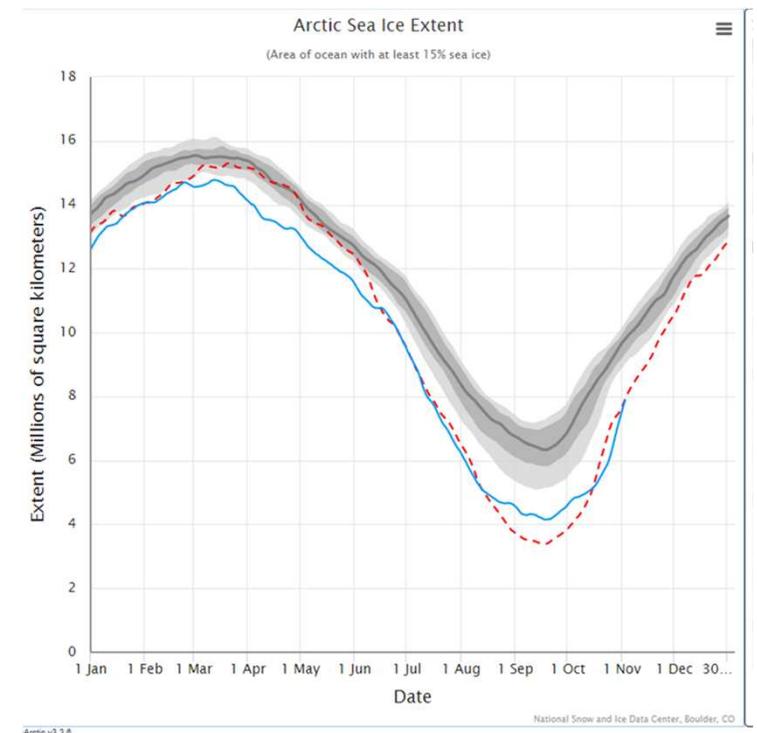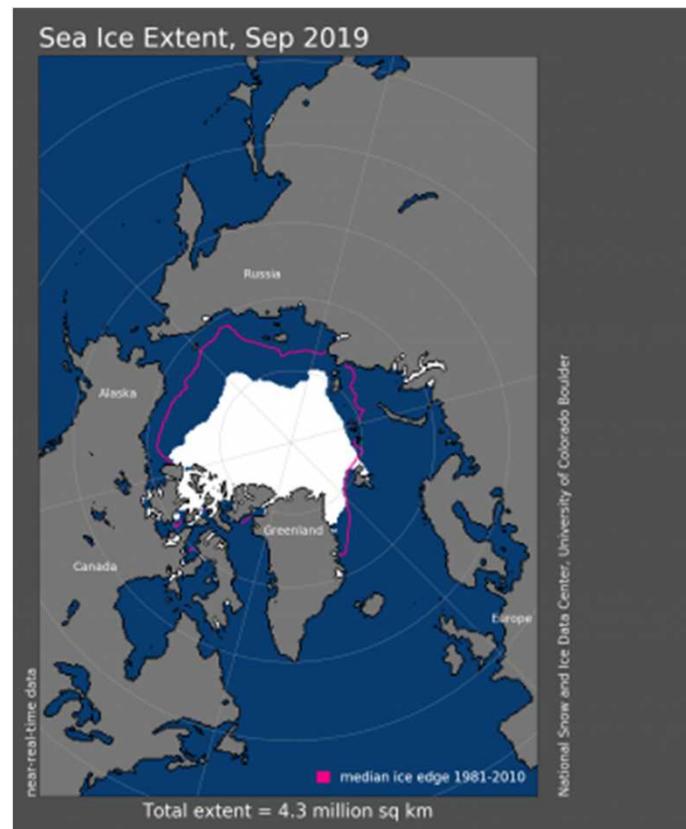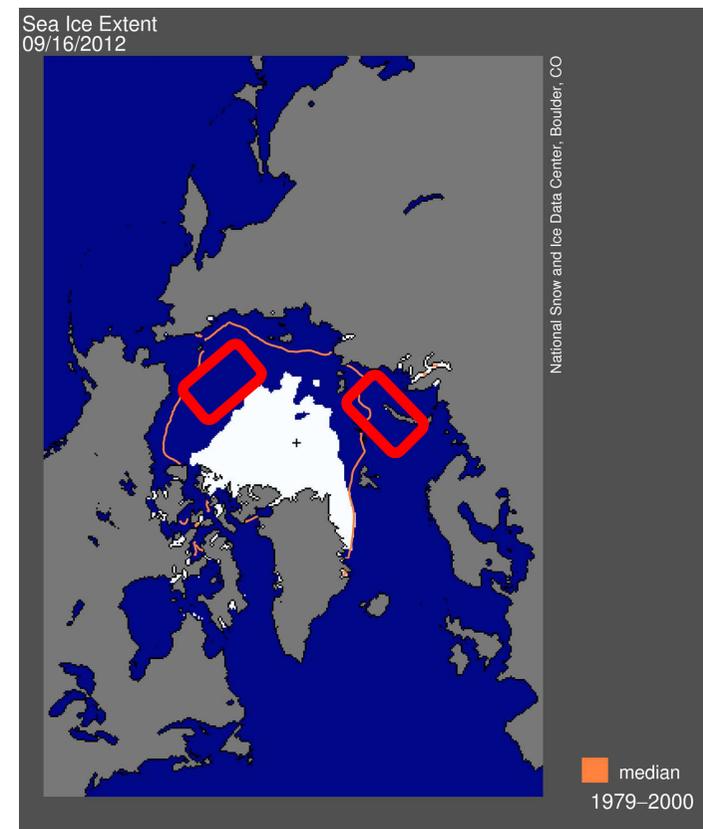


Fig. 3 Correlation coefficients between EAWM index and winter temperature over East Asia

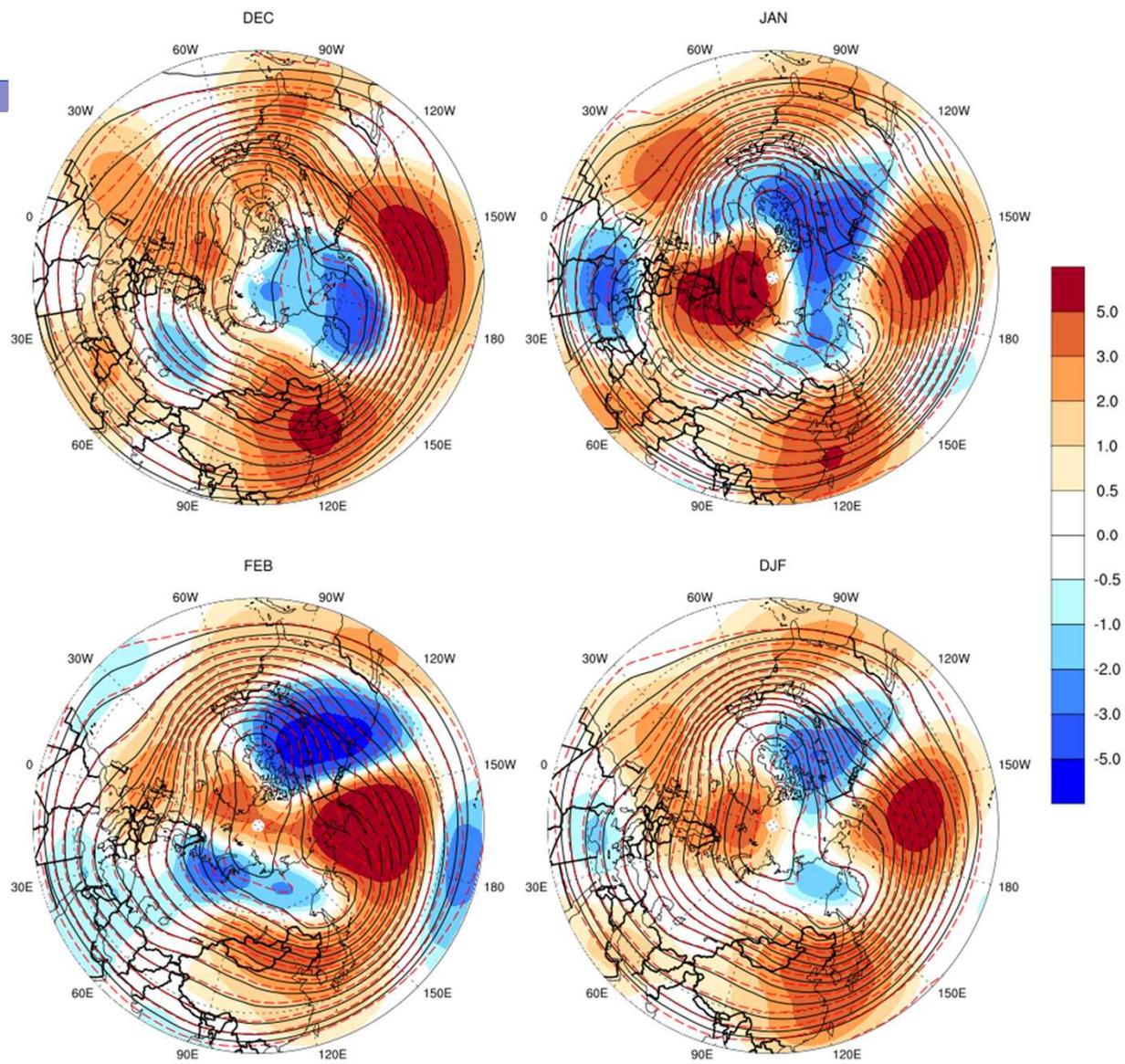A.Davaadorj and L.Oyunjargal 2015, Scientific paper on IRIMHE
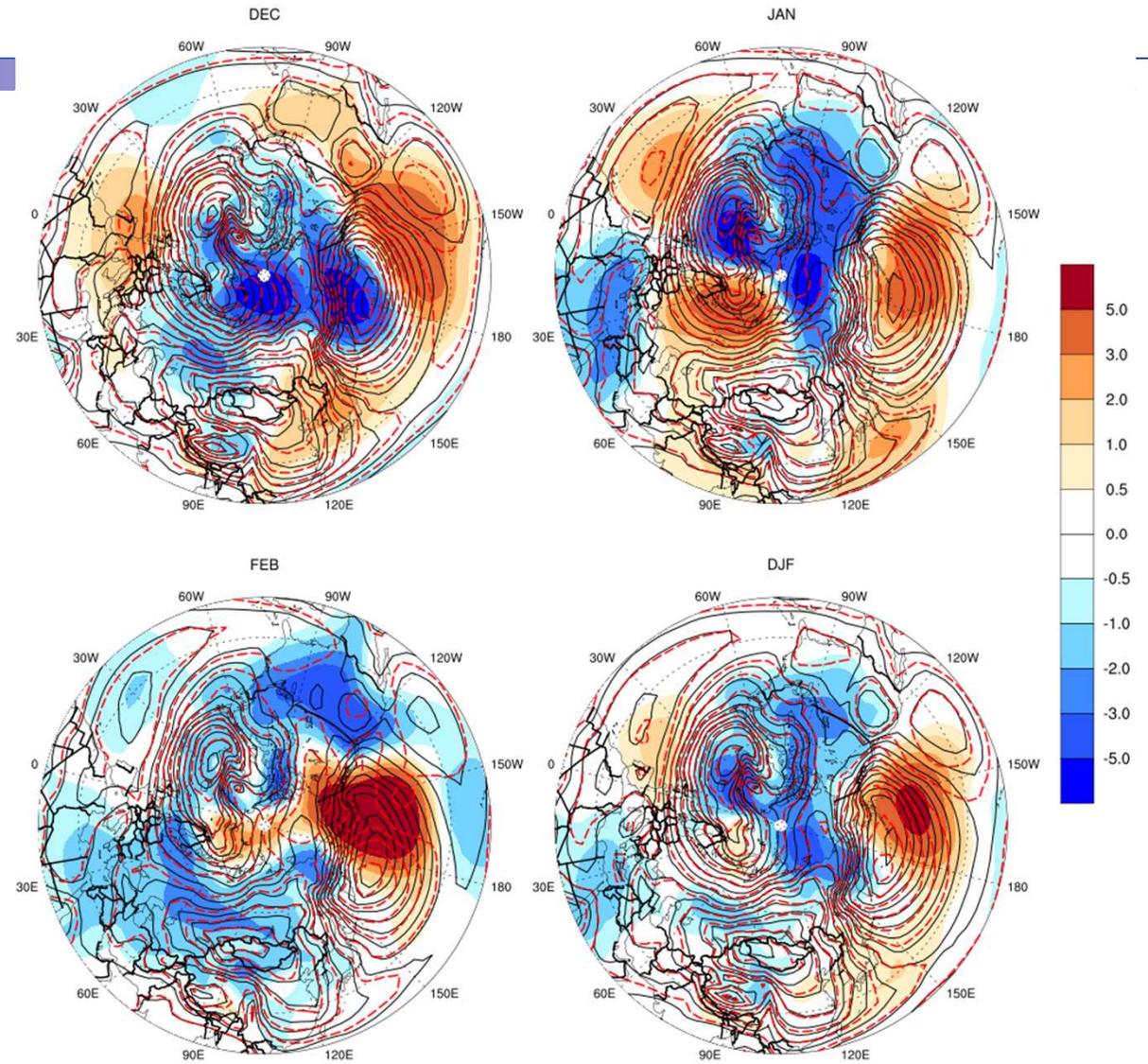
# Arctic Impact

# General circulation for coming winter by CGCM
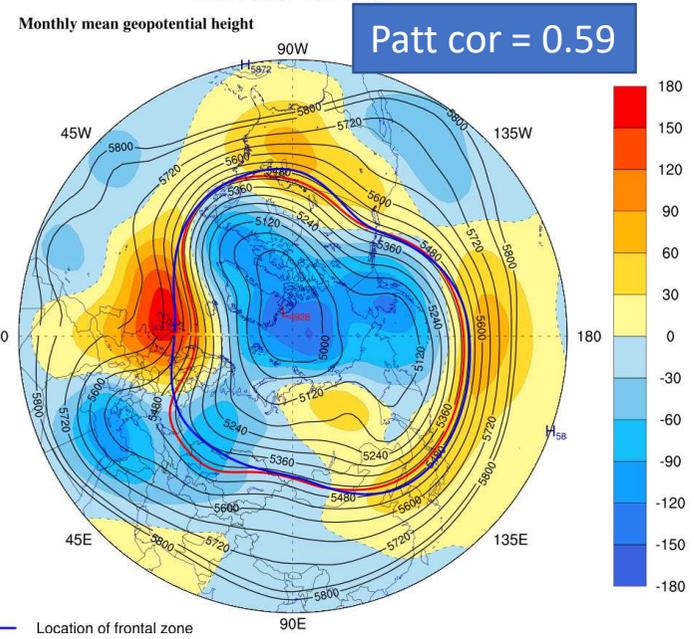
# Z500 by CGCM

# SLP by CGCM

# Anomaly pattern correlation analysis (DECEMBER)



HGT500-1991-12
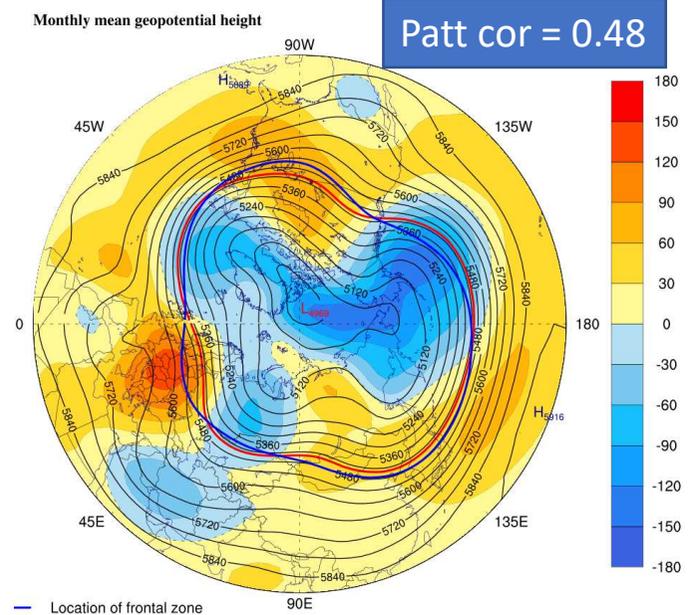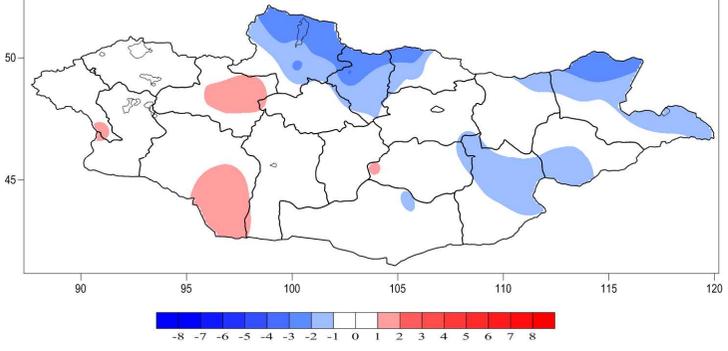
Monthly mean geopotential height

Patt cor = 0.59

HGT500-1997-12

Monthly mean geopotential height

Patt cor = 0.50

HGT500-2006-12

Monthly mean geopotential height

Patt cor = 0.48

— Location of frontal zone

— Location of frontal zone
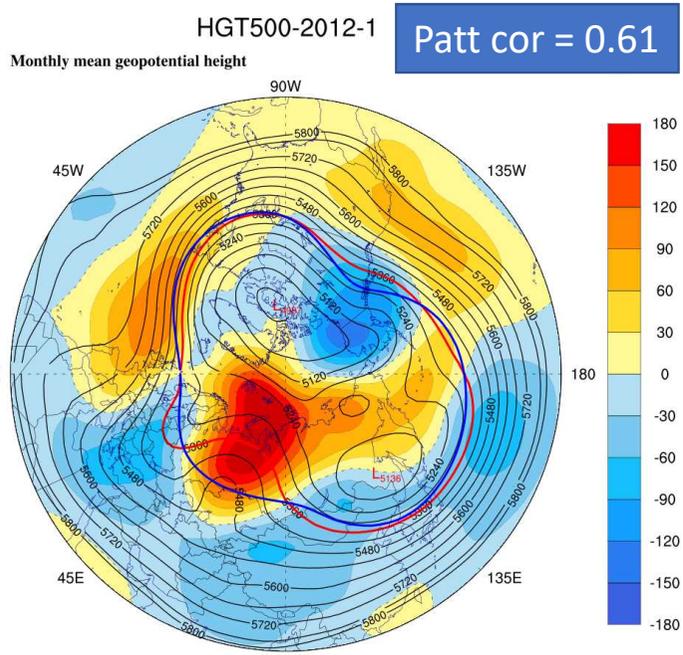
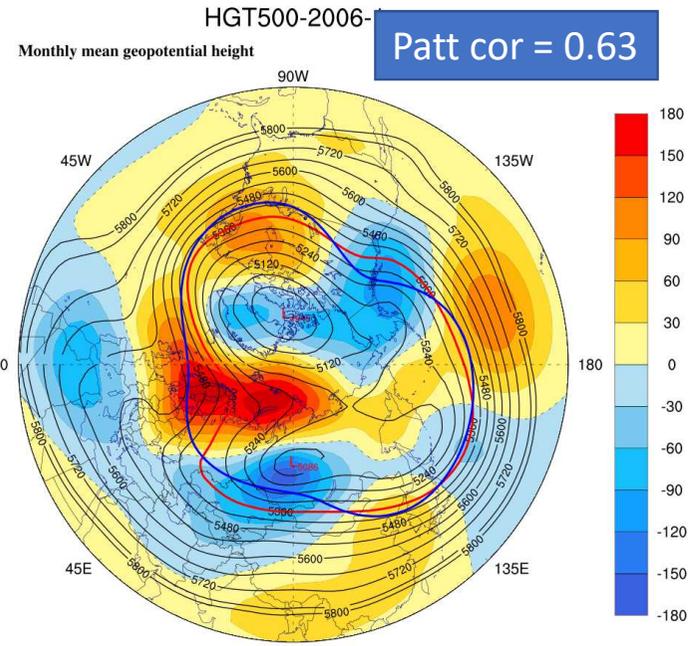— Location of frontal zone
— Frontal zone

Forecasting Division, NAMF
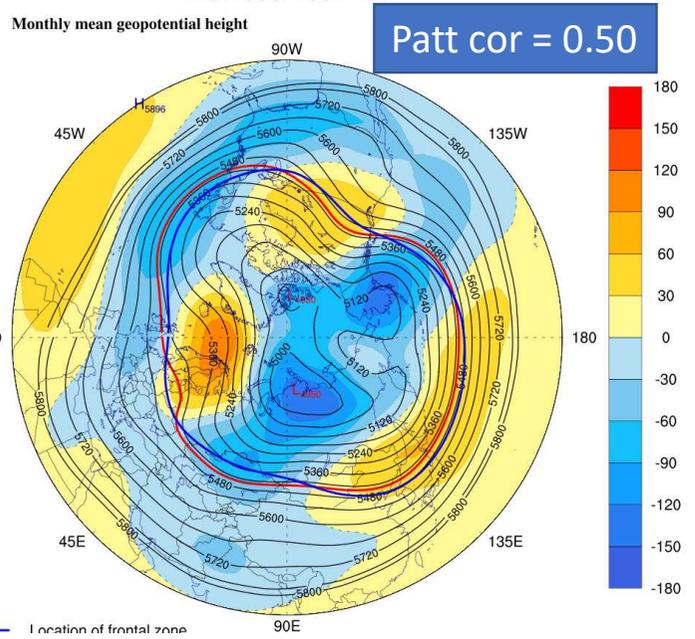
Temperature anomaly 1991-12

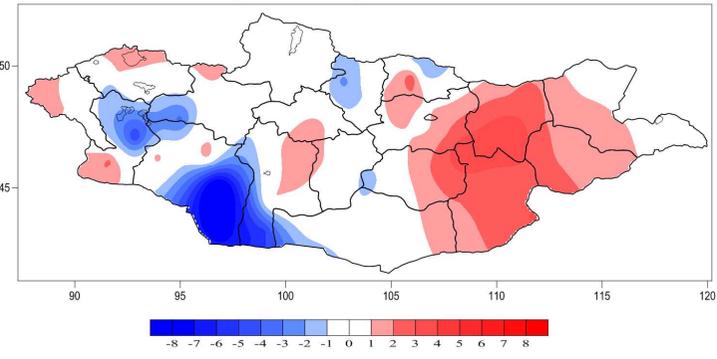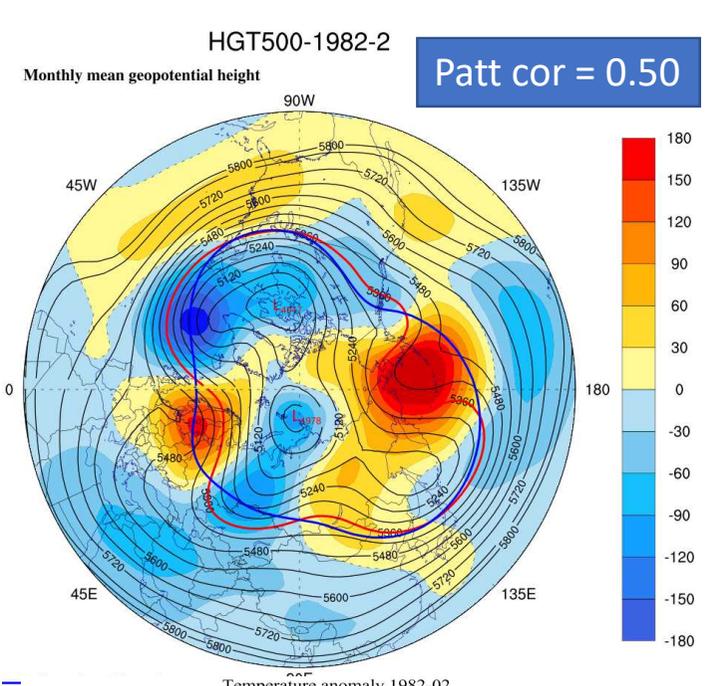Temperature anomaly 1997-12
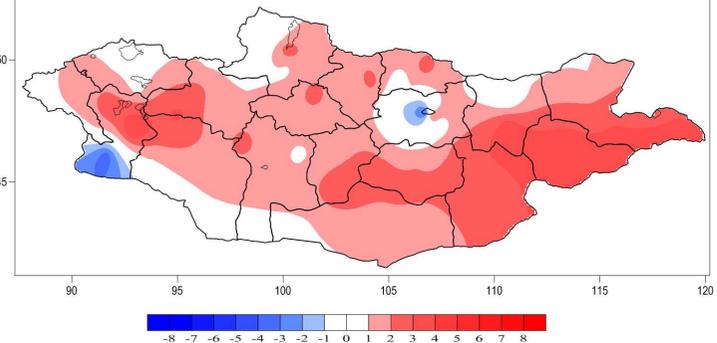
Temperature anomaly 2006-12
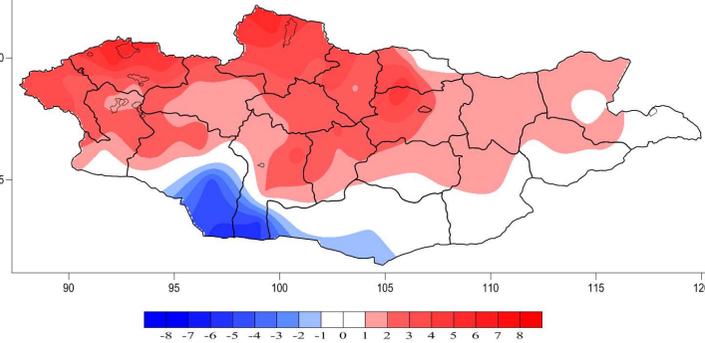
# Anomaly pattern correlation analysis (JANUARY)



HGT500-2006-1 — Monthly mean geopotential height — Patt cor = 0.63

HGT500-2012-1 — Monthly mean geopotential height — Patt cor = 0.61

HGT500-1990-1 — Monthly mean geopotential height — Patt cor = 0.57
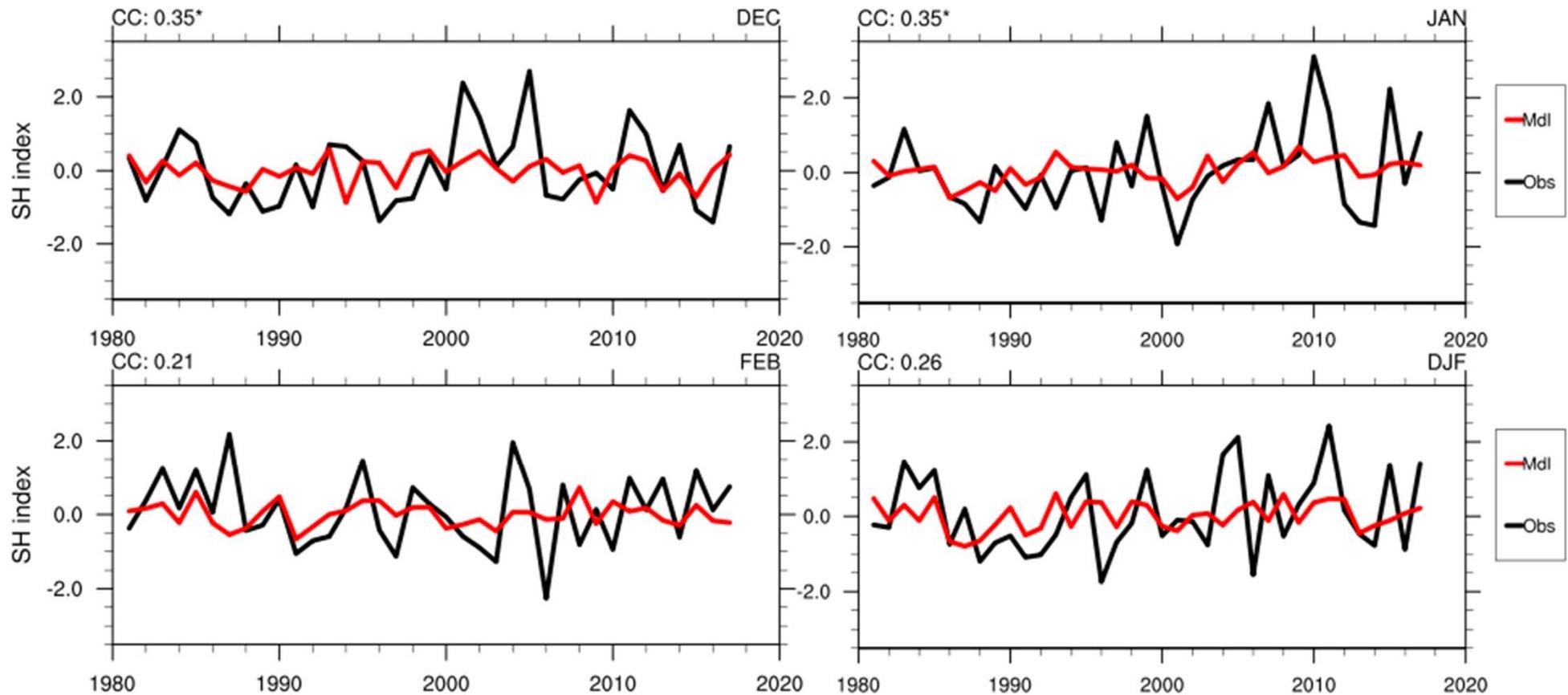
Location of frontal zone

Temperature anomaly 2006-01

Temperature anomaly 2012-01

Temperature anomaly 1990-01
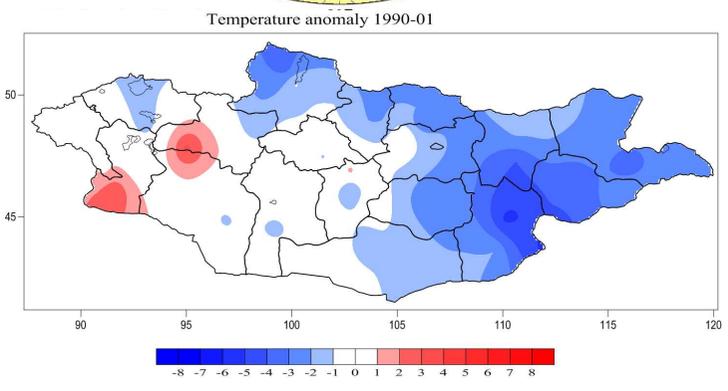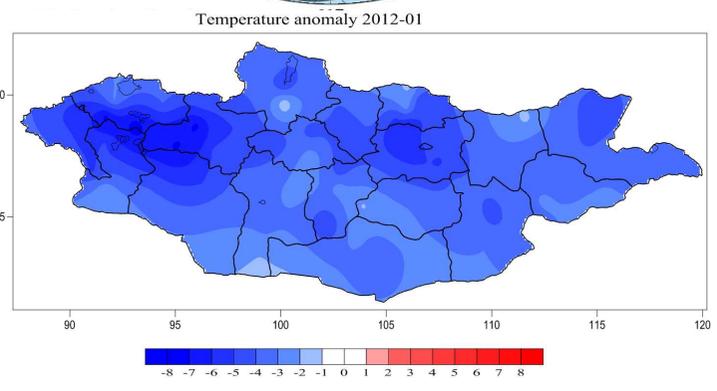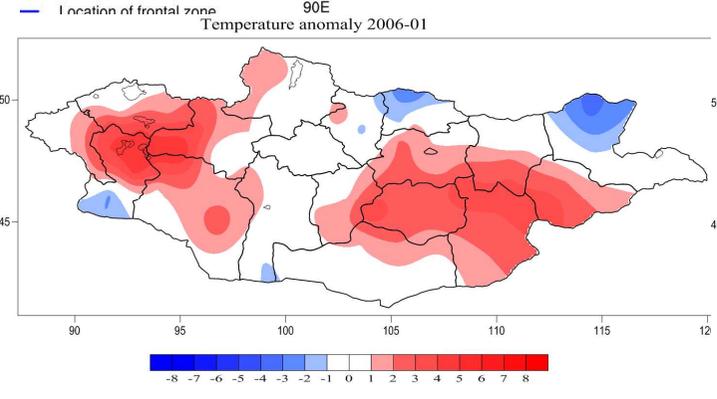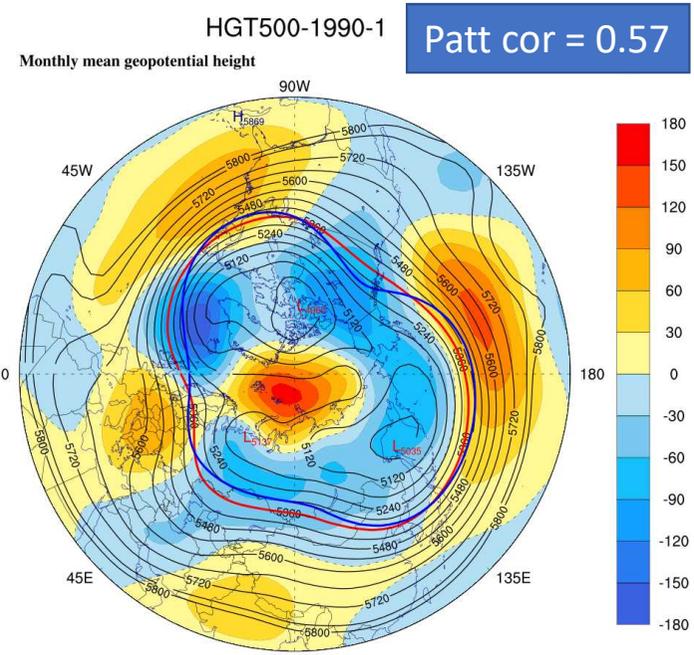
# Anomaly pattern correlation analysis (FEBRUARY)
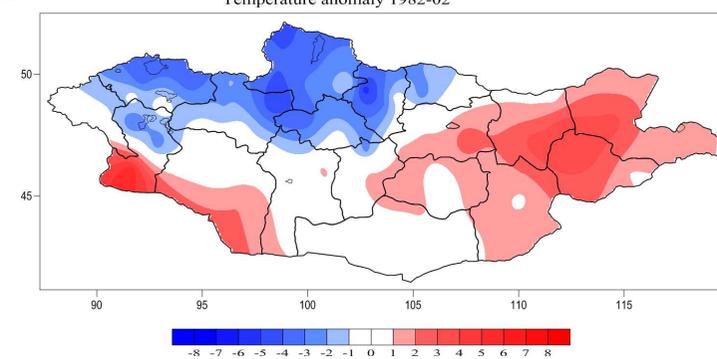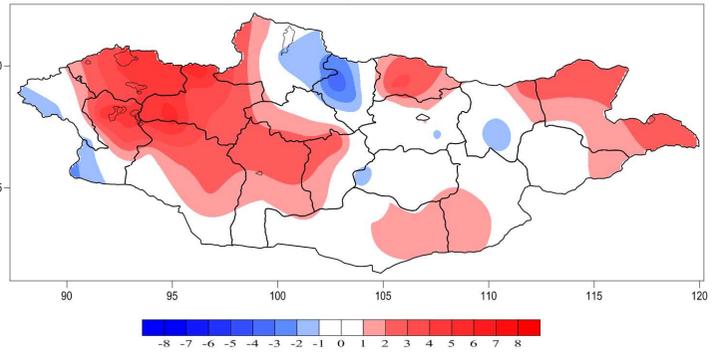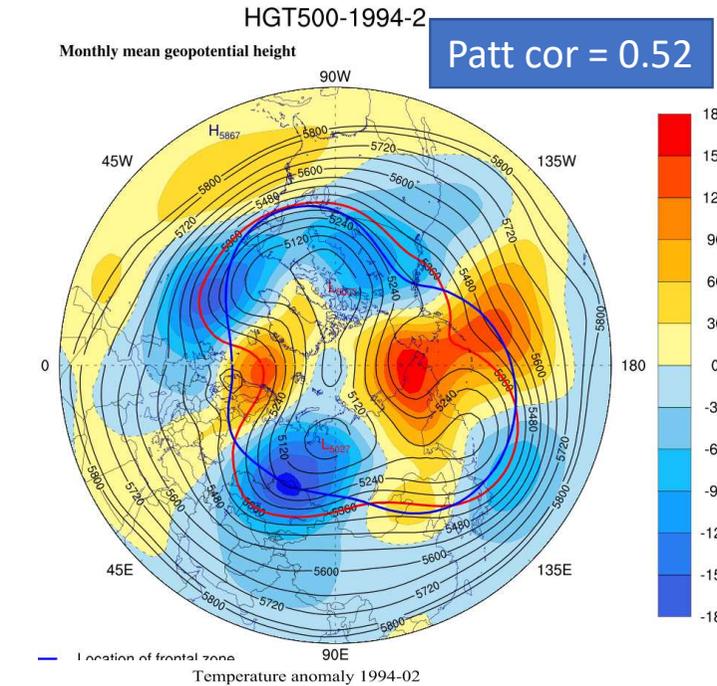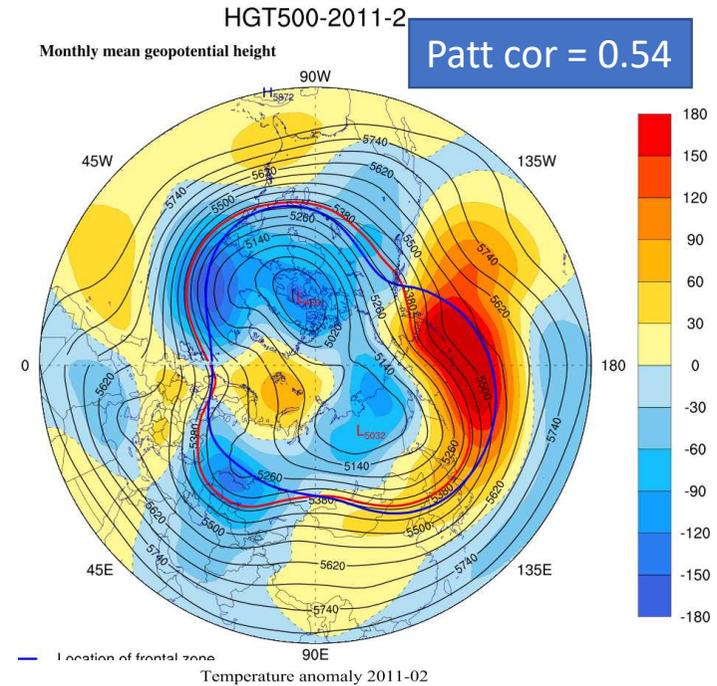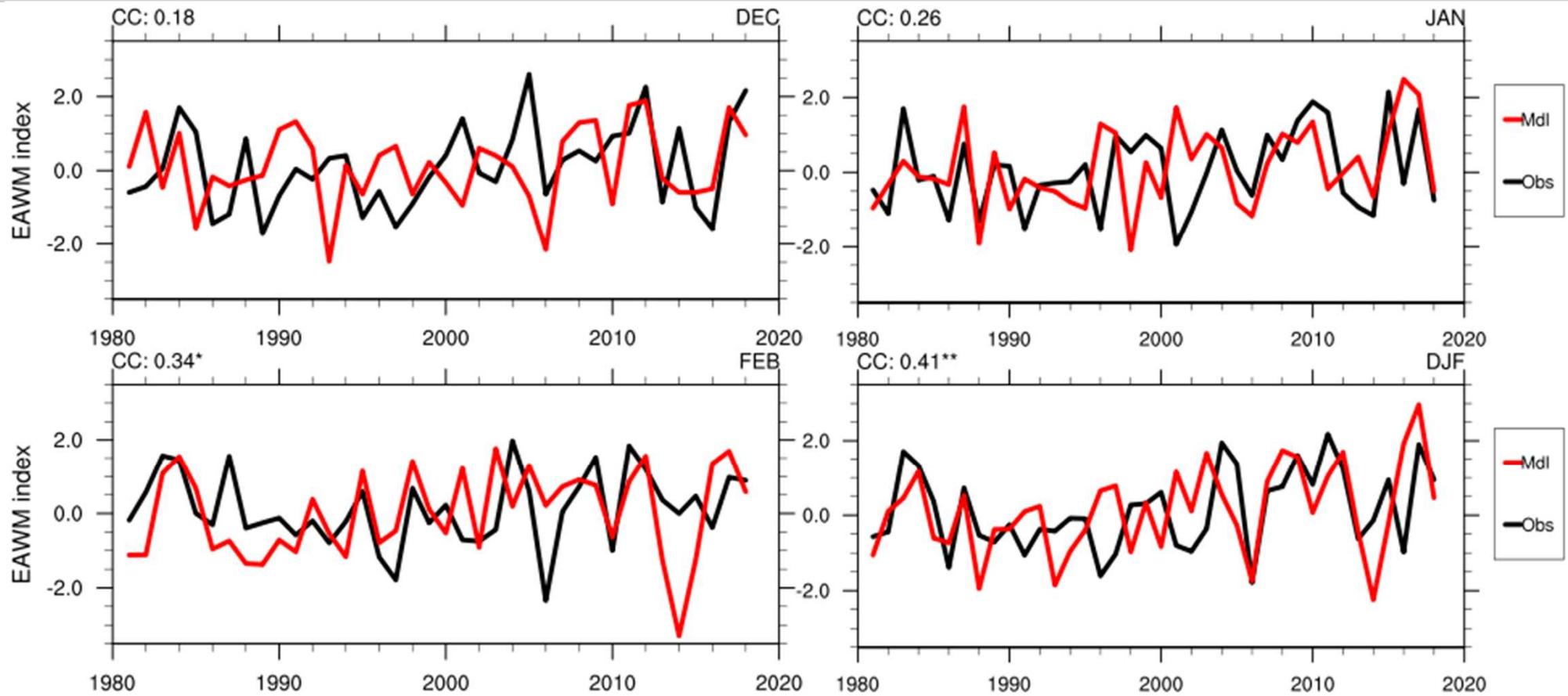
# Hindcast experiments

# Hindcast experiment of a CGCM
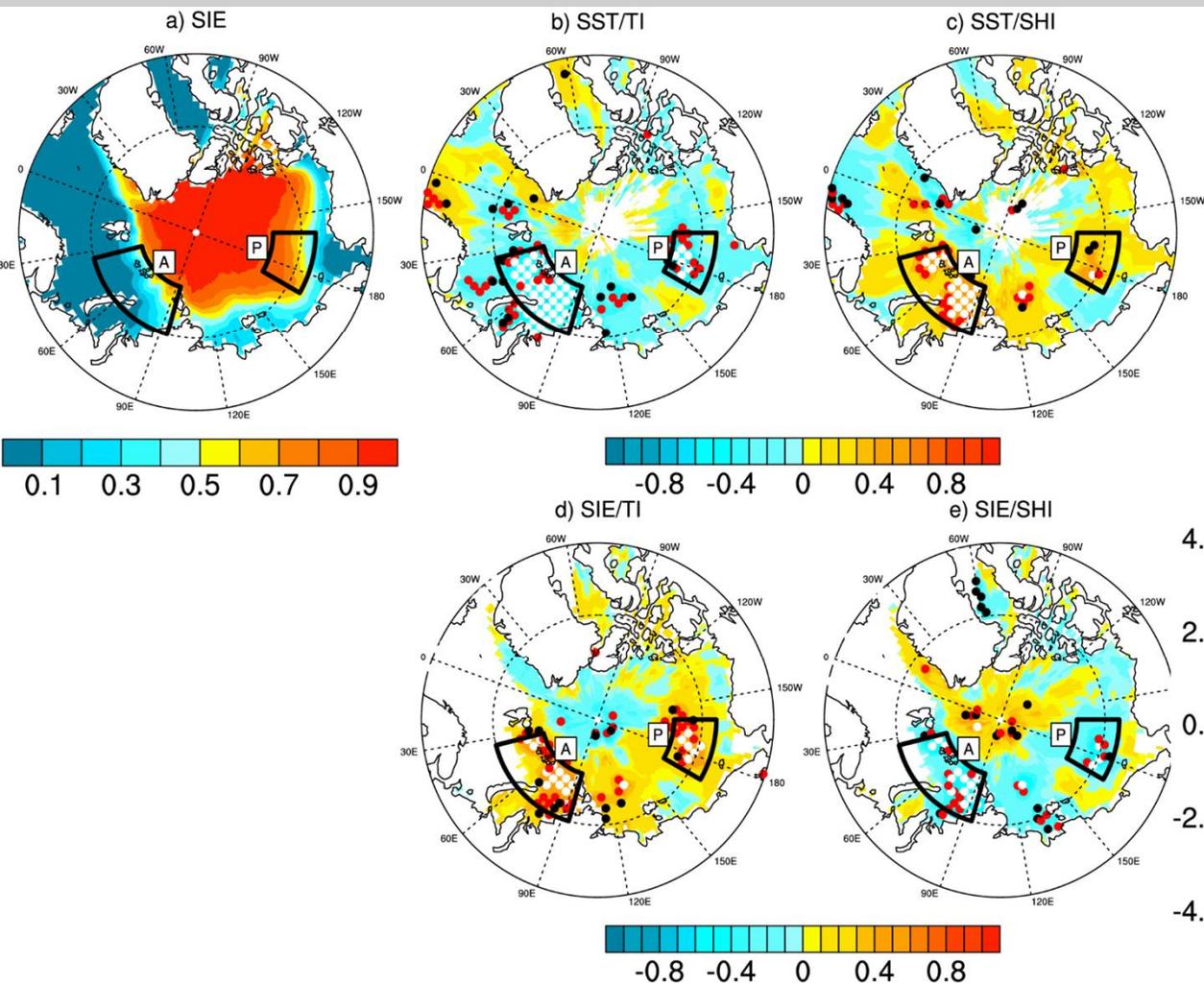
## Time series of observed and predicted SHI

# Hindcast experiment of a CGCM

**Time series of observed and predicted EAWMI**

# Artic Impact

a) SIE

b) SST/TI
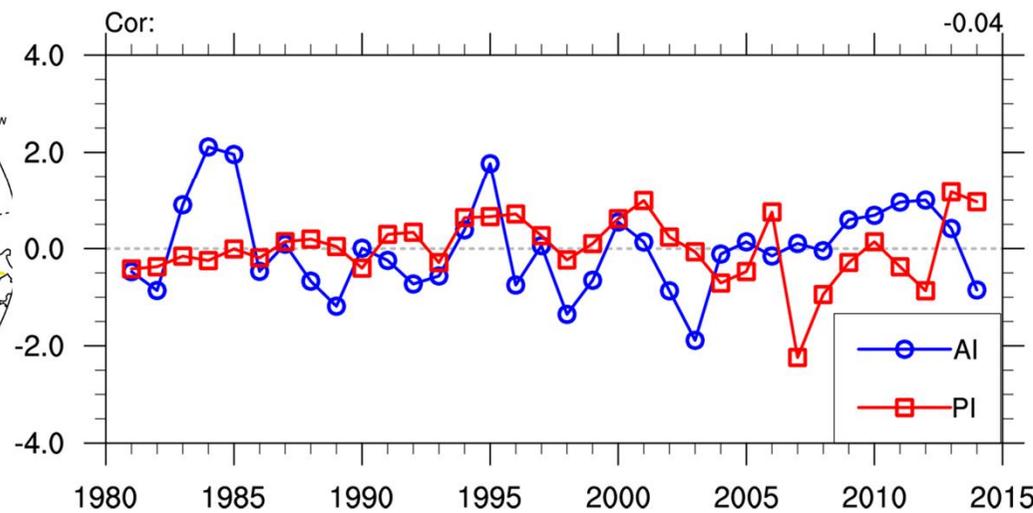
c) SST/SHI

d) SIE/TI

e) SIE/SHI

**A index (AI):**
AI is defined as area averaged (34-94E, 75-82N) ASO SST from Research Data Archive at NCAR.

**P index (PI):**
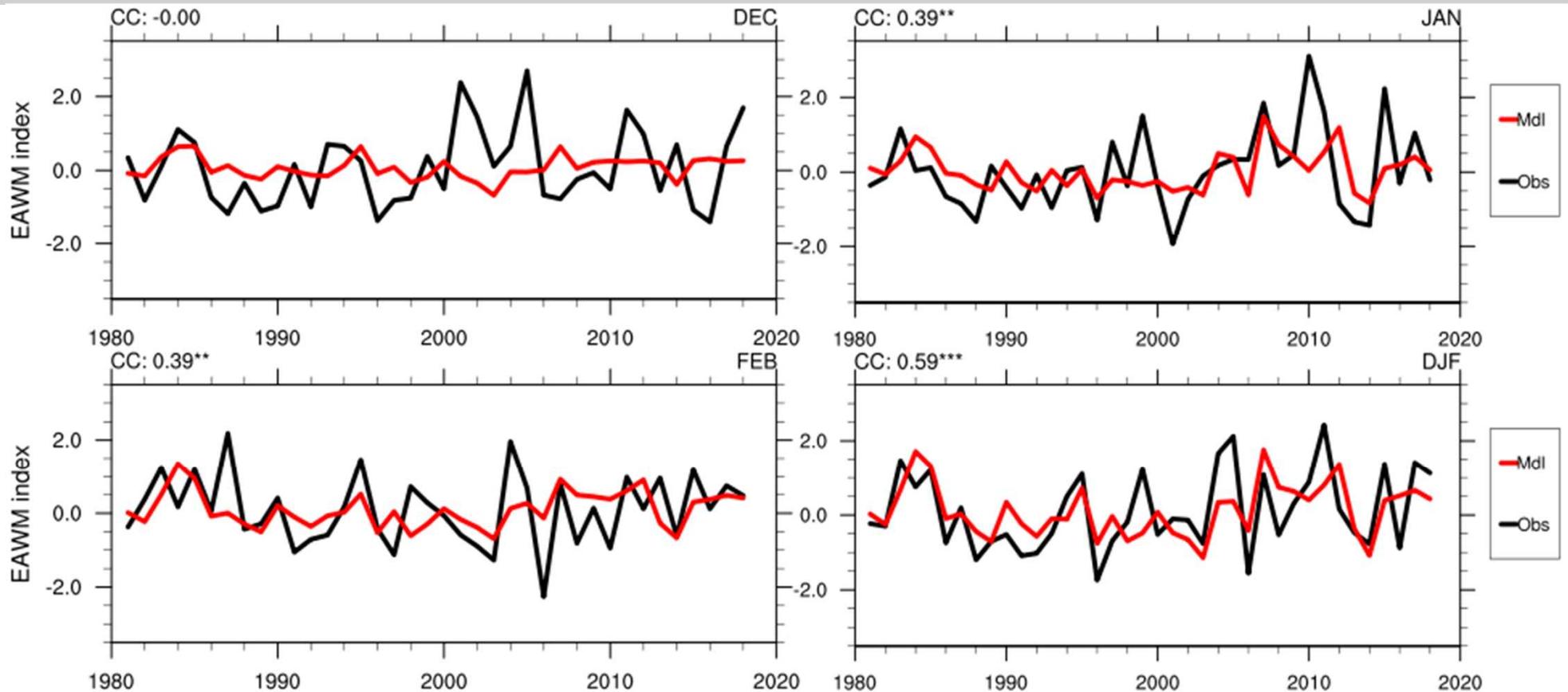PI is defined as area averaged (170E-160W, 73-79N) ASO SIE from Research Data Archive at NCAR.

Cor:                                    -0.04
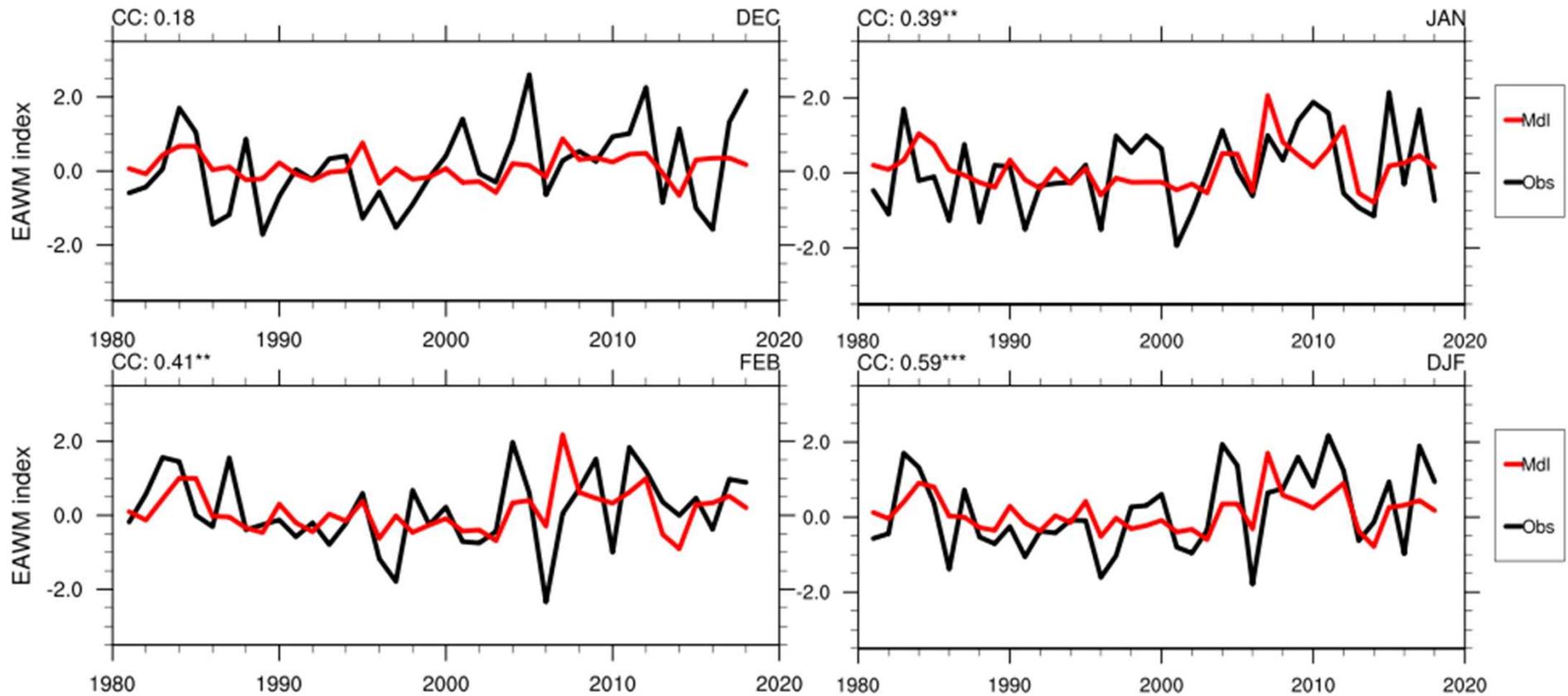
AI

PI

# Hindcast experiment of a statistical model

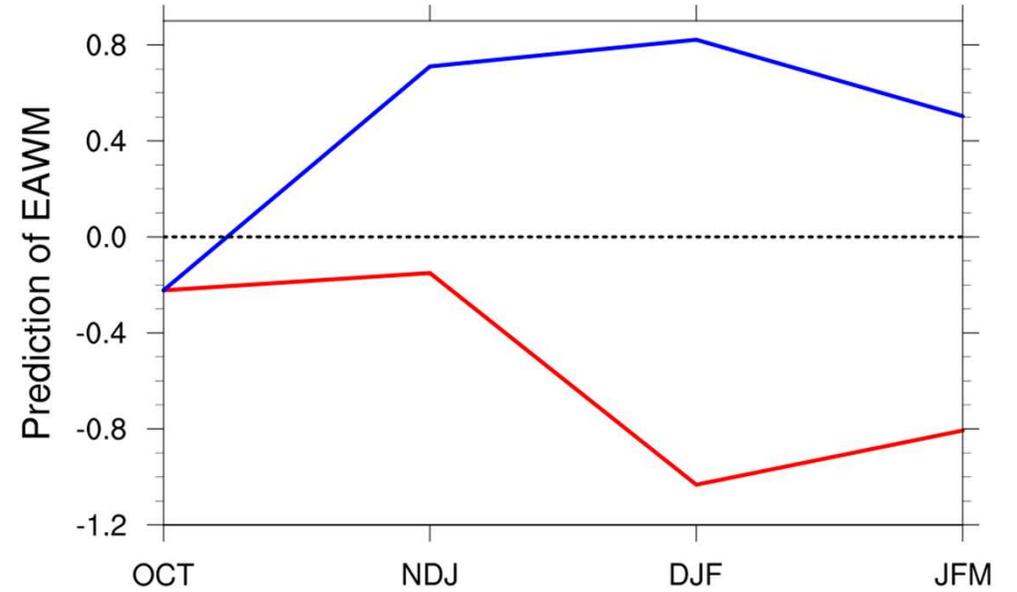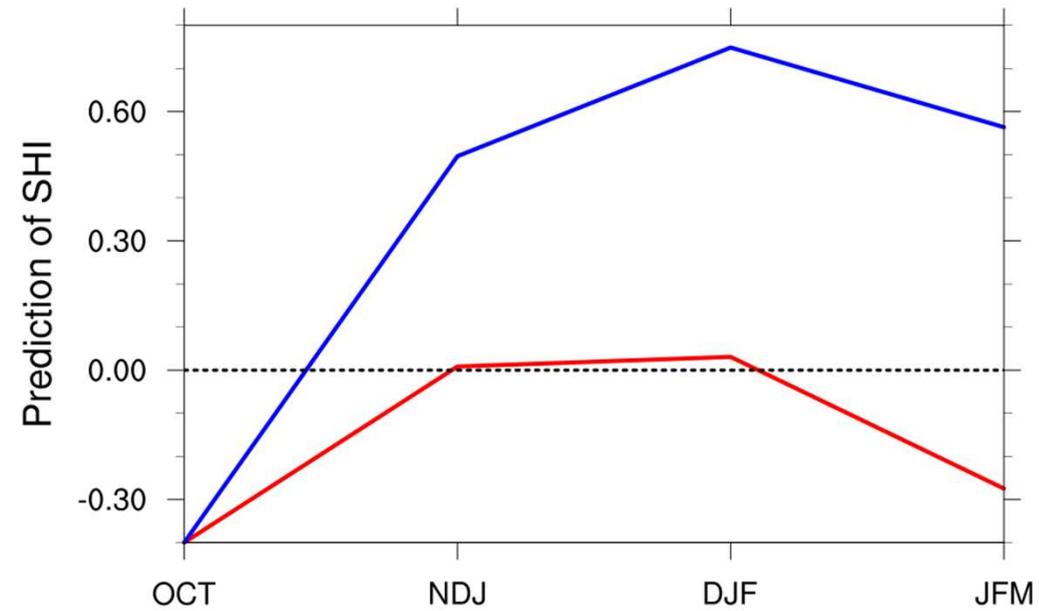Time series of observed and predicted SHI

# Hindcast experiment of a a statistical model

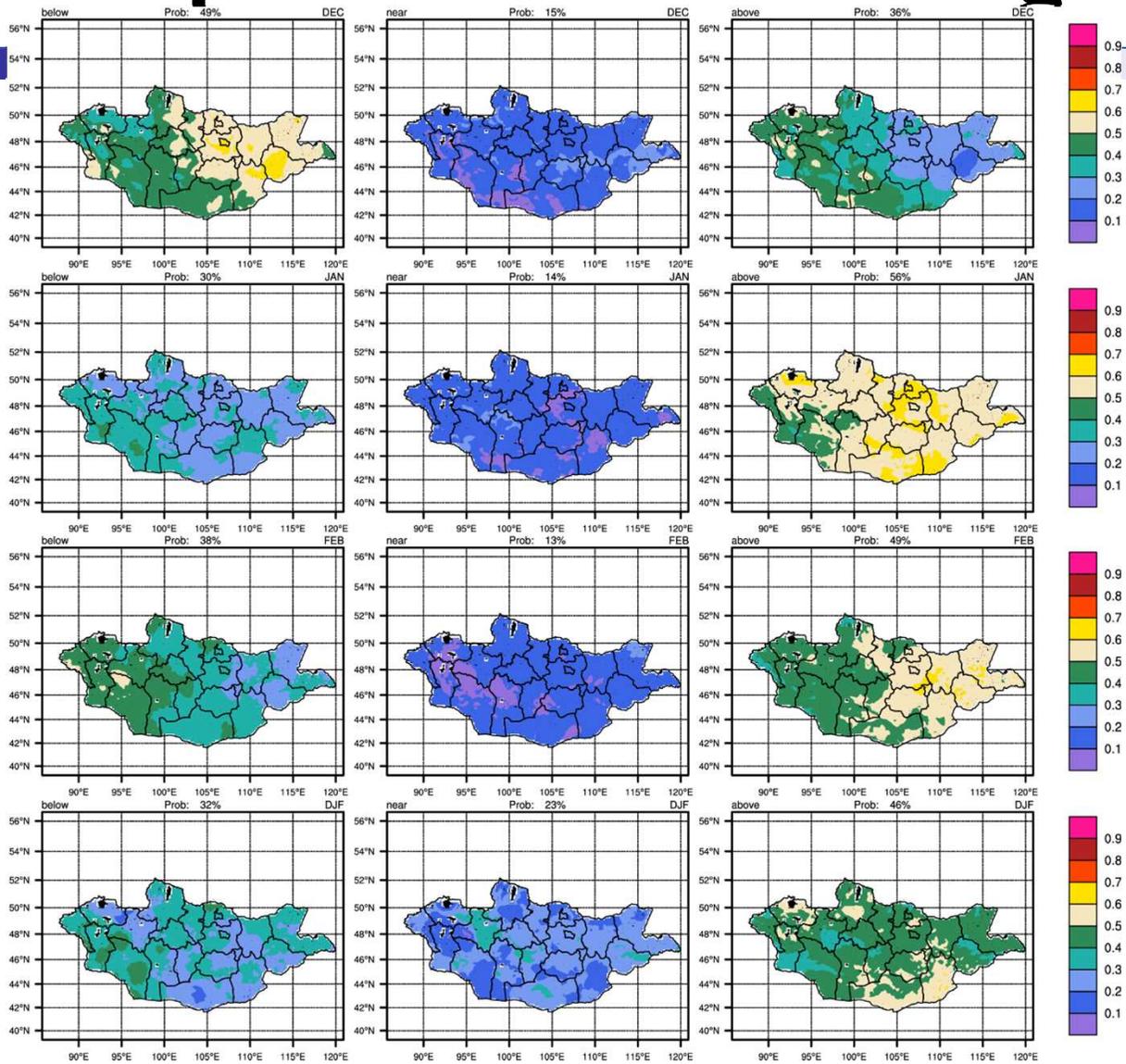Time series of observed and predicted EAWMI

# Seasonal outlook

# Prediction for SHI and EAWMI

# Probabilistic prediction over Mongolia

# Summary