



Nansen-Zhu International Research Centre (NZC)

Connection between November snow cover over Eastern Europe and winter precipitation over East Asia

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Outline

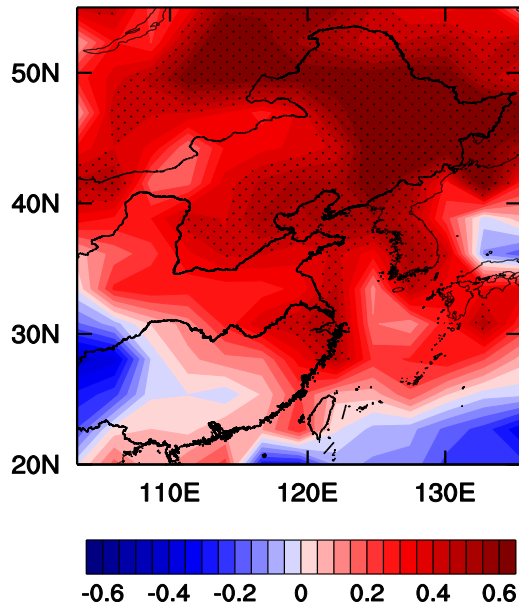
- ◆ Relationship between the winter precipitation over East Asia and November snow cover over Eurasia.
- ◆ Atmospheric circulation associated with winter precipitation over East Asia and November snow cover over Eastern Europe.
- ◆ How does the anomalous November snow cover over Eastern Europe have a delayed relationship with the following winter' s atmospheric circulation over East Asia.
 - *December
 - *January-February
- ◆ Conclusion and discussion

Data sets

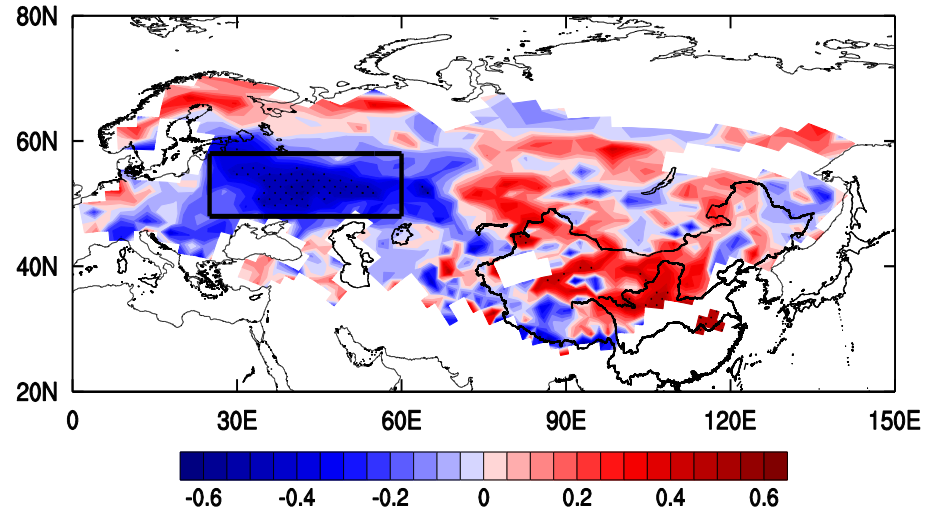
- ◆ Monthly precipitation data over East Asia for the period 1979–2010 on a $2.5^\circ \times 2.5^\circ$ grid were obtained from the Global Precipitation Climatology Project.
- ◆ Monthly snow cover extent data over Eurasia for the period 1979–2010 on an 89×89 grid were acquired from the Rutgers University/National Oceanic and Atmospheric Administration National Climatic Data Center
- ◆ Monthly atmospheric circulation reanalysis data sets on a $2.5^\circ \times 2.5^\circ$ grid were provided by the National Centers for Environmental Prediction–National Center for Atmospheric Research (NCEP–NCAR)

SVD of winter precipitation over East Asia and November snow cover over Eurasia

**SVD1:
26.9%**



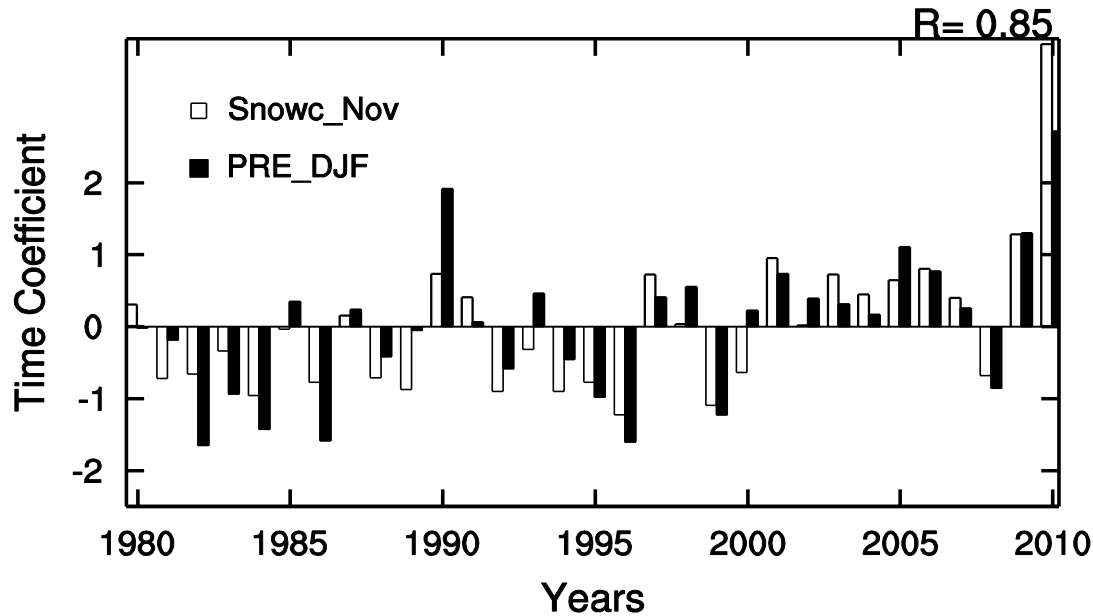
↑
winter (DJF) precipitation over East Asia



↑
November snow cover over Eurasia

SVD of winter precipitation over East Asia and November snow cover over Eurasia

the standardized time series of SVD1, 99.99% confidence level:



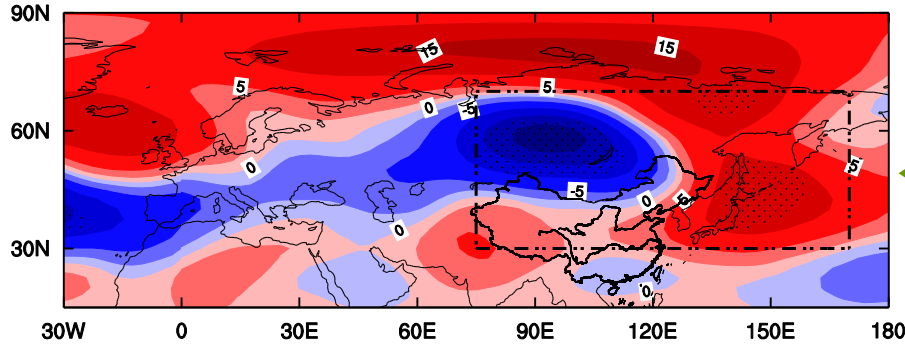
Snow cover index(SCI): $48^{\circ} - 58^{\circ} \text{ N}, 25^{\circ} - 60^{\circ} \text{ E}$ ($\uparrow -0.74$) (negative)

East Asian winter precipitation index: over East Asia north of 35° N ($\uparrow 0.90$)

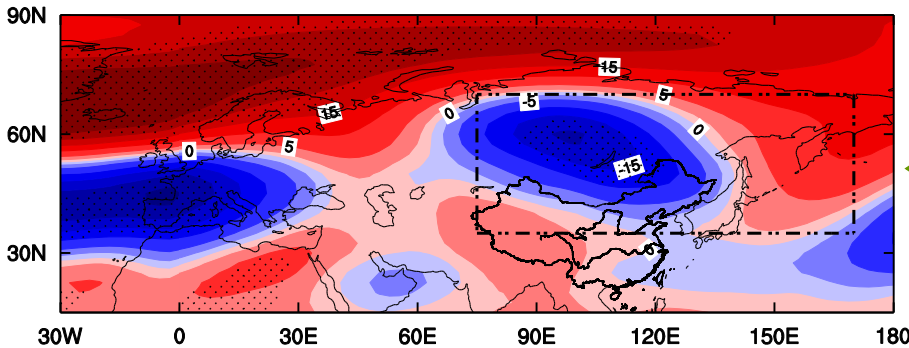
0.54

Atmospheric circulation

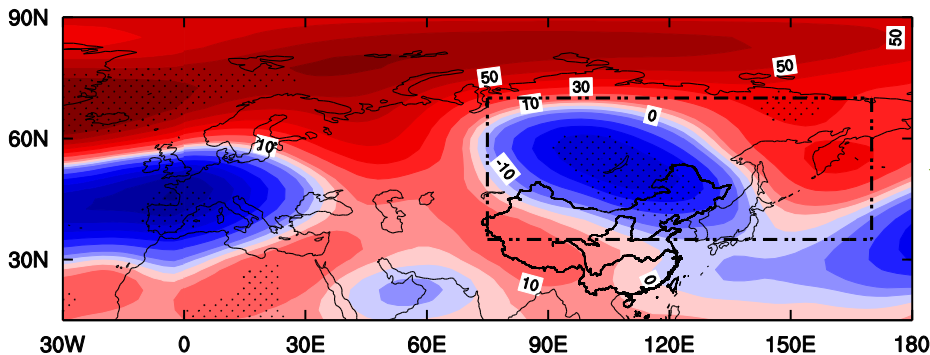
Regressions of geopotential height at 500 hPa:



← area average winter precipitation over East Asia north of 35° N



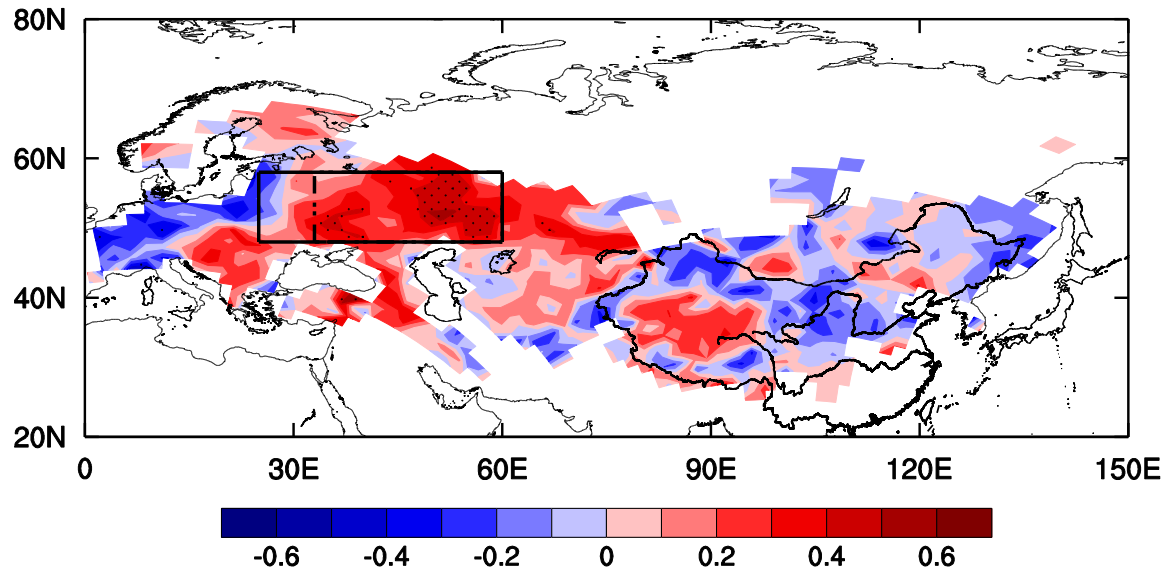
← the negative SCI over Eastern Europe



← composite differences of winter geopotential height between low SCI (<-1) years and high SCI (>1) years

Mechanism in December

Correlation distributions of SCI in November and in December



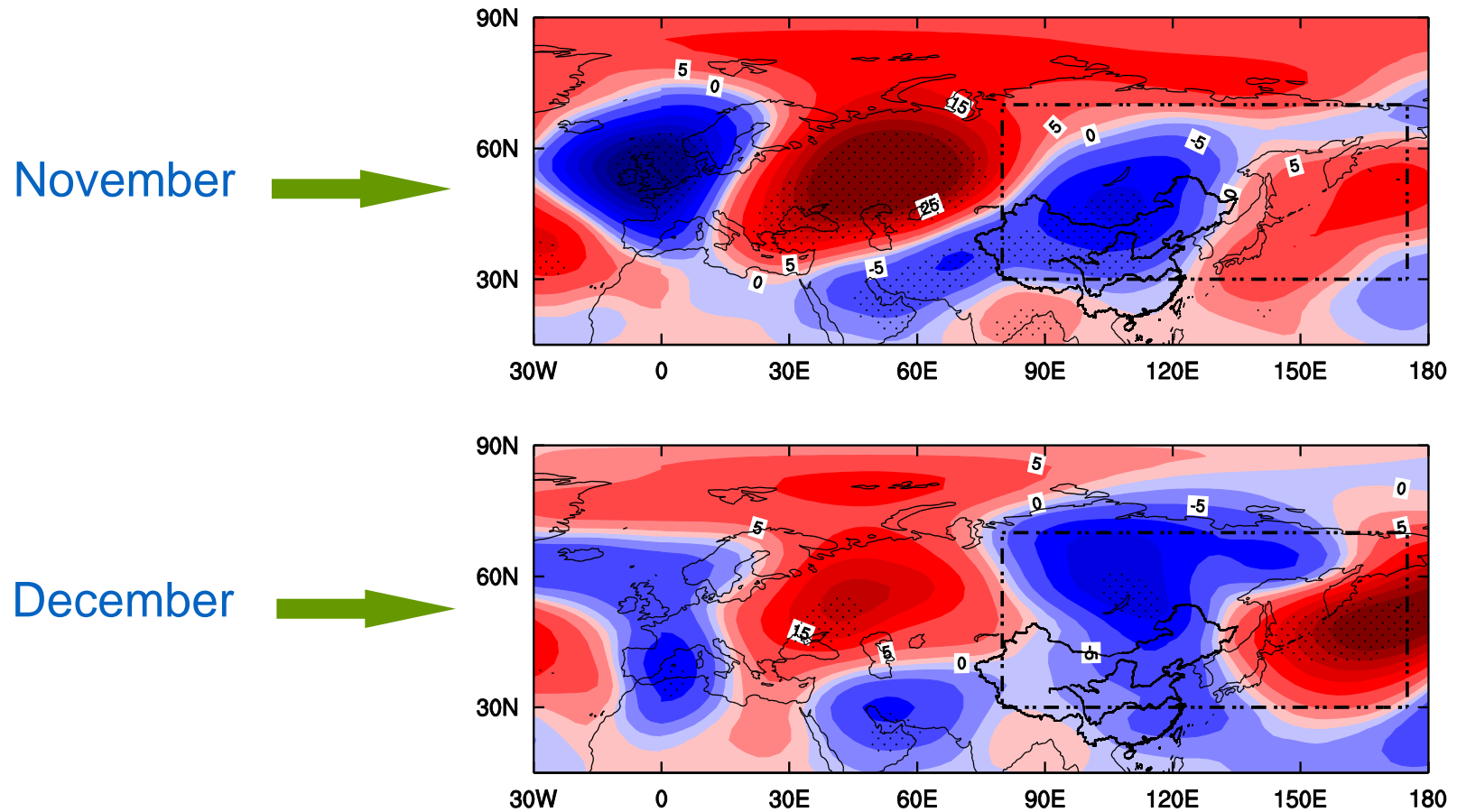
SCI(Nov)~snow cover(Dec)
Corr: 0.50
99% confidence level



Good persistence from
November to December

Mechanism in December

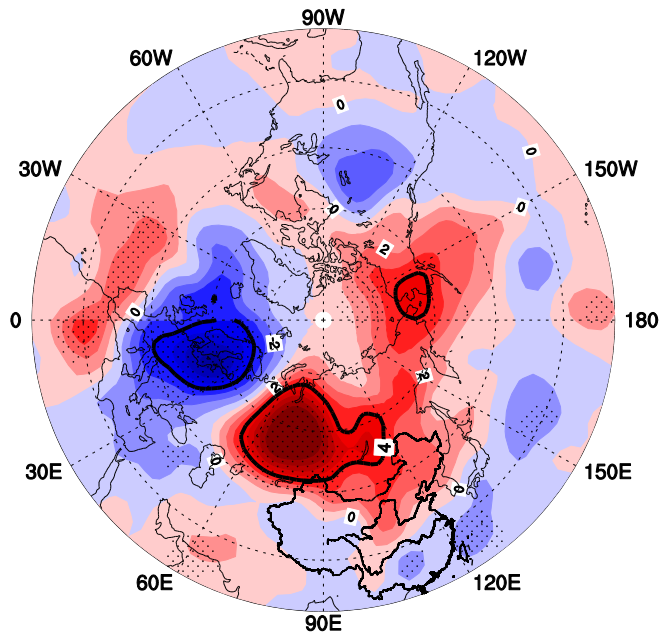
Regressions of negative SCI with geopotential height at 500 hPa



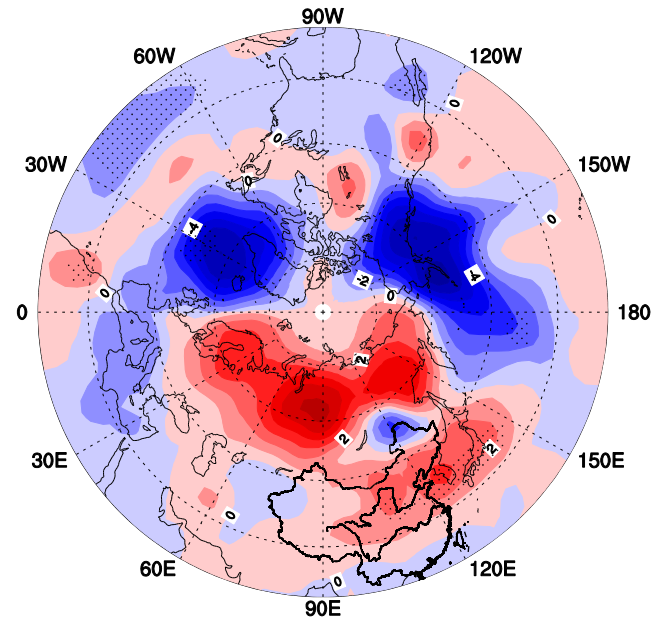
Signal disappears during January-February (SCIs corr: 0.31)

Mechanism in December

Regressions of Wave Activity Flux (WAF) at 100 hPa with negative November SCI:



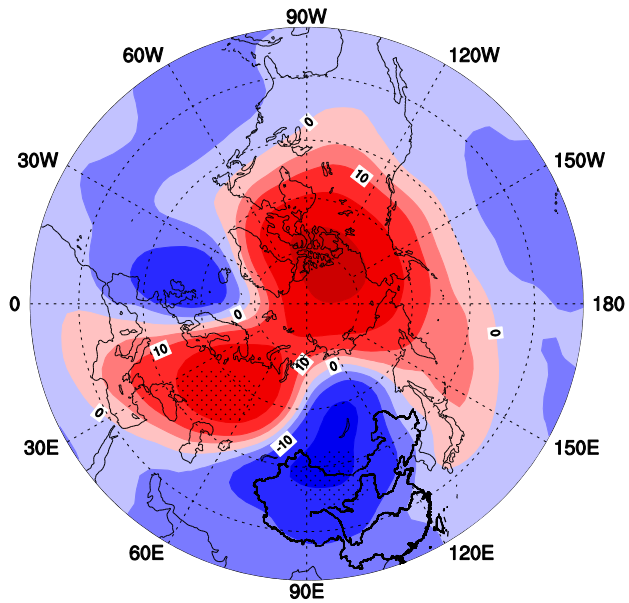
↑
November



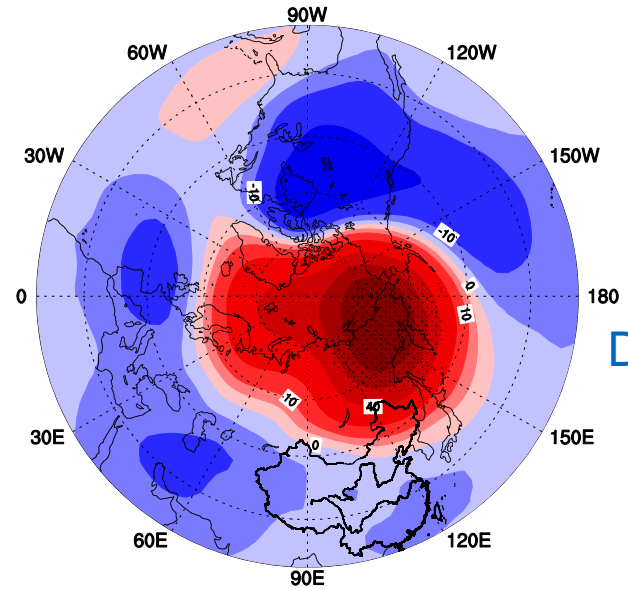
↑
December

Regressions of geopotential height at 50 hPa with negative November SCI

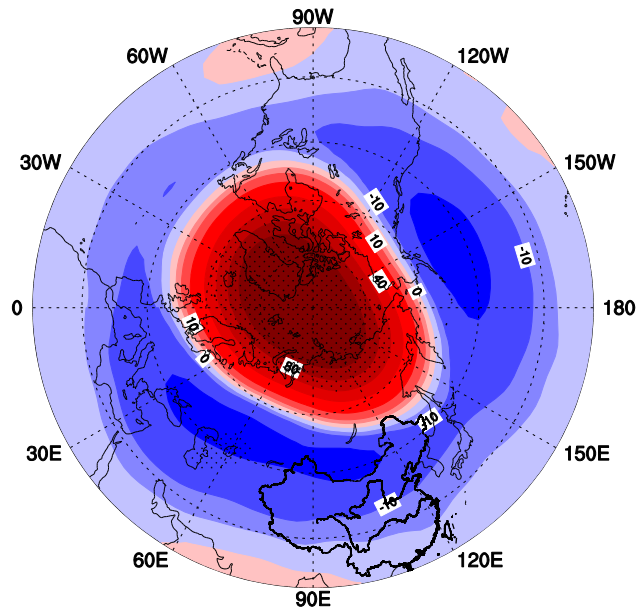
November



December



January-February



Mechanism in January and February

Correlation coefficients of PVI with November SCI and East Asian winter precipitation index from November to February

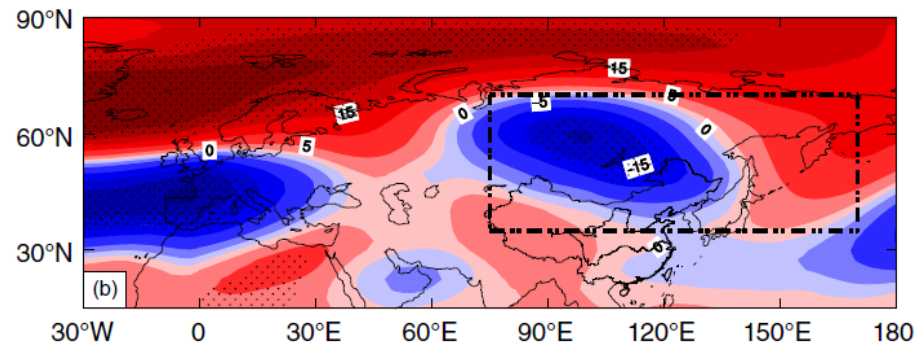
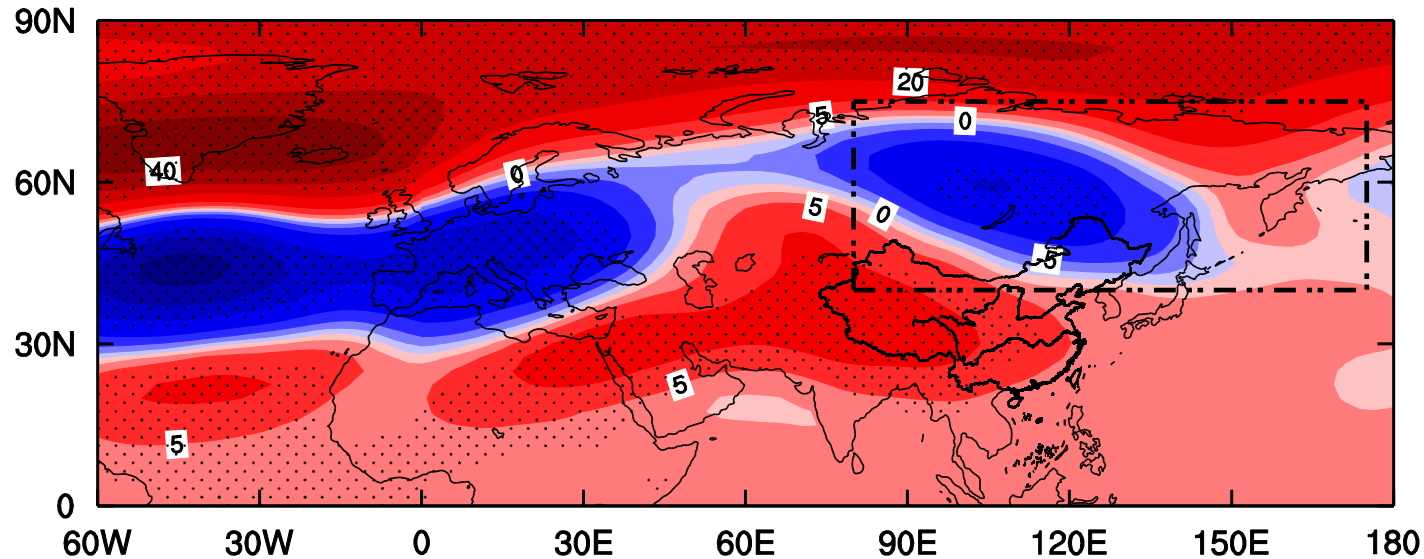
	PVI		
	Nov.	Dec.	Jan.&Feb.
SCI (Nov)	-0.29	-0.28	-0.45(***)
Precipitation (DJF)	-0.0057	-0.024	0.32(*)

(* and *** mean 90 and 99% significance level, respectively)

Polar Vortex Index (PVI): averaged geopotential height at 50 hPa over the region north of 60° N

Mechanism in January and February

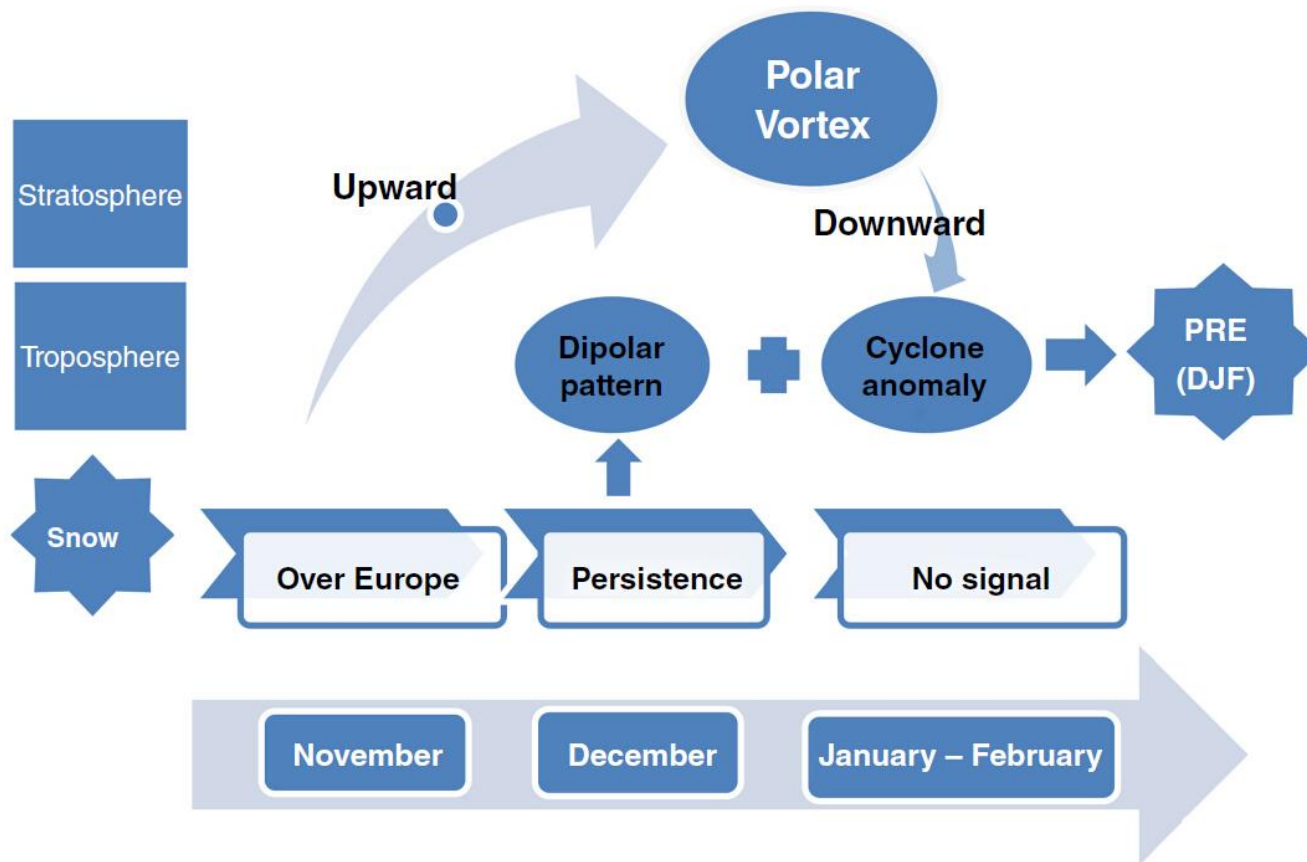
Regressions of geopotential height at 500 hPa with (PVI) at 50 hPa in January–February



Conclusion

- ◆ There is a strong connection between the November snow cover over Eastern Europe and winter precipitation over East Asia.
- ◆ November snow cover anomalies connection to winter precipitation over East Asia consists of two different aspects:

Conclusion



Different Processes

Eastern Europe

East Asia

November
snow cover



Dec. precipitation

Jan.&Feb. precipitation

Different--

a



*memorize signal and
impact circulation*

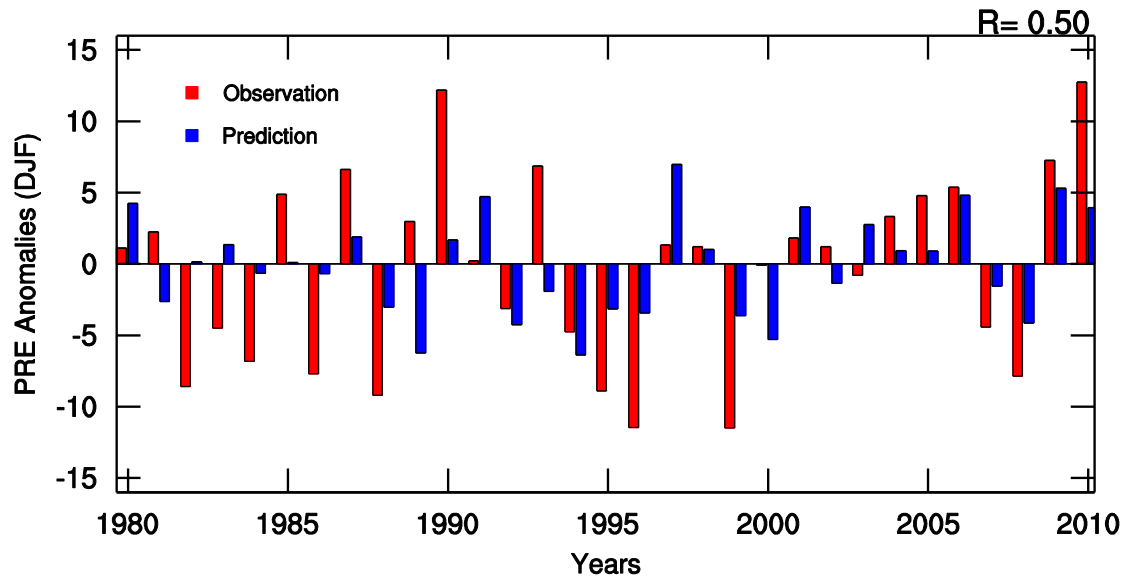
b



*variability of the polar
vortex*

Discussion

East Asian winter precipitation anomalies(unit: mm) averaged over the region north of 35° N **observation** and **prediction** via the cross-validation regression



Corr: 0.50

99% confidence level

Discussion

- ◆ The snow cover over Eastern Europe and over Siberia are independent of each other. The relationship between SCI over Siberia and winter precipitation over East Asia is instable:
 - 1950-1978, weak correlation
 - 1979-2010, corr reaches -0.39, significant at 95% confidence level.
- ◆ There could be a decadal change of relationship between snow cover over Eastern Europe and East Asian winter precipitation.
- ◆ For East Asia, the impact of ENSO on winter climate was weakened significantly after 1970. What are the new physical processes and climatic factors affecting East Asian winter climate?

A winter landscape featuring a snow-covered hill in the foreground. A cluster of bare, leafless trees stands on the crest of the hill. The sky is a clear, pale blue, filled with soft, white, wispy clouds. The overall scene is bright and serene.

Thanks for your
attention!