Identification of an Multidecadal Teleconnection Pattern in the Extratropical Northern Hemisphere

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Teleconnection Families

Family of "P": EA, WP, PNA, EU, TNH, ...

Family of "O": NAO, ENSO, PDO, IPO, AMO...

Family of "M": IOZM(IOD), NAM, SAM, AMM, ...

 A new baby in the family?
➢ Location – Eurasia/North Pacific, upper tropospher
➢ Time scale: Multidecadal





Pacific Decadal Oscillation







EOF analysis

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Northern Hemisphere



What is EOF1?





Eurasian-Pacific Multidecadal Oscillation ? Unique Northern Hemisphere Multi-decadal Variability

Correlation

Correlation EOF PC1 & ERA40 t700200

vs. PC1

T700~200



Correlation EOF PC2 & ERA40 t700200





Correlation

Correlation EOF PC1 & ERA40 2mT T2m vs. PC1



0.5

0.6

0.7

0.9

0.8

-0.7 -0.6 -0.5

-0.9

-0.8

Composite (positive minus negative) 40°N -60°N



Significant at the 5% level are shaded

Relationship with Climate



Composite

Annual mean Kaplan SST



Significant at the 5% level are shaded

Gobal Anomaly Temperature 5 4 9yrs running 3 NH ocean(20°~90°N) 2 · **PC2** Normalize 0 -2-AMO -3 SH ocean(90°~20°S) -4 -5 |__ 1930 1935 1940 1945 1950 1955 1960 1965 1970 1975 1980 1985 1990 1995 2000

Data from: NCDC (ftp://ftp.ncdc.noaa.gov)



left figure : Vertical profile of geopential height in modify 20C and ERA40 over middle northern Hemisphere(40~60N,0~360E average), the value had been normalized by ERA40(1962~1997) and smoothed by 9yrs running averaging. **right figure :** similar to left figure except at 200, 500, 850 hPa.

20C: 20 Century Reanalysis



ECHAM5 simulation: H200 (AMO+ minus Climatology SST)



T2m (AMO+ minus Climatology SST)



ERA40

Model



Unit = STD

- A multidecadal pattern over Eurasia/North Pacific (Euraisan-Pacific Multidecdal Oscillation, EAPMO) is identified
- Most apparent in the upper troposphere, barotropic, larger amplitude near mountain
- Independent of "global warming" mode, EOF1+EOF2 to account for recent change
- ≻Is it truly an oscillation? Likely! (as suggested by 20C data)
- Simulation: Atmospheric Response to AMO (but much weaker than observed), influenced by mountain
- A natural mode should be taken into account in climate change study

Thank You for Your Attention



20 **BADC (Britich Atmospheric Data Centre)**

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EOF analysis

Normalized PC2

Composite for four seasons

H200(MAM) Composite of ERA40 H200 (MAM,P1&P2 minus N)

Significant at the 5% level are shaded

HadAM3

Atmospheric response to warming of the North Atlantic.

(Sutton and Hodson, 2007)

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HadAM3

Atmospheric response to warming of the North Atlantic.

SLP

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T2m

(Sutton and Hodson, 2007)