一步法海氣耦合氣候預報系統長期積分之診斷與評估

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2016/10/4

CWB 1-tier Coupled Model (CWB/CFS1T1)

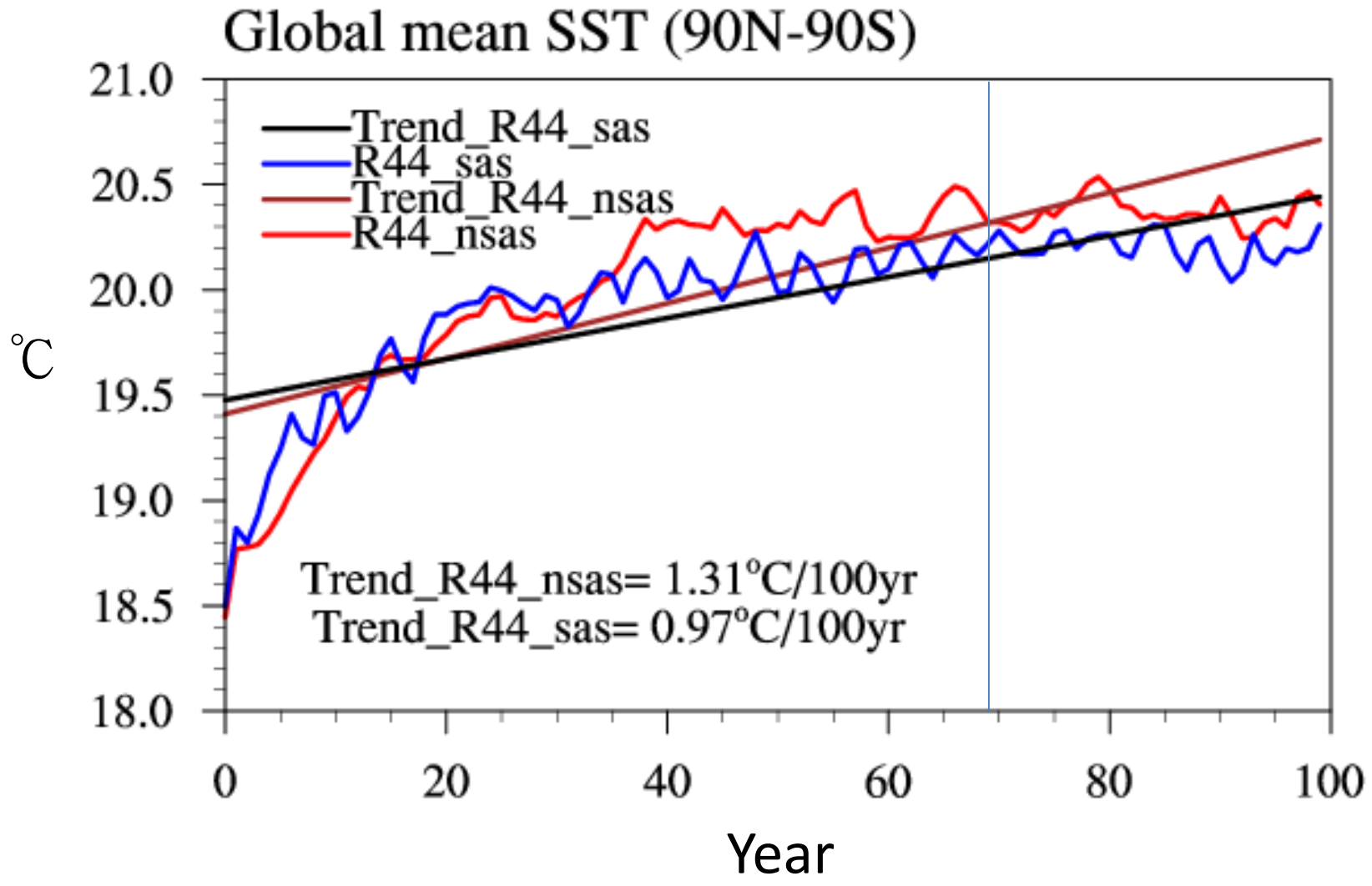
- **Atmospheric Model : CWB GFS model : T119L40**
- **Ocean Model : GFDL MOM3 model**
- **Coupled once per day**

Physics	Method
Cumulus convection	New Simplified Arakawa-Schubert scheme
Soil model	Noah land surface model (4 layers)
Vertical turbulence	a first order closure of nonlocal scheme
Shallow convection	turbulent diffusion-based approach
Grid scale precipitation	Predict cloud water(pcw) and diagnose precipitation with cloud physics (3-time level) (Zhao and Frederick 1997)
Gravity wave drag	Palmer et al.
Radiation	Unified two-stream calculation with k-correlated method

實驗版本	
NSAS	CWB/CFS1T1 by using New Simplified Arakawa-Schubert scheme
SAS	CWB/CFS1T1 by using Simplified Arakawa-Schubert scheme
積分時間	100年 free run
診斷項目	climatology, ENSO, MJO (王斌、李天明教授提供)

OBS：校驗所使用的觀測資料

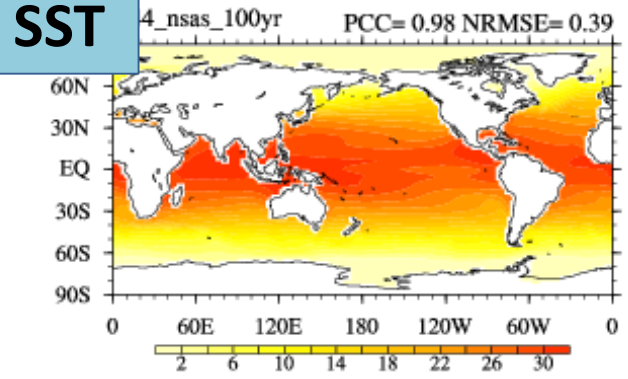
變數		資料來源
SST	海面溫度	ERSST data
Precip	降水	GPCP precipitation data
T2m	2米溫度	CFSR data
Wind	風場	CFSR data
OLR	大氣層頂之長波輻射	NOAA

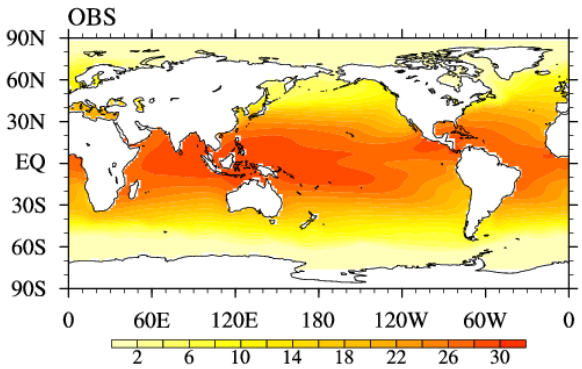

Global mean SST (90N-90S)
21.0
20.5
20.0
19.5
19.0
18.5
18.0
℃
Trend_R44_sas
R44_sas
Trend_R44_nsas
R44_nsas
Trend_R44_nsas= 1.31°C/100yr
Trend_R44_sas= 0.97°C/100yr
0
20
40
60
80
100
Year

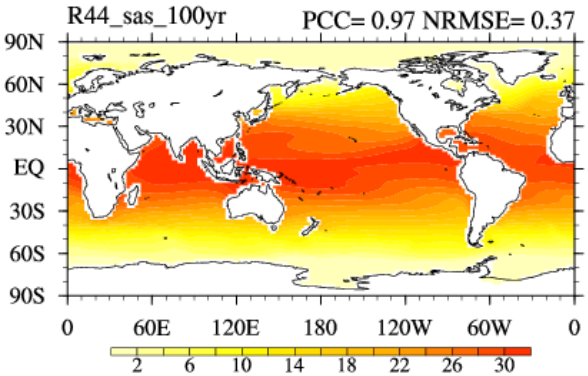
Climatology
(30 year averaged)

NSAS OBS SAS

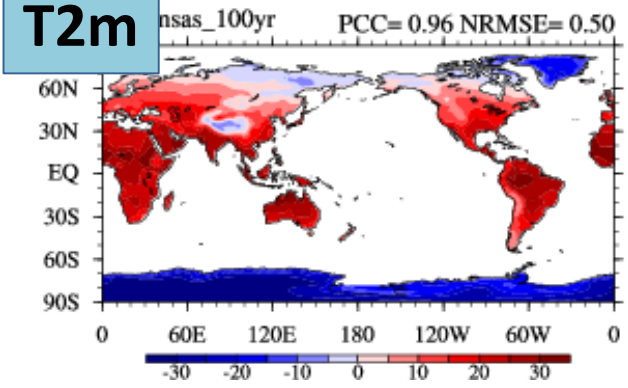
SST

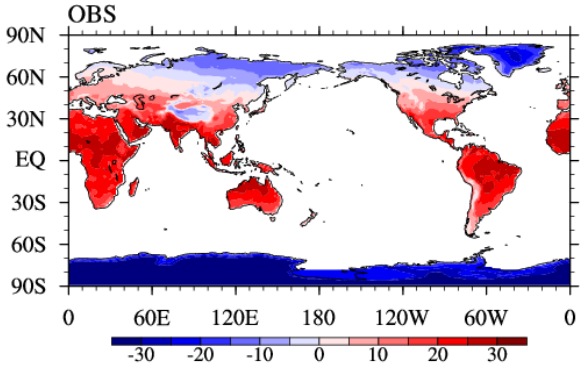


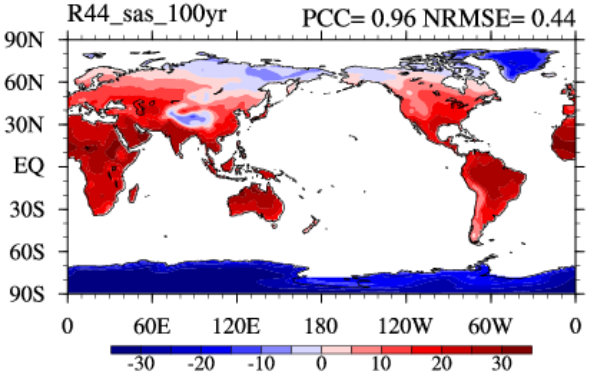




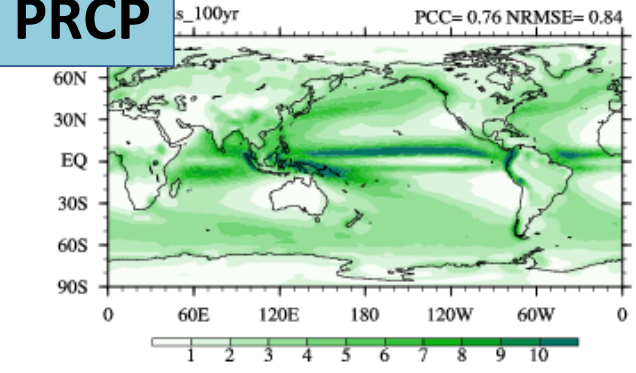
T2m

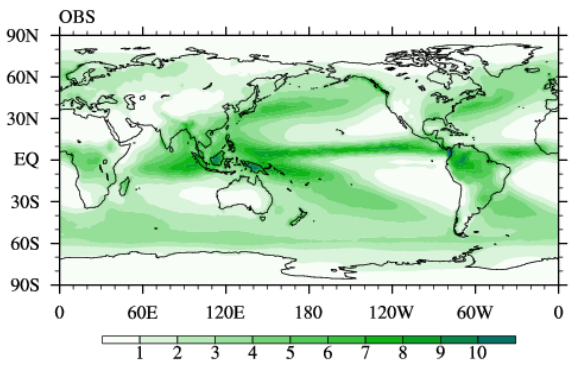


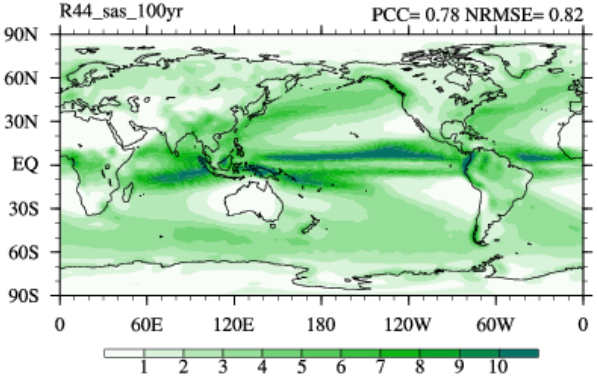




PRCP

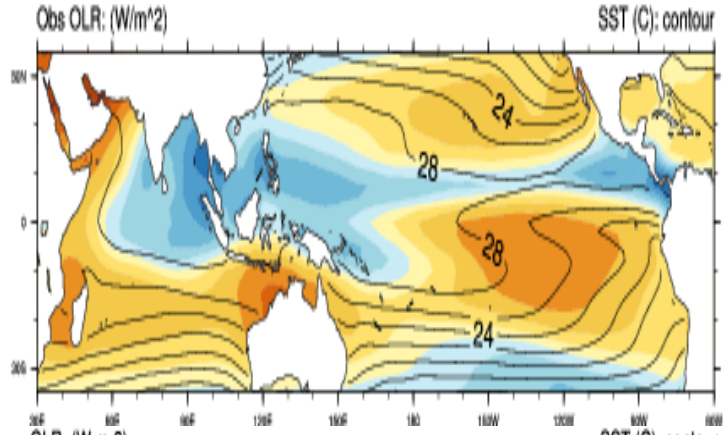




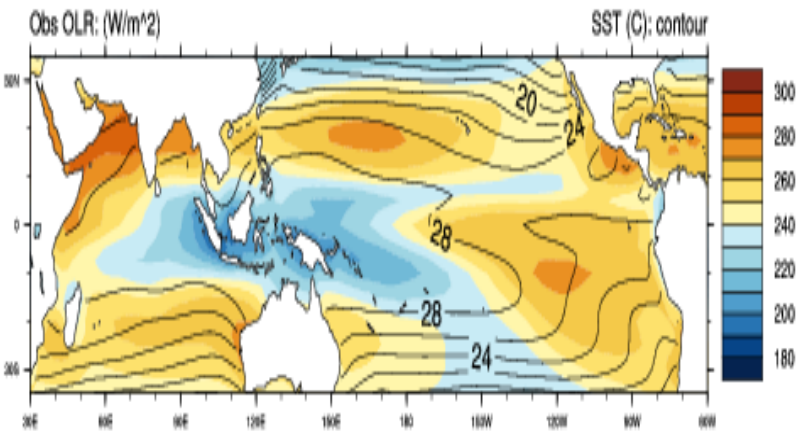


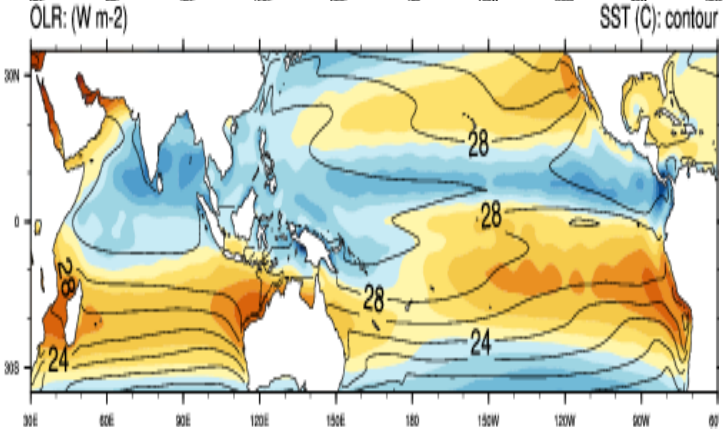
Summer

Winter

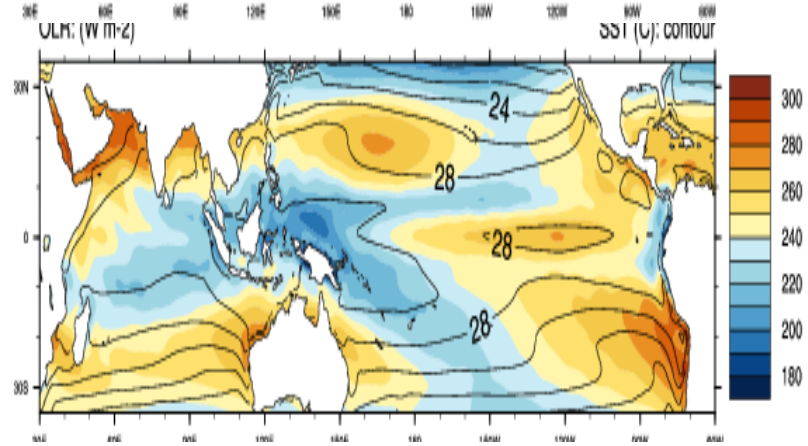


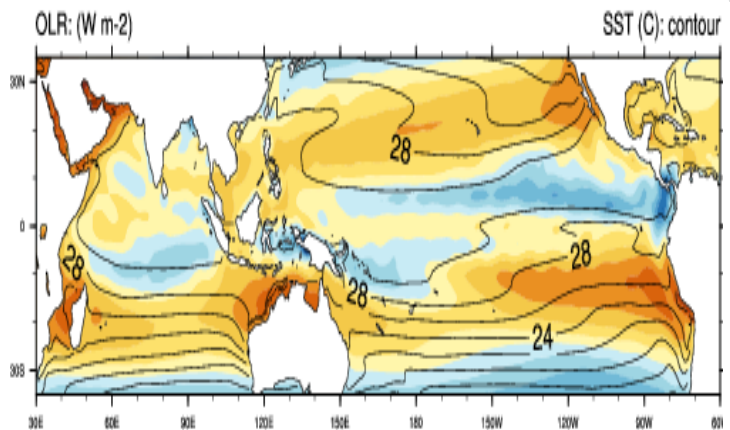
OBS





NSAS





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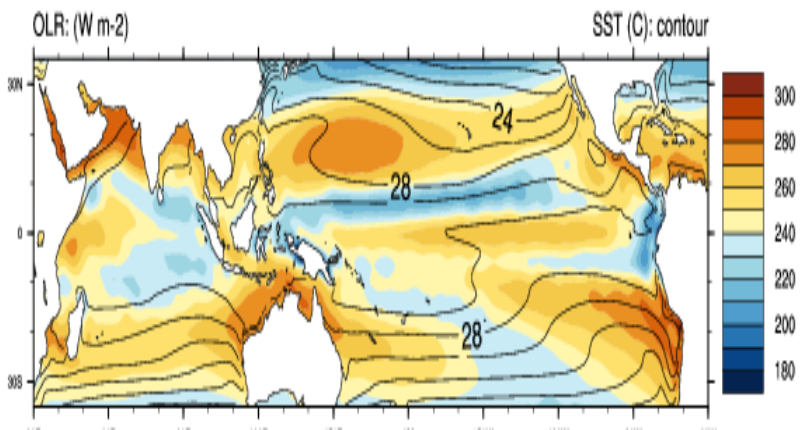


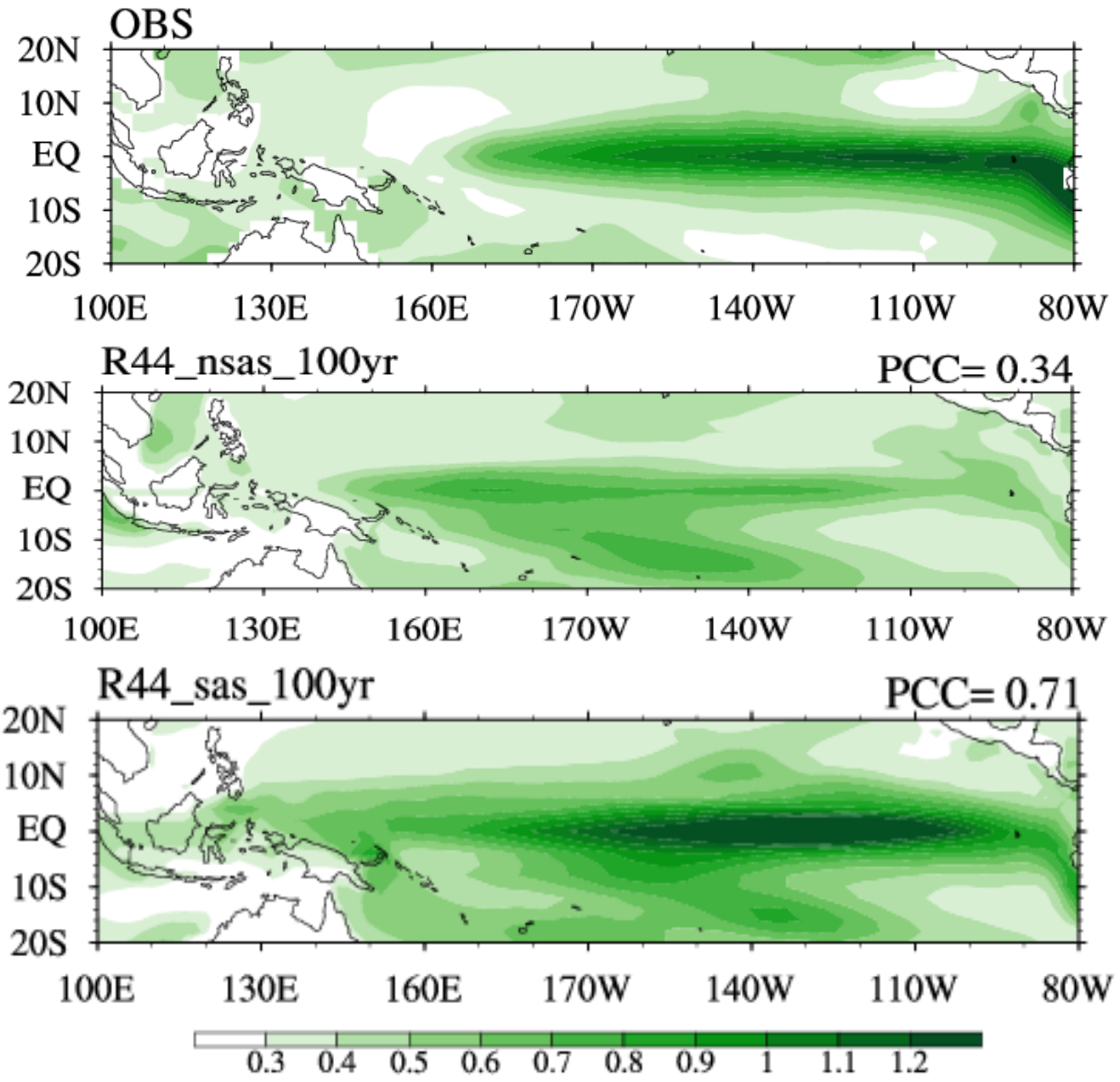
ENSO
(El Niño / Southern Oscillation)

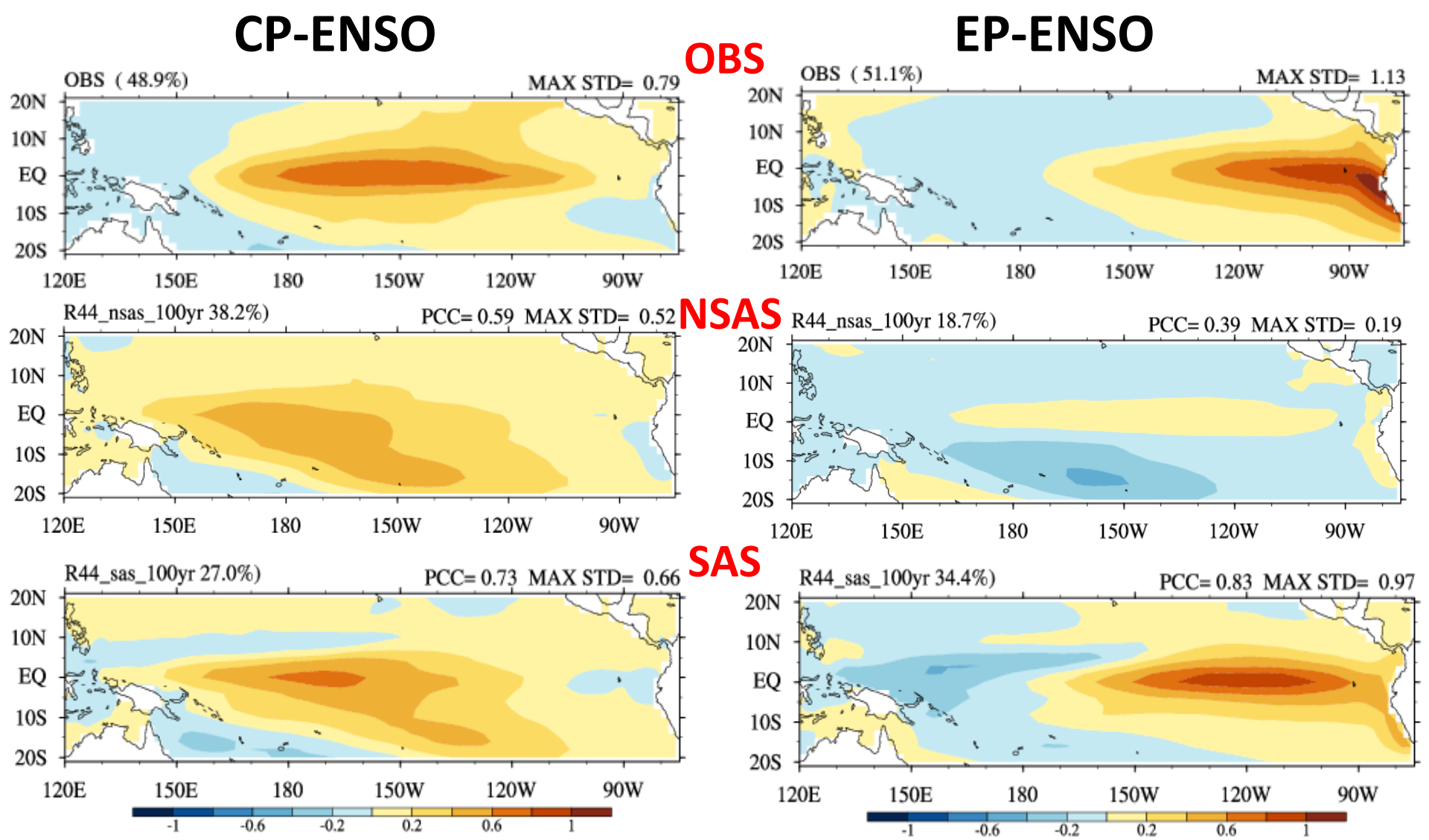
Standard Deviation of SST

OBS

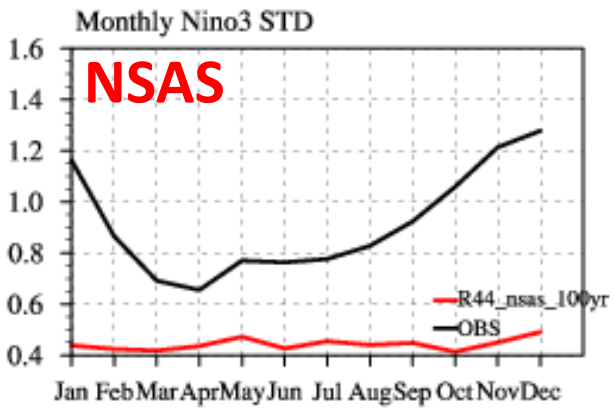
NSAS

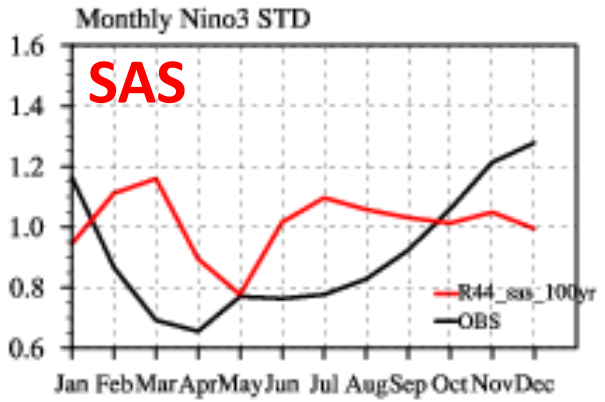
SAS



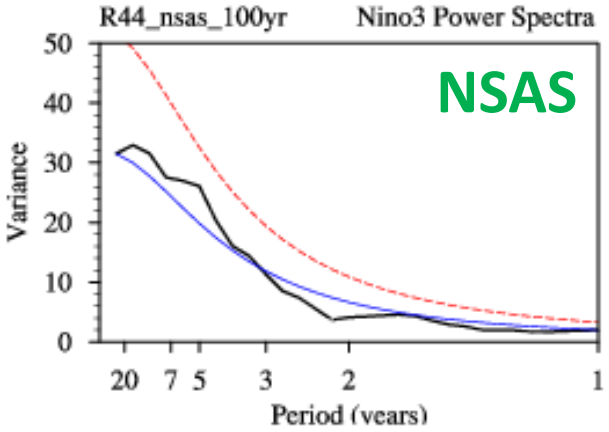

CP-ENSO
EP-ENSO
OBS
NSAS
SAS
OBS (48.9%)
MAX STD= 0.79
OBS (51.1%)
MAX STD= 1.13
R44_nsas_100yr 38.2%)
PCC= 0.59 MAX STD= 0.52
R44_nsas_100yr 18.7%)
PCC= 0.39 MAX STD= 0.19
R44_sas_100yr 27.0%)
PCC= 0.73 MAX STD= 0.66
R44_sas_100yr 34.4%)
PCC= 0.83 MAX STD= 0.97
20N
10N
EQ
10S
20S
120E
150E
180
150W
120W
90W
-1
-0.6
-0.2
0.2
0.6
1

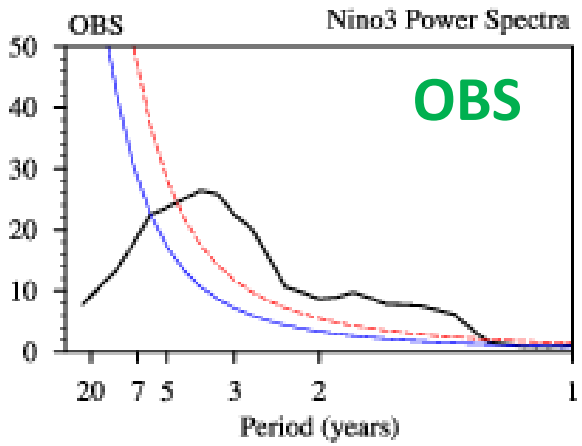
Monthly NINO3 SSTA Standard Deviation

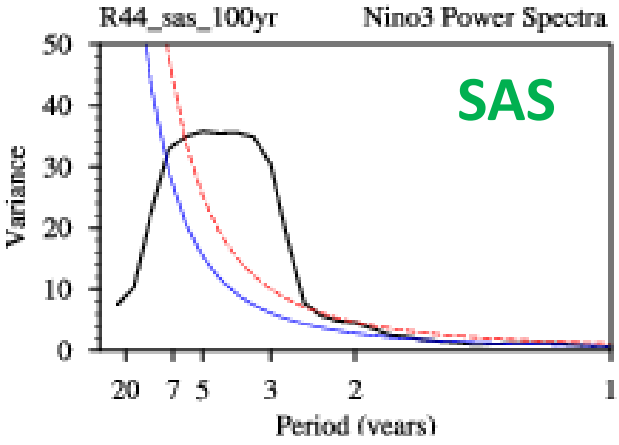




NINO3 Power Spectra





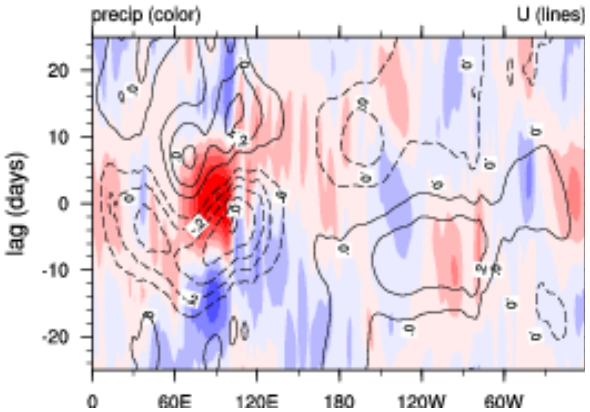


MJO
(Madden-Julian Oscillation)

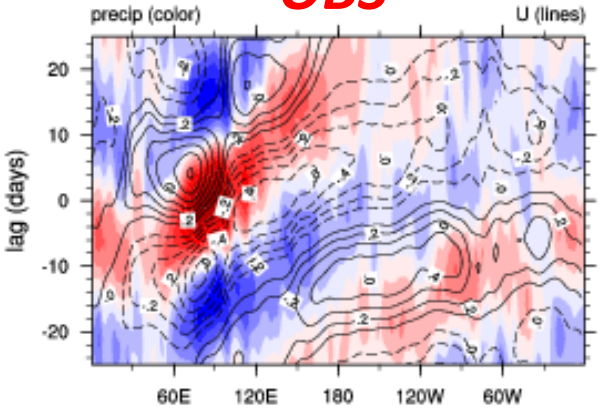
Lag Correlation Diagram

Summer

NSAS



OBS



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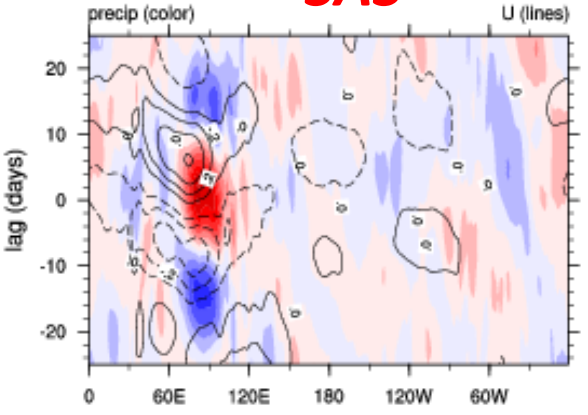
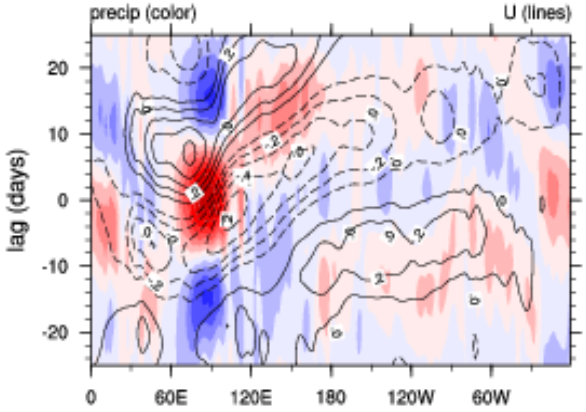
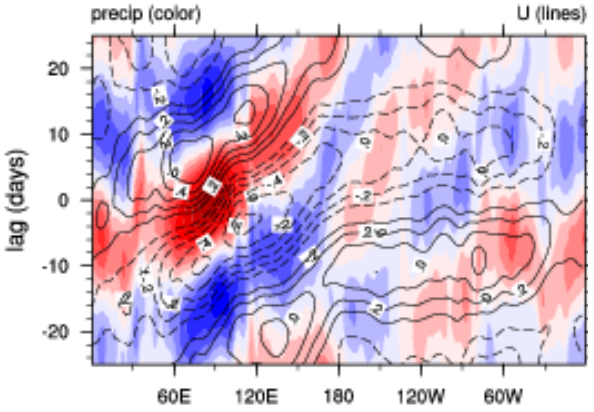
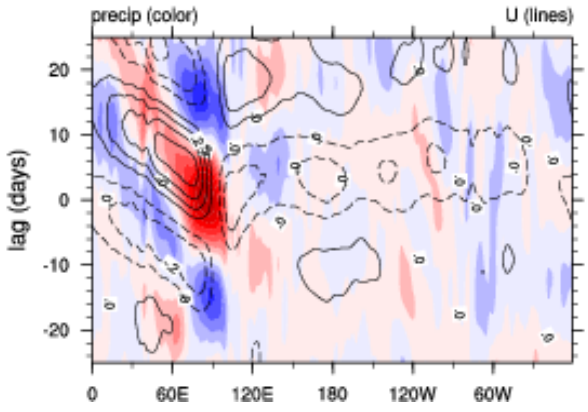
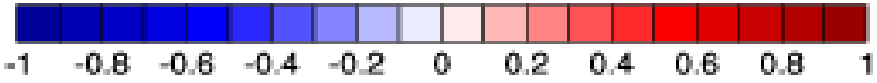


Winter

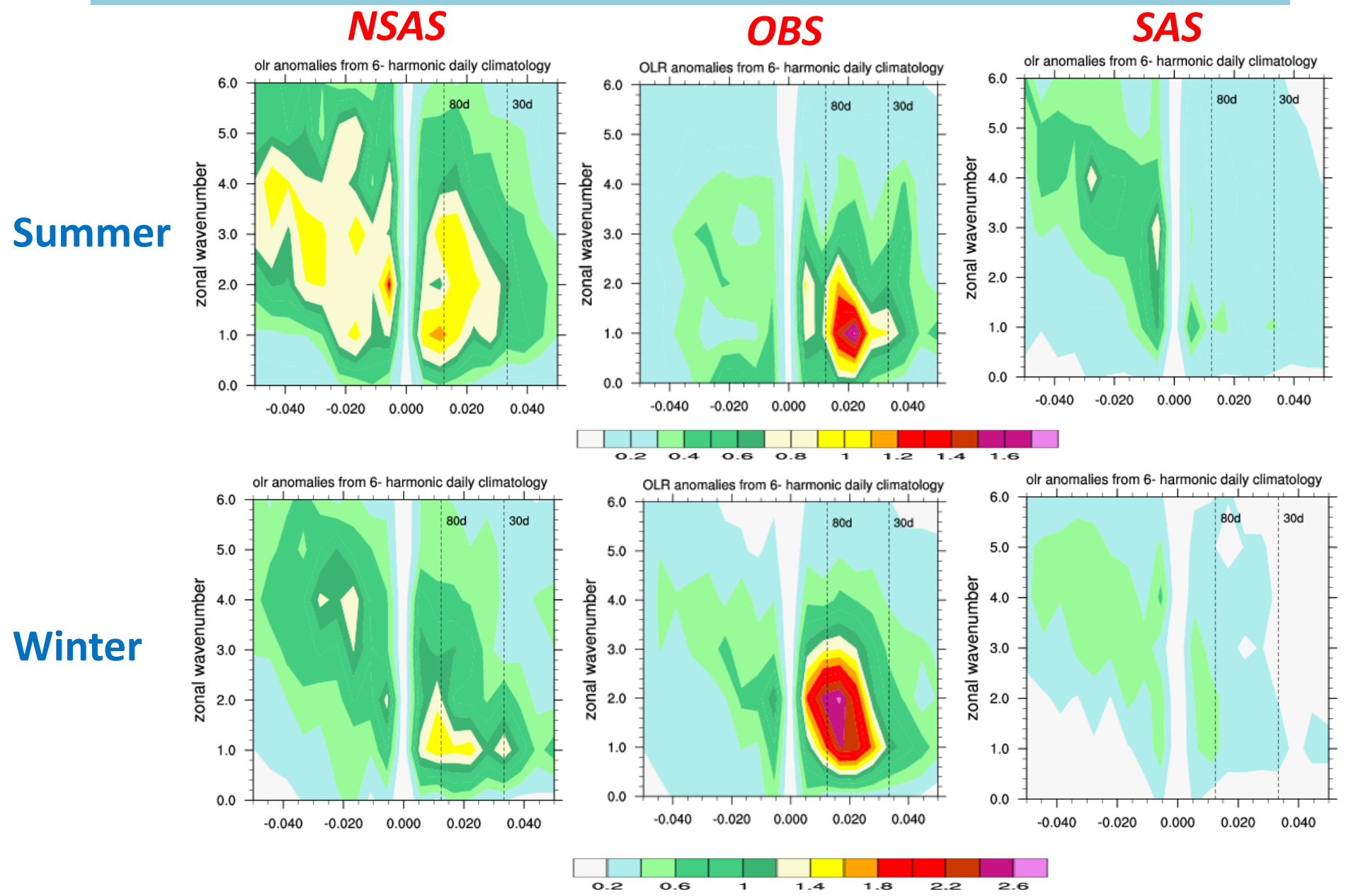








Wavenumber-Frequency Spectra

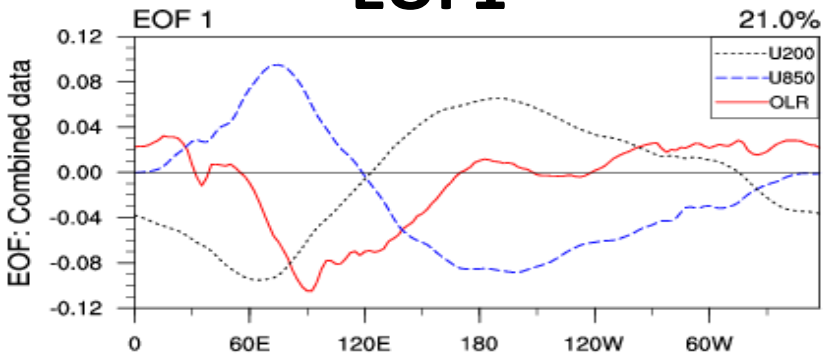


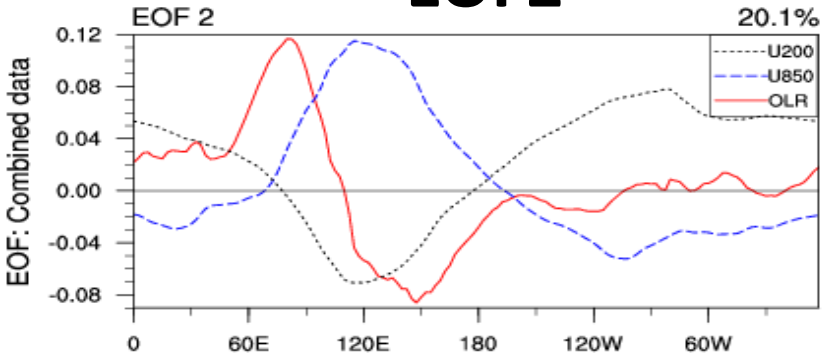
Multi-variate EOF : 15S-15N

EOF1

EOF2

OBS





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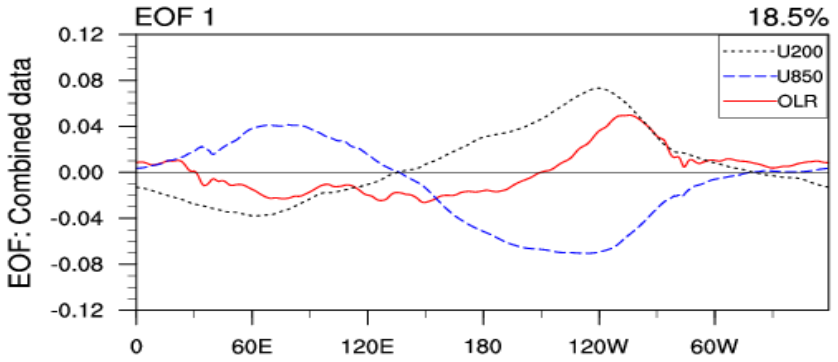
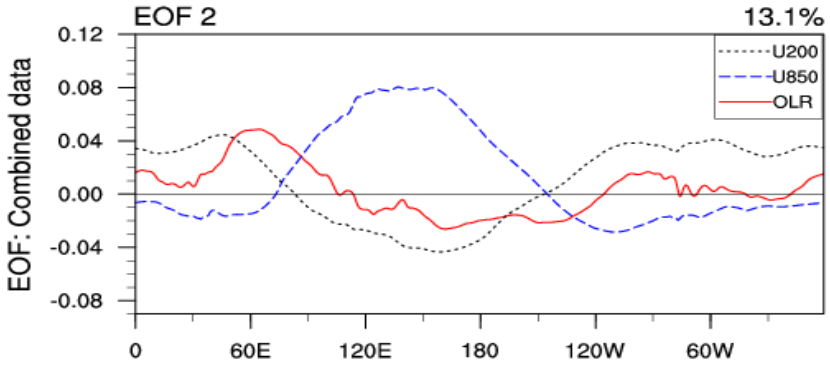
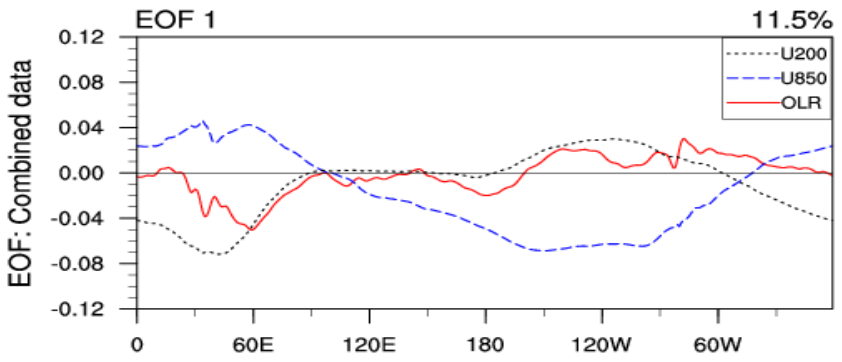
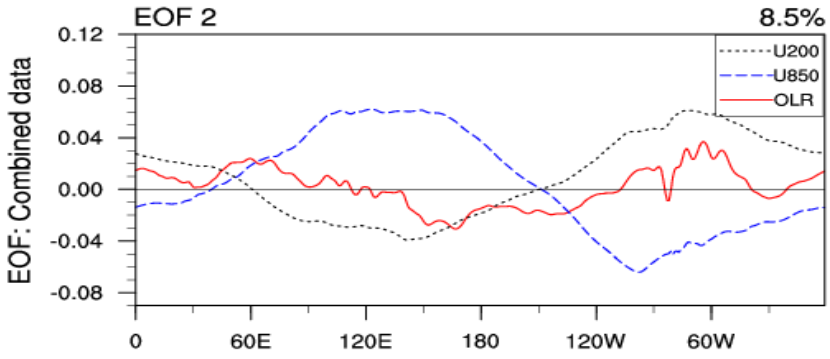




SAS





結論

- 本研究使用一步法海氣耦合模式評估不同積分參數法對氣候值、ENSO及MJO模擬之影響
- 目前作業版使用NSAS版本之積雲參數法，初步分析顯示此系統對東亞地區氣候值與MJO之特性掌握較佳。
- SAS版本積雲參數法對ENSO之模擬優於NSAS版本。
- 積雲參數法對一步法海氣耦合模式之預報影響甚大，未來需要更積極改進。