ICTP-IITM-COLA Targeted Training Activity (TTA):
on
"Challenge in Monsoon Prediction"

Comparison of Monsoon Rainfall Surrounding Bangladesh using Global Models

Group: 8
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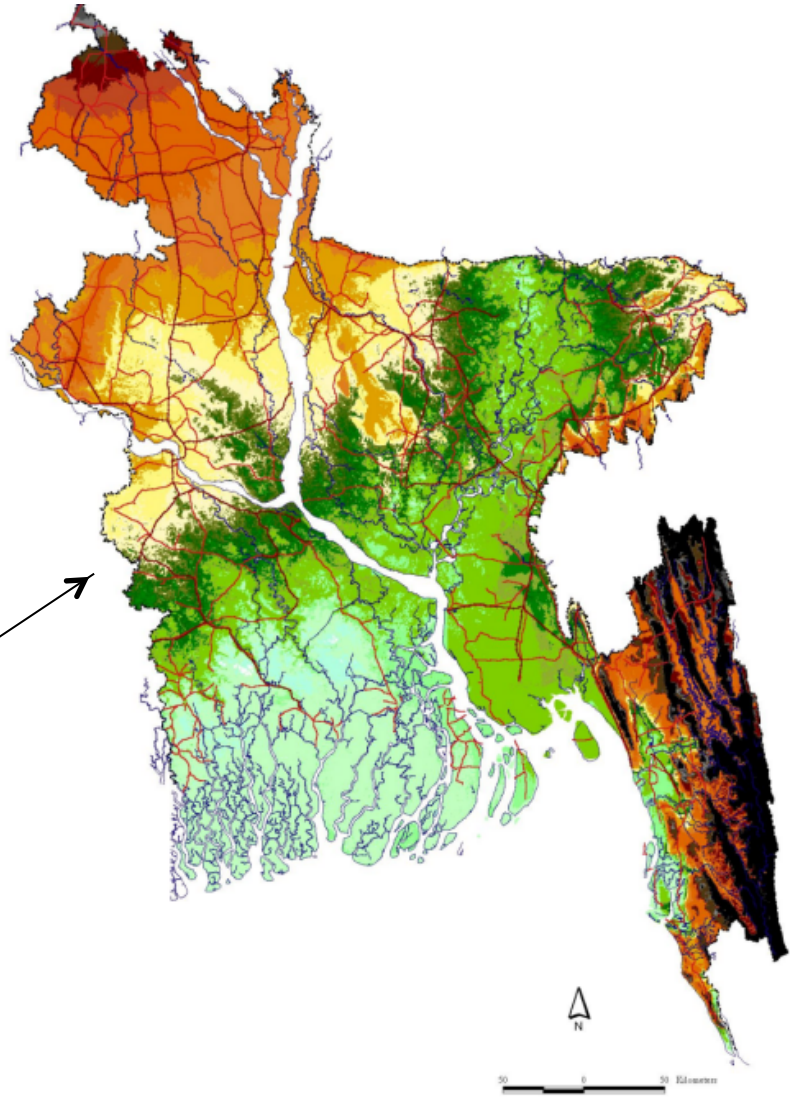
GEOGRAPHY OF BANGLADESH

Bangladesh is vulnerable due to its position in the globe

- about 147,570 sq. Km.
- Lat: 20°45' to 26°40'N
- Long: 88°05' to 92°40'E
- Bangladesh is a land of about 230 rivers
- But its 57 rivers originate from outside
- The major rivers-Meghna, Jumana, Padma and Brahmaputra



CLIMATE OF BANGLADESH

Total Annual Rainfall = 2400 mm

Seasons	Period	Weather Events	Rainfall
Summer (Pre-monsoon)	March to May	Nor'wester, Tornado, Hail, Cyclone, Heat Wave	19%
Rainy Season (Southwest Monsoon)	June - September	Heavy rain, Monsoon Depression, Flood	71%
Autumn (Post-monsoon)	October - November	Cyclone, Tornado	8%
Winter (Northeast Monsoon)	December - February	Abnormal Dryness (Drought), Cold Wave	2%

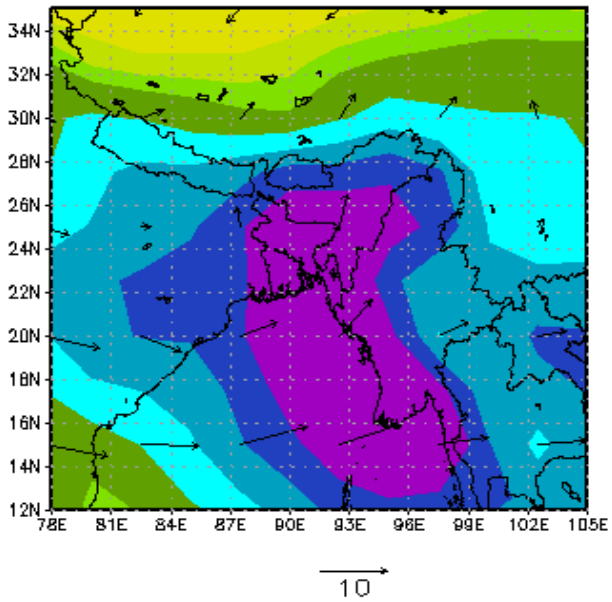
Methodology

- For monsoon season has been selected for the following models
- Region is [78:105E; 12:35N]

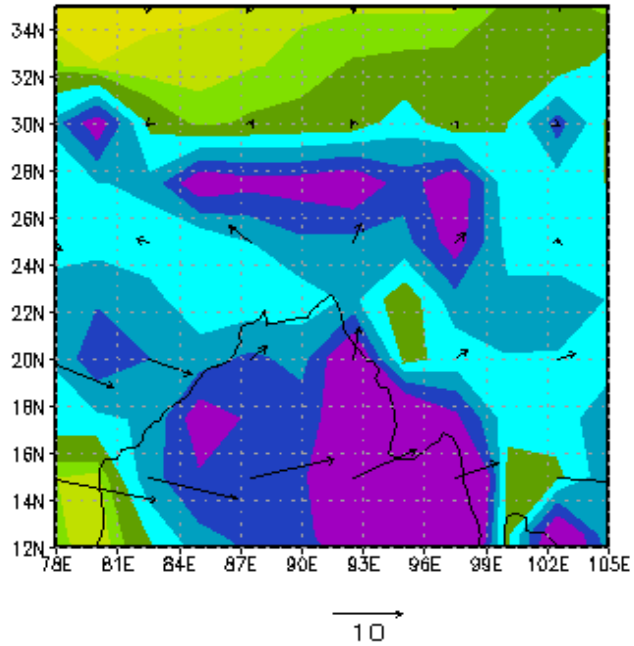
Models	Period
GPCP	1981-2012
ECMWF SYS-4	1981-2012
HadISST	1981-2012
NCEP	1981-2012

Climatology (mm/d)

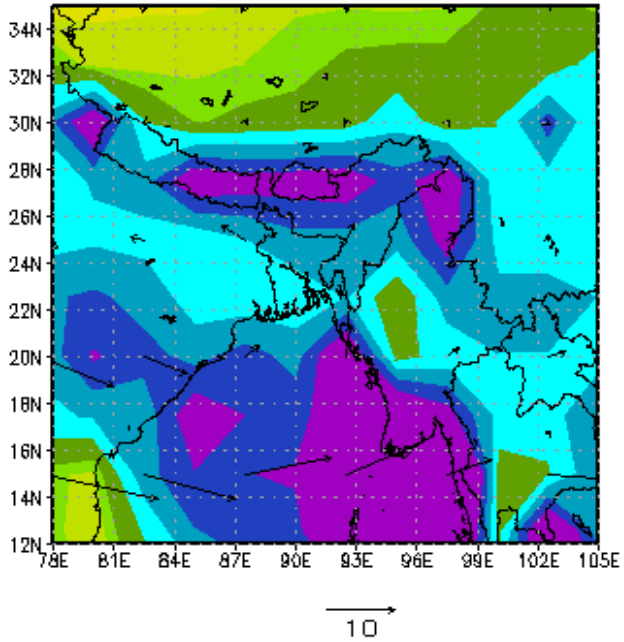
clim GPCP JJA 81–12



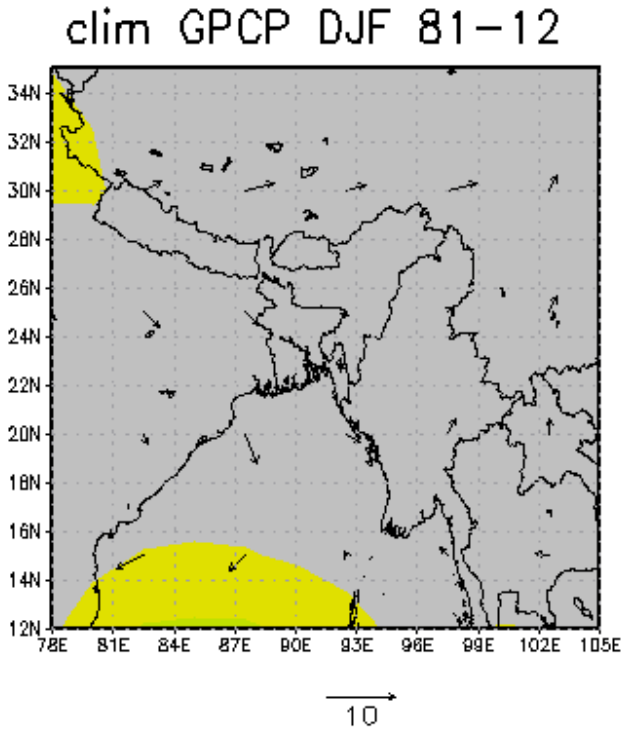
clim sys4 JJA feb init 81–12

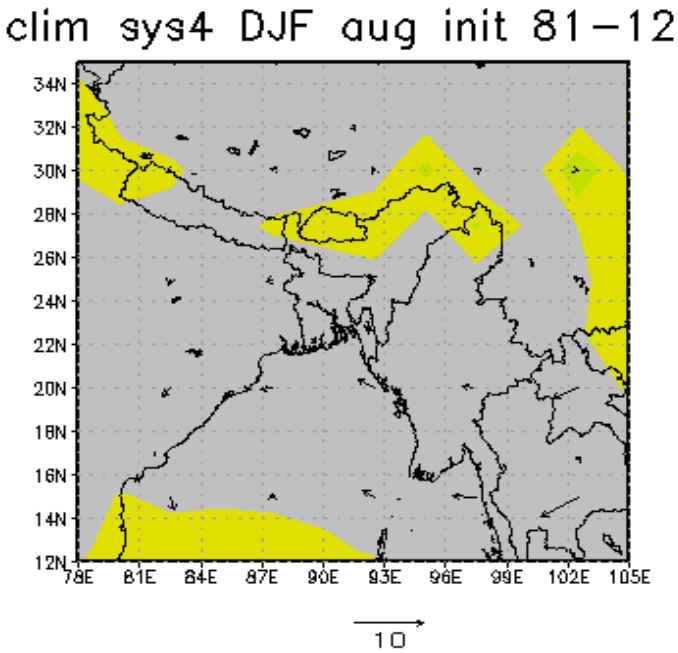


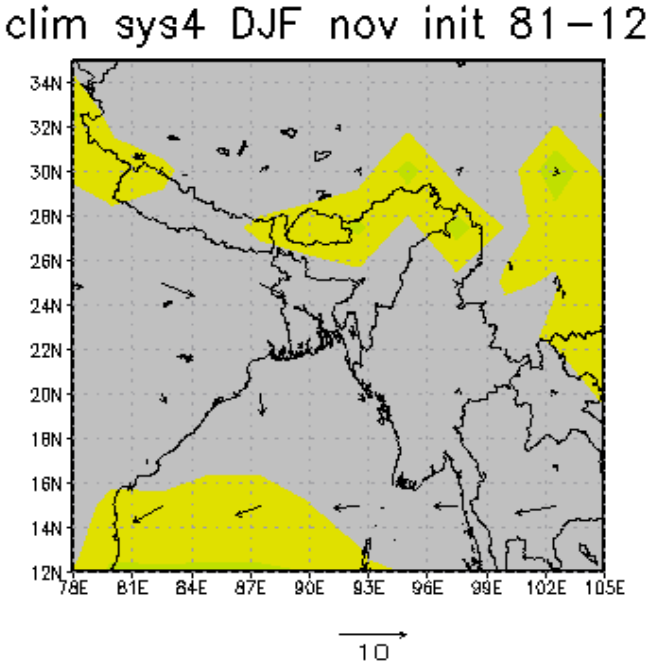
clim sys4 JJA may init 81–12



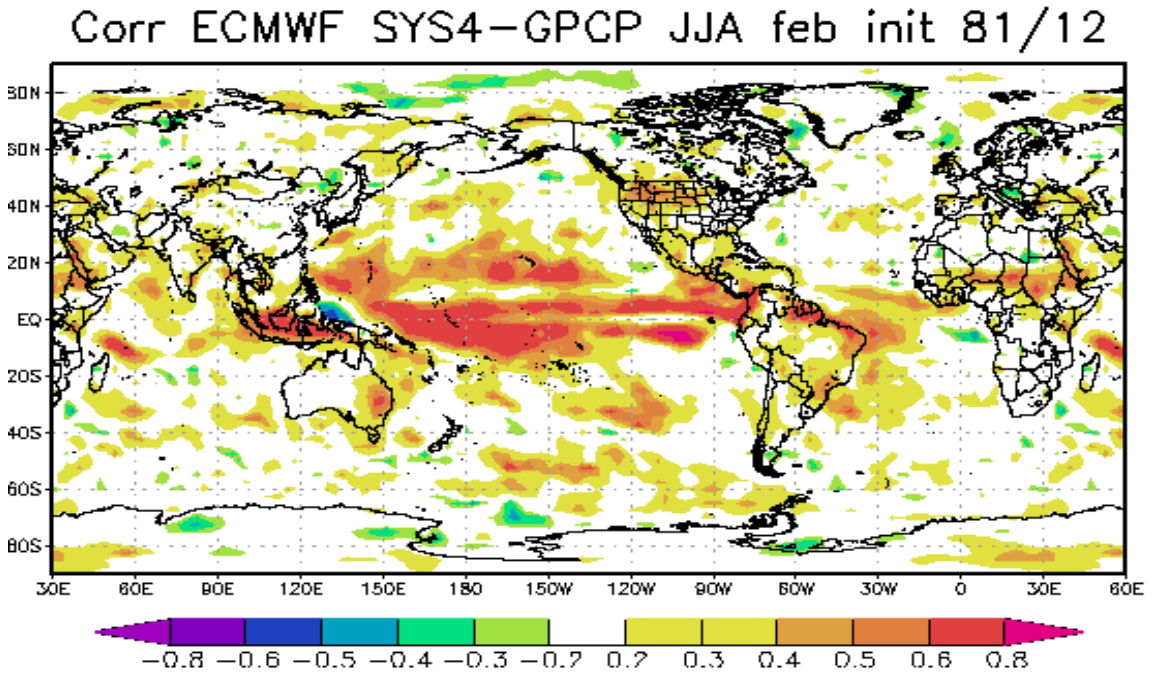
Climatology (mm/d)

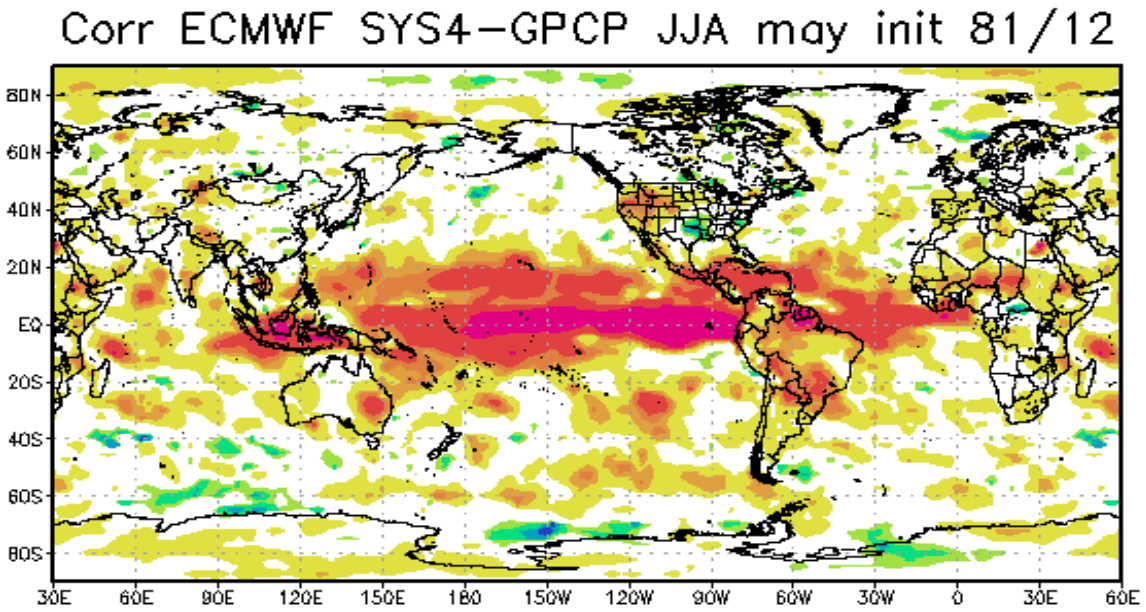






Correlation





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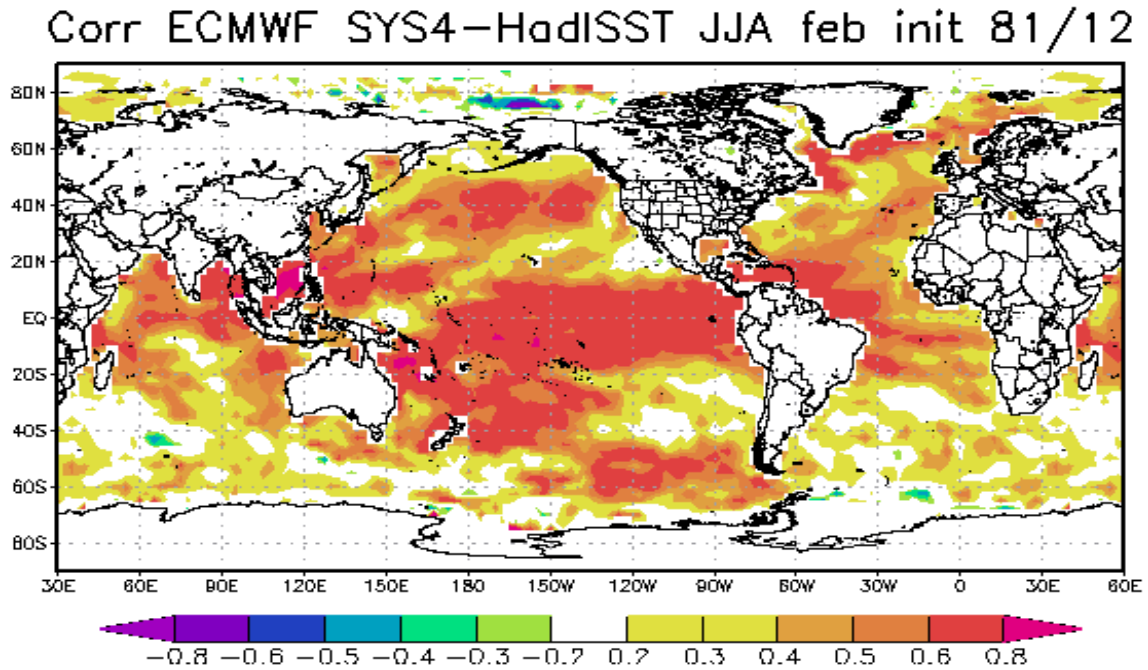

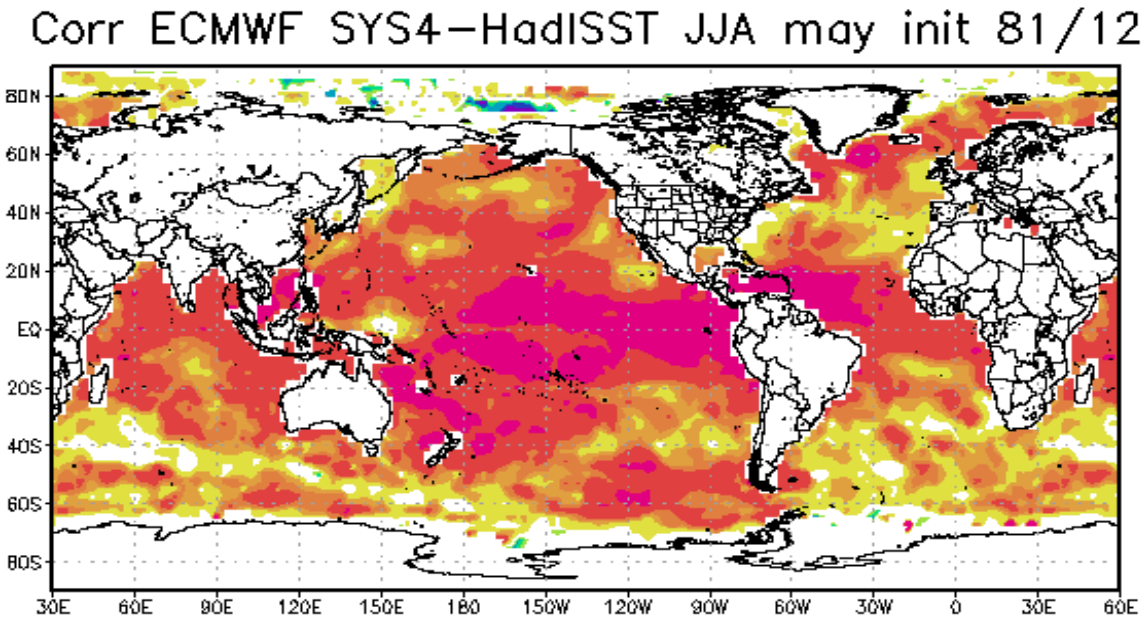

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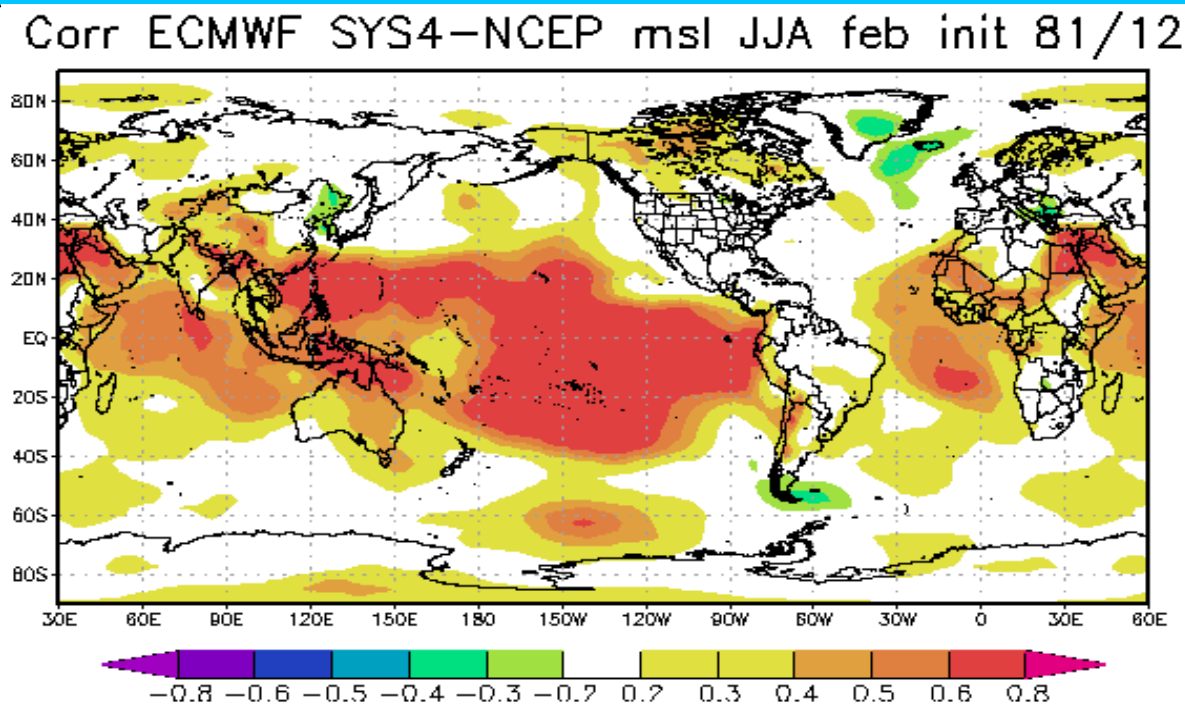

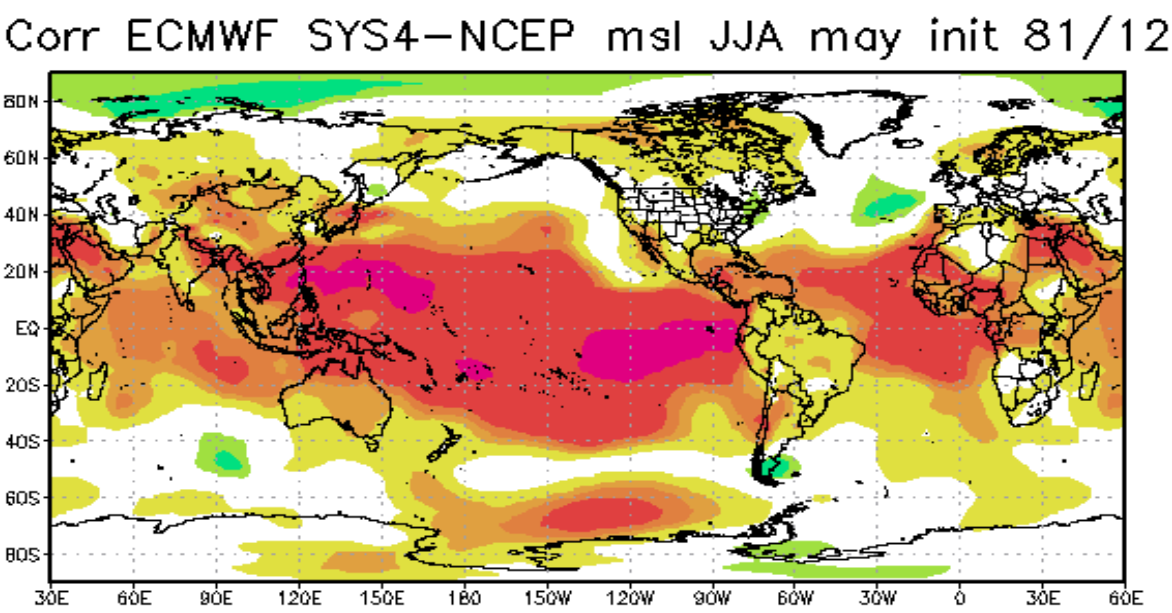

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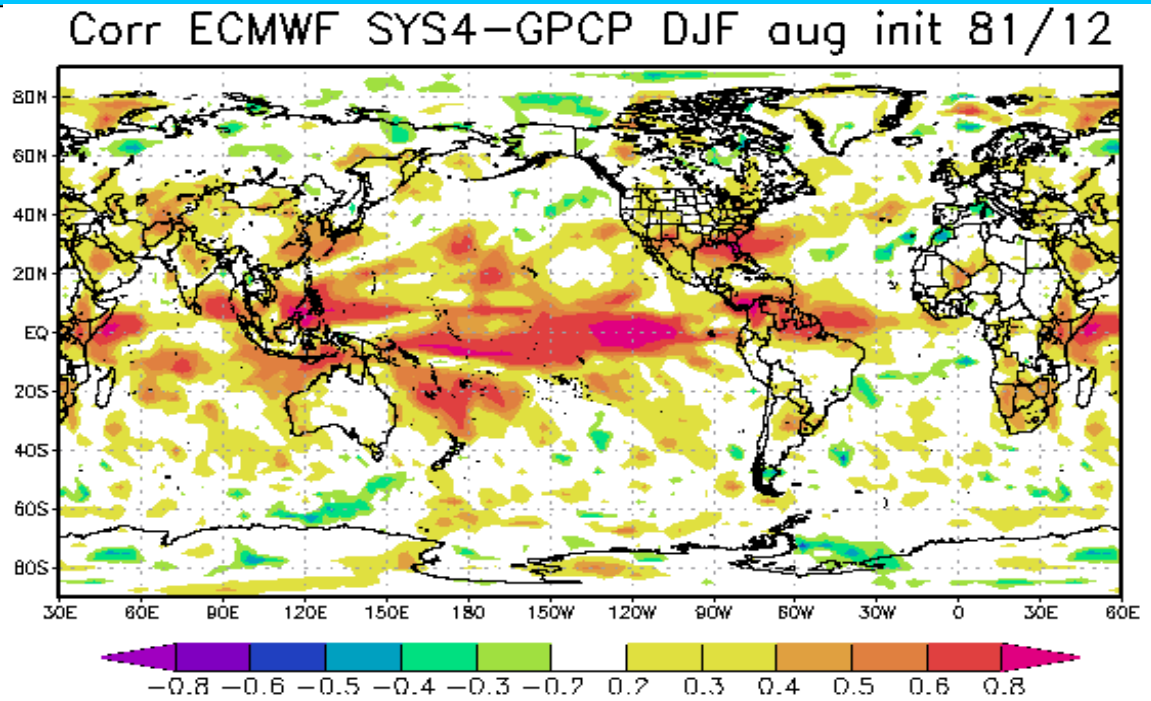

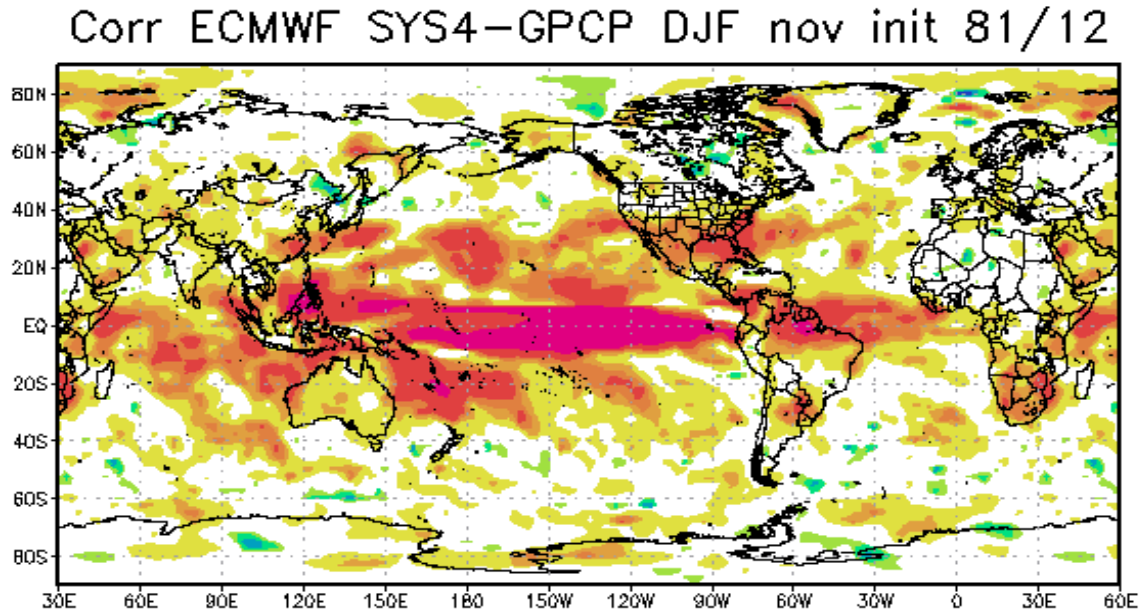

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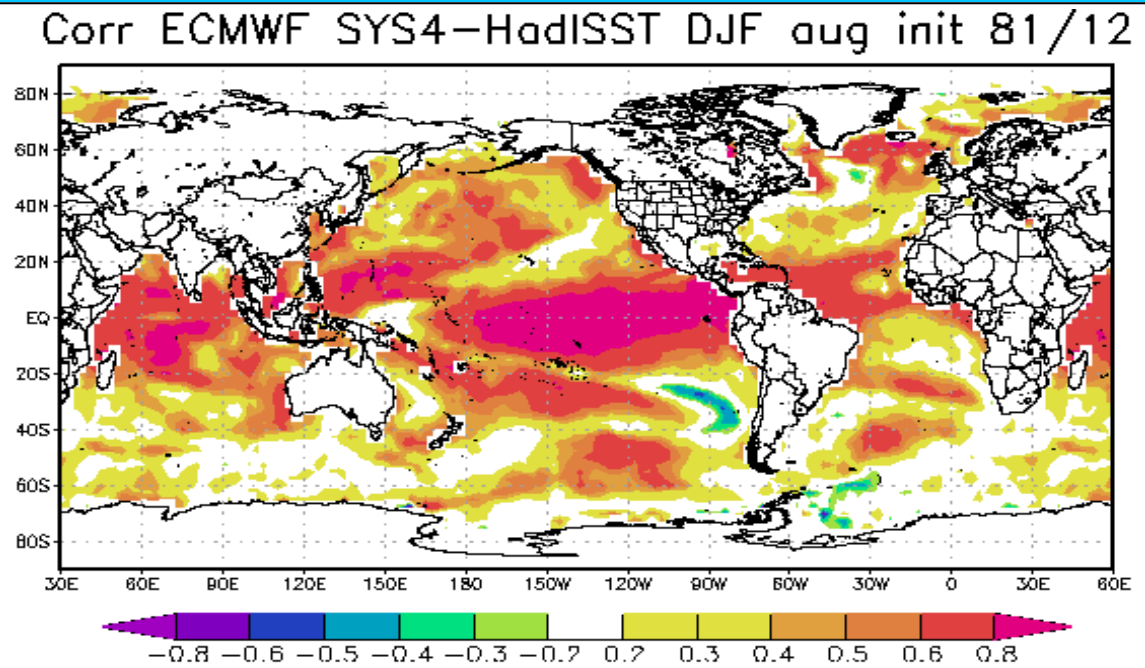

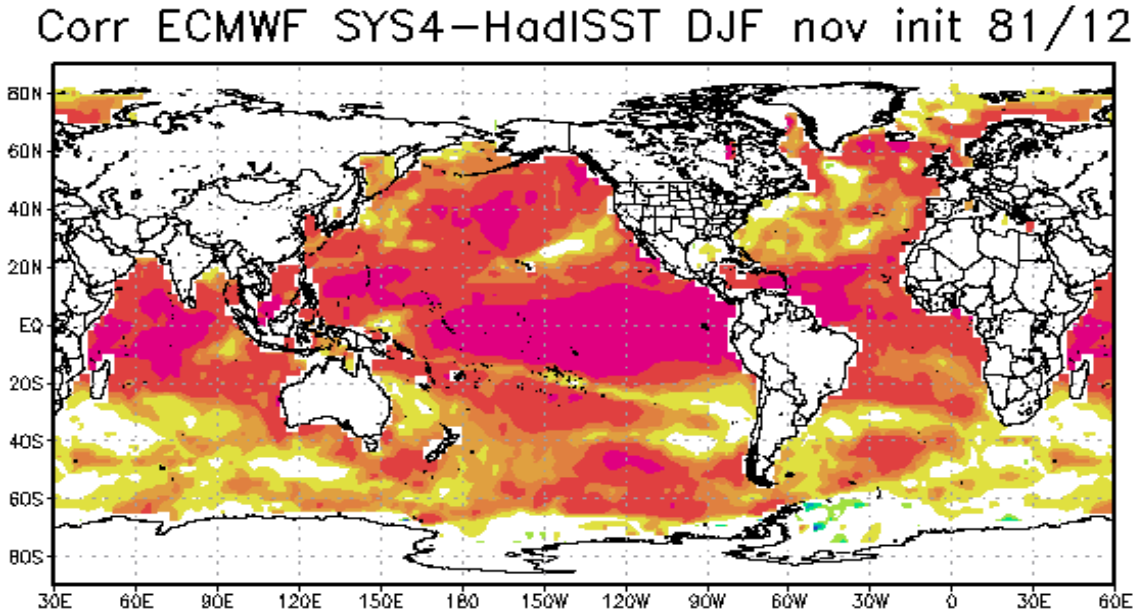

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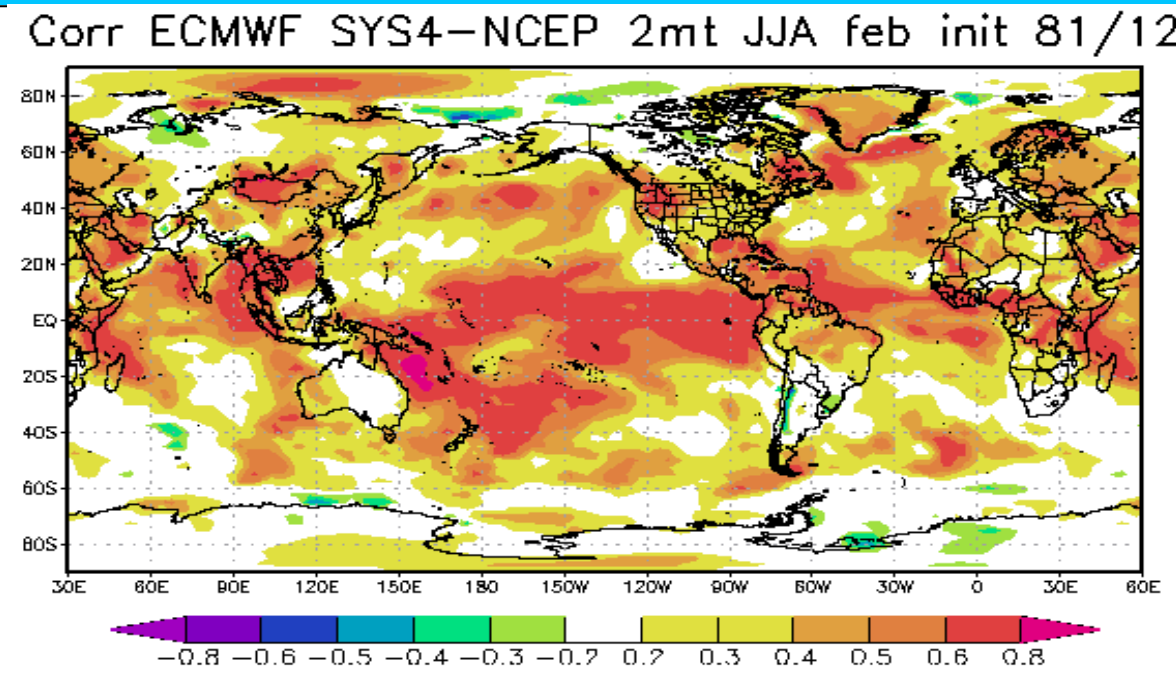
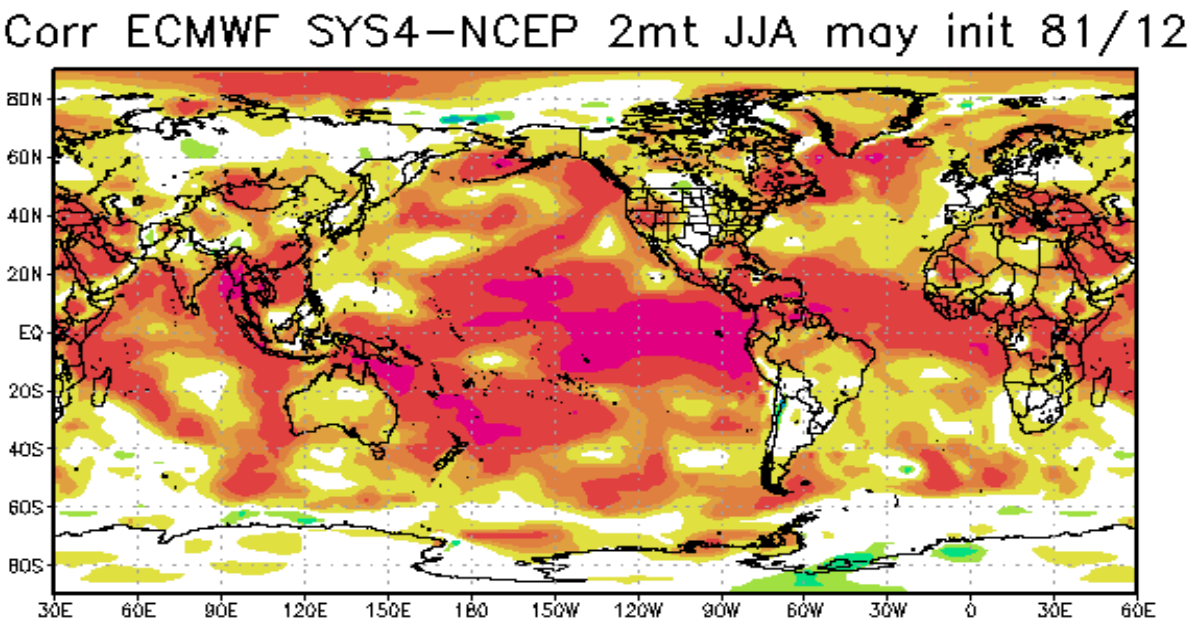
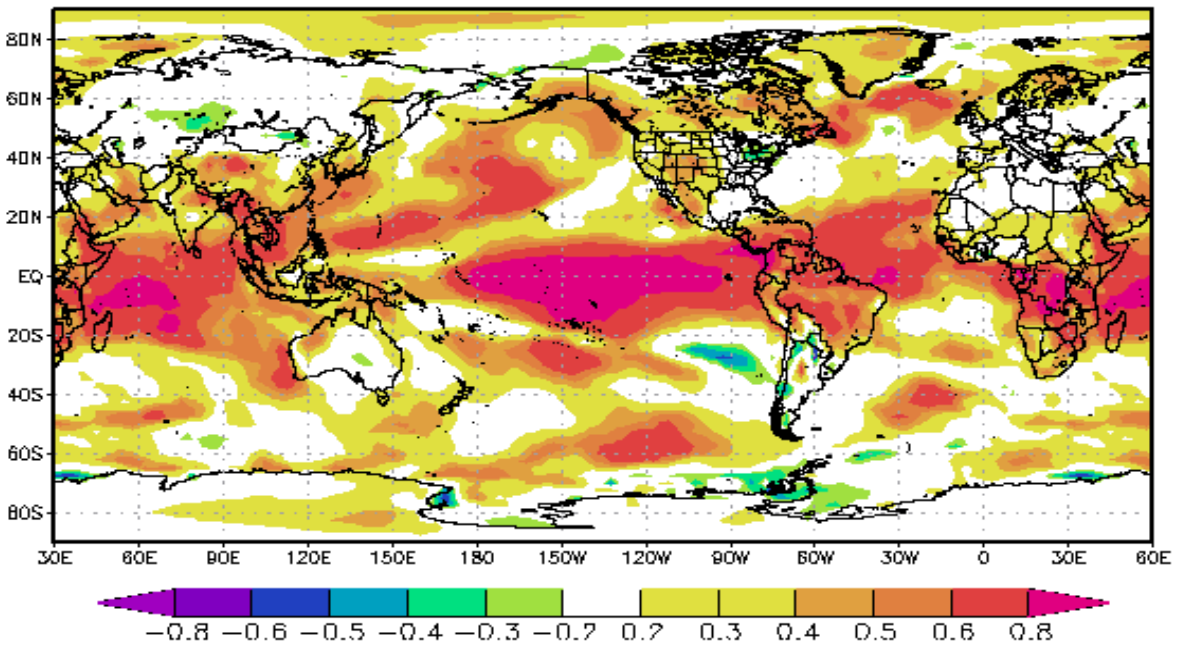


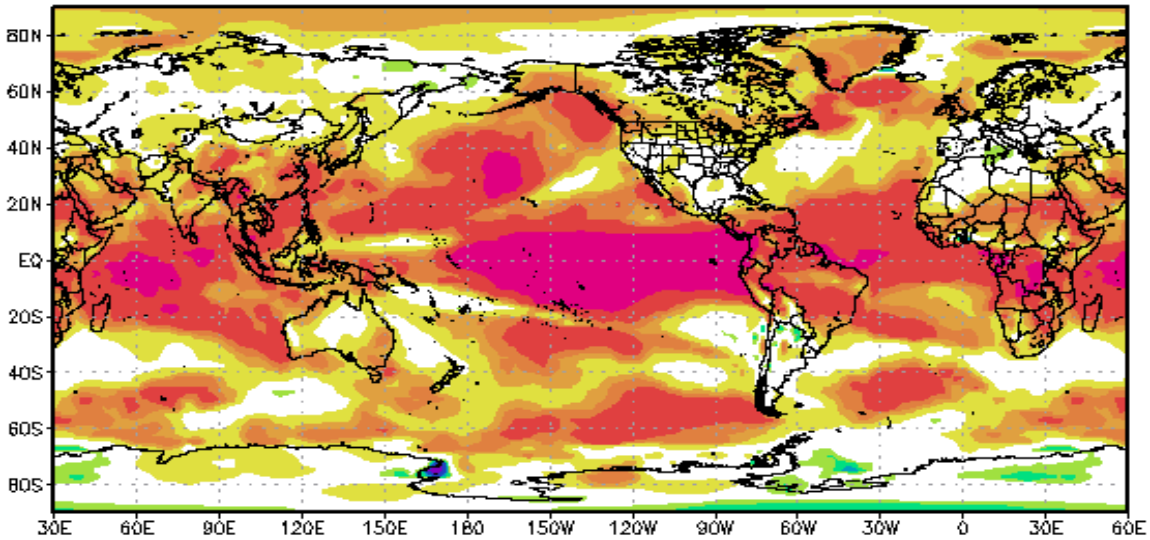


Correlation

Corr ECMWF SYS4–NCEP 2mt DJF aug init 81/12



Corr ECMWF SYS4–NCEP 2mt DJF nov init 81/12



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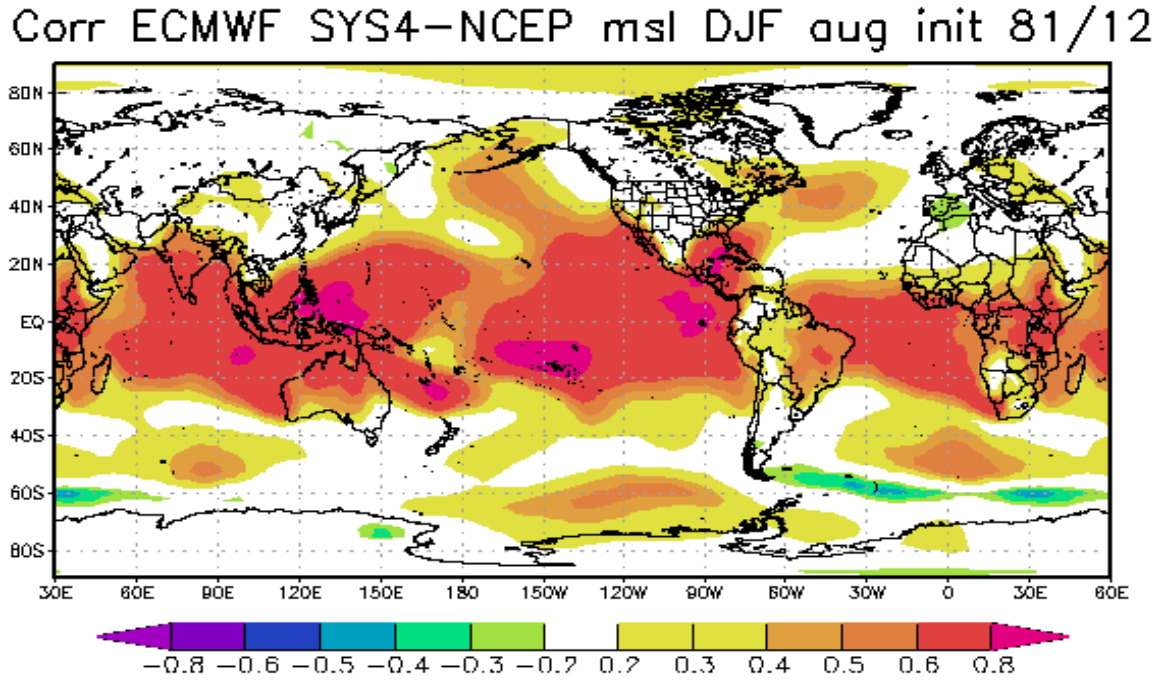
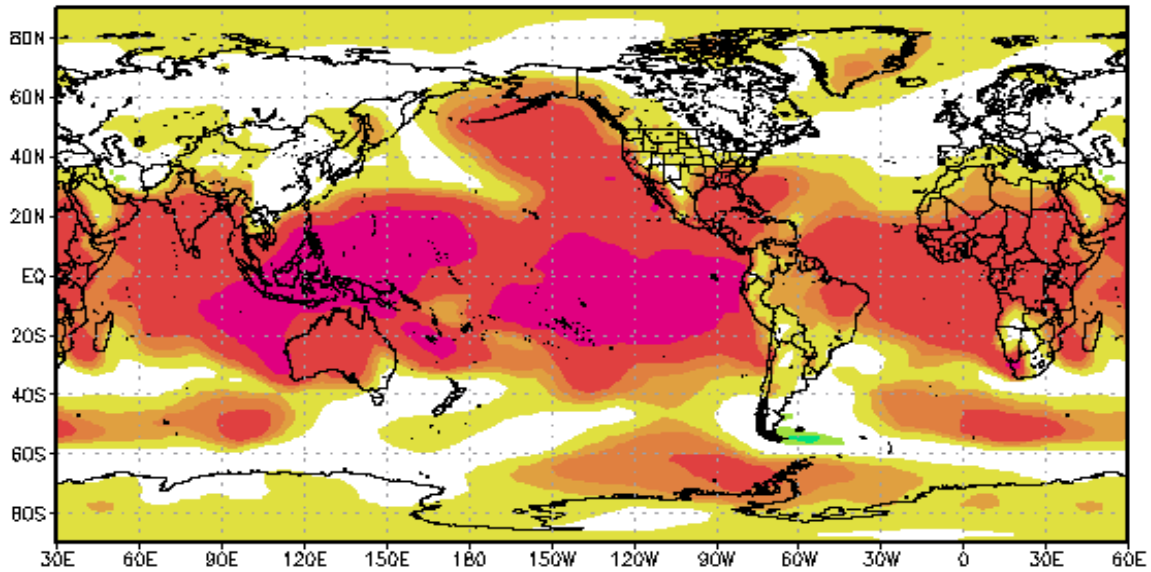
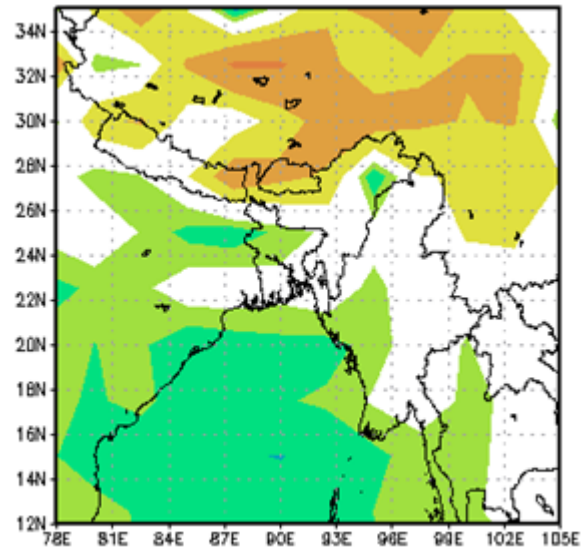


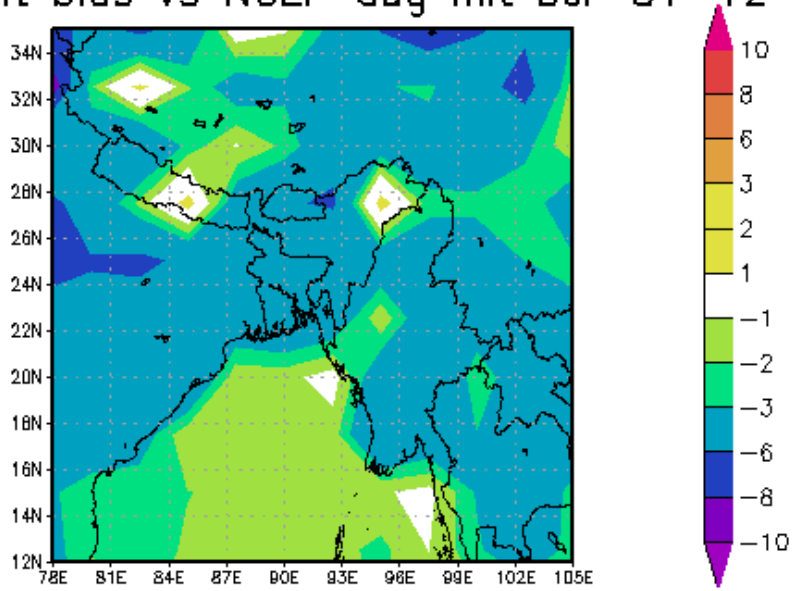


Bias of different models

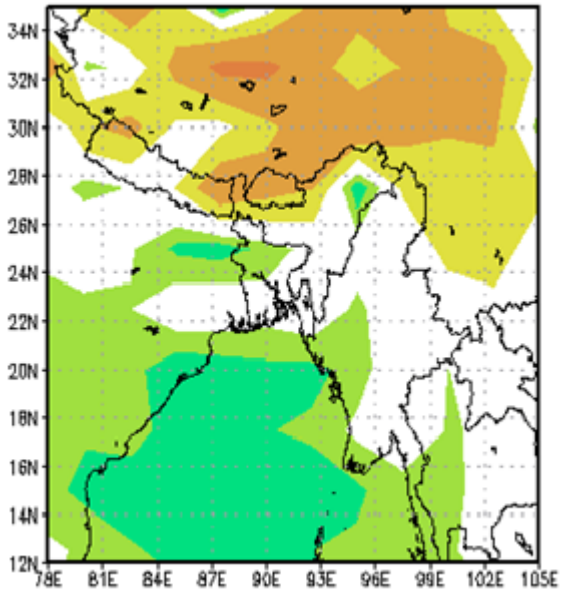
sys4 msl bias vs NCEP feb init JJA 81–12



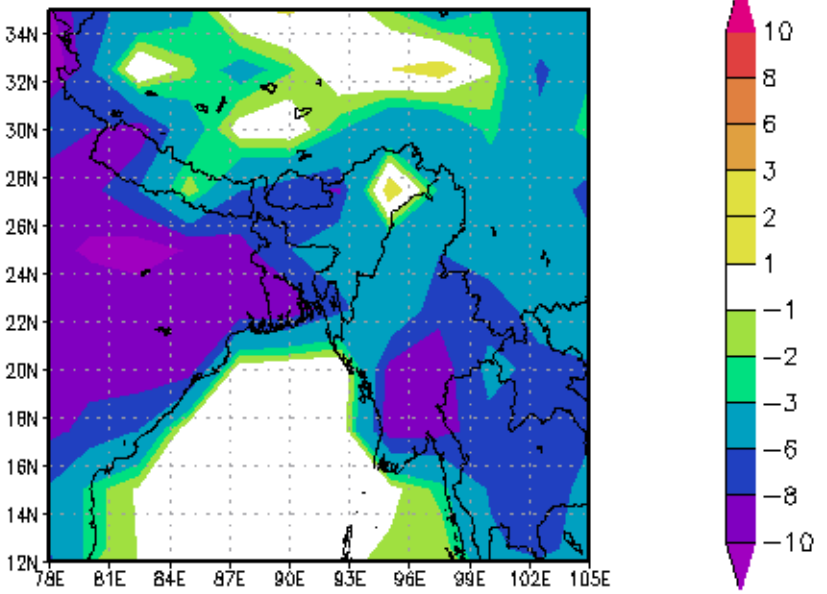
sys4 2mt bias vs NCEP aug init DJF 81–12



sys4 msl bias vs NCEP may init JJA 81–12

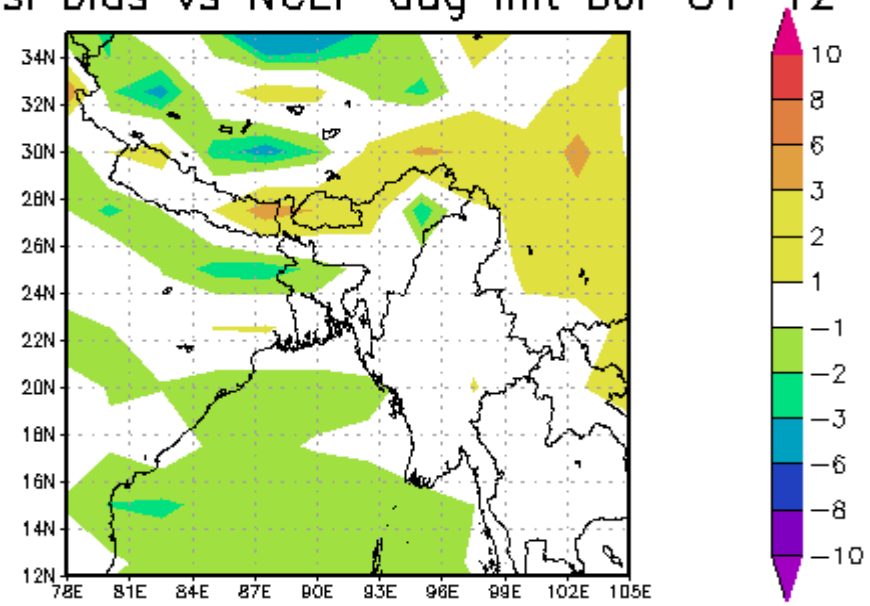


sys4 2mt bias vs NCEP nov init DJF 81–12

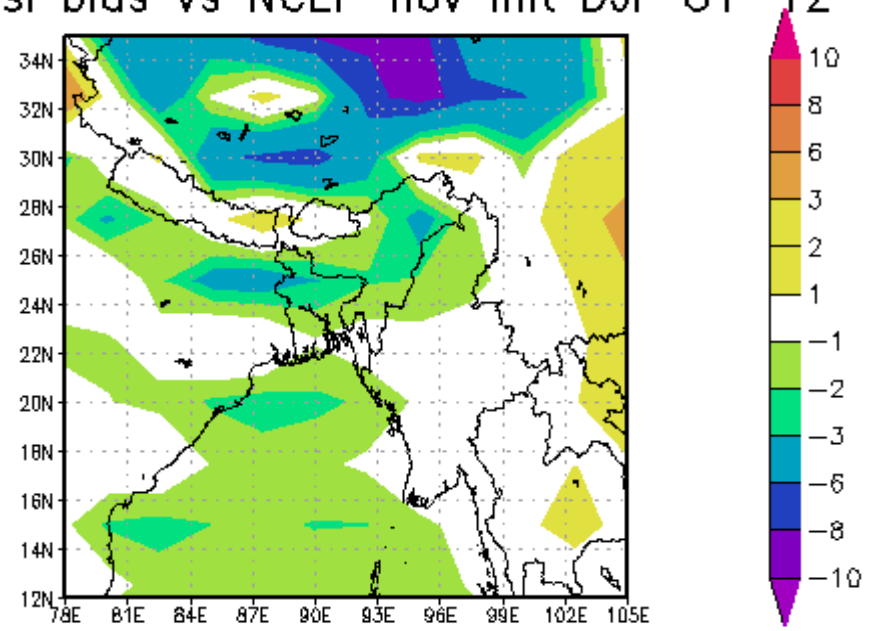


Bias vs Model

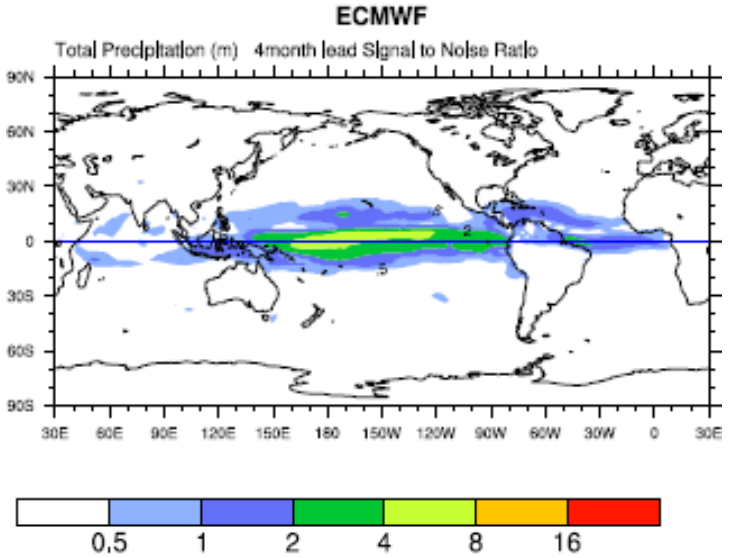
sys4 msl bias vs NCEP aug init DJF 81–12

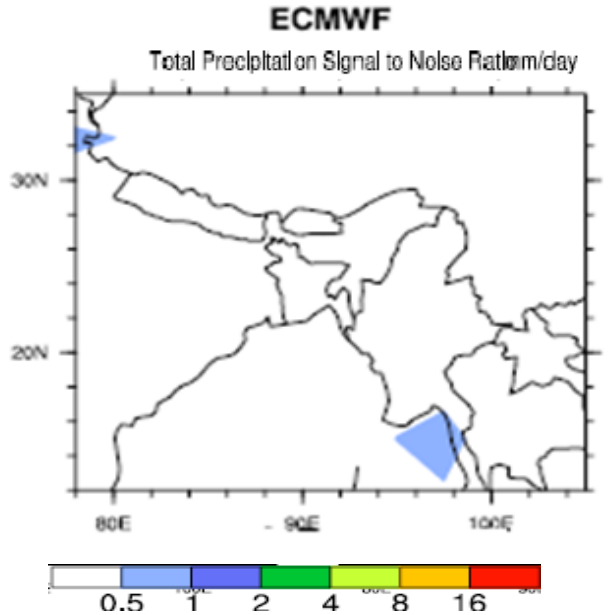


sys4 msl bias vs NCEP nov init DJF 81–12

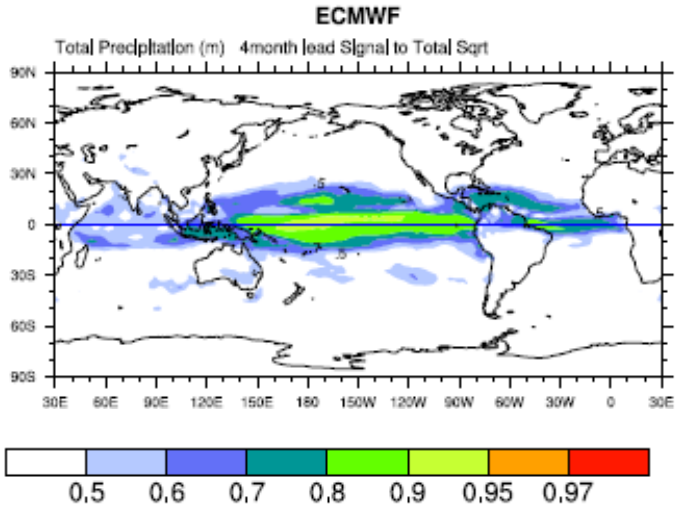


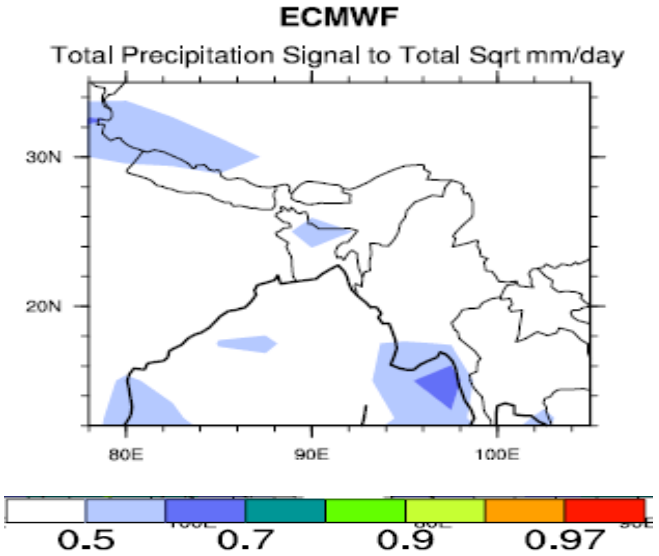
JJAS Total Precipitation Signal to Noise Ratio IC:May



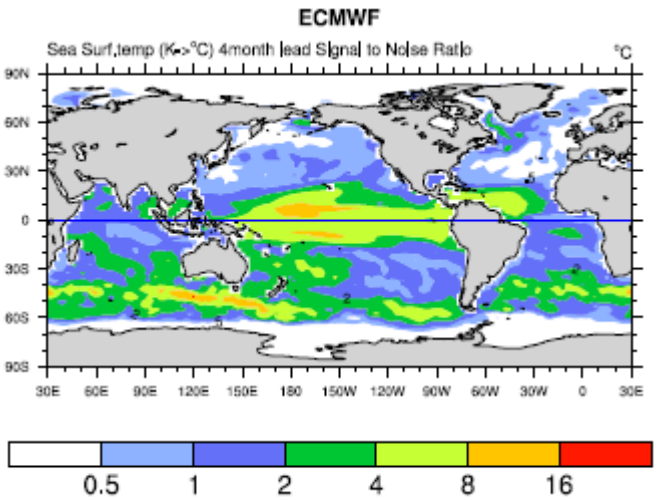


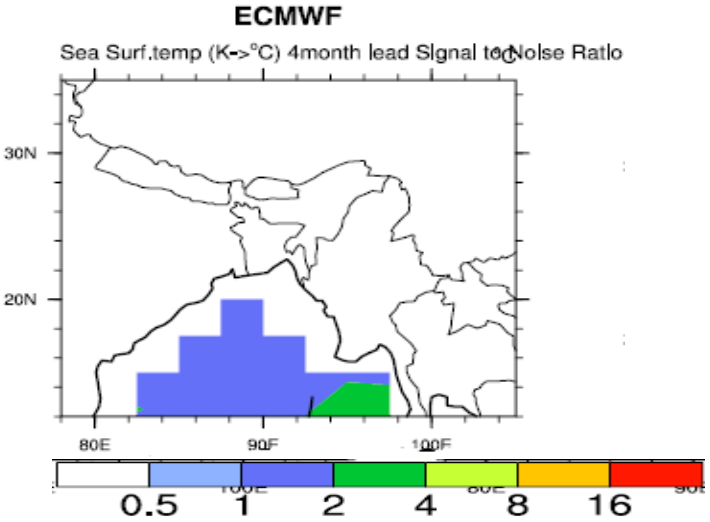
JJAS Total Precipitation Signal to Total Sqrt IC:May



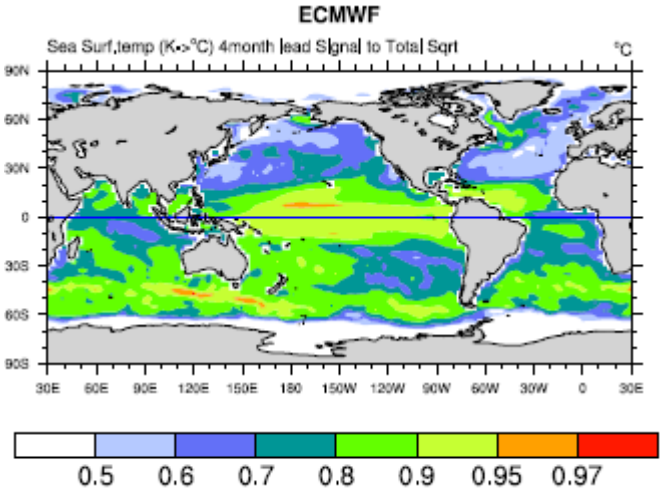


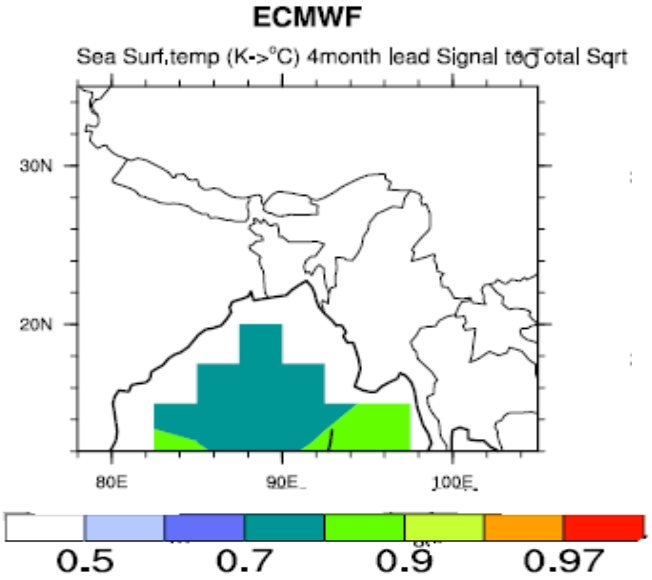
JJAS Sea Surface Temperature Signal to Noise Ratio IC:May





JJAS Sea Surface Temperature Signal to Total Sqrt IC:May



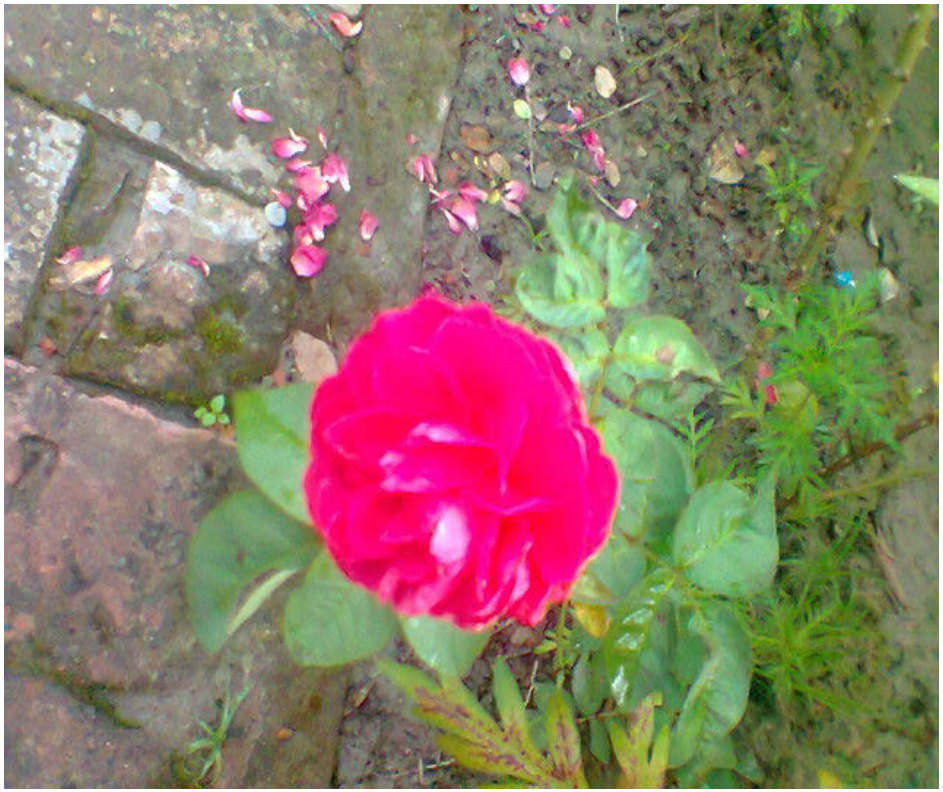


Conclusion

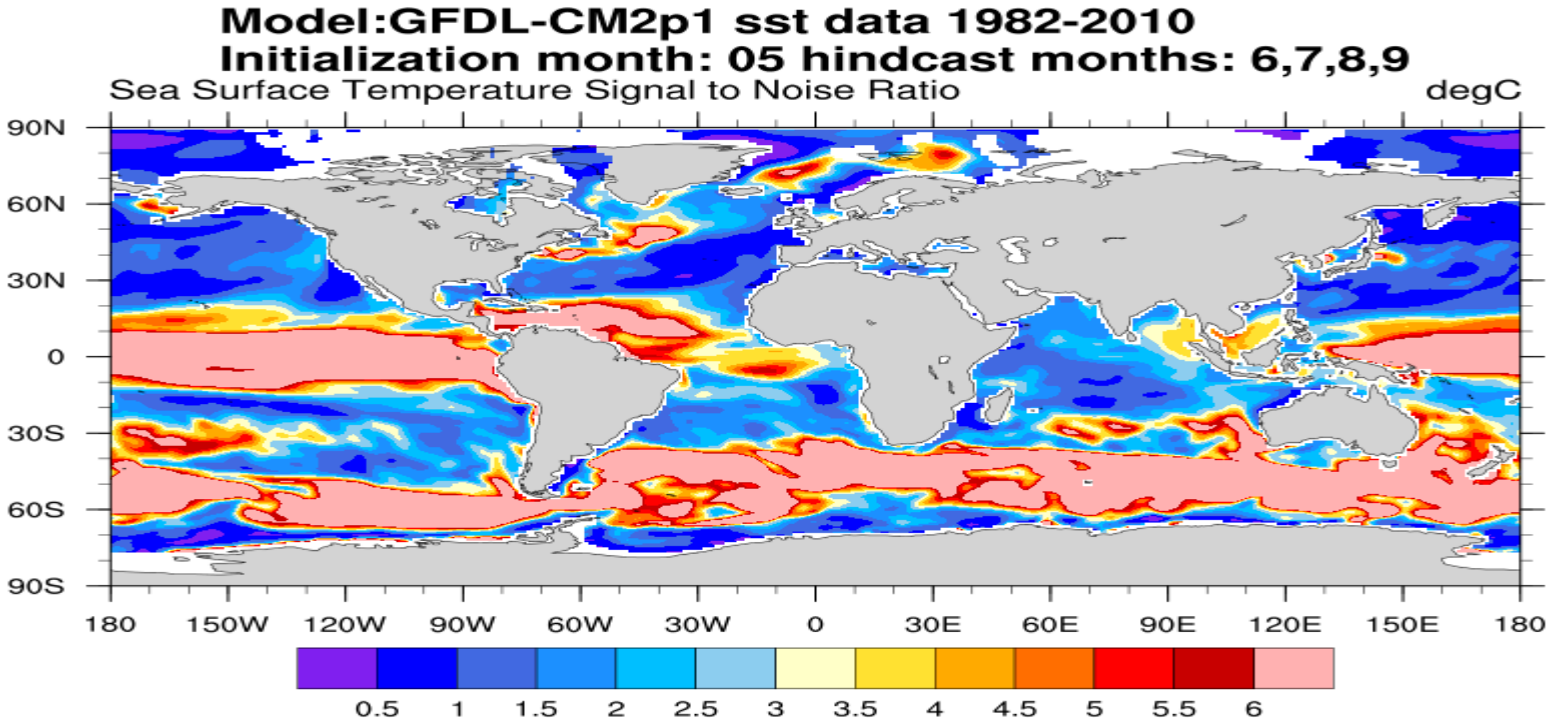
- It is a good agreement with observation, if we consider initial condition May for forecast JJA for monsoon rainfall by using ECMWF SYS-4
- We found that better correlation between GPCP and ECMWF SYS-4 and HadISST (initial condition May) in western pacific regions
- We have found that signal to noise ratio for JJAS precipitation over Bangladesh and surrounding regions are very less
- Square root of signal precipitation over study areas are 0.5 to 0.7

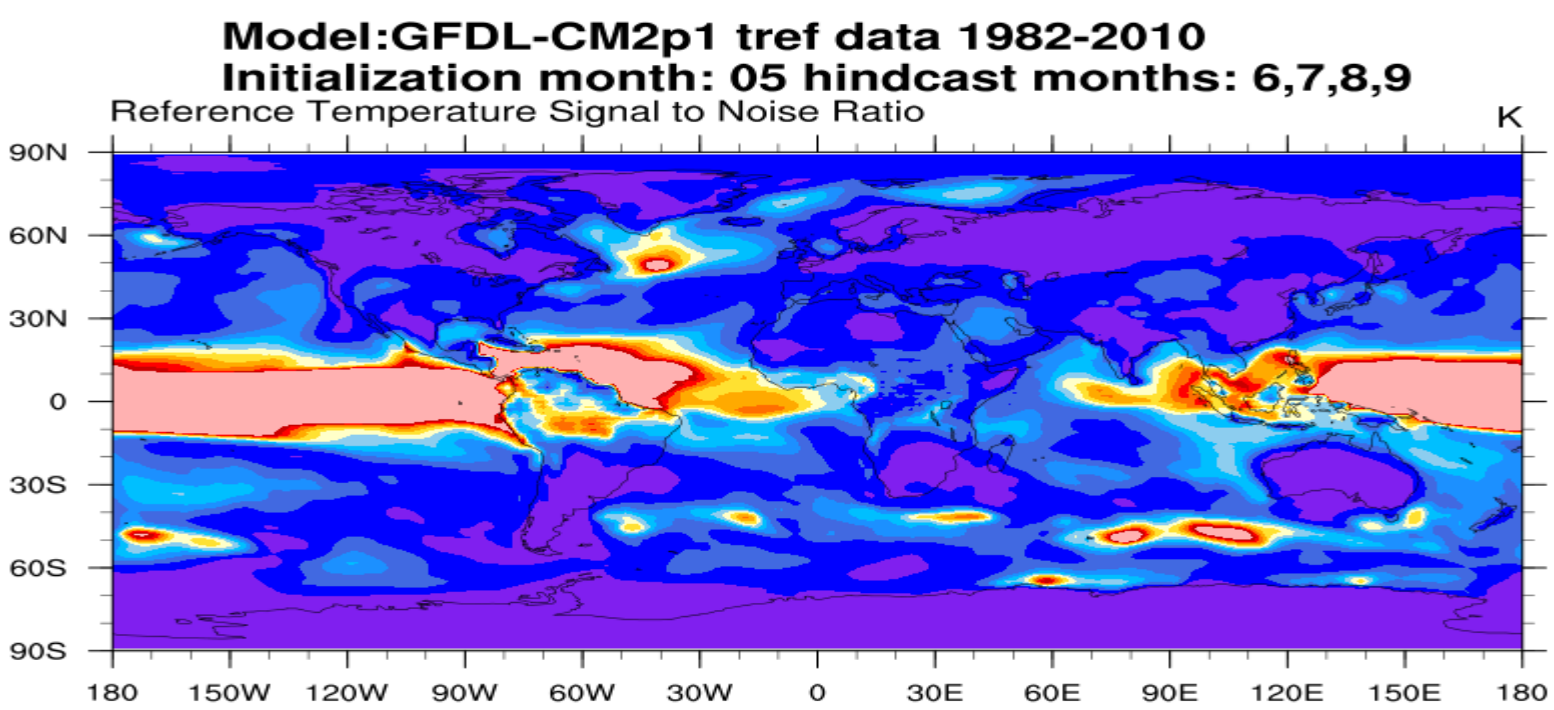
Acknowledgment

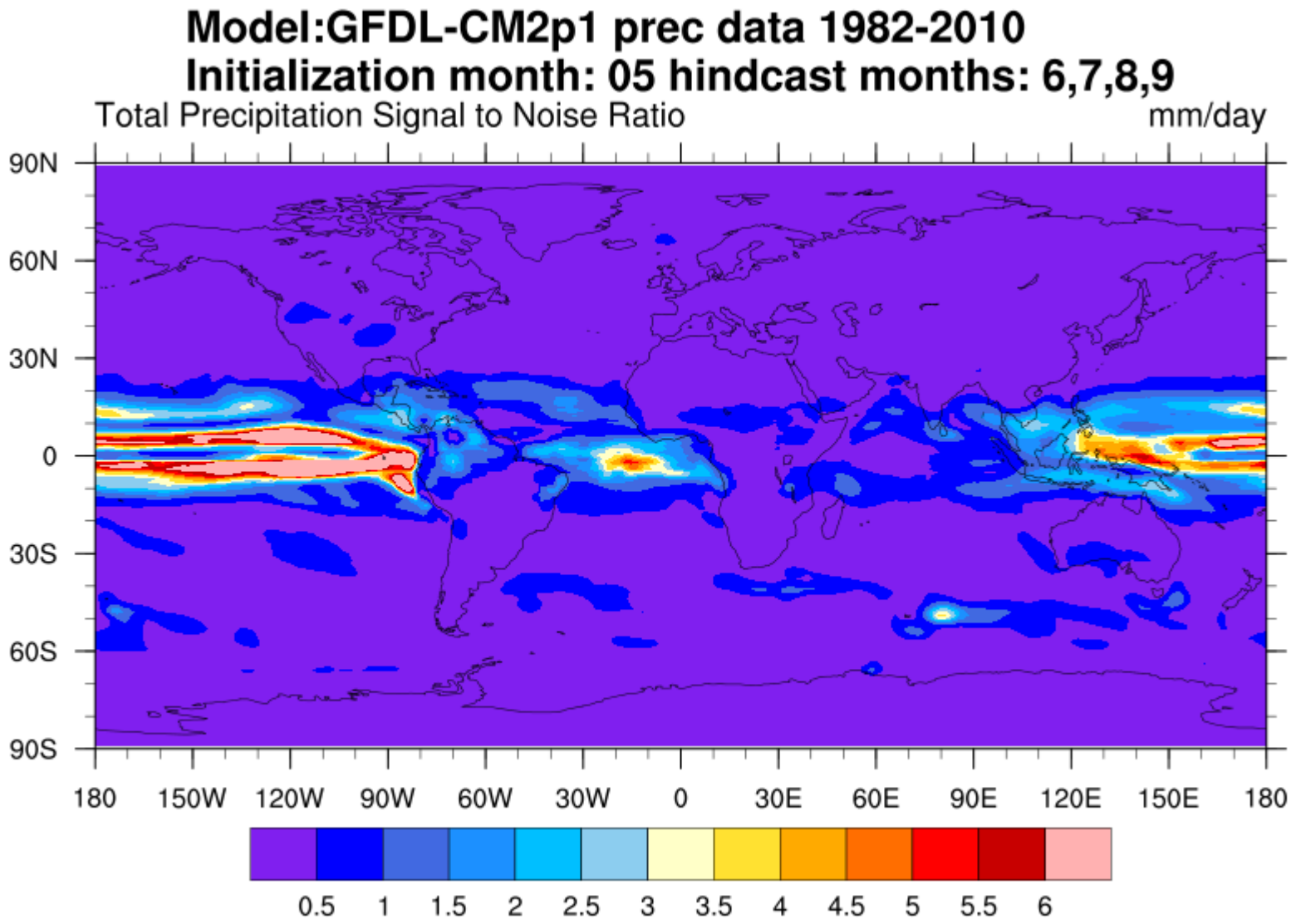
- Dr. J.Shukla (GMU & COLA, USA)
- Dr. F. Kucharshi (ICTP) &
- Mr. Zaiyu Wang (GMU)

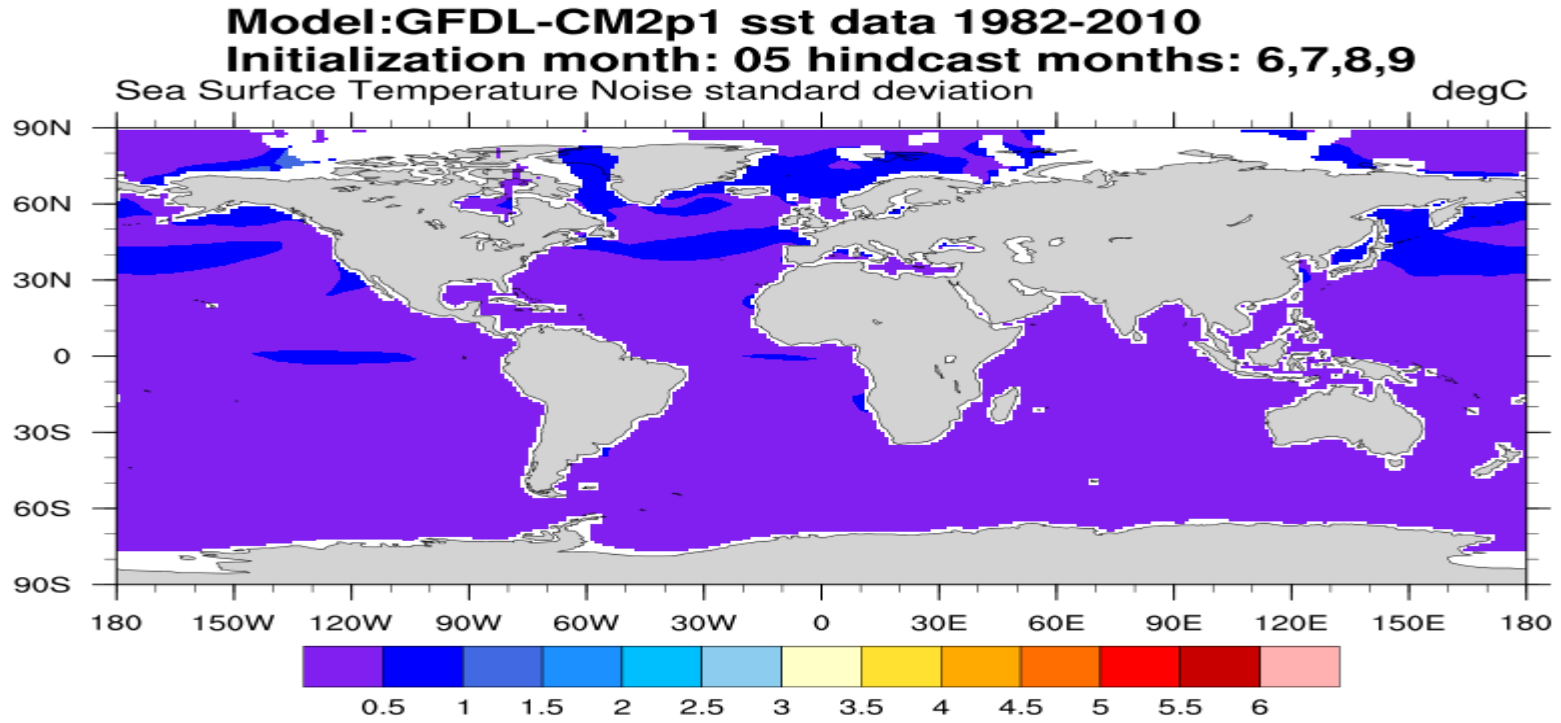


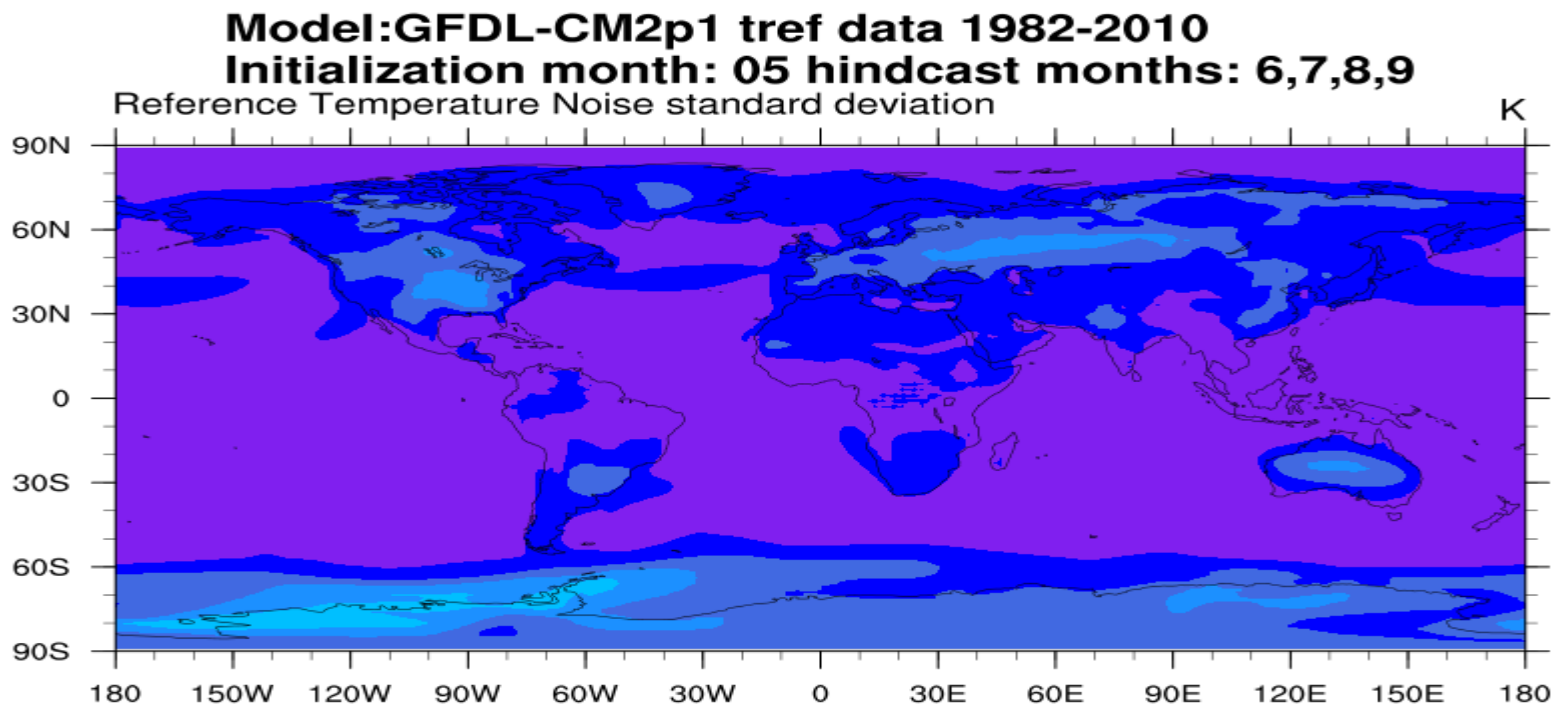
Thanks for kind attention

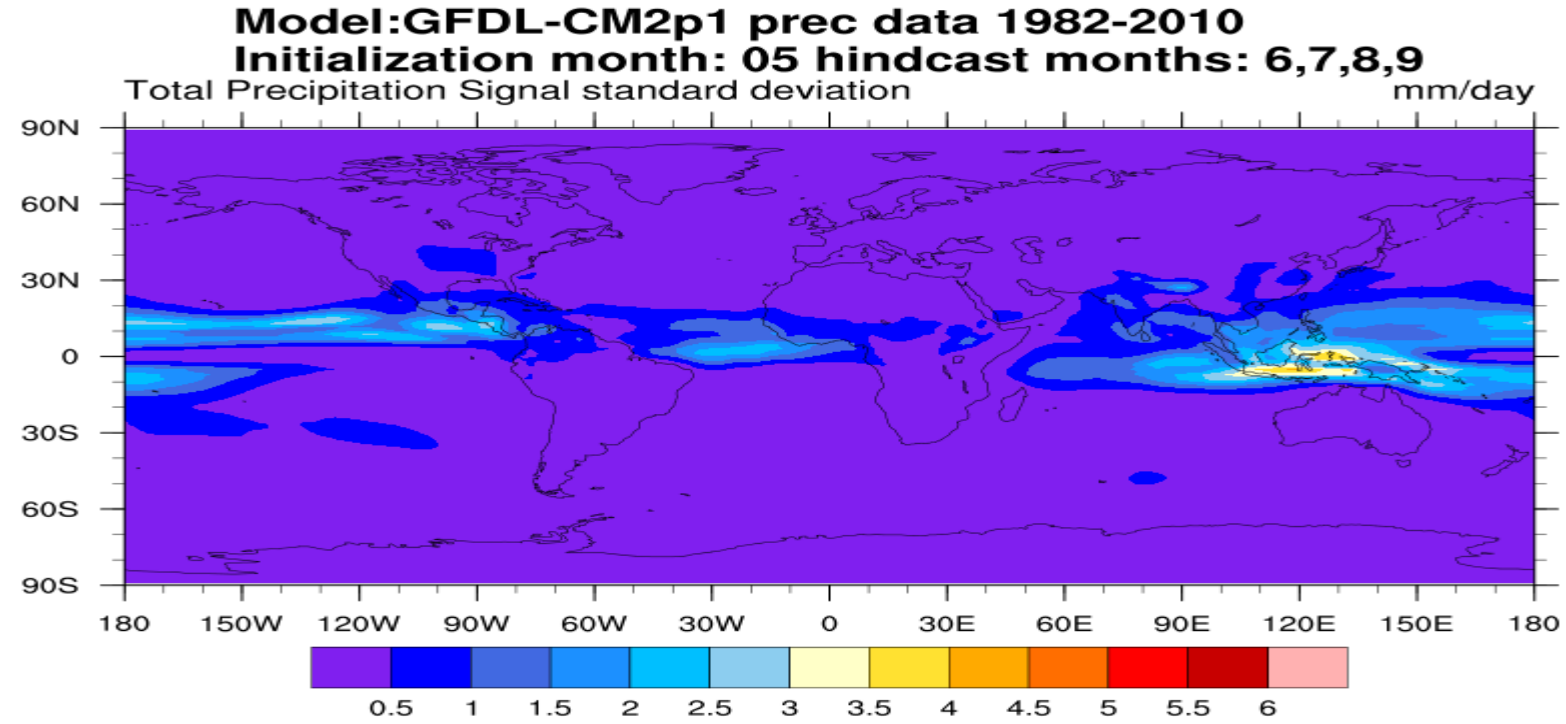

Model:GFDL-CM2p1 sst data 1982-2010
Initialization month: 05 hindcast months: 6,7,8,9
Sea Surface Temperature Signal to Noise Ratio
degC
90N
60N
30N
0
30S
60S
90S
180
150W
120W
90W
60W
30W
0
30E
60E
90E
120E
150E
180
0.5
1
1.5
2
2.5
3
3.5
4
4.5
5
5.5
6

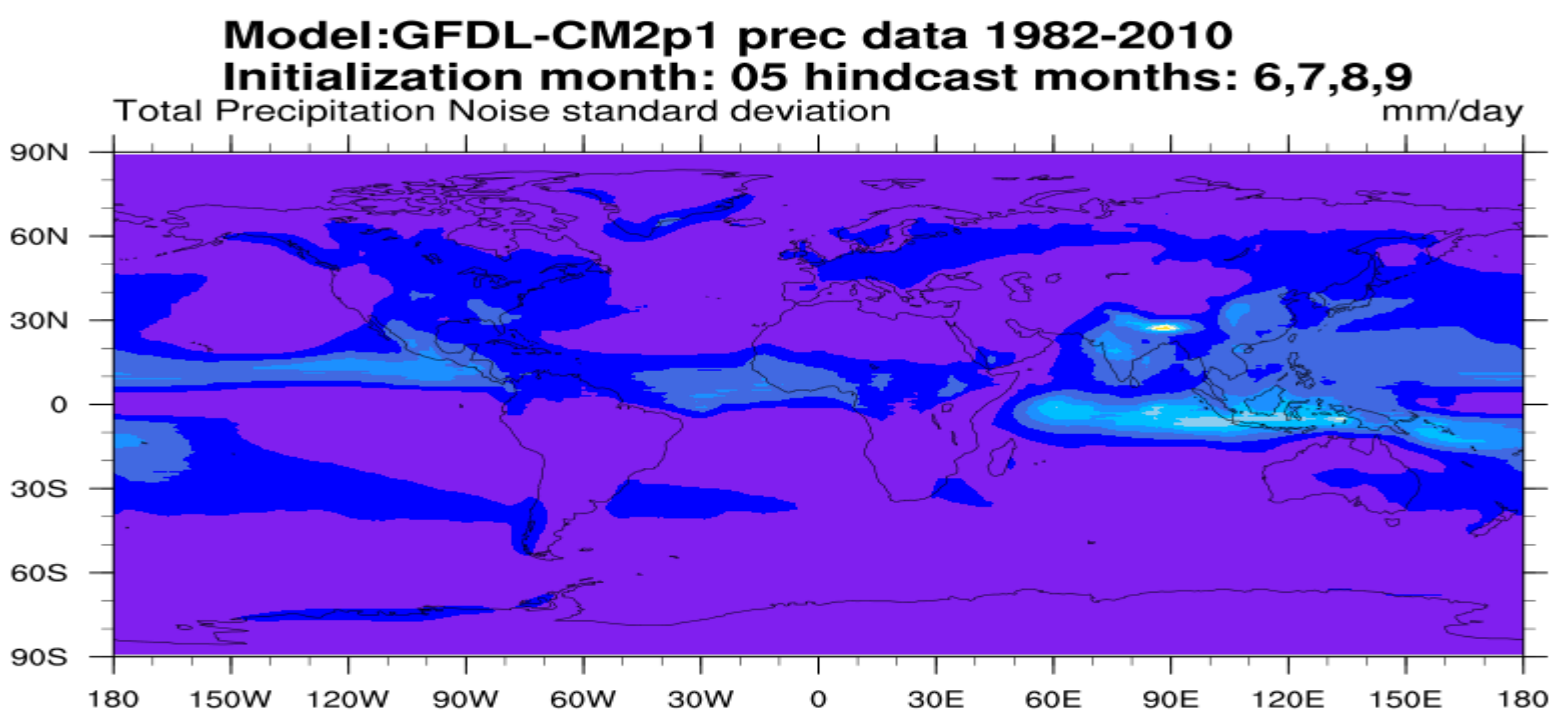

Model:GFDL-CM2p1 tref data 1982-2010
Initialization month: 05 hindcast months: 6,7,8,9
Reference Temperature Signal to Noise Ratio
K
90N
60N
30N
0
30S
60S
90S
180
150W
120W
90W
60W
30W
0
30E
60E
90E
120E
150E
180


Model:GFDL-CM2p1 prec data 1982-2010
Initialization month: 05 hindcast months: 6,7,8,9
Total Precipitation Signal to Noise Ratio
mm/day
90N
60N
30N
0
30S
60S
90S
180
150W
120W
90W
60W
30W
0
30E
60E
90E
120E
150E
180
0.5
1
1.5
2
2.5
3
3.5
4
4.5
5
5.5
6


Model:GFDL-CM2p1 sst data 1982-2010
Initialization month: 05 hindcast months: 6,7,8,9
Sea Surface Temperature Noise standard deviation
degC
90N
60N
30N
0
30S
60S
90S
180
150W
120W
90W
60W
30W
0
30E
60E
90E
120E
150E
180
0.5
1
1.5
2
2.5
3
3.5
4
4.5
5
5.5
6

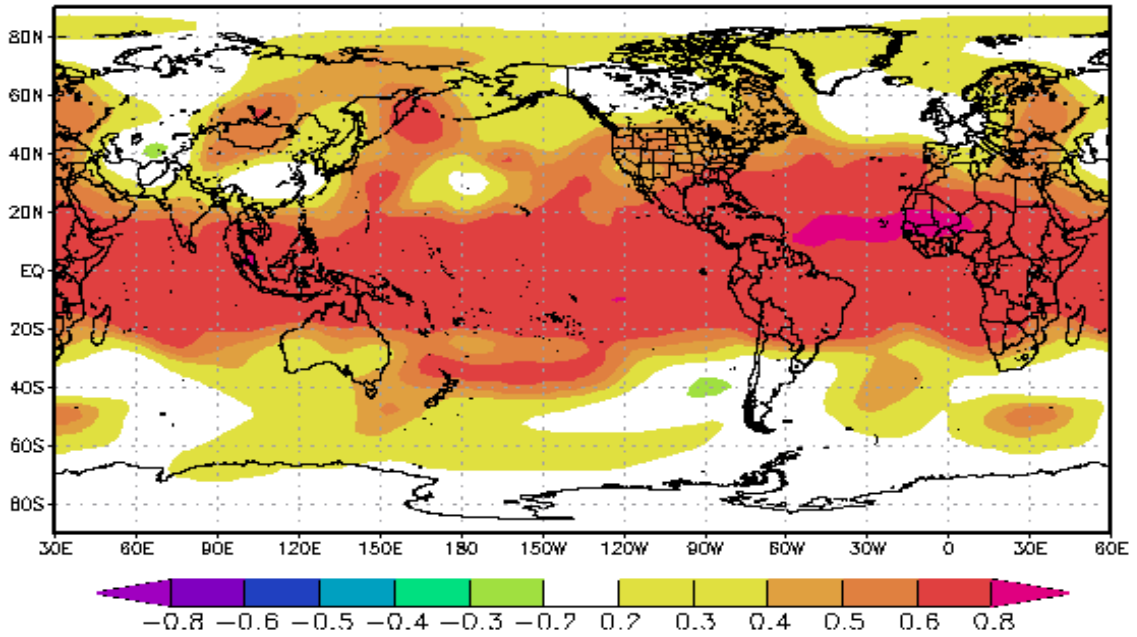

Model:GFDL-CM2p1 tref data 1982-2010
Initialization month: 05 hindcast months: 6,7,8,9
Reference Temperature Noise standard deviation
K
90N
60N
30N
0
30S
60S
90S
180
150W
120W
90W
60W
30W
0
30E
60E
90E
120E
150E
180


Model:GFDL-CM2p1 prec data 1982-2010
Initialization month: 05 hindcast months: 6,7,8,9
Total Precipitation Signal standard deviation
mm/day
90N
60N
30N
0
30S
60S
90S
180
150W
120W
90W
60W
30W
0
30E
60E
90E
120E
150E
180
0.5
1
1.5
2
2.5
3
3.5
4
4.5
5
5.5
6

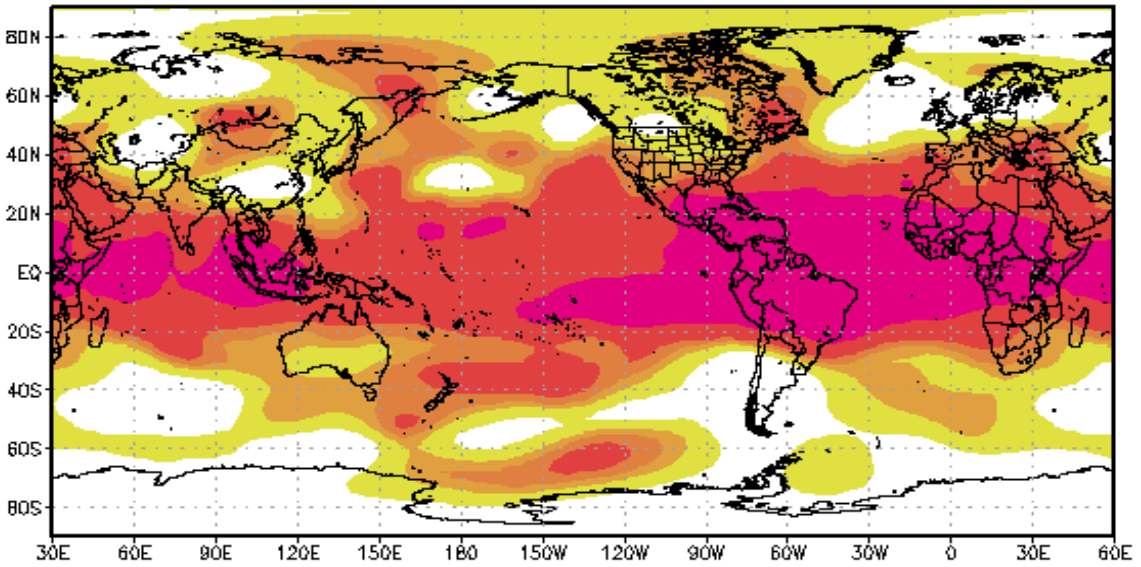

Model:GFDL-CM2p1 prec data 1982-2010
Initialization month: 05 hindcast months: 6,7,8,9
Total Precipitation Noise standard deviation
mm/day
90N
60N
30N
0
30S
60S
90S
180
150W
120W
90W
60W
30W
0
30E
60E
90E
120E
150E
180

Correlation (Geo-potential height)

Corr ECMWF SYS4−NCEP z200 JJA feb init 81/12

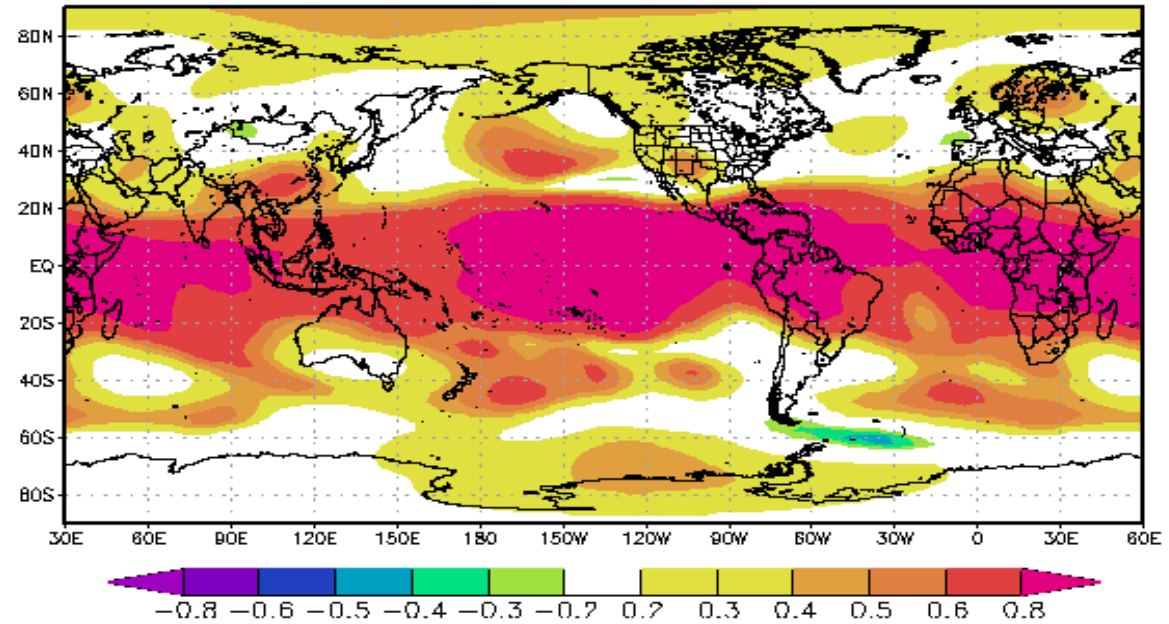


Corr ECMWF SYS4−NCEP z200 JJA may init 81/12



Correlation (Geo-potential Height)

Corr ECMWF SYS4–NCEP z200 DJF aug init 81/12



Corr ECMWF SYS4–NCEP z200 DJF nov init 81/12