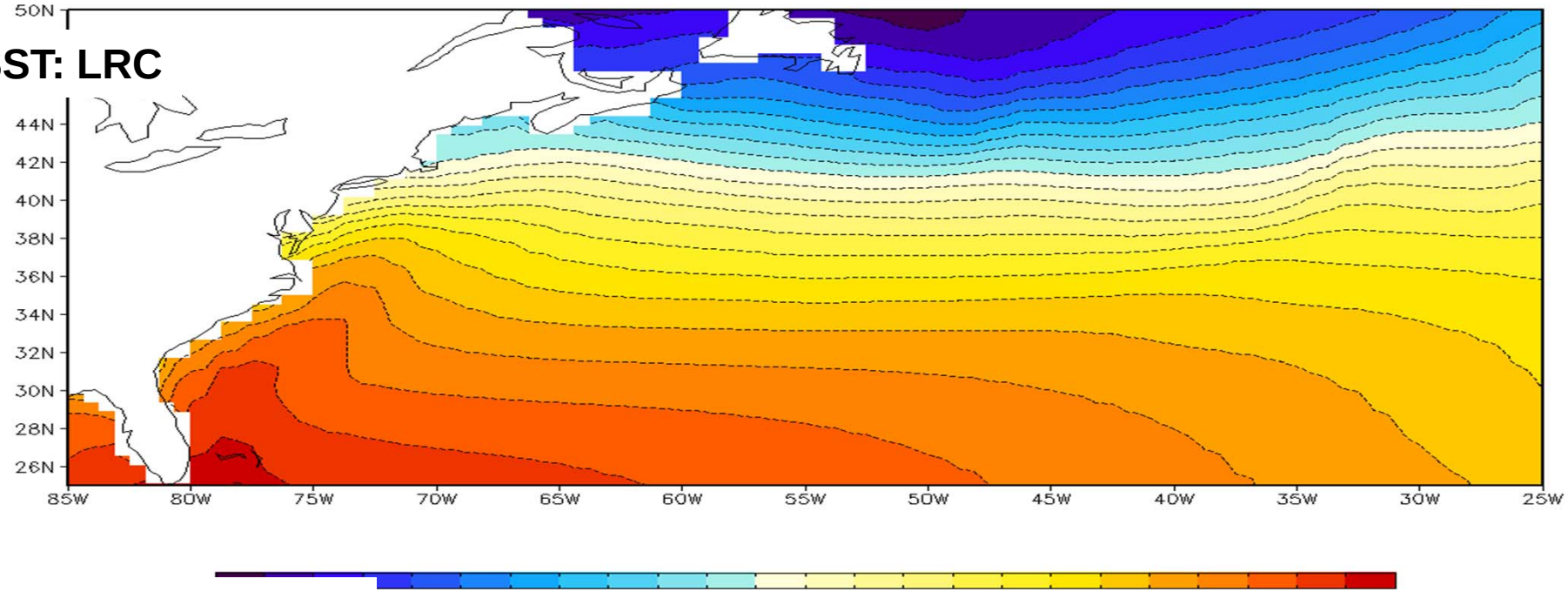
The Role of Ocean Eddy Resolving Models in Seasonal to Decadal Prediction

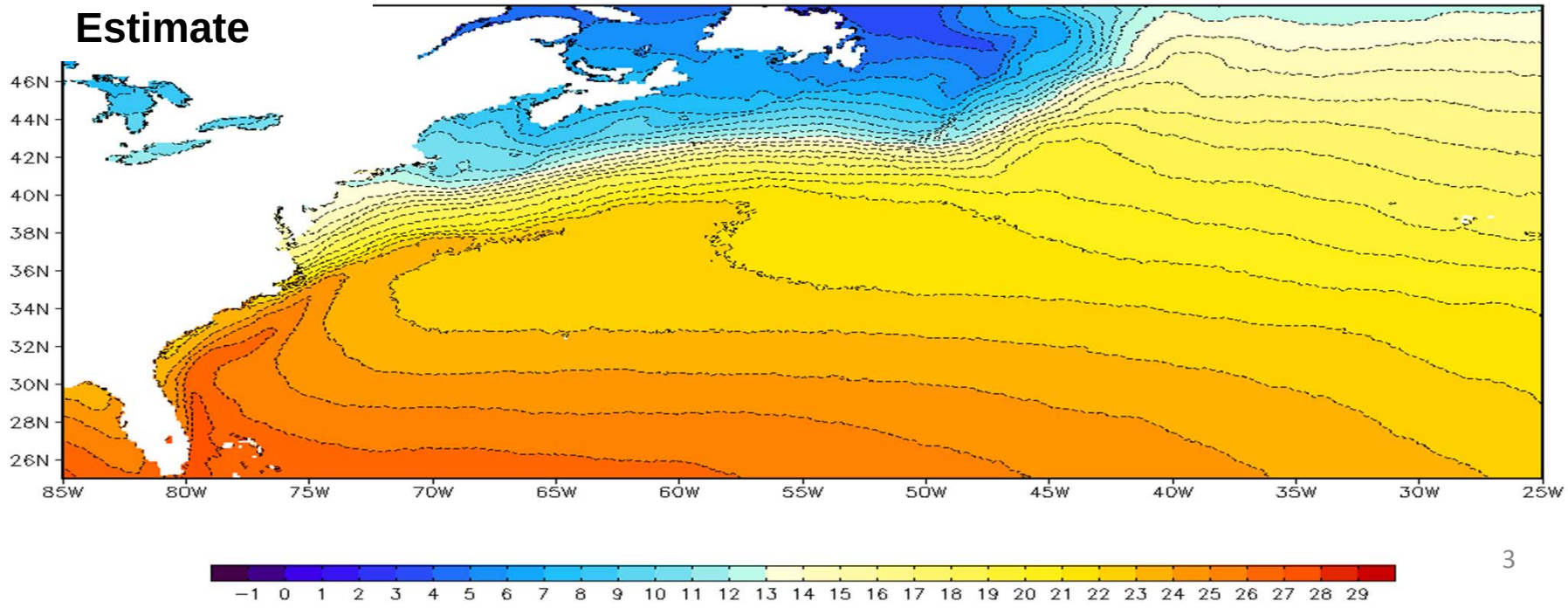
Ocean Eddy Resolving Coupled Predictability

- **CESM**
  - **Atmosphere: 0.5x0.5**
  - **Ocean: 0.1x0.1 [HRC] vs. 1x1 [LRC]**
- **“New” Seasonal-to-Decadal Variability**
  - **Means, Fronts vs. Eddies (or Both)?**
- **Does the Atmosphere Interact with the Individual Ocean Eddies?**
- **Forecast Errors with LRC**
  - **Local Air-Sea Feedbacks**

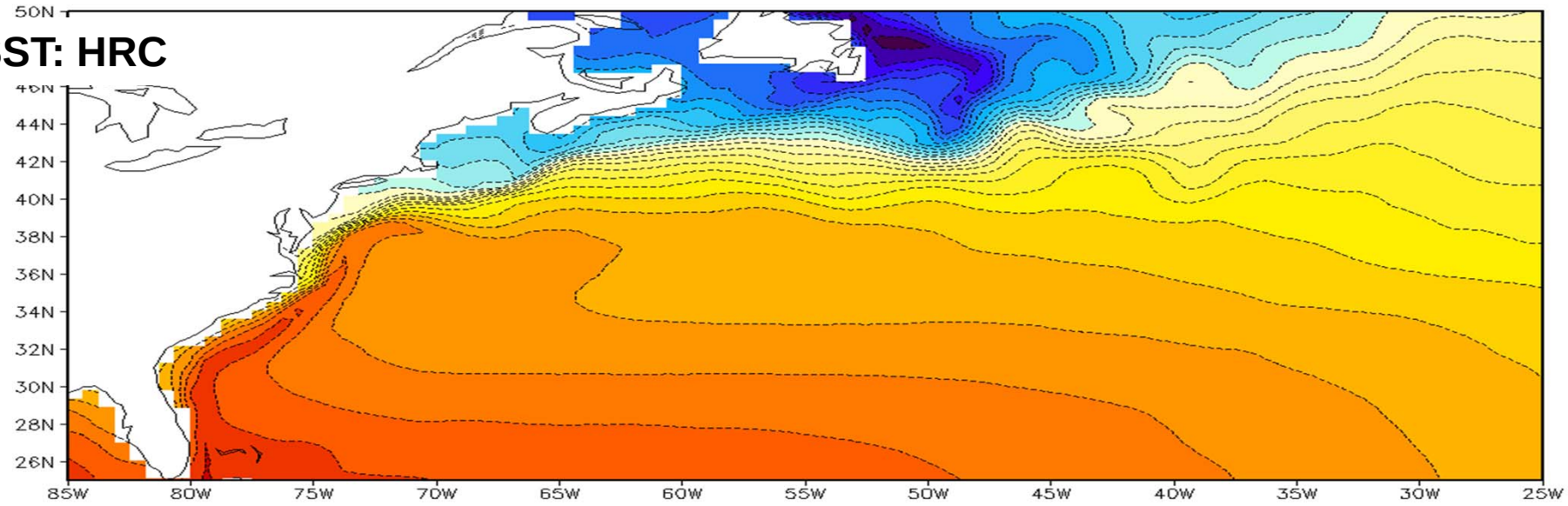
SST: LRC



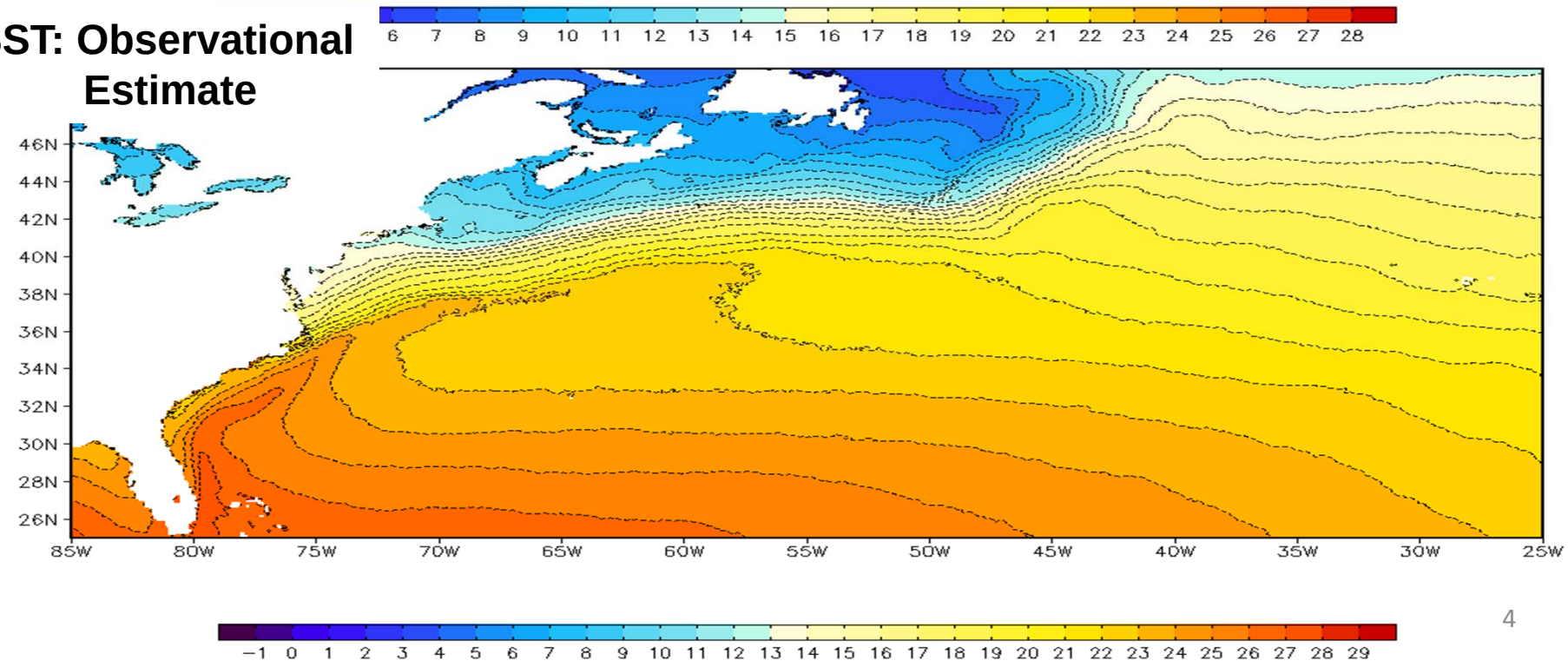
SST: Observational Estimate



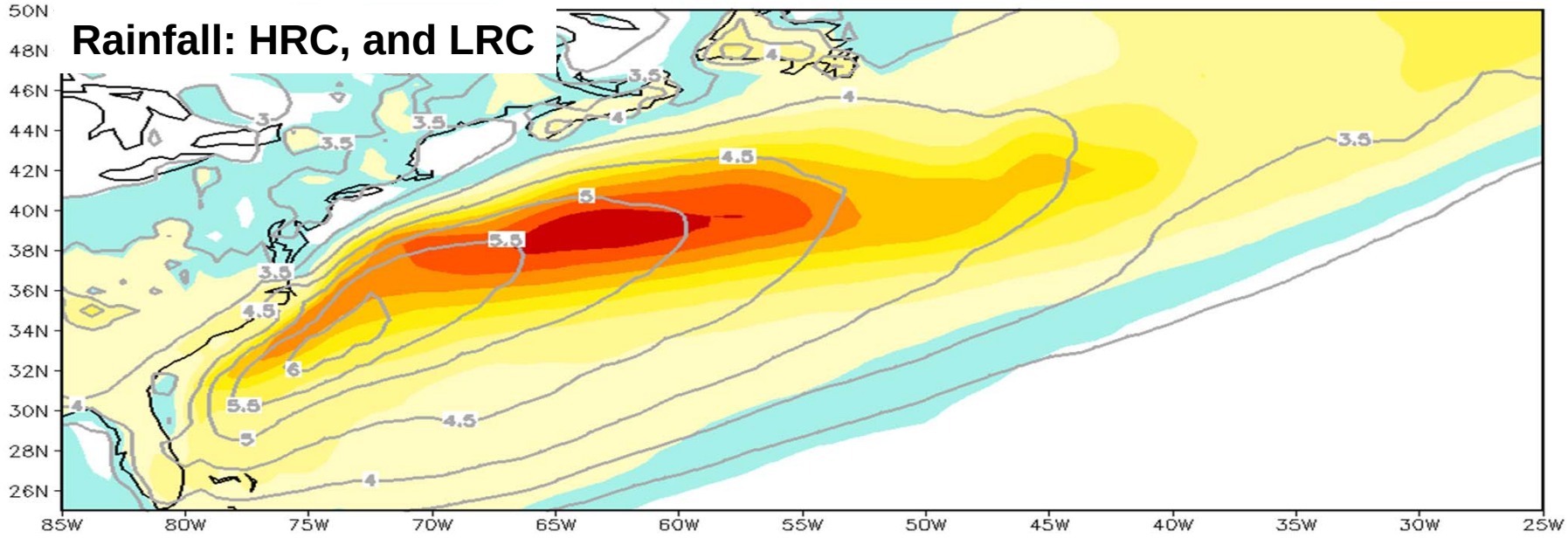
SST: HRC



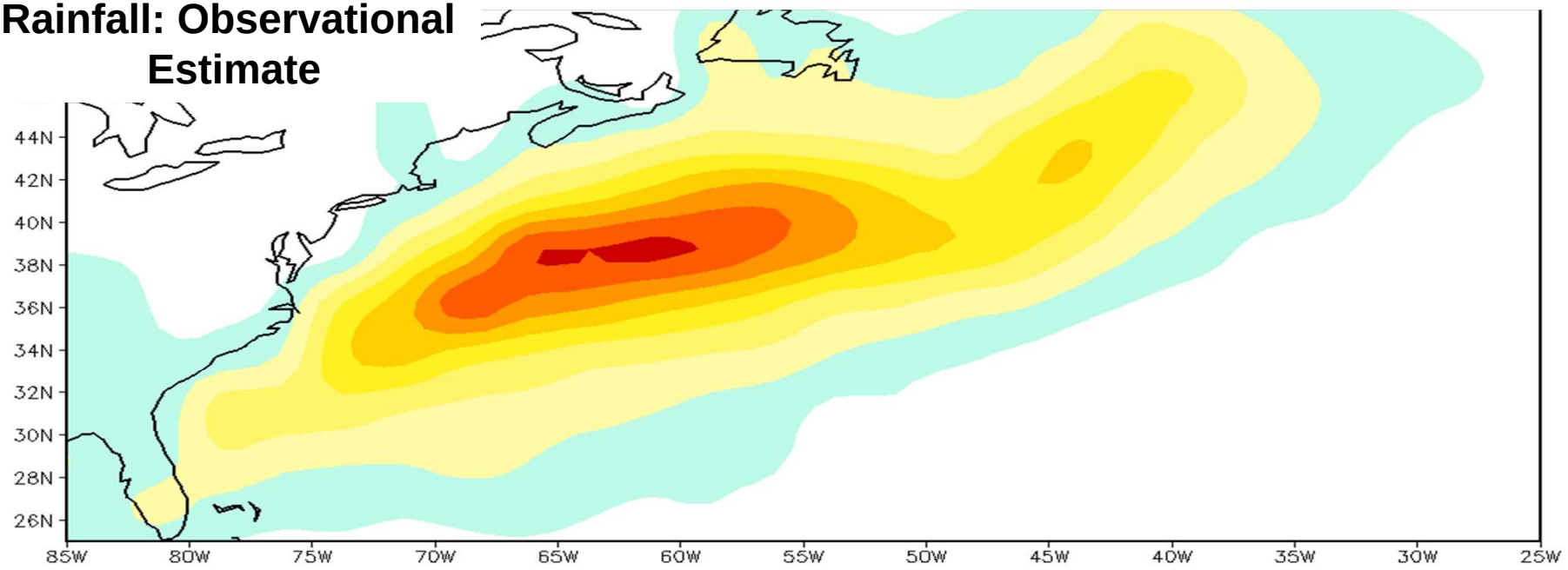
SST: Observational Estimate



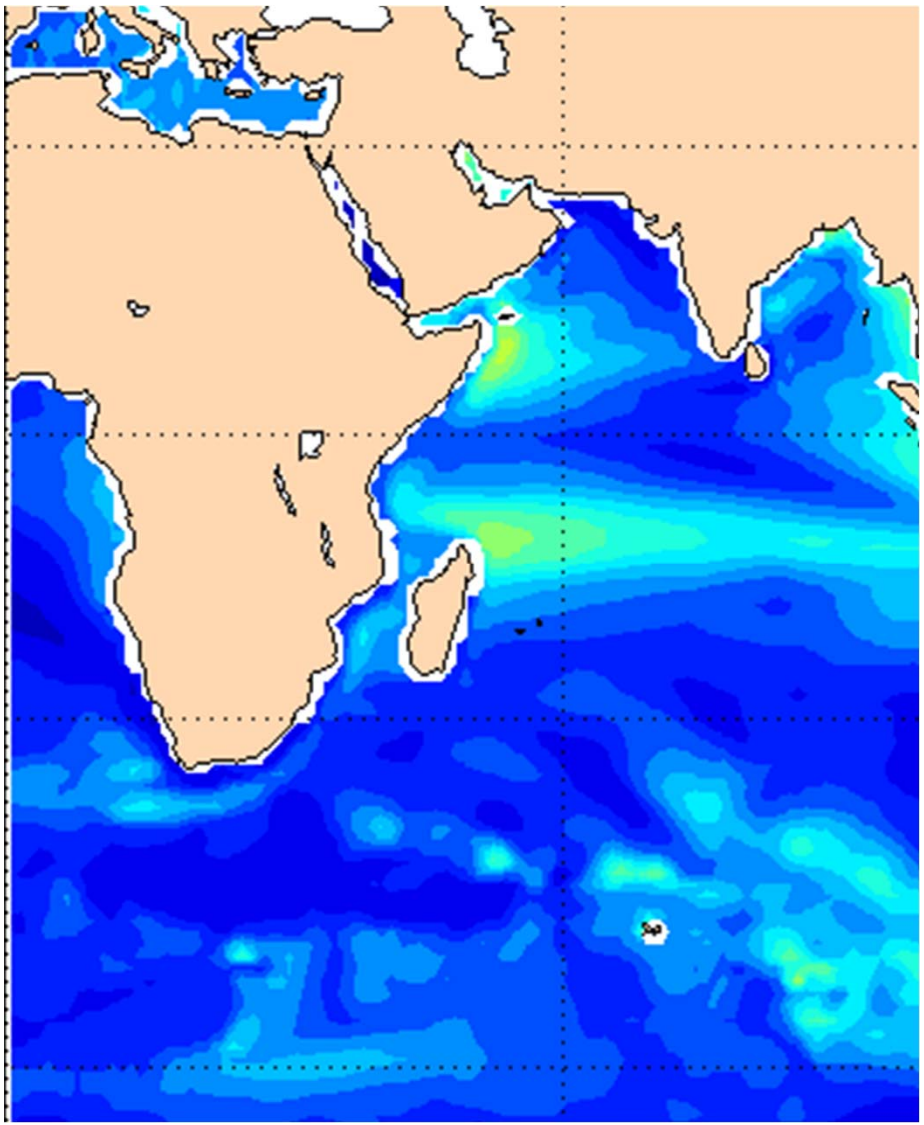
Rainfall: HRC, and LRC



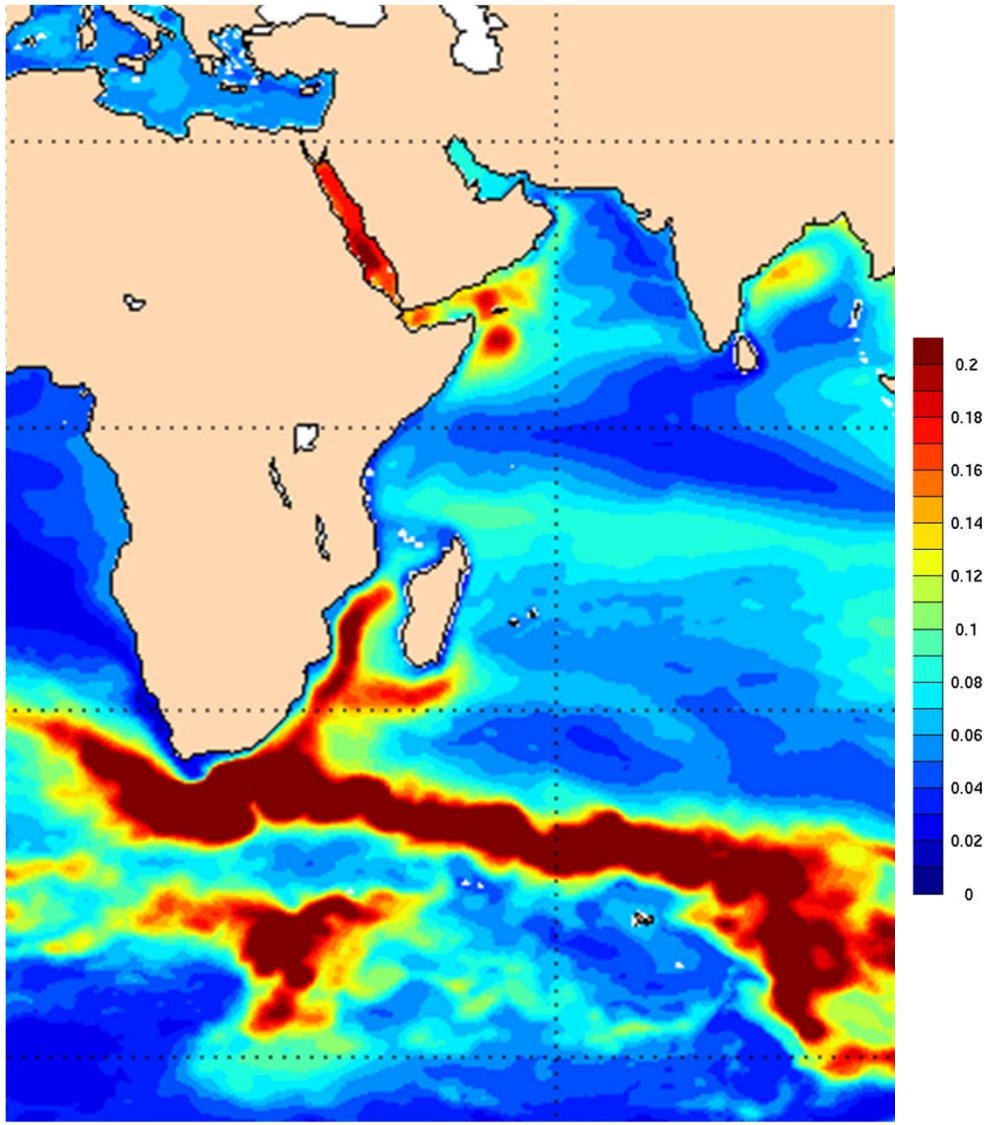
Rainfall: Observational Estimate



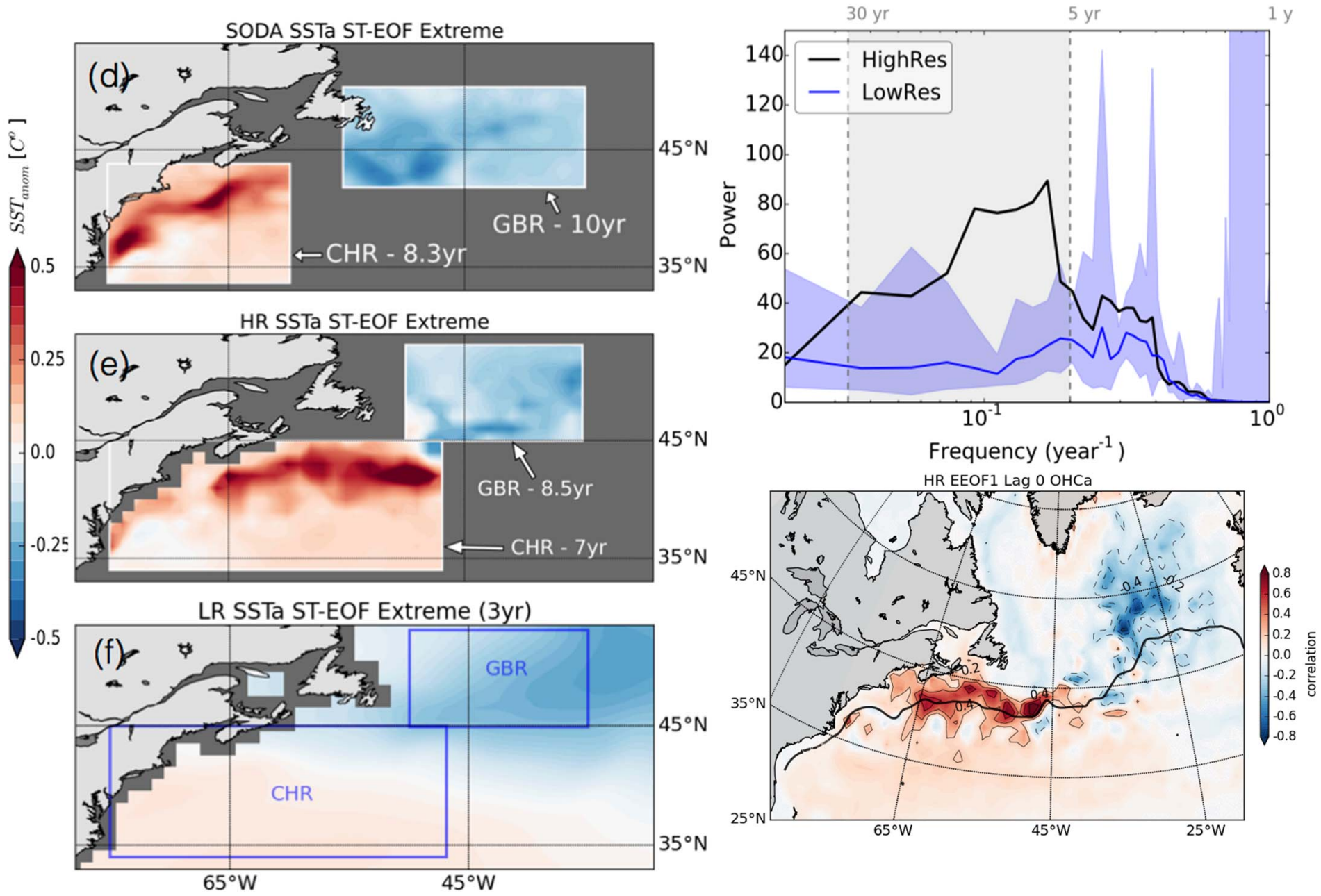
Sea Surface Height Standard Deviation

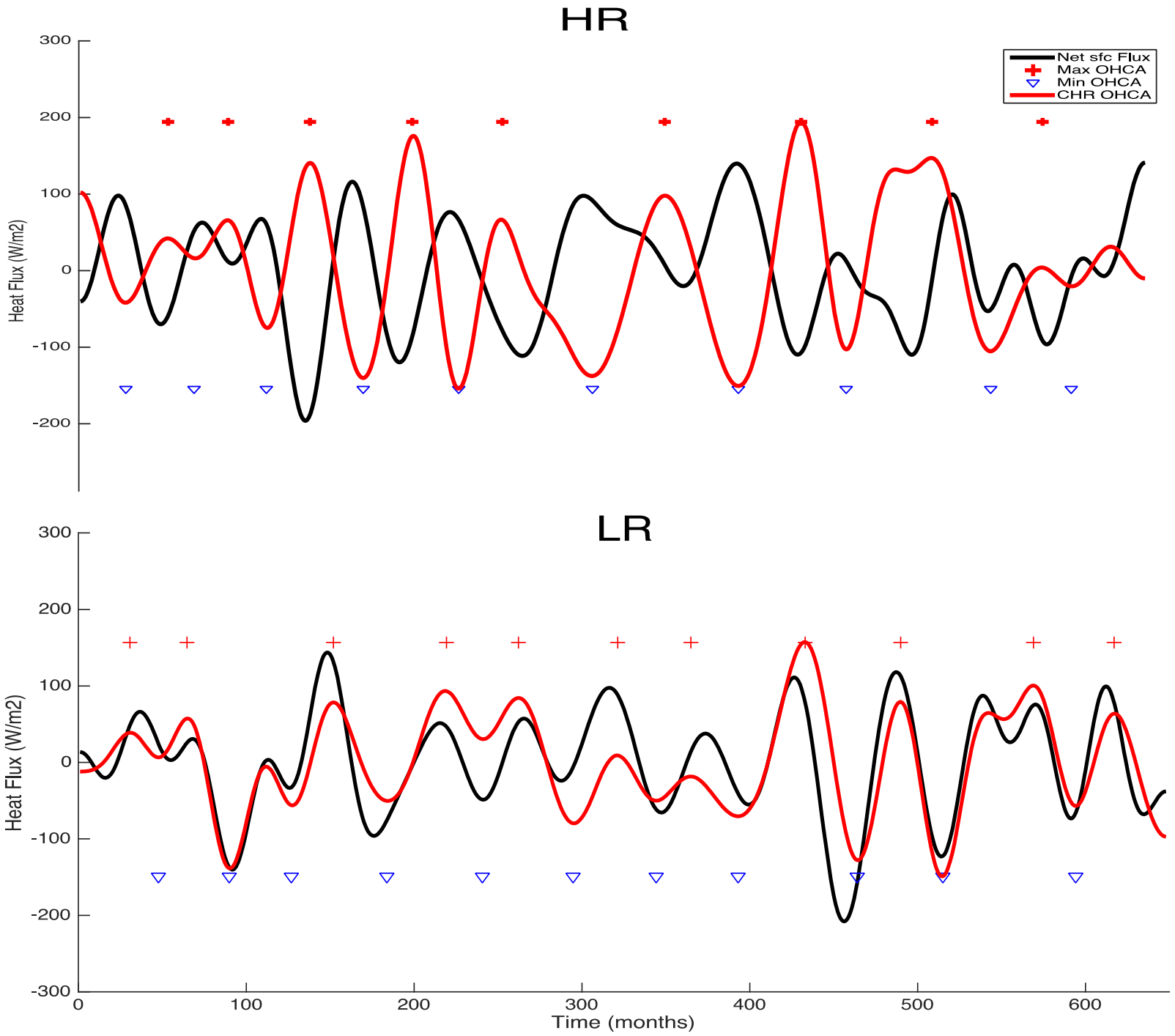


LRC SSH



HRC SSH

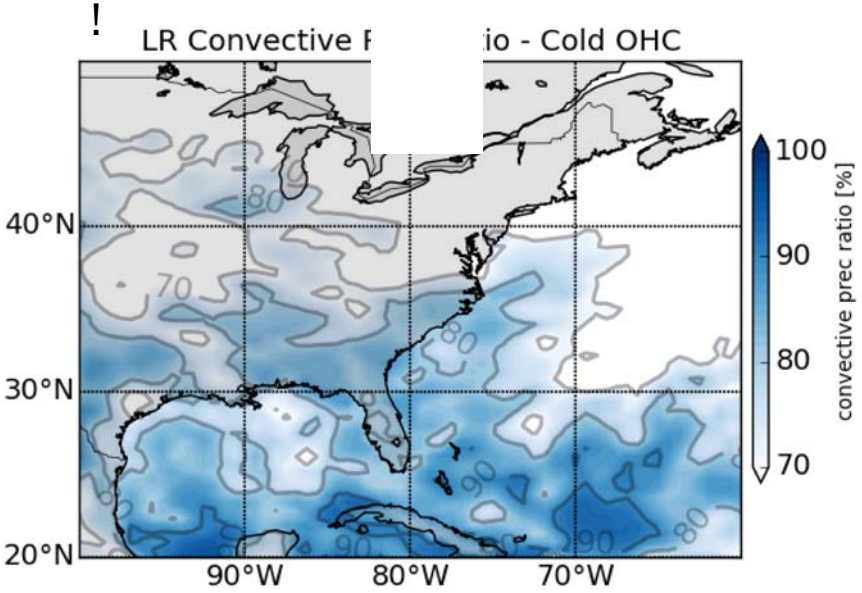

SODA SSTa ST-EOF Extreme
(d)
GBR - 10yr
CHR - 8.3yr
HR SSTa ST-EOF Extreme
(e)
GBR - 8.5yr
CHR - 7yr
LR SSTa ST-EOF Extreme (3yr)
(f)
GBR
CHR
SST_{anom} [C^o]
0.5
0.25
0.0
-0.25
-0.5
45°N
35°N
65°W
45°W
30 yr
5 yr
1 y
HighRes
LowRes
Power
Frequency (year^{-1})
HR EEOF1 Lag 0 OHCa
25°N
correlation
0.8
0.6
0.4
0.2
0.0
-0.2
-0.4
-0.6
-0.8

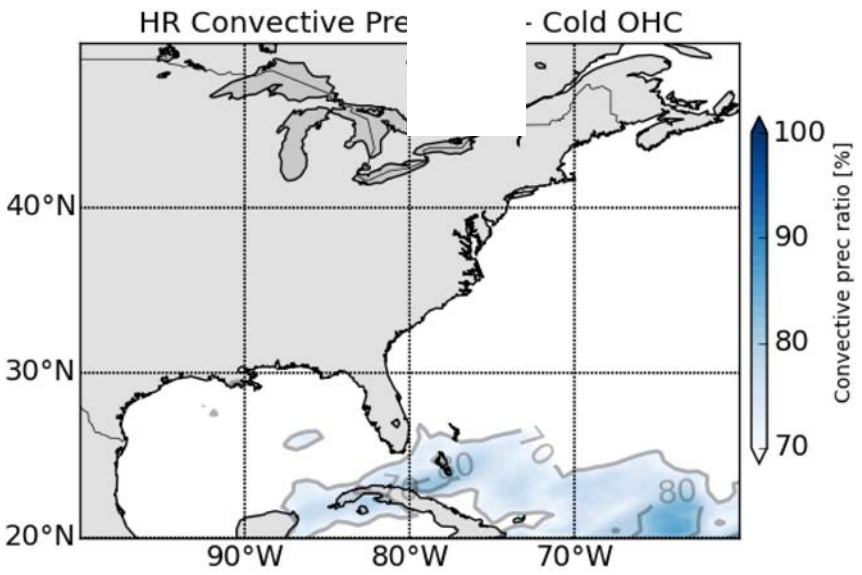

HR
LR
Net sfc Flux
Max OHCA
Min OHCA
CHR OHCA
Heat Flux (W/m2)
Time (months)
300
200
100
0
-100
-200
-300
0
100
200
300
400
500
600

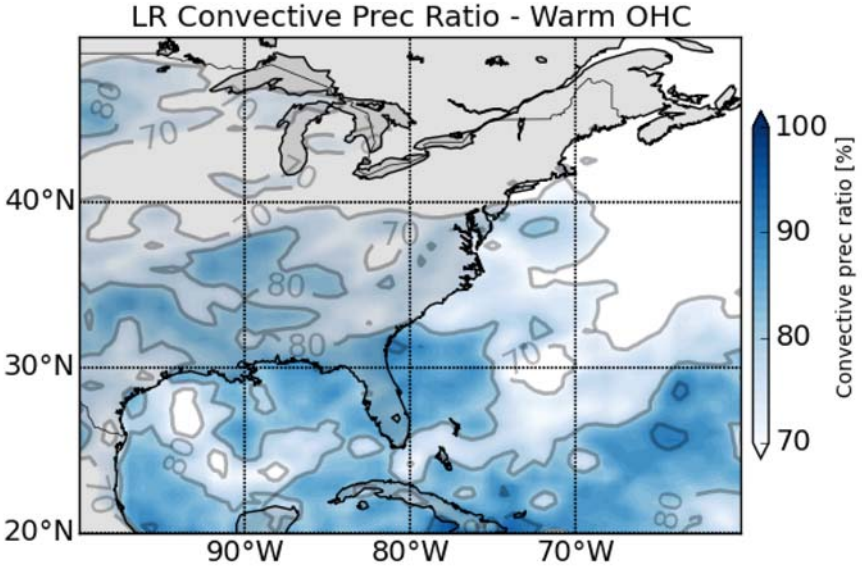
LR!

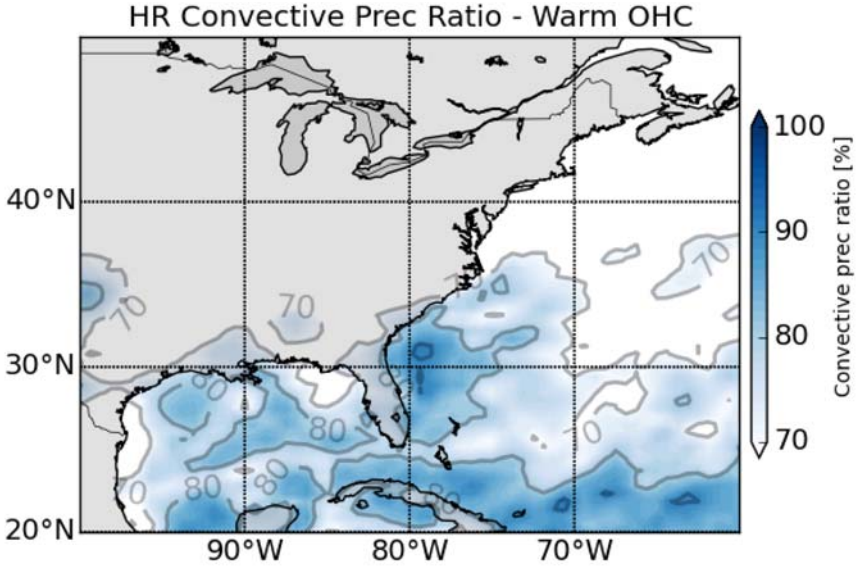
HR!

!


LR Convective F
io - Cold OHC
40°N
30°N
20°N
90°W
80°W
70°W
100
90
80
70
convective prec ratio [%]


HR Convective Pre
- Cold OHC
40°N
30°N
20°N
90°W
80°W
70°W
100
90
80
70
Convective prec ratio [%]


LR Convective Prec Ratio - Warm OHC
40°N
30°N
20°N
90°W
80°W
70°W
100
90
80
70
Convective prec ratio [%]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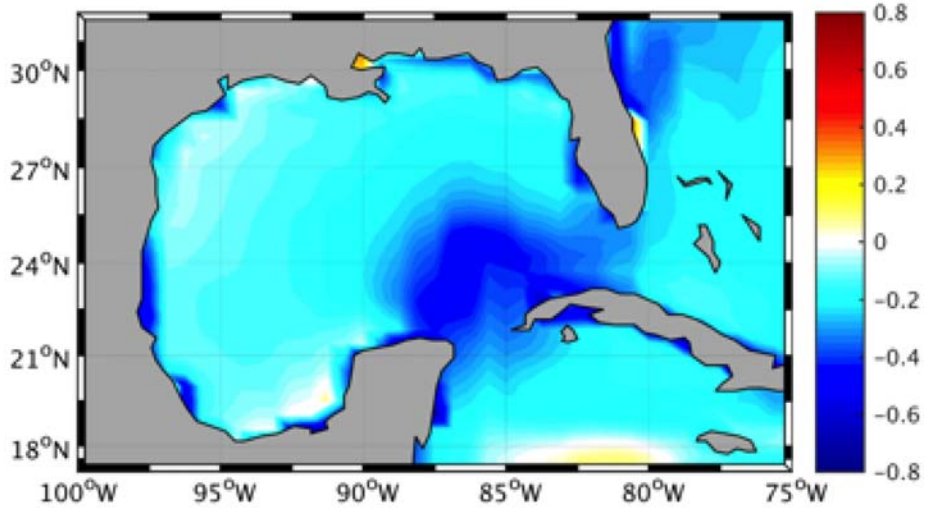
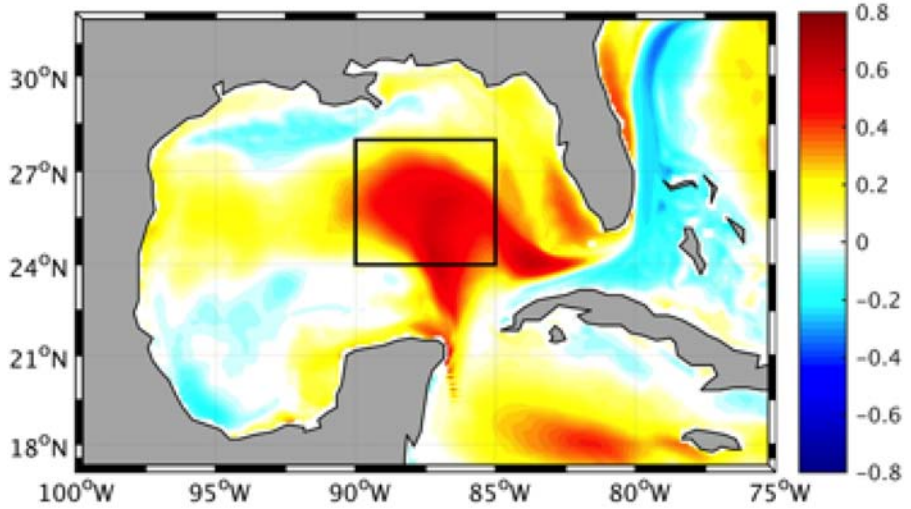
30°N
20°N
90°W
80°W
70°W
100
90
80
70
Convective prec ratio [%]

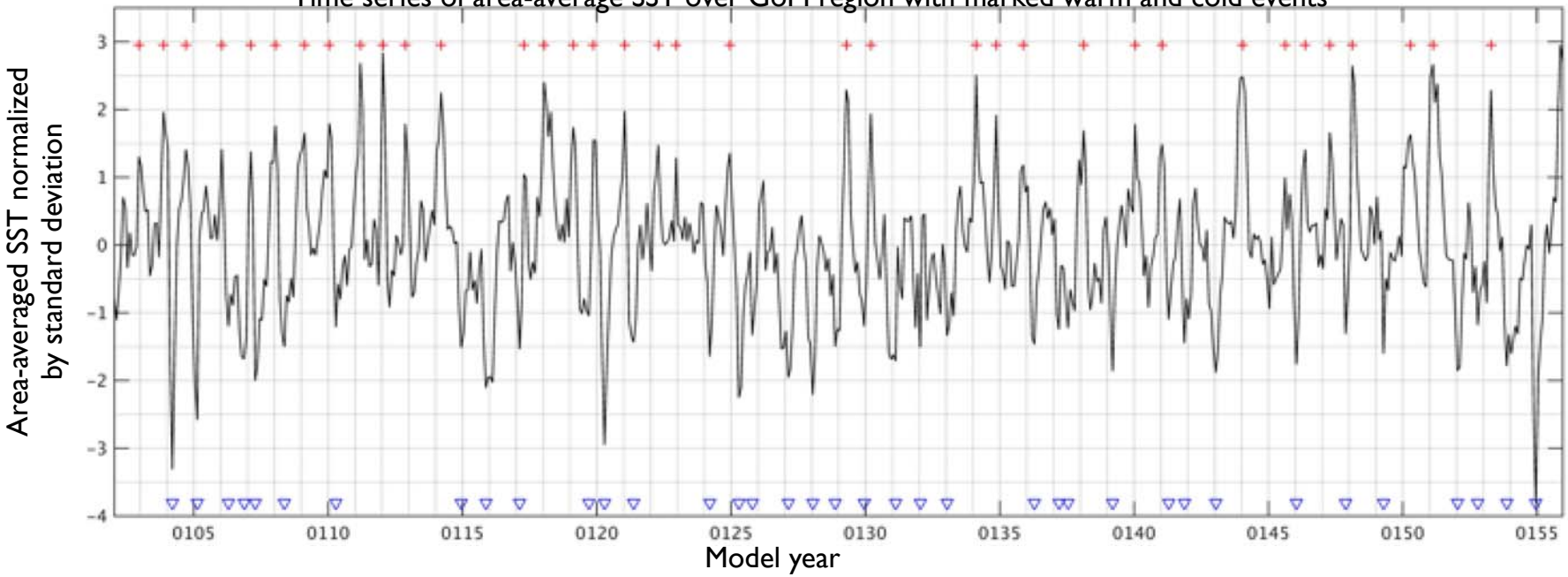
Correlation of LHF and SST for LRC

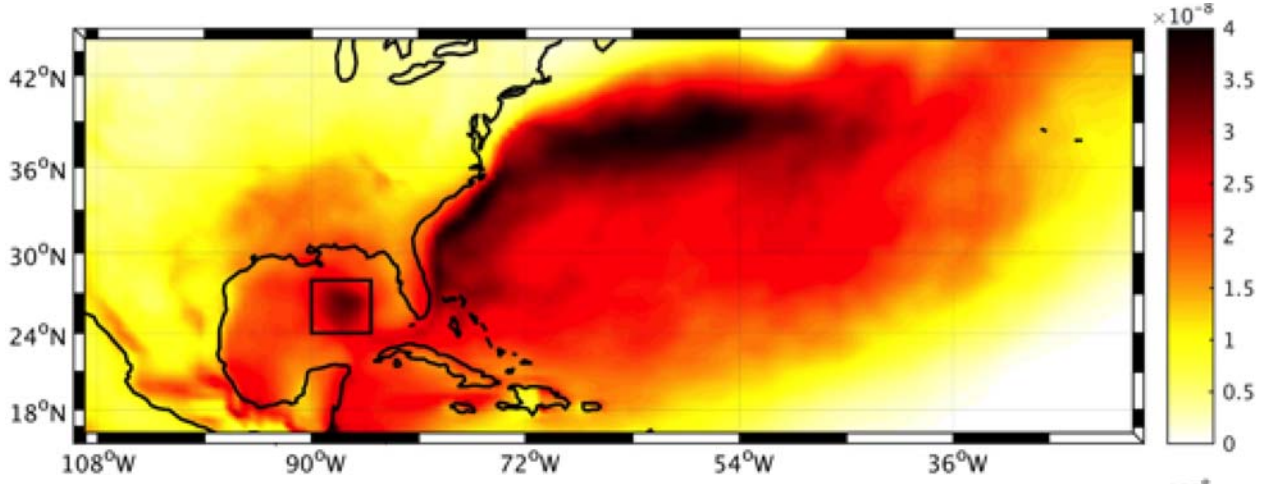


Correlation of LHF and SST for HRC

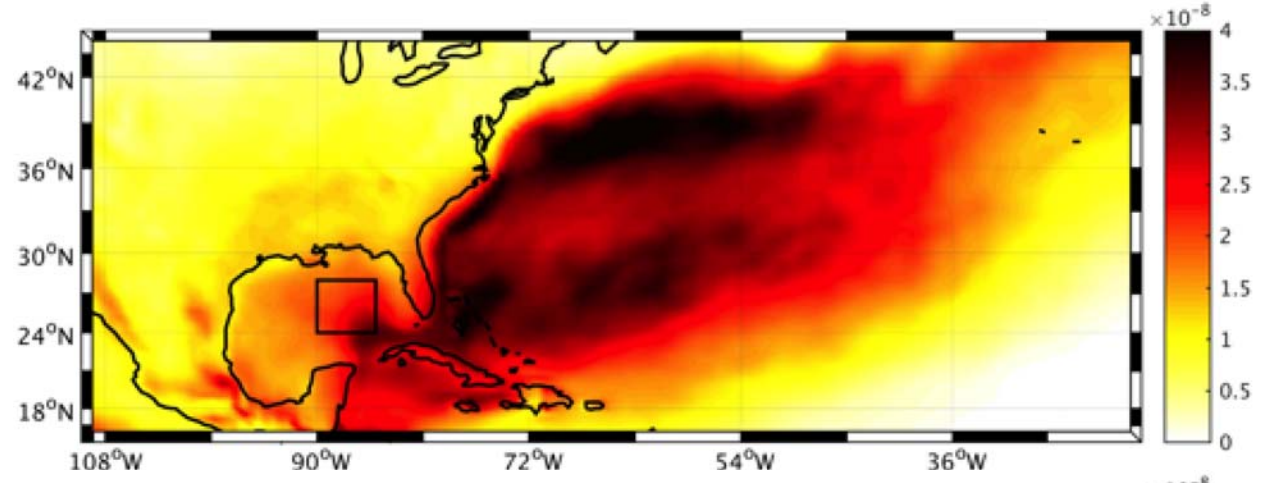


Time series of area-average SST over GoM region with marked warm and cold events

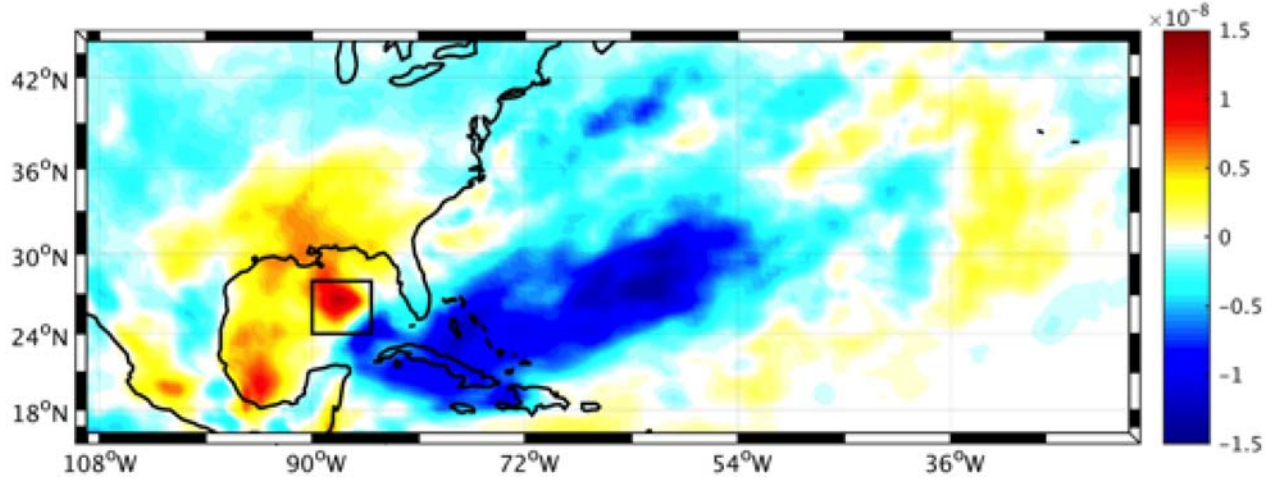




Full precipitation composite based on warm SST events over GoM (m/s)



Full precipitation composite based on cold SST events over GoM (m/s)



Full precipitation composite based on warm-cold SST events over GoM (m/s)

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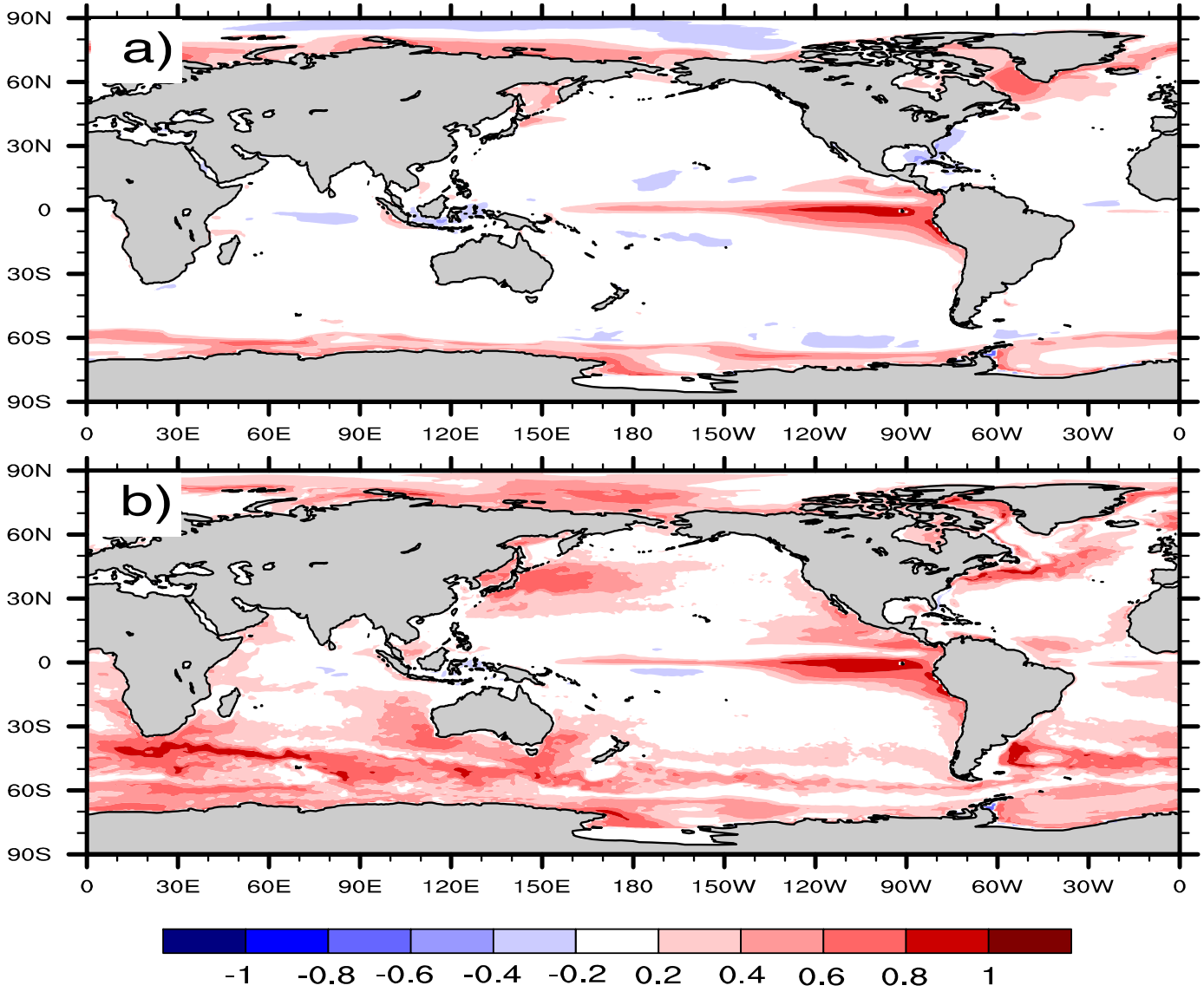
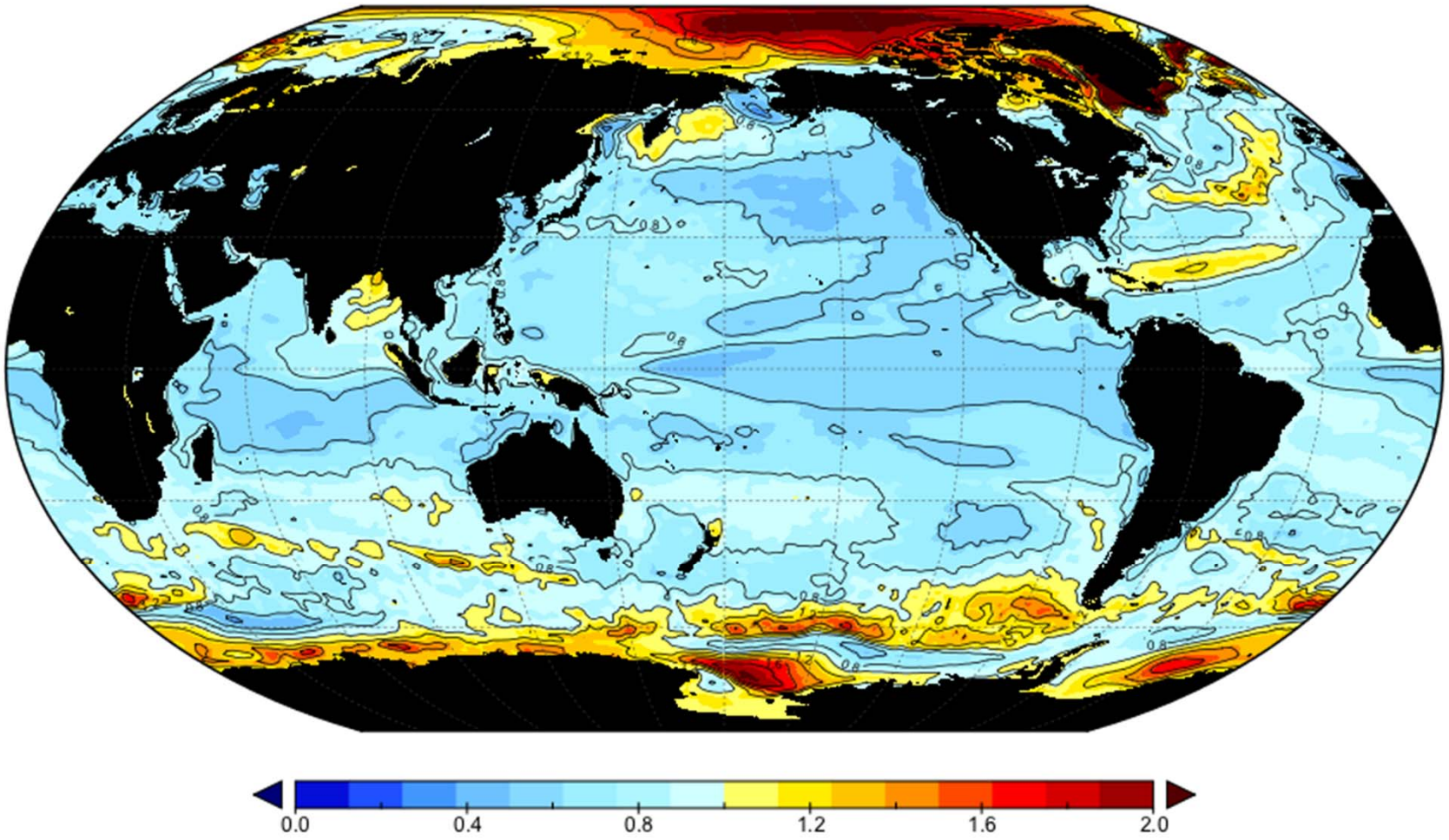
Local SSTA- Turbulent Heat Flux Correlation



SST Standard Deviation Ratios



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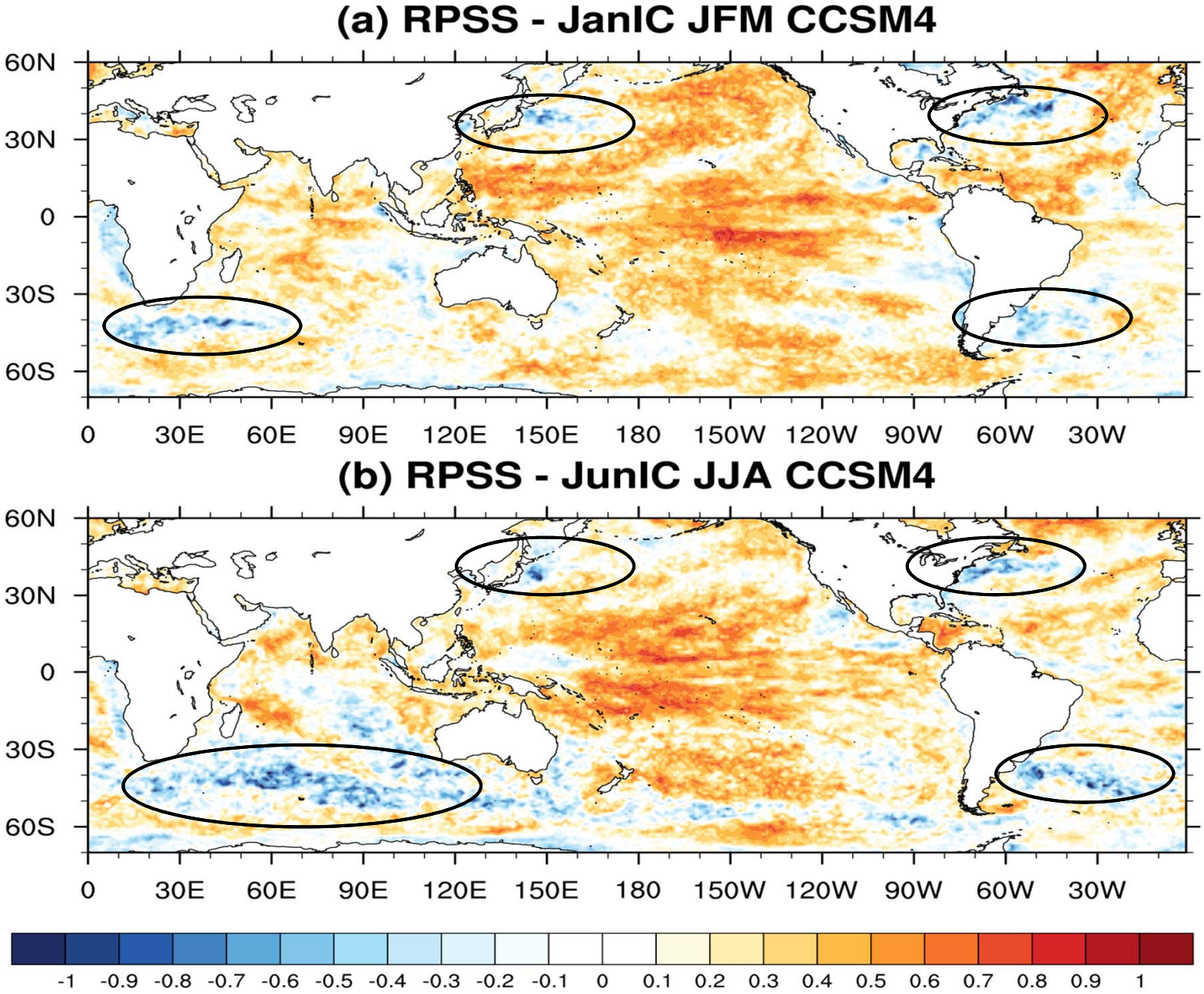
Seasonal Forecast Errors



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