

# Update on BGCWG, Feb 2010

K. Lindsay (NCAR)

# Outline

- BGC features in CCSM4
- BGC features in CESM1
- Preliminary Results from IPCC Runs with BGC in Progress

# BGC features in CCSM4

- Carbon-Nitrogen Model within CLM
  - Directly impacts transpiration (water cycle), LAI (energy cycle)
  - Introduced into 1 degree Track I experiments Summer '09, modest impacts on climate
- Time-varying Land Use

# BGC features in CESM1

- BEC Ecosystem Model within POP
  - Directly impacts surface Chl (SW adsorption)
  - Negligible impact on mean surface climate
  - Modest impact on variability
- Land & Ocean CO<sub>2</sub> fluxes used as surface boundary condition for atmospheric CO<sub>2</sub> constituent.

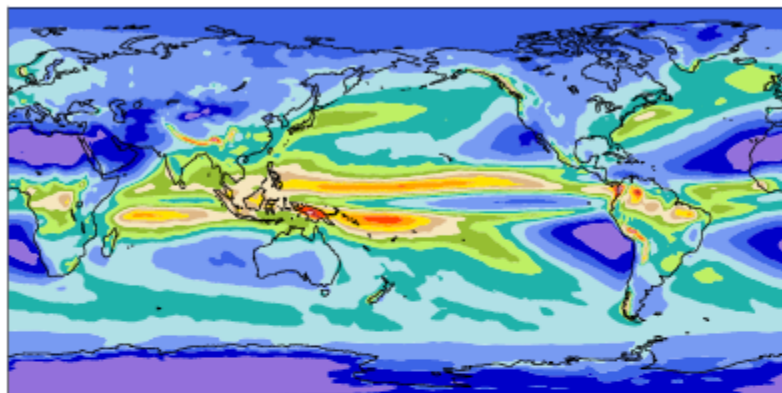
# ANN

b40.1850.track1.1deg.006.ecosys (yrs 11-20)

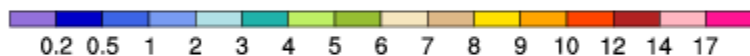
Precipitation rate

mean= 2.93

mm/day



Min = 0.05 Max = 20.08

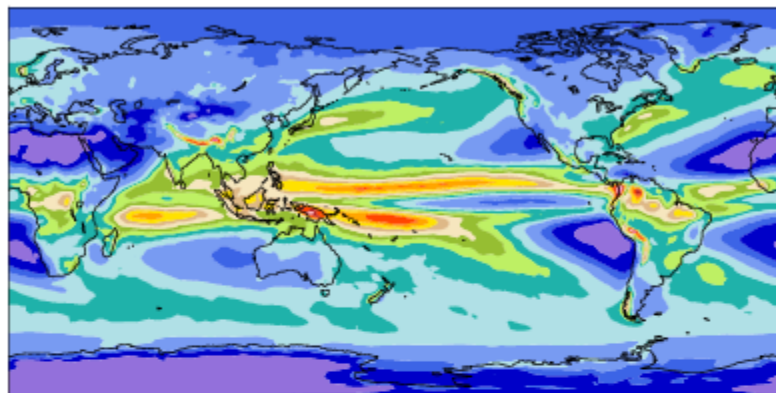


b40.1850.track1.1deg.006 (yrs 11-20)

Precipitation rate

mean= 2.95

mm/day



Min = 0.04 Max = 20.14

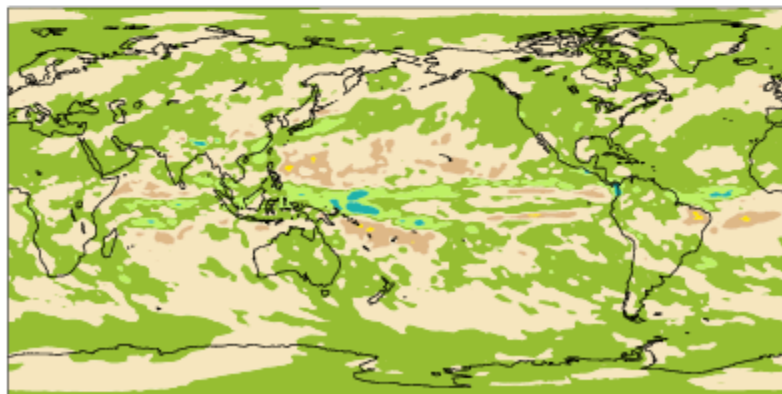


b40.1850.track1.1deg.006.ecosys - b40.1850.track1.1deg.006

mean = -0.01

rmse = 0.26

mm/day

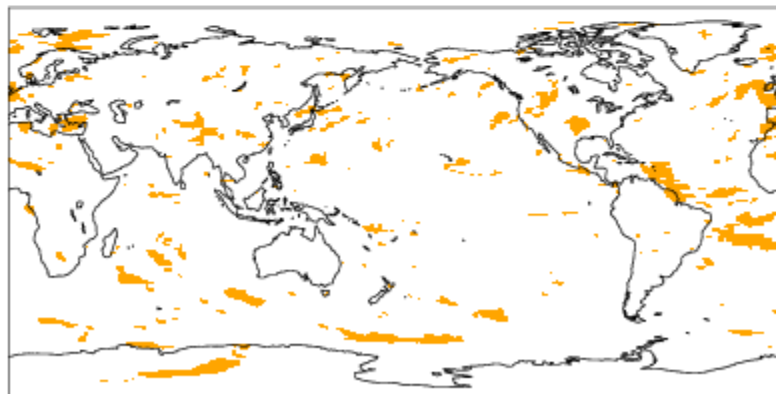


Min = -1.91 Max = 1.29



T-test of the two means at each grid point

Colored cells are significant at the 0.05 level



# Status of Runs in Progress

2010-02-09

- BGC Runs have only been run w/ Track I
- 1850 Control Prognostic CO<sub>2</sub> : 192 years
- 1850 Control Prescribed CO<sub>2</sub> : 74 years
  
- 'non-BGC' runs have CN within CLM
  - 1850 Control : 1300 years (complete)
  - Multiple 1850-2005 transients complete

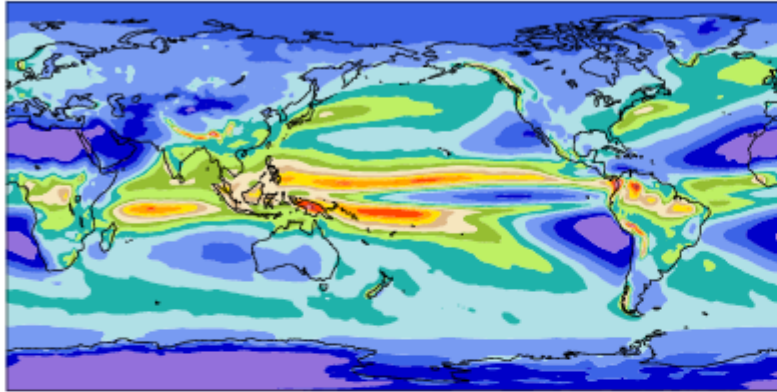
# ANN

b40.coup\_carb.004 (yrs 41-60)

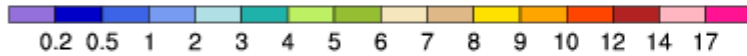
Precipitation rate

mean= 2.93

mm/day



Min = 0.05 Max = 19.13

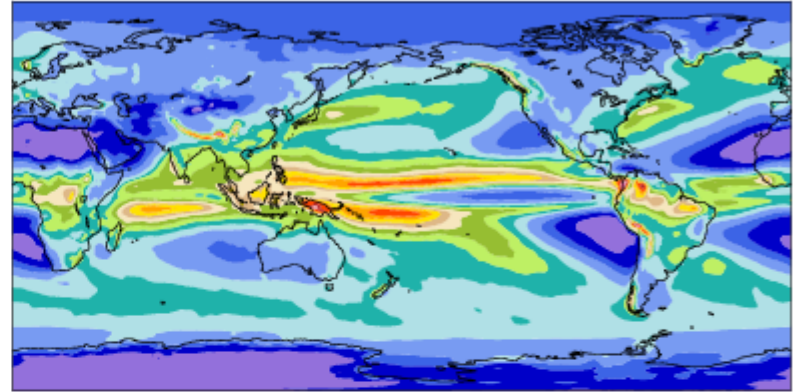


b40.1850.track1.1deg.006 (yrs 91-110)

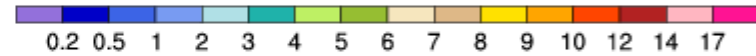
Precipitation rate

mean= 2.94

mm/day



Min = 0.05 Max = 19.82

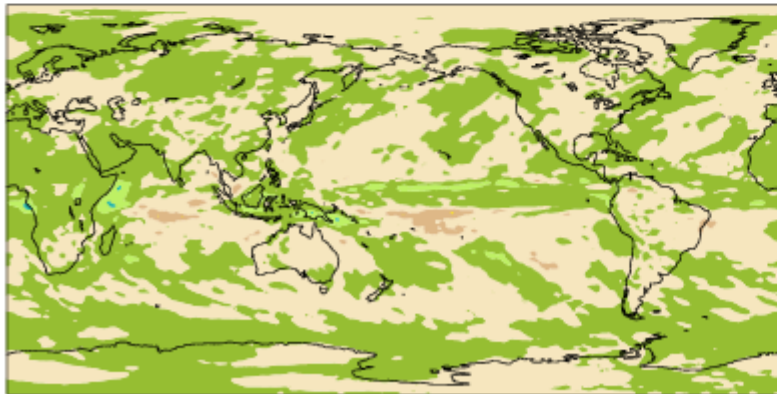


b40.coup\_carb.004 - b40.1850.track1.1deg.006

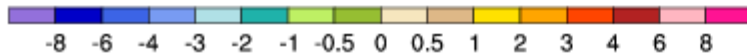
mean = -0.01

rmse = 0.19

mm/day

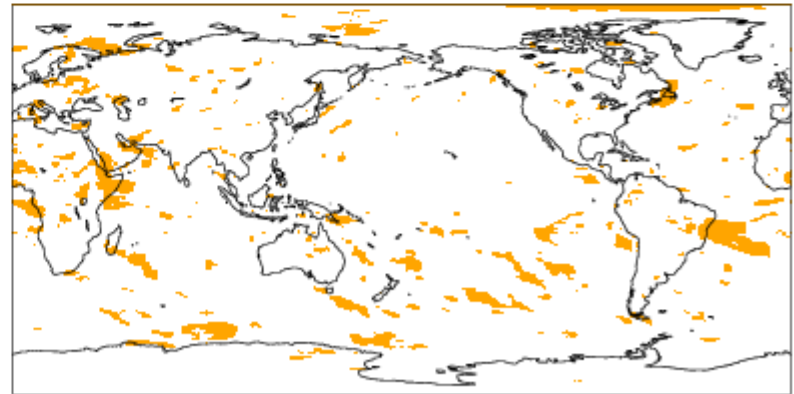


Min = -1.30 Max = 1.05



T-test of the two means at each grid point

Colored cells are significant at the 0.05 level

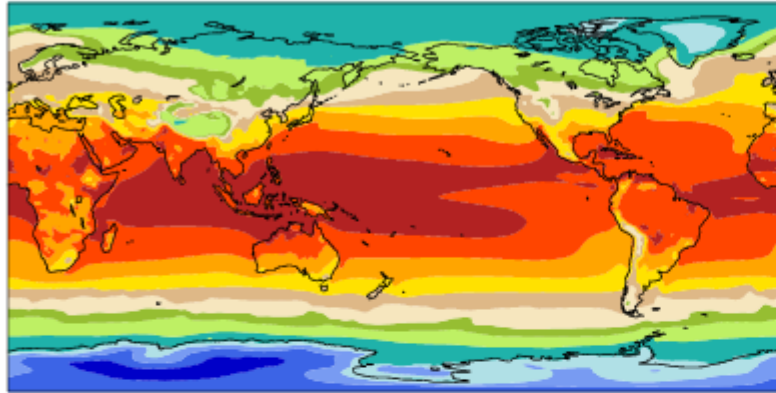


# ANN

b40.coup\_carb.004 (yrs 41-60)

Surf Temp (radiative)

mean= 287.33



Min = 214.18 Max = 304.32

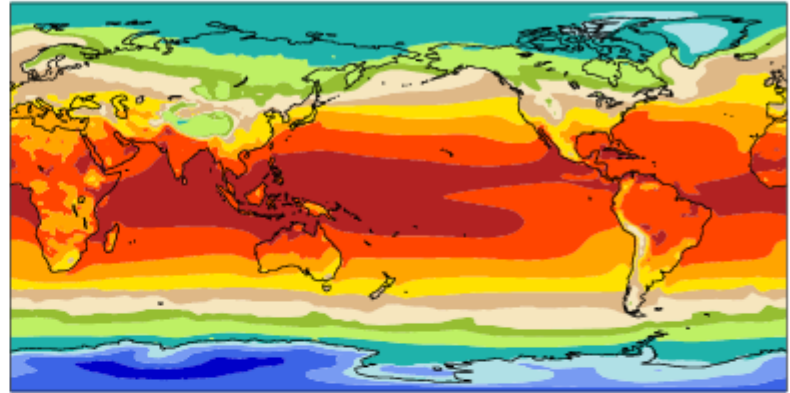


b40.1850.track1.1deg.006 (yrs 91-110)

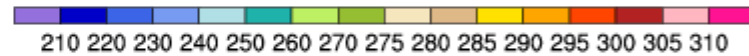
K Surf Temp (radiative)

mean= 287.40

K



Min = 214.95 Max = 304.42

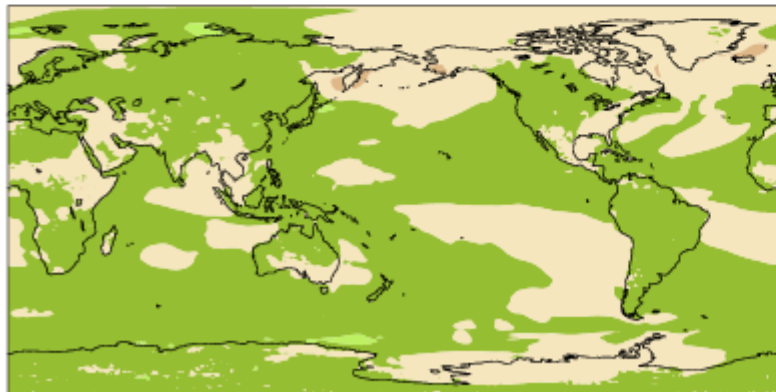


b40.coup\_carb.004 - b40.1850.track1.1deg.006

mean = -0.08

rmse = 0.26

K

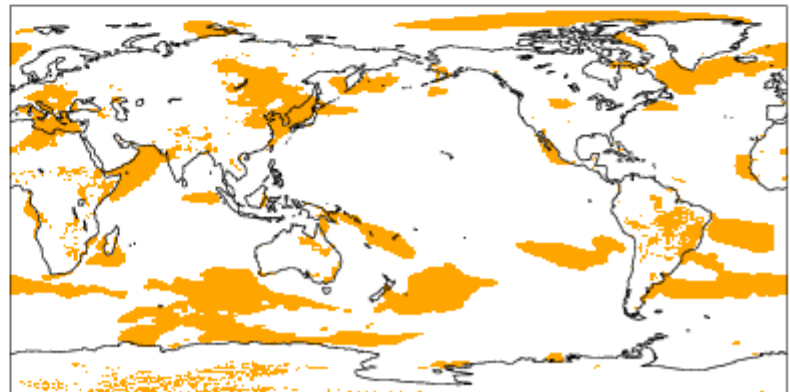


Min = -1.71 Max = 1.47



T-test of the two means at each grid point

Colored cells are significant at the 0.05 level





# ANN

b40.coup\_carb.004 (yrs 41-60)

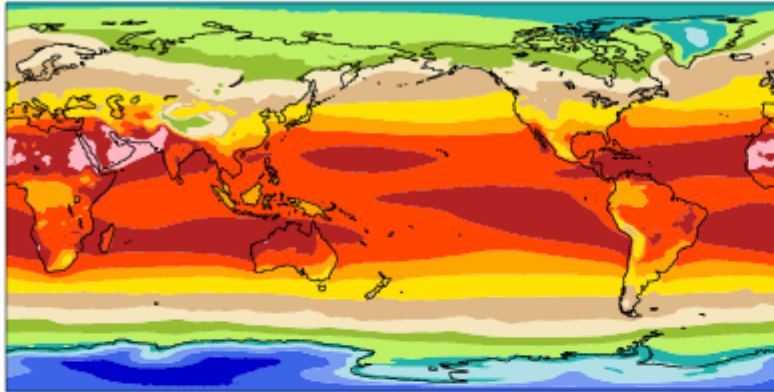
TOM clearsky net LW

mean = 265.65

W/m<sup>2</sup> TOM clearsky net LW

mean = 265.75

W/m<sup>2</sup>



Min = 124.21 Max = 309.53

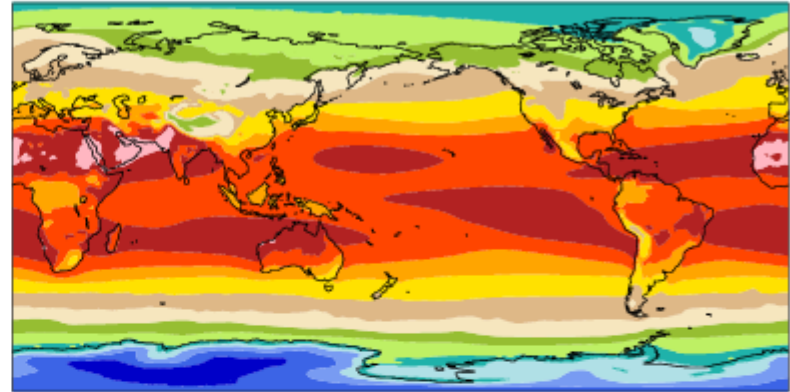


b40.1850.track1.1deg.006 (yrs 91-110)

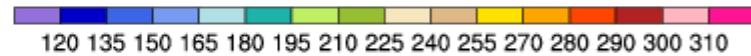
TOM clearsky net LW

mean = 265.75

W/m<sup>2</sup>



Min = 124.21 Max = 308.50



b40.coup\_carb.004 - b40.1850.track1.1deg.006

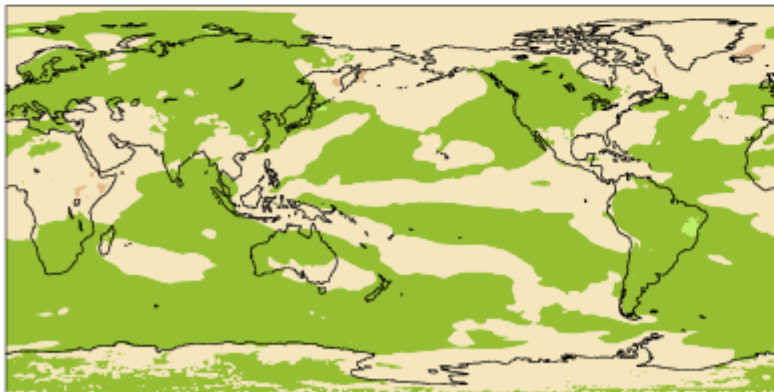
mean = -0.10

rmse = 0.59

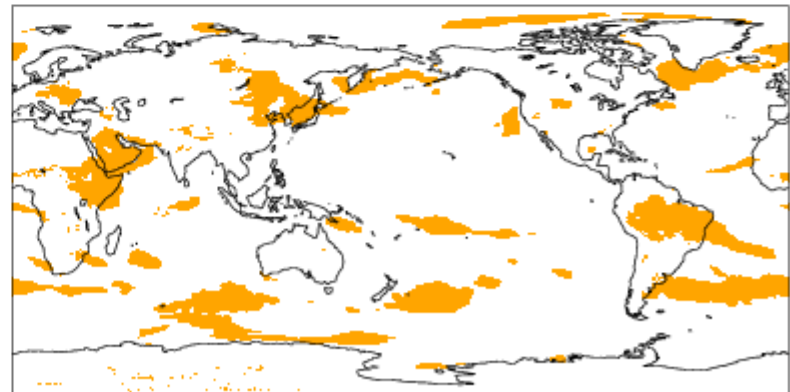
W/m<sup>2</sup>

T-test of the two means at each grid point

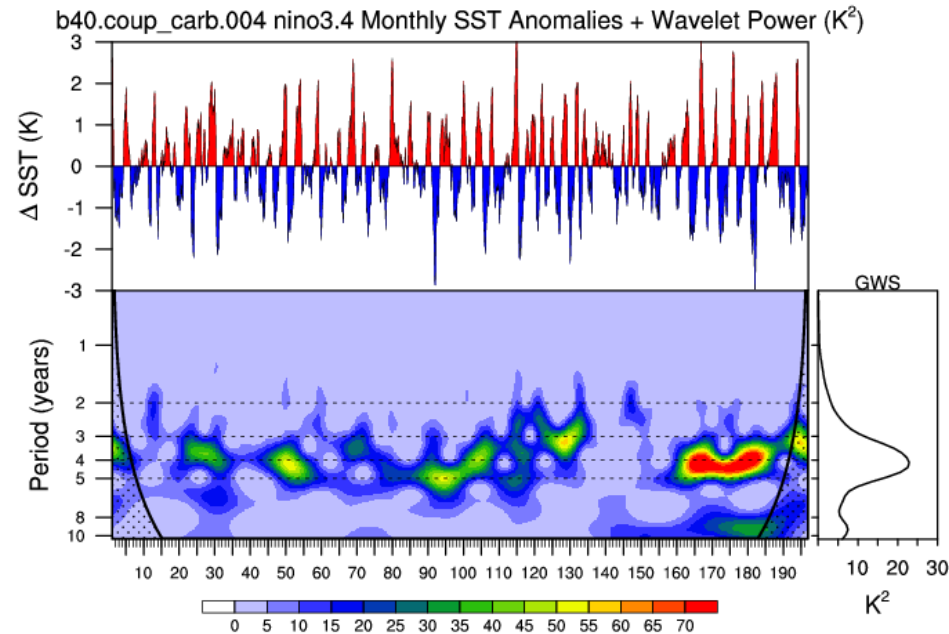
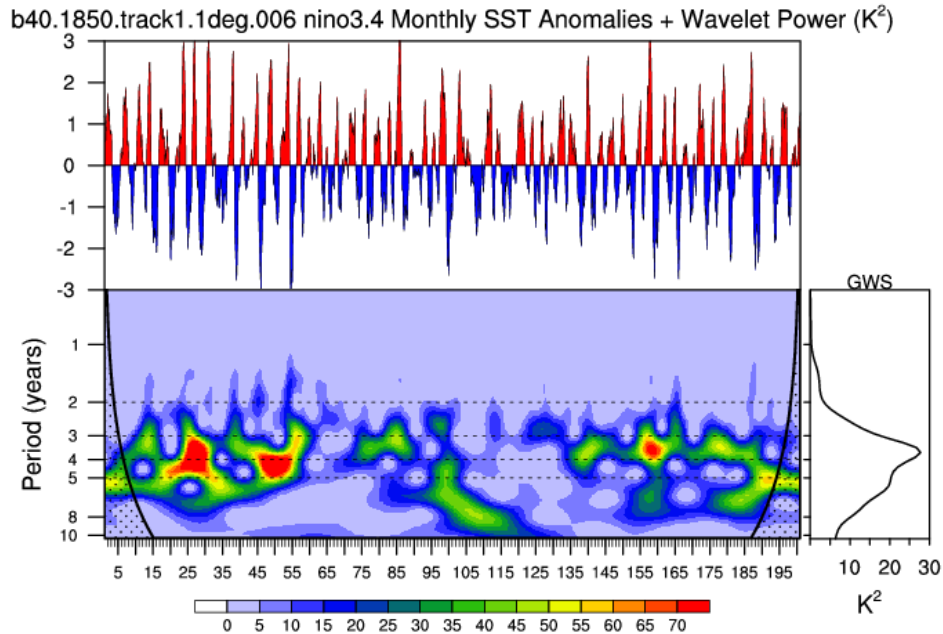
Colored cells are significant at the 0.05 level



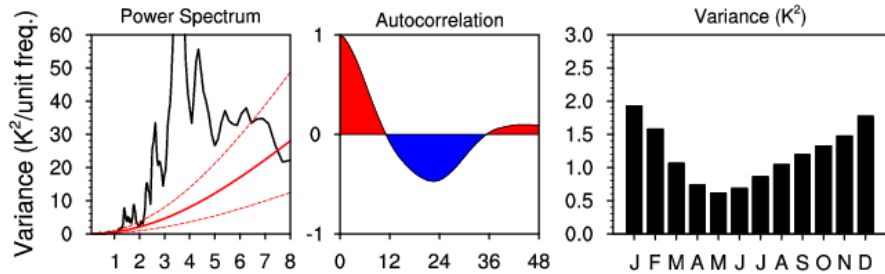
Min = -2.62 Max = 2.94



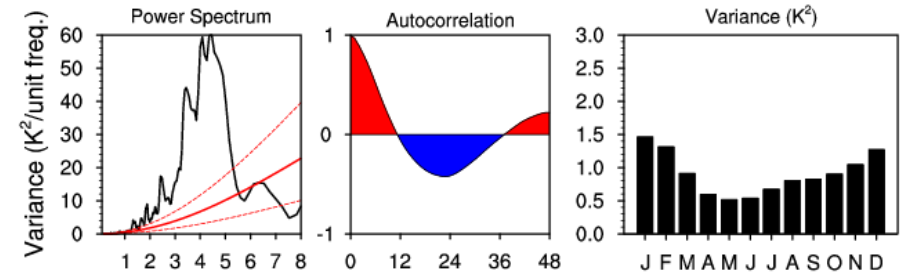
# Nino 3.4 Variability



Averaged over years 1 to 200:



Averaged over years 1 to 196:

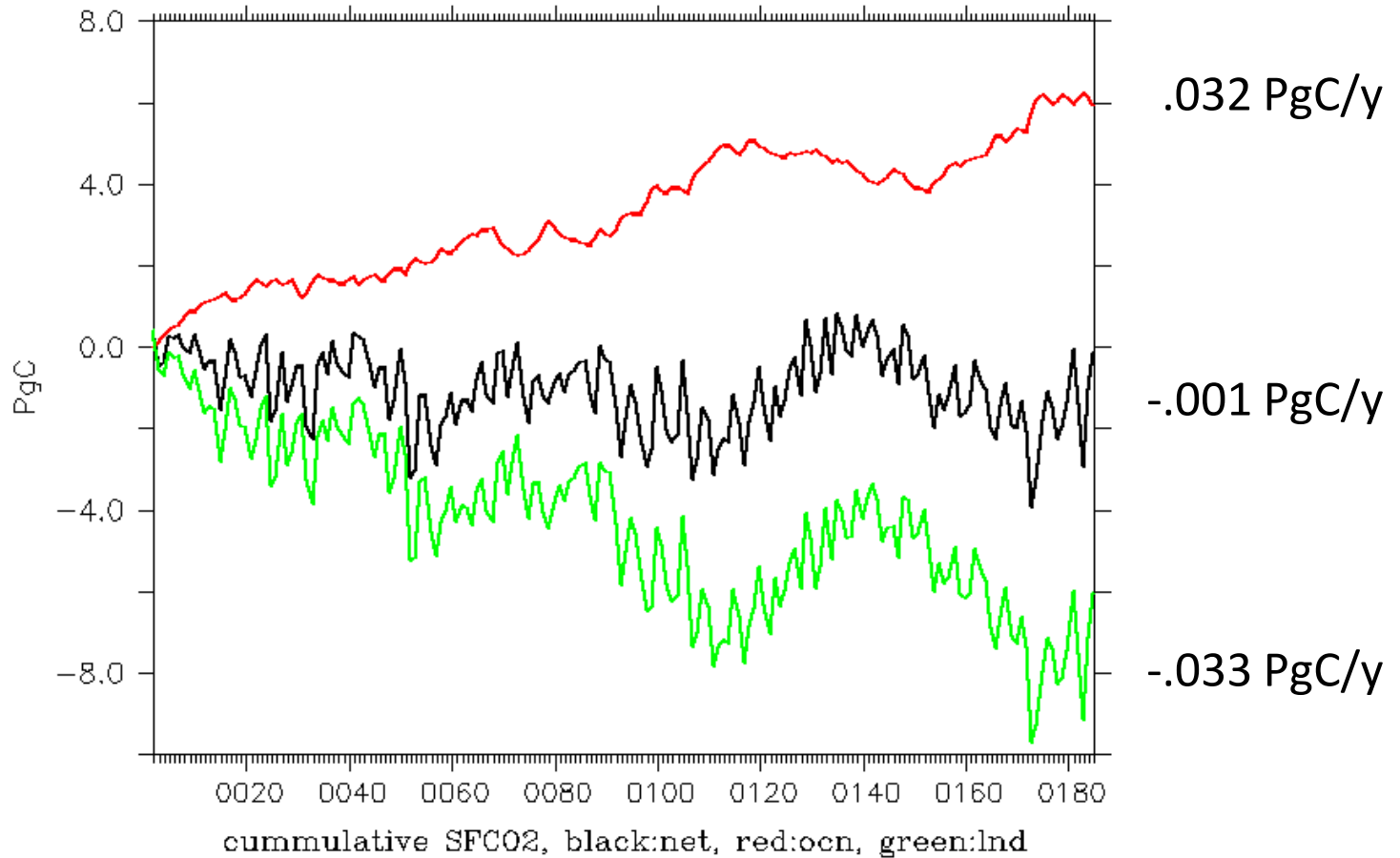


# Cumulative CO<sub>2</sub> Fluxes w/ Prognostic CO<sub>2</sub>

LONGITUDE : 0.6W(-0.6) to 0.6W  
LATITUDE : 90.5S to 90.5N  
CALENDAR: NOLEAP

FERRET Ver. 8.1  
NOAA/PHEL THAP  
Feb 11 2010 16:23:51

DATA SET: SFCO2



# What's Next

- Incorporate ATM CO<sub>2</sub> fields into AMWG diagnostics package
- Analysis, analysis, analysis, ...
- Transient Runs
  - 20<sup>th</sup> Century
  - 21<sup>st</sup> Century RPCs
  - Various Sensitivity Studies