Coupled Carbon Simulations with CESM-(BGC)

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BGCWG Co-chairs: N. Mahowald, J. Randerson

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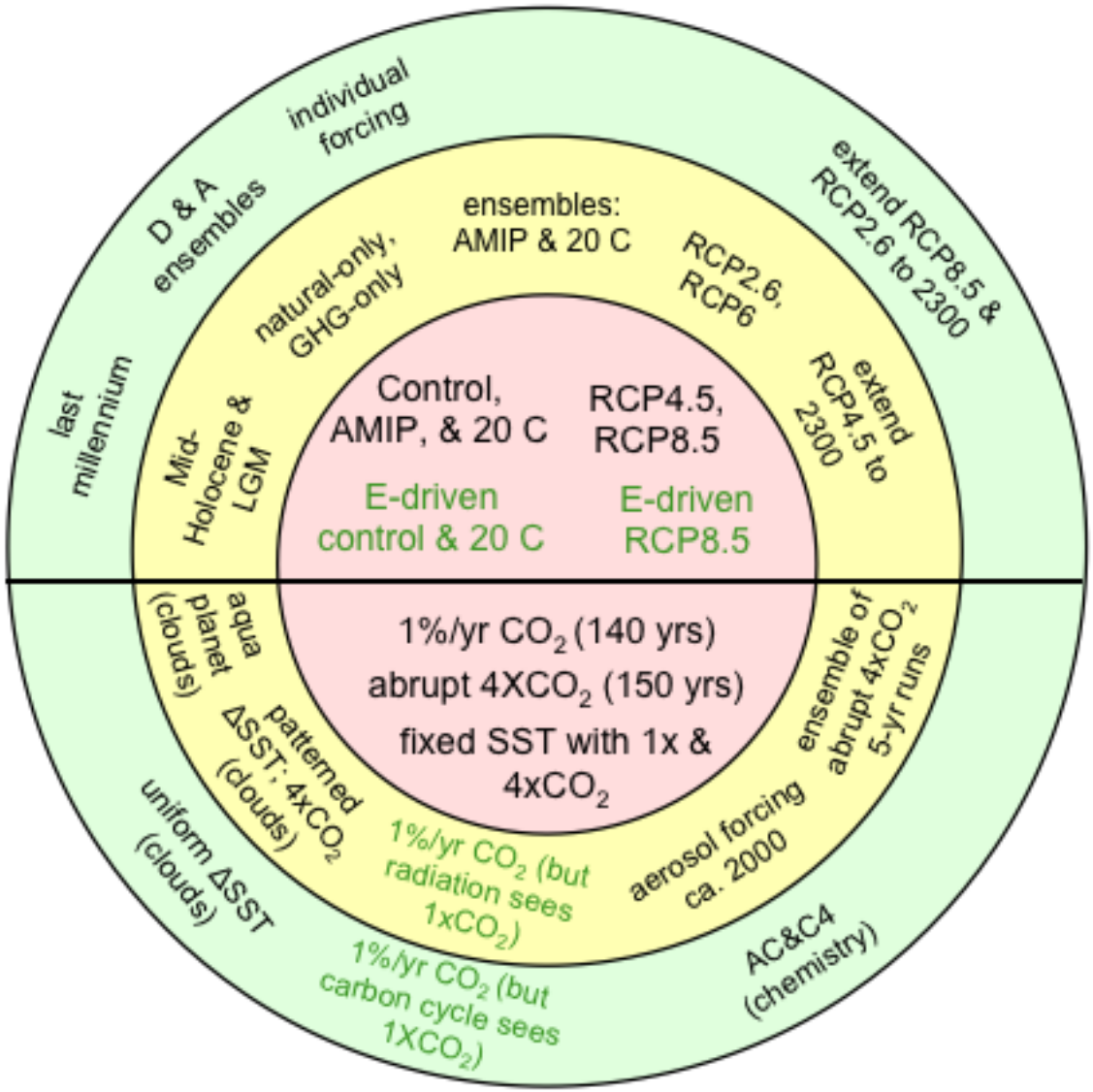
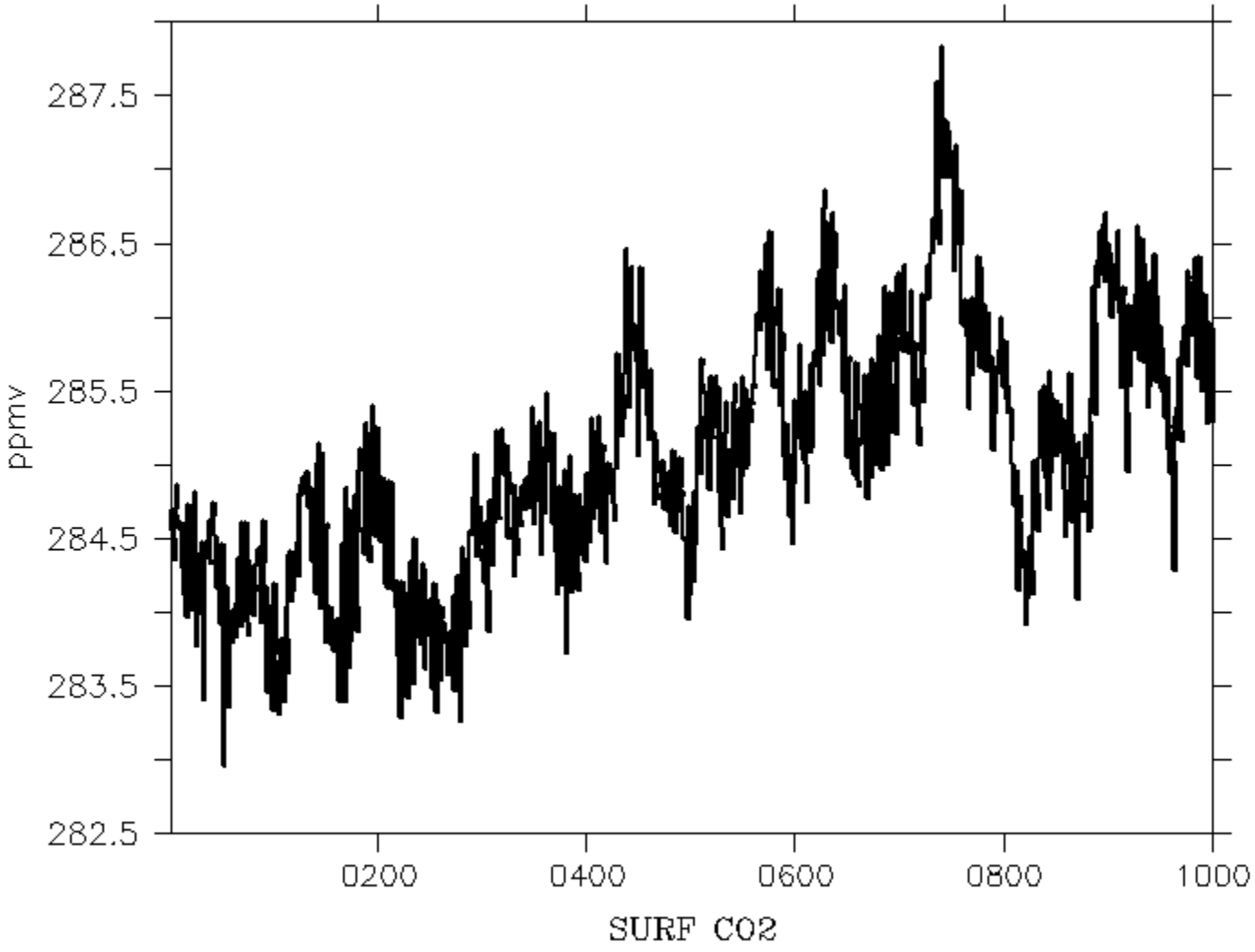
CMIP5 Long-Term Experiments



Prognostic CO_2 1850 Control



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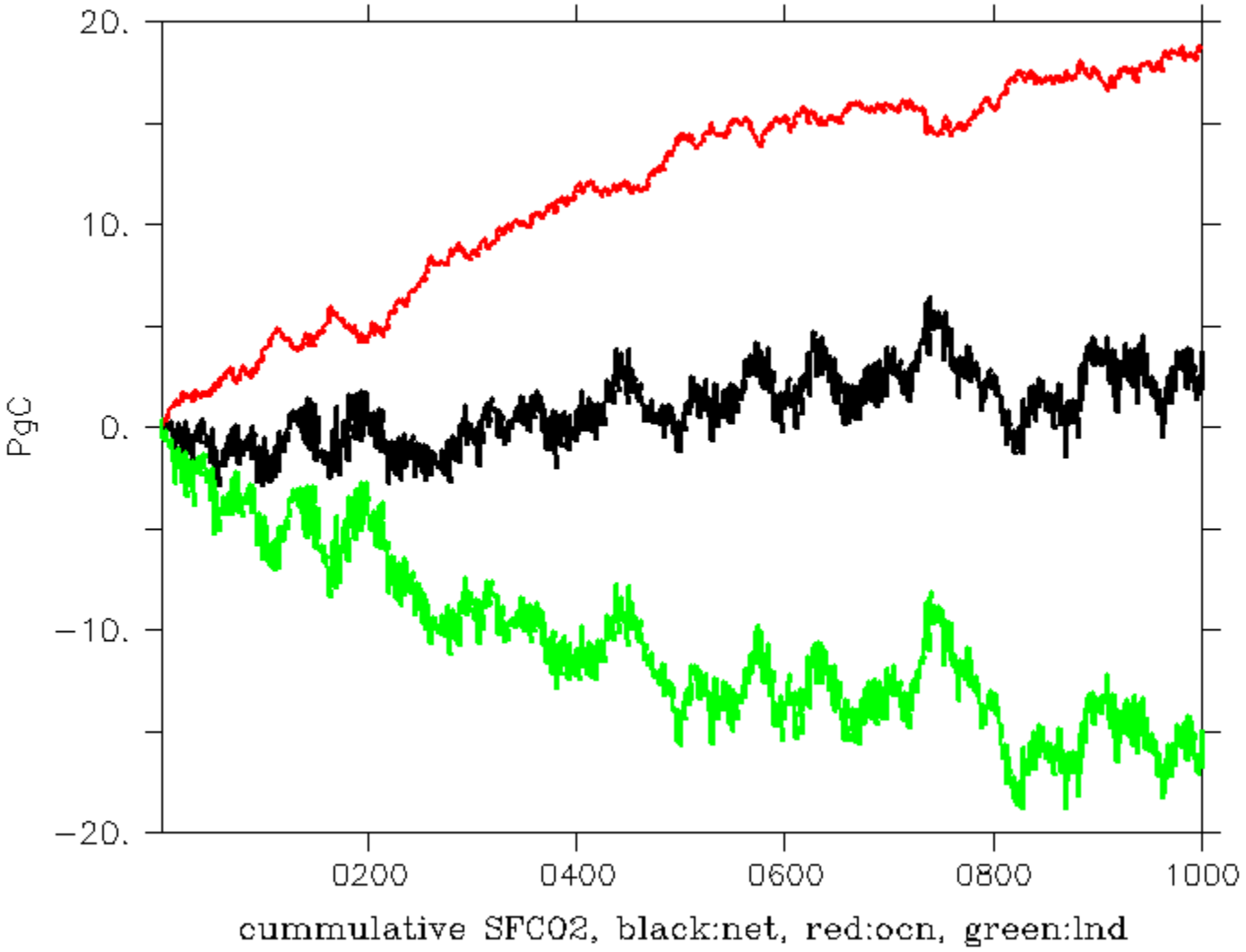
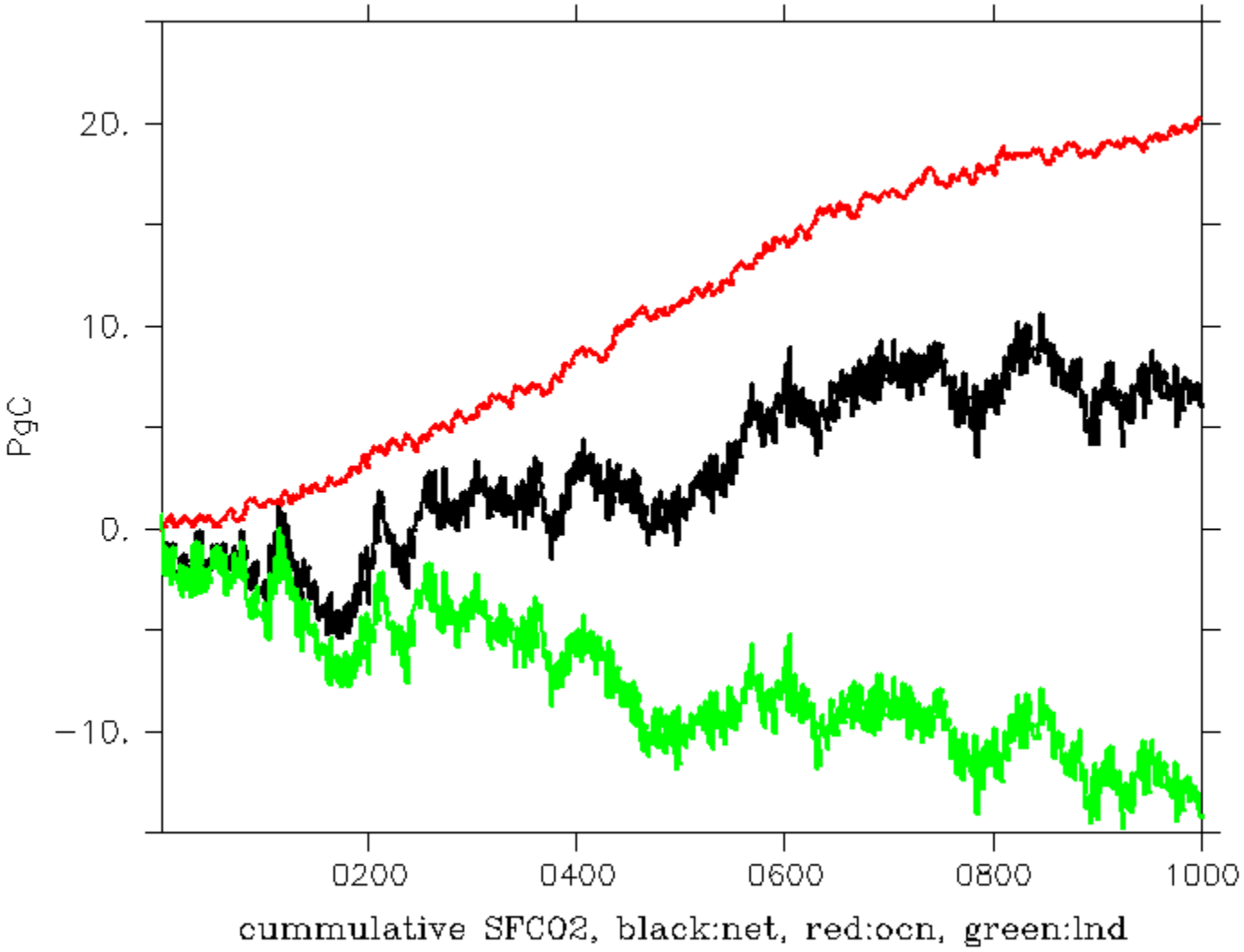


.018 PgC/y

.004 PgC/y

-.013 PgC/y

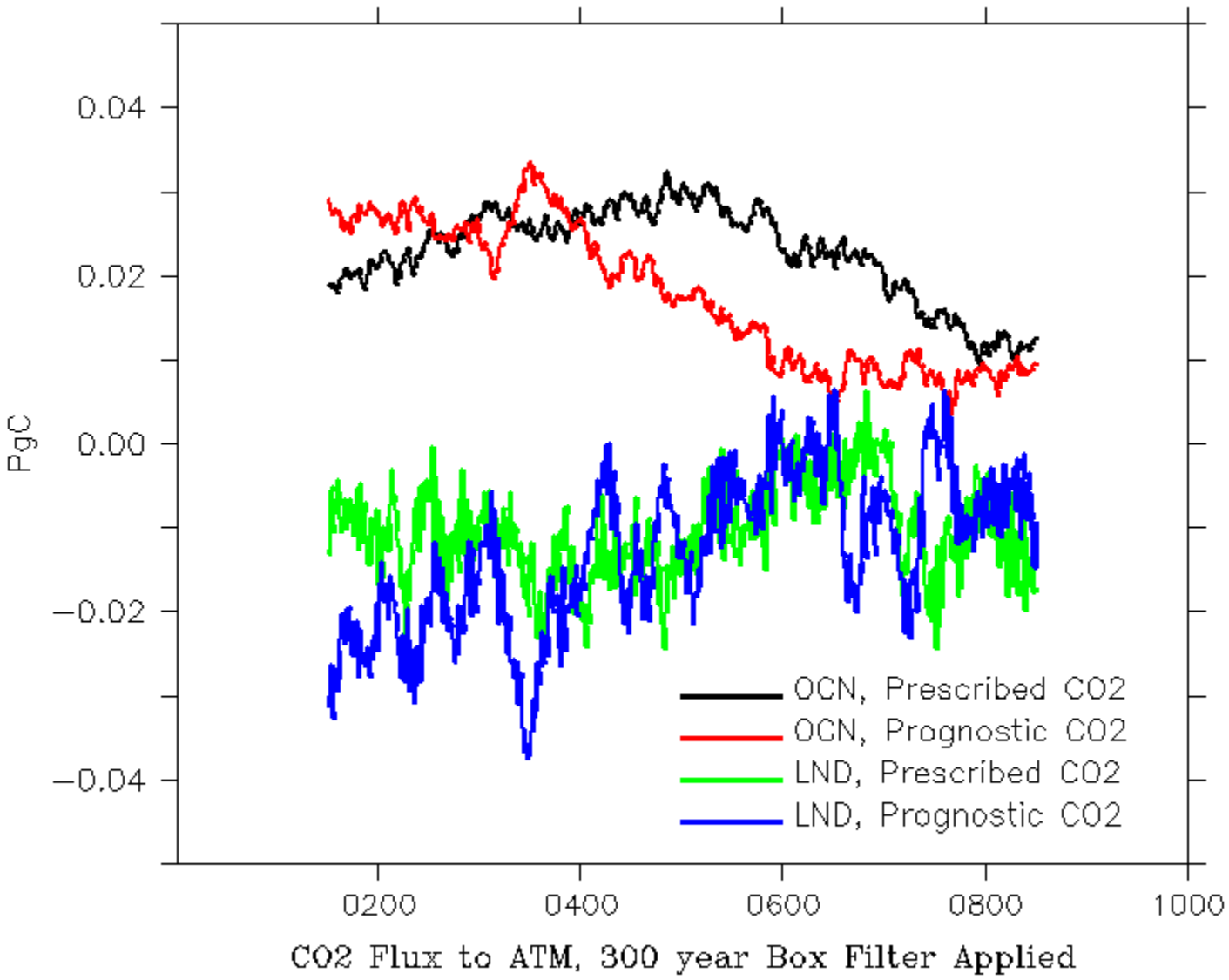
Prescribed CO_2 1850 Control



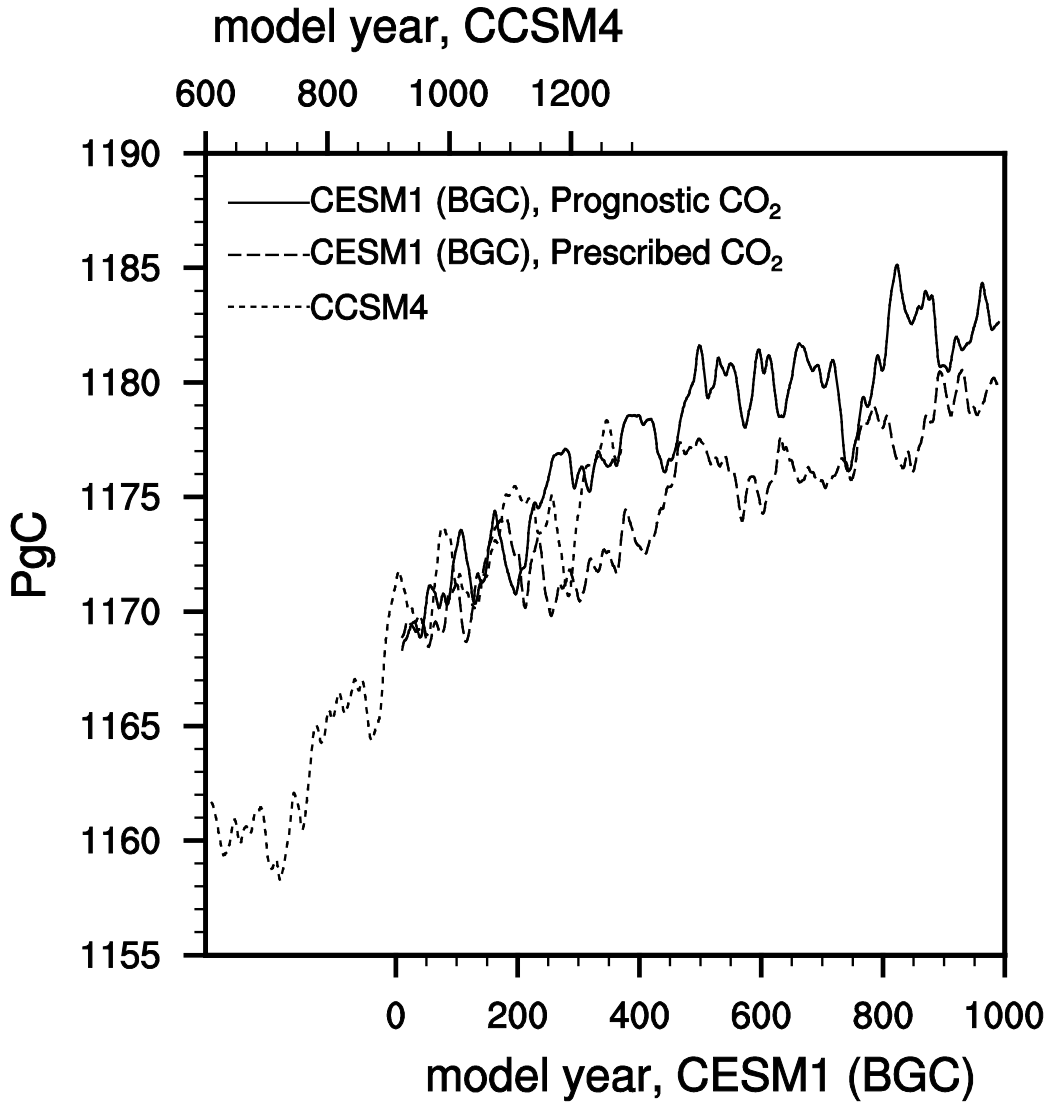
.023 PgC/y

.012 PgC/y

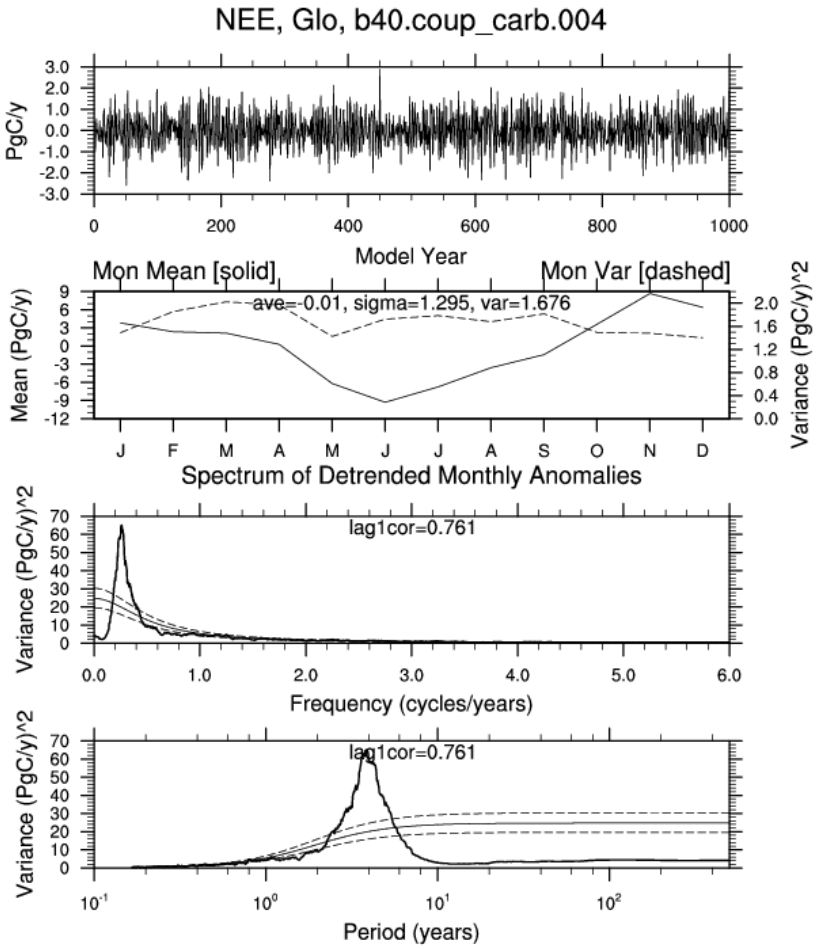
-.011 PgC/y

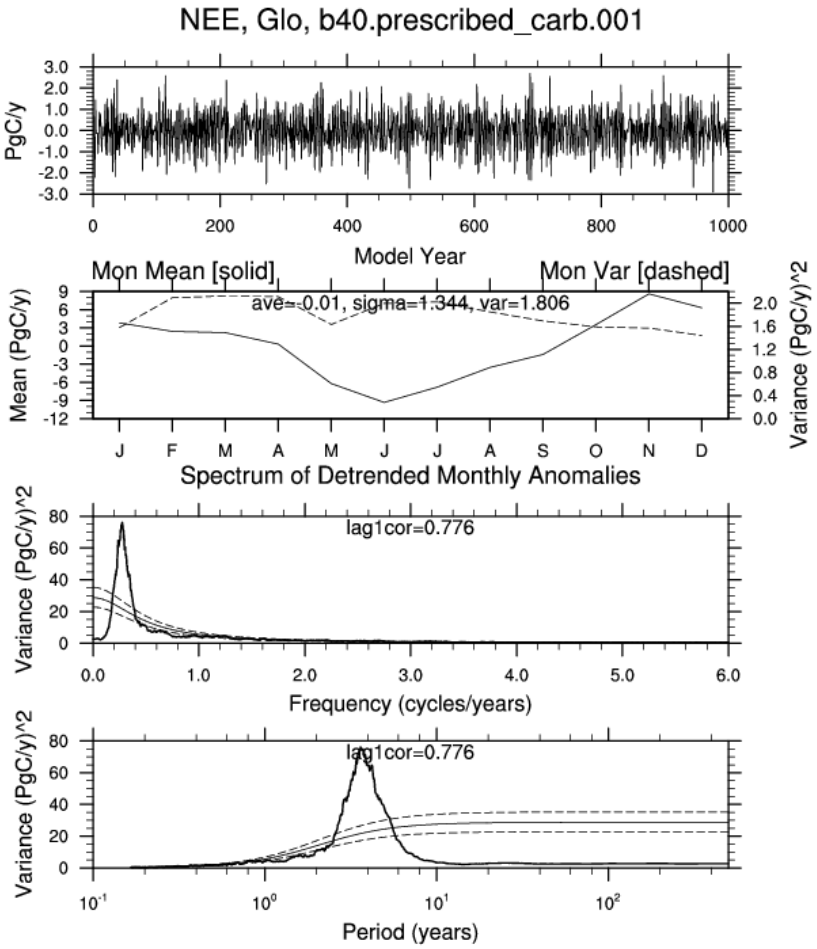

0.04
0.02
0.00
−0.02
−0.04
PgC
0200
0400
0600
0800
1000
OCN, Prescribed CO2
OCN, Prognostic CO2
LND, Prescribed CO2
LND, Prognostic CO2
CO2 Flux to ATM, 300 year Box Filter Applied

Land C Drift Extrapolated from CCSM4

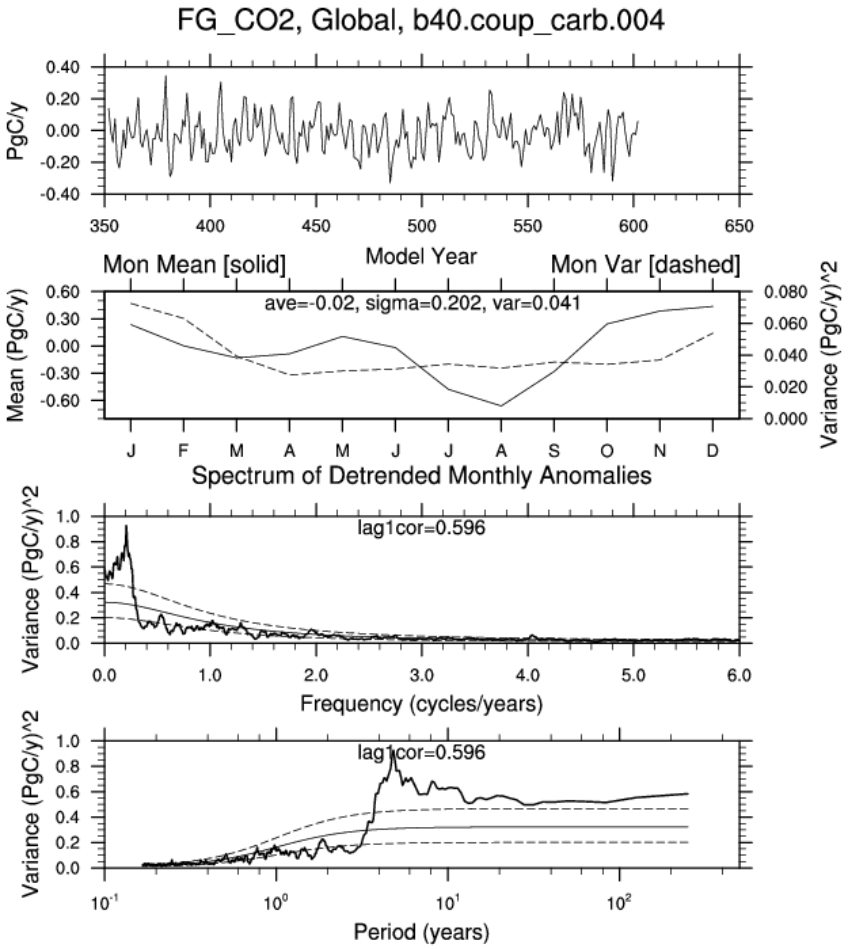


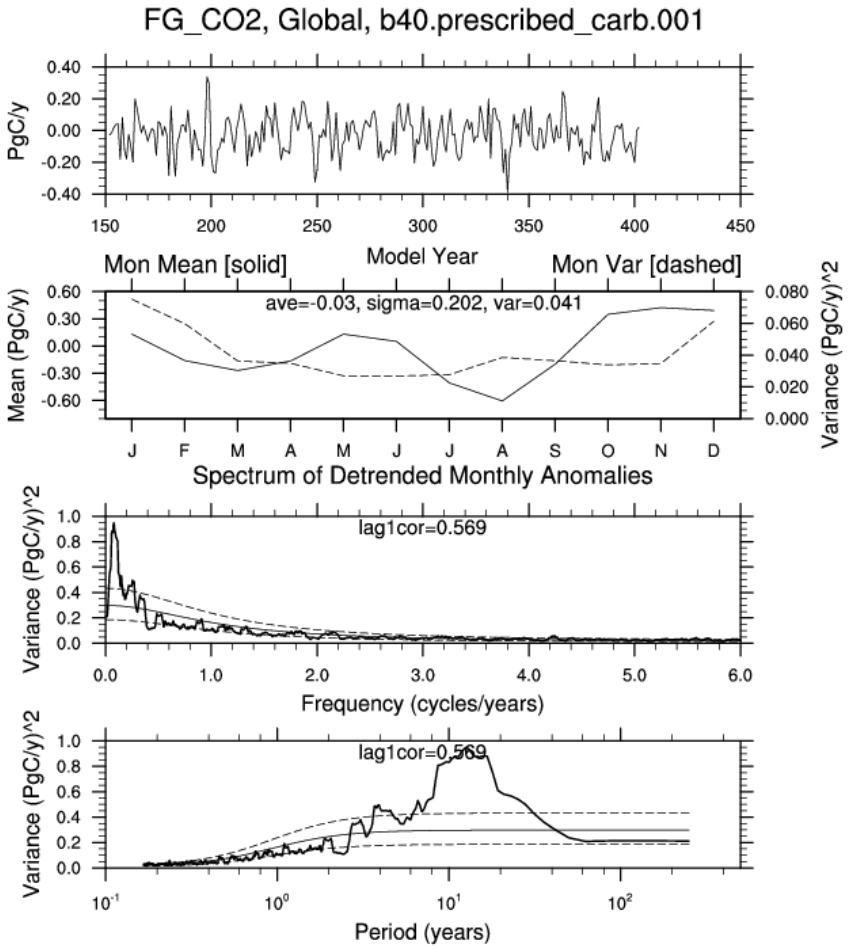
Analysis of Global NEE, 1850 Controls



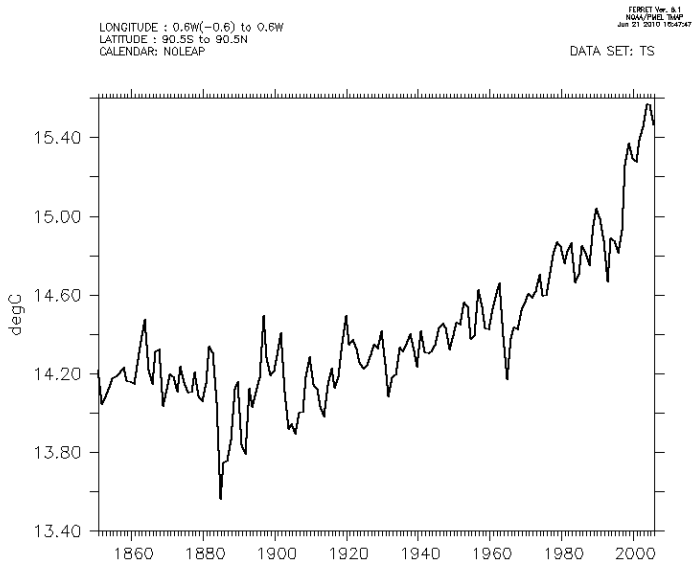


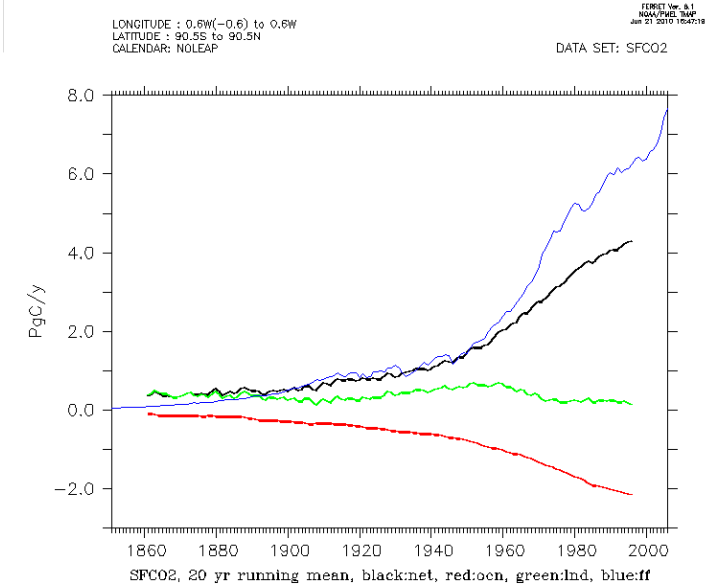
Analysis of Global Air-Sea CO_2 Gas Exchange, 1850 Controls

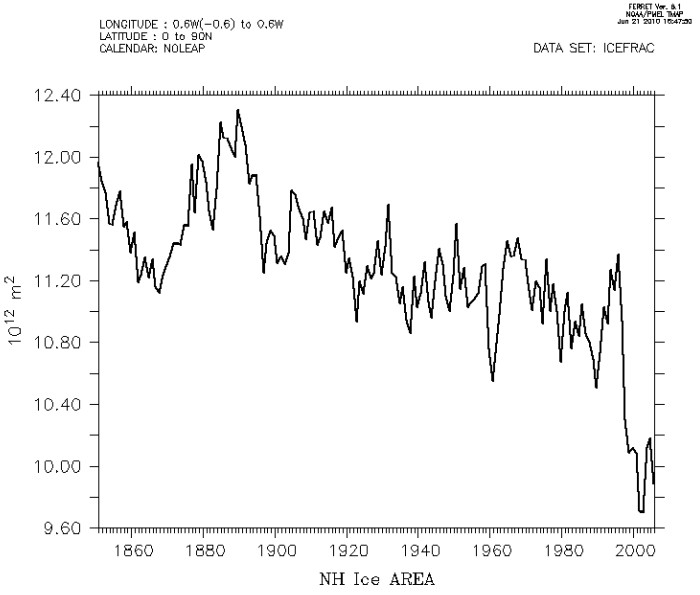


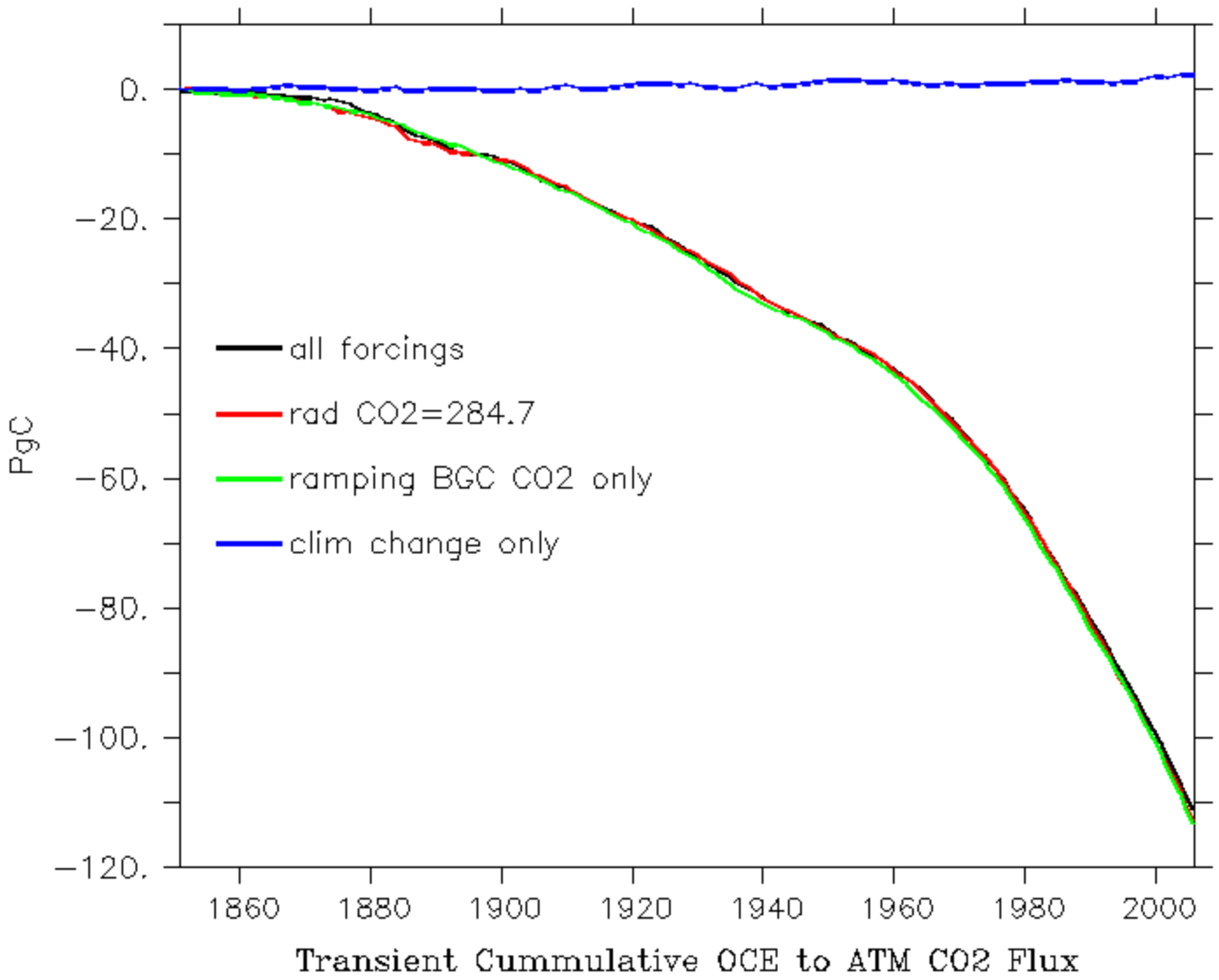


20th Century, Prognostic CO_2

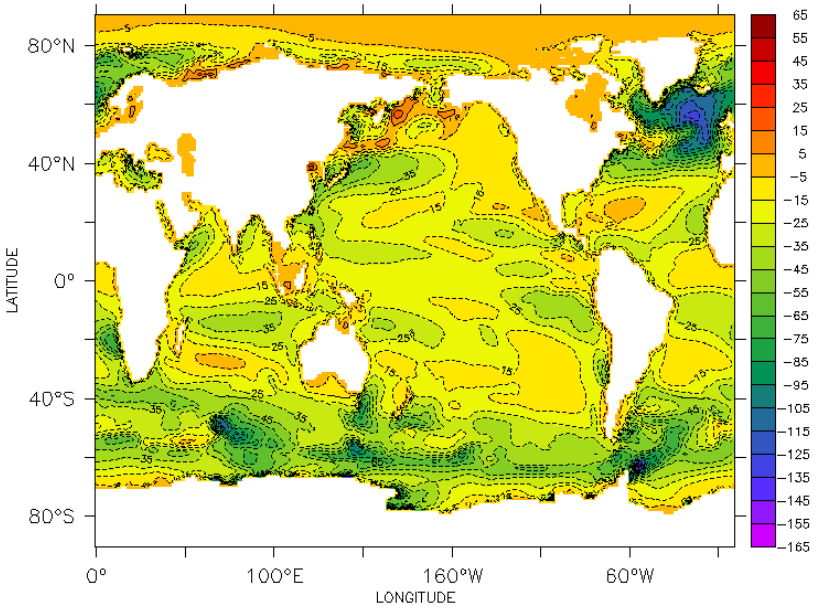






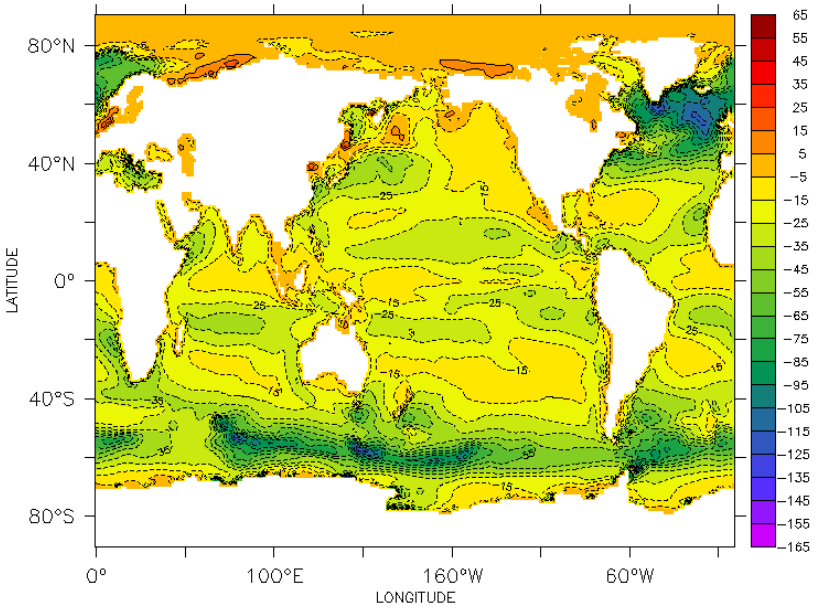

0.
−20.
−40.
−60.
−80.
−100.
−120.
PgC
all forcings
rad CO2=284.7
ramping BGC CO2 only
clim change only
1860
1880
1900
1920
1940
1960
1980
2000
Transient Cummulative OCE to ATM CO2 Flux

TIME : 02-JUL-1850 12:00 to 02-JUL-2006 12:00 NDLEAP



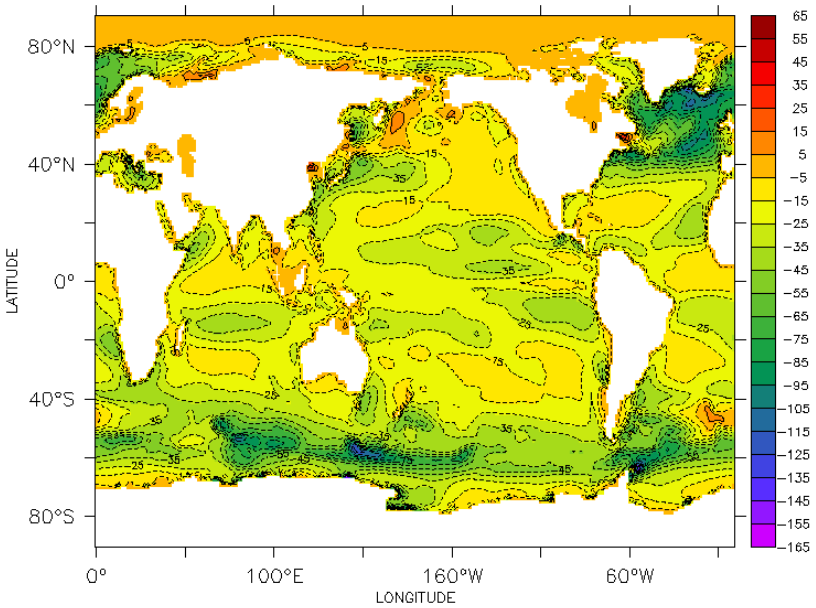
Transient Cummulative OCE to ATM CO2 Flux Anom (mol/m^2), All Forcings

TIME : 02-JUL-1850 12:00 to 02-JUL-2006 12:00 NDLEAP



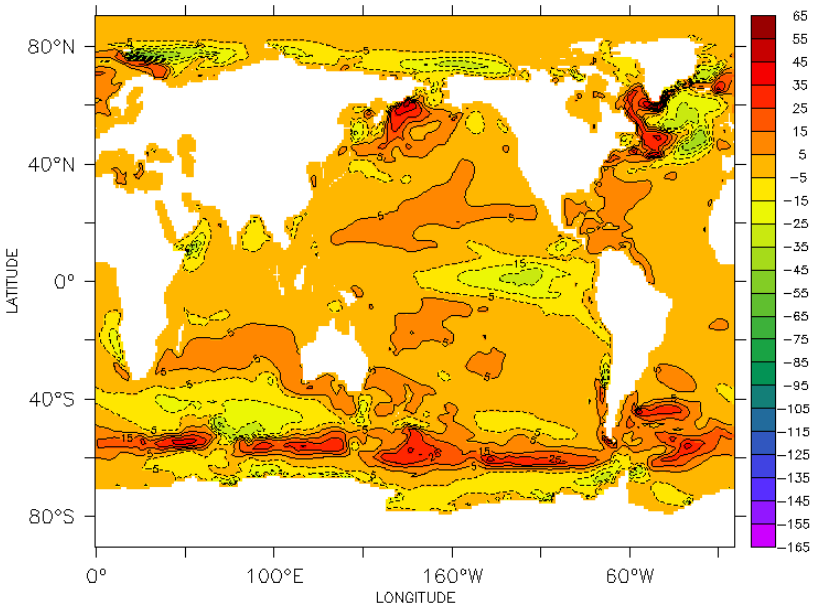
Transient Cummulative OCE to ATM CO2 Flux Anom (mol/m^2), ramping BGC CO2 only

TIME : 02-JUL-1850 12:00 to 02-JUL-2006 12:00 NDLEAP

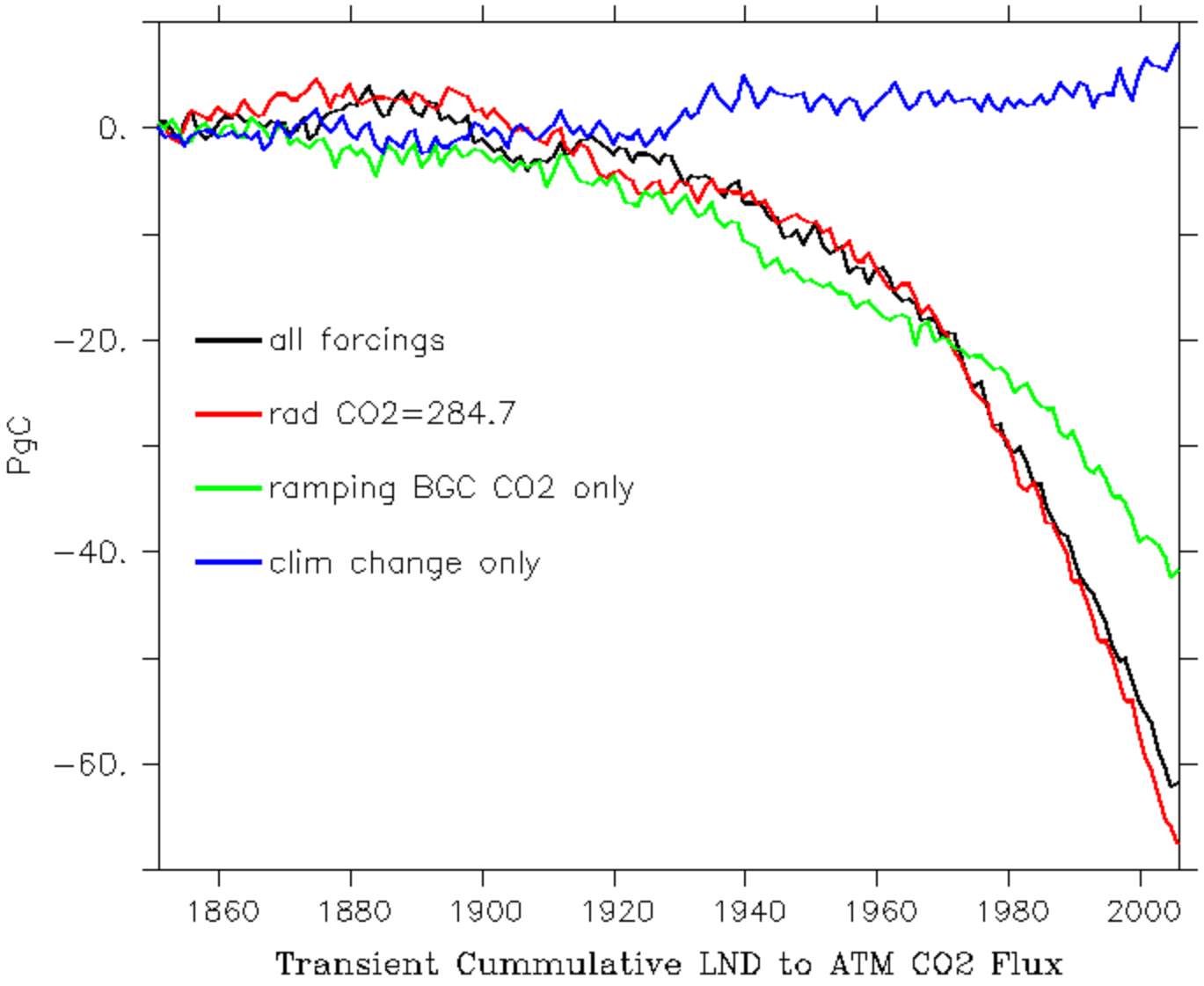


Transient Cummulative OCE to ATM CO2 Flux Anom (mol/m^2), rad CO2=284.7

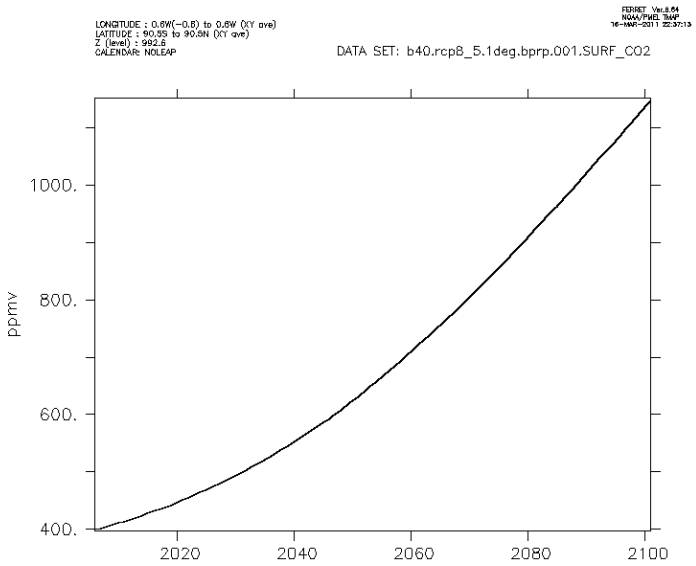
TIME : 02-JUL-1850 12:00 to 02-JUL-2006 12:00 NDLEAP

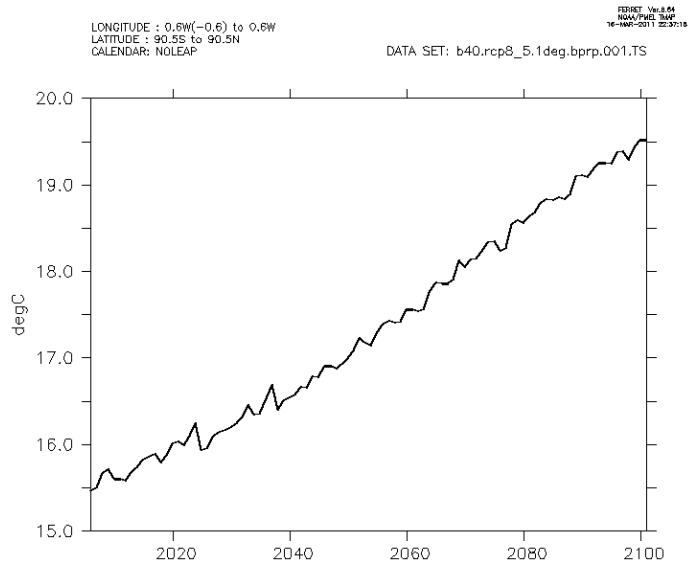


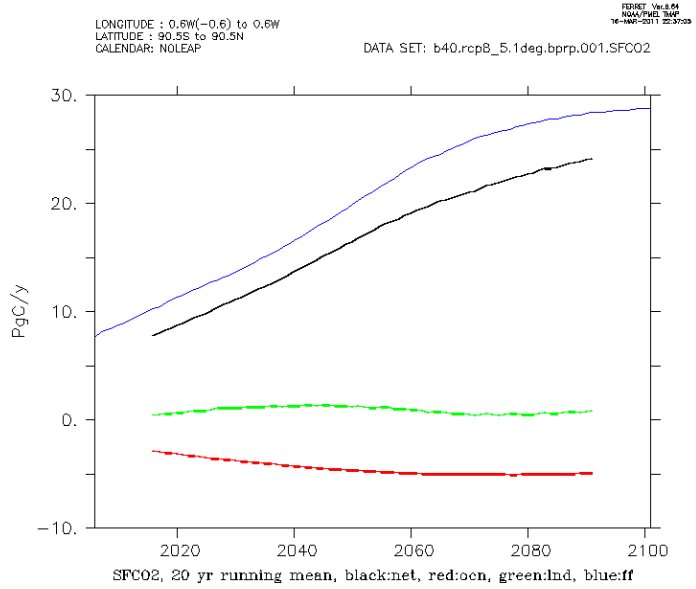
Transient Cummulative OCE to ATM CO2 Flux Anom (mol/m^2), clim change only

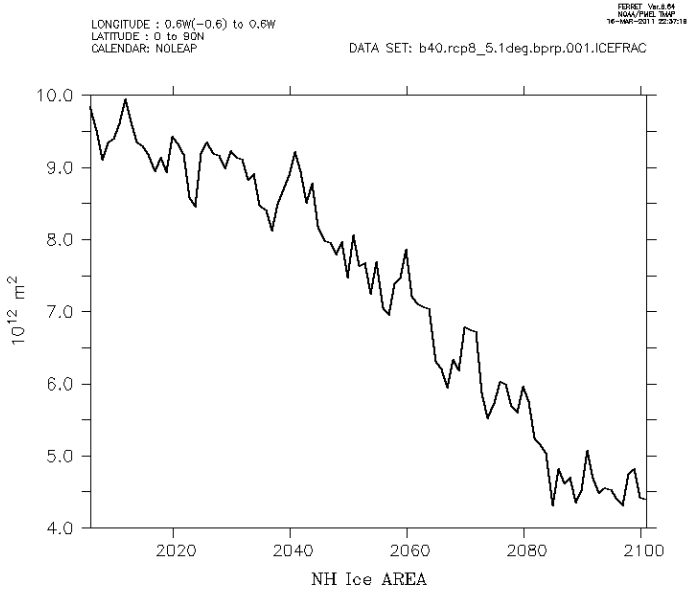

0.
−20.
−40.
−60.
PgC
all forcings
rad CO2=284.7
ramping BGC CO2 only
clim change only
1860
1880
1900
1920
1940
1960
1980
2000
Transient Cummulative LND to ATM CO2 Flux

RCP8.5, Prognostic CO_2

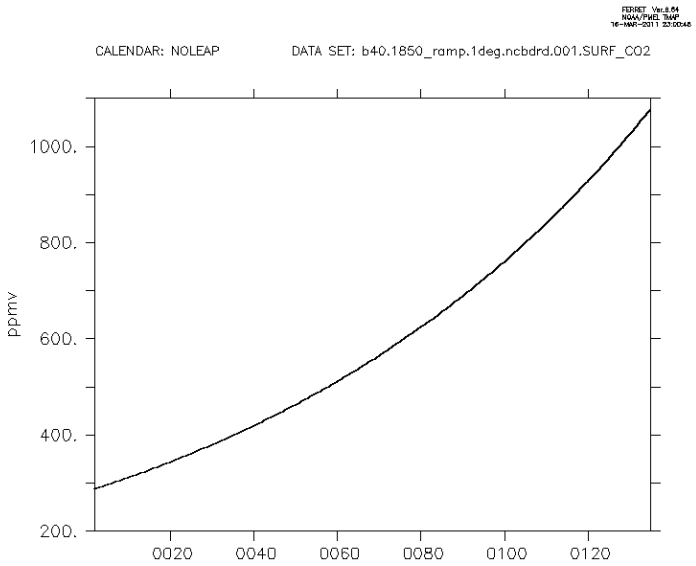


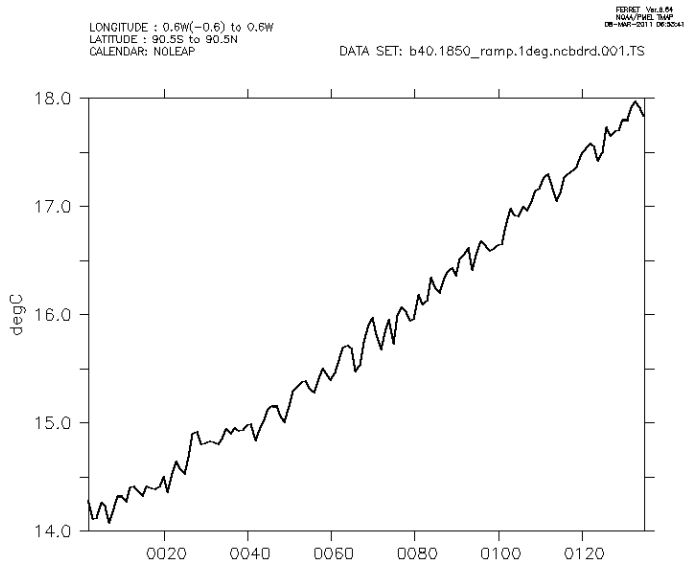


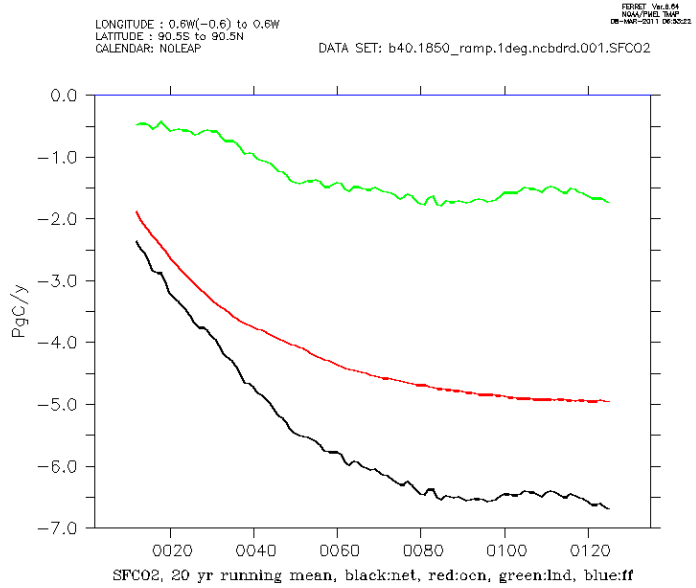


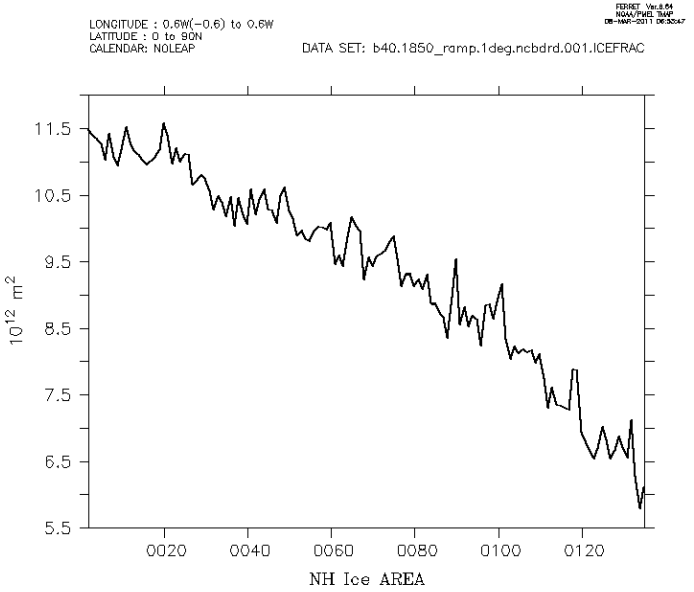


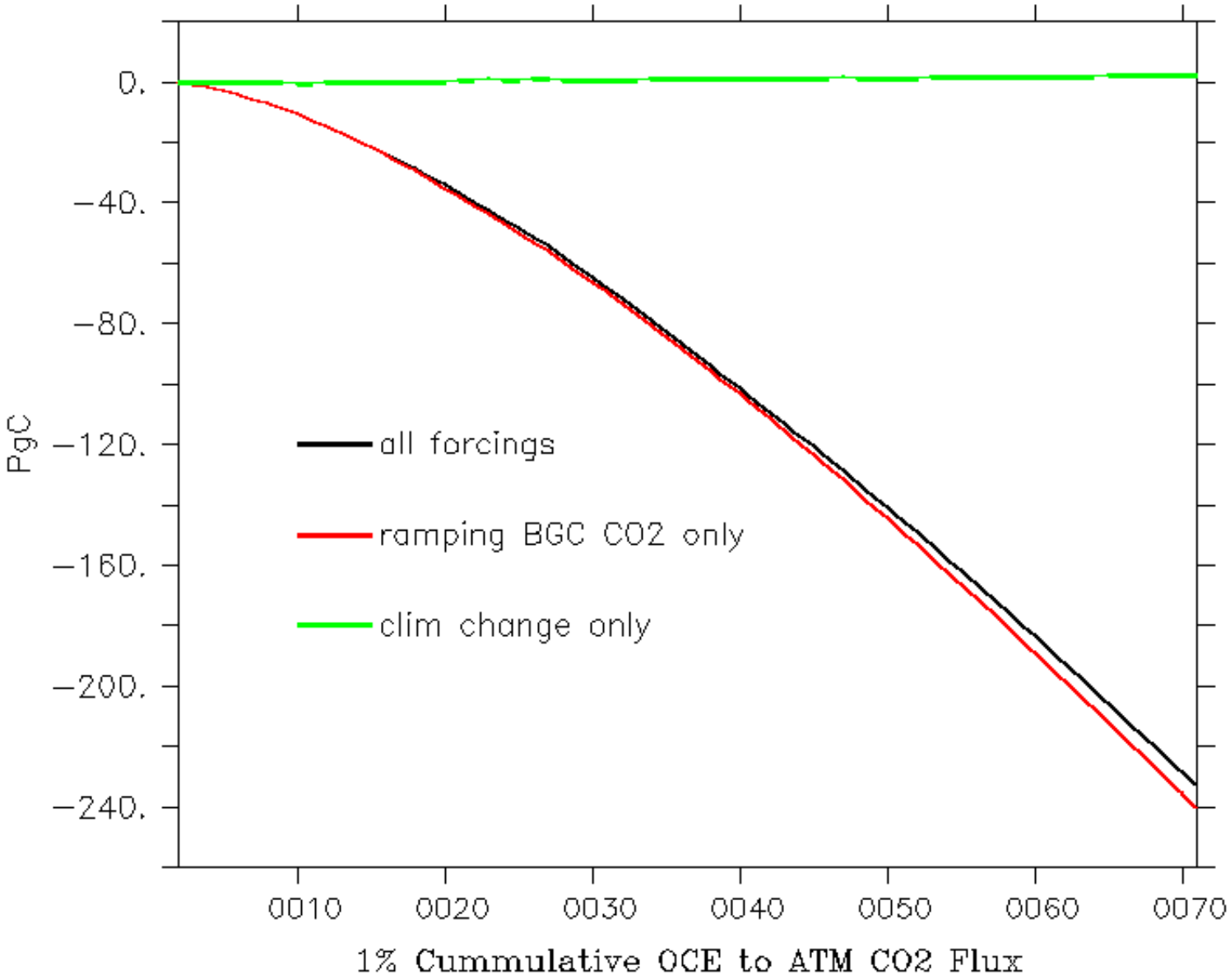
1% CO_2, Prescribed CO_2

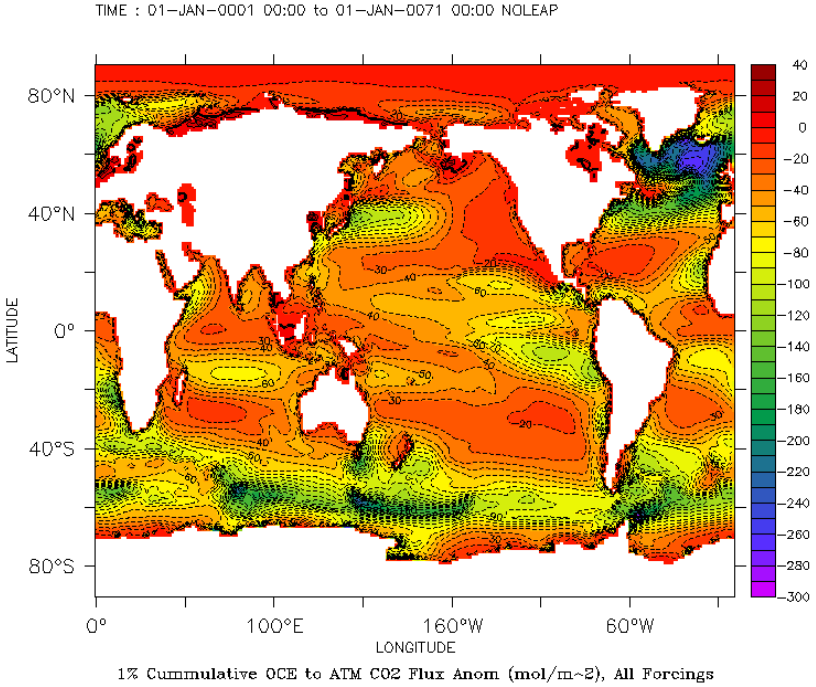




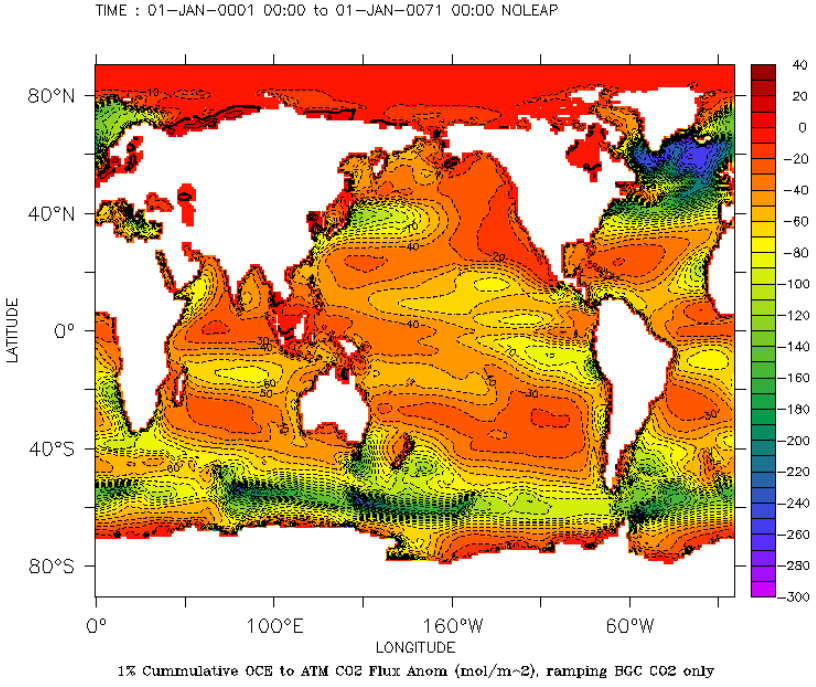




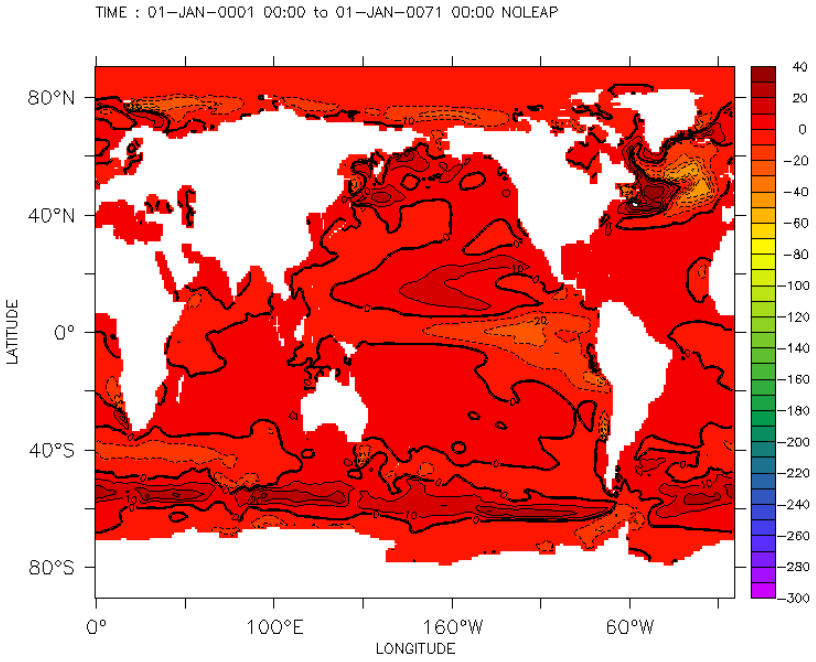

0.
−40.
−80.
−120.
−160.
−200.
−240.
PgC
all forcings
ramping BGC CO2 only
clim change only
0010
0020
0030
0040
0050
0060
0070
1% Cummulative OCE to ATM CO2 Flux



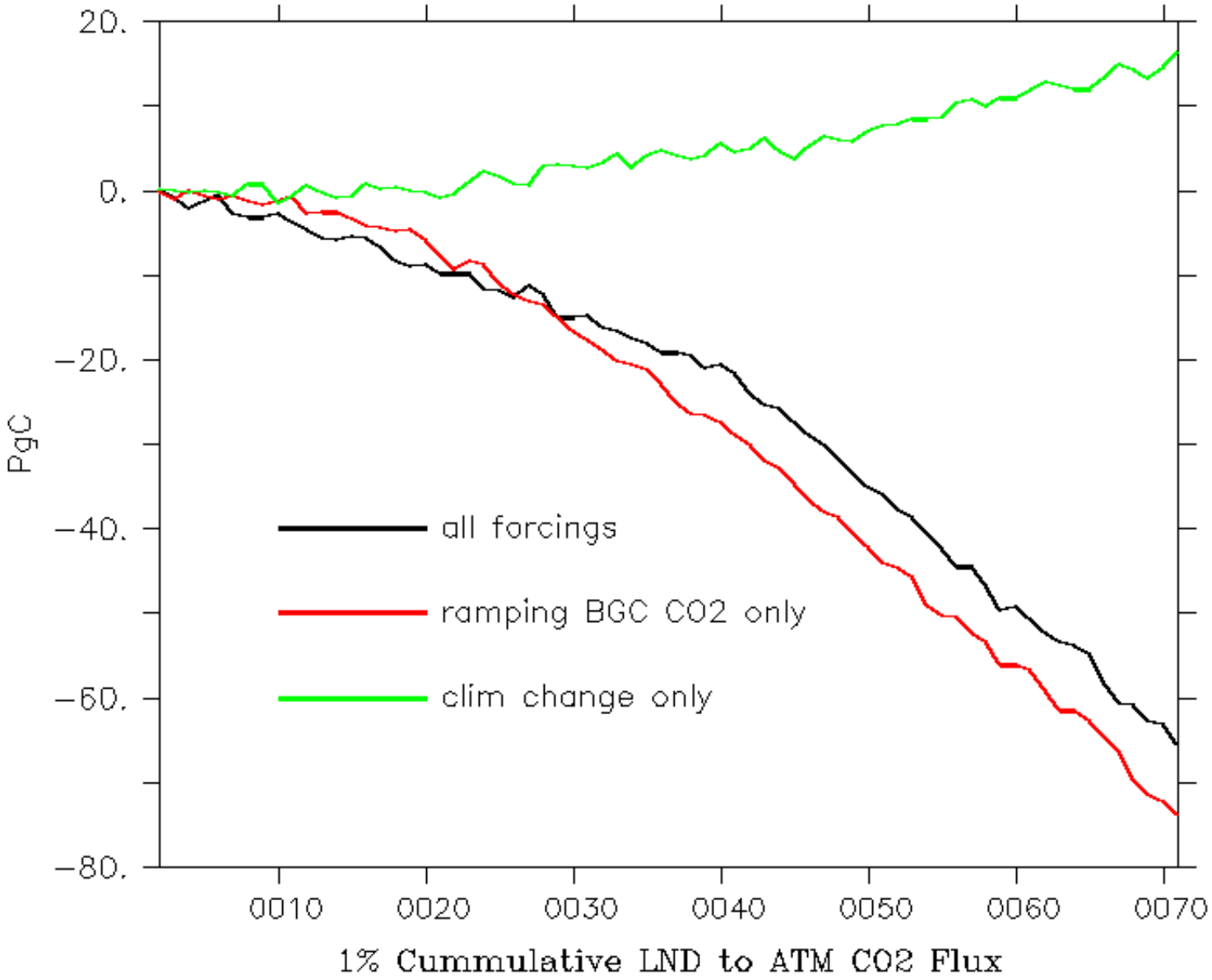
1% Cummulative OCE to ATM CO2 Flux Anom (mol/m^2), All Forcings



1% Cummulative OCE to ATM CO2 Flux Anom (mol/m^2), ramping BGC CO2 only



1% Cummulative OCE to ATM CO2 Flux Anom (mol/m^2), clim change only


20.
0.
−20.
−40.
−60.
−80.
PgC
all forcings
ramping BGC CO2 only
clim change only
0010
0020
0030
0040
0050
0060
0070
1% Cummulative LND to ATM CO2 Flux

Summary

- Variability in Control Runs under analysis
  - Much work to do, particularly wrt metrics
- Feedbacks Examined in 20th Century Runs
  - Similar analysis in RCP4.5 w/ ORNL runs
- Feedbacks Examined in 1% CO_2 Runs
  - Runs still progressing