Coupled Carbon Simulations with CESM-(BGC)

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CMIP5 Long-Term Experiments
Prognostic CO$_2$ 1850 Control
Prognostic CO$_2$ 1850 Control

cumulative SFCO$_2$, black:net, red:ocn, green:ind
Prescribed CO$_2$ 1850 Control

Graph showing cumulative SFCO$_2$ with lines represented by different colors: black for net, red for ocean, and green for land. The graph indicates an increase in CO$_2$ emissions over time, with labels for .023 PgC/y, .012 PgC/y, and -.011 PgC/y.
CO2 Flux to ATM, 300 year Box Filter Applied
Air-Land CO$_2$ Flux, 1850 Controls
Air-Sea CO$_2$ Flux, 1850 Controls

![Graphs showing air-sea CO$_2$ flux](image)
Air-Sea CO₂ Flux, 1850 Controls

CO₂, Global

Mon Mean [solid]

Mean (ppmv)

J F M A M J J A S O N D

SFCO2_OCN, Global

corr vs Nino 3.4

Lag (months)

reg coeff (PgC/yr/K)

Lag (months)
20th Century, Prognostic CO₂
Breakdown of 20\textsuperscript{th} Century CO\textsubscript{2} Fluxes

Prescribed CO\textsubscript{2}
$1\% \text{ CO}_2$, Prescribed $\text{CO}_2$
Impact of Warming on CO$_2$ Fluxes
CAVEAT: Climate in constant climate experiment not so constant.

Greening of CLM warms the surface.

This may need to be taken into account in $\beta$ & $\gamma$ computations.

Magnitude of response probably depends on CAM physics.
Summary & What’s Next

• CMIP5 runs nearly complete
  – Control, 20^{th} C, RCPs, 1\% CO_2 Ramp

• Analysis of Runs is Ongoing
  – Being written up for CESM J Clim Spec Issue

• Public Release of Model Output

• More Specialized Papers

• Next Model Release in Fall-Winter 2012