

North American Carbon Program

Status update and invitation to the Ocean Color Research Team


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Galen McKinley

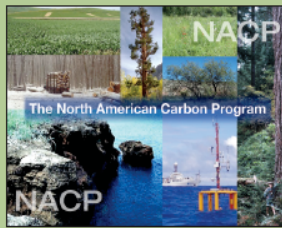


What is the NACP?

Alphabet soup!



- Carbon Cycle Science Plan- Sarmiento & Wofsy, 1999
- Climate Change Science Program (née U.S. GCRP)
- Carbon Cycle Interagency Working Group (CCIWG)

- NACP Science Implementation Strategy- Denning et al 2005
- NACP Office & Coordinator- since 2006 at NASA GSFC Carbon Cycle & Ecosystems Office
- NACP is a kissing cousin to OCCC / OCB
- OCB and NACP overlap in the coastal oceans of North America

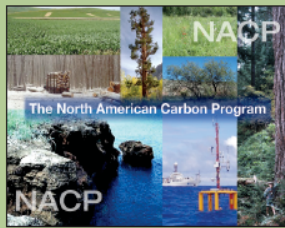


NACP Goals



Implementation Strategy, 2005

- Develop quantitative scientific knowledge, robust observations, and models to determine the emissions and uptake of CO₂, CH₄, and CO, changes in carbon stocks, and the factors regulating these processes for North America and adjacent ocean basins.
- Develop the scientific basis to implement full carbon accounting on regional and continental scales. This is the knowledge base needed to design monitoring programs for natural and managed CO₂ sinks and emissions of CH₄.
- Support long-term quantitative measurements of fluxes, sources, and sinks of atmospheric CO₂ and CH₄, and develop forecasts for future trends.



NACP Science Questions

Implementation
Strategy, 2005

- **Diagnosis:** What is the carbon balance of North America and adjacent oceans? What are the geographic patterns of fluxes of CO₂, CH₄, and CO? How is the balance changing over time?
- **Process/Attribution:** What processes control the sources and sinks of CO₂, CH₄, and CO, and how do the controls change with time?
- **Prediction:** Are there potential surprises where sources increase or sinks disappear?
- **Decision Support:** How can we enhance and manage long-lived carbon sinks, and provide resources to support decision makers?



5-year deliverables from NACP Plan

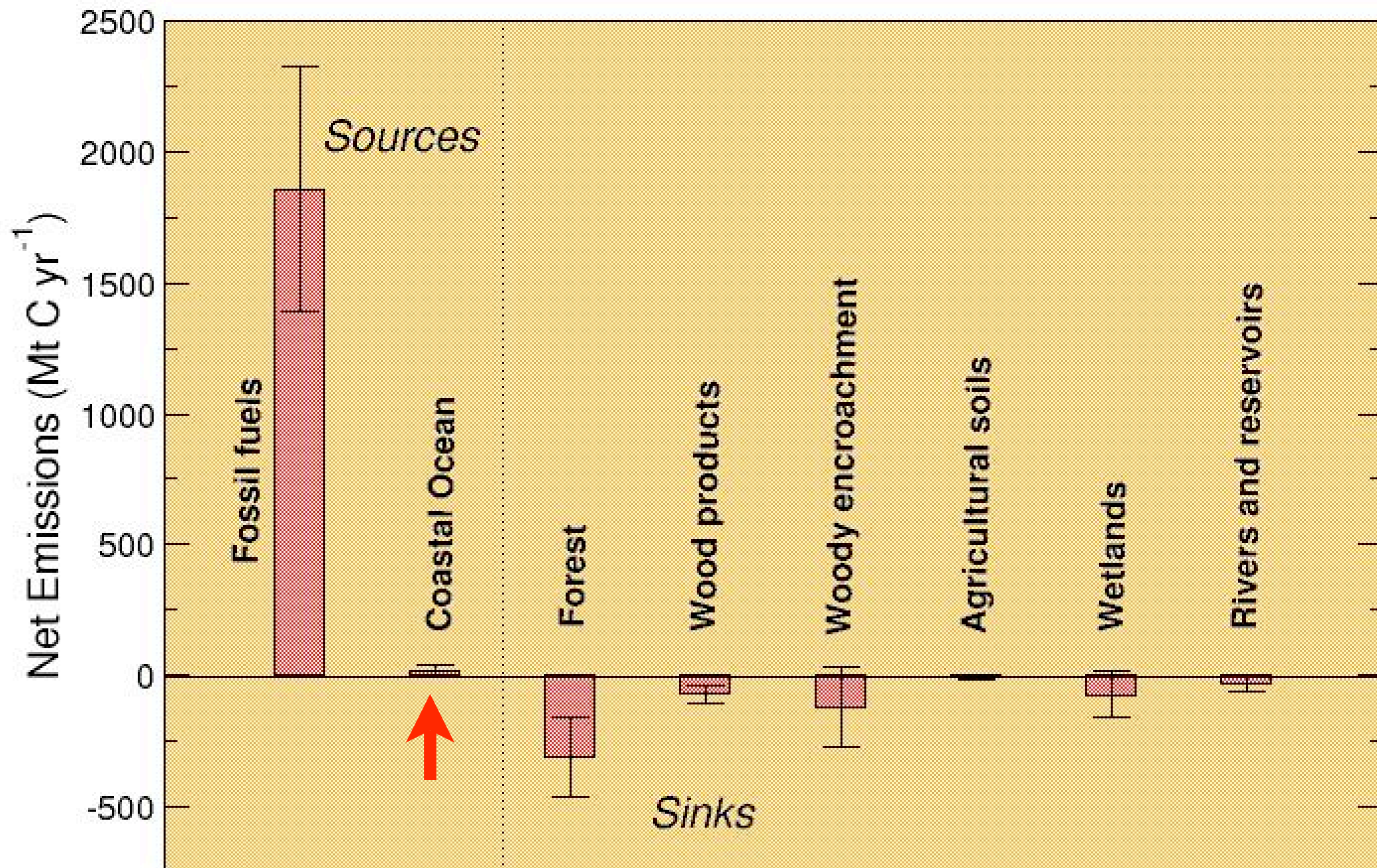
Implementation
Strategy, 2005

- Measurements of sources and sinks for CO₂, CH₄, and CO for North America and adjacent ocean basins at scales from continental to local, with seasonal resolution.
- Attribution of sources and sinks to contributing mechanisms.
- Documentation of North America's contribution to the Northern Hemisphere carbon budget.
- Optimized sampling networks (both ground-based and remote) to determine past, current, and future sources and sinks.
- Data assimilation models to compute carbon balances.
- First State of the Carbon Cycle Report (SOCCR) for North America.

State of the Carbon Cycle Report



- SOCCR CCSP SAP 2.2 : North America is currently a net source of CO₂ (1264 Mt C yr⁻¹), with 30% of fossil fuel emissions (1856 464 Mt C yr⁻¹ in 2003) offset by a net terrestrial sink of 592 296 Mt C yr⁻¹.
- Coastal ocean estimate a result of adding large numbers of opposite sign and high uncertainties



2nd All Investigators Meeting

San Diego, February 2009

Programmatic Progress

courtesy of Ken Davis



- We are nearing “success” at regional and continental diagnoses of the CO₂ budget (e.g. MCI synthesis, CarbonTracker, VULCAN).
- Essential elements of our continental observation and analysis system are endangered (flux towers, tall towers, CO₂ sampling, satellites).
- We need to engage whole-heartedly in research that is integrated with decision support. This will require:
 - Increased emphasis on prediction, model-data syntheses and model comparisons.
 - Increased emphasis on uncertainty assessment, network design, and data/metadata management.
 - Increased focus on human emissions of carbon and study of the mechanisms governing these emissions.
- We need to articulate which decisions we are supporting.

2nd All Investigators Meeting

Significant improvements yet varying maturity of essential elements
courtesy of Ken Davis



- [CO2] observational system
- Non-CO2 GHG observational network
- Flux tower network
- Forest and agricultural inventory data
- Fossil fuel inventory data
- Remote sensing of the land surface (MODIS, Landsat)
- Manipulative experiments
- **Coastal ocean observations and lake/river carbon observations**
- Analytic systems for 'operational' diagnosis and attribution
- Human, ecosystem and coastal ocean prognostic models
- Decision support systems
- Data management and model-data synthesis systems

NACP Interim Syntheses



- Site Interim Synthesis –Synthesis of modeled and measured carbon, water, and energy fluxes across North America; regional to continental upscaling of AmeriFlux data
- Mid Continental Intensive (MCI) Interim Synthesis –Synthesis of Tower CO2 Flux observations, inventory-based CO2 budget, atmospheric inversions, through 2005.
- Non-CO2 Greenhouse Gases Interim Synthesis
- Regional Interim Synthesis –NACP spatial model-data comparisons, inverse modeling, West Coast analyses
- NEW! Coastal Interim Synthesis –carbon budgets for the East Coast, Gulf of Mexico, Pacific Coast, Arctic Ocean, and Great Lakes
- EVEN NEWER but moving fast! Continental-scale Disturbance Synthesis

2nd All Investigators Meeting

Interim Synthesis Progress



- Site, MCI 2005, Non-CO2 GHG, and Regional Interim Syntheses – have all had one or more independent workshops; identified data sets and models to share; prepared websites or wiki spaces to host common data products and model outputs; presented initial synthesis results at NACP meeting (reports available on meeting website); and have made plans to write and submit papers for publication within the next 6-9 months.
- The MCI synthesis has launched a new activity to analyze and synthesize data through 2007.
- The site and regional synthesis efforts are considering how to migrate new knowledge gained at the site level up to regional and global scales: a “synthesis of syntheses”. Goal was also identified to develop new collaborations among measurement/experimentation/decision support groups (e.g. soil carbon networks, forest inventories, climate change experiments).


2nd All Investigators Meeting

Coastal Oceans Progress



- Presentations downloadable at http://www.nacarbon.org/meeting_2009/
- Carbon Measurements along the North American Continental Margins (Christopher L. Sabine et al)
- Toward understanding of carbon fluxes in the coastal oceans: synthesis activities for the U.S. East Coast and the Gulf of Mexico (Steven Lohrenz et al)
- Recent (and Future) Advances in Carbon Cycle Synthesis along the North American Pacific Coast (Simone Alin et al)
- Diagnosing carbon dynamics in diverse ocean environments using in-situ optical and remotely- sensed data (Doug Vandemark et al)
- A New Method for Evaluating the Ocean Acidification of Coastal Waters Using Chemical and Hydrographic Data (Richard Alan Feely et al)
- Breakout sessions to plan Coastal Interim Synthesis

Coastal Ocean Interim Synthesis



A CORE ELEMENT OF THE U.S. CLIMATE CHANGE SCIENCE PROGRAM

North American Carbon Program

CONTINENTAL CARBON BUDGETS, DYNAMICS, PROCESSES, AND MANAGEMENT

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NACP Synthesis Activities

NACP Investigators have organized several synthesis activities to evaluate and intercompare models and observations at local and regional scales. These activities are open to all investigators who have data or model results for North America.

Click on the Email List links below to subscribe to the email lists and join these syntheses activities being conducted:

Coastal Synthesis: [Learn More...](#)

- **East Coast (including Gulf of Maine) Synthesis** [Email List](#) (join, view members and message archive)
Coordinator: [Wei-jun Cai](#)
- **West Coast (including Gulf of Alaska) Synthesis** [Email List](#) (join, view members and message archive)
Coordinator: [Simone Alin](#)
- **Gulf of Mexico Synthesis** [Email List](#) (join, view members and message archive)
Coordinator: [Paula Coble](#)
- **Arctic (including Bering, Chukchi and Beaufort Seas) Synthesis** [Email List](#) (join, view members and message archive)
Coordinator: [Jeremy Mathis](#)
- **Great Lakes Synthesis** [Email List](#) (join, view members and message archive)
Coordinator: [Galen McKinley](#)

Coastal Ocean Interim Synthesis

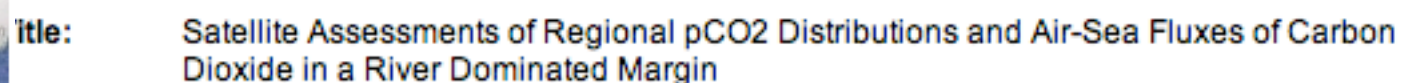


- Coastal carbon budgets - literature-based carbon budgets, to identify what we know and what the gaps are.
- Compile existing carbon budget information from coastal carbon models.
- Plan to use the NACP website to identify and locate necessary and available data products (see next slide).
- An unsolicited mini-proposal has been drafted to present to the CCIWG.
- If you would like to get involved, join the discussion at <<http://coastalcarbon.pbwiki.com/Coastal-Synthesis-Email-Communication>>



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Leader: [Steven Lohrenz](#), University of Southern Mississippi

Questions: