Global Carbon Project
Overview of Activity
September 2006 – August 2007
Theme 1: Patterns and Variability
New Analysis of FF CO₂ Emissions & C Intensity

Global and regional drivers of accelerating CO₂ emissions.
PNAS, doi:10.1073/pnas.0700609104
Annual Update of the Global Carbon Budget

2006 budget finished
PNAS paper in review
Web materials
Model-Data Fusion Activity

• **OptIC: Optimization InterComparison.** Comparison of parameter estimation methods in terrestrial biogeochemical models


OptIC project: An intercomparison of optimization techniques for parameter estimation in terrestrial biogeochemical models

Cathy M. Trudinger,1 Michael R. Raupach,2 Peter J. Rayner,3 Jens Kattge,4 Qing Liu,5 Bernard Pak,1 Markus Reichstein,4 Luigi Renzullo,6 Andrew D. Richardson,7 Stephen H. Roxburgh,5,9 Julie Styles,10,11 Ying Ping Wang,1 Peter Briggs,2 Damian Barrett,6 and Sonja Nikolova2,12

Received 10 November 2006; revised 1 March 2007; accepted 20 March 2007; published 1 June 2007.

• **CarbonFusion**

**REFLEX : REgional FLux Estimation eXperiment**

A model-data fusion inter-comparison project aimed at assessing the capability of extrapolating observations of CO₂ fluxes from intensively studied sites (e.g. flux towers) to other locations (i.e. the surrounding region).
Regional Project on Carbon and Water Issues in SE Asia

1. "Regional project on carbon and water issues in SE Asia" has funded 7 projects with PIs from Vietnam, Thailand, Singapore, Malaysia, Indonesia and the Philippines in 2006.

2. "Advanced training workshop on carbon and water issues in SE Asia" An international team of 18 lecturers from 8 countries provided training to 33 junior faculty and senior technician/staff from 13 countries in Southeast Asia (including Australia) and South Asia. The Workshop was organized by the Southeast Asia Regional Committee for START (SARCS) and sponsored by the GCP.
Theme 2: Processes and Feedbacks
Vulnerability of the Carbon Cycle in the 21st Century

Hot Spots of the Carbon-Climate-Human System

Land
Permafrost
HL Peatlands
T Peatlands
Veg.-Fire/LUC

Oceans
CH$_4$ Hydrates
Biological Pump
Solubility Pump

GCP 2005
Vulnerability of Frozen Carbon: Synthesis

Synthesis Papers
To be completed by the end of 2007

1. The vulnerability of permafrost carbon to climate change: conceptual Framework_Ted Schuur et al.

2. Soil organic carbon stocks in the northern circumpolar permafrost region_Charles Tornacai et al.

3. Potential frozen ground changes_Annette Rinke et al.

4. Vulnerability of permafrost carbon: overall synthesis_Chris Field et al.
Vulnerability of Carbon in Peatlands

- Synthesis of state of knowledge on the “Vulnerability of carbon in tropical peatlands”. Special feature in Ecosystems_Canadell et al. (in ECOSYSTEMS). To be completed October 2007

- New APN grant to support science-policy interface on “Climate and tropical peatlands” with focus on biofuel from palm oil in Southeast Asia_Parish-Canadell (2007-2008)

- Synthesis paper on the role of high latitude peatlands in the global carbon cycle_Juul Limpens et al (for Biogeosciences). To be completed October 2007

- Riverine carbon in West Kalimantan (Chen’s Program). Ongoing.
# Vulnerability of Ocean Sinks and Sources

**Trend in sea-air pCO₂ (μatm per decade)**

<table>
<thead>
<tr>
<th>Process</th>
<th>Link to climate index</th>
<th>Size of pool at risk</th>
<th>Level of understanding</th>
<th>Longevity</th>
</tr>
</thead>
<tbody>
<tr>
<td>observed trend (confidence)</td>
<td>link to climate index</td>
<td>size of pool at risk</td>
<td>level of understanding</td>
<td>longevity</td>
</tr>
<tr>
<td>process</td>
<td>model performance</td>
<td>potential abrupt change</td>
<td>level of understanding</td>
<td></td>
</tr>
<tr>
<td>North Pacific:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0 or - (medium)</td>
<td>ENSO and PDO</td>
<td>?</td>
<td>?</td>
<td></td>
</tr>
<tr>
<td>Circulation and biology</td>
<td>good for IAV, unassessed for trend</td>
<td>unkn known</td>
<td>medium</td>
<td></td>
</tr>
<tr>
<td>Arctic:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>not enough observations</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AO</td>
<td>?</td>
<td>?</td>
<td>?</td>
<td></td>
</tr>
<tr>
<td>Water fluxes and circulation</td>
<td>yes</td>
<td>poor</td>
<td></td>
<td></td>
</tr>
<tr>
<td>North Atlantic:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0 or + (medium)</td>
<td>NAO</td>
<td>?</td>
<td>?</td>
<td></td>
</tr>
<tr>
<td>Circulation and T</td>
<td>medium to poor*</td>
<td>link to MOC</td>
<td>medium</td>
<td></td>
</tr>
</tbody>
</table>

**Mode water formation regions (by basins?):**

<table>
<thead>
<tr>
<th>Equatorial Pacific</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>low O₂, high DIC</td>
<td>NAO-PDO-SAM</td>
<td>200-800 m</td>
<td>decades to centuries</td>
</tr>
<tr>
<td>Circulation, surface buoyancy fluxes and winds</td>
<td>medium to poor</td>
<td>yes</td>
<td>medium</td>
</tr>
<tr>
<td>Integrated coastal ocean</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0 to + in west, - in east. NET is -</td>
<td>ENSO and PDO</td>
<td>?</td>
<td>?</td>
</tr>
<tr>
<td>Upwelling of DIC</td>
<td>good</td>
<td>link to SOI</td>
<td>good</td>
</tr>
<tr>
<td>Not enough observations and C input, upwelling (winds)</td>
<td>local</td>
<td>?</td>
<td>?</td>
</tr>
<tr>
<td>Nutrient and C input, upwelling (winds)</td>
<td>very poor</td>
<td>unknown</td>
<td>poor</td>
</tr>
</tbody>
</table>

**Southern Ocean:**

- Weakening of 0.1 PgC/yr decade at least since 1981 (medium)
- SAM and ENSO
- Deep ocean
- Feedback on decadal time-scale affects the long-term equilibration of atm CO₂

**Caveat:**
- *Based on what comparison?
- *Missing regions?

**Arctic:****

**North Atlantic:**

**Integrated coastal ocean:**

**Potential abrupt changes:**
- MOC and deep water formation, arctic ice melt and land ice, SO winds, mode waters buoyancy, biological processes (particularly at high lat acidification, T-NEP).
- N changes in coastal ocean

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**Lead by Le Quere**
Vulnerabilities: Synthesis and Integration

• Raupach MR, Canadell JG (2006)

**Observing a vulnerable carbon cycle.**


**Saturation of the terrestrial carbon sink.**
Theme 3: Carbon Management
List of activities after Mexico SSC Meeting:

- **Thematic workshops**
  - Institutional dimensions (with IHDP) on 5th December 2006 in Bali
  - Urbanization and development pathways (with IIASA) on 28-30th March 2007 in Tsukuba

- **Science Policy interfacing**
  - UNFCCC COP-12 side-event (with ECN Policy Studies Netherlands) on 15th November 2007 in Nairobi

- **Forum creation for energy-emission modeling**
  - A workshop on modeling low-carbon society (with Asia Energy-Environment Modeling Forum) on 30-31 May 2007 in Beijing
Urban and Regional Carbon Management

• Goal
  – Syntheses, thematic papers, scientific networking and community building

• Products examples
  – URCM Science framework
  – URCM Brochure and poster
  – Web-based URCM Resource Center (under preparation)

Lead by Dhakal, Romero-Lankao
Science bases for “Options for including Agriculture and Forestry Activities in a Post-2012 International Climate Agreement”

Published this year
Avoided Deforestation

Gullison RE, Frumhoff PC, Canadell JG, Field CB, Nepstad DC, Hayhoe K, Avissar R, Curran LM, Friedlingstein, Jones CD, Nobre C
2007
GCP Wide: Program Developments
Policy Briefing for UNESCO-SCOPE

6,000 printed (almost gone)
Carbon Reductions and Offsets Report

15 July 2007
A GCP report for the ESSP
Liese Coulter, Pep Canadell, Shobhakar Dhakal

1. Introduction
2. Carbon management and cultural change
3. Carbon emission efficiencies
4. Voluntary carbon offsets
5. Carbon offset criteria
6. Project standards
7. Carbon offset providers
8. Calculating carbon emissions
9. The GCP carbon neutral program
10. Conclusions
11. Web links
12. References

Project Wide
Publications

English

Chinese

Russian

Japanese

Oct. 2003

Nov. 2004

June 2005

March 2006

Project Wide
Homepage: New Structure and Look

The Global Carbon Project

The Global Carbon Project (GCP) was established in 2001 in recognition of the enormous scientific challenge and fundamentally critical nature of the issue for Earth sustainability.

The scientific goal of the project is to develop a complete picture of the global carbon cycle, including both its biophysical and human dimensions together with the interactions and feedbacks between them.

Job Opportunity

The Walker Institute for Climate Systems Research, Reading University has an upcoming post-doctoral position starting on 1 October 2007 to work on implementing a simulation module into the Joint UK Land Environment Simulator (JULES) under the supervision of Dr. Allan Spencer, Reading University. This will be a 6 month position. See announcements.

News and Job Announcements [ view all ]

Project Wide