RECCAP
REgional Carbon Cycle Assessment and Processes

Version: 6 October 2010
Scope

• To establish the mean carbon balance of large regions of the globe at the scale of continents and large ocean basins, including their component fluxes.

• To do it by comparing and reconciling multiple bottom-up estimates with the results of regional top-down atmospheric inversions, with attribution to main flux components.

• To evaluate the regional ‘hot-spots’ of interannual variability and possibly the trends and underlying processes over the past two (or more) decades by combining available long-term observations and modeling.
Why RECCAP?

• To provide higher spatial resolution of the global carbon balance with the aim to improve attribution to processes and hot-spots regions essential to understand the future evolution of the carbon-climate feedback.

• To address a growing demand for a capacity to Measure, Report, and Verify (MRV) the evolution of regional fluxes and the outcomes of climate mitigation policies.

• To develop the technical capacity in regions with regional carbon balances of global significance but with little or not technical capabilities.

• To respond to the Group on Earth Observations (EOS) in establishing a global carbon observatory to track the evolution of natural and anthropogenic carbon sources and sinks.
How we expect to achieve it

• Establishing a large global coordination effort.

• Developing of a “soft protocol” to guide and ensure consistency among regional syntheses (so they can be compared and add up at the end).

• Relying primarily on:
  – existing analyses,
  – ongoing analyses from regional and national programs (eg, North American Carbon Plan, CarboEurope, Australian NCAS),
  – global modeling and assessment efforts (eg, GCP Carbon Budget, GCP-TRENDY, TRANSCOM, SOCAT).

• Relying secondarily on:
  – the establishment of new synthesis teams in regions where there is not an established carbon program.
RECCAP Principle
Multiple Constraints to Understand One Carbon Budget

Top-down

Atmospheric CO$_2$ Inversion Models + ghg observations

Bottom-up

Land, Ocean models + Observations (in situ + remote sensing)

Regional Carbon Balance
Components of Regional Synthesis

Tier 1

**Global Products**

- Regional fluxes
- Atmospheric CO$_2$ Inversion Models
- TransCom
  (Low resolution)

Regional Carbon Balance

- Regional cuts from global land & ocean models
  (Low resolution)
- Regional cuts from global data products

Tier 1 model outputs are coordinated by RECCAP
Components of Regional Synthesis

Tier 1
Global Products

Regional fluxes
Atmospheric CO₂
Inversion Models
TransCom
(Low resolution)
+ Global Obs. Network

Tier 2
Regional-Specific Products

Regional application
Atmospheric CO₂
Inversions Model
(High resolution)
+ Regional ghg obs.

Regional Carbon Balance

Regional cuts from global land & ocean models
(Low resolution)
+ Regional cuts from global data products
+ Regional specific Models
(continental, ocean basin, biome, land use change, others)
+ Regional specific observations
(fluxes, pCO₂, remote sensing, forest inv., others)

Tier 1 model outputs are coordinated by RECCAP
Synthesis Approach
(top-down and bottom-up)

- **Reconciliation of flux estimates** (independently assessed and often partially overlapping) as a means to build confidence in our understanding of the component fluxes, mean estimates, and inter-annual variability.

- Although we are ultimately interested in building a mathematically-formalized multiple constraint approach, model data fusion or data assimilation, RECCAP is not pursuing this approach in its first phase with a completion date of end of 2011.

- Uncertainties need to be quantitatively estimated.
# Global Model Outputs for Regional Syntheses

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Data Fair-Use Policy

• Inspired on the successful model of the AmeriFlux data policy (also used in FluxNet):
  – Request permission to use.
  – Assess possible clashes with other users.
  – Determine which arrangement are appropriate:
    • co-authorship
    • acknowledgements
Which ghgs?

Species:
- **Minimum requirement**: \( \text{CO}_2 \)
- **Additional**: \( \text{CH}_4, (\text{N}_2\text{O}, \text{others}) \)

Spatially explicit:
- **Minimum requirement**: Biological fluxes of \( \text{CO}_2 \) (\( \text{CH}_4, \text{N}_2\text{O}, \text{others} \))
- **Additional**: Fossil Fuel emissions
RECCAP period

Variable but centered around:

- Budget period: 1990-2007/9
- 1983-2007/9 (ocean trends observations)
Global Assessments

- Fossil fuel emissions
- Land use change emissions
- Global atmospheric budget
- Global ocean surface $\text{CO}_2$
- Global ocean storage
- Coastal Ocean
- Rivers fluxes
- Embedded fluxes in international trade
Land and Ocean Regional Syntheses

**Land**

| L1  | Africa             |
| L2  | Arctic tundra     |
| L3  | Australia         |
| L4  | Europe            |
| L5  | North America     |
| L6  | Russia            |
| L7  | South America     |
| L8  | East Asia         |
| L9  | Southeast Asia    |
| 10  | South Asia        |

**Oceans**

| O2  | Pacific           |
| O3  | Atlantic and Arctic |
| O4  | Southern Ocean    |
| O5  | Indian            |
Global Syntheses of Syntheses

Ch-S1  Comparison of top & bottom up

Ch-S2  Inter-annual var. region.

Ch-S3  Attribution to regional processes

Ch-S4  Past and future trends in regional C budgets

Ch-S5  Final recommendations
Regional Masks
Products

• **Scoping paper for EOS or “News” in Science:** 'An international endeavour to tackle regional carbon fluxes'

• **Special Journal Issue/s** (online eg, Biogeosciences, IF=3-4) with all regional and global syntheses.

• **2-4 high-level syntheses papers reporting** key results (eg, Special feature in Nature-Geosciences, or Nature-Climate Change).

• **Summary for Policy Makers.**

• **Distributed Data Repository** (to be updated in the future) of C fluxes from regional and global estimates available for further research and publications.
Objectives of 2nd Workshop

- To work towards a set of agreed high-level syntheses: “syntheses of syntheses”.

- It is an intense 5-day meeting modeled to the Dahlem conferences (e.g., Ubatuba Carbon Cycle Scope Book, 2004).

- Background papers are written in advance, i.e., all regional and global syntheses (and made available to participants).

- We produce 1st order drafts for all agreed “syntheses of syntheses”.

- Mss. to be completed and submitted over the following 6 months; individually submitted or as part of a set for a special feature in e.g., Nature-Geo or Nature-Climate Change.
2nd Workshop: Syntheses of Syntheses

Initial Ideas

- Comparison of atmospheric and bottom up fluxes (mean decadal).

- Inter-annual variability at regional scale.

- Attribution to regional processes over the globe.

- Future regional carbon trends.

- Methods (protocols and uncertainty analyses).

- Final recommendations
Scientific Steering Committee

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