CEOS-CTF on 12th April 2010 @ Tokyo
Summary for SIT-25

CEOS Carbon Task Force updates

GEO/CEOS Contribution to Greenhouse Gas Observations

Takashi Moriyama (JAXA)
GEO CL-09-03c and CEOS Carbon Task Force

3rd CEOS-CTF Objectives

- Input current activities and progresses of CTF in 2009, and plan in 2010
- Introduction and discussion on " GEO Carbon Strategy " for final revision. CEOS is in charge of responding the science requirements on GHG which describes in the strategy, and implement harmonized long term GHG monitoring from space through the Gap Analysis.
- Discussion on collaboration with ACC(Atmospheric Chemistry Composition) constelllations and GHG, including establish GHG constellation group.
- Introduction of idea of "GEO Carbon Showcase " for GEO ministerial summit based on the "A Global Carbon Tracking System " proposed by GEO Carbon CoP.
- Report agency efforts to GHG monitoring and analysis to reflect "GHG High Profile Publications" for policy makers and stake holders.

CEOS Organizational Structure

Plenary
Chair: INPE

28 Members
20 Associates

Secretariat
(NASA/NOAA,MEXT/JAXA, ESA/EUMETSAT)

Strategic Implementation Team (SIT)
Chair: JAXA
Vice Chair: NASA

CEOS Executive Officer
ESA

CEOS Carbon Task Force: JAXA
-GreenHouse Gas Monitoring from Space
-Forest Carbon Tracking
-Integrated Global Carbon Observation

System Engineering Office (SEO)
NASA

SBA coordinator

Constellations
Land Surface Imaging (LSI) : USGS
Ocean Surface Altimetry (OST) : CNES
Atmospheric Chemistry Composition (ACC) : NASA/ESA
Precipitation (PC) : JAXA/NASA
Ocean Color Radiometer (OCR) : JAXA/EC/NASA
Ocean Surface Vector Wind (OSVW) : NASA

WGCV
Chair : ESA

WGISS
Chair : GISTDA
Vice Chair: JAXA

WG-Edu
Chair: EUMETSAT

As of 120410 moriyama

CEOS supports GEO Carbon tasks

CL-09-03c
Global Carbon Observation and Analysis System

CEOS Carbon Task Force
(for fulfilling GEO task CL-09-03c , reporting to CEOS SIT)
*Cross-communication & coordination among CL-09-03 tasks
*Create synergistic implementation plan for the long term global carbon observations and global warming
*To support / facilitate space GHG data

GHG group

* Improve spatial / temporal coverage
* Cross instrument CAL/VAL
* Enhanced data products and utilization
* Algorithm & validation collaboration

Collect & deliver data for synergetic use

CL-09-03b Task team
(Forest Carbon Tracking)

CL-09-03a Task team

Gap analysis //Users requirements

Next generation satellite missions, Data products

GEO-Carbon CoP for Global Carbon Observations
***highlight the observational requirements for global Carbon cycle**
***provide strategy advice to GEO and carbon community**

Updates IGCO Carbon Theme Report

GEO Carbon Strategy

Current CEOS-Virtual Constellations

CEOS
ACC /GHG portal

Data quality assurance | Datasets standardization

CEOS
WGCV, WGISS

GHG Data retrieval

GOSAT,AIRS IASI,SCIAMACY

Data will be distributed from each space Agency by respecting their own data policy

GEO CL-09-03c scope and progress

a) The task will foster the use of space-based greenhouse gas (GHG) observations and consolidate data requirements for the next-generation GHG monitoring missions from space

>> Re-started GEO Carbon CoP to create GEO Carbon Strategy

b) The task will create a synergistic strategy for easy access to GHG satellite observations, including GOSAT and current observations, and to harmonise the next generation of GHG satellite observations.

>> Develop "Carbon from space web portal "

c) Includes comparison and potential integration of GOSAT GHG products with mid tropospheric AIRS and IASI GHG products

>> Underway by NOAA

d) The task will pursue the technical and organisational progress required for the application and integration of results with those of the other GEO Carbon CL-09-03 tasks, to which it is closely linked CL-09-03a (Integrated Global Carbon Observations (IGCO)) and CL-09-03b (Forest Carbon Tracking).

e) To ensure the necessary coordination and integration of outcomes of these tasks, the task (CL-09-03c) will also serve as a vehicle for the purposes of coordinated reporting to CEOS and GEO.

>> Establishe CEOS Carbon Task Force as a vehicle for all CL-09-03 tasks

Events in 2009

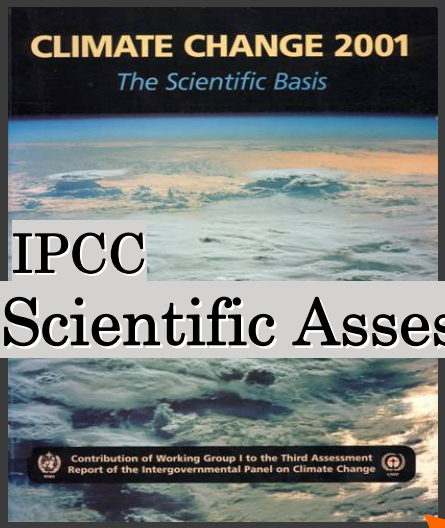
- CEOS SIT23, launch Carbon Task Force, 3-5 March 2009, Florida
- GEO Carbon Task Workshop, 20-21 May 2009, Canberra
- CEOS SIT24, 1st Carbon Task Force, 9-11 September 2009, Darmstadt
- GEO Carbon CoP kick-off, 14 September 2009, Jena
- IAF Plenary event (climate day) , 14 October 2009, Daejeon
- GEO Plenary & Carbon CoP side meeting, 14 November 2009, Washington D.C.
- IGOS Symposium , 15 November 2009, Washington D.C.
- 23rd CEOS Plenary, 2-4 November 2009, Phuket
- COP-15 side event, 7-18 December 2009, Copenhagen

  >> CEOS Contribution to Greenhouse Gas Observations

  (Organized by EUMETSAT)

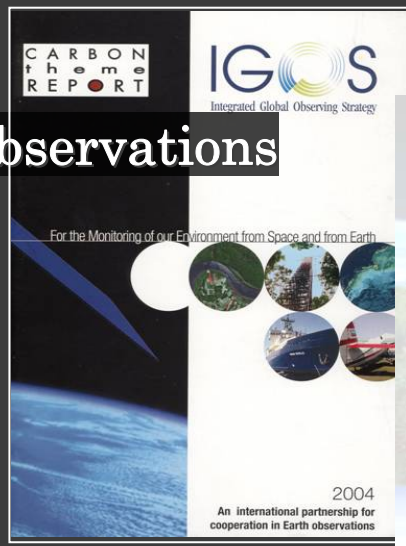
International Framework

IPCC AR-5

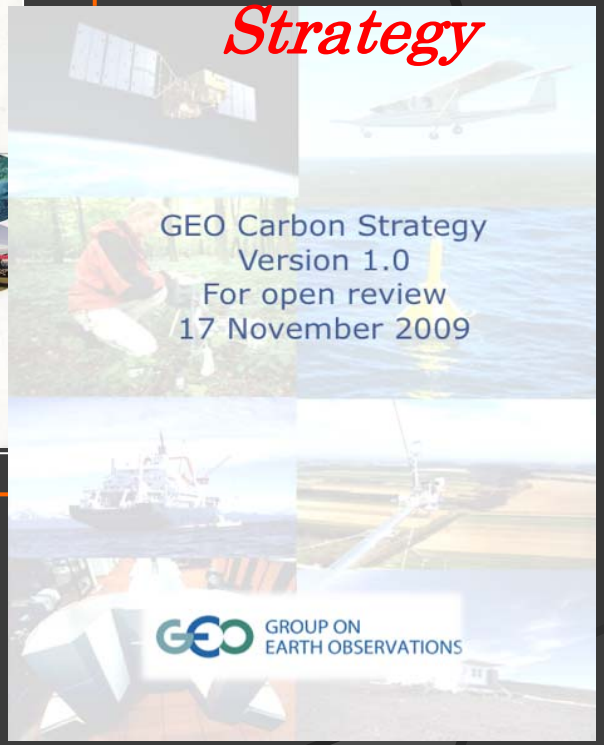


IPCC
Scientific Assessment

IGCO
Operational Observations
2004



GEO Carbon Strategy



GCP
Process studies and campaigns
Analysis and Synthesis
Prognostic modeling

2003

Diagnostic modeling
Data assimilation
and products

GEO Carbon Strategy (1/2)

- The purpose of this document is to update the IGOS-P Carbon Theme Report (2004) – and to provide an overview of the carbon observing system given the recent updates in observing technologies and data interpretation techniques. These improvements include the improvements in ocean pCO2 and terrestrial flux data, new satellite technology including GOSAT and active sensors in the planning stages, and data assimilation tools such as CarbonTracker
- The document including definition of science requirements for next generation of GHG monitoring satellites such as follow-on to GOSAT and other key missions, and encourage total carbon management harmonized with ground based measurements, modeling and decision support/action

GEO Carbon Strategy (2/2)

- Version 0 released at CEOS SIT-23 in March 2009
- Version 1.0 released at GEO-VI plenary in November 2009 for open review
- GEO Carbon Strategy (brochure) distributed at COP-15 in December
- Complete version will be distributed in April 2010 for CEOS Carbon Task Force expert review
- Lead Authors: Philippe Ciais, Han Dolman, Roger Dargaville, Takashi Moriyama, Chris Sabine, Christoph Heinz, Pep Canadell, Scott Denning, Peter Rayner, Alex Held – plus many contributing authors

GEO Carbon Strategy

Philippe Ciais, Han Dolman, Roger Dargaville
Len Barrie, Tom Battin, Antonio Bombelli
Alberto Borges, Heinrich Boversmann, François-Marie Bréon
Michael Bushwitz, James Butler, Pep Canadell
Robert Cook, Nadine Gobron, Christophe Heinze
Martin Heimann, Alex Held, Martin Henry
Eric Kasischke, Beverly Law, Sebastiaan Luyssaert
Gregg Marland, John Miller, Takashi Moriyama
Rosemary Munro, Dennis Ojima, Yude Pan
Stephen Plummer, Shaun Quegan, Peter Rayner
Chris Sabine, David Schimel, Oksana Tarasova
Ricardo Valentini, Andy Watson, Guido van der Werf
Claus Zehner

- Contents

- Human perturbation of the carbon cycle: the current state
- Rationale for an Integrated Global Carbon Observing System
- Vision and Elements of IGCO
- Towards an Integrated Global Carbon Observing System
- ***Future Requirements***
  - **Atmospheric domain**
  - Ocean Domain
  - Terrestrial domain
  - Fossil fuel emissions
  - Lateral carbon fluxes
  - Regional hotspot
  - Harmonization of regional carbon budgets

- Data Management and Processing
- Bringing the whole system together – global data integration
- Implementation timetable gor IGCO
- Bibliography

To fulfill the GCOS requirements on the GHG ECV's CO_2 and CH_4 the next generation of GHG satellite measurements needs to provide high accuracy measurements with high spatial resolution (1-2 km) and good global coverage (global coverage at the Equator with 1-3 day repeat-frequency to get good monthly mean GHG fields), the latter to effectively monitor emissions from strong local source areas for example industrialized urban areas or power plants.

In the long term this could be achieved by an international GHG-satellite constellation equipped with both passive sensors (for GHG imaging and monitoring the natural and anthropogenic hot spots) and active sensors (to deliver very precise but spatially sparse GHG data). The active sensor mission could be accomplished using the measurement technique based upon Laser Absorption Spectroscopy (LAS), which is a powerful tool for high-precision trace gas spectroscopy.

Thus, the highest short term priority for the international community is to continue the time series of space-based planetary boundary-layer CO_2 and CH_4 measurements which was started with SCIAMACHY on ENVISAT (launched in 2002, expected mission end 2013) and is continued by GOSAT (launched in 2009, expected mission end 2014). These measurements should be continued over the next decades with incrementally improved passive sensors, ideally in a GHG-satellite constellation within the international system of operational meteorological satellites.

Within this overall priority, over the next 5 years, the first priority is the continuation of SCIAMACHY and GOSAT, and the development of improved passive GHG observation capabilities from space.

Greenhouse Gases Monitoring from Space
- Current and future prospects -

Aqua AIRS

EnviSat
SCIAMACHY

Metop
IASI

GHG satellite missions with PBL sensitivity

2002	2004	2006	2008	2010	2012	2014	2016	2018	2020	2022
SCIAMACHY										
			GOSAT							
Possible reflight (2 year mission); no CH_4					OCO ?					
No CO_2, CH_4 only as CO by-product						Sentinel 5 P				
Specification ongoing									Sentinel 5 ASCENDS ?	
Gap: No dedicated CH_4 No or limited CO_2										

GOSAT

OCO-2

GOSAT F/O

CH4 DIAL | MICROCARB | CarbonSat

Potential Solutions to the Atmospheric CO_2 Gap Analysis

- **Extend existing missions**: Utilize the full mission capacity of ENVISAT and GOSAT to make total column CO_2 measurements in the lower troposphere at least until OCO or ASCENDS are launched.
- **Future mission lifetimes**: Consider designing future space missions with more capacity for extended operations beyond 10 or 15-years. Many existing missions, designed for 3 to 5 years, have lasted much longer and provided significant contributions.
- **Adjust new missions**: Optimize time overlap of current and future missions by adjusting launch schedules or adjusting orbits to maximize coverage or sampling.
- **Add new missions**: Consider the design and approval of new CEOS missions focused on near-surface (lower troposphere) atmospheric CO_2 measurements with a direct benefit to studies of sources and sinks and transport. The current plans only include NASA's OCO-2 and ASCENDS.
- **Add new instrument capabilities:** Consider adding CO_2 channels to existing instruments for incremental increases in cost or complexity.
- **Constellations**: Consider a long-term plan utilizing multiple satellites to maximize data acquisition and secure the required data for science and policy-makers.

- **GEO Carbon Showcase**

  We will have **a podium presentation** on the global carbon tracking system of about 5-10 min, by a narrator, we will include a short movie of about 2 minutes showing the variability of CO2 in the global atmosphere, the change in forest cover, and satellite observations of GHGs and the implications for sources and sinks.

- **Documents** available: 4 page Flyer; Geo carbon strategy report, ….

- **Exhibition booth,**

  including demonstration of

  - Online carbon tracking: CarbonTracker, CarboScope, Forest Carbon Tracking, satellite observations (GOSAT)

Events in 2010

- APRSAF-16, 26-29 January 2010, Bangkok
- GEOSS-AP4, 10-12 March 2010, Bali
- CEOS ACC ,30-01 March 2010, Montrial
- CEOS SIT25 & 3rd Carbon Task Force, 12-14 April 2010, Tokyo
- GEO Work Plan Symposium, 17-19 May, Pretoria
- Carbon from Space Workshop & ACC, TBD September 2010, UK
- CEOS Plenary, 13-15 October 2010, Rio
- GEO Ministerial Summit , 3-5 November 2010, Beijin
- COP-16 side event, 29-10 December 2010, New Mexico

Side meeting outcomes

CEOS CARBON TASK FORCE

Focal point and discussion

- Reviewed context and activities of CTF in 2009, and plan in 2010 >>Establishing a new mailing list and distributing responsibilities, Add Carbon CoP
- Reviewed " GEO Carbon Strategy Report " for final revision >>Request CEOS comments to GEO Carbon CoP
- Gap analysis for GHG monitoring from space >>Need to undertake more detailed analysis, including of coverage, of other GHG and the need for MIM improvements, Institutional arrangements

Focal point and discussion

- ACC(Atmospheric Chemistry Composition) and GHG constellations >>Create CEOS strategy for continuity of GHG monitoring from space, New constellation team – representation from ACC and others, or strengthened Carbon Task Force ? , Need to have the visible and active involvement of all relevant agencies

Focal Point and Discussion

- Report "GEO Carbon Showcase " for GEO ministerial summit >>Reffered to the GEO ministerial task force and the preparation to date, Consolidation FCT, (GEO-CoP + GHG) ?
- Report agency efforts to GHG monitoring and analysis >>NOAA presented Carbon Crucible – a vision to support emissions reduction, CNES reported on the new carbon initiatives ; CH4 DIAL, MICROCARB