# Status Report on CEOS Carbon Task Force

***24-25 May 2011 SIT-26 ESRIN***

***Dr. Diane E.Wickland and Dr. Takashi Moriyama***

***CEOS Carbon Task Force Co-Chairs***

## Activity Status (1/3)

- **CEOS Carbon Task Force established to**
  - Ensure close coordination among the GEO Climate tasks (CL-09-03 Global Carbon Observation and Analysis System (a,b and c)

**03a : Integrated Global Carbon Observations (IGCO)**

**03b : Forest Carbon Tracking (FCT)**

**03c : GHG Monitoring from Space**

  - Provide an effective interface for CEOS to the GEO Carbon Community of Practice (CCoP)

# Activity Status (2/3)

❖ ***Events in 2010 – 2011***

- GEOSS-AP4, 10-12 March 2010, Bali
- CEOS ACC ,30-01 March 2010, Montreal
- CEOS SIT-25 & 3rd Carbon Task Force, 12-14 April 2010, Tokyo
- Carbon from Space Workshop & CEOS CTF, 6-8 September 2010, Oxford
- CEOS 24th Plenary, 13-15 October 2010, Rio de Janeiro
- CEOS SIT Technical WS, 20-22 September 2010, Montreal
- GEO Plenary & Ministerial Summit, 3-5 November 2010, Beijing
- COP-16 side event, 29-10 December 2010, Mexico
- CEOS-GEO WS, 16-17 February 2011, Washington D.C.
- CTF side meeting, 18 February 2011, Washington D.C.
- CEOS Strategy for Carbon Observation from Space; Atmospheric community consultation meeting, 18 May 2011, Edinburgh UK

# Activity Status (3/3)

❖ **Main achievements:**

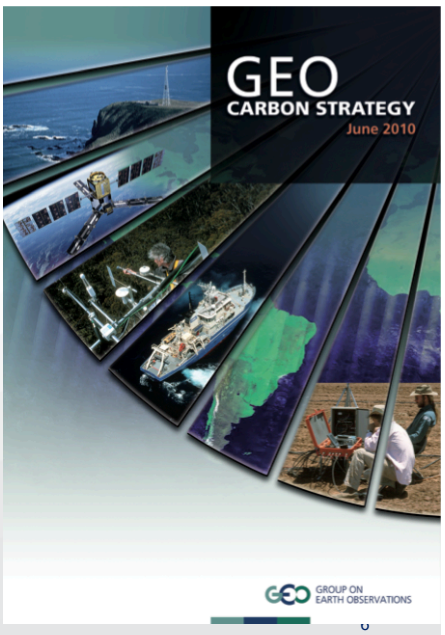
- Expanded CTF leadership and membership to ensure a comprehensive and balanced response
- Initiated planning for the CEOS response to the GEO Carbon Strategy
- Developed Carbon Showcase video for GEO-VII plenary and Ministerial through cooperation with the GEO CCoP and Secretariat
- Joint discussion with Carbon from Space WS and CTF
- Reviewed CEOS Systems Engineering Office (SEO) gap analyses for $CO_2$ and $CH_4$
- Recruited three domain leads (Land, Ocean, and Atmsophere chapter authors) for the CEOS response to the GEO Carbon Strategy, tentatively entitled *CEOS Strategy for Carbon Observations from Space*

# Main achievements (1/3)

- **Expanded CTF leadership and membership to ensure a comprehensive and balanced response**
  - CTF co-chair: Diane E.Wickland (NASA), Takashi Moriyama (JAXA)
  - CEOS Agency representatives:
    - **NASA:Richard Eckman, Kenneth W.Jucks, David Crisp, Joanne Nightingale**
    - **NOAA:Chris Barnet, Mitch Goldberg, Kerry Sawyer, Brent Smith**
    - **ESA:Stephen Plummer, Clause Zehner**
    - **CNES:Francisco Bermudo, Carole Deniel**
    - **DLR:Albrecht von Bargen**
    - **EUMETSAT:Rosemary Munro**
    - **USGS:Jonathan H.Smith, Zhiliang Zhu**
    - **JAXA:Masakatsu Nakajima, Osamu Ochiai**
    - **CSIRO:Alex Held**
    - **WMO/GAW:Slobodan Nickovic, Leonard Barrie**
    - **GCOS, GEO-CCoP, U.Bremen, COCOS, LSCE, U. Colorado, U. Oklahoma U.Jena, NIES, RESTEC**

# Main achievements (2/3)

- **GEO Carbon Strategy published (new version of IGCO Carbon report)**
- **Coordinated by GEO CCoP with public review**
- **Describes science requirements for long-term synergistic GHG observations**
- **Available by Web and printed document (Living document)**
- **http://www.falw.vu/~dola/downloads.html**



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# GEO carbon strategy (i)

- Increase the density of *in situ* networks, in particular for stations and aircraft atmospheric observations, ocean pCO2 observing systems using Voluntary Observing Ships, and eddy covariance terrestrial ecosystem flux measurement networks.
- Develop space measurements of global $CO_2$ and $CH_4$ distributions, to fill the gap after GOSAT and SCIAMACHY;
- Develop spatial scaling techniques for $pCO_2$ and land flux observations for application to wider regions, using satellite information;
- Undertake a decadal full basin survey of ocean carbon state, together with regular inventories of forest biomass and soil carbon pools;

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# GEO Carbon strategy (ii)

- Improve access to a continuous supply of mid-resolution Earth observing (satellite) data, to monitor areas of forest;
- develop space measurements of vegetation 3-dimensional structure to improve estimates of global terrestrial aboveground biomass and carbon stocks;
- develop new space missions and satellite products to improve estimation of carbon capture and export in the ocean;
- Improve access to geospatial and temporal fossil fuel emission information, including spatial-data infrastructure;
- Assemble geospatial information about use of wood and food products, and continuously monitored dissolved and particulate carbon, if possible with age information, for relevant rivers;

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# GEO Carbon strategy (iii)

- **Implement a data architecture that facilitates the combination of different data-streams;**
- **Establish an International Carbon Office to operate a program to produce annually updated regional and global carbon budgets.**

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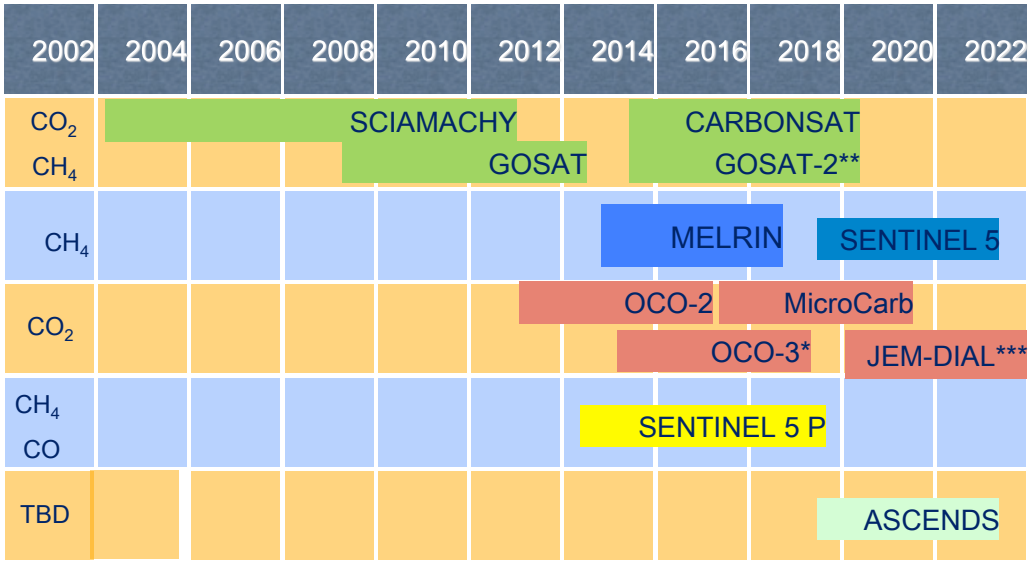
Satellite GHG mission with PBL sensitivity




*OCO-3 instrument will be assembled and ready for integration on to a flight of opportunity as soon as 2015

**GOSAT-2 mission definition review will be in 2010, and request budget for start pre-project in 2011.

***JEM-DIAL has been studying dedicated CO2 measurement to be aboard ISS –Japan Exposure Module

# Main achievements (3/3)

- CEOS CTF assisted in the development of the CEOS contribution to the GEO Ministerial Carbon Showcase
  - Video for CL-09-03 (Global Carbon Observation and Analysis System) task
  - Commented on several iterations of the video script
  - Worked with Carbon CoP and GEO Secretariat to incorporate review comments
  - Demonatrated at GEO Ministerial in Beijing ,November 2010

  (JAXA produced the video)

# 2nd Carbon From Space Workshop

- **Held in Oxford, UK on 6-8 September 2010**
- **Convened by the European Space Agency to identify the necessary steps to implement the Integrated Global Carbon Observing System (IGCO) / GEO Carbon Strategy**
  - Primary objective was to develop a position paper on the IGCO for a peer-reviewed journal
  - Agenda evolved based on issues raised and expertise of the participants
  - Workshop participants recognized the need for a balanced, comprehensive approach to space-based and in situ observations of carbon (including terrestrial and oceanic inventories and fluxes as well as atmospheric concentrations and fluxes)
- **It was concluded that CEOS should seek to develop a comprehensive response – defining an observations strategy in support of global carbon observational requirements and all sources and sinks therein – covering atmospheric, terrestrial, and oceanic observations and observations of the interfaces among them**

## CTF Workshop held on 18 Feb. 2011

- **CTF co-chairs arranged a CTF meeting in Washington D.C. on 18th February in conjunction with CEOS-GEO WS with the objectives of :**

  - Finalising identification of the domain leads (chapter authors); as well as identifying candidate supporting experts (co-authors) from CEOS agencies and the international scientific community, and clarifying their roles;
  - Agreeing on the 2011 Work Plan and key dates; including the relationship to the CEOS response to the GCOS IP and key dates in that process;
  - Development of a table of contents for the *CEOS Strategy for Carbon Observations from Space*

## CTF Workshop outputs (1/6)

- **21 participants from** NASA/HQ,JPL,LaRC,NOAA/HQ,NESDIS,USGS,JAXA/HQ,EORC,SAPC,RESTEC,ASI,INPE,EUMETSAT,DLR,U.Oklahoma,CEOS-sec,GEO-sec, and SIT Chair

- **Meeting goals: Purpose is to plan the response to GEO Carbon Strategy and future CTF activities**

  (1) Consideration of domain leads for chapters of CEOS Response to GEO Carbon Strategy

  (2) Discussion of structure of report for CEOS Response to GEO Carbon Strategy

  (3) 2011 work plan for CTF

# CTF Workshop outputs (2/6)

**Made recommendations for domain leads for each chapter of CEOS Response to GEO Carbon Strategy**

- **Atmosphere Domain:**
  **Domain Lead: Berrien Moore, U. Oklahoma, USA**
- **Land Domain:**
  **Domain Lead: Christiane Schmullius, U. Jena, Germany**
- **Ocean Domain:**
  **Domain Lead: Shuba Sathyendranath, Plymouth Marine Laboratory, UK**
- **Integration:**
  The suggestion was to define an "integration" lead within each domain team who will be explicitly involved in helping the Domain Leads and CTF Co-Chairs in drafting the integration chapter

# CTF Workshop outputs (3/6)

**Discussion of structure of report for CEOS Response to GEO Carbon Strategy**

Further gap analysis work would be good for identifying existing gaps between GCOS-IP and GEO report. Also recommend to consider for all domains.

The atmospheric domain is targeting to complete its chapter by the end of 2011; the other two domains (and integration chapter) will be completed in 2012.

If existing and future constellations are to be addressed, the report will need to clearly define the science requirements and gaps to enable future agency coordination. To understand existing constellations and what is planned, the domain leads and CTF Co-Chairs should plan to interact with the Constellation working groups.

# CTF Workshop outputs (4/6)

**Report with 6 main chapters:**

- Executive Summary
- Introduction/Context for Integrated Global Carbon Observations & Analysis System (IGCOAS)
- Land Domain
- Ocean Domain
- Atmosphere Domain
- Integration

Impacts / User Benefits / Expected Payoffs should be addressed in each domain chapter.

The CTF agreed that each domain lead should have a small team of collaborators who can help draft the chapter and provide balanced inputs regarding the science, remote sensing, and space agency plans/capabilities.

# CTF Workshop outputs (5/6)

**2011 work plan for CTF**

The following were nominated as suitable venues for face-to-face meetings of the chapter authors and/or meetings for community consultation:

a. IWGGMS, 16-18 May 2011, Univ. Edinburgh UK
b. CEOS Cal/Val Land Products WS, 16-17 June, Austria
c. CEOS ACC, 21-22 June, Washington DC, US
d. IGARSS 2011, 25-29 July, Vancouver, Canada
e. WCRP OSC, October 2011 Denver Colorado, US
f. GEO Carbon meeting ?, Octber 2011
g. Ocean Color mtg, October 2011, Lisbon, Portugal
h. IOCCG, February 2012

# CTF Workshop outputs (6/6)

**Other business**

- CTF to work with further GHG gap analysis work (SEO, Brian Killough)
- CTF would coordinate with the ACC to complete the A-29 action template
- CTF will send an appropriate person to the June ACC meeting

# Rationale of the CEOS Strategy

- **CEOS Response to the GEO Carbon Strategy Report:**
  - Follow successful model of the IGOS-CEOS relationship
  - Help definition of next generation missions for individual agencies
  - Big picture understanding for CEOS in defining space segment in support of emerging ambitions for global carbon monitoring and accounting system
  - Take into account information requirements of both the UNFCCC and IPCC , consider how future satellite missions will support them
  - Also take account of, and be consistent with, the GCOS Implementation Plan requirements

# Management structure

- Carbon Task Force co-chairs take overall responsibility for the implementation of the CEOS Response
- Per the approach to the GCOS IP Response:
  - Domain leads identified to oversee development of the analysis for each of the atmospheric, terrestrial and oceanic domains
  - CTF co-chairs and domain leads are responsible for supply of the relevant chapters and for identifying the expertise required for their completion
- GEO Carbon Community of Practice will be asked to supply suitable experts responsible to provide an overall interface with the CEOS process and with the expert domain teams
- Maximum use of existing groups for relevant experience – eg Constellations and Working Groups
  - e.g., ACC, SEO, CEOS MIM, LSI
  - efforts of the newly-established Working Group on Climate (WGC)

# Notional Timetable
## (to be confirmed by Domain Leads)