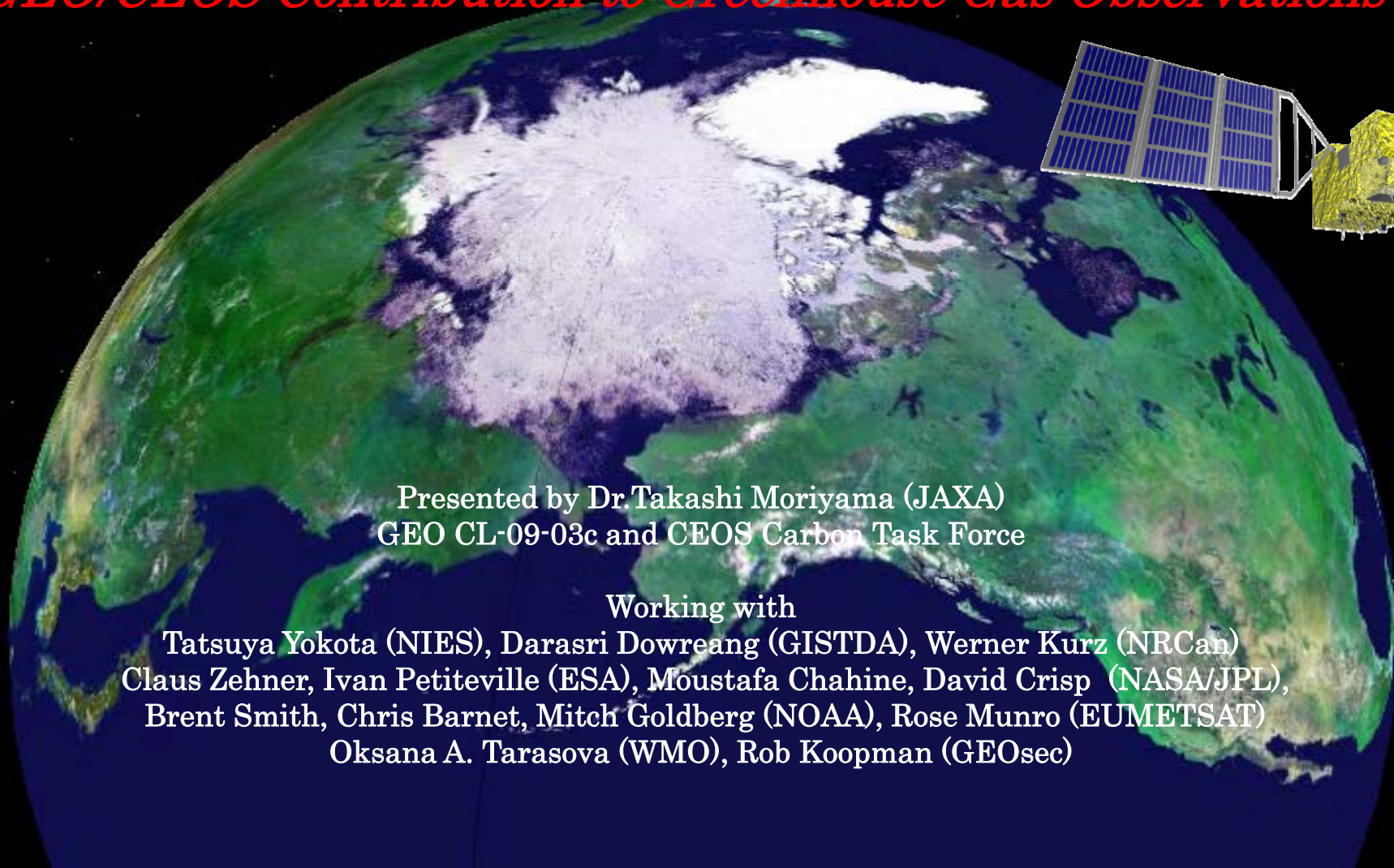


CEOS Carbon Task Force updates

GEO/CEOS Contribution to Greenhouse Gas Observations



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

Working with

Tatsuya Yokota (NIES), Darasri Dowreang (GISTDA), Werner Kurz (NRCan)
Claus Zehner, Ivan Petiteville (ESA), Moustafa Chahine, David Crisp (NASA/JPL),
Brent Smith, Chris Barnet, Mitch Goldberg (NOAA), Rose Munro (EUMETSAT)
Oksana A. Tarasova (WMO), Rob Koopman (GEOsec)

Background

- ◆ CEOS Carbon Task Force proposed by JAXA at SIT-23 to:
 - ◆ Ensure close coordination among the CL-09-03 a/b/c GEO Carbon task efforts of CEOS
 - ◆ Provide an effective interface for CEOS to the GEO Carbon Community of Practice
 - ◆ **Action SIT-23-3: JAXA to formally establish by May 2009 the Carbon Task Force, coordinating CEOS efforts in addressing the 3 Sub-Tasks under GEO Task CL-09-03 and to reporting on measurable outputs in connection with the November 2009 CEOS-23 and GEO-6 Plenaries**

CEOS Carbon Task Force operation scheme

a) Participants

The Task Force consists of experts representing from space agencies and CL task science representatives, involved in carbon observations from space and applications of the data.

b) Chairperson

JAXA is willing to supply a chairperson for the Task Force and resources to ensure necessary bridging among the tasks CL-09-03a, CL-09-03b and CL-09-03c. The chairperson has a responsibility to make an overview report to CEOS-SIT.

c) Meeting

The Task Force typically convenes twice a year, or as needed for the purpose of overall management of the task, interaction with CEOS related activities such as Virtual Constellations, and securing conclusion and communication of outputs to key events.

d) Secretariat

Co-leads of CL-09-03 a/b/c tasks and representatives of NASA, NOAA, ESA and JAXA requested to serve as a loose/lightweight secretariat function to drive progress within key agencies. JAXA is willing to provide 'the glue'.

CL-09-03c task leads

Japan: Takashi Moriyama (JAXA, moriyama.takashi@jaxa.jp)

Japan: Gen Inoue (RIHN, inouegen@chikyu.ac.jp)

USA: Ernest Hilsenrath (NASA, ernest.hilsenrath@nasa.gov)

USA: Ken Jucks (NASA, kenneth.w.jucks@nasa.gov)

USA: Mitch Goldberg (NOAA, Mitch.Goldberg@noaa.gov)

USA: Chris Barnet (NOAA, Chris.barnet@noaa.gov)

Europe: Claus Zehner (ESA, claus.zehner@esa.int)

Europe: Einer-Arne Herland (ESA, Einar-Arne.Herland@esa.int)

WMO: Len Barrie (WMO (GAW), LBarrie@wmo.int)

Representative from CL-09-03a: Han Dolman (Netherlands, han.dolman@geo.falw.vn.nl)

Representative from CL-09-03b: Alex Held (Australia, Alex.Held@csiro.au)

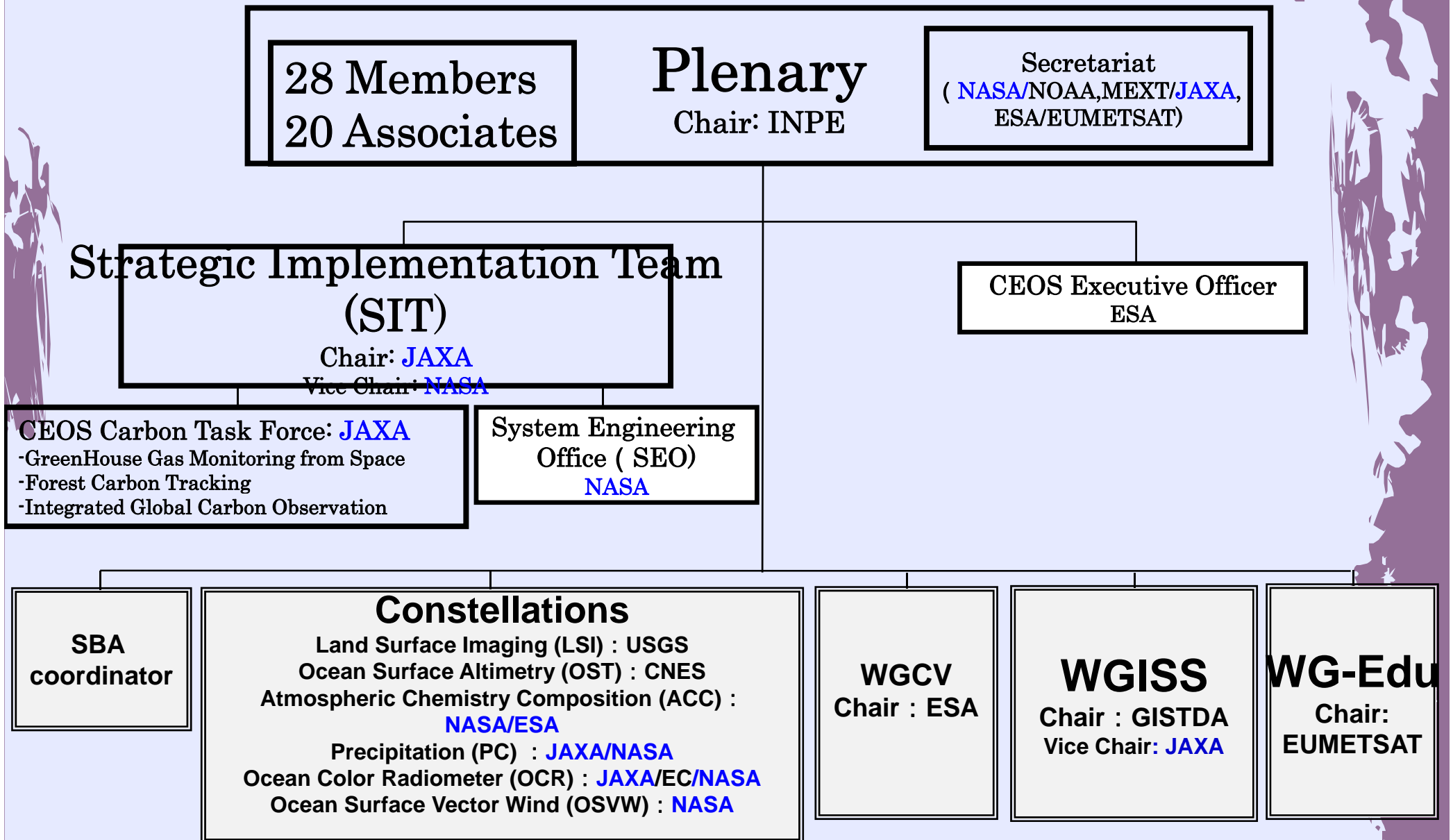
Carbon Task Force Report by Moriyama /JAXA for CEOS/SIT@EUMETSAT, Sept. 10, 2009



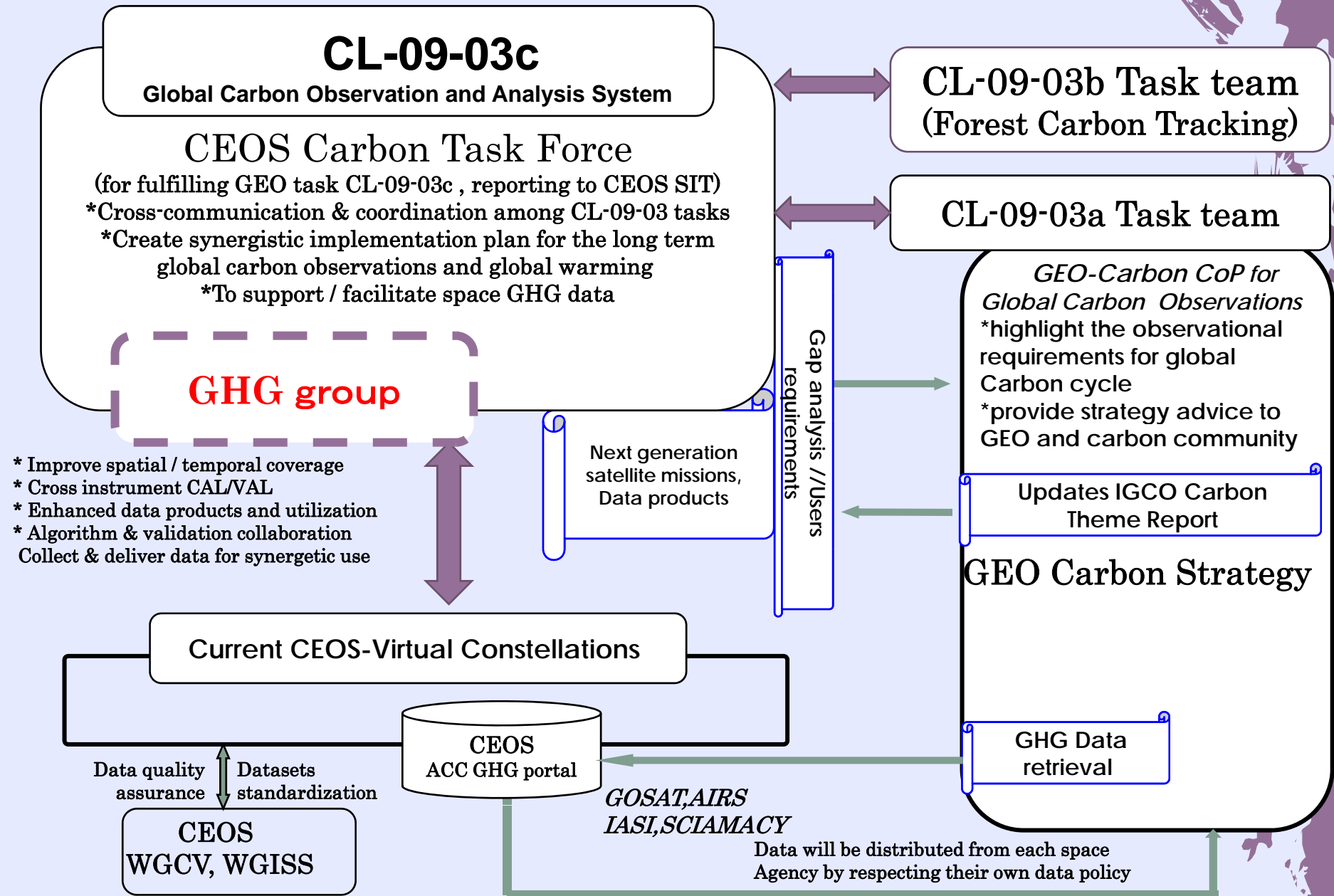
Events

- 14 Sep, Jena (@ ICDC-8)
 - GEO Carbon Community of Practice
 - 1st face to face meeting
 - Carbon Report progress review
- 14 Oct, Informing Climate Change Mitigation Decisions through Global Carbon Monitoring - IAF Plenary Event
- 18 Nov, CCoP meeting as a side meeting of GEO-VI
- 19 Nov, IGOS Symposium
 - Official launch of GEO Carbon Report V1

CEOS Organizational Structure



CEOS supports GEO Carbon tasks



Carbon from space web portal

- ◆ Currently under development by JAXA (in English) to provide a web portal linking to outcomes from the GEO CL-09-03 tasks
- Version. 2 is available at <http://www.symbioscomms.com/JCP/> (login: portaldemo password: carbon09)
- Possible migration into GEO Portal in future
- Comments are welcome. (moriyama.takashi@jaxa.jp, ochiai.osamu@jaxa.jp, miura.satoko@jaxa.jp)

CARBON From Space OBSERVATIONS

Home
Greenhouse Gases
Forest Carbon
Whats New?

CARBON OBSERVATIONS FROM SPACE
Missions and Data Access

The Kyoto Protocol established goals for the reduction of emissions of six key greenhouse gases. The measurement of greenhouse gases globally, using only ground-based instruments, presents many challenges.

Complementing high-accuracy ground-based measurements with satellite measurements allows observations worldwide using common instruments, helping to ensure globally consistent results.

This site introduces the monitoring of greenhouse gases, especially Carbon Dioxide, using satellites by providing background information, and data access links and instructions. The site is divided into two broad categories: satellite monitoring of greenhouse gases and monitoring forests carbon.

GREENHOUSE GASES

This section includes information on GOSAT, GHG modelling and simulation, and data access information. **Click here**

FOREST CARBON

This section includes information on Forest Carbon (Biomass) modelling and simulation, relevant satellite data, and data access information. **Click here**

Home Page | About Us | Contact Us

JAXA
Japan Aerospace
Exploration Agency

GEO Carbon task goals

- ⦿ GEO Carbon task goal is to “implement a global carbon observation and analysis system addressing the three components of the carbon system (atmosphere, land and ocean)”
- ⦿ Divided into three sub-tasks (CL-09-03 a/b/c)
 - Integrated Global Carbon Observations
 - Forest Carbon Tracking
 - Global Monitoring Greenhouse Gases from Space

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.

>> [Carbon from space web portal] is now available

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.

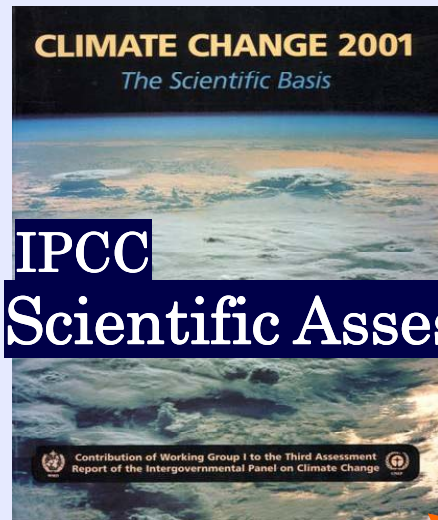
>> Established CEOS Carbon Task Force as a vehicle of all CL-09-03 tasks

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**

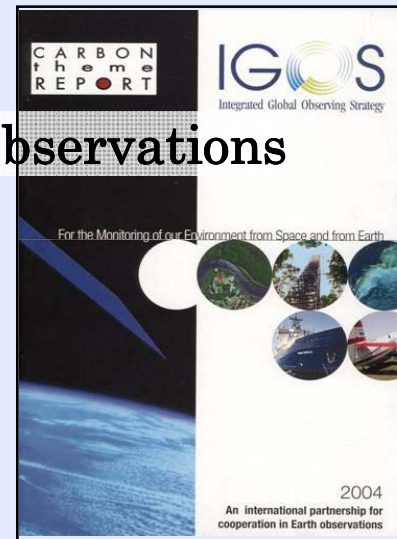
GCP
Process studies and campaigns
Analysis and Synthesis
Prognostic modeling



2003

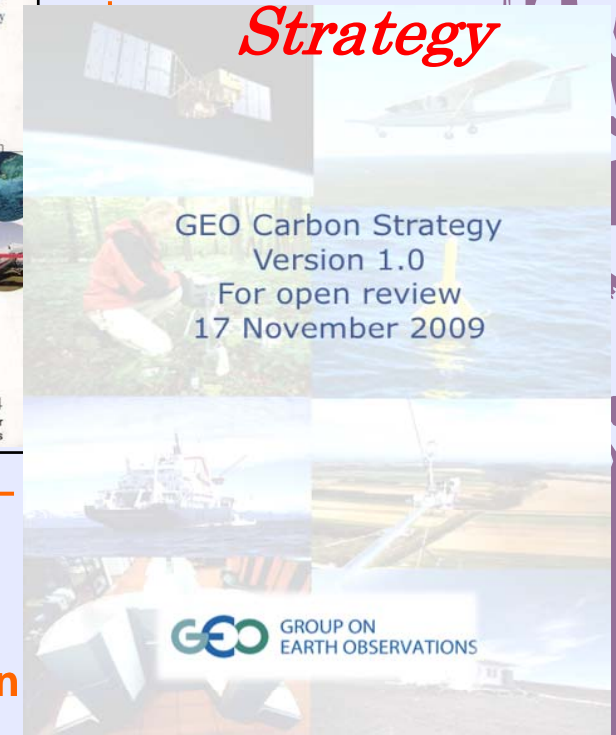
**IGCO
Operational Observations**

2004



**Diagnostic modeling
Data assimilation
and products**

GEO Carbon Strategy



GEO Carbon Strategy (1/2)

- ④ The purpose of this document is to update the IGOS-P Carbon Theme Report (2002) – 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
- ④ 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-24 in March 2009
- Version 1.0 released at GEO-VI plenary for open review
- GEO Carbon Strategy (brochure) distributed at COP-15, Copenhagen
- Version 1.1 will be released at SIT-25 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

Greenhouse Gases Monitoring from Space

- Current and future prospects -

Aqua AIRS



EnviSat
SCIAMACHY



Metop
IASI



GOSAT



OCO-2



GOSAT F/O



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 CH₄ No or limited CO₂							

Sentinel 5

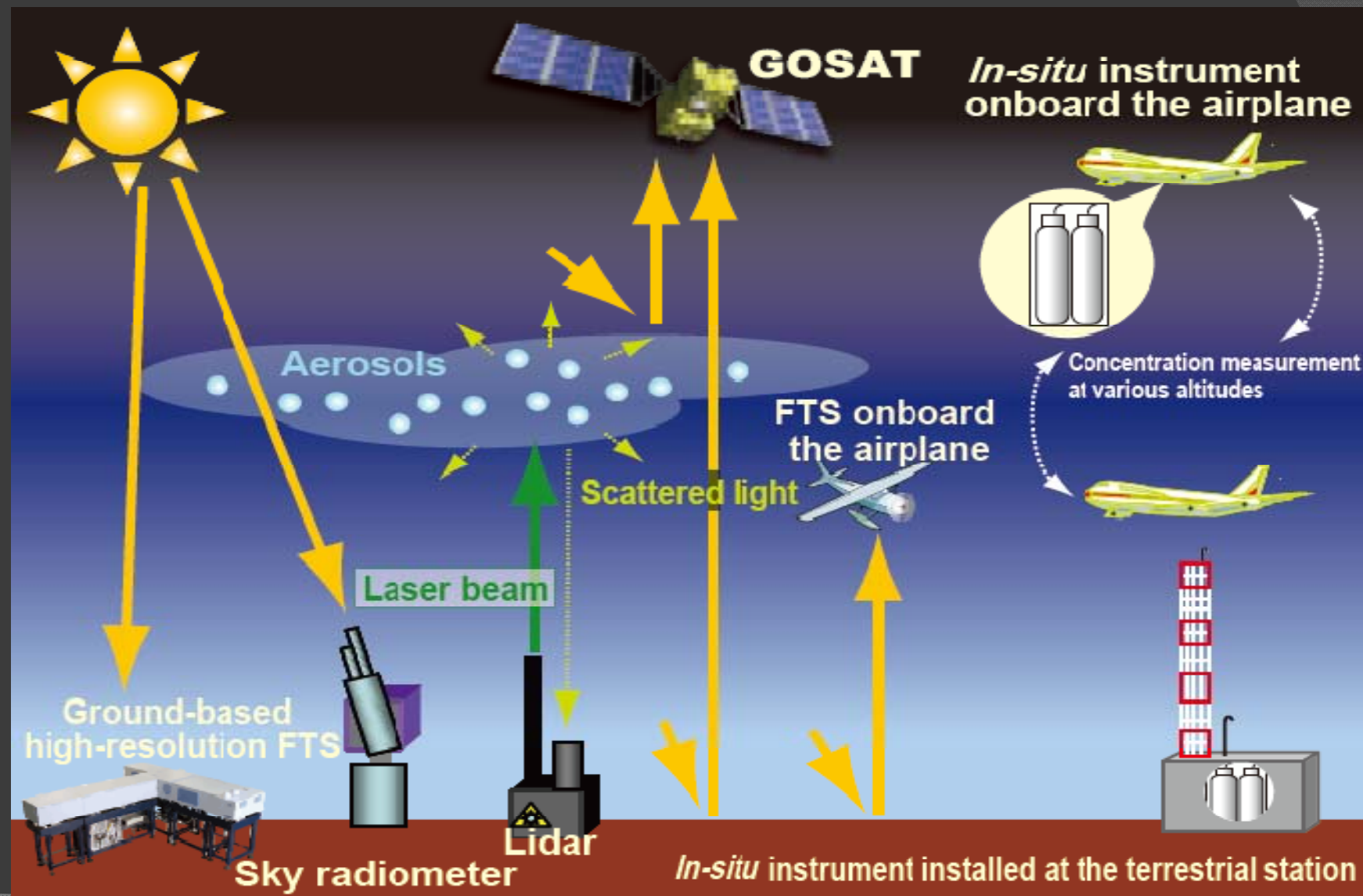
ASCENDS

New missions

Events in 2010

- APRSAF-16, 26-29 January 2010, Bangkok
- GEOS-AP4, 10-12 March 2010, Bali
- CEOS ACC ,30-01 March 2010, Montreal
- CEOS SIT25 & 3rd Carbon Task Force, 12-14 April 2010, Tokyo
- Carbon from Space Workshop & ACC, TBD September 2010, UK
- CEOS Plenary, 13-15 October 2010, Rio
- GEO Plenary & Ministerial , 3-5 November 2010, Beijing
- COP-16 side event, 29-10 December 2010, New Mexico

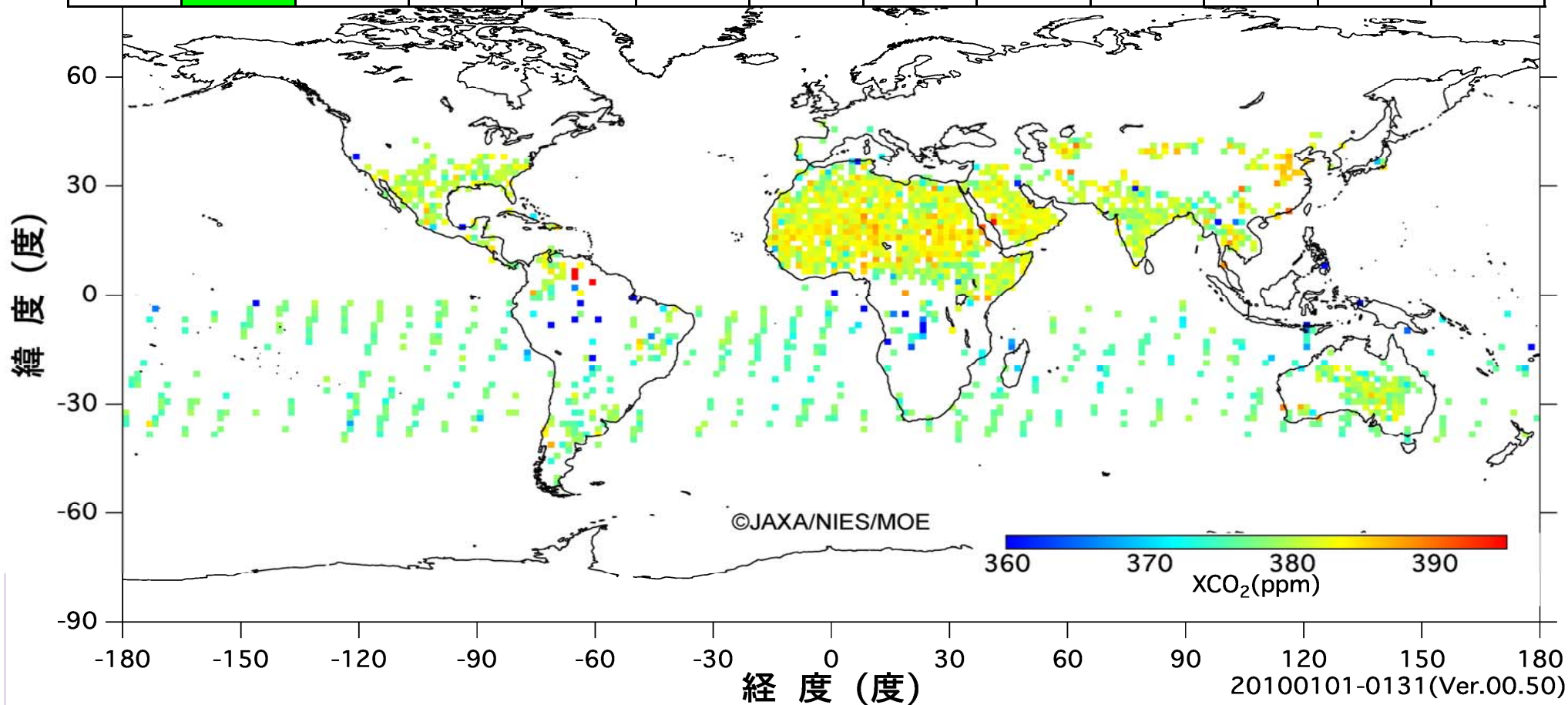
Schematic layout of validation experiments for GOSAT



From NIES GOSAT Project pamphlet

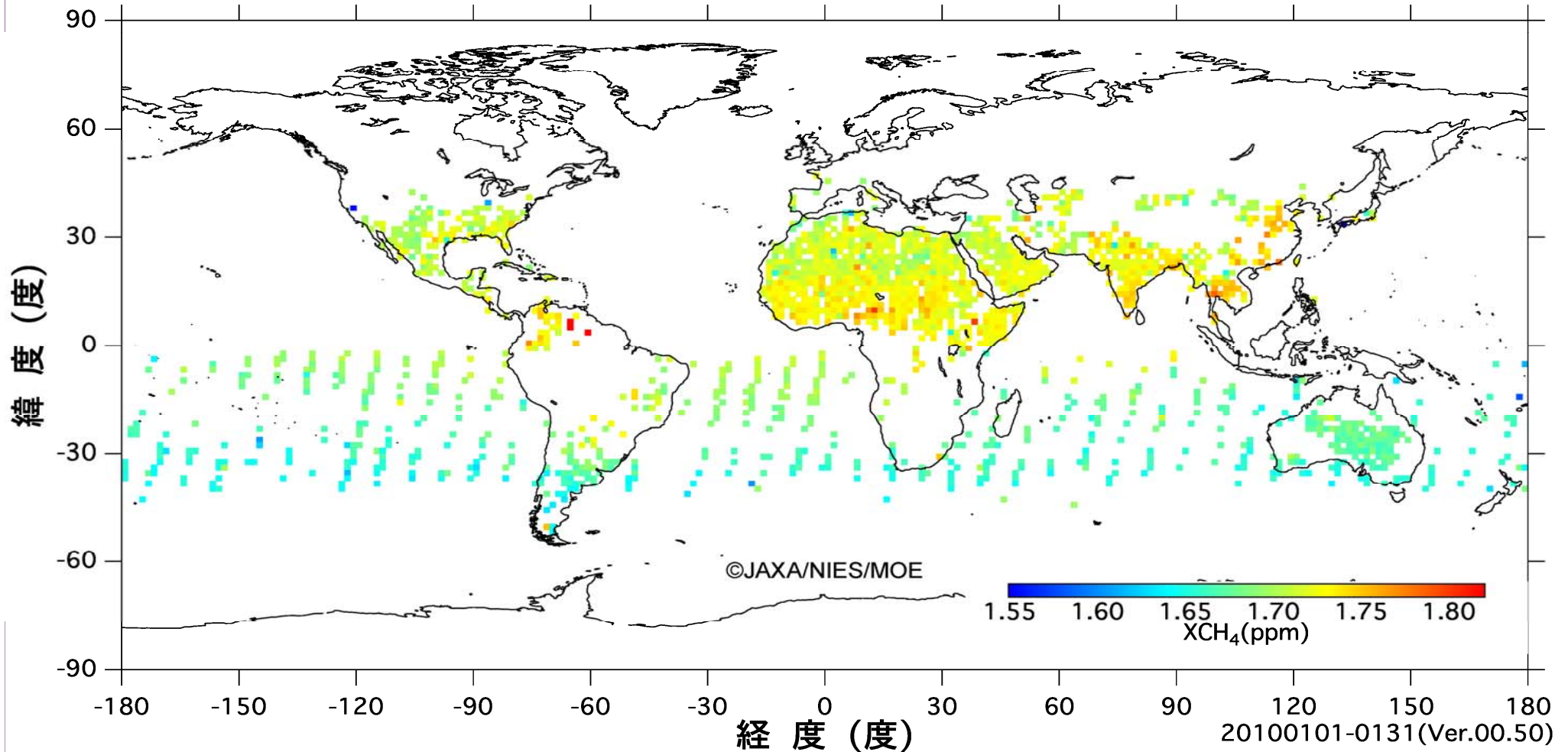
Global distribution of Carbon dioxide XCO₂ observed by GOSAT

2009	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2010	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec



Global distribution of Methane XCH₄ observed by GOSAT

2009	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2010	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec



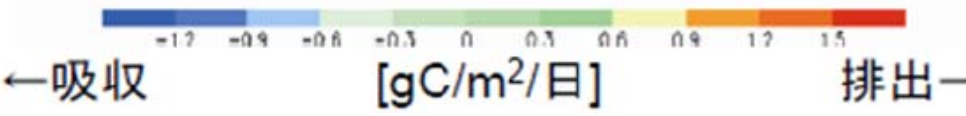
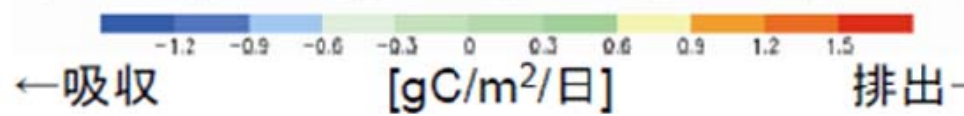
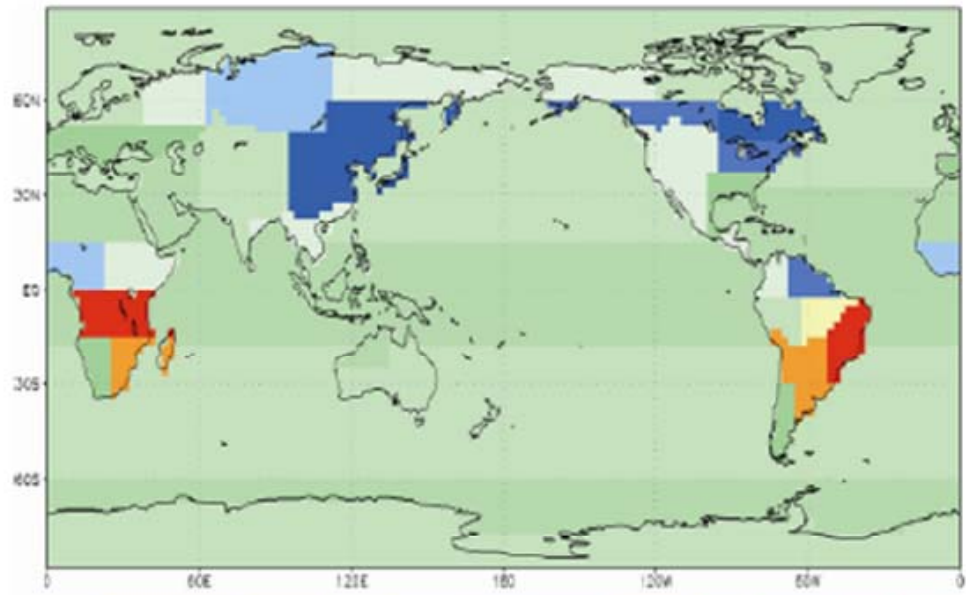
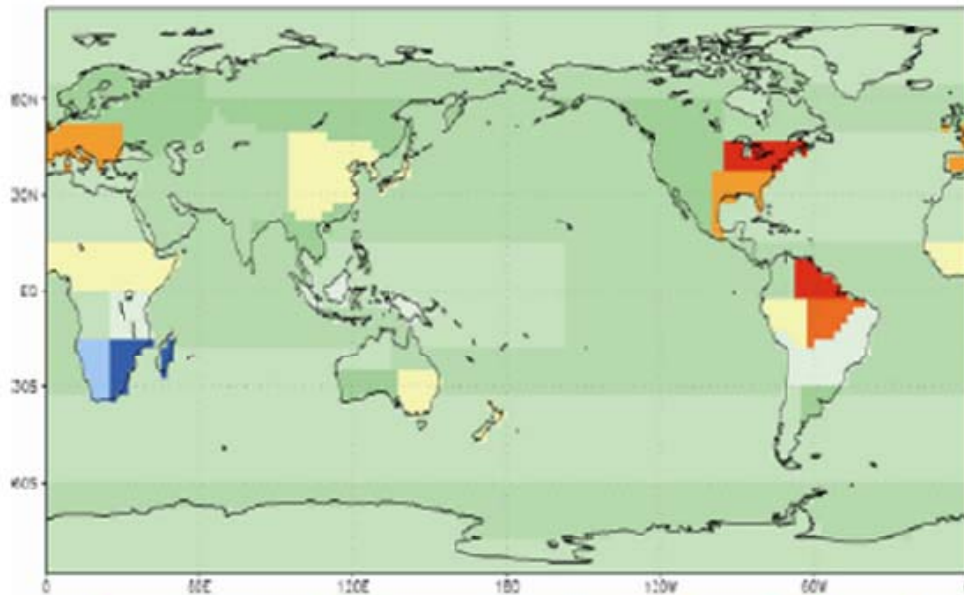
Global Carbon Flux (Seasonal Change Simulation)

February

August

(2月)

(8月)
























Absorption

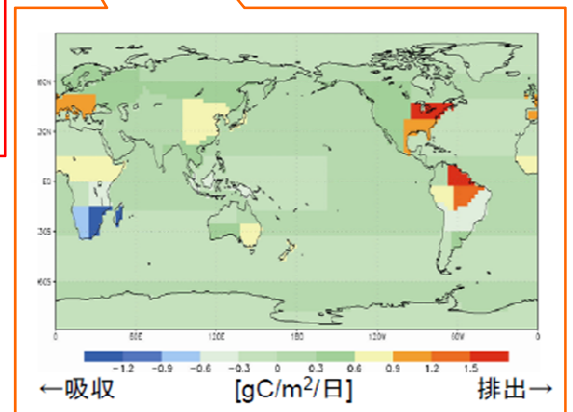
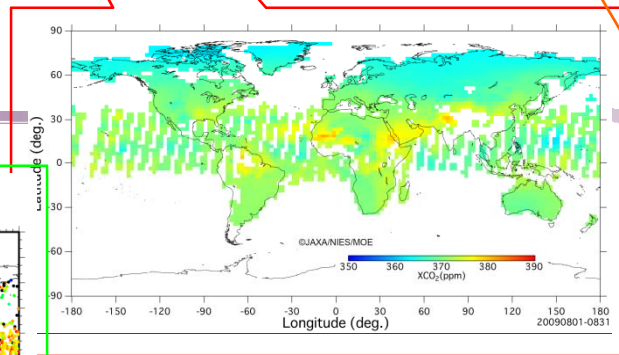
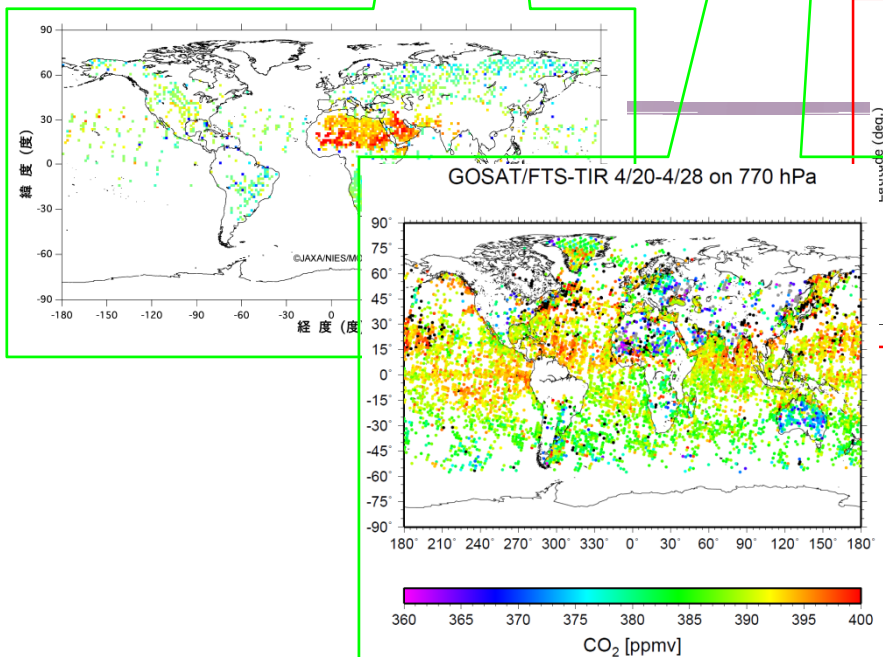
Emission

Absorption

Emission

GOSAT Data Release and Outreach

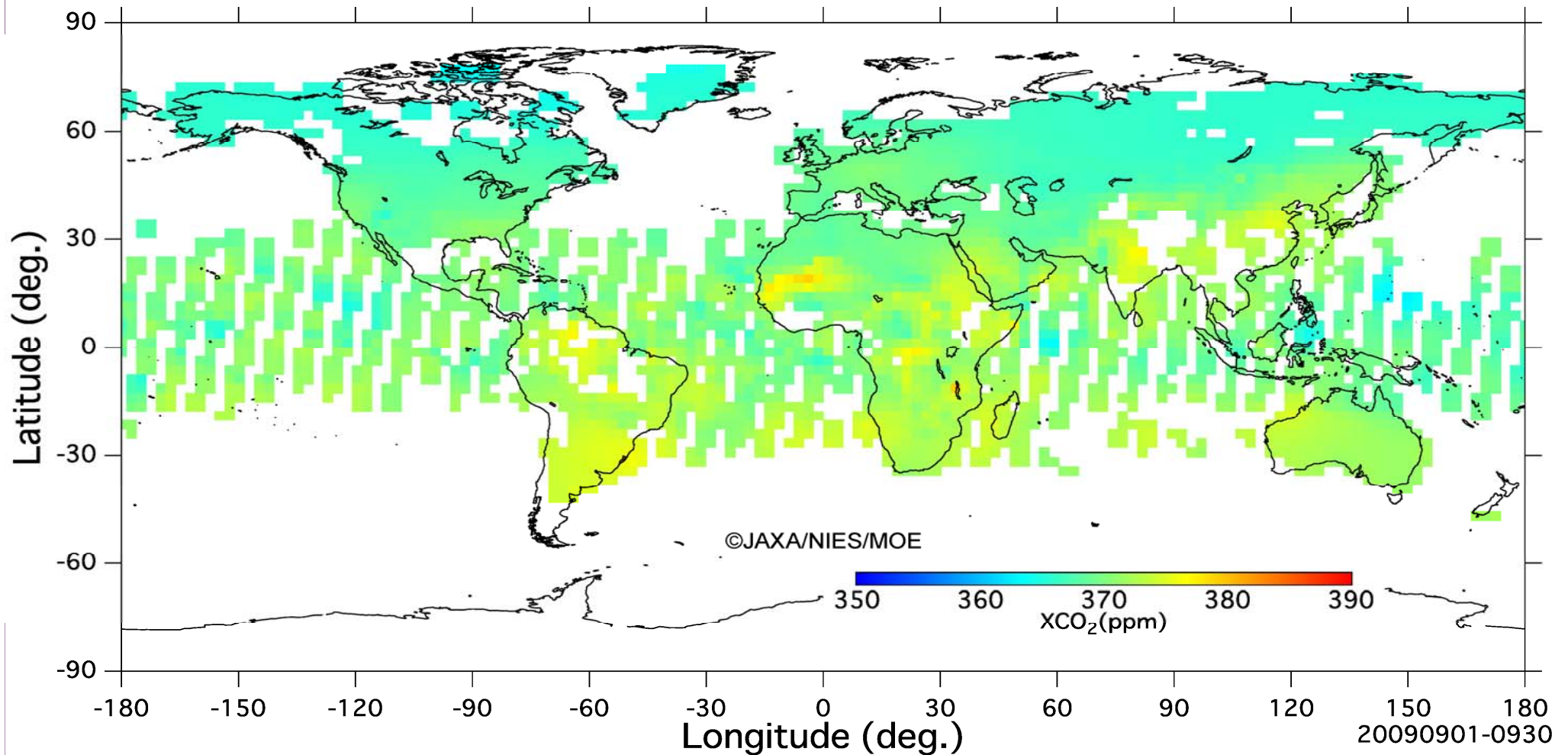
	2	3	4	5	6	7	8	9	10	11	12
GOSAT Datasets	 CO ₂ , CH ₄ column data distribution										
		 CO ₂ , CH ₄ seasonal variation datasets (1000km ² , 3mon's ave.)					 Sample CO ₂ flux per region, per year				
Events	 GEOSS-AP		 CEOS-SIT CTF + CCOP	 UN-COPUOS		 Carbon from Space WS		 CEOS Plenary  GEO Ministerial	 COP-10		 COP-16



CO2 Observation from Space

GOSAT monthly mean XCO₂ in Jul. – Sep., 2009 (unvalidated)

Averaged and Interpolated by Kriging method (2.5 deg grid)



CH₄ Observation from Space

GOSAT monthly mean XCH₄ in Jul. – Sep., 2009 (unvalidated)

Averaged and Interpolated by Kriging method (2.5 deg grid)

