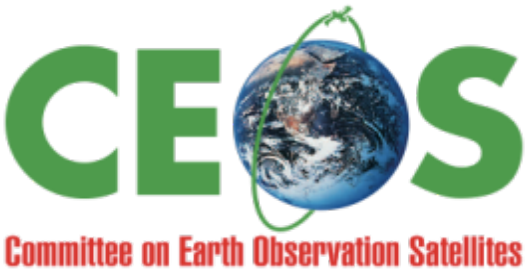

THE CEOS IMPLEMENTATION PLAN FOR SPACE-BASED OBSERVATIONS FOR GEOSS 2011

20 March 2012

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PART 1: INTRODUCTION AND BACKGROUND

1. INTRODUCTION

Background

Since its establishment in 1984 - under the aegis of the Group of Seven (G7) Economic Summit of Industrialised Nations Working Group on Growth, Technology and Employment – the Committee on Earth Observation Satellites (CEOS) has evolved to provide a broad framework for international coordination on space-borne Earth observation missions. The wide range of activities of CEOS and its subsidiary groups derive from CEOS's three primary objectives:

- To optimize benefits of space-borne Earth observations through cooperation of its participants in mission planning and in development of compatible data products, formats, services, applications, and policies;
- To serve as a focal point for international coordination of space-related Earth observation activities; and,
- To exchange policy and technical information to encourage complementarity and compatibility of observation and data exchange systems.

The Group on Earth Observations, GEO, was established by a series of three ministerial-level summits. As of November 2011, GEO consists of 89 national governments plus the European Commission and 67 participating organizations – including CEOS. GEO's membership seeks to cooperate in establishing a Global Earth Observation System of Systems (GEOSS) by 2015, guided by the GEOSS 10-Year Implementation Plan. The GEO vision for GEOSS is to realize a future wherein decisions and actions for the benefit of humankind are informed via coordinated, comprehensive and sustained Earth observations and information.

The 20+ years invested by CEOS agencies towards these objectives has resulted in recognition of CEOS as the primary forum world-wide for coordination of space-based Earth observations. As such, CEOS is tasked to lead coordination of the space observations required by the GEOSS.

GEOSS will build on and add value to existing Earth-observation systems by coordinating their efforts, addressing critical gaps, supporting their interoperability, sharing information, reaching a common understanding of user requirements, and improving delivery of information to users.

Further information on CEOS and GEO may be obtained via the following websites:

CEOS: www.ceos.org

GEO: www.earthobservations.org

Purpose

This document presents the CEOS Implementation Plan for Space-based Observations for the GEOSS. It is based on the GEO Tasks described in the GEO 2009-2011 Work Plan. It further develops actions required for delivery of the space segment of the GEOSS – presenting an Implementation Plan focused exclusively on the space segment aspects and on the efforts of space agencies to implement it. It provides a year-end summary of CEOS accomplishments *vis-*

à-vis GEO. In conjunction with decisions taken at the 2011 CEOS and GEO Plenaries, this document also provides a baseline for establishment of the 2012 CEOS Work Plan. Further information on oversight for these activities is provided in Part II.

This document is *not* an all-inclusive summary of CEOS activities and accomplishments for 2011. Other CEOS accomplishments for 2011 were based on the interests of its collective membership, and those of other external stakeholders. These activities, including release of an updated and expanded Missions, Instruments, and Measurements (MIM) database, a review of CEOS and other information portals, a mapping of space-based measurement requirements against CEOS members' capabilities, and various CEOS outreach/communications efforts, are not addressed in this document.

Structure

The CEOS Implementation Plan is presented in three parts:

Part I: **An Introduction to the Plan –** This part describes the plan, its purpose, and to the GEO Tasks agreed between CEOS and GEO Secretariat for implementation of the GEOSS space segment. These Tasks have been derived from the GEO Strategic Targets. It also provides the existing and emerging priorities for CEOS in 2011.

Part II: **An Overview CEOS Implementation Mechanisms and Actions in Support of GEO –** This Part provides an overview of the various CEOS implementation mechanisms engaged in supporting GEO activities. It includes explanations of the CEOS Virtual Constellations, Working Groups, and Societal Benefit Coordinators. It also includes an introduction to how the information is presented in Part III.

Part III: **Space Segment Implementation Plan and Status –** This Part details the actions, milestones, delegation of responsibility, and CEOS coordination with other bodies required to achieve the CEOS actions related to the GEO Tasks for the GEOSS space segment expressed in Part I. It includes a current snapshot of progress by space agencies towards the actions identified and a review of progress during 2011.

This document will be significantly updated during 2012 as a result of the recent adoption of the 2012-2015 GEO Work Plan, and the role that CEOS Agencies will play in its implementation.

Part I will remain relatively static – as a description to the background to the plan and to the long-term Targets for the GEOSS space segment and the actions required to realize the Targets. It is expected that Part II will be revised following the annual updated edition of the GEO Work Plan which is endorsed at the GEO Plenary. Part III is intended to be updated annually.

2. SPACE-BASED OBSERVATIONS FOR GEOSS

GEOSS Long-term Targets

The GEOSS 10-Year Implementation Plan establishes the intent, operating principles, and institutions relating to GEOSS. It is supported by a longer Reference Document which is consistent with the Plan, and provides substantive detail necessary for implementation. The Plan was adopted at the third Earth Observation Summit in Brussels, in February 2005. The Reference Document was extensively reviewed by technical experts, countries and international organizations and sets out a series of Targets – to be achieved over 2, 6, and 10 year timescales – for the realization of the GEOSS. Those Targets were revised in 2009 and are described in the "GEOSS Strategic Targets" Document 12 (rev 1) endorsed at the GEO-VI Plenary (November 2009).

Those Targets are related to implementation of the space segment, or integration/ application of the space segment's outputs with other GEOSS components. They are grouped by SBA and cross-cutting domain and include objectives to be reached by 2015.

It should be noted that the outcome of the CEOS analysis reflects the different stages of maturity of the various SBAs – with Climate the most developed and studied. In 2011, space observation requirements were identified for the Biodiversity SBA while no space observation requirements were identified for the Weather SBA, hence CEOS created an CEOS SBA Coordinator for Biodiversity and rescinded the position for Weather. This change demonstrates the fluidity of resources and support to GEOSS.

GEO Work Plan Tasks

The GEOSS 10-Year Implementation Plan, its related Reference Document, and the Rules of Procedure were adopted when GEO was established in 2005. These documents form the basis for the definition of the GEO Tasks described in the GEO Work Plan. The 2009 - 2011 GEO Work Plan (WP) used for the generation of this 2011 CEOS IP was adopted in December 2010. This version of the 2009-2011 GEO Work Plan is available at http://www.earthobservations.org/documents/work%20plan/geo_wp0911_rev3_101208.pdf.

The GEO Tasks and Sub-Tasks aim at defining the activities to be undertaken by the GEO Members and Participating Organizations for the timely implementation of the GEOSS. The GEO Tasks are divided into two separate categories: *Building an Integrated GEOSS* and *The Nine GEOSS Societal Benefit Areas*.

CEOS Existing and Emerging Priorities in 2011

It must be noted that CEOS has a number of priorities that must be considered when determining how best to support external organizations, including GEO. The existing and emerging priorities for CEOS in 2011 are:

- Continued development and implementation of the CEOS Virtual Constellations

- Enabling the GEOSS Common Infrastructure and populating the GEOSS Date CORE, including optimization of CEOS Agency-related portals and web-based information access
- Improved coordination of climate-related activities (e.g., support to updated CL-09-02 Task, CEOS response to the 2010 GCOS Implementation Plan, input to a revised GCOS "Satellite Supplement", and initial activities of the CEOS Working Group on Climate)
- Terrestrial observations for land cover, land use change, urbanization, and agriculture (including global land cover and the Joint Experiments on Crop Assessment and Monitoring [JECAM] initiative)
- Continued progress in CEOS Forest Carbon Tracking from space, including GEO's Global Forest Observations Initiative (e.g., 2009-2010 GEO Forest Carbon Dataset and Results, 2011 GEO Forest Carbon data acquisitions, and CEOS FCT/GFOI Data Strategy 2011-2015
- Development of the CEOS response to the GEO Carbon Report
- New initiatives and outcomes in support of Data Democracy
- Support for the Geohazards Supersites initiative
- Support for the GEO Biodiversity Observation Network (GEOBON)
- Further development of and support to the Quality Assurance for Earth Observations (QA4EO) framework
- Use of remote sensing for enhanced conservation and informed management of fresh water resources
- Support to development and implementation of 2012-2015 GEO Work Plan

CEOS Support to GEO in 2011: Overview

CEOS was co-Lead for 16 GEO Tasks/Sub-Tasks from the GEO 2009-2011 WP (8 December 2010 version) and was a Task Contributor for an additional 25 Tasks/Sub-Tasks. The detailed list highlighting CEOS leadership and contributions to GEO 2009-2011 WP is available in the Annex – *CEOS Contributions to 2009-2011 GEO Tasks/Sub-Tasks.* Figure 2-1 summarizes only those Tasks/Sub-Tasks co-led by CEOS.

Task	GEO Task Title	CEOS Task Lead	Agency
	ARCHITECTURE		
AR-09-02a	Virtual Constellations	Makoto Kajii	JAXA
	CAPACITY BUILDING		
CB-09-05b	CBERS	Stefano Bruzzi	ASI
CB-09-05e	Data Democracy	Stefano Bruzzi	ASI
	CLIMATE		
CL-06-01a	Sustained Reprocessing and Reanalysis of Climate Data	Mitch Goldberg	NOAA
CL-09-02b	Key Climate Data from Satellite Systems	Mitch Goldberg	NOAA
CL-09-03b	Forest Carbon Tracking	Frank Martin Seifert	ESA
CL-09-03c	Global Monitoring of Greenhouse Gases from Space	Takashi Moriyama	JAXA
	DATA MANAGEMENT		
DA-09-01a	GEOSS Quality Assurance Strategy	Gregory Stensaas	USGS
DA-09-01b	Data, Metadata and Products Harmonisation	Martin Yapur	NOAA
DA-09-03a	Global Land Cover	Pascal Lecomte	ESA
DA-09-03d	Global DEM	Jan-Peter Muller	UKSA
	DISASTERS		
DI-06-09	Use of Satellites for Risk Management	Guy Seguin	CSA
DI-09-02b	Regional End-to-End Disaster Management Applications	Guy Seguin	CSA
	ENERGY		
EN-07-01	Management of Energy Sources	Richard Eckman	NASA
	HEALTH		
HE-09-03b	Predicting and Reducing Incidence of Vector-Borne and Zoonotic Diseases	Michelle Hertzfeld	NOAA
	WATER		
WA-06-07b	Africa	Diego Fernandez Prieto	ESA

Figure 2-1: 2009-2011 GEO Tasks Co-Led by CEOS

PART II: AN OVERVIEW OF CEOS IMPLEMENTATION MECHANISMS AND ACTIONS IN SUPPORT OF GEO

3. MANAGEMENT AND OVERSIGHT

The CEOS framework for management and oversight of the various actions directed towards implementation of the GEOSS space segment is summarized in Figure 3-1 and described in more detail below.

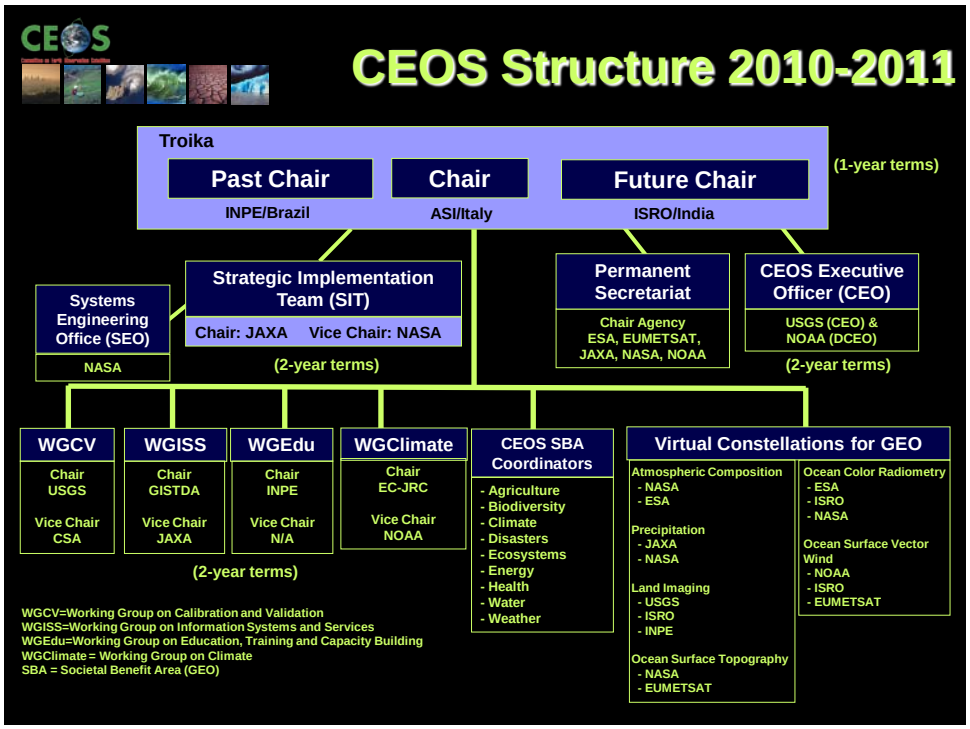

Figure 3-1: CEOS Structure

The CEOS Implementation Plan is developed under the authority of the CEOS Strategic Implementation Team (SIT) Chair by the CEOS Executive Officer and Deputy Executive Officer (CEO and DCEO), in close consultation with CEOS Agency actionees and the GEO Secretariat.

Implementation

There are four main implementation mechanisms (and resource pools) available to CEOS to undertake the work required on individual Actions in support of GEOSS Space Segment Tasks. In addition to the agencies and individuals listed in the following sections, these entities/organizations provide substantial support:

CEOS Virtual Constellations for GEO

The CEOS Virtual Constellations (VCs) for GEO consist of specialist teams assembled to provide focused resources and attention to particular implementation domains which have been designated as a special priority by SIT, and where it is possible to foresee tangible results in the near-term. The CEOS VCs are organized around the following domains: Atmospheric Composition, Land Surface Imaging, Ocean Color Radiometry, Ocean Surface Topography, Ocean Surface Winds, and Precipitation. In 2011, seventh VC was approved for Sea Surface

Temperature. Further Constellation teams may be added in due course. Each VC is led by CEOS agencies with a heritage of operations in the relevant EO domain, and a team of participants from other space agencies willing to contribute to implementation coordination through CEOS. VC leads are responsible for the delivery of outputs and results to SIT Chair, as the CEOS body responsible for oversight of the VCs, and of the CEOS IP progress and reporting in general.

The Constellations can be considered as a major CEOS cross-cutting activity, since many VCs do map directly to specific GEOSS space segment requirements (e.g. the Precipitation Constellation directly serves the GEOSS Targets numbers 44 and 156 calling for three-hourly global precipitation measurements and for implementation of the GPM and other supporting missions). The outputs of the VCs span the Targets of several SBAs – including Climate in all cases and the provision of observations for Essential Climate Variables – and are equally important in providing resources and attention to the issue of continuity of space-based observations for key measurements of Earth's oceans, atmosphere, and land surfaces.

Virtual Constellations for GEO Co-Leads	
Atmospheric Composition Constellation (ACC)	
Richard Eckman	NASA
Claus Zehner	ESA
Land Surface Imaging Constellation (LSI)	
Tom Holm	USGS
P.G. Diwakar	ISRO
Julio D'Alge	INPE
Ocean Colour Radiometry Constellation (OCR)	
Peter Regner	ESA
Prakash Chauhan	ISRO
Paula Bontempi	NASA
Ocean Surface Topography Constellation (OST)	
François Parisot	EUMETSAT
Eric Lindstrom	NASA
Ocean Surface Vector Wind Constellation (OSVW)	
Paul Chang	NOAA
Hans Bonekamp	EUMETSAT
B.S. Gohil	ISRO
Precipitation Constellation (PC)	
Steven Neeck	NASA
Riko Oki	JAXA
Sea Surface Temperature Constellation (SST)	
Ken Casey	NOAA
Craig Donlon	ESA

Table 3-1: Virtual Constellations Co-Leads

CEOS Working Groups

CEOS has four standing Working Groups, formed to provide expert (typically technical) advice on particular domains of interest to space agencies and to provide resources and capabilities to CEOS and its participating agencies in these domains.

Working Group on Information Systems and Services (WGISS): WGISS aims to stimulate, coordinate, and monitor the development of the systems and services which manage and supply the data and information from participating organizations' missions. WGISS aims to assist CEOS participants, as data providers, to maintain efficient support to diverse users worldwide for easy discovery, access, and application of these data. Thus, WGISS addresses the needs of data providers by improving their efficiency of operation and maximizing the usefulness and benefit of the EO data which they gather. WGISS also addresses the needs of data and information users by aiding the development of simpler and wider access to the resources they require.

Working Group on Calibration and Validation (WGCV): The aim of WGCV is to ensure long-term confidence in the accuracy and quality of Earth observation data and products. The WGCV provides a forum for instrument calibration and data validation (cal/val), information exchange, and related coordination activities. The WGCV promotes the international exchange of technical information and documentation, joint experiments, and the sharing of facilities, expertise and resources. The WGCV serves as the first point of contact for the international user community on cal/val issues. To this end, WGCV addresses the need to standardize ways of combining data from different sources to ensure the interoperability required for effective use of existing and future Earth observing systems.

Working Group on Capacity Building and Data Democracy (WGCapD)[1]: WGCapD was established in 1999 to facilitate CEOS activities that enhance education, training and capacity building in Earth observation techniques, data analysis, interpretation, and applications. In recent years the Working Group has placed increased emphasis on support to the GEO and CEOS Data Democracy initiatives, to facilitate the free distribution of remotely-sensed data and related software tools and training modules to enhance user capacity, with a particular focus on developing countries.

Working Group on Climate (WGClimate): The WGClimate, established in 2010, encourages and coordinates CEOS Agency activities in the area of climate monitoring, by facilitating the development and use of satellite-derived Essential Climate Variable (ECV) data records by the Global Climate Observing System (GCOS), as called for by the GEO Climate Task and the UN Framework Convention on Climate Change (UN FCCC). WGClimate also supports and advises on CEOS interfaces with the UN FCCC and the Intergovernmental Panel on Climate Change (IPCC).

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[1] Prior to 2011, WGCapD was known as the Working Group on Education, Training, and Capacity Building (WGEdu). The new name reflects an enhanced focus on the GEO/CEOS Data Democracy initiative.

Working Group Chairs are responsible for the interface between their Group and the SIT Chair, who has oversight of the efforts of the Working Groups in support of the CEOS Implementation Plan. Working Group Chairs also serve as the interface between the Constellation study team Leads and the GEO Work Plan and CEOS IP action contacts – since these groups have a recognized need for their technical expertise. The CEOS Plenary in 2005 accepted a Task Force report calling for the Working Group resources to be realigned primarily in support of the CEOS Implementation Plan Tasks (while allowing for a continued research function). This process is well underway.

CEOS Working Group Chairs/Vice Chairs		
Working Group on Calibration and Validation (WGCV)		
Chair	Greg Stensaas	USGS
Vice Chair	Satish Shrivastiva	CSA
Working Group on Information Systems and Services (WGISS)		
Chair	Pakorn Apaphant	GISTDA
Vice Chair	Satoko Miura	JAXA
Working Group on Capacity Building and Data Democracy*		
Chair	Hilcea Ferreira	INPE
Vice Chair	Jacob Sutherlun	NOAA
Working Group on Climate (WGClimate)		
Chair	Mark Dowell	EC-JRC
Vice Chair	John Bates	NOAA
*Formerly Working Group on Education, Training, and Capacity Building		

Table 3-2: CEOS Working Group Leadership

CEOS Societal Benefit Area Coordinators and Teams

CEOS has established nine Societal Benefit Area Coordination Teams in support of SBA-specific actions linked to the GEO Work Plan. Each Team is led by a CEOS SBA Coordinator, who is to work with relevant subject-matter experts on the GEO Secretariat staff. The CEOS Teams cover nearly all GEO subject-specific SBAs (with the recent exception of Weather) and the GEO Transverse Area SBA. CEOS SBA Coordinators are listed in Table 3-3.

CEOS Societal Benefit Area Coordinators		
Agriculture		
	Prasad Thenkabail	USGS
Biodiversity		
	Martin Wegmann	DLR
Climate		
	Mitch Goldberg	NASA
Disasters		
	Guy Séguin	CSA
Ecosystems		
	Asanda Ntsana	SANSA
Energy		
	Richard Eckman	NASA
Health		
	Murielle Lafaye	CNES
Water		
	Osamu Ochiai	JAXA

Table 3-3: CEOS SBA Coordinators

The CEOS Systems Engineering Office (SEO)

The CEOS SEO was established in April 2007, to facilitate the development of CEOS space constellation plans. The SEO provides systems engineering leadership, provides a framework for coherent architecture plans, and provides decision support tools for trade studies and the assessment of execution options to maximize the probability of their implementation. While the CEOS VCs and WGs are diverse and have multiple goals, selected commonality and a consistent systems analysis approach will strengthen plans and improve coordination and collaboration toward the realization of the GEOSS.

To date, the SEO technical efforts include requirements definition, constellation assessment, gap analyses, and future architecture development. In addition, the SEO fosters communications among CEOS partners by coordinating and participating in CEOS Constellation Workshops and Working Group meetings, developing tools for file sharing and action item tracking, developing visualization products for educating the global Earth Observation community about CEOS, and supporting the content development and management of the CEOS website. The SEO has been very instrumental in several activities in 2011 to support other CEOS groups in their support to GEO.

4. CEOS Implementation Plan Actions – Including Support to GEO Work Plan Tasks

CEOS is supporting a large number of GEO Work Plan Tasks, with the majority, naturally, aimed at implementation of the GEOSS space segment and the Targets outlined in Part I. In addition, CEOS has defined further actions – beyond those being undertaken under the GEO umbrella – specifically in support of the CEOS Implementation Plan. The first set of these were defined in association with the Global Climate Observing System (GCOS) Implementation Plan, and are intended to ensure that the detailed Targets specified by GCOS for the GEOSS Space segment, are satisfied.

For each of the GEO WP Tasks and CEOS IP action defined and underway, a Lead Agency and Point of Contact has been identified – with the responsibility of steering progress on the action and of reporting to the CEOS Executive Officer (CEO). The CEO supports the SIT Chair by overseeing these Contacts and collating periodic inputs in support of the annual status reports on the CEOS IP, which the SIT Chair must develop for the CEOS Plenary meetings. The CEO also takes responsibility for liaising with the GEO Secretariat on these efforts and coordinating the provision of update reports to GEO Secretariat on a recurring basis.

Oversight

Following a 2005 Task Force Report, CEOS adopted the following recommendations:

- The SIT Chair should be the principal CEOS interface with GEO at the working level;
- SIT meetings should be planned and scoped to optimize progress on the main business of implementation of CEOS's contribution to the GEOSS space segment;
- SIT should play the central role in coordination of existing and future missions of CEOS agencies to support GEO in its realization of the space segment of GEOSS;
- SIT must be clear about what can be achieved with existing and planned missions - so that the expectations of the user community and policy makers defining various information needs will not be disappointed;
- Having SIT as the principal interface to GEO should not preclude direct communication between GEO and individual CEOS Agencies. Such communication should continue where necessary, with all parties encouraged to ensure that the SIT Chair is kept informed of any developments;
- The SIT Chair should make, maintain and report to the CEOS Chair and Plenary annually, for endorsement by CEOS Principals, CEOS agency commitments for the GEOSS 10-Year Implementation Plan.

Thus, the SIT Chair oversees progress against the annual CEOS Implementation Plan – assisted in the communication and collation of information by the Constellation study team leaders, Working Group Chairs, and the CEO and DCEO. The SIT Chair provides the 'big picture' analysis of actual progress towards the space segment Targets being achieved by the individual GEO WP Tasks, Constellation studies, or other CEOS IP actions; and will identify - for the attention of SIT and CEOS Plenary meetings – overall progress, issues and obstacles, and priorities for the

coming year. These analytical reports will form the basis for Part III of the Implementation Plan, which will be updated annually for presentation to CEOS Principals.

CEOS activities continue to be undertaken on a best-efforts basis. Top-down management of effort and resources is, in general, loosely applied – and overall progress is at a rate determined by the contributions of individual agencies and their willing staff.

CEOS Actions in Support to GEO

Following the endorsement of the revised GEO 2009-2011 Work Plan during the GEO-VII Plenary (November 2010), CEOS looked internally to refine and define a set of CEOS Actions supporting the Tasks of the new Work Plan and to consolidate the CEOS Actions defined in 2010 and described in the CEOS IP v4.1. This definition phase started with an initial CEOS-GEO Secretariat bilateral meeting (December 2010) where the participants pre-identified the GEO Tasks where CEOS support was most anticipated. Proposals of activities related to that list of GEO Tasks were generated by staff from all CEOS Agencies during January 2011.

A workshop organized in Arlington, VA, USA, 16-17 February 2011 by the CEOS Executive Officer (CEO) and CEOS Systems Engineering Office (SEO), gathered CEOS Virtual Constellation Leads, the CEOS Working Group Chairs, the CEOS SBA Coordinators, CEOS Chair representative, and SIT Chair representatives, as well as other interested CEOS entities helped to define an initial list of 16 Actions based on the proposals received from CEOS Members, in addition to the 59 CEOS "GCOS" actions. In addition, 25 Actions from 2010 were updated and revised and continued into 2011 and 9 Actions were identified as under further review/classification.

Each proposed Action had to meet five criteria:

- Address one of the GEO Tasks identified during CEOS-GEO meeting, with Actions addressing one of the top CEOS priorities favored;
- Cooperation of at least two CEOS Agencies;
- Significant level of efforts and good coordination;
- Significant and citable benefits towards meeting societal needs;
- "Actionable" (properly described, feasible with Lead Agencies [or WG, VC], at least one Contributor, clear Milestones and Deliverables)

As was the case in 2008, 2009, and 2010, CEOS Principals representing CEOS agencies leading the actions were requested to confirm the allocation of resources necessary to the timely execution of their Actions.

In 2011, a final count of 46 Actions was captured in support of 18 GEO Tasks. The Actions were evenly split between Category 1 (Top Priority) and Category 2 Actions (22 and 24, respectively). Category 1 Actions were those Actions related both to GEO Tasks led/co-led by CEOS and related to CEOS's existing and emerging priorities for 2011 (as described previously in Part I), and considered critical for CEOS contribution to GEO in 2011.

Category 1 Actions were distinguished by the following criteria:

- Data provision (including data reprocessing) and data access (including data interoperability, and user portals)
- Scientific and Calibration/Validation
- Programmatic (planning of future missions/sensors, requirements/gaps analysis, funding)
- Capacity Building

To improve the management of the CEOS Actions in support to GEO, the System Engineering Office (SEO, NASA) developed a web-based on-line CEOS-GEO Action Tracking System, accessed directly from the CEOS Home Page (see "Actions" tab on www.ceos.org). This Actions Tracker provides real-time status reports for each CEOS-GEO Action with direct linkages to the GEO Task Sheets. It also provides online editorial privileges for CEOS Actions Leads. The Actions Tracker also provides a "one-stop shop" for historical reference to all open and closed Actions. Figure 4.1 is a screenshot of the CEOS-GEO Action Tracking System.

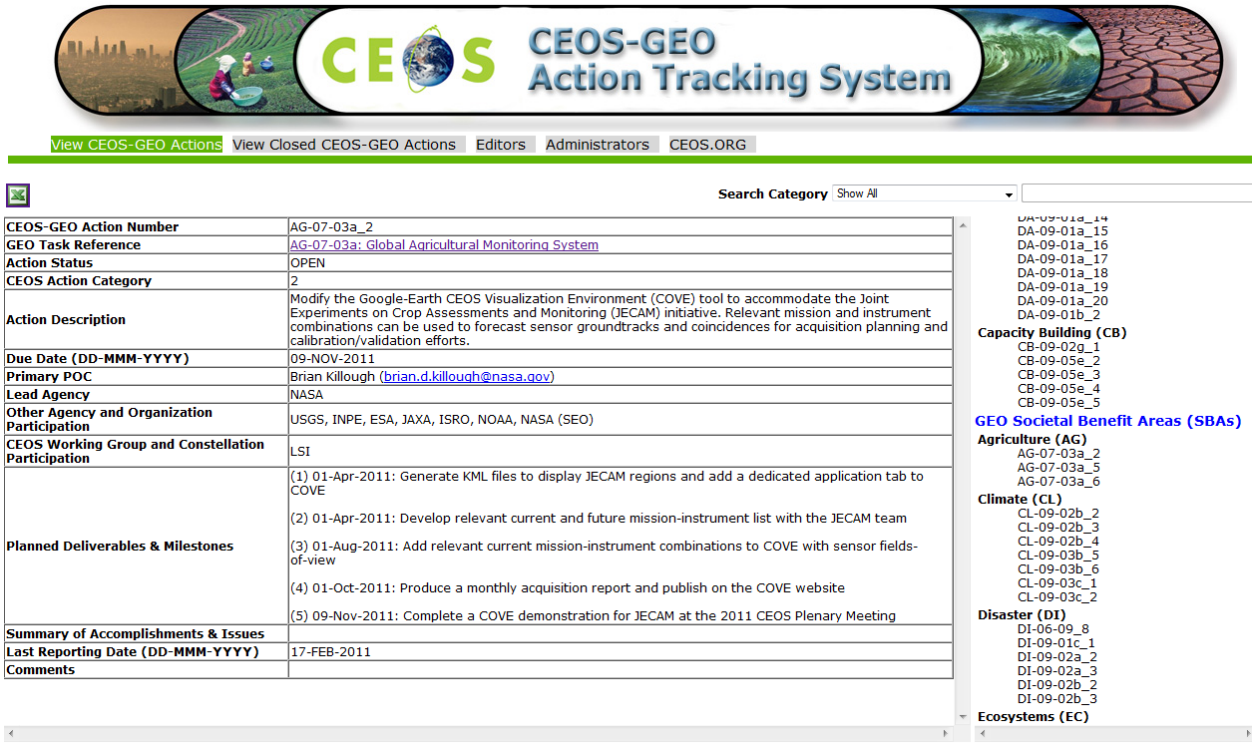


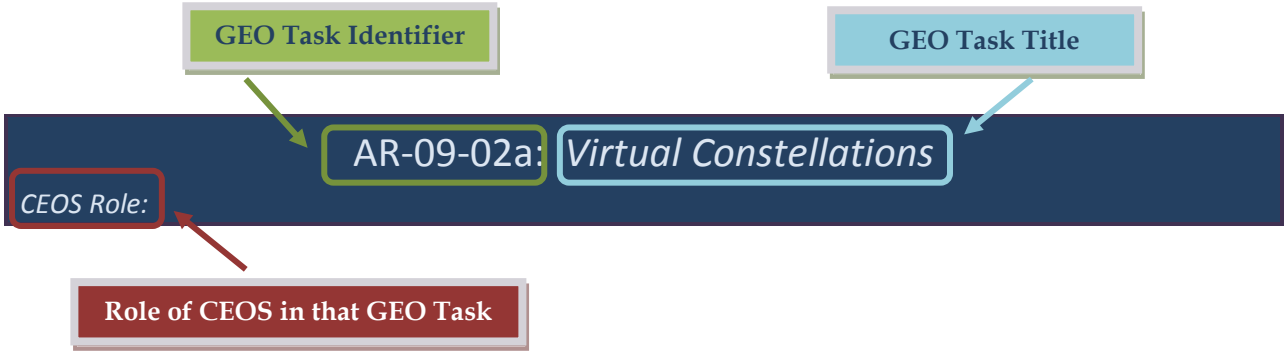
Figure 4-1: Screenshot of Online CEOS-GEO Action Tracking System

How to Interpret Part III

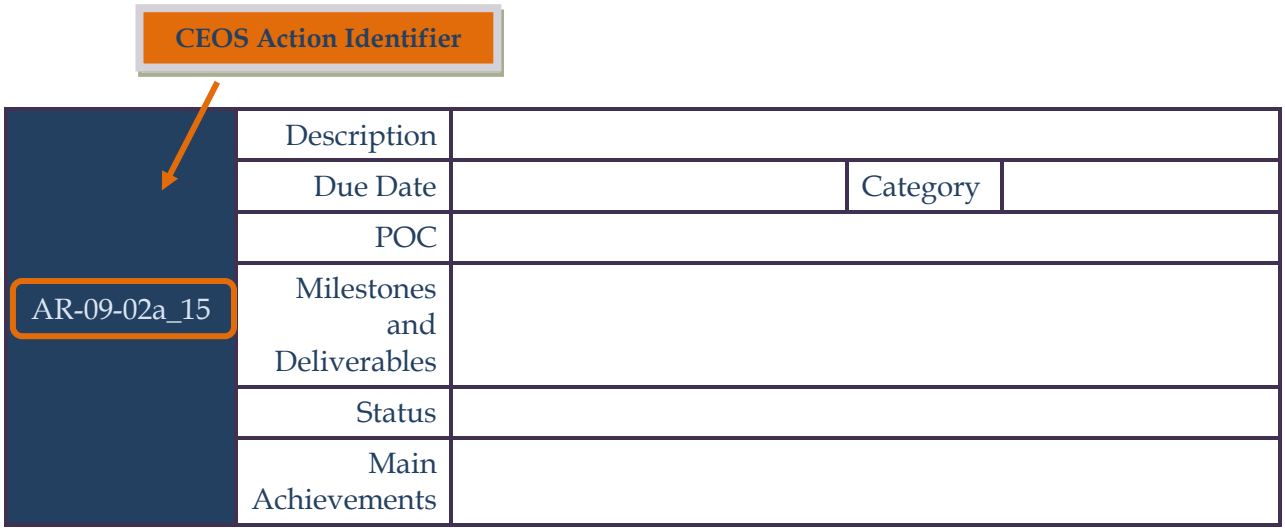
The purpose of this section is to provide the user with some information to facilitate the understanding of Part III.

Part III is composed of several sections which reference the GEO 2009-2011 Work Plan, with four sections on *Building an Integrated GEOSS* and nine sections on *The Nine GEOSS Societal Benefit Areas.* Each section contains the list of GEO Tasks supported by CEOS and the list of corresponding CEOS-GEO Actions. Each GEO Task is followed by one or more CEOS Action(s) related to that specific GEO Task.

The name of the GEO Task is contained in a blue box as represented in the example below:



This blue box is followed by one or more tables that provide the descriptions of one or more CEOS GEO Actions contributing to that specific GEO Task, as shown in the following example:



PART III: SPACE SEGMENT IMPLEMENTATION PLAN AND STATUS

STATUS SUMMARY

Part III of this document summarizes the implementation status of the GEOSS space segment, as characterized by progress towards the relevant GEO Tasks identified in the GEO 2009-2011 Work Plan, providing a detailed status of the actions, milestones, delegation of responsibility, and CEOS coordination with other bodies required to achieve the CEOS Actions related to the GEO Tasks for the GEOSS space segment expressed in Part I. It includes a current snapshot of progress by space agencies towards the Actions identified and a review of progress during 2011.

Part III is intended to be updated annually and is the basis of the report of the SIT Chair (responsible for overseeing execution of the CEOS IP) to the CEOS Plenary meeting and to the GEO Secretariat. The sections below report on the status by providing details for each Action, on the main achievements with respect to the initial list of milestones and deliverables.

Characteristics of CEOS GEO Actions

After the CEOS-GEO Actions workshop organized by SIT (Feb 16-17, 2011), a series of 46 CEOS Actions were defined in support of 18 GEO Tasks/Sub-Tasks. Those 46 Actions were led by 13 CEOS Agencies. The Actions were grouped into two categories, 1 and 2, that indicated their degree of priority. Category 1 Actions were those Actions related both to GEO Tasks led/co-led by CEOS and related to CEOS's existing and emerging priorities for 2011 (as described previously in Part I), and considered critical for CEOS contribution to GEO in 2011. All remaining Actions were considered as Category 2.

Category 1	Category 2	Total	Open CEOS Actions in Support of 18 GEO Tasks/Sub-Tasks
22	24	46	

Most of Category 1 Actions relied on activities either ongoing or already planned by the CEOS Agencies. However, the level of efforts (financial, human, etc.) overall was considerable but not distributed equally among CEOS Agencies (two-thirds of the CEOS Actions are being led by five CEOS Agencies).

CEOS Working Groups and Constellations were involved in 37 CEOS Actions. There were many instances where Working Groups and Constellations were supporting the same Actions.

Working Group/Constellation	Number of Actions
Working Group on Calibration and Validation	10
Working Group on Information Systems and Services	10
Working Group on Climate	4
Working Group on Capacity Building and Data Democracy*	6
Atmospheric Composition Constellation	8
Land Surface Imaging Constellation	16
Ocean Colour Radiometry Constellation	5
Ocean Surface Topography Constellation	5
Ocean Surface Vector Wind Constellation	3
Precipitation Constellation	8
Sea Surface Temperature Constellation**	0

* Formerly the Working Group on Education, Training and Capacity Building (WGEdu)
** Sea Surface Temperature VC was just approved at the Nov 2011 Plenary so no Actions

Progress on Actions

The progress of each Action is measured against its planned milestones and deliverables, defined early in 2011. The Lead Agencies for each Action were asked to update the status of the Actions regularly, using the online CEOS-GEO Action Tracking System. Because the online tracking system was a new system, regular updates were not provided. Instead, updates were provided only when requested by the CEO/DCEO in anticipation of key CEOS meetings. The Actions were updated three times in 2011: once prior to the May 2011 SIT-26 meeting; again prior to the September 2011 SIT Workshop; and lastly in early 2012, in preparation for the final updating reporting provided by this IP.

The following tables provide information on the final status of the CEOS Actions (as of 16 February 2012).

- 27 Actions were CLOSED
- 2 Actions were DELETED (due to lack of interest, deliverables, milestones, etc.)

- 17 Actions are OPEN and will be remapped to the 2012-2015 GEO Work Plan

Sections 5 through 18 highlight the 46 Actions that were defined in 2011 in support of 18 GEO Tasks/Sub-Tasks.

5. IMPLEMENTATION OF THE SPACE SEGMENT FOR ARCHITECTURE

In 2011, there were six (6) Category 1 Actions and four (4) Category 2 Actions in support of GEO Architecture Tasks/Sub-Tasks, for a total of ten (10) Actions. Of those ten Actions:

- Eight were closed in 2011
- Two will be remapped to the 2012-2015 GEO Work Plan

AR-09-02a: *Virtual Constellations*

CEOS Role: Co-Lead this GEO Sub-Task

AR-09-02a_15	Description	Maintain continuity with one high-accuracy, lower inclination Jason-type and at least two, lower-accuracy, higher-inclination, altimeters.		
	Due Date	31 December 2014	Category	**1**
	POC	François Parisot, EUMETSAT Eric Lindstrom, NASA (Stan Wilson, NOAA)		
	Milestones/ Deliverables	• Jul 2011: SOA/CNSA launch HY-2A; • Sep 2011: Retirement of ESA ERS-2 completed • Apr 2012: ISRO/CNES launch SARAL/AltiKa. • End of 2012: ESA, EUMETSAT & NOAA completePhase B Study for Jason-CS • 2013: ESA launch Sentinel-3A. • 2014: EUMETSAT & NOAA launch Jason-3		
	Status	**CLOSED**		
	Main 2011 Achievements	• Jason-2/OSTM is maintaining the sea level time series (now 20-year time series). • Jason-3 instrument development is on track for delivery of instruments to CNES for integration in 2013. Uncertainty in schedule has been introduced into the Jason-3 project by launch vehicle issues (two NASA losses on the intended Taurus XL launch vehicle). Selection of alternative means to space is expected in early 2012. • For the period beyond Jason-3, ESA, EUMETSAT and NOAA are working together on a Phase B Study for Jason-CS (Continuity of Service) altimetry, to be completed at the end of 2012 with a		

		launch planned for 2017. • Jason-1 is being maintained in an interleaved orbit with Jason-2 until such time as SARAL/AltiKa is launched and its data stream is validated. • The commissioning phase for ESA's Cryosat-2 (launched in Febr 2010) was completed in Oct 2010, and a Cal/Val Workshop was held in early Feb 2011. • Further tracking of progress of this activity will be folded into the reporting of the Ocean Surface Topography Constellation in 2012.

AR-09-02a_19	Description	Extend the capability of altimetry to denser observational coverage through the development of swath altimetry.		
	Due Date	31 December 2010	Category	**1**
	POC	Eric Lindstrom, NASA Eric Thouvenot, CNES (Selma Cherchali as of Jan 2012)		
	Milestones/ Deliverables	• Jun 2010: Delivery concept pre-phase A report • Dec 2010: Agreement on Responsibility Sharing, and Action End Date		
	Status	**CLOSED**		
	Main 2011 Achievements	• CNES/NASA letter of Apr 4, 2011; confirmed CNES receipt of investment program funding for SWOT. • CNES/NASA SWOT MOU signed in Sep 2011. • NASA and CNES have reached agreement on responsibility sharing for SWOT Mission in last quarter of 2011 so the Dec 2010 milestone is complete. • The SWOT Mission is in Phase A in France and in the USA the mission will go through reviews to enter Phase A in mid-2012 (Mission Concept Review in late May and Key Decision Point A targeted for Jul). Target launch readiness date is Dec 2019. • Documents related to pre-phase A concept studies are available at the SWOT website http://swot.jpl.nasa.gov and a lengthy Mission Science Document is available at ftp://ftp-oceans.jpl.nasa.gov/pub/llf/SWOT/SWOT_MSD_Draft_112211.pdf . • The Jun 2010 milestone with regard to pre-phase A reports is complete. • As of Jan 2012, the overall CEOS Action on the development of swath altimetry may be considered closed. The lead partners in the mission - NASA and CNES and the science communities of physical oceanography and surface water hydrology have been successful in early formulation studies and concept design of an executable swath altimetry mission planned for launch in Dec 2019. • Further tracking of progress of this activity will be folded into the reporting of the Ocean Surface Topography Constellation in 2012.		

AR-09-02a_26	Description	Complete the definition of standards (guidelines) for future mid resolution LSI satellite systems to produce information products that benefit several SBA areas.		
	Due Date	7 November 2011	Category	**1**
	POC	Tom Holm USGS Julio D'Alge, INPE PG Diwakar, ISRO		
	Milestones/ Deliverables	• Mar 2011: Complete 2nd draft report for review by the LSI Constellation Team. • Jun 2011: Complete 3rd draft report for review by the LSI Constellation Team. • Sep 2011: Final report completed and presented at the CEOS SIT Workshop. • Oct 2011 - submit a plan for use by the land imaging community at the CEOS Plenary		
	Status	**CLOSED**		
	Main 2011 Achievements	• Aug 2011 LSI Mid-Resolution Optical Guidelines document completed. The Guidelines are available on the CEOS website: http://ceos-actions.com:8080/CEOS/documents/1/1.pdf		

AR-09-02a_29	Description	Implement common data processing parameters, data formats, and map projections.		
	Due Date	30 April 2011	Category	**2**
	POC	Tom Holm USGS Julio D'Alge, INPE PG Diwakar, ISRO		
	Milestones/ Deliverables	• Feb 2011: Release of stand-alone command line orthorectification tool. • Apr 2011: upgrade SPRING freeware GIS with Orthorectification.		
	Status	**CLOSED**		
	Main 2011 Achievements	• This action is proceeding with support from INPE. INPE has concluded that there was no longer a need for it to develop image format conversion tools, since anyone can now provide images in GeoTIFF format (resulting in a closed LSI action). As an alternative, INPE has released Marlin (www.dgi.inpe.br/CDSR) as open source software. Marlin is a tool for image visualization and analysis. It is the same tool that INPE uses to test radiometry and geometry of CBERS image data. • INPE is using an ongoing GIS software project, SPRING		

		(www.dpi.inpe.br/spring) presented at LSI workshop (Sep 2010). • Final delivery of SPRING version, containing the Orthorectification was initially planned for Dec 2010 but was delivered Apr 2011. • INPE has also developed a stand-alone command line orthorectification tool which will support all med-resolution sensors that are available: Landsat, Resourcesat, and CBERS.

AR-09-02a_32	Description	Gap assessment and coordination of GEO Geostationary atmospheric composition measurement .		
	Due Date	31 December 2011	Category	2
	POC	Jay Al-Saadi, NASA		
	Milestones/ Deliverables	• Feb 2011: Final report delivered (change from Oct 2010) • May 2011: Consideration of white paper by Principals at SIT-26 • Jun 2011: Next steps discussed at ACC-7 workshop		
	Status	**CLOSED**		
	Main 2011 Achievements	• Mar 2011: Paper completed, including revisions following review by CEOS Constellation members. Document publicly available on the CEOS ACC website: http://www.ceos.org/images/ACC/AC_Geo_Position_Paper_v4.pdf ; was presented for consideration by Principals during SIT-26. • May 2011: Paper recommendations endorsed without comment by Principals during SIT-26. • Jun 2011 During ACC-7 meeting, agreed this Action is complete and agreed to propose a new 3-year Action to implement the three recommendations endorsed during SIT-26.		

AR-09-02a_33	Description	Publish an International Ocean Colour Coordinating Group (IOCCG) report with new Level-1 Ocean Colour Radiometry requirements. This report will consider radiometric observations, spectral bands, data quality (cal/val), data formats, reprocessing, new products and applications, societal needs and the CEOS constellation concept.		
	Due Date	30 June 2012	Category	2
	POC	Paula Bontempi, IOCCG (NASA)		
	Milestones/ Deliverables	• Apr 2010: First IOCCG Workshop (Washington DC, USA) • Nov 2010: Second IOCCG Workshop (Europe) • Mar 2012: IOCCG-17 Meeting, Present Draft Report • Jun 2012: Complete Final Report		
	Status	OPEN – to be remapped to 2012-2015 GEO Work Plan		
	Main 2011	• 1st meeting of the IOCCG working group addressing Level 1 Requirements for Ocean-Colour Remote Sensing held in		

	Achievements	Washington, D.C. from 20-21 Apr 2010. Goal of the working group is to develop a consensus for the minimum requirements for ocean-colour sensors that meet a broad range of user needs, and to identify options to sustain a long-term, global, climate research quality ocean-colour dataset. Representatives from NASA, ESA, JAXA, CNES and NOAA took part in the meeting and discussed the science traceability matrix (STM) in detail, which will provide the structure upon which the report of the working group will be based. An outline for the report was drafted, identifying the lead authors for each of the seven chapters (see the Minutes of the meeting). • The IOCCG Level 1 Requirements report draft will be discussed at the IOCCG-17 meeting, 28 Feb to 2 Mar 2012. The writing team will refine and finalize by Jun 2012.

AR-09-02a_36	Description	Conduct study of the availability of conical scanning microwave imagers (MI) in the late-GPM Phase and the Post-GPM Phase of the Precipitation Constellation.		
	Due Date	30 November 2011	Category	**2**
	POC	Steve Neeck, NASA Riko Oki, JAXA		
	Milestones/ Deliverables	Report to be made available to PC Agencies in October 2011 with final report provided to SIT by Nov 2011.		
	Status	**CLOSED**		
	Main 2011 Achievements	• Prepared final report following receipt of Roshydromet Satellite Program information. Revised milestones reflecting delays in Roshydromet information and report finalization. • Report was reviewed at 4th CEOS PC Workshop Nov 2011. Study leads to finalize paper with distribution to PC Agencies and to SIT by end of 2011. • Study leads finalized paper and distributed to PC Agencies and SIT. Revised deliverables and milestones are: • Sep 2011: Delivery of the report to CEOS PC leads – COMPLETE • Oct 2011: Delivery of report to CEOS PC members – COMPLETE • Dec 2011: Final approval of report and submission to SIT - COMPLETE		

AR-09-02a_37	Description	Provision of optical satellite data through LSI in support of Joint Experiment for Crop Assessment and Monitoring (JECAM).		
	Due Date	30 November 2011	Category	**1**
	POC	Tom Holm USGS Julio D'Alge, INPE		

		PG Diwakar, ISRO
	Milestones/ Deliverables	• Feb 2011: Transmission of full JECAM proposal to CEOS Chair (cc to JAXA [SIT Chair], LSI, Ag SBA Coordinator, CEO/DCEO, SEO • Mar 2011: Statement of JECAM Support by CEOS SIT • Apr 2011: CEOS Data Coordination Meeting for JECAM • Nov 2011: Organize JECAM-CEOS Exchange Meeting
	Status	OPEN – to be remapped to 2012-2015 GEO Work Plan
	Main 2011 Achievements	• LSI request for support from CEOS Member Agencies for JECAM Project [USGS (Tom Holm), INPE (Julio Dalge), ISRO (VS Hegde) letter of Sep 1, 2010. • Initial exchange of letters between Jose Achache (GEO Secretariat) and Gilberto Camara (INPE, 2010 CEOS Chair). • Discussion of JECAM support at Nov 2010 CEOS Plenary and related action. • Ongoing data provision by selected CEOS Agencies • Recommend remapping to AG-01, *Global Agricultural Monitoring and Early Warning* - C1, *A Global Observational Monitoring System of Systems for Agriculture Production, Famine Early-warning, Food Security, and Land Use Change* - Priority Action, *Undertake Joint Experiment Crop Assessment and Monitoring (GEO-JECAM).*

AR-09-02a_38	Description	Continue progress in instrument and spacecraft manufacturing and testing for GPM implementation, advancing GPM science algorithms through ground validation experiments, and partnership building with space agencies to contribute additional microwave sensors and satellites to the GPM constellation. Action is necessary to realize GPM Phase of Precipitation Constellation.		
	Due Date	1 December 2011	Category	**1**
	POC	Steve Neeck, NASA Riko Oki, JAXA		
	Milestones/ Deliverables	Completed Milestones: • Conduct MC3E Field Campaign (NASA, DOE)(2Q2011) • Complete GMI-1 instrument Pre Environmental Review (NASA)(3Q2011) • Implement a NASA-CNES-ISRO agreement on Megha Tropiques-GPM cooperation (4Q2011) • Implement a NASA-INPE agreement on GPM cooperation (4Q2011) • Prepare for GPM Cold-season Precipitation Experiment (GCPEX) field campaign (NASA, Environment Canada)(4Q2011) Other Milestones: • Hold GPM International Planning Workshop (2015) and 4th CEOS Precipitation Constellation Workshop (4Q2011)		

		Complete Core Spacecraft Bus integration and testing (NASA)(4Q2011) • Ship DPR instrument (KaPR and KuPR PFMs) for integration on the Core Spacecraft (JAXA)(1Q2012) • Ship the GMI instrument for integration on the Core Spacecraft (NASA)(1Q2012) • Integrate DPR and GMI instruments on Core Spacecraft bus (NASA, JAXA)(1Q2012)
	Status	**CLOSED**
	Main 2011 Achievements	• Completed six week MC3E field campaign in Oklahoma, USA on Jun 22. • Completed preparations for GCPEX including a field operations dry-run for the NASA-EC GPM Cold-season Precipitation Experiment (GCPEX) in Canada was held Dec 15. • Completed GMI instrument Pre-Environmental Review on Jul 19-20. • NASA completed negotiations on the NASA-CNES-ISRO agreements on Megha Tropiques-GPM cooperation. The agreements are being finalized for signing in Oct. The NASA-CNES Megha-Tropiques-GPM Implementing Agreement was signed in Sep. • Revised milestone date on NASA-INPE agreement on GPM cooperation reflecting continuing review by the US and Brazil of the draft Implementing Arrangement. NASA and AEB/INPE signed GPM study Implementing Arrangement in Oct. • Rescheduled the GPM International Planning Workshop to 2012 and location and 4th CEOS Precipitation Constellation Workshop to Nov 10 in Denver, Colorado, USA due to impact of 2011 Great Tohoku Earthquake in Japan. • Revised DPR instrument shipment date due to impact (facilities damage) of 2011 Great Tohoku Earthquake in Japan and hardware development issues. Revised DPR and GMI integration on Core Spacecraft date due to instrument delivery delays. Both DPR and GMI thermal vacuum testing was completed in December. NASA and Environment Canada signed Letter of Agreement for GCPEX. Completed preparations for GCPEX including site preparation, instrument deployment, and a field operations dry-run.

AR-09-02a_39	Description	Continue TRMM operations through 2011. Action is necessary to support GPM Preparatory Phase of the Precipitation Constellation.		
	Due Date	31 October 2011	Category	**1**
	POC	Steve Neeck, NASA Riko Oki, JAXA		
	Milestones/ Deliverables	• Mar 2011: Submission of TRMM mission extension proposal to NASA ESD Senior Review Panel - COMPLETED		

		• May 2011: 2011 Senior Review Panel Meeting - COMPLETED • Sep 2011: NASA ESD Senior Review guidance on mission extension, allowing for the completion of 14 years of of TRMM 3-hr, multi-satellite standard products (TMPA, 3B42), through Dec 2011 - COMPLETED
	Status	**CLOSED**
	Main 2011 Achievements	The TRMM Senior Review Proposal was submitted in March and evaluated in the May 3-5 Senior Review Panel Meeting. The panel's report was published on Jul 26 for use in developing the NASA Earth Science Division (ESD) guidance on TRMM operations in Fiscal Year 2012 and beyond per the planned September milestone. The report recommended continued funding of TRMM operations in US Government Fiscal Year 2012-2013 and that a further two years of operations be budgeted subject to review of the spacecraft's health and propellant usage by the 2013 Senior Review Panel. The report can be found at http://nasascience.nasa.gov/earth-science/missions/operating/. The NASA ESD guidance letter was released on 26 Sep.

6. Implementation of the Space Segment for Data Management

In 2011, there were four (4) Category 1 Actions and five (5) Category 2 Actions in support of GEO Data Management Tasks/Sub-Tasks, for a total of nine (9) Actions. Of those nine Actions:

- Two were closed in 2011
- Five will be remapped to the 2012-2015 GEO Work Plan
- Two were deleted for lack of clarity/definition

DA-06-01: *GEOSS Data Sharing Principles*

CEOS Role: N/A

The following two CEOS Actions were originally opened during the February 2011 CEOS Actions Workshop but were never fully developed and were thus recommended for deletion during the September SIT Workshop. We have counted them as OPEN actions because they were formally accepted at the February Workshop, then CLOSED, for accounting purposes.

DA-06-01_2	Description	Data Collection of Open Resources for Everyone (Data-CORE)		
	Due Date	N/A	Category	**1**
	POC	N/A		

	Milestones/ Deliverables	Never Developed
	Status	**CLOSED-DELETED**
	Main 2011 Achievements	Lack of clarity/definition

DA-06-01_3	Description	Licensing and Attribution		
	Due Date	N/A	Category	**1**
	POC	N/A		
	Milestones/ Deliverables	Never Developed		
	Status	**CLOSED-DELETED**		
	Main 2011 Achievements	Lack of clarity/definition		

DA-09-01a: *GEOSS Quality Assurance Strategy*

CEOS Role: Co-Lead this GEO Sub-Task

DA-09-01a_12	Description	Use Dome-C as prototype and developing continued and on-going methodology to tie into the Cal/Val portal enhancement as a reference for Landnet sites.		
	Due Date	31 March 2012	Category	**2**
	POC	Nigel Fox, UKSA Satish Srivastava, CSA		
	Milestones/ Deliverables	• Mar 2011: Use Dome-C as prototype and developing continued and on-going methodology to tie into the cal val portal enhancement as a reference for Landnet sites. • Mar 2011: Evaluate prospect of BRDF at the Italian base in Antarctica as a test. • Dec 2011-Jan 2012: Dome C intercomparison campaign planned; any interested parties may participate. • Jun 2012: Establish detailed surface BRDF data of DOME-C to provide improved corrections for satellite view and illumination geometries.		
	Status	OPEN – to be remapped to 2012-2015 GEO Work Plan		
	Main 2011 Achievements	• The Phase 2 study of the Dome C project has been completed. A journal paper has been submitted to the Canadian Journal of Remote Sensing. The study shows that most of the 7 radiometers agreed well within 2% at the Dome C, although some		

		instruments still have large biases. It is very promising that the Dome C site can be used as a community reference standard site for all space agencies. • Results of the DOME C comparsions (and others) were discussed as part of a CEOS IVOS workshop held in ISPRA in Oct 2010. This workshop sought to develop a strategy for on-going and regular use of such a site as part of a global calibration system for CEOS. • An intercomparison campaign is planned over Dome C from December 2011 to January 2012. • The WGCV's SAR subgroup is investigating the potential use of the DOME C for the radiometric calibration of SAR. RADARSAT-2 SAR data at C-band is being routinely acquired and analyzed for radiometric characterization of the site. Compared to Amazon, backscatter level is low but consistency of measurements appears commensurate with (if not better than) Amazon data for incidence angle> 30°. • An experiment to determine the localised small scale surface measurement of BRF of Snow near to DOME-C has been carried out in Dec 11/Jan 12 using the same goniometer as used at Tuz Golu (GRASS from NPL) led by the Italian antarctic research group and Royal Holloway coll London, following on from a pilot exercise carried out at the Terranova base in 2010/11 which included the addition of JRC.

DA-09-01a_13	Description	The Quality Assurance Framework for Earth Observation (QA4EO) will be implemented for GEOSS and broadened to ensure QA4EO's application to all EO disciplines within all SBA communities. A wider focusing task team with new leadership and representation from all SBA communities is to be identified. This team will work towards an appropriate implementation and action plan to achieve a solid QA4EO approach for all members of GEOSS. The dedication of necessary resources (secretariat and facilitation support, website maintenance, etc.) is also part of this process.		
	Due Date	31 December 2011	Category	**1**
	POC	Greg Stensaas, USGS		
	Milestones/ Deliverables	• QA4EO Workshop was held in October 2011. • Draft QA4EO Implementation Plan currently under development		
	Status	**CLOSED**		
	Main 2011 Achievements	• For more information visit http://qa4eo.org/. • The goal of QA4EO is to understand how all data sets can work together, and how CEOS members can provide interoperability and use multiple data sets to develop integrated science products. The quality assurance indicators are to be used across various/multiple levels of products.		

		• The QA4EO team is seeking to establish a high-level coordination body within CEOS. The team will continue to promote QA4EO within CEOS and to assist in the development of domain-specific procedures within the WGCV subgroup communities. Work on the establishment of a GEO QA4EO board, responsible for QA4EO implementation across GEOSS, is also underway. It is envisaged that this board will comprise members from all the GEO Societal Benefit Areas (SBAs), with support from CEOS and others. • A QA4EO implementation workshop was held 18-20 October 2011 at RAL, UK. At that workshop, a roadmap working towards QA4EO implementation across EO communities for GEOSS was discussed and established.

DA-09-01a_14	Description	Develop a Cal/Val test site dossier over the WGCV subgroup domains to assist implementation of QA4EO for GEOSS.		
	Due Date	31 March 2012	Category	2
	POC	Greg Stensaas, USGS Philippe Goryl, ESA		
	Milestones/ Deliverables	• Dec 2011: A list of CEOS-endorsed reference sites was published by each WGCV subgroup domain • Mar 2012: Create an automated intercalibration process for the test sites on the Cal/Val Portal.		
	Status	**CLOSED**		
	Main 2011 Achievements	• The WGCV and its subgroups are working on the definition of a list of CEOS endorsed reference sites. Once defined, the list will be presented to CEOS plenary and CEOS Member Agencies will be requested to collect and provide information of each site relevant to their sensor domain in order to facilitate interoperability, underpin internationally harmonised calibration/validation and embrace QA4EO within GEOSS. The list will also include recommended resource requirements for active agency support of site instrumentation and maintenance. • Core (primary sub-set of) Sites have been identified by all sub-groups where appropriate, although this will continue to be improved for specific sensor characteristics *e.g.* (some smaller sites for high res opitcal sensors radiometric gain for IVOS). The sub-groups have initiated activites to establish a baseline scope and cost of ensuring that this type of infrastructure can be maintained into the future to meet the long-term needs of the community particularly climate in a non-mission specific manner. This key task will be remapped into the new GEO program and detailed criteria on requirements for new key sites, (particularly in the southern hemisphere from countries such as Australia) that can be offered to complete the baseline needs will be made clear.		

DA-09-01a_15	Description	Undertake a pilot project to exemplify QA4EO implementation in Cal/Val activities.		
	Due Date	31 December 2011	Category	2
	POC	Philippe Goryl, ESA		
	Milestones/ Deliverables	• ESA is working with NPL on the preliminary implementation of QA4EO within its missions and in developing a strategy for future missions. The implications for QA4EO implementation will be assessed using the Sentinel missions as a case study. This case study should help others wishing to implement QA4EO with their missions. Reports from this study will form the basis for the deliverables for this task action. • ESA has also started a survey for assessing QA4EO consistency that will review the Cal/Val facilities (e.g., Boussole) and will review the Cal/Val protocols, guidelines, best practice, and current documentation for the Sentinels. QA4EO within the Long Term Data Preservation (LTDP) programme is also being considered.		
	Status	OPEN – to be remapped to 2012-2015 GEO Work Plan		
	Main 2011 Achievements	This Action will be broadened in the new GEO plan to include contributions from other agencies on their activities to implement QA4EO.		

DA-09-01a_16	Description	Develop Cal/Val Portal and post-launch test sites to assist implementation of QA4EO for GEOSS.		
	Due Date	30 March 2012	Category	2
	POC	Gyanesh Chander, USGS Philippe Goryl, ESA		
	Milestones/ Deliverables	• 2011: Enhance the cal/val portal to support campaigns and WGCV test sites by: o Building a prototype database for Landnet use (an equivalent of Mermaid for Land). o Initiating an activity to automate a process for intercalibration of medium resolution sensor. • N.B. These two activities include a link between the Landnet (instrumented for high resolution sensors) and the Invariant not instrumented sites (for the medium resolution sensors).		
	Status	OPEN – to be remapped to 2012-2015 GEO Work Plan		
	Main 2011 Achievements	• The online catalog is located at http://calval.cr.usgs.gov/sites_catalog_map.php and provides easy public access for the global community. • Land sites for radiometric gain and stability are well established and agencies have been requested to regularly observe them.		

		Similarly sites for Ocean colour and Water temp (IR) have been endorsed. QA4EO Procedures have been established to aid their characterisation, description and CEOS registration. • Work is now in progress to expand the catalouge to sites for other applications and other sensor domains and also to allow storage of associated satellite imagery by USGS. Agencies are requested to regularly observe these sites and to provide data to the database. • CNES are working towards making available easy access to the SADE database of pseudo-invariant sites for cal/val purposes for CEOS members. • ESA has been working on a new-look updated Cal/Val portal with increased functionality, including wiki-based input and edit capability. The 8 instrumented Landnet sites are included in the portal (http://calvalportal.ceos.org/cvp/web/guest/ceos-landnet-sites). The Cal/Val portal supported the 2010 Tuz Golu and Ocean Colour campaigns, and the Miami 2009 campaign.

DA-09-01a_17	Description	Investigate options for QA4EO support services and tools, including support for the development of peer-reviewed lower-level guidelines through templates, structures and/or tools.		
	Due Date	30 March 2012	Category	2
	POC	Greg Stensaas, USGS		
	Milestones/ Deliverables	The need for support services and tools were discussed at the QA4EO implementation workshop, held from 18-20 October 2011 at RAL, UK. The CEOS WGCV and its subgroups will also consider requirements and options within its meetings. The deliverables will be the minuted discussions and actions resulting from these two meetings.		
	Status	OPEN – to be remapped to 2012-2015 GEO Work Plan		
	Main 2011 Achievements	• Work QA4EO Implementation definitions and implementations processes (WGISS/SEO). • Contiune working CEOS list of Cal/Val sites. • Continue to enhance processes of using Cal/Val test sites. • Description of instrumentation requirements for the sites. • Establish new process for CEOS Field Campaigns. • Provide recommendations for tools to implement QA4EO in CEOS datasets; being reviewed by WGCV subgroups; needs WGISS input also. • Other tools/services proposals are needed by WGCV and WGISS under IN-02, C1; COVE Tool interactions and Updates The COVE tool will support QA4EO implementation primarily through its support of Cal-Val campaigns. The COVE team will ensure that all relevant mission-instrument combinations are part of the COVE database and that all Cal-Val test sites are available as KML file overlays for visualization of groundtrack		

		coverage and calculation of coincidences. In addition, as a result of discussions at WGCV-34, the COVE team will investigate the inclusion of cloud data, detailed viewing geometry data, data ordering links, and overlays for ground stations, global DEM and GlobCover.

DA-09-01b: *Data, Metadata and Products Harmonisation*

CEOS Role: Co-Lead this GEO Sub-Task

DA-09-01b_2	Description	Establish a WGISS project to focus its contributions to the subject task and to generate those contributions. The focus in 2010 will be the development of a community catalog for satellite data, the CEOS WGISS Integrated Catalog (CWIC). The associated CWIC information model will serve as input from CEOS as the GEO community refines the GEOSS information model.		
	Due Date	31 December 2011	Category	**1**
	POC	Martin Yapur, NOAA		
	Milestones/ Deliverables	• May 2011: GEOSS portals review • Jun 2011: Recommendations for GEOSS Information Model • Sep 2011: Mapping of current capabilities of existing CEOS agency systems to those that will be provided by CWIC. • Dec 2011: The WGISS/CWIC team initiated the registration of CWIC in the GCI registries		
	Status	OPEN – to be remapped to 2012-2015 GEO Work Plan		
	Main 2011 Achievements	• May-Dec 2010: The WGISS/CWIC team has been developing an information model to characterize the data and information services of the CEOS agencies and to begin to address the integration of these capabilities with those of the broad GEO community. • May-Dec 2010:The CWIC team worked with various community portals and clients that have expressed interest in directly accessing CWIC services. • Jun 2011: CWIC Prototype 1.0 using test client demonstrated at WGISS meeting. • First draft of information model paper completed which highlights the complexity of satellite data and access to satellite data.		

DA-09-03a: *Global Land Cover*

CEOS Role: Co-Lead this GEO Sub-Task

In 2011, there were no CEOS Category 1 or Category 2 Actions in support of the *Global Land Cover* GEO Sub-Task, even though CEOS was identified as a co-lead of this GEO Sub-Task.

DA-09-03d: *Global DEM*

CEOS Role: Co-Lead this GEO Sub-Task

In 2011, there were no CEOS Category 1 or Category 2 Actions in support of the *Global DEM* GEO Sub-Task, even though CEOS was identified as a co-lead of this GEO Sub-Task.

7. Implementation of the Space Segment for Capacity Building

In 2011, there were four (4) Category 1 Actions and one (1) Category 2 Action in support of GEO Capacity Building Tasks/Sub-Tasks, for a total of five (5) Actions. Of those five Actions:

- All five were closed in 2011

CB-09-02g: *GEONETCast Training*

CEOS Role: Contributor

CB-09-02g_1	Description	Develop the GEONETCast Training Channel that will focus on (i) training end-users to use products for specific purposes and to disseminate data via GEONETCast; (ii) linking GEONETCast products and product navigator (inside portal) with specific training material; (iii) transmitting training materials via GEONETCast to local trainers; and (iv) disseminating training materials on GEOSS-related environmental data.		
	Due Date	2 November 2010	Category	2
	POC	Eric Madsen, NOAA		
	Milestones/ Deliverables	Implementing and maintaining the GEONETCast Training channel is the responsibility of the individual GEONETCast broadcast organizations, coordinated by the GEONETCast Global Implementation Group.		
	Status	**CLOSED**		
	Main 2011	All three current GEONETCast regions participate in capacity		

	Achievements	building activities; but usage of training channel is very low. GEONETCast needs input and cooperation from the GEO Community to determine requirements, users and data for broadcast on GEONETCast Training Channel. WGCapD has not yet developed local applications for the training channel.

CB-09-05b: *CBERS*

CEOS Role: Co-Lead this GEO Sub-Task

In 2011, there were no CEOS Category 1 or Category 2 Actions in support of the *CBERS* GEO Sub-Task, even though CEOS was identified as a co-lead of this GEO Sub-Task.

CB-09-05e: *Data Democracy*

CEOS Role: Co-Lead this GEO Sub-Task

CB-09-05e_2	Description	Strengthen the Earth observation data utilization cycle by sharing Software Tools in developing countries.		
	Due Date	31 December 2011	Category	**1**
	POC	Aurelie Sand, CNES		
	Milestones/ Deliverables	• Get acquainted of any existing GIS and RS open source software inventories available or used by CEOS Agencies. • Create a questionnaire to detail the main characteristics, functionalities, strengths of existing tools at each agency. • Establish a complete list of free GIS & image processing tools such as libraries or software developed by CEOS members. • Each agency provides information on its own products.		
	Status	**CLOSED**		
	Main 2011 Achievements	• SANSA has successfully developed open source software in collaboration with INPE. • Action was recommended for closure at the September SIT Workshop due to lack of outputs.		

CB-09-05e_3	Description	Strengthen the Earth observation data utilization cycle by increasing Data Dissemination Capabilities in developing countries.		
	Due Date	1 October 2010	Category	**1**
	POC	Pakorn Apaphant, GISTDA		
	Milestones/ Deliverables	October 2010: Data Democracy Portal Development		

	Status	**CLOSED**
	Main 2011 Achievements	Data Democracy Portal was never developed. This Action was closed due to lack of outputs.

CB-09-05e_4	Description	Online CEOS Mission, Instruments & Measurements (MIM) Database (DB): Update the CEOS MIM DB with newest information, including those of CGMS Members not involved in CEOS. Optimization of on-line access tools.		
	Due Date	31 October 2011	Category	**1**
	POC	Ivan Petiteville, ESA		
	Milestones/ Deliverables	• May 2011: call to all CEOS Agencies and CGMS Members to provide updated information (updates expected Jun 2011) • Oct 2011: Update on line • Oct 2011: On-line tools implemented		
	Status	**CLOSED**		
	Main 2011 Achievements	• All the foreseen work has been completed in due time as detailed hereafter. A special update is foreseen for the special edition of the CEOS EO Handbook at the occasion of the Rio+20 Summit (Jun 2012). • Database Enhancements o Added fields for data access (missions) and data format (instruments). o Incorporated information from SEO on VCs, ECV, and SBA links for measurements. o Addition of atmospheric layer information to atmospheric measurements. o Addition of specific wavebands for radar instruments. o Subset of the MIM's instrument-measurement information being review by VCs. • Online Enhancements o With support from the SEO, adding links from the MIM online to the COVE tool. o Adding filtering by instrument resolution to the Instruments Table. o General enhancements to website performance, streamlining. o Online launch ahead of CEOS Plenary.		

CB-09-05e_5	Description	GCI Training - GEO Members and Participating Organizations are invited to register EO resources that they wish to share as a formal contribution to GEOSS. This is done through a registration process using the GEOSS Component and Service Registry, as part of the GEOSS Common Infrastructure (GCI). Registration is the first step in making data and services available to users through the GEO Web Portal. This training will provide background information on

		GCI, and will present in detail the steps to be taken for Components and Services Registration.		
	Due Date	31 October 2011	Category	1
	POC	Hilcea Ferreira, INPE		
	Milestones/ Deliverables	GCI Training - GEO Members and Participating Organizations are invited to register EO resources that they wish to share as a formal contribution to GEOSS. This is done through a registration process using the GEOSS Component and Service Registry, as part of the GEOSS Common Infrastructure(GCI). Registration is the first step in making data and services available to users through the GEO Web Portal. This training will provide background information on GCI, and will present in detail the steps to be taken for Components and Services Registration.		
	Status	**CLOSED**		
	Main 2011 Achievements	• May 2011: Face-to-face training activity involving GCI and registry of components during the GEO Workplan Symposium, Geneva. • The GCI is still under construction and therefore it is not useful to have GCI training courses until the GCI is final. • Can reactivate this action for 2012, depending on GEO 2012-2015 Work Plan.		

8. Implementation of the Space Segment for Science and Technology

In 2011, there were no CEOS Category 1 or Category 2 Actions in support of any GEO Science and Technology Tasks/Sub-Tasks.

9. Implementation of the Space Segment for User Engagement

In 2011, there were no CEOS Category 1 or Category 2 Actions in support of any GEO User Engagement Tasks/Sub-Tasks.

10. Implementation of the Space Segment for Agriculture

In 2011, there were no Category 1 Actions and three (3) Category 2 Actions in support of GEO Agriculture Tasks/Sub-Tasks, for a total of three (3) Actions. Of those three Actions:

- One was closed in 2011
- Two will be remapped to the 2012-2015 GEO Work Plan

AG-07-03a: *Global Agricultural Monitoring System*

CEOS Role: N/A

AG-07-03_2	Description	Modify the Google-Earth CEOS Visualization Environment (COVE) tool to accommodate the Joint Experiments on Crop Assessments and Monitoring (JECAM) initiative. Relevant mission and instrument combinations can be used to forecast sensor groundtracks and coincidences for acquisition planning and calibration/validation efforts.		
	Due Date	9 November 2011	Category	2
	POC	Brian Killough, NASA		
	Milestones/ Deliverables	• Apr 2011: Generate KML files to display JECAM regions and add a dedicated application tab to COVE • Apr 2011: Develop relevant current and future mission-instrument list with the JECAM team • Aug 2011: Add relevant current mission-instrument combinations to COVE with sensor fields-of-view • Oct 2011: Produce a monthly acquisition report and publish on the COVE website • Nov 2011: Complete a COVE demonstration for JECAM at the 2011 CEOS Plenary Meeting		
	Status	**CLOSED**		
	Main 2011 Achievements	• JECAM KML files completed for all 12 global regions. Dedicated JECAM tab on COVE website will be implemented on new website later in 2011. • List of relevant mission-instrument combinations provided to JECAM team for review in Apr 2011. • 25 relevant missions have been identified for JECAM. 18 of those missions are currently in COVE with the remaining missions to be added by the end of Jun. • Action is CLOSED as of Jul 2011. COVE now includes 33 optical and radar missions relevant to JECAM. In addition, the SEO worked with CSA to complete a *Data Acquisition Planning Template* to optimize data acquisition requests from space-based data providers. This template is currently being used for the late-2011 growing seasons in Paraguay and Argentina. Lessons learned from this process will be used for the other JECAM sites in 2012.		

AG-07-03_5	Description	Global Croplands and their water use assessments using multi-sensor remote sensing data fusion. Co-operation in: (a) multi-sensor data exchange and fusion, and (b) modeling capabilities from different CEOS agencies to ensure global croplands and water use at multiple resolutions.		
	Due Date	31 December 2013	Category	2
	POC	Prasad Thenkabail, USGS		
	Milestones/ Deliverables	• Jul 2011 - Additional JECAM sites in USA (California), Uzbekistan, Tajikistan, and India • Sep 2011: USGS Powell Center meeting on Global croplands (first meeting) • Aug 2012 - PE&RS special issue on Global Croplands • Dec 2012 - Product Release through USGS Powell Center web portal		
	Status	OPEN – to be remapped to 2012-2015 GEO Work Plan		
	Main 2011 Achievements	• Jul 2010: Comprehensive proposal • Oct 2010: Special issue on Global Croplands (Journal Remote Sensing • Jan 2011: Project commences • July 2011 - JECAM site finalization, JECAM meeting of data providers		

AG-07-03_6	Description	Global Initiative on Water for the World for Food Security through Spaceborne Data Facilitating multi sensor data availability for the water for the world projects to ensure global food security		
	Due Date	31 December 2013	Category	2
	POC	Prasad Thenkabail, USGS		
	Milestones/ Deliverables	• Jan 2012: water harvesting project in India progress; release of Vision document. • IEEE Global Water Cycle meeting planned for Jan 2012 in Kenya • Dec 2013: final products on at least three projects (India water harvesting, Ghana water access, and Nicaragua water quality)		
	Status	OPEN – to be remapped to 2012-2015 GEO Work Plan		
	Main 2011 Achievements	• Currently, the CEOS Agriculture SBA Coordinator is co-leading an IEEE Water for the World project. This project has received start-up funding from NASA, mostly for coordinating and initiating projects. This project has collaborators and cooperators from a network of organizations and Institutions. Water for the World is a three-phase program to bring water to those in the world who do not have adequate fresh water. o Phase One is the development of an Actionable Vision (which we are currently working on). o Phase Two of Water for the World is the execution of the Pilot Projects.		

		o Phase Three of Water for the World is institutionalization. Currently, the task has funded one project in India. The project is entitled: *Smart Rain Water Harvesting for Human Welfare and Environmental Sustainability in Semi Arid Regions- An actionable vision and futuristic need to bring Water to the world,* led by Dr. Sharma of the Indian Space Research Organization (ISRO). • Jan 2011 – vision document delivered.

11. IMPLEMENTATION OF THE SPACE SEGMENT FOR BIODIVERSITY

In 2011, there were no CEOS Category 1 or Category 2 Actions in support of any GEO Biodiversity Tasks/Sub-Tasks.

12. IMPLEMENTATION OF THE SPACE SEGMENT FOR CLIMATE

Two types of CEOS Climate actions have been tackled by the CEOS Agencies from 2008 to 2011:

1. **CEOS "GCOS" actions** defined in 2006 in response to the Global Climate Observing System (GCOS) Implementation Plan (IP) and described in the CEOS IP v1. This series of actions addresses the GEO Task CL-09-02b *Key Climate Data from Satellite Systems*. More information may be found in the following section *Background of CEOS GCOS Actions*.
2. New CEOS-GEO Actions defined during of 2011 to address the GEO 2009-2011 Climate Tasks/Sub-Tasks

Background of CEOS GCOS Actions

In 2006, CEOS developed a full response to the Global Climate Observing System (GCOS) Implementation Plan (IP) and submitted the report to the 12th Conference of the Parties (COP-12) meeting of the United Nations Framework Convention on Climate Change (UNFCCC) Subsidiary Body on Scientific and Technical Advice (SBSTA). This process involved extensive consultation with the atmospheric, terrestrial, and oceanic climate communities and with GCOS itself.

The CEOS report to COP-12 provides a response by space agencies regarding the adequacy of past, present, and future satellite measurements in support of GCOS. It specifically responds to the UNFCCC needs for satellite observations as detailed in the GCOS IP and its Satellite Supplement. Responding to these needs represented a unique opportunity for space agencies to review the way in which multi-agency cooperation on climate-related observations is prioritized, agreed, funded, implemented, and monitored. In the report, CEOS identified what can be achieved by better coordination of existing and future capabilities as well as those improvements that require additional resources and/or mandates beyond the present capacity of space agencies. This report was intended to initiate action and assist the Parties in advising and commenting on the planning actions within the agencies.

59 individual actions were identified in order to address the requirements expressed by GCOS and these represent the basis of the implementation plan presented here for the Climate SBA (as was always the intention in undertaking the work with GCOS). The SBSTA subsequently invited CEOS to provide an updated progress report entitled *Coordinated Response from Space Agencies Involved in Global Observations to the Needs Expressed in the Global Climate Observing System (GCOS) Implementation Plan: Update on Climate Actions.* This report was presented at SBSTA's 29th session in December 2008. At its 15th session in December 2009, the UNFCCC Conference of the Parties expressed its appreciation for the report and encouraged CEOS to continue coordinating and supporting implementation of the satellite component of the GCOS, as well as actions in the CEOS report, in particular on long-term continuity of observations and data availability. At its 33rd session in November-December 2010, SBSTA invited CEOS to report on progress made in its efforts to meet the relevant needs of the Convention. Furthermore, SBSTA welcomed the commitment by CEOS Agencies to work towards improved availability of current and future data for forest carbon monitoring, and also encouraged CEOS to accelerate development of methodologies, and validation and inter-comparison of satellite-based applications for the terrestrial domain. In October 2010, CEOS provided to UNFCCC SBSTA a report entitled *2010 Progress Report: Coordinated Response from Parties that Support Space Agencies Involved in Global Observations to the Needs Expressed in the Global Climate Observing System (GCOS) Implementation Plan of 2004*. This document provided the final report for the 59 actions and addressed all SBSTA's recommendations from December 2009. CEOS in now coordinating the response to the latest update of the GCOS Implementation Plan on behalf of space agencies.

The GCOS Community, including several CEOS Agency representatives, updated the GCOS Implementation Plan in August 2010 (IP-10). The purpose of the GCOS IP-10 *is to provide an updated set of Actions required to implement and maintain a comprehensive global observing system for climate that will address the commitments of the Parties under Articles 4 and 5 of the UNFCCCC and support their needs for climate observations in fulfillment of the objectives of the Convention.* The revised plan updates the Actions, taking account of recent progress in science and technology, the increased focus on adaptation, enhanced efforts to optimize mitigation measures, and the need for improved prediction and projection of climate change. It focuses on the 2010-2015 timeframe. Another key update was the revised list of the GCOS Essential Climate Variables (ECVs). CEOS is now responding to 47 Actions in three domains: atmosphere, ocean, terrestrial. CEOS is completing detailed "templates" for each Action, and the templates will comprise the coordinated response to the 2010 GCOS IP. The final report is estimated for completion in September 2012.

In December 2011, an update to the *Systematic Observation Requirements for Satellite-Based Data Products for Climate* was released. This "Satellite Supplement" details the satellite-based component of the IP-10. It provides additional technical detail to the Actions and needs identified in IP-10.

As a result of its efforts in support of the GCOS Implementation Plan, its appointment of a CEOS Climate SBA Coordinator, a new Working Group on Climate to track progress of new actions being developed in response to the new GCOS implementation plan and satellite supplement,

and its initiation of the CEOS Virtual Constellation concept, CEOS has emerged as an effective organization for advancing space-based climate observations. These activities have also led to improved coordination within CEOS and of CEOS agencies with GEO and GCOS.

CEOS Actions in Support of GEO Climate Tasks/Sub-Tasks

In 2011, there were four (4) Category 1 Actions and three (3) Category 2 Actions in support of GEO Climate Tasks/Sub-Tasks, for a total of seven (7) Actions. Of those seven Actions:

- One was closed in 2011
- Six will be remapped to the 2012-2015 GEO Work Plan

CL-06-01a: *Sustained Reprocessing and Reanalysis of Climate Data*

CEOS Role: Co-Lead this GEO Sub-Task

In 2011, there were no CEOS Category 1 or Category 2 Actions in support of the *Sustained Reprocessing and Reanalysis of Climate Date* GEO Sub-Task, even though CEOS was identified as a co-lead of this GEO Sub-Task.

CL-09-02b: *Key Climate Data from Satellite Systems*

CEOS Role: Co-Lead this GEO Sub-Task

CL-09-02b_2	Description	CEOS Response to new GCOS Implementation Plan: Once the updated GCOS IP is released, CEOS is expected to update its response to the original IP from 2006 which served as the basis for the 59 CEOS Climate actions. The Climate SBA Coordinator will take responsibility for ensuring a plan is put in place for development of a CEOS Response which has broad consultation across the community and provides the basis for future planning and priority setting by space agencies in response to climate information needs.		
	Due Date	30 September 2012	Category	**1**
	POC	Mitch Goldberg, NOAA		
	Milestones/ Deliverables	Jun 2011 -- 30% templates completed Nov 2011 70% templates completed Feb 2012 100% templates completed May 2012 Draft CEOS response report completed Sep 2012 Final CEOS response report ready for submission to UNFCCC SBSTA		
	Status	OPEN – to be remapped to 2012-2015 GEO Work Plan		
	Main 2011	• The final GCOS-IP from GCOS was released in Aug 2010 • May 2011 CEOS response report for feedback.		

	Achievements	• SEO did an analysis of the current input and provided feedback which resulted in a new template with clear instructions to avoid duplication of the GCOS Satellite Supplement

CL-09-02b_3	Description	Evaluate and implement improved TRMM algorithm.		
	Due Date	31 December 2011	Category	2
	POC	Steve Neeck, NASA Riko Oki, JAXA		
	Milestones/ Deliverables	• Jun 2011 - Implement Version 7 of the TRMM standard algorithms • Jul 2011 - Reprocessing and public release of the Version 7 standard products		
	Status	**CLOSED**		
	Main 2011 Achievements	• Testing and analysis of PR product underway with completion scheduled for spring 2011 (Dec 2010). • Operation Acceptance Test with updated algorithm began Apr 2011 and completed in Jun 2011. • JAXA and NASA formal review of Version 7 algorithm for acceptance scheduled for Jun 2011. Updated milestone dates to reflect algorithm update, additional acceptance testing, and JAXA/NASA formal acceptance review (May 2011). • Completed implementation of Version 7 algorithm on Jun 2011 Completed reprocessing of all TRMM data using Version 7 algorithm in Aug. Data are available at http://trmm.gfsc.nasa.gov/data_dir/data.html.		

CL-09-02b_4	Description	Complete a climate ECV meta-analysis in cooperation with the Working Group on Climate. The analysis will be used to support CEOS strategic planning, assess gaps in application support and mission plans, and to support a conceptual climate architecture framework.		
	Due Date	30 June 2012	Category	2
	POC	Mark Dowell, EC-JRC		
	Milestones/ Deliverables	• Nov 2011: Complete a preliminary ECV report and present findings at the CEOS Plenary Meeting. Release the first version of a CEOS Climate ECV database. • Dec 2011: Develop prioritized plans for 2012. Consider the ECV Maturity Index, Calibration/Validation (QA4EO), Climate Policy, and Measurement Accuracy and Uncertainty.		
	Status	OPEN – to be remapped to 2012-2015 GEO Work Plan		
	Main 2011 Achievements	• Apr 2011: Complete an EXCEL table for agency inputs on ECV efforts and send out for agency response.		

		• May 2011: Reviewed agency responses at the 1st CEOS Working Group on Climate (WGClimate) Meeting. • This is one of the first tasks that WGClimate will address.

CL-09-03b: *Forest Carbon Tracking*

CEOS Role: Co-Lead this GEO Sub-Task

CL-09-03b_5	Description	FCT: Acquisition, provision and documentation of optical and SAR satellite data products for GEO FCT .		
	Due Date	31 December 2011	Category	**1**
	POC	Frank Martin Seifert, ESA		
	Milestones/ Deliverables	• Mar 2011: Contributing space agencies report on acquisition status in response to the 2010 FCT Data Requirements at CEOS SIT. • Apr 2011: After the "2nd FCT Data & Science Summit" issue of the "FCT 2011 Data Requirements" including long term acquisition scenario. • Dec 2011: Acquire and provide in a systematic and timely manner the optical and SAR satellite data products requested in the "FCT 2011 Data Requirements" document.		
	Status	OPEN – to be remapped to 2012-2015 GEO Work Plan		
	Main 2011 Achievements	• Report at 24th CEOS Plenary in Rio in Oct 2010: Over 65,000 scenes from contributing sensors (optical: Landsat, CBERS, IRS, SPOT and SAR: ALOS PALSAR, ENVISAT ASAR, RADARSAT, TerraSAR-X, CosmoSkyMED) have been acquired systematically over the 10 FCT National Demonstrators until Sep 2010. • Second FCT Science and Data Summit at FAO in Rome (Italy) in Feb 2011 with 4th EO Data Coordination Meeting at ESRIN.		

CL-09-03b_6	Description	FCT: Support the generation of the document that will contain Interoperability Methods for Satellite Data for Forest Carbon Tracking.		
	Due Date	30 April 2012	Category	**1**
	POC	Frank Martin Seifert, ESA		
	Milestones/ Deliverables	• Mar 2011: Status of Interoperability Methods document after consolidation during the 2nd Science and Data Summit in Feb 2011 at CEOS SIT. • Status of Interoperability Methods document after consolidation during the 3rd Science and Data Summit in Feb 2012 awill be reported at CEOS SIT-27.		
	Status	OPEN – to be remapped to 2012-2015 GEO Work Plan		

	Main 2011 Achievements	• This document is a Country Guidance on options for satellite data processing workflows for deriving the products as specified, including the potential for interoperability between the various satellite sensors being used for GEO FCT. • Activity has been reshuffled with the Global Forest Observation Initiative approved by GEO VIII Plenary. Status will be reported at CEOS SIT-27.

CL-09-03c: *Global Monitoring of Greenhouse Gases from Space*

CEOS Role: Co-Lead this GEO Sub-Task

CL-09-03c_1	Description	Foster the use of GHG observations and consolidate data requirements for the next-generation GHG monitoring missions from space; create a synergistic strategy for easy access to GHG satellite observations, including GOSAT and current observations, and harmonize the next generation of GHG satellite observations; establish an international coordination Task Force (CEOS Carbon Task Force) within the CEOS structure.		
	Due Date	31 December 2011	Category	**1**
	POC	Takashi Moriyama, JAXA Diane Wickland, NASA		
	Milestones/ Deliverables	• Actual fusion datasets from GOSAT, OCO2 and future GHG missions will be developed and made available to GEO users, by 2012. • Create global CO2 sink/source map in sub-continental scale over the whole globe and provide GEO stake holders, by 2011. • Facilitate Air, Ground and Ocean insitu data for cross validation among on going/future space GHG satellite, by 2012. • CEOS Strategy for Carbon Observation from Space which covers all domains (Atmospheric, Terrestial and Oceanic) to harmonise and secure future GHG data supply from space responding to users requirements described in the GEO Carbon Strategy, by 2012. • Support to the CEOS periodic reports to UNFCCC SBSTA informing of progress by space agencies towards the requirements of the GCOS Implementation Plan, by 2011. • Compelling demonstrations and communications in support of key GEO meetings in 2011 and 2012 ? including the Ministerial noting the science and policy implications of the new technical capabilities supplied by space systems, by 2011. • CTF will move forward with Atmospheric domain chapter and aims to have a draft ready by early 2012. • The Land and Oceanic domain chapter drafts will lag by a few months, to then be followed by the Integration chapter. The final report will be completed by the end of 2012.		

	Status	OPEN – to be remapped to 2012-2015 GEO Work Plan
	Main 2011 Achievements	• GEO Carbon Strategy is developed and distributed worldwide through web and printed document. Coordination on science requirements among GCOS-IP and GEO Carbon Strategy is a issue. CEOS Carbon Task Force started to develop CEOS Strategy for Carbon Obesrvations from Space. The atmospheric domain report will be completed by the end of 2012; whole strategy document covering terrestrial and oceanic by end of 2012. • Needs coordination among Constellations and WGClimate.

CL-09-03c_2	Description	Expand the strategic gap assessment for atmospheric Carbon Dioxide (CO2) to include detailed requirements matched to science and societal applications. Conduct a preliminary strategic gap assessment for Methane (CH4). The output of these reports will be used by the SIT, ACC, and CTF.		
	Due Date	30 March 2012	Category	2
	POC	Brian Killough, NASA		
	Milestones/ Deliverables	• Apr 2011: Preliminary report of CO2 applications and requirements • Mar 2012: Final CO2 and CH4 gap reports delivered to CTF		
	Status	OPEN – to be remapped to 2012-2015 GEO Work Plan		
	Main 2011 Achievements	• Preliminary report of CO2 applications and requirements presented to CTF team in Feb 2011 in Washington. An updated report was provided to CTF for review in Jun 2011. • SEO plans to complete the CO2 and CH4 reports by Mar 2012 for the CTF meeting. This delay was caused by increased work for other SEO tasks as well as new CTF plans for developing the future *CEOS Response to the GEO Carbon Strategy* report.		

13. IMPLEMENTATION OF THE SPACE SEGMENT FOR DISASTERS

In 2011, there were three (3) Category 1 Actions and four (4) Category 2 Actions in support of GEO Disasters Tasks/Sub-Tasks, for a total of seven (7) Actions. Of those seven Actions:

- Six were closed in 2011
- One will be remapped to the 2012-2015 GEO Work Plan

DI-06-09: *Use of Satellites for Risk Management*

CEOS Role: Co-Lead this GEO Task

DI-06-09_8	Description	Development of system architecture for risk management, including validation with users. Based on user requirements developed under DI-06-09_1 (with an initial focus on floods), the action will identify measurement requirements, document existing and planned systems that perform these measurements, determine gaps, make system architecture recommendations and propose an end-to-end plan for satellite data use to support risk management		
	Due Date	15 November 2011	Category	**1**
	POC	Guy Séguin, CSA		
	Milestones/ Deliverables	• Sep 2011: review preliminary flood gap analysis based on key parameters required for flood managers as determined at June Disaster SBA Team mtg. • Oct 2011: complete Gap analysis for flood types. • Nov 2011: conduct preliminary review of other disaster types, products and services. • Dec 2011: Complete plan to transition activity to new workplan, including development of satellite data gaps for other disasters types.		
	Status	**CLOSED**		
	Main 2011 Achievements	• User requirements identification completed and validated. A draft architecture requirements was developed but it was decided to develop a roadmap and to perform a gap analysis before completing the validation of the architecture requirements. A roadmap was developed for the action plan of 2009-2011 taking in consideration the GEO Targets for 2015. A plan has been developed for a gap analysis by the SEO. • Video has been produced by the SEO and is available on the CEOS website under the CEOS videos link (www.ceos.org). Initial focus on floods but attempt will be made to extend to other types of disaster management. Completed milestones: • Sep 2010: draft video on use of satellites for disaster management. • Oct 2010: completed video on use of satellites for disaster management. • Feb 2011: conduct preliminary review of the floods types, products and services. • Jun 2011: DSBA Team meeting reviewed gap analysis approach. Development of list of observation parameters relevant for flood managers.		

DI-09-01c: *Supersites and Natural Laboratories*

CEOS Role: Contributor

DI-09-01c_1	Description	Provision of SAR and InSAR Data over the Geohazard Supersites.		
	Due Date	N/A	Category	**1**
	POC	Craig Dobson, NASA		
	Milestones/ Deliverables	• Sep 2011 - Meeting between space agencies • Week of Sep 18 - Meeting with users • Nov 2011 - Recommendations to CEOS		
	Status	**CLOSED**		
	Main 2011 Achievements	See DI-09-01a_4 Accomplishments		

DI-09-01c_2	Description	Modify the Google-Earth CEOS Visualization Environment (COVE) tool to accommodate the geohazard Supersites initiative. Relevant mission and instrument combinations can be used to forecast sensor groundtracks and coincidences for acquisition planning and calibration/validation efforts.		
	Due Date	9 November 2011	Category	**2**
	POC	Brian Killough, NASA		
	Milestones/ Deliverables	• Apr 2011: Generate KML files to display Supersite regions and add a dedicated application tab to COVE • Apr 2011: Develop relevant current and future mission-instrument list with the Supersites team • Aug 2011: Add relevant current mission-instrument combinations to COVE with sensor fields-of-view • Oct 2011: Produce a monthly acquisition report and publish on the COVE website • Nov 2011: Complete a COVE demonstration for Supersites at the 2011 CEOS Plenary Meeting		
	Status	**CLOSED**		
	Main 2011 Achievements	• Supersite KML files completed for all 8 global regions. Dedicated Supersites tab on COVE website will be implemented on new website later in 2011. • List of relevant mission-instrument combinations provided to Supersites team for review in Apr 2011. • 13 relevant missions have been identified for Supersites. All of those missions are currently in COVE. • All 2011 actions were not completed due to lack of requirements from Supersites for specific missions and measurements. Further support to project will be defined in 2012.		

DI-09-02a: *Implementation of a Multi-Risk Management Approach*

CEOS Role: Contributor

DI-09-02a_2	Description	Demonstrate a global operational volcanic ash alert system for aviation hazard avoidance. Improved algorithms, improved data latency, and the addition of EUMETSAT/SEVIRI data is planned.		
	Due Date	31 December 2012	Category	2
	POC	Claus Zehner, ESA		
	Milestones/ Deliverables	• Project phase 3 will be finalised early 2012 • Based on the outcome (detailed user requirements - http://earth.eo.esa.int/workshops/Volcano/files/STM_280_ash101124.pdf.) of the Workshop organised by ESA & EUMETSAT about the Iceland's Eyjafjoll volcanic eruption at ESRIN-ESA (Frascati, Italy) in May 2010, an ESA call for new activities was prepared on volcanic ash monitoring from space. This new activity/project will start early 2012 with a duration of 3 years with a budget of 2 million Euro.		
	Status	OPEN – to be remapped to new 2012-2015 GEO Work Plan		
	Main 2011 Achievements	A global Web-based ash alert demonstration service is available since early 2011 at http://sacs.aeronomie.be/. This demonstration service combines European services based on EUMETSAT (IASI, GOME-2), and ESA (SCIAMACHY) with existing US services based on NASA/NOAA (OMI) and NASA-JPL (AIRS). All data are being incorporated in a single Web-page (including information on SO2 and ash derived from UV/VIS and IR instruments). Ash movement prediction and height derivation capabilities have been enhanced especially via the SAVAA project (http://savaa.nilu.no/) by using the FLEXPART dispersion model.		

DI-09-02a_3	Description	Plans for 2011 onwards: Based on the economic impact (2-3 Billion Euro) of the Eyjafjoll eruption in Europe and the results of the ESA/EUMETSAT workshop more activities on volcanic ash monitoring/forecasting will be initiated during 2011 in order to prepare for such events especially in Europe and to further strengthen international cooperation. Plan to initiate specific international cooperation work on atmospheric ECVs.		
	Due Date	31 December 2011	Category	2
	POC	Claus Zehner, ESA		
	Milestones/ Deliverables	Plans for 2011 onwards: Based on the economic impact (2-3 Billion Euro) of the Eyjafjoll eruption in Europe and the results of the ESA/EUMETSAT workshop more activities on volcanic ash monitoring/forecasting will be initiated during 2011 in order to		

		prepare for such events especially in Europe and to further strengthen international cooperation on future actions. Further planning to initiate specific international cooperation work on atmospheric ECVs was discussed at the Jun 2011 ACC meeting in Washington, with emphasis first on ozone.
	Status	**CLOSED**
	Main 2011 Achievements	Action subsumed by DI-09-02a_2 and should be closed

DI-09-02b: *Regional End-to-End Disaster Management Applications*

CEOS Role: Co-Lead of this GEO Sub-Task

DI-09-02b_2	Description	Provision of satellite data and other support for Caribbean Satellite Disaster Pilot (formerly the Caribbean Flood Pilot).		
	Due Date	31 December 2011	Category	2
	POC	Stuart Frye, NASA		
	Milestones/ Deliverables	• Jun-Nov 2011: implementation of 2011-2012 workplan • Fall 2011: input of CSDP to CDEMA multi-year planning activities and discussions with donor agencies • Nov 2011: Draft plan/status on transition to becoming operational • Dec 2011: Year Two review meeting at Comprehensive Disaster Management Confernece and discussion with stakeholders on transition to sustainable operations		
	Status	**CLOSED**		
	Main 2011 Achievements	• Apr 2011: Conducted a face-to-face meeting at CDEMA Headquarters in Barbados with CSA, World Bank, UNDP, USAID, CIDA, Red Cross, CIMH, Univ of W Indies, and European Commission participants • May-Nov 2011: Covered numerous hurricanes, landslides, and tropical storms during with daily flood maps from MODIS, observations from EO-1 and Radarsat-2, and space and ground precipitation accummulation amounts • May 2011: Arranged for Radarsat-2 tasking, raw data delivery, and value added processing for CSDP partners to extend through 2012 • Jun 2011: Hosted a meeting at NASA GSFC for the CEOS Disaster SBA team • Sep and Nov 2011: Participated in two CEOS Action Item Review meetings • Oct 2011: Participated in the GEOSS in the Americas Symposium in Santiago Chile and presented status of the CDSP • Dec 2011: Developed the CSDP 2012 Work Plan with respect to		

		the GEO 2012-2015 Work Plan and defined transition to becoming an operational CDEMA-sponsored program during a face-to-face meeting in Trinidad with CDEMA, CIMH, and Univ of W Indies participants

DI-09-02b_3	Description	Provision of satellite data and other support for the Southern African Flood and Health Pilot (formerly Namibia Flood Pilot).		
	Due Date	30 December 2011	Category	**1**
	POC	Stuart Frye, NASA		
	Milestones/ Deliverables	• Update Campaign Manager to accept AMSR-E triggers from JRC GDACS and supply image metadata and products back to JRC website (Sep 2011), jointly assigned to JRC and NASA • Revise hydrological key stations (Sep 2011), assigned to Namibia Hydrology • Update waterlevels for past 5 years (Oct 2011), Namibia Hydrology to pass on data, NASA to incorporate on Flood Dashboard • Incorporate Radarsat-2, EO-1, and other high resolution satellite data as additional layers on the daily MODIS flood map (Oct 2011), CSA to supply data and NASA to develop map overlays • Daily update waterlevels (Nov 2011), Namibia Hydrology to pass on data, NASA to incorporate on Flood Dashboard • Update daily TRMM rainfall actuals and predictions (Nov 2011), NASA • Implement automated tasking interface for Radarsat-2 (Dec 2011), CSA and NASA cooperative • Predicted waterlevels for next 7 days (Jan 2012), Namibia Hydrology to pass on data, NASA to incorporate • Ground verification exercise of images in Kavango (Jan 2012) - Hydrology+NASA+CSA • Flood season coverage (Jan-Apr 2012), NASA delivers model predictions, JRC delivers daily AMRS-E data, CSA and NASA deliver satellite observations and flood maps • Post flood season assessment and evaluation report (Jul 2012), including inputs from NASA, CSA, JRC, and Namibia Hydrology		
	Status	**CLOSED**		
	Main 2011 Achievements	• Jan-Feb 2011: Arranged for a flood modeling, forecasting, and rapid mapping field trip and workshop in Namibia • Mar-May 2011: Arranged for Radarsat-2 tasking, raw data delivery, and value added processing for flood identification data products • Mar-May 2011: Delivered EO-1 observations and flood algorithm processing to cover flooding in northern Namibia • Apr-Dec 2011: Delivered daily flood maps from the MODIS instruments on Terra and Aqua		

		• Sep 2011: Updated Campaign Manager to accept automated AMSR-E triggers from JRC GDACS and supply image metadata and products back to JRC website. Worked with JRC to update the GDACS source from AMSR-E on the Aqua satellite to use TRMM inputs instead after the AMSR-E instrument died • Oct 2011: Worked with Namibia Hydrology to revise hydrological key stations and capture their daily outputs in the Flood Dashboard at http://matsu.opencloudconsortium.org/ • Nov 2011: Updated waterlevels for past 5 years on Flood Dashboard • Nov-Dec 2011: Worked with CSA and MDA to implement an automated tasking interface for Radarsat-2 (still under development) • Dec 2011: Incorporate predicted waterlevels for next 7 days on the Flood Dashboard

14. IMPLEMENTATION OF THE SPACE SEGMENT FOR ECOSYSTEMS

In 2011, there were no CEOS Category 1 or Category 2 Actions in support of any GEO Ecosystems Tasks/Sub-Tasks.

15. IMPLEMENTATION OF THE SPACE SEGMENT FOR ENERGY

EN-07-01: *Management of Energy Sources*

CEOS Role: Co-Lead this GEO Sub-Task

In 2011, there were no CEOS Category 1 or Category 2 Actions in support of the *Management of Energy Sources* GEO Sub-Task, even though CEOS was identified as a co-lead of this GEO Sub-Task.

16. IMPLEMENTATION OF THE SPACE SEGMENT FOR HEALTH

In 2011, there were no Category 1 Actions and three (3) Category 2 Actions in support of GEO Health Tasks/Sub-Tasks, for a total of three (3) Actions. Of those three Actions:

- All three were closed in 2011

HE-09-01: *Information Systems for Health*

CEOS Role: Contributor

HE-09-01_1	Description	Develop a long-term plan to support critical space-based imagery to support modeling, forecasting and monitoring of health issues.		
	Due Date	31 December 2011	Category	2
	POC	Murielle Lafaye, CNES		
	Milestones/ Deliverables	• First meeting of the Health Community of Practice (CoP) was held in Washington DC in Nov 2009. • A second meeting was held in Paris in Jul 2010.		
	Status	**CLOSED**		
	Main 2011 Achievements	• Feb 13, 2012: SBA Health meeting was held on "EO performance addressing health policy issues" (file provided to CEOS). • Coordinator proposes to CLOSE this action, because objectives are not well defined.		

HE-09-03b: *Towards a Globally Coordinated Malaria Warning System*

CEOS Role: Co-Lead this GEO Sub-Task

HE-09-03b_1	Description	Malaria Early Warning systems - Ecological method and product integration into surveillance and decision making systems - taking an integrated approach to using satellite observations in supporting decision making in preventing Malaria outbreaks.		
	Due Date	31 December 2011	Category	2
	POC	Murielle Lafaye, CNES		
	Milestones/ Deliverables	• Dec 2011: CEOS Agencies coordinated international Malaria monitoring demonstration project Africa-Asia, 2009-2012; this international cooperation would benefit from results of WASSA, MATE and other CNES Malaria demonstration projects as well as NOAA work in predicting Malaria incidence using VHI products. Potential partnerships in user engagement will include partnerships with WHO and regional organizations as well as other specialists in Malaria early warning, prevention, and treatment. • Report on demonstration projects, including results of integrating observations to serve user communities.		
	Status	**CLOSED**		
	Main 2011 Achievements	• Reported in Feb 2012 that theobjectives of this Action are too ambitious and too wide. Health users' involvement took much more time then expected; they are now involved in the writing		

		of Health Task of new GEO WP. • Coordinator proposes to CLOSE this task, and to open a new CEOS health task adressing more specifically GEO Task HE-01-C3 on vector borne diseases.

HE-09-03b_4	Description	Develop a plan to integrate in-situ vegetation health data to improve global Vegetation Health Index (VHI) products in affected countries.		
	Due Date		Category	2
	POC	Felix Kogan, NOAA		
	Milestones/ Deliverables	No milestones were completed in 2011.		
	Status	**CLOSED**		
	Main 2011 Achievements	Recommend that activities in actions HE-09-03b_1 and HE-09-03b_4 be merged into one action, with focus on determining best practices and how CEOS can support an integrated approach to using satellite observations in Malaria early warning.		

17. IMPLEMENTATION OF THE SPACE SEGMENT FOR WATER

In 2011, there was one (1) Category 1 Action and one (1) Category 2 Action in support of GEO Water Tasks/Sub-Tasks, for a total of two (2) Actions. Of those two Actions:

- One was closed in 2011
- One will be remapped to the 2012-2015 GEO Work Plan

WA-06-07b: *Africa*

CEOS Role: Co-Lead this GEO Sub-Task

WA-06-07b_2	Description	Follow-on of WA-06-07b_1 Support the development of a sustainable African Water Observation Systems making the best use of EO technology to improve the collection of water information, to enhance knowledge of water cycle and to improve monitoring of water resources for effective adaptation and mitigation measures against impacts of climate change.		
	Due Date	31 December 2012	Category	2
	POC	Benjamin Koetz, ESA (prev. Diego Fernandez Prieto, ESA)		
	Milestones/	• Coordination with CSA to provide Radarsat data to TIGER projects within the SOAR initiative: Second communication of		

	Deliverables	the initiative availability to TIGER Principal Investigators; Support of TIGER NET with a contribution through RADARSAT-2 data access. • From Sep 2010 to 2013: Implementation of capacity building plans per projects and execution of research stages in ITC, Univ. of delft, Uni. of Lisbone of African participants. • Mar 2011: Launch of the TIGER-NET project (1.5 Mio. Euro) at the 6th World Water Forum to develop information systems and services in Africa • Jun 2011: Launch of 6 research studies (6x100 KEuro) supporting TIGER fellowships to develop African-European research collaborations • Sep 2011: Installation of additional 3 DDS stations at the host institutions of TIGER-NET • Oct 2011: TIGER special session at the AARSE conference in Morroco
	Status	OPEN – to be remapped to 2012-2015 GEO Work Plan
	Main 2011 Achievements	• TIGER Capacity Building Facility: - 20 African projects on-going; - 4 training sessions organized in Africa; - 50 Research stages of African scientist supported by European expert centers; • TIGER NET: Preparation for the project launch of TIGER-NET, which will support the development of Water Observation Systems in collaboration with initially 5 African water authorities. 16 ESA Data Dissemination Systems (DDS) installed in Africa; Development of a specific software tool supporting the access and utility of EO data over the DDS. • SOAR-Africa: CSA launched in 2011 the SOAR-Africa Initiative to give access to RADARSAT-2 data free of charge for scientific purposes and applications in Africa; The initiative has been communicated to TIGER Principal Investigators and one proposal from the Institut et Observatoire de Geophysique d'Antananarivo, Universita d'Antanâ has been received. • TIGER workshop 2011, 12-13 Dec, Pretoria presenting the results of the 20 TIGER research projects with more than 100 participants.

WA-08-01e: *Water Cycle Data Integration*

CEOS Role: N/A

WA-08-01e_1	Description	To establish the CEOS Water Portal which provides assistance to the water relevant scientists and general users (or non-researchers) in the development of data services associated with data integration

		and distribution.		
	Due Date	31 December 2011	Category	1
	POC	Satoko Miura, JAXA		
	Milestones/ Deliverables	The Alpha version was completed in December 2011. A Beta version is now planned for March 2012 but will be a separate Action under the 2012-2015 GEO Work Plan.		
	Status	**CLOSED**		
	Main 2011 Achievements	• The alpha version of the CEOS Water portal is now being operated at http://waterportal.ceos.org/, which is linked from the CEOS website • As of Dec 2011, there are 180 users registerd to access the portal		

18. Implementation of the Space Segment for Weather

In 2011, there were no CEOS Category 1 or Category 2 Actions in support of any GEO Weather Tasks/Sub-Tasks.

19. List of Main Outcomes from CEOS Virtual Constellations and Working Groups for 2011

The following sections provide a summary of the deliverables and main achievements of the CEOS Virtual Constellations for GEO and the Working Groups as outcomes of the CEOS Actions in 2011.

CEOS Virtual Constellations for GEO

Overall Status of the Constellations Process

The Virtual Constellations Concept was proposed by the SIT Chair to CEOS in early 2006 and was enthusiastically endorsed and welcomed by CEOS Principals as a promising way forward for space agencies to focus on specific implementation outcomes. Initially, four pilot studies were agreed to test the process and practicalities. Two new Constellations were accepted at SIT-22 in September 2008, bringing the total number of Constellations to six. A seventh Constellation was accepted at 25th CEOS Plenary in November 2011.

These seven Virtual Constellations focus on the following domains:

- Atmospheric Composition (led by NASA and ESA);
- Ocean Surface Topography (led by EUMETSAT and NASA);
- Precipitation (led by NASA and JAXA);
- Land Surface Imaging (led by USGS, INPE, and ISRO);
- Ocean Colour Radiometry (led by ESA, ISRO, and NASA);

- Ocean Surface Vector Wind (led by NOAA, EUMETSAT, and ISRO); and
- Sea Surface Temperature (led by NOAA and ESA)

The status of the seven CEOS Virtual Constellations (VCs) were regularly reported to CEOS Plenary and SIT meetings in 2011, including details of the implementation measures required of space agencies to address the Constellation objectives. A current status summary and top five accomplishments and issues for the seven Constellations were reported to the 25th CEOS Plenary by the SIT Chair. A summary of those accomplishments and issues is presented below (excerpted from the 25th CEOS Plenary Minutes).

Atmospheric Composition Constellation (ACC) Status

Progress since 24th CEOS Plenary (October 2010):

- The added value of Volcanic Ash monitoring by satellites was demonstrated in 2011 (*e.g.,* Icelandic volcanic ash)
- Air Quality Constellation position paper was endorsed in May 2011 at SIT-26
- Total ozone set intercomparison
- Supplied draft response to CEOS response to GCOS IP
- Atmospheric Composition Portal is under WGISS control

Land Surface Imaging Constellation (LSI) Status

Progress since 24th CEOS Plenary (October 2010):

- Mid-resolution guidelines were finalized and released in August 2011
- LSI Portal enhanced map-based query and direct data download capability
- Support for FCT/GFOI and JECAM requirements
- Free and Open-Source Tools for GIS available on-line
- Definition of LSI role in support to terrestrial ECVs

Precipitation Constellation (PC) Status

Progress since 24th CEOS Plenary (October 2010):

- Enhancement of PC Space Segment (*e.g.,* progress in Global Precipitation Measurement [GPM] implementation, launch of ISRO's Megha-Tropiques satellite)
- Implementation of improved Tropical Rainfall Measuring Mission (TRMM) algorithm (Version 7)
- Improvements in inter-satellite calibration techniques through the X-Cal WG
- Data availability from Chinese (CMA) & Russian (ROSHYDROMET) microwave (MW) imagers is still an issue
- Conical scan MW imagers availability in late-GPM phase and post-GPM phase (>2018) is also a challenge

Ocean Colour Radiometry Constellation (OCR) Status

Progress since 24th CEOS Plenary (October 2010):

- International Ocean Colour Coordinating Group (IOCCG) standing WG for evaluation of ECVs established; Chair selection underway
- IOCCG Level-1 Requirements report target completion Dec 2011
- INSITU-OCR WG in progress, Chairs established
- INSITU-OCR white paper outline by end of November 2011; Workshop February 2012
- iOCRT for 2013, IOCCG engagement of academic community at 2012

Ocean Surface Topography Constellation (OST) Status

Progress since 24th CEOS Plenary (October 2010):

- Continuity of climate record for sea level (Jason-1, -2, -3, and Continuity of Service follow-on mission [CS])
- Continuity of complementary coverage (Cryosat-2, ENVISAT, ERS-2, SARAL/AltiKA, Sentinel-3A, -3B) and their phasing in the Constellation
- Data Policy– timely access to data from the Chinese HY-2A
- Harmonized, easily accessible altimeter products (AVISO & RADS portals, Cryosat-2 Ocean Product)
- Training and Workshop organization

Ocean Surface Vector Wind Constellation (OSVW) Status

Progress since 24th CEOS Plenary (October 2010):

- Continuity of Ku-band (QuikSCAT, OSCAT/Oceansat-2, OSCAT follow-on)
- Continuity of C-band (ASCAT/METOP, EPS-SG, ERS-2)
- Integrating Ku- and C-band OVW products
- Timely data access from Chinese (SOA) and Russian scatterometers remains an issue
- Training courses: a second training course on significant wave height and surface vector wind was held in December 2011, co-hosted by the IOC/IODE, EUMETSAT, and NOAA.

Sea Surface Temperature Constellation (SST) Status

The SST Constellation was accepted at the 25th Plenary and was confirmed to proceed with preparing its Constellation Implementation Plan, to be presented at SIT-27 in March 2012.

CEOS Working Groups

A large part of the CEOS contributions to GEO in 2011 were made through the four CEOS Working Groups. Highlights of their progress since the 24th CEOS Plenary (November 2010) are provided below. Further information is provided above in the GEO Task-specific actions updates, as appropriate.

Working Group on Information Systems and Services (WGISS)

Since November 2011, WGISS made substantial advancements in data discovery and access methods, in support of enhancements to the GEOSS Common Infrastructure (GCI). All metadata records held in the CEOS International Directory Network (IDN) collection are now

available to the GCI. This collection is comprised of **20,994 data set** metadata records in ISO-19115 format. This includes records contributed to the IDN directly by IDN partners. Further information about this project is available at:

http://gcmd.gsfc.nasa.gov/Aboutus/collaborations/geosscsw.html

The WGISS Sensor Web Interest Group (IG) has supported the GEO Task DI-09-02, the 'Use of Satellites for Risk Assessment', through two subtasks incorporating technologies for end-to-end Disaster Management applications in the Caribbean and Southern Africa. The flood sensor web successfully demonstrated both the Caribbean Satellite Disasters Pilot capabilities during the 2010 hurricane season and the Namibian floods of 2010. Both cases directly involved regional disaster management teams.

The WGISS Data Stewardship IG directly supported GEO Task IN-02, "Advances in Life-Cycle Data Management, through new reference documents, long-term archive strategies, preservation practices, data life cycle models and concepts, and browse data formats.

The WGISS Web Services IG provided a venue for preview and discussion of various CEOS Agencies' web services activities, and introduced their new technologies to GEO.

The WGISS Architecture and Data Contributions Project IG demonstrated a "system of systems" proof of concept for greatly enhanced remote sensing data discovery and access via CEOS Agencies' systems

The WGISS GRID Computing Interest Group published a paper entitled, "Special issue of Interoperability architectures and arrangements for multi-disciplinary Earth Observation systems and applications" in IEEE Journal of Selected Topics in Applied Earth Observations and Remote Sensing (J-STARS).

The WGISS Applications Subgroup has supported further enhancements to portals for the Land Surface Imaging Virtual Constellation and the Atmospheric Composition Virtual Constellation, as well as assisting the Disaster SBA and Water SBA teams.

The IDN Interest Group has developed a Digital Elevation Model (DEM) quality information system (DEMqis), and supported the development of a DEM showcase relating to the GEO-CEOS Quality Assurance for Earth Observations (QA4EO) activity. The Group has also discussed a potential enterprise architecture for the CEOS Disaster SBA Team.

Working Group on Calibration and Validation (WGCV)

WGCV served as co-lead (with IEEE) on GEO task DA-09-01a: GEOSS Quality Assurance Strategy. Pursuant to this task, WGCV members supported a highly-successful GEO Quality Assurance for Earth Observation (QA4EO) workshop in October 2011. The workshop reviewed data quality assurance implementation examples across a wide variety of societal benefit areas, and their alignment with the QA4EO principle that "all data and derived products must have associated with them a Quality Indicator (QI) based on documented quantitative assessment of its traceability to community agreed (ideally satellite instrumentation) absolute reference standards". QA4EO principles have begun to be implemented within CEOS and throughout GEO.

WGCV provided a list of CEOS-endorsed reference sites over which CEOS Member Agencies should collect and provide information in order to facilitate interoperability and underpin internationally harmonised calibration/validation activities. This list, provided on the enhanced CEOS Cal/Val portal, also included recommended resource requirements for active agency support of site instrumentation and maintenance.

In December 2011, WGCV initiated a major international instrument intercalibration campaign over the DOME-C test site in Antarctica. This campaign will contribute further to the reliable comparison and synergistic use of information from a wide range of optical and radar remote sensing space systems.

WGCV members provided significant substantive comments to the CEOS-supported draft Architecture for Climate Monitoring from Space, emphasizing the need for improved instrument accuracy and data traceability to support benchmark measurements.

Working Group on Climate (WGClimate)

WGClimate was endorsed as the fourth standing CEOS Working Group in October 2010 so 2011 was the first year for capturing WGClimate activities. WGClimate was created to coordinate and encourage collaborative activities between the world's major space agencies in the area of climate monitoring.

WGClimate met for the first time in May 2011, following SIT-26, in Frascati, Italy. The participants at this first meeting discussed the WGClimate Terms of Reference and identified a number of priorities for the Working Group.

WGClimate focused on remote sensing space agencies' ability to address the Essential Climate Variables (ECVs) requested by the Global Climate Observing System (GCOS) Implementation Plan (IP), and began to develop pilot projects for certain key observations. WGClimate liaised with the CEOS Virtual Constellations on the question of the latters' ECV implementation.

WGClimate consulted with the CEOS Climate SBA Team on the future development of a "maturity matrix" on climate data collection methods, algorithm stability, metadata/quality assurance, documentation, validation, public release, and science and applications.

WGClimate representatives conducted extensive outreach and consultations via meetings with key stakeholders and partners such as the Global Climate Observing System (GCOS), the Coordination Group for Meteorological Satellites (CGMS), the World Climate Research Programme (WCRP), the World Meteorological Organization (WMO) Space Programme, and the CEOS Systems Engineering Office.

In 2011, WGClimate members also were heavily engaged with GCOS, CGMS, and the WMO Space Programme in development of an international architecture that seeks to ensure delivery of relevant observations necessary for long-term analysis of the Earth's climate system.

Working Group on Capacity Building and Data Democracy (WGCapD)

In response to a request from the 23rd CEOS Plenary, the 2011 CEOS Chair, in coordination with Working Group Chairs and the CEOS Secretariat, developed a proposal to more formally

incorporate principles of the GEO/CEOS Data Democracy initiative within the CEOS structure. The result was a proposed re-organization of the old CEOS Working Group on Education, Training, and Capacity Building to include Data Democracy-supporting CEOS Agencies and initiatives.

The 2011 CEOS Plenary approved of this reorganization and established the Working Group on Capacity Building and Data Democracy. It was decided that the Working Group will focus and unify CEOS efforts toward providing wider and easier access to important Earth Observation data, increasing the sharing of software tools such as the use of open source software and open systems interfaces, increasing data dissemination capabilities, transferring relevant technologies to end users, and providing intensive capacity building, education, and training.

ANNEX

CEOS Contributions to 2009-2011 GEO Tasks/Sub-Tasks

This annex provides information on the Tasks/Sub-Tasks that CEOS has co-led and contributed to for 2011.

GEO Task	Title	CEOS Task Lead	Agency	CEOS Task Contributor	Agency
	AGRICULTURE				
AG-06-02	Data Utilization in Fisheries and Aquaculture			Paul Briand	CSA
				David Antoine	IOCCG
	ARCHITECTURE				
AR-06-11	Radio Frequency Protection			Edoardo Marelli	ESA
AR-09-01a	Enabling Deployment of a GEOSS Architecture			Bryan Bailey	USGS
AR-09-02a	Virtual Constellations	Makoto Kajii	JAXA	Juliette Lambin	CNES
				Ivan Petiteville	ESA
				Mark Drinkwater	ESA
				Claus Zehner	ESA
				Michael Berger	ESA
				Francois Parisot	EUMETSAT
				Hans Bonekamp	EUMETSAT
				Julio D'Alge	INPE
				David Antoine	IOCCG
				B.S. Gohil	ISRO
				Hiroshi Murakami	JAXA
				Riko Oki	JAXA
				Mark Dowell	JRC
				Steven Neeck	NASA
				Richard Eckman	NASA
				Eric Lindstrom	NASA
				Paula Bontempi	NASA
				Stan Wilson	NOAA
				Tom Holm	USGS
AR-09-02b	WIS			Stefan Falke	NASA
AR-09-02c	Sensor Web Enablement for In-Situ Observing Network Facilitation			Terence Van Zyl	CSIR
				Ivan Petiteville	ESA
AR-09-03b	Legacy of the International Polar Year 2007-08			Yves Crevier	CSA
				Masanobu Shimada	JAXA
AR-09-03d	Global Observing System (GOS)			Steven Neeck	NASA
				Mitch Goldberg	NOAA

GEO Task	Title	CEOS Task Lead	Agency	CEOS Task Contributor	Agency
	CAPACITY BUILDING				
CB-09-02a	Recognition of Cross Border Education and Training in Earth Observation			Supapis Polngam	GISTDA
CB-09-02g	GEONETCast Training			Gordon Bridge	EUMETSAT
CB-09-05b	CBERS	Stefano Bruzzi	ASI		
CB-09-05e	Data Democracy	Stefano Bruzzi	ASI		
	CLIMATE				
CL-06-01a	Sustained Reprocessing and Reanalysis of Climate Data	Mitch Goldberg	NOAA	Lothar Schueller	EUMETSAT
				Michele Rienecker	NASA
CL-09-02b	Key Climate Data from Satellite Systems	Mitch Goldberg	NOAA	Didier Renaut	CNES
		Stephen Briggs	ESA	Pascal Lecomte	ESA
				Claus Zehner	ESA
				Steven Neeck	NASA
				Jeff Key	NOAA
				Chris Barnet	NOAA
				Cheng-Zhi Zou	NOAA
				Richard Eckman	NASA
				Eric Lindstrom	NASA
				Ivan Petiteville	WGISS
CL-09-03a	Integrated Global Carbon Observation (IGCO)			Takashi Moriyama	JAXA
CL-09-03b	Forest Carbon Tracking	Frank Martin Seifert	ESA	Yves Crevier	CSA
				Chaowalit Silapathong	GISTDA
				Masanobu Shimada	JAXA
CL-09-03c	Global Monitoring of Greenhouse Gases from Space	Takashi Moriyama	JAXA		

GEO Task	Title	CEOS Task Lead	Agency	CEOS Task Contributor	Agency
	DATA MANAGEMENT				
DA-09-01a	GEOSS Quality Assurance Strategy	Gregory Stensaas	USGS	Nigel Fox	BNSC/NPL
				Philippe Goryl	ESA
				Gyanesh Chander	USGS
DA-09-01b	Data, Metadata and Products Harmonisation	Martin Yapur	NOAA	Frederic Baret	CNES
		Yonsook Enloe	NASA	Gregory Stensaas	USGS
DA-09-01c	Long Term Preservation of Earth Observation Data			John Faundeen	USGS
DA-09-02c	Global Geodetic Reference Frames			Steven Hosford	CNES
DA-09-03a	Global Land Cover	Pascal Lecomte	ESA		
DA-09-03d	Global DEM	Jan-Peter Muller	UKSA		
		Lorant Czaran	UNOOSA		
		Dave Meyer	USGS		
		Dean Gesch	USGS		
	DISASTERS				
DI-06-09	Use of Satellites for Risk Management	Guy Seguin	CSA	Steven Hosford	CNES
				Ivan Petiteville	ESA
				Simon Jutz	ESA
				Jolyon Martin	ESA
				Pakorn Apaphant	GISTDA
				Ivan Csiszar	NOAA
DI-09-01a	Vulnerability Mapping and Risk Assessment			Vern Singhroy	CCRS
DI-09-02a	Implementation of a Multi-Risk Management Approach			Claus Zehner	ESA
DI-09-02b	Regional End-to-End Disaster Management Applications	Guy Seguin	CSA	Stuart Frye	NASA
	ECOSYSTEM				
EC-09-01a	Ecosystem Classification and Mapping			Daniel Matsapola	CSIR
				David Antoine	IOCCG
EC-09-01c	Regional Networks for Ecosystems			Mark Dowell	IOCCG
EC-09-01e	Forest Mapping and Change Monitoring			Tom Holm	USGS
	ENERGY				
EN-07-01	Management of Energy Sources	Richard Eckman	NASA	Antti Pulkkinen	NASA
				Gene Fosnight	USGS

GEO Task	Title	CEOS Task Lead	Agency	CEOS Task Contributor	Agency
	HEALTH				
HE-09-01	Information Systems for Health			Murielle Lafaye	CNES
				Jack Fishman	NASA
HE-09-02b	Air Quality Observations, Forecasting and Public Information			Shobha Kondragunta	NOAA
HE-09-03a	Implementation of Meningitis Decision Support Tool			Murielle Lafaye	CNES
HE-09-03b	Predicting and Reducing Incidence of Vector-Borne and Zoonotic Diseases	Michelle Hertzfeld	NOAA	Murielle Lafaye	CNES
				Chaowalit Silapathong	GISTDA
				Felix Kogan	NOAA
	USER ENGAGEMENT				
US-09-01a	Identifying Synergies between Societal Benefit Areas			Multiple CEOS SBA Reps	
	SCIENCE AND TECHNOLOGY				
ST-09-02	Promoting Awareness and Benefits of GEO in the Science and Technology Community			David Antoine	IOCCG
	WATER				
WA-06-07a	Latin America			Gordon Bridge	EUMETSAT
				Carlos Frederico Angelis	INPE
				Ivan Petiteville	ESA
WA-06-07b	Africa	Diego Fernandez Prieto	ESA		
WA-08-01b	Runoff			Nelly Mognard	CNES
WA-08-01g	Global Water Quality Monitoring			Nelly Mognard	CNES
				David Antoine	IOCCG
				Jared Entin	NASA