

# **Update to CEOS WGCV Plenary on Constellation tasks**

**March 2010**

**Greg Stensaas (USGS)  
CEOS WGCV Vice Chair**

# CEOS Constellation history

- CEOS recommended 4 constellation pilot studies in late 2005. The formal work plans for each constellation team was approved in late 2006
  - Atmospheric Composition** (NASA)
  - Precipitation** (NASA/JAXA)
  - Ocean Surface Topography** (NOAA/EUMETSAT)
  - Land Surface Imaging** (USGS/ISRO)
- Additional approved constellations by CEOS
  - **Ocean Surface Vector Wind Constellation (OSVW)** (*NOAA, EUMETSAT, ISRO*)
  - **Ocean Color Radiometry Constellation (OCR)**
- Promotes contribution to GEO observational requirements (GEOSS 10-year Implementation Plan)
- Promotes synergies among national and regional satellite programs
- Promotes common systematic guidelines and standards
- Promotes coordinated user requirements for future system architectures and optimal end-to-end capabilities

# Coordination and cooperation to achieve the GEOSS space segment

National and regional Earth Observation will continue to dominate space agency spending.

CEOS promotes coordination between member organizations and cooperation in the development of Earth observing satellites.

In support of the Group on Earth Observations (GEO) objectives and as a space component of the Global Earth Observation System of Systems (GEOSS), CEOS has developed the concept of virtual, space-based Constellations. A Constellation is a coordinated set of space and/or ground segment capabilities from different partners that focuses on observing a particular parameter or set of parameters of the Earth system.

The “**CEOS Virtual Constellations**” concept is an approach to facilitate agreements, develop standards, and address shortcomings in the international planning process. The results will help secure resources from space agencies for space-based implementation of Earth observations, all without eroding the independence of individual agencies.

# Atmospheric Composition Constellation (ACC)

- The CEOS Constellation for Atmospheric Composition (ACC) goal is to collect and deliver data to improve monitoring, assessment and predictive capabilities for changes in the ozone layer, air quality and climate forcing associated with changes in the environment through coordination of existing and future international space assets. The ACC Constellation directly addresses the SBAs of Disasters, Health, Energy, Climate, and Ecosystems.

# AAC next meeting and Projects

ACC-5, 30-31 March 2010, Canada, Montreal, CSA

## PROJECTS

- **Project #1: Fire / Smoke Aerosol Forecasts**
  - [Demonstration of a Global Fire/Aerosol Operational Product Target](#)  
Jack Fishman (NASA LaRC)
  - [Development of a Global Fire/Aerosol Operational Product as part of the CEOS Atmospheric Composition Constellation](#)  
Presentation by Jay Al-Saadi (NASA LaRC) at the 2008 EUMETSAT Meteorological Satellite Conference, Darmstadt, Germany, Sep 8-12, 2008
- **Project #2: Nitrogen Dioxide (NO<sub>2</sub>) Air Quality Forecasts**
  - [Characterization of Metop-A GOME-2 and Aura OMI NO<sub>2</sub> Data for Regional and Global Air Quality Modeling Applications](#)  
Shobha Kondragunta (NOAA)
- **Project #3 Aviation Alerts for Volcanic Eruptions**
  - [Global Support to Aviation Control](#)  
Presentation by Claus Zehner (ESA) at the ACC-3 Workshop, 16-Oct, 2008.

**Recommended WCGV POC - - ACSG Leads**  
**–Jean-Christopher Lambert and Bojan Bokjov**

# AAC Reports

## [ACC-4 Workshop Final Report](#) (9 pages)

Report of the Atmospheric Composition Constellation (ACC), Workshop on Air Quality (June 2009)

## [ACC Gap Analysis Report](#) (6MB, 127 pages)

Atmospheric Composition Constellation (ACC), Gap Analysis Report, Final Version (November 2008) Conducted by Jolyon Reburn (Rutherford Appleton Lab - RAL) in cooperation with Brian Killough (CEOS SEO) and Ernest Hilsenrath (CEOS ACC Co-Lead)

## [ACC-3 Workshop Final Report](#) (29 pages)

Report of the CEOS ACC-3 Workshop on the Impact of Data Gaps on Climate Modeling, Validation, and Forecasts - Recommendations to the CEOS Agencies (October 2008)

## [Minutes of the 2nd Atmospheric Composition Constellation Workshop \(ACC-2\)](#)

Hosted by EUMETSAT, Darmstadt, Germany, 13-14 September, 2007

## [Minutes of the 1st Atmospheric Composition Constellation Workshop \(ACC-1\)](#)

Hosted by the US Geological Survey, Reston, Virginia, 27-28 March 2007

## [Atmospheric Composition Constellation \(ACC\) System Requirements Document](#)

Draft Version, November 5, 2007

• Ernest Hilsenrath	<a href="mailto:ernest.hilsenrath@nasa.gov">ernest.hilsenrath@nasa.gov</a>	(retired)	NASA
• Claus Zehner	<a href="mailto:claus.zehner@esa.int">claus.zehner@esa.int</a>	(new lead)	ESA
• Joerg Langen	<a href="mailto:joerg.langen@esa.int">joerg.langen@esa.int</a>		ESA
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• Richard Engelen	<a href="mailto:richard.engelen@ecmwf.int">richard.engelen@ecmwf.int</a>		ECMWF
• DeWayne Cecil	<a href="mailto:ldcecil@usgs.gov">ldcecil@usgs.gov</a>		USGS

# Precipitation Constellation (PC)

- Comments from constellation lead Steven Neeck

The CEOS Precipitation Constellation has substantial cal/val activities being conducted in support of the existing on-orbit constellation and the upcoming GPM constellation. We reiterate the invitation (first made in 2008) for the MWSS to participate in our X-Cal Working Group and to contact us to explore potential support that would be truly value added to our current activities.

I attach a brief presentation that you may wish to use. Unfortunately, I do not expect to be able to participate tomorrow afternoon and my cognizant colleagues are participating in the conflicting MicroRad 2010 meeting. I do however look forward to future interactions.

- See attached slides from Steven Neeck (NASA) and Oki Riko (JAXA)
- Discussion



# Ocean Surface Topography Constellation (OST)

- The CEOS Constellation for Ocean Surface Topography (OST) goal is to implement a sustained, systematic capability to observe the surface topography of global oceans from the basin scale to the mesoscale ( $\sim 100$  km).
- The surface topography from satellite altimeters and the upper-ocean density field from Argo profiling floats are oceanic analogues to the surface pressure from barometers and the density field from atmospheric profilers.
- Observations of these two fundamental state variables are necessary for understanding the dynamics of the oceans, assessing their role in climate, and developing an operational forecast capability.

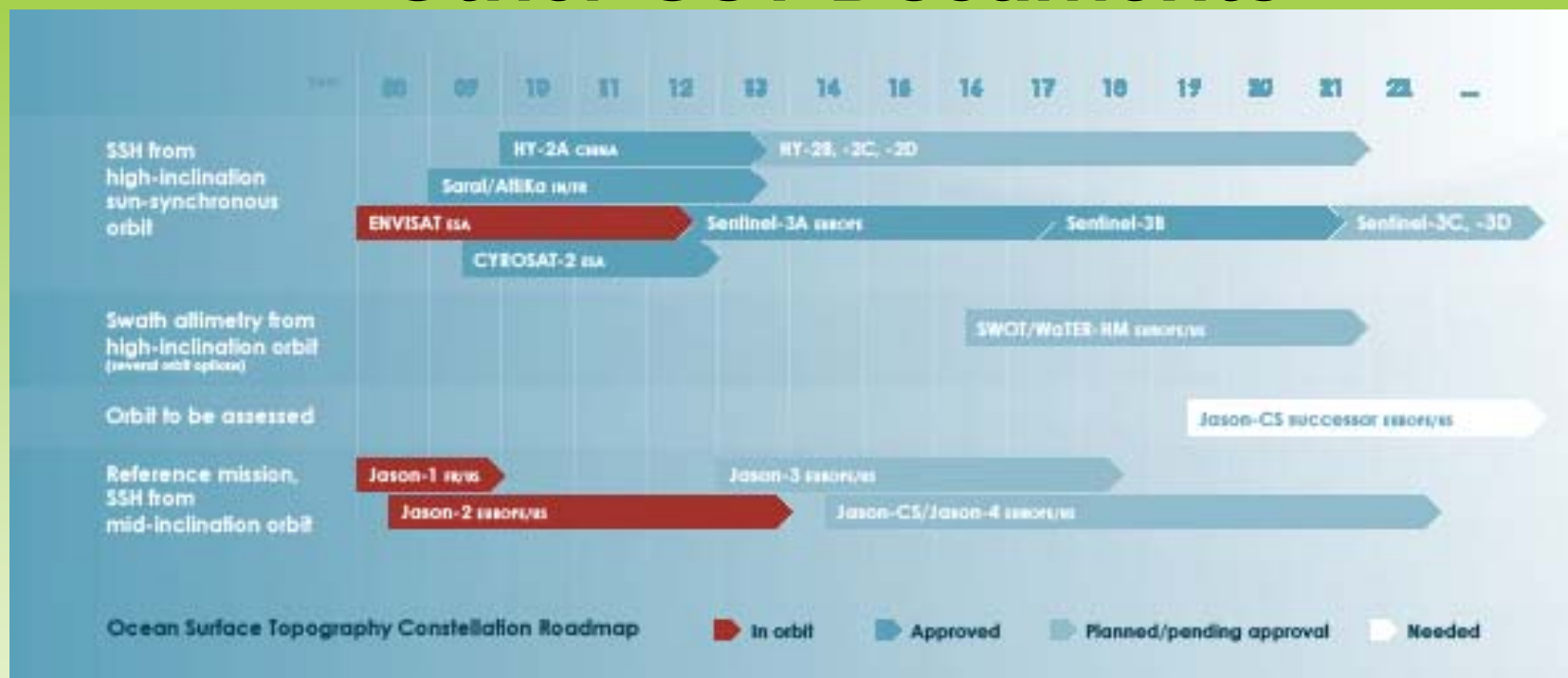
# OST Documents

In February 2008, the European Organisation for the Exploitation of Meteorological Satellites (EUMETSAT) and the U.S. National Oceanic and Atmospheric Administration (NOAA) initiated a study to define long-term, high-level mission requirements for satellite altimetry. Given the existing and emerging altimetry capabilities within the international community, this study was conducted in support of the OST Constellation.

The report resulting from this study, "The Next 15 Years of Satellite Altimetry: Ocean Surface Topography Constellation User Requirements Document", was prepared under contract with EUMETSAT by the companies Collecte Localisation Satellites (CLS) and Orange Bleue Conseil. It presents high-level user requirements - based both on operational and research needs - for satellite altimetry over the next 15 years; as such, it develops a rationale, minimal composition and general characteristics of the OST Constellation. It is intended to provide a context for the definition of requirements for specific altimetry missions in the future, including those for Jason-3. The document has been reviewed by key participants from the user community and the space agencies. It is a EUMETSAT and NOAA contribution in support of the CEOS OST Constellation.

This report is intended to be a living document, to be regularly updated and refined based on progress made by the ocean community and space agencies. To download this document, click [here](#).

# Other OST Documents



- [OST Constellation Strategic Workshop Report](#) Assmannshausen, Germany January 2008
- [OST Constellation Report, SIT-21](#) Woods Hole, April 2008
- [CEOS Climate Action O-4 and O-5 Status Report](#) July 2008
- [OST Constellation Report, CEOS Plenary 21](#) Hawaii, November 2007

# Land Surface Imaging (LSI)

- The fundamental mission of the CEOS Land Surface Imaging (LSI) Constellation is to promote the efficient, effective, and comprehensive collection, distribution, and application of space-acquired image data of the global land surface, especially to meet societal needs of the global population, such as those addressed by the Group on Earth Observations (GEO) societal benefit areas (SBAs).
- Significantly, this mission addresses not only the building and launching of satellite systems, but also the development and operation of associated ground segments and their ability to get critical data efficiently into the hands of many interdisciplinary science users and practical applicationists. To accomplish this mission, a LSI Constellation Study Team, charged with carrying out necessary studies and activities, has been established.

# LSI Meeting

CEOS Land Surface Imaging (LSI) Constellation Meeting,  
February 23-24, 2010, INPE, Sao José dos Campos, Brazil

- Meeting Documents
  - [LSI Meeting Agenda](#)
  - [LSI Constellation 2009 Overview](#)
  - [LSI Work Plan 2009](#)
  - [2010 FCT Data Requirements LSI Participants \(EXCEL\)](#)
- [LSI Guidelines Data \(EXCEL\)](#). Meeting Presentations
- [LSI Overview](#) – Holm
- [WGCV Report](#) – Stensaas
- [FCT Report](#) – Holm
- [ESA Report](#) – Berger
- [LSI Portal](#) – Oleson
- [NASA Report](#) - Ungar for Gutman
- [Climate Records](#) – Dwyer
- [LSI Guidelines](#) - Keyes and Killough

View Following Slides from CEOS LSI web page  
01\_LSI\_Holm.ppt

# Land Surface Imaging (LSI) Constellation Overview Slides from Tom Holm LSI Meeting Feb 2010

***Co-Leads:***

*and the*

*(INPE)*

*U.S. Geological Survey (USGS),  
Indian Space Research Organization (ISRO),*

*Instituto Nacional de Pesquisas Espaciais*



# LSI Constellation Study Team - 2009

## CEOS Agency Members

- USGS: **Co-Chair**, Tom Holm (new 2009)
- ISRO: **Co-Chair**, V. Hegde (new 2009)
- INPE: **Co-Chair**, (Julio Dalge new 2009)
- INPE: João Viane Soares
- EC: Herve JeanJean
- ESA: Michael Berger
- CSA: Daniel DeLisle
- CONAE: Ana Medico
- JAXA: Takeo Tadono
- NOAA: Kevin Gallo
- NASA: Garik Gutman
- NRSCC: Yonghong Zhang
- CRESDA: Xiaohua Yi
- GISTDA: Phuriwaj Ruengnaowaroj
- CNES: Aurelie Sand
- CDTI: Mónica Lopez

## CEOS WG Members

- WGCV (NASA): Stephen Ungar
- WGCV (USGS): Greg Stensaas

## User Community Members

- USGS: Brad Reed
- JRC: Alan Belward
- JPL: Mike Abrams
- Nagoya U.: Yasushi Yamaguchi
- BGS: Stuart Marsh
- U. Maryland: J. Townshend
- CSIRO: Alex Held

# Status of Activities and Future Plans




Committee on Earth Observation Satellites  
Working Group on Calibration and Validation

- **LSI Constellation Portal:** “Mid-Resolution Optical Land Surface Imaging Satellite Systems”
  - Information and Enhanced Data Access
    - Now online at <http://wgiss.ceos.org/lsip>

CEOS Land Surface Imaging Constellation Portal  
for  
Mid-Resolution Optical LSI Satellite System Information and Enhanced Data Access

Home About Portal About LSIC GEO FCT

Satellites and Sensors  
Direct Access to Data



GEO Forest Carbon Tracking

CEOS

CEOS Land Surface Imaging Constellation Portal  
for  
Mid-Resolution Optical LSI Satellite System Information and Enhanced Data Access

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Overview

- CEOS Agency Mid-Resolution Optical Satellite Systems
- Satellites & Sensors
- Status & Launches
- Orbit Information
- Sensors
  - Band Information
  - Visible & NIR Bands
    - SWIR Bands
    - Thermal Bands
  - Panchromatic Bands
  - Hyperspectral Bands
  - Radiometric & Geometric Characteristics
  - Geographic Characteristics
- Data
  - Data Access
  - Documentation

CEOS Agency Current and Former Mid-Resolution Optical Satellites & Sensors

Satellite	Sensors	Agencies
ADEOS-1	AVNIR-1	JAXA
ALOS	AVNIR-2	JAXA
CBERS-1	HRCC, IRMSS	CAST, INPE
CBERS-2	HRCC, IRMSS	CAST, INPE
CBERS-2B	HRCC	CAST, INPE
EO-1	ALI, Hyperion	NASA, USGS
IMS-1	MX-T	ISRO
IRS-1A	LISS-I, LISS-II	ISRO
IRS-1B	LISS-I, LISS-II	ISRO
IRS-1C	LISS-III A	ISRO
IRS-1D	LISS-III A	ISRO
IRS-P2	LISS-III A	ISRO
IRS-P6	LISS-III B, AWiFS	ISRO
JERS-1	OPS	JAXA
LandSAT 1	MSS	NASA, USGS
LandSAT 2	MSS	NASA, USGS
LandSAT 3	MSS-B	NASA, USGS
LandSAT 4	MSS, TM	NASA, USGS
LandSAT 5	MSS, TM	NASA, USGS
LandSAT 7	ETM+	NASA, USGS
SAC-C	HRTC	CONAE
SPOT-1	HRV	CNES
SPOT-2	HRV	CNES
SPOT-3	HRV	CNES
SPOT-4	HRVIR	CNES
SPOT-5	HRG	CNES
Terra	ASTER	NETI, NASA
THEOS	MS	GISTDA





# CEOS Land Surface Imaging Constellation Portal

for

## Mid-Resolution Optical LSI Satellite System Information and Enhanced Data Access

### Overview

• CEOS Agency  
Mid-Resolution Optical  
Satellite Systems

### Satellites

- Satellites & Sensors
- Status & Launches
- Orbit Information

### Sensors

- Band Information
- Visible & NIR Bands
  - SWIR Bands
  - Thermal Bands
- Panchromatic Bands
- Hyperspectral Bands
  - Radiometric &  
Geometric Characteristics

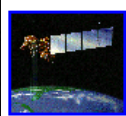
• Geographic  
Characteristics

### Data

- Data Access
- Documentation

### CEOS Agency Current and Future

Satellite	Sensor	Agency
<a href="#">ADEOS-1</a>	AVIRIS	AVIRIS
<a href="#">ALOS</a>	AVIRIS	AVIRIS
<a href="#">CBERS-1</a>	HRCC	HRCC
<a href="#">CBERS-2</a>	HRCC	HRCC
<a href="#">CBERS-2B</a>	HRCC	HRCC
<a href="#">EO-1</a>	ALI, HRS	ALI, HRS
<a href="#">IMS-1</a>	MS	MS
<a href="#">IRS-1A</a>	LISS-I	LISS-I
<a href="#">IRS-1B</a>	LISS-I	LISS-I
<a href="#">IRS-1C</a>	LISS-I	LISS-I
<a href="#">IRS-1D</a>	LISS-I	LISS-I
<a href="#">IRS-P2</a>	LISS-III	LISS-III
<a href="#">IRS-P6</a>	LISS-III	LISS-III
<a href="#">JERS-1</a>	OC	OC
<a href="#">Landsat 1</a>	MS	MS
<a href="#">Landsat 2</a>	MS	MS
<a href="#">Landsat 3</a>	MS	MS
<a href="#">Landsat 4</a>	MS	MS
<a href="#">Landsat 5</a>	MS	MS
<a href="#">Landsat 7</a>	ET	ET
<a href="#">SAC-C</a>	HR	HR
<a href="#">SPOT-1</a>	HR	HR
<a href="#">SPOT-2</a>	HR	HR
<a href="#">SPOT-3</a>	HR	HR
<a href="#">SPOT-4</a>	HR	HR
<a href="#">SPOT-5</a>	HR	HR
<a href="#">Terra</a>	ASTER	ASTER
<a href="#">THEOS</a>	MS	MS



Platform: LANDSAT-7

[Click to view more](#)

Platform-based Instruments:

[Click to view more](#)

#### Orbit

Orbit Altitude: 705km

Orbit Inclination: 98.2 degree

Equator Crossing: nominally 10 AM

Period: 99 minutes

Repeat Cycle: 16 days

Orbit Type: LEO > Low Earth Orbit > Polar Sun-Synchronous

#### Related Data Sets

[View all records related to this platform](#)

#### Description

Landsat 7 systematically provides well-calibrated, multispectral, moderate resolution, substantially cloud-free, sun-lit digital images of the Earth's continental and coastal areas with global coverage on a seasonal basis. It covers the United States every 16 days. Operations were transferred to USGS on Fall 2000.

The Landsat Project is a joint initiative of the U.S. Geological Survey (USGS) and the NASA to gather Earth resource data using a series of satellites. NASA

[Click to view more](#)

#### Online Resource:

<http://nasascience.nasa.gov/missions/landsat-7>

<http://landsathandbook.gsfc.nasa.gov/handbook/handbook.html#chapter2/chapter2.html>

<http://landsat.gsfc.nasa.gov/>

#### Platform Logistics:

Design Life: 5 Years

Launch Date: 1999-03-15

Primary Sponsors:

USA/USGS

USA/NASA

**The Forest Carbon Tracking Task (GEO FCT)** has been established to support countries wanting to establish national forest-change, carbon estimation and reporting systems. It will facilitate access to long-term satellite, airborne and in situ data, provide the associated analysis and prediction tools, and create the appropriate framework and technical standards for a global network of national forest carbon tracking systems. The task follows the guidelines set out by the **United Nations Framework Convention on Climate Change (UNFCCC)**. Its outputs will be available to support interested countries in their efforts to implement the Convention. The task is being carried out by a **partnership** of GEO member governments, key UN bodies, space agencies, the science community and the private sector.



[Click here to see the 2009 FCT data acquisitions.](#)

**What is GEO?** GEO was launched in response to calls for action by the 2002 World Summit on Sustainable Development and by the G8 (Group of Eight) leading industrialized countries, to coordinate the construction of a **Global Earth Observation System of Systems (GEOSS)**, as a way to assist developed and developing country governments to respond better to disasters, manage their resources and promote the well-being of their citizens. Since 2005, the **Group on Earth Observation (GEO)** has grown to become a partnership between close to 80 governments and 56 leading international organisations.

**For more information please see the GEO FCT Brochure by clicking here.**

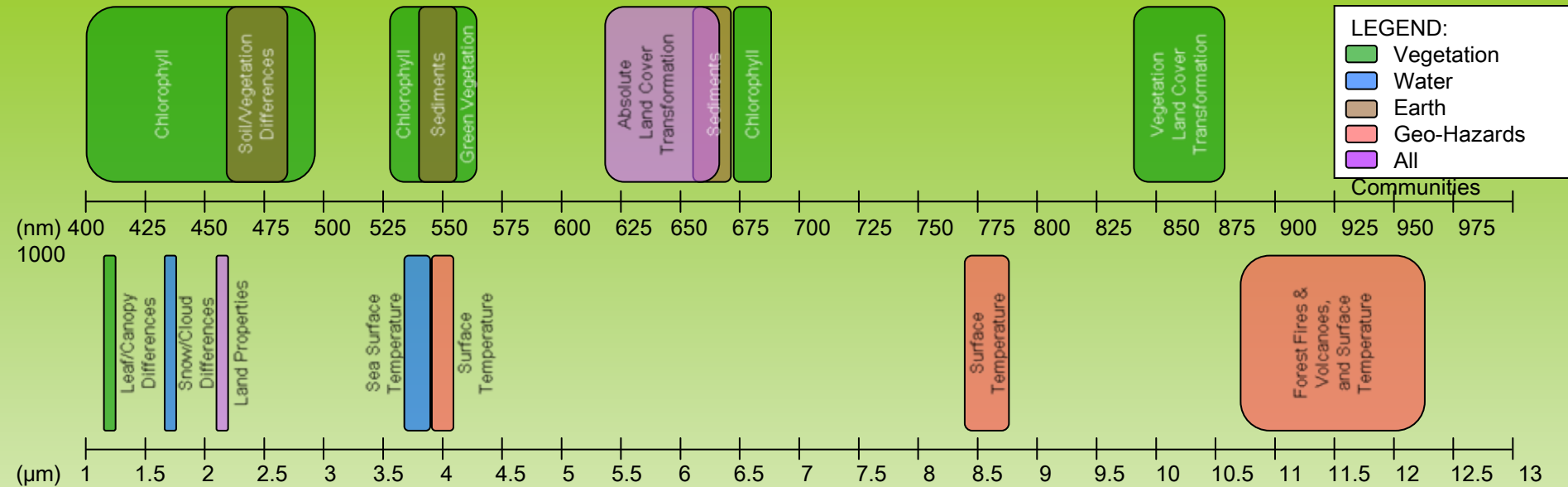
**The GEO Forest Carbon Tracking Task seeks to:**

1. Define a set of standards, methods and requirements that future spatially explicit National Forest Monitoring and Carbon Accounting Systems could adopt, to provide the most accurate results relying on the full potential of existing observational and processing capabilities.
2. Coordinate the use of data from current and planned Earth observing satellites operated by GEO member countries to provide the technical capability and continuity to support the monitoring, reporting, and verification (MRV) information required by future regulatory frameworks for the inclusion of forests in post-Kyoto climate agreements.
3. Coordinate the use of in-situ data, models and verification techniques, considered here as essential elements of future MRV systems.
4. Secure time-series of SAR and optical satellite data and analysis tools, integrated with ecosystem models and in-situ data, that can be used interoperably and in complementary ways to support the information needs of MRV systems for FCT.
5. Appropriate international institutional frameworks, and supporting data policies allowing open access and application of the supporting satellite datasets will be essential to secure the sustained supply of information in support of MRV requirements.

# LSI Mid-Resolution Optical Guidelines



Committee on Earth Observation Satellites  
Working Group on Calibration and Validation

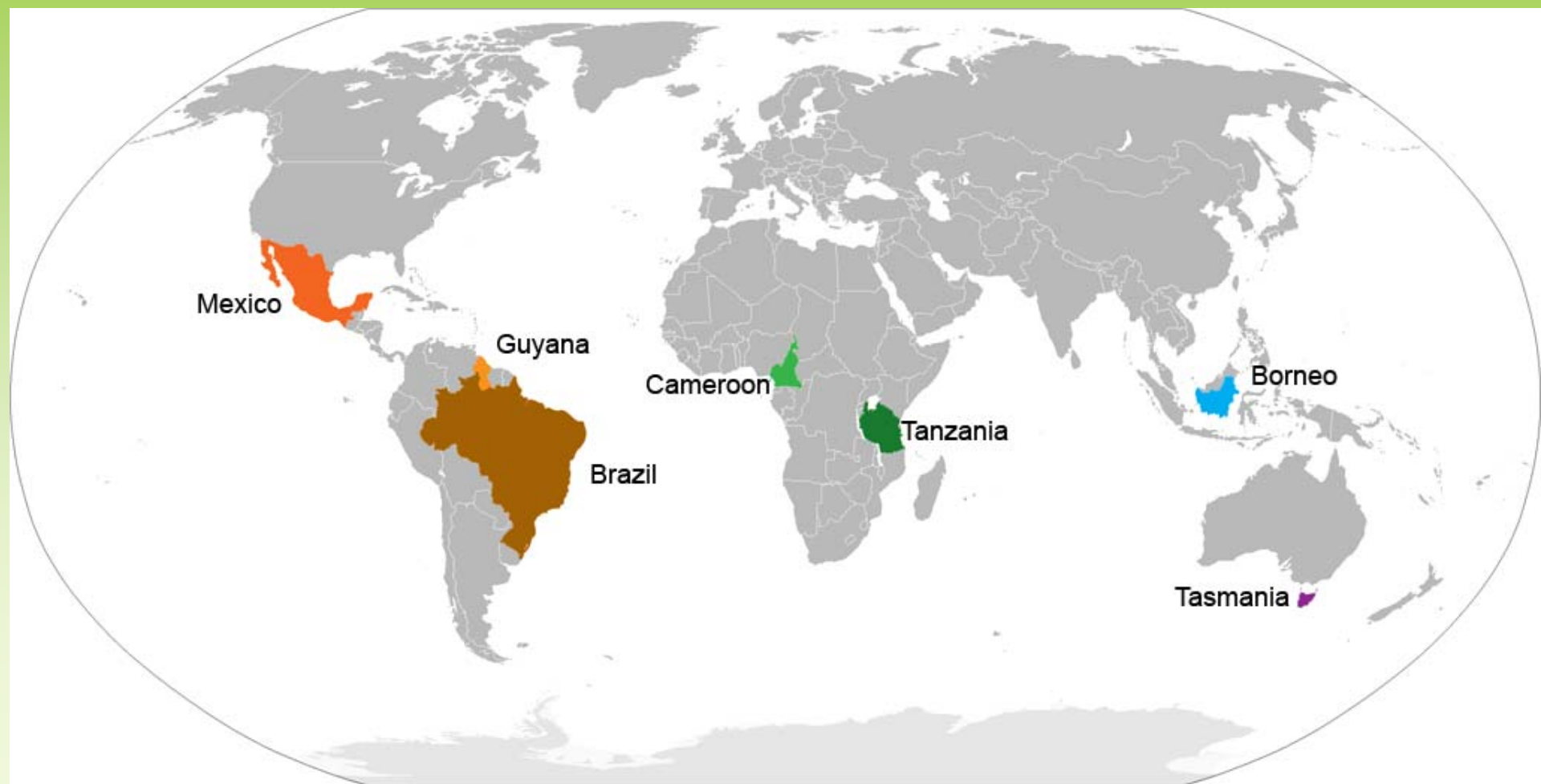


The regions designated above for each user community are based on the MODIS band applications.  
A more detailed visualization in Microsoft Excel is available.

**Need help from the international user communities to specify lower level needs and guidelines for values such as specific spectral bands, spatial resolutions, swath width, repeat frequencies, accuracies, etc.**

# GEO Forest Carbon Tracking Task

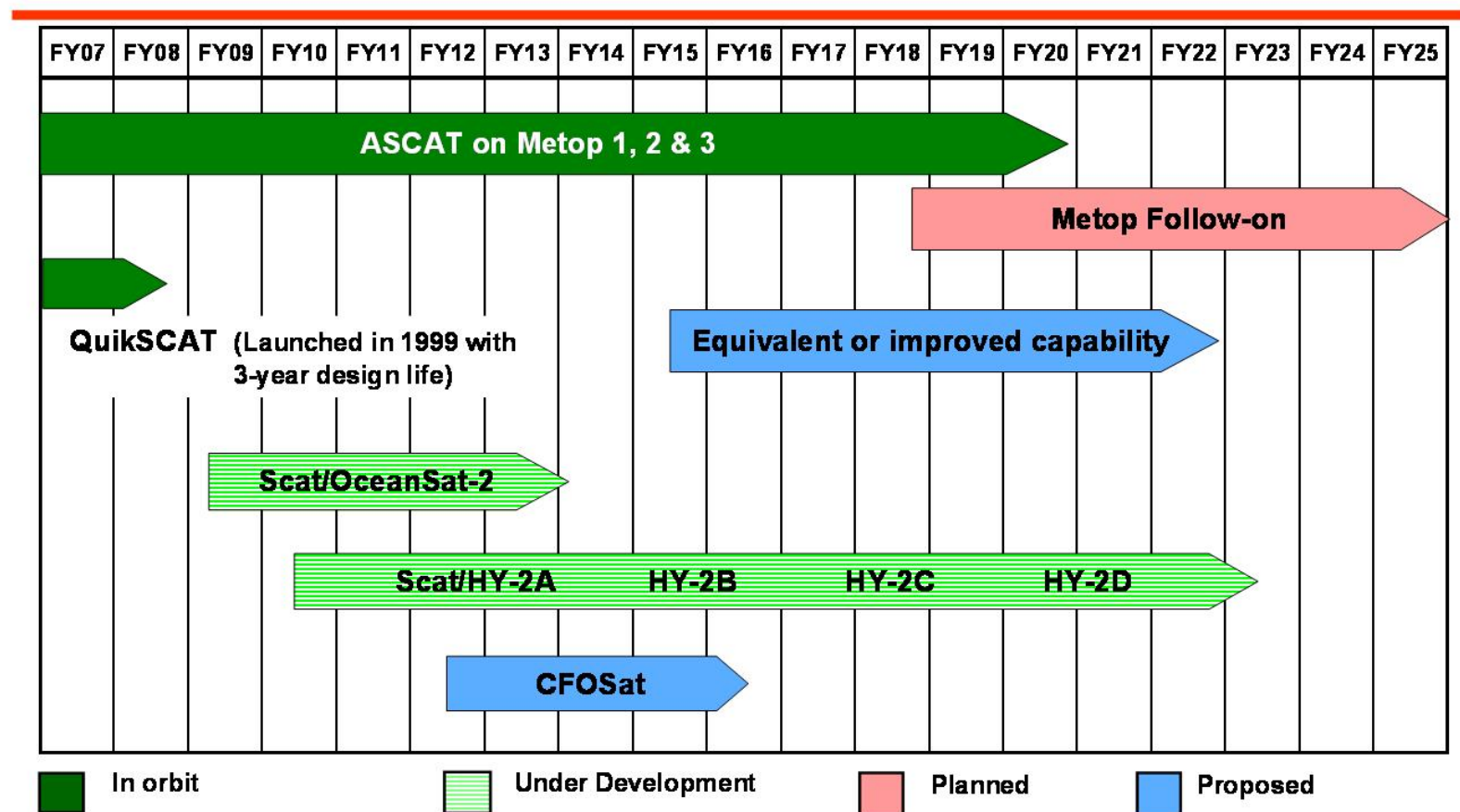
## National Demonstrator Sites - 2009



## Ocean Surface Vector Wind Constellation (OSVW)

- The Ocean Surface Vector Wind Virtual Constellation (OSVW-VC) will improve operational marine warnings and forecasts through the use of ocean surface vector winds (OSVW) from satellite scatterometry (together with significant wave height, SWH, from the Ocean Surface Topography Virtual Constellation).
- The OSVW-VC will also characterize the OSVW field for use in climate-quality data records and facilitate research related to the influence of wind forcing on the circulation of the oceans.

## OSVW Satellite Missions Present and Proposed





# OSWV Implementation Plan

Initial [OSWV Implementation Plan](#) presented and discussed at SIT-24

**Initial Implementation Plan for the  
Ocean Surface Vector Wind Virtual Constellation<sup>[1]</sup>  
in collaboration with the Ocean Surface Topography Virtual  
Constellation<sup>[2]</sup>**

**Stan Wilson, NOAA; Hans Bonekamp, EUMETSAT; and B.S. Gohil, ISRO  
10 August 2009**

- [1]** Formally established by the CEOS Plenary in November 2008, the *OSWV Virtual Constellation* (VC) is working closely with the international community to harmonize among the different scatterometer systems – agreement on timely, unrestricted and easy access to data products with consensus standards and formats; joint participation in calibration and validation efforts; and collaboration in the use of those products for both research and operational forecasting.
- [2]** The OSWV VC is partnering with the *Ocean Surface Topography VC* to facilitate access to significant wave height in addition to SVW products; both of these are required for marine analyses and forecasts.

# OSWV Comments from Stan Wilson

Greg: I regret that I will be enroute to India on a joint NOAA/NASA visit to the Indian Space Research Organization at the time of your meeting.

Since Changyong is familiar with a calibration issue concerning the microwave radiometer used for water vapor correction in Jason-class satellite altimetry, might I suggest that he speak to interests of the Ocean Surface Topography Constellation for your meeting. While I am unaware of any, he can speak with one of his NOAA/STAR colleagues, Laury Miller, to see whether there are additional such issues that might be addressed. Other than this one issue, it is not obvious to me that there is much, if any, overlap in expertise of the WGCV and the cal/val needs of satellite altimetry. However, we would be pleased to have someone from the WGCV attend the annual meetings of the Ocean Surface Topography (OST) Science Team, as well as the OST Constellation. These meetings, to be held this year in Lisbon, Portugal from 18-20 October, 2010, will focus on the analysis of the OSTM/Jason-2 mission post-validation phase, in comparison with the tandem Jason-1 mission data, and will include CalVal results and in-orbit mission performance assessment. On-going activities concerning current and future altimetric projects will also be presented and discussed. This represents an opportunity to assess the extent to which the WGCV can bring its expertise to bear on cal/val issues of concern to the OST Science Team and Constellation.

Changyong might also speak with another of his NOAA/STAR colleagues, Paul Chang, to assess the extent to which the expertise of the WGCV overlaps with the needs of the Ocean Vector Wind (OVW) Constellation. As with the above, we would be pleased to have someone from the WGCV attend the annual meeting of the International OVW Science Team, as well as the OVW Constellation. These meetings, including the NASA OVW Science Team, will be May 18-20, 2010 in Barcelona, Spain. The meeting web site <http://coaps.fsu.edu/scatterometry/meeting/> includes information on the hotel location and area information, as well as the meeting agenda. One of the topics of discussion will concern the preparation of a global, inter-calibrated OVW data set from the C-band ASCAT and the Ku-band QuikSCAT sensors.

If any of my Constellation co-chairs have additional thoughts, please speak up. Thanks for your interest. Stan



# OSWV Comments from Hans Bonekamp

- Dear all,
- In general, I see Cal Val (especially the cal) in first instance as a theme for the mission project teams and mission advisory groups, but additionally international science teams are very useful for mission cross-validations and to create multi-mission products which need inter-calibration activities. Here comes also the interplay with CEOS virtual constellations which are pursuing sustainability and synergy of the missions regarding key observable services. For Ocean Surface Topography the multi-mission products are among the key services for operational use. The need for Ocean Vector Winds multi-mission products and hence the activities to develop as Stan indicated are enhanced. Finally, needless to say, inter-calibration is also needed in the climate (ECV development) context which is aspect not out of the scope of the constellations.
- In concreto, the OVW remark of Stan below reminds me of the fact that last year at ASCAT project level, Pascal Lecomte and I (and others) discussed the WGCV, QA4EO and the Cal/Val portal in the context of ERS SCAT and ASCAT calibration and validation and the understanding of the differences especially also at lower processing levels. We conclude that it would be easy and useful to convey information and our findings via the WGCV and Cal Val Portal. So far we have not given this idea follow-up, but we should revive. I will discuss this shortly within the EUMETSAT ASCAT team and ESA/EUMETSAT SAG to identify first actions.

# Ocean Color Radiometry Constellation (OCR)

- The Ocean Color Radiometry Virtual Constellation (OCR-VC) will provide long time series of calibrated ocean color radiance (OCR) at key wavelength bands from measurements obtained from multiple satellites. OCR-VC activities will include calibration, validation, merging of satellite and *in situ* data, product generation, as well as development and demonstrations of new and improved applications. Examples and prototypes of programs the OCR-VC will require to meet its objectives include the SIMBIOS (NASA), GlobColour (ESA), ChloroGIN (POGO-GEO-GOOS) and SAFARI (CSA/GEO) projects.
- For more information, see the [OCR-VC presentation given at the 2008 SIT-22 Meeting in Tokyo, Japan.](#)

# Ocean Colour Radiometry (OCR) Constellation Leadership Group

## **Co-Chairs:**

Mark Dowell (JRC, EC)  
Hiroshi Murakami (JAXA, Japan)  
Paula Bontempi (NASA, USA)

## **Members:**

Paul DiGiacomo (NOAA, USA)  
Peter Regner (ESA, Europe)  
Eric Thouvenot (CNES, France)  
Hans Bonekamp (EUMETSAT)  
Yves Crevier (CSA Canada)  
Hu-Hwan Ahn (KORDI, Korea)  
Prakash Chauhan (ISRO, India)  
Milton Kampel (INPE, Brazil)

## **Ad hoc Members:**

Venetia Stuart (IOCCG Project Scientist)  
David Antoine (IOCCG Chairman)  
Prakash Chauhan (ISRO)

# OCR

## Meeting of Full Steering Group of the OCR-VC

- The meeting of the full steering group for the Ocean Color Radiometry Virtual Constellation was held on April 21, 2009 as a session within the IOCG-14 Committee Meeting in Hangzhou, China. To view the minutes, click [here](#).

### OCR Documents

- [White Paper](#) presented at OceanObs'09 Symposium, 21-25 September, 2009 Venice, Italy
- [SIT-24 Presentation](#) by Mark Dowell, 10-11 September, 2009 Darmstadt, Germany
- [OCR Implementation Plan](#) presented and discussed at SIT-24
- [OCR-VC Implementation Plan Timeline](#)

# WGCV Constellation Ideas and Support

- **Discussion**
  - WGCV support and WGCV poc for each constellation
  - WGCV support list for each constellation

# **WGCV POC List for Constellations**

**Atmospheric Composition – Jean-Christopher Lambert  
(Belgium), Bojan Bokjov (ESA)**

**Precipitation - ?**

**Ocean Surface Topography – Changyong Cao (NOAA)**

**Land Surface Imaging – WGCV POCs - Greg Stensaas  
(USGS), Steve Ungar (NASA)**

**LPV Support - Fred Baret (INRA)/Joanne Nightingale  
(NASA)**

**Ocean Surface Vector Wind Constellation – Changyong  
Cao (NOAA)**

**Ocean Color Radiometry Constellation –  
Carol Johnson (NIST)**

# WGCV Support List for Constellations

- **Atmospheric Composition**
  - ?
- **Precipitation**
  - ?
- **Ocean Surface Topography**
  - ?
- **Land Surface Imaging**
  - Enhanced WGCV-LSI Coordination
    - WGCV support LSI cal/val needs
    - LSI agencies coordinate with and attend WGCV meetings and subgroup meetings as appropriate
    - Establish LSI agency sensor representative and LSI cal/val representative
    - Regular LSI – WGCV action tracking
  - LSI collect and provide data or data links over CEOS recommended Cal/Val test sites on a basis
    - Make data available at CalVal portal and/or Earth Explorer
  - WGCV support cross calibration for LSI efforts, such as Forest Carbon Tracking
  - LPV support
- **Ocean Surface Vector Wind Constellation**
  - ?
- **Ocean Color Radiometry Constellation**
  - ?

# CEOS Precipitation Constellation

*Steven Neeck*  
*NASA Headquarters*

*Riko Oki*  
*JAXA*

Constellation interactions with WGCV  
WGCV-31  
Potomac, MD, USA  
March 3, 2010



## Goals of the Precipitation Constellation

*To establish an international framework to guide, facilitate, and coordinate the continued advancements of multi-satellite global precipitation missions*

- 1) To provide a framework for implementation and monitoring of GEO task AR-06-10

*Advocate and facilitate the timely implementation of the Global Precipitation Measurement (GPM) mission and encourage more nations to contribute to the GPM constellation*

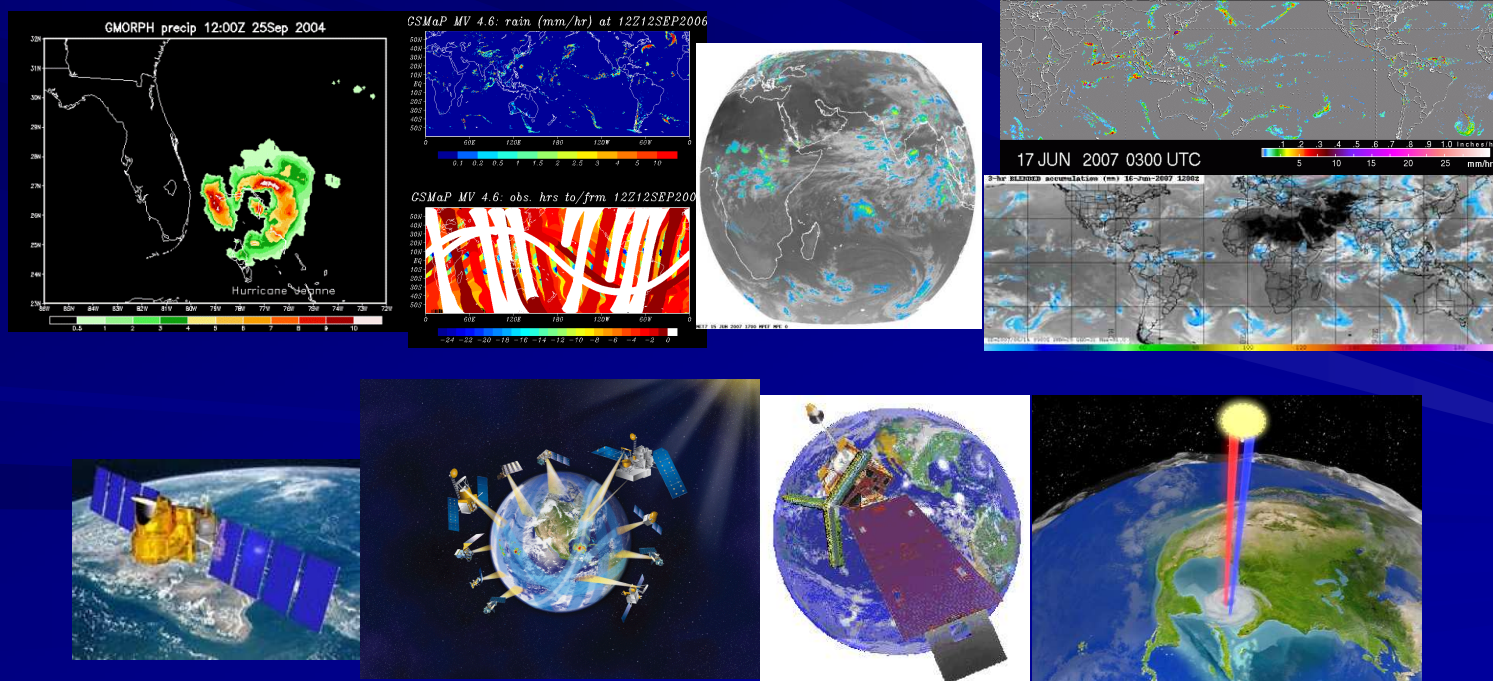
- 2) To sustain and enhance an accurate and timely global precipitation data record including a Fundamental Climate Data Record essential for understanding the integrated weather/climate/ecological system, managing freshwater resources, and monitoring and predicting high-impact natural hazard events.

*This data record should be fit for the purpose specified by GCOS for the monitoring of Precipitation as an essential climate variable (ECV) (as defined in the recent GCOS document 'Systematic Observation Requirements for Satellite-based Products for Climate')*

# Precipitation Constellation

■ CEOS PC is unique in having:

1. an existing constellation of precipitation sensors using TRMM as a reference for providing multiple merged multi-satellite global precipitation products for research and applications,
2. an international constellation satellite mission in development, the Global Precipitation Measurement (GPM) mission envisioned to be a realization of the CEOS PC,
3. other existing and planned missions capable of observing precipitation.



## Cal/Val and the CEOS Precipitation Constellation

- Advancement of Cal/Val is essential to meeting the goals of the CEOS PC and realizing the multi-satellite precipitation measuring systems of the future
- Passive microwave radiometer calibration (e.g. GMI, TMI, AMSR-2, etc.)
- Passive microwave radiometer inter-satellite calibration (X-Cal WG see p.5)
- Space based precipitation radar calibration (e.g. GPM DPR)
- Ground Validation System (GVS) critical component of GPM system
  - Pre-launch retrieval algorithm development
  - Post-launch product validation
  - Major functions/development items: validation network (national, international), field campaigns (DOE, NOAA, international partners), Ku/Ka band Dual Frequency, Dual Polarized, Doppler Radar (D3R)

## X-Cal Working Group

### ■ X-Calibration Working Group (WG)

- International working group (in coordination with WMO CGMS/GSICS) to develop a consensus reference standard for cross-calibration of microwave radiometers to produce uniform global precipitation products within a consistent framework.
- Five WG meetings held since 2007
- 6<sup>th</sup> WG meeting, March 5-6, 2010, ESSIC, College Park, MD
- NASA, JAXA, CNES, ISRO, INPE, CONAE, NOAA, NRL, EUMETSAT, JMA, CMA, UKMET, Universities from the U.S. and Asia participating (WGCV/MWSS invited since January 2008)
- Discovered/Fixed Problem in TMI (*ca.* 2K p-p), implemented fix in V7 algorithm
- “Rolling wave” implementation of L1C intercalibration processing (conical imagers) in 2010
- Working on approach for sounders
- Instrument liaisons identified for 9 contemporary passive microwave instruments
- <http://www.gpm-x-cal.info/>

## Next Steps

---

- Invitation for WGCV/MWSS to participate in X-Cal WG reiterated
- Consider also the Fourth International GPM GV Workshop, hosted by the Finnish Meteorological Institute, Helsinki, Finland, June 21-23, 2010  
<http://gpm.fmi.fi/>
- We also welcome dialog with the PC on other aspects of our activities and potential WGCV/MWSS interests/support



## Contacts

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- CEOS PC Co-Leads – Steve Neeck, [steven.neeck@nasa.gov](mailto:steven.neeck@nasa.gov), Riko Oki, [oki.riko@jaxa.jp](mailto:oki.riko@jaxa.jp)
- X-Cal WG – Tom Wilheit, [wilheit@tamu.edu](mailto:wilheit@tamu.edu)

# Land Surface Imaging (LSI) Constellation

***Co-Leads:***

*U.S. Geological Survey (USGS),  
Indian Space Research Organization (ISRO), and the  
Instituto Nacional de Pesquisas Espaciais (INPE)*



# Land Surface Imaging Agenda

## Purpose:

- **Review and Reflect on 2009 Activities.**
- **Work Plan Accomplishments**
  - What still needs to be completed from our 2009 Work Plan in 2010?
- **GEO Forest Carbon Tracking Initiative**
  - 2009 Accomplishments
  - 2010 Requirements.
- **Look Strategically at LSI Constellation Activities.**
  - What is the scope of our overall task?
  - How do we better organize ourselves to accomplish the work?
  - Can we better utilize WGCV, WGISS, SEO, etc.?
- **Define our 2010 Work Plan.**



# Land Surface Imaging Agenda

## Tuesday, February 23, 2010 (a.m.)

9:00 a.m.	Welcome Opening Remarks and Meeting Expectations	INPE LSI Co-Chairs
9:10 a.m.	Logistics	INPE
9:15 a.m.	2009 LSI Work Plan Accomplishments – An Overview	T. Holm
9:30 a.m.	LSI Constellation Portal – Status and Plans	T. Holm
10:30 a.m.	Break	
11:00 a.m.	Tools for Data Format Conversion	INPE
11:45 a.m.	Working Group on Radar – Progress/Need	T. Holm
12:15 p.m.	Regional Data Set Compilation Activities Status and Recommendation	T. Holm

LUNCH

# Land Surface Imaging Agenda

## Tuesday, February 23, 2010 (p.m.)

- |           |   |                         |
|-----------|---|-------------------------|
| 1:30 p.m. | WebEx on LSI and WGCV   | G. Stensaas             |
| 2:30 p.m. | Defining Guidelines for Future Mid-Resolution<br>Optical Satellite Systems                      | B. Killough<br>J. Keyes |
| 3:30 p.m. | Break   |                         |
| 4:30 p.m. | Defining Guidelines for Future Mid-Resolution<br>Optical Satellite Systems ( <b>continued</b> ) | B. Killough<br>J. Keyes |
| 5:00 p.m. | GEO Forest Carbon Tracking (FCT) Task<br>Overview and Review of 2009 Activities                 | T. Holm                 |
| 5:30 p.m. | Adjourn   | All                     |

# Land Surface Imaging Agenda

## Wednesday, February 24, 2010 (a.m.)

9:00 a.m. Development of the 2010 LSI Work plan

All

2009 Carryover Tasks

Look Strategically at LSI Constellation Activities

(**LSI Goal #3:** Meaningful contribute to the production of a fundamental climate data records by providing mid--resolution LSI data to support GEO and CEOS priorities.)

10:30 a.m. Break

11:00 a.m. Development of the 2010 LSI Work plan - **Continued**

All

How do we better organize ourselves to accomplish the work?

Can we better utilize WGCV, WGISS, SEO, etc.?

LUNCH

# Land Surface Imaging Agenda

## Wednesday, February 24, 2010 (p.m.)

2:00 p.m. Development of the 2010 LSI Work plan - **Continued**  
Defining our 2010 Activities

All

3:30 p.m. Break

4:00 p.m. Concluding Remarks INPE/Co-Chairs

4:15 p.m. Adjourn

# Land Surface Imaging Constellation

## Goals and Objectives

- “...promote the efficient, effective, and comprehensive collection, distribution and application of space-acquired image data of the global land surface, **especially to meet societal needs of the global population, such as those addressed by the GEO societal benefit areas**”
- Define the optimal observational capabilities (and policies) to guide planning/development/operation of future LSI systems

# LSI Constellation Study Team - 2009

## CEOS Agency Members

- USGS: **Co-Chair**, Tom Holm (new 2009)
- ISRO: **Co-Chair**, V. Hegde (new 2009)
- INPE: **Co-Chair**, (Julio Dalge new 2009)
- INPE: João Viane Soares
- EC: Herve JeanJean
- ESA: Michael Berger
- CSA: Daniel DeLisle
- CONAE: Ana Medico
- JAXA: Takeo Tadono
- NOAA: Kevin Gallo
- NASA: Garik Gutman
- NRSCC: Yonghong Zhang
- CRESDA: Xiaohua Yi
- GISTDA: Phuriwaj Ruengnaowaroj
- CNES: Aurelie Sand
- CDTI: Mónica Lopez

## CEOS WG Members

- WGCV (NASA): Stephen Ungar
- WGCV (USGS): Greg Stensaas

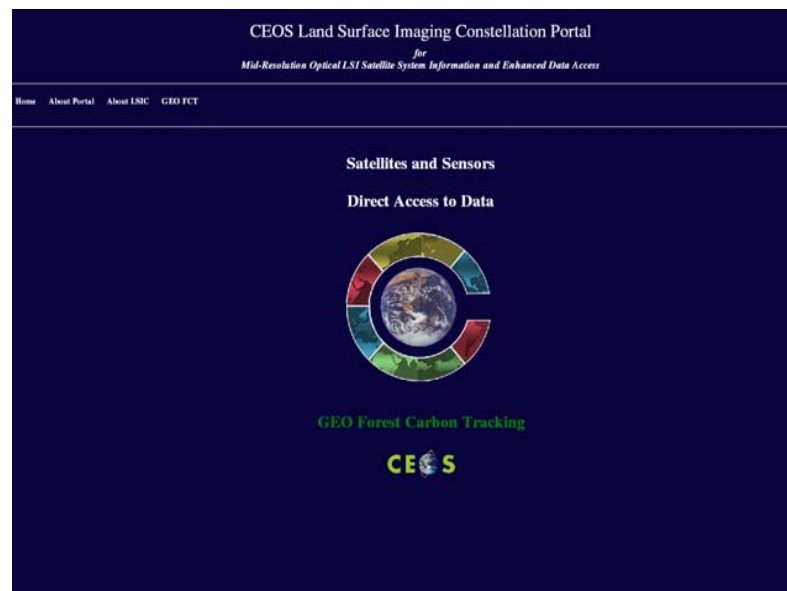
## User Community Members

- USGS: Brad Reed
- JRC: Alan Belward
- JPL: Mike Abrams
- Nagoya U.: Yasushi Yamaguchi
- BGS: Stuart Marsh
- U. Maryland: J. Townshend
- CSIRO: Alex Held

# Status of Activities and Future Plans

- LSI Constellation Portal:** “Mid-Resolution Optical Land Surface Imaging Satellite Systems” -- Information and Enhanced Data Access

— Now online at <http://wgiss.ceos.org/lsip>



CEOS Land Surface Imaging Constellation Portal for Mid-Resolution Optical LSI Satellite System Information and Enhanced Data Access			
Home	CEOS LSI	About LSIC	About Portal
Contact			
Overview			
<ul style="list-style-type: none"> <li>CEOS Agency Mid-Resolution Optical Satellite Systems</li> </ul>			
Satellites			
<ul style="list-style-type: none"> <li>Satellites &amp; Sensors</li> <li>Status &amp; Launches</li> <li>Orbit Information</li> </ul>			
Sensors			
<ul style="list-style-type: none"> <li>Band Information</li> <li>Visible &amp; NIR Bands</li> <li>SWIR Bands</li> <li>Thermal Bands</li> <li>Panchromatic Bands</li> <li>Hyperspectral Bands</li> <li>Radiometric &amp; Geometric Characteristics</li> <li>Geographic Characteristics</li> </ul>			
Data			
<ul style="list-style-type: none"> <li>Data Access</li> <li>Documentation</li> </ul>			
CEOS Agency Current and Former Mid-Resolution Optical Satellites & Sensors			
Satellite	Sensors	Agencies	
ADEOS-1	AVNIR-1	JAXA	
ALOS	AVNIR-2	JAXA	
CBERS-1	HRCC, IRMSS	CAST, INPE	
CBERS-2	HRCC, IRMSS	CAST, INPE	
CBERS-2B	HRCC	CAST, INPE	
EO-1	ALI, Hyperion	NASA, USGS	
IMS-1	MX-T	ISRO	
IRS-1A	LISS-I, LISS-II	ISRO	
IRS-1B	LISS-I, LISS-II	ISRO	
IRS-1C	LISS-III	ISRO	
IRS-1D	LISS-III	ISRO	
IRS-P2	LISS-III	ISRO	
IRS-P6	LISS-III, AWiFS	ISRO	
JERS-1	OPF	JAXA	
Landsat 1	MSS	NASA, USGS	
Landsat 2	MSS	NASA, USGS	
Landsat 3	MSS-B	NASA, USGS	
Landsat 4	MSS, TM	NASA, USGS	
Landsat 5	MSS, TM	NASA, USGS	
Landsat 7	ETM+	NASA, USGS	
SAC-C	HRTC	CONAE	
SPOT-1	HRV	CNES	
SPOT-2	HRV	CNES	
SPOT-3	HRV	CNES	
SPOT-4	HRVIR	CNES	
SPOT-5	HRG	CNES	
Terra	ASTER	METI, NASA	
THEOS	MS	GISTDA	

# CEOS Land Surface Imaging Constellation Portal

*for*  
*Mid-Resolution Optical LSI Satellite System Information and Enhanced Data Access*

[Home](#) [About Portal](#) [About LSIC](#) [GEO FCT](#)

**Satellites and Sensors**

**Direct Access to Data**



**GEO Forest Carbon Tracking**







# CEOS Land Surface Imaging Constellation Portal

for  
Mid-Resolution Optical LSI Satellite System Information and Enhanced Data Access

## Overview

• CEOS Agency  
Mid-Resolution Optical  
Satellite Systems

## Satellites

- Satellites & Sensors
- Status & Launches
- Orbit Information

## Sensors

- Band Information
- Visible & NIR Bands
  - SWIR Bands
  - Thermal Bands
- Panchromatic Bands
- Hyperspectral Bands
  - Radiometric &  
Geometric Characteristics

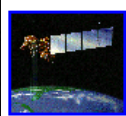
• Geographic  
Characteristics

## Data

- Data Access
- Documentation

## CEOS Agency Current and Future

Satellite	Sensor	Agency
ADEOS-1	AVHRR	AVR
ALOS	AVHRR	AVR
CBERS-1	HRCC	HRCC
CBERS-2	HRCC	HRCC
CBERS-2B	HRCC	HRCC
EO-1	ALI, HRS	ALI, HRS
IMS-1	MIRS	MIRS
IRS-1A	LISS-I	LISS-I
IRS-1B	LISS-I	LISS-I
IRS-1C	LISS-III	LISS-III
IRS-1D	LISS-III	LISS-III
IRS-P2	LISS-III	LISS-III
IRS-P6	LISS-III	LISS-III
JERS-1	OCRS	OCRS
Landsat 1	MS	MS
Landsat 2	MS	MS
Landsat 3	MS	MS
Landsat 4	MS	MS
Landsat 5	MS	MS
Landsat 7	ET	ET
SAC-C	HRCC	HRCC
SPOT-1	HRCC	HRCC
SPOT-2	HRCC	HRCC
SPOT-3	HRCC	HRCC
SPOT-4	HRCC	HRCC
SPOT-5	HRCC	HRCC
Terra	ASTER	ASTER
THEOS	MS	MS



Platform: LANDSAT-7

[Click to view more](#)

Platform-based Instruments:

[Click to view more](#)

### Orbit

Orbit Altitude: 705km  
Orbit Inclination: 98.2 degree  
Equator Crossing: nominally 10 AM  
Period: 99 minutes  
Repeat Cycle: 16 days  
Orbit Type: LEO > Low Earth Orbit > Polar Sun-Synchronous

### Related Data Sets

[View all records related to this platform](#)

### Description

Landsat 7 systematically provides well-calibrated, multispectral, moderate resolution, substantially cloud-free, sun-lit digital images of the Earth's continental and coastal areas with global coverage on a seasonal basis. It covers the United States every 16 days. Operations were transferred to USGS on Fall 2000.

The Landsat Project is a joint initiative of the U.S. Geological Survey (USGS) and the NASA to gather Earth resource data using a series of satellites. NASA

[Click to view more](#)

### Online Resource:

<http://nasascience.nasa.gov/missions/landsat-7>  
<http://landsathandbook.gsfc.nasa.gov/handbook/handbook.html#chapter2/chapter2.html>  
<http://landsat.gsfc.nasa.gov/>

### Platform Logistics:

Design Life: 5 Years  
Launch Date: 1999-03-15  
Primary Sponsors:  
USA/USGS  
USA/NASA

Satellites and Sensors  
Direct Access to Data



GEO Forest Carbon Tracking

**CEOS**



## CEOS Land Surface Imaging Constellation Portal

for  
Mid-Resolution Optical LSI Satellite System Information and Enhanced Data Access

Home About Portal About LSIC GEO FCT

Contact

### Overview

- CEOS Agency
- Mid-Resolution Optical Satellite Systems

### Satellites

- Satellites & Sensors
- Status & Launches
- Orbit Information

### Sensors

- Band Information
- Visible & NIR Bands
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- Thermal Bands
- Panchromatic Bands
- Hyperspectral Bands
- Radiometric & Geometric Characteristics
- Geographic Characteristics

### Data

- Data Access
- Documentation

## GEO Forest Carbon Tracking Initiative

### CEOS Role

- CEOS, with the support of the LSI Constellation, is demonstrating the technical capacity and institutional frameworks to support continuity of the required satellite observations in support of post-Kyoto regulatory frameworks.
- 7 National Demonstrator countries have been the subject of a coordinated satellite data acquisition effort by CEOS agencies in 2009 - with complete coverage achieved for both radar and optical data (LSI contributions).
- A demonstrator portal showing available data and forest carbon datasets has been developed:

**Link to GEO Forest Carbon Tracking Portal: [portal.geo-fct.org](http://portal.geo-fct.org)**



- In addition, the Landsat contributions for the 7 National Demonstrator countries are searchable through the USGS:

**Link to Earth Explorer - Forest Carbon Sites: [earthexplorer.usgs.gov](http://earthexplorer.usgs.gov)**



### Forest Carbon Tracking Goals:

**Demonstrate** that coordinated Earth observations, validated by in situ measurements and properly linked to forest models, can provide reliable information of suitable consistency, accuracy and continuity to support forest carbon Monitoring, Reporting and Verification leading to eventual establishment of a network of **national** forest and carbon monitoring systems.

**Define** a set of standards and interoperability requirements and methodologies to provide the most accurate results relying on the full potential of existing observational and processing capabilities.

**The Forest Carbon Tracking Task (GEO FCT)** has been established to support countries wanting to establish national forest-change, carbon estimation and reporting systems. It will facilitate access to long-term satellite, airborne and in situ data, provide the associated analysis and prediction tools, and create the appropriate framework and technical standards for a global network of national forest carbon tracking systems. The task follows the guidelines set out by the **United Nations Framework Convention on Climate Change (UNFCCC)**. Its outputs will be available to support interested countries in their efforts to implement the Convention. The task is being carried out by a **partnership** of GEO member governments, key UN bodies, space agencies, the science community and the private sector.



[Click here to see the 2009 FCT data acquisitions.](#)

**What is GEO?** GEO was launched in response to calls for action by the 2002 World Summit on Sustainable Development and by the G8 (Group of Eight) leading industrialized countries, to coordinate the construction of a **Global Earth Observation System of Systems (GEOSS)**, as a way to assist developed and developing country governments to respond better to disasters, manage their resources and promote the well-being of their citizens. Since 2005, the **Group on Earth Observation (GEO)** has grown to become a partnership between close to 80 governments and 56 leading international organisations.

**For more information please see the GEO FCT Brochure by clicking here.**

***The GEO Forest Carbon Tracking Task seeks to:***

1. Define a set of standards, methods and requirements that future spatially explicit National Forest Monitoring and Carbon Accounting Systems could adopt, to provide the most accurate results relying on the full potential of existing observational and processing capabilities.
2. Coordinate the use of data from current and planned Earth observing satellites operated by GEO member countries to provide the technical capability and continuity to support the monitoring, reporting, and verification (MRV) information required by future regulatory frameworks for the inclusion of forests in post-Kyoto climate agreements.
3. Coordinate the use of in-situ data, models and verification techniques, considered here as essential elements of future MRV systems.
4. Secure time-series of SAR and optical satellite data and analysis tools, integrated with ecosystem models and in-situ data, that can be used interoperably and in complementary ways to support the information needs of MRV systems for FCT.
5. Appropriate international institutional frameworks, and supporting data policies allowing open access and application of the supporting satellite datasets will be essential to secure the sustained supply of information in support of MRV requirements.

# Status of Activities and Future Plans

- **LSI Portal:** Potential enhancements in cooperation with CEOS Working Group on Information Systems and Services (WGISS).
- **Options under consideration:**
  - Addition of **new data types** or descriptive information
    - Expanding the data set, sensor, and platform information as well as links to order/access systems for non-optical land imaging systems such as radar or other optical imaging systems such as MODIS and/or high resolution systems.
  - **Expand functionality** to include cross-system, granule-level, search and data retrieval
    - Expand the functionality to go beyond directory and metadata about sensors and platforms to being able to initiate a granule-level search across multiple LSI member systems to select and obtain individual data granules directly through a single portal without having to be linked or handed off to other member portals or web sites. (CWIC Tool?)
  - **Direct link to Forest Carbon Tracking portal - completed**

# Status of Activities and Future Plans

- Each option (adding new data types and cross system interoperability) evaluated against:
  - Will the enhancement provide access to member agency (LSI Constellation) data not previously available or **significantly improve the existing capabilities**?
  - Will the enhancement **provide a new capability or service** not previously available?
  - Does the enhancement **feature LSI Constellation member agency data** and capabilities?
  - What is the **relative complexity and scale of effort** associated with the enhancement?
  - Would the proposed enhancement **demonstrate the architectural goals of GEOSS** or contribute to a better understanding of the potential benefits of the architecture?
  - What is the **relative feasibility of accomplishing the enhancement** within the collegial-best-effort world of CEOS and considering the organizational structure and influence of working teams?

# Status of Activities and Future Plans

- Complete development of web-based services and/or freeware (INPE)
  - **Image format converter tool to GeoTIFF**
    - Agencies are capable of providing products in geotiff format – no longer a requirement – closed action.
    - As an alternative, INPE released Marlin ([www.dgi.inpe.br/CDSR](http://www.dgi.inpe.br/CDSR)) as open source. Marlin is a tool for image visualization and analysis. It's the tool INPE uses to test radiometry and geometry of CBERS image data.
  - **Ortho-rectification tool for Level 1 mid-resolution data:**
    - INPE now plans to use an ongoing GIS software project, SPRING ([www.dpi.inpe.br/spring](http://www.dpi.inpe.br/spring)) and add to its functions menu an ortho-rectification plug-in based on RPC (rational polynomial coefficients). The plan is to have this included in a new version of SPRING in 2010.



# Status of Activities and Future Plans

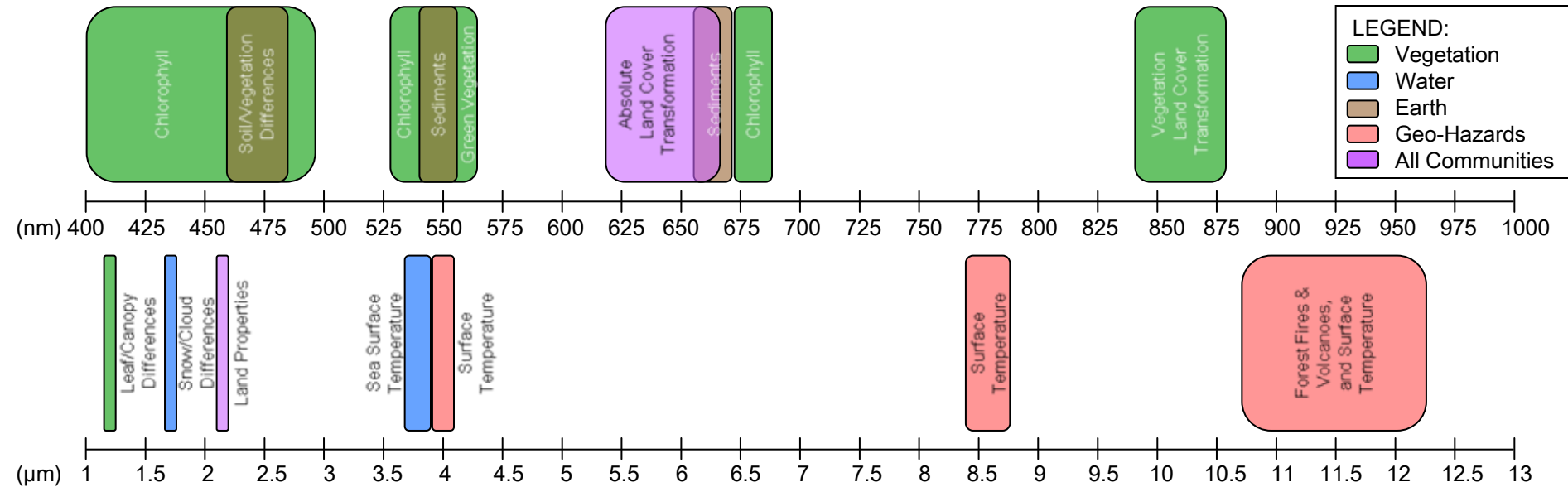
- **Working Group on Radar (WGR) – not yet a formal subgroup of LSI, although terms of reference established.**
  - **WGR intent is to:**
    - Facilitate application of CEOS agency radar data. Near-term driver for formally establishing the WGR: Support *GEO task on Forest Carbon Tracking*
    - Promote operational polarimetric SAR systems
- **LSI Mid-Resolution Optical Guidelines Document**
  - Draft report on Definition of standards for future mid-resolution, optical satellites by CEOS System Engineering Office (SEO), NASA Langley
    - **Status Continued**

# LSI Mid-Resolution Optical Guidelines

- **Goals:**
  - Guidelines to be **based on the needs of the land imaging user communities** (vegetation, earth, water, geo-hazards)
  - Guidelines are **not intended to be met by any single instrument or mission**, strive to meet them with the overall virtual constellation
- **Systems Engineering Office has been supporting the LSI Constellation to develop this document**
  - Multiple iterations worked with Bryan Bailey before his retirement, now coordinating with Tom Holm
  - Recognized that **user base is large and varied**, and from outside these communities developing guidelines is very difficult
  - An assessment of the currently flying instruments and their spectral band coverage is in progress to determine what is already being measured



# LSI Mid-Resolution Optical Guidelines



The regions designated above for each user community are based on the MODIS band applications.  
A more detailed visualization in Microsoft Excel is available.

**Need help from the international user communities to specify lower level needs and guidelines for values such as specific spectral bands, spatial resolutions, swath width, repeat frequencies, accuracies, etc.**

# LSI Mid-Resolution Optical Guidelines

- **Next Steps:**

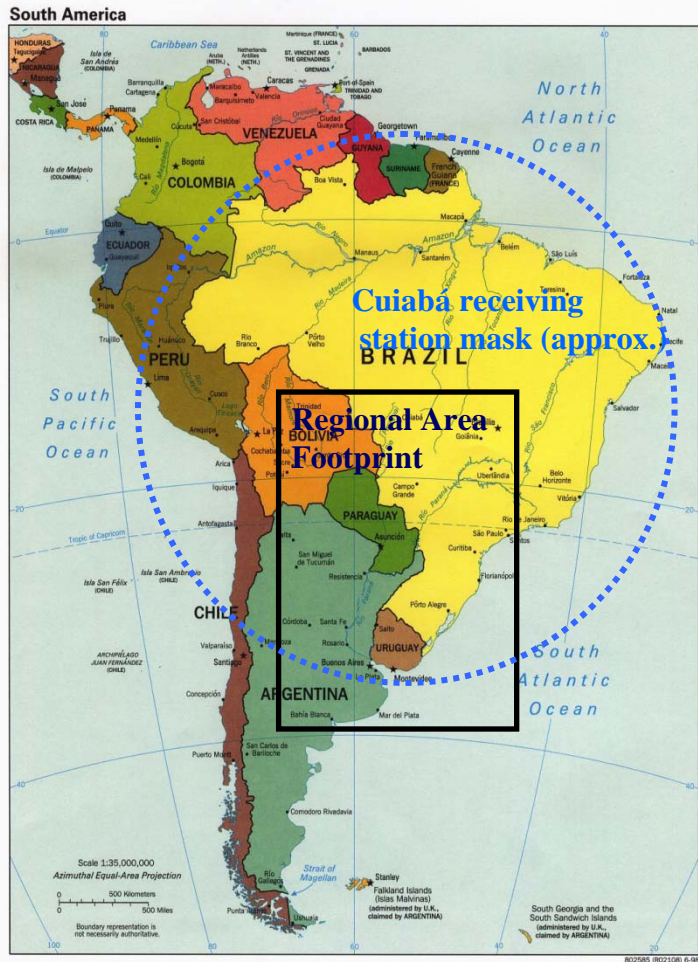
- Document **initial CEOS SEO findings** and start preliminary standards document
- CEOS SEO to participate in an LSI Constellation Team meeting to reach the international community for feedback and input

- **Milestones:**

- **Nov-2009:** Progress Report for Plenary 2009
- **May-2010:** Preliminary Report for SIT-25
- **Nov-2010:** Final Report for Plenary 2010

- **Working Group on Regional Data Set Compilation (WGRDSC)**
  - Currently working to assemble initial data sets for GLS 2010
    - Regional areas in S. America, Africa, and SE Asia have been defined
    - Regional Data Set Compilation action has moved at a slower pace than predicted
    - Zones originally identified in the Regional Data Set Compilation action will be maintained, but the FCT is a higher priority.
- **LSI Constellation is currently evaluating combining data requirements with the GEO Forest Carbon Tracking task**

# Regional Data Set Compilation Areas for GLS 2010



# GEO Forest Carbon Tracking Task



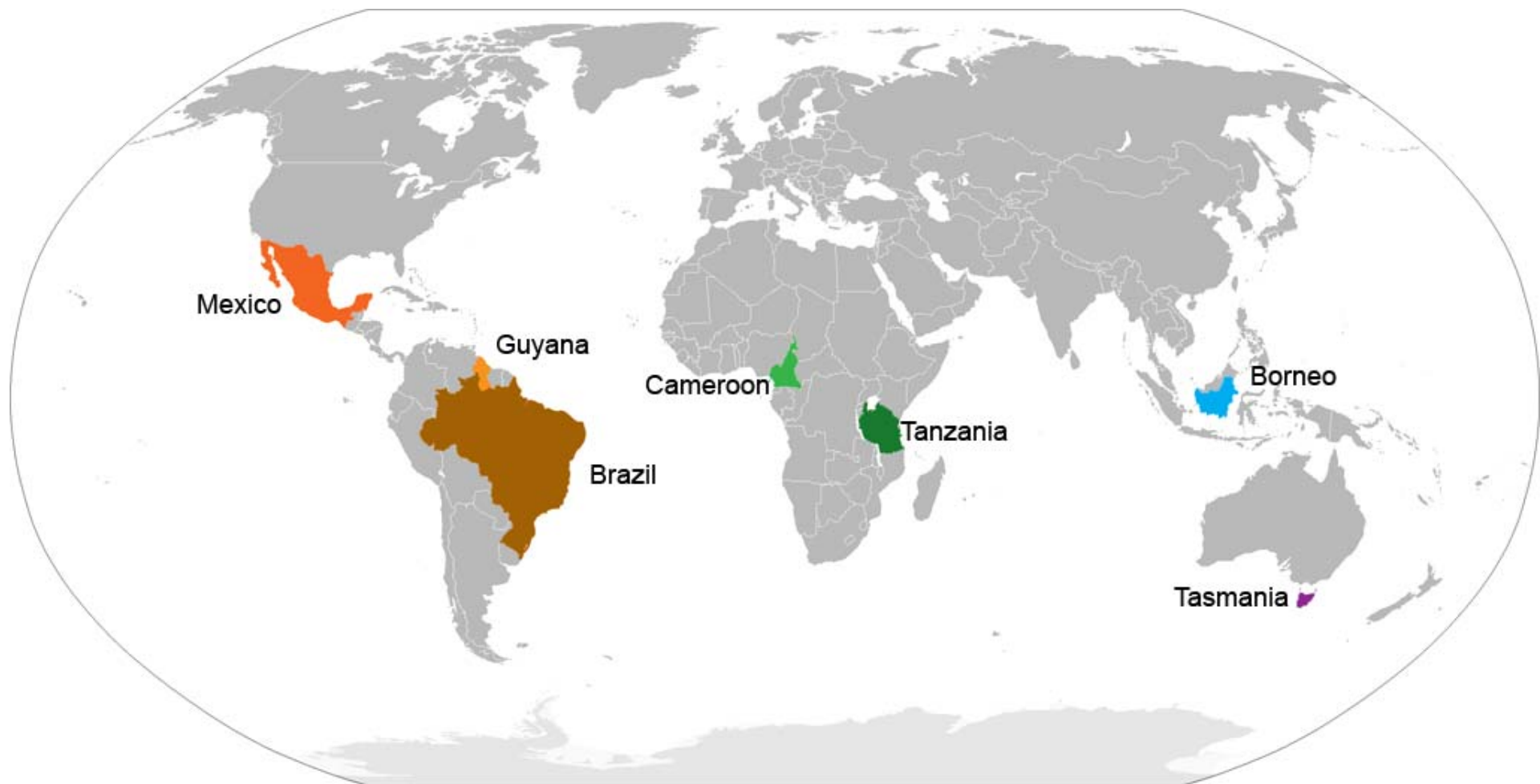
**GOAL:** Demonstrate to climate negotiators that that coordinated satellite earth observations, field measurements and reporting can provide the basis for reliable information services of suitable consistency, accuracy and continuity, to support Forest Carbon Tracking, **leading to eventual establishment of a global network of national forest carbon monitoring verification and reporting systems.**





# GEO Forest Carbon Tracking Task

## National Demonstrator Sites - 2009



# Forest Carbon Tracking: Status of LSI Optical Support

ND Sites Source	Brazil	Guyana	Mexico	Cameroon	Tanzania	Borneo	Tasmania
Landsat 5/7 USGS	Acquired	Acquired	Acquired	Acquired	Acquired	Acquired L1T gen.	Acquired L1T gen.
Landsat 5/7 IC's	Acquired INPE	Acquired INPE	Feasible CONABIO Grnd Station	Not feasible No IGS	Feasible CSIR SAC & ASI (Kenya)	Feasible GISTDA	Acquired CSIRO
IRS: AWIFS	Feasible INPE	Feasible INPE	Investigated ISRO	Investigated ISRO	Investigated ISRO	Feasible ISRO	Feasible ISRO
IRS: LISS-III	Feasible INPE	Feasible INPE	Investigated ISRO	Investigated ISRO	Investigated ISRO	Feasible ISRO	Feasible ISRO
CBERS2B: CCD	Acquired INPE	Acquired INPE	Not feasible in 2009	Not feasible in 2009	Not feasible in 2009	Not feasible in 2009	Not feasible in 2009
AVNIR-2	Investigated ESA	Investigated ESA	Investigated ESA	Investigated ESA	Investigated ESA	Investigated ESA	Investigated ESA
SPOT 4	Feasible ESA	Feasible ESA	Feasible ESA	Feasible ESA	Feasible ESA	Feasible ESA	Feasible ESA
SPOT 5	Not feasible in 2009	Not feasible in 2009	Not feasible in 2009	Not feasible in 2009	Not feasible in 2009	Not feasible in 2009	Not feasible in 2009
Kompsat-2	Investigated ESA - limited	Investigated ESA - limited	Investigated ESA - limited	Investigated ESA - limited	Investigated ESA - limited	Investigated ESA - limited	Investigated ESA - limited