

Working Group on Calibration and Validation (WGCV)

Plenary Report

Greg Stensaas, USGS



The 26th CEOS Plenary – Bengaluru, India - 24-27
October, 2012



WGCV-33

- May 16-20, 2011 in Moscow, Russia; hosted by ROSCOSMOS
- ▶ Very successful meeting, extensive Russian support

WGCV-34

- February 6-10, 2012 in Brisbane, Australia; hosted by TERN-AusCover;
- ▶ Australian Gov't initiative in EO and Cal/Val infrastructure
- ▶ Finalized 5-year WGCV work plan (see CEOS Website)

WGCV-35

- Joint meeting with WGISS, September 23-28, 2012; hosted by ISRO in Hyderabad, India
- ▶ Vice-chair elected from DLR, Dr. Albrecht von Bargaen

Future WGCV meetings

- ▶ WGCV-36, May 12-17, 2013 to be co-hosted by Academy of Opto-Electronics and National Space Science Center (NSSC) of the Chinese Academy of Sciences (CAS) in Shanghai, China
- ▶ Need support for WGCV-37, Feb 2014 and WGCV-38, Sep 2014



Very successful, comments “best joint-meeting we’ve had”

- ▶ ISRO was an excellent host and provided exceptional participation and interaction
- ▶ WGCV proposed 11 ideas for joint-efforts, 7 ideas agreed with WGISS



Agreed upon 7 joint-efforts:

1. Evaluate data quality metadata fields for sensors/products and suggest metadata requirements
2. CEOS WGCV Test Site information access in CWIC/IDN
3. Develop CEOS Quality Indicators
4. Define ECV quality information and implementation process for metadata and associated documentation
5. Identify key players from VCs to support WGCV/WGISS tasks
6. Update current and develop new CEOS Showcases
 - DEM Quality Information System (DEMqis) proposed
7. Continue to work with WGISS on data and information access



- ▶ **Working with strong WGCV supporters from China and Russia to help define key members for other VCs and WGs**
 - ▶ Sent email to Chinese and Russian WGCV members

- ▶ **Communication across CEOS**
 - WGCV has defined points of contact to interact with each WG and VC

 - WGCV has sent an email to all VCs, WGs, and Task Leads requesting Cal/Val requirements and needs
 - Will update 5 year plan as appropriate, and present changes to CEOS management
 - Working with SIT to support enhancement of CEOS communication and management processes



Developed QA4EO Framework under GEO Task *DA-09-01a*: *GEOSS QA Strategy, Now IN-02-C1*



Group on Earth Observations (GEO)/
Committee on Earth Observation Satellites
(CEOS)

A Quality Assurance Framework for Earth
Observation (QA4EO)

Implementation Strategy and Work Plan

March 2012

Version 0.4

This document was prepared and compiled by CEOS Working Group on
Calibration and Validation (WGCV) and is in review by CEOS WGCV and the
GEO QA4EO board members, as shown later in the document.



Geneva, WMO, Oct. 2007
Guiding principles



Gaithersburg, NIST, May 2008
Establishing an operational framework



Antalya, TÜBİTAK, Sept. 2009
Facilitating Implementation



Oxfordshire, UK, RAL, Oct. 2011
Providing Harmonized QI in EO Data



WGCV led IN-02: Earth Data Sets, C1: Advances in Life-cycle Data Management efforts:

- **IN-02-C1_2: 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**.
 - **Completed 3rd successful DOME-C campaign including using a SAR sensor (RADARSAT-2) and Bi-directional Reflectance Distribution assessment**
- **IN-02-C1_3: Develop a CEOS Quality Assurance Framework for Earth Observation (QA4EO) and implement** processes and structure for CEOS data and information.
 - **QA4EO Framework and Draft CEOS Implementation Plan Completed**
 - **UKSA/NPL has accepted a 2 year term for QA4EO SEC and support**
- **IN-02_4: Develop Cal/Val Portal and post-launch test sites** to assist implementation of QA4EO for GEOSS.
 - **Portal support continues via ESA and CEOS Recommended Test Sites define by WGCV SGs**
- **IN-02_5: Enabling Data and Information Interoperability and Harmonization in CEOS and GEO**. Develop an architecture and constituent elements needed for implementation of an operational system to insure the long term interoperability.
 - **Working joint efforts with WGISS and WGC to support implementation in CEOS**

WGCV led IN-02: Earth Data Sets, C2: Regional and Global Datasets:

- **IN02-C2_01: Global fused 30m** including coastal zone bathymetry and onshore DTMs.
 - **Tasks identified at ISPRS2012 and partial funding being sought as part of DEMqis**



CEOS Pseudo-Invariant Calibration Site (PICS) - Libya 4

GODDARD SPACE FLIGHT CENTER
+ Visit NASA.gov

Global Change Master Directory
Discover Earth science data and services

[Home](#)
[Data Sets](#)
[Data Services](#)
[Portals](#)
[Add to GCMD](#)
[What's New](#)
[Participate](#)
[CEOS IDN](#)
[About GCMD](#)

[Links](#)
[FAQ](#)
[Contact Us](#)
[Site Map](#)

[Preview the New GCMD Site](#)

- Agriculture
- Atmosphere
- Biological Classification
- Biosphere
- Climate Indicators
- Cryosphere
- Human Dimensions
- Land Surface
- Oceans
- Paleoclimate
- Solid Earth
- Spectral/Engineering
- Sun-Earth Interactions
- Terrestrial Hydrosphere

- Data Centers
- Locations
- Instruments/Sensors
- Platforms/Sources
- Projects

[Display Feature Guide](#)

[Full text Search](#)

[Portal Collaborations](#)

[Questions?](#)

Record Search Query:
CEOS Cal Val Test Site - Libya 4 - Pseudo-Invariant Calibration Site (PICS)
Entry ID: CEOS_CalVal_Test_Site-Libya4
[\[Update this Record \]](#)

Summary
Abstract: On the background of these requirements for sensor calibration, intercalibration and product validation, the subgroup on Calibration and Validation of the Committee on Earth Observing System (CEOS) formulated the following recommendation during the plenary session held in China at the end of 2004, with the goal of setting-up and operating an internet based system to provide sensor data, protocols ... [Click to view more](#)

Purpose: To facilitate and coordinate calibration and validation data over the Libya 4 test site.

Related URL
Link: [VIEW PROJECT HOME PAGE](#)
Description: Committee on Earth Observation Satellites (CEOS) Working Group on Calibration and Validation (WGCV) Test Sites.

Geographic Coverage

(Click for Interactive Map)
Spatial coordinates
N: 28.55 S: 28.55 E: 23.39 W: 23.39
Location Keywords
CONTINENT > AFRICA > NORTHERN AFRICA > LIBYA
Science Keywords
LAND SURFACE > LAND TEMPERATURE
LAND SURFACE > LAND USE/LAND COVER
[Click to view more](#)

CEOS Instrumented Site - Dome C, Antarctica

GODDARD SPACE FLIGHT CENTER
+ Visit NASA.gov

Global Change Master Directory
Discover Earth science data and services

[Home](#)
[Data Sets](#)
[Data Services](#)
[Portals](#)
[Add to GCMD](#)
[What's New](#)
[Participate](#)
[CEOS IDN](#)
[About GCMD](#)

[Links](#)
[FAQ](#)
[Contact Us](#)
[Site Map](#)

[Preview the New GCMD Site](#)

- Agriculture
- Atmosphere
- Biological Classification
- Biosphere
- Climate Indicators
- Cryosphere
- Human Dimensions
- Land Surface
- Oceans
- Paleoclimate
- Solid Earth
- Spectral/Engineering
- Sun-Earth Interactions
- Terrestrial Hydrosphere

- Data Centers
- Locations
- Instruments/Sensors
- Platforms/Sources
- Projects

[Display Feature Guide](#)

[Full text Search](#)

[Portal Collaborations](#)

[Questions?](#)

Record Search Query:
CEOS Cal Val Test Site - Dome C, Antarctica - Instrumented Site
Entry ID: CEOS_CalVal_Test_Site-Dome_C-Antarctica
[\[Update this Record \]](#)

Summary
Abstract: On the background of these requirements for sensor calibration, intercalibration and product validation, the subgroup on Calibration and Validation of the Committee on Earth Observing System (CEOS) formulated the following recommendation during the plenary session held in China at the end of 2004, with the goal of setting-up and operating an internet based system to provide sensor data, protocols ... [Click to view more](#)

Purpose: To facilitate and coordinate calibration and validation data over the Dome C, Antarctica test site.

Related URL
Link: [VIEW PROJECT HOME PAGE](#)
Description: Committee on Earth Observation Satellites (CEOS) Working Group on Calibration and Validation (WGCV) Test Sites.

Geographic Coverage

(Click for Interactive Map)
Spatial coordinates
N: -74.5 S: -74.5 E: 123.0 W: 123.0
Location Keywords
CONTINENT > ANTARCTICA
Science Keywords
LAND SURFACE > LAND TEMPERATURE
LAND SURFACE > LAND USE/LAND COVER
[Click to view more](#)



LPVS   **USGS**
science for a changing world
Land Product Validation System



Earth Resources Observation and Science (EROS) Center

Land Product Validation System (LPVS)

[HOME](#)

[ACRONYMS](#)

[REFERENCES](#)

Sensor 1*

L7 ETM+

Sensor 2 (Optional)

Terra MODIS

Band*

Blue

Site*


Libya 4


Parameter*

TOA Reflectance

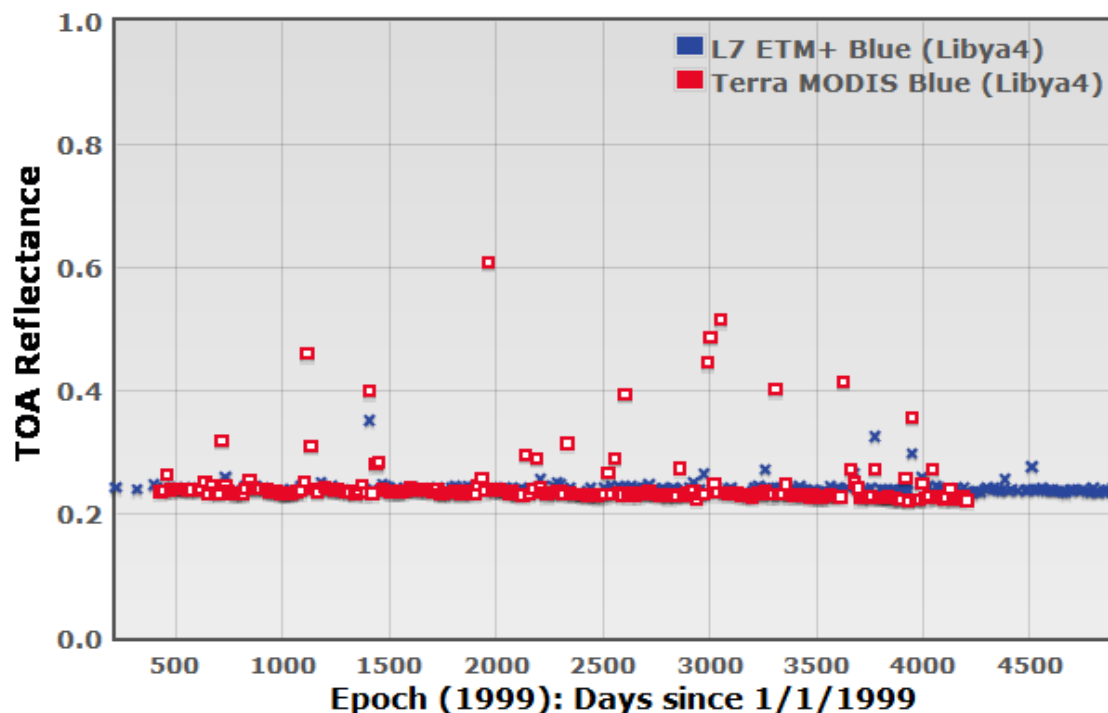
In-situ Data (Soon)

Select Instrument

 **PLOT DATA**

 **SAVE IMAGE**

Data: series=1, x=4860.00, y=0.24





- At the Joint WGCV/WGISS meeting in 2010 it was agreed to define a set of showcases to exemplify QA4EO implementation for CEOS. This activity was approved at CEOS-24.
- Three focus areas were agreed upon:
 - “Forest Carbon Tracking”
 - Changed showcase from "Air Quality" to "Climate; e.g., ozone"
 - “Global Elevation”
- ▶ Resource and support are needed via GEO Tasks and CEOS member agencies to update and finish current showcases
- ▶ New Proposed Showcase - **DEM Quality Information System (DEMqis)**



The WGCV is supported by 6 subgroups that represent key communities / domains

- Through their own dedicated meetings, these sub-groups focus on issues relevant to their communities and report back through the WGCV
- Sub-groups provide recommendations on Cal/Val and QA4EO processes and have identified test sites for all CEOS agencies to use

Synthetic Aperture Radar (SAR)	Chair: Dr. Manfred Zink, DLR
Infrared Visible Optical Sensors (IVOS)	Chair: Dr. Nigel Fox, UKSA/NPL
Microwave Sensors (MS) *	Chair: Dr. Xiaolong Dong, CAS CSSAR Co-Chair: Vacant
Terrain Mapping (TM) *	Chair: Prof. Jan-Peter Muller, UKSA/UCL Incoming Chair: Dr. Hannes Reuter, ISRIC
Land Product Validation (LPV) *	Chair: Dr. Joanne Nightingale, NASA Vice Chair: Dr. Gabriela Schaepman-Strub, Univ of Zurich
Atmospheric Composition (AC)	Chair: Dr. Bojan Bojkov, ESA Vice Chair: Dr. Jean-Christopher Lambert, IASB/BIRA
* Transition happening and/or support required from CEOS	



CEOS WGCV recommends that CEOS plenary consider action:

1. a) For agency support in developing and maintaining recommended instrumentation at the recommended CEOS Cal/Val test sites for IVOS, LPV, and SAR,
 - (1aa) Agency support for CEOS SAR test sites in India and Australia (SAR)
 - (1ab) For satellite based OC measurements, agencies to commit to long term support of CEOS reference test sites for oceans; e.g., OC Buoys MOBY, BOUSSOLE, (Kavaratti - ISRO) and develop Aeronet-OC network (IVOS)
 - (1ac) To underpin validation of satellite based SST measurements and help mitigate data gaps for climate records, agencies to support the deployment of a set of traceably calibrated drifting buoys at a cost of ~\$300k (IVOS)



CEOS WGCV recommends that CEOS plenary consider action:

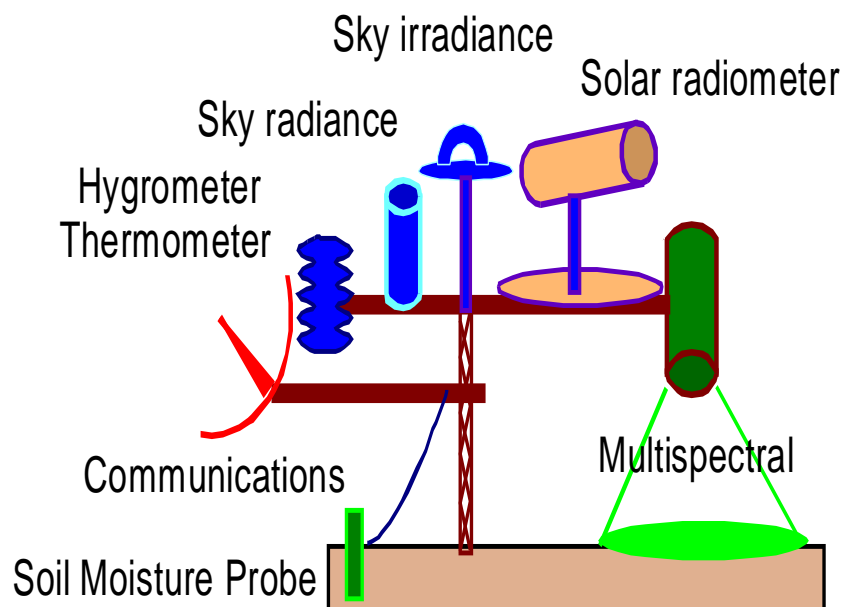
1. a) For member support in developing and maintaining recommended instrumentation at the recommended CEOS Cal/Val test sites for IVOS, LPV, and SAR,
 - (1ad) to encourage members to identify global MTF Cal/Val test sites, and provide resource to establish CEOS standard sites and webpages (similar to the USGS Worldwide test site catalog) (IVOS)
 - (1ae) for members to fund the set-up of global test sites over continental shelves where “bathymetry” truth is available for (a) clearwater (e.g. Australian bight); (b) turbid water regions (e.g. English channel) for evaluation of spaceborne visible and SAR methods respectively for bathymetry retrieval (TM)
 - (1af) Previous CEOS-24 Action: for members to support set up and long-term maintenance cost of autonomous SI traceable instruments for the CEOS land test sites (LANDNET) (minimum of 5) and establishment of infrastructure to enable coordination and dissemination of information to satellite operators (IVOS)



Minimum Sites: At least 5 CEOS LANDNET Sites

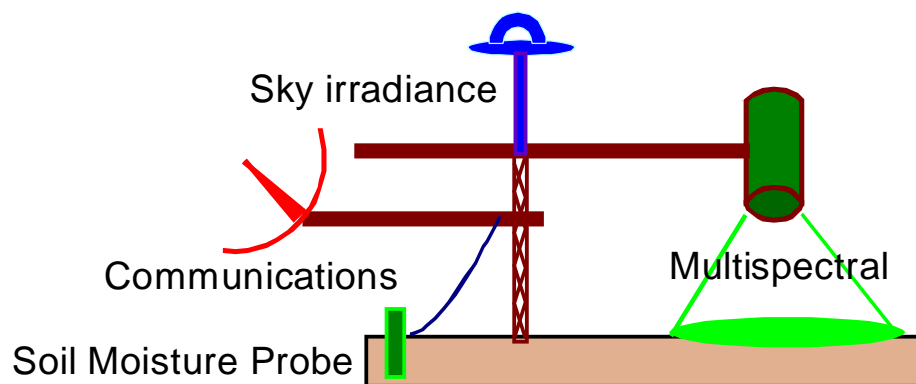
Minimum Specification of equipment on site:

- Master and nodes - 1 node per ~300 m²
- Multispectral - Min. 10 channels
- Cost varies based on site size and characteristics



Full-up Site

- Set up costs for minimum set of instruments would be \$50K
- Need annual long term maintenance and data connectivity (~ 0.5 person year for 20+ years)
- Regular traceability and comparisons (appropriate facilities and reference standards)



Minimal Instrumented Site - Many sites could omit the atmospheric aerosol measurements



CEOS WGCV recommends that CEOS plenary consider action:

1. b) to provide routine data via sensor acquisition plans over the CEOS recommended sites,

- (1ba) to encourage members to provide consistent minimal acquisition metadata in the header files; e.g., view angles, time, solar angles, etc., to support comparisons needed for data quality and interoperability (IVOS)
- (1bb) to encouraged members to ensure full PSF/MTF pre-flight characterization of the sensor and provide results to the user community (IVOS)

and, c) to provide free access to data acquired over CEOS sites to CEOS member agencies for calibration purposes, preferably via CWIC

- (1ca) to encourage members to provide through WGISS WPS services (e.g. bare earth retrievals, river catchments, data fusion engines) as well as WMS of their spaceborne DEM products including QI using the internationally agreed ICEDS color LUT for elevation and a to-be-agreed CLUT for QI (TMSG)



CEOS WGCV recommends that CEOS plenary consider action:

- 2. To provide (2a) a process for supplying resources/funding/support for ground networks and field campaigns, and (2b) to provide resources required to enable comparisons of radiometers used for validation of 1) SST and 2) OC to be organized in 2014 (preparations to commence in 2013) in support of VCs and climate***
- 3. For CEOS members to 3a) provide point of contact for WGCV and its six subgroups, 3b) to provide recommendations for LPVSG vice chair and MSSG co-chair, and 3c) to provide pocs for 2 new thematic groups within IVOS SG (Geo-spatial quality and Geo-image quality) via WGCV and IVOS SG Chairs***
- 4. To review and approve current WGCV 5-year plan (on WGCV web page)***
- 5. To encourage members to provide resource to lead and encourage widespread implementation of QA4EO principles within current and future activities of CEOS members facilitated by the new UKSA QA4EO Secretariat***



CEOS WGCV recommends that CEOS plenary approve action to:

6. Develop WGCV and WG-C interface group to establish consistent interpretation of GCOS ECV requirements and analysis methodology for accuracy and stability monitoring, and to support validation processes of EVCs (IVOS-SG and LPV-SG)

Note: IVOS SG has strong expertise in sensor calibration and QA4EO process; e.g., GCOS requirements for accuracy & stability, Interpretation and method for demonstration of stability is inconsistent between ECVs and disciplines. There is strong need to work with Working Group on Climate.

CEOS WORKING GROUP ON CALIBRATION & VALIDATION	Focus Groups			* ECV
	Focus Group	North America	Europe / Other	Listserv
	Land Cover*	Pontus Olofsson (Boston University)	Martin Herold (Wageningen University, NL)	176
	Fire* (Active/Burned Area)	Luigi Boschetti (University of Idaho)	Kevin Tansey (University of Leicester, UK)	75
	Biophysical - LAI*	Richard Fernandes (NR Canada)	Stephen Plummer (Harwell, UK)	88
	Biophysical - fAPAR*	Arturo Sanchez-Azofeifa (University of Alberta)	Nadine Gobron (JRC, IT)	
	Surface Radiation (Reflectance, BRDF, Albedo*)	Crystal Schaaf (U Mass Boston)	Gabriela Schaepman (University of Zurich, CH)	45
	Land Surface Temperature & Emissivity	Simon Hook (NASA JPL)	Jose Sobrino (University of Valencia, ES)	135
	Soil Moisture*	Tom Jackson (USDA)	Wolfgang Wagner (Vienna Uni of Technology, AT)	49
	Land Surface Phenology	Matthew Jones (University of Montana)	Jadu Dash (University of Southampton, UK)	86
	Snow/Ice*	Dorothy Hall (NASA GSFC)	Tao Che (Chinese Academy of Sciences)	71

Note: LPV SG is very closely aligned with Land ECV products. There is strong need to work with Working Group on Climate.



**Albrecht von Bargaen,
DLR**

**Gregory Stensaas,
USGS**

**Satish Srivastava,
CSA**

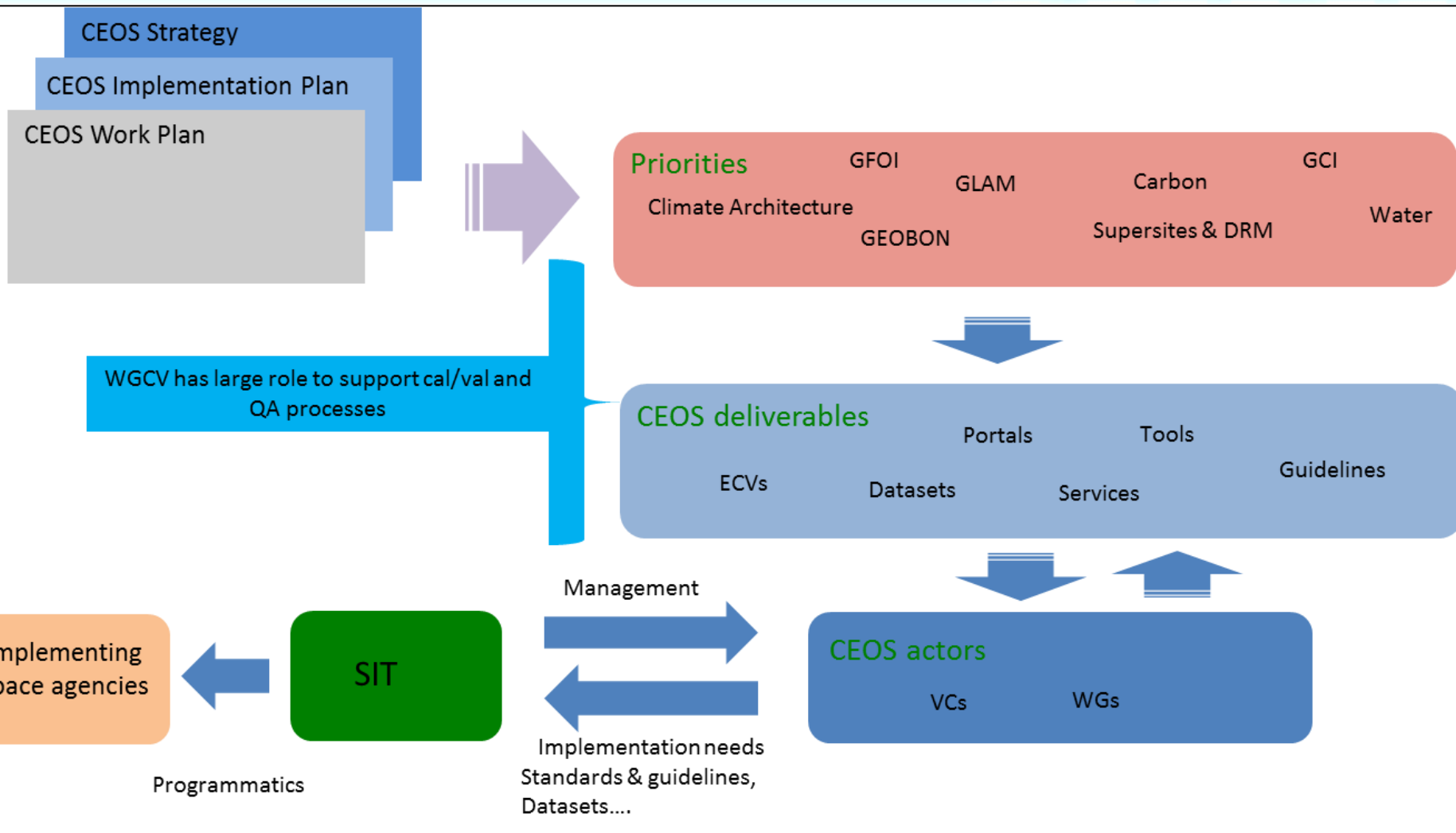


WGCV-35, ISRO, Hyderabad, India

- **Gregory Stensaas from USGS completes his two-year term as WGCV Chair (2010 – 2012)**
- **Satish Srivastava from CSA (the former WGCV vice-chair) becomes the new Chair (2012 – 2014)**
- **Albrecht von Bargaen from DLR was elected as the new WGCV vice-chair (2012 – 2014). Albrecht will become WGCV chair in 2014**

- **Thank you for the opportunity to serve as the WGCV chair!**
- **I learned much from you and truly enjoyed talking and working with many of you!**







CEOS 24-12: CEOS agencies encouraged to consider taking on responsibility for QA4EO secretariat and website maintenance

- ▶ UKSA/NPL has accepted a 2 year term for QA4EO SEC and support

CEOS 24-13: WGCV will provide 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. The list will also include **recommended resource requirements for active agency support of site instrumentation and maintenance**

- ▶ The CEOS recommended Cal/Val sites and processes are available on the Cal/Val portal and being put into CWIC/IDN.
- ▶ WGCV requests that CEOS member agencies routinely acquire data over these sites where applicable and support the maintenance of any instrumentation required on site.
- ▶ Resource requirements for the instrumented sites are required by agencies; New recommendation provided in following slides



CEOS WGCV recommends that CEOS plenary consider, General:

1. Reviewing and approving WGCV 5-year plan (on WGCV web page)
2. Providing agency support in developing and maintaining recommended instrumentation at the CEOS Cal/Val test sites, and acquiring data routinely over them**
3. Provide free access to data acquired over CEOS sites to CEOS member agencies for calibration purposes, preferably via CWIC**
4. Provide resources and support for ground networks and field campaigns
5. Agencies provide point of contact for WGCV and its subgroups
6. Provide support to lead and encourage widespread implementation of QA4EO principles within future (and where possible current) activities of CEOS agencies facilitated by the new UKSA QA4EO Secretariat.



CEOS WGCV recommends that CEOS plenary consider, SAR SG:

1. Agency support for CEOS SAR test sites in India and Australia
2. Recommend that CEOS organizations obtain and provide calibration data over SAR test sites**

CEOS WGCV recommends that CEOS plenary consider, LPV SG:

1. Recommend that agencies provide nomination for LPV Subgroup Vice Chair*
2. Recommend that CEOS agencies provide support for LPV Focus Groups
3. Recommend that agencies collect and make data available over LPV test sites as part of a regular acquisition plan**

Focus Groups * ECV			
Focus Group	North America	Europe / Other	Listserv
Land Cover*	Pontus Olofsson (Boston University)	Martin Herold (Wageningen University, NL)	176
Fire* (Active/Burned Area)	Luigi Boschetti (University of Idaho)	Kevin Tansey (University of Leicester, UK)	75
Biophysical - LAI*	Richard Fernandes (NR Canada)	Stephen Plummer (Harwell, UK)	88
Biophysical - fAPAR*	Arturo Sanchez-Azofeifa (University of Alberta)	Nadine Gobron (JRC, IT)	
Surface Radiation (Reflectance, BRDF, Albedo*)	Crystal Schaaf (U Mass Boston)	Gabriela Schaepman (University of Zurich, CH)	45
Land Surface Temperature & Emissivity	Simon Hook (NASA JPL)	Jose Sobrino (University of Valencia, ES)	135
Soil Moisture*	Tom Jackson (USDA)	Wolfgang Wagner (Vienna Uni of Technology, AT)	49
Land Surface Phenology	Matthew Jones (University of Montana)	Jadu Dash (University of Southampton, UK)	86
Snow/Ice*	Dorothy Hall (NASA GSFC)	Tao Che (Chinese Academy of Sciences)	71

Note: WGCV LPV very closely aligned with Land ECV products and there is strong need to work with Working Group on Climate



CEOS WGCV recommends that CEOS plenary consider, MSSG:

1. **Recommend agencies contact WGCV and MSSG Chair with potential co-chair candidates, and interested participants to the sub-group***

CEOS WGCV recommends that CEOS plenary consider, TMSG:

1. **Agencies should be encouraged to fund the set-up of global test sites over continental shelves where “bathymetry” truth is available for (a) clearwater (e.g. Australian bight); (b) turbid water regions (e.g. English channel) for evaluation of spaceborne visible and SAR methods respectively for bathymetry retrieval**
2. **Agencies are encouraged to provide through WGISS WPS services (e.g. bare earth retrievals, river catchments, data fusion engines) as well as WMS of their spaceborne DEM products including QI using the internationally agreed ICEDS color LUT for elevation and a to-be-agreed CLUT for QI**



CEOS WGCV recommends that CEOS plenary consider, IVOS SG:

1. Develop WGCV and WG-C task force to establish consistent interpretation of GCOS ECV requirements and analysis methodology for accuracy and stability monitoring (IVOS-SG and LPV-SG)
2. For satellite based OC measurements, agencies to commit to long term support of CEOS reference test sites for oceans; e.g., OC Buoys MOBY, BOUSSOLE, (Kavaratti - ISRO) and develop Aeronet-OC network
3. Resources are required to enable comparisons of radiometers used for validation of 1) SST and 2) OC to be organized in 2014 (preparations to commence in 2013) in support of VCs and climate
4. To underpin validation of satellite based SST measurements and help mitigate data gaps for climate records, agencies to support the deployment of a set of traceably calibrated drifting buoys at a cost of ~\$300k
5. Previous CEOS-24 Action: Agencies support set up and long-term maintenance cost of autonomous SI traceable instruments for the CEOS land test sites (LANDNET) (minimum of 5) and establishment of infrastructure to enable coordination and dissemination of information to satellite operators



CEOS WGCV recommends that CEOS plenary consider, IVOS SG:

- 6. Agencies are encouraged to regularly collect data over CEOS sites and provide access to the data via the CEOS Cal/Val portal or some other accessible database****
- 7. Encourage agencies to provide consistent minimal acquisition metadata in the header files; e.g., view angles, time, solar angles, etc., to support comparisons needed for data quality and interoperability**
- 8. Resources are needed to identify global MTF Cal/Val test sites and establish webpages, similar to the USGS Worldwide test site catalog**
- 9. Agencies are encouraged to ensure full PSF/MTF pre-flight characterization of the sensor and provide results to the user community**
- 10. Two new thematic groups (Geo-spatial quality and Geo-image quality) have been established within IVOS. Agencies are encouraged to participate**