

CEOS Working Group on Cal/Val WGCV28 Chair Report

Changyong Cao, Chair
Pascal Lecomte, Vice Chair
Petya Campbell, Technical Secretariat

Feb. 26, 2008
Rendezvous Hotel, Sanya, China

Background

- **The Working Group on Calibration and Validation (WGCV) was originally established in 1984. This resulted from the recognition by CEOS that calibration and validation activities should play a key role in all satellite Earth Observation missions to ensure the clear and quantitative understanding of the data they generate.**
 - **Calibration:** The process of quantitatively defining the system responses to known, controlled signal inputs.
 - **Validation:** The process of assessing, by independent means, the quality of the data products derived from the system outputs.
- **In the GEOSS era, CEOS has become the space segment of GEOSS in support of GEO. WGCV is actively engaged in both GEO and CEOS tasks.**
- **WGCV is one of the three CEOS working groups (WGCV, WGISS, WGEdu) that report to the CEOS and the SIT (Strategic Implementation Team)**
- **The CEOS/SIT plays a central role in coordination of existing and future missions of CEOS agencies, particularly to support GEO in its realization of the space segment of GEOSS.**

CEOS WGCV Subgroups

WGCV CHAIR (NOAA)
VICE CHAIR (ESA)

SAR (CSA)

IVOS (NPL)

MS (ESA)

TM (UCL)

LPV (CNES)

ACSG (GSFC)

Atmospheric Composition (ACSG)

Chair Dr. B. Bojkov, GSFC

Vice Chair Dr. J-C. Lambert, IASB/BIRA

Infrared Visible Optical Sensors (IVOS)

Chair Dr. N. Fox, NPL/BNSC

Land Product Validation (LPV)

Chair Dr. F. Baret, INRA/CNES

Vice Chair Dr. S. Garrigues

Microwave Sensors

Chair C. Buck, ESA

Synthetic Aperture Radar (SAR)

Chair Dr. S. Srivastava, CSA

Terrain Mapping (TM)

Chair Prof. J. Peter Muller, UCL/BNSC

Future Chair Dr. Veljko Jovanovic



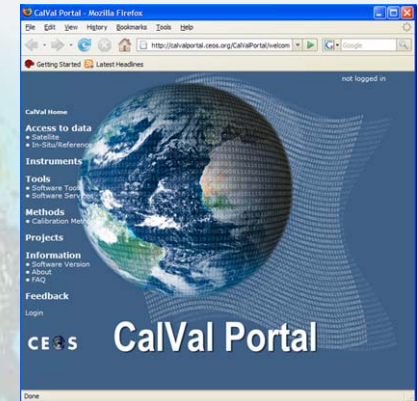
CEOS WGCV 27th Plenary
NPL, London – June 12-15, 2007

Major events since WGCV27

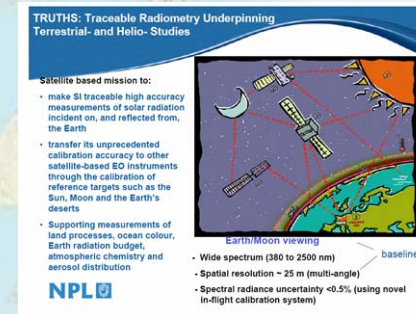
- GEOSS Workshop on Interoperability and Biodiversity, IGARSS, July 23-27, Spain, 2007, standards & calibration breakout group.
- WGCV effort on developing data quality assurance strategy is recognized as one of the early achievements for GEOSS.
- GEO-CEOS Workshop on Cal/Val, Geneva, Oct. 2-4, 2007
 - Nearly fifty participants with 4 sessions. Second workshop in May 2008.
- CEOS 21th Plenary in Hawaii, Nov. 12-15, 2007.
 - Two new members: Spain's Center for the development of Industrial technology (CDTI), and the China Center for Resources Satellite Data and Applications (CRESDA)
 - GEOSS space segment support, dialogue with GEO
 - Reports from the SBA coordinators, virtual constellations, and working groups
 - Organizational changes:
 - CEOS CEO: from Jean-Louis Fellous to Ivan Petiteville
 - CEOS SIT chair: from Volker Lebig, ESA, to Mary Kicza, NOAA
 - CEOS chair: from Barbara Ryan, USGS, to Pontsho Maruping, S. Africa
- The presentation and report are still available from the special CEOS 21th plenary website http://www.ceosplenary2007.com/materials_agenda.htm

Accomplishments in the past year

- 1) Leading cross-cutting GEO task (DA-06-02): developing data quality assurance strategy for GEOSS (broad participation):
 - ❑ GEO-CEOS Workshop on Cal/Val (Sponsored by GEO and ESA, Oct. 07):
 - Developing the **framework** and **guidelines** for cal/val; identified key elements for a data quality strategy to achieve interoperability for GEOSS.
 - Reached consensus that quality assurance should be incorporated into satellite programs.
 - **Cal/val portal** (ESA): the first step towards harmonization
 - ❑ Addressed issues related to cal/val standards, consistency, and interoperability at the GEOSS workshop (co-sponsored with IEEE at IGARSS07)
 - ❑ Coordinated the activities and reporting related to data quality assurance. Progress recognized as early achievement.



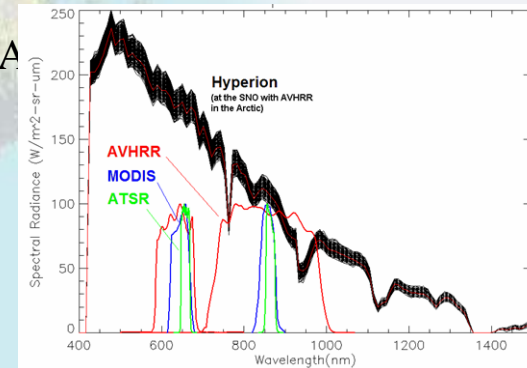
<http://calvalportal.ceos.org>



Accomplishments in the past year

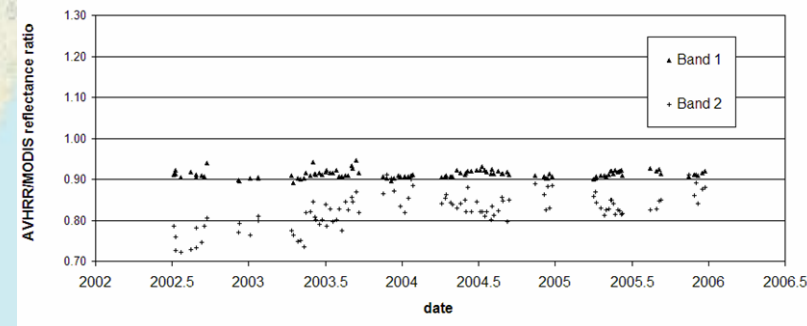
2) CEOS IP Climate Actions: Major progress in two Priority-1 actions:

- **Project 1: FCDR (T-4):** Quantified the measurement consistency among AVHRR, MODIS, and ATSR for generating Fundamental Climate Data Records (FCDRs) (NASA, NOAA, ESA, CCRS/CSA, USGS). Documented in a journal paper submitted.
- **Project 2: Benchmark Mission Planning (A-5, C-7):**
 - Active studies on **TRUTHS (NPL)** and **CLARREO (NASA)**
 - Excellent opportunity for international collaboration through CEOS



3). Other: CEOS constellation support, new members, and more participants

Details on accomplishments can be found in the supporting materials.



Thank BNSC/NPL, GEO, ESA for hosting the WGCV meeting and workshop. Thank all participating agencies.

Data Quality Assurance is among GEO's first 100 Steps to GEOSS



Development of a framework for space-based data quality assurance

Description

The CEOS Working Group on Calibration and Validation (WGCV), in conjunction with members of GEO Task DA-06-02, has developed an initial framework to provide guidelines and standards for data quality assurance for global earth satellite observations. This strategy is outlined in a White Paper, entitled: "Data Quality Guidelines for Satellite Sensor Observations Relevant to GEOSS, *Calibration and Validation Issues*", to be presented at IGARSS-2007. The approach outlined ensures the quality assessment of space-borne optical instrument data from Earth observation remote sensing systems. It exploits ongoing work and available expertise among the CEOS working group members, and provides a mechanism for further development over the 10-year timescale of the GEOSS implementation plan.

By providing a forum for space-based data quality assurance, WGCV has made a significant progress in establishing a consensus among the community of international Cal/Val experts, (representing many space agencies, academia and others) on the contents of a widely accepted data quality assurance strategy. More than 20 presentations and working discussions dealing with GEOSS programs and plans occurred during the last 5 WGCV meetings. Relevant technical issues addressed included standards, benchmark missions, cross-calibration, common solar and lunar irradiance models, recalibration/reprocessing of key data sets, and selection of global validation sites. These deliberations have resulted in formal WGCV recommendations, which were adopted by the CEOS Plenary and distributed to all member agencies. The operational agencies are incorporating the WGCV data quality assurance strategy into the Global Space-based Inter-calibration System (GSICS).

A GEO - CEOS Workshop on Quality Assurance of Calibration and Validation Processes to be hosted by GEO in Geneva from 2nd to 4th of October, 2007 has been organized by the current WGCV vice-chair under ESA sponsorship. The workshop will focus on: best practises in cal/val processes; harmonisation and standardisation of quality control and cal/val processes; the role of CEOS in identifying standards for those processes; and implementation strategy.

Where do we stand?

- CEOS is the space segment of GEOSS (GEO)
- CEOS organizational structure:
 - Chair SEC
 - SIT (Strategic Implementation Team)
 - WGCV, WGISS, WGedu
 - 4 Constellations (LSI, AC, PC, OST)
 - 9 SBA coordinators
- WGCV is changing:
 - Traditionally has provided the forum for information exchange
 - Transforming ourselves to become the work force for CEOS and GEO: GEO tasks, actions, deliverables, and milestones
- GEO and CEOS/SIT has started looking into resource issues.

Current and Future Challenges

- As more and more satellites are launched, data quality assurance becomes increasingly more important. We face many challenges:

Technical:

- Stringent cal/val requirements for climate change detection (stability on the order of 0.1K per decade).
- Lack of standards for data quality and on-orbit SI traceability

Resources:

- Getting sustained agency support for cal/val is challenging.
- Leverage on existing project funding.
- Ad hoc contribution on voluntary basis.
- Many tasks with limited resources.

Requested Agency Commitments

1). Endorsement and support:

- All satellite programs should include **adequate support** for cal/val.
- Establish quality assurance framework based on best practices, including:
 - **Cal/Val portal:** Support further development and use as the entry point for Cal/Val information.
 - Develop CEOS endorsed **Cal/Val reference sites**
 - Establish **data policy** for the access and use of Cal/Val data
- Support recalibration for generating **FCDRs** (agencies involved)
- Provide adequate resources for additional CEOS IP tasks (e.g.: Priority-2 climate action on ocean sensor cal/val (o-18) next year)

2). Coordination on benchmark measurement missions (climate action A-5):

In the context of A-5 and GEOSS data QA, space agencies should consider how best to coordinate, collaborate and implement the complimentary "international benchmark reference" mission proposals: **TRUTHS** and **CLARREO** (Benchmark constellation?)

3). Other recommendations:

Invest in comprehensive **pre-launch calibration** (especially for SARs) to facilitate postlaunch calibration/validation.

CEOS/SIT Activities

- CEOS Implementation Plan
- GEO tasks and targets remapping
- ~160 Questionnaires provided details on expected 2008 results
- CEOS-GEO Task SIT Workshop Feb. 20-22, 2008, Washington DC. Participants included SBA coordinators, constellation leads, and working groups chairs
- WGCV has 10 Actions for 2008.

CEOS Climate

- Mitch Goldberg is the CEOS Climate SBA lead. He will coordinate efforts between CEOS, GCOS and WMO
- Emphasis is on creating satellite-based climate data records through international collaboration.
 - Coordinating efforts between WGCV and GSICS
 - Coordinating efforts between GSICS and RSSC-CM
- Cannot overemphasize the importance of calval for constructing CDRs.

WGCV strategic planning

- *Vision:*

Empower the Earth Observation community by developing a data quality assurance strategy to foster sustained high quality observations and associated error characteristics, *“in order to improve monitoring of the state of the Earth, increase understanding of Earth processes and enhance prediction of the behavior of the Earth system”*

- *Mission:*

Lead the development of the data quality assurance strategy for GEOSS, beginning with space-based observations and evaluating expansion to in-situ observations, taking account of existing work in this arena. Develop the framework, guidelines, standards, best practices and recommendations for this task to ensure long-term confidence in the accuracy and quality of Earth observation data and products.

- *Values:*

Enhance coordination and complementarity, to promote international cooperation, and to focus activities in the calibration and validation of Earth observations for the benefit of the GEOSS, the CEOS members, and the international user community.

WGCV Priorities in 2008

- Continue leading DA-06-02. Workshop in May
- Framework, guidelines, best practices, and procedures.
- Cal/val portal further development
- Cal/val site classification/documentation
- R&D on selected stable radiometric reference standards. Joint experiments
- WGCV Standards and recommendations handbook
- CEOS constellation support, and GSICS coordination
- Deliverables to be further discussed:
 - DEM interoperability
 - Product harmonization
 - Microwave instrument cal/val
 - Other

WGCV GEO tasks (revised 2008)

in the order of deliverables in 2008

Task ID	Task	POC	2008 deliverables
DA-06-02	Data quality assurance	Ungar/Lecomte/ Cao/ SG chairs	Workshop, Cal/val portal and sites, joint study, standards and handbook
CL-06-02	Key climate data	Cao/Lecomte/Fox/Xiong	MODIS/ATSR/AVHRR, Antarctic site cross calibration, benchmark
CL-06-01	Reanalysis/reprocessing	Cao	HIRS spectral study using IASI
DA-06-04	Data/metadata/product harmonization	Baret/Lecomte	TBD
DA-07-01	DEM interoperability	Muller	TBD
EC-06-01	Integrated global carbon	Bojkov	Continued support to AC constellation
DA-07-03	Virtual constellations	Baret/Bojkov	TBD
EC-06-02	Ecosystem classification	Baret	TBD

Proposed 2008 WGCV Actions, Deliverables, and Milestones

Cross-cutting
DA-06-02

1	Complete the project assessing the measurement consistency of MODIS, ATSR, and AVHRR and provide recommendations for recalibration	10/1/08	J. Xiong	NASA	NASA, ESA, NOAA, CCRS, USGS
1	Conduct a joint experiment using the Dome C site for cross calibration. Investigate the feasibility of establishing the Dome C and the moon as CEOS radiometric reference standards, as well as their stability for climate quality calibration.	10/1/08	C. Cao	NOAA	NASA, ESA, NOAA, CCRS, USGS
2	Develop a CEOS/WGCV standards and recommendations handbook	12/30/08	C. Cao	NOAA	All WGCV members
1	Develop a consolidated worldwide cal/val site database to be included in the CEOS cal/val portal. Establish a WGCV consensus on uniform cal/val schemes and criteria. Further expand the cal/val portal in both content and functionality	10/1/08	P. Lecomte	ESA	ESA, USGS, NASA, NOAA, BNSC/NPL
2	Facilitate the coordination on the benchmark measurement missions. Identify POCs from space agencies to participate in WGCV meetings to explore coordination mechanisms.	12/30/08	N. Fox	BNSC/NPL	BNSC/NPL, ESA, NASA, IVOS
1	Hold the 2nd GEO-CEOS Workshop on cal/val to continue developing the framework, guidelines, and best practices for data quality assurance.	10/1/08	P. Lecomte	ESA	ESA

Proposed 2008 WGCV Actions, Deliverables, and Milestones

Cross-cutting DA-06-04	2	Continue developing the strategy for generating consistent biophysical products from medium resolution sensors. Evaluate global landcover classification at regional scale. Update the BELMANIP, and intercompare the fAPAR products. Publish the results (Note: to be updated after WGCV28).	12/30/08	F. Baret	WGC V/LP V	WGCV/LPV, CNES, NASA
Cross-cutting DA-07-01	4	Further expand the EO data portal, to include fused 30m ASTER-SRTM WMS layers for additional sites, expand the DEM representative set for instrument cal/val and intercomparisons at the cal/val sites (Note: to be updated after WGCV28).	10/30/08	J.P Muller	WGC V/TM	WGCV/TM, BNSC/UCL, JAXA, ESA, NASA, CNES, USGS.
Ecosy stems EC-06-02	3	Submit report that addresses progress related to in situ calibration and validation reporting and access issues.	2/29/08	C. Cao	WGC V	ESA, NOAA, EUMETSAT
	3	Encourage coordinated development amongst roleplayers and provide framework for evaluating Global Land Cover products and maps.	9/30/08	C. Cao	WGC V	NASA, ESA, GTOS

WGCV Support to CEOS Constellations

- Atmospheric Composition
 - Leads: Ernest Hilsenrath,
 - WGCV contribution: ACSG (Bojan Bojkov)
- Land Surface Imaging
 - Leads: Bryan Baily and V. Jay
 - WGCV contribution: Greg Stenssas and Stephen Ungar
 - LPV: Frederick Baret
- Precipitation
 - Lead: Riko Oki (JAXA) & Steve Neeck (NASA)
 - WGCV contribution: MSSG: Christopher Buck
- Ocean Surface Topography
 - Lead: Stan Wilson (NOAA) & Francois Parisot (EUMETSAT)
 - TBD

New project: CEOS/WGCV Joint Experiment

Cross calibration at Dome C

- Provides an example for consistency checking across satellites, complements the Cal/Val Portal.
- Supports both data quality assurance for more consistent observations, and potentially climate quality instrument stability.
- Hyperion data acquired (NASA/USGS). Analysis of MODIS/AVHRR over Dome C is in progress. Welcome studies for other instruments ATSR, SPOT, etc.
- Joint study with GEO ADC (to be discussed on Thursday)
- Potential usefulness for the constellations, as well as for the microwave sensors to be discussed.
- More details on Thursday



Hyperion Hyperspectral
observations over Dome C
(0.3-2.5um)

Upcoming events in 2008

- CEOS/SIT-21, April 23-24, MA, USA
- The second GEO/CEOS workshop on Cal/Val Workshop, May 2008 at NIST, Washington DC (organized by Marie-Claire and Pascal).
- IGARSS, Boston, July 6-11, Invited WGCV paper.
- ISPRS, Beijing, July 2008, TMSG
- SPIE, readiness for GEOSS, Aug. 10-14, San Diego
- WGCV 29: Avignon, France, September ?
 - LPV contributions to GEO tasks
 - Vice chair nomination
- CEOS/SIT-22, Sept. 16-18, Tokyo
- CEOS 22nd plenary, Nov. 10-13, Cape Town, SA
- SPIE Asia Pacific GEOSS/CEOS Conference, Noumea, New Caledonia, Nov. 17-21, 2008



While enjoying our meeting in Sanya, please consider what you and your agency can contribute to the CEOS/GEO tasks in 2008 and beyond!