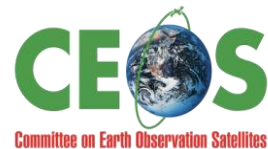


Joint WGCV 35 /WGISS 34 Plenary Meetings September 2012

WGCV and WGISS Welcome

Greg Stensaas (USGS) WGCV Chair
Satoko Miura (JAXA) WGISS Chair





- **WGCV vision and strong need for WGISS and agency cooperation**
- **We live in exciting times with the advances in storage, processing, ...**
 - **WGISS is a key collaborator for WGCV**
 - **ISRO is taking the lead in many areas with a superb Space Program**
- **Very happy to see IRSO participants attending and working via the WGCV and WGISS working groups**
 - **We look forward to continued and enhanced support**
- **A large “Thank You” to ISRO and the meeting coordinators from WGs**
 - **NRSC - Director: Dr. V. K. Dadhwal**
 - **Currently NRSC is supplying data from CartoSat - 1, 2, 2A & 2B, ResourceSat - 1 & 2, OceanSat, TES, IRS - 1D and IMS - 1 to the users.**
 - **Look forward to accessibility these via CWIC tools**
 - **Kiran Kumar, CEOS Chair, Director of Space Applications Center**
 - **Diwaker, Director EOS, ISRO HQ**
 - **Meeting Support and Coordinators – Rajeev Jaiswal, Senthil Kumar, Samar Pal, Santhi Sree**

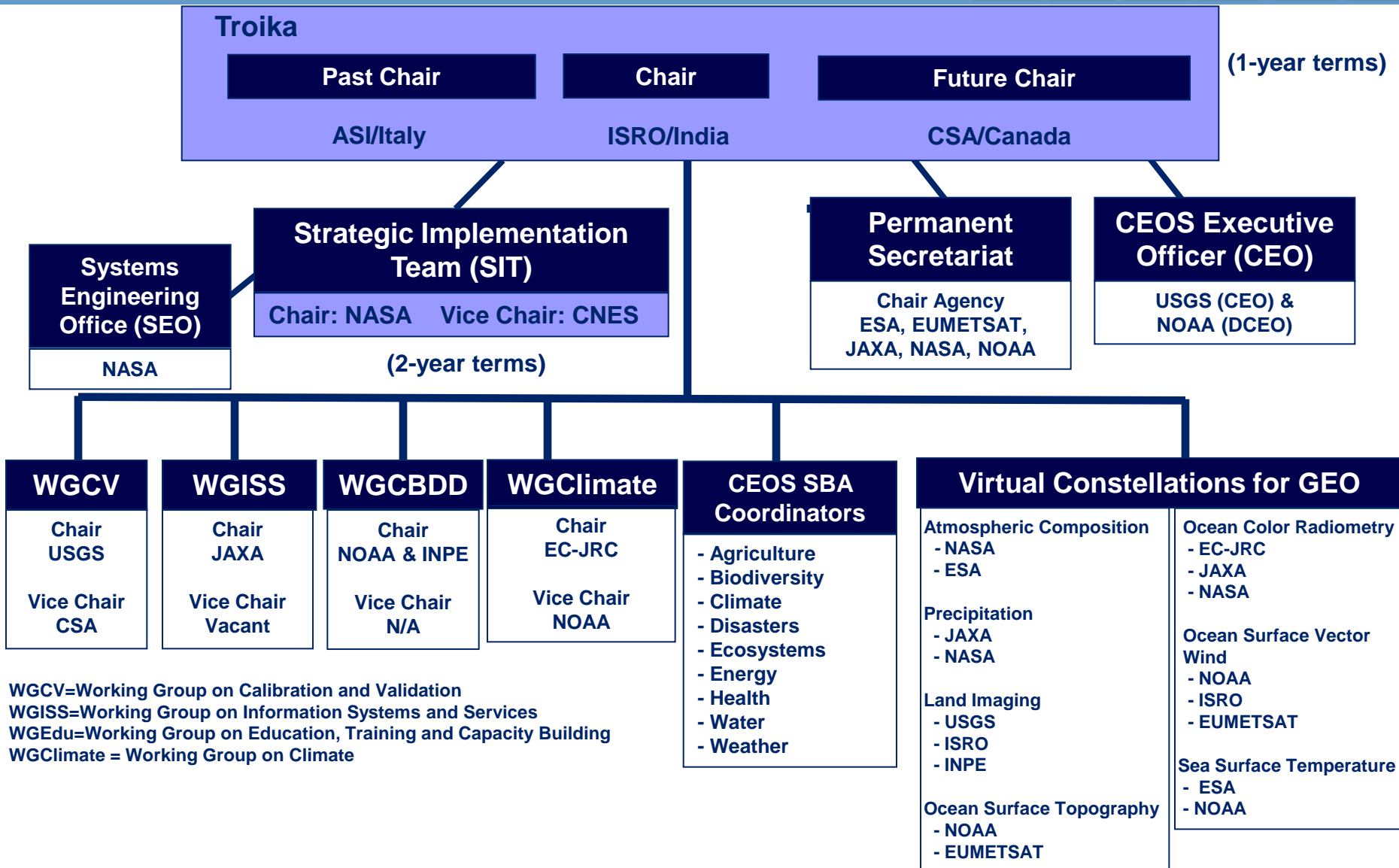
Joint WGCV 35 /WGISS 34 Plenary Meetings September 2012

Highlights and key efforts of WGCV, WGISS, and the previous Joint Meeting

Greg Stensaas (USGS) WGCV Chair
Satoko Miura (JAXA) WGISS Chair



CEOS Structure 2011-2012



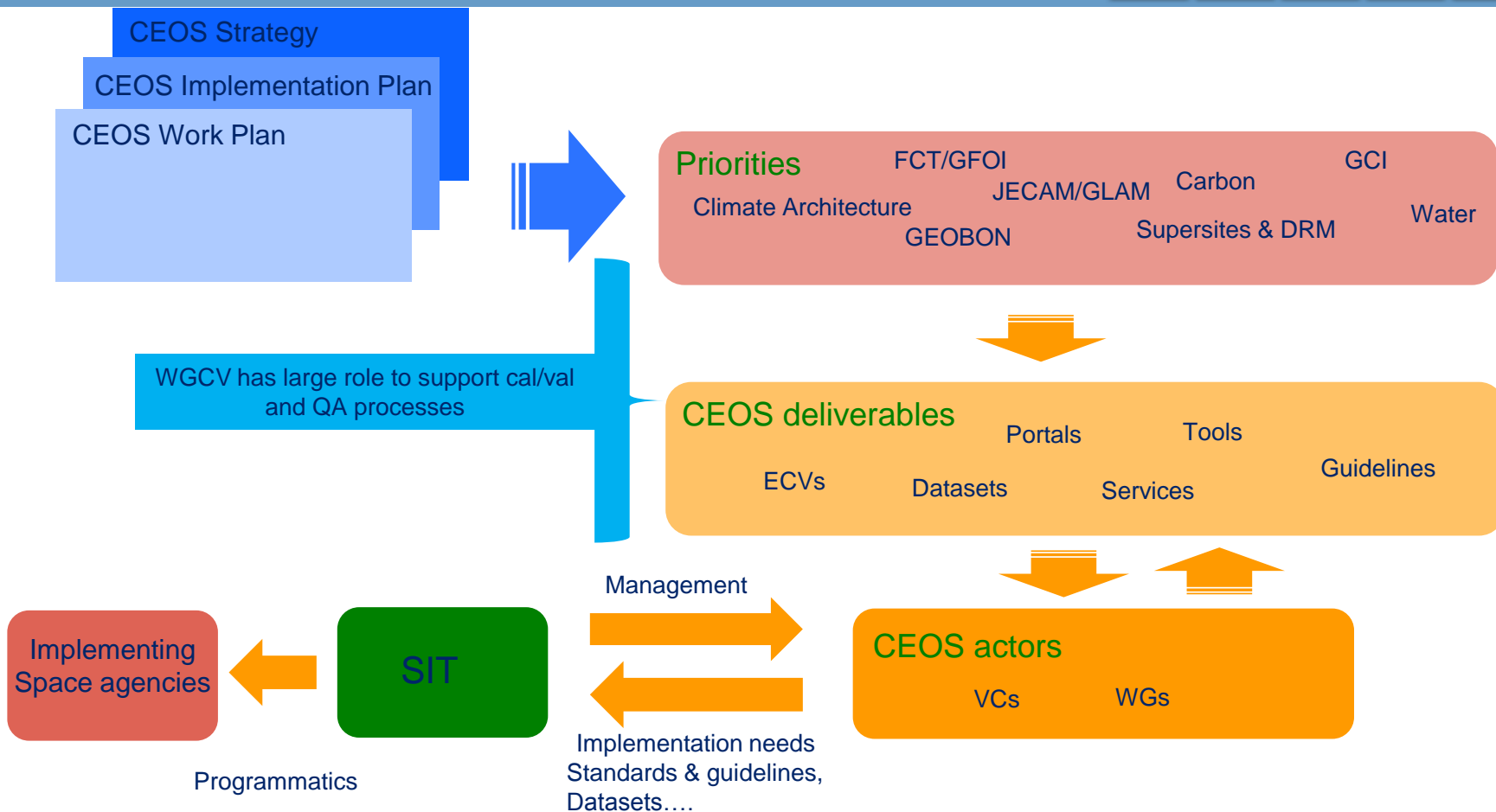


- **Sensor-specific calibration and validation** -- To document and establish forums for the assessment, recommendation and implementation of current techniques and standards for pre- and post-launch characterisation and calibration.
- **Biogeophysical validation** -- To document and establish forums for the assessment, recommendation and implementation of techniques for validation of biogeophysical parameters derived from EO satellite systems.
- Meeting these objectives will include the promotion of:
 - The exchange of EO data, technical information and documentation.
 - The investigation of possibilities for technical coordination and cooperation for space and ground segments.
 - The coordination and analysis of cal/val campaigns and programmes, optimising and sharing of available facilities, expertise and resources as appropriate.
 - Agreement on common terminology and definitions.



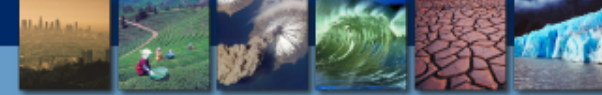
- **One stop shop for all cal/val activities within CEOS**
 - 2011 – 2016 WGCV 5-year Plan at <http://www.ceos.org/wgcv/>
 - Detailed to subgroup level; will be updated on a regular basis
- **Provide international collaboration of sensor and product cal/val**
- **Expertise related to ground-based, airborne and satellite sensors used for the cal/val of satellite sensors**
- **Consultants for cal/val requirements and standards**
- **Development/identification of cal/val sites and continuing observations and intercomparison of cal/val**
- **Quality assurance expertise to include definitions and methodologies required to establish traceable indicators for CEOS products**

CEOS Implementation Process





- **3-year outcomes defined in course of the CSS**
 - 1. Cal/Val support to CEOS efforts needed: FCT/GFOI, JECAM, ECV validation and comparisons, ...**
 - a. Continue toward definition and enhancement of cal/val test sites and processes
 - b. Support to GFOI Methods & Protocols and validation of datasets and processes
 - c. Support cal-val and quality aspects of ECV development
 - 2. QA4EO Implementation with CEOS and GEO**
 - a. Working via IN-02-C1 task
 - b. Develop common definition and methods
 - 3. WGs, VCs, CEOS Task Leads, and CEOS communication**
 - a. Defining WG and VC points of contact to obtain WGCV support and actions
 - b. Interaction process being worked
 - c. 5-year Plan updates to reflect CEOS WG and VC interaction



- **New Chair and Vice Chair at this meeting**
 - Satish Srivastava (CSA)
 - Albrecht vonBargen (DLR)
- **QA4EO Implementation Processes are required by CEOS work plan**
- **WGCV Work Plan version completed but needs to be upgraded to cover GW/VC integration**



- **WGCV-33 - ROSCOSMOS, Moscow, Russia on May 16-20, 2011**
- **WGCV-34 - CSIRO/TERN/others, Brisbane, Australia, February 6-10, 2012**
- **WGCV-35 / WGISS-34 on 24-28 Sept 2012**
 - Hosted by ISRO, NRSC, Hyderabad, India
- **WGCV-36 – May 2013 - Shanghai, China**
- **WGCV-37 – Jan/Feb 2014 – TBD**
- **WGCV-38 - Sept 2014 – TDB**
- **Subgroup meetings continue 1-2 times per year**
- **CEOS Libya-4 Workshop -**
 - October 4-5, 2012, CNES Paris, (registration deadline September 14th)

Joint meetings and the Process



- Approximately every two years, WGISS and WGCV have been holding Joint meetings
- Identifying key effort and partners
- Sharing common working experiences and lessons
- Define common goals and effort needed by the Working Groups and CEOS
- The objective for this meeting is to define these areas in the WGs and come back for input into joint sessions this week

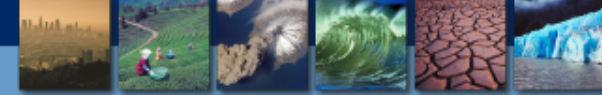
Joint meetings and the Process



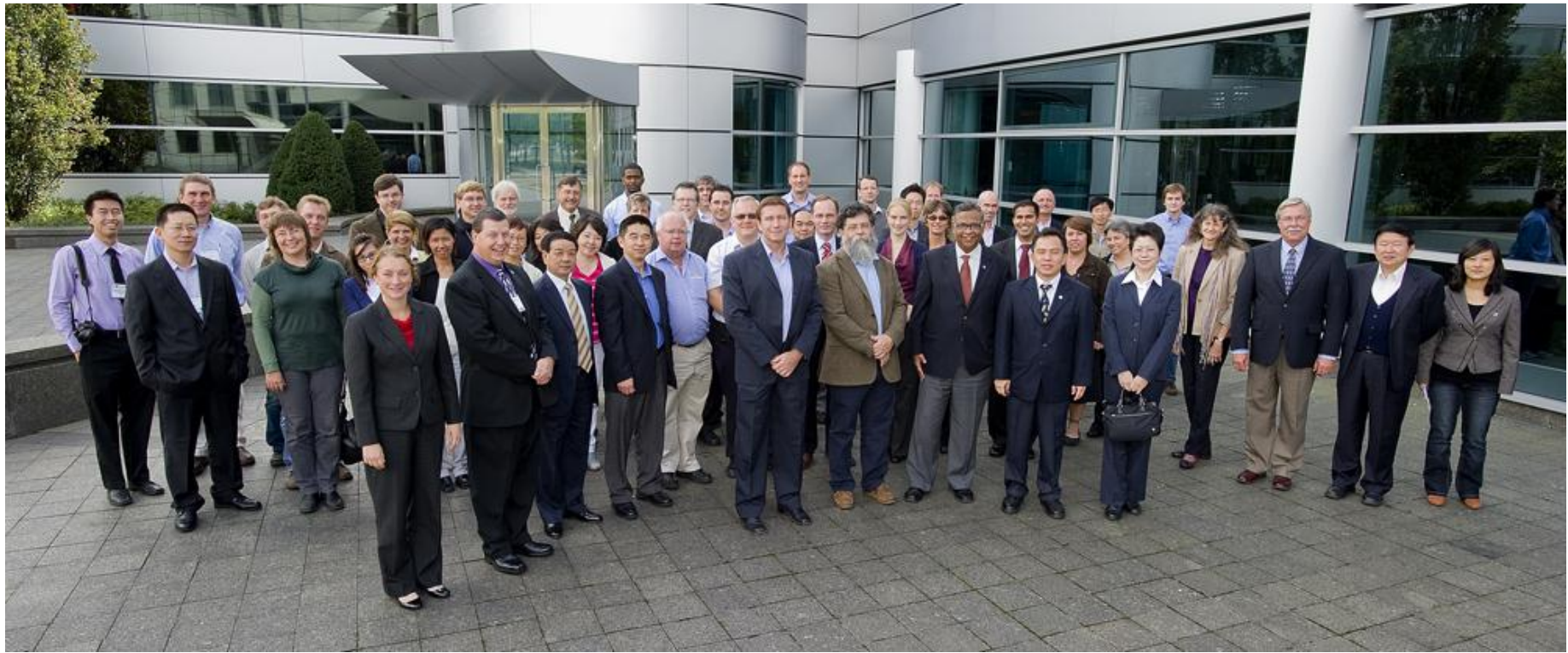
Hosted by NSOAS / CSSAR in Sanya, P.R. China, 26 - 29 February 2008



Joint meetings and the Process



Hosted by CSA in Montreal, Canada, 13- 17 September 2010



Previous Joint Meeting Actions



- **WGCV / WGISS JOINT ACTIVITIES**
 - **Recommended Quality Assurance Framework for Earth Observation (QA4EO) Implementation in CEOS**
 - *QA4EO related to data metadata and product harmonization*
 - *Incorporating Quality into the community portals*
 - *QA4EO Showcases*

From minutes of meeting:

1. Terrain elevation

Jan-Peter Muller (WGCV), Wyn Cudlip (WGISS) and Francis Lindsey (USGS) agreed to formulate a plan of action and develop a list of potential members for the terrain elevation showcase team.

2. Air quality (Now using Ozone Quality)

Albrecht von Barga (WGCV) and Stefan Faulke (WGISS) agreed to formulate a plan of action and develop a list of potential members to the air quality showcase team. von Barga explained that the highlight for this showcase would be to have quality measurements.

3. Forest Carbon Tracking (FCT)

Greg Stensaas (WGCG), Lyn Oleson (WGISS) and Tom Holm (LSI) agreed to formulate a plan of action and develop a list of potential members to the FCT showcase team.

CEOS Joint efforts needed more than ever



- There are over 100 EO systems on orbit, many sensors need to be tied together via a reference standards
- Much Data, enhanced storage and processing, >>> moving toward integrated science products
- Future satellites and constellations will continue to need system calibration and reference processes
- CEOS recommends calibration, validation, interoperability, and quality information
- Strong movement at the CEOS SIT for WG & VC interaction and coordination

**Joint WGCV 35 /WGISS 34
Plenary Meetings
September 2012**

IN-02-01 Overview (GEO Tasks)

Satoko Miura (JAXA) WGISS Chair



**Joint WGCV 35 /WGISS 34
Plenary Meetings
September 2012**

IN-02-01 Implementation and QA4EO

Greg Stensaas (USGS) WGCV Chair





- **GEO lead under a GEO task IN-02 Earth Data Sets, C1:
Advances in Life-cycle Data Management (*previous
task DA-09-01: GEOSS QA strategy*)**



- **The Quality Assurance framework for Earth Observation (QA4EO) principles:**
 - It is critical that data and derived products are easily accessible in an open manner and have associated with them an indicator of their quality traceable to reference standards (preferably SI) to enable users to assess its suitability for their application i.e. its "fitness for purpose".
 - This Quality Indicator needs to be unequivocal in its interpretation and derivation , yet sufficiently flexible, to be implemented across the full range of EO activities which are coordinated through GEO.

Quality Assurance framework for Earth Observation (QA4EO) principle



QA4EO Principle

Data and derived products shall have associated with them a fully traceable indicator of their quality

Quality Indicator

A Quality Indicator (QI) shall provide sufficient information to allow all users to readily evaluate the “fitness for purpose” of the data or derived product

Traceability

A QI shall be based on a documented and quantifiable assessment of evidence demonstrating the level of traceability to internationally agreed (where possible SI) reference standards

- Measurement/processes are only significant if their “quality” is specified
- In order to achieve the vision of GEOSS, Quality Indicators (QIs) should be ascribed to data and products, at each stage of the data processing chain - from collection and processing to delivery.

QA4EO Implementation Profile



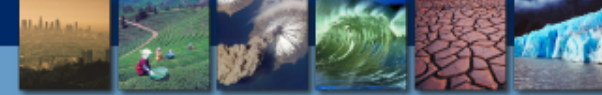
- **QA4EO implementation is supported by a framework document and a set of key guidelines to assist in its interpretation and implementation**
 - **Principles and Guidelines Version 4.0 and Implementation Management**
 - CEOS, IEEE, agency support and workshop revisions
 - **QA4EO Website** <http://qa4eo.org/>
 - **Overall Key Guidelines and associated reference documentation populated on QA4EO**
 - **Enhanced documentation continually being developed**
- **Organizations that fund and oversee the development and execution of Earth Observation programs are responsible for implementing QA4EO principles**
 - **Need CEOS and GEO requirements, guidelines, and implementation mechanisms**
 - **Need to support CEOS and GEO data and information architecture**
 - **Need to continue to provide QA4EO Showcases and Implementation Pilots**

QA4EO Events






- **Four previous QA4EO Planning Workshops**
 - **GEO SEC (Oct 2007), NIST USA (May 2008), TÜBİTAK UZAY Turkey (Sept 2009), UK Harwell (Oct 2011)**
 - *Guiding Principles, Establish Operational Framework, Facilitating Implementation, Providing Harmonised Quality Information for 2015*
- **Many related efforts:**
 - **ESA GMES Initiative, UK National Initiative, WMO-BIPM Workshop, NASA ESIP QA Cluster, ISO processes/documents,**
- **Many Sessions and Papers (past, present, future)**
- **Capstone Workshop (2011) including key GEO and CEOS members and users**
 - **Defined Actions and Timelines**
 - **GEO SEC members recommended a Ad Hoc QA4EO Working Group/Team**
- **QA4EO Implementation Plan written to include workshop recommendations**
 - **CEOS QA4EO Implementation – WGCV lead, support from other WGs and VC GEO Implementation – GEO lead under a GEO task IN-02 Earth Data Sets, C1: Advances in Life-cycle Data Management (previous task DA-09-01: GEOSS QA strategy)**

QA4EO Implementation Plan



- **Based on, previous workshop outcomes and actions**



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

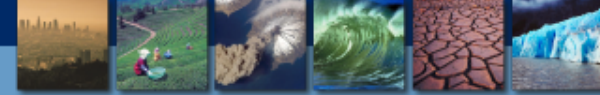
**A Quality Assurance Framework for Earth
Observation (QA4EO)**

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.



- **Authorisation - Delegated management from CEOS and GEO, responsible for recommending and proposing to GEO Secretariat**
- **Management of GEO QA4EO Implementation:**
 - Develop and define implementation prioritization of QA4EO needs in GEO
 - Create the implementation requests to obtain resource in GEO and present to GEO management
 - Support management and integration across GEO
 - Create Ad hoc Working Groups for Implementation needs
- **Efforts:**
 - Detailed promotion and management of QA4EO at technical and scientific domain level.
 - Evolution of QA4EO, scope and guidelines
 - Development of Implementation Strategy
 - Focal point for guidance on key guidelines
 - Review technical input and approve or recommend; approve procedures/comparisons as appropriate.
 - Provide scheduled actions and work as need

CEOS QA4EO Implementation Taskforce



- **Management of CEOS QA4EO Implementation:**

- Evolve QA4EO, scope and guidelines
- Develop and refine of Implementation Strategy
- Focal point for guidance on key guidelines and implementation
- Team/Effort requirements and tasks needed in CEOS for QA4EO
- Develop and define implementation prioritization of QA4EO needs in CEOS
- Create the implementation requests to obtain resource in CEOS and present to CEOS management
- Support management and integration across CEOS
- Create Ad hoc Working Groups for Implementation of new tasks or efforts in accordance with on-going CEOS efforts

Members:

- WGCV Chair/Vice Chair
- WGCV Subgroup Chairs and delegates
- WMO
- Metrological Standards bodies (2 minimum)
- QA4EO Secretariat
- WGClimat, WGCapD, WGISS delegates
- Virtual Constellation and CEOS effort leads and/or delegates
- All members of the CEOS QA4EO Management Team will be invited and considered as support and maybe called upon as needed by the taskforce.



- **UKSA with Centre of Carbon Management (CCM) at the National Physical Laboratory (NPL)**
 - **2 year effort to support QA4EO implementation support – secretariat, web, leadership**
 - **Dr. Hillary Elliott**
 - **<http://www.npl.co.uk/carbon-measurements>**

WGCV engage in common efforts w/ other CEOS components



- **WGCV engaged in these efforts and gather GEO/CEOS /support efforts to move QA4EO forward**
 - QA definitions/standards
 - Quality in metadata, “fit for purpose” information, accuracy, error, uncertainty, traceability
 - Fields in GEO and CEOS data structure
 - System specs and standards?
 - ECV cal/val and QA
 - Carbon and climate requirements validation
 - In situ and modeling quality, uncertainty, traceability
 - Other related programs and tasks
 - ISO

QA4EO actions required of SIT and CEOS members

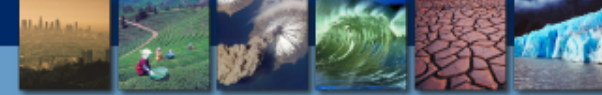


- **CEOS members to provide examples of activities current or past which are consistent with QA4EO principles which can be used as case studies on new web-site.**
- **Agencies to present/summarize their efforts to meet QA4EO principles to QA4EO implementation team/SIT.**
- **Encourage appropriate “badging” use of QA4EO logo to build awareness and visibility**
- **Provide key representatives to support any evolution/additions of the guidelines**
 - **Climate data “maturity index”**
 - **Long Term Data Preservation (LTDP)**
 - **High level product QIs**

QA4EO actions required of SIT and CEOS members (continued)



- **CEOS (GEO SBA) contacts to promote principles and implementation in GEO.**
- **Agencies to encourage reporting of QI (uncertainties with data they supply) and providing ready access to necessary metadata providing evidence to support it.**
- **Agencies to request appropriate QA information from providers (utilizing QA4EO as shorthand specification) to stimulate and progress QA4EO principles.**
- **Agencies to provide resource to facilitate QA4EO implementation team in delivering actions.**



- **CEOS QA4EO Showcase Update**
 - **Forest Carbon Tracking (FCT)**
 - Working with FCT/GFOI team to define key accomplishments and data support and integrated
 - In the context of FCT resources have now been identified in the UK to support the development of a QA4EO related case study covering optical and SAR sensors in support of a GFOI national demonstrator. This project kicked-off on Sep 5 and hopes to have a good analysis and case study by March/April 2013. It will require access to long times series data sets of some example sensors over a selected site in Indonesia. In particular, Landsat and Meris and ideally TerraSar.



- **CEOS QA4EO Showcase Update**
 - **Atmospheric Composition (AC)**
 - AC: Ozone as an example for AC is now well captured in various projects within Europe covering especially also the quality aspects; i.e. the ESA CCI project for ozone and some development projects for the coming Sentinels. The European teams within CCI and the Sentinel development are similar; work plan and project approach – especially for Sentinel 5 Precursor will allow carrying out some quality verifications. The latter is under guidance of several space agencies including ESA, DLR, and BIRA as well.
 - **Global Elevation – Global ASTER DEM completed; additional efforts being considered**

Joint WGCV 35 /WGISS 34 Plenary Meetings September 2012

Joint WG Interaction Requirements/Wrap up Session 1

Greg Stensaas (USGS) WGCV Chair
Satoko Miura (JAXA) WGISS Chair



Why so much attention to Data Quality now?



- In the past, it was difficult to access satellite data.
- Now, within minutes, a user can find and access multiple datasets from various remotely located archives via web services and perform a quick analysis.
- This is the so-called Data Intensive Science.
- The new challenge is to quickly figure out which of those multiple and easily accessible data are more appropriate for a particular use.
- However, our remote sensing data are not ready for this challenge – there is no consistent approach for characterizing quality of our data.
- This is why data quality is hot now.

Leptoukh, Pecora'11

Moving from Data to Information



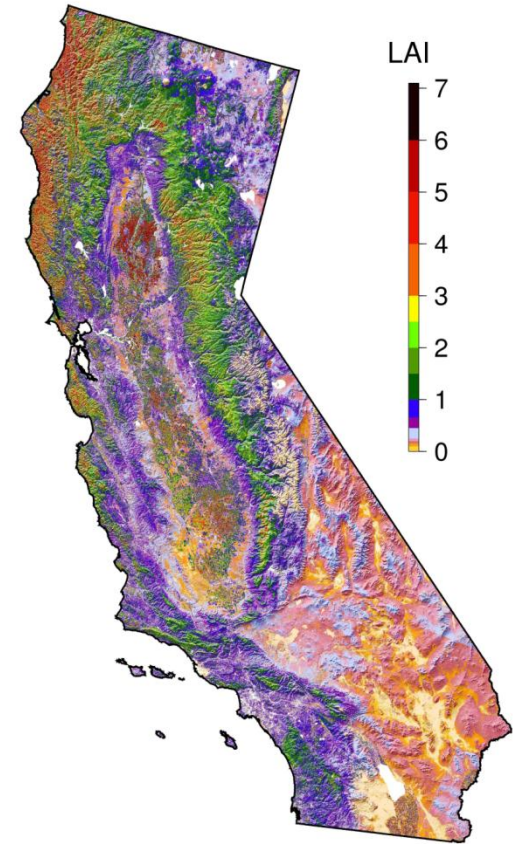
**L1T At-sensor Radiance
(FCDR)**



**Surface Reflectance
(TCDR)**



**Leaf Area Index
(LAI)**



Why so difficult?

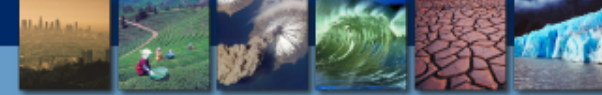


- **Quality is perceived differently by data providers and data recipients.**
- **Many different qualitative and quantitative aspects of quality.**
- **No comprehensive framework for remote sensing Level 2 and higher data quality**
- **No preferred methodologies for solving many data quality issues**
- **Data quality aspect had lower priority than building an instrument, launching a rocket, collecting/processing data, and publishing a paper using these data.**
- **Each science team handled quality differently.**



- 1) WGCV teams should also suggest ideas of quality data metadata fields for the key sensors and products.
- 2) Data access of CEOS Test Site information starting with:
 - 1) CEOS IVOS sites (also test first one prior to meeting for Libya 4 site), 2) LPV sites, 3) SAR, 4) DEM and others. Recommend starting with some key examples. SG support needed.
- 3) Metadata requirements for quality, need to tap each WGCV working group for sensor information. Have WGISS find out what is available. Get NASA ESIP feed back on this and others.
- 4) Quality indicators: get WGCV SG support and ideas and ideas from WGISS.
- 5) It would be good to have input from an ECV quality perspective (Climate).
- 6) Identifying key partners and how they benefit the working group and they benefit from WG
 - working sharing experiences and lessons learned in engaging additional partners
- 7) Updated and develop new showcases

Think big



- **What can WGCV do to support CEOS and the community?**
- **What can WGISS do to support CEOS and the community?**
- **What is needed?**
- **What can CEOS do?**
- **What can GEO do?**

- **We want your comments, thoughts, and needs**