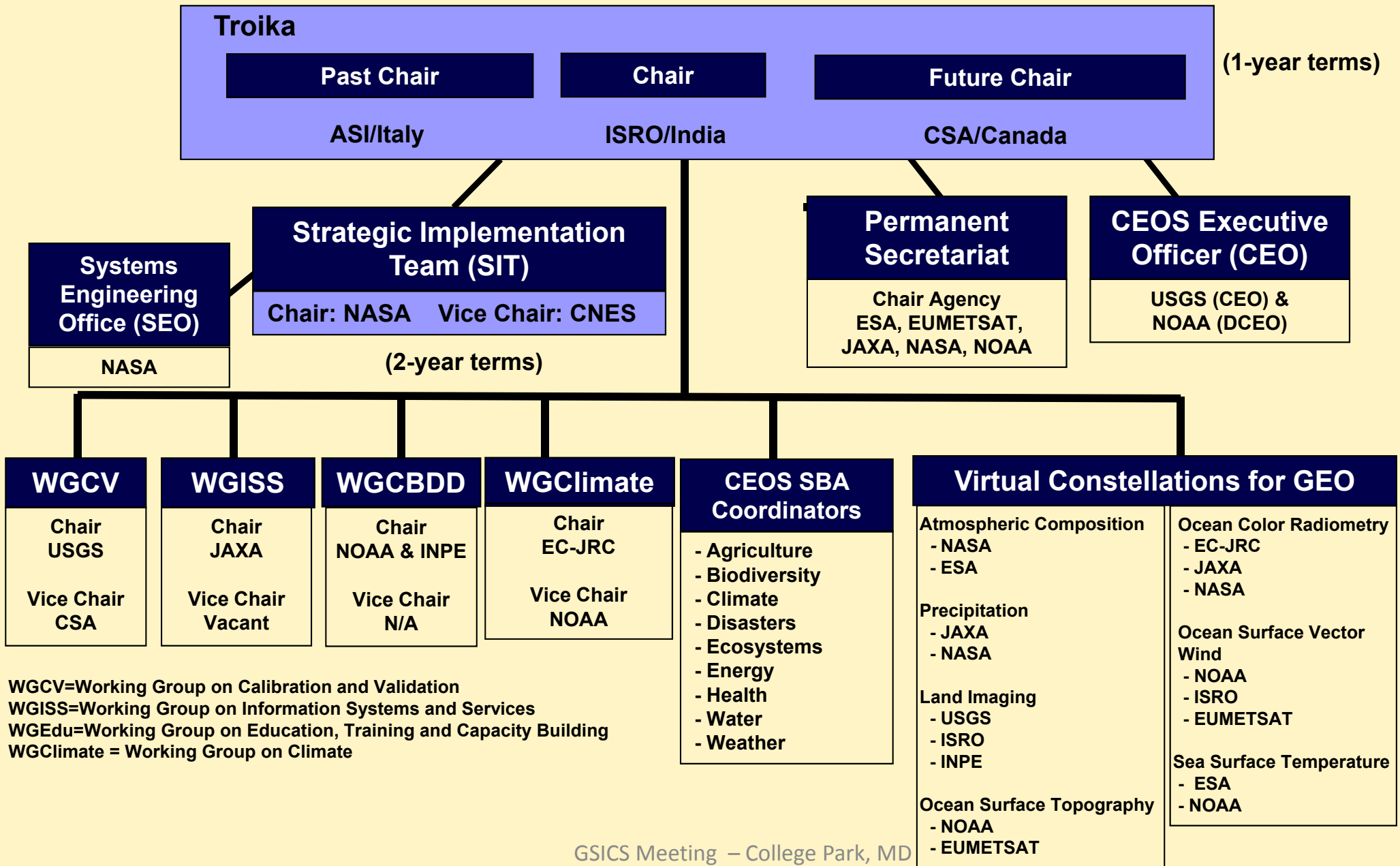




# **CEOS WGCV and QA4EO Status for GSICS Executive Panel-12 June 1, 2012**

**Greg Stensaas  
USGS, CEOS WGCV chair**

# CEOS Structure 2011-2012



# Working Group on Calibration and Validation (WGCV) Objectives

- **Committee on Earth Observation Satellites (CEOS) Working Group**
  - <http://www.ceos.org/wgcv/>
- **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.

# WGCV Subgroups

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

- Through their own dedicated meetings, these groups focus on issues relevant to their communities and report back through the WGCV.
- They are providing cal/val expertise, quality processes, and cal/val sites for all CEOS agencies to use.
- Theme teams being created in subgroups.

<b>Synthetic Aperture Radar (SAR)</b>	Chair: Dr. Manfred Zink, DLR
<b>Infrared Visible Optical Sensors (IVOS)</b>	Chair: Dr. Nigel Fox, NPL
<b>Microwave Sensors (MWS)</b>	Chair: Dr. Xiaolong Dong, CSSAR
<b>Terrain Mapping (TMSG)</b>	Co-Chair: Prof. Jan-Peter Muller, UCL Co-Chair: Dr. Hannes Rueter, NL
<b>Land Product Validation (LPV)</b>	Chair: Dr. Joanne Nightingale, NASA Vice Chair: Dr. Gabriela Schaepman-Strub, Univ of Zurich
<b>Atmospheric Chemistry (ACSG)</b>	Chair: Dr. Bojan Bojkov, ESA Vice Chair: Dr. Jean-Christopher Lambert, IASB/BIRA

# WGCV Competences

- **One stop shop for all cal/val activities within CEOS**
  - 2011 – 2016 WGCV 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**

# WGCV Plenary Meetings

**WGCV-33: ROSCOSMOS, Moscow, Russia on May 16-20, 2011**

**WGCV-34: CSIRO/TERN/others, Brisbane, Australia, on February 6-10, 2012**

- Pre-meetings for WGCV and QA4EO planning
- Transitioned to new WGCV SEC
- Very successful meeting, extensive Australian support
- New 5-year work plan for WGCV finalized -  
[http://www.ceos.org/images/MCG/WGCV34/Presentations/MeetingDocumentation/WGCV\\_work\\_plan\\_v5.3.pdf](http://www.ceos.org/images/MCG/WGCV34/Presentations/MeetingDocumentation/WGCV_work_plan_v5.3.pdf)
- Nominations for vice-chair not available

**WGCV-35: ISRO, Hyderabad, India on September 24-28, 2012**

- Joint meeting with CEOS Working Group on Information Systems and Services (WGISS)
- Vice-chair elections to be held at WGCV-35

**WGCV-36: Agreement with China to host next meeting**

# GEO QA Strategy Background

- The Global Earth Observation System of Systems (GEOSS) must deliver **timely, quality, long-term, global information** to meet the needs of its nine SBAs
- This will be achieved through the synergistic use of data derived from a variety of sources (satellite, airborne and surface-based) and the coordination of resources and efforts of the members
- Accomplishing this vision, starting from a system of disparate systems that were built for a multitude of applications, requires the establishment of an internationally coordinated framework to facilitate interoperability and harmonization

# GEO Task for Quality Assurance

- **Develop a Group on Earth Observations (GEO) data quality assurance strategy and implementation process**, beginning with space-based observations and expanding to in-situ observations, taking account of existing associated GEOSS quality assurance work, and including the quality issues of derived Earth observation information products.
- **A Quality Assurance framework for Earth Observation (QA4EO) has been established and is now being implemented within GEO and Committee on Earth Observation Satellites (CEOS).**
  - Approved by WGCV (28<sup>th</sup> Plenary Meeting, Oct. 2008)
  - Endorsed by CEOS (22<sup>nd</sup> CEOS Plenary, Nov. 2008)
  - Reviewed by GSICS and WMO (early 2009)
  - Reviewed by GSICS and WMO (early 2009)
- The QA4EO was established and endorsed by the CEOS as a direct response to GEO Task
  - **DA-06-02/ DA-09-01a: GEOSS Quality Assurance Strategy (2006-2011)**
  - **IN-02, C1 - IN-02 Earth Data Sets, C1: Advances in Life-cycle Data Management (2012)**
  - **Task led by CEOS Working Group on Calibration and Validation (WGCV)**



# WHAT IS QA4EO?

- **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.

# 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.

## GEO 2012-2015 WORK PLAN

*Please note that the lists of Leads (and Points of Contact) have been updated since the present document (Revision 1) was produced. The latest versions of these lists may be found online at:  
<http://www.earthobservations.org/docshow.php?id=129>*

**13 December 2011**

# IN-02 Earth Data Sets

## C1: Advances in Life-cycle Data Management

### Short Description

1. Coordinate data management approaches in order to prepare “GEO Best Practices”.
  - 1-1 Sharing data management life cycle models and recommendations starting with preparation of the CEOS WGISS Data Management Statement document (for Earth Observation Satellite Data)
2. Develop a GEO strategy for the long-term preservation of Earth observation data, building upon existing GEO long-term data preservation guidelines
  - 2-1 Provide data management guidance by coordination and preparing specific targeted papers shown under “Key Outputs” item 2-1.
3. Prepare Long Term Data Preservation (LTDP) User requirement document and Content Standard.
4. Develop a GEO strategy for data quality assurance, starting with CEOS Quality Assurance Framework for Earth Observation (QA4EO) and gradually expand into in-situ observations.
  - 4-1 Define GEO QA Requirements for key SBA efforts (SBA, CEOS WG/VCS)
  - 4-2 Develop QA4EO Implementation pilots on the highest priority GEO Data/Information/SBA efforts
  - 4-3 In order to establish QA4EO “being used as a quality badge” or some quality id process related to GEO Data/Information/Products, develop a draft plan for implementation,
5. Enabling Data and Information Interoperability and Harmonization in CEOS and GEO.
6. Documentation of ESSG for “GEO Best Practices”, including the followings;
  - a) Define an ESSG model with preparation of ESSG reference frame documents
  - b) Define ESSG coding scheme with preparation of corresponding documents
7. Develop a group of ESSG-based tool sets for GEOSS data sharing with functions of registration, conversion, link, access, integration, analysis, tracking and visualization
  - a) Develop ESSG-based tools for GEOSS data positioning and registration
  - b) Develop ESSG-based tools for GEOSS data access
  - c) Develop ESSG-based tools for GEOSS data conversion
  - d) Develop ESSG-based tools for GEOSS data integration and fusion
  - e) Develop ESSG-based tools for GEOSS data-updating automatic tracking
  - f) Develop ESSG-based tools for GEOSS data analysis for SBAs applications
  - g) Develop ESSG-based tools for massive GEOSS data visualization

# QA4EO Events



**Workshop I, Geneva, WMO, Oct. 2007 - Guiding principles**



**Workshop II, Gaithersburg,, NIST, May 2008 – Establishing an operational framework**



**Workshop III, Antalya, TÜBİTAK, Sep. 2009 - Facilitating Implementation**

- **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



**Workshop IV, Oxfordshire, UK, RAL, Oct. 2011 - Providing Harmonized Quality Information for EO**

# QA4EO Implementation Support

- QA4EO implementation is supported by a framework
  - Principles and Guidelines Version 4.0 and Implementation Plans
    - CEOS, IEEE, agency support and workshop revisions
  - QA4EO Website
  - <http://qa4eo.org/>
    - Enhanced documentation continually being developed
- Organizations that oversee EO programs are responsible for QA4EO implementation
- UKSA with Centre of Carbon Management (CCM) at the National Physical Laboratory (NPL)
  - 2 year effort to support QA4EO implementation
    - Dr. Hillary Elliott – QA4EO Secretariat
    - <http://www.npl.co.uk/carbon-measurements>
  - Transitioning QA4EO Web Page

# QA4EO Implementation Plan

- Based on, previous workshop outcomes and actions
- Approve a high-level working implementation plan
  - [http://www.ceos.org/images/MCG/QA4EO/QA4EO\\_implementation\\_strategy\\_for\\_CEOS\\_and\\_GEO\\_v0.3.pdf](http://www.ceos.org/images/MCG/QA4EO/QA4EO_implementation_strategy_for_CEOS_and_GEO_v0.3.pdf)
    - GEO QA4EO Implementation Task Force
    - Key activities and outputs defined and details mapped in GEO action tracker
    - CEOS QA4EO Implementation Management Team (direction and prioritization)
    - CEOS QA4EO Implementation Taskforce

**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 0.3**

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.

# CEOS QA4EO Implementation Taskforce

## Management of CEOS QA4EO Implementation:

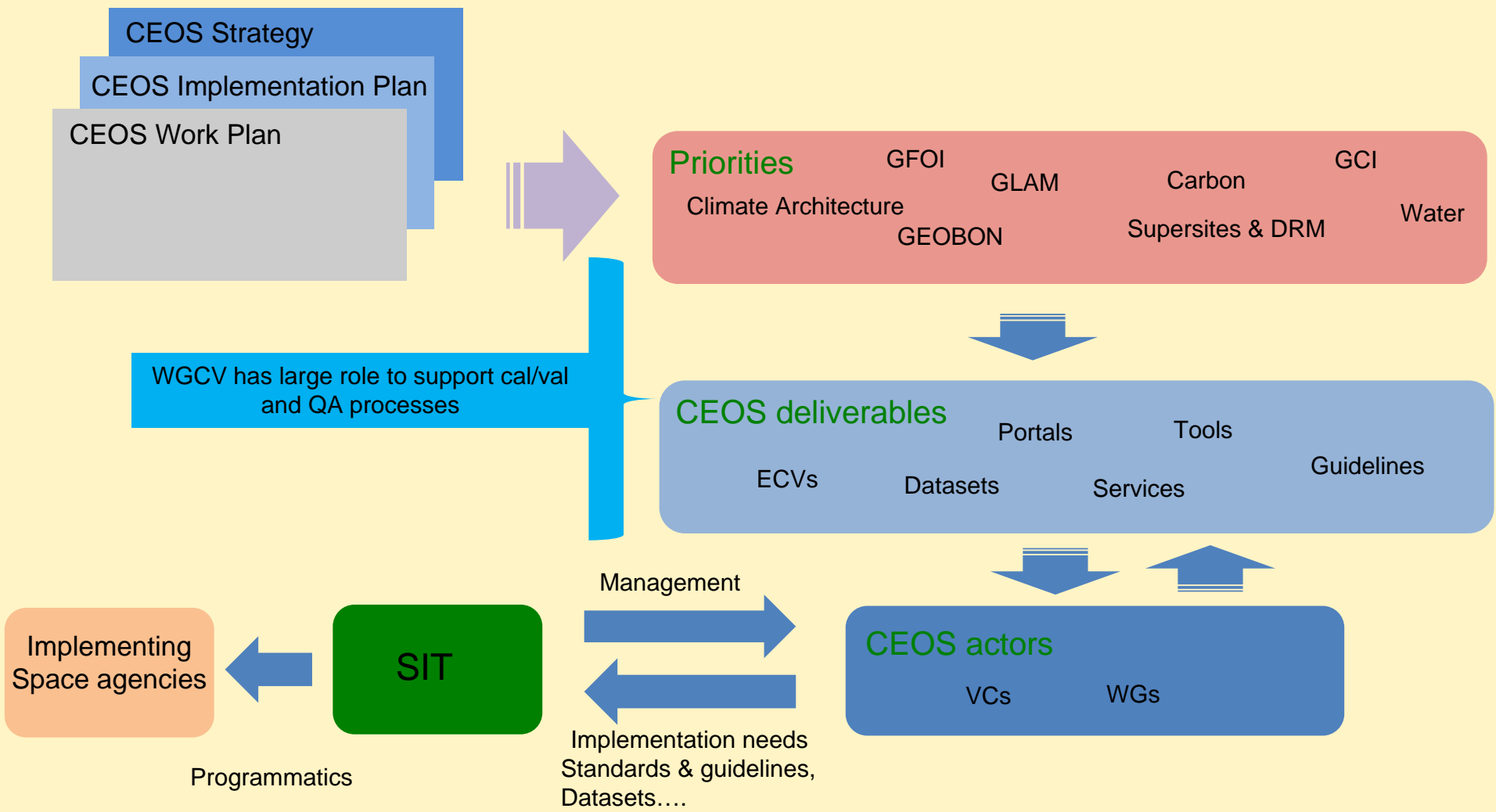
- Evolve QA4EO, scope and guidelines
- Develop and refine of Implementation Strategy
- Focal point for guidance on key guidelines and implementation
- Team/Effort requirements and tasks needed in CEOS for QA4EO
- Develop and define implementation prioritization of QA4EO needs in CEOS
- Create the implementation 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 (GSICS)
- Metrological Standards bodies (2 minimum)
- QA4EO Secretariat
- WGClimate, 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.



# CEOS Implementation Process



# Engage in common efforts w/ other GEO / CEOS components

## Engage in GEO/CEOS agency/ organization efforts to move QA4EO forward

- **Develop QA Data Infrastructure**
  - Incorporate QA into GEO and CEOS Data and Information Infrastructure
    - Common QA definitions/standards
    - Quality in metadata, “fit for purpose” information, accuracy, error, uncertainty, traceability
    - Fields in GEO and CEOS data structure (QA4EO badging process)
    - Cal/val documentation and traceability
    - Long Term Data Preservation
- **Continue to develop cal/val test sites/methods and associated processes**
- **QA4EO Implementation Pilots (QIPs)**
  - FCT/GFOI
  - Air Quality/Atmospheric Comp
- **ECV definitions and Validation Processes**
  - Working Group on Climate (maturity matrix)
  - ECV cal/val and QA
- **Carbon and climate requirement validation**
- **In situ and modeling quality, uncertainty, traceability**
- **Other programs?**
- **Comments, thoughts, ideas needed!**

# GSICS-WGCV Interaction 1

- Support QA4EO Implementation Team
  - GSICS is a key contributor
- Align ‘outline ATBDs’ with IVOS following QA4EO,
  - ‘consensus documented procedure/protocol describing how to carry out comparisons using the particular methodology with a view to CEOS endorsement’
- Extension of GEO strategy to LEO sensors
  - Including research & moderate resolution instruments
  - Review all criteria – availability/distribution, geometry
  - Submit to GSICS Procedure for Product Acceptance
  - Follow ‘hierarchical’ structure for greatest consistency:
    - First Specify processes generically
    - Then Outline methods for each class of inter-calibration (GEO-LEO)
    - Then specify details for each particular instrument/channel combination

# GSICS-WGCV Interaction 2

Benefiting from CEOS Guidelines/experience on:

- Traceability
  - Transferring references
  - SI traceability
- Uncertainty analysis
  - End-to-end error budget

Sharing data/experiences:

- Review of different Test Sites
  - For application to particular instruments
  - Temporal variability assessments
- Hyperspectral Observations
  - Of spectral & BRDF characterisation of all target types
  - Assessment of stability & accuracy of calibration

## Other GSICS-WGCV Interaction 3

- Free access of sensor information (RSR, FOV, SNR, NedL, MTF, etc.) to aid inter-comparisons
  - Instrument Information Kiosk – at GSICS Coordination Center:
  - <http://www.star.nesdis.noaa.gov/smcd/GCC/index.php>
  - Nominate Technical Points of Contact (POC)
- Instrument Event Logs – template in preparation by GCC
  - Dynamic information on the changes to instruments' operational status
  - e.g.; orbital changes, failures, decontamination procedures, etc.
  - Links to further information (operational announcements)

# Thank You

- Questions