

# Methodology & guidelines for Cal/Val

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# Methodology & guidelines for Cal/Val: Summary and progress

- Objectives of session at Geneva meeting to discuss/agree:
  - Requirement and means of establishing common terminology ☺
  - need, scope, of establishing common/harmonised guidelines (at some level) ☺
    - **Generic and technically specific** ☺
  - Implications and benefits of “traceability” ☺
    - **Uncertainties analysis** ☺  
*(“a result has no meaning without an associated uncertainty”)* ☺
  - Documentary evidence ☺
    - **Reference standards to facilitate** ☺
    - **Comparisons to evaluate bias and for validation** ☺
    - **Others ?**
  - Evaluating and assigning a “quality indicator”
  - Implementation: means and issues
  - Need for a standardising body
    - **CEOS WGCV (immediate need)** ☺
    - **Longer term potential of ISO or ...?** ☺

- **Need for a “dictionary” or set of to be linked/hosted from GEO/CEOS portal.**
  - **Many dictionaries exist – although clear value in a single document (location) no clear desire from Cal/Val community for anyone to take leadership or ownership for its development (as yet!).**
  - **Each sub-group has some specific key terms and/or dictionaries: presented to CEOS WGCV**
  - **Significant value in consistent definitions and usage (particularly in QA related context)**
    - *e.g. traceability, accuracy, precision, error, bias .....*
    - *Also sensor and product characteristics*
  - **Essential to make clear what definition is being used and its context**
    - *“Standards” – documentary, reference (artifacts), specification ...*

**ROUTE TO IMPLEMENTATION NEEDS TO BE AGREED**

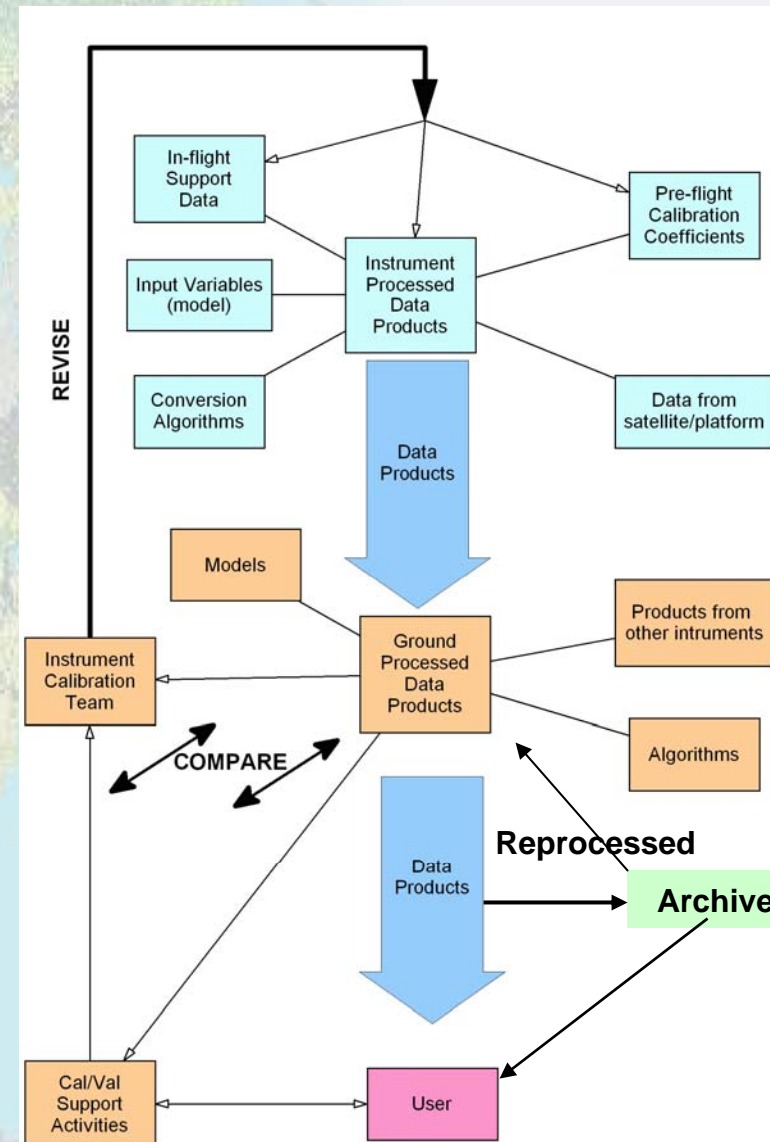
*All activities which contribute to the delivery of an end product derived from an input measurand*

## Pre-Flight

- Requirement/Design Specification
- Instrument build: characterisation/calibration
- Data processing: algorithms, ref/support data,

## Post-Launch

- Instrument performance
- Output data quality characteristics:
  - accuracy
  - equivalence to others (sensors/in-situ)
- Processing – high level products
- Data distribution/archive ...



## Collection – Processing – Validation - Delivery

# Guidelines (best practises) / Methodologies/procedures/protocols

- Need for “high level” (key) guidelines to scope governing principles to be internationally agreed (endorsed) – **framework**
- Specific technical guidelines/procedures (priority areas defined for most sub-groups, many already exist and being collated (tweaking to meet full QA needs)
  - Commonality of key content (QA information) **fundamental**
  - Consistent with Key guidelines of framework **fundamental**
  - Flexible, living
  - Where generic for broad range of EO applications (**endorsed?**)
  - Where Mature and/or have broad application for a specific application/sensor (**endorsed?**)
  - Primary reference standard e.g CEOS Test site must have guideline for use (**endorsed**)

- Can take many presentational forms
- Significant value to others (new groups/training etc) when meeting “common” need
- Documentary Evidence of USE and quantitative evaluation of performance (**Key requirement**)
- Procedures simply need to demonstrate that they meet “top-level” key guidelines
  - Commercially sensitive,
  - one-offs,
  - Can be written during development of process,
- Should not be a significant additional burden
- Encouraged to be established for future activities not necessarily retrospectively

**KEY GUIDELINES (& their content) TO SCOPE FRAMEWORK (this workshop)**

**GUIDELINE ON CONTENT (and drafting) of PROCEDURE – (Written)**

## Requirement:

“all EO measurements (data) should be traceable to international (SI) standards where appropriate”

(GEOSS implementation plan, CEOS plenary 14 and 19, WMO GSICS)

**Traceability:** *property of a measurement result relating the result to a stated **metrological reference** through an unbroken chain of calibrations of a measuring system or comparisons, each contributing to the stated measurement **uncertainty** (ISO guide 99:2007)*

**Metrological reference:** A “reference standard”, ideally traceable to SI, but could be defined by the “community” or individual (if demonstrated “fit for purpose”)

- Artifacts, data sets, “test sites” (natural & man-made)
- critical characteristics must have adequate stability between time of characterisation and use

## Reference standards

- Those used to facilitate cross-comparison / evaluation of biases at an international (GEO/CEOS level)

*should be formally endorsed by “CEOS” and their use encouraged e.g. “test sites”, artifacts for comparisons, some standard data sets e.g RAMI.*

- Not large numbers (but with redundancy)
  - range of selection criteria (including maintenance)
  - guideline for use required to support reference standard
- Those used for a specific sensor/activity need to be agreed by the sponsor agency (user) as adequate

*and may be proposed for endorsement/recommendation*

**CEOS WGCV 28:** Endorsed a set of 8 natural sites (“LandNET) for radiometric gain for land imagers  
Endorsed the Moon and 5 “invariant desert” targets for radiometric stability  
(Amazon rain forest already defined for SAR imagers)

# Evidence of traceability and “performance”

## **DRIVER:**

- to allow interoperability and meet needs of GEOSS Stakeholders  
(I.e. to remove biases and manage expectations)

**Agreed requirement (Geneva, CEOS plenary)**

**All data products must have associated with them a “Quality indicator” (QI) based on documented quantitative assessment of its traceability to internationally agreed reference standards.**

*This requires all steps (Cal/Val relevant) in the data product delivery chain (collection, processing and dissemination) to be documented with evidence of their traceability.*

## Suitable Evidence:

- **Comparison results (following a pre-defined protocol): (optimum route)**
  - *to a reference standard (known result)*
  - *of techniques between peers*
  - *of “outputs” to a common “input” for similar sensors/processes*
- **Must evaluate and declare uncertainties expected (of activity) and of comparison, as well as result (using ISO guide 98)**
- **“true value” may not exist only a “consensus value”**
- **Formal accreditation to an appropriate documentary QA standard e.g. ISO 17025 (includes comparisons and external peer review)**
- **Other adequate Evidence?? (this workshop)**

**CEOS WGCV 28:** Agreed - comparison of optical and Microwave sensors over Dome C  
- comparison of IR surface radiance measurements (SST)  
- comparison of VIS/NIR surface radiance (Land)

## Guideline 1 Data Quality: A guide to content of a documentary procedure to meet the Quality Assurance requirements of CEOS: Overview

- Provides guidance on content and necessary associated activities (**as already discussed**)
- Principle content and scope defined and agreed at Geneva workshop
- Based on ISO requirements for procedures (**probably similar to what most already do**)
- Identifies other required key guidelines needed to support/implement
- Offers indicative structure for other authors (**for documents**)
- Written in style of procedure it provides guidance on
- If followed does not require any other technical procedure or “best practise” to be endorsed (**except those it draws upon**)
- Can be adopted quickly
- Provides for both procedures to do and reports on what has been done

# Outstanding issues

- **Need for single dictionary / How to establish**
- **Process for identification / endorsement of reference standards**
- **Process for review and endorsement (if required) of “best practises”**
- **Acceptable evidence (in addition to comparisons) to support performance declarations**
- **Means to evaluate / accept evidence**
- **Implementation / resourcing etc**