

The Infrared/Visible Optical Systems (IVOS) subgroup

IVOS – GEO – Long-term datasets

25th WGCV Meeting, 9-12 May 2006, Budapest

M. Rast, GEO

Day 1, 7.11.2005

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09:00 Introduction (M. Rast)

- Welcome
- Objectives of the 16th IVOS meeting

09:15 Summary of IVOS WS 2004 and the Cordoba meeting (M. Rast)

- The IVOS WS 2004 programme
- The IVOS input to 23rd WGCV meeting at Cordoba

09:30 The CAL/VAL portal (P. Goryl)

10:15 Coffee Break

10:45 How to improve the inter-calibration strategy (M. Goldberg)

11:30 Discussion (All)

13:00 Lunch

14:00 Country/Activity report :

NASA, CNES, Eumetsat, JRC, USGS, JAXA

15:30 Coffee Break

16:00 Activity report:

NIST, NPL, RAL, DLR and other Agencies/Countries

Day 2, 8.11.2005

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9:00 Activity report :

- Intercomparison of MERIS, MODIS and SeaWiFS over Salar de Uyuni (M. Bouvet)

9:30 Optical instruments onboard calibration diffusers (S. Delwart)

10:00 Contributions from the activity reports to the CAL / VAL portal (Working session - Chairman M. Rast)

- What are the Cal/Val practices strategies required for GEOSS ?

- Required inputs for these practises to be included in the Cal/Val portal

10:45 Coffee Break

11:15 Contributions from the activity reports to the CAL / VAL portal –continued

- Requirements for interoperability
- Conclusions

13:00 Lunch

14:00 Joint Session with WGCV

- IVOS findings
- Discussion on IVOS inputs to the WGCV for plenary

17:30 End of meeting

18: 00-19:00 Ice Breaker

The objectives of the 16th IVOS meeting are:

- a) to start establishing the status of data quality guidelines for optical sensors (mainly imagers) in view of GEOSS*
- b) to detail the status of current cal/val and data quality procedures/guidelines at instrument level*
- c) to define the minimum quality requirements of all Agencies and Instrument providers for generic optical imager interoperability relevant for GEOSS*

plus – to establish the IVOS Workplan 2006-2009

In order to establish reference datasets to support the understanding of climate change and quality assure operational services by E.O. satellites, data from different sensors and the resulting synergistic data products require a high level of accuracy which can only be obtained through continuous traceable calibration and validation activities.

In this context, IVOS recommends to initiate an activity to :

- document a reference methodology to predict TOA radiance for which currently flying and planned wide swath sensors can be inter-compared, i.e., define a standard for traceability.*
- create and maintain a fully accessible web page containing, on an instrument basis, links to all instrument characteristics needed for inter-comparisons as specified above, ideally in a common format.*
- create and maintain a database (e.g.: SADE) of instrument data for specific vicarious calibration sites in a common format delivered by agencies responsible for their instruments. This database should also include site characteristics.*

This activity should be supported for an active (implementation) period of 2 years and a maintenance period over 2 subsequent years. An amount of 500 K-euro/\$ is estimated to be required for this activity. Agencies are asked to support this activity by providing appropriate information and data in a timely manner.

GEOSS Data Quality Framework

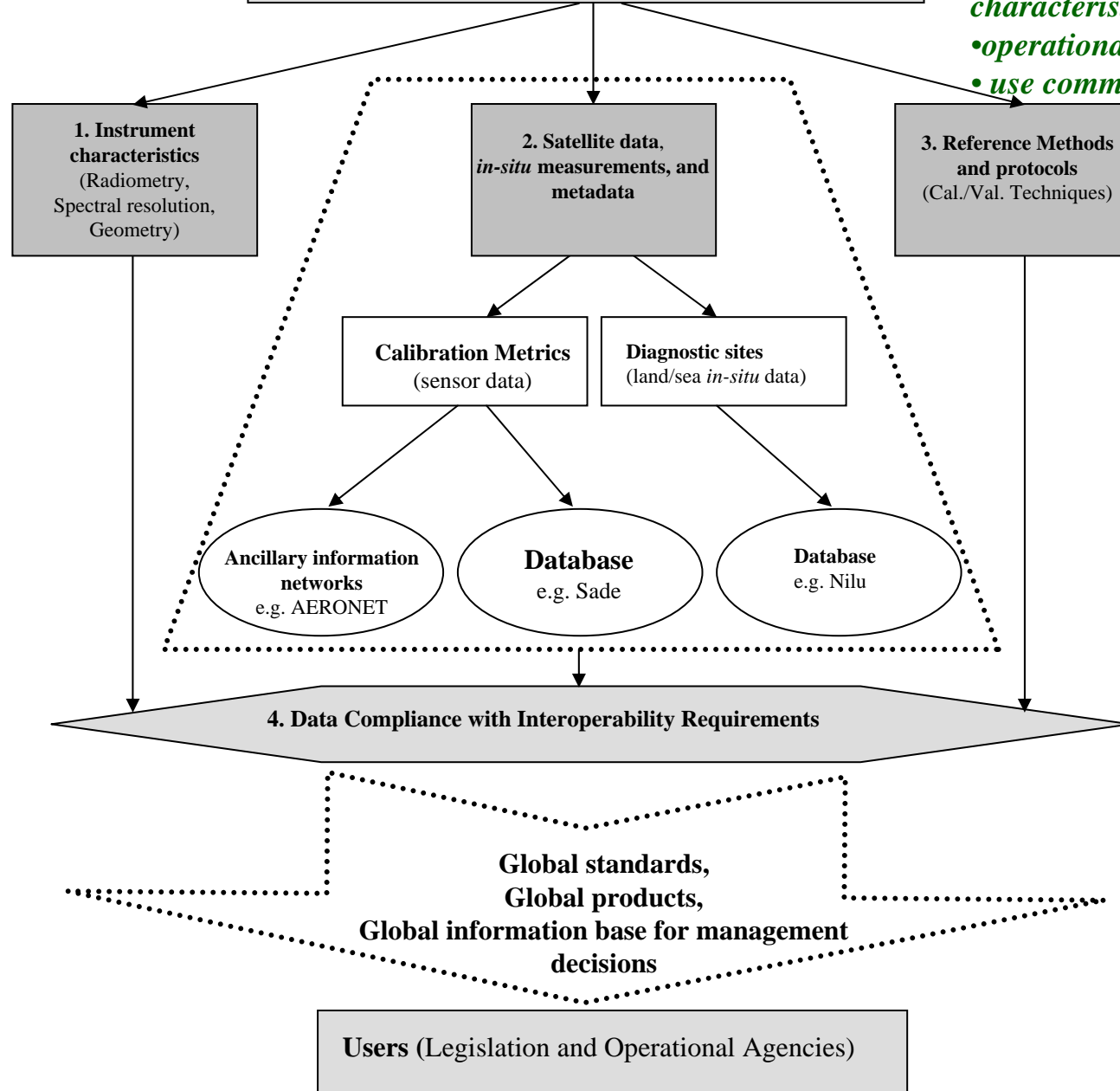
(accessible throughout GEOSS cal/val website)

includes RTC procedures and all error propag. models and methods to establish QA characteristics. Use:

- *operational processor (by all)*
- *use common data format*

Links to different Agencies

Cal/Val and data quality assessment framework system elements for GEOSS



for data combination and merging

GMES CalVal Portal

GMES CalVal Home

- Access to data
 - Satellite data
 - In-situ data
 - internal
 - NILU
 - SADE
 - AERONET
- Instruments
 - Optical
 - MERIS
 - AATSR
 - ALOS
 - Chris/Proba
 - BIRD
 - VEGETATIC
 - RADAR
 - Atm. Chem.
- Methods
 - Optical
 - RADAR
 - Atm. Chem.
- Tools
 - Campaign Planning
 - Orbit Propagator
 - 6s
 - Meteorodata preparation
 - BEAM
 - Aerosol data manipulation
 - 6S input preparation
 - 6S radiative transfer code
 - SoS radiative transfer code

CEOS

GMES CalVal Home

- Site Manager
- User Manager
- Change Password
- Projects
- CalVal Forum
- Logout
- Related Links
- Help

CEOS

- Methodologies
- Instrument characteristics
- Instrument meta data
- data
- tion software

CEOS

- Site Manager
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GMES CalVal Portal

CalVal Support system - Microsoft Internet Explorer

Adresse <http://www.CalVal-Portal.de/index.html>

GMES CalVal Portal

merci

Home | Query Products | Query Sites | Change Password | Logout | Help

Query Products

Region

Diagnostic Land Sites

Roccarespampani_11_years

Center Lat. 42.39

Center Lon. 11.921

Radius 156.0

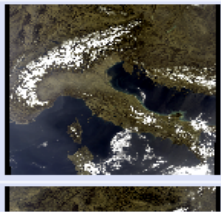
Time Range

Start date 2003-01-01

End date 2003-12-31

Submit Query 25 Results

Results 1 - 2 of 2 matching products

#	Preview	Product Name
1		MER_RR__1PQBCG20030323_094244_000001692014_00480_05544_0001.N1

Rel.Orbit(s)

Flag Statistics

BRIGHT < 15.0 %

LAND_OCEAN > 50.0 %

< 50.0 %

Collapse to Standard

Selection of
CalVal Site

"Multi-Sensor"
MERC System

Result list of
multi-catalogue
query

Click to get meta data
and download

To allow accurate retrieval of geophysical parameters that meet mission goals it is essential that a comprehensive calibration strategy is built into the system throughout the mission lifetime from initial concept to end-of-life. Ideally instruments must meet thresholds for spectral coverage and resolution, and radiometric performance (accuracy, precision and long-term stability). Instruments meeting these thresholds can be used to anchor instruments that do not;

The building blocks for a calibration / validation system shall include:

- (1) On-board calibration devices (e.g., black bodies, solar diffusers) where appropriate
- (2) Extensive pre-launch calibration tests to properly characterize instruments and ensure calibration traceable to SI standards
- (3) Sustained post launch activities including:
 - (1) In situ measurements of the state of the surface and atmosphere (e.g., the Cloud and Radiation Test-bed (CART) site, aircraft instruments with SI traceable calibrations)
 - (2) Intercomparison with other satellite observations across the range of spatial and spectral scales
- (4) Radiative transfer models that enable comparison of calculated and observed radiances both for pre-launch and post-launch CAL/VAL activities
- (5) Data archive and documentation:
 - (1) Maintain long term open access to archives, accessible, possibly through 'CAL/VAL portals'

(1) Onboard calibration devices:

- (1) Should be concept proven and characterized
- (2) Should be traceable to SI units
- (3) The witness samples should be kept

(2) Pre-launch activities:

- (1) Full instrument cycle test (including instrument and environment modeling) to ensure every element is traceable to SI standards where possible
- (2) All calibration data and procedures should be documented and kept

(3) Post launch requirements include:

- (1) Vicarious calibration of ground sites with temporally and spatially stable surface characteristics and generally clear skies, and where possible, observations of the sun, moon, and stars, are useful for characterizing calibration drifts of VIS and NIR instruments. If appropriately calibrated from benchmark instruments in space these can be used as reference standards.
- (2) Space-based benchmark observations, with required accuracy, spectral coverage and resolution and traceable to international standards as “gold” standards for validation and inter-calibration of other satellite sensors.
- (3) Permanent reference sites and dedicated campaigns to collect in situ measurements of the state of the surface and atmosphere. All instruments used for in-situ measurements should be calibrated and traceable to SI standards.
- (4) Satellite inter-calibration from simultaneous and collocated observations:
 - Simultaneous observations from collocations between a LEO and all GEO sensors have also been demonstrated and can be used as a means to inter-calibrate GEO satellites. Conversely, an instrument with high accuracy, precision and stability in GEO orbit can be used as a means to inter-calibrate all LEO sensors;
 - Collocated high spectral resolutions observations are important for validating and vicariously calibrating broader band radiometers

(4) Benchmark Radiative Transfer Models for all sensors must be documented, maintained and openly available.

(5) Data archive and documentation:

- All pre-launch instrument data must be archived with metadata and be freely and openly exchanged
- Consistent common file format and projection information or tools to perform related processing
- All collocated observations for satellite inter-calibration must be archived with metadata and be freely and openly exchanged
- Special cal/val campaigns using aircraft and ground-based measurements are encouraged and resulting data must be archived with metadata and be readily accessible
- Space Agencies should share responsibility in providing required sub-samples of satellite observations needed for inter-calibration. This data needs to be easily accessible and free

All the information provided should be end-user oriented. All delivered products should have associated with them a statement of uncertainty and its associated level of confidence

CEOS IVOS highlights the **growth in number of optical satellite sensors**, and the diversity of their spectral and spatial characteristics. It notes that these sensors have been deployed, to meet the needs of both scientific and commercial applications and that the **near “operational nature”** of data provision from such sensors means that increasing **reliance is put on** the integrity and reliability of EO data, **by governments, international agencies and the commercial sector.**

It further notes:

- that much of this data will soon be the result of, **synergistic combination of the products from more than one instrument and often more than one agency.**
- that difficulties associated with both pre-flight calibration and more importantly “transference into orbit” means that unacceptably large biases between instruments (even on the same platforms) regularly occur requiring significant corrections to be applied.
- existing strategies for in-flight calibration can provide good long-term stability but not necessarily absolute accuracy, which is required to establish a reference baseline for long-term climate change studies and to secure such records for future generations.

It therefore recommends: that CEOS develops a collaborative inter-agency programme/mission to establish a set of SI traceable standard radiometric reference targets viewable by space based EO sensors to unequivocally quantify and remove biases between optical sensors.

Such targets would probably include the Moon, Sun and a number of ground sites used by existing missions.

Traceability to SI and the assignment and maintenance of a high accuracy radiometric value could be obtained through the support of a dedicated mission (such as TRUTHS), recently proposed to ESA EEOP.

• Ensure that the satellite instrument, diagnostic site- and methodology entries/data can be used for the synergistic combination and merging of data from different optical sensors/sources, allowing the harmonization of (operational) data products and the establishment of higher level information products such as global maps and time series (from different sensor outputs) to meet the operational service requirements to be fulfilled in the framework of the GEOSS Themes.

• Differences in information products are known to exist owing to different observation techniques or system characteristics and different observing conditions (e.g. atmospheric influence). It will have to be ensured that these differences are understood and documented. Therefore the availability of means/procedures (including normalization) to combine/merge co-related information products from different systems has to be ensured.

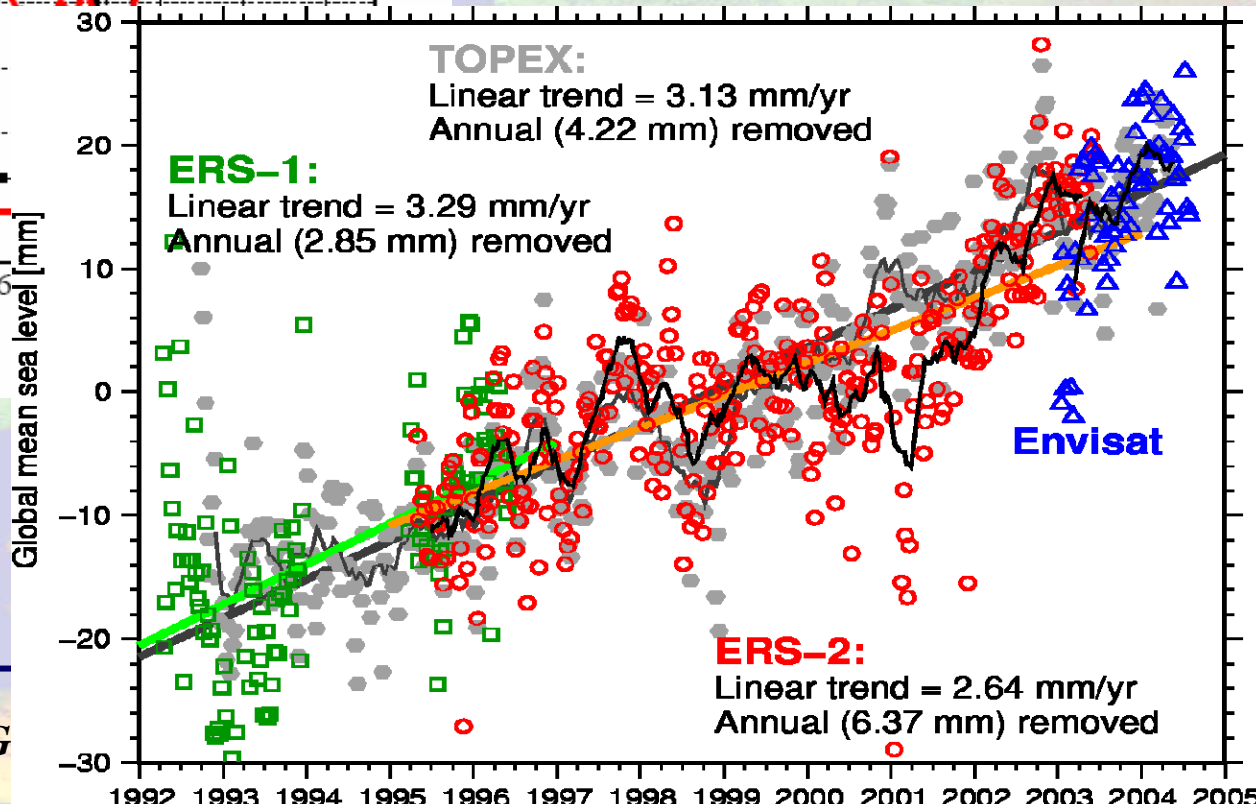
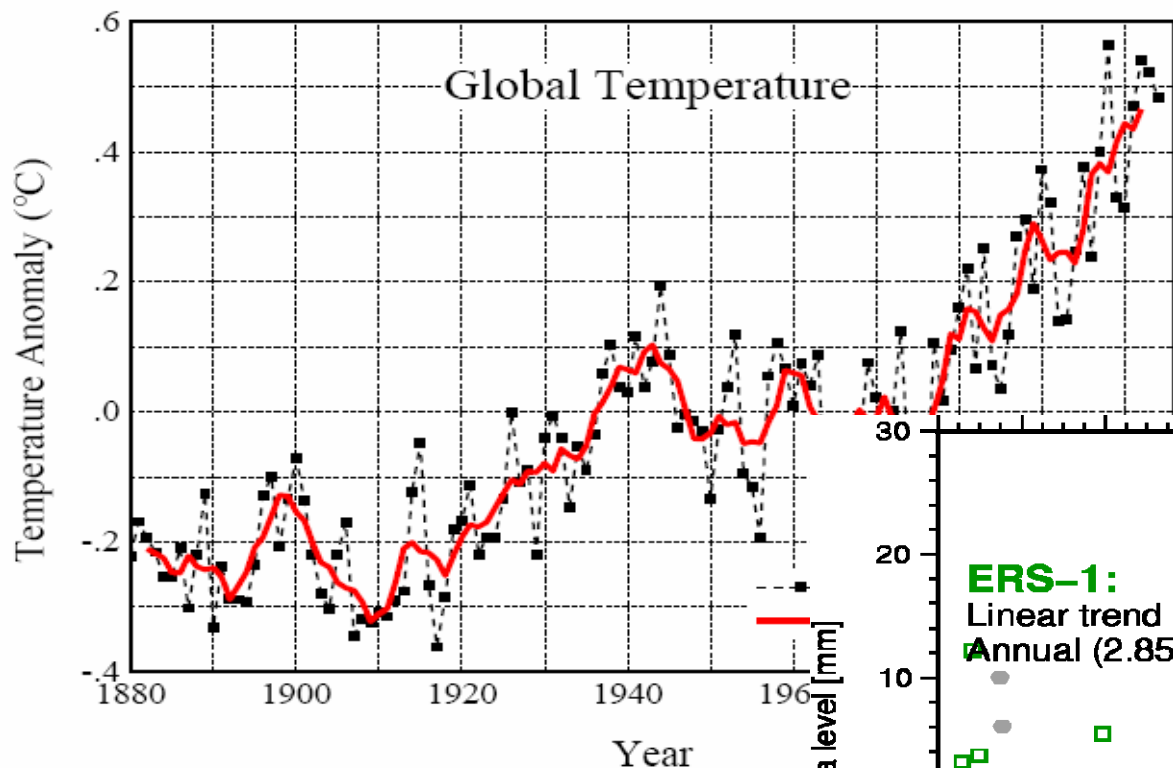
Data-management tasks for 2006 will be closely tied to user requirements, coordinated through the GEO Architecture & Data Committee, and will focus on the following:

- Initiating steps for promoting the agreed GEO data sharing principles
- Developing GEO data quality assurance strategy
- Supporting the development and use of emerging assimilation and modelling techniques for new applications
- Identifying and improving the access to common data across GEOSS societal benefit areas
- Developing common data access tools, portals and best practices for users across societal benefit areas

- **DA-06-02:** Develop a GEO data quality assurance strategy, beginning with space-based observations and evaluating expansion to *in-situ* observations, taking account of existing work in this arena.
- **DA-06-04:** Facilitate the development, availability and harmonization of data, metadata, and products commonly required across diverse societal benefit areas, including base maps, land-cover data sets, and common socio-economic data.
- **DA-06-05:** Develop a guidance document for basic geographic data (including format, precision, accuracy, etc.), taking into account relevant national, regional and global initiatives.
- **DA-06-06:** Advocate use of existing Spatial Data Infrastructure components as institutional and technical precedents, where appropriate, including standard protocols and interoperable system interfaces, among other components.
- **DA-06-07:** Define a model web portal system for access to all Earth observation data, based on existing portals and systems, designed to increase use, quality, and accessibility of existing information, tools, and networks. Particular attention will be given to the coordination of networks in specific societal benefit areas to enable reuse thereby to achieve synergy and leverage.

- Rationale:**

- Quantification of Earth's physical climate (radiation budget)
- Detection of (climatic) change or trends
 - Example Radar altimeter sea level measurements from TOPEX, ERS-1/2, Envisat, Jason
- Climate/NWP Modelling re-analysis (RA) / comparisons
- Assimilation consistencies (will be becoming more important in the near future)



- Emphasis was on single type of satellite observations (e.g. NOAA-AVHRR series) and level 1/2
- Should be extended to data consistency at level 3/4 across different sensors
 - Feasibility of cross sensor product comparison
 - Enable long term climatic data records of surface temp./precip/cloud cover etc.
 - Enable consistent model parameterizations
- Cal-Val possible at various product levels in different ways (c.f. level 1 vs. level 4 such as Tb vs. gridded Soil Moisture for different sensors).
- Easier for sensors operating with similar characteristics and retrieval schemes (freq/ spectral band/resolution, spat. resol. etc.) e.g. Ocean Colour sensors, such as MODIS, MERIS, SeaWiFS, or Scatterometers, e.g. ERS, METOP, but should not be limited too such comparisons (e.g. how do pass. microwave sensors compare with scatterometers?)