



A QUALITY ASSURANCE
FRAMEWORK FOR
EARTH OBSERVATION

DA-09-01a_8

Cal/Val & Post-launch Test Sites

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Gyanesh Chander

GEO Task: DA-09-01a_2 Lead

SGT, INC.*, contractor to the U.S. Geological Survey (USGS) Earth Resources Observation and Science (EROS) Center, Sioux Falls, SD

*Work performed under USGS contract 08HQCN0005

Telephone: 605-594-2554, E-mail: gchander@usgs.gov

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- **Develop a consolidated worldwide Cal/Val test site database and an appropriate subset of CEOS endorsed reference standards, based on community agreed criteria, to be included in the CEOS Cal/Val portal**



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Scope of Test Sites

- **Test sites are central to any future Quality Assurance & Quality Control (QA/QC) strategy**
- **Test sites provide a convenient means of obtaining information to verify sensor performance**
- **Test sites are the only practical means of deriving knowledge of biases between sensors**
- **Test sites allow, at some level, a means of bridging anticipated data gaps caused by lack of measurement continuity, due to lack of co-existent in-flight sensors**



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Radiometry Sites (IVOS)

Remote Sensing Technologies - Satellite

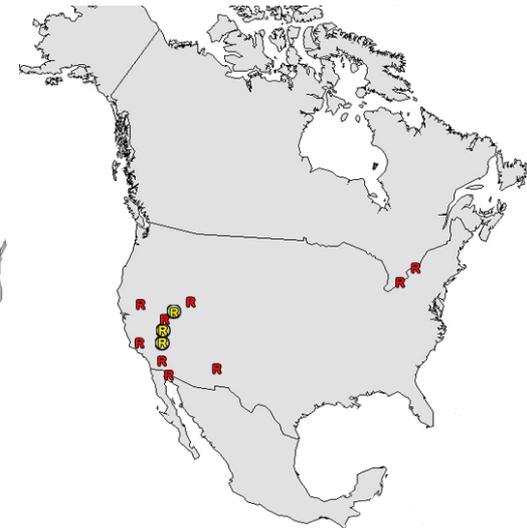
Africa

CEOS QA4E A QUALITY ASSURANCE FRAMEWORK FOR EARTH OBSERVATION

Africa Asia Australia Europe N. America S. America

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CEOS Reference Standard Test Sites

- The IVOS sub-group members established a set of CEOS reference standard test sites
 - ◆ Based on the decision from the CEOS IVOS-19 meeting, there are 8 instrumented sites and 5 pseudo-invariant sites

CEOS Reference Standard Test Sites						
#	Site	Center Latitude	Center Longitude	Point Of Contact (POC)	Affiliation	Email
Instrumented Sites						
1	Dome C, Antarctica	-74.50	123.00	Stephen Warren	University of Washington	sgw@atmos.washington.edu
2	Dunhuang, China	40.13	94.34	Xiuging Hu	NSMC/CMA	huxg@cma.gov.cn
3	Frenchman Flat, USA	36.81	-115.93	Carol J. Bruegge	NASA/JPL	Carol.J.Bruegge@Jpl.Nasa.Gov
4	Ivanpah Playa, USA	35.57	-115.40	Kurtis J. Thome	NASA/GSFC	kurtis.thome@nasa.gov
5	La Crau, France	43.56	4.86	Patrice Henry	CNES	patrice.henry@cnes.fr
6	Negev, Southern Israel	30.11	35.01	Arnon Karnieli	Ben Gurion University	karnieli@bgu.ac.il
7	Railroad Valley Playa, USA	38.50	-115.69	Kurtis J. Thome	NASA/GSFC	kurtis.thome@nasa.gov
8	Tuz Golu, Turkey	38.83	33.33	Selime Gurol	TUBITAK UZAY	selime.gurol@uzay.tubitak.gov.tr
Pseudo-Invariant Test Sites						
1	Libya 4	28.55	23.39	Patrice Henry	CNES	patrice.henry@cnes.fr
2	Mauritania 1	19.40	-9.30	Patrice Henry	CNES	patrice.henry@cnes.fr
2	Mauritania 2	20.85	-8.78	Patrice Henry	CNES	patrice.henry@cnes.fr
3	Algeria 3	30.32	7.66	Patrice Henry	CNES	patrice.henry@cnes.fr
4	Libya 1	24.42	13.35	Patrice Henry	CNES	patrice.henry@cnes.fr
5	Algeria 5	31.02	2.23	Patrice Henry	CNES	patrice.henry@cnes.fr

CEOS Reference Standard Test Sites

Remote Sensing Technologies - Satellite

CEOS Reference Sites



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Questionnaire for Information Regarding the Cal/Val Test Sites

 GROUP ON EARTH OBSERVATIONS 



Questionnaire for information regarding the CEOS WGCV IVOS subgroup Cal/Val test sites for land imager radiometric gain

QA4E-WGCV-IVO-CSP-001

 GROUP ON EARTH OBSERVATIONS 

IVOS test site questionnaire: QA4E-WGCV-IVO-CSP-001

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IVOS test site questionnaire: QA4E-WGCV-IVO-CSP-001

I. Abstract

This document provides the template to collect and present information to describe the characteristics of a Land based test site suitable for calibrating and validating the radiometric gain of an inflight satellite/aircraft imaging optical sensor. The template is structured as a series of questions to describe the sites, accessibility as well as its physical characteristics and their derivation. Test sites with varying characteristics have been used for many years for a variety of applications, however this template has been specifically designed for sites which are regularly instrumented and are or seek to be endorsed by the Committee on Earth Observation Satellites (CEOS) Working Group on Calibration and Validation (WGCV) as "reference standards". At present there are eight such sites but more are required to ensure a robust system to reliably underpin the needs of the Earth Observation (EO) community in the longer term. The template contained in this document should be completed by anyone seeking to have a site endorsed by CEOS to join this group. The current eight CEOS instrumented reference standard test sites are:

- Railroad Valley Playa, NV, USA, North America
- Ivanpah, NV/CA, USA, North America
- Lopez Frenchman Flat, NV, USA, North America
- La Crau, France, Europe
- Dunhuang, Gobi Desert, Gannu Province, China, Asia

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IVOS test site questionnaire: QA4E-WGCV-IVO-CSP-001

Questionnaire for information regarding the CEOS WGCV IVOS subgroup Cal/Val test sites for land imager radiometric gain

Author: Gyanesh Chander
E-mail: gchander@esa.es
Issued under Authority of: CEOS

Issue no: Version 1.1
Date of issue: 18 February 2009

Questionnaire for Cal/Val test site characterisation for land imager radiometric gain
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IVOS test site questionnaire: QA4E-WGCV-IVO-CSP-001

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IVOS test site questionnaire: QA4E-WGCV-IVO-CSP-001

2. The ref of the test site

I. Site location

1.1. Identification and characterisation

1.1.1. Site Name

1.1.2. Location

1.1.3. Google Earth Image (1x1 degree around the site center)

1.1.4. Altitude

1.1.5. Description of the landscape

1.1.6. Environment

1.1.7. Topography

1.2. Site view

2. Logistic information

2.1. Site proximity from road

2.2. Access

2.3. Nearest town

Questionnaire for Cal/Val test site characterisation for land imager radiometric gain
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La Crau, France

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QA4E

Questionnaire for information regarding the CEOS WGCV IVOS subgroup Cal/Val test sites for land imager radiometric gain

QA4EO-WGCV-IVO-CSP-001

Name of site: **La Crau**

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IVOS test site questionnaire: QA4EO-WGCV-IVO-CSP-001

3. Site Climatology

3.1. General atmospheric conditions: Meteorological conditions

3.1.1. Annual pluviometry

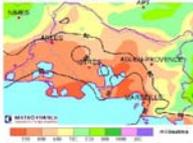


Figure 3: Pluviometry

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IVOS test site questionnaire: QA4EO-WGCV-IVO-CSP-001



Figure 8: Ciel instrument

4.2.1.2. Route of traceability

4.2.1.3. Measurement protocol

4.2.1.3.1. Scanning mode
As soon as the air mass reaches $m=5$, then the scanning protocol, illustrated in figure 2, begins.

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IVOS test site questionnaire: QA4EO-WGCV-IVO-CSP-001

1. Site location

1.1. Identification and characterisation

1.1.1. Site Name
La Crau

1.1.2. Location
Latitude 43° 33'N
Longitude 4° 51'W

1.1.3. Google Earth Image (1x1 degree around the site center)



1.1.4. Altitude
18 m

Questionnaire for Cal/Val test site characterisation for land imager radiometric gain

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IVOS test site questionnaire: QA4EO-WGCV-IVO-CSP-001

3.3.3. BRDF (or specific angles)

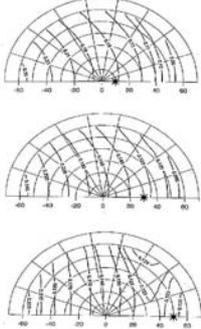


Figure 7: Polar diagram of the La Crau reflectance at 550 nm at three solar angles. Solar position is reported on the x-axis (R. Sarter)

The La Crau BRDF substantially departs from a Lambertian surface with a quite strong specular effect at low solar elevations.

3.3.3.1. Instrument used

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IVOS test site questionnaire: QA4EO-WGCV-IVO-CSP-001

6.2. Date / sensor / location of results

6.3. Regularity of satellite data (if known)

6.4. Satellite and sensor ID
ALOS data base in the calval portal

7. Contact information

7.1. Point of Contact (Name and address)

Patrice HENRY
CNES - DCT/SEMO
18 av. Edouard Belin
31401 Toulouse Cedex 4
FRANCE
Tel: +33 561 274 712
Fax: +33 561 273 633
Email: patrice.henry@cnes.fr

7.2. Instrumentation maintenance

Questionnaire for Cal/Val test site characterisation for land imager radiometric gain

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Proposed Future Plans

- **WGCV Sub-groups**
 - ◆ Compile a list of consolidated worldwide Cal/Val test sites
 - ◆ Compile a appropriate subset of CEOS endorsed reference standards
- **Gather complete site characterization data and information**
 - ◆ Define core measurements (eg. Instruments)
 - ◆ Create an operational network of sites (eg., aeronet, Landnet)
- **Encourage agencies to acquire, archive, and provide data to the Cal/Val community over CEOS reference standard test sites**
 - ◆ Develop online calibration data access infrastructure
 - ◆ Create tools to identify the potential co-incident image pairs (NASA SEO)
- **Establish traceability chain for primary site data & “best practice” guidance on site characterization and its use**

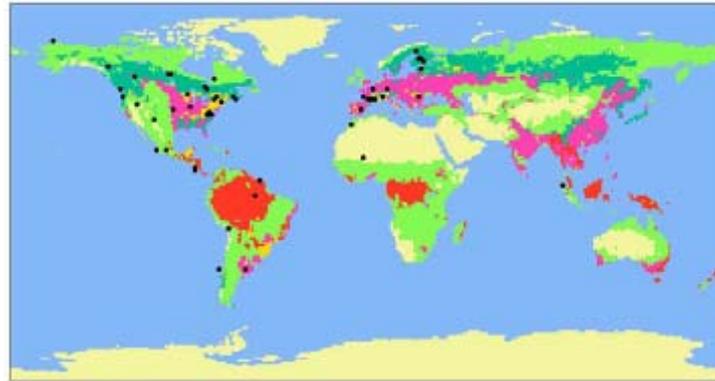


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Land Product Validation (LPV)

- CEOS Benchmark Land Multisite Analysis and Intercomparison of Products (BELMANIP) - <http://lpvs.gsfc.nasa.gov/>



- Map of sites covered by the groups represented in this paper (given on a global map of dominant surface types in each 1 x 1 cell (bare soil, water bodies, deciduous broadleaf forest, evergreen needleleaf forest, evergreen broadleaf forest, crops, grass))

Microwave Sensors Subgroup (MSSG)

- **Sandy desert (e.g. Sahara)**
 - ◆ Deep penetration depth, temporal stability of the Tb, underground structure TBD
- **Rocky/mixed desert (e.g. Gobi)**
 - ◆ Shallow penetration depth, azimuthal effects and vegetation
- **Rainforest (Amazon)**
 - ◆ Volume scatter, effects of rain cells on the canopy equivalent moisture TBD
- **Stable ocean areas**
 - ◆ Effects of the wind/salinity at L-band TBD
- **Antarctica**
 - ◆ Dry atmosphere, large penetration depth & temporally stable, low azimuthal anisotropy



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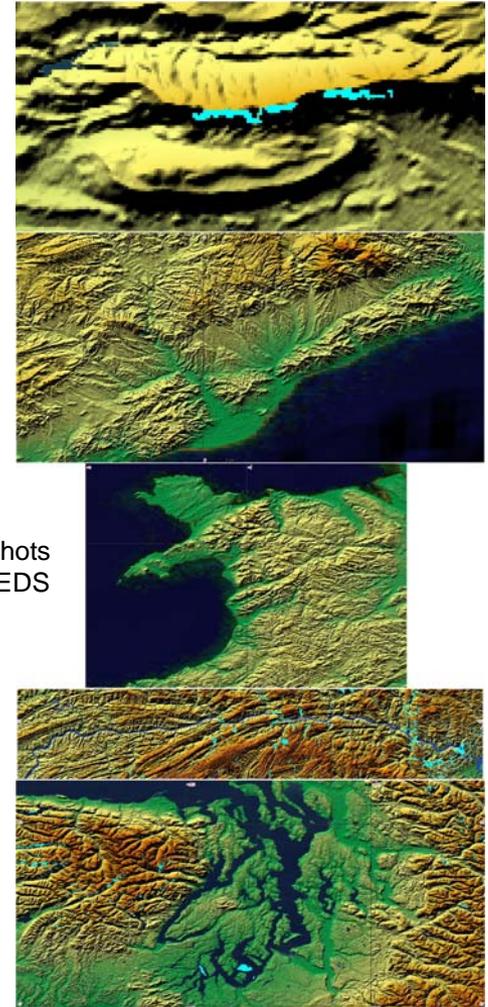
Synthetic Aperture Radar (SAR)

- **International Amazon Rainforest Site**
 - ◆ A CEOS radiometric calibration reference site
 - ◆ Data routinely collected and analyzed for calibration monitoring of SAR satellites including RADARSATs
 - ◆ Radiometry of the site remains stable
- **Canadian Boreal Forest Site**
 - ◆ Radiometric characterization completed at C-band using RADARSAT-1 data
 - ◆ Site seasonally dependent
 - ◆ Can be used as a complimentary site to the Amazon but with reduced radiometric accuracy
- **Calibration Transponder Sites**



Terrain Mapping Subgroup (TMSG)

- **Montagne Sainte-Victoire**
 - ◆ France referred to as Aix-en-Provence
 - ◆ 5.528-5.685°E, 43.502-43.560°N
 - ◆ mixed arable, forest, limestone
- **Barcelona, Spain**
 - ◆ 1.5-2.75°E, 41.25-41.82°N
 - ◆ urban, mixed arable, forest
- **North Wales,**
 - ◆ UK3-5°W, 52-53.5°N
 - ◆ urban, pasture, forest
- **Three Gorges, China**
 - ◆ 108.252-111.302°E, 30.638-31.229°N
 - ◆ forest, arable, limestone shales
- **Puget Sound, WA, USA**
 - ◆ -121.397 to -123.897°W, 46.364-48.864°N
 - ◆ forest, urban, wetlands



N.B.
screenshots
from ICEDS
extracts