



CEOS WORKING GROUP ON CALIBRATION & VALIDATION

CEOS WGCV

Land Product Validation Sub-Group

(2009 – 2010 Update)

Joanne Nightingale, Jaime Nickeson

(Sigma Space Corp / NASA GSFC)

With input from LPV Focus Group Leads



Outline

- LPV Structure → 2010
- Objectives and Goals
- LPV focus group activities since Montana
- Planned activities and meetings

LPV Sub-group Structure

Chair: Fred Baret (INRA)

Vice-Chair: Sebastien Garrigues (INRA)

NASA EOS Validation: Joanne Nightingale,
Jaime Nickeson

- New Chair & Vice-Chair (WGCV-31, March 2010)
 - Joanne Nightingale (NASA)
 - Ben Koetz (ESA)
- 3-year terms

Focus Groups (June 2009)

Focus Group	North America	Europe / Other
Land Cover	Mark Friedl (Boston University)	Martin Herold (Wageningen University, GOFC/GOLD)
Fire	Luigi Boschetti (University of Maryland)	Kevin Tansey (University of Leicester, UK)
Biophysical	Richard Fernandes (NR Canada)	Stephen Plummer (ESRIN, IT)
Surface Radiation	Crystal Schaaf (Boston University)	Gabriela Schaepman (University of Zurich, SW)
Land Surface Temperature	Simon Hook (JPL)	Jose Sobrino (University of Valencia, SP)
Soil Moisture	Tom Jackson (USDA)	Wolfgang Wagner (Vienna Uni of Technology, AT)
Land Surface Phenology	Jeff Morisette (USGS)	TBD

LPV Objective

To foster **quantitative validation** of *higher level global land products* derived from remotely sensed data, in a traceable way, and to relay results so they are relevant to users

LPV Goals

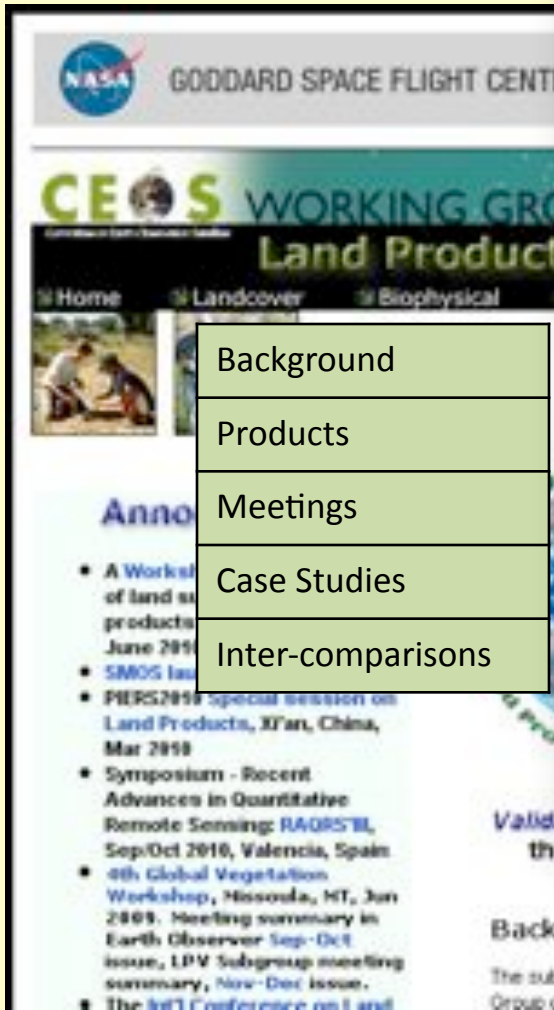
- To increase the **quality and efficiency** of global satellite product validation by developing and promoting international **standards and protocols** for:
 - Field sampling
 - Scaling techniques
 - Accuracy reporting
 - Data / information exchange
 - Process for CEOS WGCV level endorsement and publication

- To provide feedback to international structures (GEOSS) for:
 - Requirements on product accuracy and quality assurance (Validation protocols in QA4EO framework)
 - Terrestrial ECV measurement standards
 - Definitions for future missions

~8 years!

Webpage

- Updating product
- Updating backgro



- Background
- Products
- Meetings
- Case Studies
- Inter-comparisons

Meetings related to Soil Moisture

Upcoming Meetings

Past Meetings

- **SMAP Algorithms & CalVal Workshop**
Embassy Suites Mandalay Beach Hotel & Resort
Orland, CA USA
6/9/2009 - 8/11/2009

The June workshop will focus on SMAP Algorithms and CalVal. The workshop will provide a forum to review the project Algorithm Theoretical Basis Documents (ATBDs) and CalVal plan, solicit input from experts in these areas, resolve key issues, and develop implementation plans. Approximately 1.5 days each will be dedicated to the algorithms and CalVal topics.

- **SMOS Validation & Retrieval Team Readiness Review Workshop**
Hotel ABIS, Rua Castiho
Lisbon, Portugal
3/17/2009 - 3/19/2009

The primary focus of this workshop was a readiness review of the SMOS Validation and Retrieval Team (SVRT) activities in view of a launch of SMOS foreseen for 2009. It included presentations, status of the project, results from ESA campaigns, demonstration and distribution of data analysis tools, and the latest update of your SMOS CalVal project.

- **The 7th SMOS Workshop**
ESA-ESRN
Frascati, Italy
10/29/2007 - 10/31/2007

The 7th SMOS workshop will focus on the preparation of the SMOS commissioning phase and related calibration and validation activities.

Following the successful testing of the MRAS instrument the SMOS platform and payload are presently merged for final assembly, integration and test activities to form the full SMOS satellite (see http://www.esa.int/esaLP/SEMEDD90Y2F_LPsmos_0.html). Most of the efforts are thus directed towards the development of the ground segment and calibration and validation and commissioning phase activities. These efforts will be discussed in synergy with currently ongoing work on NASA's Aquarius (retrieval algorithms, calibration and validation) and other missions (ASCAT, AMSR-E etc), as well as the use of relevant auxiliary data - in view of paving the way for the future steps.

- **The 6th SMOS Science Workshop**
Technical University of Denmark
Lyngby, Denmark
5/15/2006 - 5/17/2006

ESA's Soil Moisture and Ocean Salinity (SMOS) mission has been designed to observe soil moisture over the Earth's landmasses and salinity over the oceans. Soil moisture data are urgently required for hydrological studies and data on ocean salinity are vital for improving our understanding of ocean circulation patterns.

Contact: Frederic Bardot

Institution: POSTEL

[Link to validation information](#)

Temporal Coverage: 1999

Spatial Scale: 10 deg

Temporal Scale: 10-day

Focus Group Reporting

- 1st group meeting in June 2009, Montana
- Publication in Earth Observer
- Peer-reviewed publication *in prep*

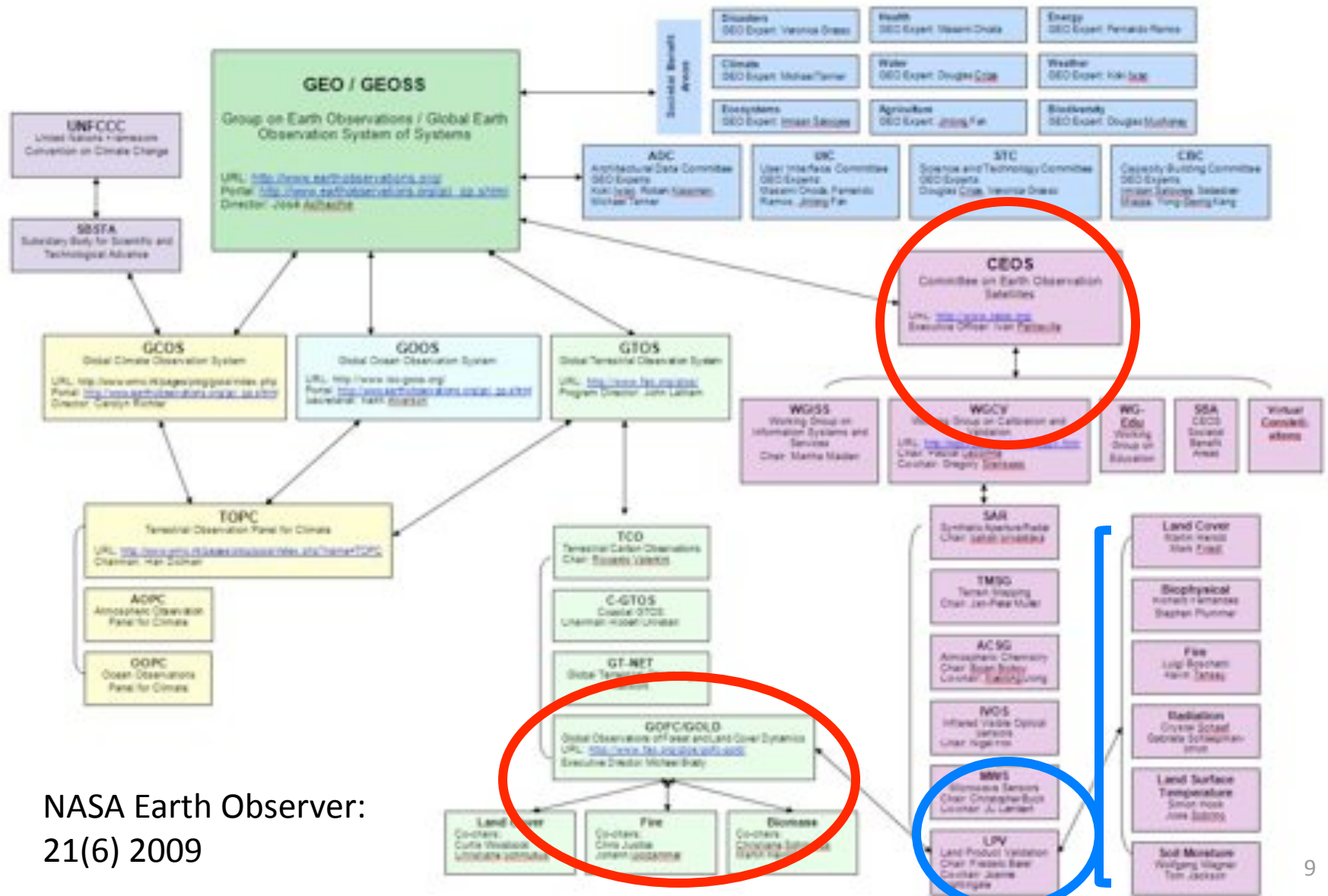


2010 strategy:

- Quarterly telecons (starting ~Feb '10)
- 6-monthly reporting for WGCV meetings

GEOSS Schematic

Linkages between International Programs concerned with Terrestrial Earth Observation



NASA Earth Observer:
21(6) 2009

Validation Stages

- Consensus from LPV leads / MODIS land PI's

Stage 1	Product accuracy is assessed from a small (typically < 30) set of locations and time periods by comparison with in-situ or other suitable reference data.
Stage 2	Product accuracy is estimated over a significant set of locations and time periods by comparison with reference in situ or other suitable reference data. <i>Spatial and temporal consistency of the product and with similar products have been evaluated over globally representative locations and time periods.</i> Results are published in the peer-reviewed literature.
Stage 3	Uncertainties in the product and its associated structure are well quantified from comparison with reference in situ or other suitable reference data. <i>Uncertainties are characterized in a statistically robust way over multiple locations and time periods representing global conditions. Spatial and temporal consistency of the product and with similar products have been evaluated over globally representative locations and periods.</i> Results are published in the peer-reviewed literature.
Stage 4	Validation <i>results for stage 3 are systematically updated</i> when new product versions are released and as the time-series expands.

MODIS LAND PRODUCT STATUS

Product	Name	Stage	Accuracy
MOD09 C5	Surface Reflectance	2 (3)	+/- (0.005 + 5 %)
MOD10/29 C5	Snow / Sea Ice	2 / 2	92 %
MOD11 C4.1/5	Land Surface Temperature	2	+/- 0.5-1.0 K
MOD12 C5	Land Cover / Dynamics	2 / 1	> 75-80 %
MOD13 C5	NDVI / EVI	3	+/- (0.002 + 2%)
MOD14 C5	Active Fire	3	100 m2 @ 800 K
MCD 45 C5	Burned Area	2	75%
MOD15 C5	LAI / fPAR	2 / 1	+/- 0.50-0.66 / +/- 0.12
MOD17 C4	GPP / NPP	3	+/- 10%
MOD29 C5	Sea Ice	2	92%, +/- 1.3 K
MCD43 C5	BRDF / Albedo	2	+/- 5%
MOD44 C4	VCF	1	+/- 11-16 %

Land Cover Focus Group

Friedl / Herold

ECV T09: GCOS-IP10; T24, T25

- Planning for Global Land Cover Validation Exercise
 - Collaboration with BU, GOFC-GOLD, VIIRS Surface type validation team
 - Initial meeting at BU, July 2009, Regional validation workshop in Kazakstan
 - Provisional sample design completed with draft documentation, site interpretation protocol in progress
- Planning for ESA Climate Change Initiative Call
 - Discussions with JRC on independent accuracy assessment (use of FRA 2010 remote sensing survey data)
- Responsibility for ensuring ECV compliance
 - **Role for GOFC and CEOS LPV articulated**
- Accuracy assessment of land cover change
 - Will move ahead in concert with GOFC-GOLD REDD Sourcebook updates and GEO Forest Carbon Tracking task

Fire Focus Group

Boschetti / Tansey

ECV T13: GCOS-IP10; T36

- Burned Area validation protocol - *in progress*
 - Part II – Accuracy measures, Part III – format Standardization and metadata
 - Collaboration with MODIS/VIIRS active fire product experts
- Protocol essential for:
 - Geoland 2 Burned Area product validation
 - Validation of fire ECV to be generated/funded by ESA Climate Change Initiative - starting mid-2010
- 12th session of the GCOS/GTOS Terrestrial Observing Panel for Climate meeting, review of:
 - Fire ECV documentation
 - GCOS requirements for Burned Area products
 - March 2010
- GOFC-GOLD Fire Implementation Team Workshop
 - LPV group meeting, March 2010

Biophysical Focus Group

Plummer / Fernandes / Nightingale

ECV T11: GCOS-IP10; T3, T28, T29

- LAI product validation protocol development:
 - Initial Meeting - Nov 2009
 - Next Focus Group meeting scheduled - Sept 2010

- Letter sent to GTOS, GCOS : **Adoption of a consistent definition for the Leaf Area Index ECV**
 - GTOS-L2008, GTOS-GV2009, GCOS-IP10, GCOS-TEMS
 - Sent December 2009, awaiting reply

- Status of LAI and *f*PAR validation paper *in prep*

- OLIVE (**O**nLine **V**alidation **E**xercise)* and repository for LAI validation data

Surface Radiation Focus Group

Schaaf / Schaepman-Strub

ECV T08: GCOS-IP10; T22

- Albedo ECV document
 - Officially posted November 2009
- Collaboration with GLOBALBEDO project
 - Started Fall 2009
- Collaboration with Geoland-2 Albedo validation effort
 - Work to being in early 2010
- Relevant publications
 - 2 papers related to MODIS Albedo validation: ***published***
 - MODIS-MISR Inter-comparison paper: ***accepted***
 - Article summarizing current state of Albedo products: ***in prep***

Work being conducted in conjunction with MODIS/VIIRS Albedo validation teams

Soil Moisture

Jackson / Wagner

“New ECV”

- International Soil Moisture Network
 - Global in-situ soil moisture database
 - Collaboration between CEOS, GEWEX and GEO
 - Online January 2010!

- Soil moisture product validation protocol
 - Discussions in progress
 - Upcoming project meetings for SMOS Science Advisory Group and WACMOS (Water cycle multi-mission observation strategy))



Land Surface Temperature

Hook / Sobrino

- Discussions with CEOS IVOS group:
 - Roles and responsibilities of LST & Emissivity validation versus at sensor radiance
 - Inclusion of automated validation sites
- Participation in journal special issue:
 - Terrestrial Reference Standard Test Sites for Post-Launch Calibration
- RAQS – 3rd international symposium on “Recent Advances in Quantitative Remote Sensing”
 - September 2010

Work being conducted in conjunction with MODIS/VIIRS LST validation teams

Land Surface Phenology

Morisette / Nightingale

- No pre-existing LSP validation methods or papers
- LSP focus group in initial stages
 - Group co-lead to be identified
- LSP product review paper *in prep*
 - 2 global products (MODIS, SPOT-Vegetation)
 - 3 products for US/North America (MODIS, AVHRR)
 - 2 products for Europe (MERIS)
 - 1 product for South Africa (AVHRR)
- LPV workshop at the Phenology conference, June 2010
 - Incorporating ground networks (NPN, PEN)
 - To bring together producers of continental- to global-scale land surface phenology products; as well as those collecting field, tower, or airborne data useful for validating those products, to develop an international protocol to quantify the accuracy of these products and initiate a validation-based inter-comparison

Moving Forward

- **Protocol development – *slow...***
 - *Time, resources, concerns about existing template*
 - Template revisions to be made on group-by-group basis

- **Cross-cutting activities with GOFC-GOLD**
 - Implementation of Biomass Focus Group – pending

- **Validation Site Networks**
 - Review of existing EOS core sites / additional sites?
 - Work with VIIRS land validation team

Moving Forward

- **Online Interactive environments for Cal/Val Activities - ESA**
 - GECA – Generic Environment for Cal/Val Analysis
 - CEOS Cal/Val Portal
- **OLIVE – OnLine Validation Exercise**
 - Tool to achieve Stage 4 systematic validation
 - *Test* and *Actual* validation modes to reduce “cheating”
 - Easy access to validation results
 - Initial demonstration with LAI, *f*PAR and Albedo
 - Project to start in early 2010

Baret, Koetz et al.

