

LAND PRODUCT



SUBGROUP REPORT

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CONEA, Cordoba, Argentina

7-10 March 2005

LPV outline



- Review of subgroup goals and objectives
- Report from LPV workshops
 - Leaf area index
 - Fire and logging disturbance in Brazil
 - Land cover harmonization
- Ongoing LPV activities
 - NASA funding for LPV activities
 - Web site update
 - CEOS Core Sites (with WGISS)
 - Special Issue – in progress
- LPV concluding remarks

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CEOS Definition



Validation:

the process of assessing by independent means the quality of the data products derived from the system outputs

LPV operates under this definition, but with the understanding that validation activities should consider user accuracy needs and feedback to algorithm improvements.

Mission Statement & Goals



- to foster quantitative validation of higher level global land products derived from remote sensing data and relay results so they are relevant to users
- to increase the quality and economy of global satellite product validation *via* developing and promoting international standards and protocols for field sampling, scaling, error budgeting, data exchange for global land product validation
- to advocate mission-long validation and intercomparison programs for current and future earth observing satellites.

Objectives



- Work with users to define uncertainty objectives
- Identify opportunities for coordination and collaboration
 - Through product Inter-comparisons
 - Through global test sites for systematic measurements
- Develop consensus “best practice” protocols for data collection and description
 - Workshops
 - Case studies
 - Publications (*with CEOS WGCV “endorsement”?*)
- To develop procedures for validation, data exchange and management - with a focus on land product validation core sites (done in conjunction with WGISS)
- To serve as a clearinghouse for accuracy statements on CEOS member global land products (possibly through the CEOS/WMO database?)

Big Picture



Previously: LPV provides a validation service to the Integrated Global Observation Strategy's:

Global Terrestrial Observation System and
Global Carbon Observing System

Implications:

- Focus Products: Biophysical, Land Cover, Fire Disturbance, & Albedo
- Working in conjunction with GOFCS/GOLD's regional networks
- Need to integrate with TEMS, GT-Net, & UN's GLC-net

Proposed: LPV provides a validation service to GEOSS

Strategy for developing protocols

LPV is working toward protocols with three steps:

- Workshops (**kick off, strategy/work plan, results**)
Bringing together producers, users, and validation experts to initiate discussion, establish the “state of the art”, and consider core sites or regions for validation activities
- Case studies (**previously**) - Inter-comparisons (**currently**)
Posted on the LPV web site
First step in developing a more formal protocol
- Publication(s) (**special issue**)
Peer review document with details pertaining to the validation of a given global land product.

“Intercomparison” General Timeline

	LAI	Albedo	Fire	Land cover
Topical meeting to establish data requirements	Boston U Privette et al. 1998	Boston U Privette et al. 2002	Lisbon - fire Morisette et al. 2001	Toulouse 2001 Percent cover: 2005
Decide on Sites			Darmstadt (geostationary) 2004	
Develop data sharing infrastructure	Frascati, Italy Privette et al. 2001	EGU, Vienna 2005		Boston U 2004
Field Campaigns & individual product analysis	Montana August 2004			
Synthesis of results	Current, on-going research			

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Topical workshops



- **Results workshop for LAI-intercomparison**
16 August 2004, University of Montana, Missoula, USA
Established an agreement for data sharing and a paper submitted to the special issue
- **Ground-based Accuracy Assessments for Fire Occurrence and Deforestation Events**
26 July 2004, Brasilia
Part of the Large scale study of the Biosphere and atmosphere in Amazonia (LBA)
- **GOFC-GOLD/FAO Workshop on Harmonization of Global Land Cover Product**
15-16 July 2004, FAO in Rome
A manuscript on this issue has been submitted to the special issue

Upcoming...

- **Albedo/BRDF Intercomparison**
2005 Avignon, France
- **Continuous Fields validation**
late summer 2005, location to be determined...

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Background on LAI intercomparison

- The initial research efforts to validate global Leaf Area Index products included the European “VALERI” program, the NASA-funded “BigFoot” program, BU’s interest in validating its own product and Canada’s validation of their country LAI product (Privette et al. 1998)
- CEOS LPV brought these and additional efforts together for its initial “intercomparison” (Privette et al., 2001)
- Currently, nine groups are participating and sharing LAI-field data and high-resolution LAI images covering 56 sites (Morissette et al., 2004)
- Collaboration involves sharing data, software, and ideas.

LAI workshop results: Global product validation framework

a) Organizing entity: CEOS LPV

b) Participants

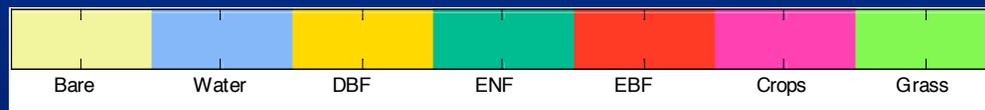
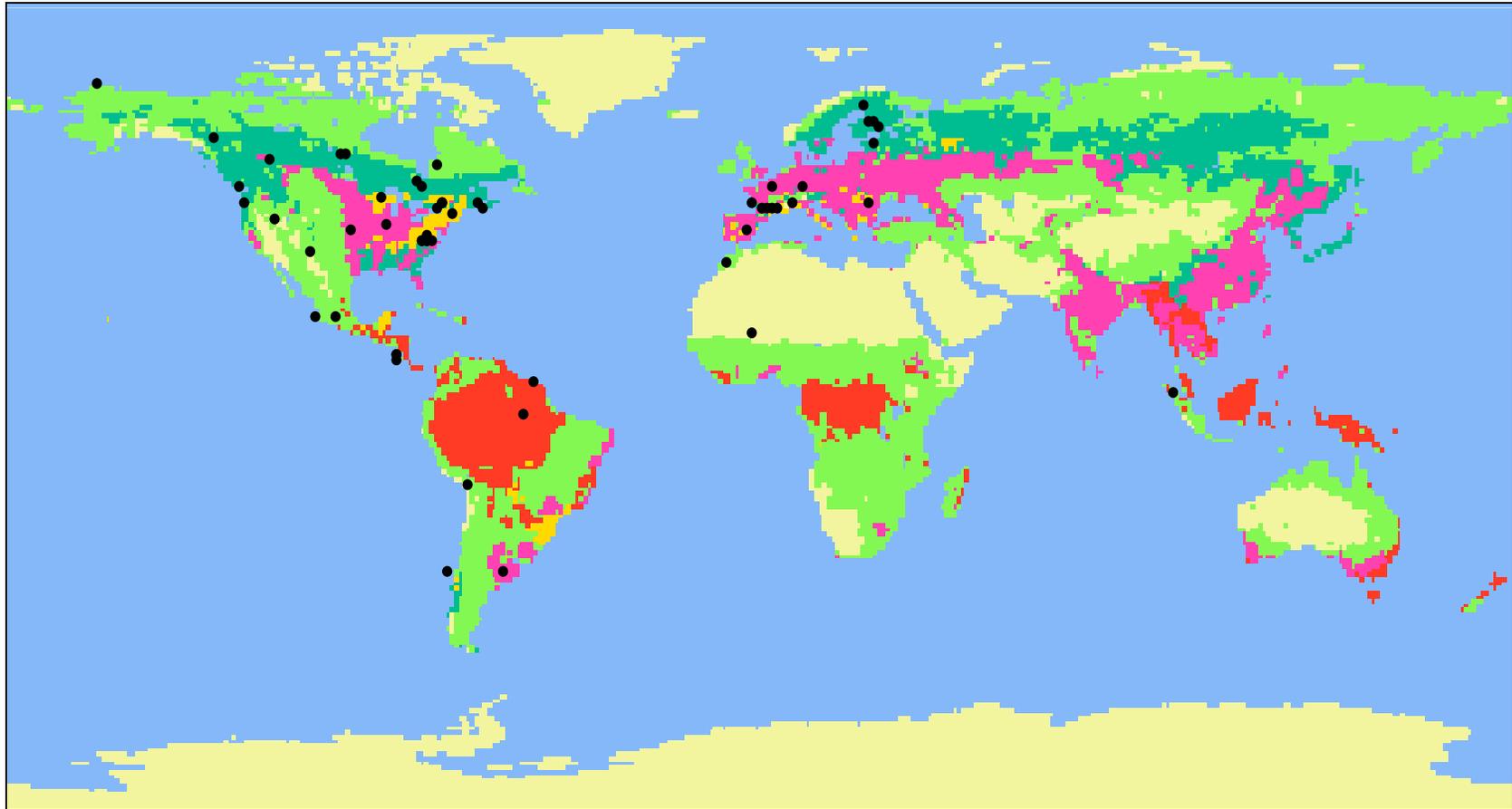
- interest in using and/or validating global LAI products
- willing to share data
- existing resources/funding
- ability to meet occasionally

c) Data sharing mechanism for site-specific field data and high resolution LAI maps from each site (Mercury system at ORNL)

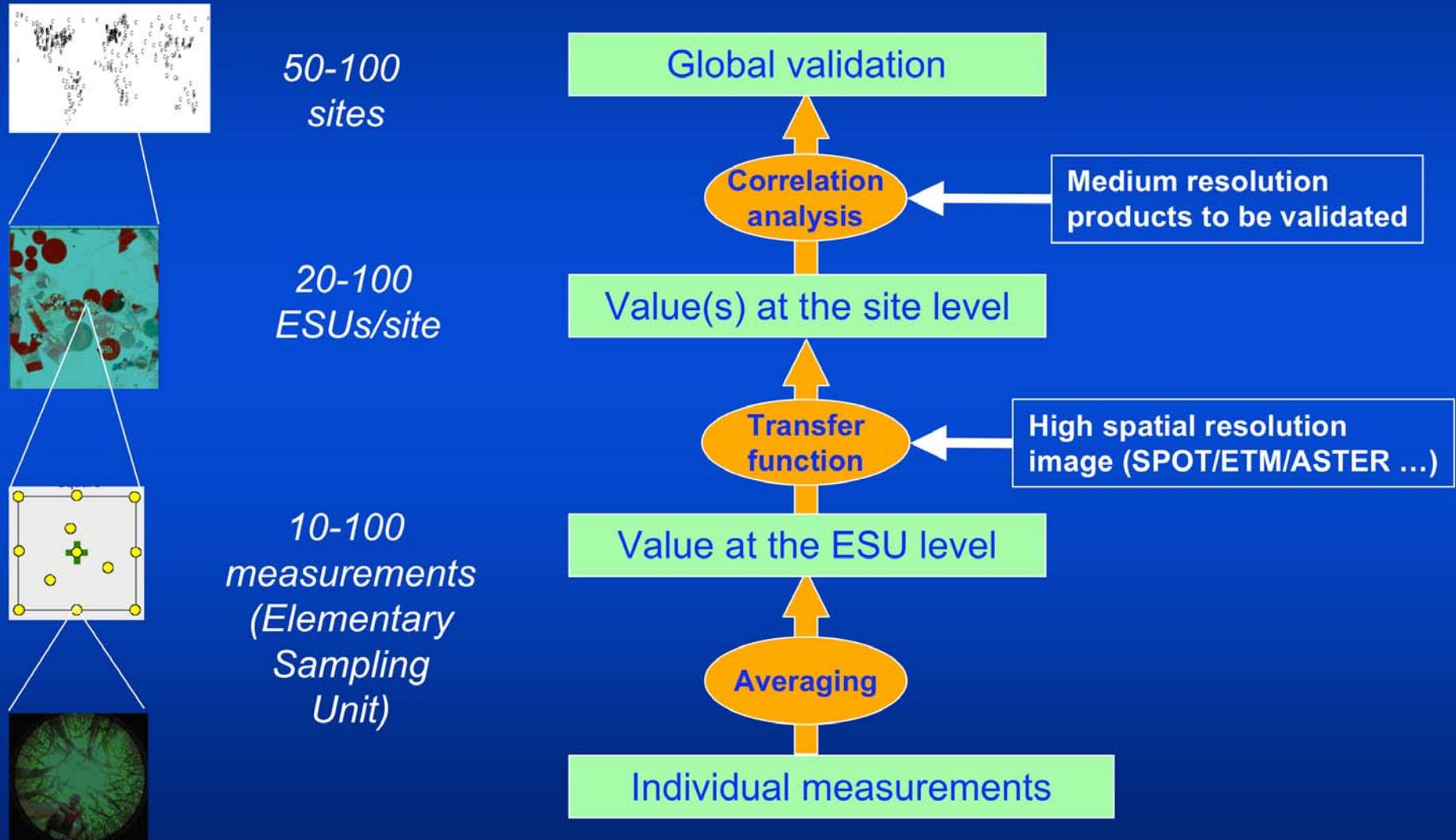
Site-specific procedures and results from each participant (exists for ~50 sites)

d) Synthesis of results toward global accuracy assessment (research needed)

LAI intercomparison field sites



General global product validation protocol



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Ground-based accuracy assessment for deforestation and fire disturbance in Brazil

- Participants: Universities & Amazonian Institutes
- Presentation and participation from, Embrapa, INPE, IBAMA, NASA, CEOS, GOFCC/GOLD, UMd, Universidade Federal do Acre, etc.
- Initial list of network participants

Site	Field Contact	High Res.Contact	Major Biome	Burn Seas	Experience
Paragominas, PA	Carlos Souza	Epiphano/Morisette	Dense Forest	May-Oct	DF
Sinop, MT	Carlos Souza	Epiphano/Morisette	Transition Forest	May-Oct	DF
Acre	Foster Brown	Epiphano/Morisette	Dense/Open Forest	Aug-Oct	DF Fire
Santarem, PA	Fernando	Epiphano/Morisette	Dense Forest	Nov-Dec	DF
NE Para	Arlete	Epiphano/Morisette	Secondary Forest	Aug-Oct	DF
Roraima	Wilfrid Schroeder	Epiphano/Morisette	Open Forest	Jan-Feb	Fire
Alto Floresta?	João Andrade - INPE	Epiphano/Morisette			

Recommendations from accuracy assessment for deforestation and fire disturbance in Brazil

- Interpret the call from the Minister of Environment for more transparency to imply that all estimates of deforestation, selective logging, and hot spots/burn areas should have explicit uncertainty estimates.
- First step for validation network is to select specific products to be validated (Burnt area and Deforestation – with specifics for these products) then establish protocol (current protocol listed on the LBA-Ecology web site)
- High resolution imagery issues:
 - Space Agencies (CEOS members) to provide access to high resolution data (ASTER, EO-1, Landsat 7 or 5, CBERS) to field site collaborators
 - Acquisition of high-res (~1m) satellite and airborne imagery necessary for more widespread accuracy assessment in critical areas.
- Integrate this effort with GOFD-GOLD and CEOS-LPV program.
- Integrate this effort with local users through information dissemination and training.
- Use producer/user collaboration to establish accuracy requirements:
 - Consider annual variability
 - Pick a target (start with 20% for deforestation)
 - What does the LBA community expect of the Prodes data set?
- Solicit funding for joint Amazon basin-wide ground-based validation (GPS, software, imagery, training, video conferencing and personnel)

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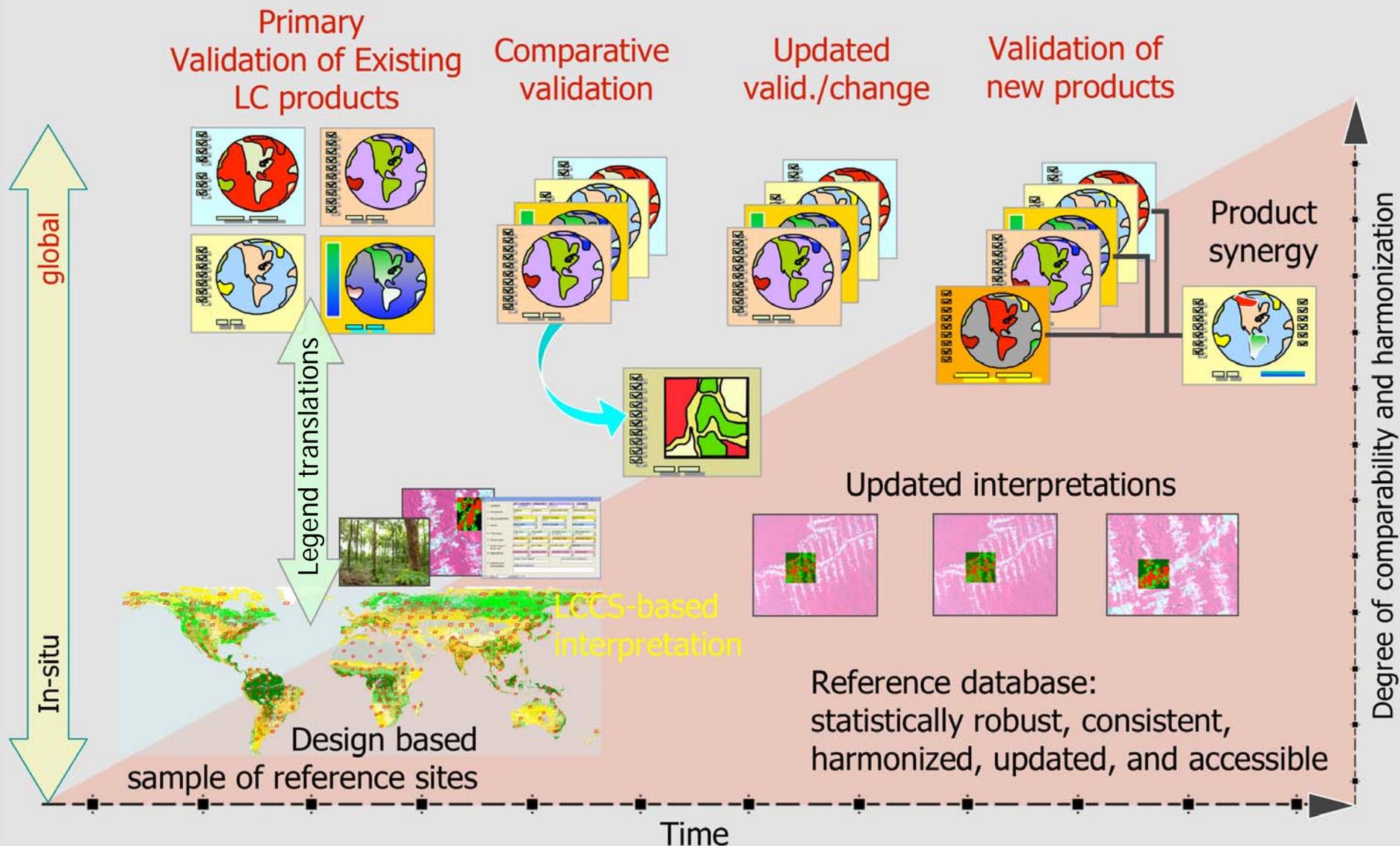
Harmonization of Global land cover product

- **Harmonization resources:**
 - Capacity building and web-based resources (LCCS)
 - Raise awareness and foster use of harmonized products
- **Harmonization experiences for existing datasets:**
 - Develop legend translation protocols/case studies
 - Translated legends: IGBP/CORINE/GLC2000/Anderson/IPCC ...
 - Compatibility/Comparability of datasets
- **Harmonization in future mapping products:**
 - Impact on future projects and operational programs
 - Standardized legend generation (e.g. MERIS products)
 - Consider inconsistencies in previous maps
- **Harmonization and validation are parallel efforts**

information provided by :

Martin Herold and Chris Schmullius, GOFC GOLD Land Cover Project Office

Framework for joint GOFC-GOLD/CEOS Harmonization/Validation initiative



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Albedo/BRDF Intercomparison



2005 Avignon, France

Co-chairs: Fred Baret, Crystal Schaaf, Jeff Privette, Jeff Morisette

This workshop will build on the discussions held at the first LPV workshop on Albedo Products held in Boston, USA in October 2002.

The goals of this day and a half workshop are to design and initiate a validation and comparison exercise for the various satellite-derived land surface albedo products which are now available from a number of instruments.

It is hoped that participants from a number of long term field sites will be willing to work with satellite albedo producers for one or more designated periods to provide an assessment of the operational products. While these would primarily be "virtual" campaigns - utilizing existing field and satellite data resources - the LPV will be able to provide limited support for posting data and comparisons and facilitating communication on the web.

To register: e-mail to albedo_2005@avignon.inra.fr by 15 March 2005 (registration for the EGU is also required, deadline for early registration is 8 April 2005).

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NASA funding for LPV activities



“Maintaining and Refining NASA’s Land Product Validation Infrastructure”

Funding for:

- post-doc research position (Sebastien Garrigue) and
- LPV workshops
- web infrastructure
- data for “Core Sites”

Three years of support: 2004-2006

http:landval.gsfc.nasa.gov/LPVS

Matches WGCV page layout and graphic

Quick links to:

- Listserves
- Announcements
- WGCV
- CEOS and
- CEOS calendar

Welcome to the Land Product Validation Subgroup - Microsoft Internet Explorer

File Edit View Favorites Tools Help

CEOS WORKING GROUP ON CALIBRATION & VALIDATION
Committee on Earth Observing Satellites
Land Product Validation Subgroup

Home Landcover Biophysical Fire/Burn Surface Rad

Subscribe!

LPV subgroup topical mailing lists:

Subscribe: [v]
Unsubscribe: [v]
List: [v]

Announcing...

Call for papers: [v] for LPV special issue in IEEE Transactions on Geoscience and Remote Sensing.

Organization:

LPV is a subgroup of the Working Group on Calibration and Validation.

WGCV is a standing Working Group of the Committee on Earth Observing Satellites

link to 2004
CEOS Calendar [v]

Mission

To foster quantitative validation of higher-level global land products derived from remote sensing data and to relay results so they are relevant to users

Background

The subgroup on Land Product Validation (LPV) is one of six subgroups of the Working Group on Calibration and Validation (WGCV), which itself is one of two standing working groups within the Committee on Earth Observing Satellites (CEOS, see also [CEOS structure](#)). The six WGCV subgroups are:

- Infrared and Visible Optical Sensors (IVOS)
- Atmospheric Chemistry (AC)
- Microwave Sensors (MS)
- Synthetic Aperture Radar (SAR)
- Terrain Mapping (TM)
- Land Product Validation (LPV)

The Land Product Validation subgroup arose out of the recognition in the late nineties that standardized approaches to global product validation were essential for wide acceptance and use of proposed global land products. Several programs at the time were aimed at global monitoring of Earth processes, many with plans to distribute higher level data products. A common approach to validation would encourage widespread use of validation data, and thus help us to move toward standardized approaches to global product validation. With the high cost of in-situ data collection, the potential benefits from international cooperation are considerable and obvious.

Previous requests for assistance from the original International Global Observing Strategy (IGOS) pilot projects and two subsequent ad hoc meetings of the WGCV identified a clear need for improved international collaboration concerning the validation of land products derived from Earth observing satellites. A new subgroup within the WGCV was proposed to the CEOS Plenary in Stockholm at the end of 1999, receiving full support. The LPV was officially adopted as a subgroup at the WGCV-17 meeting in October of 2000.

The LPV subgroup activities are divided up into four themes that compliment the research agenda of the Global Observations of Forest and Land Cover Dynamics (GOF/C/GOLD) program, namely biophysical products, fire/burn scar detection, and land cover mapping. In addition to the GOF/C/GOLD themes, the LPV subgroup includes an Albedo/Surface Radiation thematic group. Working with GOF/C/GOLD, who seek the common goal of coordinated validation of fire products by standardized protocols, LPV aims for similar coordination for all land products.

Pull-down menu for main topical areas:

- Land cover
- Biophysical
- Fire/Burn
- Surface Radiation

Each pull-down lists:

- Background
- Producers *
- Meetings
- Case studies
- Intercomparisons

* input needed

CEOS Core Sites



“CEOS Core Sites”: WGISS Test Facility

Joint project between CEOS Working Group on Cal/Val and Working Group on Information Systems and Services

The WGCV 22nd plenary established, for the long term sustainability of this effort, it must be a distributed system where each space agency stages data and derived-products from their sensors.

More on this tomorrow...

CEOS Core Sites: “MoU request”

Request from DLR to establish the DEMMIN test site.

Art. 1 Purpose of this Memorandum of Understanding

The purpose of this MoU is to establish the framework for cooperation between the Parties in the activities of WGCV’s Land Product Validation subgroup. Annex 1 to this MoU contains the basic technical data of DLR’s DEMMIN test site and high-resolution data products generated from this test site. Annex 1 forms an integral part of this MoU.

LPV “Special Issue” – ongoing

- Special Issue: describing the state of the art research on both protocol and results for validation and accuracy assessment of global land products (Liang, Baret and Morisette, eds.)
- Over 20 papers have been submitted, covering land cover, burned area, biospherical (VI, LAI, fAPAR, GPP)
- Several members from the user community have agreed to write a note for each section on the implication for the uncertainty/validation of the products (land cover, fire/burn), but still need an article on biospherical parameters.

	2004					2005					2006													
	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	N	D	J	F	M
Announcement																								
Validation papers				submissions		reviews					revisions			review						final/profs				
User perspective papers						submissions					reviews			revisions						final/profs				
Publication date																				March 2006 ->				

Currently on schedule!

Terrestrial Observing Panel on Climate “Implementation Plan”



Requested by “Conference of the Parties – 9”

“Section F: Terrestrial Domain” forwarded for comment to LPV through Alan Belward

WGCV mentioned 19 times, LPV explicitly mentioned once

Special issue should provide “state-of-the-science” for several parameters listed in section F, Table 12:

- Snow cover (Glaciers)
- Albedo
- Land use (historical)
- Land cover
- LAI/FAPAR
- Land Surf. Temp.
- Biomass
- Fire disturbance

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Accuracy statements



- Should be “user-oriented” and supported with peer-review literature
- Standardize/summarize information for each product
- MODIS land team had planned to update CEOS information for MODIS land products

CEOS/WMO page

Sat Systems - Microsoft Internet Explorer

File Edit View Favorites Tools Help

← Back → Search Favorites Media

Address <http://alto-stratus.wmo.ch/sat/stations/SatSystem.html> Go Links >>

Satellite Systems and Requirements
(The Official CEOS/WMO Online Database)
Data source: CEOS/WMO database, release February 2003, Version 2.5

- [Observational requirements \(WMO, WCRP, GCOS, GOOS, GTOS, IGBP, ICSU, UNEP\)](#)
- [Space Agency and Missions](#)
- [Missions and Instruments](#)
- [Instruments](#)
- [Parameters measured by a space-based instrument](#)
- [Parameters measured by a surface-based instrument](#)
- [Instruments that measure a parameter](#)

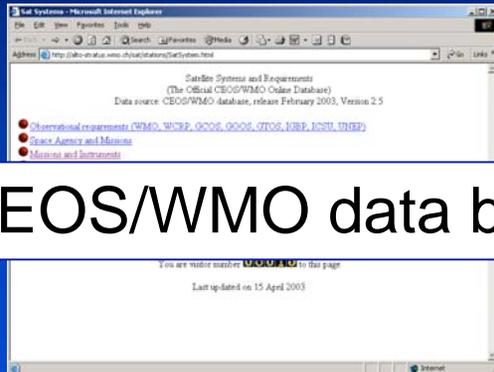
[[Up](#)]

You are visitor number **08015** to this page

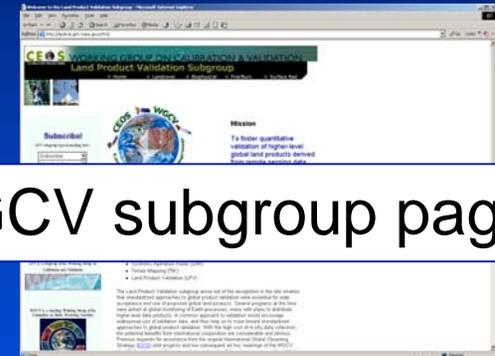
Last updated on 15 April 2003

Internet

CEOS/WMO database, potential framework



CEOS/WMO data base



WGCV subgroup page

Link to accuracy statement for each product

- Overall accuracy statement
- Link to QA information
- List of support material

... supporting materials

- Title, author, abstract
- Figures/captions
- Tables/captions

Producer maintained validation page

MODIS example: "Accuracy Statements" (1/3)

Product "pick-list"

Welcome to the EOS Land Validation Home Page - Microsoft Internet Explorer

Address: http://landval.gsfc.nasa.gov/MODIS/

MODIS land team validation

Home Core Sites Val Status Campaigns Documentation

News:

- [MODIS Vegetation workshop II](#), University of Montana, 17-19 August 2004
- [MODIS Land Data Operational Product Evaluation \(LDOPE\) software tools](#) now available to assist with the analysis and quality assessment of the MODIS Land products.
- [Call for Papers](#) - TGARS Special Issue on Global Land Product Validation
- Coordinated MODIS land validation activities will continue through the recently funded proposal: [Maintaining and Refining NASA's Land Product Validation Infrastructure](#)

MODIS News

- [Terra](#)
- [Aqua](#)

Landsat 7 News

- [Landsat ETM+ Dataset](#)
- [Transition](#)
- [Report following the Scan Line](#)

MODLAND Val

MODLAND product quality assurance (QA) and Validation. The MODLAND team contributes to and leverages off of international validation standards and activities through close coordination with the Committee on Earth Observation Satellites (CEOS) [Land Product Validation](#) subgroup, under the Working Group on Calibration and Validation ([WGCV](#)).

MODLAND uses several validation techniques to develop uncertainty information on its products. These include comparisons with in situ data collected over a distributed set of validation test sites, comparisons with data and products from other airborne and spaceborne sensors (e.g., SeaWiFS, AVHRR, MISR, TM/ETM+, ASTER), inter-comparison of trends derived from independently obtained reference data and MODLAND products, and analysis of process model results (including EOS Interdisciplinary Science models) which are driven or constrained by MODLAND products.

MODLAND's primary validation technique includes the collection of and comparison with field and aircraft data, and comparison with data and products from other satellites. The infrastructure for these efforts has resulted in the establishment of a semi-permanent array of EOS Land Validation [Core Sites](#), most of which include a flux tower, for extended temporal measurement of terrestrial biophysical dynamics over a range of landcover types. Field data are archived in cooperation with the [Oak Ridge DAAC's](#) Mercury system. Results of all validation activities are conveyed to the end-user through both published literature and the Land Product [Val Status](#)

Surface Reflectance

Quality Assurance (QA) contribute to and leverage off of international validation standards and activities through close coordination with the Committee on Earth Observation Satellites (CEOS) [Land Product Validation](#) subgroup, under the Working Group on Calibration and Validation ([WGCV](#)).

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middle infrared: first results

on earth observation. Improved spectral band placement the development of improved al change research. Surface developing several higher-order age of the Advanced Very High advantage of the new sensing ter vapor and aerosol effects and the basis for a new time. This paper summarizes the in comparison with other data ce launch. The MODIS surface set for quantifying global

MODIS example: "Accuracy Statements" (2/3)

The image shows a screenshot of a web browser displaying the EOS Land Validation website. The main heading is "EOS Land Validation" with a sub-heading "core sites". A blue arrow points from the text "Accuracy Statement for each product" to the "General Accuracy Statement" section. The "Status for: Surface Reflectance (MOD09)" section is highlighted in yellow. Below it, the "General Accuracy Statement" is also highlighted in yellow. The text states: "Validation at stage 1 has been achieved for the surface reflectance product (MOD09). The accuracy of the MODIS operational surface reflectance product is better than .5% reflectance or 5% of the signal - which ever is greatest, with slight variation from band to band." Other sections like "Supporting Studies" and "Additional Validation and Product Quality" are also highlighted in yellow. The browser address bar shows "http://landval.gsfc.nasa.gov/MODIS/ProductStatus.php?ProductID=MOD09".

Accuracy Statement for each product

EOS Land Validation

core sites

Home Core Sites Val Status Campaigns Documentation

Status for: Surface Reflectance (MOD09)

General Accuracy Statement

Validation at [stage 1](#) has been achieved for the surface reflectance product (MOD09). The accuracy of the MODIS operational surface reflectance product is better than .5% reflectance or 5% of the signal - which ever is greatest, with slight variation from band to band.

Product status updated on October 2003

Supporting Studies:

Title: Atmospheric correction of MODIS data in the visible to middle infrared: first results
Author: Eric F. Vermote, Nazmi Z. El Saleous and Christopher O. Justice
Source: Remote Sensing of Environment, 83: 97-111.
[View Summary Results From This Document](#)

Additional Validation and Product Quality

[PL Maintained Validation Page](#)
[Product Quality Documentation for MOD09A1 - Terra](#)
[Product Quality Documentation for MOD09GHK - Terra](#)
[Product Quality Documentation for MOD09G0K - Terra](#)

Summary Figures and Tables

Figure 1: The validation of the atmospheric correction has been done partially by continuing to validate the aerosol optical thickness used in the correction algorithm by comparison to AERONET data as it is

MODIS example: "Accuracy Statements" (3/3)

The screenshot shows a web browser displaying the MODIS land team validation website. The main heading is "MODIS land team validation". Below it, there are navigation buttons for "Home" and "Core Sites". A "News" section lists several items, including "MODIS Vegetation workshop II, University of Montana, 17-19 August 2004". A "MODIS News" section lists "Terra" and "Aqua". A "Landsat 7 News" section lists "Landsat ETM+ Dataset Transition" and "Report following the Scan Line".

The main content area is titled "EOS Land Validation core sites" and "Status for: Surface Reflectance". It includes a "General Accuracy Statement" and "Supporting Studies". A blue arrow points from the text "updated by product PI" to the "Supporting Studies" section.

The right side of the screenshot shows a "MODIS land team validation" sidebar with navigation buttons for "Home", "Core Sites", "Val Status", "Campaigns", and "Documentation". Below this, there is a "Summary Results from:" section with the following text:

Atmospheric correction of MODIS data in the visible to middle infrared: first results

As they relate to the validation of MOD09

Authors: Eric F. Vermote, Nazmi Z. El Saleous and Christopher O. Justice

Source: Remote Sensing of Environment, 93: 97-111.

Link to: [Access Publication](#)

Abstract: The MODIS instrument provides major advances in moderate resolution earth observation. Improved spatial resolution for land observation at 250 and 500 m and improved spectral band placement provide new remote sensing opportunities. NASA has invested in the development of improved algorithms for MODIS, which will provide new data sets for global change research. Surface reflectance is one of the key products from MODIS and is used in developing several higher-order land products. The surface reflectance algorithm builds on the heritage of the Advanced Very High Resolution Radiometer (AVHRR) and SeaWiFS algorithms, taking advantage of the new sensing capabilities of MODIS. Atmospheric correction by the removal of water vapor and aerosol effects provides improvements over previous coarse resolution products and the basis for a new time-series, which will extend through to the NPOESS generation imagers. This paper summarizes the first evaluation of the MODIS surface reflectance product accuracy, in comparison with other data products and in the context of the MODIS instrument performance since launch. The MODIS surface reflectance product will provide an important time-series data set for quantifying global environmental change.

Summary Figures and Tables

Figure 1: The validation of the atmospheric correction has been done partially by continuing to validate the aerosol optical thickness used in the correction algorithm by comparison to AERONET data as it is

Support material for each Accuracy Statement - updated by product PI and validation community



LPV outstanding issues



- Defining user accuracy requirements remains a challenge.
- There are no established standards on how to relay product accuracy to users.
- LPV covers many satellite and many products. Membership is not well defined, LPV could benefit from a call from membership from CEOS
- Perhaps WGCV has not been consistent among subgroups (“land”/ “atmosphere” or “biophysical”/“atmospheric chemistry”)
- Multi-sensor products offer great potential. The related algorithms will require an understanding of the accuracy of each sensor’s input.

LPV recommendations



- Continue with “recommendation 3” on the convergence to LCCS, perhaps explicitly listing some of the steps documented in the GOFC/GOLD/LPV harmonization of land cover
- CEOS WGCV develop a plan to share background information and data acquisition and access for new satellite data (CHRIS/PROBA, CBERES-2, Disaster Monitoring Constellation) – related to WTF
- CEOS members should continue to provide mechanism for field-data sharing (example: the NASA-sponsored MERCURY system)

references

- Morisette, J. , C. Justice, J. Pereira, J.M. Grégoire, and P. Frost, 2001, "Report from the GOFC – Fire: Satellite Product Validation Workshop", *Earth Observer*, September/October, v. 13, n. 5, p. 15-18..(available on-line at http://eosps0.gsfc.nasa.gov/eos_observ/9_10_01/Sept_Oct01.pdf)
- Morisette, Privette, Strahler, Mayaux, Justice, "Validation of Global Land-Cover Products by the committee on Earth Observing Satellites", Geospatial Data Accuracy Assessment, Lunetta and Lyon eds., 2004.
- Morisette, Jeffrey L. Privette, Jaime Nickeson, Frédéric Baret, Ranga B. Myneni, and Nikolay Shabanov, Summary of the Third International Workshop on LAI Product Validation, *Earth Observer*, Sept./Oct. 2004, v.16, n.5, p.28-31 (available on-line at http://eosps0.gsfc.nasa.gov/eos_observ/pdf/Sept-Oct04.pdf).
- Privette, J., R. Myneni, J. Morisette and C. Justice, 1998. Global validation of EOS LAI and FPAR products, *EOS Earth Observer*, 10(6) 39-42.
- Privette, J.L, J.T. Morisette, F. Baret, S.T. Gower and R.B. Myneni, 2001. Summary of the international workshop on LAI product validation, *EOS Earth Observer*, 13(3) 18-22.
- Privette, J.L., C.B. Schaaf, A. Strahler, R. Pinker, M. Barnsley, and J. Morisette, 2002. Summary of the international workshop on albedo product validation. *EOS Earth Observer*, 14 (6) p.17-18.
- WMO, 2004. Implementation Plan for the Global Observing System for Climate in Support of the UNFCCC, October, GCOS - 92, WMO/TD No. 1219, United Nations Environment Programme International Council.