CEOS/LPV workshop on LAI & fAPAR validation

Davos 15/03/2007

Proposed Agenda

09:00-09:30 Introduction, objectives of the meeting, relation to GEO/GEOSS

09:30-10:45 Ongoing direct validation activities

10:45-12:00 Sample results from direct validation activities

12:00-13:30 Lunch taken in the hotel

13:30-15:15 Methodological aspects: Ground measurements

15:15-15:35 Coffee Break (20mn)

15:35-16:30 Methodological aspects: Transfer functions and upscaling

16:30:17:30 General discussion

17:30 END

CEOS LAND PRODUCT

SUBGROUP

F. Baret, & S. Garrigues

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.

Products considered

- Land_cover (including change detection)
- Fire (active/ scars)
- Energy (LST/ albedo/ PAR/ SWR/ LWR)
- Vegetation (LAI/ fAPAR/ fCover/ VIs/ biomass)

- Soil (moisture, soil type …)

Higher level products not yet considered
(Evapotranspiration, Net Primary Productivity, …)

Mission Statement & Goals

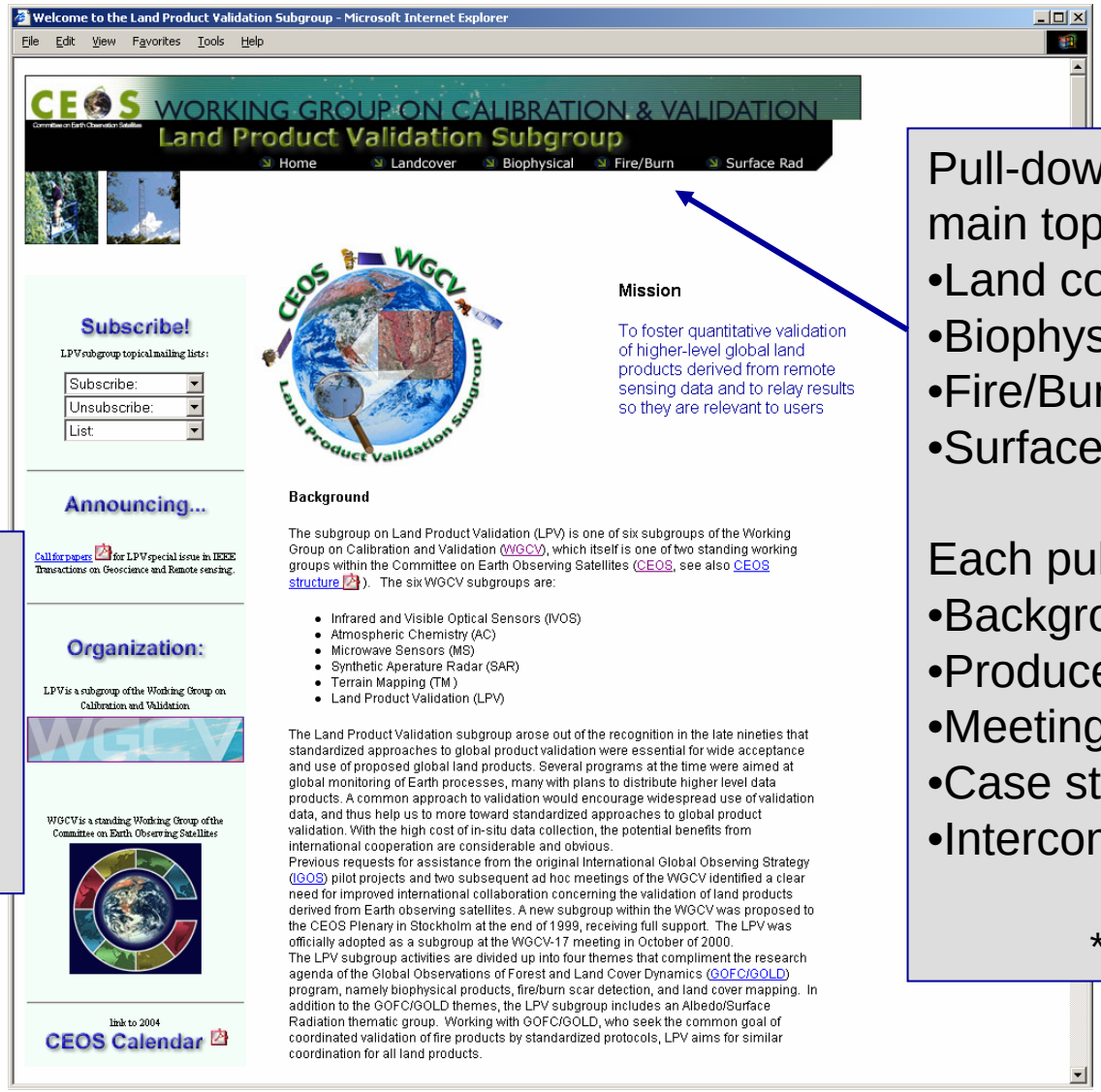
- to foster **quantitative validation** in a traceable way of *higher level global land products* derived from remote sensing data and relay results so they are relevant to users

- to increase the **quality and efficiency** of global satellite product validation *via* developing and promoting international standards and protocols for field sampling, scaling, error budgeting, data exchange

- to provide feed-back to international structures (GEO/GEOSS) for :
  - requirements and achievements on product accuracy
  - definitions of future mission

http://lpvs.gsfc.nasa.gov

Matches WGCV page layout and graphic



Pull-down menu for main topical areas:
- Land cover
- Biophysical
- Fire/Burn
- Surface Radiation

Each pull-down lists:
- Background
- Producers *
- Meetings
- Case studies
- Intercomparisons

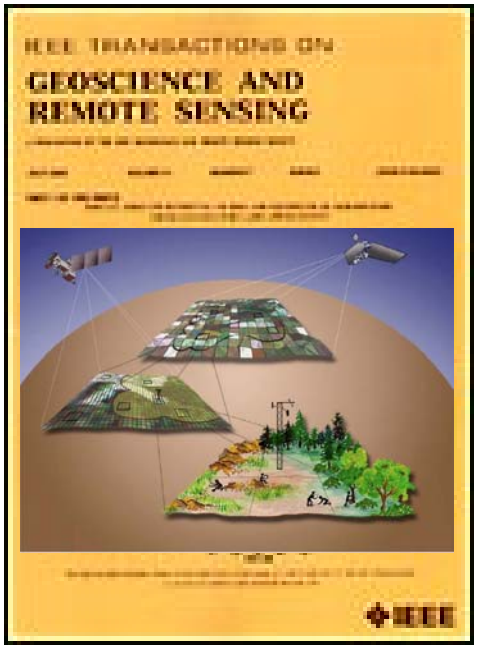
* input needed

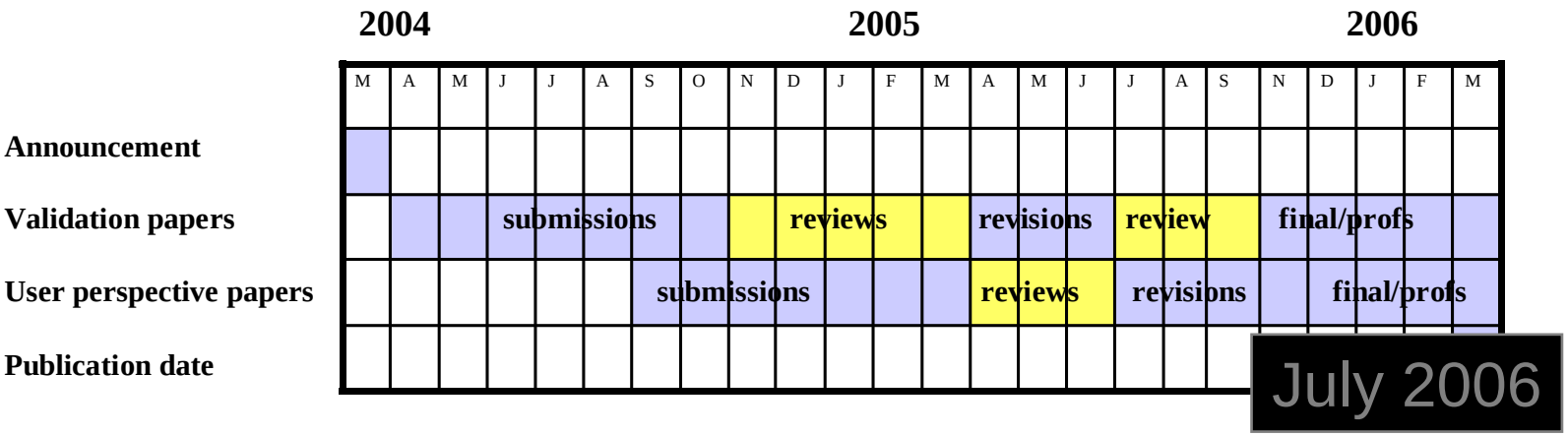
Quick links to:
- Listserves
- Announments
- WGCV
- CEOS and
- CEOS calendar

web curator: Jaime Nickeson, NASA GSFC

LPV “Special Issue” of IEEE TGRS

- Special Issue: describing the state of the art research on both protocol and results for validation and accuracy assessment of global land products
  (Morisette, Baret, and Liang guest editors)
- Three “framework” papers
  19 “validation results” and
  four “user response” papers - an attempt to solicit “user feedback”.





http://www.ntsg.umt.edu/VEGMTG/

NTSG Workshops

http://www.ntsg.umt.edu/VEGMTG/

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Numerical Terradynamic Simulation Group

Global Vegetation Workshop 2006

- **VI Validation (Aug 7):**
  - Home
- **Global Veg (Aug 8-10):**
  - Home
  - Schedule
- **Registration:**
  - Online {Credit Card}
  - Mailing {PDF Form}
  - Register a Poster
- **Missoula & Montana:**
  - Getting to Missoula
  - Hotels/Lodging
  - About Missoula
  - Other Attractions
- **Univ of Montana:**
  - UM Home
  - Campus Recreation
  - Book Store
  - Campus Map
- **More information:**
  Ms. Youngee Cho
  (406) 243-6311, phone
  (406) 243-4510, fax
  Email Youngee

Hosted By:

Long term global monitoring of vegetation variables using moderate resolution satellites:

A combined meeting of the third biennial global vegetation workshop at the University of Montana and the Committee on Earth Observing Satellites Working Group on Calibration and Validation.

August 8-10, 2006

University of Montana
Missoula, Montana

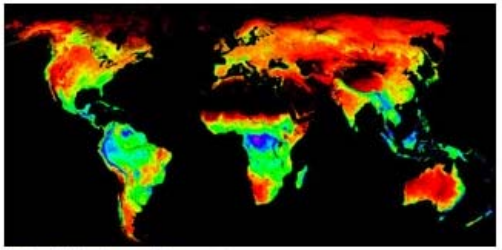
A number of international organizations are focusing on the requirements for, and the accuracy and use of, Earth observation from space to address both science and applications questions concerning our terrestrial environment. There are now multiple global vegetation products from several similar sensors - with more planned over the next several years. This situation has provided the impetus for the CEOS Working Group on Calibration and Validation (WGCV) through its Land Product Validation sub-Group (LPV) to better coordinate satellite-based global observations of vegetation parameters.

The primary objective of this workshop is to establish a framework to understand the inter-relationship between multiple, global vegetation products so to identify opportunities for:

- Increasing knowledge through combined products,
- realizing efficiency by avoiding redundancy, and
- developing near- and long-term plans to avoid gaps in our understanding of critical global vegetation information.

August 7, 2006

VI Validation Pre-Workshop
Validation of global vegetation indices and their time series (*A CEOS Land Product Validation topical workshop*)



Call For Posters

A poster session will run throughout the entire meeting. There will be an initial poster "reception" along with registration on Monday evening, August 7th.

Submit a Poster for the Meeting from the following specific areas:

Global Vegetation Monitoring: Objectives

- Advances in products validation
- long-term continuity of global vegetation data records
- multi-sensor approaches to vegetation monitoring
- global vegetation monitoring applications to the GEOSS “Societal Benefit Areas”
- strategic planning for future sensors

Global Vegetation Monitoring

Advances in products validation

- Good progress have been achieved
- Need validation exercise as independent as possible from the producer teams
- Systematic community evaluation of available products every 2-3 years

Intercomparison

- Global network of sites representative of the global biomes for intercomparison: BELMANIP
- Cut outs by each producers to be available to the whole community
- Data support and archiving required for this activity…
  - Using MERCURY system?
  - automatic intercomparison interface?
- Standard protocols for inter-comparison

Direct validation

- Improvements of representativeness of sites to reach stage 3 of the validation
- More sites
- Encourage synergy between ground measurements at fluxnet sites and RS validation
- Need seasonality description particularly for key phenological periods
- Standard protocols for measurements and data formatting and well documented
- Encourage individual groups to advertise their ground observations at the LPV web site

Global Vegetation Monitoring: Outputs

- Continuing validation/intercomparison essential: need proper support by agencies: answers the need for quantitative uncertainties
- Need for proper data fusion: should build on validation exercise
- Results from the workshop need to be brought forward and integrated in other programs and plans.
- long and consistent time series
  - Strong support of the reprocessing/benchmarking of past AVHRR data (1981…)
  - No gaps between actual series and the next ones (VIIRS, sentinel 2-3)
  - Overlap between 2 sensors necessary for the intercomparison/calibration
  - Backward compatibility
- Need large improvement in the spatial resolution for future missions: multi-agency satellite constellation and receiving/processing systems: CEOS should initiate a pilot working group on sensor constellations (for combined products and mission planning): **Virtual constellations**

Contribution to GEO/GEOSS

- Identify opportunities for coordination and collaboration
  - Capitalize on field data networks coordinated through GEOSS
- Develop consensus “best practice” protocols for data collection and description
  - GEOSS could “approve/publish” related document
- To develop procedures in support to the validation exercise, based on data exchange and management - with a focus on land product validation core sites (done in conjunction with WGISS)
  - GEOSS could “approve” related activities
- To contribute to inter-calibration between products/sensors and accuracy assessment for data fusion (virtual constellation)

CEOS recommendations

The following four WGCV recommendations, generated at WGCV-26, were accepted by the 21th CEOS Plenary:

(1) Request that CEOS members ensure that all future missions include a quality assurance component, stating the accuracy of the data and all derived products;
(2) CEOS requests that **member space agencies coordinate efforts with existing cal/val archives and that member agencies supply the necessary resources to implement the requirement to establish uniform data protocols for collecting, archiving, and accessing validation data across Earth science disciplines**;
(3) CEOS requests that their operational member agencies (e.g. WMO, NOAA, EUMETSAT, USGS, etc.) devise a comprehensive cal/val plan that meets the needs of the extended (e.g. research) user community;
(4) CEOS requests that all member agencies:
   (1) provide support to perform additional ground measurements for direct validation, taking advantage of already existing networks;
   (2) prepare subsets of data/products for global land product inter-comparisons, as described by CEOS/WGCV/LPV;
   (3) support the actual processing of these data sets and the dissemination of the corresponding validation results.

- **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.**

Morning Agenda

09:00-09:30 introduction, objectives, relation to GEO/GEOSS (F. Baret 30mn)

09:30-10:45 Ongoing direct validation activities

- **Activities at the Järvselja test site" (Miina Rautianen 10mn)**
- **Ground validation activities and processing within VALERI" (Philippe Rossello 10mn)**
- **The NCAVEO experiment in UK (T. Milton 10 mn)**
- **Validation sites in China and Germany: sampling approaches" (Frank Veroustraete 20 mn)**
- **Valencia validation activities (Aleixandre Verger 10 mn)**
- **discussion on possible future sites and problems associated to actual ones.**

10:45-12:00 Sample results from direct validation activities

- **Validation of fAPAR products (Bernard Pinty 20mn)**
- **From validation to calibration from ground measurements (R. Fernandes 20 mn)**
- **Validation of LAI and fAPAR products (CYCLOPES/MODIS V4) (F. Baret 20 mn)**
- **Discussion on current status of product validation including the involvment of carbon flux community**

12:00-13:30 Lunch taken in the hotel

Afternoon Agenda (1/2)

13:30 Methodological aspects: Ground measurements
13:30 Definition of LAI and fAPAR variables (F. Baret with all 15mn)
13:45 Comparison of results coming from LICOR and Hemiphotos (Aleixandre Verger 20mn)
14:05 Sample results for LAI estimates from Hemiphotos and CAN_EYE (F. Baret 15mn)
14:20 PAR@METER devices for LAI and fAPAR measurements (F. Baret 10 mn)
14:30 Global mapping of foliage clumping index using POLDER/PARASOL data (J. Pisek 15mn)
14:45 The impact of horizontal fluxes on canopy absorption estimates. (J-L Widlowski 20mn)
15:05 Discussion on the main issues in ground measurements (10 mn)

- clumping problem
- Woody element problem
- Understory problem
- Setting up a benchmark for indirect measurements?

15:15-15:35 Coffee Break (20mn)

Afternoon Agenda (2/2)

15:35 Methodological aspects: Transfer functions and upscaling
15:35 Selection of transfer functions in VALERI processing and sampling scheme (Ph. Rossello 20mn)
15:55 Accounting for PSF (F. Baret 15mn)
16:10 Discussion (25mn)

- Accounting for uncertainties
- Temporal interpolation
- Evaluation of uncertainties

16:30 General discussion

- Contribution to GEO/GEOSS task
- Getting closer to the carbon community in a synergistic way
- Funding of activities
- Organization and dissemination of the data
- Other issues

17:30 END

Definition of biophysical variables

- Consensus on the definitions:
  - LAI: half the developed green leaf (needle) area per unit horizontal soil
  - fAPAR/fIPAR
    - fAPAR: fraction of photosyntetically active radiation (400-700nm) absorbed by the green parts of the canopy
    - fIPAR: fraction of light intercepted by the green parts of the canopy
    - Depends on illumination conditions:
      - *Instantaneous values: satellite overpass (MODIS, Gobron) 10:00 solar (CYCLOPES)*
      - *Diffuse (white sky)*
      - *Daily integrated (depends on illumination conditions)*
      - *fAPAR(θs)*
- Each product and ground measurements should document the departure from these definitions

Conclusion

- **Format of the workshop**
  - Few from across the Atlantic and from east…
  - Lot of discussions: good size!

- **Recommendations**
  - Sharing data
  - Getting more sites for validation
  - Correcting BELMANIP
  - More investigations on clumping
  - Consider also bad products
  - No validation under 1km (3km): consequences on the size of the sites
  - Keeping row data for further processing (LAI2000)
  - Take attention to land cover (for validation of classifications)
  - Characterize (even qualitatively the background)
  - Evaluation of methodology on simulated scenes?
  - Document progresses achieved (accuracy/efficiency) since FIFE, BOREAS, HAPEX, …

- **Actions**
  - GCOS definitions
  - Paper on fAPAR definitions and measurements
  - Report of this meeting to EOS or? (R. Fernandes, G. Schaepman, B. Pinty, F. Veroustate)
  - Next meeting? In USA?
  - Discussion on resampling/projection required