CEOS WGCV
Land Product Validation Update

(September 08 - April 09)

Joanne Nightingale
Innovim LLC / NASA GSFC
Outline

- Objectives and Goals
- LPV group structure
- Ongoing activities
- Planned activities
Land Product Validation Group

• **CHAIR**: Frederic Baret (INRA, France)

• **VICE-CHAIR**: Sebastien Garrigues (CNES, France)

• **NASA Validation**: Joanne Nightingale / Jaime Nickeson (Innovim / GSFC)
Mission Statement

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

• To provide feedback to international structures (GEO/GEOSS) for:
  • Requirements on product accuracy and quality assurance (QA4EO)
  • Terrestrial ECV measurement standards
  • Definitions for future missions
Products Targeted

- Land cover / dynamics (phenology)
- Fire
  - Active
  - Burned area
- Biophysical characteristics
  - LAI / fPAR
  - NDVI / EVI
- Energy
  - Surface reflectance
  - Albedo
- Land Surface Temperature
- Soil Moisture

Images courtesy NASA Visible Earth Gallery
LPV Structure

Structural problem:

- Many diverse satellite-derived land products
- Community is large and scattered
- Need to focus on product groups
- Need to promote international collaboration

Solution: *Land Product Validation Focus Groups*

- Coordinated team leaders
- Connect community members
- Capture expertise
- Provide international partnerships / collaboration
## LPV Structure cont.

<table>
<thead>
<tr>
<th>Focus Group</th>
<th>North America</th>
<th>Europe (Other)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Land Cover / Dynamics</td>
<td>Mark Friedl (Boston University)</td>
<td>Martin Herold (GOFC/GOLD)</td>
</tr>
<tr>
<td>Fire</td>
<td>Luigi Boschetti (University of Maryland)</td>
<td>Kevin Tansey (University of Leicester, UK)</td>
</tr>
<tr>
<td>Biophysical</td>
<td>Joanne Nightingale / Richard Fernandes (NR Canada)</td>
<td>Stephen Plummer (ESA/ESRIN, IT)</td>
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<tr>
<td>Surface Radiation</td>
<td>Crystal Schaaf (Boston University)</td>
<td>Gabriela Schaepman (University of Zurich, SW)</td>
</tr>
<tr>
<td>Land Surface Temperature</td>
<td>Ana Pinheiro (NOAA)</td>
<td>Jose Sobrino (University of Valencia, SP)</td>
</tr>
<tr>
<td>Soil Moisture</td>
<td>Tom Jackson (USDA)</td>
<td>Wolfgang Wagner (Vienna Uni of Technology, AT)</td>
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Structure cont.

• Focus group leads meeting at the Global Vegetation Workshop (Montana, June 2009)
  – Define short and long-term goals of LPV sub-group

1. Communication / data - information dissemination
2. Data set maintenance / updating (field sites)
3. Validation Protocol Development
4. Product Inter-comparisons
Structure cont.

Communication:

- Process for data / information collection and sharing
- Mailing lists
- Group communication via LPV wiki
- Information sharing via LPV website
Ongoing Activities: Direct Validation Data

- CEOS Validation sites
  - Represent globally extensive or important biomes
  - Provide validation field, airborne and satellite data
Direct Validation Data cont.

- **BELMANIP**
  - Primarily developed for LAI inter-comparison work
  - Sites representative of vegetation types, globally distributed
  - Built on existing networks such as EOS Core Sites, FLUXNET, AERONET and VALERI
  - Stratified by GLC2000 land cover
  - Cross-check with Google Earth
  - Homogeneous areas for product inter-comparison
  - BELMANIP V2 = 420 sites
Ongoing Activities: Validation Protocols

Validation protocol development:

– Methods to develop validation “Protocols” - defining “best practice” for direct validation of land products in relation to data, methods, accuracy reporting
– Process for community approval and CEOS endorsement
– Ensuring classification of products via validation hierarchy:

**Stage 1:** Accuracy estimated using a small number of independent measurements obtained from *selected* locations and time periods.

**Stage 2:** Accuracy has been assessed over a *widely distributed* set of locations and time periods.

**Stage 3:** Accuracy has been assessed, and the uncertainties in the product well-established via independent measurements made in a *systematic and statistically robust* way that represents *global* conditions.
Validation Protocols cont.

• “Best practice” for land product validation
  - Current knowledge
  - Available data
  - Tools and methods
  - Tested and repeatable
  - Peer-reviewed
  - CEOS endorsed/published
  - “Living” documents
Validation Protocols cont.

Burned Area Product

- Boschetti & Roy 2008
  - Validation of moderate spatial resolution continental - global scale burned area products
  - MODIS, AVHRR, SPOT-Veg, GLOBCARBON, ATSR (L3JRC, GBA2000)

WGCV Process:

1. Fire LPV community comments
2. Journal review-style address
3. Posting back to entire LPV community
4. Endorsement by WGCV (at Plenary meeting)
5. Publish on LPV webpage and in CEOS communications
Land Product Inter-Comparisons

- Similar products derived from different sensors

- LAI
- Vegetation Indices
- Landcover / Dynamics
- BRDF / Albedo
- Fire

- MODIS
- SPOT-Veg
- AVHRR
- MSG SEVIRI
- ATSR
- TRMM
- GOES
- CERES
- METEOSAT
- ATSR
- MSG SEVIRI
- AVHRR
- MODIS
- SPOT-Veg
Inter-comparisons cont.

Direct validation is both time & resource intensive

- Often existing field data are not representative of global and seasonal variability
- Field data collection - opportunistic / expensive
- Science networks i.e. FLUXNET, difficult to get data
- Complex scaling often resolution is used

Validation Database:
- lpvs.gsfc.nasa.gov
- validation networks: VALERI, BIGFOOT, CCRS, BU,…
- 80 sites; 120 maps

Accuracy Assessment

High resolution imagery (20-30m)

Moderate resolution LAI

High resolution LAI reference map

Aggregate & Relate

Transfer function

LAI Field data
Inter-comparison cont.

• Relative validation:
  – Evaluation of spatial & temporal consistency between products
  – Highlights regions/temporal periods where detailed direct validation studies are warranted

• Completed LAI product inter-comparison at 10km spatial resolution (Garrigues et al.)

• LAI product inter-comparison at 1km resolution in progress (Weiss et al.)
  • Next products:
    – Land cover
    – Land cover dynamics / Phenology?
    – Albedo?
    – Surface Reflectance?
LPV Meetings 2009-2010

- Albedo meeting - Beijing, March 2009
- WGCV-30 Plenary - Brazil, May 2009
- Global Vegetation Workshop - Montana, June 2009
- Fire products - 2009?
- Soil moisture, TBD - 2010?
- Temporal signatures, TBD - 2010
- More TBD by Focus Group leads and community requirements
Priorities 2009 - 2010

1. Organization (focus group leads)
2. Burned Area Protocol endorsement at WGCV-30
3. Selecting next product for protocol document development
4. Finalizing LAI inter-comparison work
5. Selecting / starting next product inter-comparison
6. Enhancing global validation field site network
Val-i-da’tion *n.*

A process associated with the collection and production of intelligence that confirms that an intelligence collection or production requirement is sufficiently important to justify the dedication of intelligence resources, does not duplicate an existing requirement, and has not been previously satisfied.