LAND PRODUCT

SUBGROUP REPORT

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WGCV 21 Beijing China 15-17 October 2003

LPV outline

- review of subgroup's status and goals
- current activities
  - Land Product Accuracy statement (needs updating!)
  - CEOS Core Sites (with WGISS)
  - Listservs
  - Special Issue proposal (looking for input)
- Upcoming activities
  - Upcoming workshops
  - Biome map
  - Opportunities
- Conclusions

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Working Group on Calibration & Validation

CEOS

Land Product Validation Subgroup

- Established in 2000
- Followed Terrain-mapping subgroup as topic-specific subgroup (non-wavelength-specific)
- Jeff Morisette (NASA) starting as chair in February 2003
- Agreement from Fred Baret ("VALERI, INRA-CSE) to be "chair-elect"= potential chair in 2006)

- Web site linked off of WGCV home page (and plan to adopt WGCV web design)

CEOS Definition

Validation:

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

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

Why validate global land products

- WGCV definition implies
  validation = “Estimating Uncertainty”
- Good science and resource management require understanding of product accuracy/uncertainty
- Explicit statements of uncertainty fosters an informed user community and improved use of data
- International environmental protocols and agreements imply products may be independently evaluated and possibly challenged
- As more, and similar, global products are produced by CEOS members, inter-use will require characterization of each product’s uncertainty

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
- **To identify and support global test sites for both systematic and episodic measurements (WGCV/WGISS test facility)**
- 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”?)*
- Develop procedures for validation, data exchange and management (with WGISS)
- To serve as a clearinghouse for accuracy statements on CEOS member global land products

Big Picture

LPV provides a validation service to the Integrated Global Observation Strategy's Global Terrestrial Observation System.

Implications:

- Focus Products: Biophysical, Land Cover, & Fire
- Working in conjunction with GOFC/GOLD's regional networks
- Need to integrate with TEMS & GT-Net

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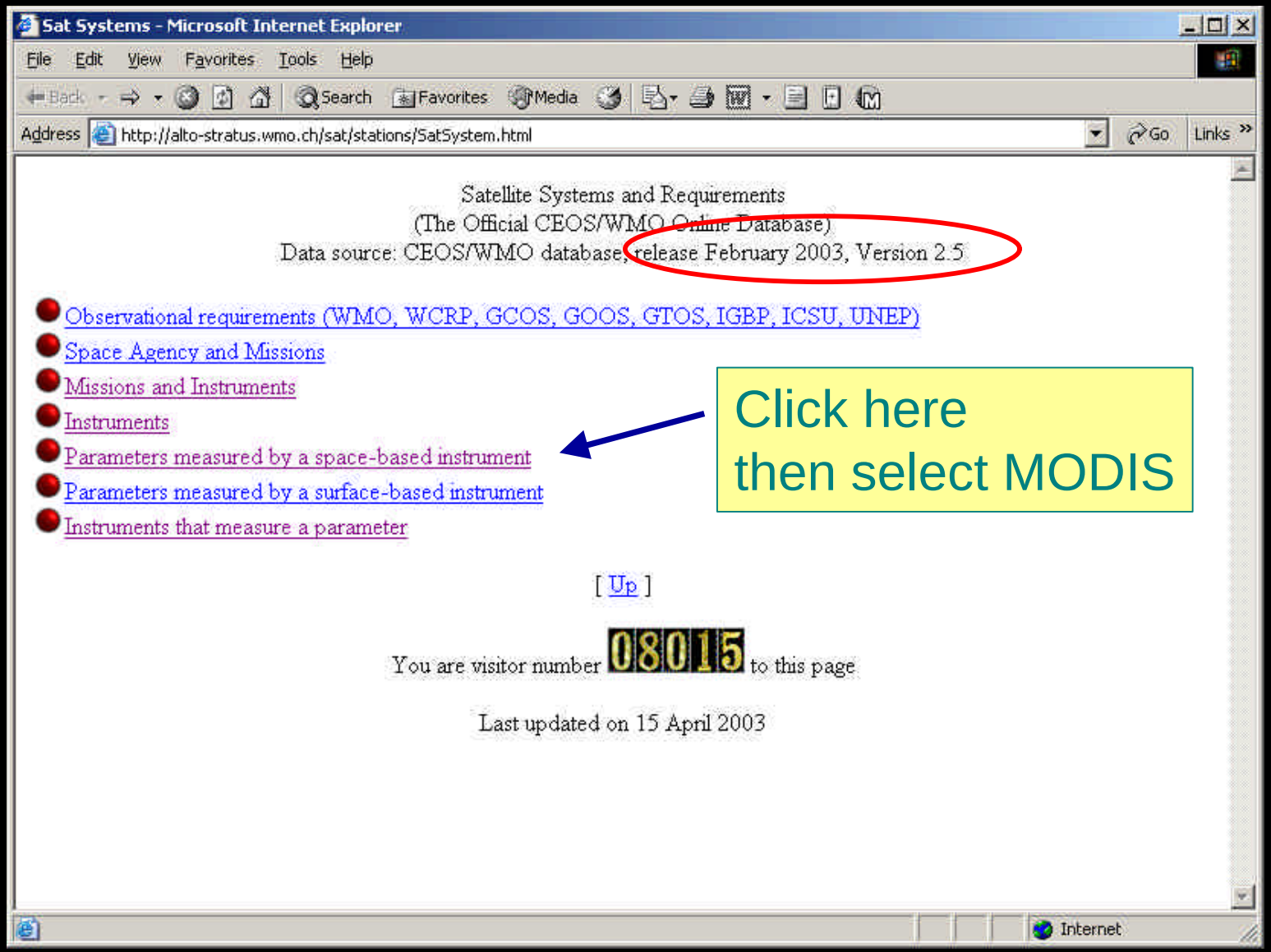
CEOS page…(independent of LPV)



…several of the MODIS parameters

Parameter	Resolution	Accuracy	Obs Cycle	Delay
Fire area	1 km	5 % (Max)	1 d	Missing
Fire temperature	1 km	Missing	1 d	Missing
FPAR	1 km	25 % (Max)	10 d	Missing
Land cover	1 m	Missing	0.085 y	Missing
Land surface imagery	Missing	Missing	Missing	Missing
Land surface temperature	1 km	1 K	24 h	24 h
Leaf Area Index (LAI)	1 km	25 % (Max)	10 d	2 d
NDVI	1 km	10 % (Max)	10 d	24 d
Sea-ice cover	1 km	Missing	24 d	24 d
Snow cover	1 km	10 % (Max)	168 h	576 h
Vegetation type	1 km	Missing	96 d	2 d

- Apparently based on algorithm theoretical base documents – not actual data
- And there did not appear to be linked support information

MODIS validation “hierarchy”

- **Stage 1 Validation:** Product accuracy has been estimated using a small number of independent measurements obtained from selected locations and time periods and ground-truth/field program effort.
- **Stage 2 Validation:** Product accuracy has been assessed over a widely distributed set of locations and time periods via several ground-truth and validation efforts.
- **Stage 3 Validation:** Product accuracy has been assessed and the uncertainties in the product well established via independent measurements in a systematic and statistically robust way representing global conditions.

Accuracy statements

- Should be “user-oriented” and supported with peer-review literature
- Augment validation “stage hierarchy”
- Standardize/summarize information for each product
- MODIS land team plans to update CEOS information for MODIS land products

Example: MODIS accuracy statements

MODLAND
Validation home page

Link to accuracy statement for each product

…page for each product

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

PI maintained validation page

…page**s** for supporting materials

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

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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

- currently staging MODIS and SPOT VEG for 5 sites
- proposal for MERIS accepted, data forthcoming
- possibly MISR, GLI, SRTM, Chinese satellites
- plan to incorporate WTF with EOS Core Site page and ORNL's Mercury

More on this later…

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Five listservs established

ceos_lpv_gen@listserv.gsfc.nasa.gov

General information regarding LPV activity, both scientific and administrative

ceos_lpv_rad@listserv.gsfc.nasa.gov

surface RADiation products, including surface reflectance/atmospheric correction, land surface temperature, albedo and BRDF

ceos_lpv_bio@listserv.gsfc.nasa.gov

BIOphysical parameters, including vegetation indices, leaf area index, FPAR, and vegetation productivity

ceos_lpv_lc@listserv.gsfc.nasa.gov

Land Cover and land cover change products

ceos_lpv_fire@listserv.gsfc.nasa.gov

FIRE, burn scar, and fire emissions products

(related to action WGCV 20-11)

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Proposed TGARS special issues

Purpose:

- Lay out the current suite of higher-level global land products and quantitatively establish their accuracy.
- Provide a user's perspective on the implications of a product's accuracy to understand:
  - how accurate the product needs to be
  - why it is important to quantify the uncertainly
  - how close currently available data come to meeting those needs

Proposed TGARS special issues

- Jeff Morisette and Fred Baret co-editors
- Describing the state of the art research on both protocol and results for validation and accuracy assessment of global land products.
- Three sections:
  - Surface Radiation variables
  - Ecosystem variables
  - Land cover characteristics (including land cover change, fire, and burnt area)
- Solicit a summary from User/GCM community to write a note for each section on the implication for the uncertainty/validation of the products

Special issues: potential invitees*

Radiation Budget Variables:

- Surface Reflectance
  - MODIS (Vermote and Morisette)
  - VEGETATION and POLDER (CNES, O. Hagolle)
  - MERIS (P. Goryl)
  - GLI (Terry Nakajima, Alfredo Huete)
- Land Surface Temperature (LST)/Emissivity,
  - MODIS (Zhangming Wan, Simon Hook, Fred Prata)
- Snow and Ice Cover,
  - MODIS (Dorothy Hall)
  - MSG (Carlos da Camara)
- Albedo/Bi-directional Reflection Distribution function (BRDF)
  - MODIS (Jeff Privette, Crystal Schaaf, Shunlin Liang)
  - Meteosat (Yves Govaerts)
  - POLDER (J.L. Roujean, R. Lacaze, B. Geiger, O. Samain)
- Global Climate Modeling perspective on the accuracy of radiation budget variables (Robert Dickinson)

** Draft list – this list does not imply commitment on behalf of the authors or the editors*

Special issues: potential invitees*

Ecosystem Variables:

- Vegetation Indices
  - MODIS/AVHRR/GLI (Alfredo Huete)
  - AVHRR-historical (Jorge Pinzon)
- Leaf Area Index (LAI)/Fractional Photosynthetically Active Radiation (FPAR),
  - MODIS and the CEOS LAI-Intercomparison (Ranga Myneni, Jeff Privette, Jeff Morisette, Fred Baret, Richard Fernandes, Jing Chen)
  - MERIS (Bernard Pinty)
  - VALERI program (Fred Baret, also include continuous fields validation)
  - BigFoot program (Warren Cohen, also include Land Cover & NPP validation)
- Vegetation Production: Daily Photosynthesis (PSN)/Annual Net Primary Production (NPP)
  - MODIS and Fluxnet (Steve Running, Dennis Baldocchi)
  - VEGETATION (Frank Veroustraete)
  - GLOBCARBON (Stephen Plummer)
- Global Climate Modeling perspective on the accuracy of Ecosystem variables (Gordon Bonan)
- Global Terrestrial Observing System perspective on the accuracy of Ecosystem variables (Josef Cihlar)

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Special issues: potential invitees*

Land Cover Characteristics:

- Fire and Thermal Anomalies and Burned Area

  JRC's fire and Burn scar products (Jean-Marie Grégoire)

  ESA's fire and burn scare products (Olivier Arino)

  MODIS fire and burnt area (Justice, Roy, Csiszar)

- Land Cover

IBGP, GLC2000, and MODIS: Strahler/Woodcock/Mayaux

Vegetative Cover Conversion and Vegetative Continuous fields:

MODIS (Ruth DeFries, Matthew Hansen)

- Global Climate Modeling perspective on the accuracy of Land cover characteristic variables (Gordon Bonan)

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Proposed TGARS special issues

- Suggestions for other invitees are welcome
- Suggestions or volunteers for reviews are welcome
- Proposal will be submitted to IEEE TGARS in 2003
- Anticipated publication date in 2005
- Ultimate objective is to provide not “mandatory protocols” but an “acceptable standard”

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LPV Upcoming Topical workshops

- "Results" workshop for LAI-intercomparison
  fruition of LAI-intercomparison
  Spring 2004, University of Montana, Missoula, USA
- Follow-up Land Cover/Change
  aiming toward "best practices" document
  Early 2004, Boston University, USA
- Fire and Burn scar:
  Global Geostationary Fire Monitoring Applications
  A Joint GOFC/GOLD Fire and CEOS LVP Workshop
  March 23-25, 2004, EUMETSAT, Darmstadt, Germany
  (related to Action WGCV 20-8)
- Surface Reflectance and Albedo/BRDF
  ? in conjunction with IVOS intercomparison meeting
  ? and/or in conjunction with next BSRN

LPV Inter-comparison

Site contacts provide “Vital Statistics”

LPV provides subsets of global LAI product(s)

LPV to create link to the site from the LAI-intercomparison page

Field campaign(s):

LPV acquires and posts relevant high-res multispectral imagery

Site contacts collect field data and register these in the Mercury system

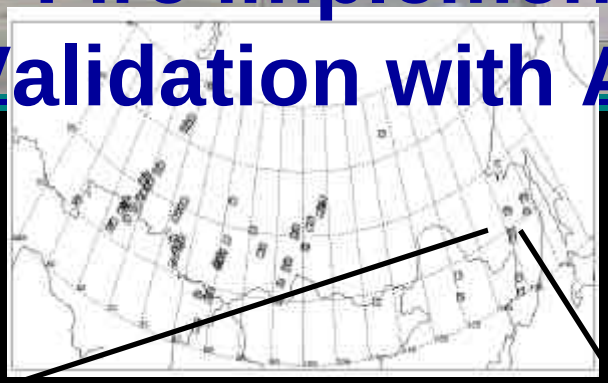
Site contacts provide Internet link to locally maintained high-resolution LAI surface, with proper documentation on how the surface was derived

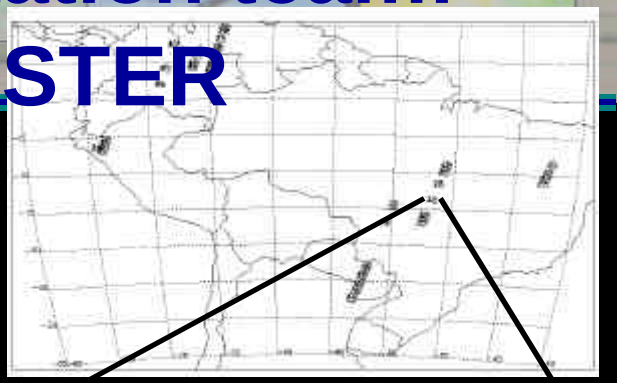
LPV posts link to LAI-surface on LAI-intercomparison page

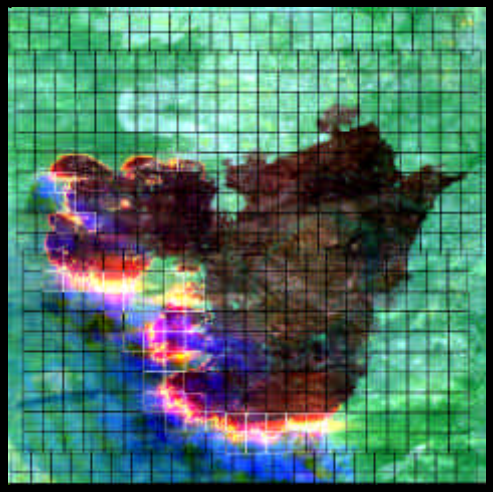
Data are shared among fellow “LAI-intercomparison” participants for research comparing both validation results and methods

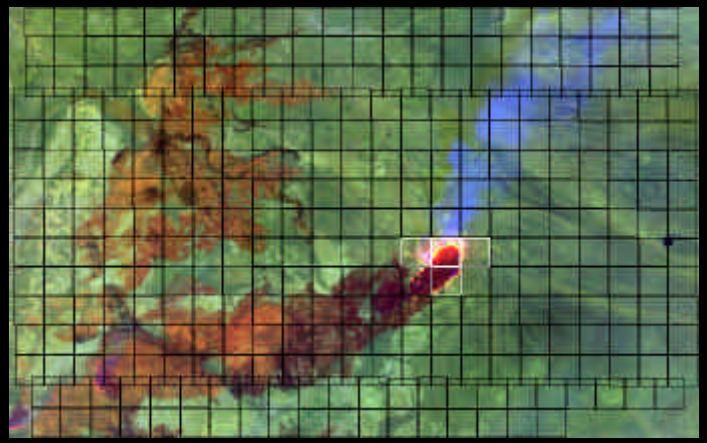
Sites added to this international activity are those that help create a globally representative sample - across biomes and continents
AND
have a strong need or intention to utilize global, coarse resolution, LAI products.

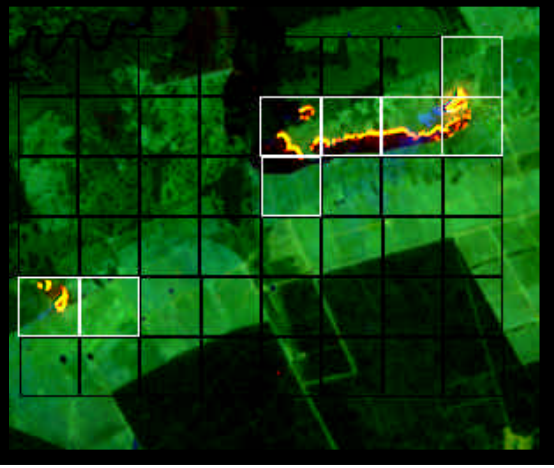
GOFC/GOLD Fire implementation team:
Active Fire Validation with ASTER

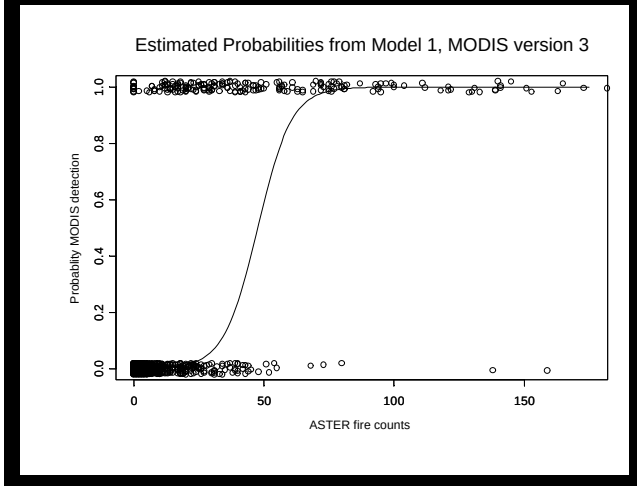


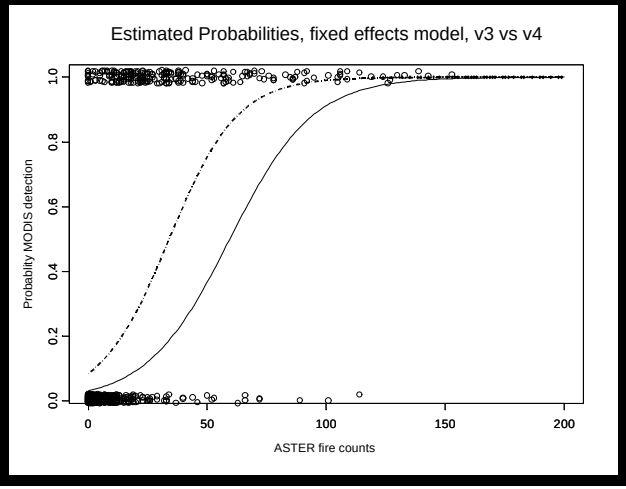


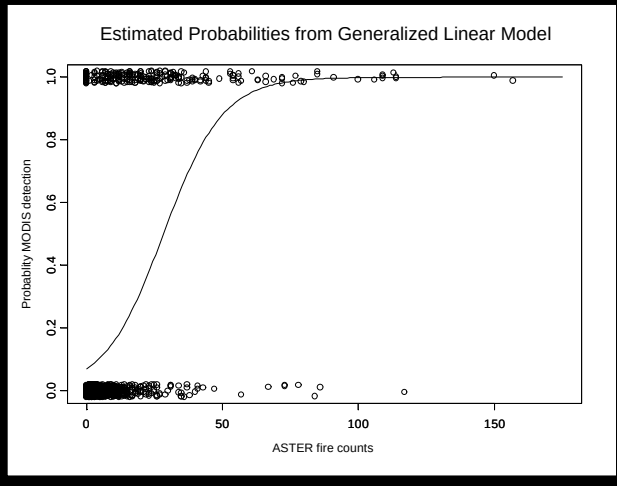












GOFC-Fire: MODIS vs BIRD

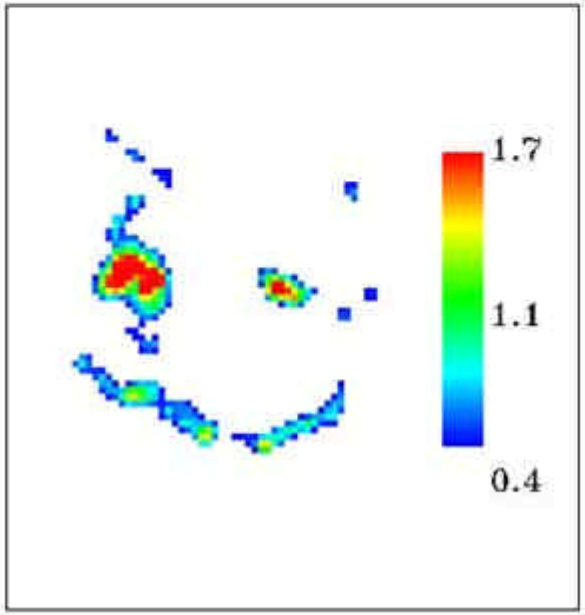
MODIS Fire - Validation

Address http://modis-fire.gsfc.nasa.gov/validation.asp go

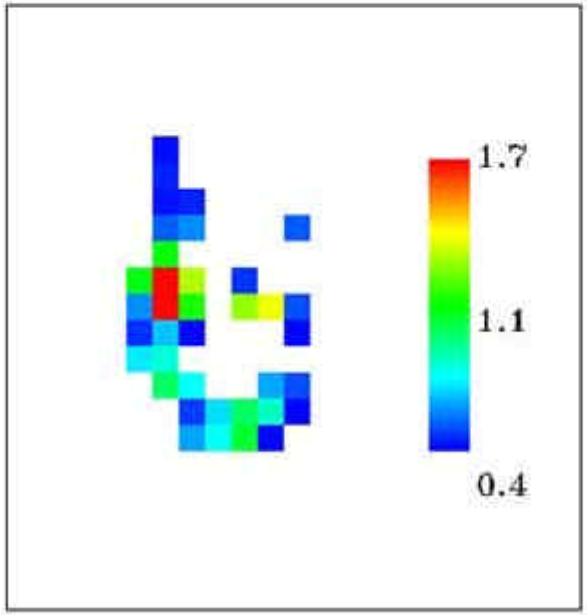
Validation by Near-Coincident Data from the Experimental Fire Satellite "BIRD"

Comparison with near-coincident observations by the BIRD (Bi-Spectral Infrared Detection) satellite is under way in collaboration between DLR, Germany, and the University of Maryland. BIRD is a dedicated experimental platform for hot spot detection with high saturation temperatures to allow the measurement of energy release.

BIRD HSRS MIR (3.4-4.2 µm)

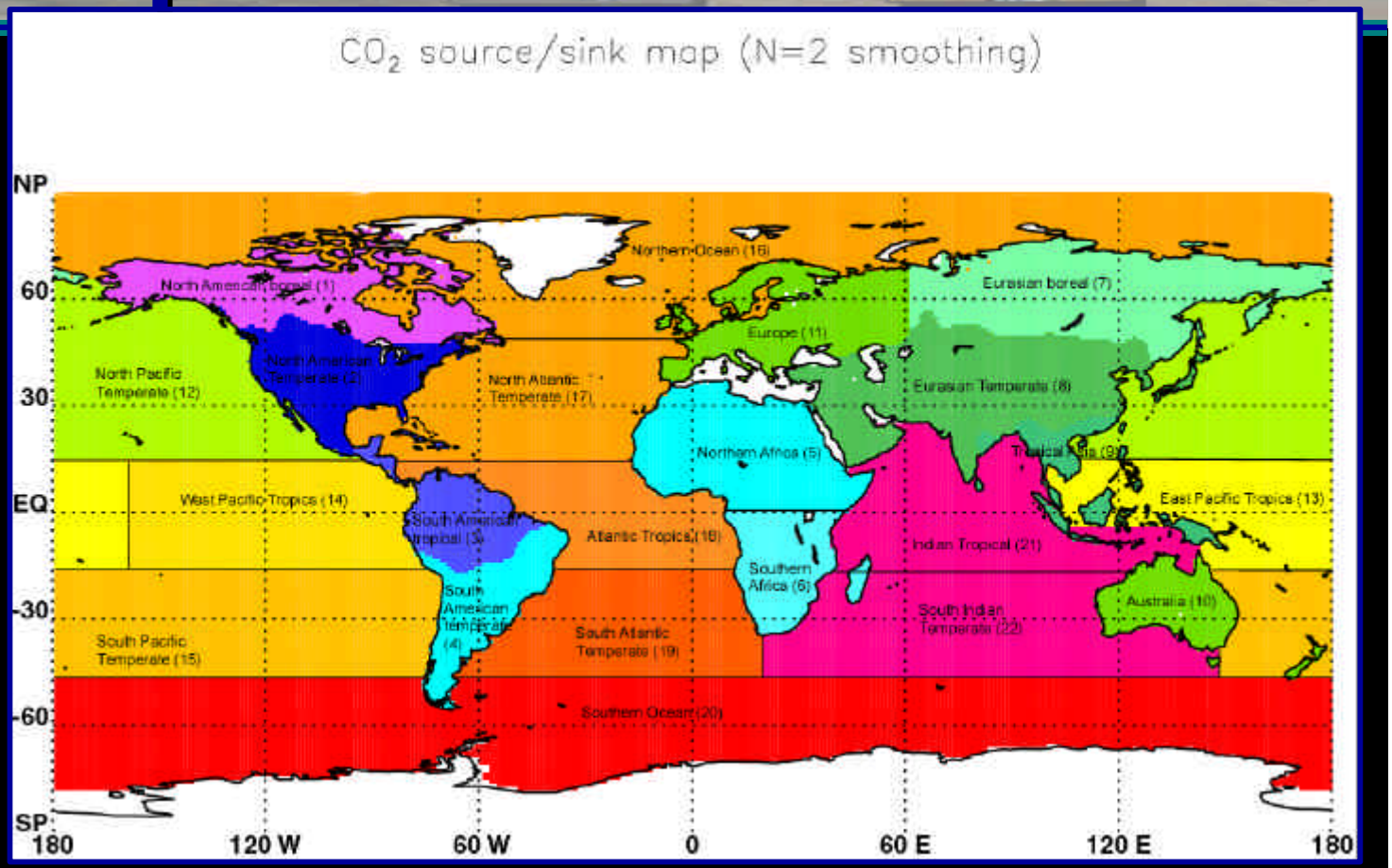


MODIS band 21 (3.929-3.989 µm)



Internet zone

Biome Map



- Exhaustive and mutually exclusive global biome map
- Serendipitously matches several GOFC/GOLD regional networks
- Published - independently of LPV

Gurney et al. (2002) Towards robust regional estimates of CO2 sources and sinks using atmospheric transport models. Nature, 415, 626-630, 7 Feb. 2002.

LPV opportunities

Need to determine the proper relationship and role for LPV/CEOS Land Validation Core Sites and the two, related GTOS activities:

- GT-Net
- TEMS

Pending Proposal will help support LPV activities:

Response to NASA Research Announcement (NRA-03-OES-02) to support LPV infrastructure
(selections anticipated by late 2003)

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Conclusion

- LPV needs to establish interaction with CEOS/WMO database
- WGISS Test Facility is getting significant attention & there is now the need to define stage 2 and beyond
- Special issue is a major undertaking but will realize some initial goals
- LAI-Intercomparison results will help assess the utility of this type of activity