VIIRS Land SIPS, JPSS Land Product, and CEOS/WGCV/LPV Status

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VIIRS Land Web Site (http://viirsland.gsfc.nasa.gov/)

Public as of 2014

Home Page includes -> News, Meetings, Sensor and Land Data information

Navigation includes -> Products - Validation - People - Tools - Publications – Links

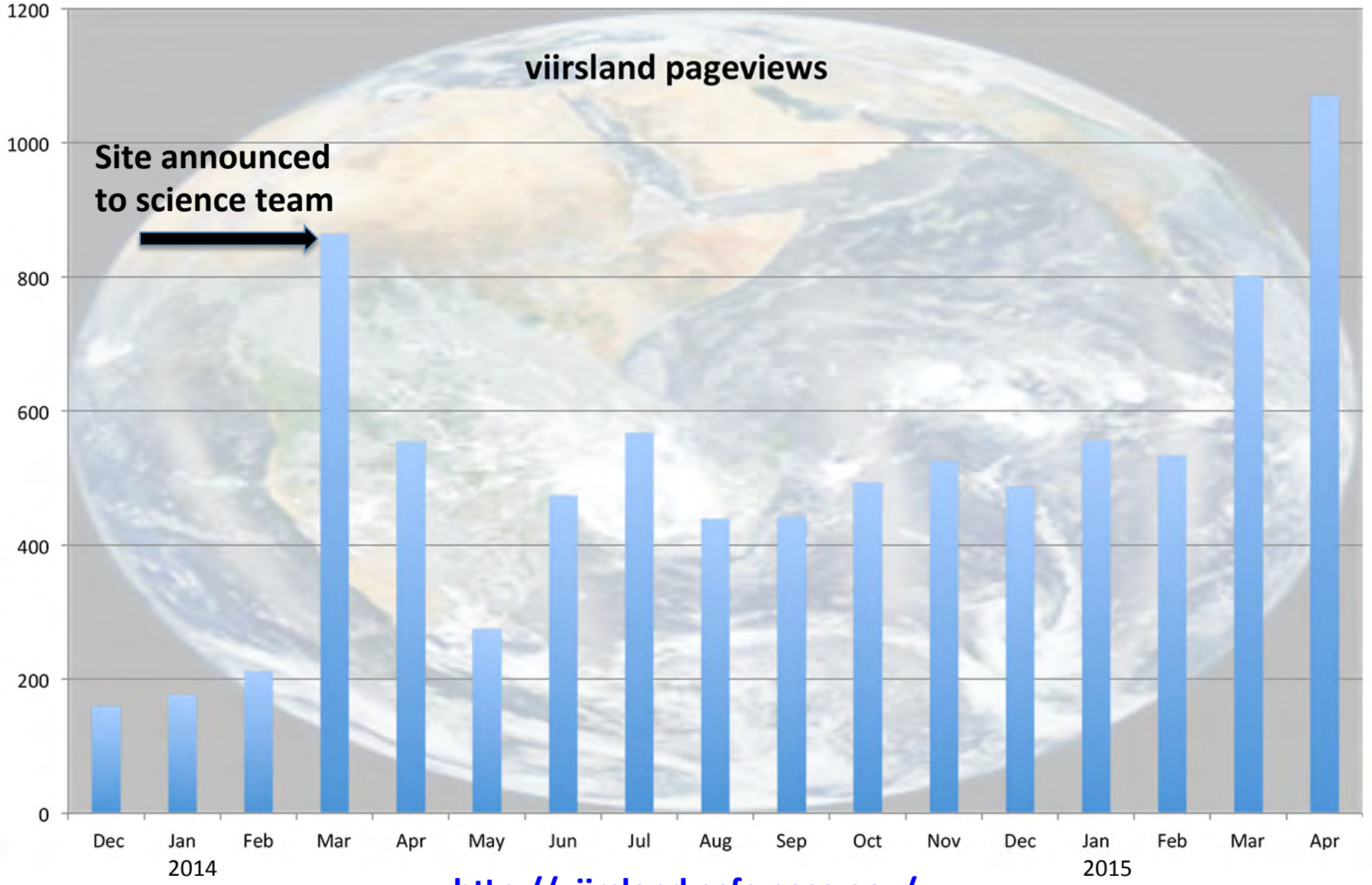
Please keep us informed of publications, particularly those that are peer-reviewed

Input is welcome, please send us news or validation plans.

Recently Updated – NASA/NOAA

- The **Products** navigation button was separated into **NOAA EDR** products and **NASA ESDR** products. Main product page for each agency describes their general approach (SIPS vs. IDPS). Each NASA product page includes a Validation Plan section. The NOAA page includes a section for NOAA-unique products.
- **People** page includes navigation at left to pages for both the NASA Science Team and NOAA Product Team members
- Additional updates as SIPS get rolling and products advance

VIIRS Land Monthly Web site visits



http://viirsland.gsfc.nasa.gov/

VIIRS Land SIPS Tasks

1. Assist the SNPP Science Team with integrating and testing the product generation software in the SIPS environment,
2. Implement the product generation software in MODAPS,
3. Create VIIRS Level 1-3 products in multiple processing streams (next slide)
4. Reprocess VIIRS products when directed by the SNPP Land Science Team,
5. Provide assessment capabilities for VIIRS land products (LDOPE),
6. Deliver VIIRS land products, software, browse imagery, and associated ancillary data and metadata to LP and NSIDC DAACs for archive and distribution.
7. Produce and deliver VIIRS products required as inputs in CERES processing

Product Generation by Land SIPS

Land SIPS processing will be separated into four separate modes, all operating simultaneously:

1. Forward Stream Processing Mode: create the best possible global VIIRS L1B and Land L2/L3 products using the highest fidelity input data sources (requires 24-48 hour delay). Land L2/L3 products are delivered to LP and NSIDC DAACs.
2. Near Real-Time Processing Mode: create low latency global VIIRS products (< 3 hours) in LANCE (nrt3 and nrt4 strings).
3. Historical Reprocessing Mode: create the best possible VIIRS L1B and Atmosphere L2/L3 products for the entire SNPP mission record. Land L2/L3 products are delivered to LP and NSIDC DAACs.
4. Experimental Reprocessing and Evaluation Mode: create global VIIRS Level 1B and Land L2/L3 test for review and evaluation by the SNPP Science Team. *Products are available to Land Science Team only.*

Items Delivered to DAAC

1. Data products along with scientific algorithm software source code, coefficients, and ancillary data used to generate these products to the NASA-assigned Distributed Active Archive Center (DAAC) *with no period of exclusive access*.
2. Algorithm Theoretical Basis Document (ATBD) documentation as well as the accompanying spatial, temporal, and product metadata associated with the standard products.
3. Browse products associated with standard products.

Land SIPS (Current Processing Status)

- AS 3000
- AS 3001
- AS 3002
- C1.1 Reprocessing
  - Mx7.2 based codes with Land PEATE improvements for Aerosols, LSR, and Geolocation
  - Snow Ice initiates from Daily NISE (Near real time Ice and Snow Extent) that is gridded, not IDPS Snow Ice GIP files.
  - VI initiates from 4-year mean of MODIS Aqua 16-day tiled product, MYD13A2, not IDPS 17-Day Rolling NDVI.
  - Uses “Best Of” LUTs for SDR/Geo codes as provided by VCST
  - 1/19/2012 through 3/31/2015 complete
  - Reprocessing of April 2015 underway

Land SIPS Reprocessing – Transition C1.1 to C1.2

C1.2 Reprocessing/Operational Forward Processing

- Will start after the NASA L1 becomes available (June 2015)
- Will use Mx8.6 based SDR and Geolocation (or NASA VCST and GEO code if becomes available)
- Will use new Mx8.6 based LUTs from VCST for Geolocation & SDR. (Could also use NASA VCST LUTs in compliant with the NASA VCST delivered calibration code)
- Implement scaling for DNB products
- C12 will be continuation to C11. Reprocessing from beginning of mission (1/19/2012) will be done with mandate from NASA science team.
- Will use same PGEs as in C11 for all other products, unless new algorithms are provided by the NASA science teams for the product
- NASA science team delivered algorithms will replace the operational PGEs as algorithms become available.
- Operational processing streams in AS 3001 and 3002 will cease.
- A science test processing system in place to support science testing of NASA ST delivered algorithms.

Land SIPS VIIRS NRT and Science PGEs

NASA VIIRS Science PGEs

- Will use EDOS L0 PDS as starting point, not RDRs
- NASA VIIRS L1A->Geolocation->L1B will be first level of processing
- Ancillary files, such as NCEP, NAAPS, TLE and PolarWander will be from GDAAC in their native format rather than the hdf5 wrapped versions from IDPS
- L1A, L1B and Geolocation products will be netCDF/HDF5 format
  - Will have option for users to obtain data in hdf4 format
- Swath products will be 6-minute granules
- Plan to port existing Land PEATE Science DDRs to Land SIPS PGEs. Will try to match MODIS numbers.
  - New numbering scheme (e.g. Surface reflectance – PGE11 in MODIS Land, PGE511 in Land SIPS)
  - New ESDTs (e.g. Surface Reflectance – MOD09 in MODIS Land, VIIRSNP09 in Land SIPS)
  - New Archive Sets to be used in processing – Inherit Collection Version Number
- Will use IDPS PGE code where necessary or desired, and science team delivered code if already available
  - CloudMask will be IDPS code initially
  - Fire algorithm provided by the science team

NRT PGEs

- Production Plans:
  - Active Fire (Louis Giglio's code)
  - Corrected Reflectance (as obtained from Direct Readout Laboratory)
  - Chain of PGEs for Land Surface Reflectance, to determine latency only
  - Daily Gridded Day/Night Band Products (Virginia Kalb and Zhuosen Wang's code)
- Using IDPS SDR/Geo codes, Mx8.6 version
- Processing with NCEP, NAAPS, TLE and PolarWander data from GDAAC

VIIRS NASA Data Production

The NASA ROSES-13 SNPP Science Team Call was for both the Science Team that would produce NASA Earth Observing System (EOS) Continuity Data Products and for the establishment of multiple Science Investigator-led Processing Systems (SIPS) to produce the science data products to be developed by the Suomi NPP science teams. The new science team selections focus on developing the refined and/or alternative data products and earth science data records (ESDRs) still needed to ensure that high-quality data records for Earth system science and applications that enable continuity with NASA EOS data products are available for all.

The activities to generate and distribute NASA Suomi-NPP VIIRS Land Science products include development of Algorithm Theoretical Basis Documents (ATBDs) prior to transition to operations at NASA's SIPS, and long-term archiving and distribution at the Land Processes Distributed Active Archive Center (LP DAAC). Most products have their heritage in the MODIS product algorithms, and in some cases early versions of the MODIS code were used by the operational VIIRS algorithm development teams. Based on these two criteria, the VIIRS Land Discipline Team, Land SIPS, and Validation leads have established priorities and phased plans detailing the production of Suomi NPP Land Science Products (see table below). The ATBDs for these products will include updates to reflect the latest MODIS (Collection 6) algorithm principles, as well as the VIIRS instrument capabilities and unique specifications. Finally, a subset of the VIIRS land product suite (Land SIPS-designated Type 2/3 products) will require, (1) a new prototype, (2) substantial algorithms modifications, and/or (3) a new approach that may result in significant additional product development.

EOS Products	Heritage MODIS ATBD	Land SIPS Production Status	Same Algorithm as JPSS ATBD	Algorithms Delivered to the Land SIPS for Processing	Draft ATBD Delivered for Review	Delivery of User's Guide	Products Delivered to DAAC
Surface Reflectance	✓	✓	✓	1-Mar-15	30-Apr-15	30-Apr-15	29-Jul-15
LAI/FPAR	✓	Prototype**	No	30-Aug-15	1-Sep-15	1-Sep-15	28-Feb-16
Snow Products	✓	Prototype*	No	30-Aug-15	30-Aug-15	30-Aug-15	26-Feb-16
MAIAC	✓	New	No	30-Aug-15	30-Sep-15	30-Sep-15	29-Dec-15
BRDF/Albedo	✓	Prototype**	No	30-Sep-15	28-Mar-16	28-Mar-16	28-Mar-16
Burned Area	✓	New	No	30-Nov-15	30-Jan-17	30-Jan-17	31-Dec-16
Active Fires	✓	✓	✓	30-Dec-15	30-Jun-15	30-Jun-15	29-Mar-16
Vegetation Index	✓	New	No	30-Dec-15	1-May-16	30-May-16	30-Apr-16
LST&E	✓	New	No	1-Jan-16	1-Aug-16	1-Aug-16	31-Dec-16
Ice Products	✓	New	No	30-May-16	30-May-16	30-May-16	26-Nov-16
Phenology	✓	New	No	31-Oct-16	31-Oct-16	31-Oct-16	29-Apr-17

✓Completed Task; *Product integration has begun; **Product integration has completed and testing has begun; *** Product integration and testing has completed.

JPSS Land EDR Product Status

JPSS/GOES-R Data Product Validation Maturity Stages – DEFINITIONS (Nominal Mission)

1. **Beta**
   - Product is minimally validated, and may still contain significant identified and unidentified errors.
   - Information/data from validation efforts can be used to make initial qualitative or very limited quantitative assessments regarding product fitness-for-purpose.
   - Documentation of product performance and identified product performance anomalies, including recommended remediation strategies, exists.

2. **Provisional**
   - Product performance has been demonstrated through analysis of a large, but still limited (i.e., not necessarily globally or seasonally representative) number of independent measurements obtained from selected locations, time periods, or field campaign efforts.
   - Product analyses are sufficient for qualitative, and limited quantitative, determination of product fitness-for-purpose.
   - Documentation of product performance, testing involving product fixes, identified product performance anomalies, including recommended remediation strategies, exists.
   - Product is recommended for operational use (user decision) and in scientific publications.

3. **Validated**
   - Product performance has been demonstrated over a large and wide range of representative conditions (i.e., global, seasonal).
   - Comprehensive documentation of product performance exists that includes all known product anomalies and their recommended remediation strategies for a full range of retrieval conditions and severity level.
   - Product analyses are sufficient for full qualitative and quantitative determination of product fitness-for-purpose.
   - Product is ready for operational use based on documented validation findings and user feedback.
   - Product validation, quality assurance, and algorithm stewardship continue through the lifetime of the instrument.

JPSS accuracy requirements: http://viirsland.gsfc.nasa.gov/NOAAprod.html

VIIRS Active Fire

Current Operational IDPS Product

- Contextual-thresholding detection algorithm based on MODIS Collection 4 algorithm
- List of detections over cloud-free land
- File format: HDF5

Cal/Val Maturity Status:

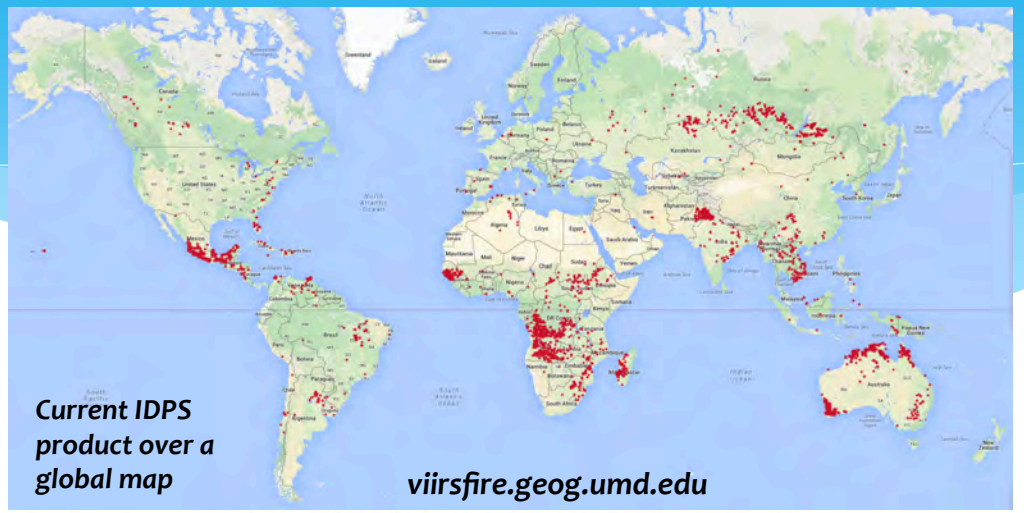
- **Validated** 09/04/2014 Science Review; S-NPP Active Fire ARP was declared **Operational** by SPSRB in Aug-2014

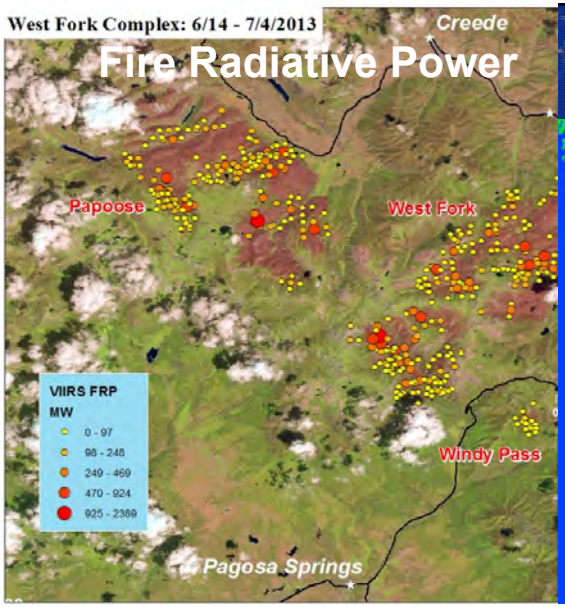
J1 Updates/Improvements:

- Collection 6-equivalent algorithm
- Include additional output: fire radiative power (FRP)
- Global coverage (including water)
- Full fire mask
- File format: netCFD4

Schedules/Timeline:

- Tailored version of the NASA science code for NOAA real-time applications
- To be implemented in NOAA's Suomi NPP Data Exploitation (NDE) system by late Summer 2015
- **To become the operational NOAA product for Suomi NPP after verification**





NASA science code output

NOAA NDE test code output

CRITICAL INFORMATION AIR QUALITY, ECOSYSTEM, AND DISASTER MANAGEMENT

Ivan Csiszar, NOAA/NESDIS/STAR; Wilfrid Schroeder, Louis Giglio et al. UMD

VIIRS Vegetation Index EDR

Products

- Normalized Difference Vegetation Index (NDVI) from top-of-atmosphere (TOA) reflectances
- Enhanced Vegetation Index (EVI) from top of canopy (TOC) reflectances
- Normalized Difference Vegetation Index (NDVI) from top of canopy (TOC) reflectances (New Product for JPSS-1)
- File format: HDF5

Cal/Val Maturity Status:

Validated 04/01/15 AERB Approved

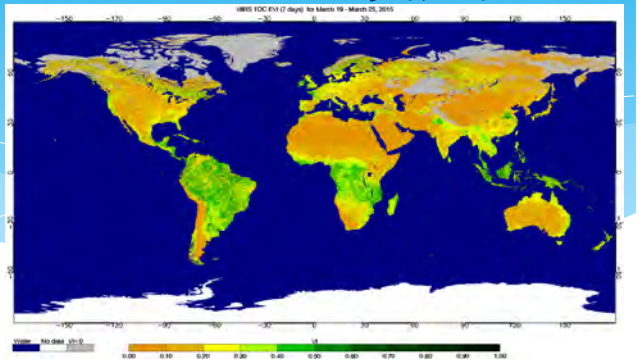
- **J1 VI EDR Updates/ Improvements:**
  - Addition of a new dataset (TOC NDVI)
  - Addition of a new Quality Flag byte (QF4)
  - Improved definition of high quality of the product
  - Implementation of an EVI alternate (EVI2) algorithm
  - Generation of Level 3 products (spatial and temporal composites)

APU Estimates (2013 – 2014)

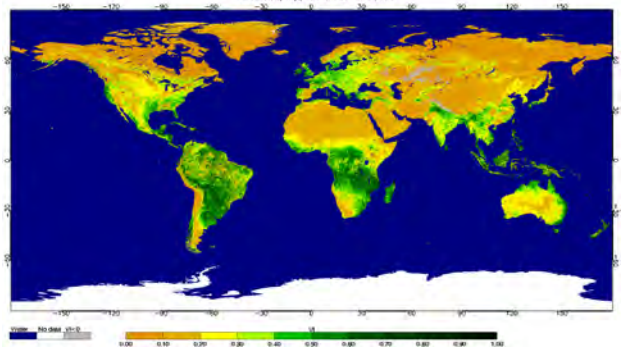
Attribute	LIRDS Threshold (VI units)	Validation Results
TOA NDVI Accuracy	0.05	0.005
TOA NDVI Precision	0.04	0.017
TOA NDVI Uncertainty	0.06	0.020
TOC EVI Accuracy	0.05	0.037
TOC EVI Precision	0.04	0.015
TOC EVI Uncertainty	0.06	0.039
TOC NDVI Accuracy	0.05	0.009
TOC NDVI Precision	0.04	0.035
TOC NDVI Uncertainty	0.06	0.038

- **J1 VI EDR Updates Implementation Schedule:**
  - CDR - May 2014
  - TRR – November 2014
  - ARR – March 2015
  - IDPS Block 2.0 – Late 2015

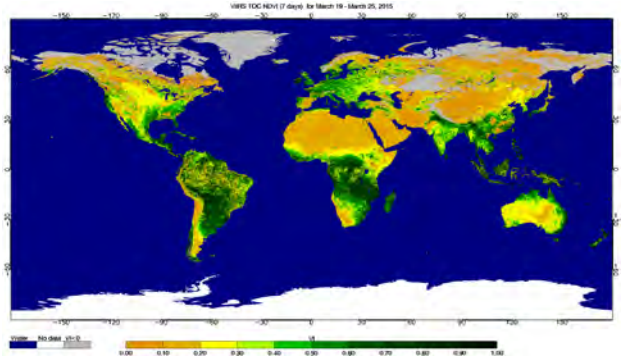
TOC – EVI March 19-25, 2015



TOA – NDVI March 19-25, 2015



TOC – NDVI March 19-25, 2015

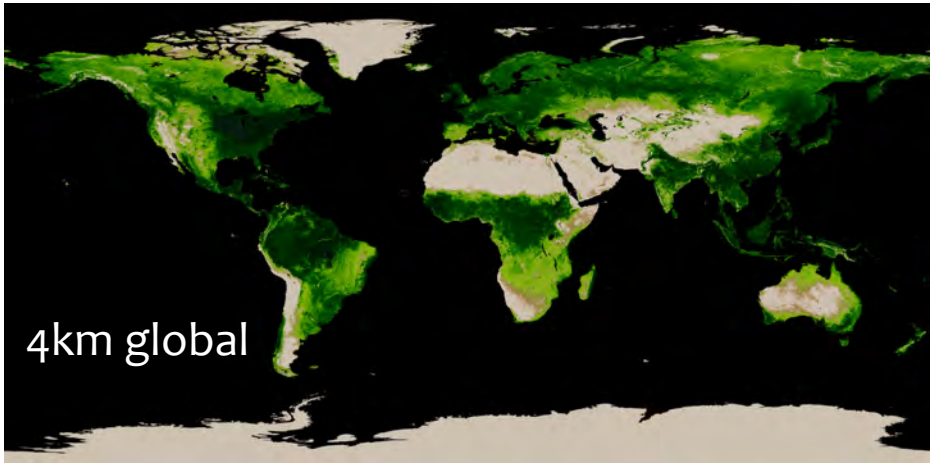


JSTAR VI Lead: Marco Vargas UH VI EDR Cal/Val Lead Tomoaki Miura

SNPP VIIRS Green Vegetation Fraction (GVF) NOAA Unique Product (NUP)

Products

- The SNPP VIIRS Green Vegetation Fraction (GVF) consists of two products:
  - Weekly global GVF at 4 km resolution
  - Weekly regional GVF (Lat 7.5°S to 90°N, Lon 130°E to 30°E) at 1 km resolution
- Sliding weekly composites are produced daily in Plate Carrée projection in NetCDF4 format
- The file size is 80MB for the regional product and 15MB for the global product.
- The 4km product is available, starting on Feb. 13, 2015, from CLASS: www.class.noaa.gov
- Declared operational on 02/12/2015



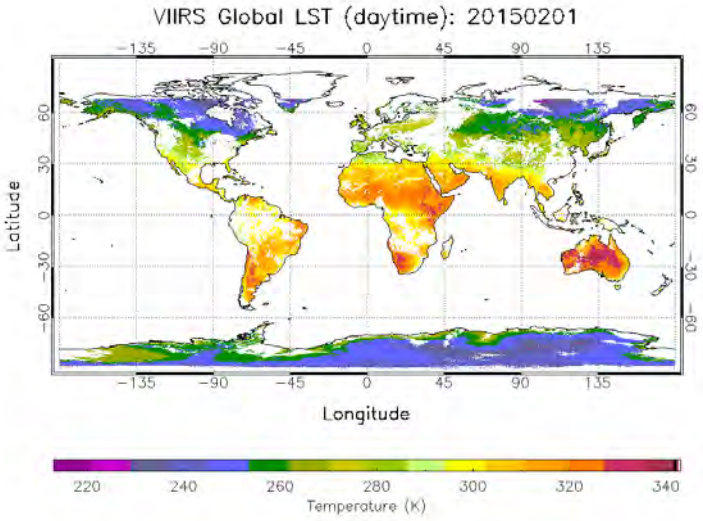
Sep 1-7, 2014

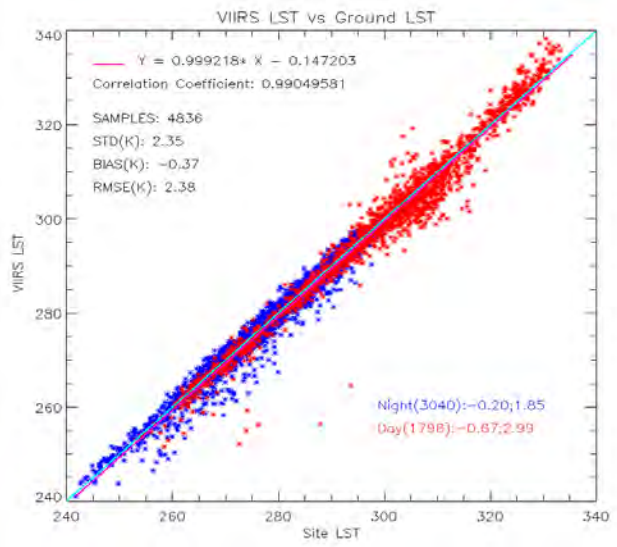
Attribute Analyzed	L1RD Threshold	VIIRS GVF
Measurement accuracy		
1. Global	12%	7.9%
2. Regional	12%	6.5%
Measurement precision		
1. Global	15%	10.9%
2. Regional	15%	12.6%
Measurement uncertainty		
1. Global	17%	13.4%
2. Regional	17%	14.2%

JSTAR GVF Lead: Marco Vargas

VIIRS Land Surface Temperature (LST)

- **Products**
  - Land Surface Temperature
  - File format: HDF5
- **Cal/Val Maturity Status:**
  - **Validated** 03/25/2015 AERB Approved
- **J1 Updates/Improvements:**
  - Water Vapor correction
  - Angular correction
  - Emissivity explicit algorithm





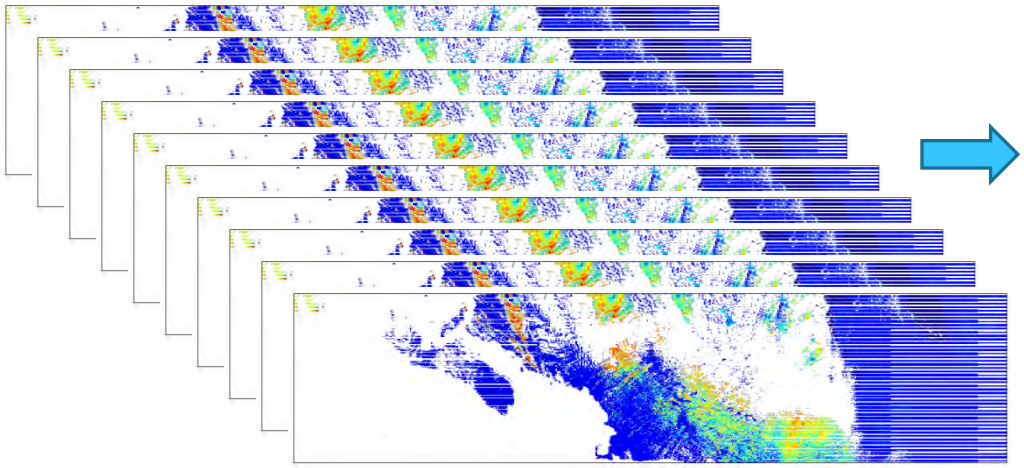
Attribute Analyzed	L1RD Threshold	Validation Result	Description
In-situ Validation	1.4K (2.5K)	**-0.37 (2.35)**	Results are based on the VIIRS data over SURFRAD sites for over 2.5 years . The error budget estimation is limited by ground data quality control, cloud filtering procedure and upstream data error.
R-based Validation	1.4K (2.5K)	0.47(1.12)	A forward radiative transfer model is used, over 9 regions in globe, representing all 17-IGBP types over the seasons. The error budget estimation is limited by profile quality, cloud screening procedure and sampling procedure.
Cross satellite Comparison		0.59(1.93): daytime 0.99(2.02): nighttime	The results are based on comparisons to MODIS LST, over 100 scenes, over low latitude, polar area and CONUSThe error budget estimation is limited by the spatial and temporal difference, sensor difference, angle difference etc.

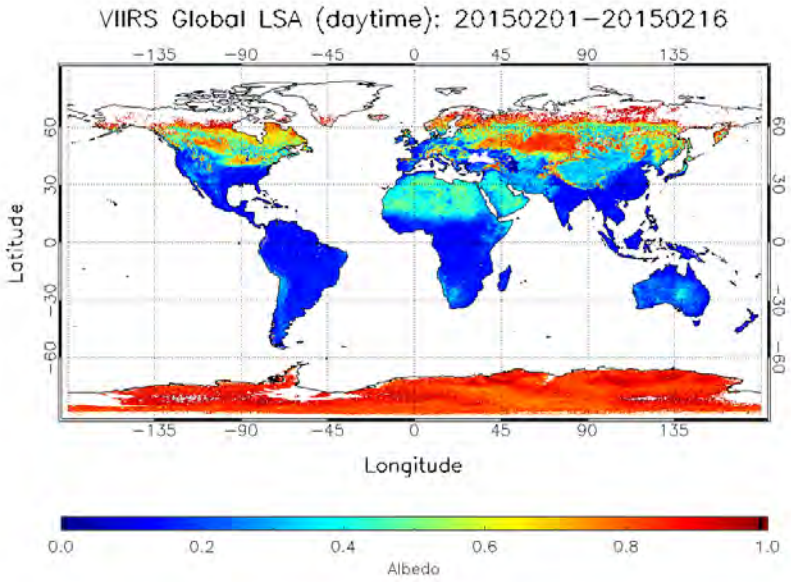
JSTAR LST Lead: Bob Yu

VIIRS Surface Albedo

- **Products**
  - Land Surface Albedo (LSA)
  - Ocean Surface Albedo (OSA)
  - Sea-Ice Surface Albedo (SSA)
  - Only LSA and SSA are validated and maintained in the current VIIRS Albedo release
  - File format: HDF5
- **Cal/Val Maturity Status:**
  - **LSA Validated** 03/25/2015 AERB Approved

- **J1 Updates/Improvements:**
  - Update LUT of regression coefficients for estimating sea ice Albedo
  - Develop a separate LUT for snow pixels and other major land surface types
  - Implement a temporal filtering to improve both quality and continuity
  - Work with NWP users to develop a framework to generate gridded data set of LSA that fit users' needs

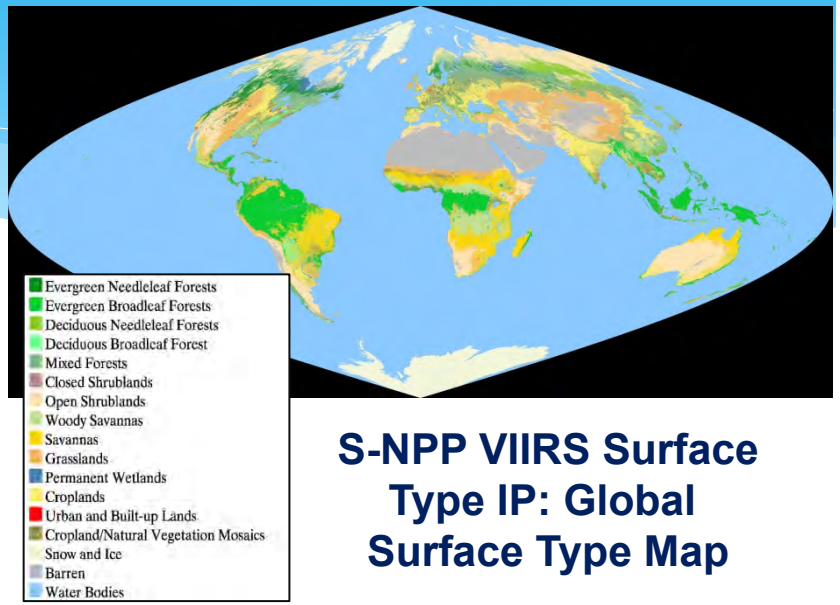




JSTAR LSA Lead: Bob Yu

VIIRS Surface Type

- **Products**
  - VIIRS Surface Type (granule level)
  - VIIRS Quality Surface Type IP (QST IP, Global Gridded Surface Type Map)
  - File format: HDF5
- **Cal/Val Maturity Status:**
  - **Validated** 04/01/2015 AERB Approved
- **Users:**
  - Modeling studies
    - Land surface parameterization for GCMs (e.g. NCEP Noah LSM)
    - Biogeochemical cycles
    - Hydrological processes
  - Carbon and ecosystem studies
    - Carbon stock, fluxes
    - Biodiversity
  - Downstream products
    - Land surface temperature, cloud mask, aerosol products, other products require global land/water location information



S-NPP VIIRS Surface Type IP: Global Surface Type Map

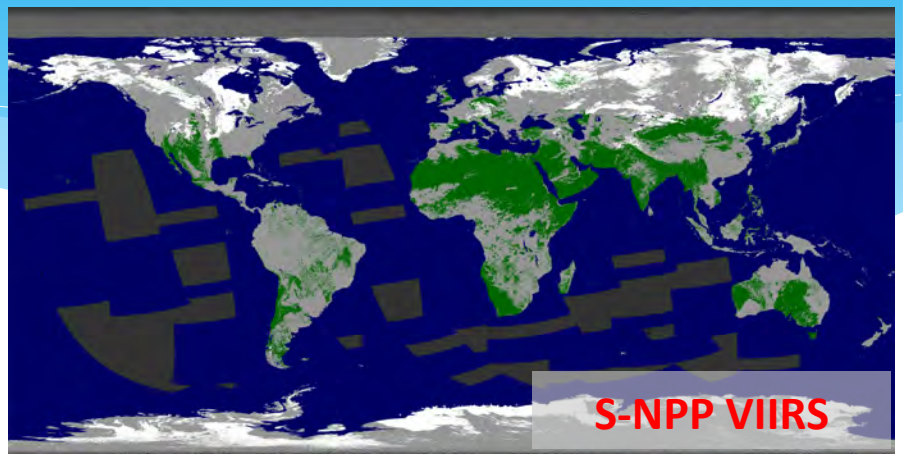
- **J1 Updates/Improvements:**
  - Support vector machines (SVM) may replace the decision tree (DT) algorithm for higher reliability/stability
  - Multiple year classification metrics are expected to produce more stable Surface Type map
- **Schedules/Timeline:**
  - SVM product evaluated Dec-2015
  - New global surface type IP (QST IP) delivered to IDPS Dec-2015

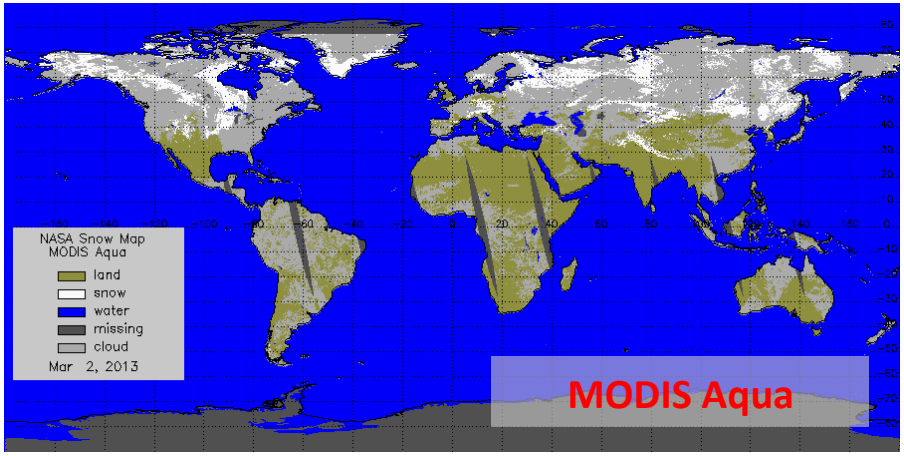
JSTAR Surface Type Lead: Jerry Zhan

VIIRS Snow and Ice

- **Products &Cal/Val Maturity Status:**
  - **Snow Cover: Binary Map**
    - **Validated** 01/08/2014
  - **Snow Cover: Fractional Snow Cover**
    - **Provisional** 12/20/2013
  - **Ice Surface Temperature**
    - **Validated 01/08/2014**
  - **Sea ice characterization**
    - **Provisional** 12/20/2013
  - File format: HDF5

- **J1 Updates/Improvements:**
  - Two new VIIRS snow fraction products will be generated by NOAA, both at 375 m, one providing MODIS heritage and one providing GOES heritage.
  - A new VIIRS ice thickness product will be generated by NOAA.
  - The fate of the current operational snow fraction and ice characterization products is unclear.





March 2, 2013 (day 2013061)

CEOS/WGCV/LPV Status

CEOS > WGCV > LPV

CEOS - Committee on Earth Observation Satellites

31 CEOS Members

24 Associate Members (eg UNEP, GTOS, IGBP, WMO, GCOS)

CEOS coordinates civil space-based observations of the Earth

This is achieved through its working groups and virtual constellations. The **Working Group on Calibration and Validation (WGCV)** is one of 5 CEOS working groups.

Land Product Validation (LPV) is one of 6 WGCV subgroups

Current LPV Officers

Chair	Gabriela Schaepman-Strub	University of Zurich
Vice-Chair	Miguel Román	NASA/GSFC
LPV Support	Jaime Nickeson	SSAI/GSFC

9 Focus Areas with 2 co-leads each

CEOS WORKING GROUP ON CALIBRATION & VALIDATION

This Year: Focus-area Strategy

Aims

1. Review validation stage and activities (focus area co-leads)
2. Define next validation steps (focus area co-leads and LPV officers)
3. Define goals and action items for 2015/2016 (i.e., GCOS interaction, specific workshops, protocol writing and processing of fiducial reference data.)
4. Review organization and contributions to focus area (i.e., update LPV terms of reference)

Participants

1. Focus area co-leads
2. LPV Officers
3. Guests (proposed by co-leads and chair)

LPV 2014-2016 Deliverables

Capacity Building, Data Access, Availability and Quality Objectives/Deliverables: 2014-2016			
Objective/Deliverable	**Projected Completion Date**	**Background Information**	**Responsible CEOS Entity**
CV-11: Validation of terrestrial ECV products	Q1 2015 – Q4 2016	The validation of terrestrial ECV products is in line with activities carried out in WGCV-Land Product Validation (LPV). The validation of ECVs covered within WGCV-LPV shall be strengthened. This includes (a) an update of validation stage, (b) ECV-specific synthesis of a state-of-the-art validation approach for each terrestrial variable with corresponding references and protocols, (c) ECV-specific identification of a golden standard for validation, and (d) continuation of development of ECV-specific validation protocols, including a community review process and updates. Results of each step will be made public via the WGCV-LPV website and finally the Cal/Val portal.	WGCV
CV-12: Evaluation of validation supersites and new validation approaches	Q2 2015	Evaluation of well-characterized supersites with data continuity prospects for validation purposes that allow for testing of products, algorithms, and validation strategies through radiative transfer modeling.	WGCV

LPV Web Site

Established in 2003.

Subscribed member list has grown to nearly 700 members over the years.

Each focus area (ECV) has pull down menu of links to

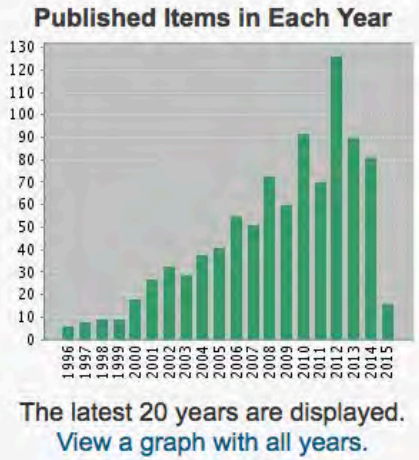
- Home page
- References
- Collaboration
- Products

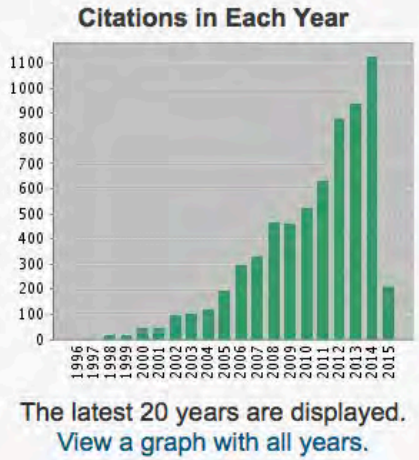
http://lpvs.gsfc.nasa.gov

LPV Web of Science Metrics

Searched word: “Land Product Validation” **OR** “LPV”

– 962 items are searched; **~80 items published in 2014; ~1100 citations**





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Citing Articles without self-citations [?] : 3742

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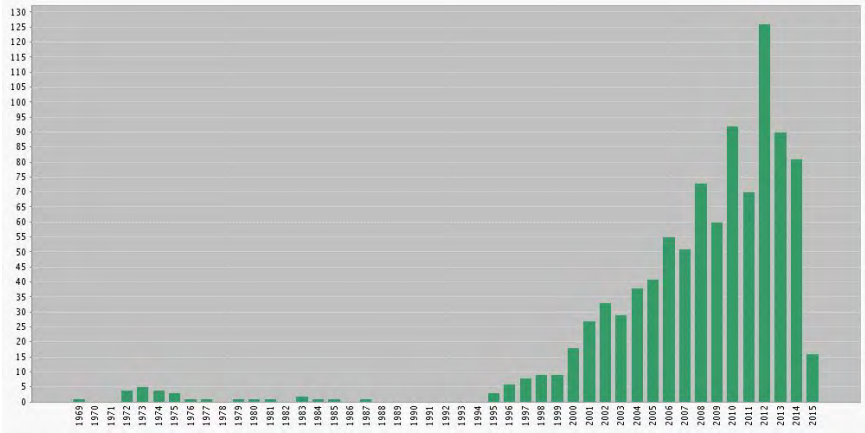

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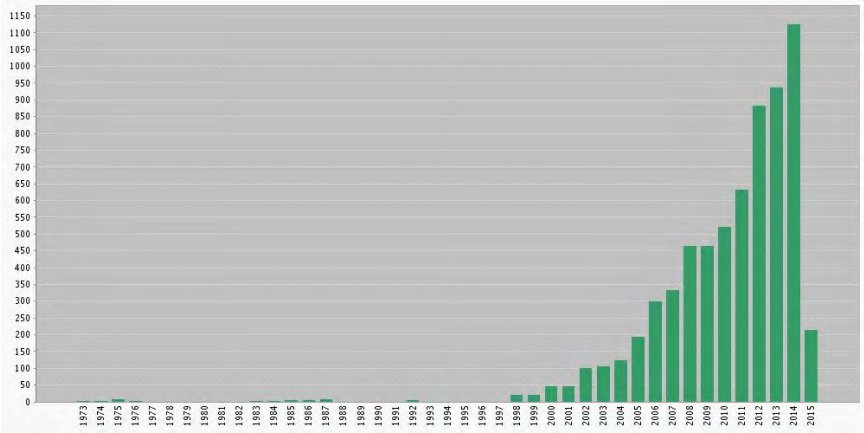
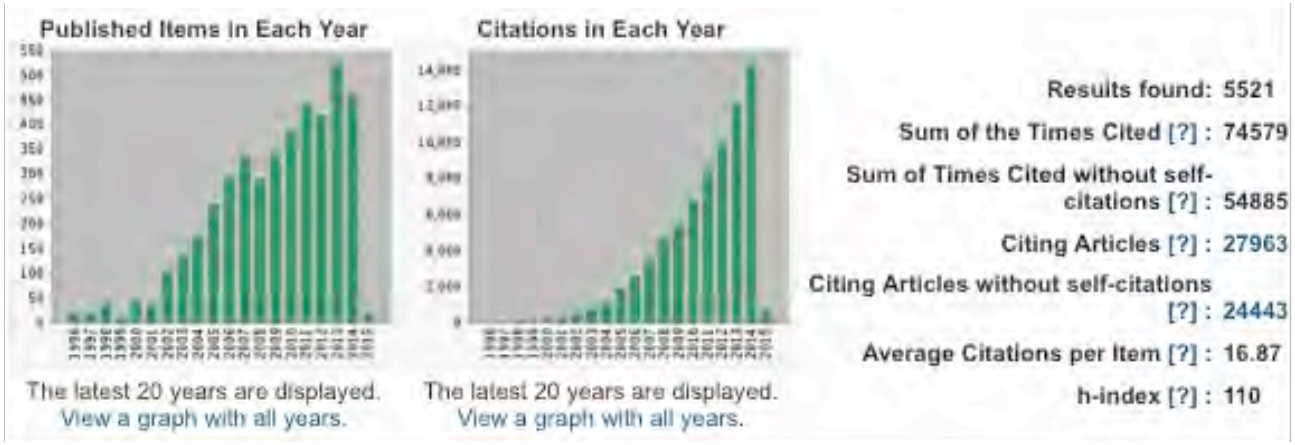


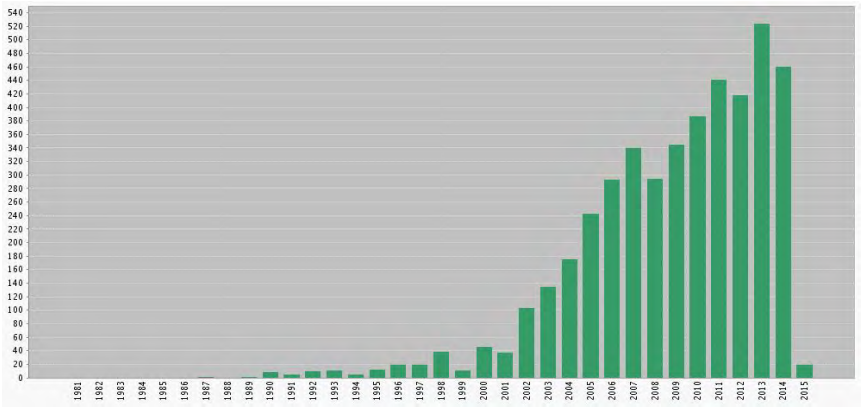
From: Taejin Park (BU)

NASA/MODIS Web of Science Metrics

Searched word: “MODIS” **or** “Moderate Resolution Imaging Spectroradiometer”

– 5,521 items are searched





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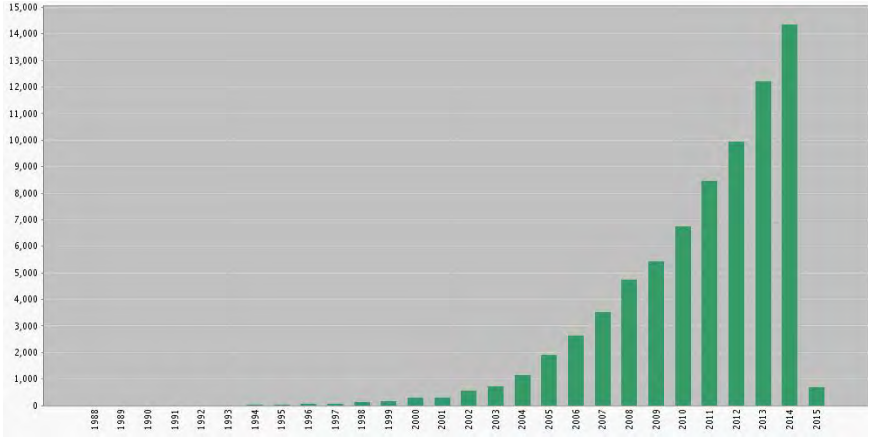


Citations in Each year (All years)

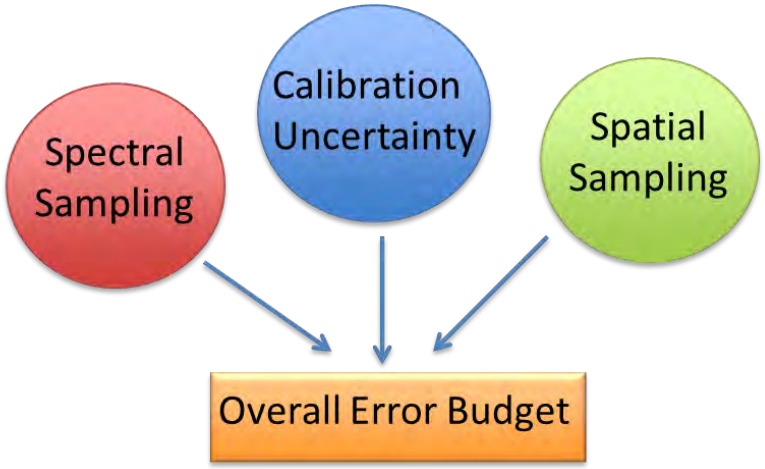
From: Taejin Park (BU)

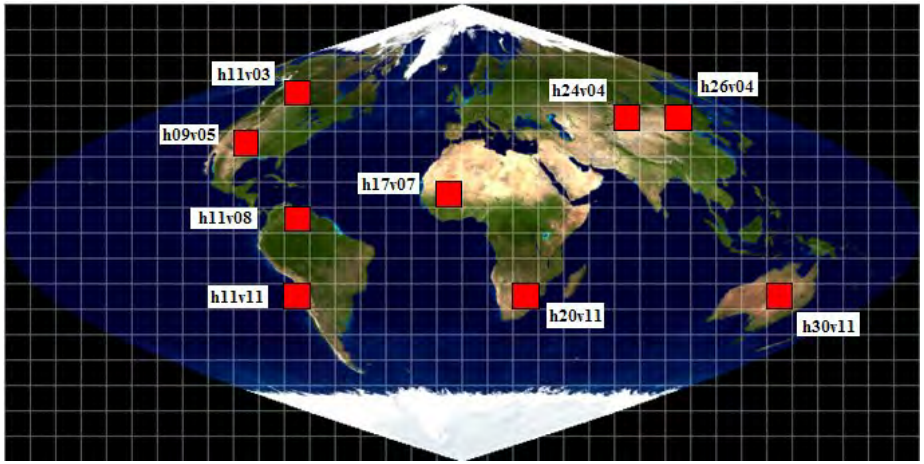
from 2015 Aqua Senior Review Panel:

Q.14: Could there be further classification of the errors associated with the MODIS data/ observations and products?

Senior Review panel's question 14: ***Could there be further classification of the errors associated with the MODIS data/observations and products?***

Mapping Aqua-MODIS Sensor Per-pixel Uncertainty (N. Pahlevan, SSAI / NASA GSFC)





Objective: **To establish a comprehensive error budget model for Aqua MODIS instrument data records (Level 1b/2) by decomposing measurement errors into its major constituents.**

Approach: **Simulations and sensitivity analyses using existing moderate-to-high spatial-spectral measurements (e.g., Landsat-8 and EO-1 Hyperion) are performed over all MODIS Land Golden Tiles – i.e., 9 regions that are representative of the variability of the majority of the MODIS Land products (shown in red squares) .**

Team Response: **At the Aqua-MODIS sensor level (Level 1b/2), further classification of errors is possible by: (1) considering all constituents within an overall error budget and (2) providing a representative global sample of land surface and retrieval conditions.**

Senior Review panel's question 14: ***Could there be further classification of the errors associated with the MODIS data/observations and products?***

Protocol for Validation of the Aqua-MODIS Land Surface reflectance using AERONET (J.C. Roger, E. Vermote and B. Holben)

Validation of Land Surface Reflectance

The Problem: **A standard land surface reflectance protocol for using reference AERONET products needs to be agreed on by the MODIS science team.**

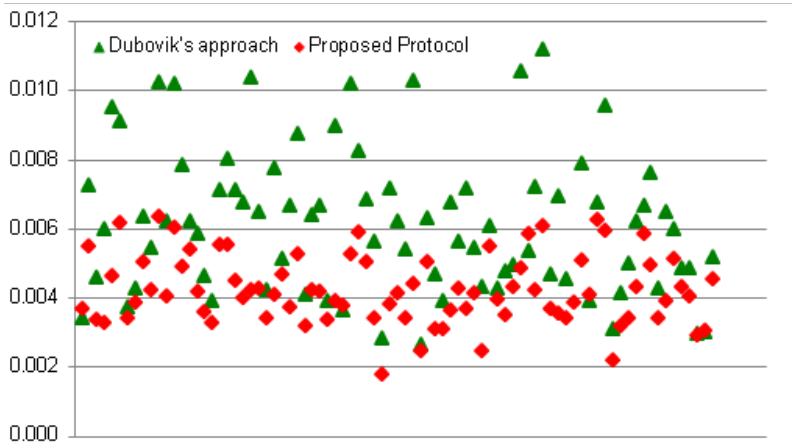
The Solution: **A validation protocol for MODIS Land surface reflectance that requires the aerosol model to be readily available.**

Description of Surface Reflectance Validation Protocol

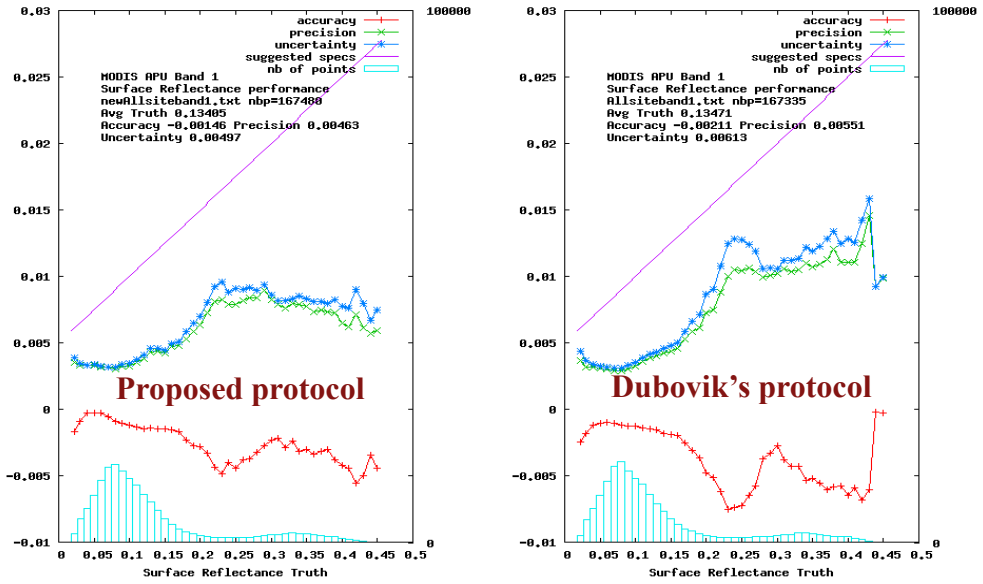
Aerosol models for each AERONET site can be defined using new regressions with optical properties (i.e., τ_{440} and α) as standardized parameters. For the aerosol models, the **aerosol microphysical properties** provisioned by AERONET, including size-distribution (%C_f, %C_c, r_f, r_c, σ_r, σ_c), complex refractive indices and sphericity, can also be used as standardized protocol measures.

Comparisons with AERONET indicate that parameter standardization produces Accuracy-Precision-Uncertainty (APU) metrics up to 20% lower than the current baseline (Dubovik et al., 2002).

Uncertainties on the retrieved surface reflectance for 40 AERONET sites
MODIS band 1 (red) – synthetic input surface reflectance = 0.05



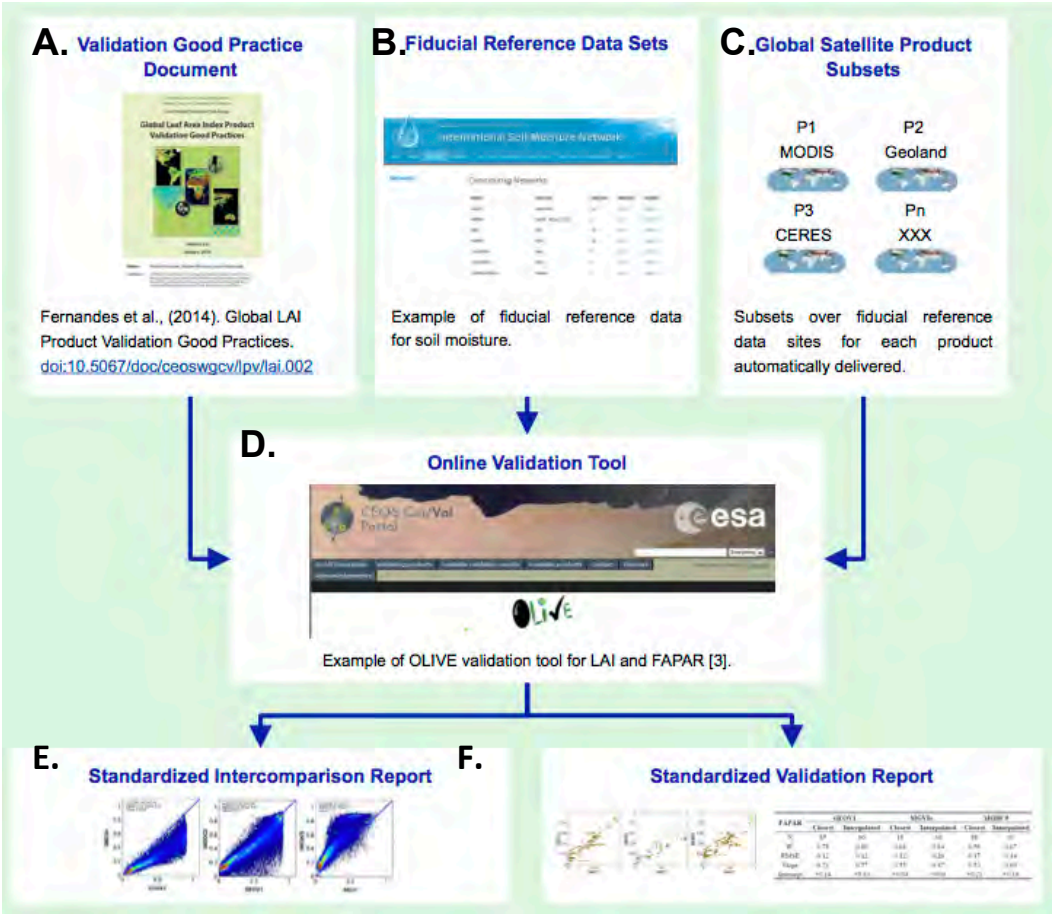
Example of APU for MODIS band 1 (red) for the whole 2003 year data set



Team Response: **Further classification of errors requires the adoption of consistent and agreeable protocols across MODIS land surface reflectance products. This is also crucial to enable objective assessment and characterization of downstream product impacts (e.g., NDVI/EVI, LAI/FPAR, BRDF/Albedo/NBAR).**

Senior Review panel's question 14: ***Could there be further classification of the errors associated with the MODIS data/observations and products?***

A Global Framework for Land Product Intercomparison and Validation (Miguel Román, NASA/GSFC)



The MODIS Land Science team has adopted the global framework for product intercomparison and validation developed by the Land Product Validation (LPV) subgroup of the CEOS Working Group on Calibration and Validation (WGCV).

This framework is based on a peer-reviewed protocol (A.), collection of fiducial reference data (B.), and development of automated subsetting capabilities (C.) Each of these parts are then integrated into an online platform (D.) where quantitative tests are run, and standardized intercomparisons (E.) and validation results (F.) reported.

Team Response: At the final (Level 3+) product level, further classification of errors is possible when products are characterized in a statistically rigorous way (i.e., over multiple locations and time periods representing global conditions). Establishing a global framework for land product validation is key to this effort, and of high priority for Aqua-MODIS and future sensors.