JPSS DPA Program Planning Meeting
Land Surface EDR Team

Ivan Csiszar and Jeff Privette

September 21, 2012

with input from team members

Team membership

Role or Product Focus	Name	Organization
Product Lead, Fire	Ivan Csiszar	STAR
S. Reflectance; VCM & SDR Liaison	Eric Vermote	UMD -> NASA GSFC
Surface Reflectance	Alex Lyapustin	GSFC
Albedo	Bob Yu / Shunlin Liang	STAR / UMD
Albedo	Crystal Schaaf	Univ. Mass / Boston
LST	Bob Yu	STAR
Validation Lead, LST	Jeff Privette / Pierre Guillevic	NOAA/NCDC/NC
Vegetation Index	Marco Vargas	STAR
Vegetation Index	Tomoaki Miura/ Alfredo Huete	U. of Hawaii / Arizona
Team Coordination, product development	Chris Justice	UMD
NASA Coordination & Validation, albedo	Miguel Roman	NASA/GSFC
Surface Type	Jerry Zhan	STAR
Surface Type	Mark Friedl	Boston Univ.

Land team external partners

- DPA / JAM
  - Leslie Belsma
- NGAS
  - Alain Sei, Justin Ip
- Raytheon
  - W. Johnsen (ST)
- NASA Land PEATE
  - R. Wolfe
- NCEP Users
  - Michael Ek, Matthew Rosencrans
- USDA Users
  - Eric Luebehusen
- USFS
  - Brad Quayle, Everett Hinkley (fire)

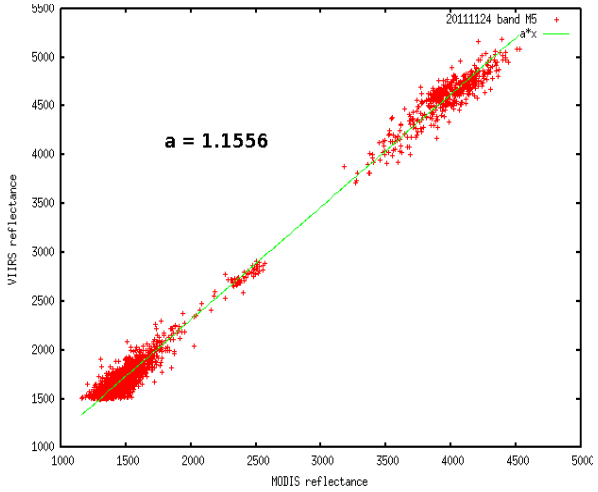
FY-12 Accomplishments (SR-UMD)

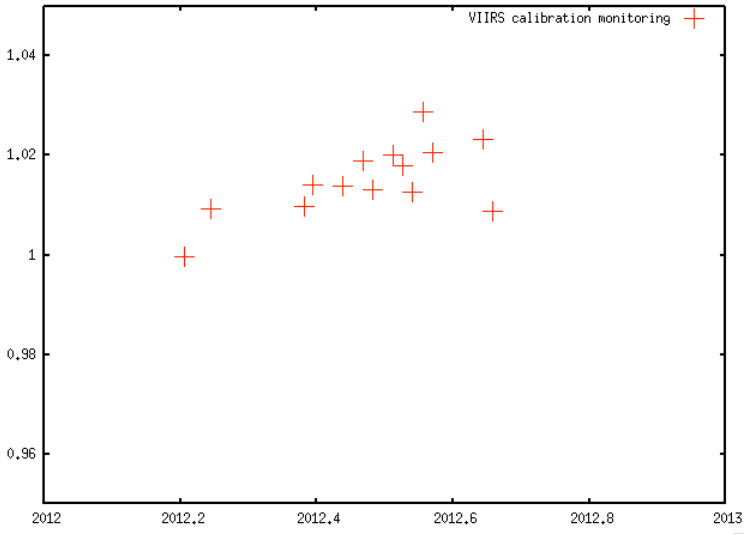
- Early first light images
- VIIRS calibration monitoring

VIIRS First light image

DR number	Short Description
DR 4488	Processing of surface reflectance under extended conditions (cloudy, high aerosol etc..) to enable an easier assessment of VCM and atmospheric correction

Early calibration assessment



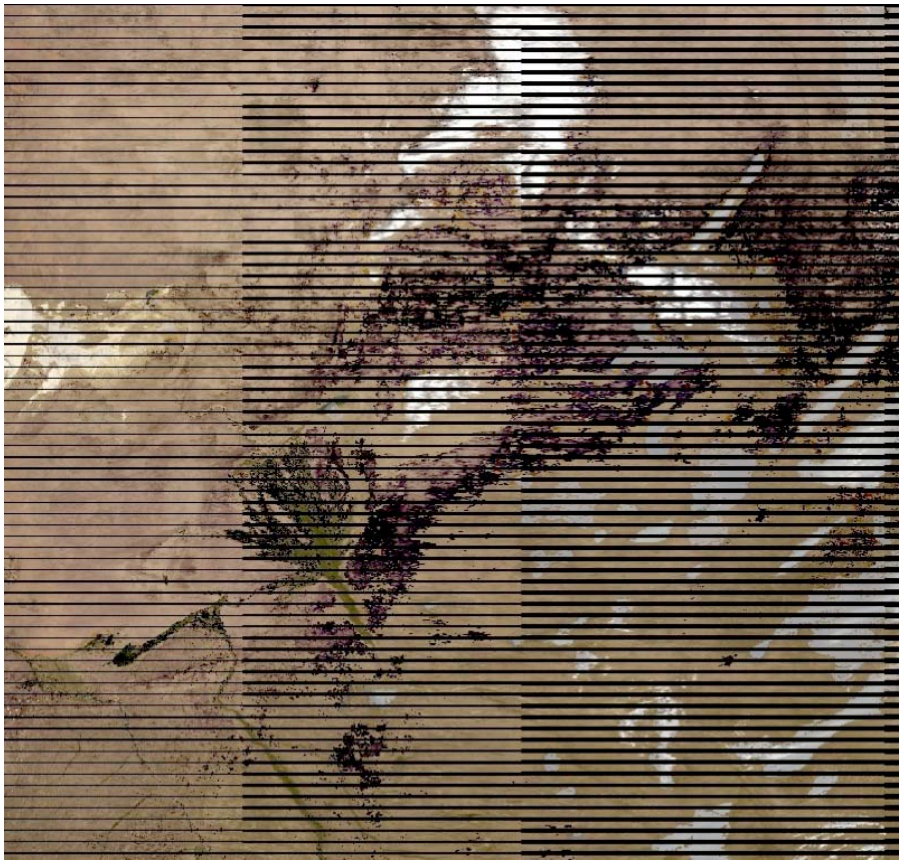


Continuous calibration monitoring

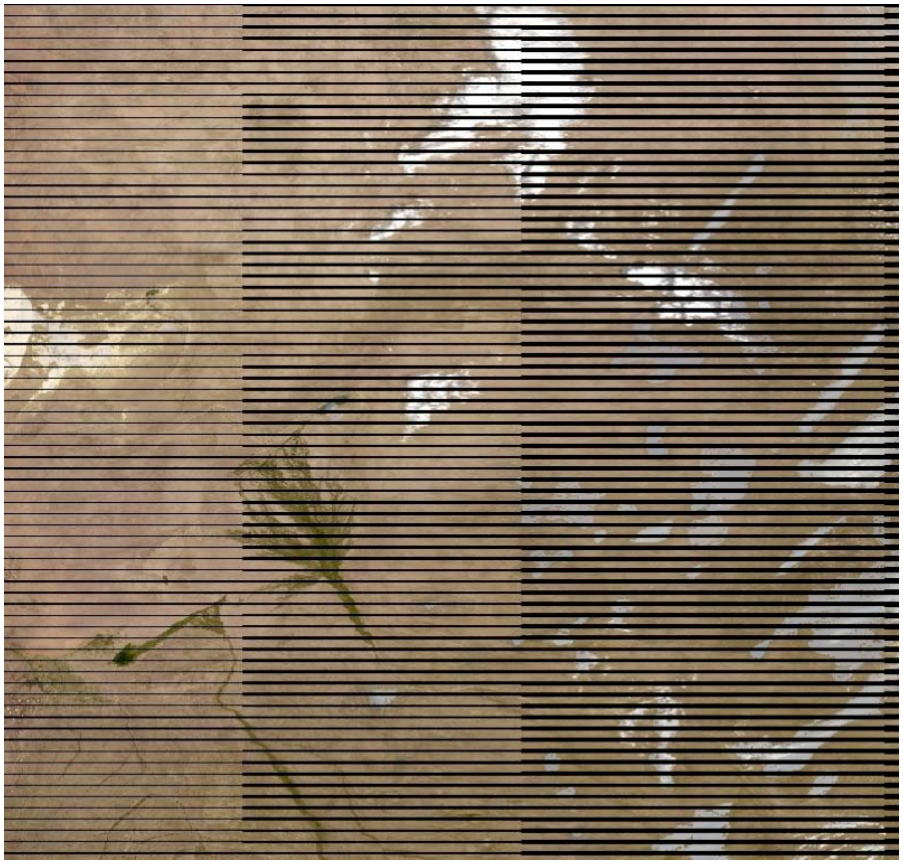
FY-12 Accomplishments (SR-UMD)

- Surface reflectance EDR assessment and recommendations (ongoing) – example dust model

Erroneous atmospheric correction when aerosol dust model is selected



Disabling the aerosol dust model fix the problem



FY-13 Schedule and Milestones (SR-UMD)

- Continue role of liaison with VCM an SDR (calibration) Teams
- Continue monitoring calibration
- Intercomparison of VIIRS SR EDR and VCM with Aqua equivalent on the CMG dataset
- VIIRS evaluation of aerosol and SR on validation subsets
- VIIRS SR APU metrics

Team Members' Roles & Responsibilities (VI)

EDR	Name	Organization	Funding Agency	Task
VI - EDR	Marco Vargas	NOAA/NESDIS/STAR	NJO	VI-EDR Algorithm Lead
VI - EDR	Nikolay Shabanov	NOAA/NESDIS/STAR	NJO	Algorithm Support, Cal/Val
VI - EDR	Tomoaki Miura	University of Hawaii	NJO	Cal/Val Lead
VI - EDR	Alfredo Huete	University of Technology Sydney		Consultant
VI - EDR	Leslie Belsma	Aerospace		Land JAM
VI - EDR	Alain Sei	NGAS		External Partner, Consultant
VI - EDR	Michael Ek	NOAA/NCEP		Product User
VI - EDR	Eric Luebehusen	USDA		Product User
VI - EDR	Matthew Rosencrans	NOAA/NCEP		Product User

FY-12 Accomplishments (VI)

- The team is routinely performing comparison of Suomi NPP VI data to heritage satellite products (MODIS and AVHRR).
- Developed the STAR VI web monitoring system. http://www.star.nesdis.noaa.gov/smcd/viirs_vi/Monitor.htm
- Support fixes and improvements to data processing algorithms.
- The team is producing experimentally TOC NDVI from Surface Reflectance IP.
- Beta release of VIIRS VI EDR (Scheduled late Sept 2012).
- Local access to VI EDR algorithms in ADL 4.0.
- Developed monitoring tools for VI EDR performance.

FY-12 Accomplishments (VI)

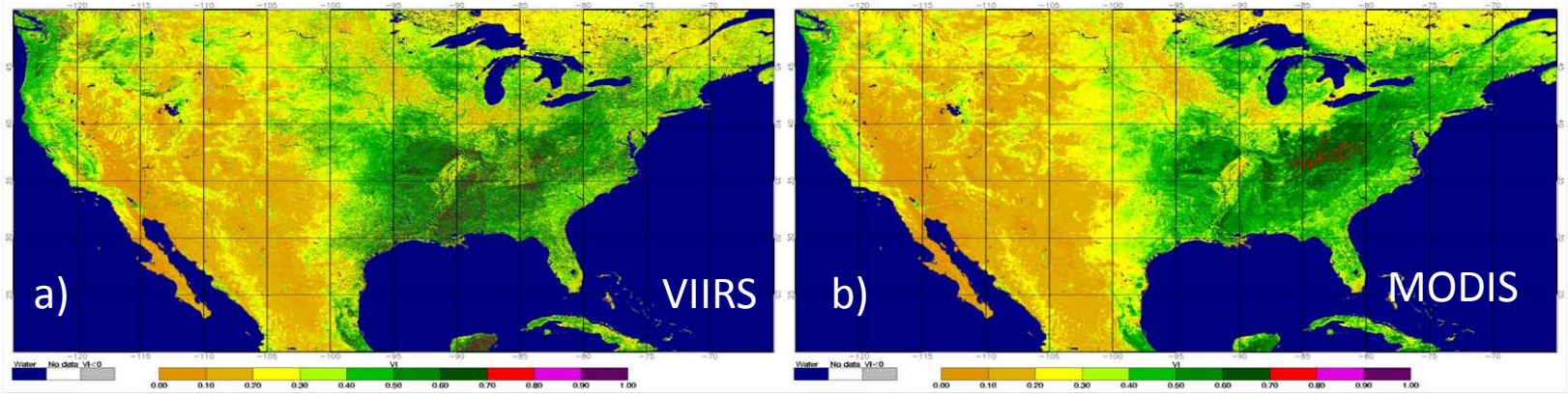
- Performed time series analysis between VIIRS and heritage VI products (MODIS and AVHRR).
- Set up an APU statistical metric computation protocol for VIIRS VI EDR using global mosaics and using Aqua MODIS as a reference
- Investigated impact of degradation of I2 band on VI-EDR.
- Presentations at AMS 2012 and IGARSS 2012.
- Involvement in VI-related DRs.

FY12 Accomplishments: DRs (VI)

DR number	Short Description
DR 4622	**Erroneous quality flag for missing input data**. DR status: open. VI-EDR team is preparing an enhanced set of QFs to improve the VI product quality. We expect to close this DR before provisional release (July 2013)
DR 4708	**Update seeded data for VI**. DR status: Open. NG was tasked to generate the VI seeded data.
DR 4376	**Vegetation Index: L1RD requires NVDI TOC**. DR status: open. We expect to close this DR before provisional release (July 2013)
DR 4290	**EVI Quality should degrade AOT>1**. DR status: open. QF update in preparation, we expect to close this DR before provisional release (July 2013)
DR 4377	**Baseline of ephemeral tuning coefficients**. DR status: open. We expect to close this DR before provisional release (July 2013)
DR 4379	**L1RD drops wavelengths, needs to be defined**. DR status: open. We expect to close this DR before provisional release (July 2013)

Overview of Data Products (VI)

TOC EVI comparison VIIRS vs. MODIS



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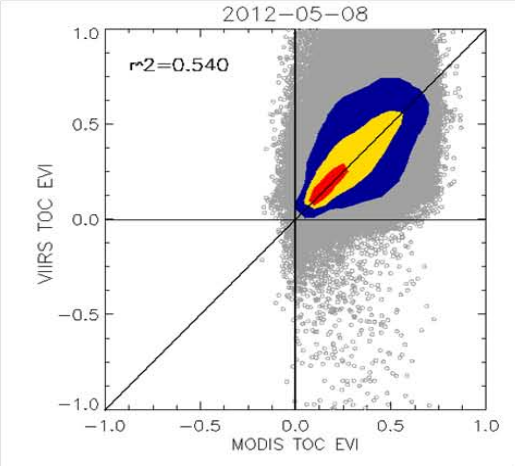
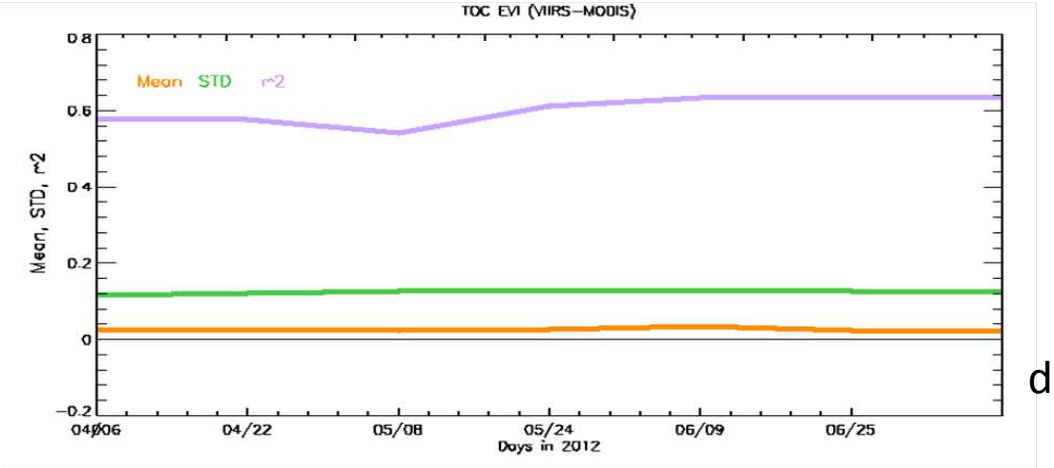


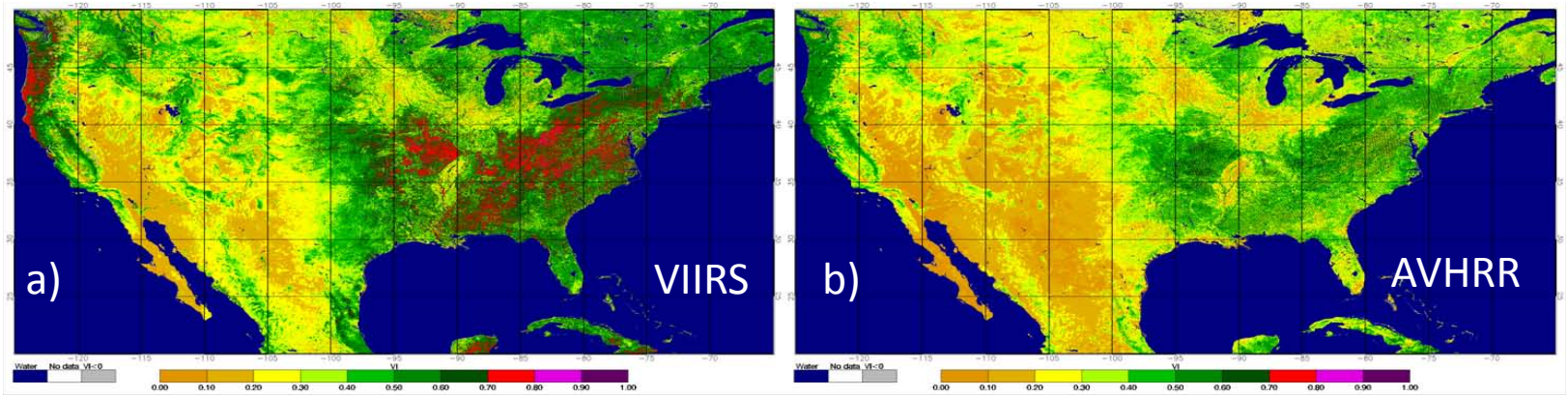


d)

TOC EVI- comparison between VIIRS (a) and MODIS (b), scatter plot (c) and time series (d) of Mean and STD of product differences as well as products correlation (R^2) for April-June 2012.

Overview of Data Products (VI)

TOA NDVI comparison VIIRS vs. AVHRR (NOAA-18)



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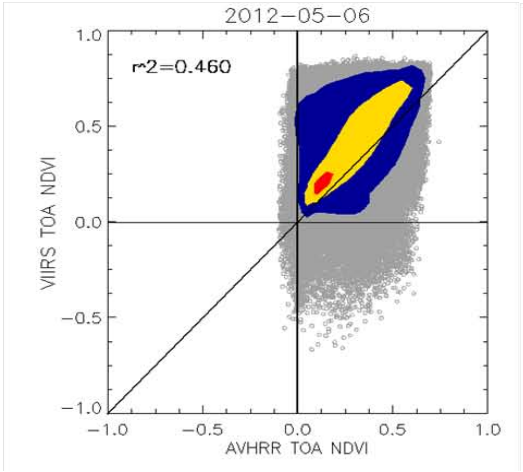
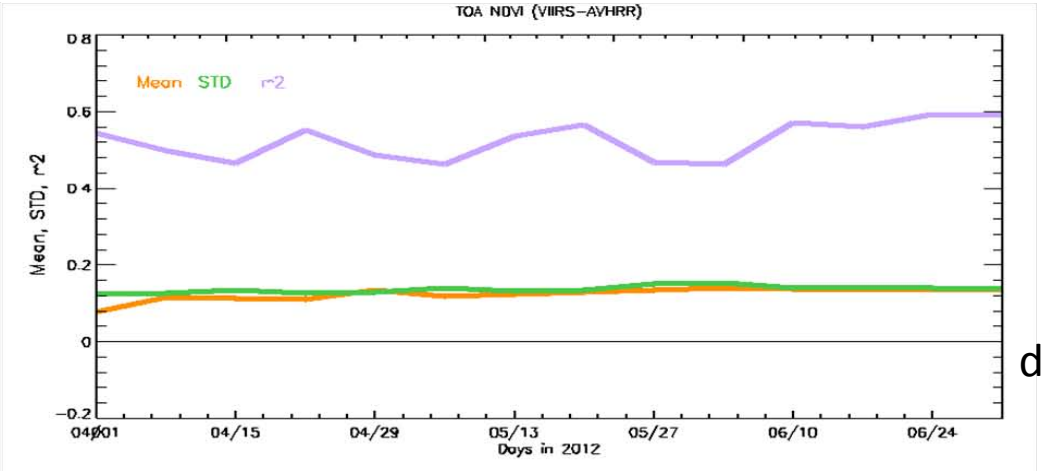


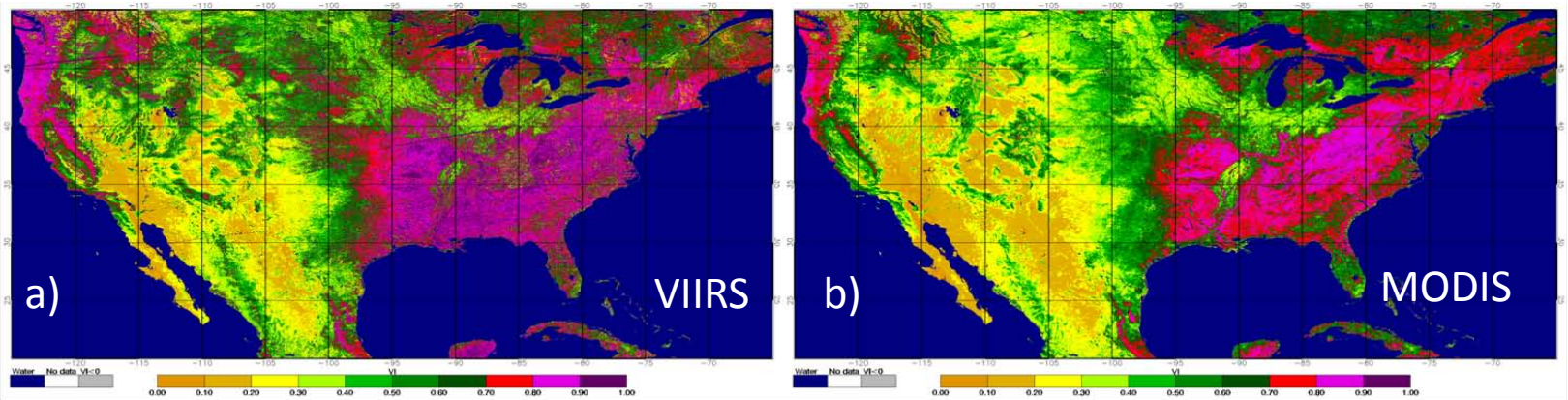


d)

TOA NDVI- comparison between VIIRS (a) and AVHRR (b), scatter plot (c) and time series (d) of Mean and STD of product differences as well as products correlation (R^2) for April-June 2012.

Overview of Data Products (VI)

TOC NDVI comparison VIIRS vs. MODIS



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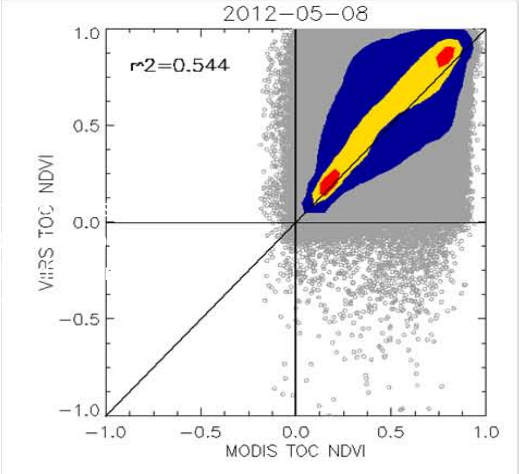
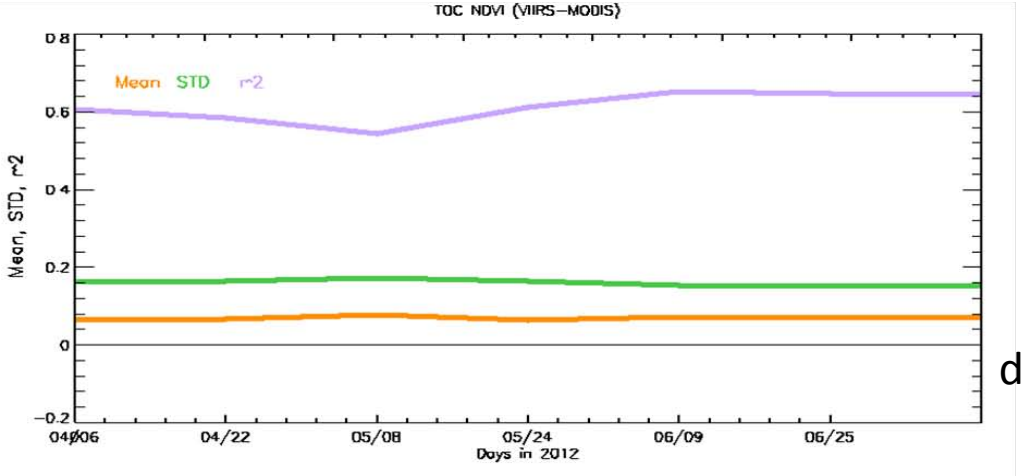


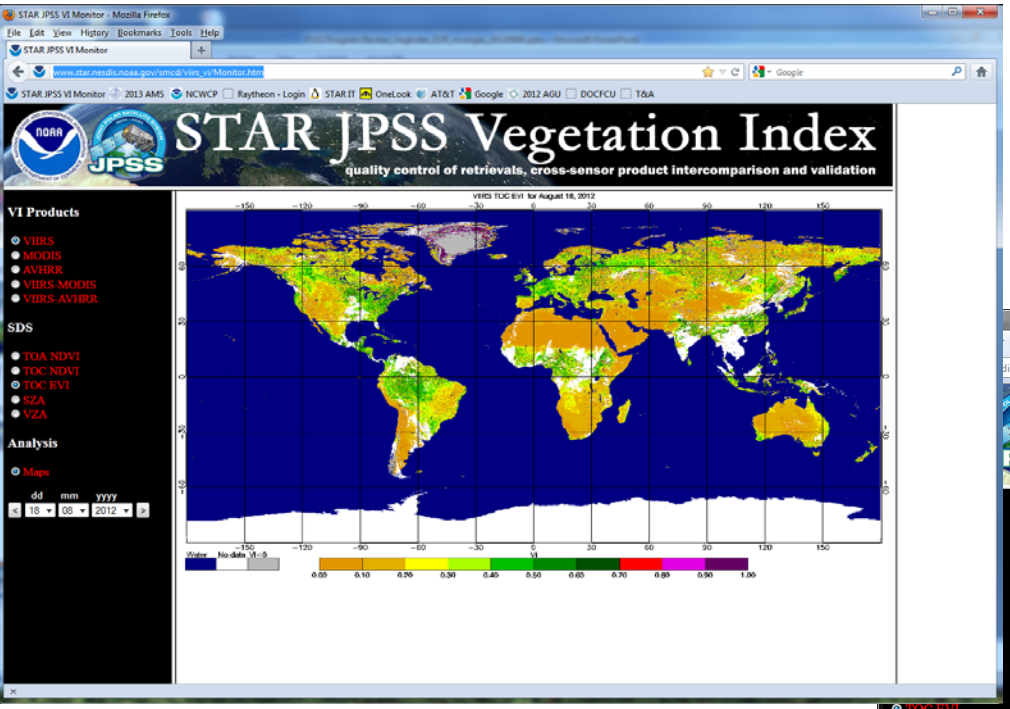


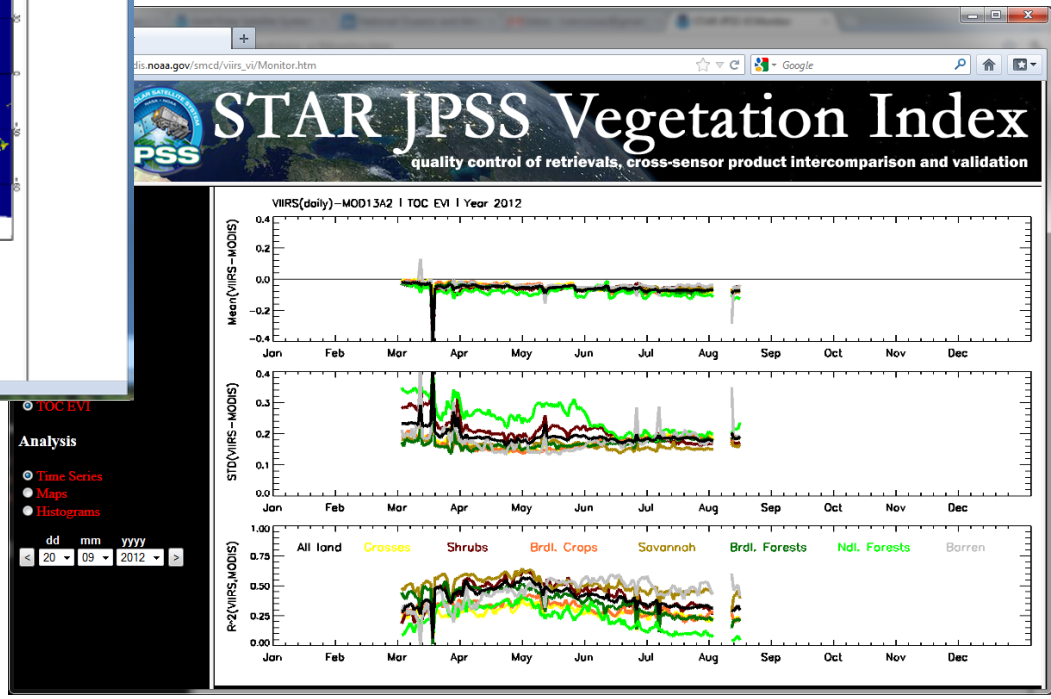
d)

TOC NDVI- comparison between VIIRS (a) and MODIS (b), scatter plot (c) and time series (d) of Mean and STD of product differences as well as products correlation (R^2) for April-June 2012. **TOC NDVI is being produced experimentally at STAR.**

Overview of Data Products (VI)

STAR VI web monitoring system



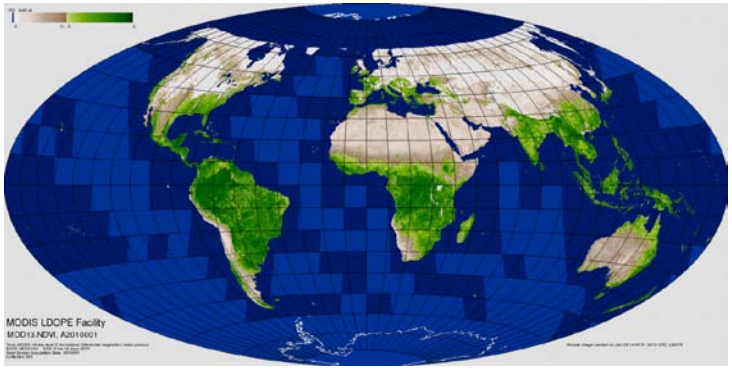


http://www.star.nesdis.noaa.gov/smcd/viirs_vi/Monitor.htm

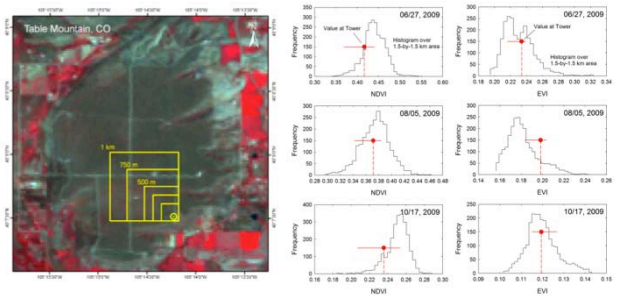
Overview of Data Products (VI)

Validation Plan & Current Activities

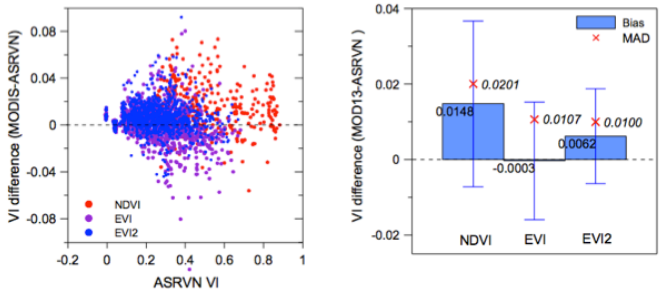
1. Aqua MODIS



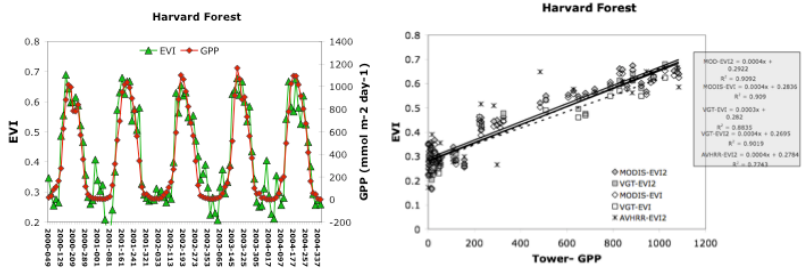
2. Tower Spectral Reflectance & Albedo Measurements



3. ASRVN (AERONET-based Surface Reflectance Network)



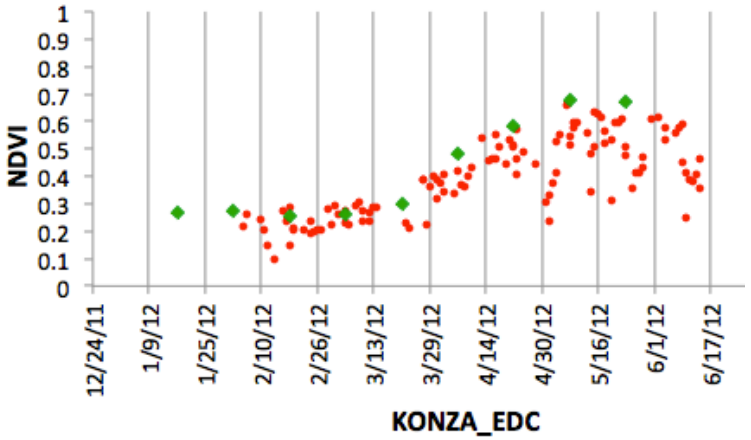
4. Tower Flux Measurements

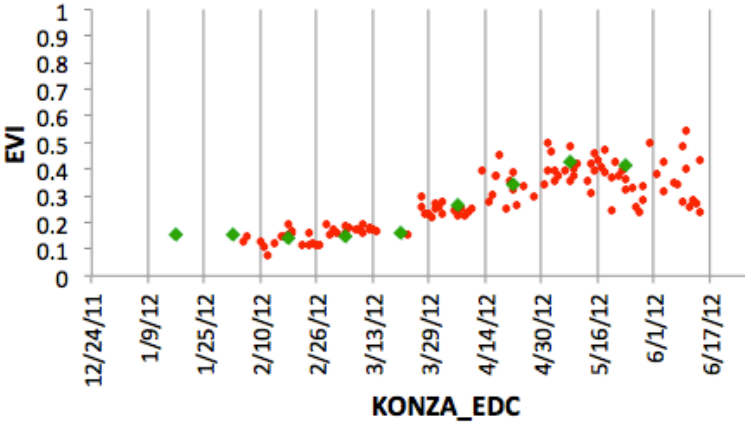


Overview of Data Products (VI)

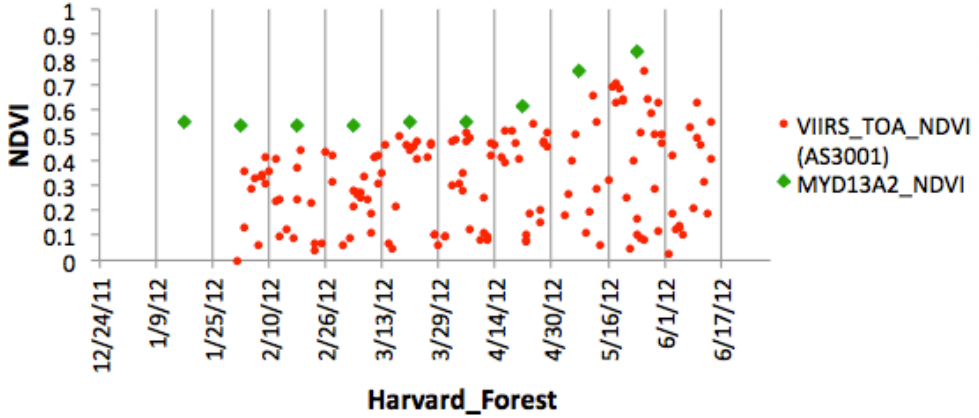
VIIRS NDVI & EVI Time Series Along with Aqua MODIS Time Series

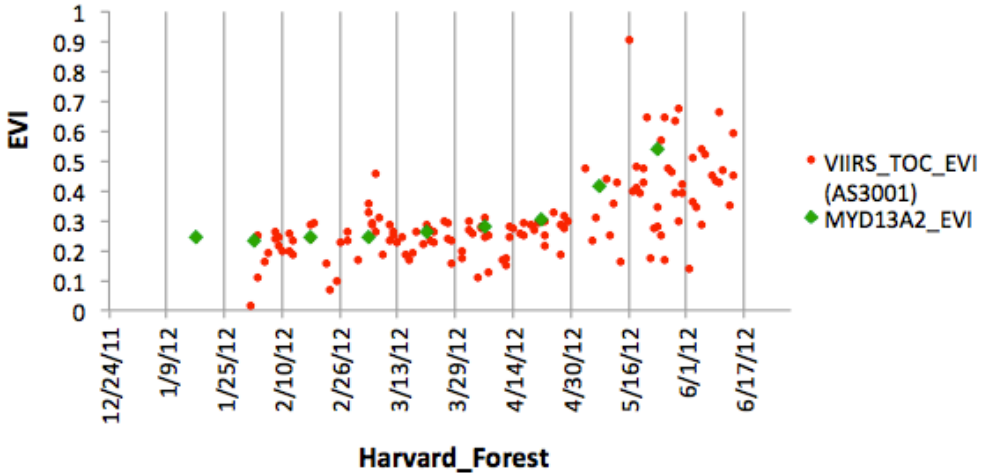
Konza Prairie, KS, USA





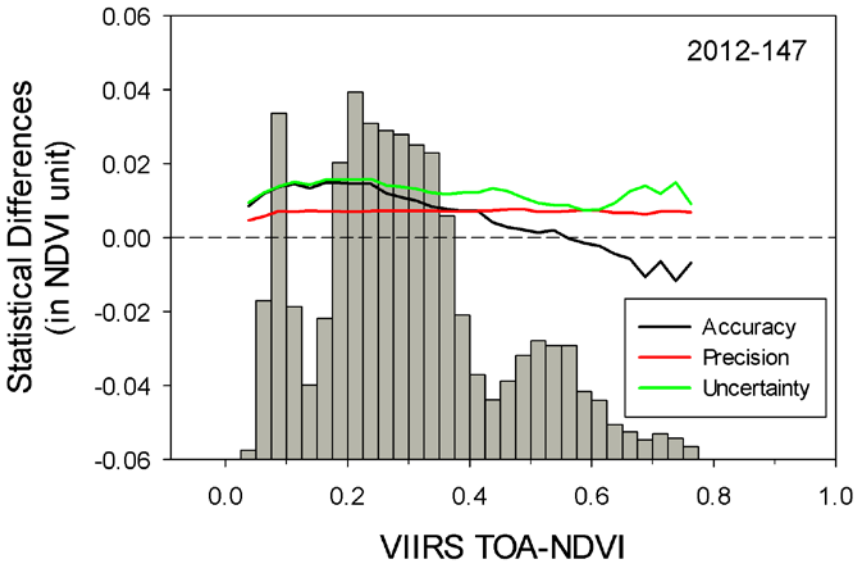
Harvard Forest, MA, USA

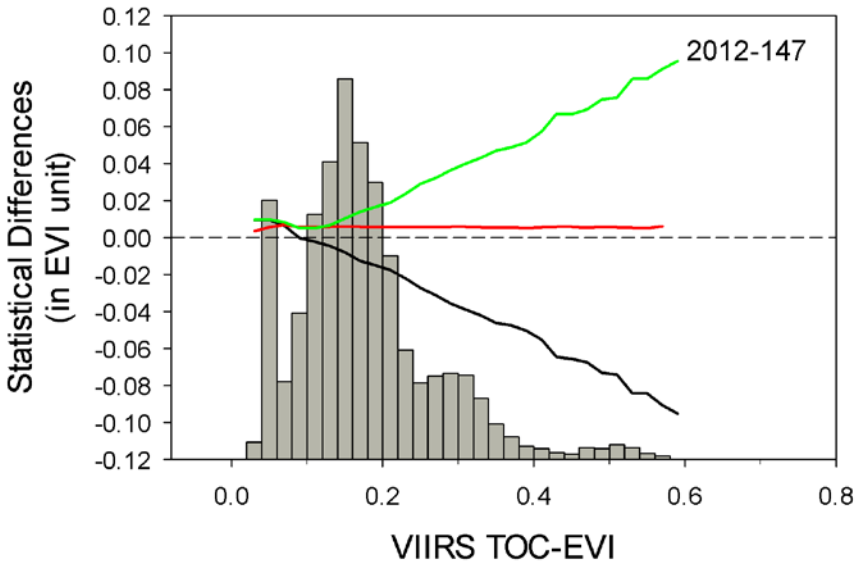


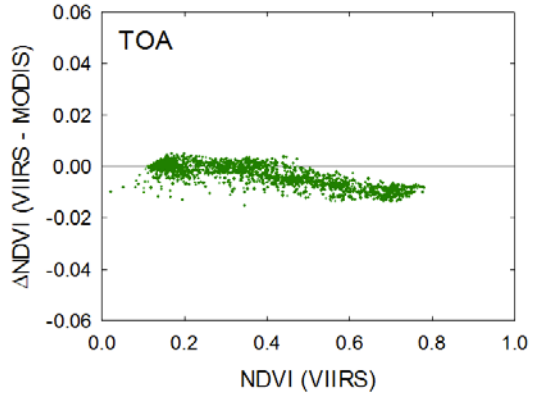


Overview of Data Products (VI)

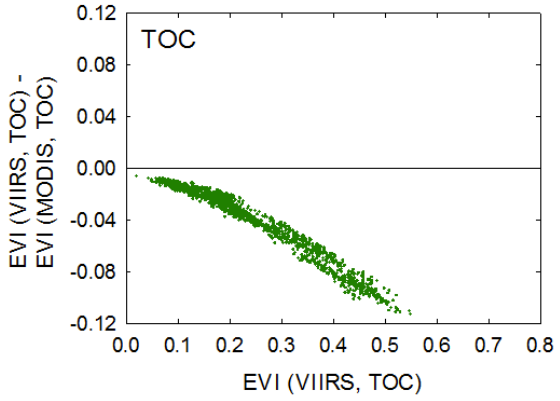
VIIRS VI EDR APU Metrics Using Aqua MODIS as a Reference





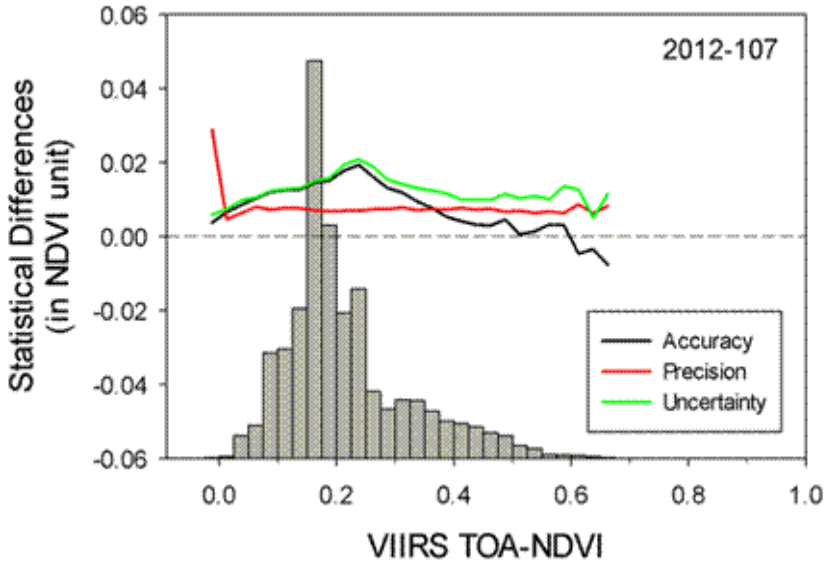


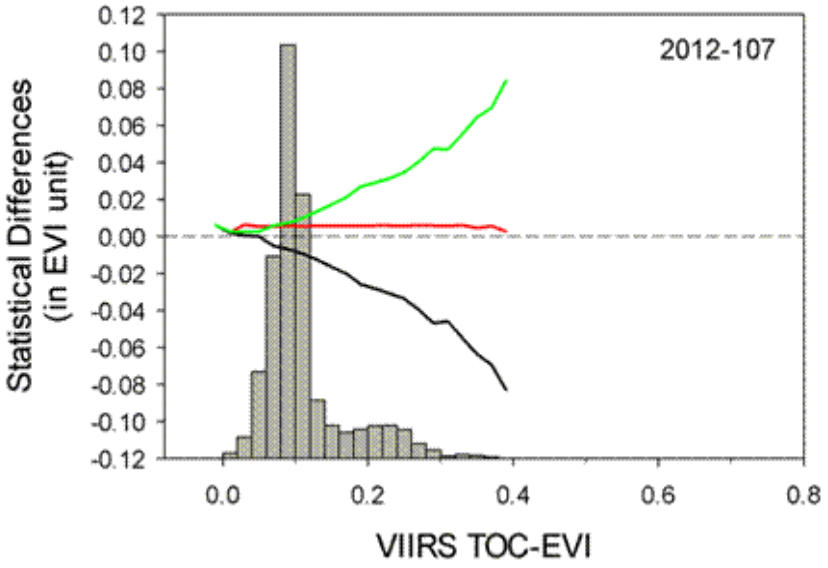
Baseline accuracy obtained from Hyperion data

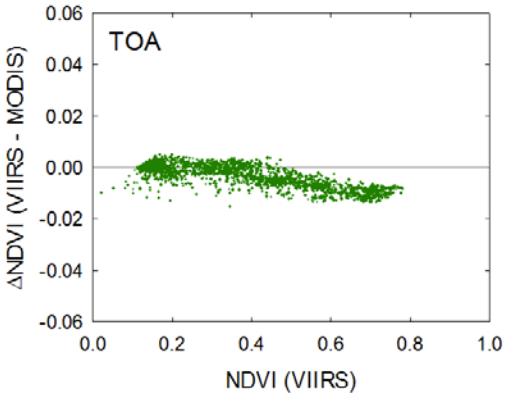


Overview of Data Products (VI)

VIIRS VI EDR APU Metrics Using Aqua MODIS as a Reference







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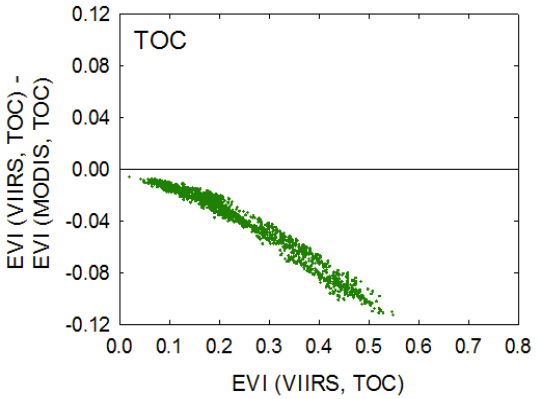


Issues, Challenges, Setbacks

Changes likely to be proposed to the VI EDR

1) Adding TOC-NDVI
2) Updating/revising QA fields (same as MODIS)
3) Refining the EVI algorithm
   - A backup algorithm over snow/ice covered areas
   - Coefficient adjustment or an EVI2 algorithm
4) Temporal compositing
5) EVI equation revision: the gain factor

VIIRS

$$EVI = \boxed{(1+L)} \frac{\rho_{\text{NIR}} - \rho_{\text{red}}}{\rho_{\text{NIR}} + C_1\rho_{\text{red}} - C_2\rho_{\text{blue}} + L}$$

MODIS

$$EVI = \boxed{G \cdot} \frac{\rho_{\text{NIR}} - \rho_{\text{red}}}{\rho_{\text{NIR}} + C_1\rho_{\text{red}} - C_2\rho_{\text{blue}} + L}$$

FY-13 Schedule and Milestones (VI)

- Provisional release of VI-EDR (July 13).
- VI algorithm evaluation report (March 2014)
- ATBD update (March 2014)
- Evaluate Top Of Canopy (TOC) NDVI produced from Surface Reflectance IP (ongoing)
- Continue global comparisons (VIIRS, MODIS, AVHRR); expand the analysis for off-nadir observations; address land cover dependencies (ongoing)
- ASRVN, Tower Reflectance, FLUXNET: obtain initial APU estimates before provisional release (July 2013);
- continue the analysis to increase a number of sites with longer time series (ongoing)

Path Forward (FY-13 thru FY-17)

(assume "FYxx" runs from April 1, 20xx to March 31, 20xx+1)

	Suomi NPP	JPSS J1
FY13	• Maintenance of VI-EDR algorithm • VI-EDR declared PROVISIONAL •Evaluation and introduction of products into applications	• Evaluate TOC NDVI
FY14	• Maintenance of VI-EDR algorithm • VI-EDR to achieve VAL 1 stage • Evaluation and introduction of products into applications.	• Support J1 pre-launch. • ATBD update. • Develop validation tools.
FY15	• Maintenance of VI-EDR algorithm • VI-EDR to achieve VAL 2 stage • Evaluation and introduction of products into applications.	• Update OPSCON and Cal/Val tasks document for J1. • Algorithm readiness for J1. • Validation tools readiness for J1.
FY16	• Maintenance of VI-EDR algorithm • VI-EDR to achieve VAL 3 stage • Continue validation using in-situ network • Evaluation and introduction of products into applications.	• Support J1 post-launch intensive Cal/Val (ICV). • Continue development of validation tools and protocols. • Beta release
FY17	• Maintenance of VI-EDR algorithm	• Support J1 post-launch intensive Cal/Val (ICV) and beyond. • Provisional release

Overview of Data Products (Albedo)

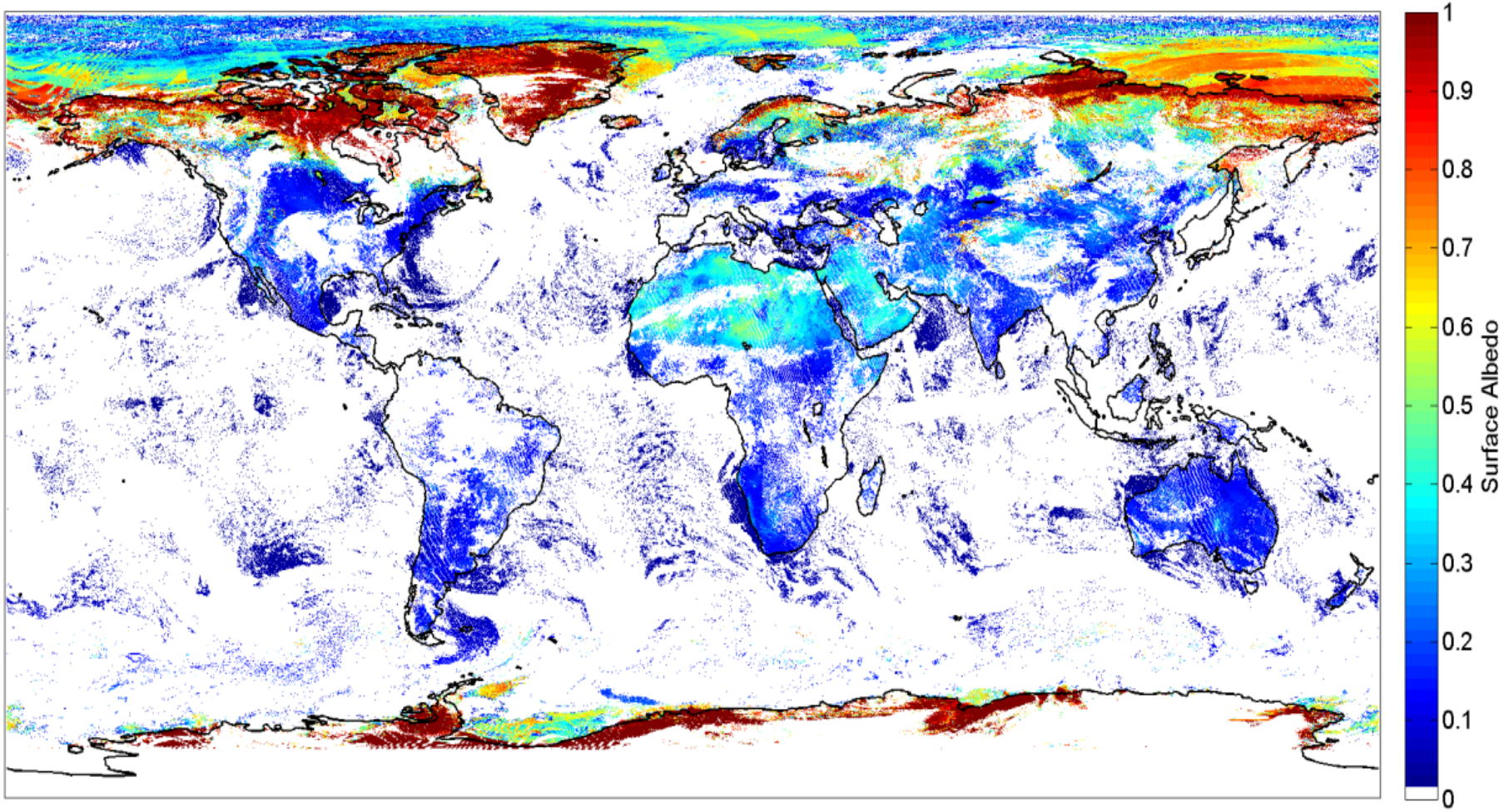
- VIIRS Albedo EDR provides a single daily broadband value at the time of overpass
- Two algorithms have been implemented
  - Bright Pixel Surface Albedo (BPSA) is a TOA LUT approach
    - based on extensive RT simulation
    - Designated as primary algorithm
  - Dark Pixel Surface Albedo (DPSA) is based on heritage MODIS
    - Spectral BRDF (and NBAR) information is produced as unreleased gridded albedo IP
      - inversion of kernel-driven BRDF models
    - DPSA and BRDF IP currently are switched off
- Evaluation underway
  - Comparison with MODIS products
  - Comparison with tower albedometer measurements
    - At spatially representative sites
- Recent proposed Changes
  - BPSA LUT Update
  - BRDF historical data update
  - DPSA switch on

FY-12 Accomplishments (Albedo)

- Evaluation performed
  - surface albedo EDR (BPSA) values display and analysis
  - Examined the corresponding QA
  - VIIRS BPSA is very unstable at present
- Comparisons of the VIIRS BPSA with MODIS albedo
  - Compared the MODIS blue-sky albedo with the VIIRS BPSA
- Updating BPSA LUT
  - Built up a new LUT using simulation analysis and up-to-date spectral response functions
  - Tested the new LUT using the actual VIIRS data
- Monitored VIIRS versus MODIS at four locations
  - Harvard Forest (MODIS compares well to this location)
  - Howland Forest (MODIS compares well to this location)
  - Table Mountain (MODIS compares well to this location)
  - Sahara Location (Stable location – MODIS is stable)
- BPSA over snow are spuriously high out of range
  - Antarctic and northern high latitudes
- Evaluated Multi-kernels versus single-kernel (RTLSR) DPSA albedo issue

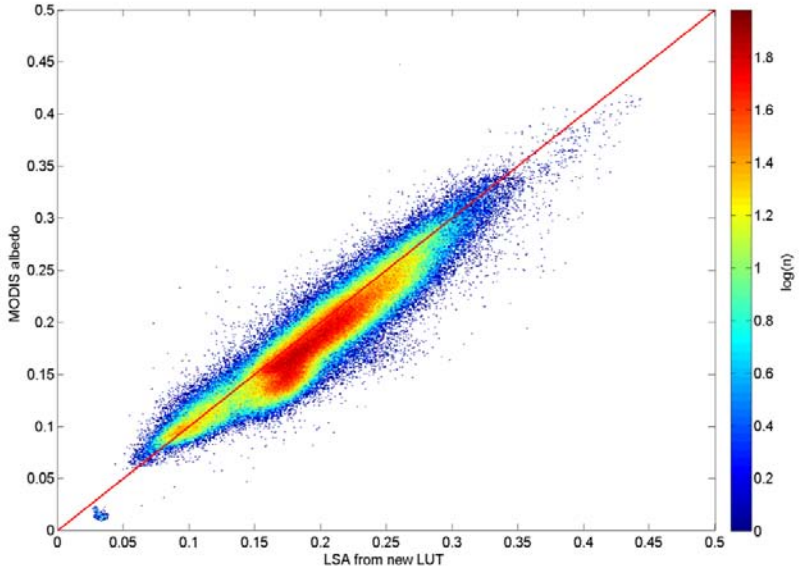
FY-12 Accomplishments (Albedo)

Global map of VIIRS albedo EDR (BPSA)

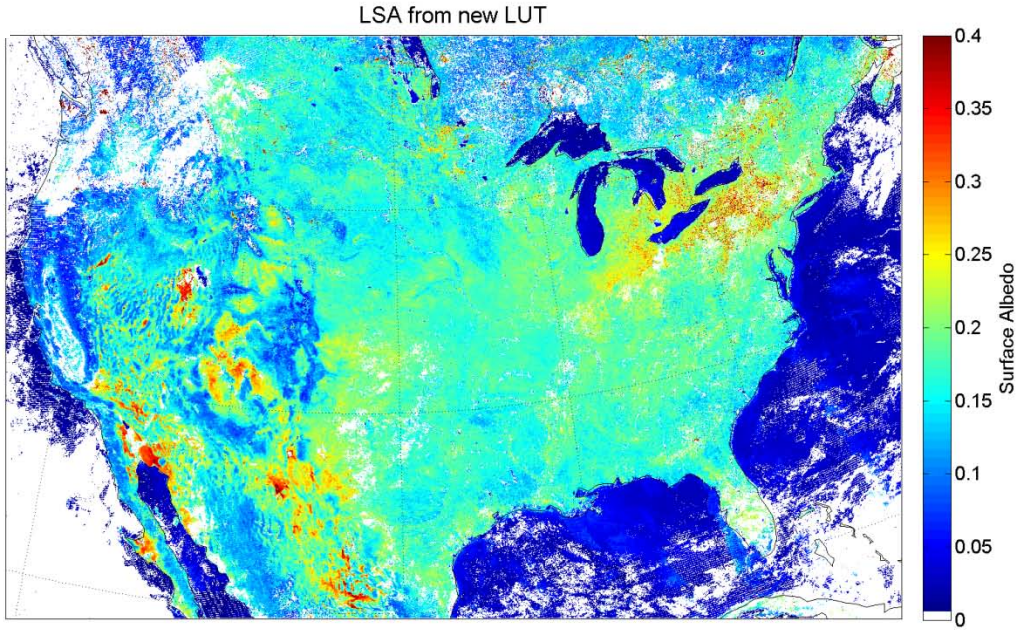


Date April 3, 2012.

FY-12 Accomplishments (Albedo)

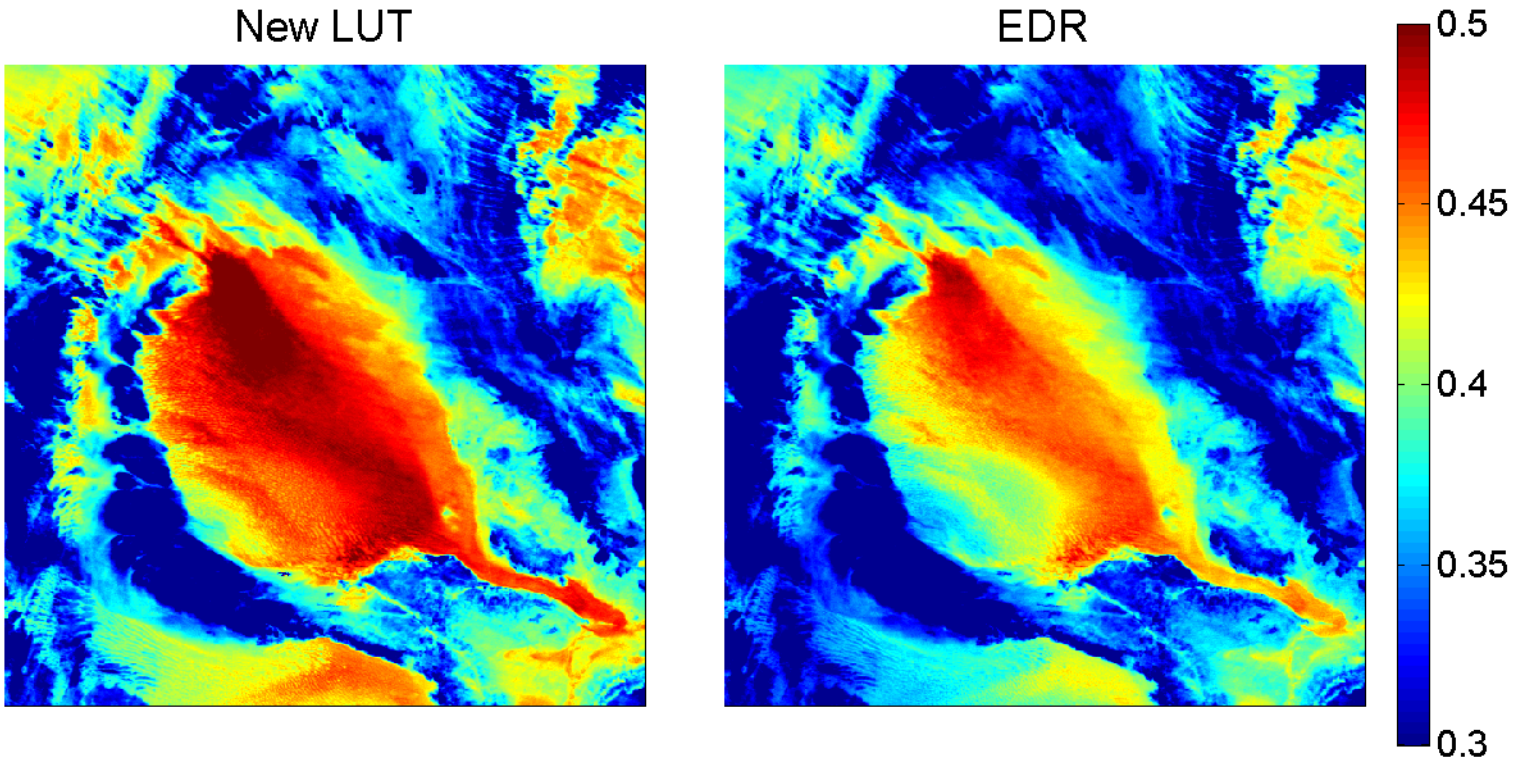


Left: Comparison between VIIRS BPSA retrieved from the new LUT and the MODIS albedo products. VIIRS data cover the US continent during DOY 145-160, 2012 are used. Ten clear-sky retrievals are needed in the calculation of the mean values.



Right: Map of VIIRS BPSA retrieved from the new LUT. VIIRS data cover the US continent during DOY 145-160, 2012 are used.

FY-12 Accomplishments (Albedo)

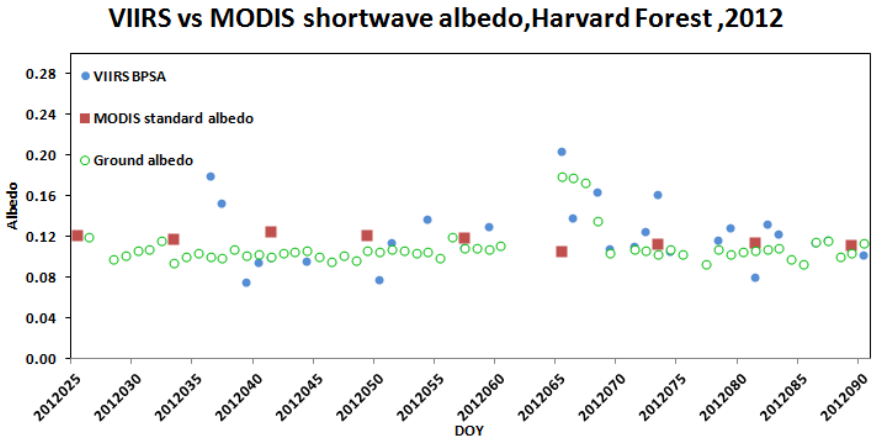


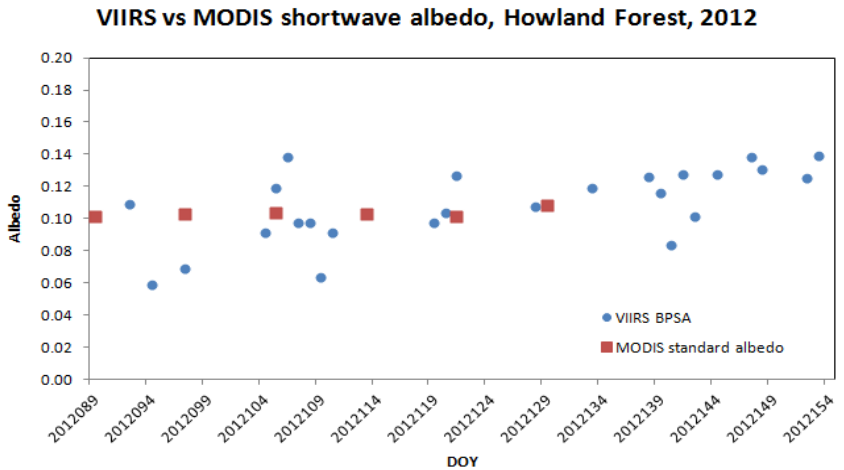
Maps of VIIRS albedo: left using updated BPSA LUT; right current VIIRS BPSA

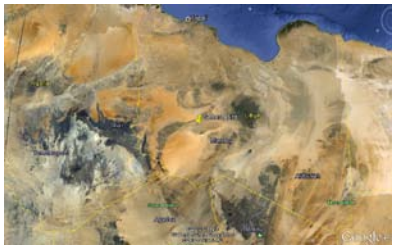
DR number	Short Description
4704	Update BPSA LUT

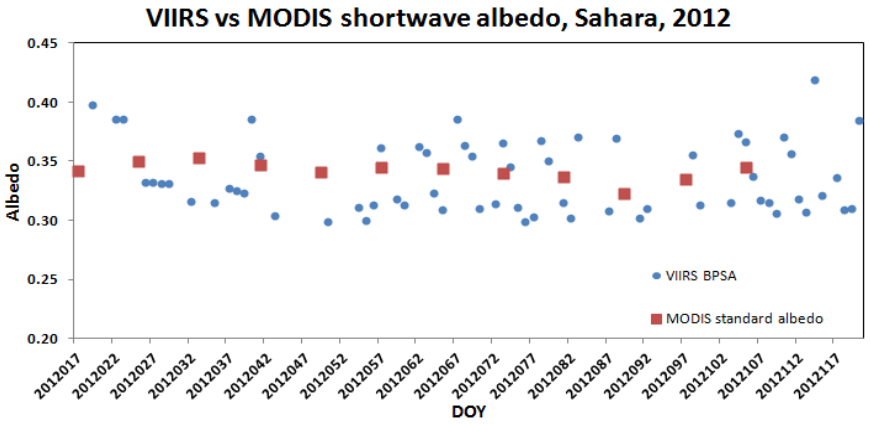
FY-12 Accomplishments (Albedo)

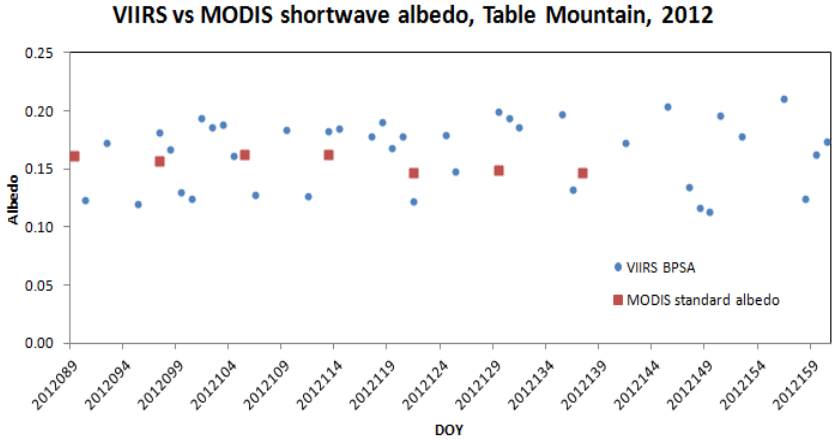
Comparison of VIIRS BPSA with MODIS albedo





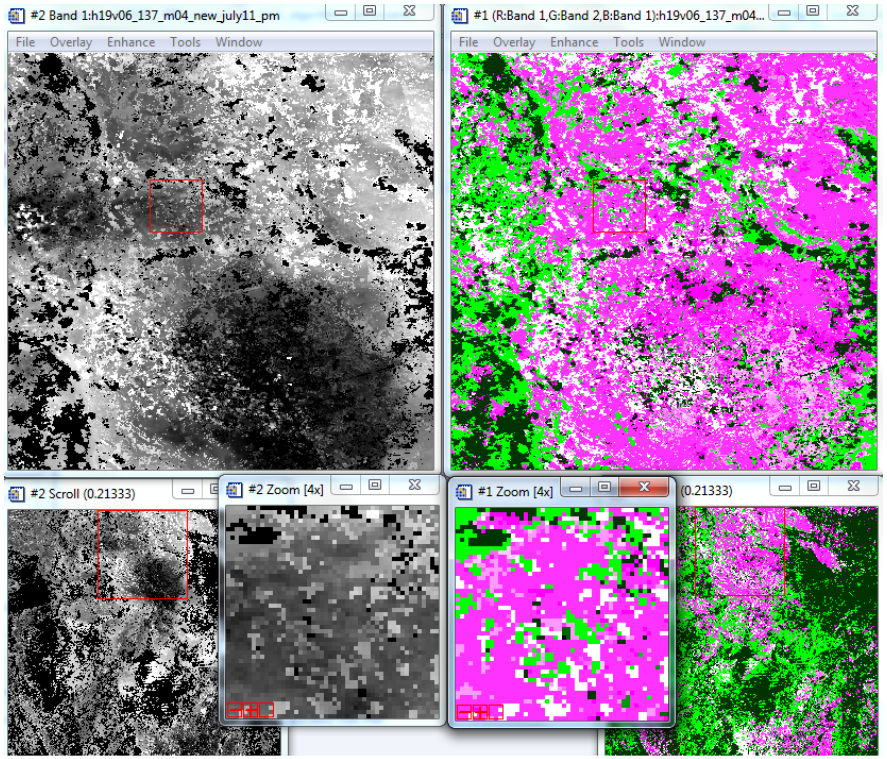




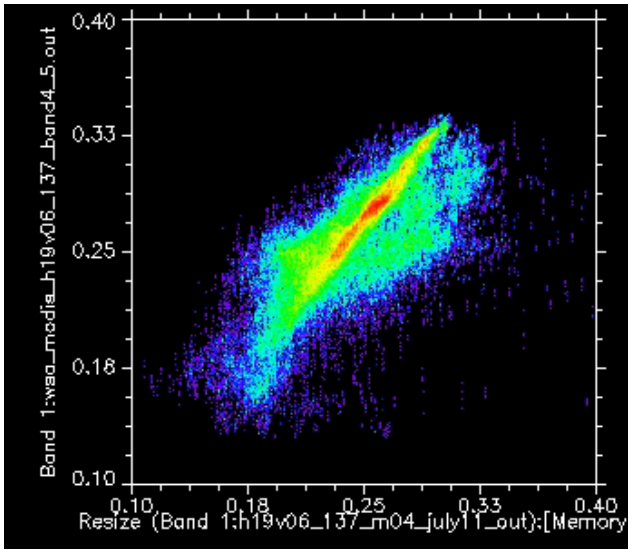


FY-12 Accomplishments (Albedo)

Study of multi-kernels vs single-kernel (RTLSR) for DPSA -- multi-kernels



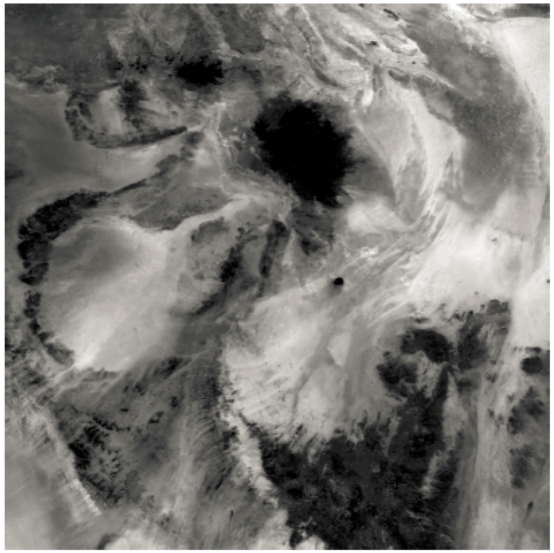
VIIRS full inversion band 4 white sky albedo (left) and kernel combinations (right)



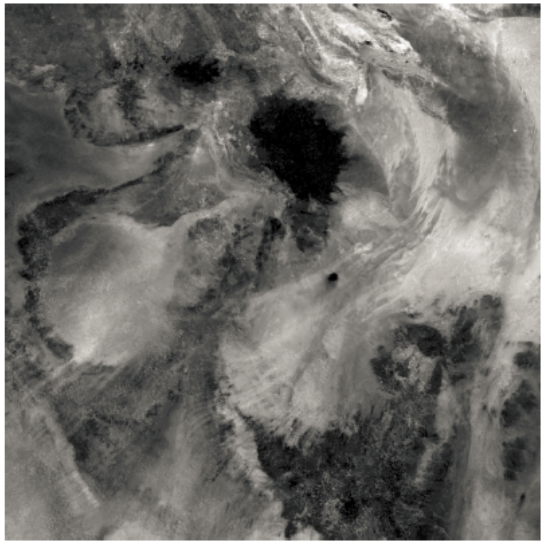
Scatter plot of band 4 MODIS white sky full inversion albedo and VIIRS full inversion white sky albedo for DOY 137

FY-12 Accomplishments (Albedo)

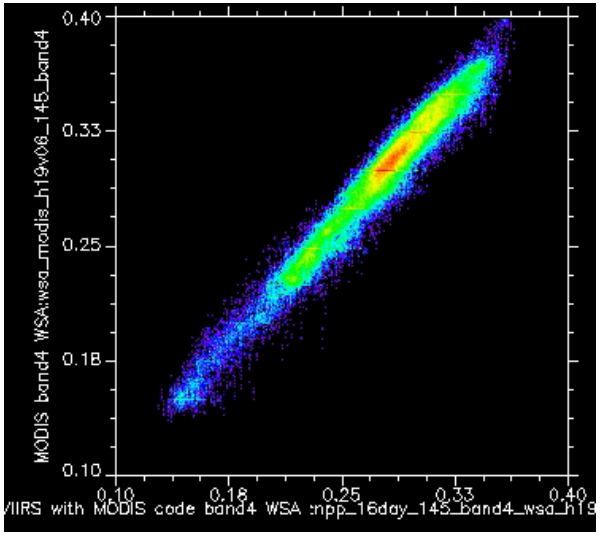
Study of multi-kernels vs single-kernel (RTLSR) for DPSA
-- single-kernels



MODIS standard Band 4 WSA for DOY 145



VIIRS Band 4 WSA through the MODIS code (RTLSR) for DOY 145 (from Land PEATE)



Scatter plot of MODIS Band 4 versus VIIRS through MODIS code Band 4 for DOY 145

Scientific Advancements (Albedo)

- The quality of current albedo EDR has been preliminarily evaluated.
- A new LUT is generated to improve the BPSA albedo estimation.
- A set of diversified ground sites are used to study the fluctuations of the albedo retrievals.
- A LUT with the consideration of surface BRDF effects is under development.

Issues, Challenges, Setbacks (Albedo)

- VIIRS BPSA is very unstable at present (update is on the way).
- The quality flags may not reflect the retrieval status correctly.
- Gridded albedo IP is not switched on, so DPSA data cannot be evaluated.
- Cloud contamination is still an issue which has significant impact to BPSA.
- More investigations are needed to understand whether the co-exist of BPSA and DPSA is necessary, or at what circumstances the BPSA or DPSA is better.
- Complexity and inconsistency of using multi-kernel combination of BRDF model
- Validation difficulties
  - Limited high quality in-situ data
  - Surface heterogeneity in a pixel
  - Impact of cloud contamination

Changes in Strategy (Albedo)

- Switch on DPSA (as well as the Albedo Grided IP) production.
- Update BRDF archetypal data
- Update BPSA LUT reflecting recent BPSA technical/theoretical development in the last decade.
- Using fixed kernel model combination instead of the multi-kernel selection process
- Investigate BPSA and DPSA differences and user preference.

FY-13 Schedule and Milestones (Albedo)

- A comparison report of BPSA and DPSA – April 15, 2013
- Beta version readiness —— May, 2013
- Beta version Albedo evaluation report – July, 2013
- Second update version of the LUTs for BPSA derivation – August, 2013
- Update for DPSA LUTs —— September, 2013
- Provisional version readiness —— November, 2013
- Second statistical validation analysis report of VIIRS LSA – December, 2013

Path Forward (FY-13 thru FY-17) -- Albedo

(assume "FYxx" runs from April 1, 20xx to March 31, 20xx+1)

	Suomi NPP	JPSS J1
FY13	▪ Algorithm coefficients Update ▪ Beta version readiness ▪ Evaluation report ▪ provisional version readiness ▪ Development of validation tool	▪ Algorithm development ▪ Investigate advantages and disadvantages of BPSA and DPSA ▪ Proxy data collection ▪ Study of aerosol variation and impact to albedo production
FY14	• Validated/calibrated version I readiness • Possible algorithm update o LUT updates o BPSA algorithm update • VIIRS albedo validation report • Validated/calibrated version II readiness • ATBD update, if needed	▪ JPSS J1 albedo ATBD version I ▪ Algorithm evaluation using proxy data ▪ Software design and development ▪ Preliminary evaluation report ▪ Ground data validation model development and test
FY15	• Algorithm coeffs update, if needed • Validated/calibrated version III readiness • ATBD update, if needed	▪ JPSS J1 albedo ATBD version II ▪ JPSS J1 albedo Algorithm readiness package ▪ Validation tool readiness ▪ Post-launch intensive test and evaluation ▪ Algorithm evaluation report
FY16	▪ NPP Allbedo maintenance • Algorithm coeffs update, if needed	▪ Algorithm coefficients Update ▪ ATBD update, , if needed ▪ J1 albedo evaluation and provisional version readiness ▪ Development and improvement of validation tool
FY17	▪ NPP LST maintenance ▪ Applications	▪ Algorithm evaluation using JI and NPP data ▪ J1 albedo evaluation/validation report II ▪ ATBD update, , if needed

Overview of Data Products (LST)

- VIIRS LST EDR provides effective land surface skin temperature value at the time of overpass
- Two algorithms have been implemented
  - Split Window LST(SWLST) is derived using two thermal infrared channels (31, 32)
    - baseline algorithm
  - Dual Split Window LST (DSWLST) is is derived using two thermal infrared channels (31, 32) and two shortwave infrared channels (14, 15)
    - Back-up algorithm
- Evaluation underway
  - Comparison with MODIS LST product
  - Comparison with Ground LST measurements
  - Results of preliminary evaluation are promising : Beta version release is scheduled in October, 2012
- Recent Build Changes
  - SWLST is switched as baseline algorithm (DSWLST was the baseline)
  - LUT (alg cofficients) were updated by NGAS; correction of surface type order

FY-12 Accomplishments (LST)

- Pre-launch scientific support
  - Proxy data evaluations. We performed internal evaluations such as quality flags, image display etc; external evaluations including cross satellite comparison with MODIS Terra and Aqua, comparison with ground data such as data from SURFRAD and CRN.
  - Evaluation tool development. We developed the tool for image display, data evaluation and analysis etc.
- Post-launch scientific support
  - Set up of local running environment. ADL3.1 is installed at STAR local Linux server. We tested the code using the VIIRS proxy data.
  - Tracked the LST data quality after launch and collect raw data for generating VIIRS LST at the local computing environment.
  - Evaluated LST EDR
    - *LST data quality evaluation and associated quality flag check.*
    - *LST algorithm comparisons. We did comparisons of the two algorithms: 2 band split window algorithm and 4 band dual split window algorithm.*
    - *Cross comparison of the VIIRS LST data using other satellite data, e.g. MODIS LST.*
    - *Evaluate LST EDR against existing ground measurements, e.g. SURFRAD, CRN, etc.*
  - Collected ground truth data for validation
  - Developed and refined the validation tools
  - Performed the ground site characterization analysis for validation uncertainty and quality control.
  - Supported the tuning of the LST algorithms and coefficients.
- Management support
  - Participated TIM meetings, workshops, conferences arranged and required by the JPSS mission
  - Submitted weekly, monthly, quarterly report

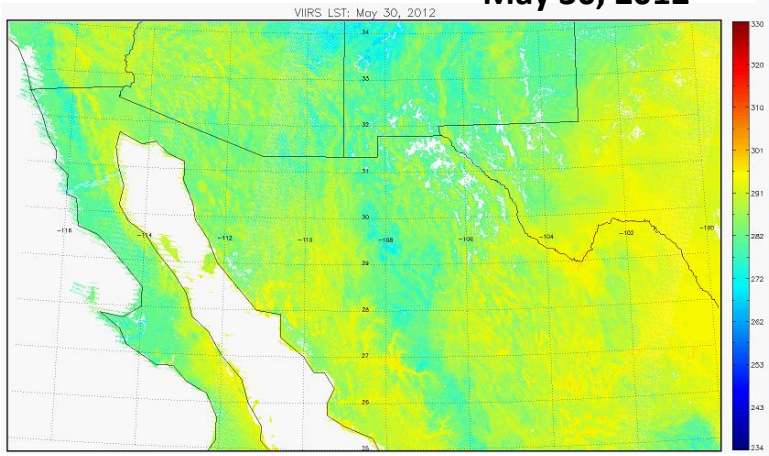
FY-12 Accomplishments (LST)

- Experimented LST comparisons of a large set of the ground data and other satellite data such as MODIS and SEVIRI , which prepares us to run the VIIRS LST validation for good performance evaluation.
- Continuous efforts on tracking the LST data quality, which provides us the information on how the LST product performs over a time scale.
- A satellite and ground measurement comparison model is established and tested for more accurate LST validation.
- A couple of site characterization models are established for mapping the ground point measurement to the satellite pixel measurement, which prepares us to perform the satellite and ground measurement comparisons at the same pixel size.
- Update of algorithm coefficients based on MODTRAN simulation to improve the LST product.
- 8 Airborne campaigns in 2012 over Bondville, IL in collaboration with NOAA's ATDD and the University of Tennessee Space Institute to fully describe the spatial variability of LST around a ground station
- 1 peer-reviewed publication
  - Guillevic P., Privette J., Coudert B., Palecki M. A., Demarty J., Ottlé C. and Augustine J. A. (2012). Land Surface Temperature product validation using NOAA's surface climate observation networks – Scaling methodology for the Visible Infrared Imager Radiometer Suite (VIIRS). *Remote Sensing of Environment*, 124 (2012) 282–298.

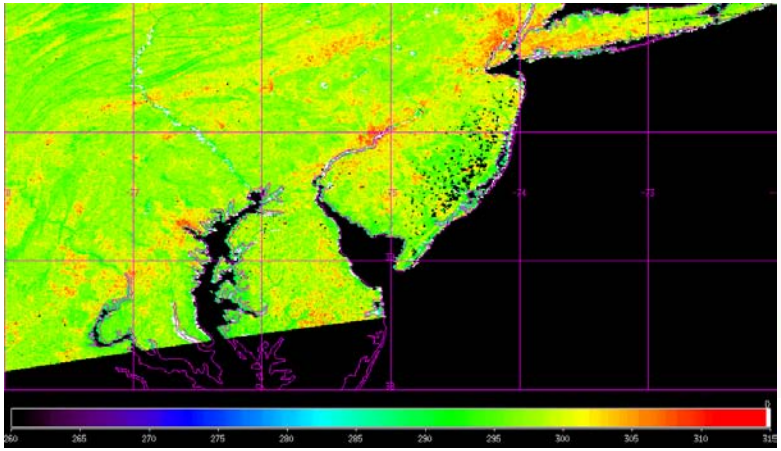
FY-12 Accomplishments (LST)

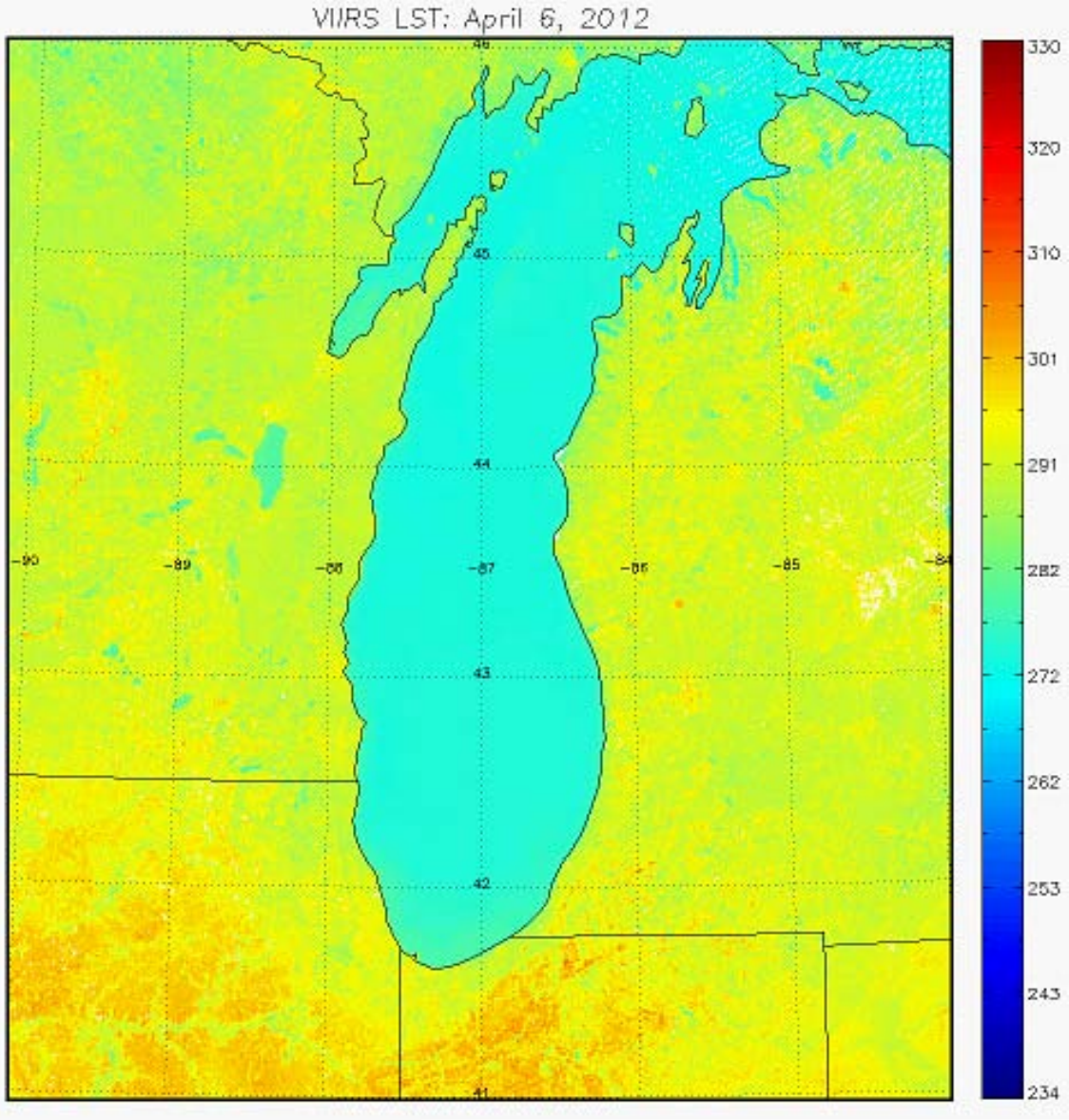
Sample VIIRS LST images processed using the LST EDR team local computing environment.

May 30, 2012



APR 13, 2012





FY-12 Accomplishments (LST)

A display tool developed at LST EDR team for global composite LST maps --- comparisons of LST algorithms:

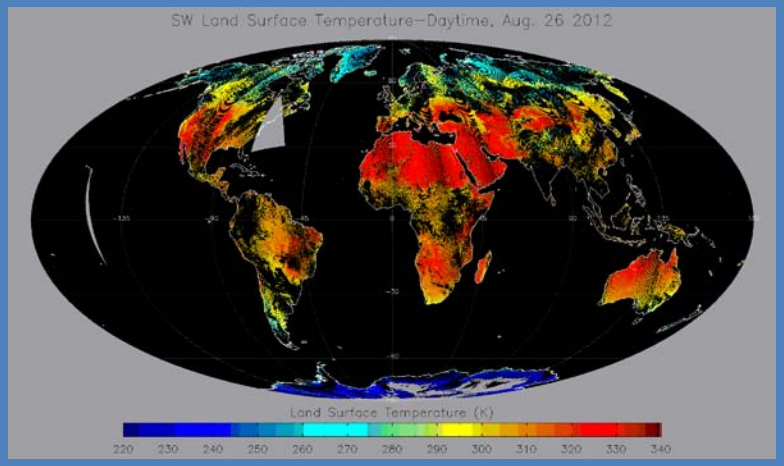


Figure 1a. Global image of daytime SWLST on Aug. 26, 2012

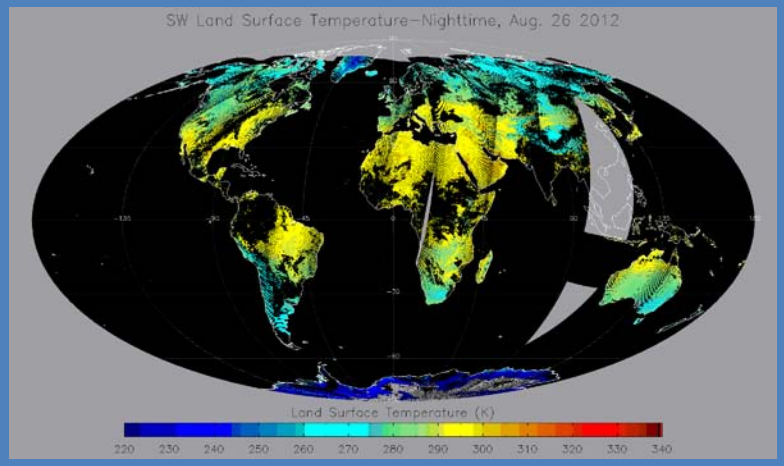


Figure 1b. Global image of nighttime SWLST on Aug. 26, 2012

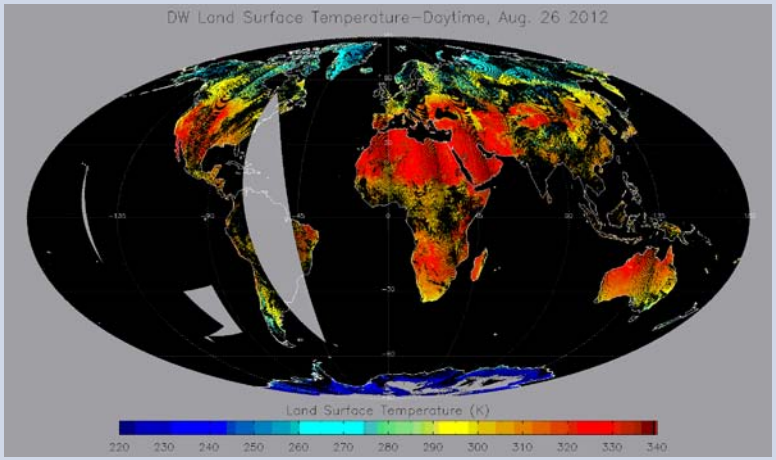


Figure 2a. Global image of daytime DWLST on Aug. 26, 2012

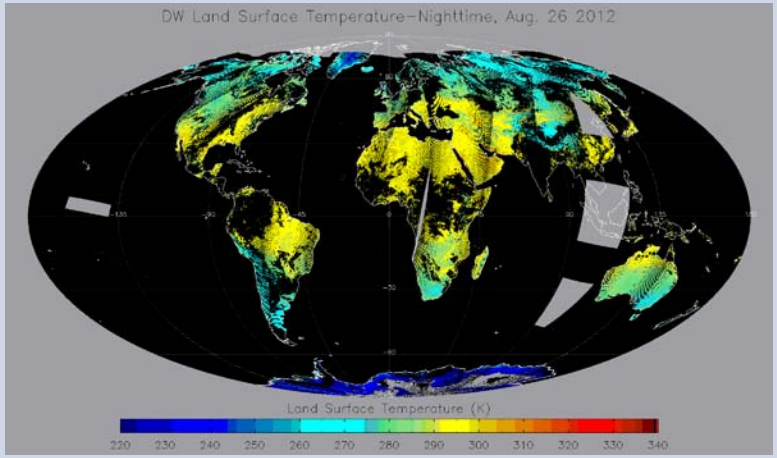


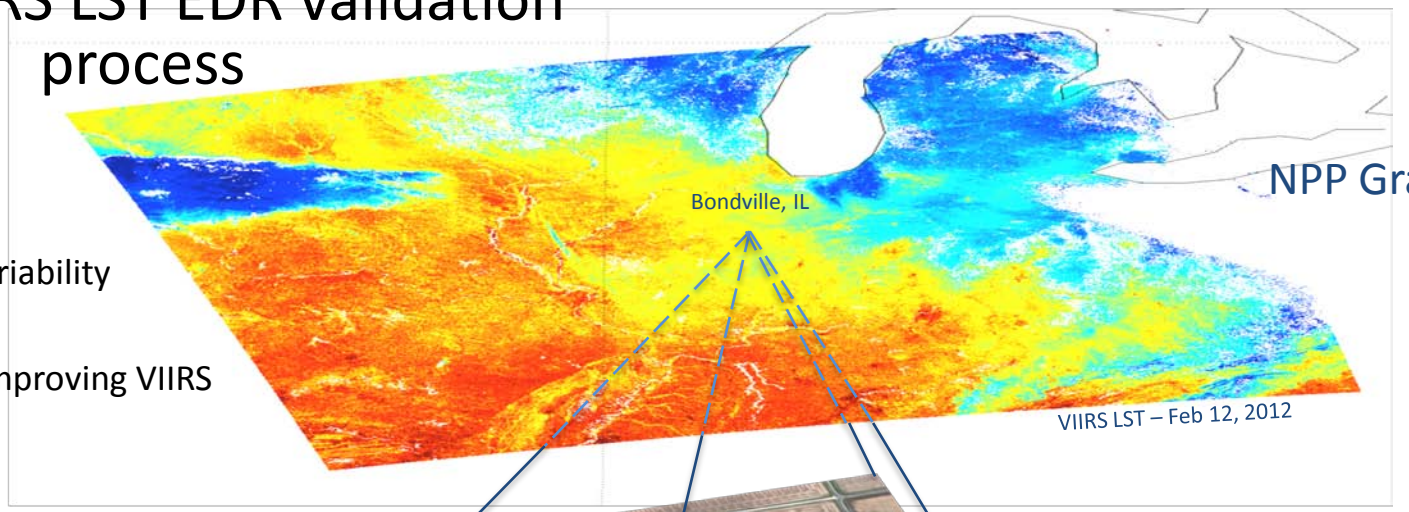
Figure 2b. Global image of nighttime DWLST on Aug. 26, 2012

FY-12 Accomplishments (LST)

One of VIIRS LST EDR validation process

Account for variability between CRN

Potential for improving VIIRS algorithm



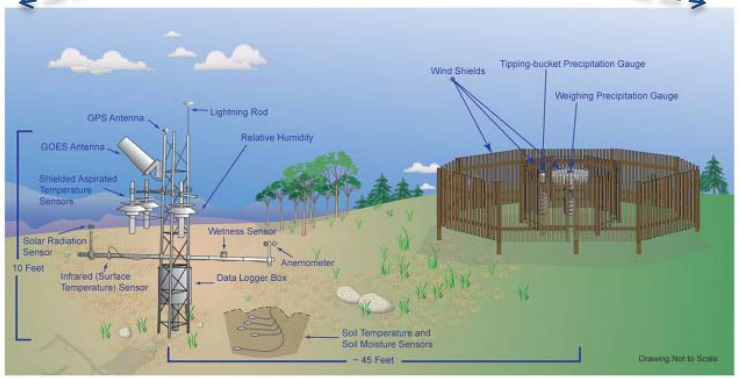
NPP Granule

within a VIIRS pixel at 750m resolution

Scaling

Based on CRN products:

- *Skin temperature (as reference)*
- *Meteorological variables (for scaling up)*



CRN Station

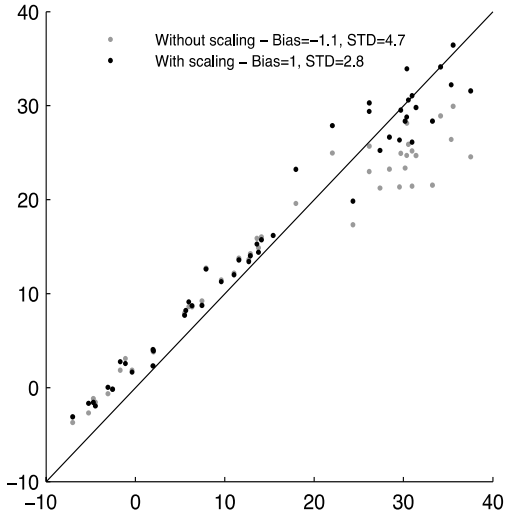
LST accuracy ≈ -0.3K, precision ≈ 1.9K

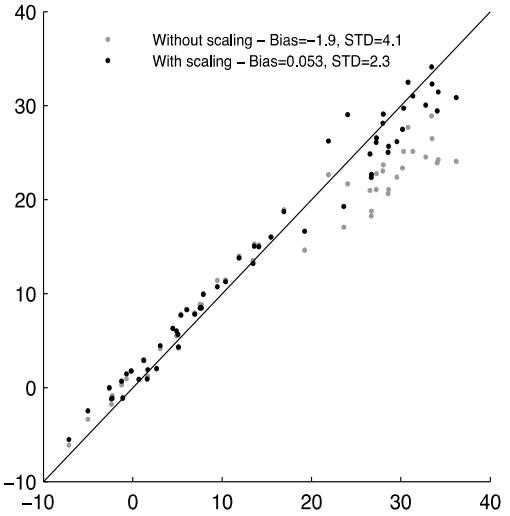
(based on 13 clear-sky day or night VIIRS measurements)

FY-12 Accomplishments (LST – NCDC)

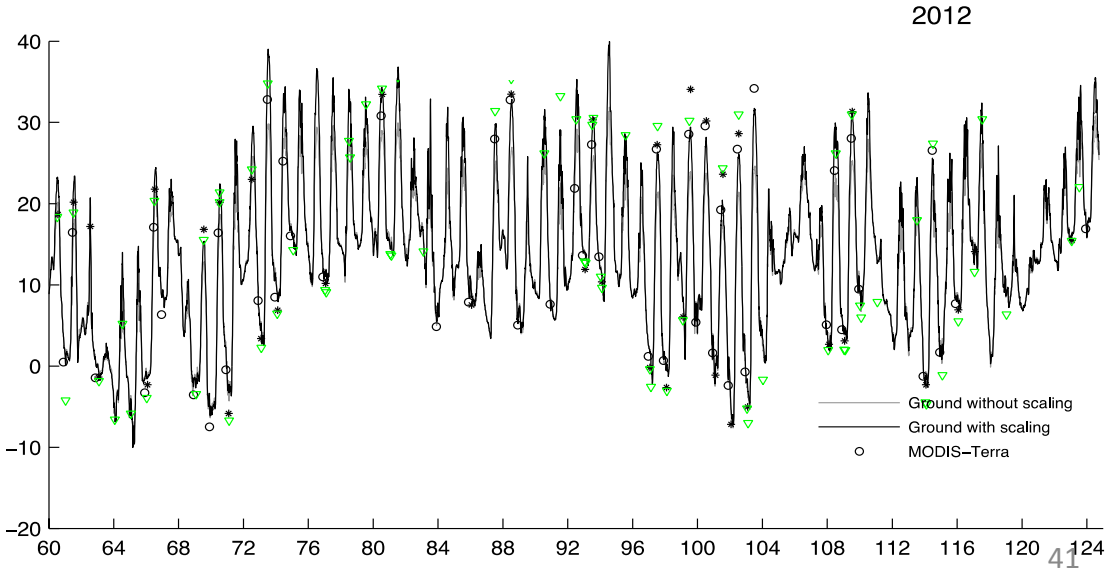
Bondville/Champaign, IL

(40.05N, 88.37W)

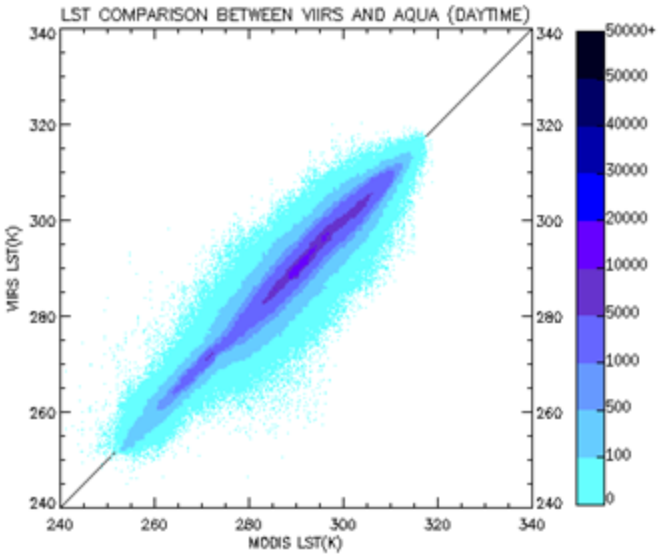


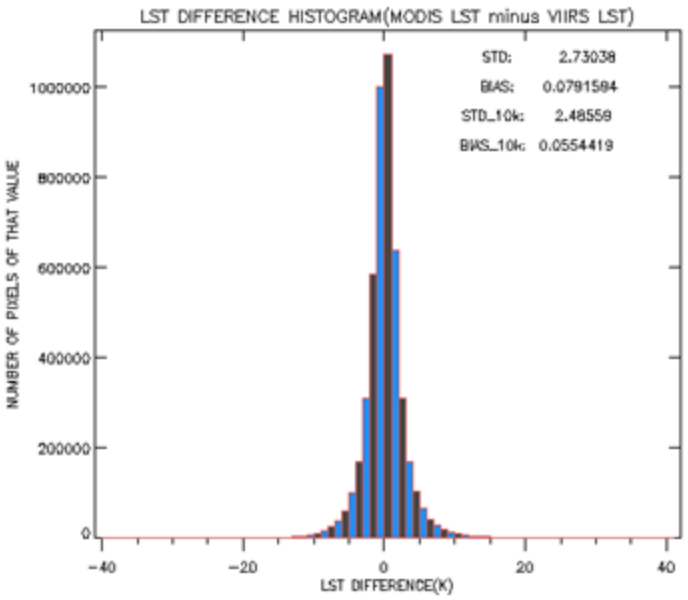


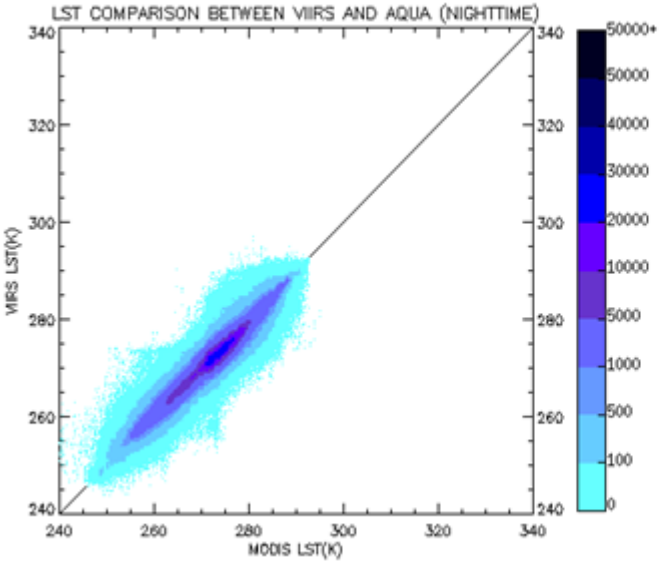
VIIRS and MODIS agree better with scaled-up field data than with non-scaled field observations.

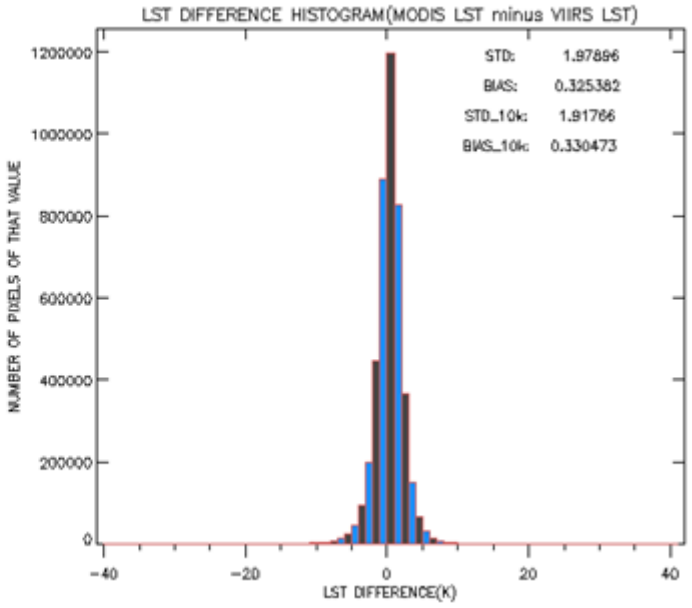


FY-12 Accomplishments (LST)









Performed cross-satellite comparisons with MODIS LST data.

Samples on left: Daytime and Nighttime comparison between the SWLST and AQUA LST. Color bar represents density of LST pairs in each bin (0.5K). STD_10K and BIAS_10K represent results of filtered data (abs(MODIS_LST -VIIRS_LST) < 10K).

MODIS LST vs. SWLST (Region=CONUS)

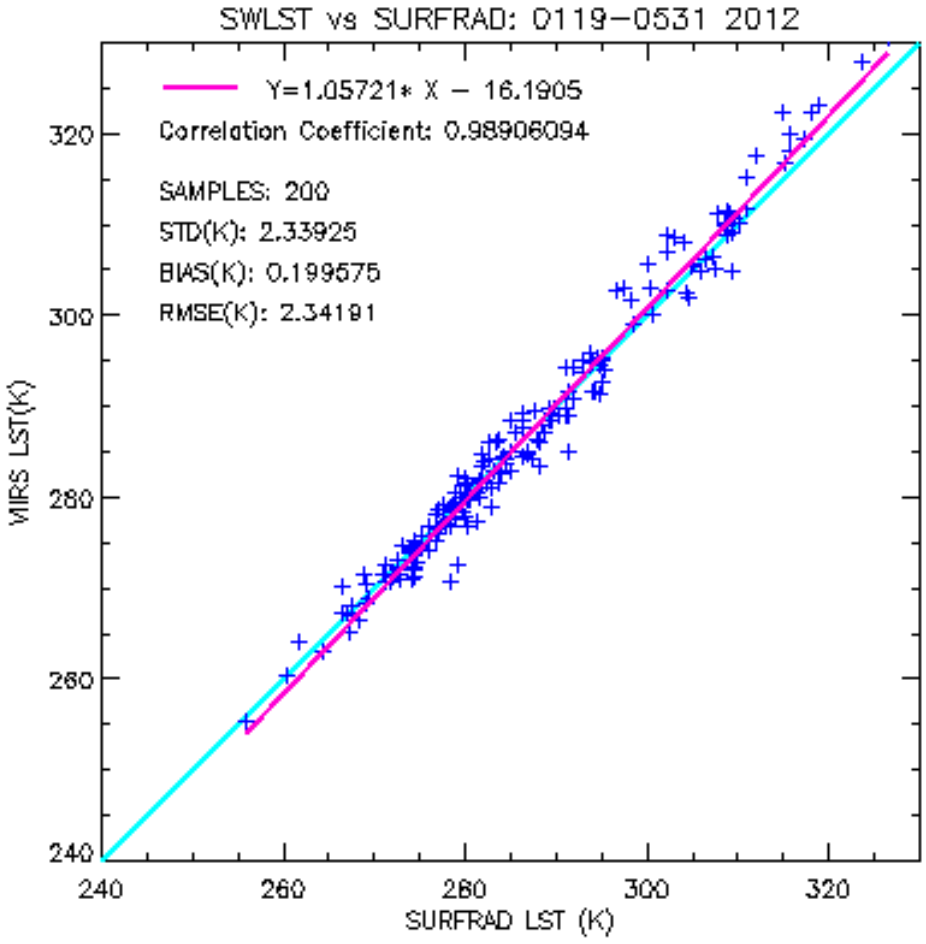
Daytime (top) : 1/24, and 2/01, 2012

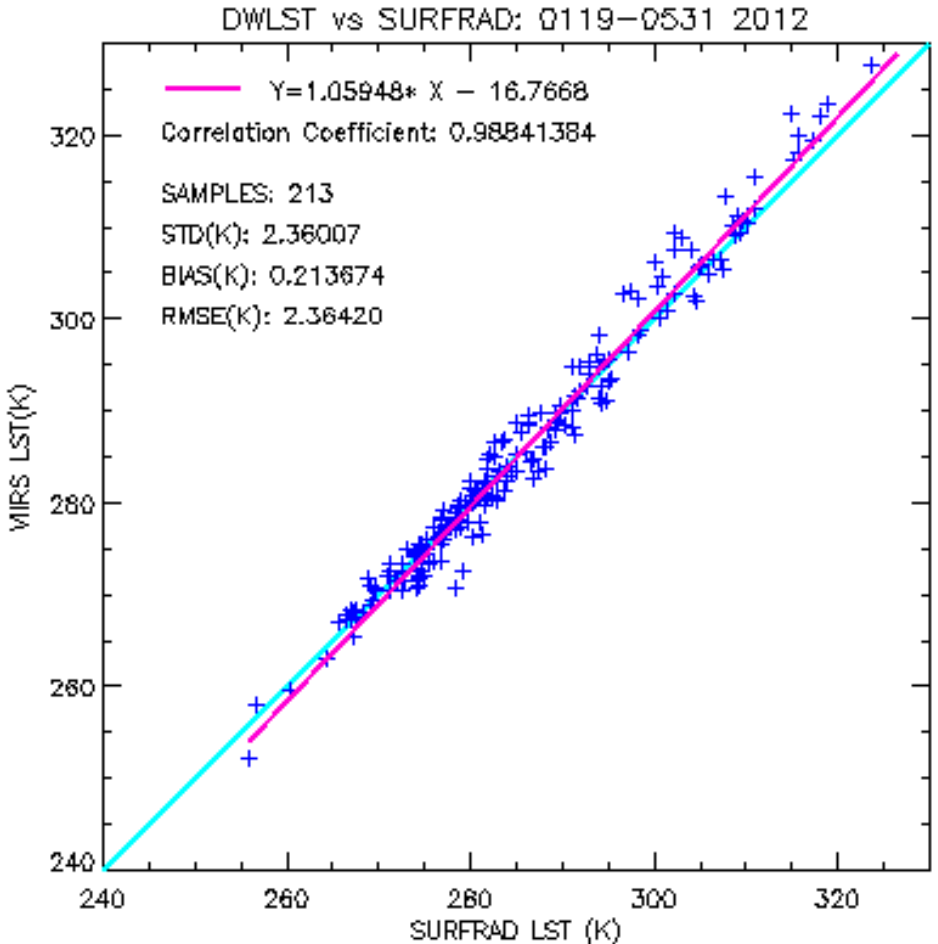
Nighttime (bottom): 1/22 and 1/30, 2012

FY-12 Accomplishments (LST)

Validation Against Ground Data

-- Sample scatter plots of the VIIRS LSTs and the SURFRAD LSTs --





FY12 Accomplishments (LST): DRs

DR number	Short Description
DR 4608	Split-window algorithm - Baseline Coefficient files. LUT update #2 (same as"Updated LUT" in slides): DR 4608/CCR 12-0355: Corrects errors for both dual split window and split window.
DR 4353	snow/ice field is always "no snow" at night. The output of surface type provides the Quarterly Surface Type for the given pixel, plus three bits for fire, snow, and vegetation... These bits currently are only valid daytime so that the snow field is always "0" at night... We should have an output at night so that downstream functions can work, such as LST
DR 4582	LST Day Night Land Water Misidentification, The LST EDR appears to have a coding error that may have incorrectly mixed up the Day/Night flag with the Land/Water and Surface Type QA Flag within the QF Byte 3 of the LST EDR... This same Day/Night flag is being correctly encoded in the bit3 of QF Byte1 of the LST EDR.
DR 4203	The OPS LST code, both v1.5.00.48 and v1.5.03.00, do not verify that the value for the Surface Type input falls within the valid range prior to calculating LST
DR 2724	Ice Surf. Temp & nighttime Sea Ice Age. The nighttime energy-balance method requires the surface temperature of the snow cover that may be present on top of the ice. There is no such parameter currently available within the VIIRS algorithm system. The input used from the processing chain is ice surface temperature, not snow surface temperature.

Scientific Advancements

- Algorithm simplicity and robustness

  Split Window (SW) LST

  $$LST(\text{Daytime/Nighttime}) = c_0 + c_1 T_{11} + c_2(T_{11} - T_{12}) + c_3(\sec\theta - 1) + c_4(T_{11} - T_{12})^2$$

  Dual Split Window (DSW) LST

  $$LST(\text{Daytime}) = a_0 + a_1 T_{11} + a_2(T_{11} - T_{12}) + a_3(\sec\theta - 1) + a_4 T_{3.75} + a_5 T_{4.0} + a_6 T_{3.75}\cos\phi + a_7 T_{4.0}\cos\phi + a_8(T_{11} - T_{12})^2$$

  $$LST(\text{Nighttime}) = b_0 + b_1 T_{11} + b_2(T_{11} - T_{12}) + b_3(\sec\theta - 1) + b_4 T_{3.75} + b_5 T_{4.0} + b_6 T_{3.75}^2 + b_7 T_{4.0}^2 + b_8(T_{11} - T_{12})^2$$

- Explicit corrections on View zenith (θ) (SW) and solar zenith (ϕ) *(DSW)* angle correction
- Sensor advantage : High spatial resolution (new data aggregation method) , low noise
- Algorithm heritage (SW)

Issues, Challenges, Setbacks

General

- Processing complexity of CCR request
- Nighttime snow/ice cover information may not be right
- Qualified ground measurement data are very limited; may need specific ground campaigns; international cooperation is a must.
- Funding support is less than needed, resulting limited activities in LST EDR activities.

Issues, Challenges, Setbacks

- The algorithm coefficients were out of date(generated in 2004). The algorithm performance in Spring and Summer is not as good as in Winter according to the our preliminary evaluations. So there is a need to tune the algorithm coefficients to improve the LST product.
- Though the SW LST algorithm has been switched to baseline, the comprehensive evaluation of the two algorithms need to be conducted using all post launch data.
- Evaluation needs for LST consistency due to the algorithm and coefficients difference between different surface types and day/night conditions. Improvement maybe difficult based on current surface-type dependent algorithm.
- Anisotropic feature and land surface emission and its impact to VIIRS LST product; improvement on water vapor correction
- Considerable spectral variation in emissivity for different land surface type is a big concern of the current algorithm.
- Validation difficulties
  - Limited high quality in-situ data
  - Surface heterogeneity in a pixel
  - Emissivity variation within a surface type
  - Impact of cloud contamination
  - High LST temporal and spatial variation and its impact to match-up dataset

Changes in Strategy (due to funding constraints)

- LST EDR improvement will be mostly on the data consistency, water vapor correction and, atmospheric correction.
- Analysis of emissivity variation impact to the surface-type dependent algorithm.
- Algorithm coefficients update will be based on a combination of simulation data, high quality in-situ data and MODIS data.
- Seeking international cooperation, and users cooperation for the LST evaluation/validation; seeking validation from applications.
- Site characterization model development and evaluation for the VIIRS LST validation.

FY-13 Schedule and Milestones (LST)

- Beta version readiness —— October, 2012
- Beta version LST evaluation report —— December, 2012
- VIIRS LST validation tool developed —— January 2013
- Algorithm coeffs update (for provisional version) —— February, 2013
- LST local computing environment update —— March, 2013
- ATBD update —— April, 2013
- Provisional version readiness —— April, 2013
- Provisional version LST evaluation report —— July2013
- Algorithm coeffs update (for Val I version)—— August, 2013
- Preparations for long-term monitoring – Sept. 2013

Path Forward (FY-13 thru FY-17) -- LST

(assume "FYxx" runs from April 1, 20xx to March 31, 20xx+1)

	Suomi NPP	JPSS J1
FY13	▪ algorithm coefficients Update ▪ ATBD update, if needed ▪ NPP LST evaluation and provisional version readiness ▪ Investigate spatial discontinuity in the sun glint area and adjacent surface type areas ▪ Development and improvement of validation tool ▪ LST applications	▪ Algorithm development ▪ Investigate possibility of replacing NPP surface-type dependent algorithm using emissivity explicit algorithm ▪ Proxy data collection ▪ Study of emissivity variation and impact to LST production
FY14	• Validated/calibrated version I readiness • Possible algorithm update o Better atmospheric/water vapor correction o Better surface emissivity explicity o Better view-angle correction • VIIRS LST validation report • Validated/calibrated version II readiness • ATBD update, if needed	▪ JPSS J1 LST ATBD version I ▪ Algorithm evaluation using proxy data ▪ Software design and development ▪ Preliminary evaluation report ▪ Ground data validation model development and test
FY15	• ATBD update, if needed • Algorithm coeffs update, if needed • Validated/calibrated version III readiness • Application report	▪ JPSS J1 LST ATBD version II ▪ JPSS J1 LST Algorithm readiness package ▪ Validation tool readiness ▪ Post-launch intensive test and evaluation ▪ Algorithm evaluation report
FY16	▪ NPP LST maintenance ▪ Applications	▪ Algorithm coefficients Update ▪ ATBD update, , if needed ▪ J1 LST evaluation and provisional version readiness ▪ Development and improvement of validation tool
FY17	▪ NPP LST maintenance ▪ Applications	▪ Algorithm evaluation using JI and NPP data ▪ J1 LST evaluation/validation report II ▪ ATBD update, , if needed

FY-12 Accomplishments (Fire)

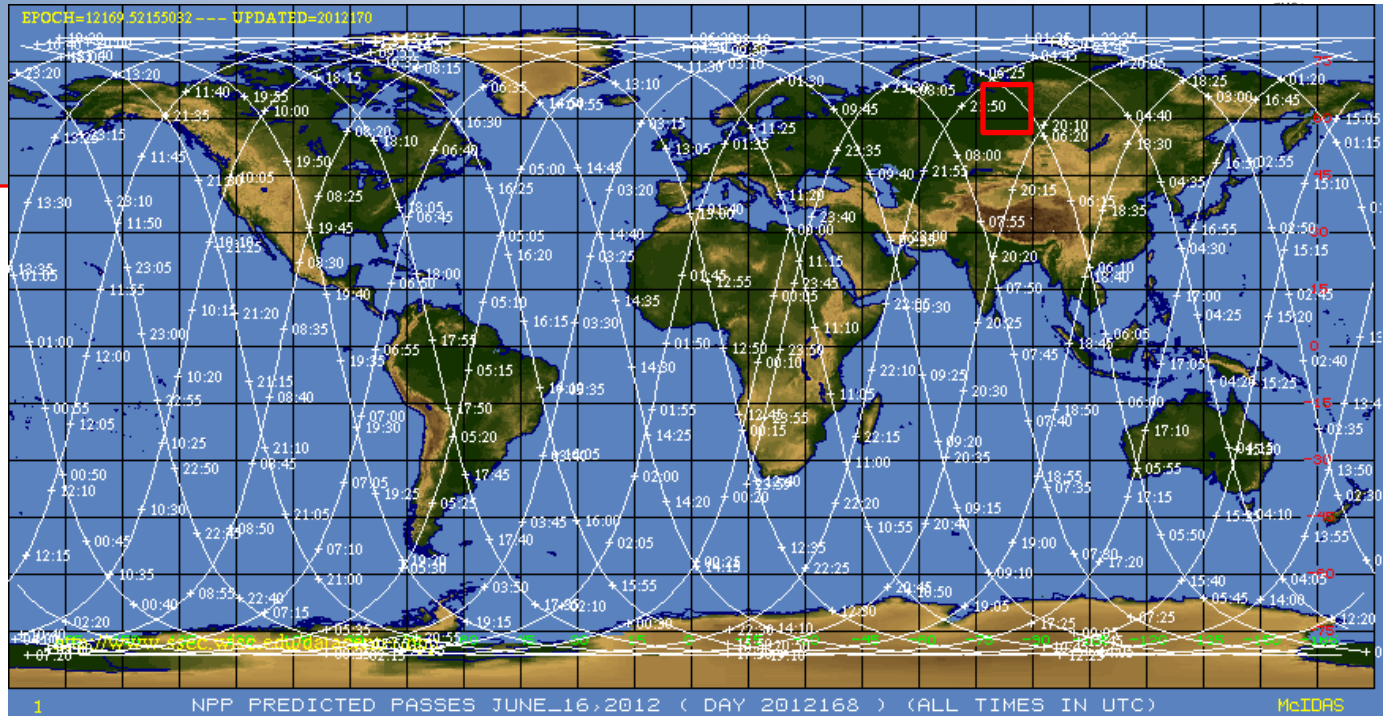
- Fire-related DRs
  - SDR feedback, product errors, deficiencies, Beta maturity
- Aqua/MODIS and SNPP/VIIRS AF corelative analysis
- Collection of limited airborne and in-situ validation data
- Presentations at AMS, NASA ST, IGARSS, EUMETSAT
- Initial agreement with DLR on data exchange
- Product website and user readiness
  - http://viirsfire.geog.umd.edu/
- Online articles
  - *First Fire Images from VIIRS (January 26, 2012)*
    - http://earthobservatory.nasa.gov/IOTD/view.php?id=77025
  - *NASA/NOAA Satellite Sees Western U.S. High Mountain Blazes (July 13, 2012)*
    - http://www.nasa.gov/mission_pages/NPP/news/west-blazes.html

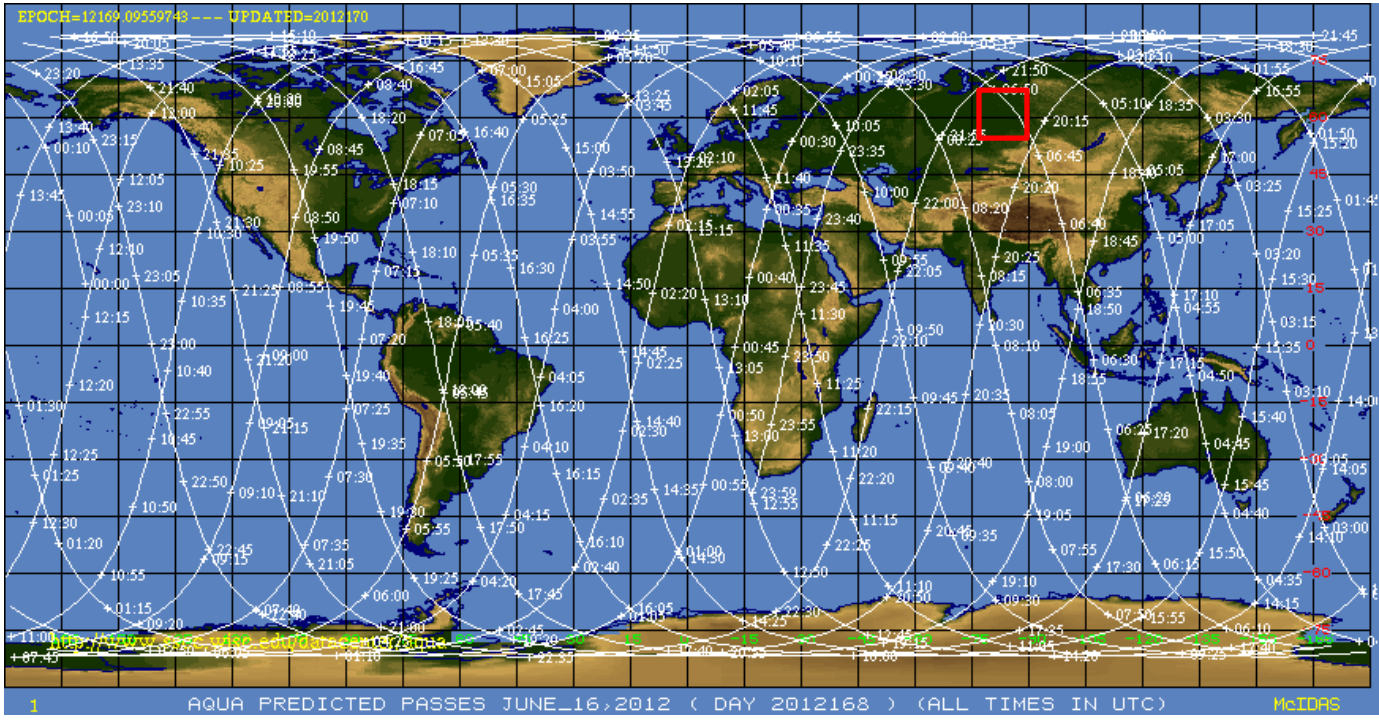
NPP

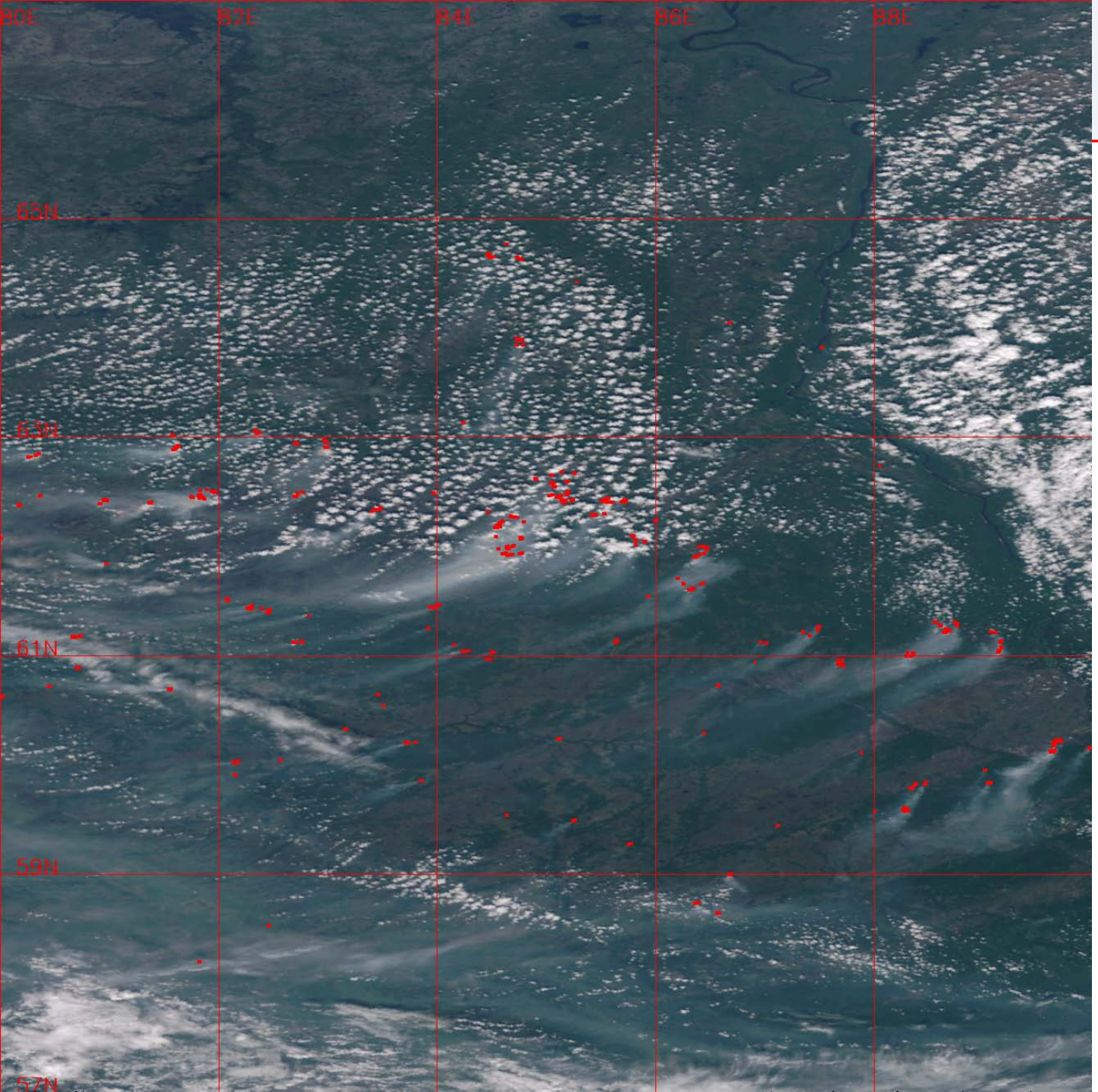
Satellite orbit tracks

June 16, 2012

Aqua







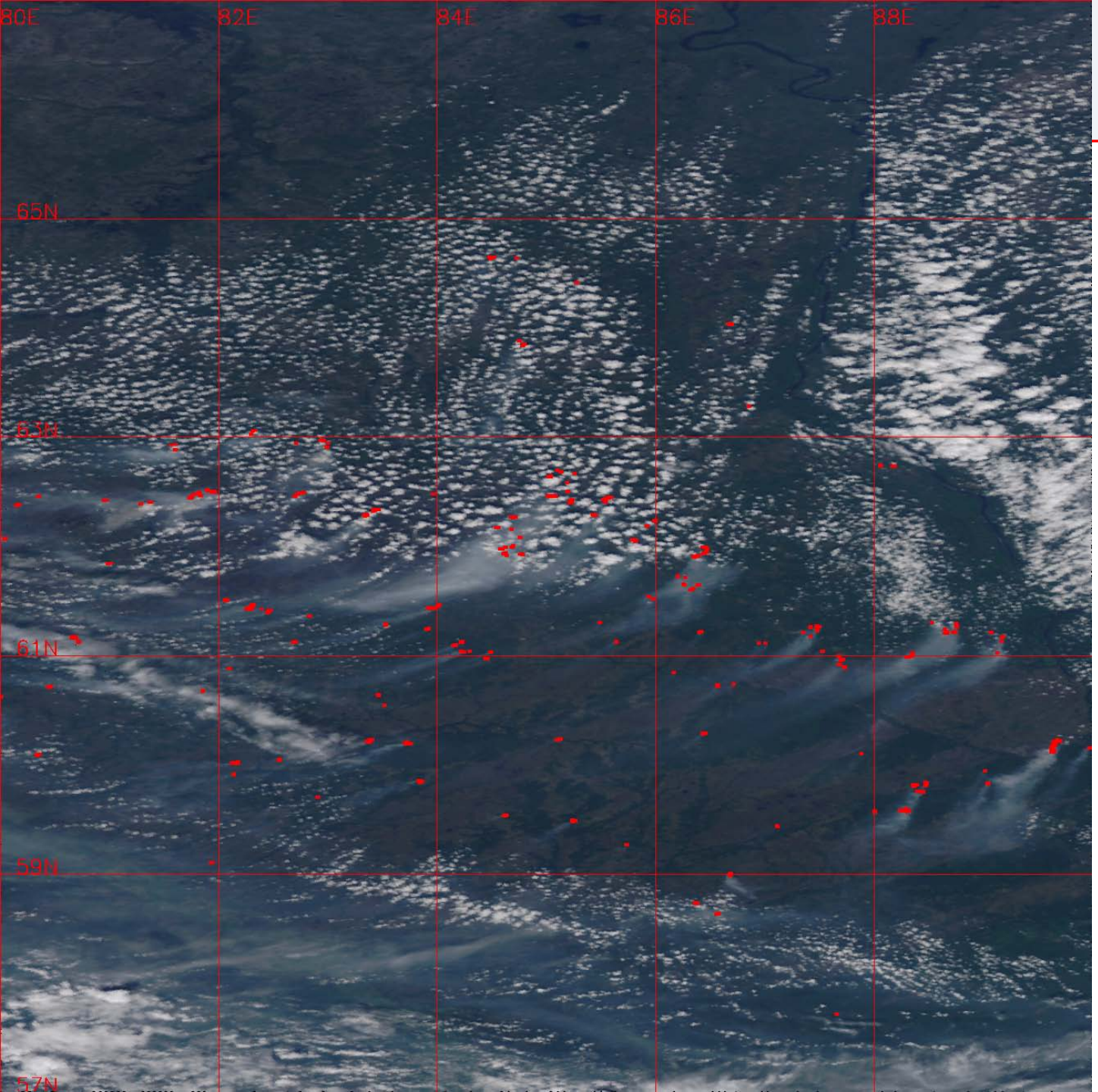
NPP VIIRS

Western Siberia

June 16 2012

6:15 UTC

M5-M4-M3 RGB
+
IDPS Active Fire ARP



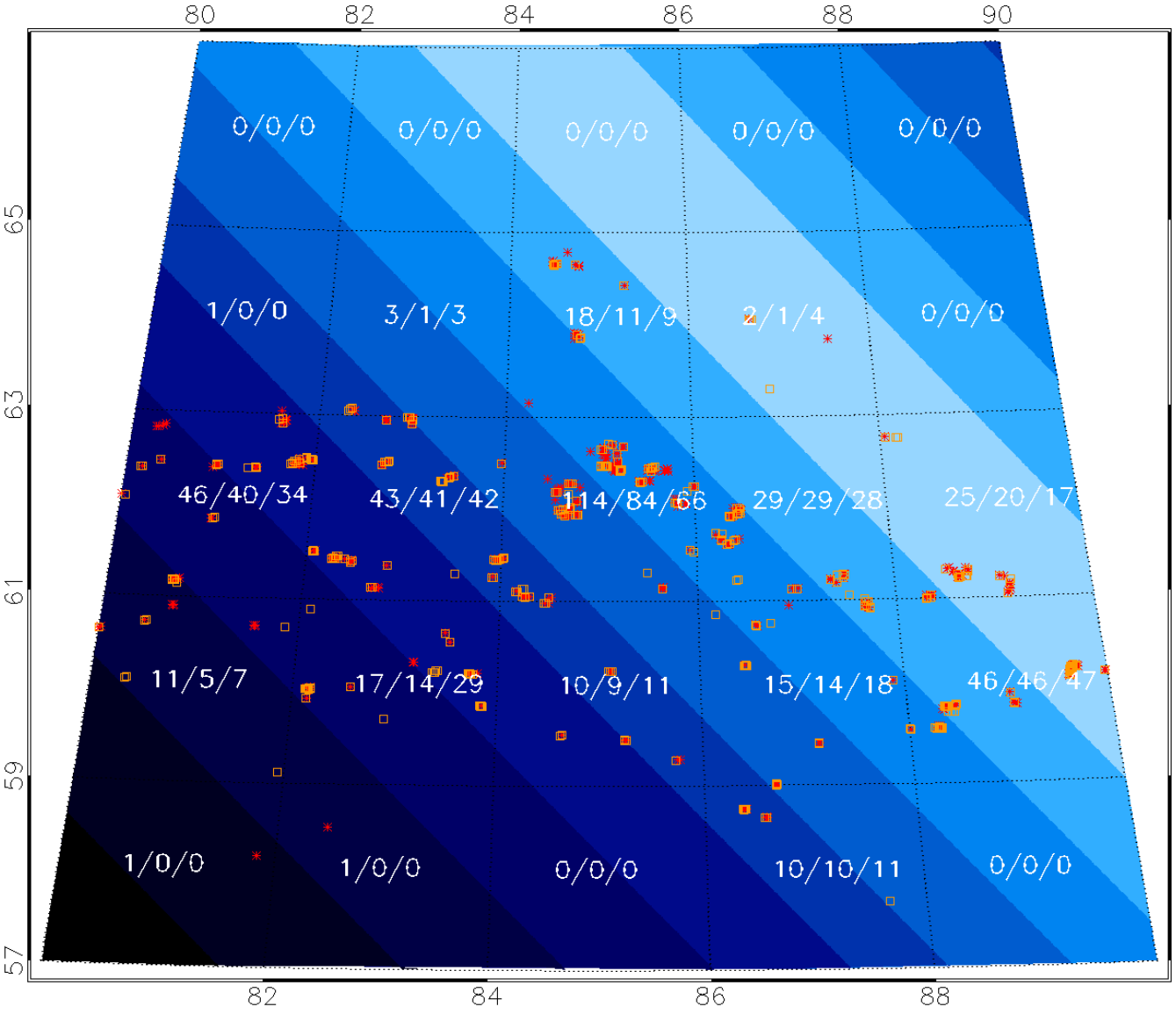
Aqua MODIS

Western Siberia

June 16 2012

6:42 UTC

Band 1-4-3 RGB
+
MYD14



VIIRS/overlap/MODIS

VIIRS

vs.

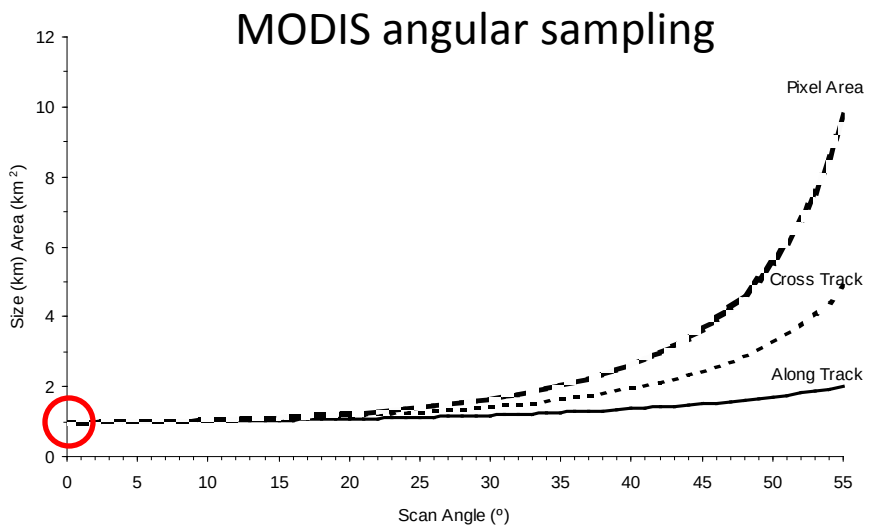
MODIS

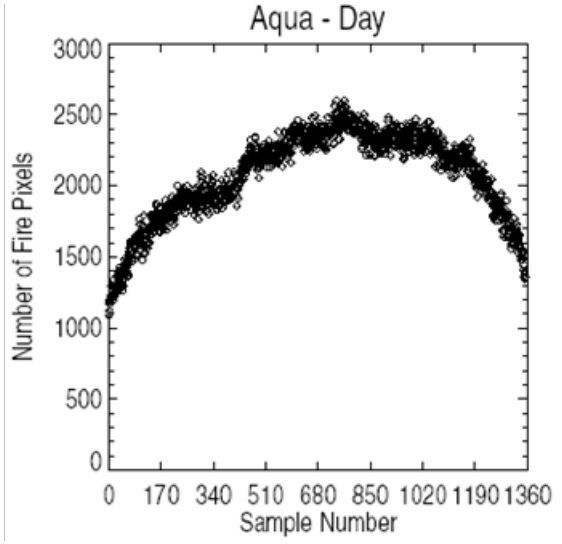
Western Siberia

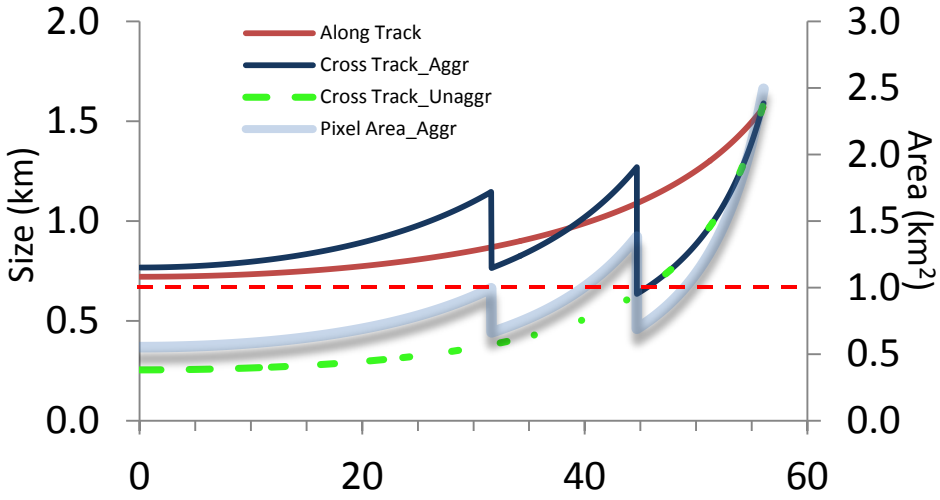
April 13 2012

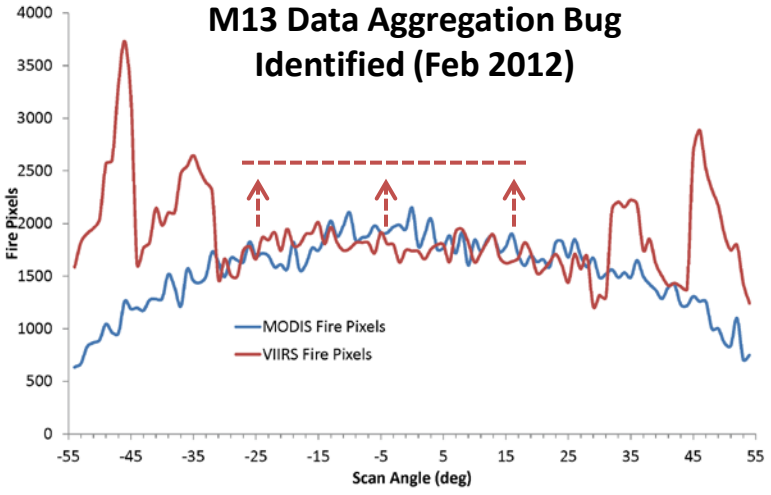
Gridded statistics: AA/BB/CC
AA – number of VIIRS fire pixels (red symbols)
BB – number of VIIRS fire pixels with overlapping Aqua/MODIS fire pixels
CC – number of Aqua/MODIS fire pixels (orange symbols)

Aqua MODIS vs. Suomi NPP VIIRS





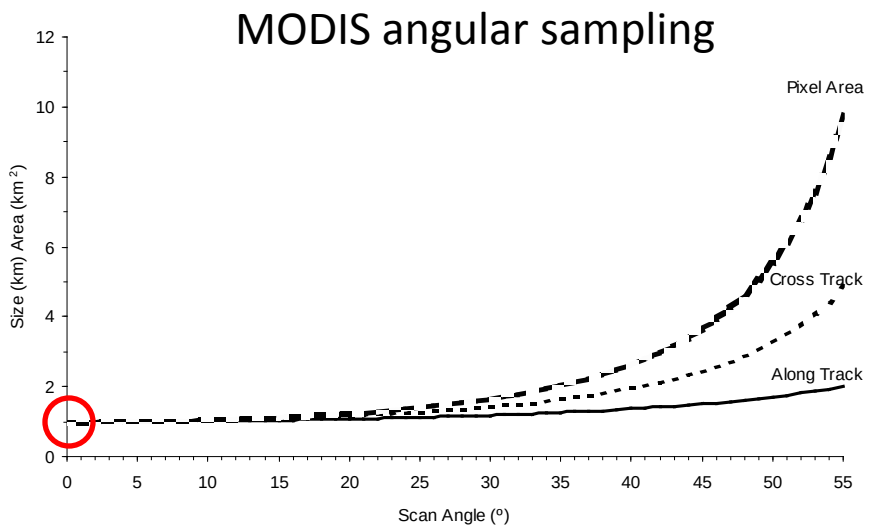


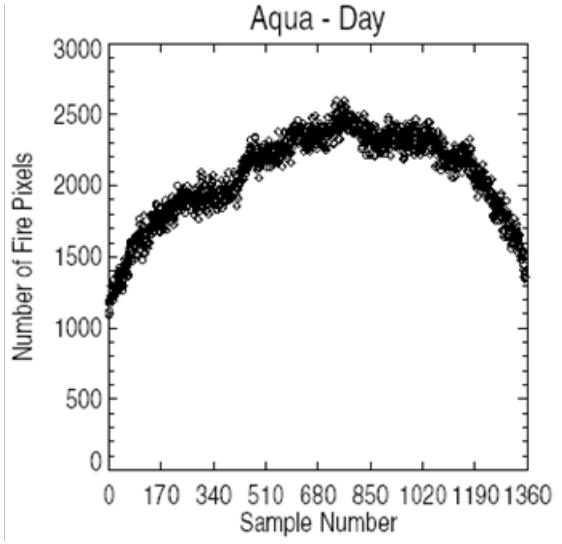


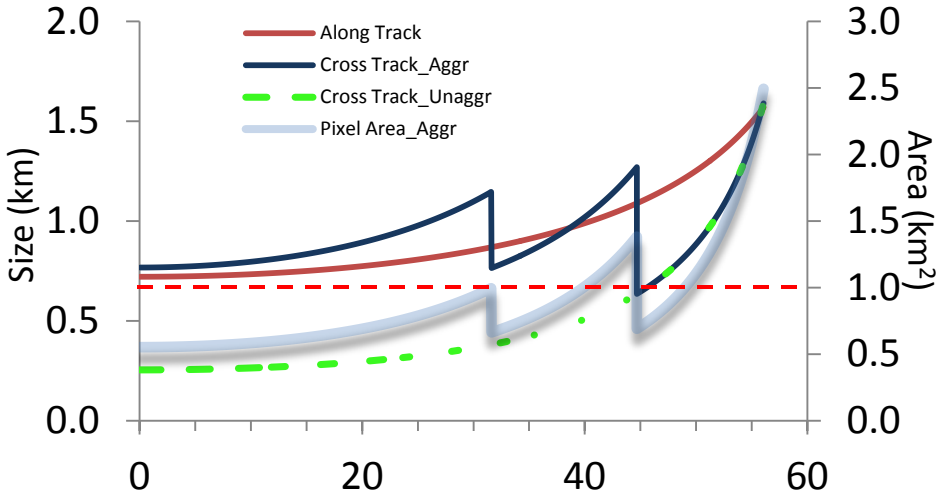
Compatible orbital segments are determined by pixel sizes

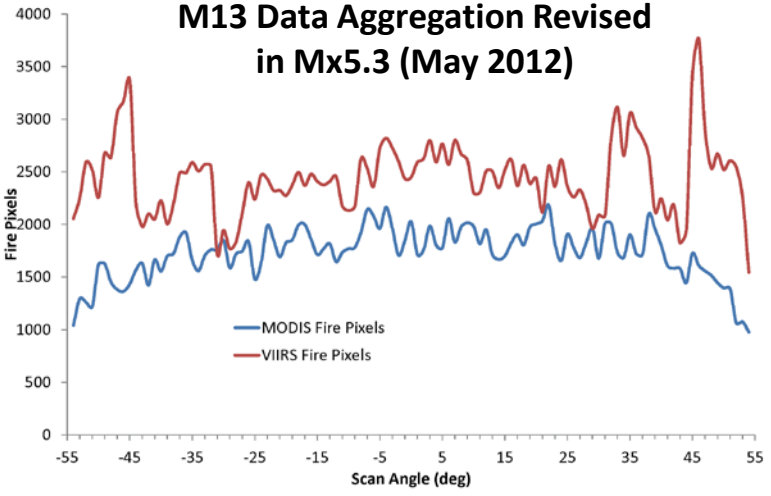
VIIRSxMYD14 Fire Detection Frequency (**19 Jan <> 13 Feb**)

Aqua MODIS vs. Suomi NPP VIIRS





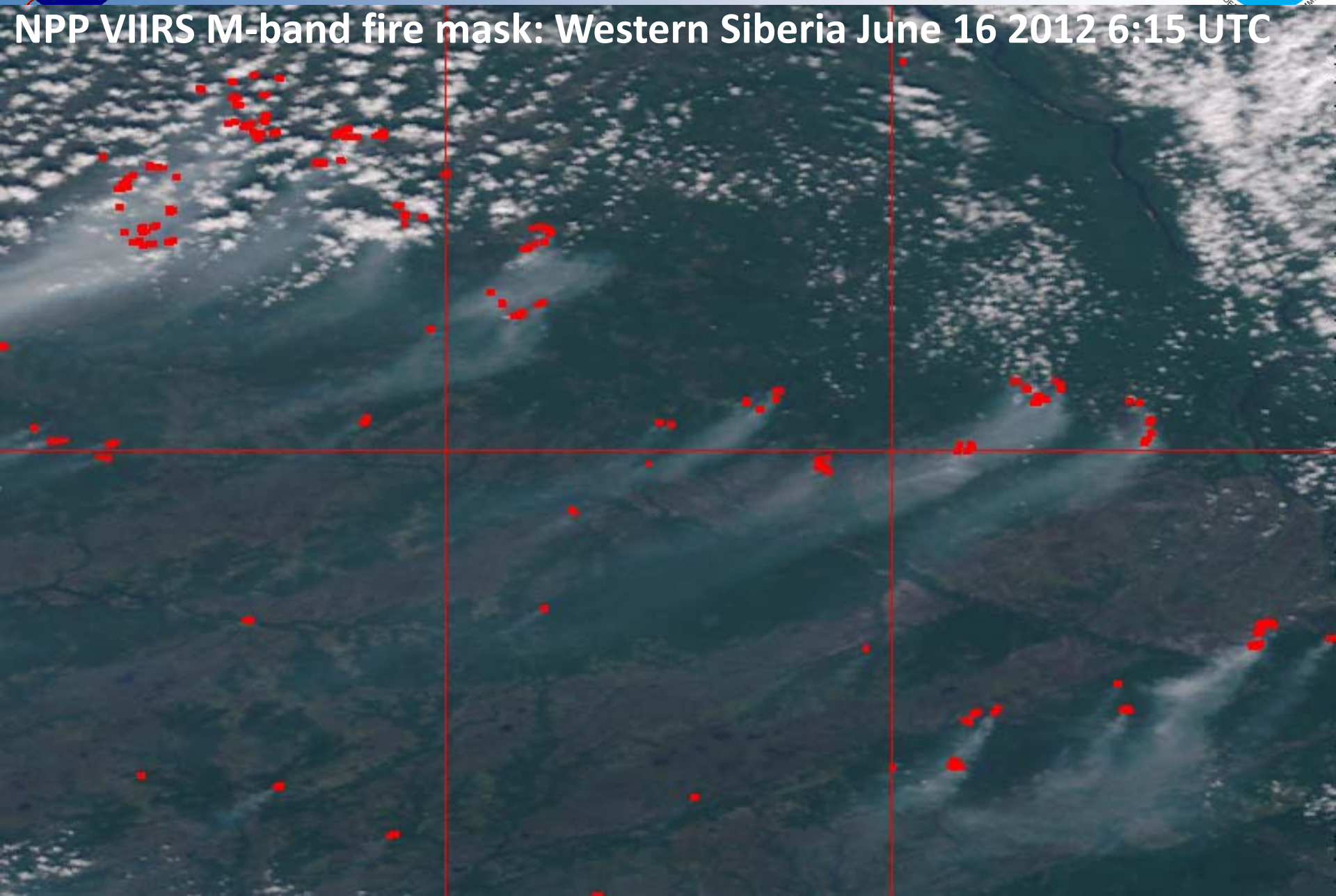




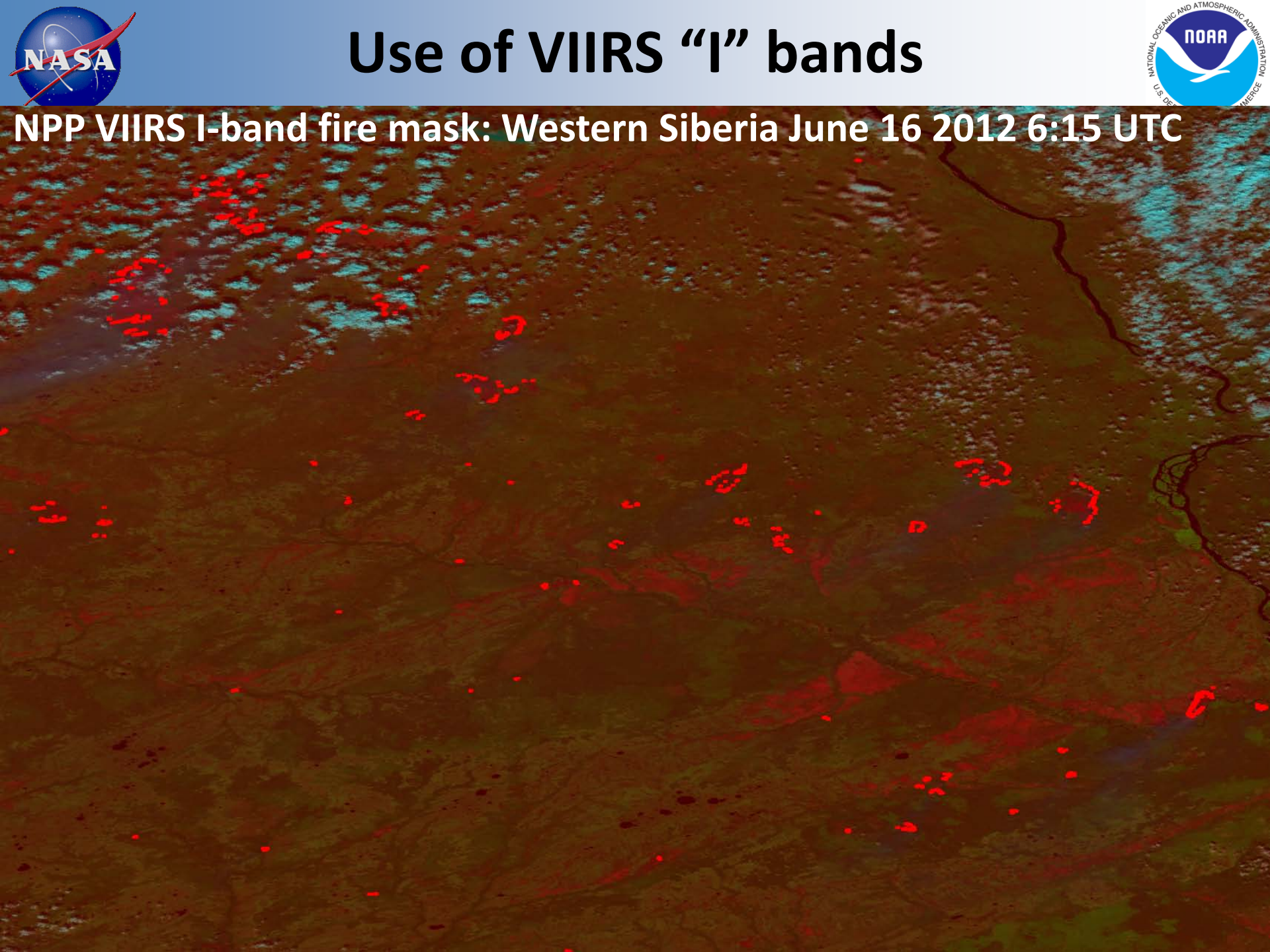
Compatible orbital segments are determined by pixel sizes

VIIRSxMYD14 Fire Detection Frequency (**11 May <> 10 Jun**)

Use of VIIRS “I” bands



Use of VIIRS “I” bands



Major DRs (Fires)

Date	DR#	Reason	Status
2-2-2012	DR 4547	Spurious Fire Pixels	3-8-2012; worked through VIIRS SDR DR 4620
3-6-2012	DR 4620	Dual Gain Calibration OBC States Mismatch	POC Assigned and CCR in Work; Priority fix for block 1.5
1-31-2012	DR 4543	M13 Low Gain SDR Calibration Mismatch with High Gain SV	Implemented in Mx5.3
2-9-2012	DR 4568	M13 LG Calibration Coefficients Incorrect	Closed; implementation included in DR 4591
2-19-2012	DR 4591	Update delta C LUT and G coefficients	Implemented 2/29/12
2-7-2012	DR 4563	VIIRS M13 SDR Aggregation in Temperature Domain	Implemented in Mx5.3
4-6-2012	DR 4655	Dual Gain Bands Cal Sequence Anomaly	Code change scheduled
9-14-2012	DR 4905	Active Fires Beta Maturity	CCR in preparation

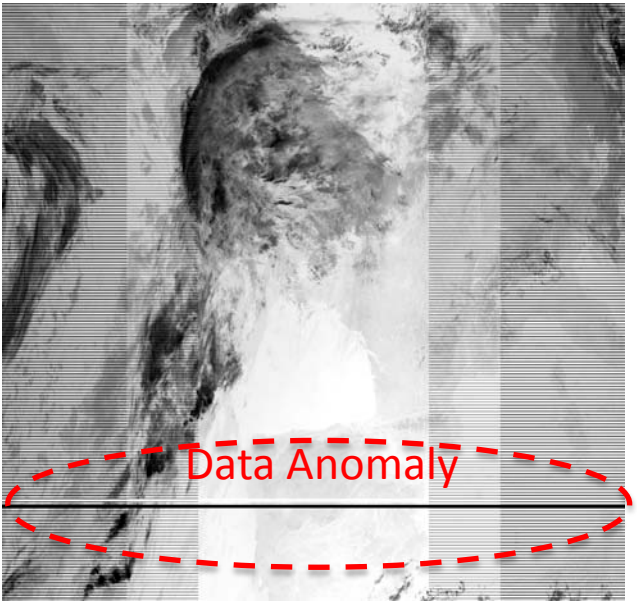
Issues, Challenges, Setbacks (Fires)

- ADL was found to be too complex and impractical for algorithm improvements and testing
  - New code / algorithm is developed in LandPEATE environment
  - Issues may arise during operational implementation – this weeks workshop may have clarified some issues
- Airborne data collection is somewhat opportunistic
  - Funding
  - Coordination (including satellite underflights)
- New L1 requirements necessitate algorithm updates
- Streamlining / coordinating operational and science quality algorithms

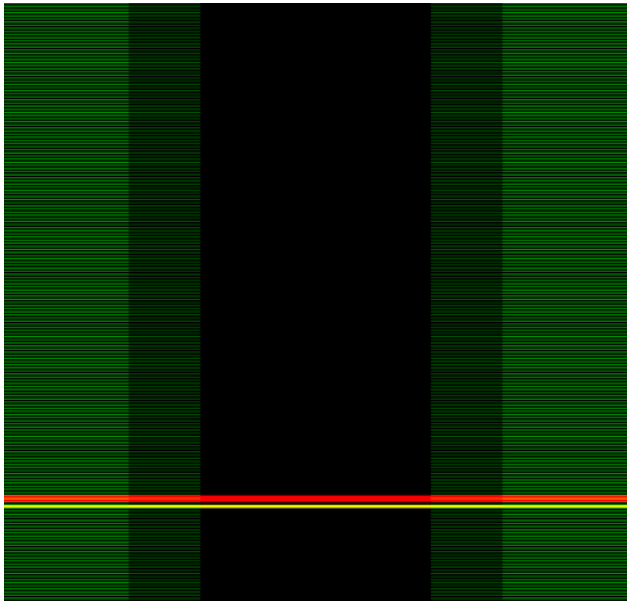
M13 - QA33 Issue

VIIRS_20120817_t0211442_e021724

5min Swath – Nighttime Data

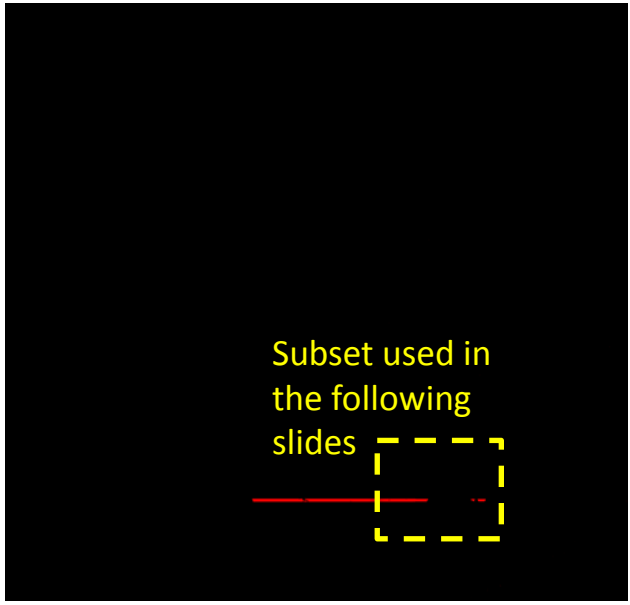


M13 brightness temperature data



M13 QA layer

Black = 0
Green = 2
Red = 33 (*Poor Calibration - Cal data missing*)
Yellow = 34 (*No Calibration - Cal data missing*)



Active Fire Product

Black = no fire
Red = fire

Changes in Strategy (due to funding constraints) (Fires)

- More emphasis on alternative data sources and methodologies for validation due funding issues for airborne data collection
  - MOU, costs of flight hours
- Agreements with DLR on TET/BIROS satellite data access
  - Potential for synchronizing satellite orbit to provide simultaneous fire observations
  - Process to set up MOI with DLR has been slow

FY-13 Schedule and Milestones (Fires)

Algorithm support

- Implement VIIRS-specific algorithm adjustments in science code: June 2013
- Complete testing of science code updates: October 2013
- Prepare algorithm change package for the operational implementation of updated algorithm: December 2013

Product validation

- Collect and analyzed MODIS-VIIRS correlative data: Oct 2013
- Test case validation analyses using SAMBBA and RxCADRE reference data sets (contingent upon experimental fires and observation conditions): May 2013
- Preliminary baseline product (primary) validation using airborne reference data: contingent upon airborne data collection.
  - First FY13 airborne sensor deployment (goal) Spring 2013;
  - follow-up deployments during Summer and Fall 2013. Initial results: Summer 2013

Path Forward (FY-14 thru FY-17) (Fires)

- Algorithm update and transition into operations
  - Driven by L1RD and user needs
- Airborne data collection for product validation
- TET / BIROS / MIROS satellite data collection for validation – late 2013 and onwards
- Product validation
  - Beta: Sep 2012 (in progress)
  - Provisional: May 2013
  - Stage 1: May 2014
  - Stage 2: May 2015
  - Stage 3: Aug 2015
- Alternative / complementary algorithms for full exploitation of VIIRS data

Path Forward (FY-13 thru FY-17)

(assume "FYxx" runs from April 1, 20xx to March 31, 20xx+1)

	Suomi NPP	JPSS J1
FY13	▪ Algorithm coefficients update ▪ ATBD update as needed ▪ NPP AF evaluation and provisional version readiness ▪ Development and improvement of validation tool ▪ Provisional status readiness	▪ Algorithm development: FRP, fire mask
FY14	• Validated Stage 1 readiness • VIIRS AF validation report • ATBD update, if needed	▪ JPSS J1 AF ATBD version I ▪ Algorithm evaluation using SNPP data ▪ Software design and development ▪ Preliminary evaluation report
FY15	• Validated Stage 2 readiness • ATBD update as needed • Algorithm coeffs update as needed • Validated Stage 3 readiness	▪ JPSS J1 AF ATBD version II ▪ JPSS J1 AF Algorithm readiness package ▪ Validation tool readiness ▪ Algorithm evaluation report
FY16	▪ SNPP AF maintenance ▪ Applications	▪ Algorithm coefficients Update ▪ ATBD update as needed ▪ J1 AF evaluation and provisional version readiness ▪ Development and improvement of validation tool
FY17	▪ SNPP AF maintenance ▪ Applications	▪ Algorithm evaluation using JI data ▪ J1 LST evaluation/validation report II ▪ ATBD update as needed

Overview of Data Products (ST)

- VIIRS Surface Type (ST) team is responsible for the algorithm development, production and validation of the Quarterly Surface Type (QST) IP and ST EDR.
- QST IP production requires at least one full year of VIIRS gridded monthly composited SR, NDVI, BT.
- The current QST IP seed in IDPS was derived from MODIS C4 land cover product (2001).
- An undated QST IP seed is being delivered to IDPS by NGST from BU's MODIS Collection 5.1 land cover data.
- ST EDR is an overlay of QST IP, fire and snow EDRs.
- UMD is preparing to generate the 1st QST IP based on one full year VIIRS data.

Team Members' Roles & Responsibilities

EDR	Name	Organization	Funding Agency	Task
Lead	Xiwu Zhan	NOAA/NESDIS/STAR	NJO	Lead Surface Type EDR Team
Validation Lead	Mark Friedl	Boston University	NJO	EDR Validation
Validation	Damien Sulla-Menashe	Boston University	NJO	EDR Validation
Development Lead	Chengquan Huang	University of Maryland	NJO	EDR Development
Development	Kuan Song	University of Maryland	NJO	EDR Development
Former Developer	Alain Sei	NGST	NJO	Algorithm Transition

FY12 Accomplishments: DRs

DR number	Short Description
4348	ST EDR does not cover AOT>1 exclusion: *NG to answer the question*
4452	ST to rename vegetation fraction: *discuss after cal/val*
4458	C5 DT algorithm for QST IP to be replaced: *future evaluation after cal/val*
4459	QST IP update go to annual: *to be discussed at TIM with MODIS group*
4707	Update QST Seed: *NGST is delivering MODIS C5.1 land cover to IDPS as the update*
4900	Remove “Unclassified pixels” in the new QST IP seed: *BU is working on the issue and will provide solution in the week of Sept 17, 2012*

New QST IP Seed for IDPS

Previous seed: MODIS MOD12Q1 collection 4

New seed: MODIS MOD12Q1 collection 5

Unchanged land cover class labels: 66.2% of global land area

		Collection 5															
		Class1	**Class2**	**Class3**	**Class4**	**Class5**	**Class6**	**Class7**	**Class8**	**Class9**	**Class10**	**Class11**	**Class12**	**Class13**	**Class14**	**Class15**	**Class16**
Collection 4	**Class1**	2.5	0.1	0.2	0	1.6	0	0.1	1.1	0.2	0.2	0.3	0	0	0.1	0	0
	Class2	0	14.1	0	0	0.3	0	0	0.8	0.3	0.1	0.2	0.1	0	0.9	0	0
	Class3	0	0	0.8	0	0.1	0	0.1	0.1	0	0	0	0	0	0	0	0
	Class4	0	0.1	0	0.8	0.5	0	0	0.6	0.2	0.1	0	0.1	0	0.3	0	0
	Class5	0.3	0.1	0.2	0.2	5.1	0	0.1	0.6	0.1	0.2	0.1	0.2	0	0.6	0	0
	Class6	0	0	0	0	0	0	0.3	0.1	0.1	0.2	0	0.1	0	0	0	0
	Class7	0.1	0	0.2	0.1	0.2	0	18.3	1	1	5.5	0.5	0.8	0	0.3	0.2	2.5
	Class8	0.2	0.3	0.3	0.2	0.7	0	0.9	5.3	2.2	0.7	0.2	0.4	0	1.2	0	0
	Class9	0	0.1	0	0.1	0.1	0	0.4	1.9	5.8	1	0.1	0.7	0	1.5	0	0
	Class10	0	0	0.1	0.1	0.1	0	2	0.4	0.9	9.8	0.1	0.8	0	1.1	0	0.2
	Class11	0	0.1	0	0	0	0	0	0	0	0	0.2	0	0	0	0	0
	Class12	0	0	0	0	0.2	0	0.2	0.3	0.2	1.3	0	10	0.2	2.8	0	0
	Class13	0	0	0	0	0	0	0	0	0	0.1	0	0.2	0.4	0.1	0	0
	Class14	0	0.1	0	0.1	0.2	0	0	0.3	0.5	0.5	0	0.6	0	1.3	0	0
	Class15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	16.8	0
	Class16	0	0	0	0	0	0	1.5	0	0.1	1.6	0	0.1	0	0.1	0.3	19.5

The error confusion matrix between two QST IP seeds

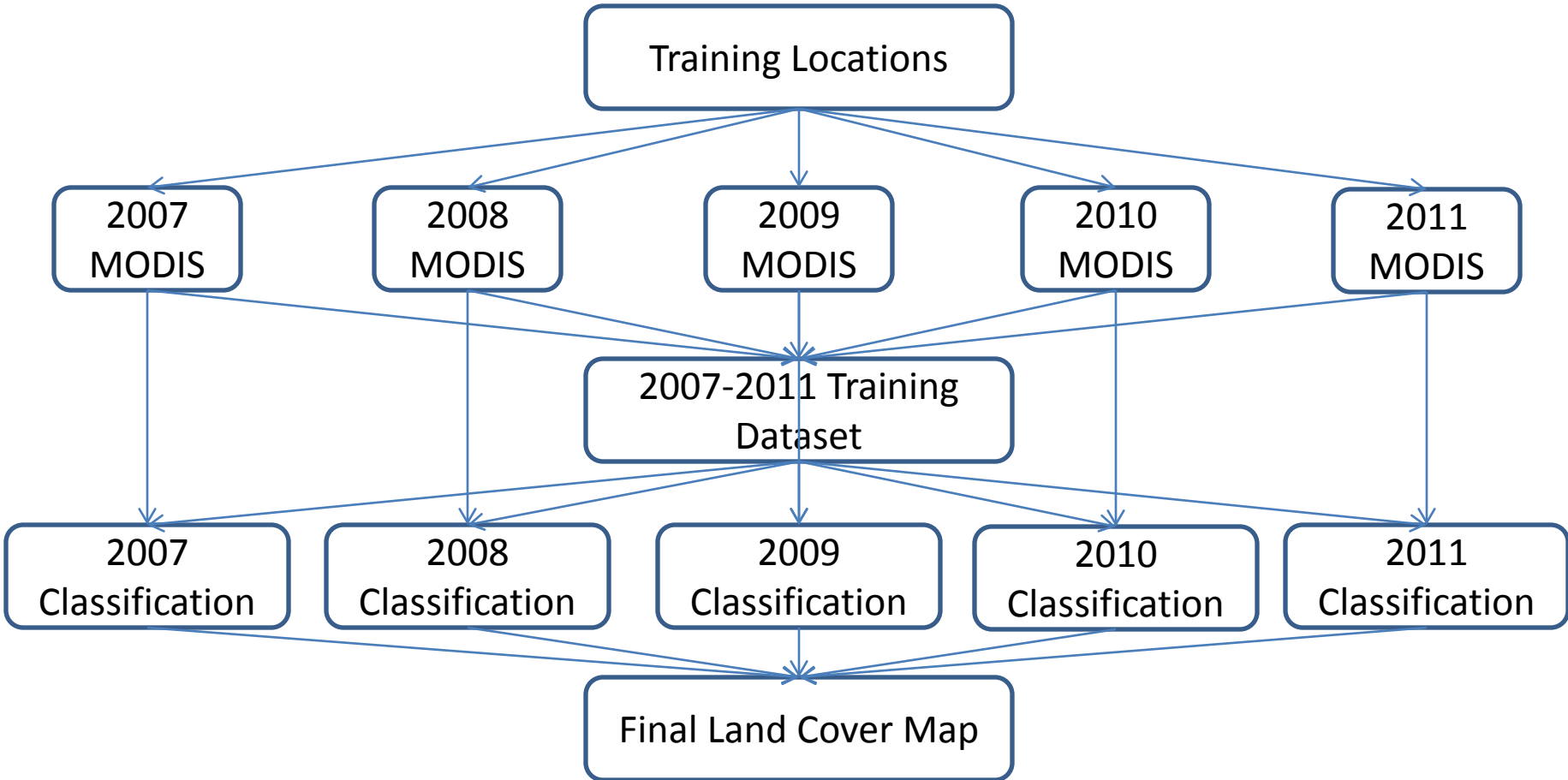
The unit of this table is million square kilometer

The green diagonal of the matrix indicates the amount of unchanged class labels

The red elements of the matrix indicate the amount of changed class labels

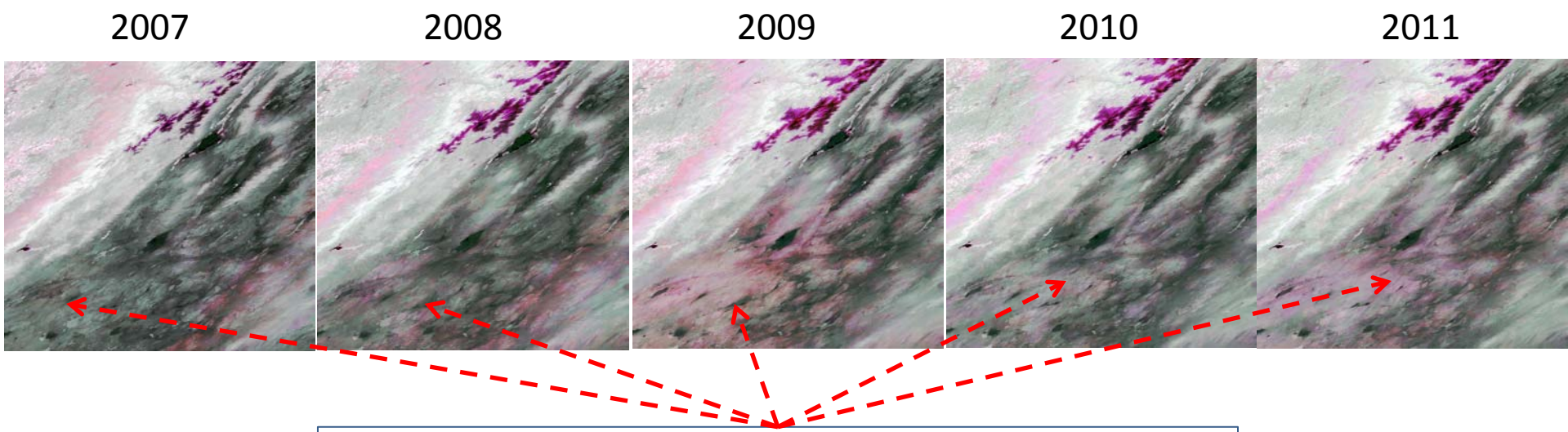
Scientific Advancements

- Inter-annual variability in global land cover appearances
- Internalizing Inter-annual variability: Multi-year training
- Multi-year global land cover classification



Inter-annual variability in global land cover appearances

- Same Land cover, different appearances every year
- Insufficient training data to characterize all land cover classes under all types of climate variations
- Example: California-Nevada region, 2007-2011
  - R-G-B bands are annual metrics derived from MODIS
  - R: annual max NDVI; G: annual minimum NDVI; B: annual median NDVI

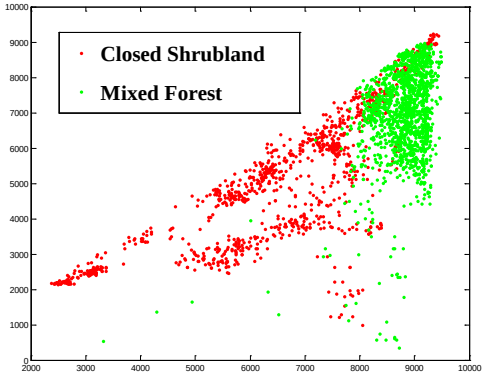


Color tone variation indicates Inter-annual variability

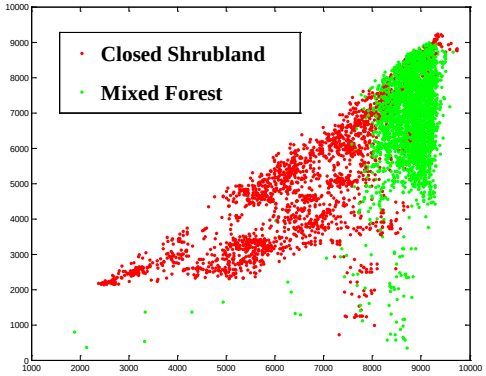
Training samples gathered From same locations during 2007-2011

- Training samples gathered incrementally from 2007 to 2011
  - Result: Much better land cover class characterization in feature space
  - Major benefiters: Herbaceous and Shrubland classes

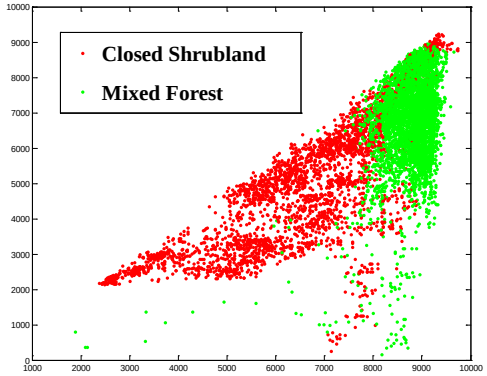
2007



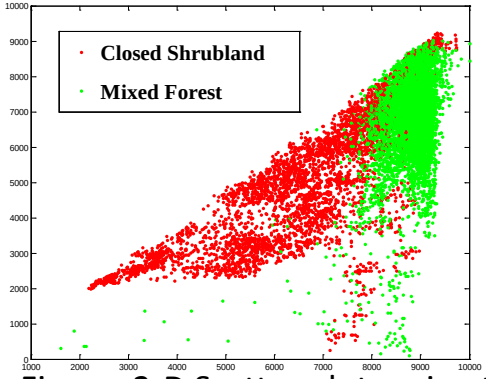
2007-2008



2007-2009



2007-2010



2007-2011

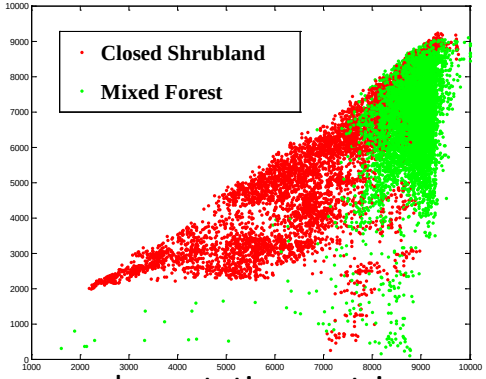
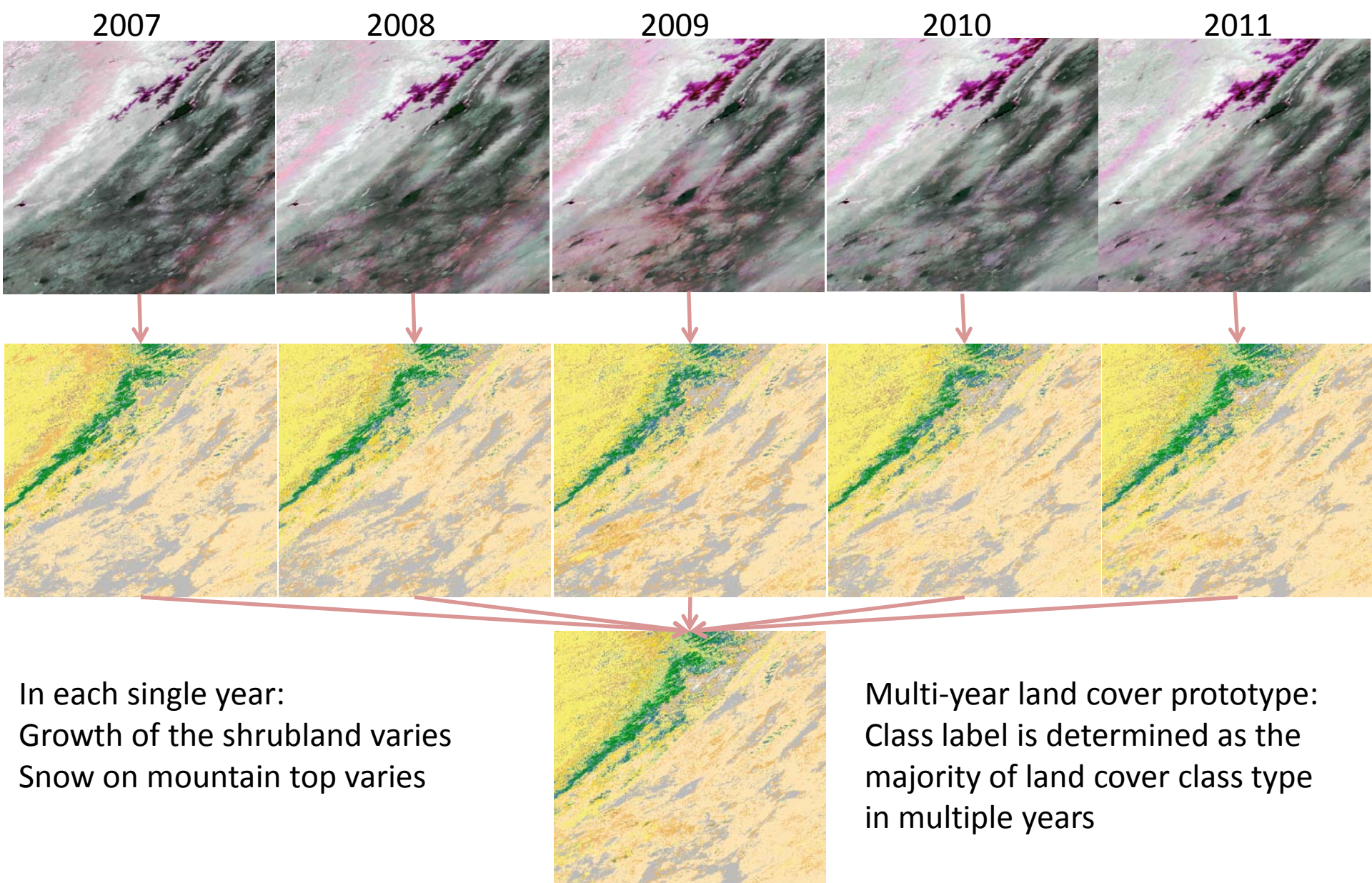


Figure: 2-D Scatter plots using two annual vegetation metrics
The green color outlines the land cover class 'Mixed Forest' in 2-D feature space
The red color outlines the land cover class 'Closed Shrubland' in 2-D feature space

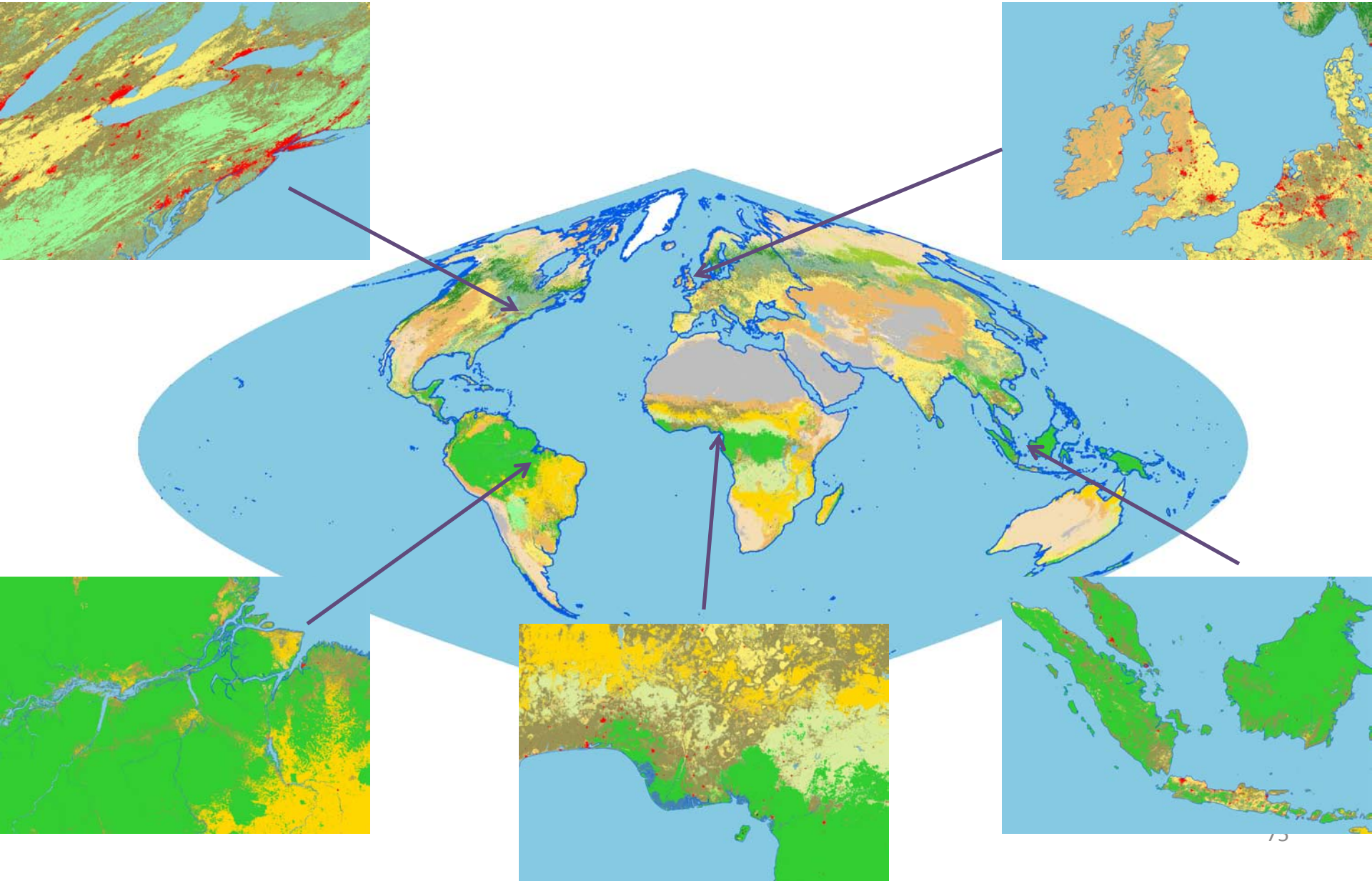
Multi-year global land cover classification



In each single year:
Growth of the shrubland varies
Snow on mountain top varies

Multi-year land cover prototype:
Class label is determined as the majority of land cover class type in multiple years

Updated Surface Type IP

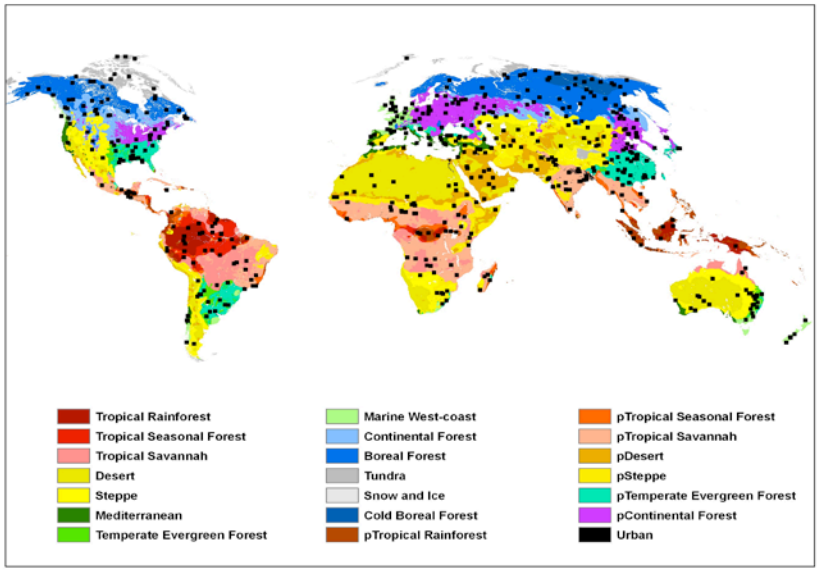


Testing QST IP algorithm using MODIS data

- Training Data
  - Importing training data from Boston U. and U. of MD
  - Fine tune the orchard subtype from Boston training set
  - Collection training data using 2007-2011 MODIS imagery
  - Adjust the class weights of training data so that they represent global ground truth
- Annual Metrics Improvements
  - Elimination of metrics with inferior visual appearances
  - Elimination of metrics with low information content
  - Improving metrics to be more statistically reliable and robust
    - Median instead of Mean, second maximum instead of maximum
- Training-Classification Strategy Designs
  - Training dataset now consists of 5 years (2007-2011)
  - Classification of 5 years, then statistically merged

QST Validation

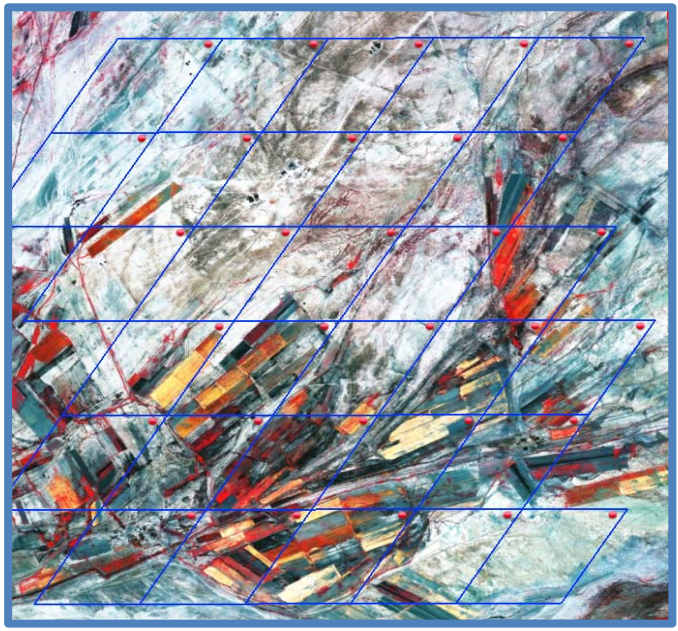
- Strategy:
  - based on global sample of high quality validation sites.
  - Sites are based on classification of high resolution imagery

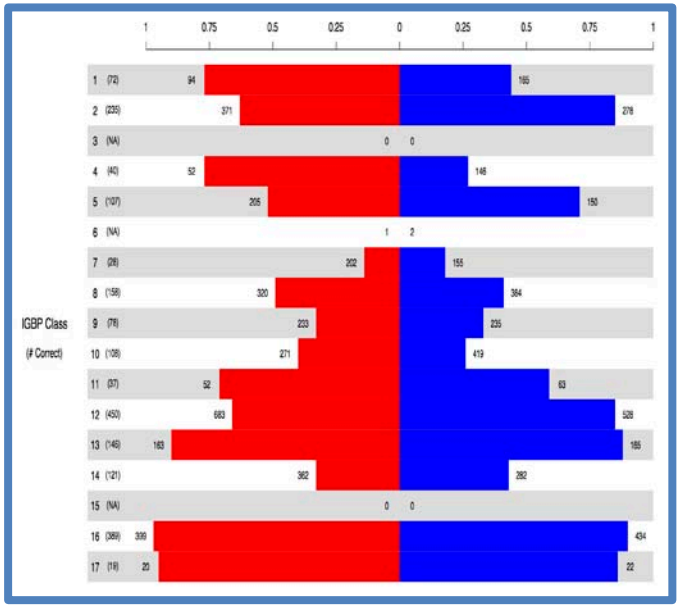


- Accomplishments
  - QST EDR requires full year of input data for production
  - In interim, validation focusing on: (1) compilation of global site database; and (2) development and testing of tools for estimating accuracy statistics.
  - Using sample of 100 sites drawn globally from random sample and testing codes using MODIS C4 and C5.1 land cover products.

QST Validation

- Current Status:
  - Site Database
    - ~150 sites completed (~3500 VIIRS QST pixels); currently being expanded.
    - Image at right shows dryland agriculture site from Chaacha, Turkmenistan. Blue lines show the VIIRS QST grid superimposed on high-res image.
  - Statistical Methods/Tools
    - Currently being tested and used to assess MODIS C4 Land cover and VIIRS QST seed based on MODIS C5.1
    - Graphic at left shows sample results (user, producer accuracies) for MODIS C4 product Each horizontal bar corresponds to one IGBP class; red="producer's" accuracy; blue = "user's" accuracy; overall accuracy ~50%).





Issues, Challenges, Setbacks

- **Issue**: Gridding module turning on late in IDPS may delay accumulation of one full year VIIRS gridded monthly composited SR, NDVI and BT data;
- **Challenge:** Post-processing of VIIRS QST IP algorithm direct output may be time consuming;
- **Setback:** None

Changes in Strategy (due to funding constraints)

- QST IP is used in ST EDR as an ancillary data input. VIIRS Surface Type team will not work on providing updated code for generating the QST IP in JPSS production. Instead, we will focus on improving the quality of QST IP offline and updating the JPSS production system with the ancillary data delivery periodically.

FY-13 Schedule and Milestones

- **Apr-June, 2013:** Continue to process classification metrics from one full year VIIRS data
  - ✓ **June 31, 2013**: Metrics data for 1st VIIRS QST IP ready
- **July-Sept, 2013:** Generate 1st QST IP based on VIIRS data using C5.0
  - ✓ **Sept 30, 2013**: 1st VIIRS QST IP generated and ready for delivery as "Provisional" version
- **Oct-Dec, 2013**: Validate 1st VIIRS QST IP using independent validation site data
  - ✓ **Dec 31, 2013**: "1st Validated QST IP" ready for delivery
- **Jan-Mar, 2014**: Refine QST IP and ST EDR algorithm/code based on lessons learned from the validation statistics of current ST EDR
  - ✓ **Mar 31, 2014**: "2nd Validate QST IP" ready for delivery

Path Forward (FY-13 thru FY-17)

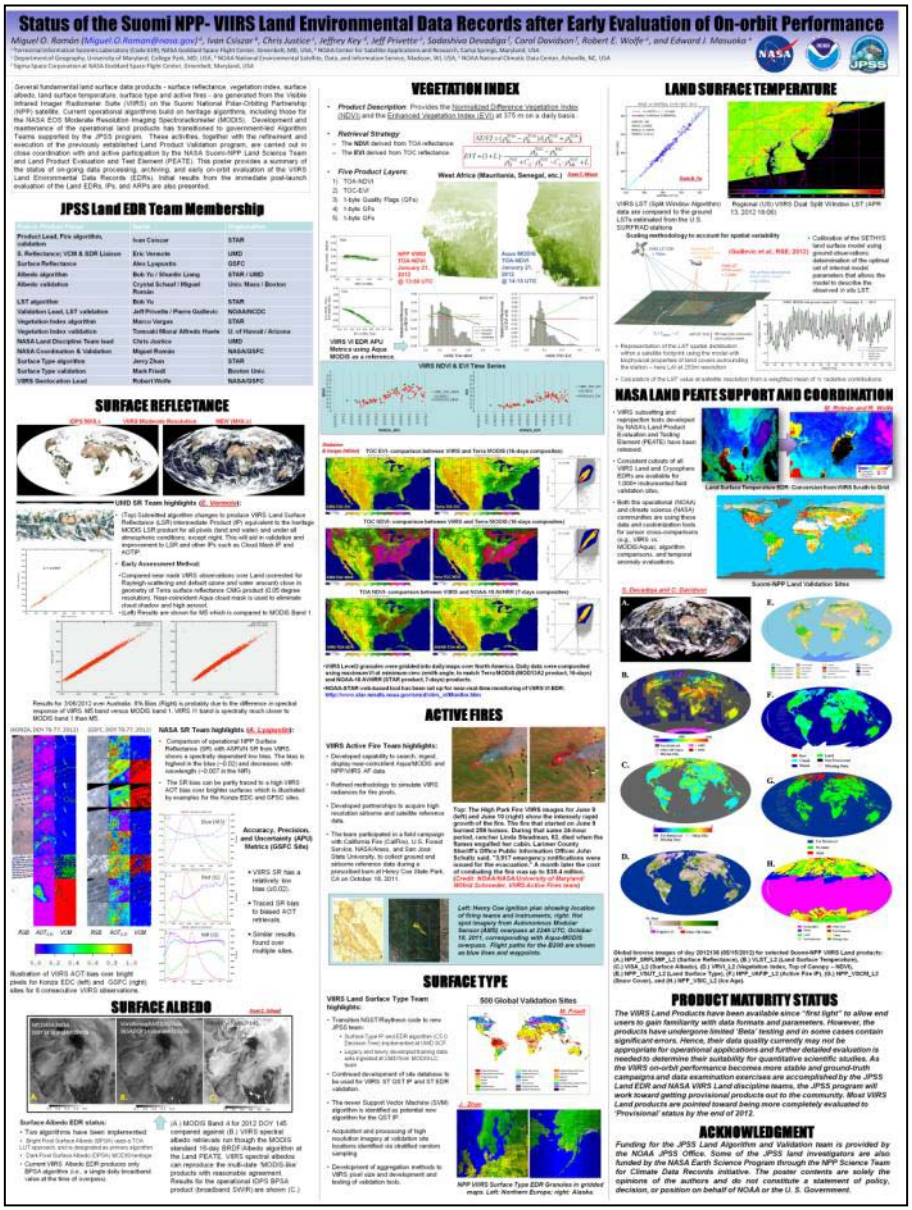
(assume "FYxx" runs from April 1, 20xx to March 31, 20xx+1)

	Suomi NPP	JPSS J1
FY13	Generate 1st provisional, validated 1 and validated 2 VIIRS QST IP Continue to develop more validation sites	
FY14	Update and validate VIIRS QST IP Develop validation data from more validation sites	
FY15	Refine VIIRS QST IP algorithm Continue to develop more validation sites Develop algorithms to enhance ST EDR for more surface type changes for broader applications	Prepare QST IP and ST EDR software for JPSS J1 Continue to develop more validation sites
FY16	Update and validate VIIRS QST IP Continue to develop more validation sites Evaluate algorithms for enhanced ST EDR	Prepare to generated 1st JPSS J1 VIIRS QST IP and ST EDR Continue to develop more validation sites
FY17	Update and validate VIIRS QST IP Continue to develop more validation sites Deliver enhanced ST EDR from NPP VIIRS	Generate and validate VIIRS QST IP Continue to develop more validation sites Deliver enhanced ST EDR from J1 VIIRS

FY-12 Accomplishments (LandPEATE)

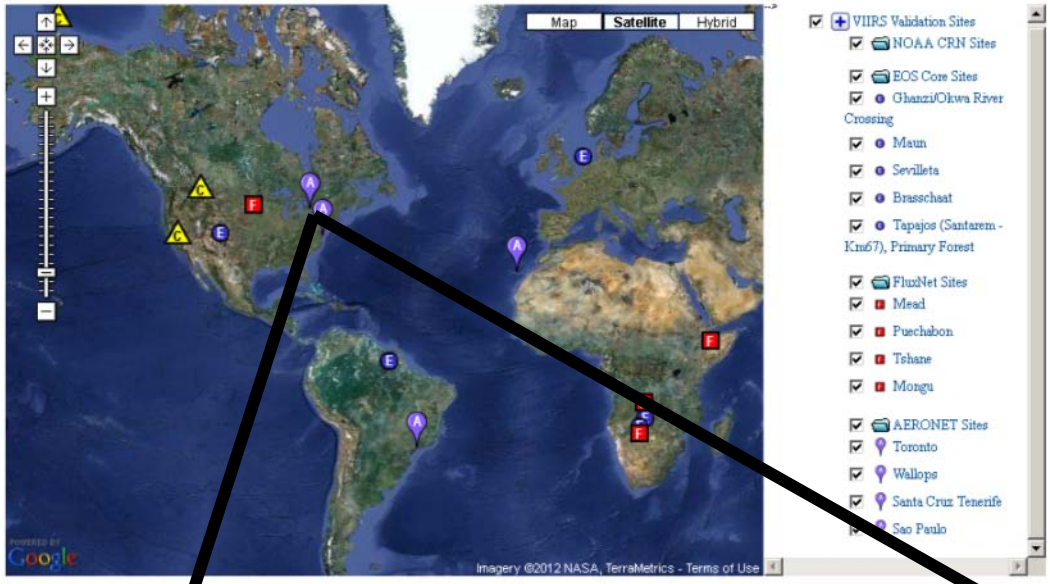
Land EDR C/V Activities (Román)

- **IGARSS'12 Paper**: "Status of the Suomi NPP VIIRS Land EDRs after Early Evaluation of On-orbit Performance".
- Provided programmatic support for activities surrounding the VIIRS Land cal/val team; including, holding weekly telecons, preparing, reviewing, and evaluating project plans, schedules, and mission reports.
- Coordinated Land DR prioritizations for Build Mx6.2.
- Leveraging (i.e., "piggy-backing") on upcoming (FY'13 - FY'14) in-situ and airborne field campaigns of opportunity, particularly within the NASA Airborne Sciences Program.
- Lead efforts to document inconsistencies between VIIRS EDR product documentation (both between each other and between the documents and the data).



FY-12 Accomplishments (LandPEATE)

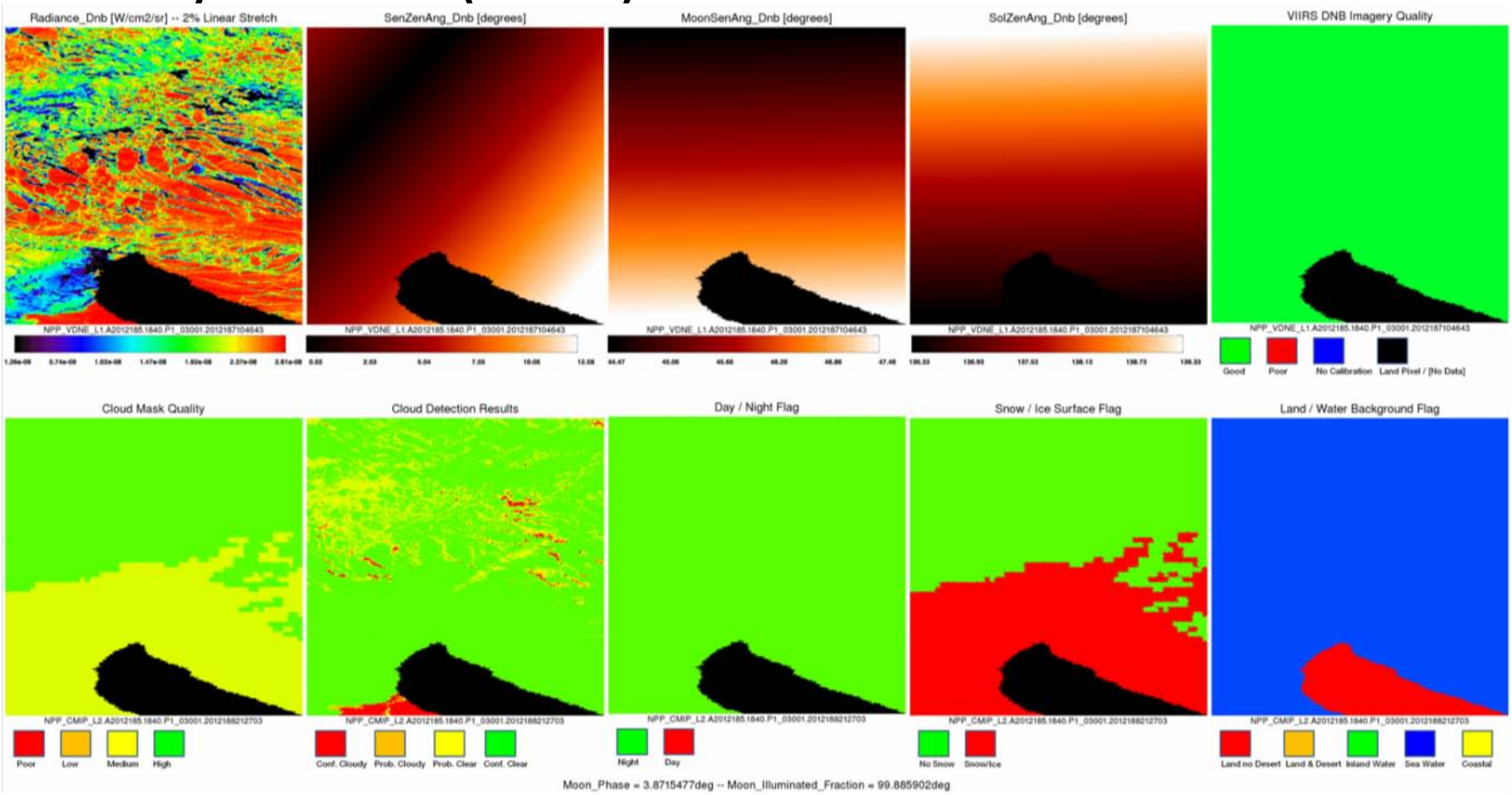
Land EDR C/V Activities (Román)



- A web presence for the VIIRS Land Validation subsets was established to allow the science team to retain cutouts of all VIIRS Land EDR indefinetly .
- Focused on incorporating PI-requested products over established operational networks (e.g., NOAA-CRN, DOE-ARM, BSRN, ASVRN/AERONET).
- Performed site characterizations to evaluate the spatial heterogeneity of the operational network sites over an area of 50km^2 (cf., Román et al., 2009).

FY-12 Accomplishments (LandPEATE)

Land EDR C/V Activities (Román)



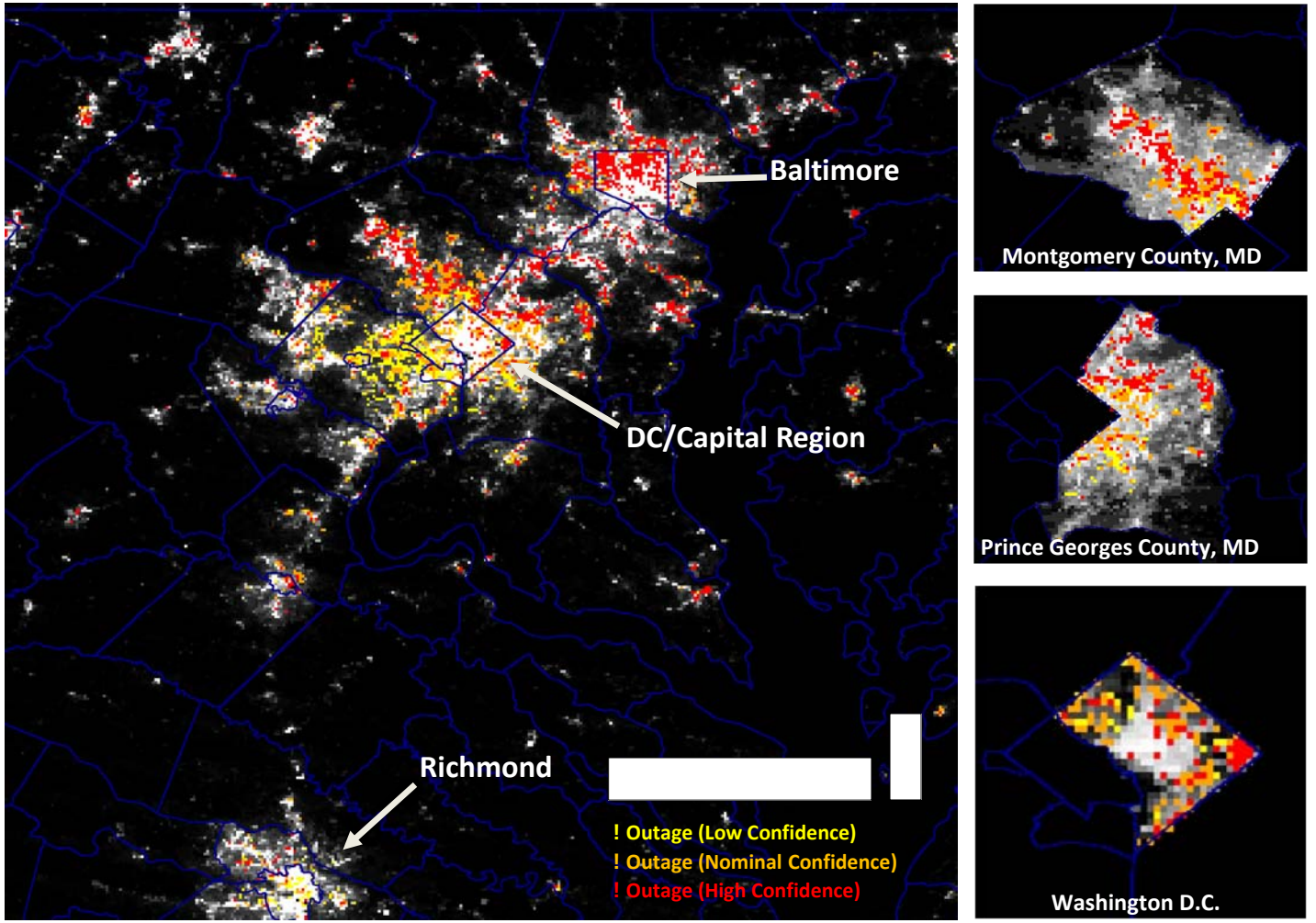
VIIRS Land EDR SwathToGrid tool has been progressively generalized so it incorporates SDR and VIIRS Day-Night-Band geometries (top images). Testing has focused on the tropics and high latitudes to characterize the effect of stray-light on VIIRS DNB and evaluate VIIRS Cloud Mask output quality flags (bottom images).

Scientific Advancements (LandPEATE)

Detection of Light Outages using the VIIRS Day/Night Band: An Early Case Study on the D.C. Derecho Storm

The VIIRS sensor has a new high quality day/night visible band that images the earth and atmosphere at all illumination levels.

VIIRS nighttime calibrated radiances acquired 1-day after the June 30, 2012 D.C. Derecho storm were used to create outdoor light outage maps, using an analytical approach that considers urban area extent, clouds and observation quality.



Spatial distribution of light outages in Washington, DC and vicinity after the D.C. Derecho Storm. (Román et al., 2012, GRL, *in preparation*)

FY12 Accomplishments: DRs

DR number	Short Description
DR 4488	**Surface Reflectance IP: Retrieve for all pixels except night.** ACP in work, need to schedule second TIM for downstream impacts/processing impacts.
DR 4707, 4708, 4709	Update seeded data for QST, VI, SA respectively.
DR 4622	Erroneous quality flag for missing input data
DR 4608	Split Window Algorithm- Baseline Coefficient Files [MX 6.2]
DR 4353	Surface Type Snow/Ice field is always “no snow” at night
DR 4769	Surface Type Snow/Ice field is always “no snow” at night
DR 4787	Update to the VIIRS Snow Cover QA LUT
DR 4700	Alternative snow/ice grid needed to support algorithms: Fast track Monthly Updating
DR 4582	LST Day Night Land Water Misidentification
DR 4376	Vegetation Index: L1RD requires NVDI TOC.

Path Forward (FY-13 thru FY-17)

(assume "FYxx" runs from April 1, 20xx to March 31, 20xx+1)

	Suomi NPP / JPSS J1
FY13	Submit Flight Requests to NASA Airborne Sciences. Deploy Land EDR cal/val instrument platform on P3-B (Winter Campaign)
FY14	Submit Flight Requests to NASA Airborne Sciences. Deploy Land EDR cal/val instrument platform on P3-B (La Selva Campaign)
FY15	Long Term Monitoring of VIIRS Land EDRs using NEVCAN network infrastructure (cf.: http://sensor.nevada.edu/NCCP) – Stage 1 validation
FY16	Continue Long Term Monitoring activities across the wider FLUXNET/BSRN network to achieve Stage 2 -- validation
FY17	Continue Long Term Monitoring activities across the wider FLUXNET/BSRN network to achieve Stage 2 -- validation

Issues, Challenges, Setbacks (FY11 Team)

- Reduced / late funding
- Test datasets were limited
  - Only functional testing possible
- Some land products were available only in ADL 3.1
  - STAR team tested ADL installation using existing ADL code for other products
- Need to exercise the algorithm / code change process
  - Active participation in DRs
  - Leverage LandPEATE experience
- Cal/val findings tool
  - lower priority
- SDR communication; quick reporting of validation results
  - CasaNOSA wiki space etc.

Path forward: VIIRS Land Surface

Algorithm	Beta	Provisional	Val 1	Val 2	Val 3
Land Surface Reflectance IP	Sep-12	Jul-13	Jul-14	Jan-15	Jan-16
Land Veg Index	Sep-12	Jul-13	Jul-14	Jan-15	Jan-16
Land Surface Albedo	May-13	Nov-13	Jul-14	Jan-15	Jan-16
Surface Temps - LST	Dec-12	May-13	Dec-13	May-14	May-15
Land Active Fires	Sep-12	May-13	May-14	May-15	Aug-15
Land Surf Type	Dec-12	Sep-13	May-14	May-15	Aug-15