Suomi NPP Terrestrial Data Products and Their Use in NOAA Operations

I. Csiszar, X. Zhan, M. Vargas, Y. Yu, F. Kogan *(NOAA/NESDIS Center for Satellite Applications and Research)*

M. Ek *(NOAA NCEP Environmental Monitoring Center)*

Miguel Román *(NASA Goddard Space Flight Center)*

NOAA JPSS Suomi NPP VIIRS Land Products and Team Principals

Role or Product Focus	Name (+ et al.)	Affiliation	System
NOAA Product Team Lead, **Fire**	*Ivan Csiszar* / Wilfrid Schroeder	NOAA / UMD	IDPS/NDE
NASA Coordination, Validation co-lead	Miguel Román, Chris Justice	NASA / UMD	NASA ST
Surface Reflectance, VCM, calibration	*Eric Vermote*	NASA	IDPS
Surface Reflectance	Alexei Lyapustin	NASA	IDPS
Vegetation Index, Green Vegetation Fraction*	*Marco Vargas*	NOAA	IDPS/NDE
Vegetation Index	Tomoaki Miura	Univ. of Hawaii	IDPS
Vegetation Health*	*Felix Kogan*	NOAA	NDE
Phenology**	*Yunyue (Bob) Yu* / Xiaoyang Zhang	NOAA/SDSU	PGRR
Albedo	*Yunyue (Bob) Yu* / Shunlin Liang	NOAA / UMD	IDPS
Land Surface Temperature	*Bob Yu*	NOAA	IDPS
Surface Type	*Jerry Zhan* / Chengquan Huang	NOAA / UMD	IDPS
Validation, data continuity	Kevin Gallo	NOAA	IDPS/NDE
STAR AIT Land	Walter Wolf, Marina Tsidulko	NOAA	IDPS/NDE
NASA LandPEATE, **gridding/granulation**	Sadashiva Devadiga,	NASA	IDPS/NASA ST
Raytheon	Daniel Cumpton	Raytheon	IDPS
JPSS Algorithm Manager	Leslie Belsma	Aerospace	IDPS
NCEP Land Team, data assimilation	Mike Ek	NOAA	IDPS/NDE/PGRR

IDPS: Interface Data Processing Segment; *NDE: NOAA-Unique; **PGRR: Proving Ground / Risk Reduction

Surface Reflectance Intermediate Product Requirements (proposed)*

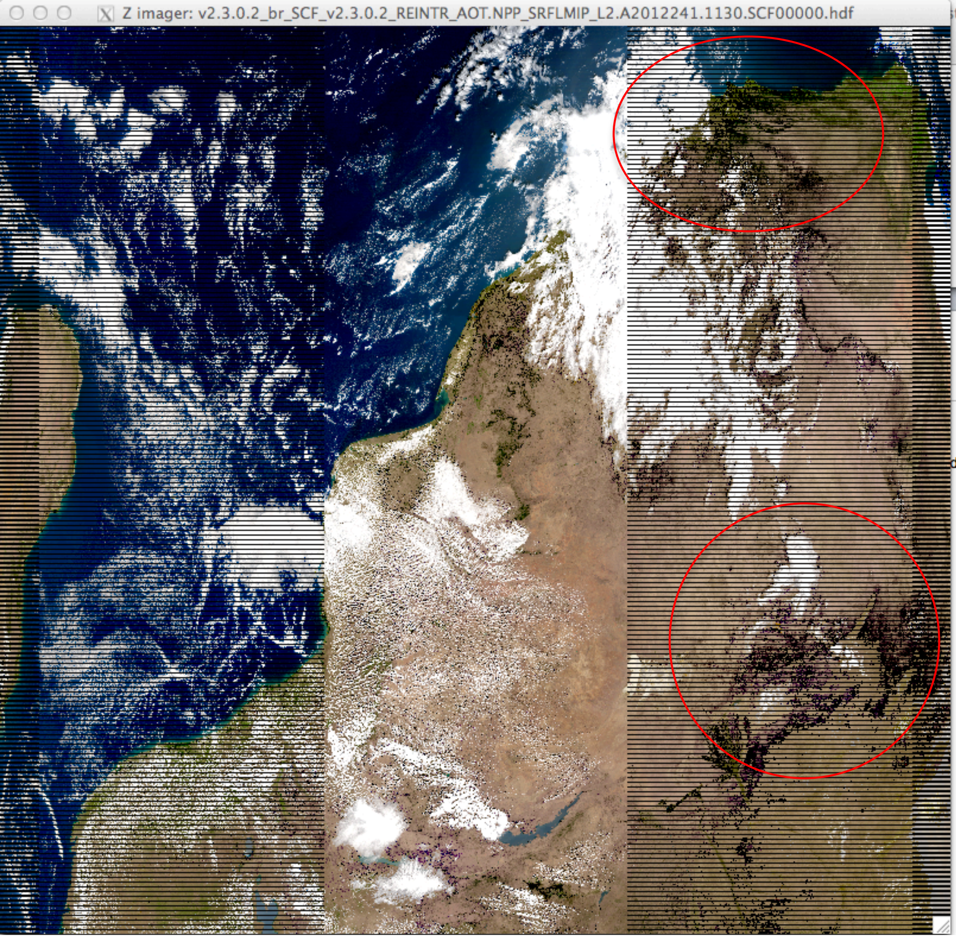
Table X.X.X – Surface Reflectance (SR) VIIRS		
EDR Attribute	Threshold	Objective
SR Applicable conditions: 1. Clear, daytime only (1)		
a. Horizontal Cell Size	Pixel resolution in radiometric (800m) and imagery (400m) bands	250m
b. Mapping Uncertainty, 3 Sigma	VIIRS SDR pixel geolocation uncertainty	
c. Measurement Range	0-1 (In some instances (e.g. at certain angles over snow), the reflectance can be larger than 1)	
d. Measurement Accuracy (A) (1)	$0.005+0.05\rho$	$0.003+0.03\rho$
e. Measurement Precision (P) (1)	$0.005+0.05\rho$	$0.003+0.03\rho$
g. Refresh	At least 90% coverage of the globe every 24 hours (monthly average)	24h
Notes: 1. The symbol ρ denotes the retrieved surface reflectance. The APU metrics are applicable in conditions of low-to-moderate atmospheric turbidity (AOT(0.55µm) x m <1) where m is the air mass. The performance is degraded for the SR at wavelengths lower than 0.55µm by at least a factor 2. The SR errors may also be higher under partly cloudy and snow conditions.		

Surface reflectance IP requirements are currently not listed in the L1RD Supplement. Process is ongoing to advance the product to EDR status.

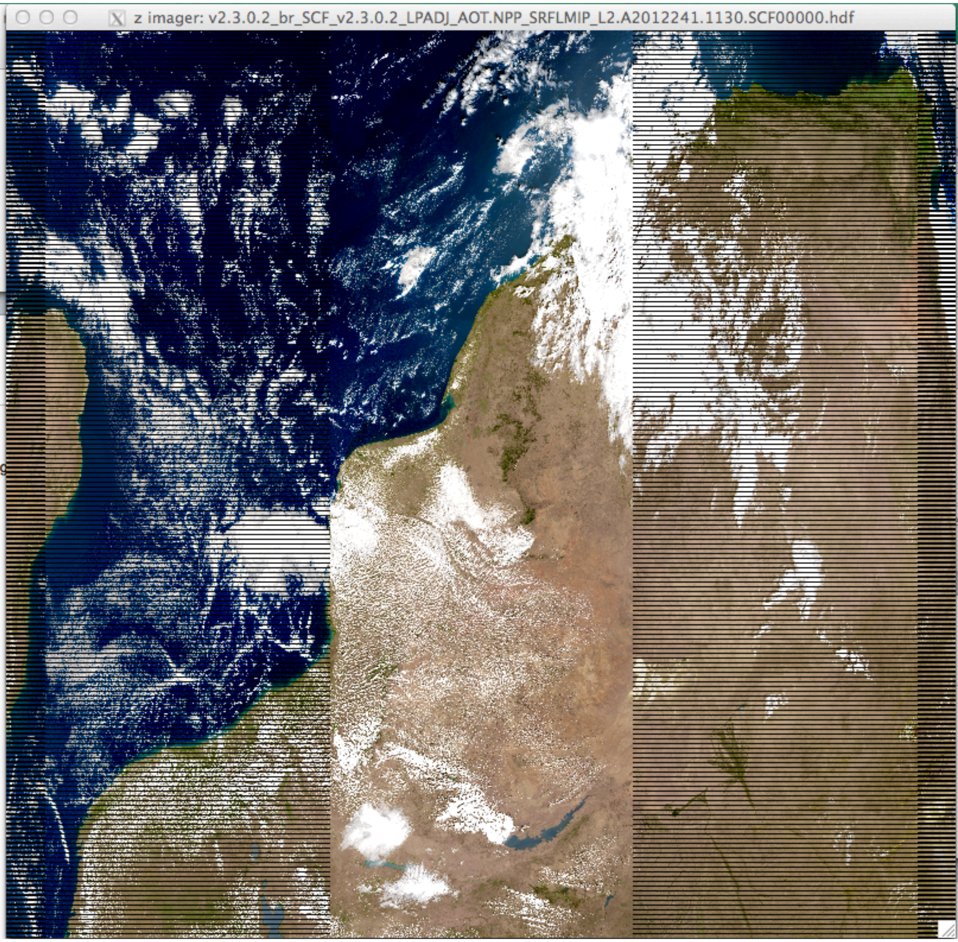
The performance is dependent on both the spectral band and the magnitude of the reflectance (increased surface brightness results in a multiplicative error of 5%).

Improving Surface Reflectance product performance

Dust model on



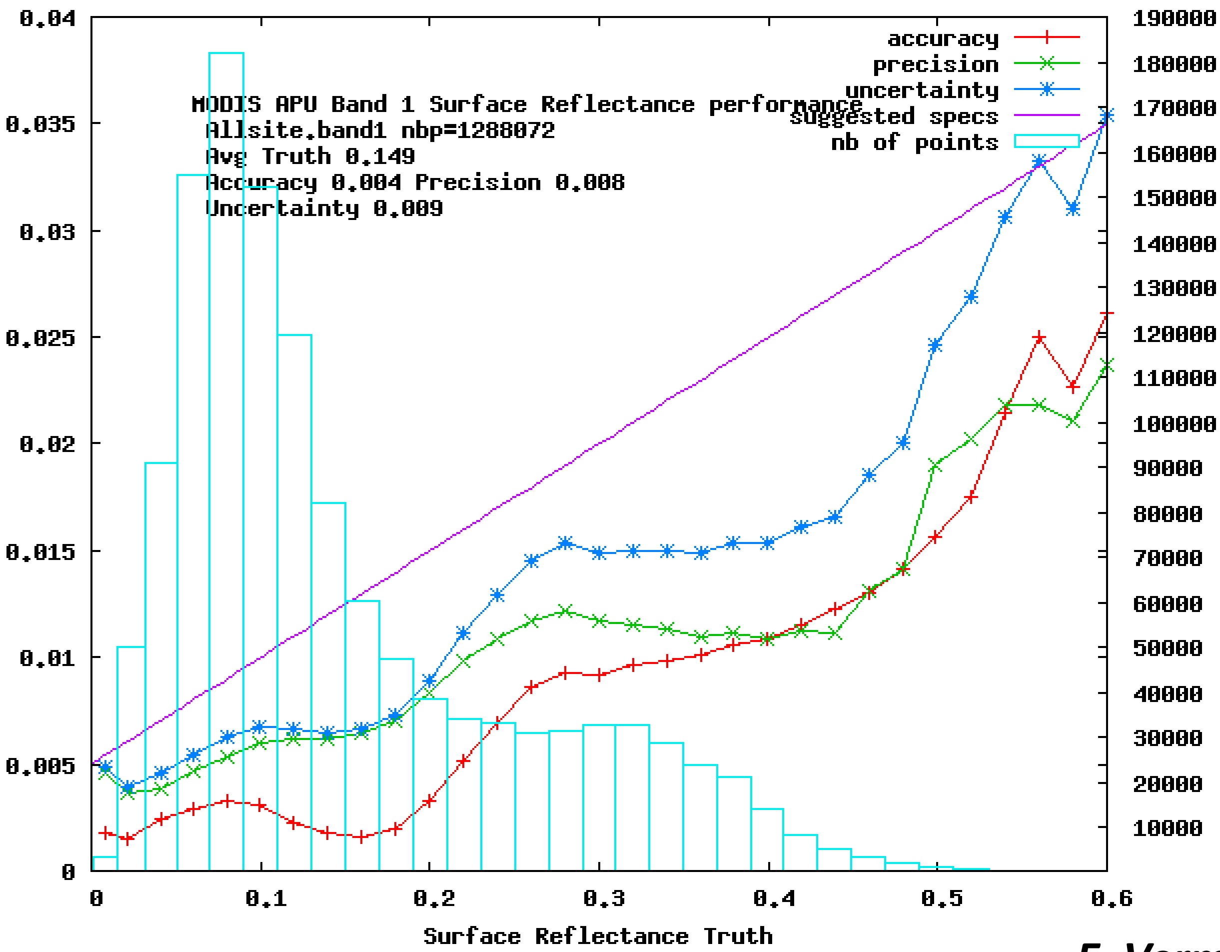
Dust model off



Negative reflectance values in the visible are present in the left picture (dark spot in RGB)

E. Vermote, S. Devadiga, NASA GSFC

MODIS Collection 5



1,3 Millions 1 km pixels were analyzed for each band.

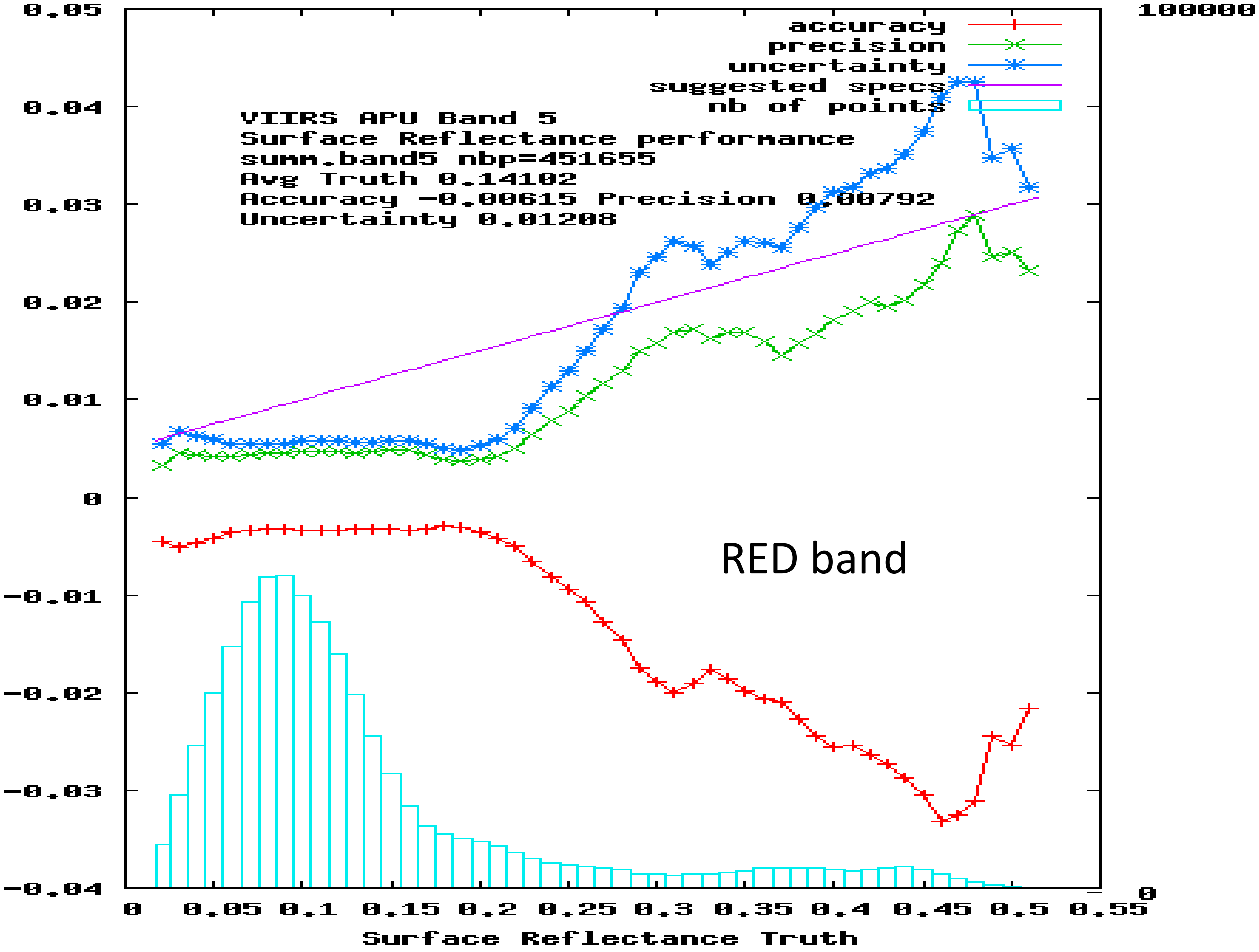
Red = Accuracy (mean bias)
Green = Precision (repeatability)
Blue = Uncertainty (quadatric sum of A and P)

On average well below magenta theoretical error bar

E. Vermote, S. Devadiga, NASA GSFC

Evaluation of SR Algorithm Performance

VIIRS C11 reprocessing



450000 pixels were analyzed for each band.

Red = Accuracy (mean bias)
Green = Precision (repeatability)
Blue = Uncertainty (quadratic sum of A and P)

On average well below magenta theoretical error bar

E. Vermote, S. Devadiga, NASA GSFC

VIIRS Vegetation Index EDR Requirements

Table 5.5.9 - Vegetation Indices (VIIRS)

EDR Attribute	Threshold	Objective
Vegetation Indices Applicable Conditions		
1. Clear, land (not ocean), day time only		
a. Horizontal Cell Size	0.4 km	0.25 km
b. Mapping Uncertainty, 3 Sigma	4 km	1 km
c. Measurement Range		
1. NDVITOA	-1 to +1	NS
2. EVI (1)	-1 to +1	NS
3. NDVITOC	-1 to +1	NS
d. Measurement Accuracy - $NDVI_{TOA}$ (2)	0.05 NDVI units	0.03 NDVI units
e. Measurement Precision - $NDVI_{TOA}$ (2)	0.04 NDVI units	0.02 NDVI units
f. Measurement Accuracy - EVI (2)	0.05 EVI units	NS
g. Measurement Precision - EVI (2)	0.04 EVI units	NS
h. Measurement Accuracy - $NDVI_{TOC}$ (2)	0.05 NDVI units	NS
i. Measurement Precision - $NDVI_{TOC}$ (2)	0.04 NDVI units	NS
j. Refresh	At least 90% coverage of the globe every 24 hours (monthly average)	24 hrs.

Notes:

1. EVI can produce faulty values over snow, ice, and residual clouds (EVI > 1).
2. Accuracy and precision performance will be verified and validated for an aggregated 4 km horizontal cell to provide for adequate comparability of performance across the scan.

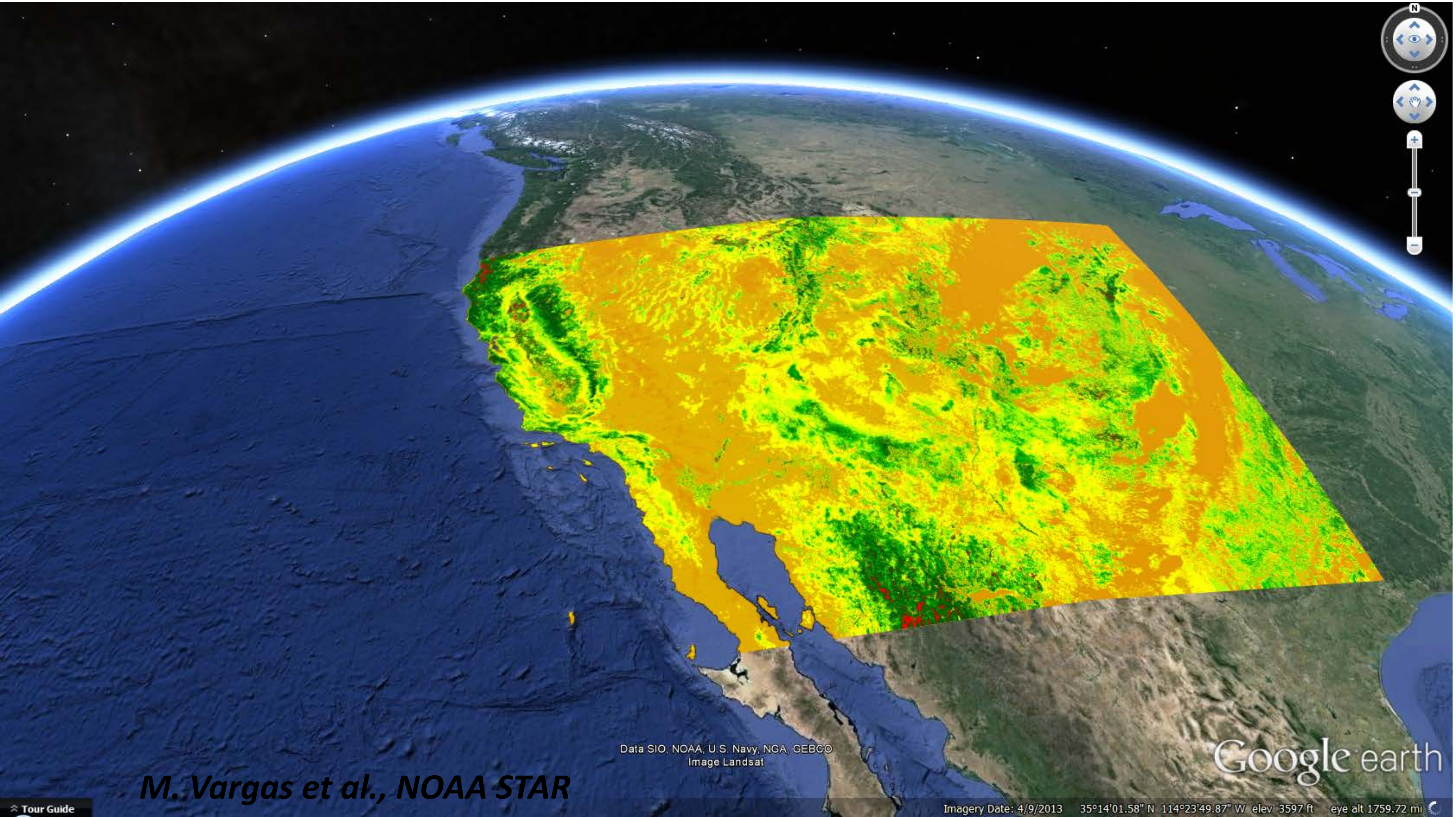
New for JPSS1

$NDVI_{TOC}$ Excluded for SNPP (L1RD-S Appendix D, Table D-1)

Source: Level 1 Requirements Supplement – Final Version:2.10 June 25, 2014

TOA NDVI August 28, 2014 (Mx8.5)

VIVIO_npp_d20140828_t2038279_e2039520_b14691_c20140829030212719401_noaa_ops.h5
VIVIO_npp_d20140828_t2039533_e2041174_b14691_c20140829030212719401_noaa_ops.h5
VIVIO_npp_d20140828_t2041187_e2042428_b14691_c20140829031109580173_noaa_ops.h5



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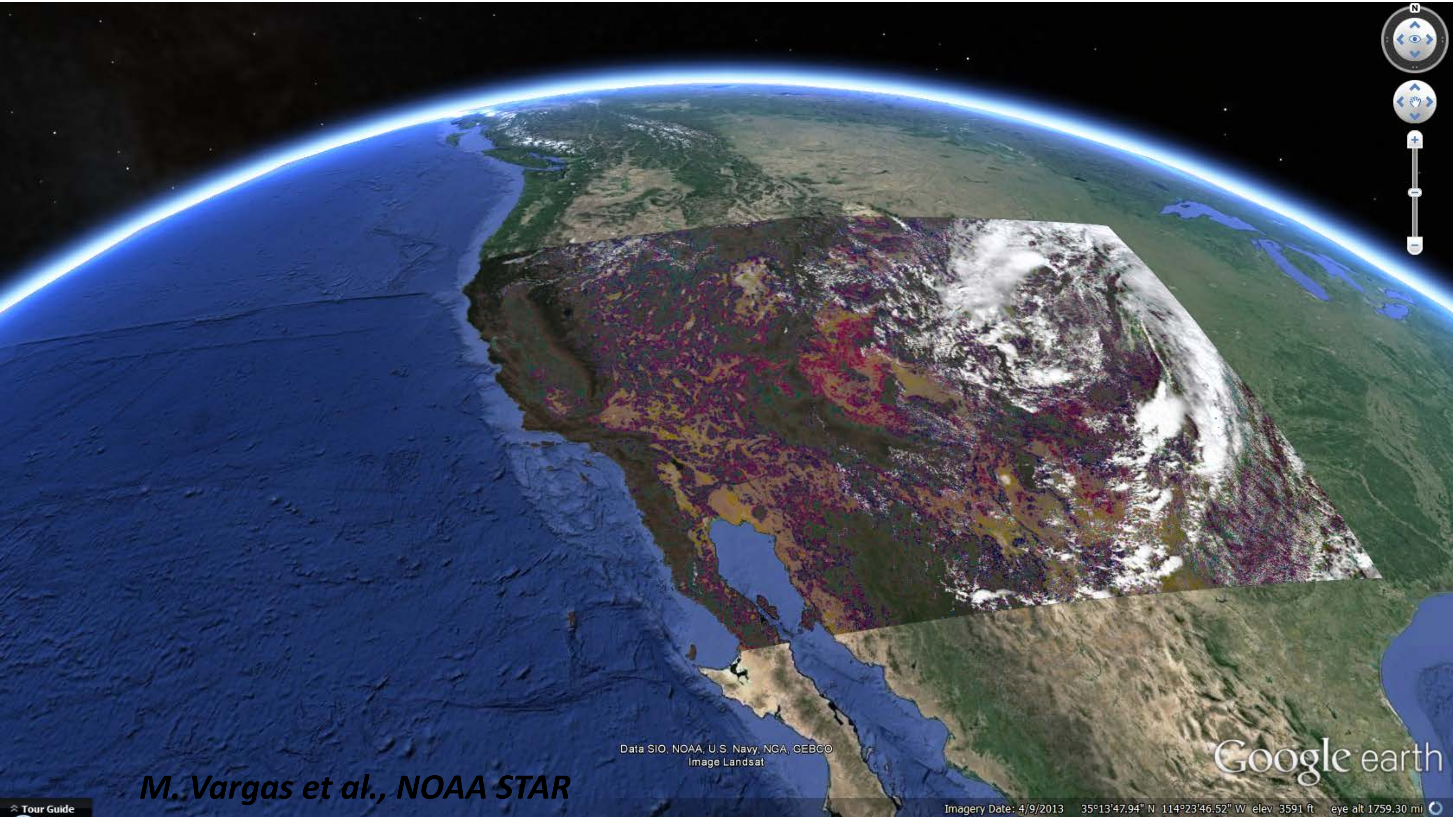
RGB composite August 28, 2014

Surface Reflectance bands M5, M4 and M3 (Mx8.5)



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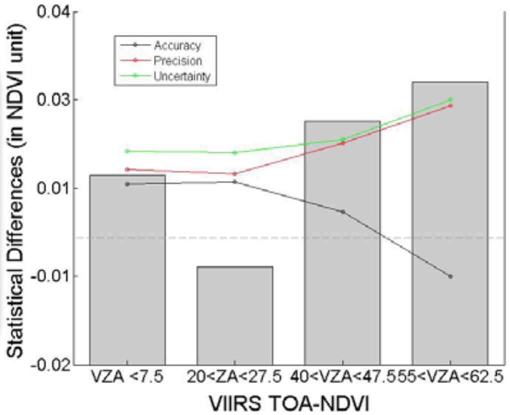
VIIRS VI EDR APU Metrics
MODIS Reference; All Data Days

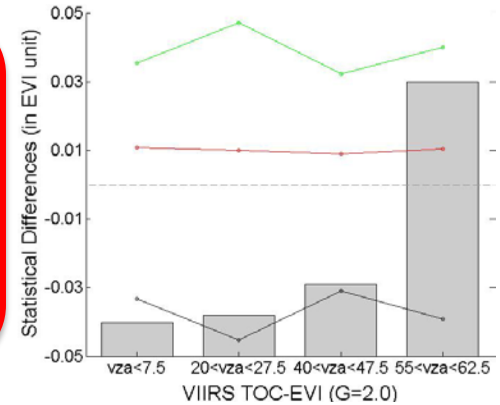
TOA NDVI

	Summary
A	0.005
P	0.017
U	0.020

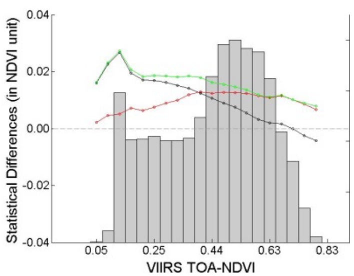


TOC EVI

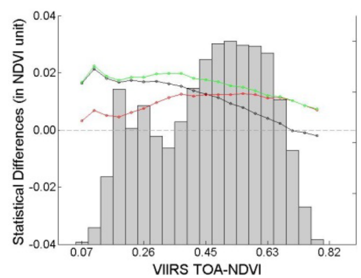
	Summary
A	-0.037
P	0.011
U	0.039



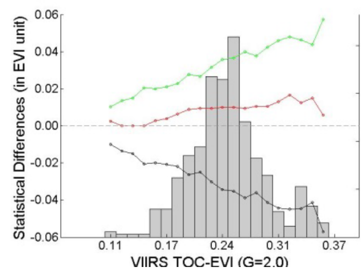
VZ <7.5^{o}



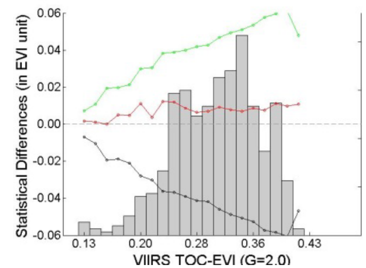
20^{o} < VZ <27.5^{o}



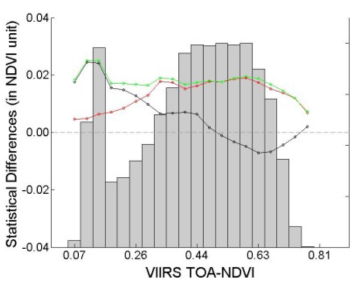
VZ <7.5^{o}



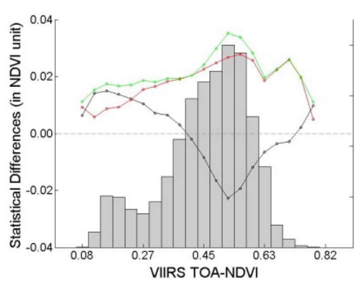
20^{o} < VZ <27.5^{o}



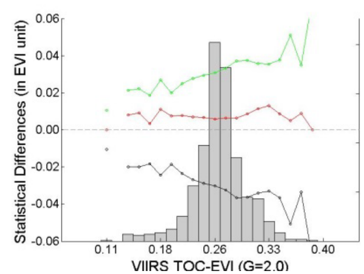
40^{o} < VZ <47.5^{o}



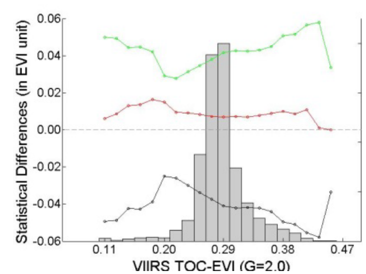
55^{o} < VZ <62.5^{o}



40^{o} < VZ <47.5^{o}



55^{o} < VZ <62.5^{o}



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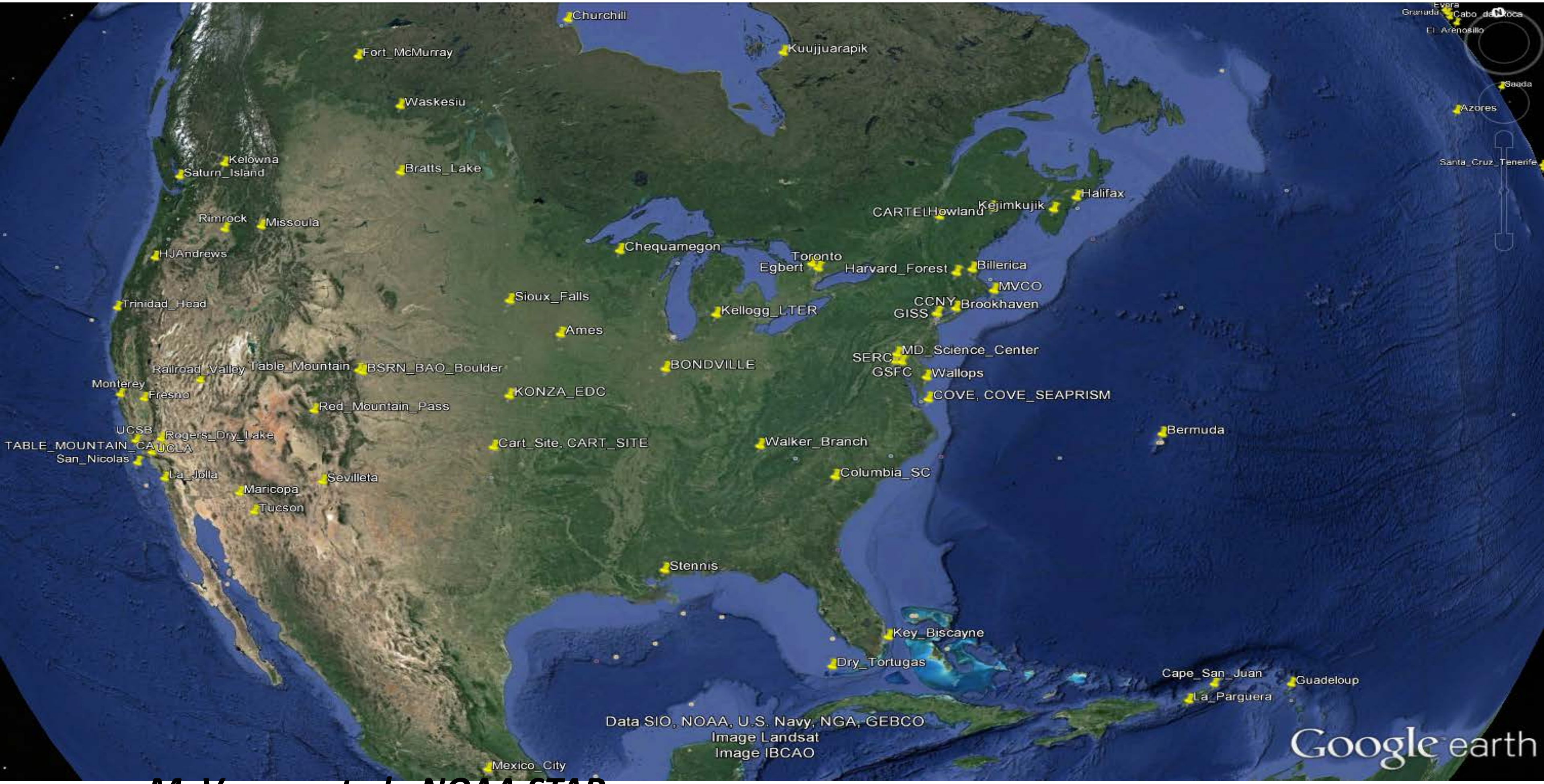
VI EDR Validation: Matchup Data Analysis

Surface Reflectance and VI cutouts collected daily at 229 Aeronet sites: North America Example



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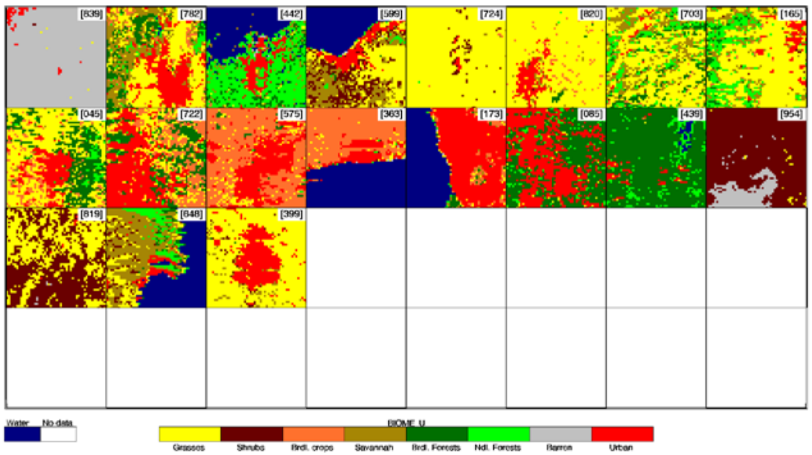
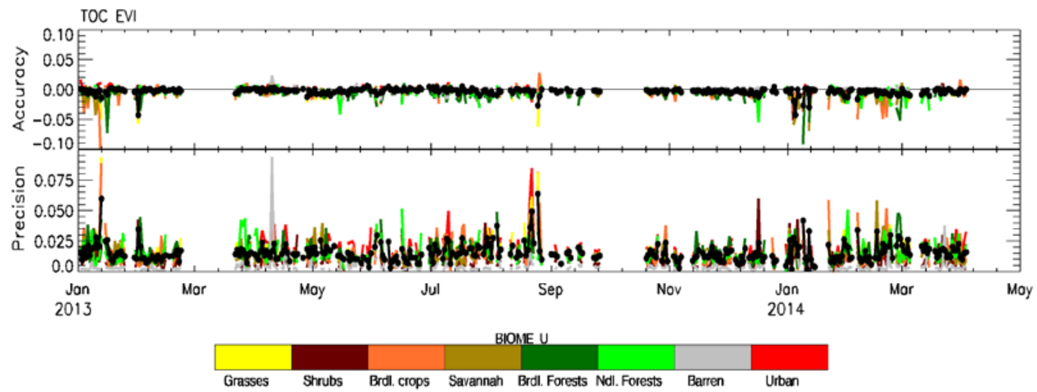
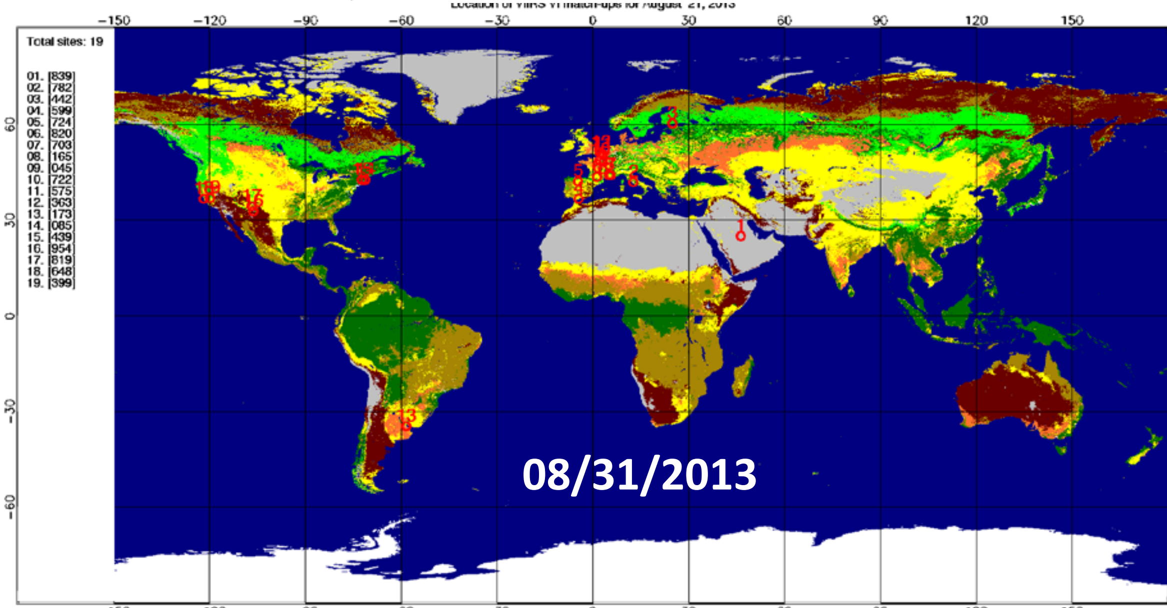
VI EDR Validation
Using AERONET Based SR (Matchup Data)

Sample of global daily distribution of match-up sites (August 21, 2013) covering different surface types and including urban areas. Global Land cover is derived from Combined Terra & Aqua MODIS LAI/FPAR LC product (MCD12C1, ver. 5.1).







Global APUs
(Jan 1, 2013 – Mar 31, 2014)

	TOC EVI	TOC NDVI
A	-0.004	0.009
P	0.015	0.035
U	0.016	0.038

M. Vargas et al., NOAA STAR

Land Model Requirements

To provide these proper boundary conditions, land model must have:

- **Atmospheric forcing** to drive land model,
- Appropriate **physics** to represent land-surface processes,
- Proper **initial land states**, such as snow & soil moisture (analogous to initial atmospheric conditions, though land states may carry more “memory”, especially deep soil moisture, similar to ocean SSTs),
- **Land data sets**, e.g. land use/land cover (vegetation type), soil type, surface albedo, and associated parameters, e.g. surface roughness, soil and vegetation properties.

M. Ek, NOAA/NCEP

JPSS Land Data Proving Ground Initiative

•*The overarching goal of the JPSS Land Proving Ground Initiative is to* ***maximize the utilization of JPSS land surface environmental data products****, as well as data products from other environmental satellites, by the NOAA numerical weather prediction community.*

•*The ultimate scientific objective of the collaboration is the characterization of the sensitivity NCEP's coupled environmental prediction models* ***to improved land surface data input and assimilation****.*

•*This will be achieved by the initial utilization and testing the performance of NCEP's stand-alone land surface modeling suite with use of the* ***most accurate and updated land surface data products from the S-NPP satellite and other missions****.*

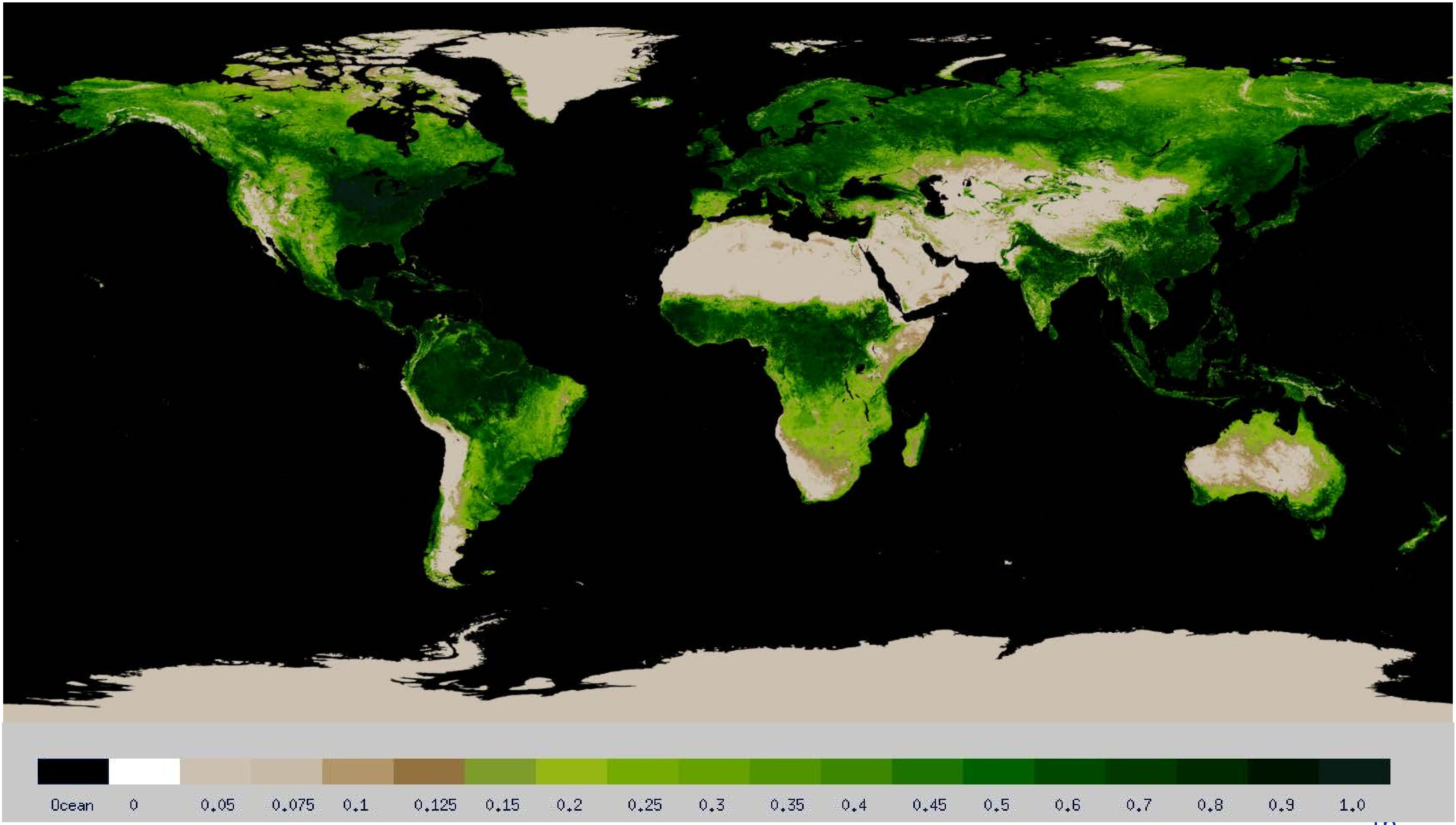
VIIRS GREEN VEGETATION FRACTION

•**The VIIRS Green Vegetation NUP generated at NDE/ESPC consists of two products:**
•1) **Weekly global GVF at 4 km resolution** (produced daily) Plate Caree projection.
•2) **Weekly regional GVF (Lat 7.5°S to 90°N, Lon 130°E to 30°E) at 1 km resolution** (produced daily)
•The VIIRS GVF product format is NetCDF4. The file size is 80MB for the regional product and 15MB for the global product.
•The VIIRS GVF NUP **was approved by the NOAA SPSRB to run in the operational environment** at NDE on September 17, 2014. The product is still being generated pre-operationally at NDE (NDE is having security issues to resolve). Planned start for full operational production in early 2015.
•GVF data delivered to CLASS from the NDE distribution zone will have a latency of 1 hour.

•**VIIRS GVF NUP Documentation**
•Green Vegetation Fraction (GVF) NOAA-Unique Product ALGORITHM THEORETICAL BASIS DOCUMENT Version 2.1
•Green Vegetation Fraction (GVF) External Users Manual Version 1.0
•The VIIRS GVF NUP Cal/Val plan is under development.
There are plans to produce the VIIRS GVF NUP from the JPSS1 satellite in FY17.

VIIRS Green Vegetation Fraction

4-km Global GVF (Sep 1-7, 2014)



Coverage Lat 90°N - 90°S, Lon 180°W - 180°E

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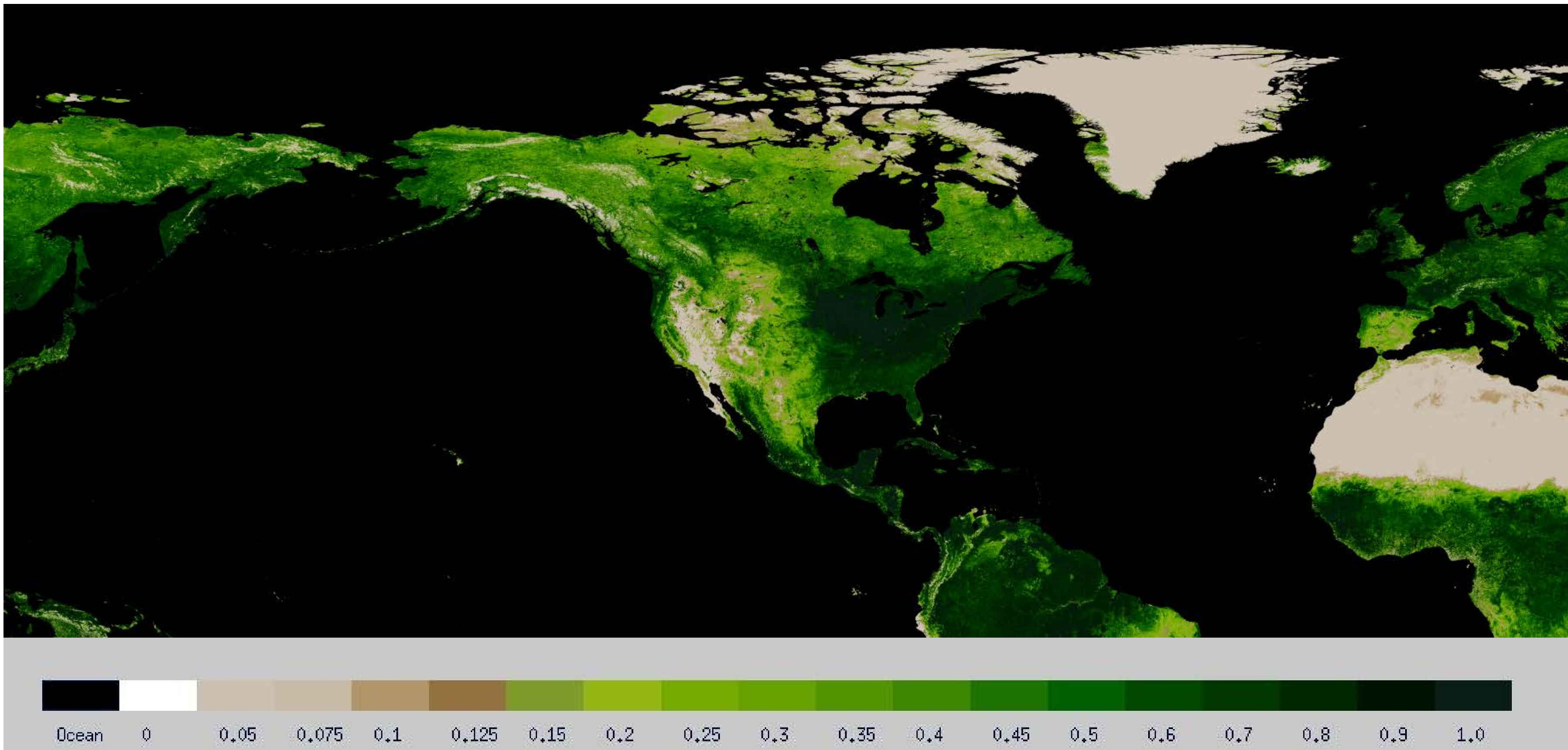
VIIRS Green Vegetation Fraction

1-km Regional GVF (Sep 1-7, 2014)



Coverage Lat 90°N - 7.5°S, Lon 130°E - 30°E

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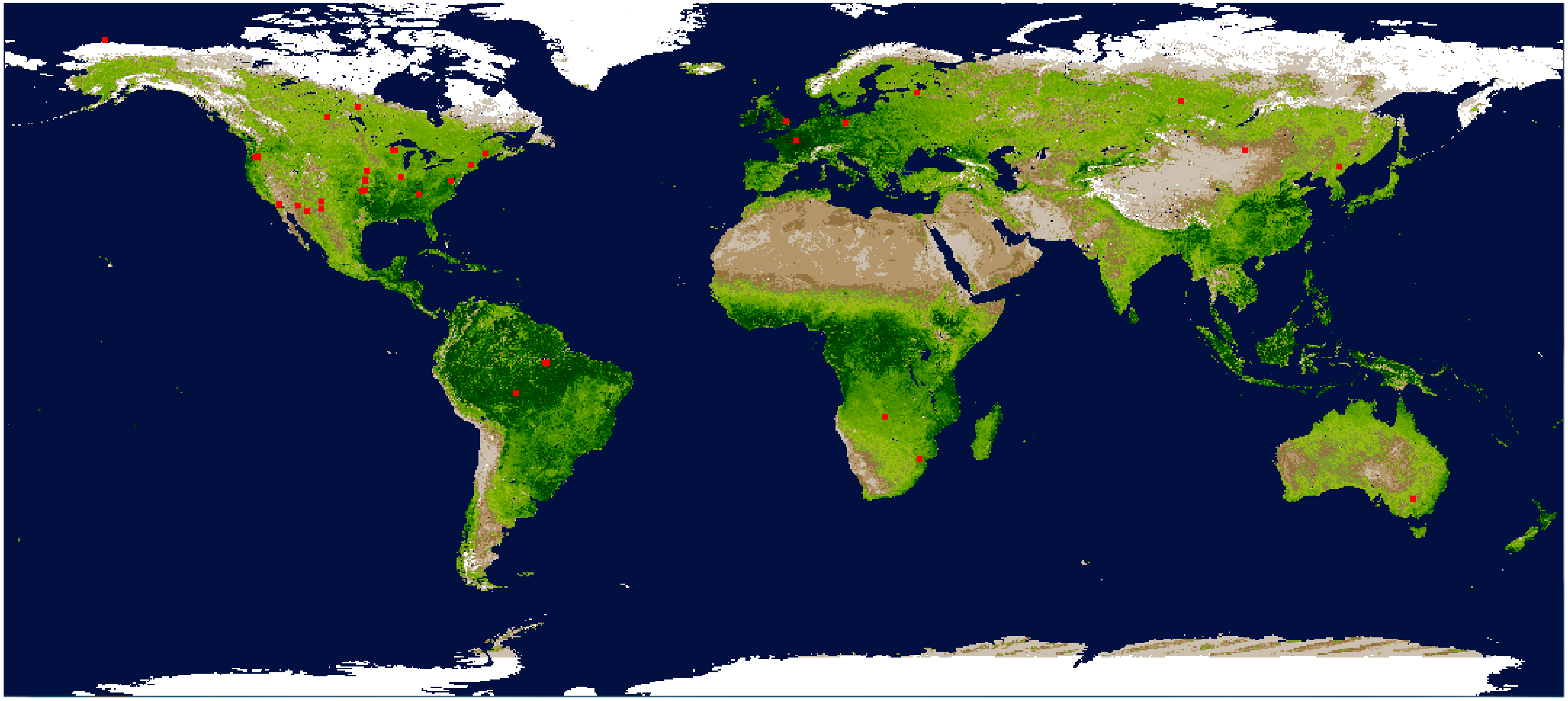
GVF Validation Sites



- **The EOS Land Validation Core Sites are intended as a focus for land product validation over a range of biome types (http://landval.gsfc.nasa.gov/coresite_gen.html)**

M. Vargas et al., NOAA STAR

VIIRS Green Vegetation Fraction

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%

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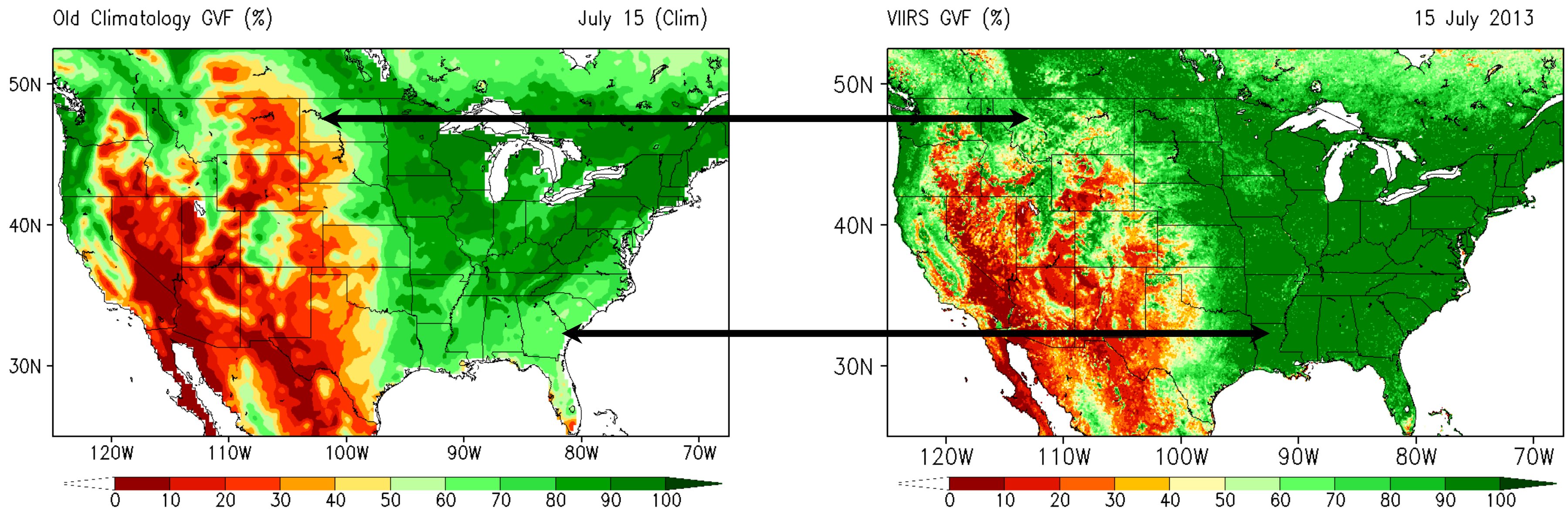
NOAA NESDIS VIIRS Green Vegetation Fraction

AVHRR Climatology (16km) ***VIIRS weekly composite (4km)***

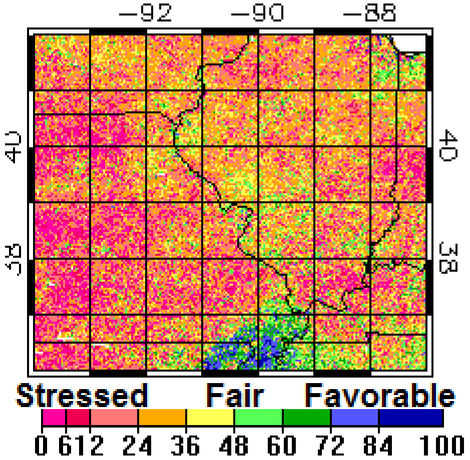


Weekly GVF composites updated daily are being generated for use by the NOAA National Weather Service (NWS) National Centers for Environmental Prediction (NCEP). Early sensitivity studies have shown a reduction of errors of temperature, humidity and wind speed forecasts, and an improvement of precipitation scores in Global Forecasting System (GFS) performance, compared to the use of the heritage AVHRR-based climatology.

M. Ek, M. Vargas (NOAA), W. Zheng (IMSG), I. Csiszar (NOAA)

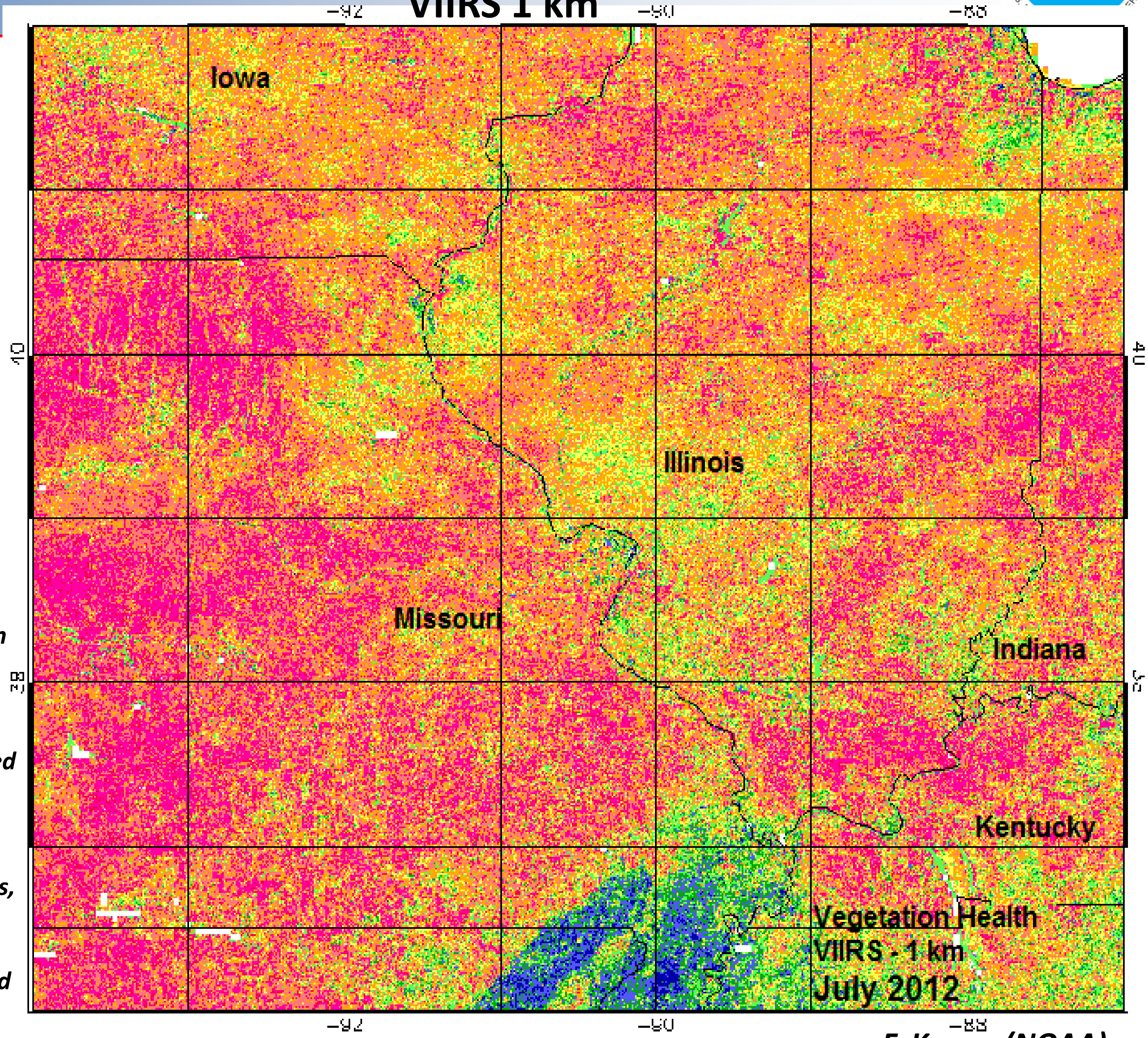
Suomi NPP VIIRS DROUGHT, USA Midwest, July 2012

AVHRR 4 km



- *Droughts affect Global Food Security by reducing agricultural production below consumption.*
- *Since 2000, this occurred in 8 years.*
- *Early drought detection and accurate monitoring its area, intensity, duration and impacts are important for the mitigation of the consequences of droughts.*
- *Vegetation health(VH) method applied to Suomi NPP VIIRS data greatly improve drought watch and impact assessment.*
- *The two images show similar patterns, but VIIRS provides further detail: over the background of drought (red) no drought (yellow and green) is observed along the rivers (western part of the 1 km VIIRS image).*

VIIRS 1 km



F. Kogan (NOAA)

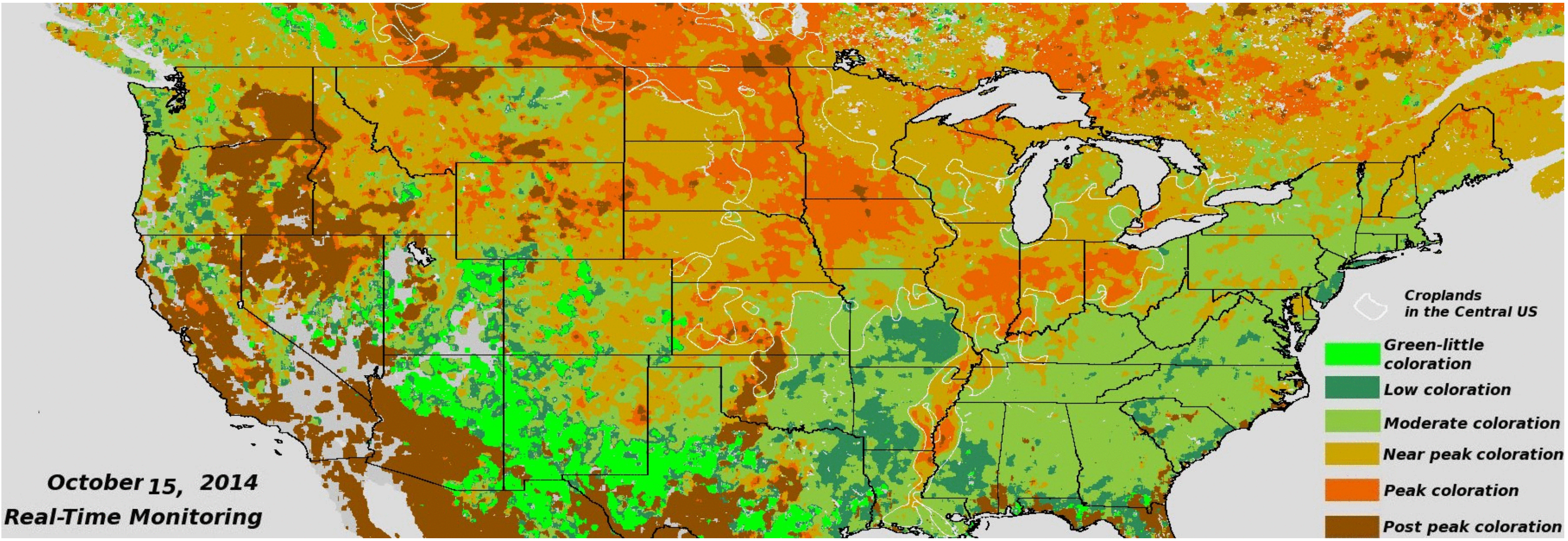
NOAA JPSS PGRR Phenology Project

Monitoring Land Surface Vegetation Phenology from VIIRS

Overview and Objective

- *To develop an operational land surface phenology product using near-real time NPP VIIRS data with a spatial resolution of 500-m at a global coverage.*
- *To model temporal trajectories of the vegetation growth for real-time monitoring and short-term forecasting of vegetation phenology in North America (4-km)*
- Satellite sensors used:
  - VIIRS
- Targeted NOAA users:
  - Numerical Weather Prediction Systems at NOAA Environmental Modeling Center

Establishing a framework regarding the application of VIIRS phenology data in NWPS

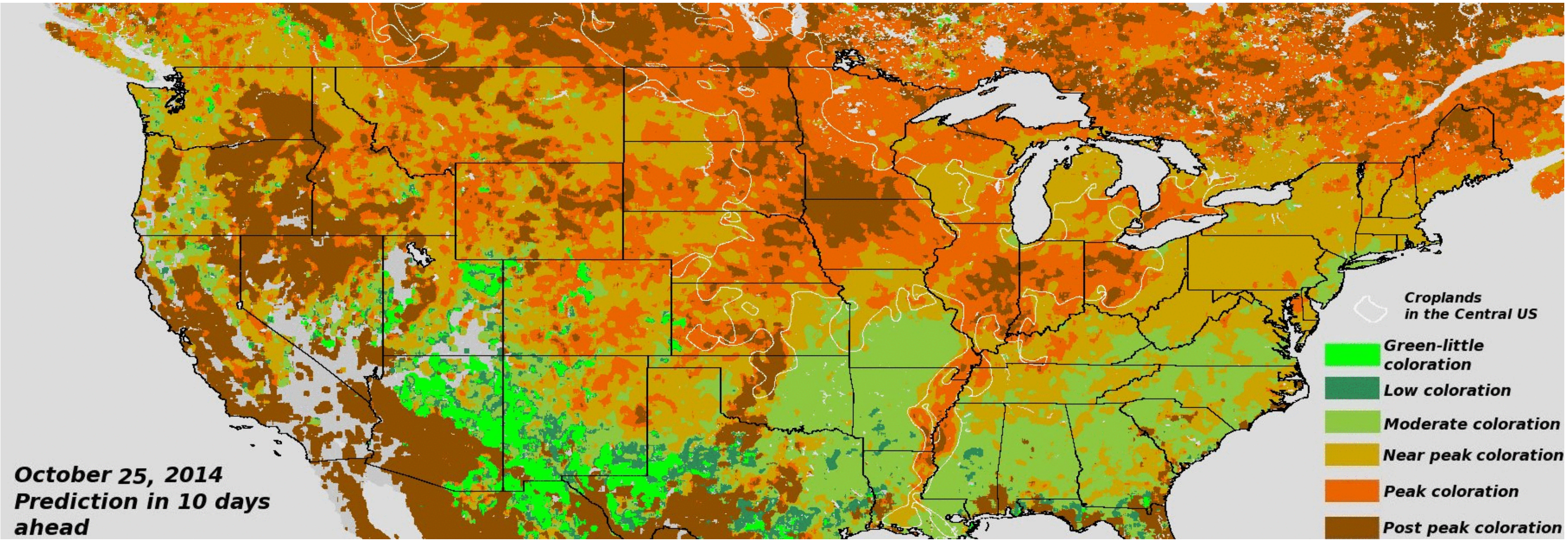


Y. Yu, X. Zhang

Phenology: Short-term Forecasting of Fall Foliage from VIIRS

Tasks completed, ongoing, future plan

- Investigate VIIRS time series of NDVI and EVI (compl)
- Develop and test algorithms for generating annual time series of EVI trajectories (compl)
- Develop algorithms for near-real time monitoring and short-term forecasting of phenology development at a spatial resolution of 4km across CONUS (ong)
- Generate climatology data of phenology from MODIS (2001-2012) for real-time monitoring of VIIRS phenology development (ong)
- Develop algorithms for operational phenology product (500m-1km globally) for improving the numerical weather prediction system (ong)
- Establish approaches for uncertainty analysis of phenology detection
- Test VIIRS phenology data and provide results for improving Numerical Weather Prediction model

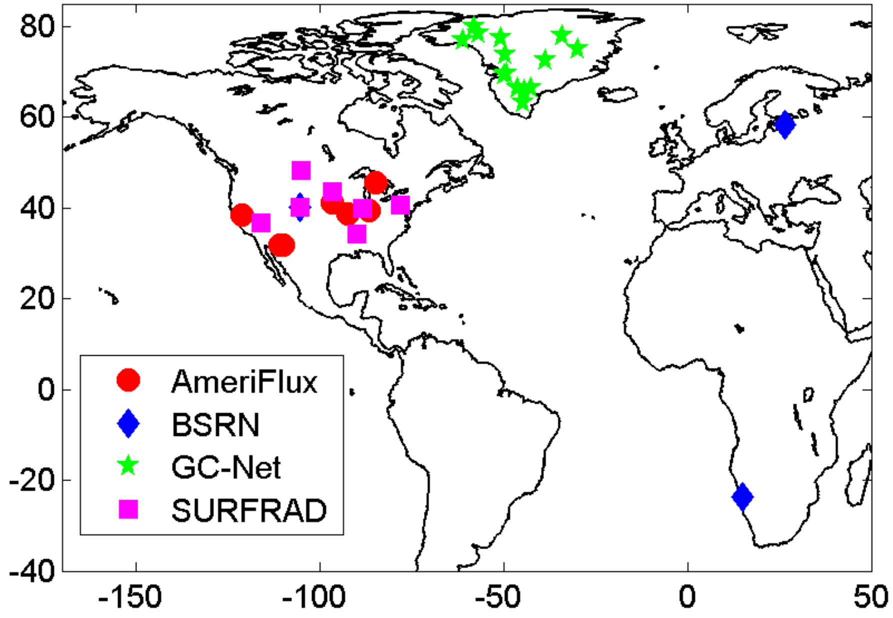


Short-term prediction at http://www.star.nesdis.noaa.gov/star/news2014_201410_FallFoliage.php

Y. Yu, X. Zhang

Land Surface Albedo: Validation methods

- Data of 35 stations are collected over the recent three years.
  - 11 AmeriFlux, 3 BSRN, 14 GC-Net and 7 SURFRAD sites
- Only relatively homogenous sites are used in data comparison.
- Information of land type, snow cover and cloud mask is used as ancillary data in validation.

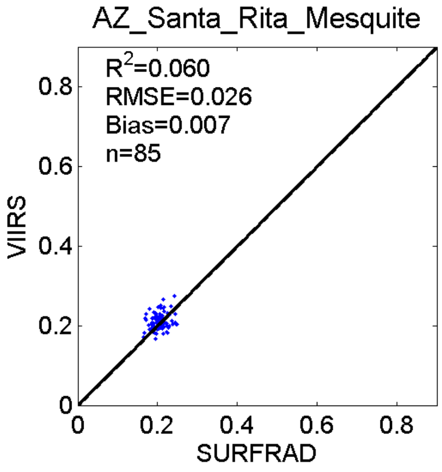


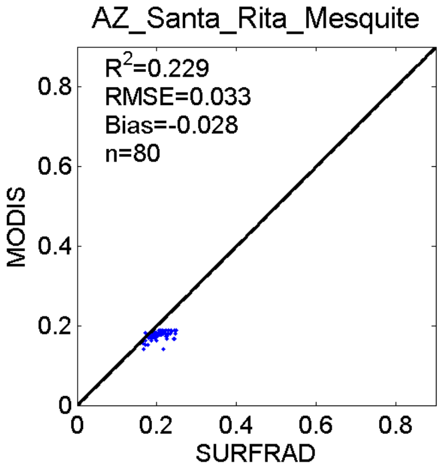
Y. Yu, NOAA/STAR, D. Wang (UMD)

Land Surface Albedo: Validation results

Site	RMSE VIIRS	RMSE MODIS	Bias VIIRS	Bias MODIS
AZ_Kendall_Grassland	0.042	0.062	-0.030	-0.057
AZ_Lucky_Hills_Shrubland	0.025	0.042	0.001	-0.039
AZ_Santa_Rita_Creosote	0.044	0.048	0.003	-0.035
AZ_Santa_Rita_Mesquite	0.026	0.033	0.007	-0.028
IN_Morgan_Monroe_State_Forest	0.043	0.063	-0.032	-0.058
MI_UMBS	0.200	0.028	0.136	-0.028
MI_UMBS_Disturbance	0.243	0.039	0.171	-0.032
MO_Missouri_Ozark_Site	0.025	0.041	-0.012	-0.035
NE_Mead_irrigated	0.032	0.141	0.007	-0.047
NE_Mead_Rainfed	0.209	0.184	0.088	0.096
Boulder	0.051	0.117	-0.017	-0.049
GITS	0.112	0.761	-0.057	-0.570
Humboldt	0.114	0.112	-0.071	-0.096
Summit	0.106	0.074	-0.028	-0.061
DYE-2	0.152	0.059	-0.009	0.027
Saddle	0.094	0.104	-0.028	-0.039
South-Dome	0.109	0.095	0.055	0.046
NASA-SE	0.142	0.241	-0.043	-0.086
Sioux_Falls	0.114	0.078	0.048	0.009
Table_Mountain	0.050	0.163	0.020	-0.019
Desert_Rock	0.038	0.011	0.029	-0.009
Fort_Peck	0.042	0.258	-0.006	-0.131
Penn_State	0.081	0.073	-0.066	-0.035
Goodwin_Creek	0.037	0.045	-0.031	-0.042

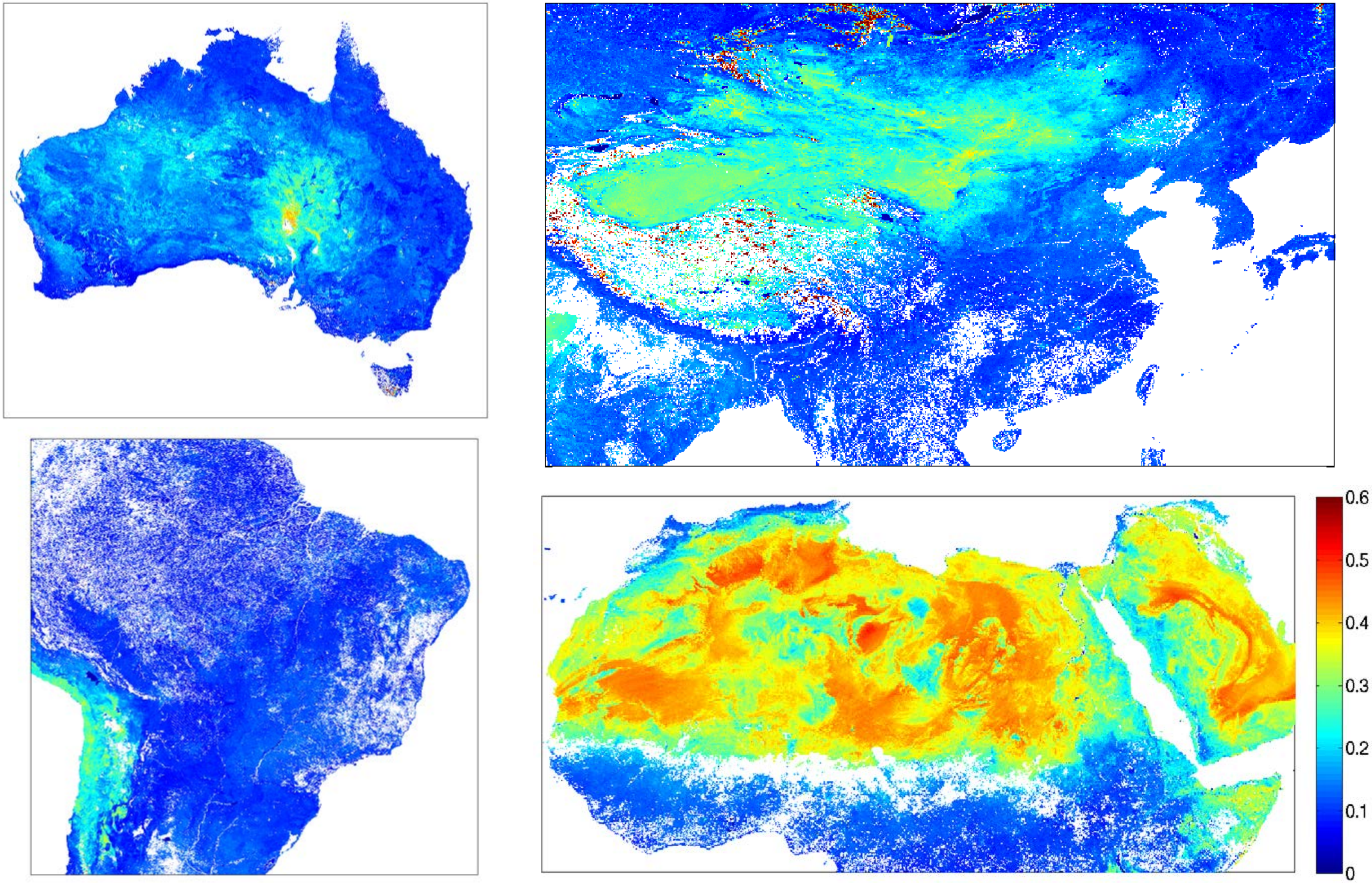
Attribute Analyzed	L1RD Threshold	Analysis/ Validation Result
RMSE	0.05	0.024 (non-snow)
Bias	0.08	-0.006 (non-snow)
RMSE	0.05	0.065 (snow)
Bias	0.08	-0.023 (snow)
RMSE	0.05	0.045 (combined)
Bias	0.08	-0.013 (combined)





Y. Yu, NOAA/STAR, D. Wang (UMD)

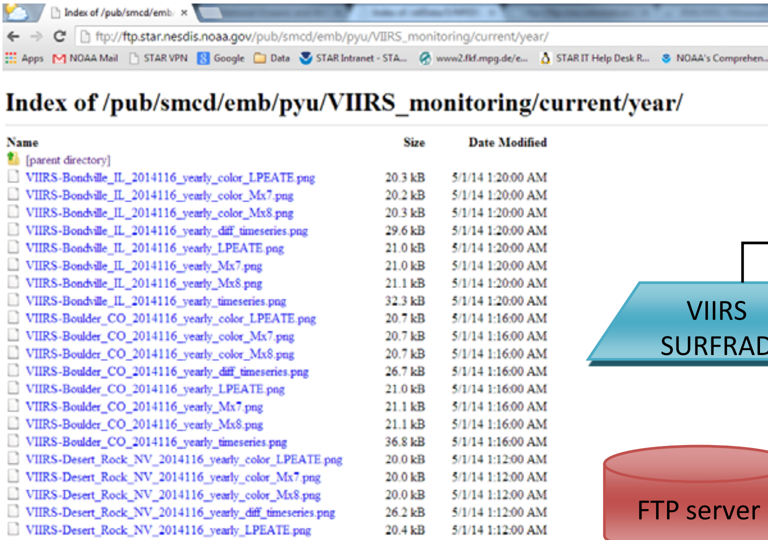
Land surface albedo: temporal means



Temporal averaged maps of surface albedo, May 8-23, 2012

Y. Yu, NOAA/STAR, D. Wang (UMD)

Land Surface Temperature: Product Monitoring



Index of /pub/smcd/emb/pyu/VIIRS_monitoring/current/year/

Name	Size	Date Modified
[parent directory]		
VIIRS-Bondville_IL_2014116_yearly_color_LPEATE.png	20.3 kB	5/1/14 1:20:00 AM
VIIRS-Bondville_IL_2014116_yearly_color_Mx7.png	20.2 kB	5/1/14 1:20:00 AM
VIIRS-Bondville_IL_2014116_yearly_color_Mx8.png	20.3 kB	5/1/14 1:20:00 AM
VIIRS-Bondville_IL_2014116_yearly_diff_timeseries.png	29.6 kB	5/1/14 1:20:00 AM
VIIRS-Bondville_IL_2014116_yearly_LPEATE.png	21.0 kB	5/1/14 1:20:00 AM
VIIRS-Bondville_IL_2014116_yearly_Mx7.png	21.0 kB	5/1/14 1:20:00 AM
VIIRS-Bondville_IL_2014116_yearly_Mx8.png	21.1 kB	5/1/14 1:20:00 AM
VIIRS-Bondville_IL_2014116_yearly_timeseries.png	32.3 kB	5/1/14 1:20:00 AM
VIIRS-Boulder_CO_2014116_yearly_color_LPEATE.png	20.7 kB	5/1/14 1:16:00 AM
VIIRS-Boulder_CO_2014116_yearly_color_Mx7.png	20.7 kB	5/1/14 1:16:00 AM
VIIRS-Boulder_CO_2014116_yearly_color_Mx8.png	20.7 kB	5/1/14 1:16:00 AM
VIIRS-Boulder_CO_2014116_yearly_diff_timeseries.png	26.7 kB	5/1/14 1:16:00 AM
VIIRS-Boulder_CO_2014116_yearly_LPEATE.png	21.0 kB	5/1/14 1:16:00 AM
VIIRS-Boulder_CO_2014116_yearly_Mx7.png	21.1 kB	5/1/14 1:16:00 AM
VIIRS-Boulder_CO_2014116_yearly_Mx8.png	21.1 kB	5/1/14 1:16:00 AM
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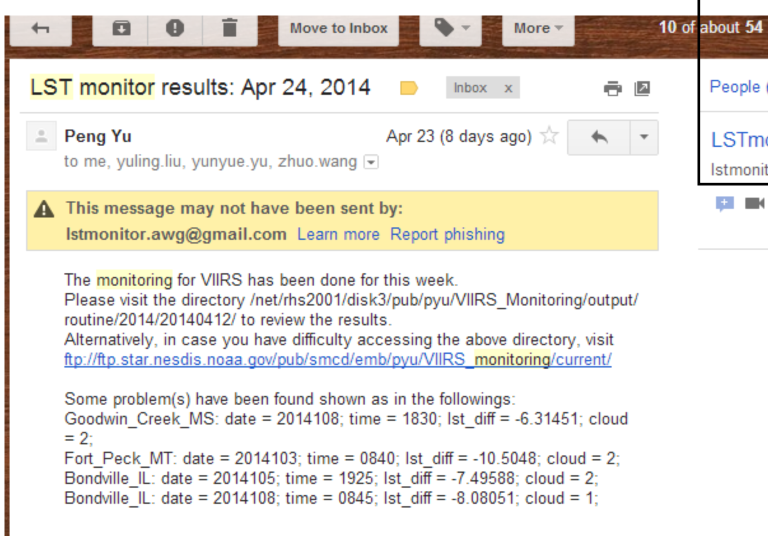
VIIRS-Desert_Rock_NV_2014116_yearly_LPEATE.png	20.4 kB	5/1/14 1:12:00 AM



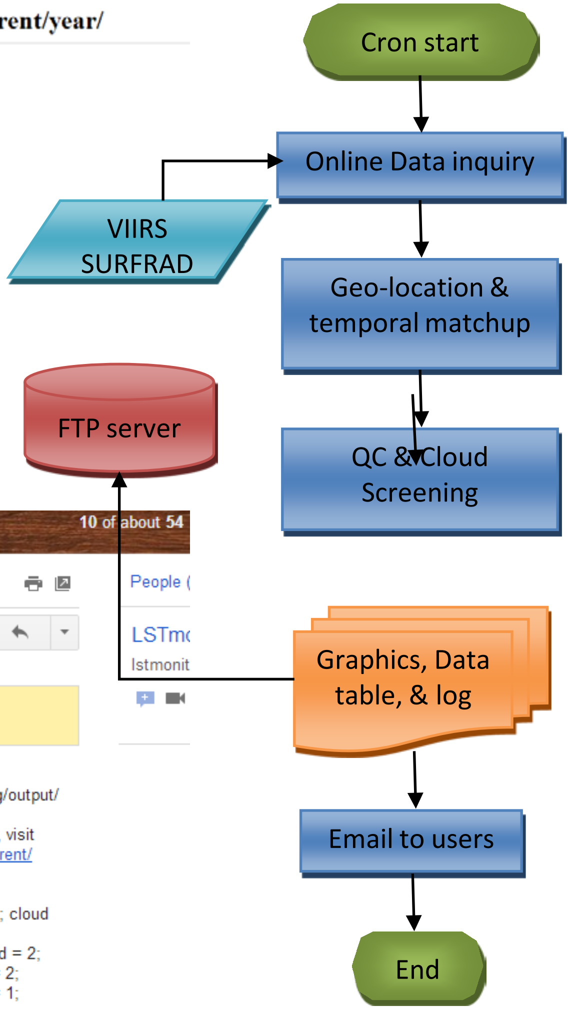
LST monitor results: Apr 24, 2014

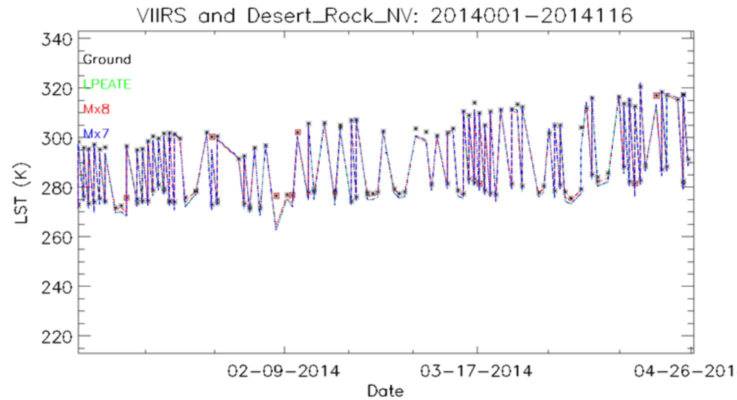
Peng Yu — Apr 23 (8 days ago)
to me, yuling.liu, yunyue.yu, zhuo.wang

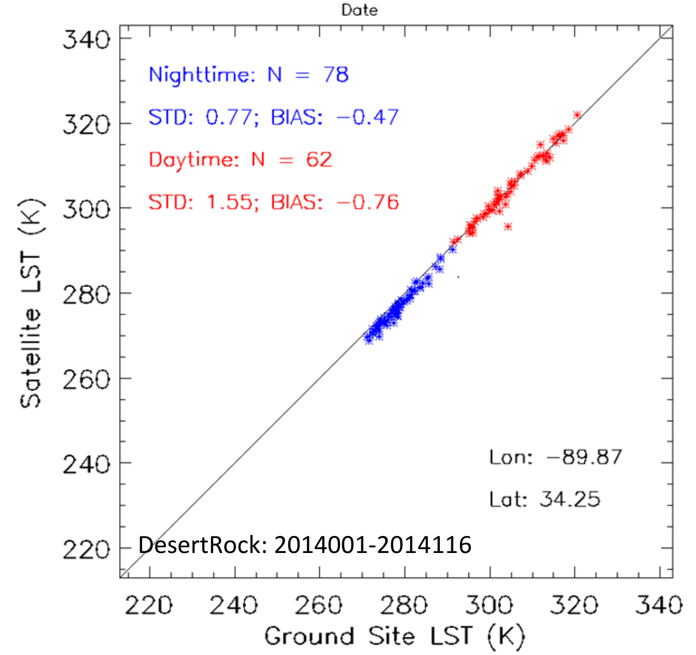
This message may not have been sent by: lstmonitor.awg@gmail.com Learn more Report phishing

The monitoring for VIIRS has been done for this week.
Please visit the directory /net/rhs2001/disk3/pub/pyu/VIIRS_Monitoring/output/routine/2014/20140412/ to review the results.
Alternatively, in case you have difficulty accessing the above directory, visit ftp://ftp.star.nesdis.noaa.gov/pub/smcd/emb/pyu/VIIRS_monitoring/current/

Some problem(s) have been found shown as in the followings:
Goodwin_Creek_MS: date = 2014108; time = 1830; lst_diff = -6.31451; cloud = 2;
Fort_Peck_MT: date = 2014103; time = 0840; lst_diff = -10.5048; cloud = 2;
Bondville_IL: date = 2014105; time = 1925; lst_diff = -7.49588; cloud = 2;
Bondville_IL: date = 2014108; time = 0845; lst_diff = -8.08051; cloud = 1;







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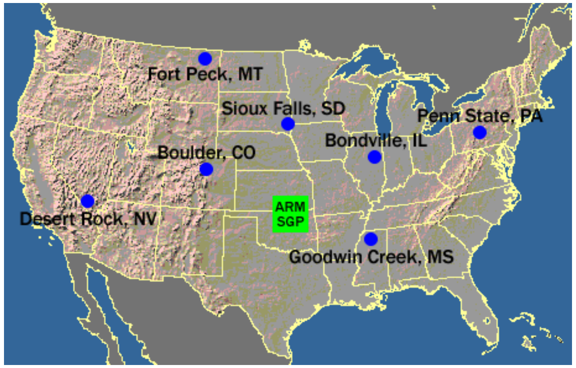
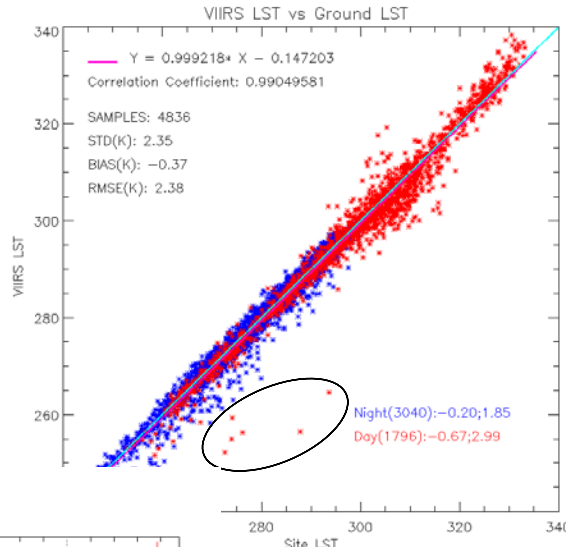
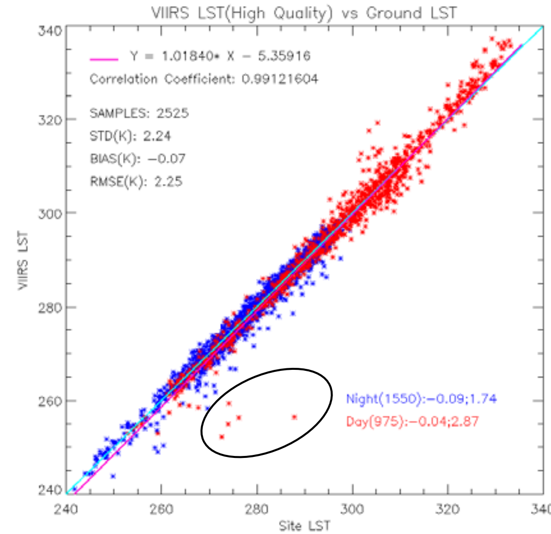
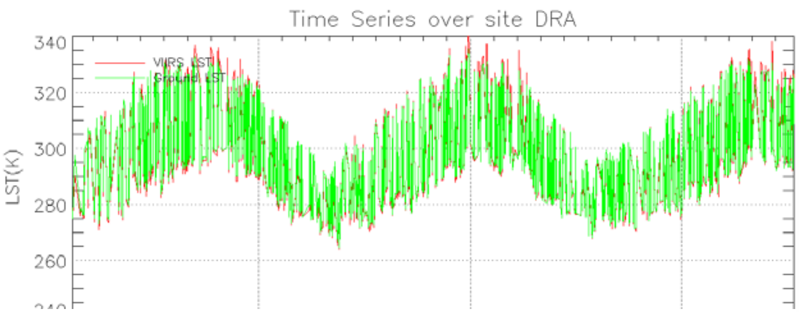
LST Quality Analysis/Validation: SURFRAD

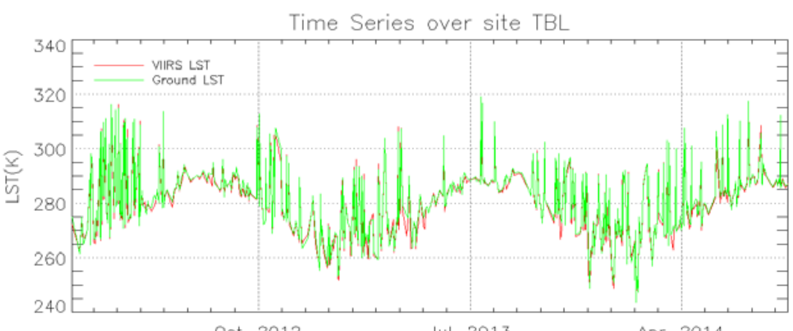








Season	Samples	Overall		Day		Night	
		Bias	STD	Bias	STD	Bias	STD
Spring	1297	-0.54	2.78	-0.69	3.82	-0.46	1.97
Summer	1403	-0.1	2.43	-0.87	3.68	0.26	1.39
Fall	1160	-0.28	1.9	-0.32	2.04	-0.24	1.79
Winter	976	-0.65	2.01	-0.83	1.65	-0.53	2.21



IGBP type	Samples	Overall		Day		Night	
		Bias	STD	Bias	STD	Bias	STD
4	18	-1.41	3.01	-1.82	2.66	-1.26	3.22
6	96	-0.98	1.41	-0.5	1.88	-1.32	0.84
7	955	-0.2	1.59	0.24	2.06	-0.61	0.79
8	286	0.19	2.56	-1.7	2.6	1.38	1.66
10	1048	-0.49	1.81	-0.85	2.3	-0.37	1.59
12	1238	-0.35	2.68	-0.63	3.8	-0.22	1.91
14	857	-0.28	2.54	-1.28	2.4	0.19	2.47
15*	189	-1.72	4.31	-1.72	4.31		
16	149	-0.23	1.55	0.87	1.67	-1.04	0.75

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LST Error Budget

Count from validation methods:

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.

Count from error sources:

Attribute Analyzed	L1RD Threshold	Theoretical Results	Real data results	Description
Overall	1.4K(2.5K)	0.00(0.46)	**-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.
Surface Type		(0.73)	(1.21)	This error is from surface type EDR quality.
Sensor noise		(0.2)	(0.23)	This error is from sensor noise from M-band 15 and M16
Others			(1.98)	Uncertainty from ground data quality control, viewing angle, cloud contamination, Aerosol effect etc.

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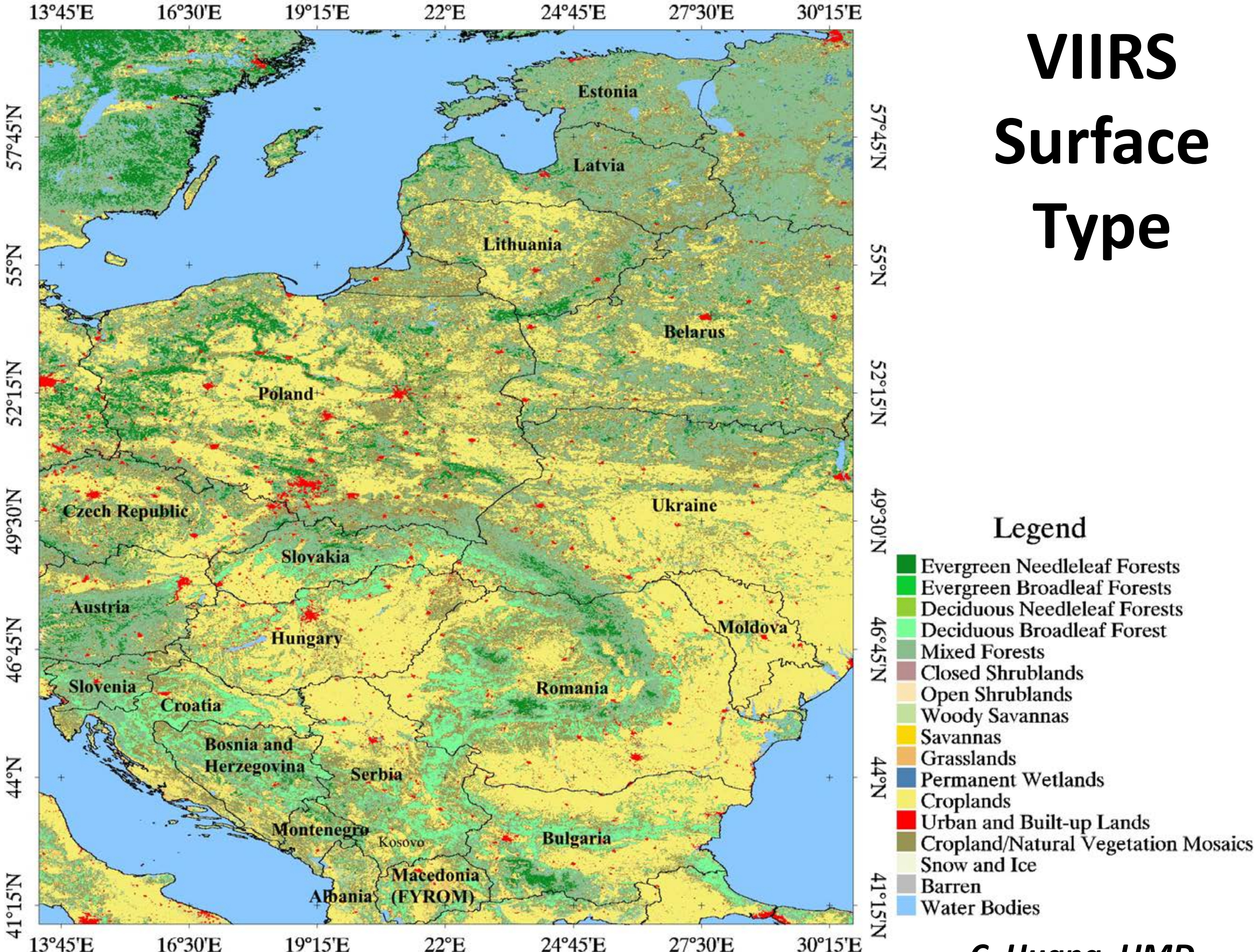
VIIRS Surface Type



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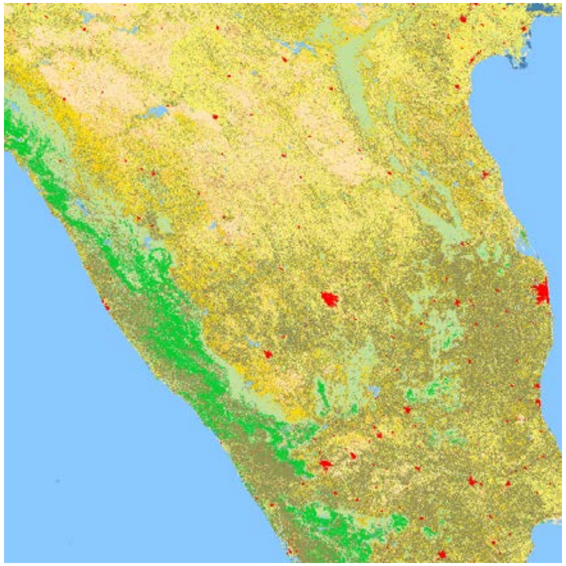
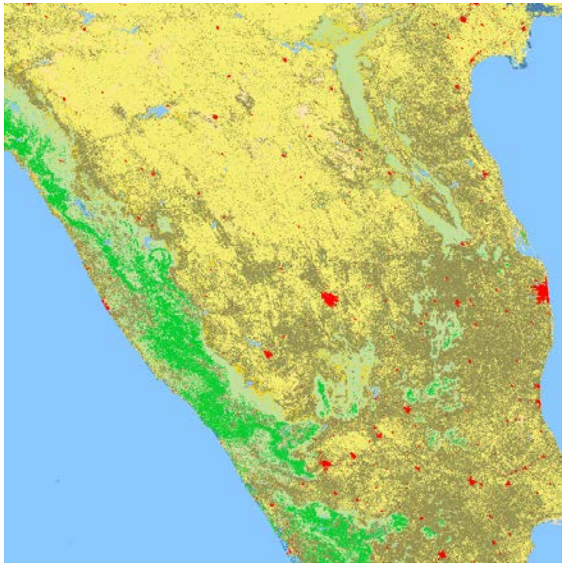
Surface Type algorithm improvements

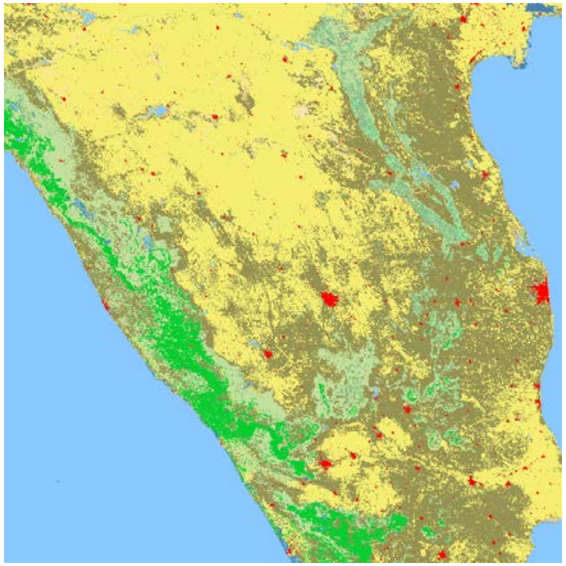
- Post-classification modeling for croplands. An four land cover (GLC2000, GLC, MODIS LC, UMD LC) agreement data set is used as reference to improve croplands class.



Initial QST IP (April'14)



Improved QSTIP (post-classification modeling)



MODIS-based Seed

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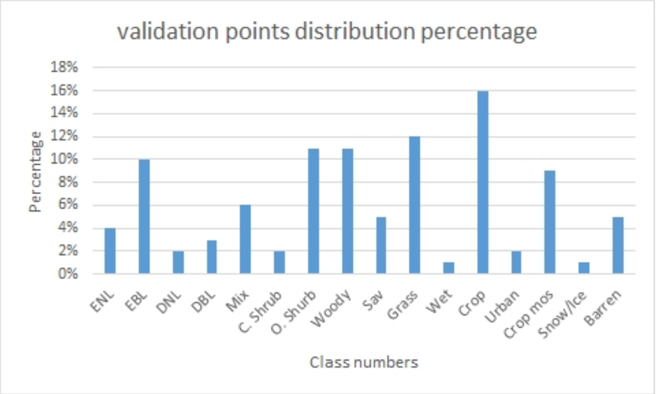
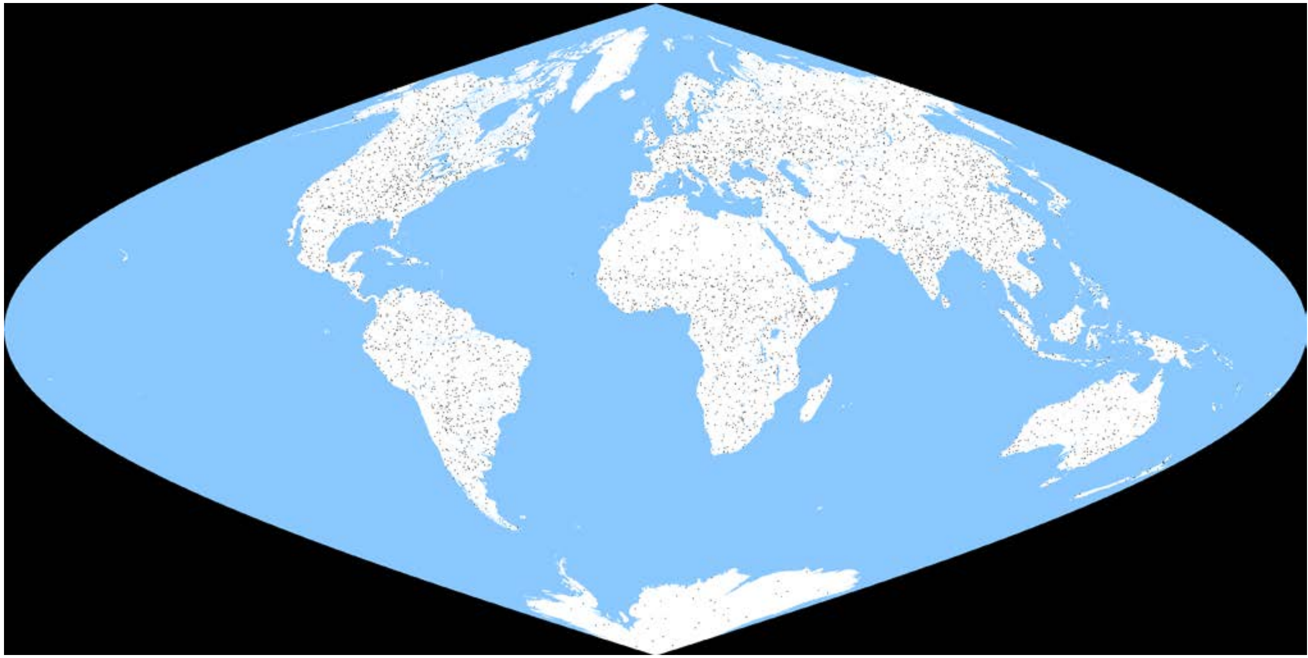
Surface Type validation

- Cal/Val Activities for evaluating algorithm performance: Test / ground truth data sets
  - 5000 validation pixels were selected globally using stratified random sampling strategy (Olofsson et al., 2012 in IJRS), the same method with previous validations conducted by Boston University.





Stratified random sampling:
- important classes
- classes affected by human activities
- rare classes

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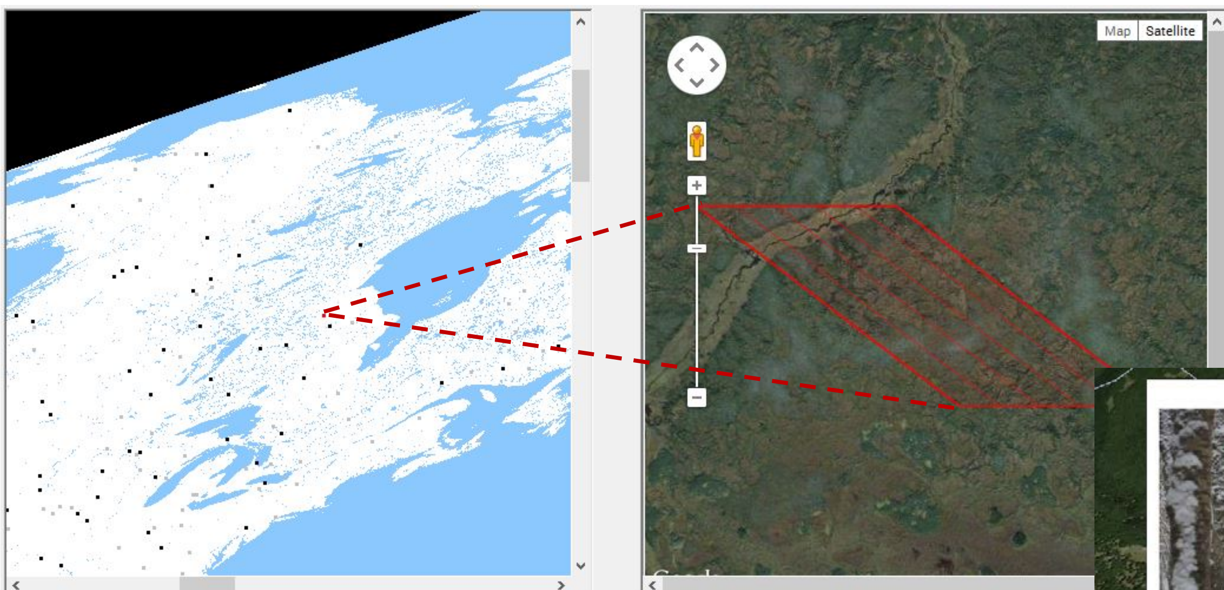
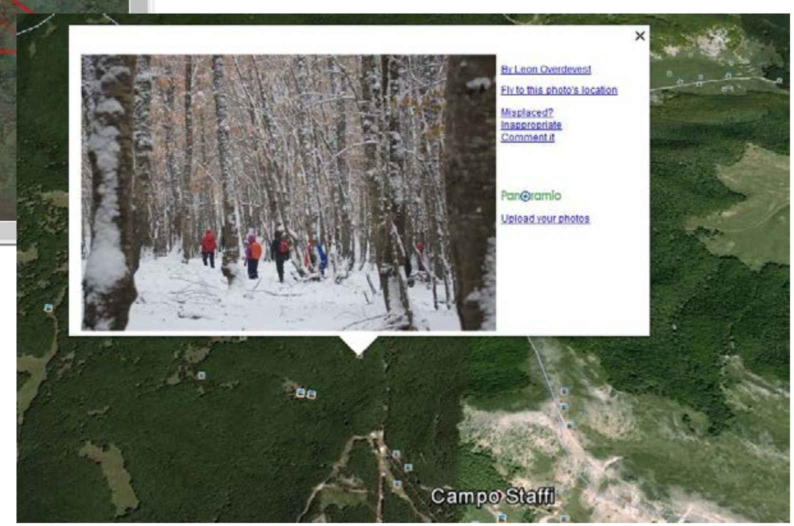
Surface Type validation

- Cal/Val Activities for evaluating algorithm performance: Test / ground truth data sets
  - Integrated validation GUI tool developed.



1. Automatically load in Google map high resolution image for each reference point (1km)

2. Ground photo from Google Earth can be used to improve interpretation confidence.



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Surface Type validation results

- Overall accuracy: 73.92% (required 70%)
- Confusion Matrix (in percent):

	ENL	EBL	DNL	DBL	Mix	C. Shurb	O. Shurb	Woody	Sav	Grass	Wet	Crop	Urban	Crop mos	Snow/Ice	Barren
ENL	85.98	0	3.85	1.43	10.74	0	0.2	3.4	1.12	0.18	2.38	0.13	0	0	0	0
EBL	0	94.09	0	1.9	3.7	0	0	4.29	2.8	0	0	0.13	0	0.73	0	0
DNL	2.44	0	71.15	0	2.59	0.9	0	1.61	0.28	0	0	0	0	0	0	0
DBL	0	0	0.96	55.24	2.59	0	0	2.15	2.52	0.36	0	0	0	0.73	0	0
Mix	4.88	0.61	17.31	22.38	66.3	0	0	6.44	1.68	0.36	0	0.13	1.02	1.95	0	0
C. Shrub	0.61	0	0	1.43	0.37	62.16	1.81	0.36	0.84	0	0	0.13	0	0.97	0	0
O. Shurb	1.22	0	0	0.48	1.48	15.32	80.89	0.89	0.84	9.79	9.52	1.73	1.02	2.19	0	8.42
Woody	3.05	2.24	4.81	9.05	6.3	5.41	1.21	64.04	15.69	1.42	2.38	1.33	2.04	7.3	0	0
Sav	0	0.61	0	0.48	0.74	4.5	1.41	4.83	47.9	1.42	0	0.66	1.02	3.41	0	0
Grass	0.61	0	0	1.9	1.11	9.91	10.06	2.33	5.88	72.06	0	6.12	2.04	3.41	0	5.26
Wet	0.61	0	0	0.48	1.48	0	0.8	0.36	1.12	0.36	80.95	0.13	0	0	0	0
Crop	0.61	0	0.96	1.9	0.74	0.9	1.01	0.89	5.32	9.07	4.76	83.38	8.16	15.57	0	0
Urban	0	0.2	0	0	0	0	0.2	0.36	0.28	0.18	0	1.33	81.63	0.97	0	0.35
Crop mos	0	2.24	0.96	3.33	1.85	0.9	1.81	8.05	13.73	4.27	0	4.65	3.06	62.77	0	0.35
Snow/Ice	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100	0
Barren	0	0	0	0	0	0	0.6	0	0	0.53	0	0.13	0	0	0	85.61

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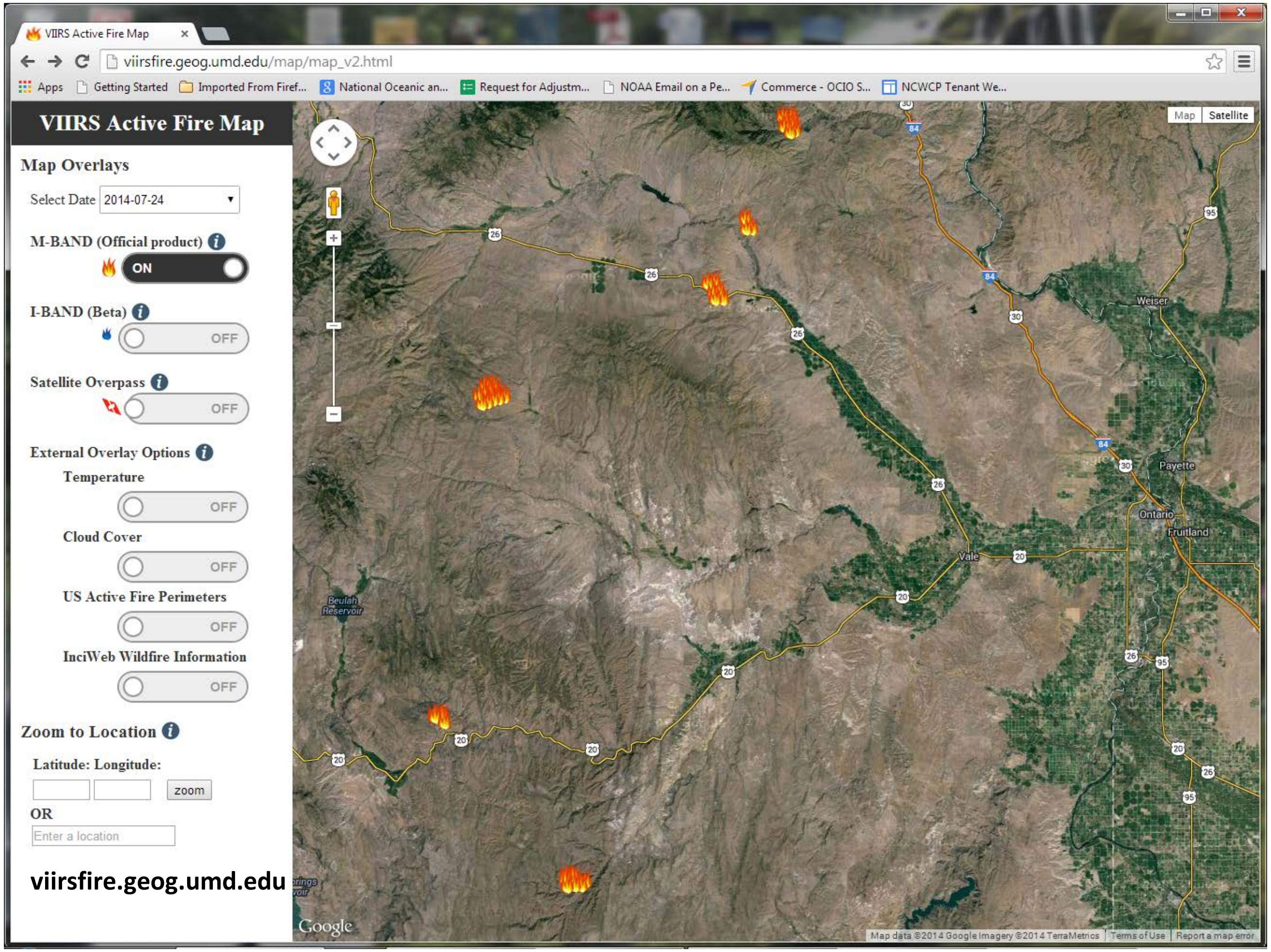
VIIRS Fire Product

- The operational SNPP VIIRS Active Fire product is a sparse array containing **locations of pixels** flagged as "fire" by the detection algorithm
- The science team is developing a suite of improved products, including **fire radiative power to characterize the fire intensity**
- End users are engaged through **Proving Ground and User Readiness efforts**

http://viirsfire.geog.umd.edu/



Fire detections from the operational Suomi NPP VIIRS Active Fire product in NW US on July 24, 2014. Data in various user-friendly formats are available from the product evaluation portal at viirsfire.geog.umd.edu .

NOAA SNPP Land Product Maturity

Product	Science Maturity	Operational product implementation date	NDE Operational status
Surface Reflectance	Validated 1	Spring 2015 (Mx8.8?)	N/A
Vegetation Index	Validated 1	August 13, 2014 (Mx8.5)	N/A
Green Vegetation Fraction	N/A	Early 2015 (NDE)	Approved
Vegetation Health	N/A	TBD (NDE)	In progress
Albedo	Validated 1	November 21, 2014 (Mx8.6)	N/A
LST	Validated 1	August 13, 2014 (Mx8.5)	N/A
Active Fire	Validated 1	August 13, 2014 (Mx8.5)	Operational
Surface Type	Validated 1	November 14, 2014 (off-cycle Mx8.5)	N/A

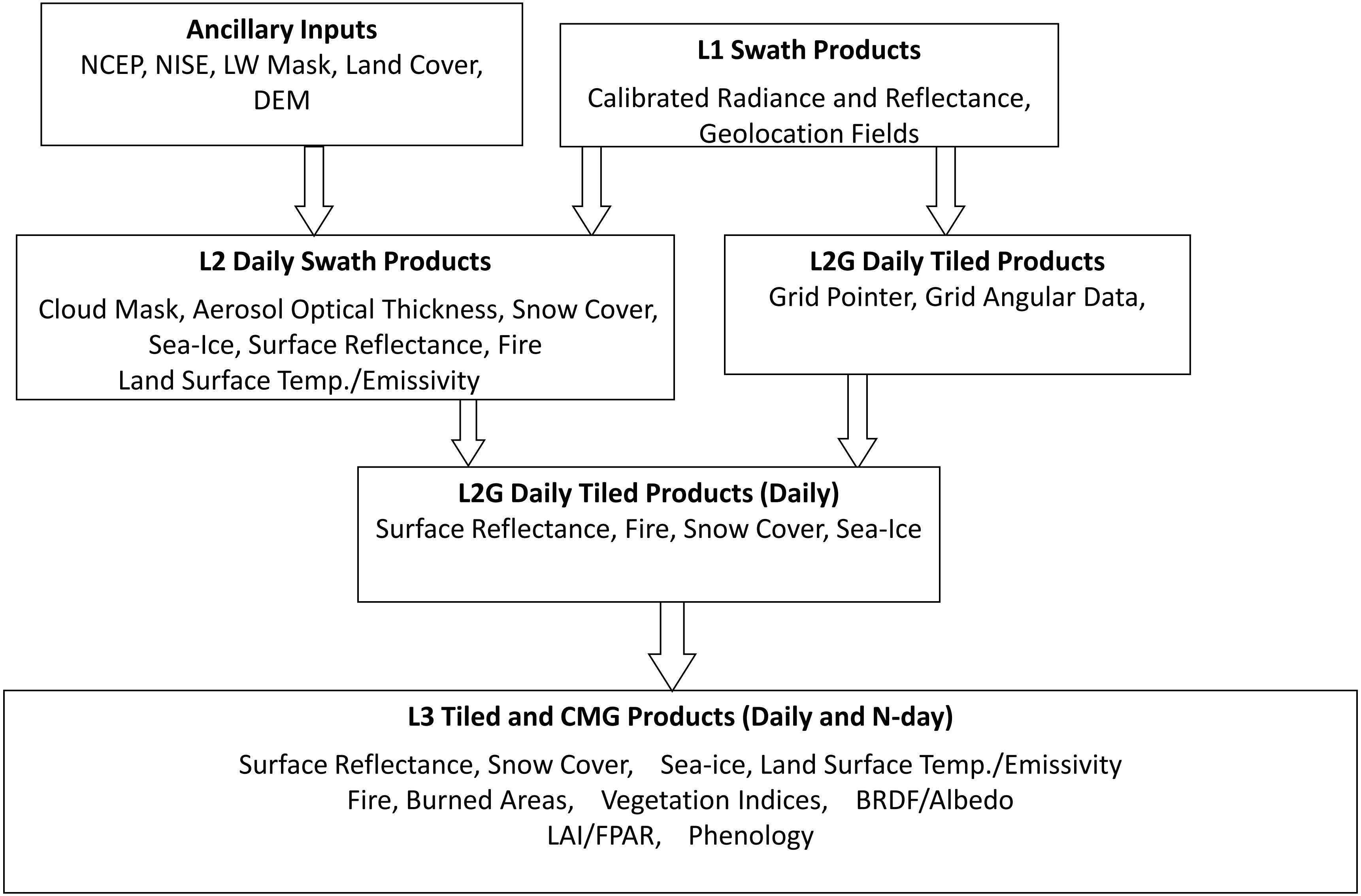
NASA VIIRS Land Science Team

1st Suomi-NPP Land Workshop (Dec 3 - 4, 2014)
NASA Goddard Space Flight Center, Greenbelt, MD

	Heritage MODIS ATBD	Land SIPS Production Status	Current JPSS Algorithm & ATBD	Finalized Production Schedule
Surface Reflectance	✔	✔	✔	1
Active Fires	✔	✔	✔	1
BRDF/Albedo	✔	Prototype***	No	2
LAI/FPAR	✔	Prototype**	No	2
MAIAC	✔	Prototype*	No	2
Snow/Ice Cover	✔	Prototype*	No	2
Burned Area	✔	New	No	2 / 3
Vegetation Index	✔	New	No	2 / 3
Phenology	New	New	No	2 / 3
LST & Emissivity	New	New	No	2 / 3

Our goal: To move quickly and efficiently to get a series of NASA VIIRS products out to the community, providing 'dynamic continuity' with the MODIS land products.

NASA VIIRS Land Data Product Hierarchy



Summary and Conclusions

- S-NPP VIIRS land IDPS and NOAA-Unique NDE development and evaluation is progressing well
- Development of data products not in the suite of operational NOAA products (i.e. IDPS or NDE)
  - NOAA JPSS Proving Ground and Risk Reduction
  - NASA SNPP Science Team
- Teams are continuing the development of improved and additional products
- Development and operational implementation of products to meet new Level 1 requirements
  - Top-of-canopy vegetation index
  - Full active fire mask and fire radiative power
- Work towards improved utilization of the data products in NWP continues
  - Land Proving Ground Initiative

For more information

- NOAA JPSS
  http://www.jpss.noaa.gov/

- NOAA STAR
  http://www.star.nesdis.noaa.gov/jpss/

- NASA VIIRS Land
- http://viirsland.gsfc.nasa.gov/

- STAR JPSS 2014 Annual Science Team Meeting
  http://www.star.nesdis.noaa.gov/star/meeting_2014JPSSAnnual_agenda.php

- JGR-Atmospheres Special Issue Papers