



# Land Monitoring using S-NPP VIIRS

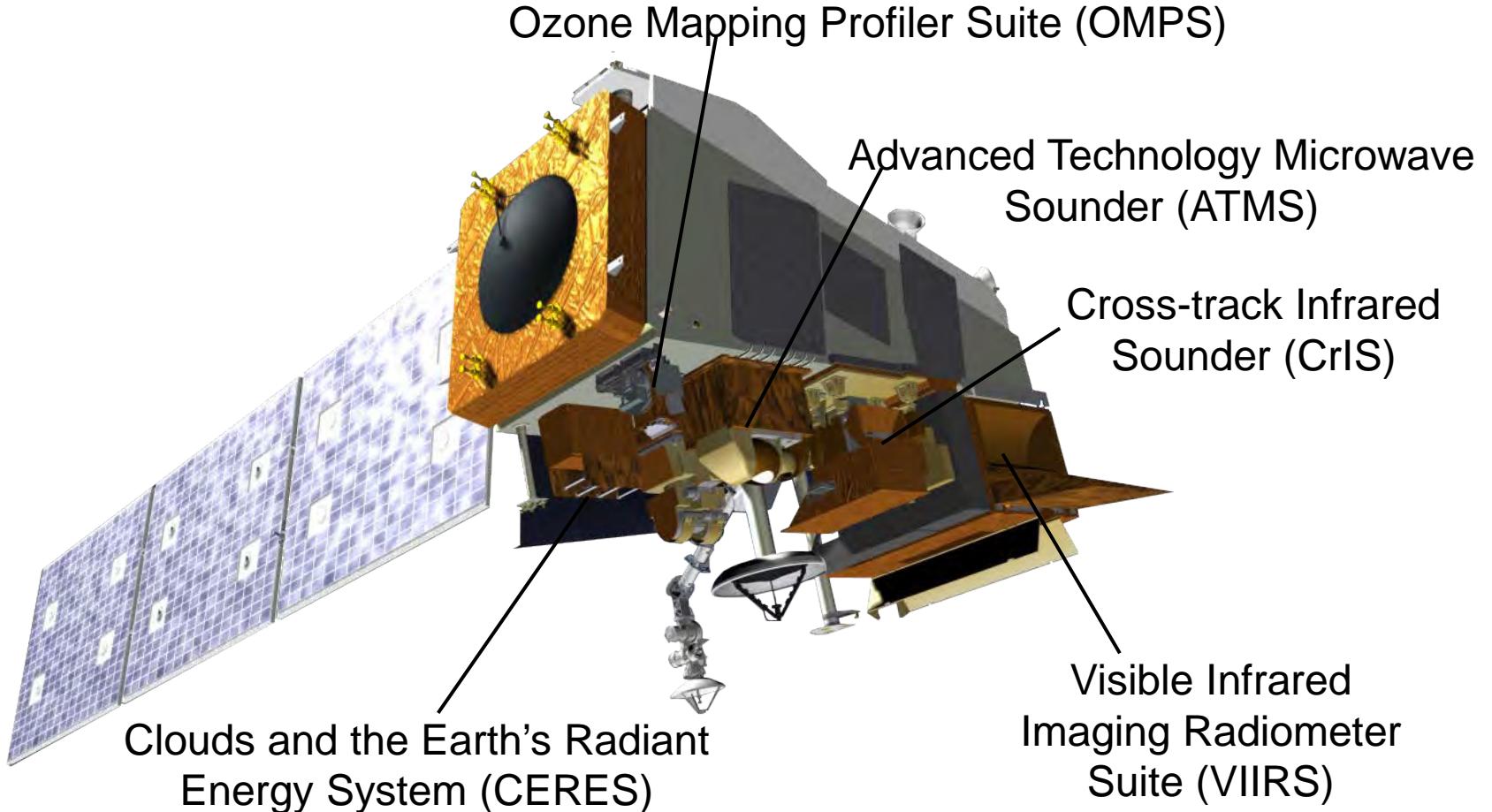


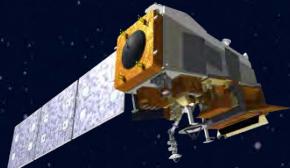
Chris Justice (UMd),  
Ivan Csiszar (NOAA), Miguel O. Román (NASA),  
and the VIIRS Land Discipline Team





# JPSS Spacecraft





# The JPSS Enterprise



## JPSS consists of:

- Suomi NPP\* satellite, JPSS-1 satellite, and JPSS-2 satellite
- Four primary instruments
- Global ground system (Alaska, Colorado, Maryland, West Virginia, Norway, Antarctica)

## NOAA Responsibilities:

- End-to-end responsibility, requirements, funding, delivering to National Weather Service
- Operations, data product science, enterprise ground services

## NASA Goddard Space Flight Center Responsibilities:

- Systems Engineering lead
- Procurement and acquisition
- Safety and Mission Assurance

### JPSS Schedule

Launch Dates*	No later than 2nd Quarter FY 2017 (JPSS-1); 1 <sup>st</sup> Quarter FY 2022 (JPSS-2)
Program Architecture	3 Satellites (Suomi NPP, JPSS-1, JPSS-2) Suomi NPP: 5-year operational design life; JPSS-1: 7-year operational design life
Program Operational Life	FY 2012 - FY 2025
Program Life-cycle (FY 2014 President's Budget)	\$11.349 billion

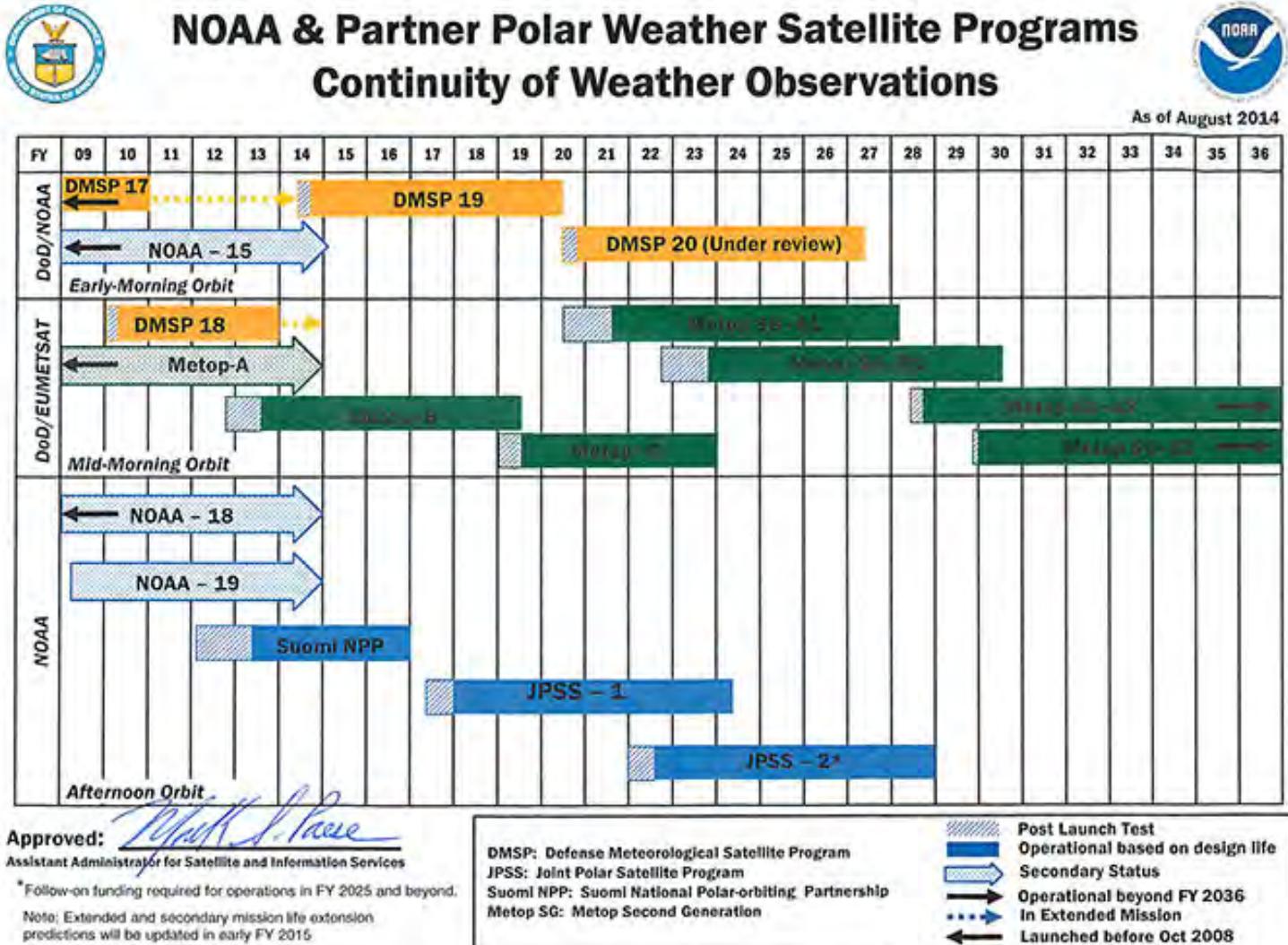
\*Suomi-NPP is a joint NASA / NOAA mission

\*Launch Date based on FY 2014 President's Budget Request



# Polar orbiter flyout chart

[http://www.nesdis.noaa.gov/flyout\\_schedules.html](http://www.nesdis.noaa.gov/flyout_schedules.html)





# VIIRS and heritage imagers

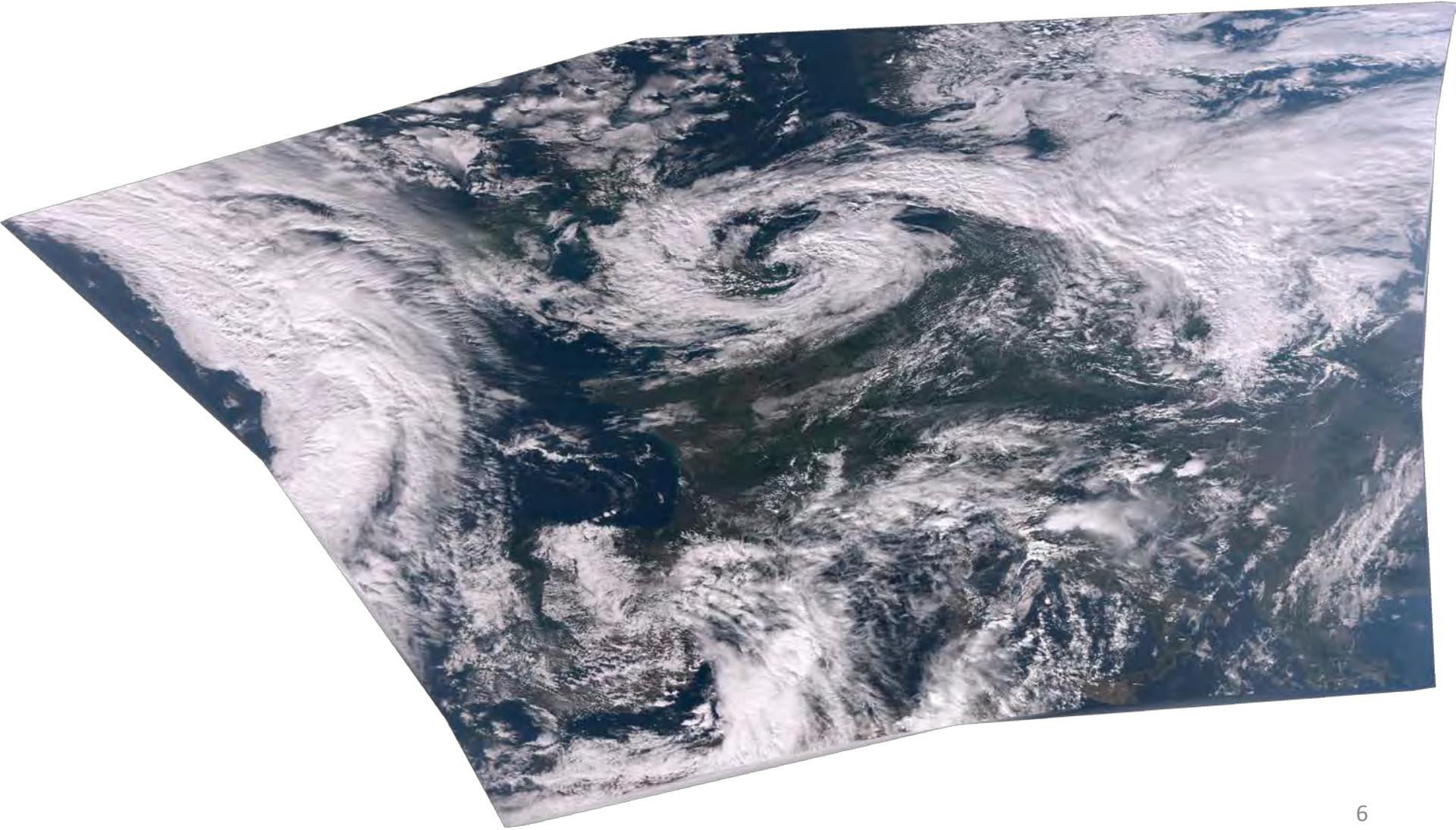
VIIRS			MODIS Equivalent			AVHRR-3 Equivalent			OLS Equivalent		
Band	Range (um)	HSR (m)	Band	Range	HSR	Band	Range	HSR	Band	Range	HSR
DNB	0.500 - 0.900	750	NONE			Low light capabilities			HRD	0.500 - 0.900	550 2700
M1	0.402 - 0.422	750	8	0.405 - 0.420	1000	NONE			Ocean Color, Aerosol		
M2	0.436 - 0.454	750	9	0.438 - 0.448	1000	NONE			Imagery		
M3	0.478 - 0.498	750	3	0.459 - 0.479	500	NONE			Ocean Color, Aerosol		
M4	0.545 - 0.565	750	4	0.545 - 0.565	500	NONE			Atm Correction		
I1	0.600 - 0.680	375	1	0.620 - 0.670	250	0.572 - 0.703			NDVI		
M5	0.662 - 0.682	750	13	0.662 - 0.672	1000	0.572 - 0.703			Cloud Particle Size		
M6	0.739 - 0.754	750	15	0.743 - 0.754	1000	NONE			Thin Cirrus		
I2	0.846 - 0.885	375	2	0.846 - 0.885	1000	2			Snow Map		
M7	0.846 - 0.885	750	16	0.846 - 0.885	1000	2			Snow Fraction		
M8	1.230 - 1.250	750	NONE			NONE			Cloud		
M9	1.371 - 1.386	750	1.360 - 1.390			NONE			Imagery, Clouds		
I3	1.580 - 1.640	375	1.628 - 1.652			3a			SST, Fire		
M10	1.580 - 1.640	750	6	1.628 - 1.652	500	SAME			SST, Fire		
M11	2.000 - 2.300	750	7	2.105 - 2.155	500	NONE			Cloud Top Properties		
I4	2.000 - 2.300	375	20	3.660 - 3.840	1000	3b			SST, Fire		
	2.300 - 2.840	750	20	SAME	1000	3b			Cloud Imagery		
	3.973 - 4.128	750	21	3.929 - 3.989	1000	3.550 - 3.930			10.300 - 12.900		
	3.973 - 4.128	750	22	3.929 - 3.989	1000	NONE			550		
	3.973 - 4.128	750	23	4.020 - 4.080	1000	5			SST		
M14	8.400 - 8.700	750	29	SAME	1000	1100			Cloud Imagery		
M15	10.263 - 11.263	750	31	10.780 - 11.280	1000	4			10.300 - 12.900		
I5	10.500 - 12.400	375	31	10.780 - 11.280	1000	4			Cloud Imagery		
	10.500 - 12.400	375	32	11.770 - 12.270	1000	5			SST		
M16	11.538 - 12.488	750	32	11.770 - 12.270	1000	5			HRD		

VIIRS: Greater spectral coverage with increased radiometric quality



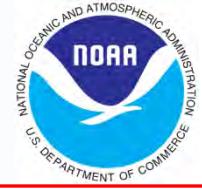
# SNPP VIIRS M3-M4-M5 RGB

October 14, 2014 12:33 - 12:38 UTC (5 VIIRS granules)

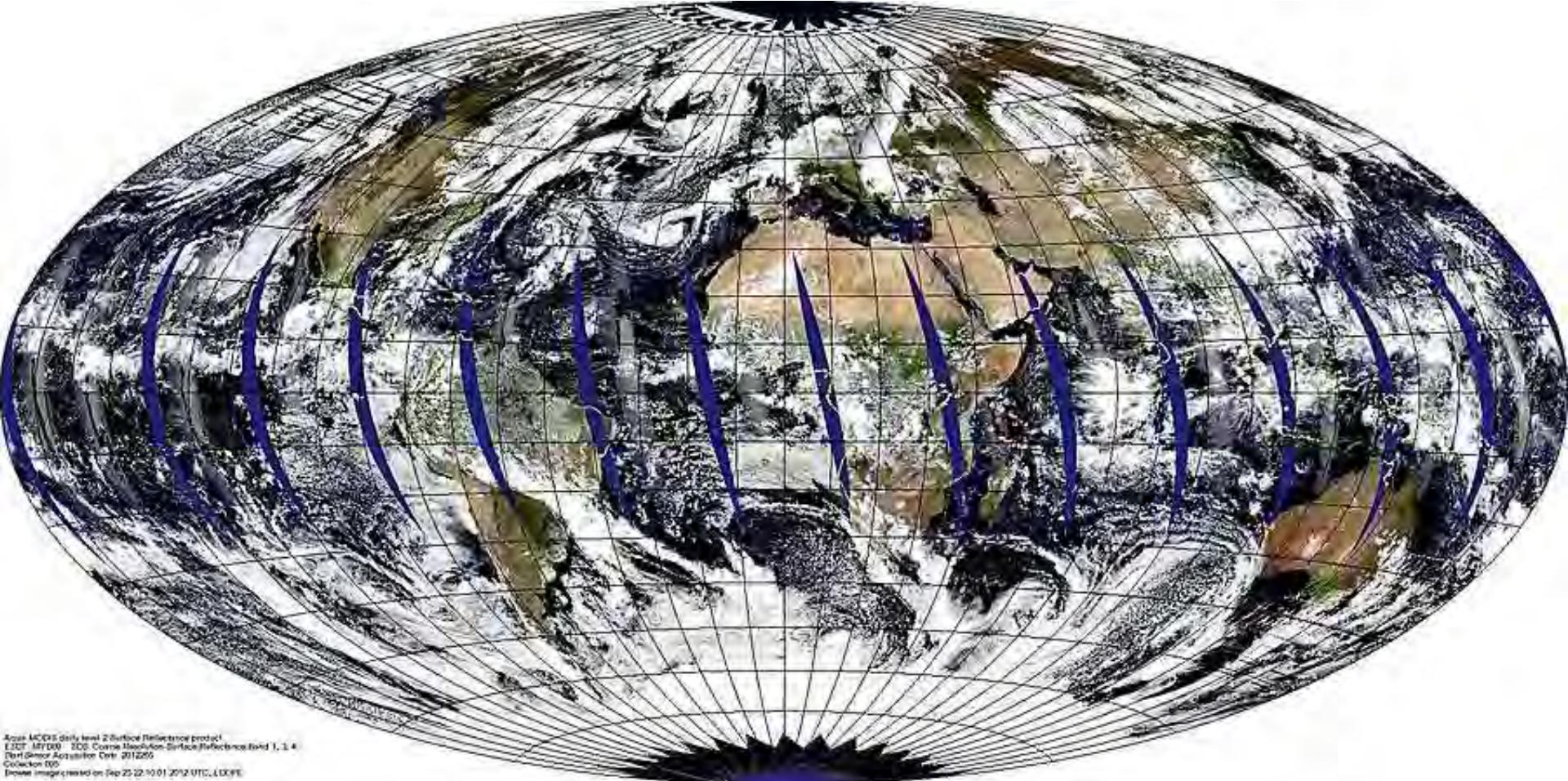




# Aqua MODIS Global Browse



[landweb.nascom.nasa.gov](http://landweb.nascom.nasa.gov)



Aqua MODIS daily level 2 Surface Reflectance product  
E20T MYD09\_2005\_Correct Resolution Surface Reflectance band 1, 2, 4  
Data Sensor Acquisition Date: 201205  
Collection 005  
Downloaded on Sep 25 22:10:01 2012 UTC, LDCFE

**Daily Land Surface Reflectance Bands 1,4,3 (MYD09)**

September 21, 2012

**NASA LandPEATE**



# Suomi NPP VIIRS Global Browse



[landweb.nascom.nasa.gov](http://landweb.nascom.nasa.gov)



***NPP\_VMAE\_L1 L1B Moderate input, Day Band 5,4,3***

September 21, 2012

***NASA LandPEATE***

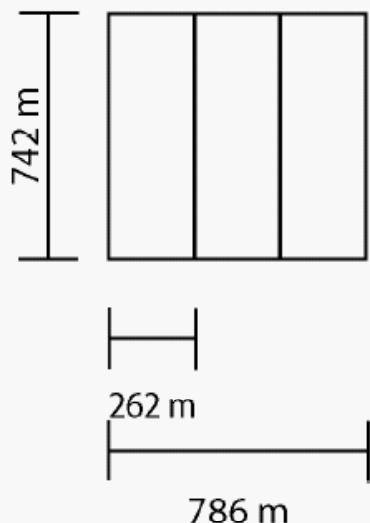


# VIIRS Detector Aggregation Scheme

## Nadir

Aggregate 3 Samples

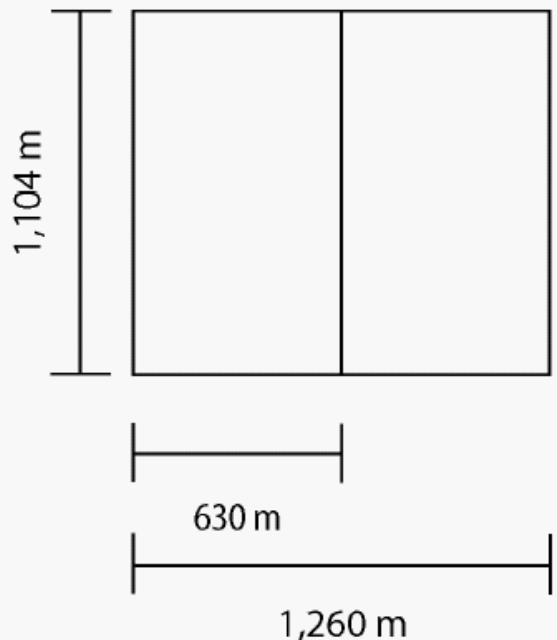
SNR  $\sim \sqrt{3} \times$  Baseline



## $\pm 850$ Km

Aggregate 2 Samples

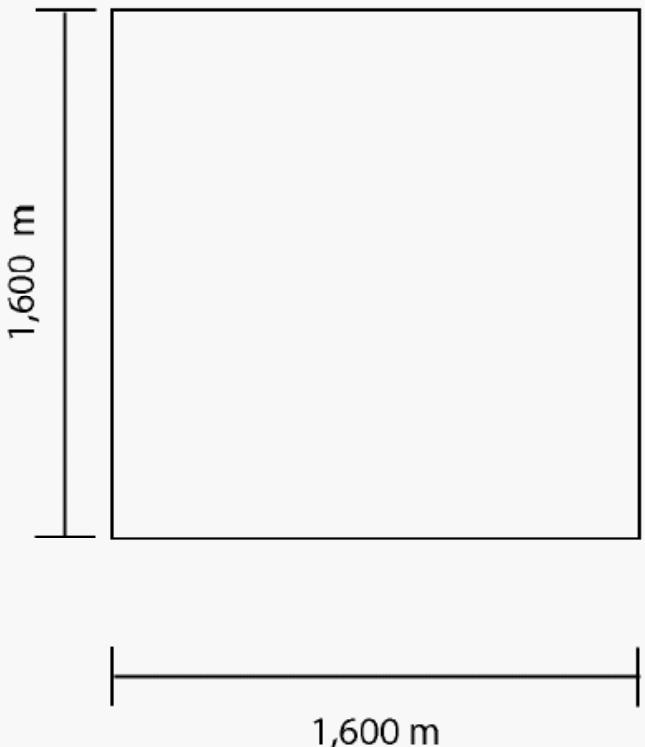
SNR  $\sim \sqrt{2} \times$  Baseline



## $\pm 1,500$ Km

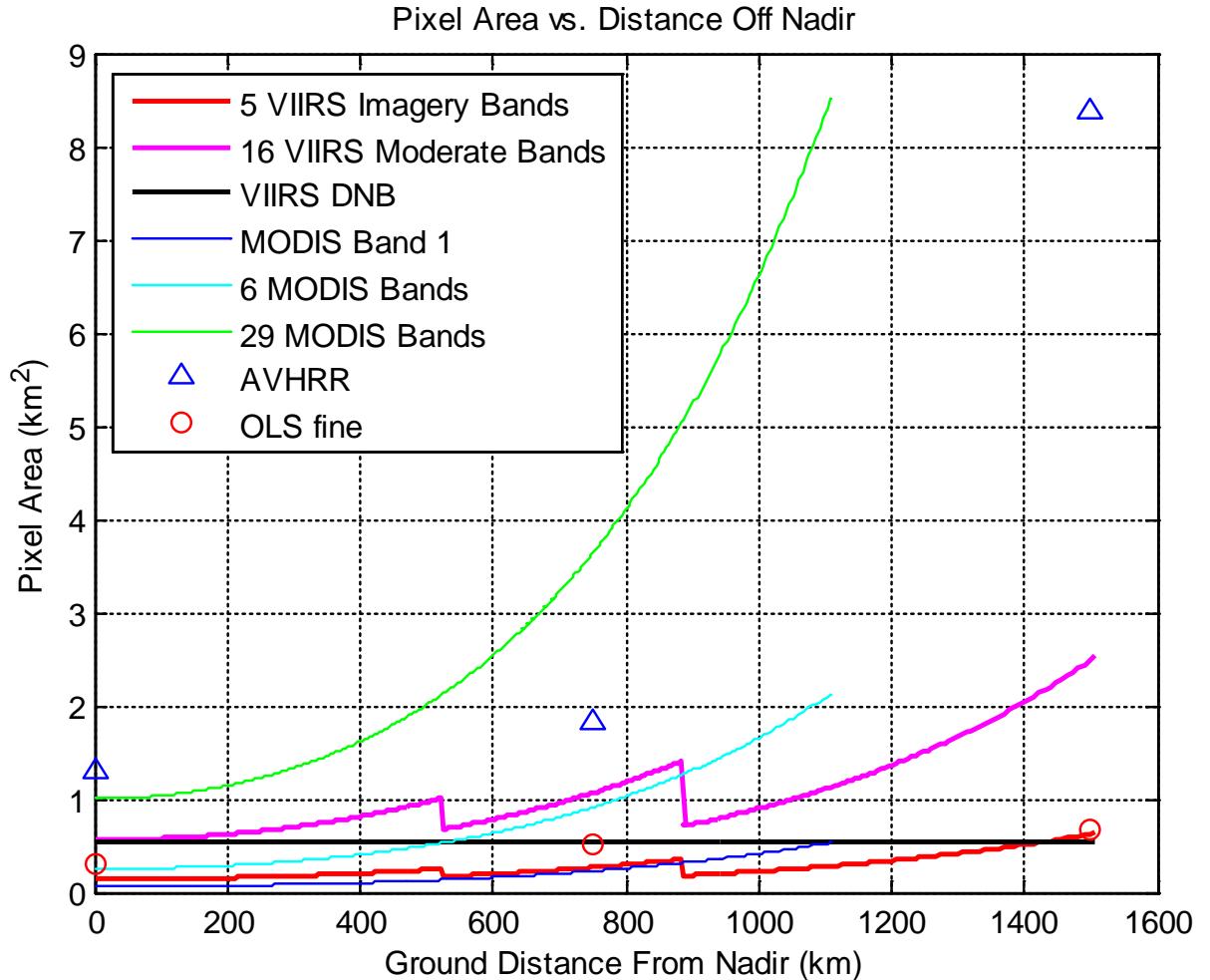
No Aggregation

SNR = Baseline





# Near-constant pixel size

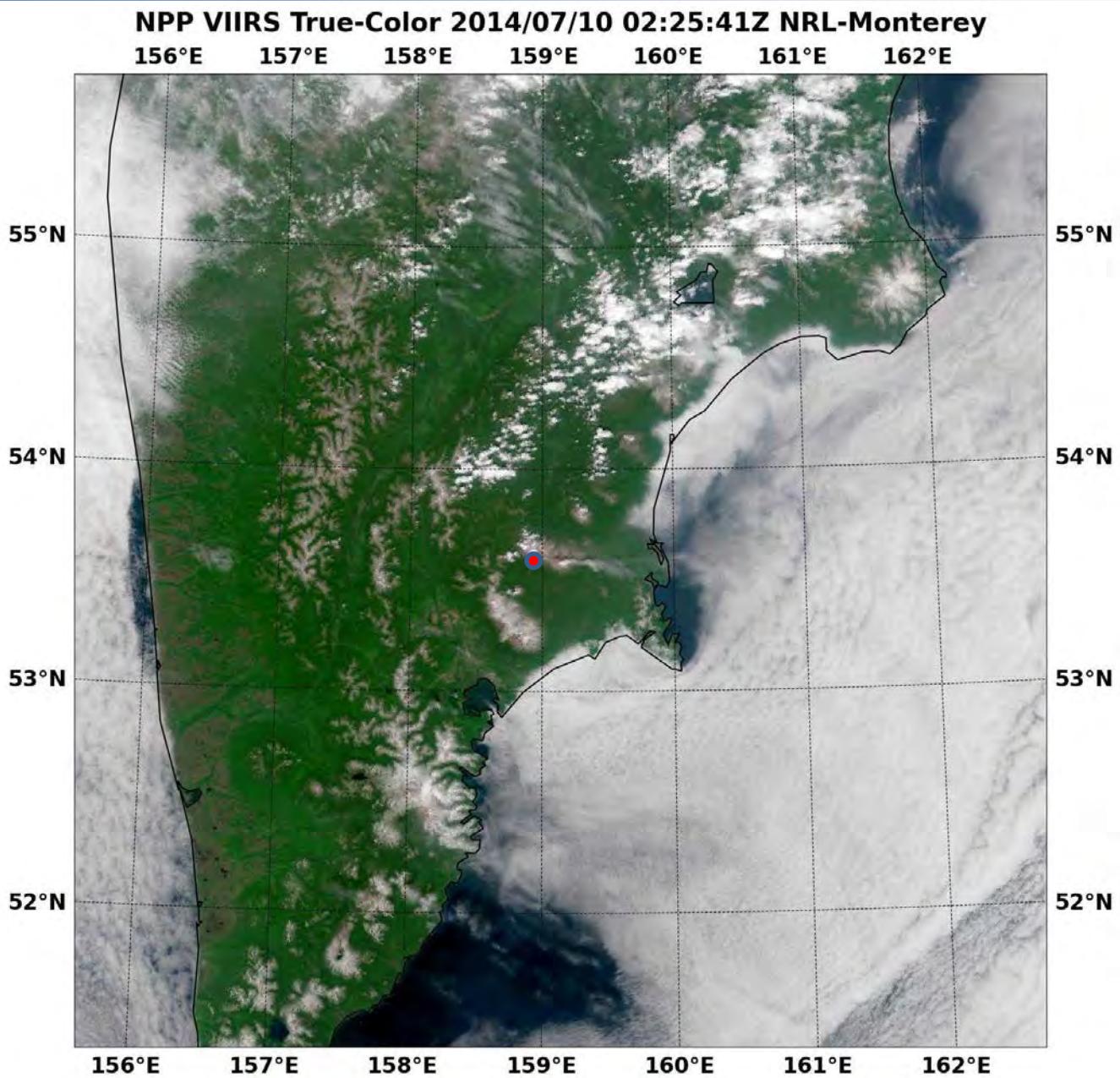
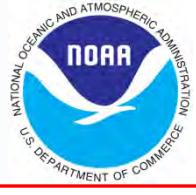


*Spatial Resolution Comparisons for VIIRS, AVHRR, MODIS and OLS at Nadir and Across Swath*

**Because of aggregation VIIRS has much better resolution away from nadir, pixel area 8 times smaller than AVHRR or MODIS**



# Comparing MODIS (250m) to VIIRS (375m)

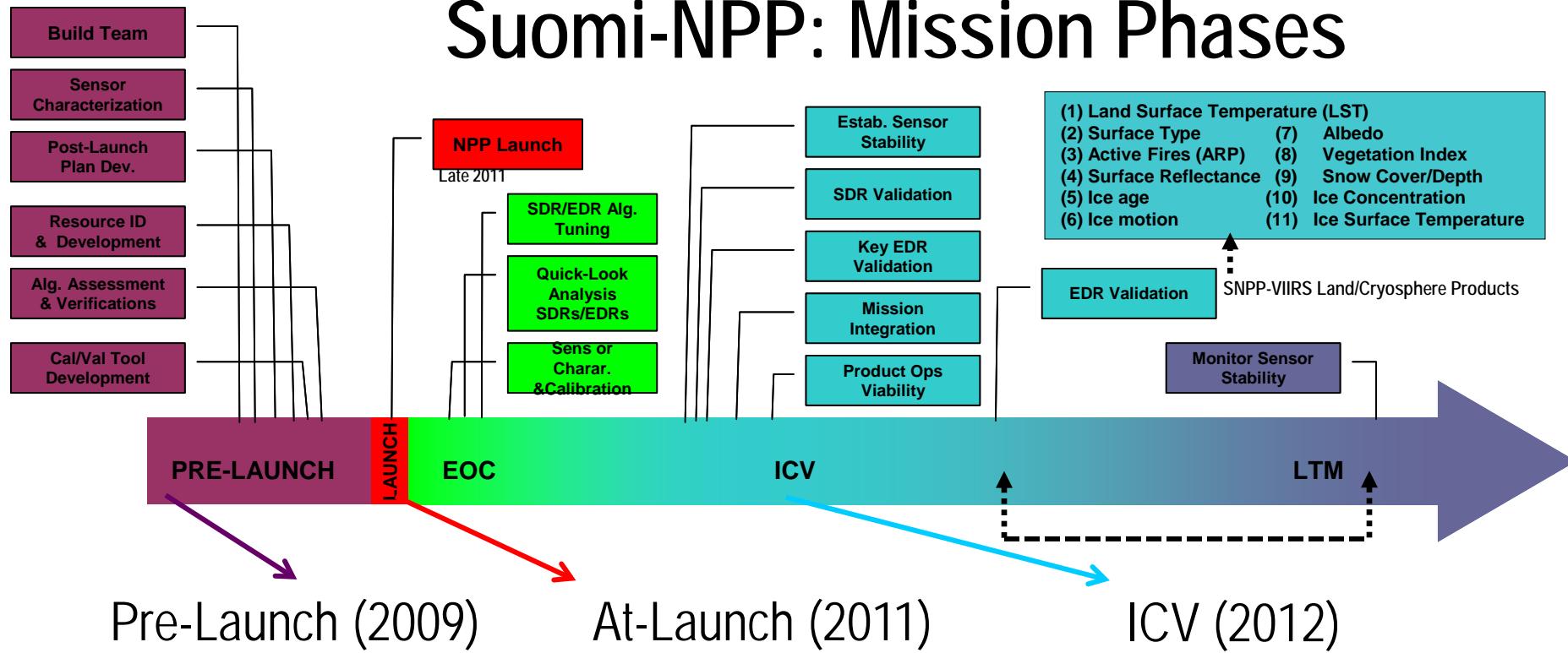




# VIIRS vs. MODIS for land monitoring

- **What can VIIRS do better than MODIS?**
  - Better coverage and scanning geometry, including higher resolution of "M" bands
    - Improved fire detections (25% higher VIIRS fire counts than MODIS in the three-pixel VIIRS aggregation zone)
    - No gaps at low latitudes, more consistent data for temporal compositing
- **What can VIIRS do that MODIS cannot?**
  - VIIRS Day/Night Band: VIIRS can directly assess a variety of phenomenon associated with human settlements (e.g., population, socio-economic activity, the built environment, and urbanization).
- **What can MODIS do better than VIIRS?**
  - MODIS can 'see' the Amazon better: TERRA-MODIS was designed to cross the equator at a time when cloud cover is at its daily minimum (10:30AM, descending).
- **What can VIIRS do that is currently missing?**
  - VIIRS can/should be used to measure the Earth's Biosphere: (i.e., not just daily VI and Surface Type, but also LAI/FPAR, NPP/GPP, Burned Area, Phenology, etc.)
  - Multiple threads of VIIRS product development and generation: IDPS, NOAA JPSS (NDE), Proving Ground, NASA Science Team and Applied Science etc.

# Suomi-NPP: Mission Phases





# The Land PEATE: meeting the needs of the NASA Science Team and collaborating with NOAA IDPS

VIIRS LDOPE QA: [http://landweb.nascom.nasa.gov/NPP\\_QA/](http://landweb.nascom.nasa.gov/NPP_QA/)

National Aeronautics and Space Administration  
Goddard Space Flight Center

NPP- Land Product Evaluation and Testing Element  
**Land Product**

**VIIRS**  
Visible/Infrared Imager/Radiometer

Home Browse Time Series

Welcome to the NPP VIIRS Land Product QA

The objective of the VIIRS (Visible Infrared Imaging Spectro Radiometer) document the science quality of products made from the remote assessment of samples of VIIRS Land products made at IDPS evaluation of improvements to the VIIRS Land Science algorithm (Product Evaluation and Testing Element) using the new algorithm (National Polar Orbiting Earth Satellite System Preparatory Project products from the IDPS OPS algorithms, and the Land PEATE at PEATE and of the science algorithm improvements are done at IDPS evaluation of the pre-launch and at launch version MODIS data are posted on the Algorithm Updates/Evaluation section evolving. For global browse images from immediate post-launch page. Please direct your questions and comments to [Sashaiva](#).

All the browses available for IDPS (AS3000), day 2012325:

VMAE\_L1C-D VIAE\_L1C-D CMIP\_L2C-D CMIP\_L2C-N VAMIP\_L2C VAOTIP\_L2C VCOPIP\_L2C-COT  
SRPLMIP\_L2C SRFLIIP\_L2C VRVI\_L2C-EVI VRVI\_L2C-NDVI VLST\_L2C-D VLST\_L2C-N VSCD\_L2C  
VICIP\_L2C VSIC\_L2C

## VIIRS Global Browse

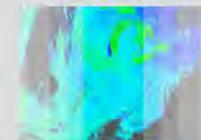
## Known Issues Page

### Detailed Description

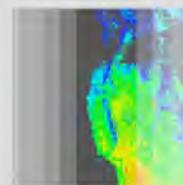
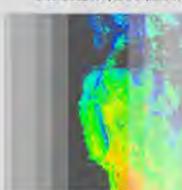
[Color Key](#) [Case pending](#) [Case closed](#) [Case reopened](#) [On note](#)

Case #:PM\_NPP\_VLST\_12122 Opening date: 05/01/12 Last update: 08/15/12  
Status: Closed

The VIIRS NPP\_VLST\_L2 Land Surface Temperature product reports incorrect high temperatures over inland water bodies. This issue is observed in both the IDPS and Land PEATE archive. The images below show two examples in IDPS and LPEATE where inland water bodies report incorrect high temperatures. The first and second images below show a LST granule over North America, where the Great Lakes report a high temperature of 310K (98F) on DOY 2012.097. The third and fourth images show the Western coast of North America, and the inland water bodies such as the Salton Sea in Southern California, which is smaller and shallower than the Great lakes. The Salton Sea reports a temperature of 340K (152F).



Filename: NPP\_VLST\_L2.A2012097.1835.AGG.03000.2012100032020.hdf  
NPP\_VLST\_L2(Land Surface Temperature-Daytime)  
DOY 2012097, IDPS (AS3000)



NPP\_VLST\_L2.A2012111.2055.AGG.03000.2012112108045.hdf  
NPP\_VLST\_L2(Land Surface Temperature-Daytime)  
DOY 2012111, IDPS (AS3000)

NPP\_VLST\_L2.A2012111.2055.P1.03001.2012114104917.hdf  
NPP\_VLST\_L2(Land Surface Temperature-Daytime)  
DOY 2012111, LPEATE (AS3000)

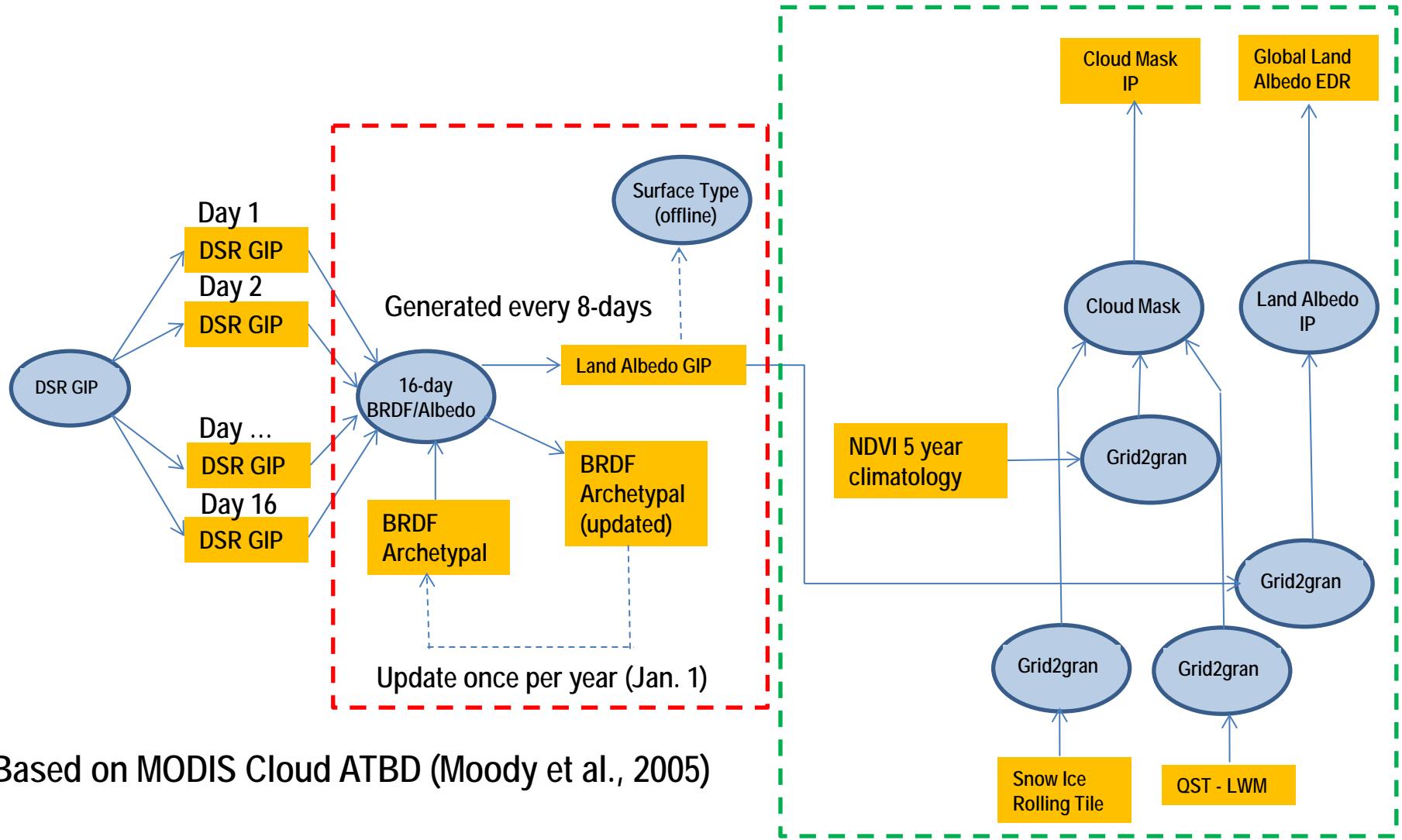


Note: This issue has been fixed in Mst6.2 put into operation at IDPS starting data day 2012223 (8/10/2012)

## VIIRS Level 3 Products



# NASA (V1.1) Land Gridding/Granulation

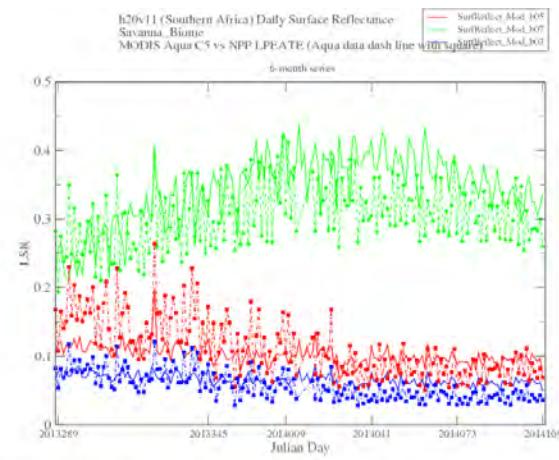
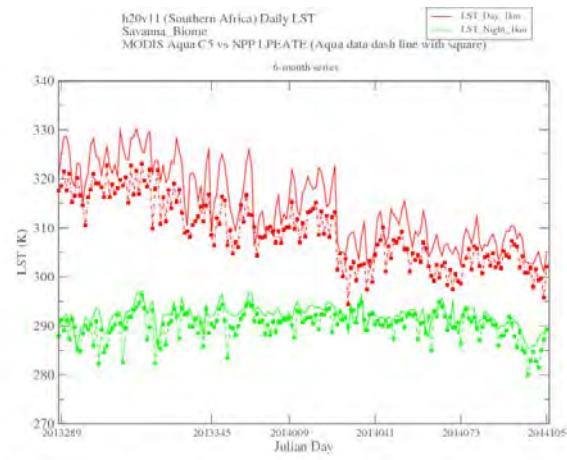
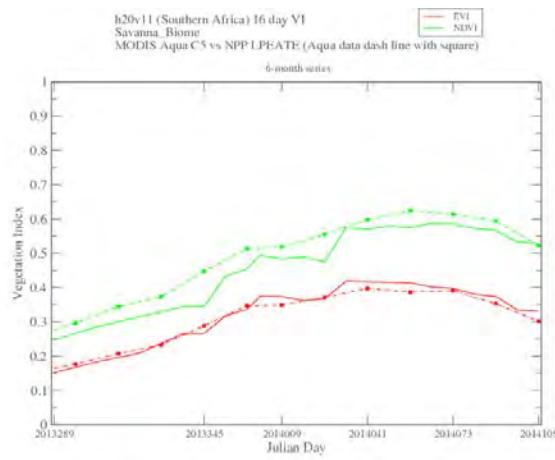
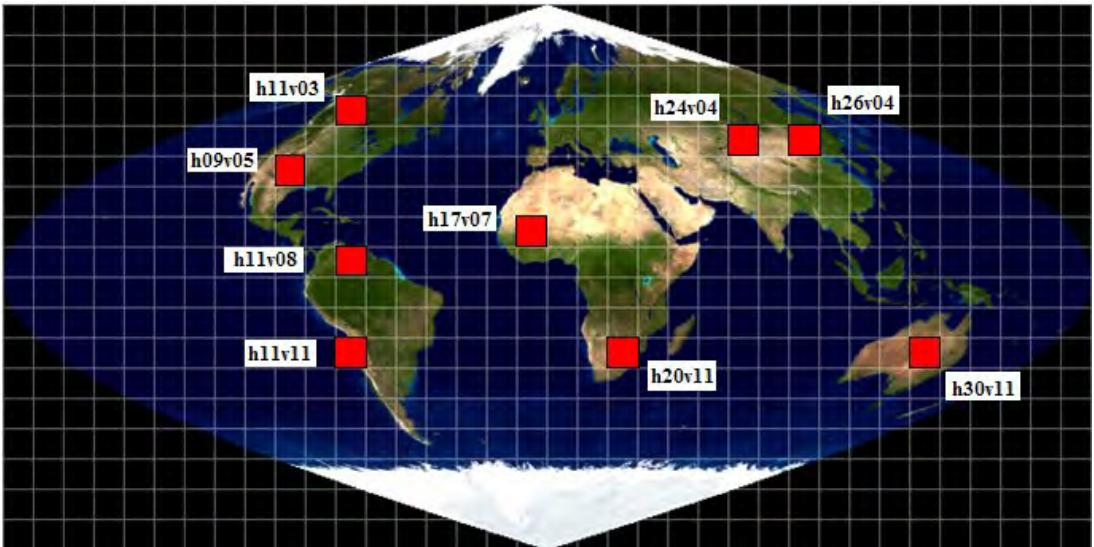




# Land Product Quality Assessment Golden Tile Time Series



**Approach:** Summary statistics derived at a number of fixed globally distributed locations ( $10^\circ \times 10^\circ$  tiles) include mean, standard deviation, min, max, and number of good quality observations.



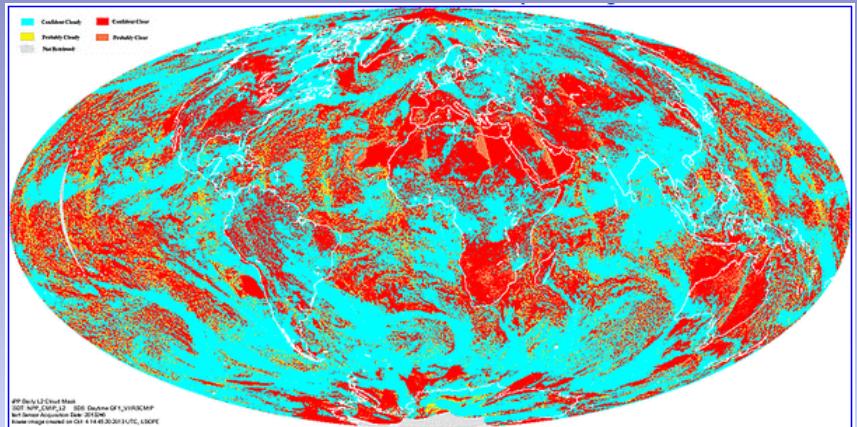
VIIRS (V1.1) vs. MODIS (V5) Vegetation Index (left), LST (center), and Surface Reflectance (right). 6-month trending shown for observations from savanna class (tile h20v11).



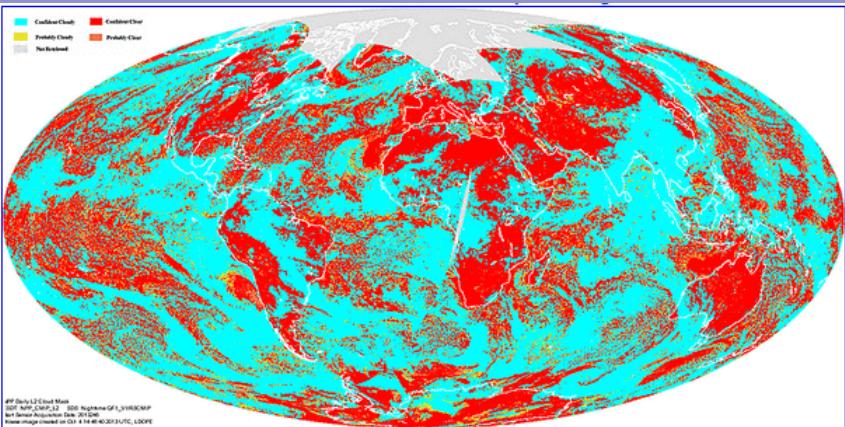
# VIIRS Cloud Mask: C11 vs. IDPS

IDPS

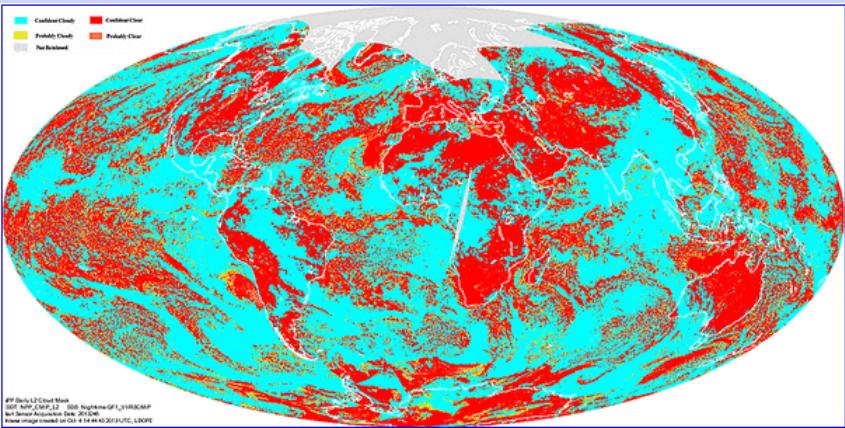
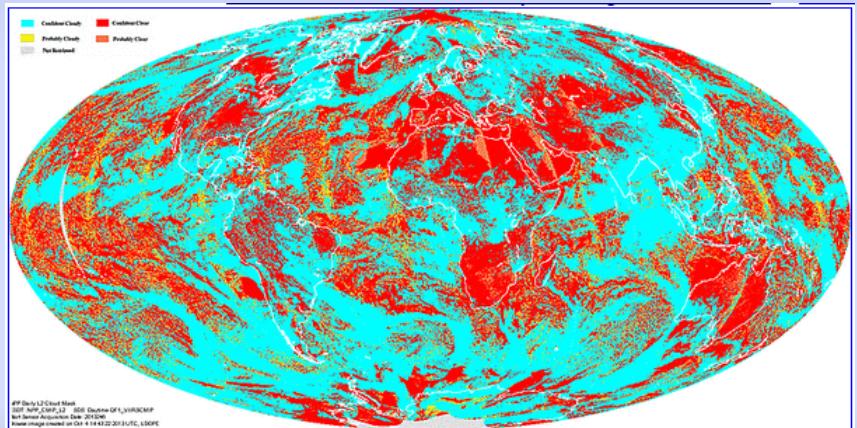
Day time



Night time



LPEATE- C11



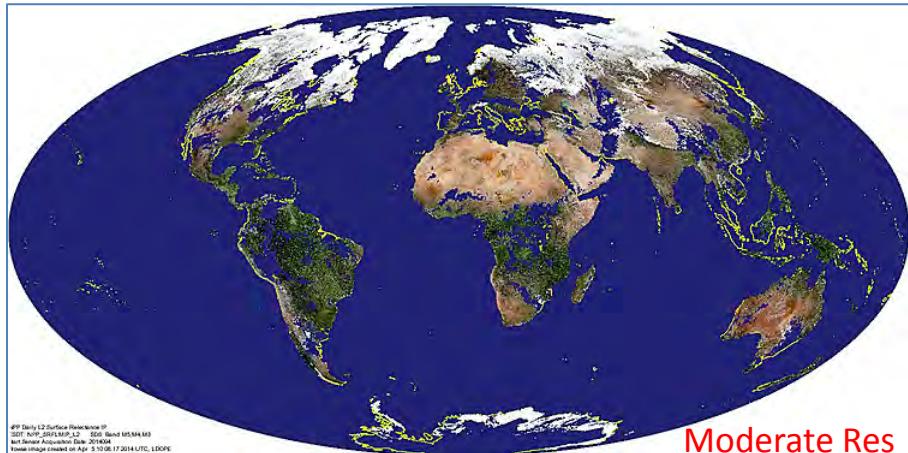
Confidently clear  
 Probably clear

Probably cloud  
 Confidently cloud



# Surface Reflectance IP from Day 2014094

Retrieved under all atmospheric conditions for all non-ocean (not sea-water) pixels except for night pixels and where input L1B is invalid



Moderate Res

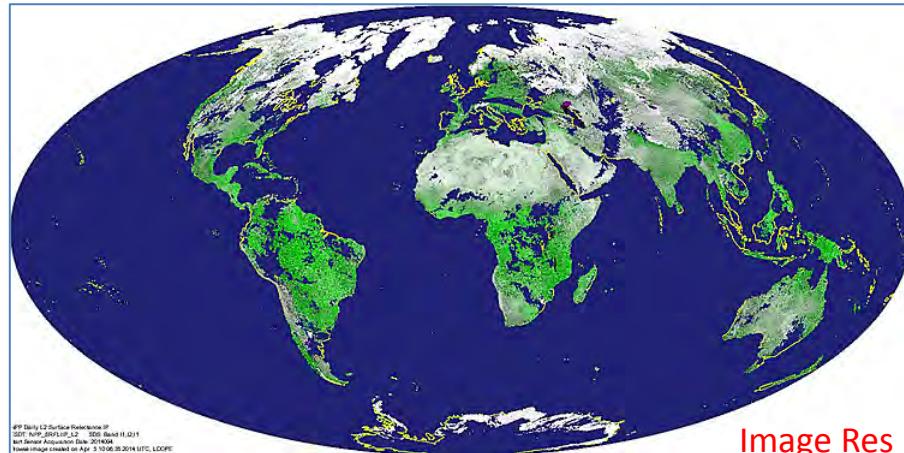
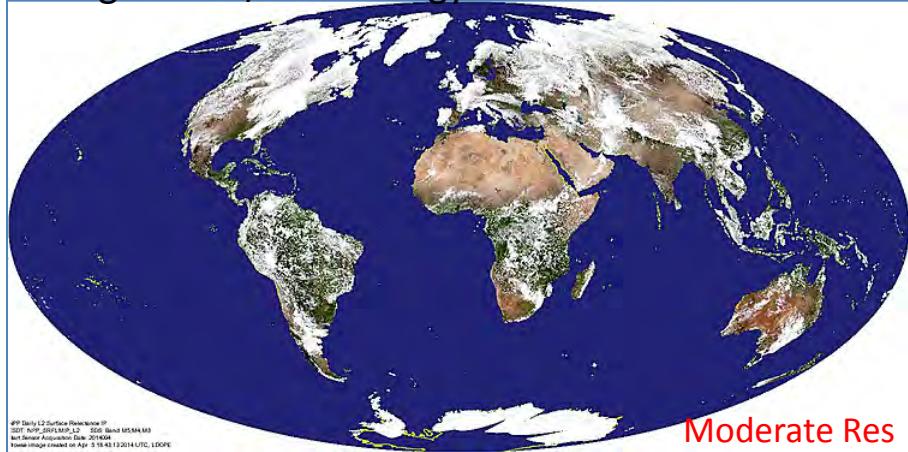


Image Res

Retrieval using Mx73 at Land PEATE – SRIP not retrieved under confidently cloud and heavy aerosol, using NAAPS/Climatology when AOTIP is not retrieved.



Moderate Res

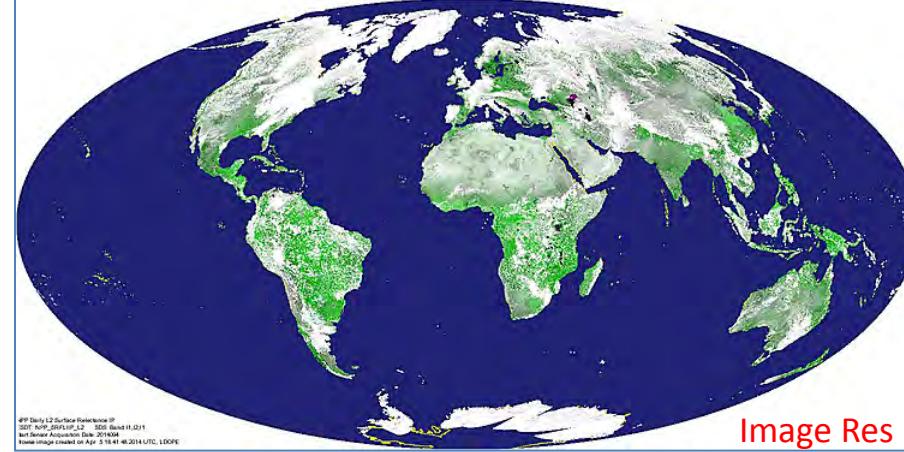


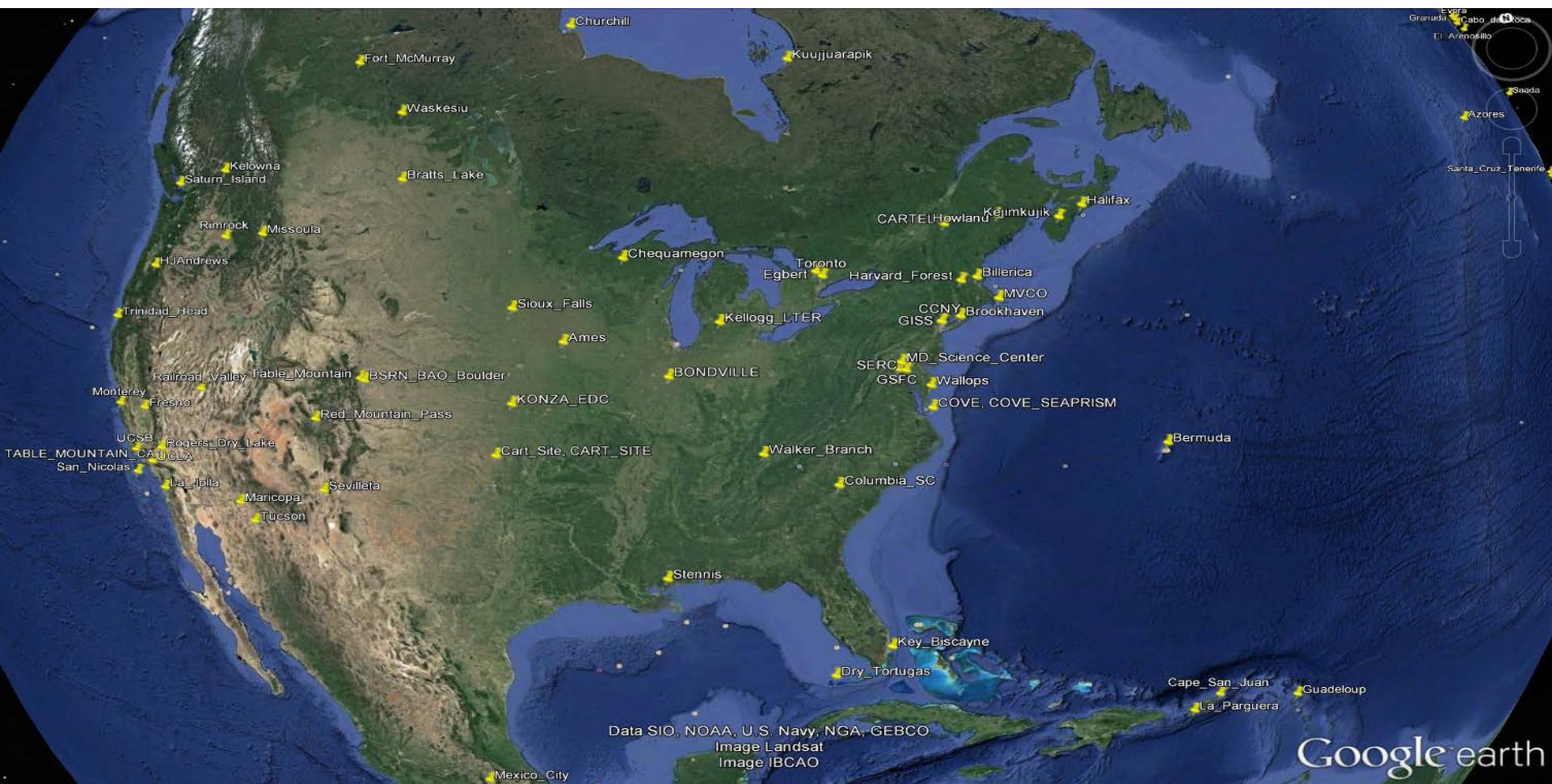
Image Res

Retrieval using Mx83 at IDPS – SRIP retrieved under all atmospheric conditions replacing NAAPS/Climatology with MODIS Climatology.



# VI EDR Validation: Matchup Data Analysis

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

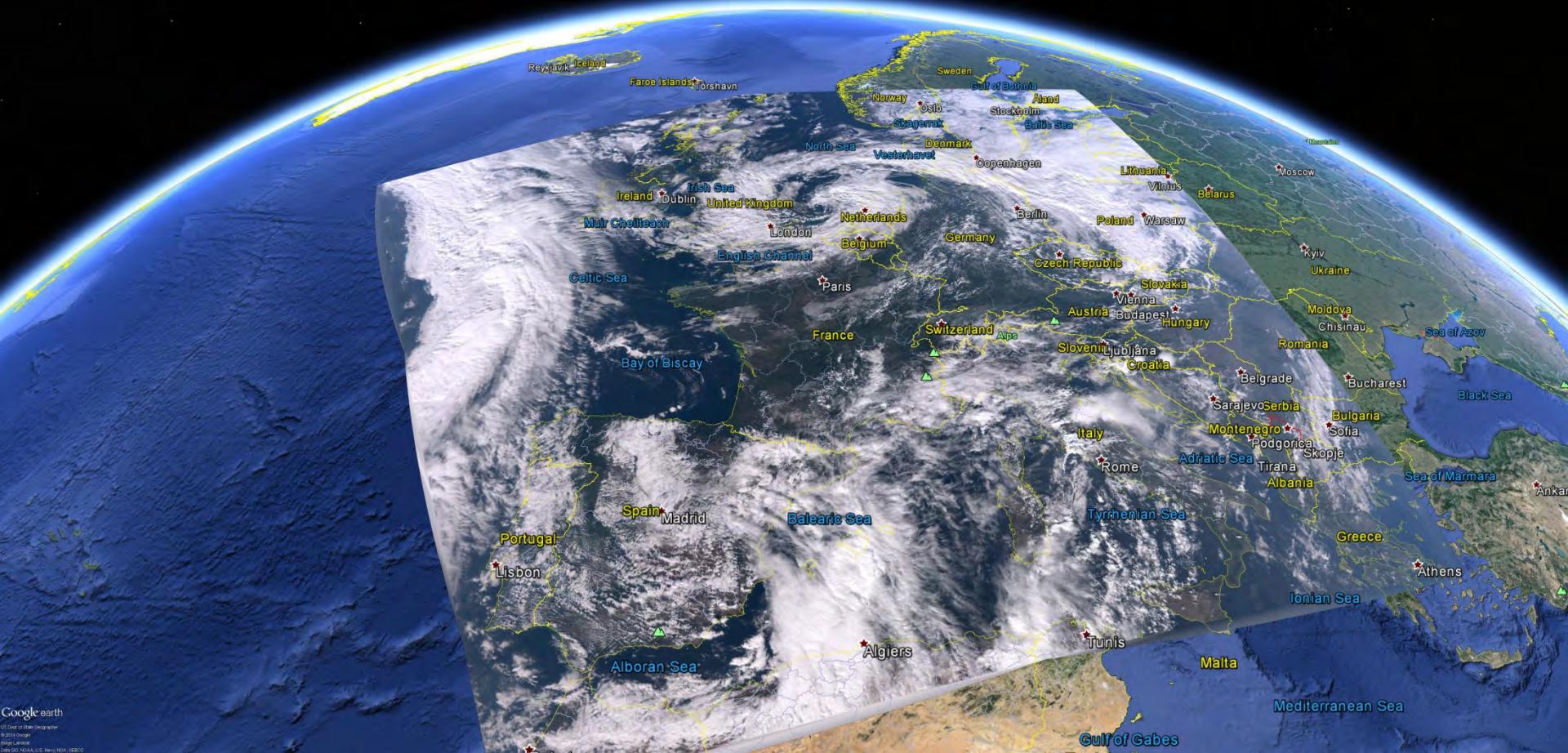




# SNPP VIIRS M3-M4-M5 RGB



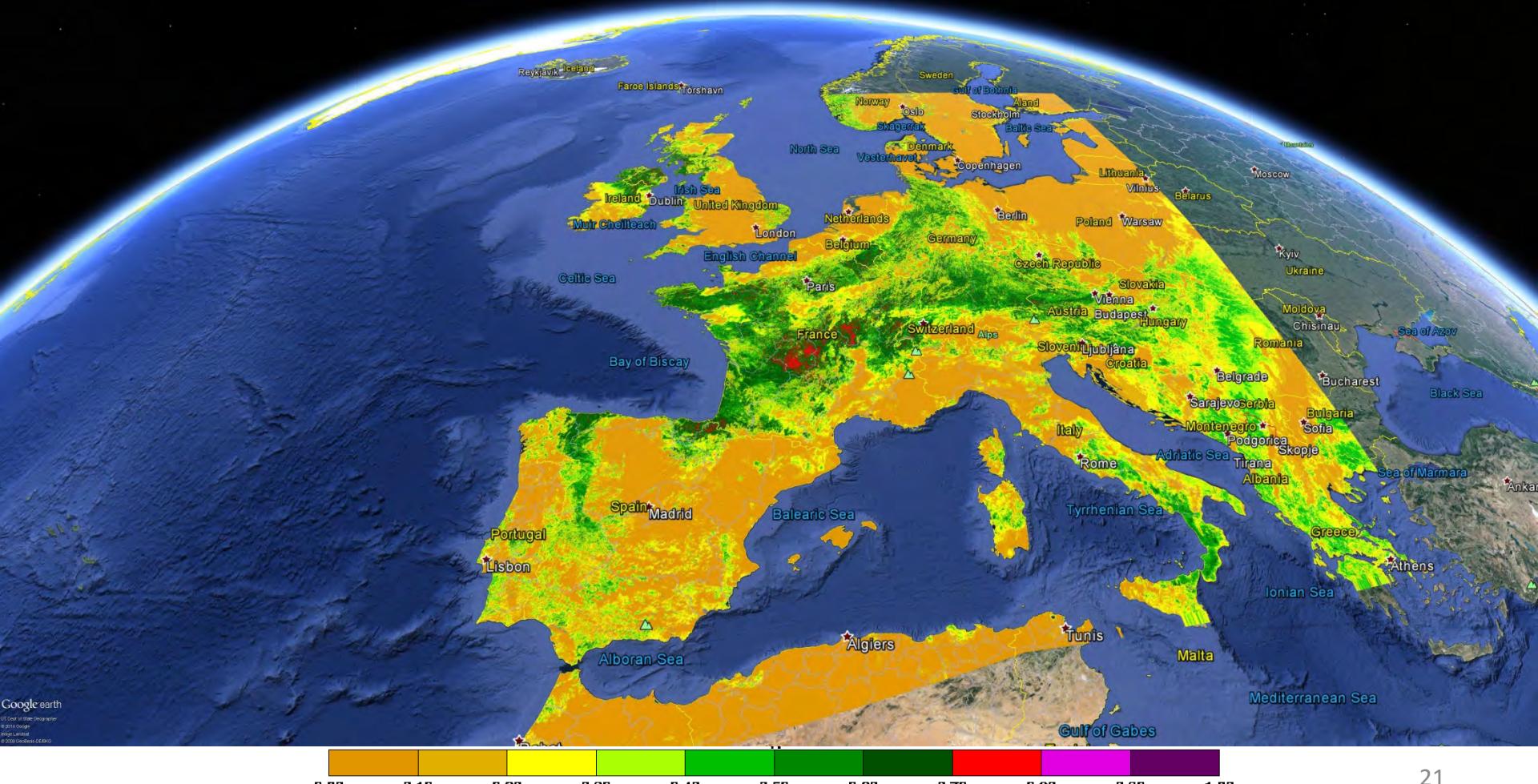
October 14, 2014 12:33 - 12:38 UTC (5 VIIRS granules)





# SNPP VIIRS TOA NDVI

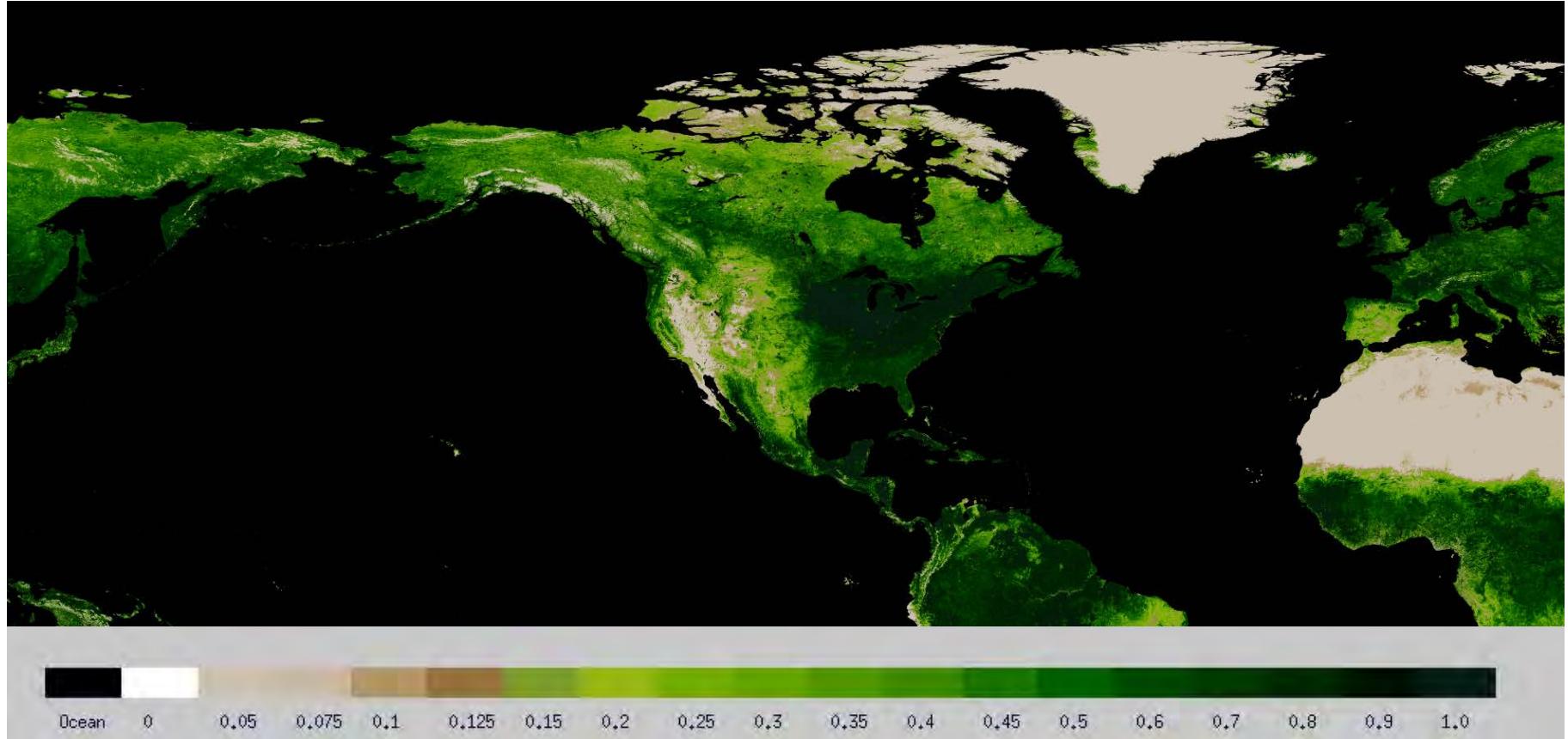
October 14, 2014 12:33 - 12:38 UTC (5 VIIRS granules)





# VIIRS Green Vegetation Fraction

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

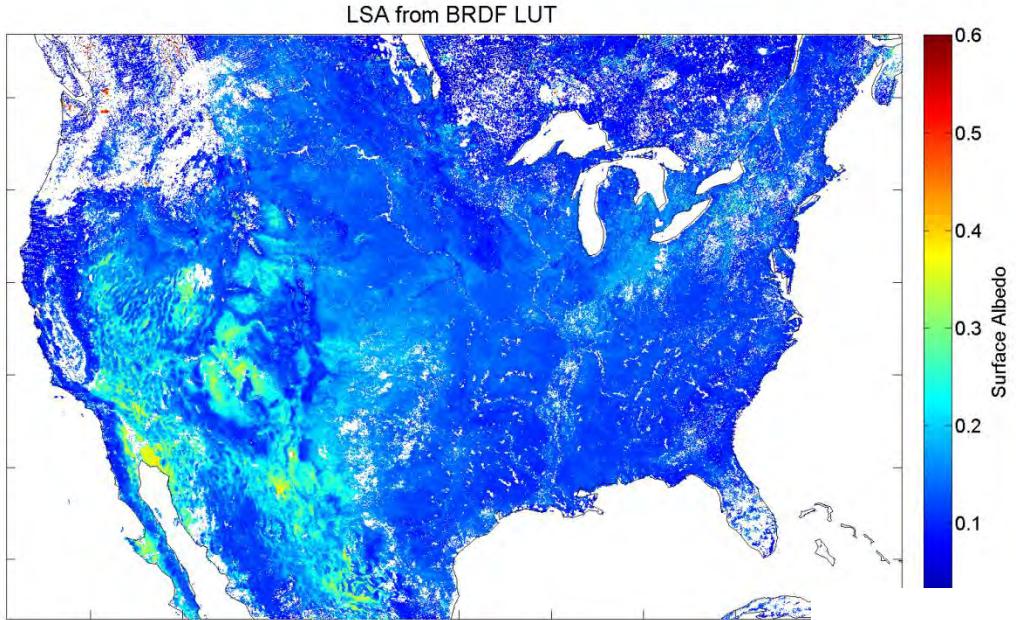


Coverage Lat 90°N - 7.5°S, Lon 130°E - 30°E

M. Vargas et al., NOAA STAR



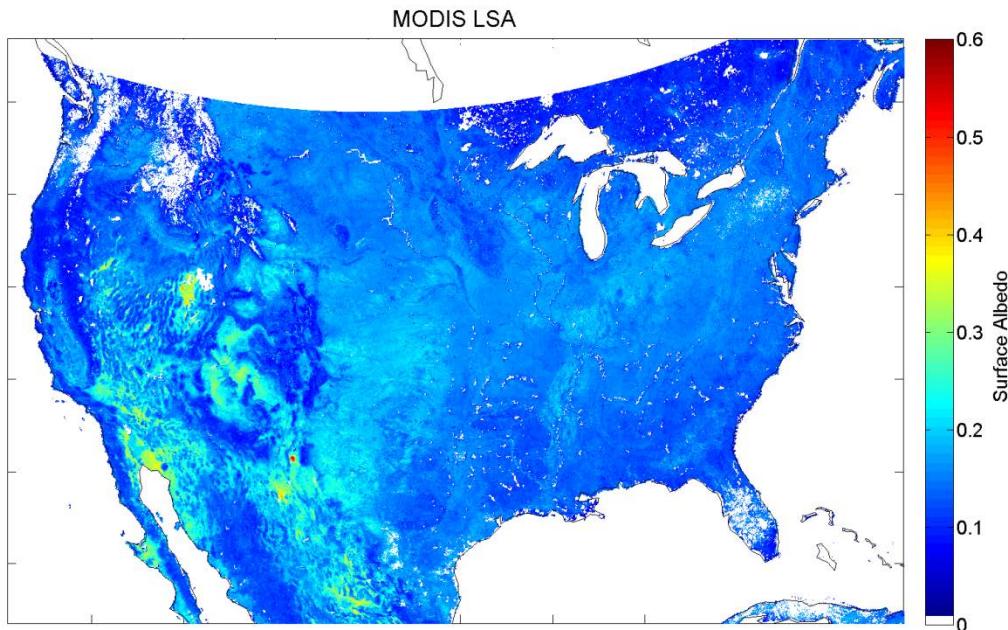
# Maps of 16-day mean albedo



An LUT update for the VIIRS provisional albedo (BPSA – Bright Pixel Surface Albedo) is being implemented in IDPS Mx8.6 (October 2014)

Contiguous US maps of 16-day (DOY 145-160, 2012) mean LSA and MODIS albedo.

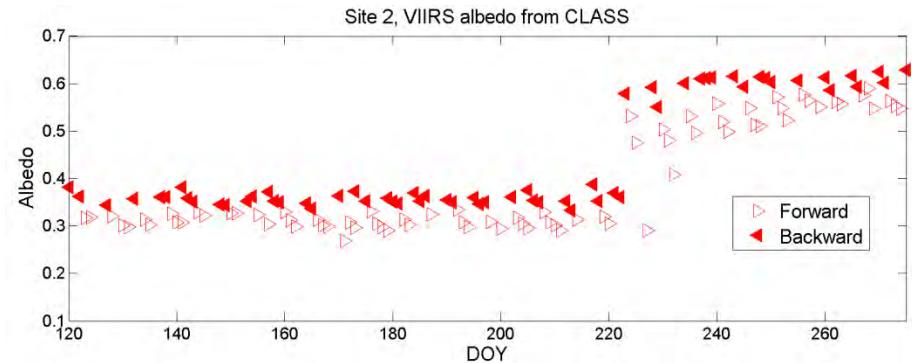
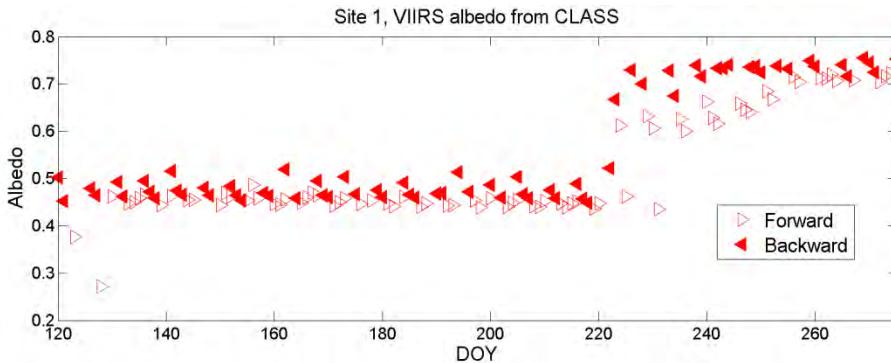
*Top: the VIIRS BPSA albedo  
Bottom: the MODIS albedo*





# Land Surface Albedo

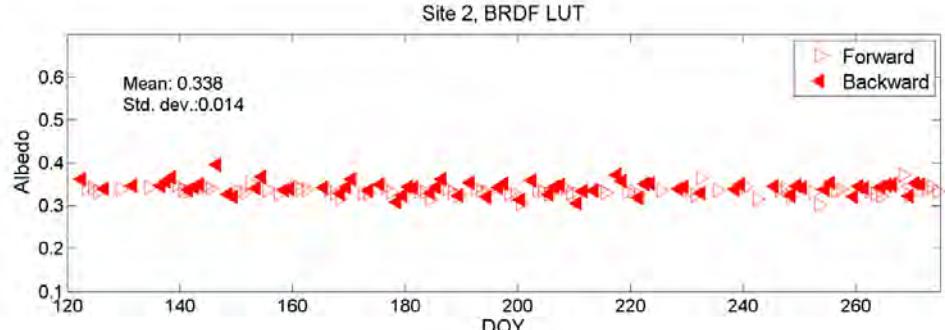
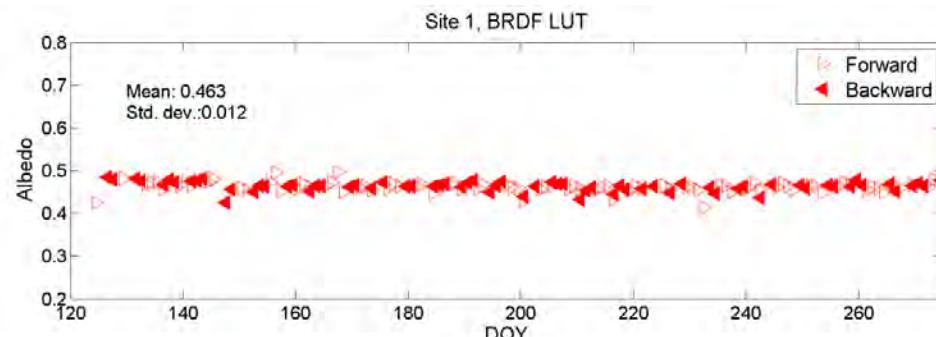
The LSA retrievals in the summer of 2012 over two Libya desert sites (Site 1: 24.42°N 13.35°E and Site 2: 26.45°N, 14.08°E) are used to illustrate the issue of temporal variability of LSA.



"Forward" means pixels with relative azimuth angle >90° and "backward" means those with relative azimuth angle <90°.  
Jumps around 8/9 were caused by the bugs in a early version of the operational codes.

**New albedo estimated with the BRDF LUT has improved in temporal stability**

LSA retrieved from new BRDF LUT. The spurious retrievals caused by undetected cloud and cloud shadow are excluded with the threshold of mean  $\pm 0.05$ .



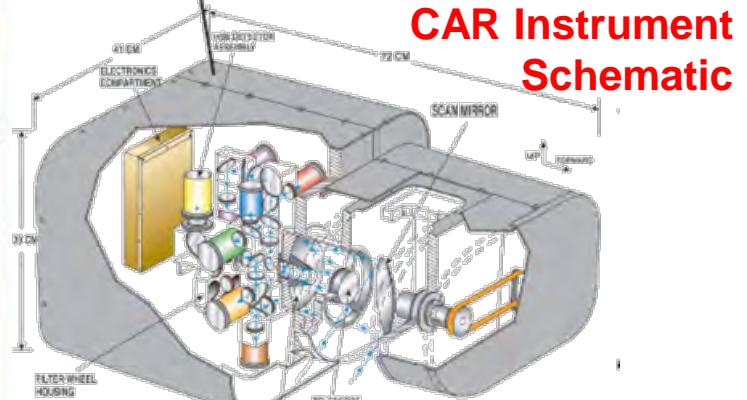
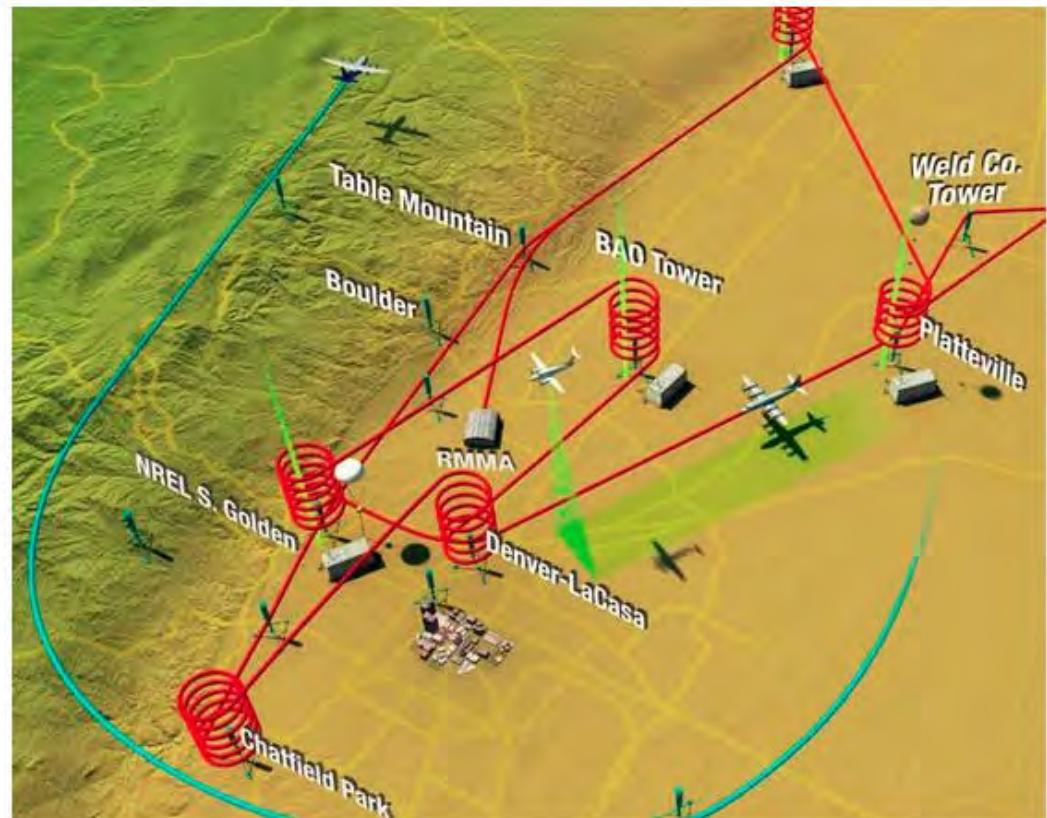


# Ongoing Land Validation Activities



Our #DISCOVERAQ air pollution field campaign is heading to Denver.  
[go.nasa.gov/1ohdmSN](http://go.nasa.gov/1ohdmSN) #EarthRightNow

Reply Retweeted Favorite More

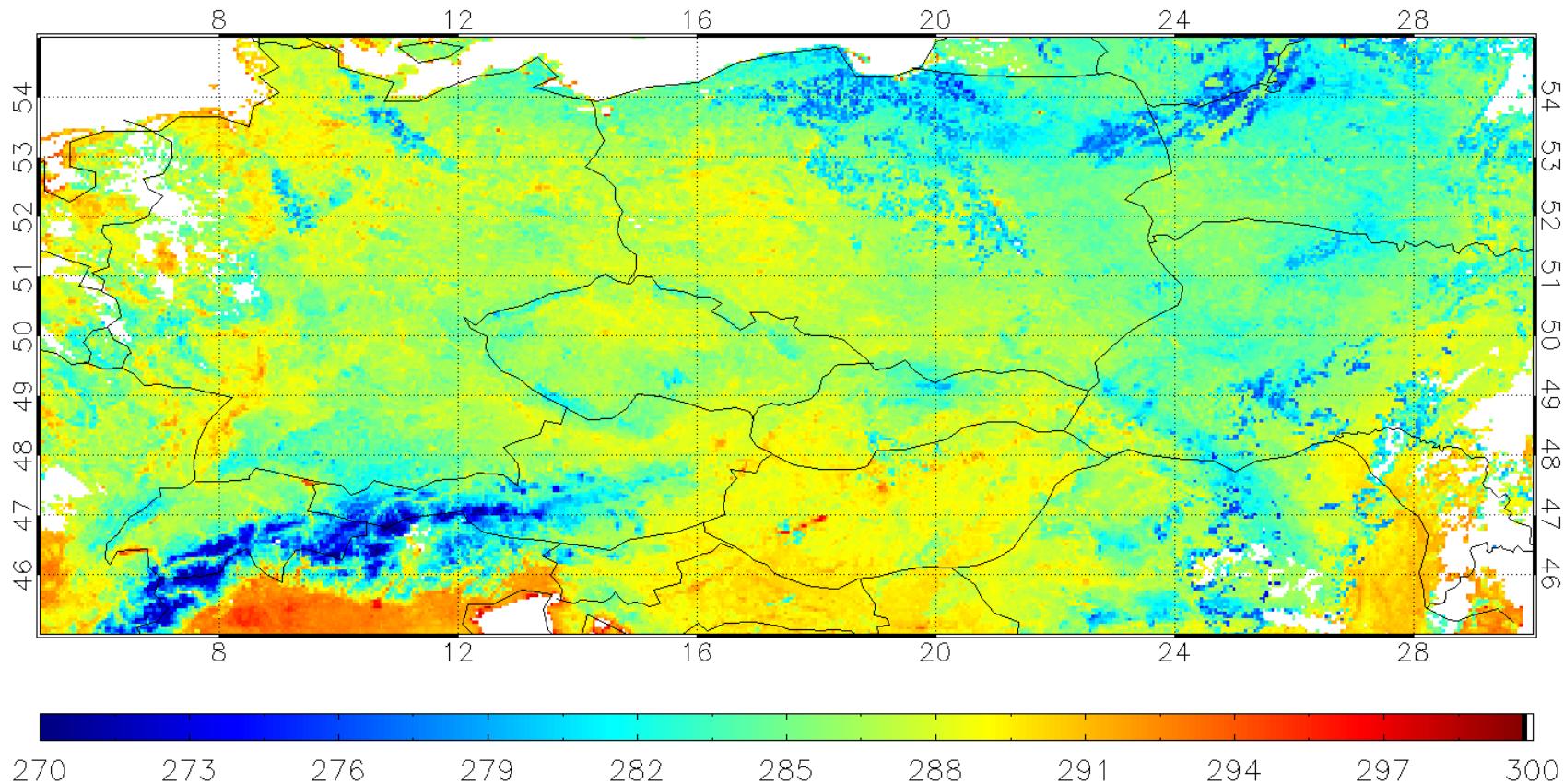


(King et al., 1986)  
(Gatebe et al., 2003)

Spiral flight patterns are being taken at multiple heights to achieve an even sampling of the surface reflectance anisotropy (aka BRDF).

# VIIRS Land Surface Temperature

VIIRS LST over Central Europe on 20140719 Nighttime





# LST 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 12:00 AM
VIIRS-Bondville_IL_2014116_yearly_color_Mx7.png	20.2 kB	5/1/14 12:00 AM
VIIRS-Bondville_IL_2014116_yearly_color_Mx8.png	20.3 kB	5/1/14 12:00 AM
VIIRS-Bondville_IL_2014116_yearly_diff_tmeseries.png	29.6 kB	5/1/14 12:00 AM
VIIRS-Bondville_IL_2014116_yearly_LPEATE.png	21.0 kB	5/1/14 12:00 AM
VIIRS-Bondville_IL_2014116_yearly_Mx7.png	21.0 kB	5/1/14 12:00 AM
VIIRS-Bondville_IL_2014116_yearly_Mx8.png	21.1 kB	5/1/14 12:00 AM
VIIRS-Bondville_IL_2014116_yearly_tmeseries.png	32.3 kB	5/1/14 12:00 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_tmeseries.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
VIIRS-Boulder_CO_2014116_yearly_tmeseries.png	36.8 kB	5/1/14 1:16:00 AM
VIIRS-Desert_Rock_NV_2014116_yearly_color_LPEATE.png	20.0 kB	5/1/14 1:12:00 AM
VIIRS-Desert_Rock_NV_2014116_yearly_color_Mx7.png	20.0 kB	5/1/14 1:12:00 AM
VIIRS-Desert_Rock_NV_2014116_yearly_color_Mx8.png	20.0 kB	5/1/14 1:12:00 AM
VIIRS-Desert_Rock_NV_2014116_yearly_diff_tmeseries.png	26.2 kB	5/1/14 1:12:00 AM
VIIRS-Desert_Rock_NV_2014116_yearly_LPEATE.png	20.4 kB	5/1/14 1:12:00 AM

## 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 12:00 AM
VIIRS-Bondville_IL_2014116_yearly_color_Mx7.png	20.2 kB	5/1/14 12:00 AM
VIIRS-Bondville_IL_2014116_yearly_color_Mx8.png	20.3 kB	5/1/14 12:00 AM
VIIRS-Bondville_IL_2014116_yearly_diff_tmeseries.png	29.6 kB	5/1/14 12:00 AM
VIIRS-Bondville_IL_2014116_yearly_LPEATE.png	21.0 kB	5/1/14 12:00 AM
VIIRS-Bondville_IL_2014116_yearly_Mx7.png	21.0 kB	5/1/14 12:00 AM
VIIRS-Bondville_IL_2014116_yearly_Mx8.png	21.1 kB	5/1/14 12:00 AM
VIIRS-Bondville_IL_2014116_yearly_tmeseries.png	32.3 kB	5/1/14 12:00 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_tmeseries.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
VIIRS-Boulder_CO_2014116_yearly_tmeseries.png	36.8 kB	5/1/14 1:16:00 AM
VIIRS-Desert_Rock_NV_2014116_yearly_color_LPEATE.png	20.0 kB	5/1/14 1:12:00 AM
VIIRS-Desert_Rock_NV_2014116_yearly_color_Mx7.png	20.0 kB	5/1/14 1:12:00 AM
VIIRS-Desert_Rock_NV_2014116_yearly_color_Mx8.png	20.0 kB	5/1/14 1:12:00 AM
VIIRS-Desert_Rock_NV_2014116_yearly_diff_tmeseries.png	26.2 kB	5/1/14 1:12:00 AM
VIIRS-Desert_Rock_NV_2014116_yearly_LPEATE.png	20.4 kB	5/1/14 1:12:00 AM

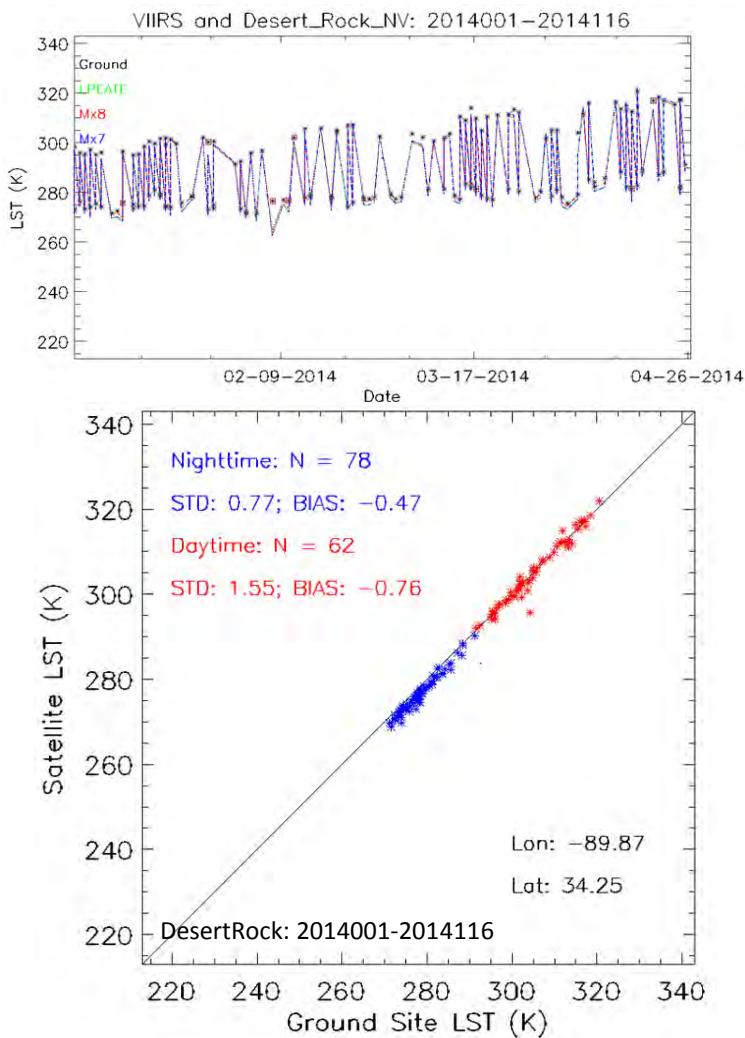
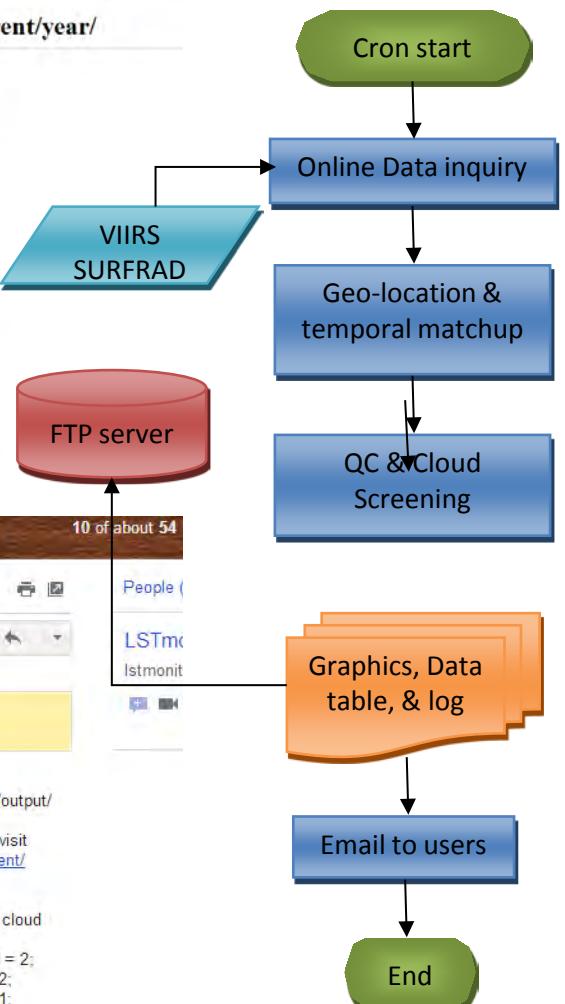
LST monitor results: Apr 24, 2014

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

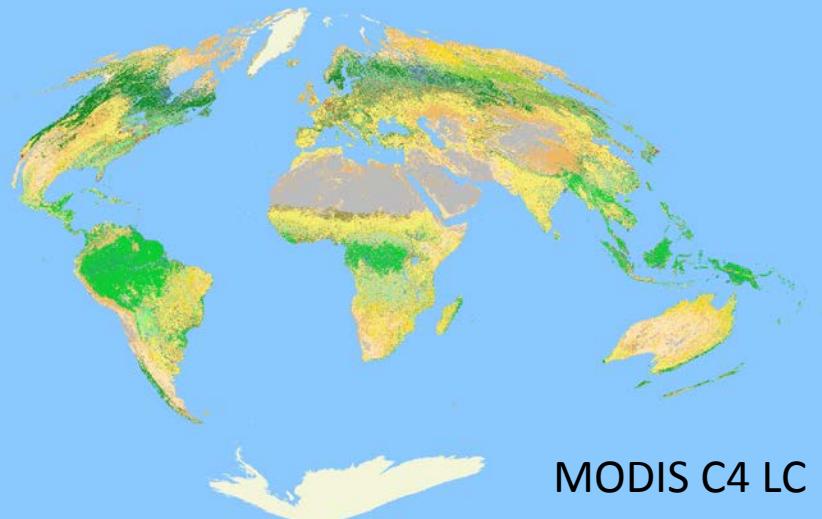
The monitoring for VIIRS has been done for this week.  
Please visit the directory /net/rhs2001/disk3/pub/pyu/VIIRS\_Monitoring/output/routine/2014/20140412/ to review the results.  
Alternatively, in case you have difficulty accessing the above directory, visit [http://ftp.star.nesdis.noaa.gov/pub/smcd/emb/pyu/VIIRS\\_monitoring/current/](http://ftp.star.nesdis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

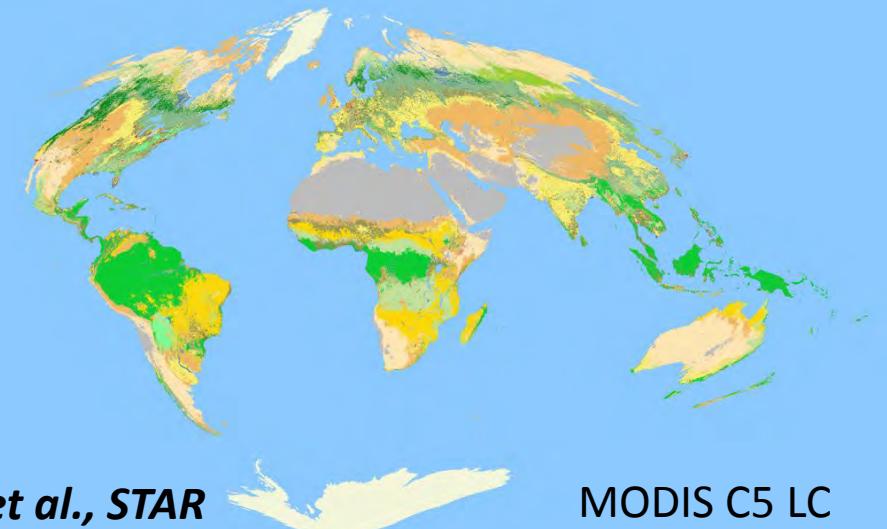
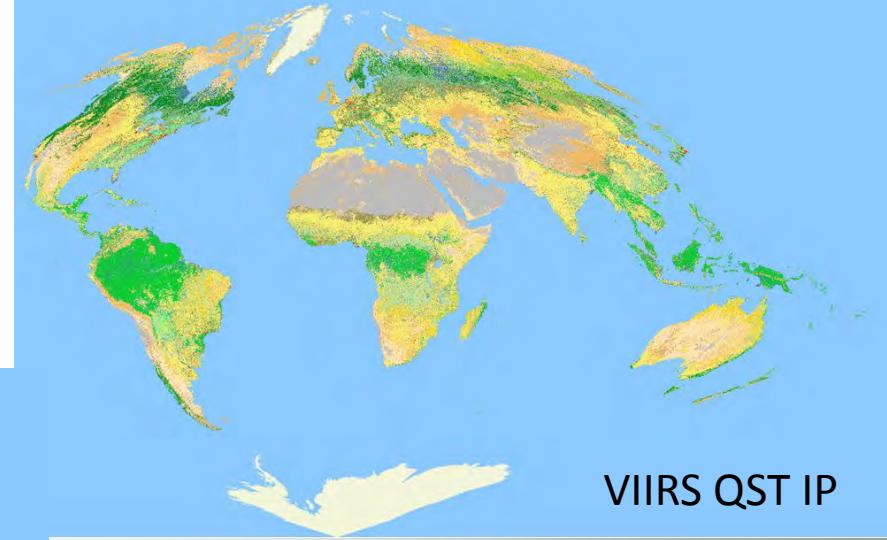




# Surface Type: Comparison with MODIS C4/C5 LC



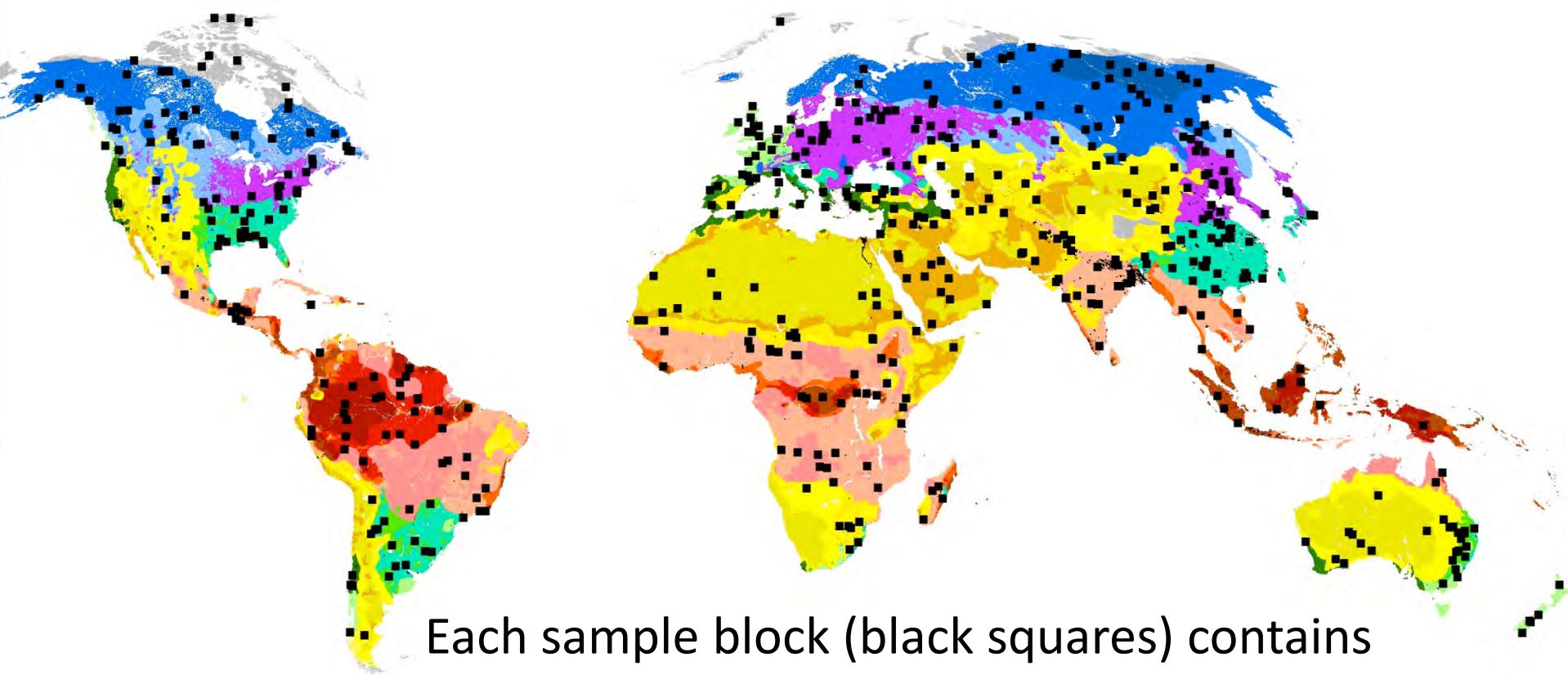
- Legend**
- Evergreen Needleleaf Forest
  - Evergreen Broadleaf Forest
  - Deciduous Needleleaf Forest
  - Deciduous Broadleaf Forest
  - Mixed Forest
  - Closed Shrublands
  - Open Shrublands
  - Woody Savannas
  - Savannas
  - Grasslands
  - Permanent Wetlands
  - Croplands
  - Urban and Built-Up
  - Cropland/Natural Vegetation Mosaic
  - Snow and Ice
  - Barren or Sparsely Vegetated
  - Water Bodies



X. Zhan et al., STAR



# Validation Sample Design



- Each sample block (black squares) contains between 10 and 35 1-km VIIRS pixels.

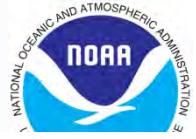
[Red]	Tropical Rainforest
[Orange]	Tropical Seasonal Forest
[Pink]	Tropical Savannah
[Yellow]	Desert
[Light Yellow]	Steppe
[Dark Green]	Mediterranean
[Bright Green]	Temperate Evergreen Forest

[Light Green]	Marine West-coast
[Blue]	Continental Forest
[Dark Blue]	Boreal Forest
[Grey]	Tundra
[White]	Snow and Ice
[Medium Blue]	Cold Boreal Forest
[Brown]	pTropical Rainforest

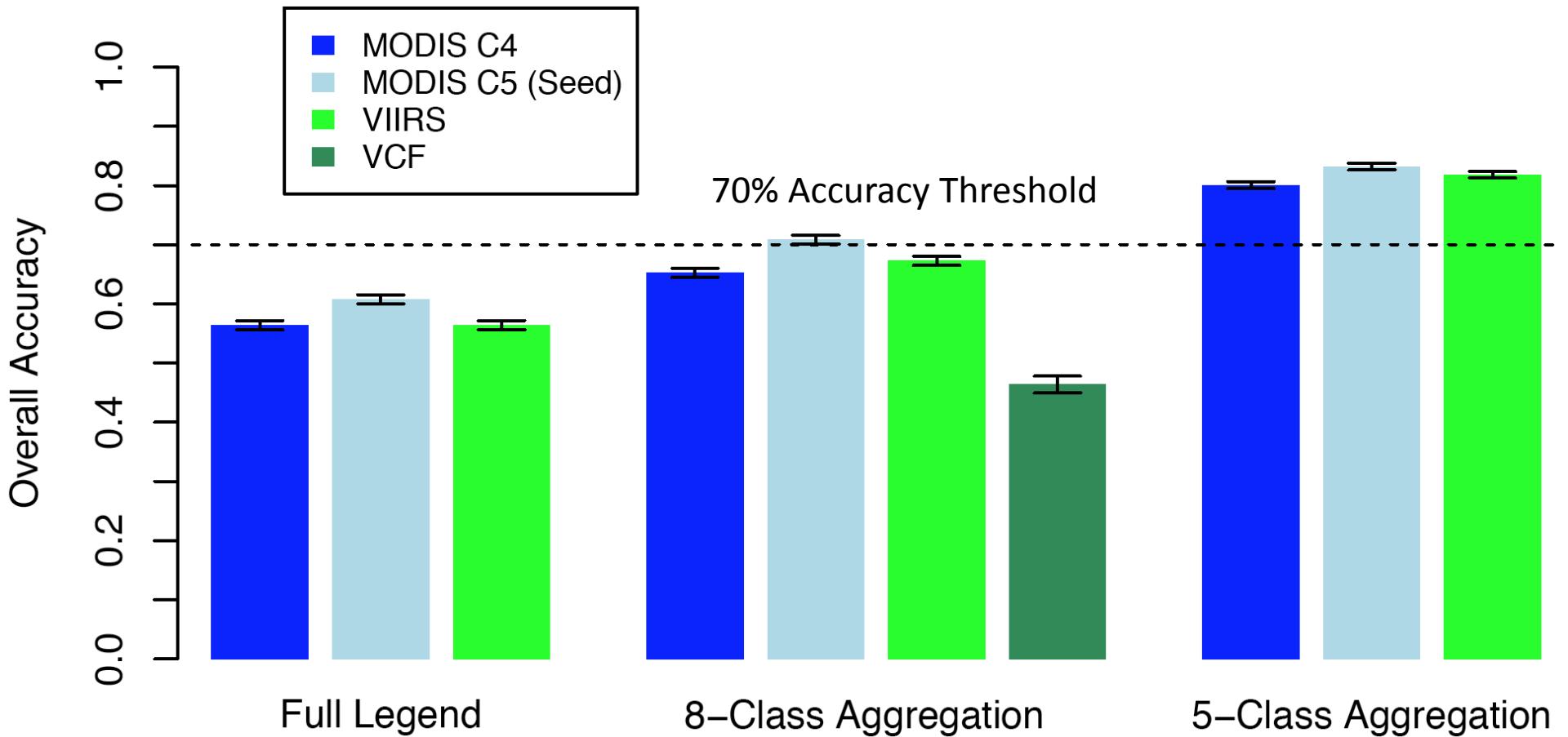
[Orange]	pTropical Seasonal Forest
[Light Orange]	pTropical Savannah
[Yellow-Orange]	pDesert
[Light Yellow]	pSteppe
[Teal]	pTemperate Evergreen Forest
[Purple]	pContinental Forest
[Black]	Urban



# Surface Type Validation Results



## Overall Accuracies for Different Products



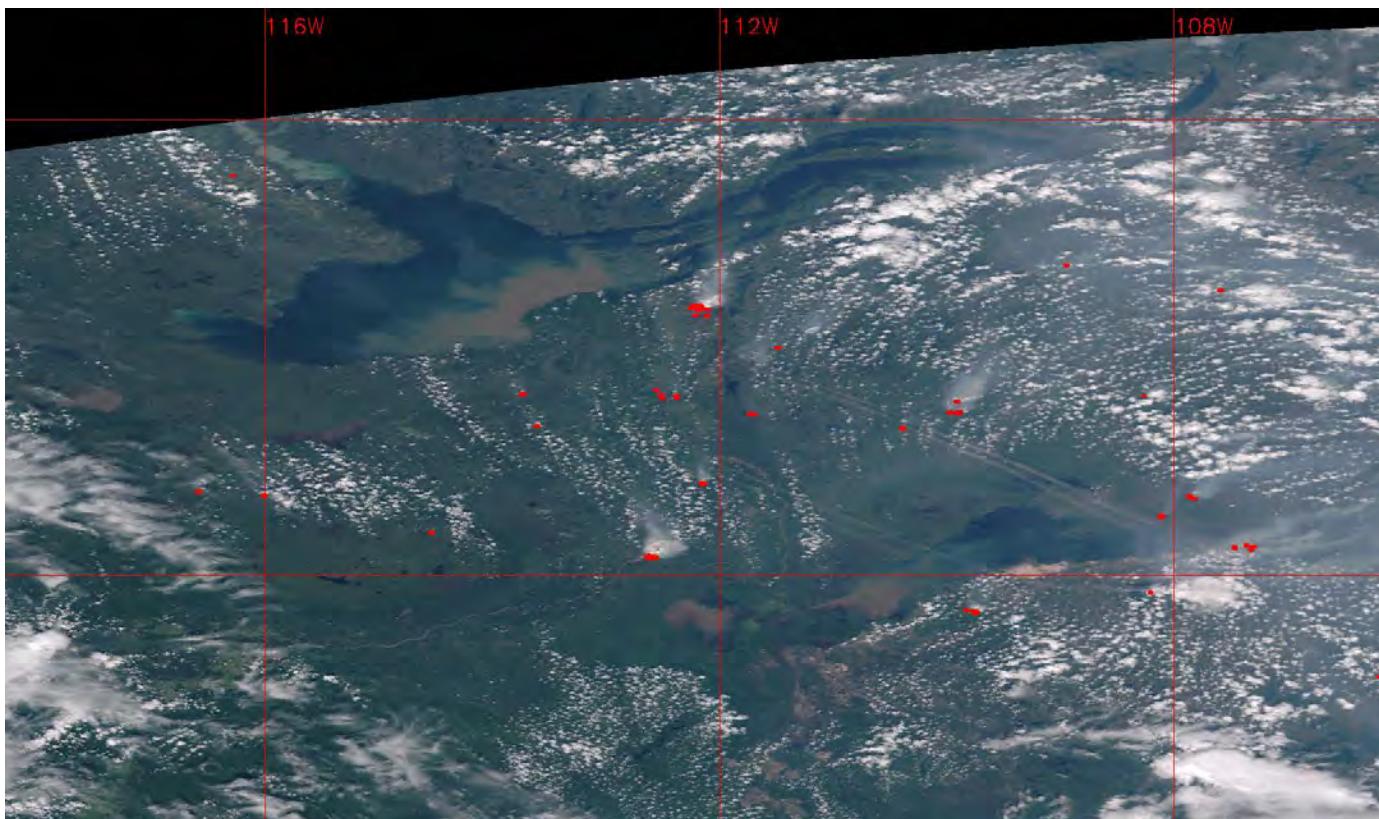
There is more variance in overall accuracies across aggregation levels than between maps.



# VIIRS NOAA Active Fire Product



- Represents continuity with NASA EOS MODIS and NOAA POES AVHRR fire detection (and also international missions such as (A)ATSR)
- VIIRS design allows for radiometric measurements to detect and characterize active fires over a wide range of observing and environmental conditions
- Product is expected to be used by real-time resource and disaster management; air quality monitoring; ecosystem monitoring; climate studies etc.



**NW Canada  
07 July 2013  
20:14:55-20:20:34 UTC**

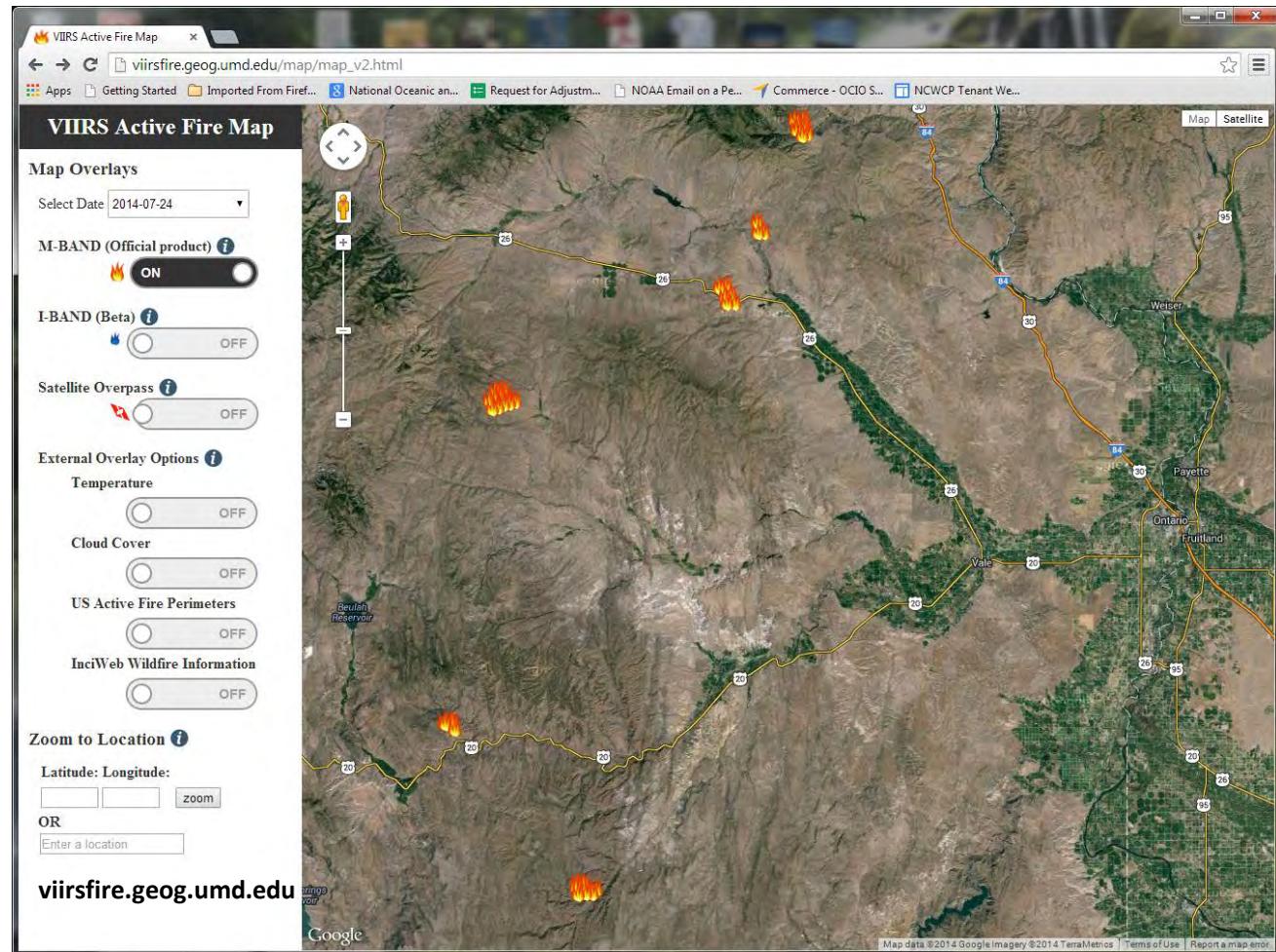


# VIIRS Fire Product and User Outreach



- 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

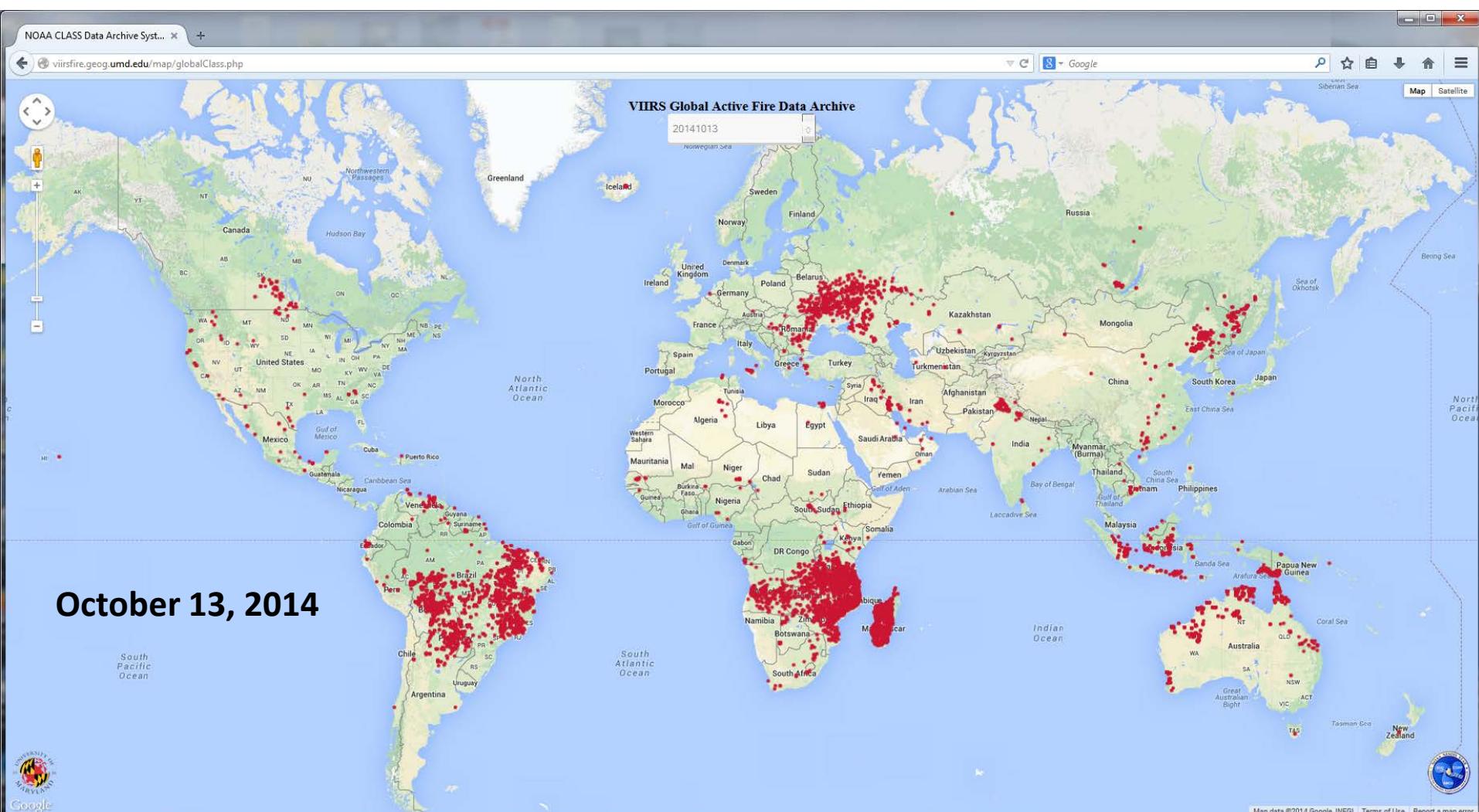
<http://viirsfire.geog.umd.edu/>



*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](http://viirsfire.geog.umd.edu).*



# NOAA VIIRS Fire Product



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

*Data from NOAA CLASS: <http://www.nsfc.class.noaa.gov/>*

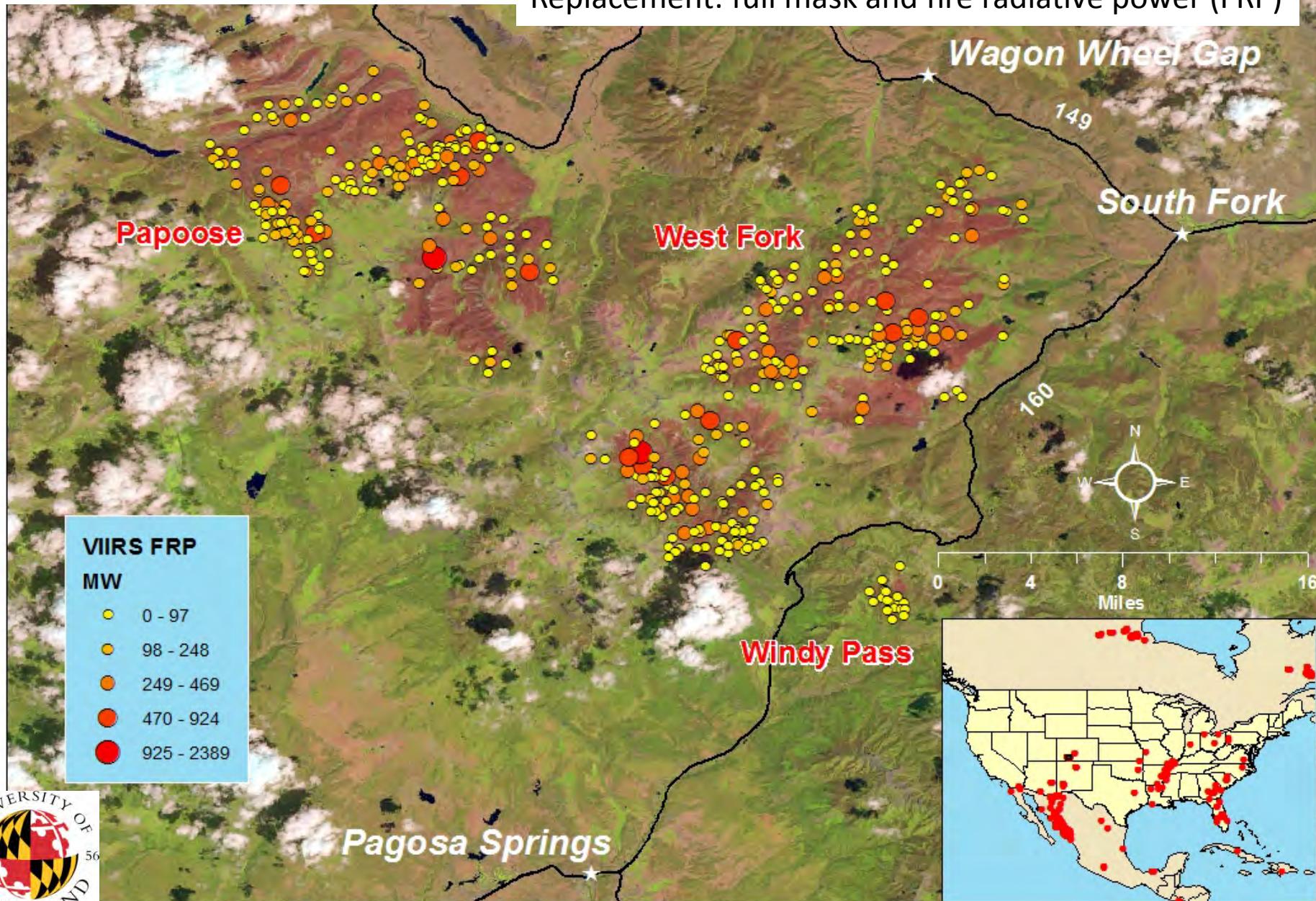
West Fork Complex: 6/14 - 7/4/2013

# New MODIS-compatible Active Fire product

Landsat-8 background: July 31, 2013

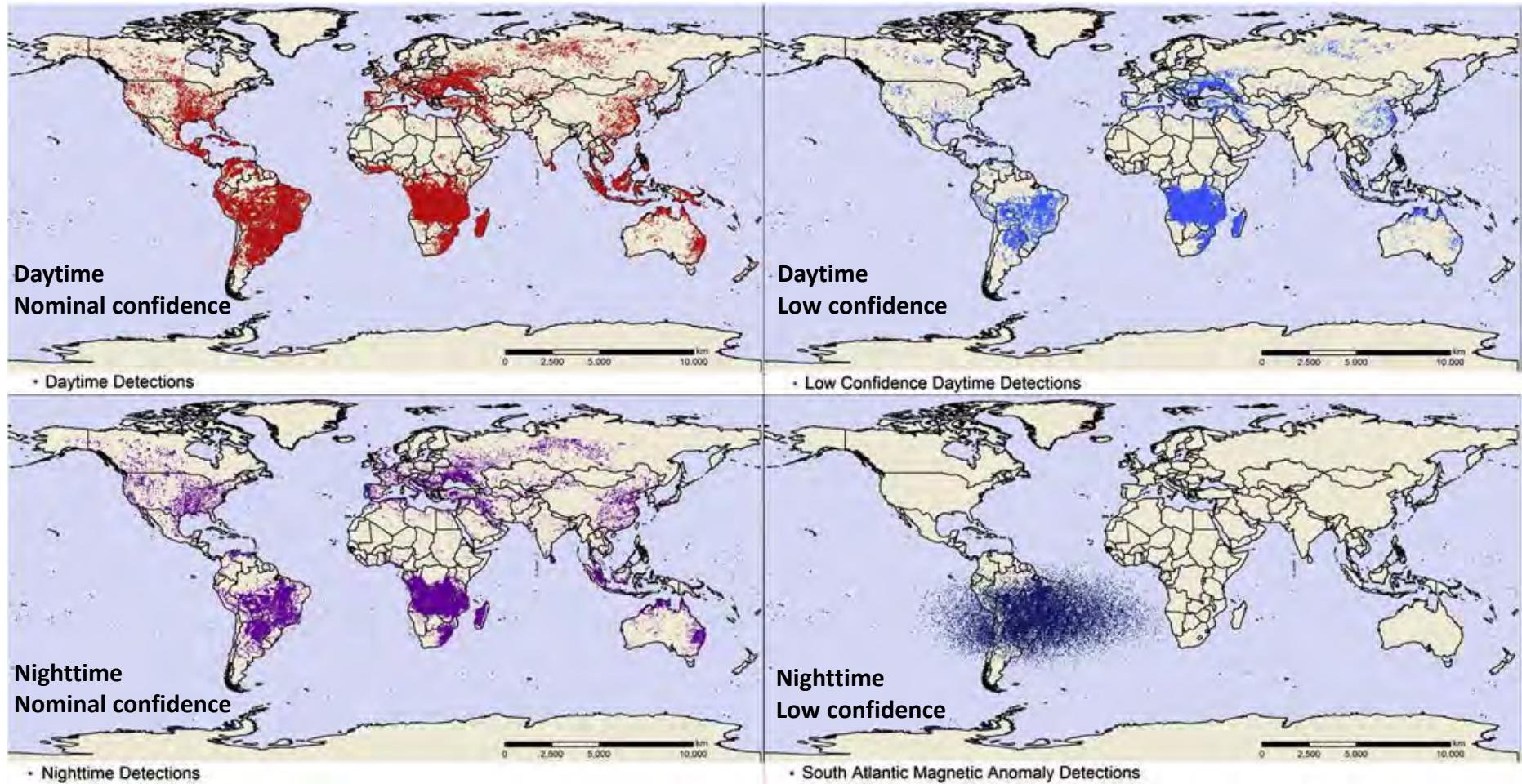
Current: locations only

Replacement: full mask and fire radiative power (FRP)





# Global fires from VIIRS I-band data



VIIRS 375 m fire algorithm output showing the accumulated daytime nominal confidence fire pixels (upper left), low confidence daytime pixels (upper right), nighttime fire pixels (purple; lower left), and SAMA-related low confidence nighttime pixels (dark blue; lower right) during 1–30 August 2013.

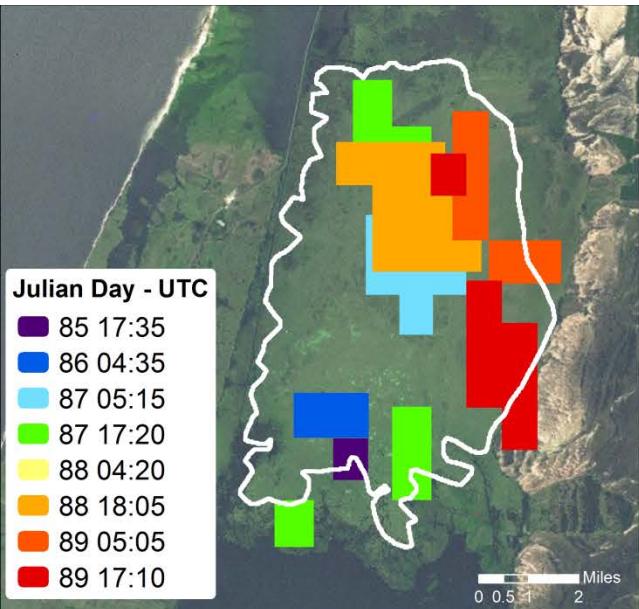
Wilfrid Schroeder, Patricia Oliva, Louis Giglio, Ivan A. Csiszar, The New VIIRS 375 m active fire detection data product: Algorithm description and initial assessment, *Remote Sensing of Environment*, Volume 143, 5 March 2014, Pages 85–96, ISSN 0034-4257, <http://dx.doi.org/10.1016/j.rse.2013.12.008>.



# Improved Satellite Mapping of Active Fires Achieved Using VIIRS I-bands

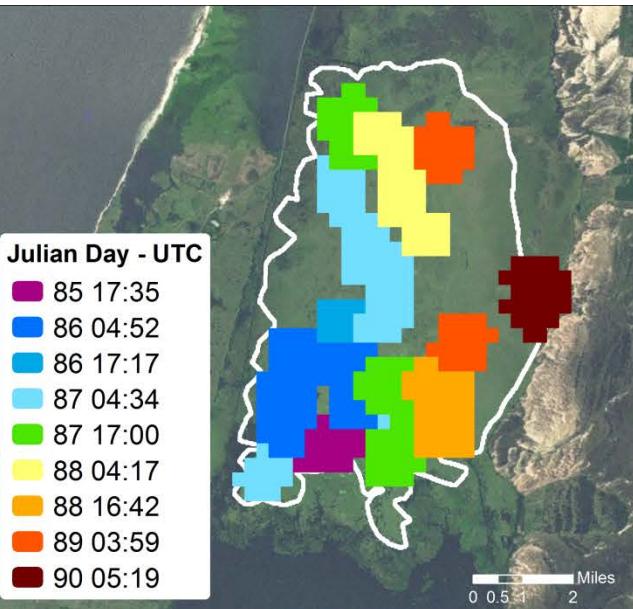


Wildfire in southern Brazil, March/2013



Aqua/MODIS 1 km

Spotty detection pixels and  
coverage gap at low latitudes



S-NPP/VIIRS 750 m

Spotty detection pixels

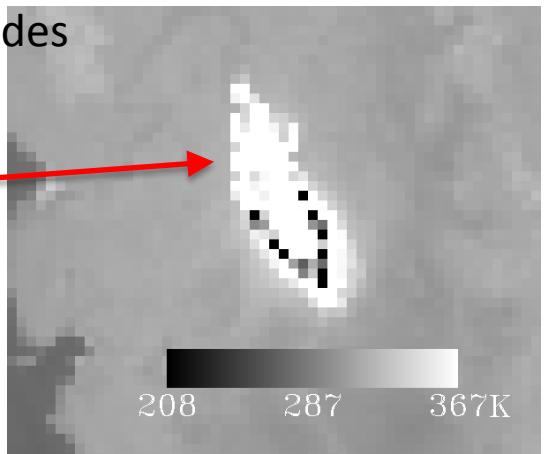


S-NPP/VIIRS 375 m

Improved fire line mapping

## Issues of VIIRS fire detection:

- Anomalous behavior at sensor saturation
- Inconsistent quality flags
- Unknown saturation of native resolution pixels prior to aggregation (single-gain bands)
- South Atlantic Magnetic Anomaly

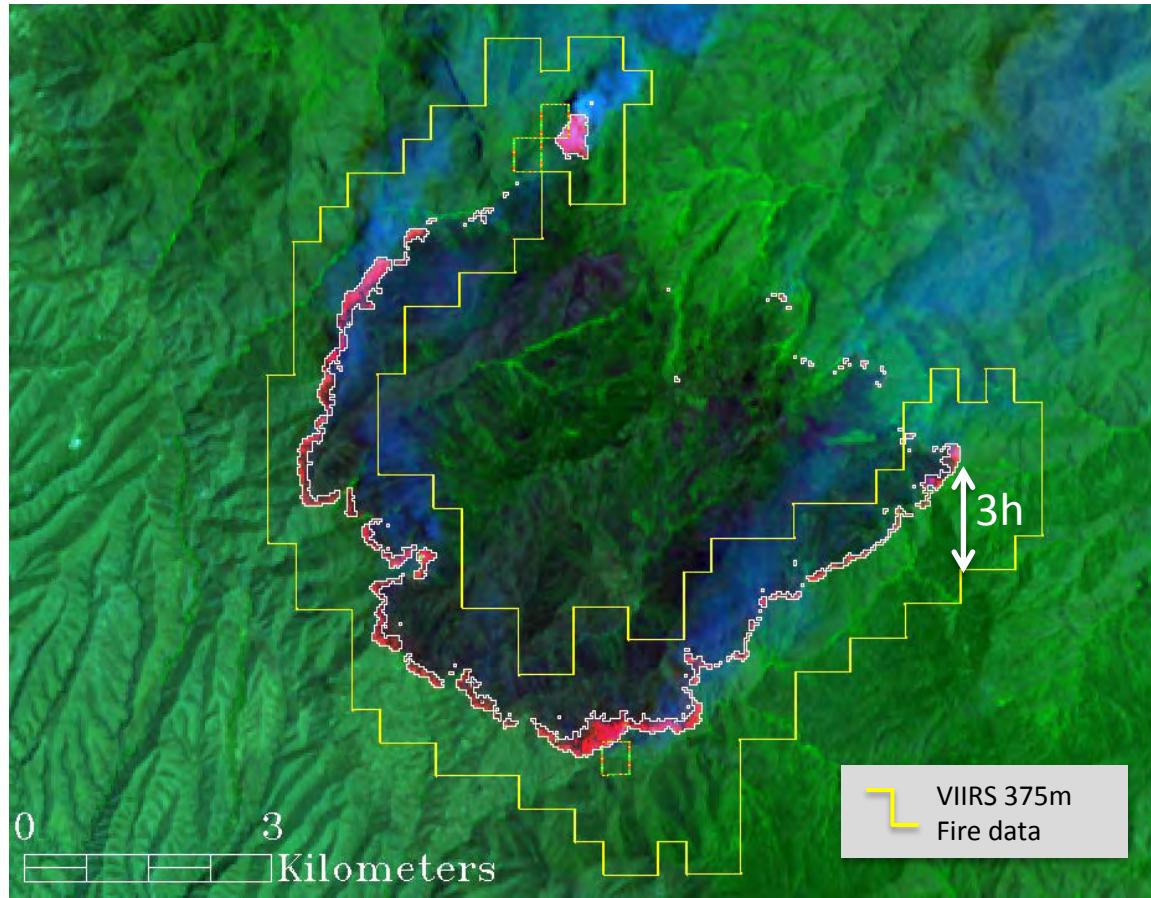




# New Landsat-8 30 m Active Fire Data



Built on proven ASTER/Landsat (5&7) fire algorithms [Giglio *et al.*, 2008; Schroeder *et al.*, 2008]  
Day & nighttime detections 16/8-day revisit (day/&night)  
Spatial resolution providing detailed fire perimeter information (plus area estimate)



***W. Schroeder, UMD***

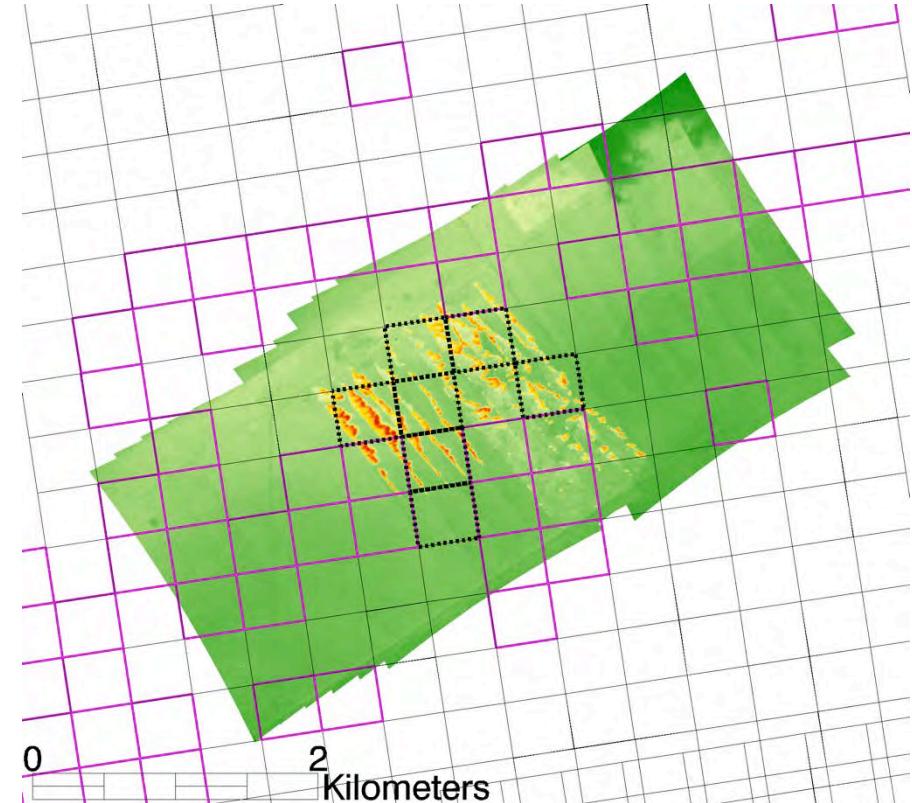


# VIIRS 750 m Active Fire Algorithm Validation Using Airborne Reference and Auxiliary (fire mask replacement code) Input Data



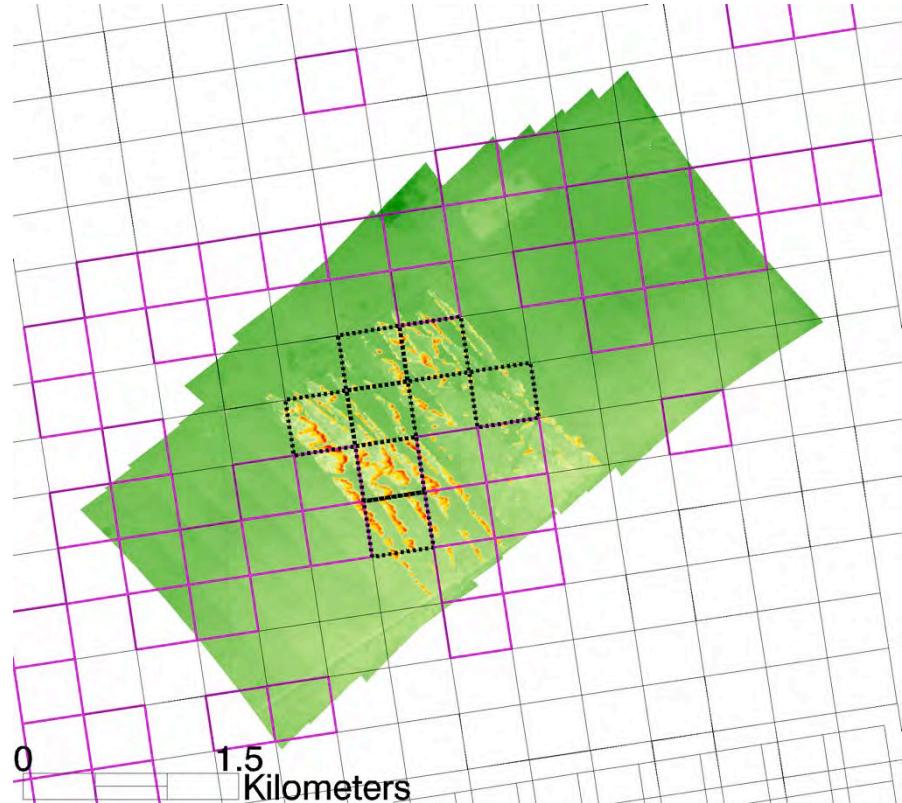
Grassland fire 04 Nov 2012

(≈35ha flaming/smoldering; 158MW)



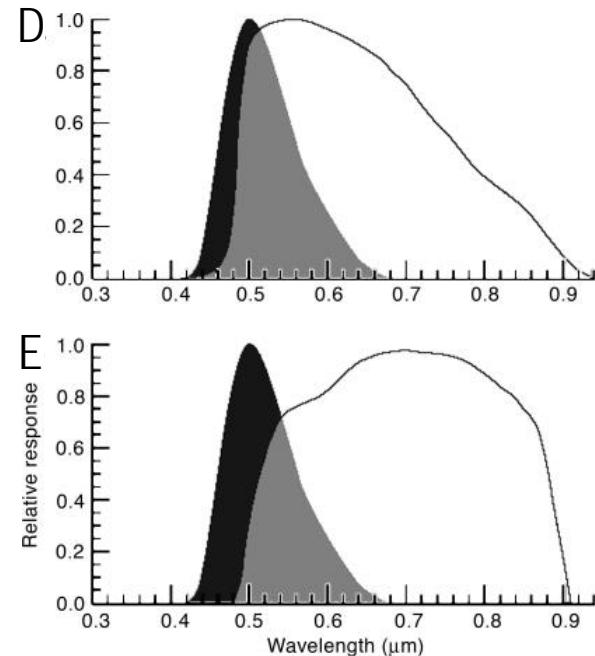
VIIRS 18:59:54 UTC  
WASP 18:58:55-18:59:43 UTC

- Cloud pixel
- Fire pixel
- Land pixel



VIIRS 18:59:54 UTC  
WASP 19:03:05-19:03:44 UTC

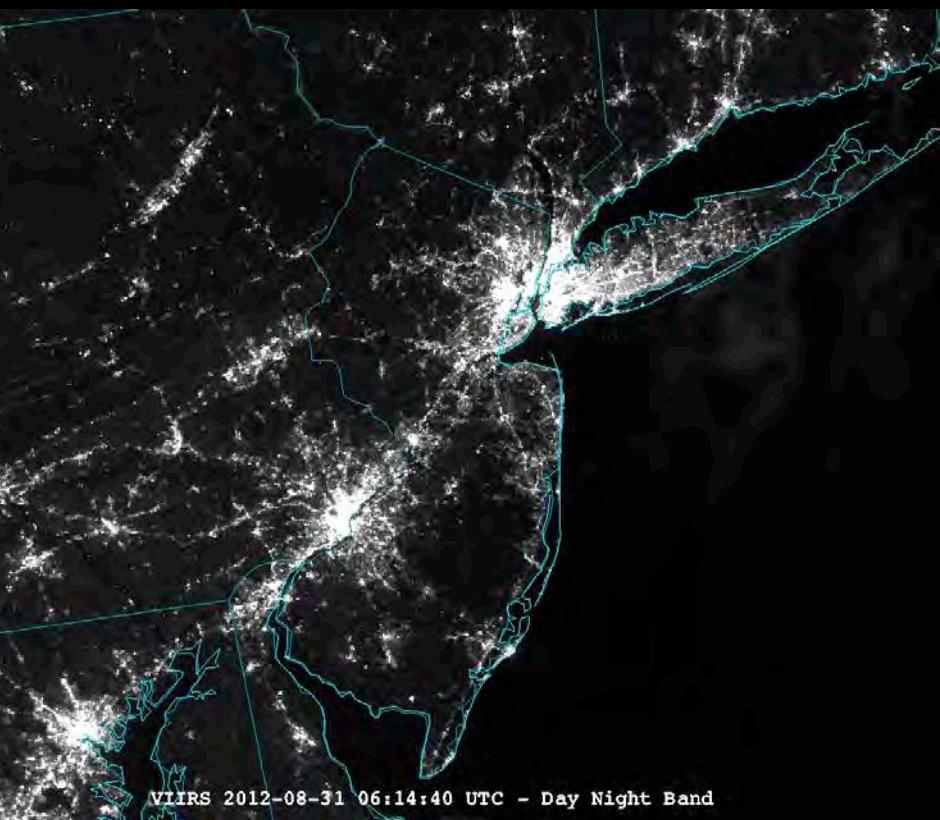
# VIIRS DNB nighttime detection capabilities (A) with and (B) without lunar illumination\*



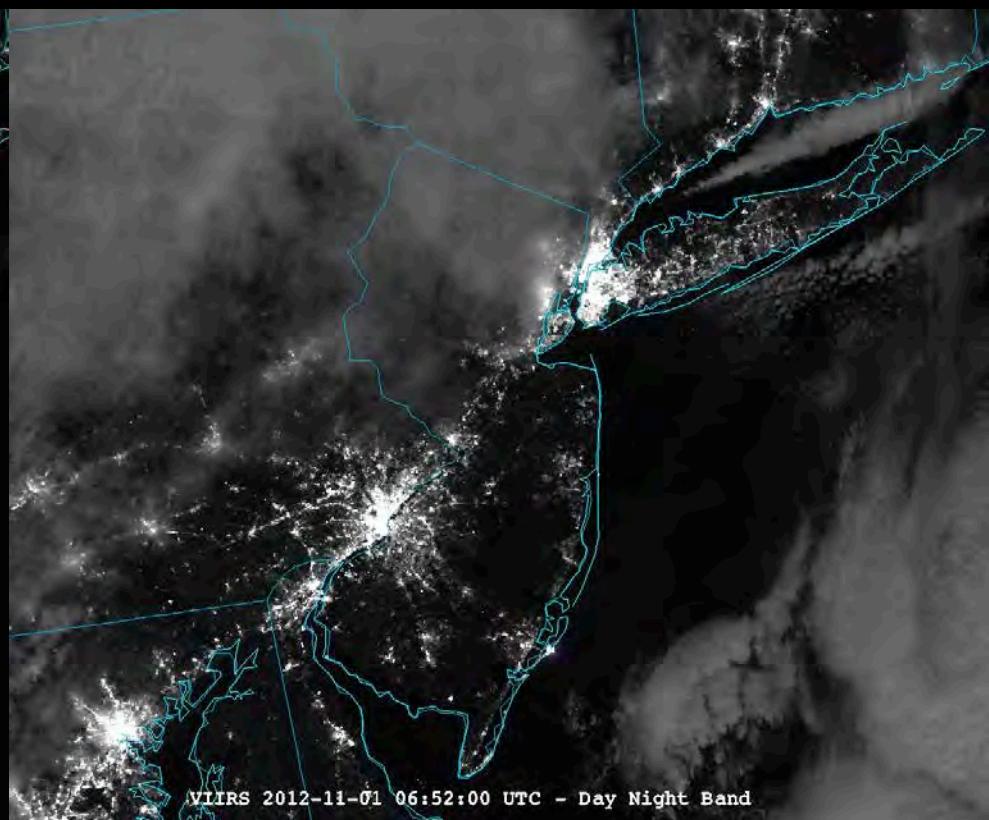
Bioluminescent bacteria (black area) compared with OLS (D.) and VIIRS (E.) spectral response functions. Regions of spectral overlap are shown in gray.

\*JPSS does not have a requirement for low-light detection

# Infrastructure Changes: Outages During Hurricane Sandy

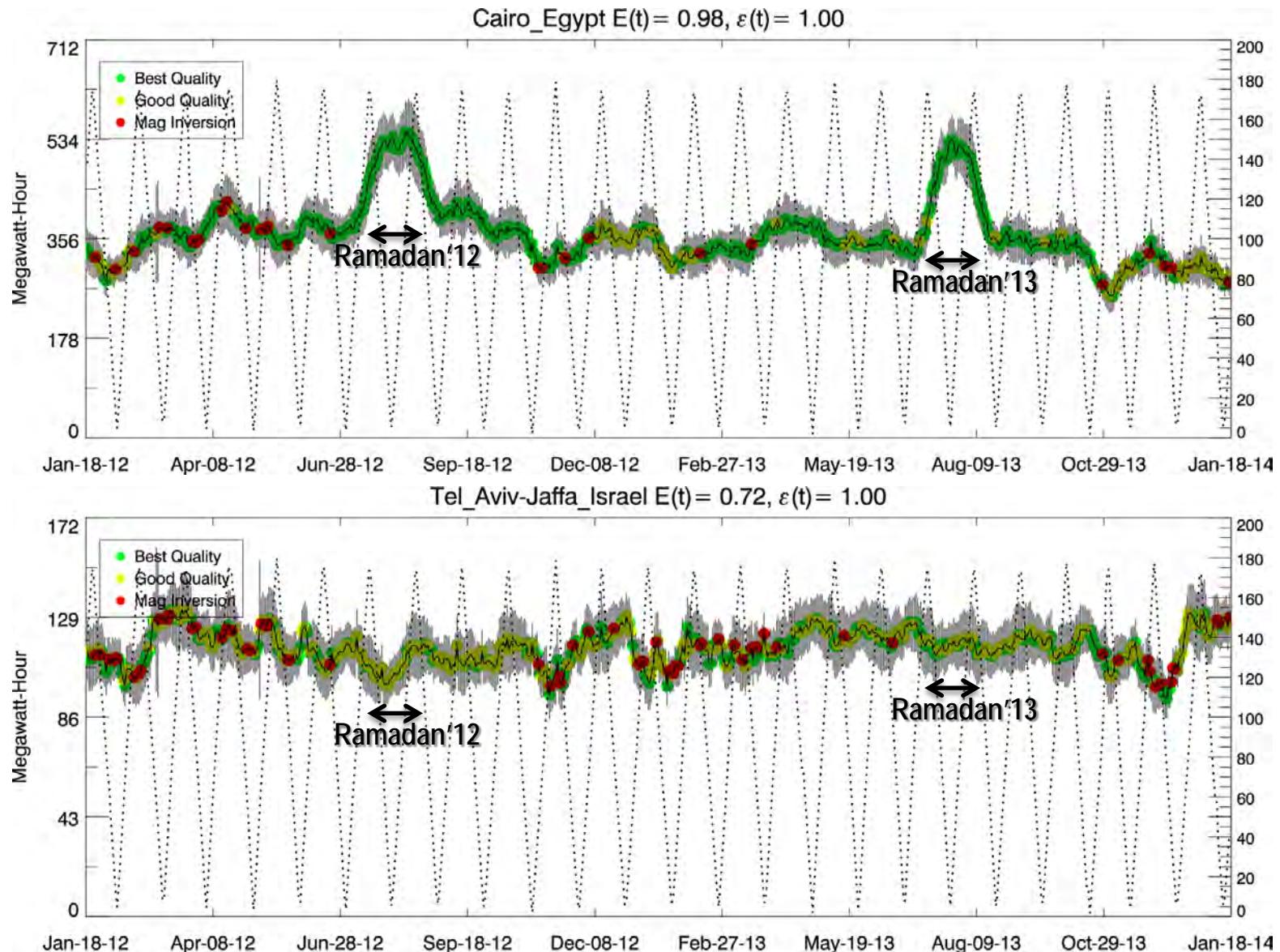


Before Power Outage



After Power Outage

# Outdoor Electricity Usage from Lighting (VIIRS C11 Reprocessing)

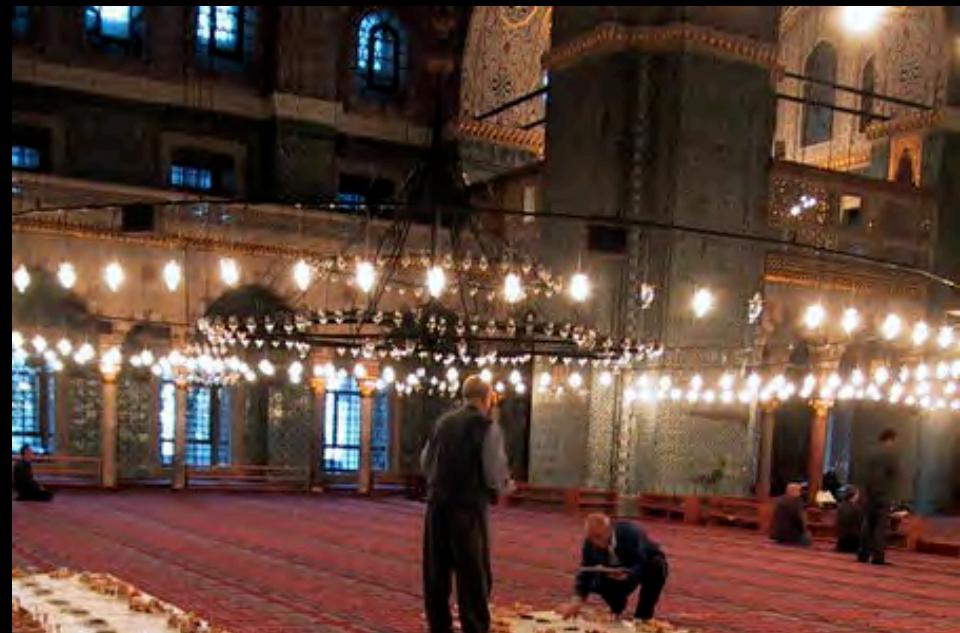


Goddard  
SPACE FLIGHT CENTER



Yale University  
School of Forestry  
& Environmental Studies

# Human Activity: Ramadan, 2012 (Jul19 – Aug 18) and 2013 (Jul 8-Aug 7)





# JGR Special Issue on Suomi NPP Calibration and Validation



34 papers have been published in AGU Journal Geophysical Research Special Issue on Suomi NPP satellite calibration, validation and applications.

*Guest Editor: Fuzhong Weng*





# For more information

- NOAA JPSS  
<http://www.jpss.noaa.gov/>
- NOAA STAR JPSS  
<http://www.star.nesdis.noaa.gov/jpss/>
- NASA VIIRS Land  
<http://viirsland.gsfc.nasa.gov/>
- VIIRS Fire Evaluation and Data Portal  
<http://viirsfire.geog.umd.edu>
- STAR JPSS 2014 Annual Science Team Meeting  
[http://www.star.nesdis.noaa.gov/star/meeting\\_2014JPSSAnnual\\_agenda.php](http://www.star.nesdis.noaa.gov/star/meeting_2014JPSSAnnual_agenda.php)
- JGR-Atmospheres Special Issue Papers

# Suomi-NPP VIIRS Land Website: <http://viirsland.gsfc.nasa.gov/>

National Aeronautics and Space Administration  
Goddard Space Flight Center

Search NASA.gov GO  
Sciences and Exploration

Suomi NPP VIIRS Land

Visible Infrared Imaging Radiometer Suite

Home Products Validation People Tools Publications

Links

VIIRS Land Team

**Mission**

• VIIRS Special Annual Science Team Meeting: 12-16 May, 2014, College Park, MD. Land Breakout, Thursday (agenda).

• JGR Special Issue on Suomi NPP VIIRS Land Surface Temperature Satellite Results; see Land and atmosphere contributions by the VIIRS Science Team. Overview and Status. Visit our Publication page for more information (DOI) for a full list of VIIRS references.

• Global Global Vegetation Monitoring 2013. M. Desbois, C. D'Amato, P. Parrot des Papes, Angoulême, France.

• Land Product Validation & Evolution workshop, January 28-30, 2014, Frascati, Italy.

**VIIRS News**

• NPP Algorithm Maturity Matrix

• NOAA 2013 Satellite Conference for Decision Support and Operational Use: April 8-12 at NOAA Center for Weather and Climate Prediction.

• VIIRS Calibration Workshop 1/22/2013

• VIIRS Science Team HQ Review 1/23/2013

• VIIRS Active Fire Product BETA Release

**VIIRS Processing**

• VIIRS Land Prod/Launch Science

**Announcements**

The VIIRS sensor is a component of the Suomi National Polar-orbiting Partnership (NPP) satellite. The Joint Polar Satellite System (JPSS), a NOAA/NASA program, and the Defense Weather Satellite System, a U.S. Air Force program, were tasked with the next generation of polar-orbit environmental satellites for weather forecasting and climate monitoring. The measurement categories that Suomi NPP represents. These capabilities include atmospheric parameters such as clouds, radiation, temperature, humidity and ozone distribution, and surface parameters such as snow cover, vegetation index, ocean parameters such as sea surface temperature, chlorophyll, productivity, sea ice, surface wind fields and sea height, and solar parameters such as total solar irradiance.

Suomi NPP was launched at 5:48 a.m. EDT on Oct. 28, 2011, from Vandenberg Air Force Base in California, with 5 key instruments, including VIIRS (image at right).

VIIRS extends and improves upon a series of measurements initiated by its predecessors, the Advanced Very High Resolution Radiometer (AVHRR), and the Moderate Resolution Imaging Spectroradiometer (MODIS). VIIRS data is used to measure cloud and aerosol properties, ocean color, ocean and land surface temperature, ice movement and temperature, fires, and the Earth's albedo. Climatologists use VIIRS data to improve our understanding of global climate change.

**Mission**

• VIIRS Image Gallery (NOAA)

• CLIPS (NOAA)

**VIIRS Info**

• VIIRS QA

• NOAA RCC VIIRS

**VIIRS Browse Imagery**

• VIIRS Global AS3000 - IDPS

Launch of NPP satellite, Oct. 28, 2011

All the browses available for IDPS (AS3000), day 2012325:

VMAF\_L1C-D VIAE\_L1C-D CMIP\_L2C-D CMIP\_L2C-N VAMIP\_L2C VAOTIP\_L2C VCOPIP\_L2C-COT

SRPLMIP\_L2C SRPLIIP\_L2C VRVI\_L2C-EVI VRVI\_L2C-NDVI VLST\_L2C-D VLST\_L2C-N VSCD\_L2C

VICIP\_L2C VSIC\_L2C

File Name: NPP\_VLST\_L2.A2012097.1835.P1\_03001.201210030200.hdf  
NPP\_VLST\_L2(Land Surface Temperature-Daytime)  
DOY 2012097, IDPS (AS3000)

## VIIRS Global Browse

ce IP, Moderate), day 2012325 (11/20/2012), IDPS (AS3000)

Please zoom in. Go To Day: 2012325 Submit

View: LPA (AS3002) 24 km Browse 6 km Browse Orbit

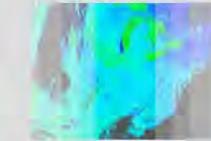


### Detailed Description

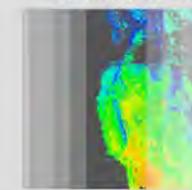
Color Key Case pending Case closed Case reopened OA note

Case #:PM\_NPP\_VLST\_12122 Opening date: 05/01/12 Last update: 08/15/12  
Status: Closed

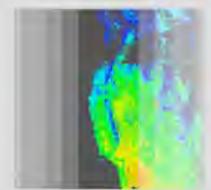
The VIIRS NPP\_VLST\_L2 Land Surface Temperature product reports incorrect high temperatures over inland water bodies. This issue is observed in both the IDPS and Land PEATE archive. The images below show two examples in IDPS and LPEATE where inland water bodies report incorrect high temperatures. The first and second images below show a LST granule over North America, where the Great Lakes report a high temperature of 310K (98F) on DOY 2012.097. The third and fourth images show the Western coast of North America, and the inland water bodies such as the the Salton Sea in Southern California, which is smaller and shallower than the Great Lakes. The Salton Sea reports a temperature of 340K (152F).



NPP\_VLST\_L2.A2012097.1835.P1\_03001.201210030200.hdf  
NPP\_VLST\_L2(Land Surface Temperature-Daytime)  
DOY 2012097, LPEATE (AS3000)



NPP\_VLST\_L2\_A2012111.2055.AGG.03000.20121112180045.hdf  
NPP\_VLST\_L2(Land Surface Temperature-Daytime)  
DOY 2012111, IDPS (AS3000)



NPP\_VLST\_L2\_A2012111.2055.P1\_03001.20121114104917.hdf  
NPP\_VLST\_L2(Land Surface Temperature-Daytime)  
DOY 2012111, LPEATE (AS3000)



Note: This issue has been fixed in Mx6.2 put into operation at IDPS starting data day 2012223 (8/10/2012)

NASA's Land PEATE (Product Evaluation and Analysis Tool Element):  
Meeting the needs of the Suomi-NPP Science Team and helping the NOAA IDPS.

# Next Steps

- Continue to develop and enhance the IDPS generated products and NDE
  - New Level 1 requirements for TOC VI and full Active Fire mask and FRP
  - Proving ground for new ‘applications; products
- Form NASA VIIRS Land Science Team
  - Land SIPS = Land PEATE
  - SR, BRDF VI, LAI, Snow/Ice, Fire, Burned Area, Phenology, Ag Applications
  - Establish process for ATBD review
  - Move quickly to develop and distribute NASA VIIRS products
- Start to develop the NASA VIIRS Product Suite with an emphasis on MODIS Continuity
- Continue to liaise with NOAA / STAR concerning transition of improvements into the operational chain