



NEW BIOMASS BURNING OBSERVING CAPABILITIES FROM SUOMI NPP VIIRS FOR CONTINUING REGIONAL FIRE MONITORING IN NORTHERN EURASIA

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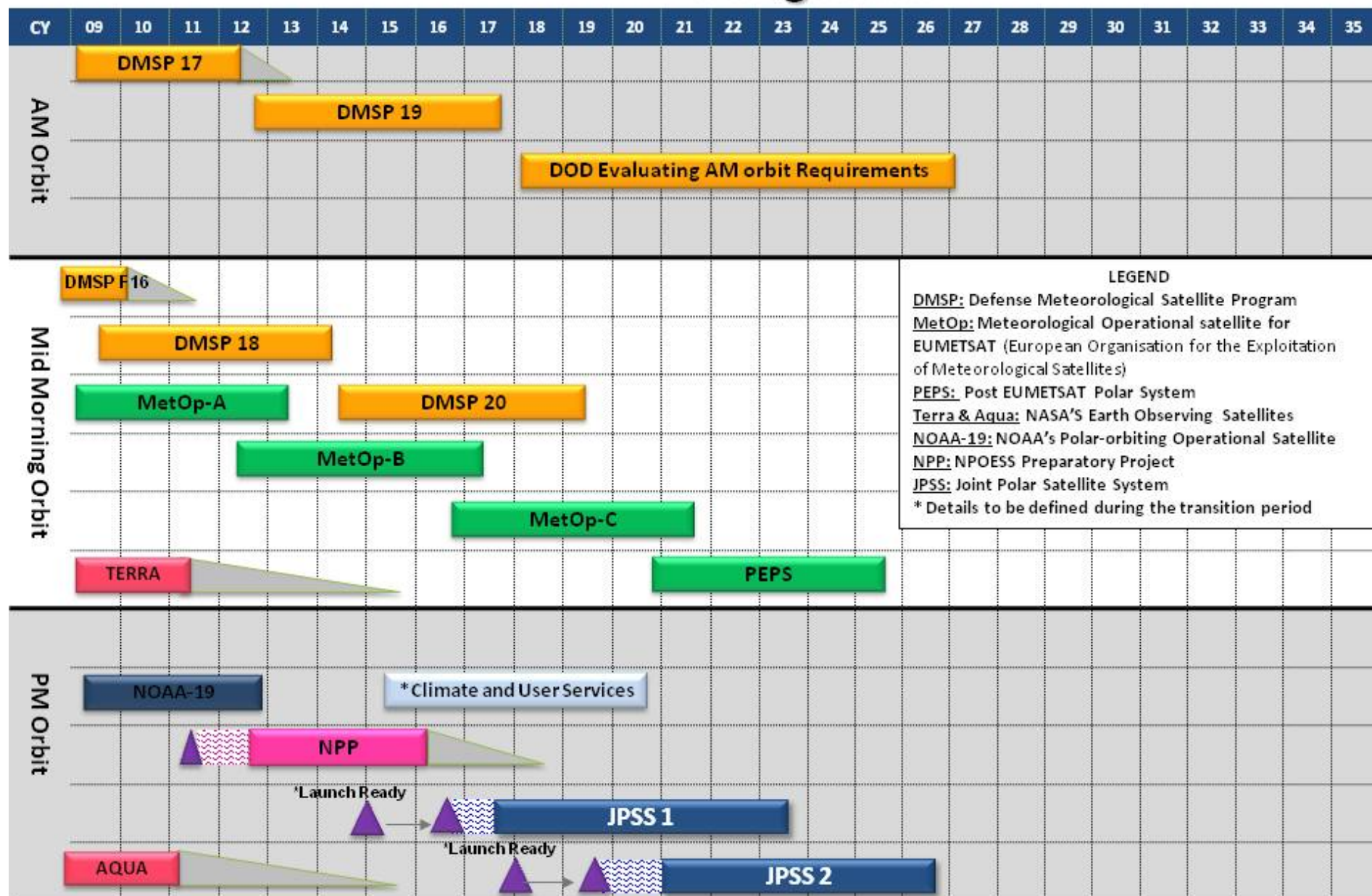
This work was supported by the NOAA JPSS and NASA Suomi NPP programs

Outline

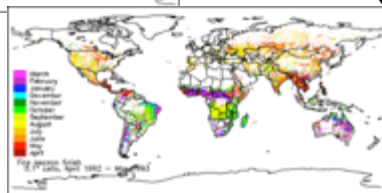
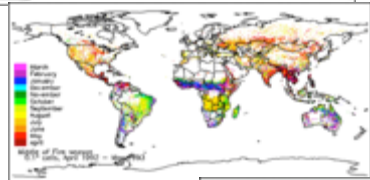
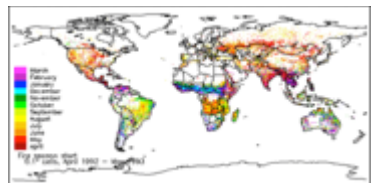
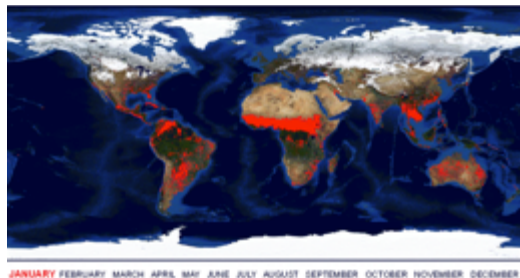
- **The Suomi NPP satellite**
- **Fundamental Suomi NPP VIIRS sensor characteristics related to fire detection**
- **Examples of Suomi NPP VIIRS fire data**
- **Product status**
- **Data continuity with MODIS**
- **Conclusions**



Continuity of Polar Operational Satellite Programs



THE GLOBAL FIRE PRODUCT (1992-93)



bioval.jrc.ec.europa.eu/

AVHRR global analyses
AVHRR production

1980s

1990s

GOES production

MODIS validation
MODIS production

MODIS CMG
2000s

GCOS Fire ECV
GOFC-GOLD Fire

NPP VIIRS

JPSS VIIRS

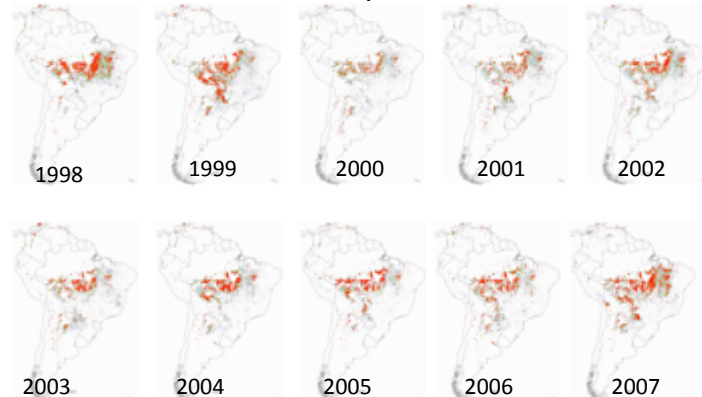
2010s

PRESENT

GOES-R ABI

GOES reprocessing

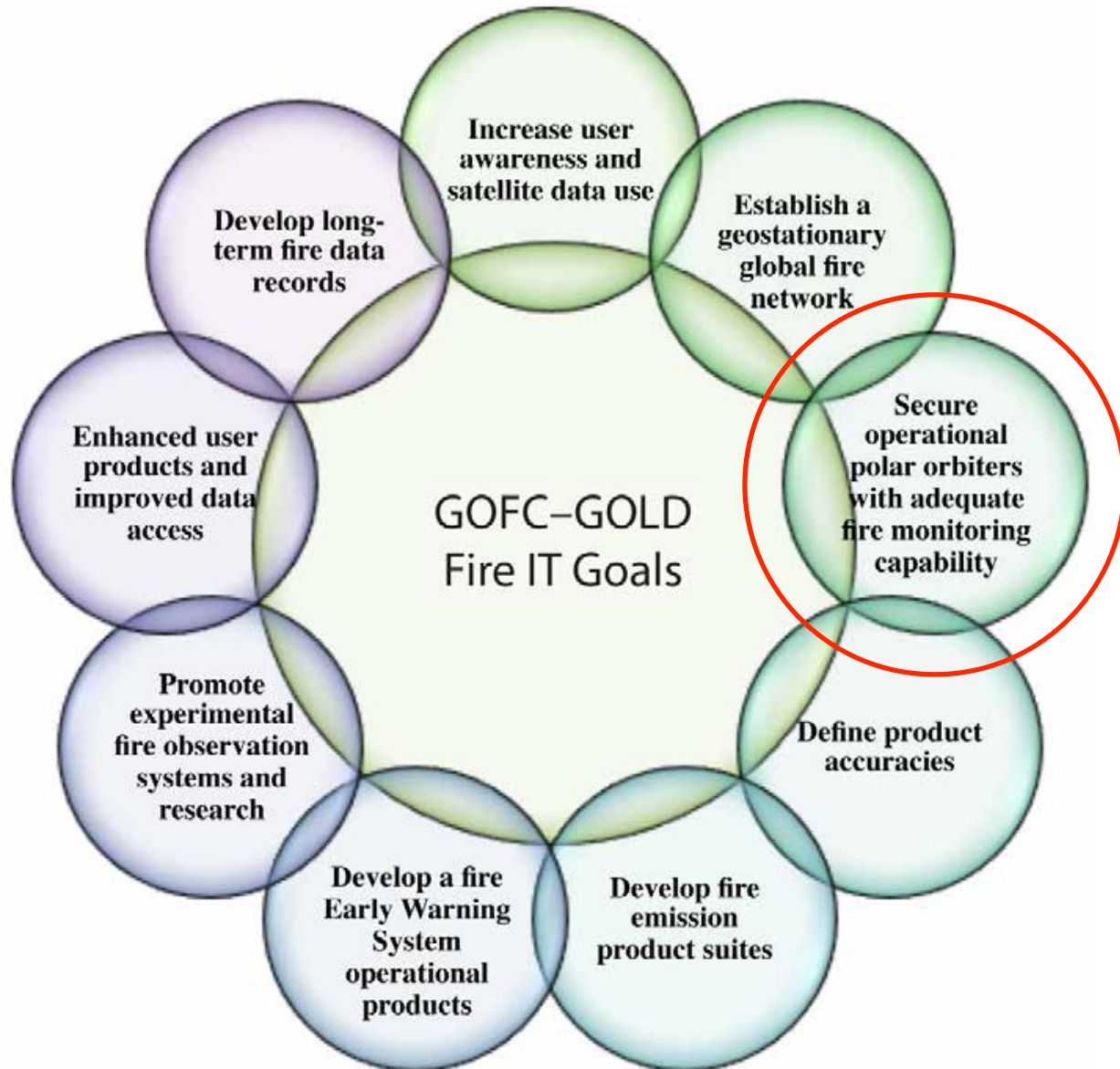
Fraction of GOES clear-sky observations with fire



0

0.05%

Global Observation of Forest and Landcover Dynamics (GOFC-GOLD)



Fire Mapping and Monitoring is of the three thematic areas of GOFC-GOLD.



Suomi NPP (National Polar-orbiting Partnership) Earth-Observing Mission

Suomi NPP provides data continuity for NASA, and NOAA, and risk reduction for JPSS instruments, algorithms, ground system, and archive.

Suomi NPP will continue critical climate and weather data from polar orbit:

NASA EOS

AIRS > CrIS
AMSU > ATMS
MODIS > VIIRS
OMI > OMPS
CERES > CERES

NOAA POES

HIRS > CrIS
AMSU > ATMS
AVHRR > VIIRS
SBUV2 > OMPS

Anticipated Benefits

Tracking Our Changing Climate (measurements to understand climate and the health of our planet)

A Vigilant Eye on Ozone (daily measurements to assess recovery of the ozone layer)

A Sentinel When Disaster Strikes (wildfires, volcanic eruptions, snowstorms, droughts, floods, hurricanes)

Watching the Weather (soundings of atmospheric temperature and moisture, cloud cover)

Suomi NPP Instruments

- Visible Infrared Imaging Radiometer Suite (VIIRS)
- Cross-track Infrared Sounder (CrIS)
- Advanced Technology Microwave Sounder (ATMS)
- Ozone Mapping and Profiler Suite (OMPS), and
- Clouds and the Earth's Radiant Energy System (CERES)

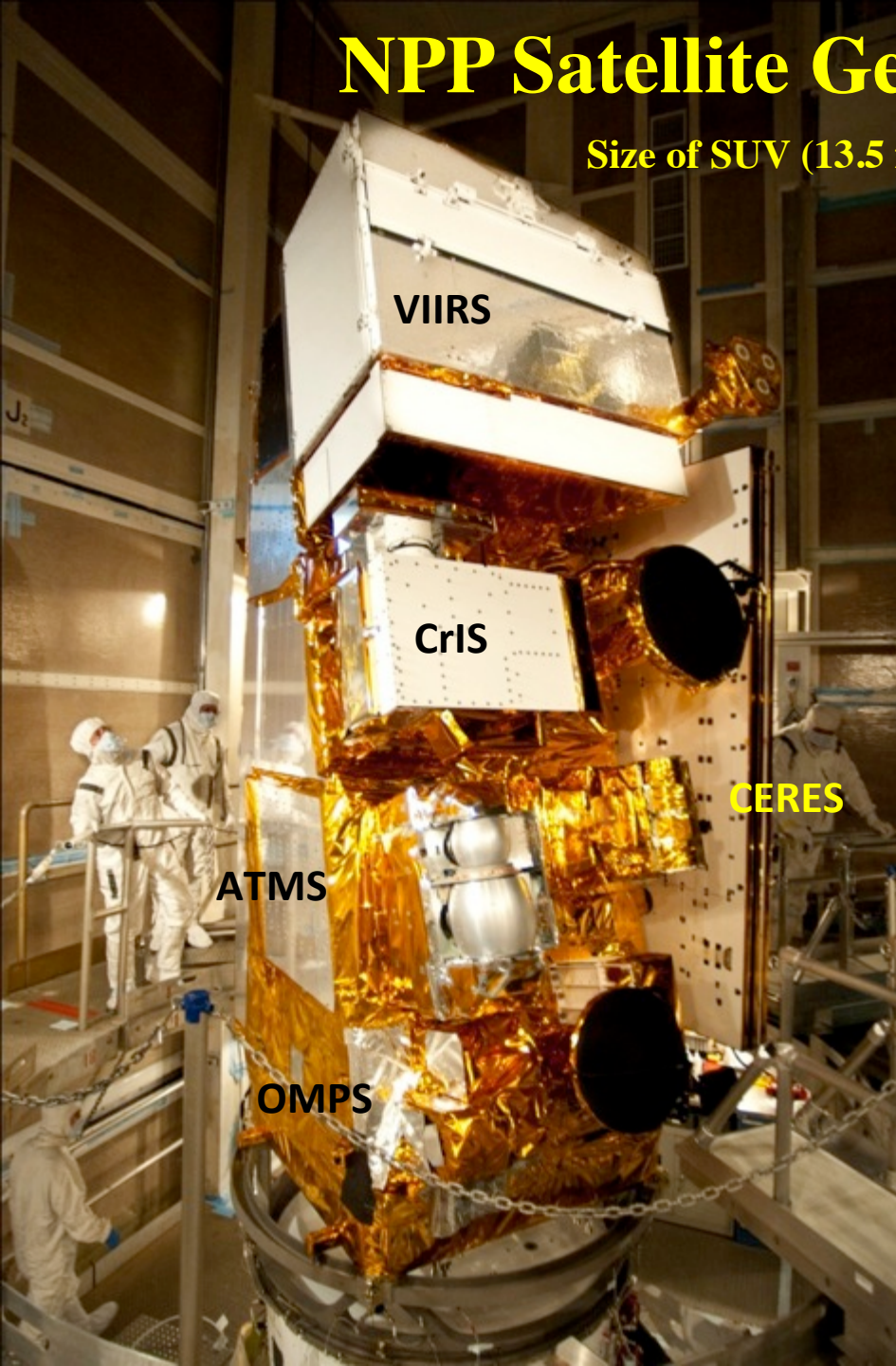
→ Only CERES has flown in space before, the other four instruments are new designs.



Launch: October 28, 2011

NPP Satellite Getting Ready for Launch

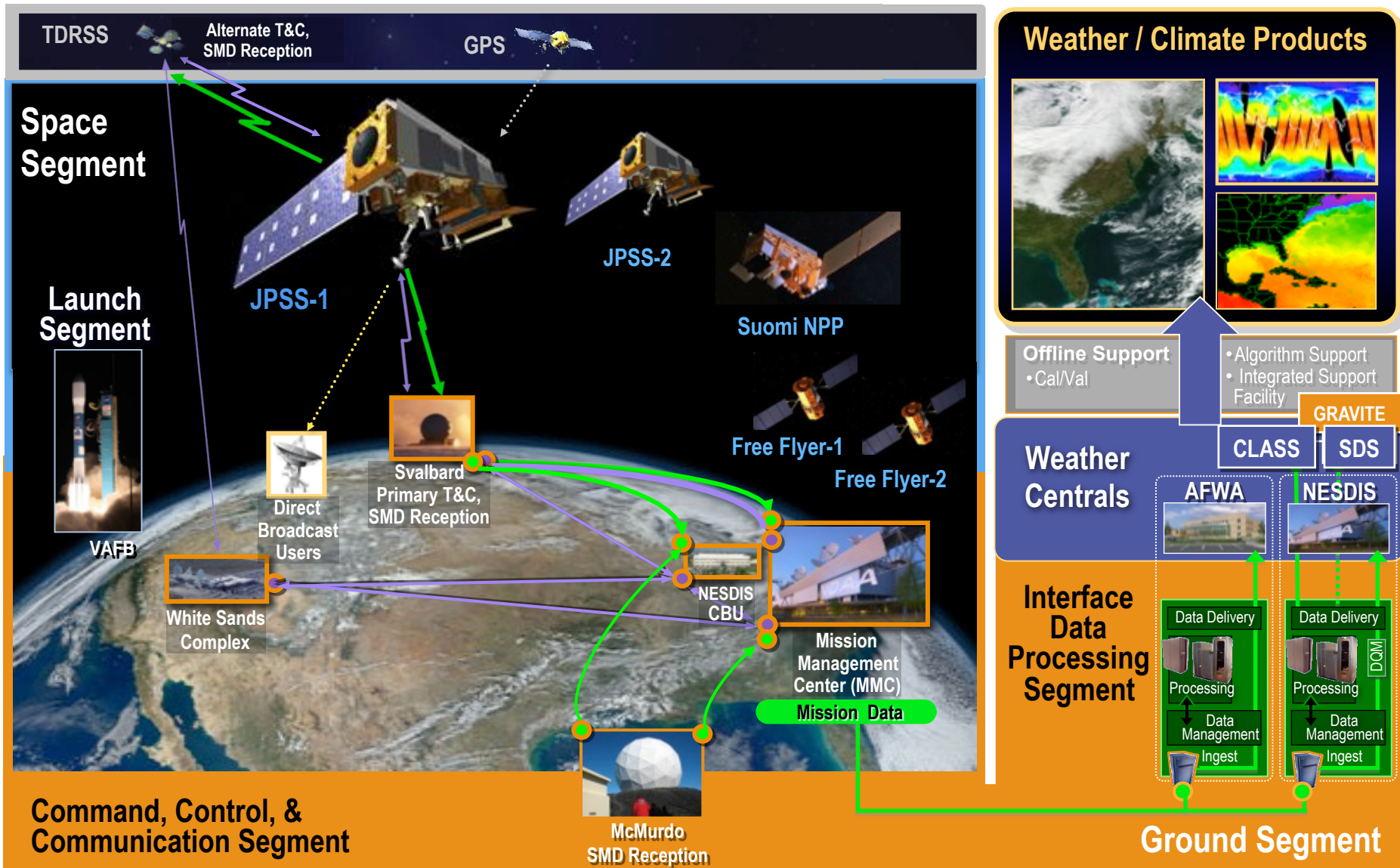
Size of SUV (13.5 ft tall & 4,500 lbs); 512 mile orbit



Suomi NPP Launch: October 28, 2011

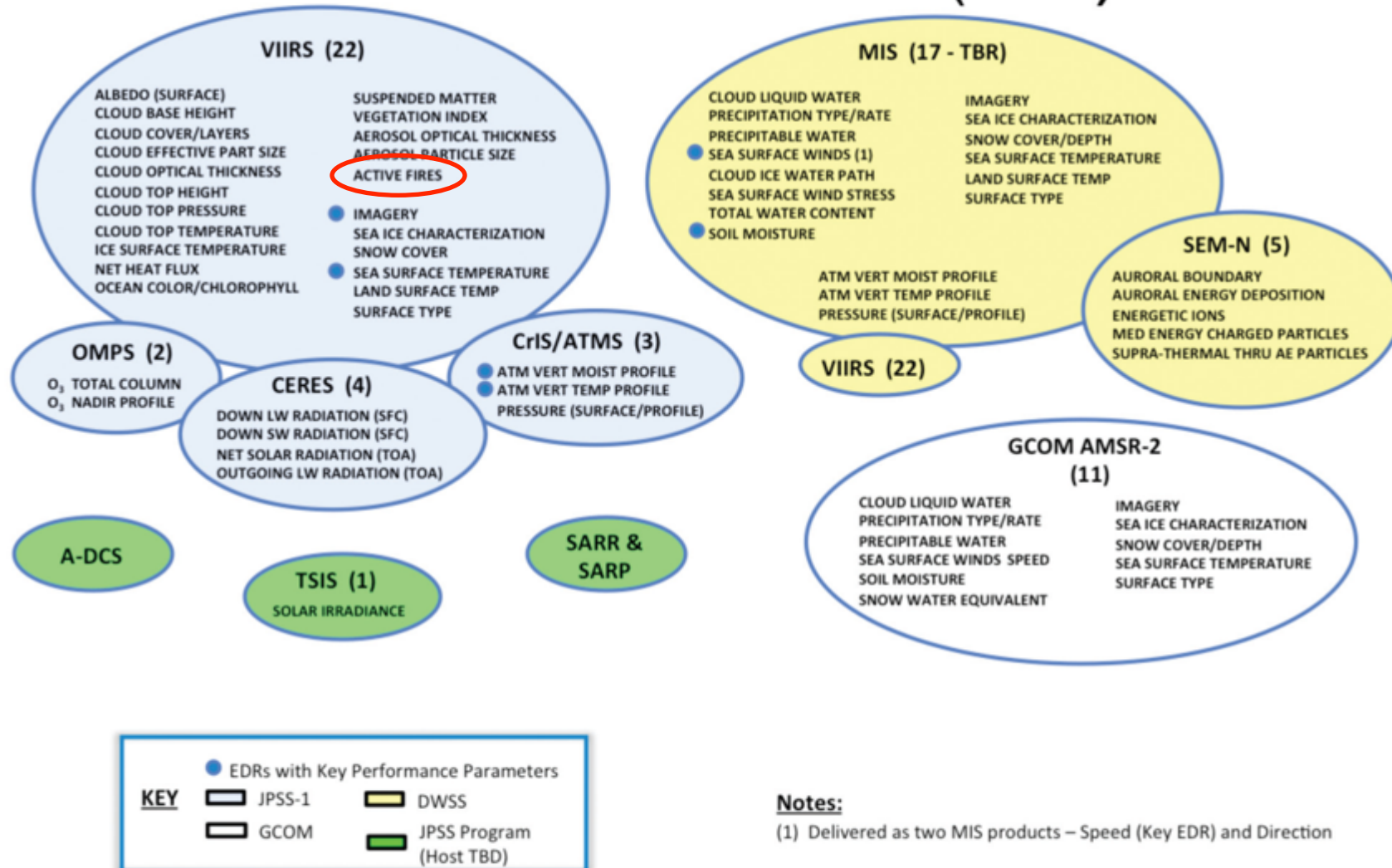


Joint Polar Satellite System High Level Overview





JPSS L1RD Defined Environmental Data Records (EDRs)

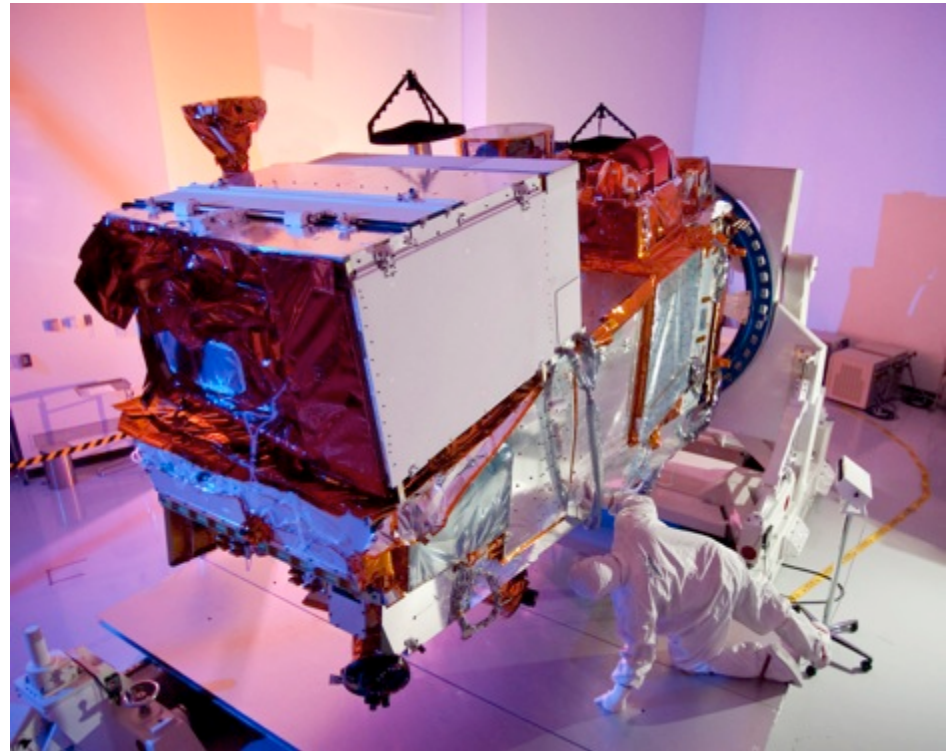


SUOMI NPP VIIRS AND FIRE MONITORING

- NPP (Suomi National Polar-orbiting Partnership) was **launched** on October 28, 2011)
- The Visible Infrared Imager Radiometer Suite (VIIRS) sensor was developed to allow for the **detection and characterization of hot targets**
- The community expects and **society needs** the continuation of these high quality observations from VIIRS on NPP (launched on October 28, 2011) and future JPSS satellites

Visible Infrared Imaging Radiometer Suite

- **Purpose:**
Global observations of land, ocean, and atmosphere parameters at high temporal resolution ($\sim$ daily)
- **Predecessor Instruments:**
AVHRR, OLS, MODIS, SeaWiFS
- **Approach:**
Multi-spectral scanning radiometer
(22 bands between $0.4\mu\text{m}$ and $12\mu\text{m}$)
12-bit quantization
- **Swath width:**
3000 km



Spatial Resolution

- 16 bands at 750m
- 5 bands at 325m
- DNB

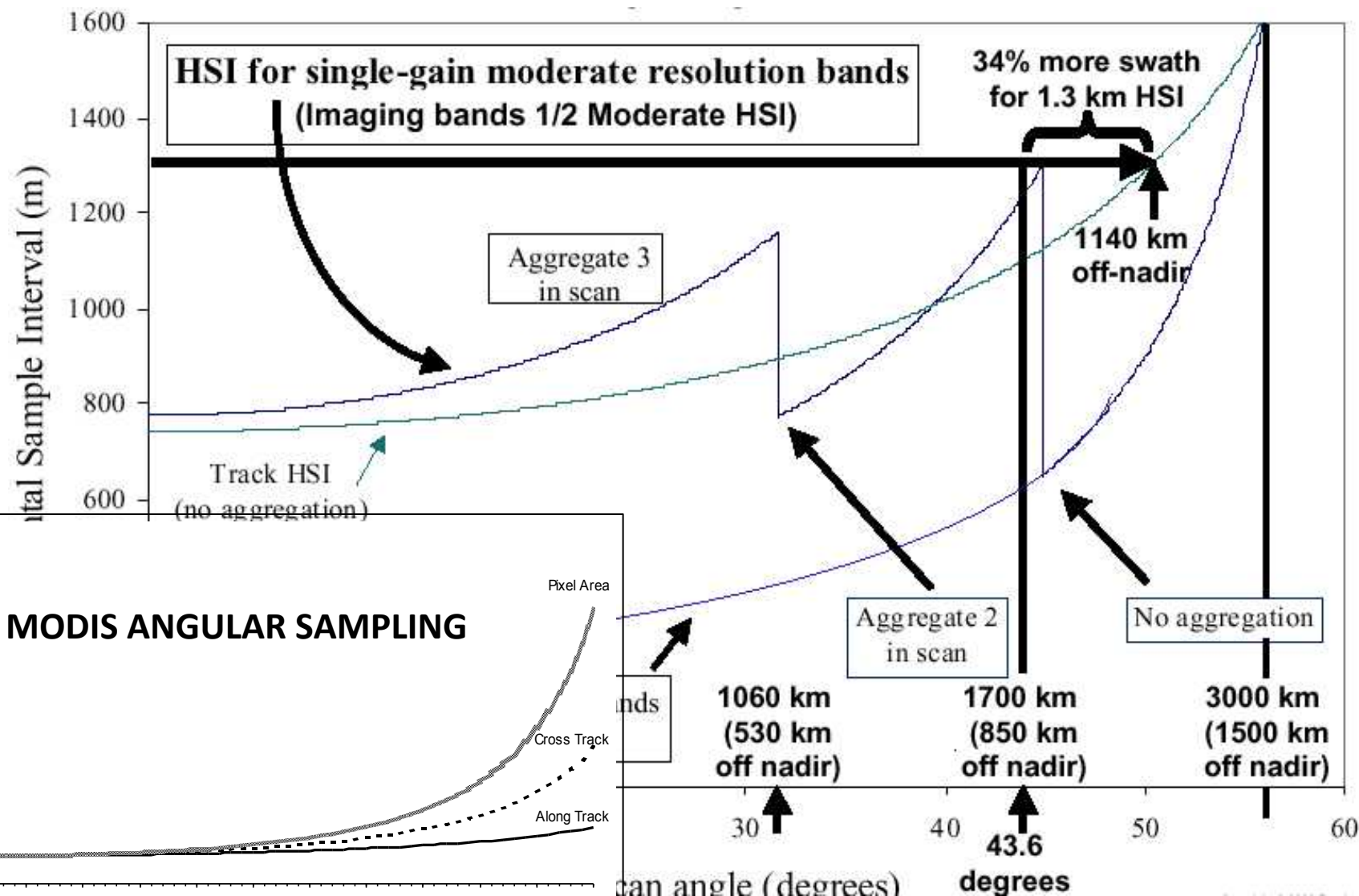
VIIRS: Visible Infrared Imager Radiometer Suite

		Band No.	Wave-length (μm)	Horiz Sample Interval (km Downtrack x Crosstrack)		Driving EDRs	Radiance Range	Ltyp or Ttyp
				Nadir	End of Scan			
VIS/NIR FPA	Silicon PIN Diodes	M1	0.412	0.742 x 0.259	1.60 x 1.58	Ocean Color Aerosols	Low High	44.9 155
		M2	0.445	0.742 x 0.259	1.60 x 1.58	Ocean Color Aerosols	Low High	40 146
		M3	0.488	0.742 x 0.259	1.60 x 1.58	Ocean Color Aerosols	Low High	32 123
		M4	0.555	0.742 x 0.259	1.60 x 1.58	Ocean Color Aerosols	Low High	21 90
		I1	0.640	0.371 x 0.387	0.80 x 0.789	Imagery	Single	22
		M5	0.672	0.742 x 0.259	1.60 x 1.58	Ocean Color Aerosols	Low High	10 68
		M6	0.746	0.742 x 0.776	1.60 x 1.58	Atmospheric Corr'n	Single	9.6
		I2	0.865	0.371 x 0.387	0.80 x 0.789	NDVI	Single	25
		M7	0.865	0.742 x 0.259	1.60 x 1.58	Ocean Color Aerosols	Low High	6.4 33.4
CCD	DNB	0.7	0.742 x 0.742	0.742 x 0.742	Imagery	Var.	6.70E-05	
S/MWIR	PV HgCdTe (HCT)	M8	1.24	0.742 x 0.776	1.60 x 1.58	Cloud Particle Size	Single	5.4
		M9	1.378	0.742 x 0.776	1.60 x 1.58	Cirrus/Cloud Cover	Single	6
		I3	1.61	0.371 x 0.387	0.80 x 0.789	Binary Snow Map	Single	7.3
		M10	1.61	0.742 x 0.776	1.60 x 1.58	Snow Fraction	Single	7.3
		M11	2.25	0.742 x 0.776	1.60 x 1.58	Clouds	Single	0.12
		I4	3.74	0.371 x 0.387	0.80 x 0.789	Imagery Clouds	Single	270 K
		M12	3.70	0.742 x 0.776	1.60 x 1.58	SST	Single	270 K
		M13	4.05	0.742 x 0.259	1.60 x 1.58	SST Fires	Low High	300 K 380 K
LWIR	PV HCT	M14	8.55	0.742 x 0.776	1.60 x 1.58	Cloud Top Properties	Single	270 K
		M15	10.763	0.742 x 0.776	1.60 x 1.58	SST	Single	300 K
		I5	11.450	0.371 x 0.387	0.80 x 0.789	Cloud Imagery	Single	210 K
		M16	12.013	0.742 x 0.776	1.60 x 1.58	SST	Single	300 K

VIIRS Heritage: MODIS and AVHRR

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								HRD PMT	0.580 - 0.910 0.510 - 0.860	550 2700
M1	0.402 - 0.422	750	8	0.405 - 0.420	1000						
M2	0.436 - 0.454	750	9	0.438 - 0.448	1000						
M3	0.478 - 0.498	750	3	0.459 - 0.479	500						
			10	0.483 - 0.493	1000						
M4	0.545 - 0.565	750	4	0.545 - 0.565	500						
			12	0.546 - 0.556	1000						
I1	0.600 - 0.680	375	1	0.620 - 0.670	250	1	0.572 - 0.703	1100			
M5	0.662 - 0.682	750	13	0.662 - 0.672	1000	1	0.572 - 0.703	1100			
			14	0.673 - 0.683	1000						
M6	0.739 - 0.754	750	15	0.743 - 0.753	1000						
I2	0.846 - 0.885	375	2	0.841 - 0.876	250	2	0.720 - 1.000	1100			
M7	0.846 - 0.885	750	16	0.862 - 0.877	1000	2	0.720 - 1.000	1100			
M8	1.230 - 1.250	750	5	SAME	500						
M9	1.371 - 1.386	750	26	1.360 - 1.390	1000						
I3	1.580 - 1.640	375	6	1.628 - 1.652	500						
M10	1.580 - 1.640	750	6	1.628 - 1.652	500	3a	SAME	1100			
M11	2.225 - 2.275	750	7	2.105 - 2.155	500						
I4	3.550 - 3.930	375	20	3.660 - 3.840	1000	3b	SAME	1100			
M12	3.660 - 3.840	750	20	SAME	1000	3b	3.550 - 3.930	1100			
M13	3.973 - 4.128	750	21	3.929 - 3.989	1000						
			22	3.929 - 3.989	1000						
			23	4.020 - 4.080	1000						
M14	8.400 - 8.700	750	29	SAME	1000						
M15	10.263 - 11.263	750	31	10.780 - 11.280	1000	4	10.300 - 11.300	1100			
I5	10.500 - 12.400	375	31	10.780 - 11.280	1000	4	10.300 - 11.300	1100	HRD	10.300 - 12.900	550
			32	11.770 - 12.270	1000	5	11.500 - 12.500	1100			
M16	11.538 - 12.488	750	32	11.770 - 12.270	1000	5	11.500 - 12.500	1100			

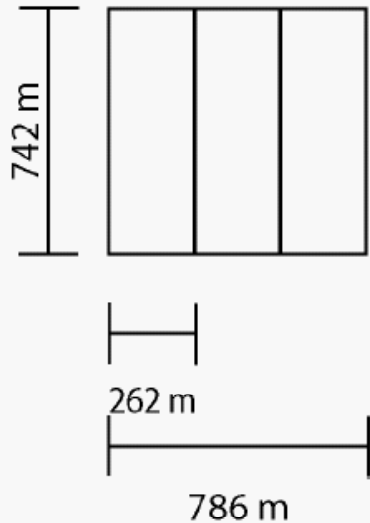
VIIRS Detector Aggregation Scheme



VIIRS Detector Aggregation Scheme

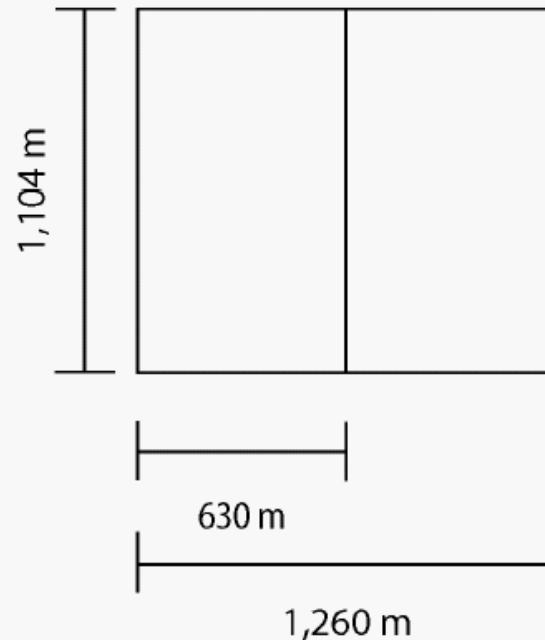
Nadir

Aggregate 3 Samples
SNR $\sim \sqrt{3}$ X Baseline



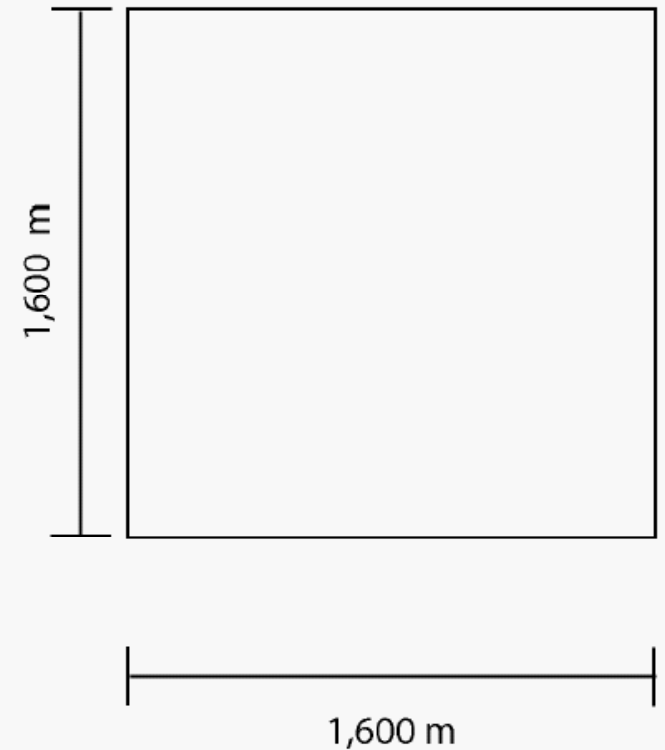
± 850 Km

Aggregate 2 Samples
SNR $\sim \sqrt{2}$ X Baseline



$\pm 1,500$ Km

No Aggregation
SNR = Baseline

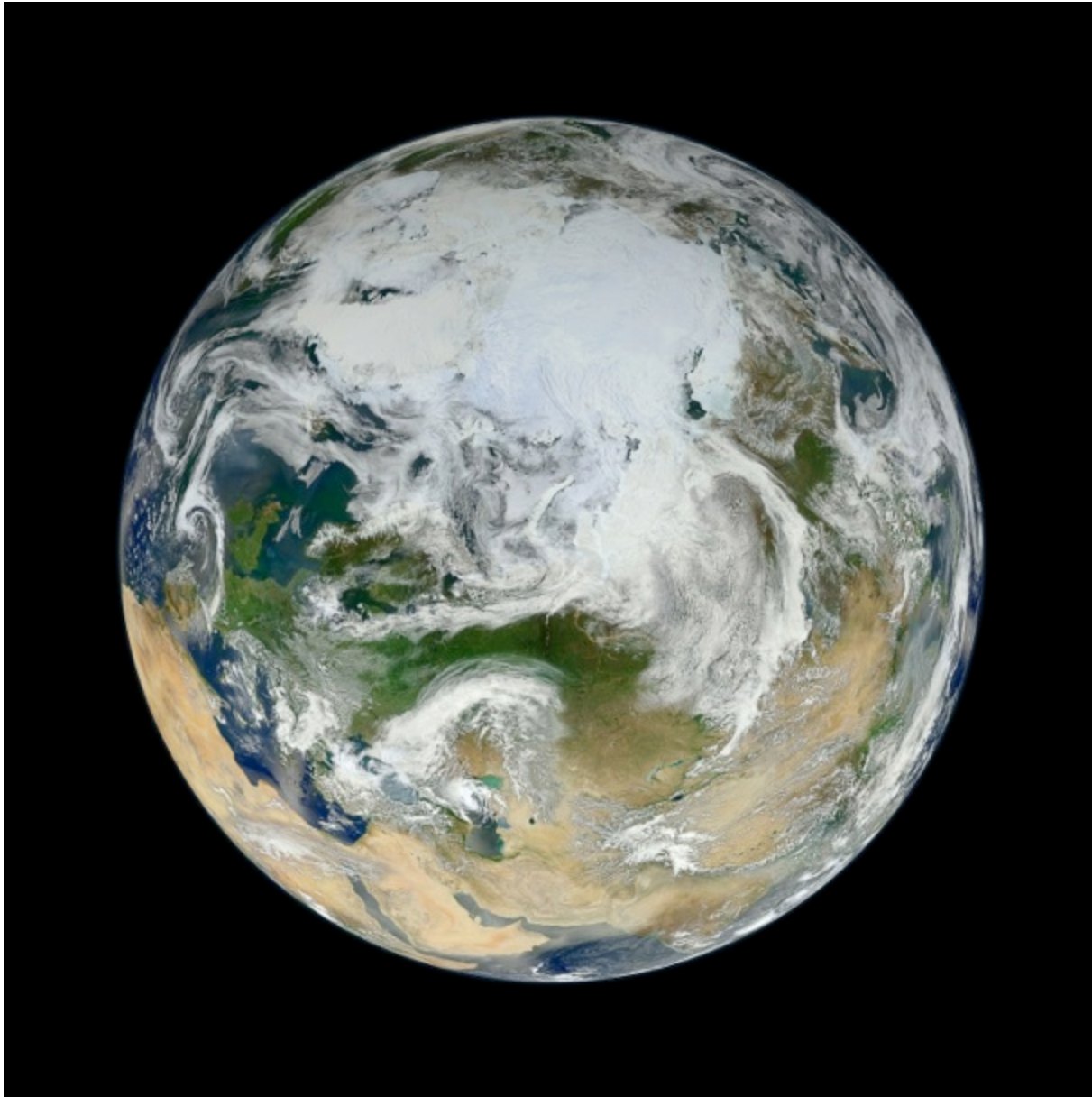


VIIRS GLOBAL COMPOISITE IMAGE



***NO GAPS AT LOW LATITUDES; MORE OVERLAPS AT HIGH LATITUDES;
REDUCED PIXEL DEGRADATION***

VIIRS BLUE MARBLE

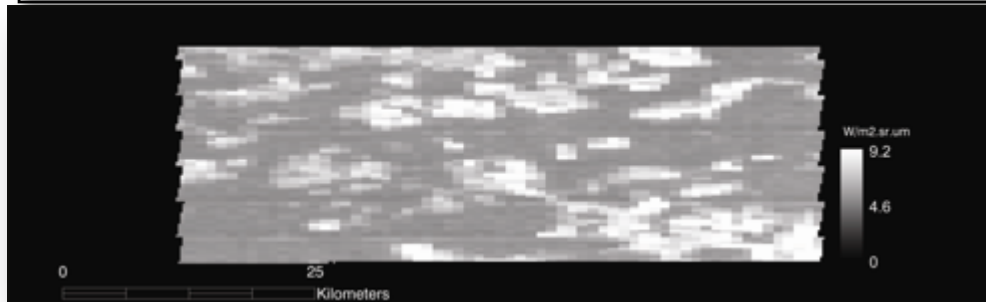
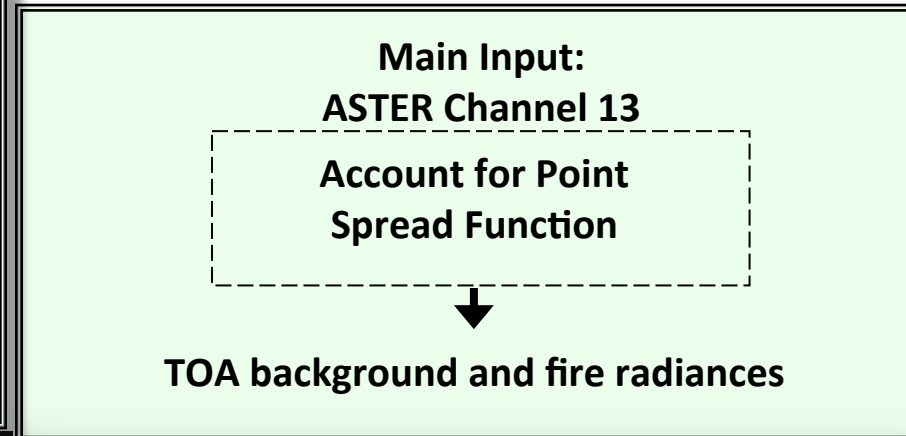
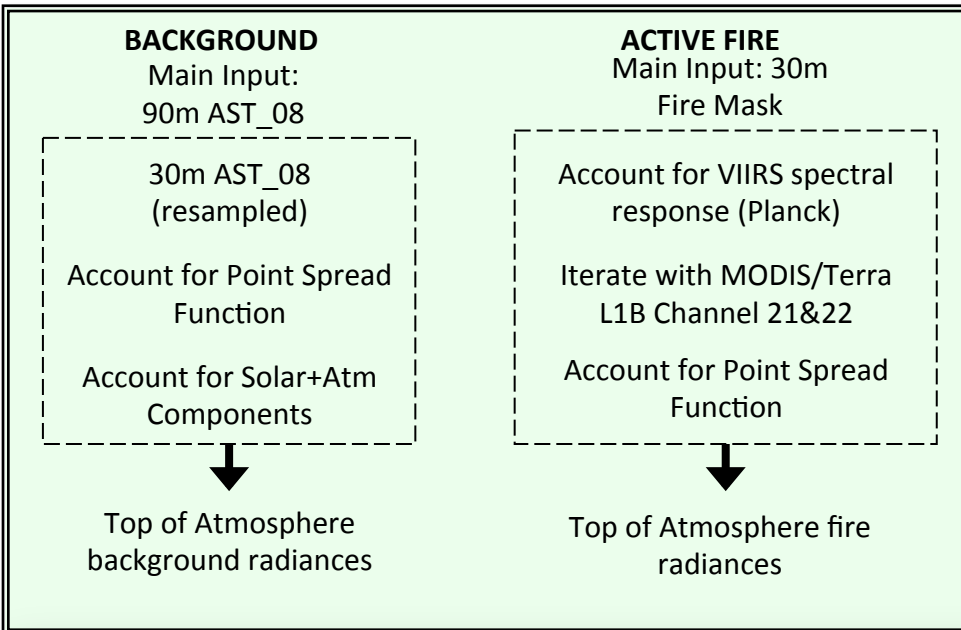


earthobservatory.nasa.gov

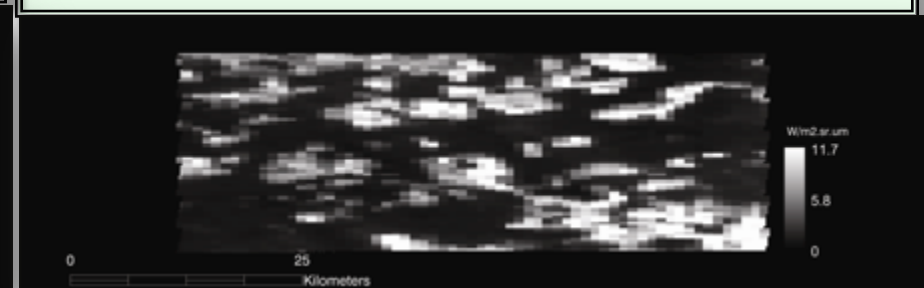
Image by Norman Kuring, NASA/GSFC/Suomi NPP. Caption by Michael Carlowicz.

Fires: pre-launch product evaluation

- Theoretical simulations
- *Evaluate effects of sensor design*
- *Estimate of expected product performance*
- Use of MODIS as proxy
- *Test of algorithm and processing chain*



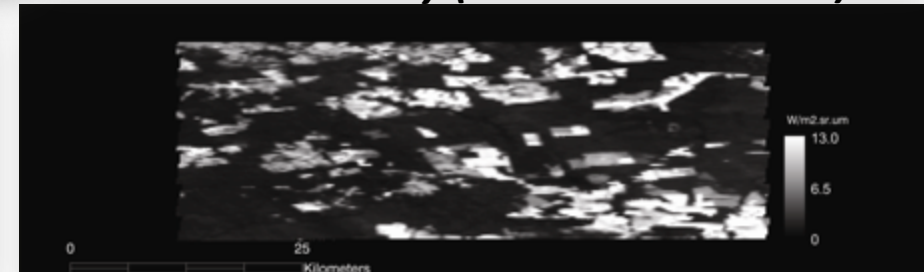
VIIRS M13 Proxy (MODIS Channel 21)



VIIRS M15 Proxy (MODIS channel 31)



Simulated VIIRS M13

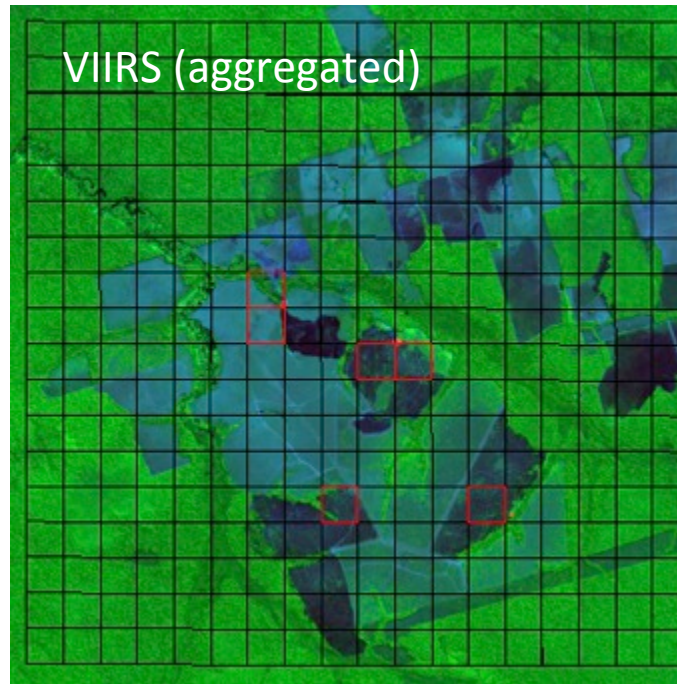
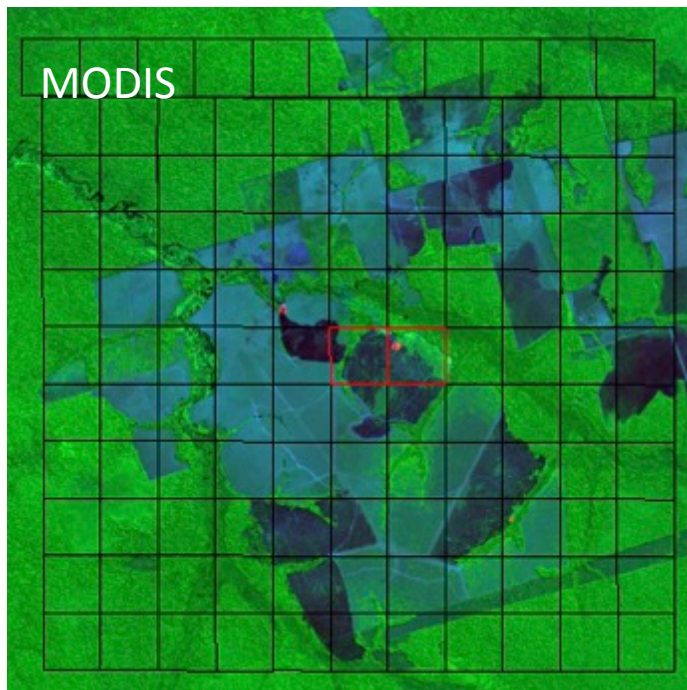


Simulated VIIRS M15

MODIS and VIIRS fire detections at nadir: modeling

VIIRS spatial resolution is higher than that of MODIS; in general, VIIRS is expected to detect smaller fires at nadir

(based on modeling using ASTER fire masks)

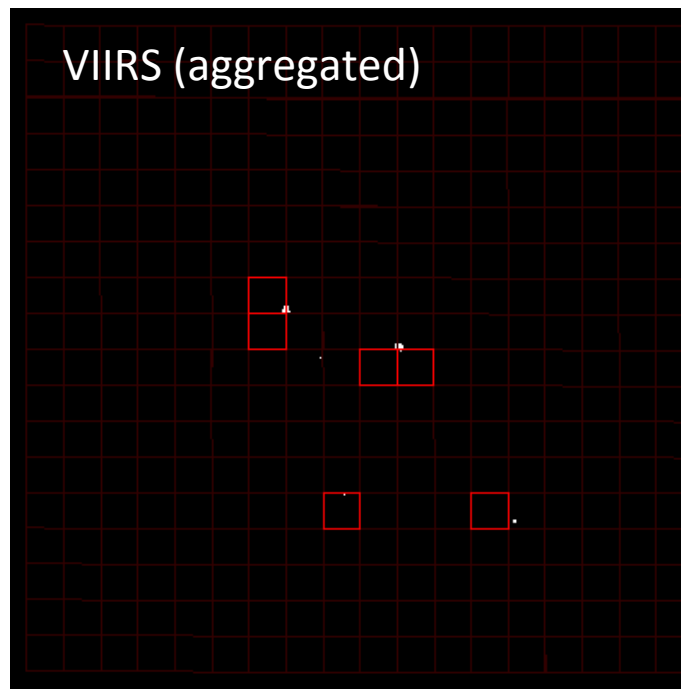
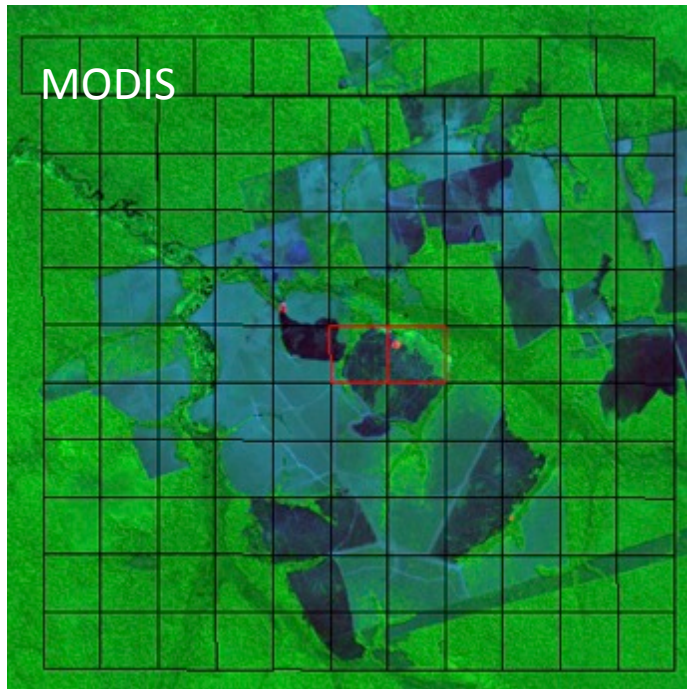


7 Aug 2004 1405 UTC
~11.7° S 56.6° W
(Brazil)

MODIS and VIIRS fire detections at nadir: modeling

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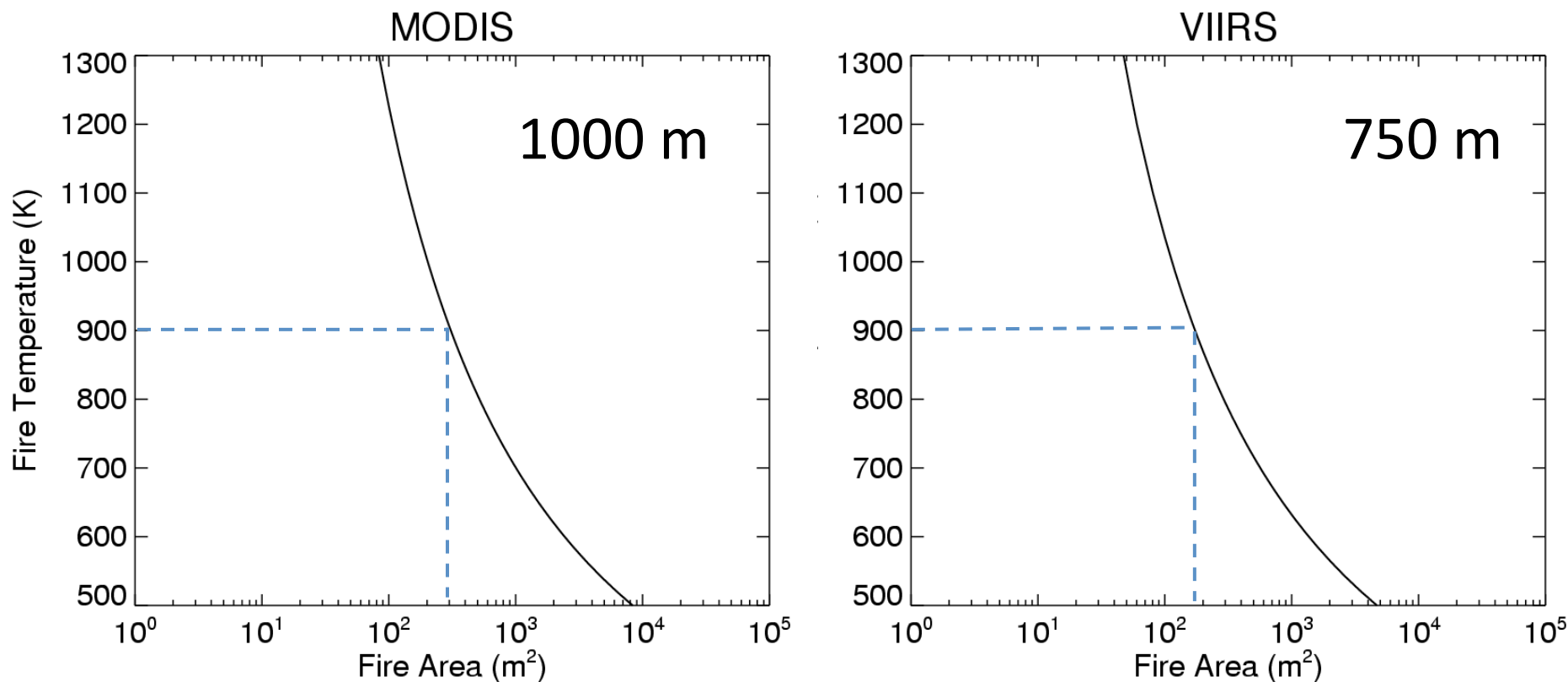
(based on modeling using ASTER fire masks)



7 Aug 2004 1405 UTC
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(Brazil)

MODIS and VIIRS fire detections at nadir: modeling

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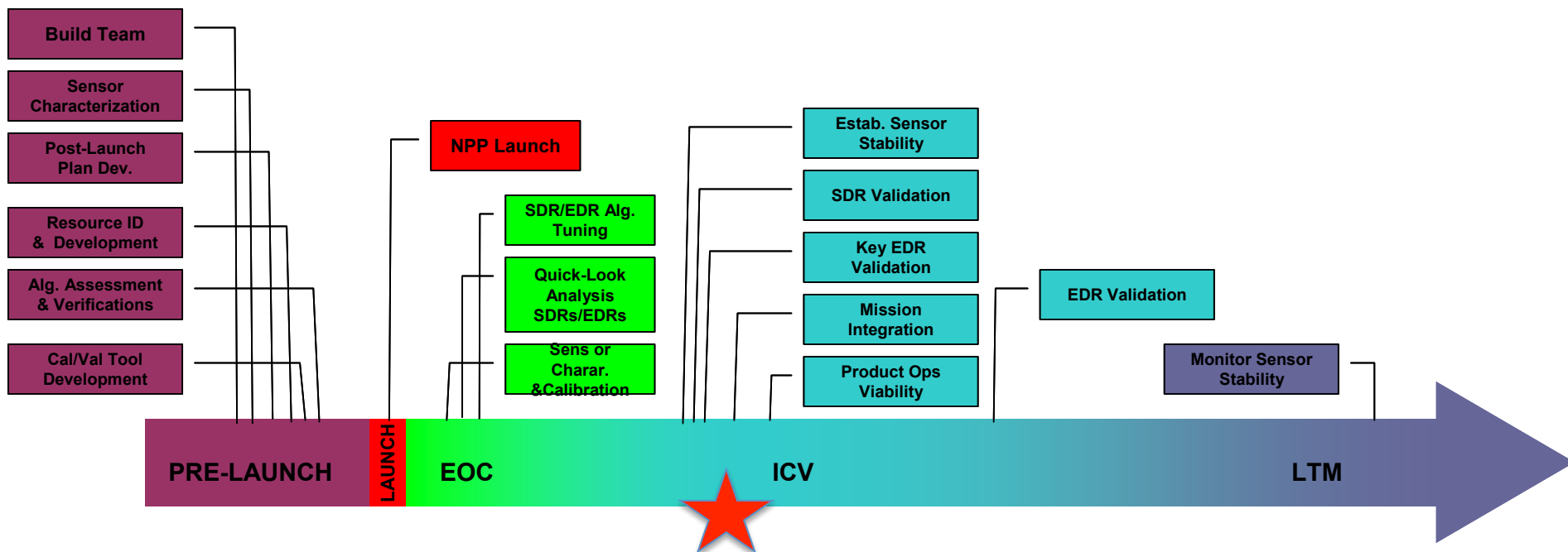


90% probability of detection; boreal forest; nadir view

Cal/Val Phase Activities Defined for Each Product

Four Phases of Cal/Val:

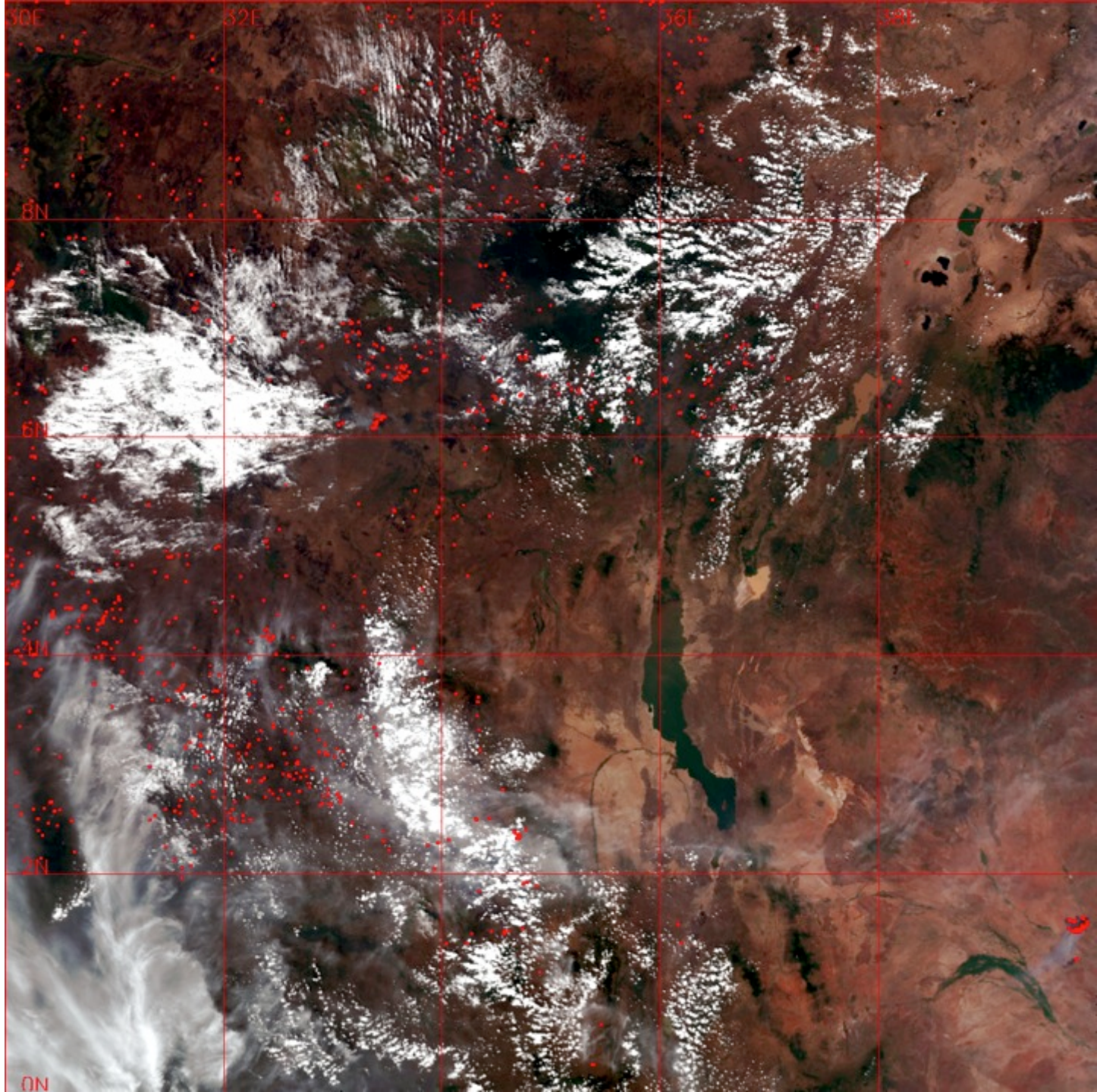
1. Pre-Launch; all time prior to launch – Algorithm verification, sensor testing, and validation preparation
2. Early Orbit Check-out (first 30-90 days) – System Calibration & Characterization
3. Intensive Cal/Val (ICV); extending to approximately 24 months post-launch – xDR Validation
4. Long-Term Monitoring (LTM); through life of sensors



First light NPP VIIRS fire data

***M5-M4-M3 RGB
+
IDPS Active Fire ARP***

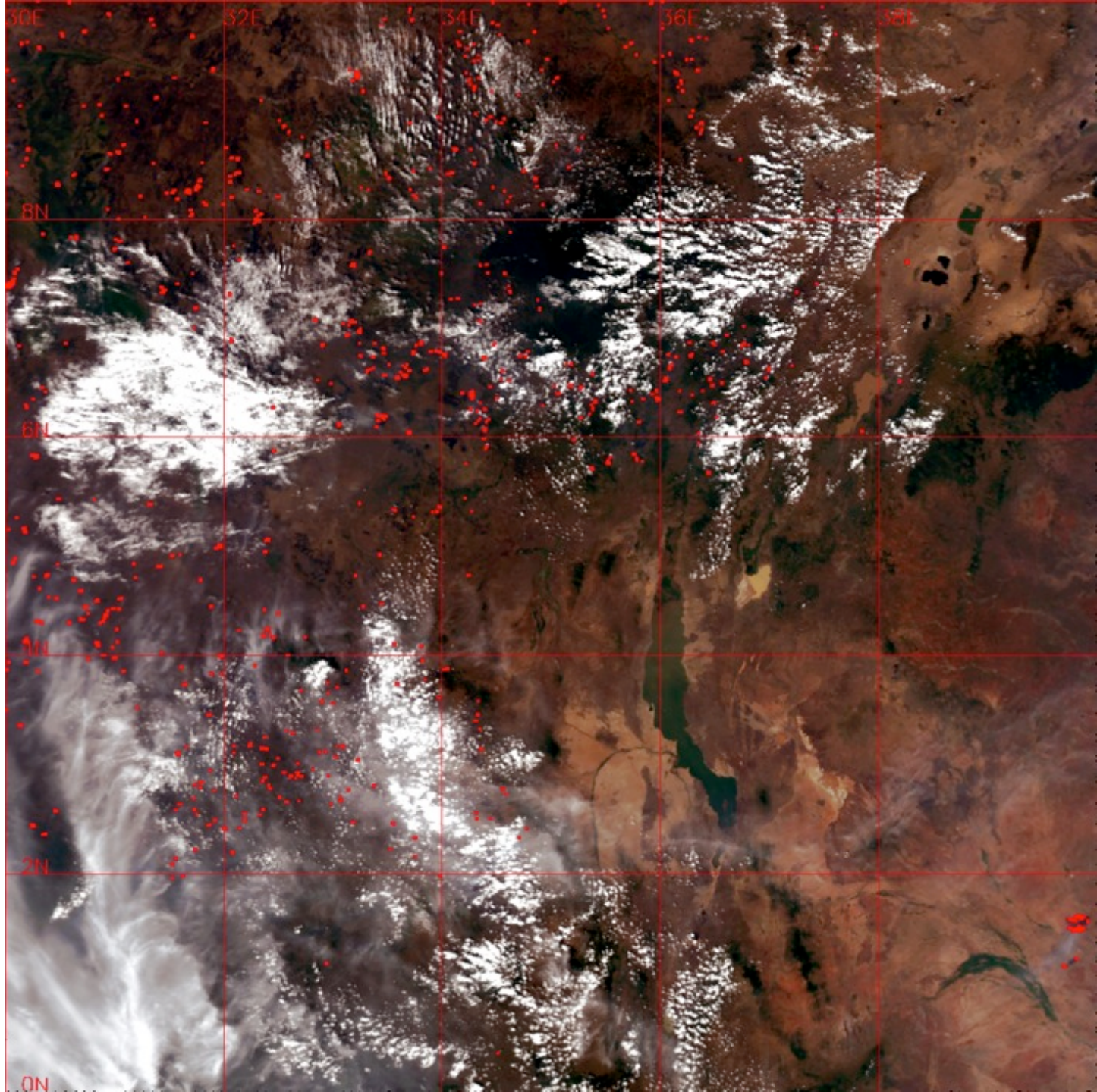
January 19, 2012
~11:05 UTC



...followed
by Aqua
MODIS five
minutes
later

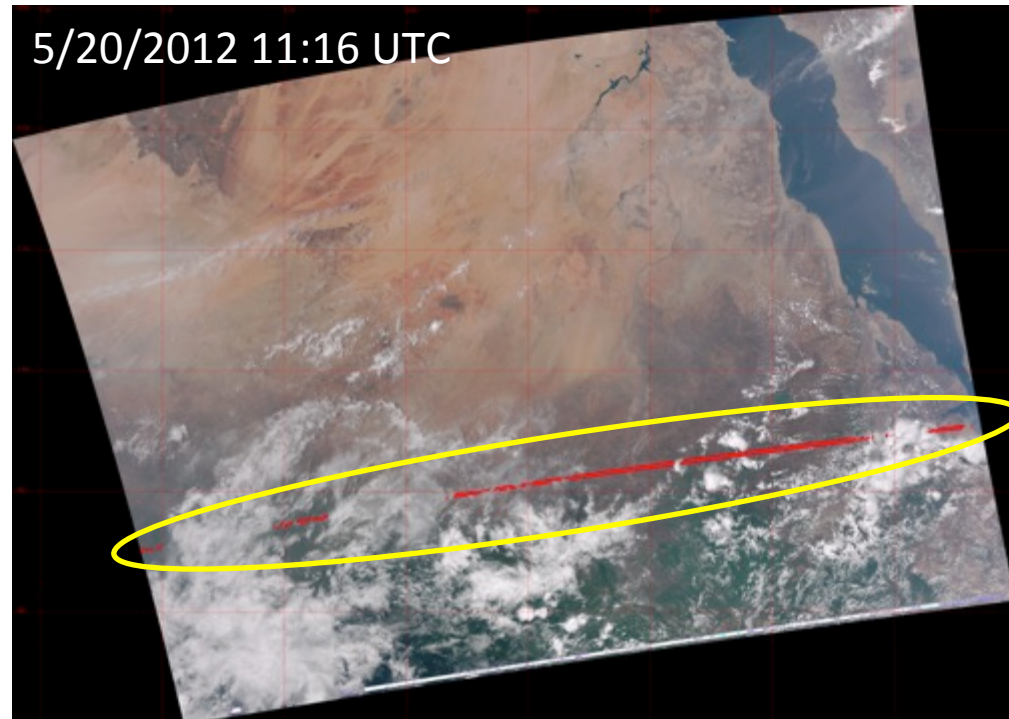
*Band 1-4-3 RGB
+
MYD14*

January 19, 2012
~11:05 UTC

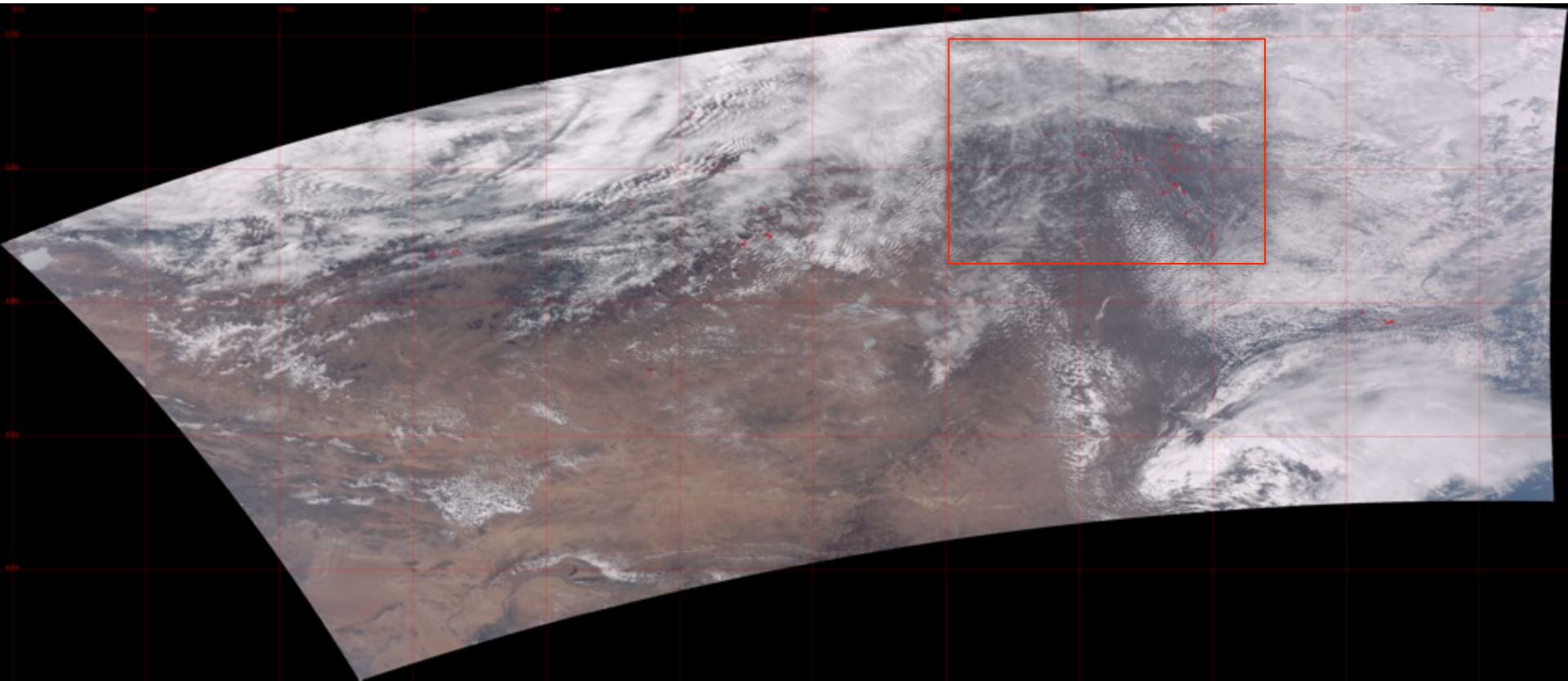


Post-launch product evaluation

- 24/7 script for data visualization
 - *Designed for qualitative assessment of fire data*
 - *Used to identify major anomalies in data*
- VIIRS x Aqua/MODIS intercomparison
 - *Designed for qualitative assessment of VIIRS fire detection using near-coincident Aqua/MODIS data*
 - *Verify active fire product consistency on a per-pixel and/or grid basis*
- Detailed data inspection tool
 - *Used to assess quality of individual bands and the corresponding quality flags*
- Collection and analysis of in-situ and airborne data
 - *Explicit validation*
- M13 SDR feedback
 - *Aggregation, low/high gain*
- Product improvements
 - *Spatially explicit fire mask*
 - *FRP*
 - *VIIRS-specific algorithm changes*



Onset of 2012 fire season in Siberia



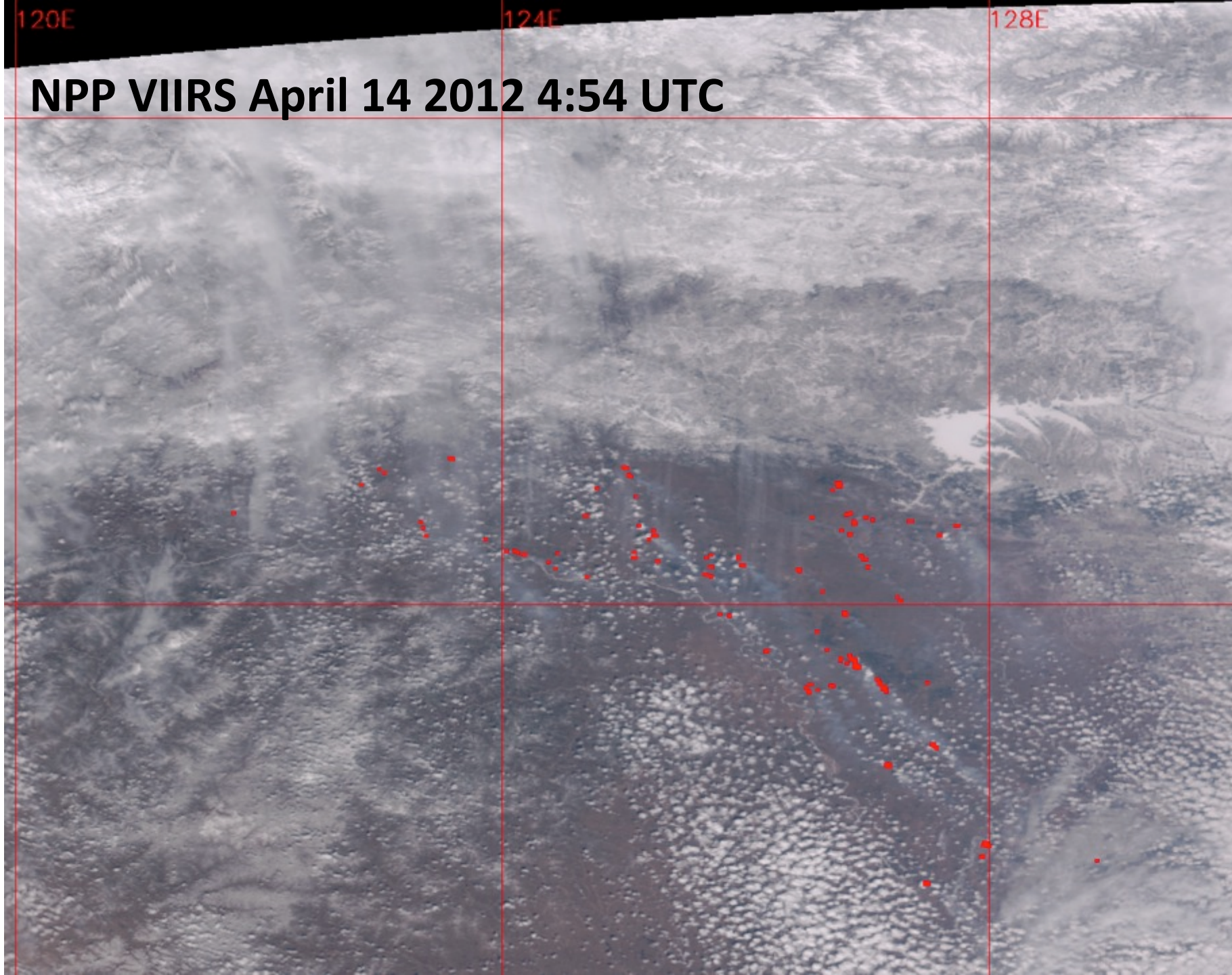
NPP VIIRS April 14 2012 4:54 UTC

120E

124E

128E

NPP VIIRS April 14 2012 4:54 UTC

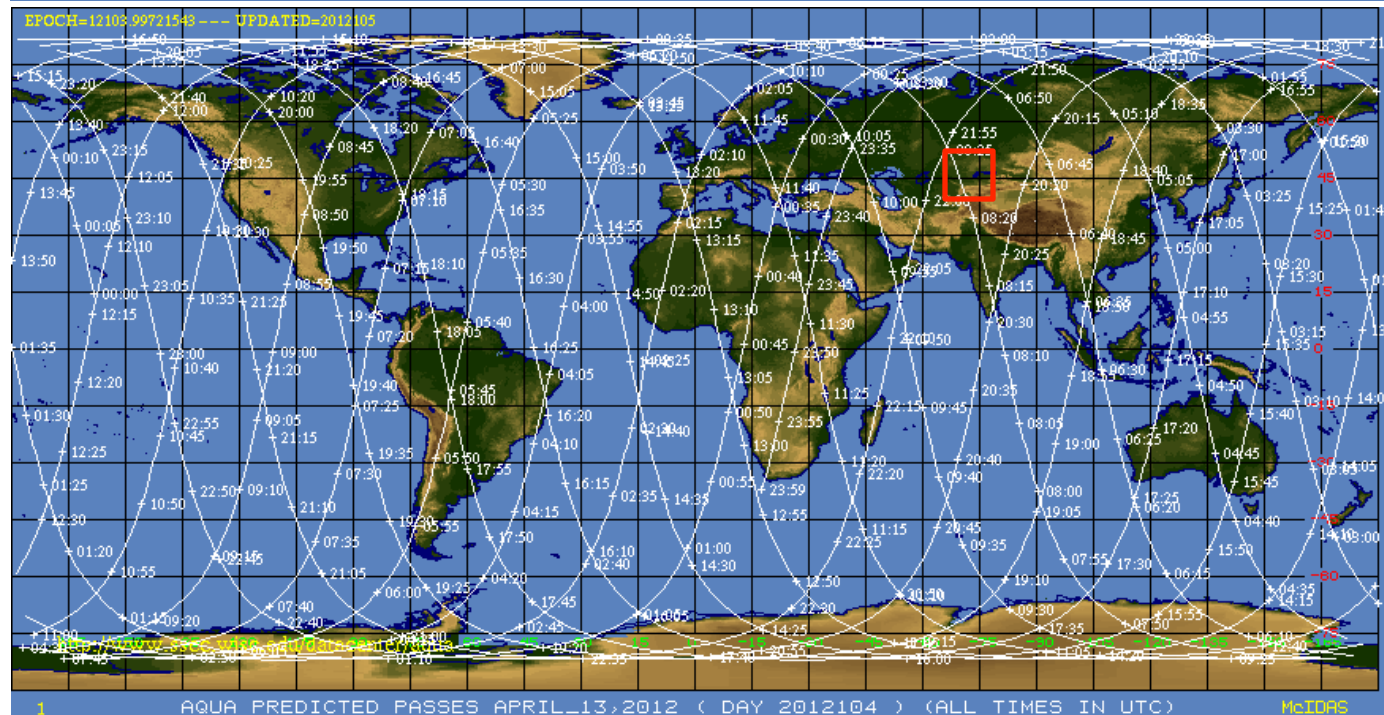
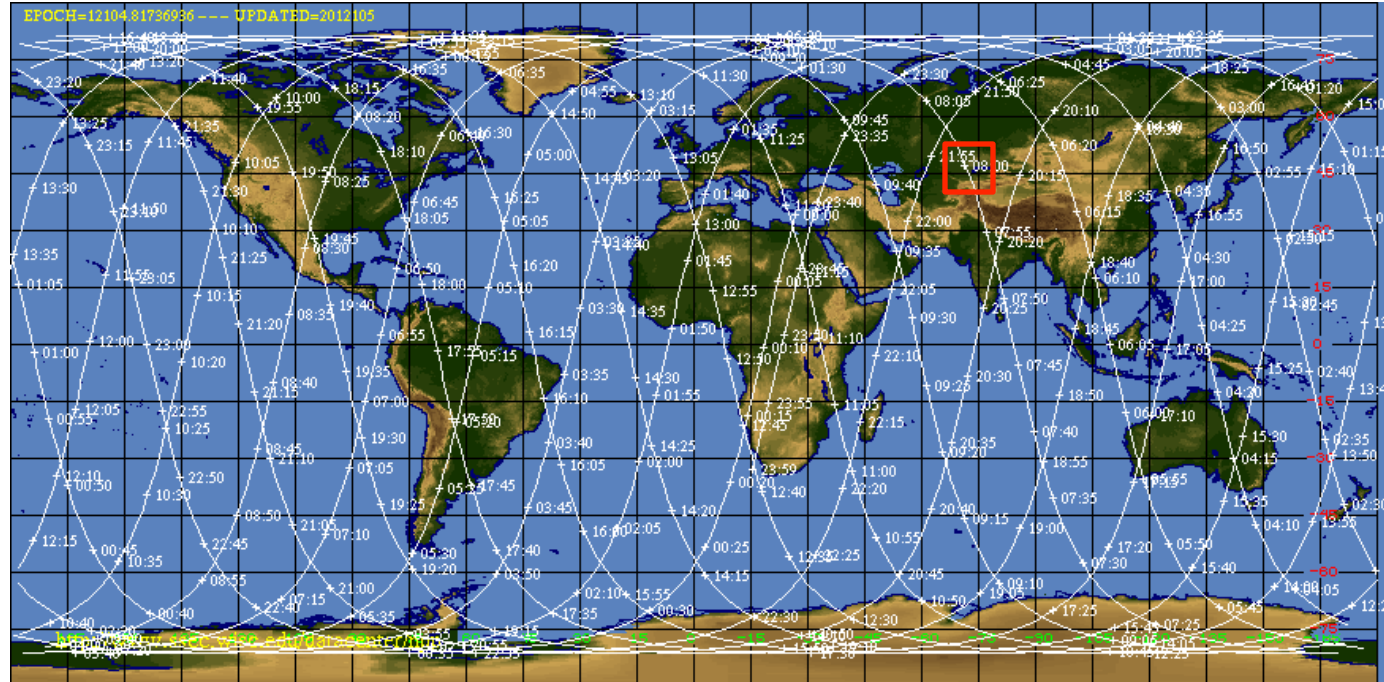


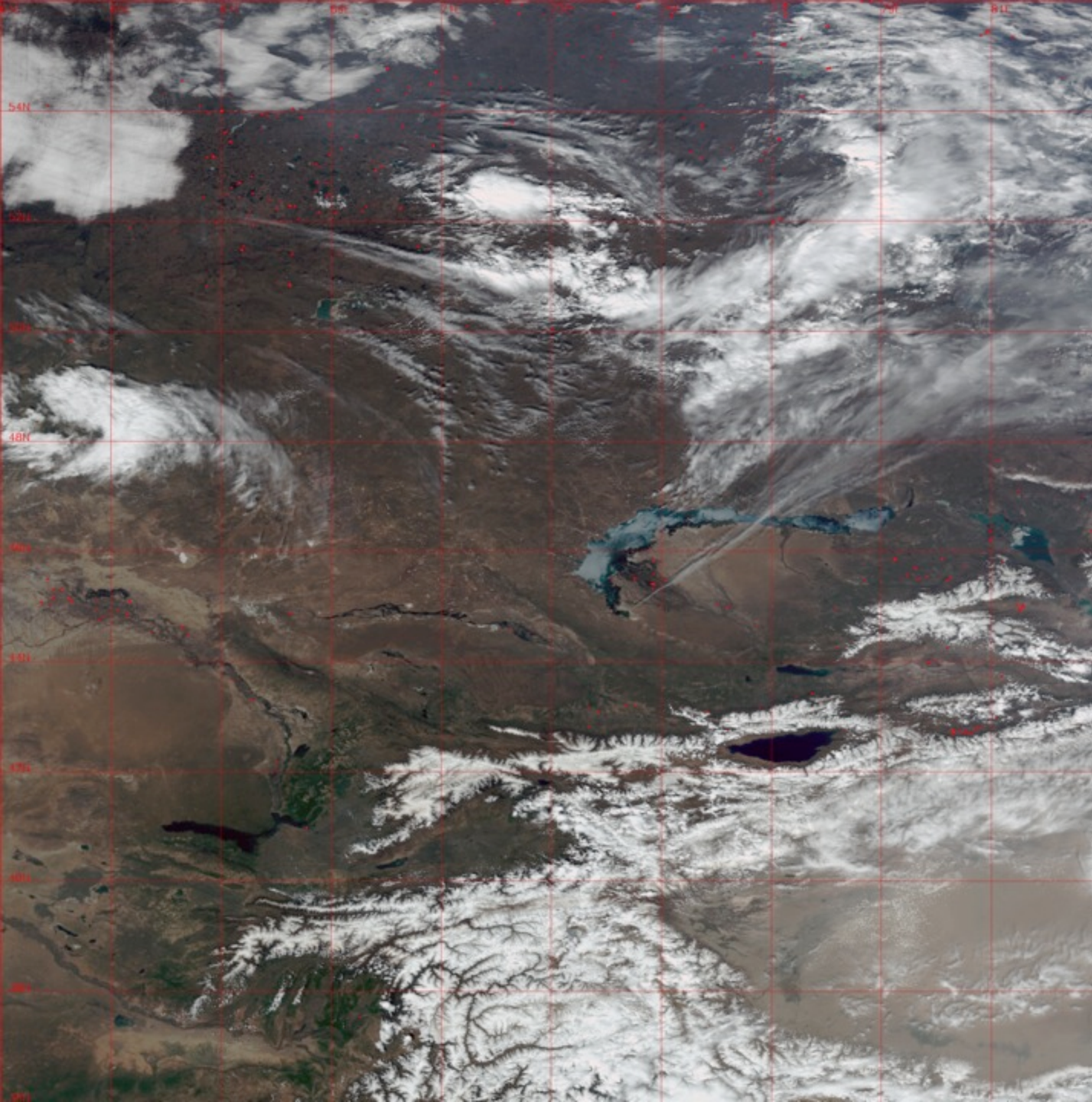
NPP

Satellite orbit tracks

April 13, 2012

Aqua





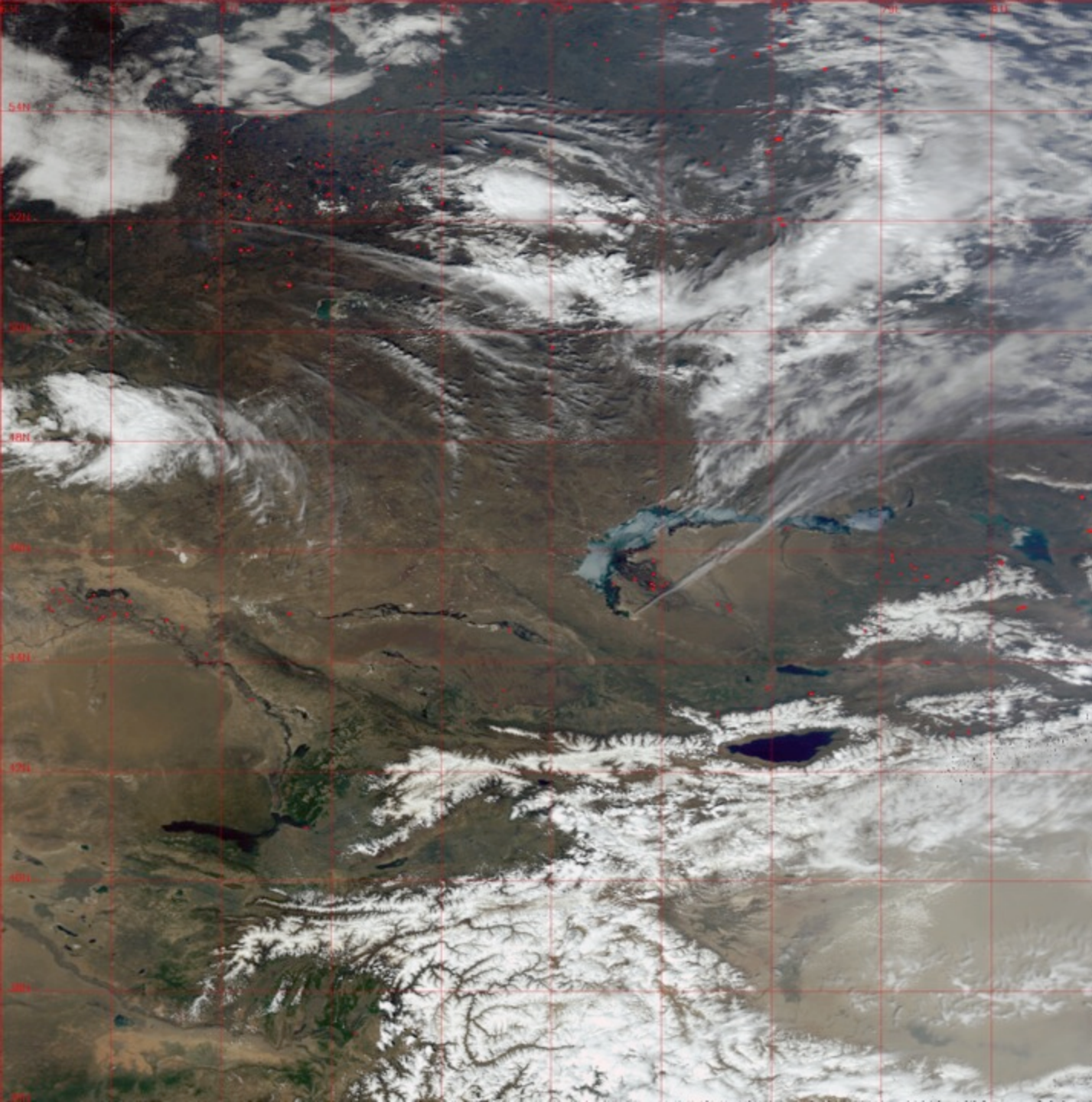
NPP VIIRS

Central Asia

April 13 2012

7:53 UTC

M5-M4-M3 RGB
+
IDPS Active Fire ARP



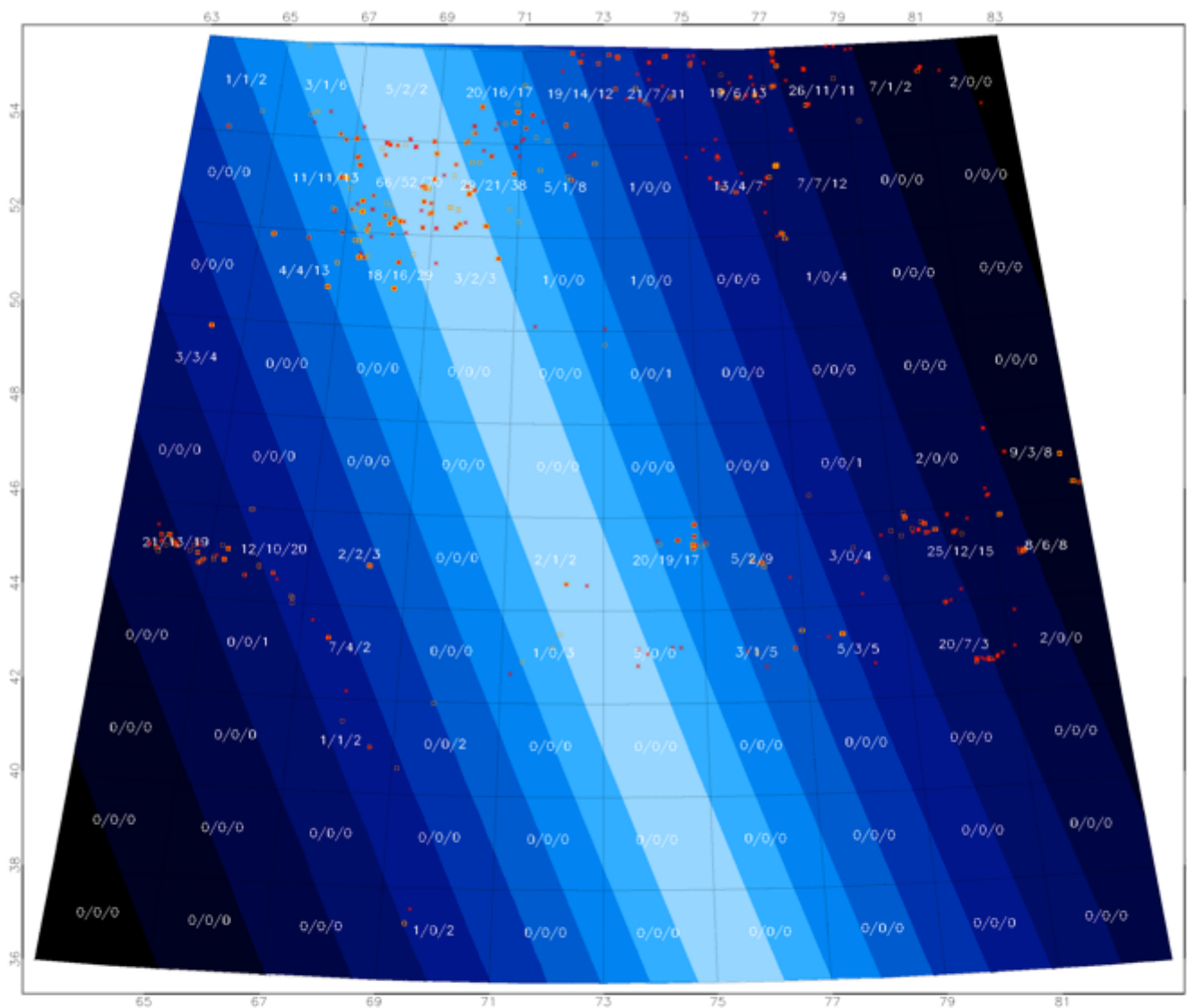
**Aqua
MODIS**

Central Asia

April 13 2012

8:18 UTC

***Band 1-4-3 RGB
+
MYD14***



VIIRS/overlap/MODIS

VIIRS Scan Angle (deg)



VIIRS

vs.

MODIS

Central Asia

April 13 2012

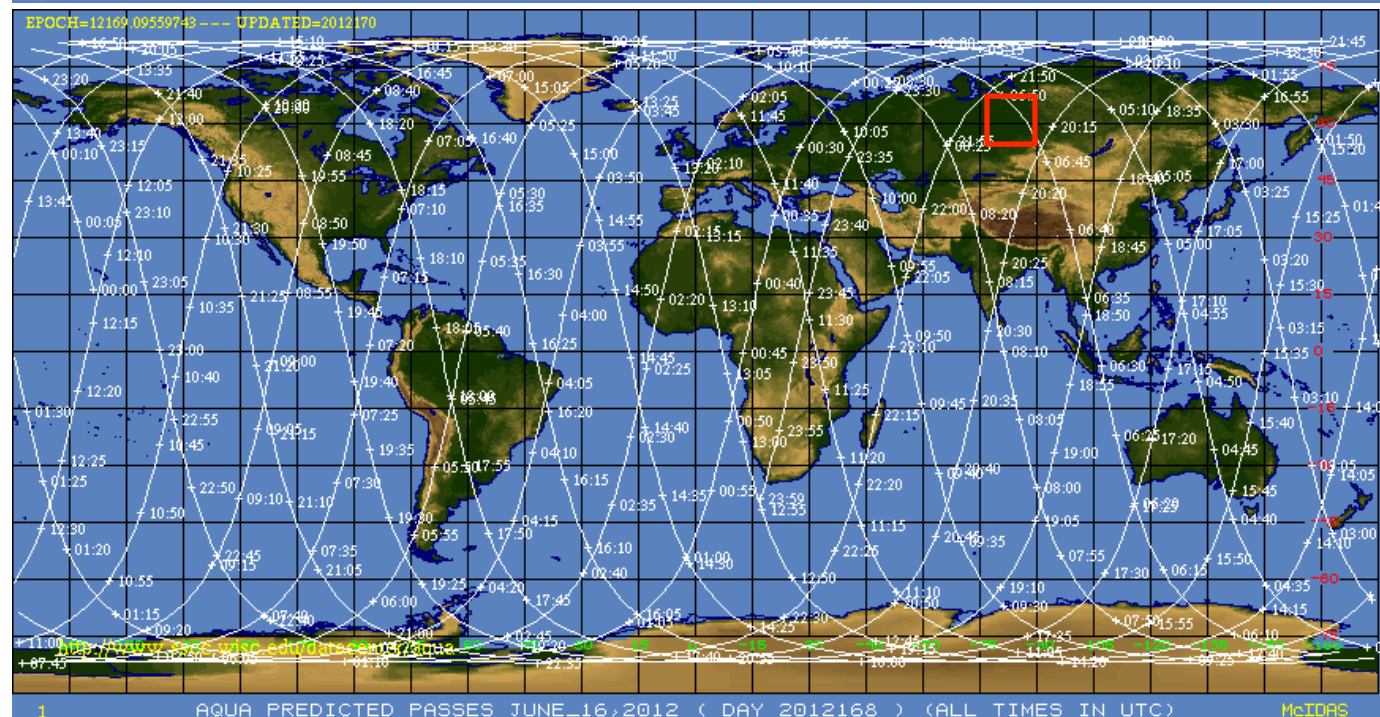
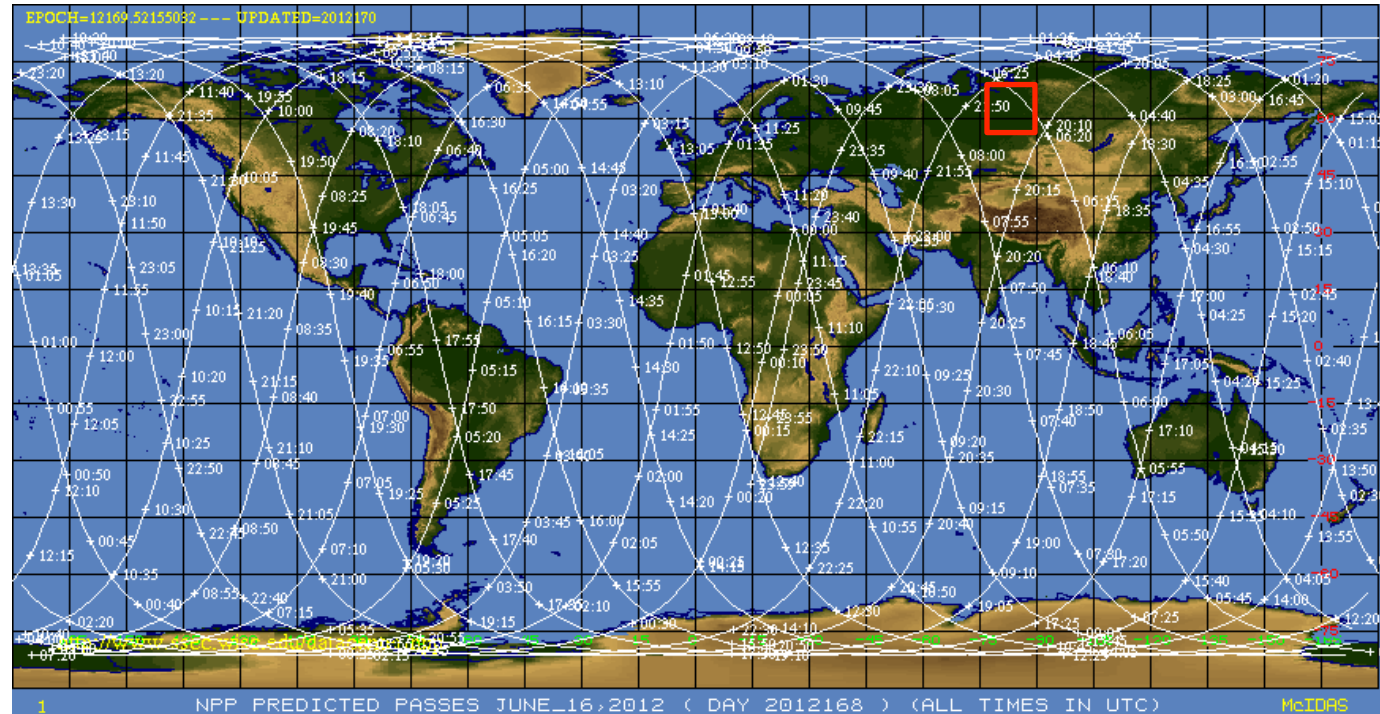
Gridded statistics: AA/BB/CC
 AA – number of VIIRS fire pixels
 (red symbols)
 BB – number of VIIRS fire pixels
 with overlapping Aqua/MODIS
 fire pixels
 CC – number of Aqua/MODIS
 fire pixels (orange symbols)

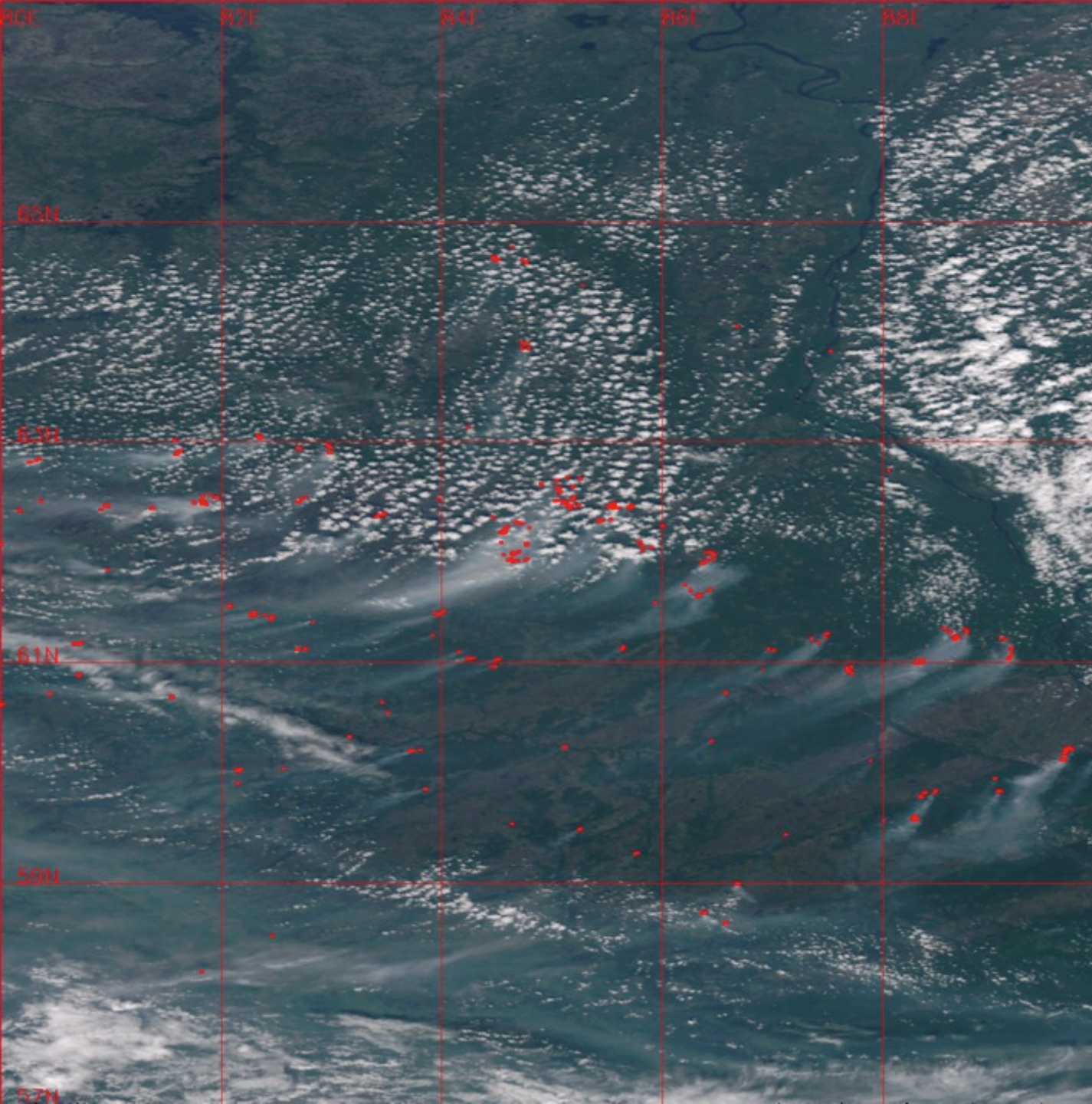
NPP

**Satellite orbit
tracks**

June 16, 2012

Aqua





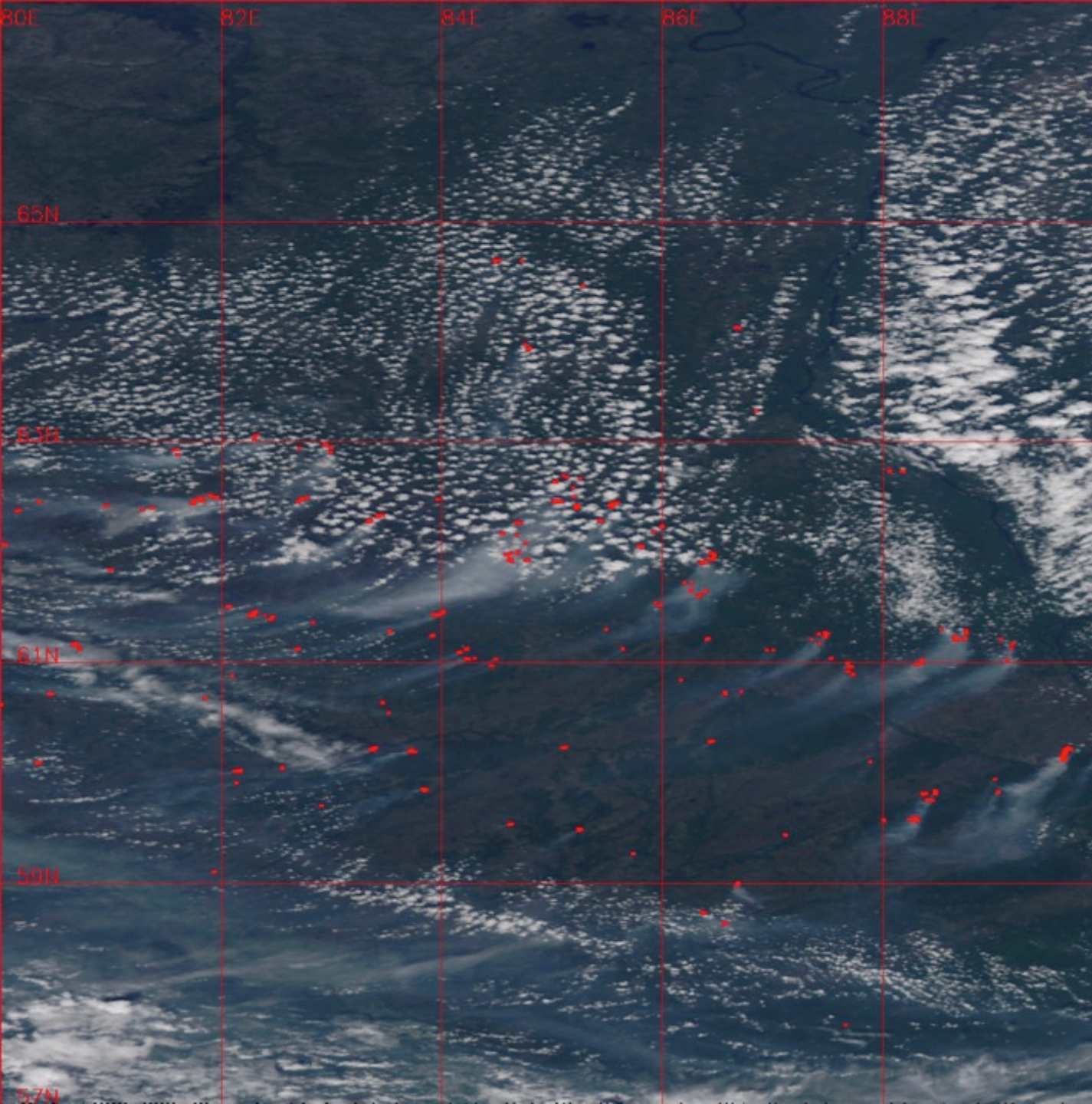
NPP VIIRS

**Western
Siberia**

June 16 2012

6:15 UTC

***M5-M4-M3 RGB
+
IDPS Active Fire ARP***



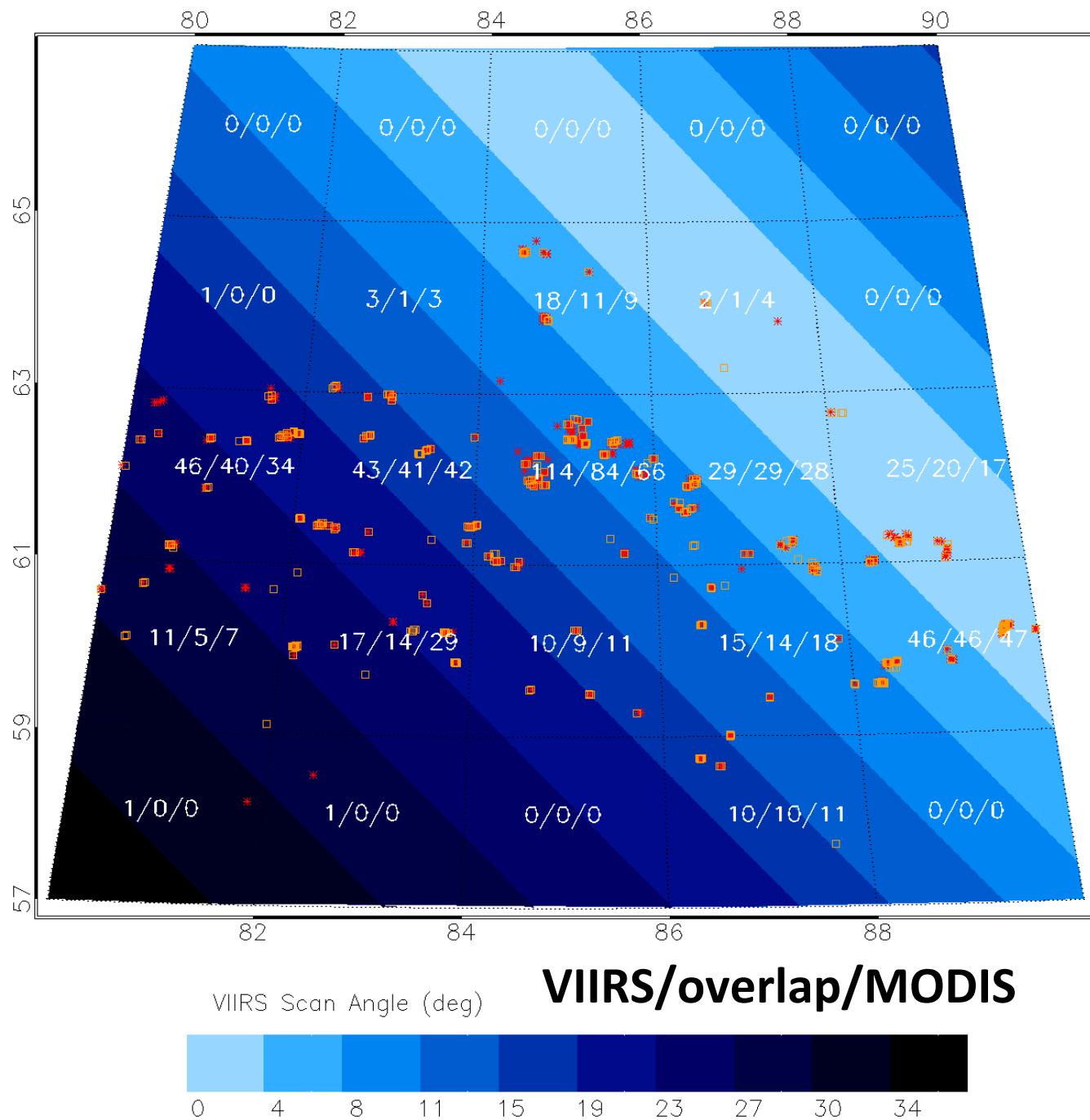
**Aqua
MODIS**

**Western
Siberia**

June 16 2012

6:42 UTC

***Band 1-4-3 RGB
+
MYD14***



VIIRS

vs.

MODIS

Western Siberia

April 13 2012

Gridded statistics: AA/BB/CC

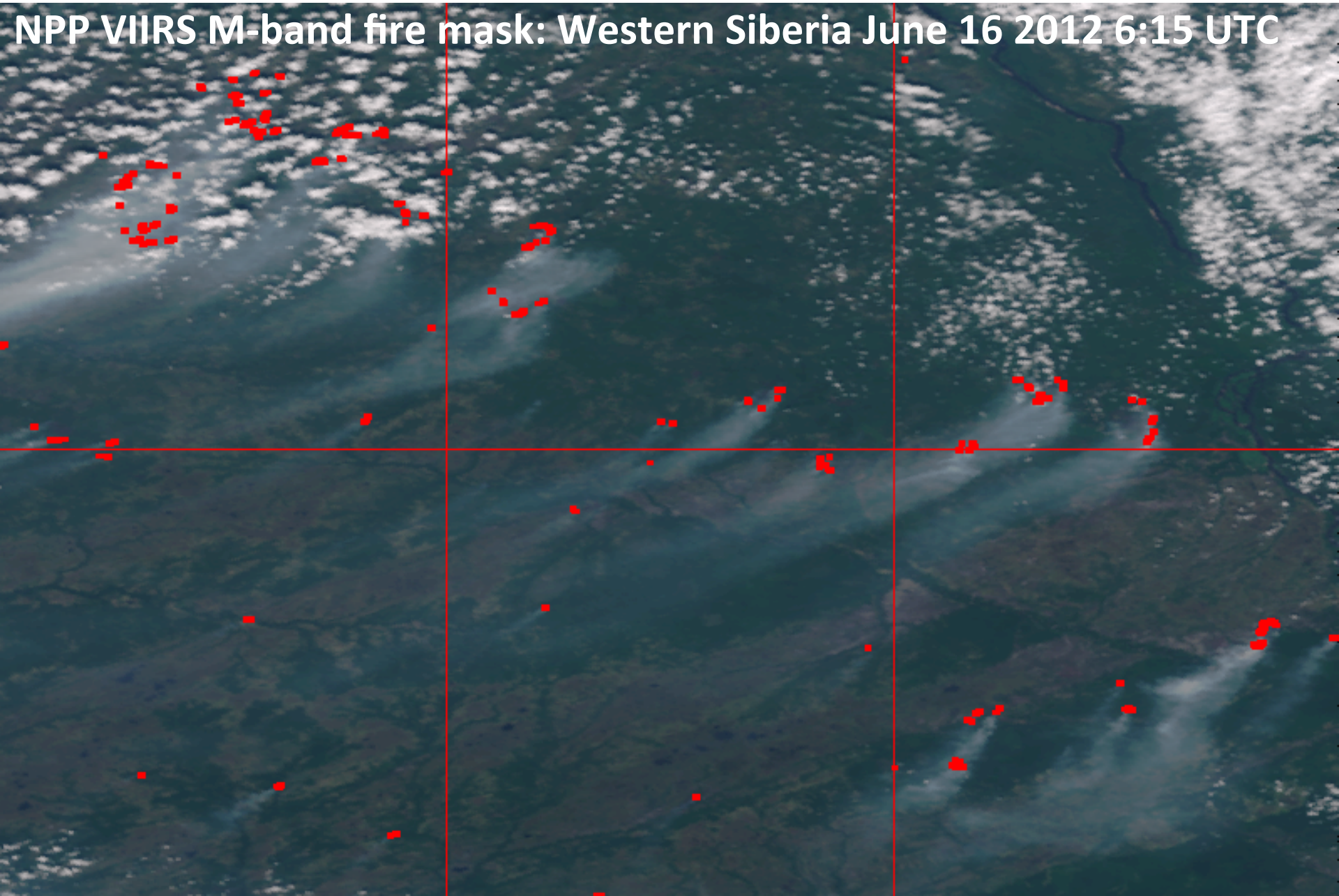
AA – number of VIIRS fire pixels
(red symbols)

BB – number of VIIRS fire pixels
with overlapping Aqua/MODIS
fire pixels

CC – number of Aqua/MODIS fire
pixels (orange symbols)

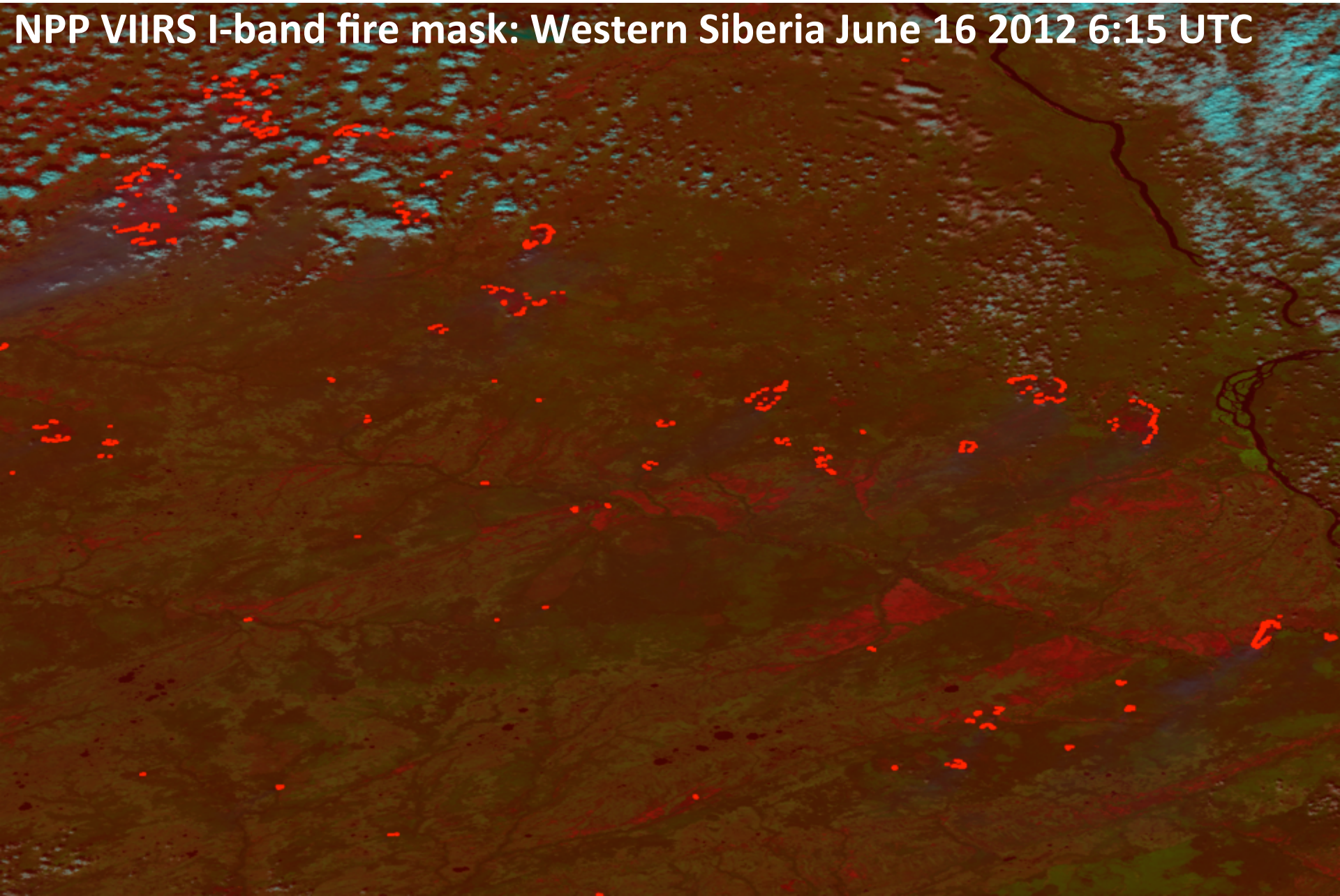
One step further: use of VIIRS “I” bands

NPP VIIRS M-band fire mask: Western Siberia June 16 2012 6:15 UTC



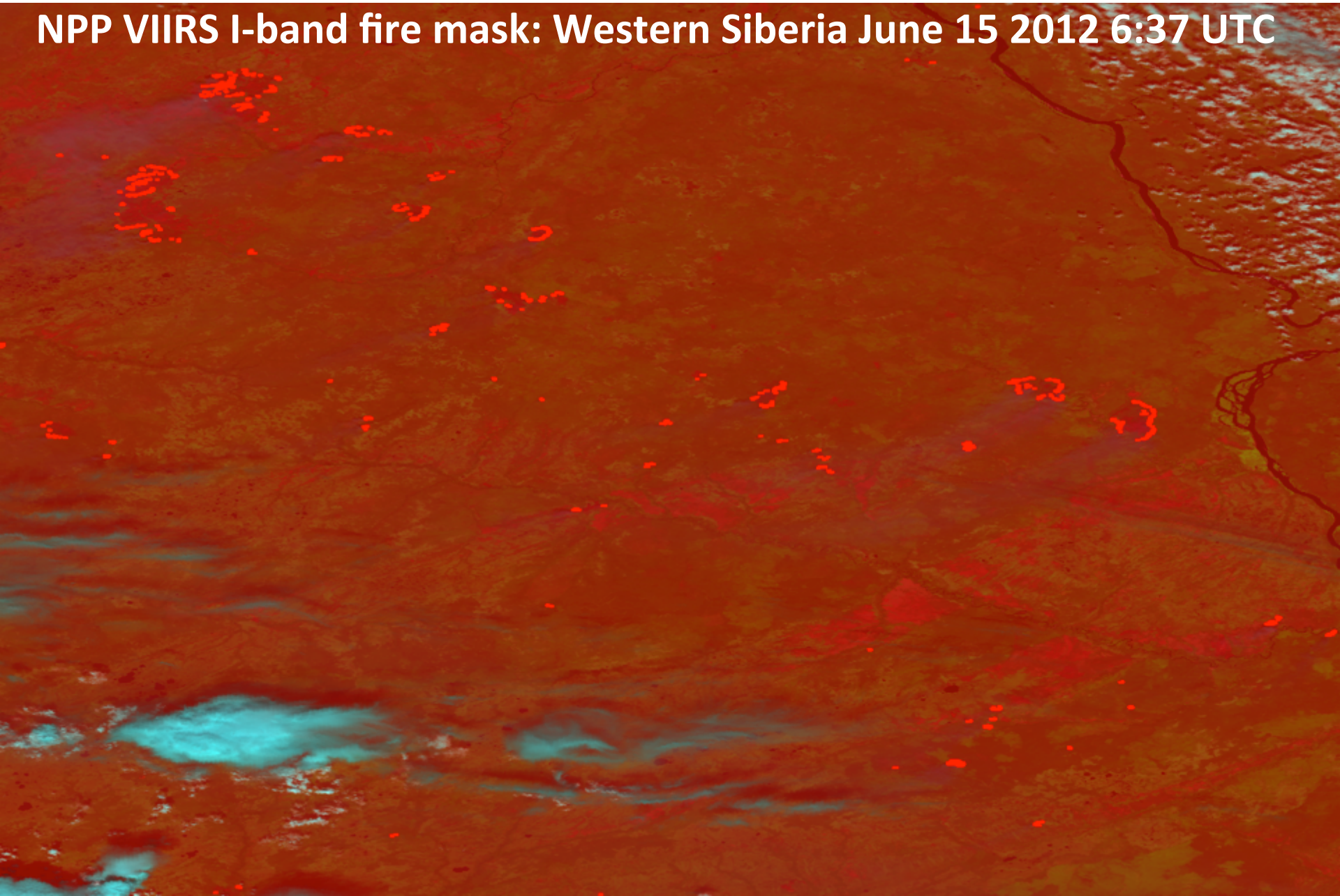
One step further: use of VIIRS “I” bands

NPP VIIRS I-band fire mask: Western Siberia June 16 2012 6:15 UTC



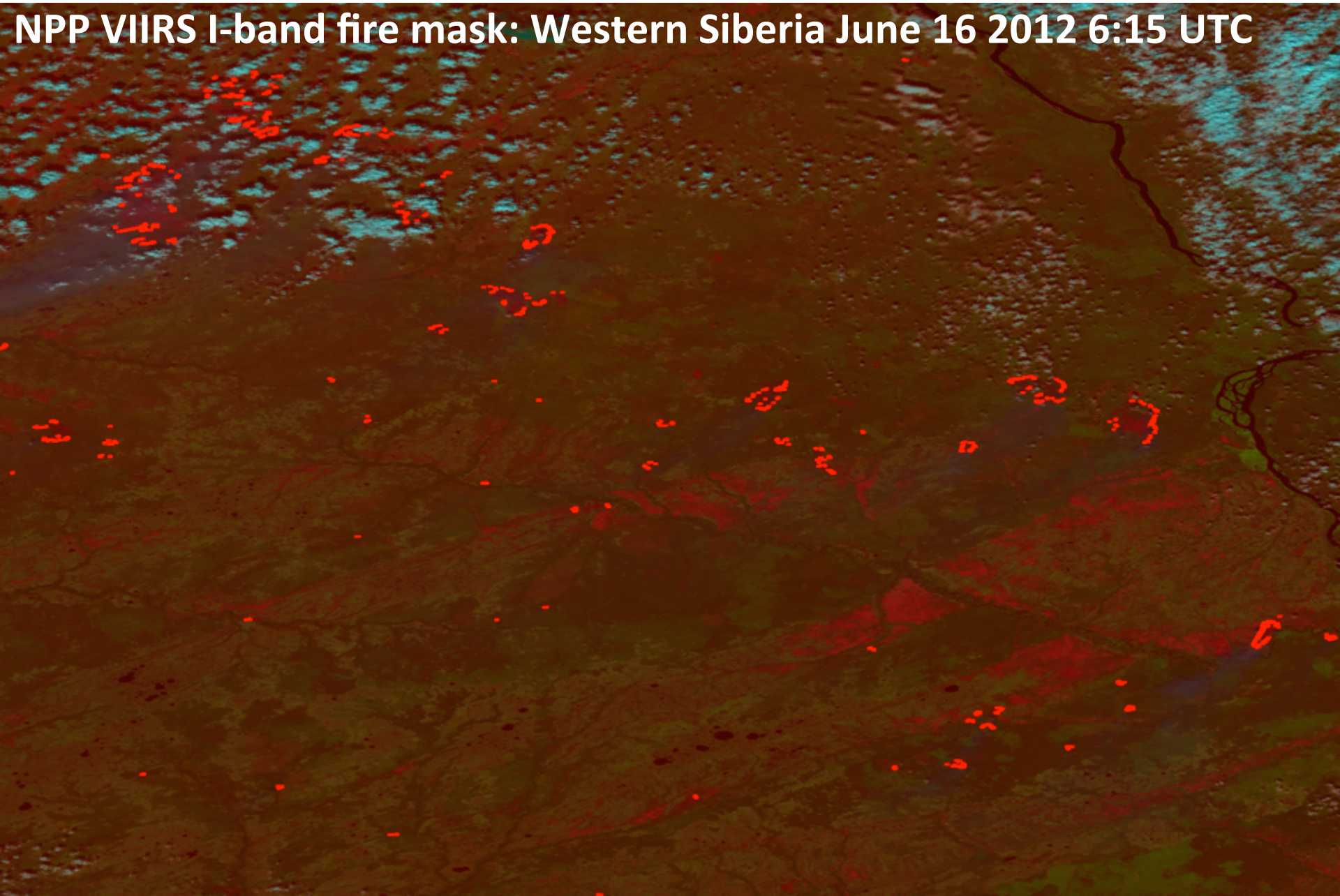
One step further: use of VIIRS “I” bands

NPP VIIRS I-band fire mask: Western Siberia June 15 2012 6:37 UTC



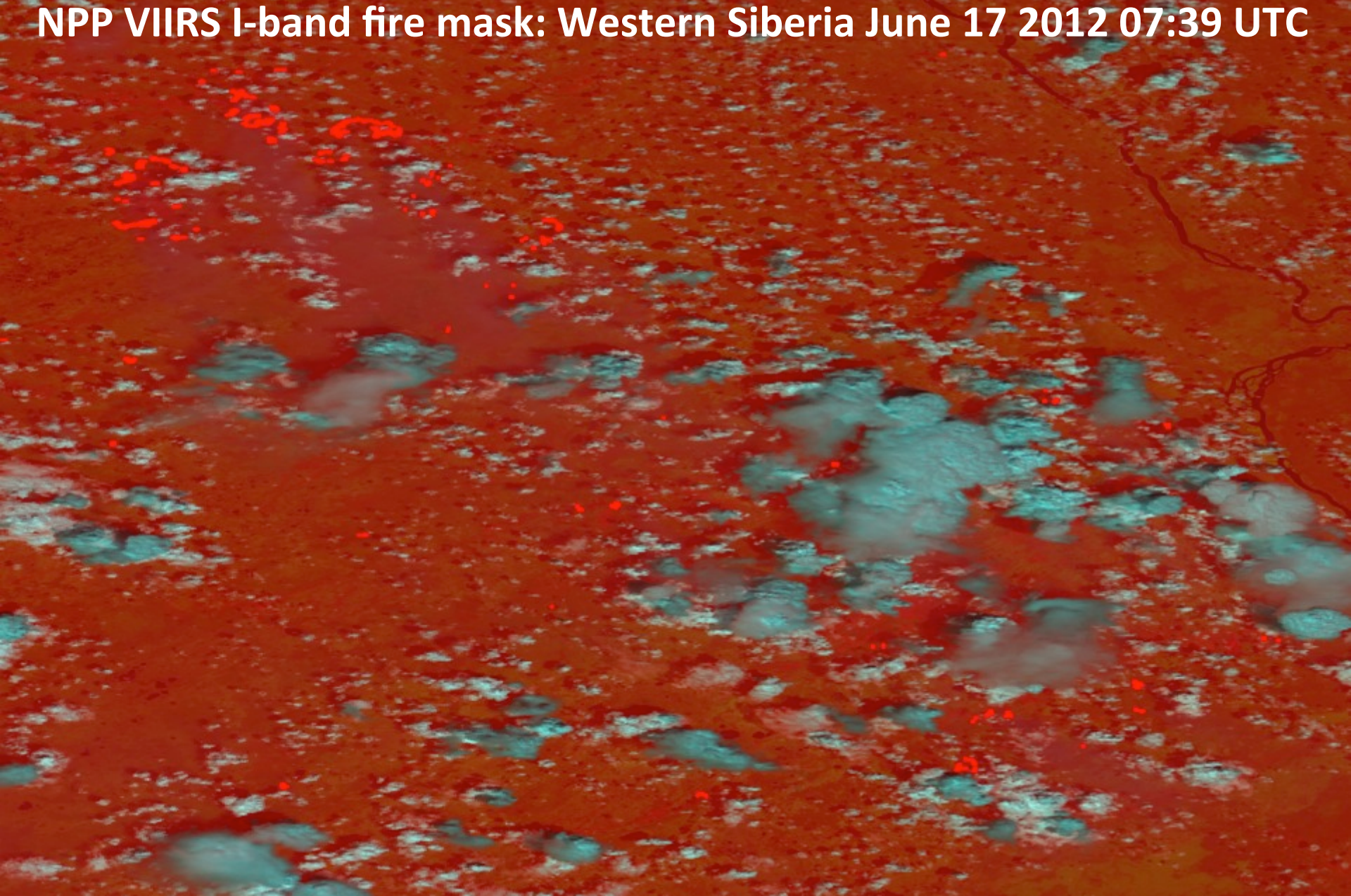
One step further: use of VIIRS “I” bands

NPP VIIRS I-band fire mask: Western Siberia June 16 2012 6:15 UTC



One step further: use of VIIRS “I” bands

NPP VIIRS I-band fire mask: Western Siberia June 17 2012 07:39 UTC



One step further: use of VIIRS “I” bands

NPP VIIRS I-band fire mask: Western Siberia June 18 2012 5:39 UTC



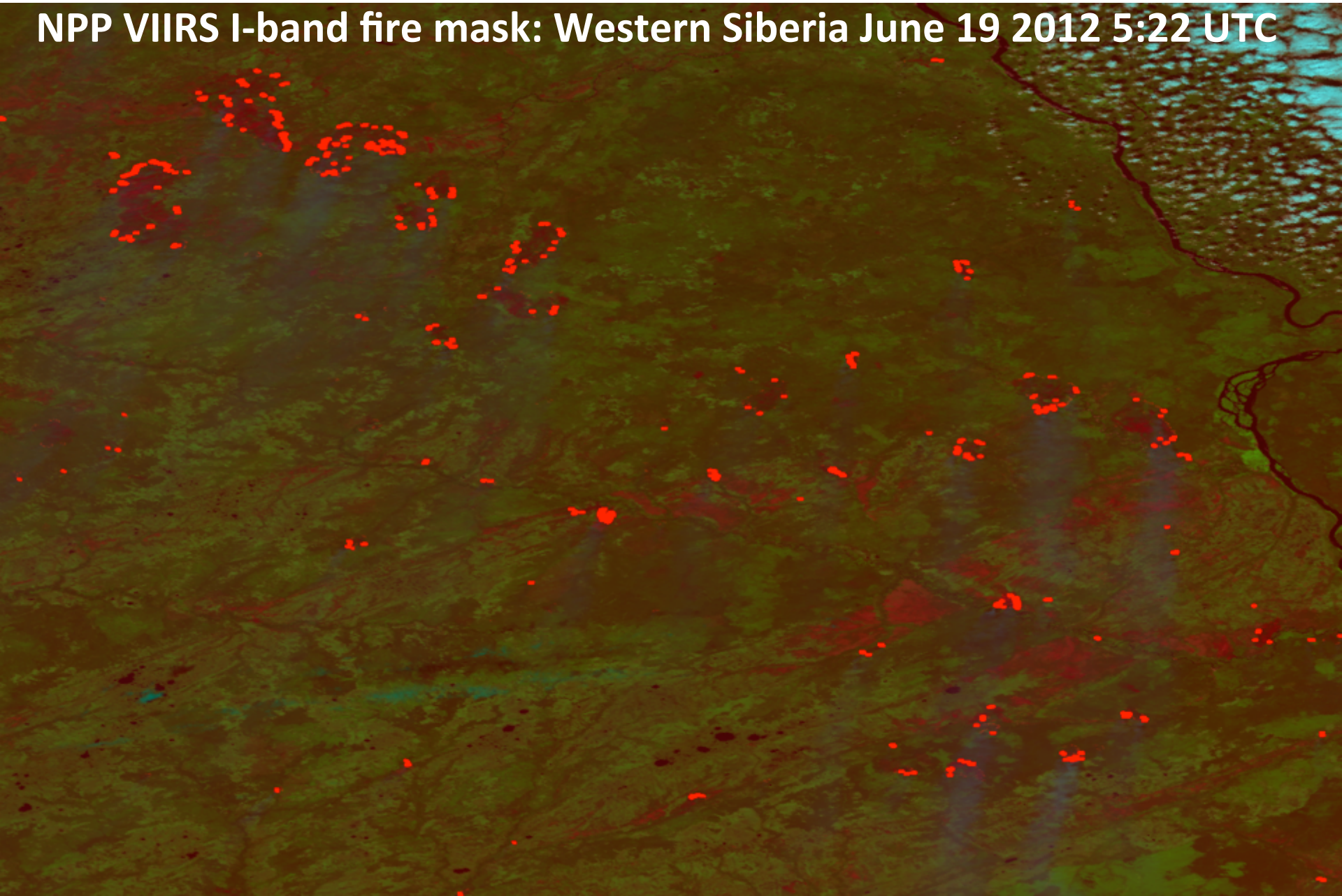
One step further: use of VIIRS “I” bands

NPP VIIRS I-band fire mask: Western Siberia June 18 2012 7:27 UTC



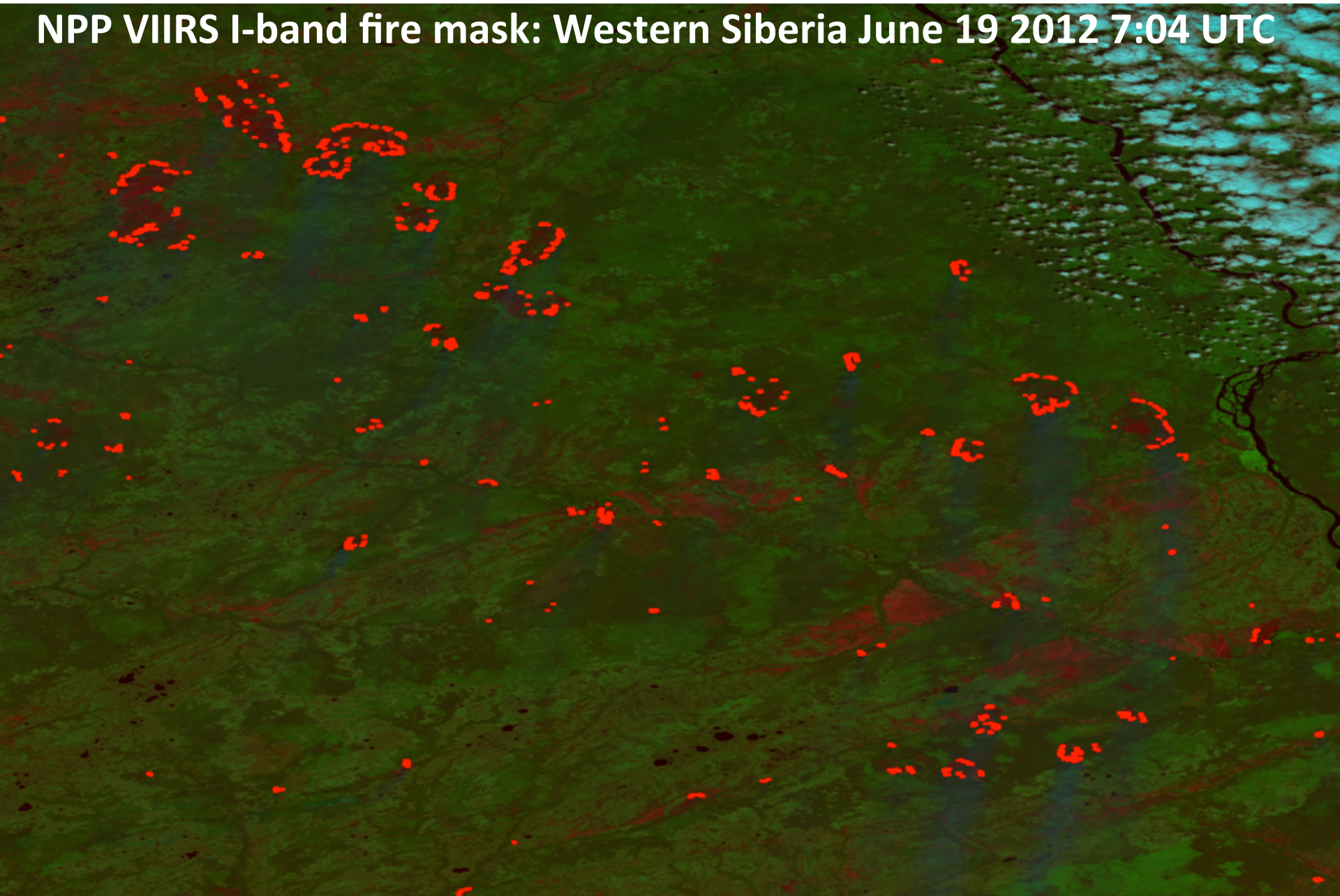
One step further: use of VIIRS “I” bands

NPP VIIRS I-band fire mask: Western Siberia June 19 2012 5:22 UTC



One step further: use of VIIRS “I” bands

NPP VIIRS I-band fire mask: Western Siberia June 19 2012 7:04 UTC



Fire characterization from S-NPP VIIRS

- **M13 saturation temperature: 634K**
 - very small percentage of fires to trigger saturation
 - Fire Radiative Power retrieval is possible
- **M15 saturation temperature: 363K**
 - small, but non-negligible percentage of fires triggers saturation of native resolution pixels
 - more complex characterization (i.e. smoldering ratio) be compromised
- **FIRE RADIATIVE POWER PRODUCT TO BE INCLUDED IN VIIRS ACTIVE FIRE PRODUCT SUITE**

MODIS: a success story for fire detections

- MODIS is the first sensor designed to detect and characterize hot targets (predominantly actively burning fires) on a global and systematic basis
- MODIS fire data have been extensively used for disaster and resource management, air quality applications, ecosystem monitoring, climate studies etc.

Examples of MODIS fires/thermal anomalies data

Real-time data

FIRMS | Fire Information For Resource Management System - Mozilla Firefox

File Edit View History Bookmarks Tools Help

FIRMS | Fire Information For Resource Mana... +

http://maps.geog.umd.edu/firms/

Home
About
Web Mapping Services
Email Alerts
Active Fire Data
Burned Area **New!**
MODIS Subsets
Resources
Publications
FAQs
Links

The Fire Information for Resource Management System (FIRMS) integrates remote sensing and GIS technologies to deliver global MODIS hotspot/fire locations and burned area information to natural resource managers and other stakeholders around the World.

FIRMS is funded by NASA and builds on [Web Fire Mapper](#), a web mapping interface that displays hotspots/fires detected by the [MODIS Rapid Response System](#) and delivers near real-time hotspot/fire information and monthly burned area information to international users and support fire managers around the World.

[Read more...](#)

March 22, 2011 - Fires in Myanmar
Source: [MODIS Rapid Response System](#). [Read More...](#)

FIRMS delivers MODIS fire and burned area information through:

- Email messages: [Global Fire Alerts](#);
- Interactive WebGIS: [Web Fire Mapper](#);
- Monthly [Burned Area](#) images in [Web Fire Mapper](#);
- Latest hotspot/fire data downloads: [Shapefiles/Text Files](#), [KML/Google Earth](#), [WMS](#), [World Wind](#);
- Subsets of [MODIS images](#)

Click on the graphics below to access the different services:

EMAIL ALERTS

WEB FIRE MAPPER

WITH BURNED AREA

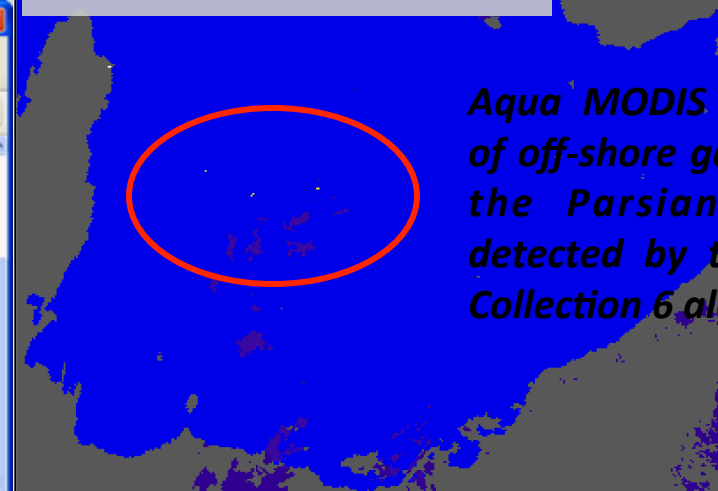
ACTIVE FIRE DATA

MODIS SUBSETS

Announcements

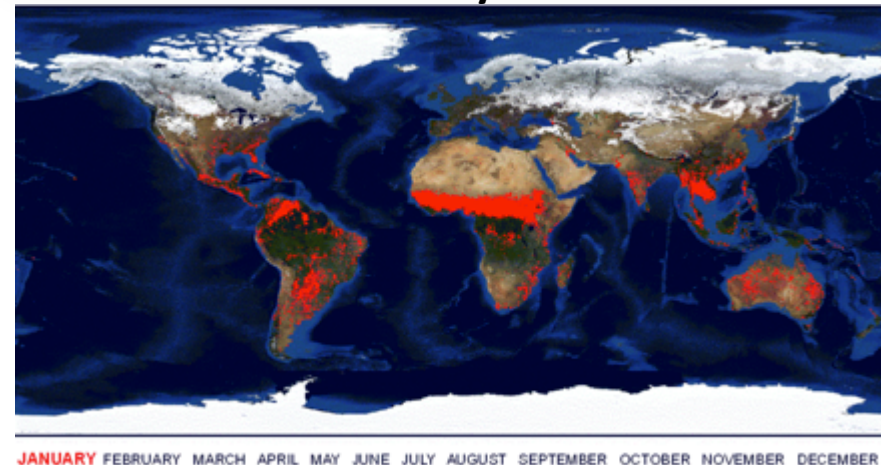
Standard level 2
product

13 Nov 2010 0935UTC



Aqua MODIS detections of off-shore gas flares in the Persian Gulf as detected by the MODIS Collection 6 algorithm

Global dynamics



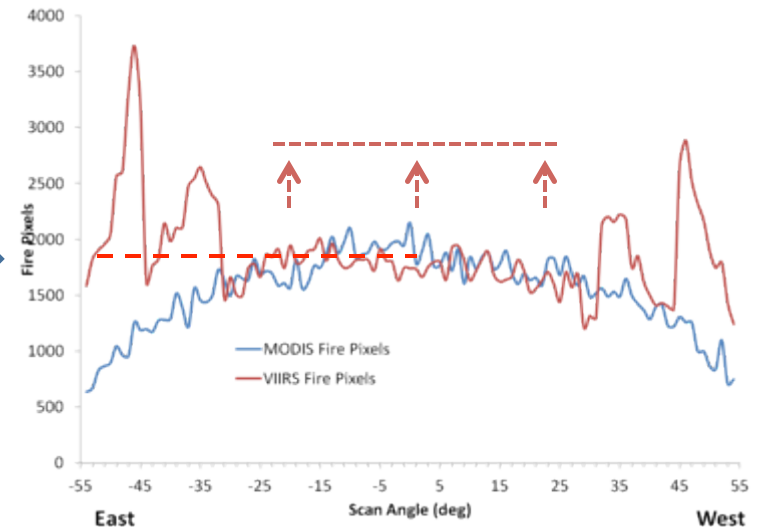
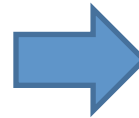
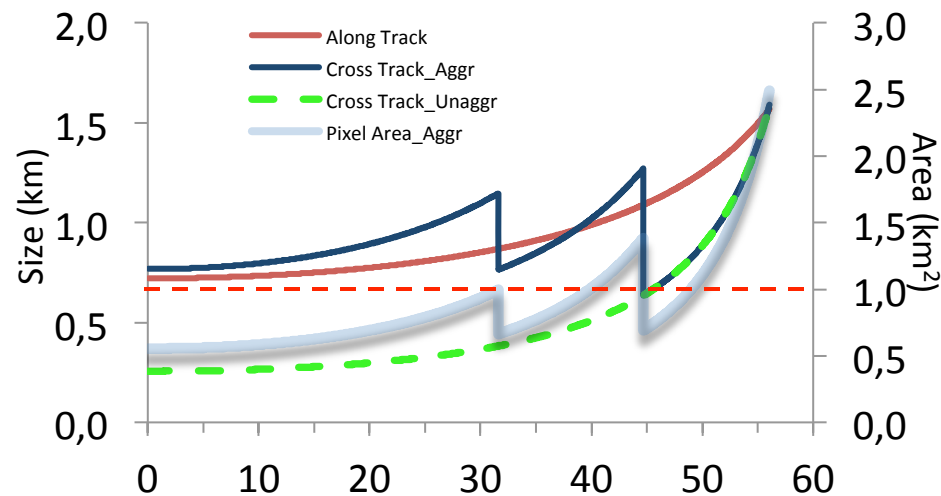
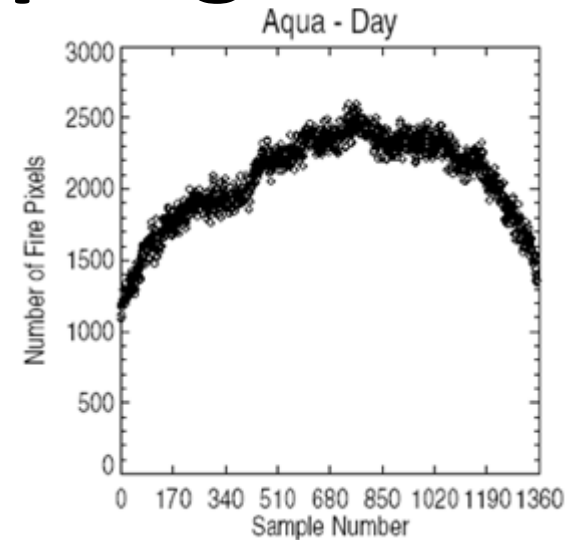
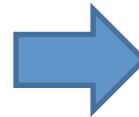
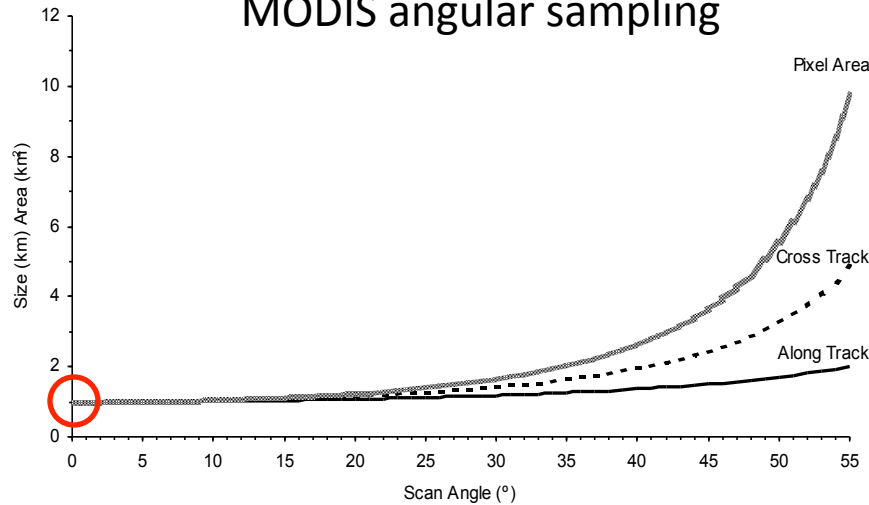
JANUARY FEBRUARY MARCH APRIL MAY JUNE JULY AUGUST SEPTEMBER OCTOBER NOVEMBER DECEMBER

Aqua MODIS vs. Suomi NPP VIIRS

- Aqua and NPP have **similar overpass times (1:30pm)**
 - sampling of the diurnal fire cycle is similar
- Saturation levels of the primary bands allow **unsaturated radiance measurements** for most fires
 - Bands 21/22 for MODIS and M13 for VIIRS
- Some differences in **spectral placement**
- Processing **algorithms are compatible**
 - Current VIIRS algorithm is based on MODIS, albeit an earlier version
 - Differences can be resolved and the impact can be minimized
- **Primary driver** of differences is **spatial sampling**
 - Pixel size
 - Variations along scanline (aggregation schemes)
 - Variations within pixels (line-spread function, aggregation)
 - Differences in swath width (VIIRS has no gaps at low latitudes)

Angular sampling

MODIS angular sampling



Compatible orbital segments are determined by pixel sizes

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

VIIRS active fire product development

NOAA: real-time operational applications

- Operational product generated by IDPS (Interface Data Processing Segment)
- Part of integrated processing chain
- Low latency
- Detections only
- Locations only (no fire mask)

NASA: science, long-term continuity + added value NRT

- Experimental MODIS continuity product produced by LandPEATE (Product Evaluation and Test Element)
- Detections and Fire Radiative Power
- Spatially explicit fire mask
- Spatial and temporal aggregates

Algorithm updates



Upstream processing updates

algorithm synchronization, end user feedback

DIRECT READOUT

- Can run IDPS, NASA or locally developed code
- Stand-alone

Direct Readout

Community Satellite Processing Package

The Community Satellite Processing Package (CSPP) supports the Direct Broadcast (DB) meteorological and environmental satellite community through the packaging and distribution of open source science software. CSPP supports DB users of both polar orbiting and geostationary satellite data processing and regional real-time applications through distribution of free open source software, and through training in local product applications. CSPP is funded through NOAA JPSS.

Suomi National Polar-orbiting Partnership (NPP) Products

CSPP software to support Suomi NPP:

- VIIRS, ATMS and now CrIS calibration and geolocation software (Raw Data Records (RDRs) to Science Data Records (SDRs)); [Learn more ...](#)
- CrIS University of Wisconsin dual regression single Field-of-View (FOV) Temperature, Moisture, and Cloud Retrieval Environmental Data Record (EDR). [Learn more ...](#)

Coming Soon:

- VIIRS Cloud Mask, Active Fires, Cloud Top Properties, Cloud Optical Properties, and Aerosol Optical Thickness Environmental Data Records (EDRs).
- AVHRR (POES and MetOp) Cloud and Land Surface Retrievals.

For more information about Suomi NPP, please see:

- the JPSS website;
- the Suomi NPP website;
- the Suomi NPP document library.

Last updated 04-May-2012. [Contact us.](#)

<http://cimss.ssec.wisc.edu/cspp/>

Welcome to Direct Readout

This Portal provides the Direct Readout (DR) community with easy access to Earth remote sensing data and technologies through shared information resources.

We achieve this by:

1. Providing mission-specific information and free technologies to acquire and process Direct Broadcast Data.
2. Introducing the user community to Direct Readout Systems Technologies.
3. Providing users with a design template to receive, process and analyze their own Direct Readout Data.

DRL Highlights

- RT-STPS V5.3 Released
- VIIRS-SDR SPA V1.5.05.03 Released
- H2G SPA V2.0a Released
- Simulcast V5.1 Released
- VIIRS-SDR SPA V1.5.05.03 Released
- RT-STPS V5.2 Released
- Suomi NPP HRD Broadcast Activation
- RT-STPS v5.1a Released
- Simulcast v5.0 Released
- IPOPP V1.7b Released
- GBAD V2.7 Released
- Dynamic Direct Readout Site Map
- NPP VIIRS Algorithm Implementation
- RT-STPS V5.0 Released
- Simulcast V4.3 Released
- NPP/HRD Report and Test Data
- L2GEN V6.4.2 Released
- CREFL V1.7.1 Released
- IMAPP V2.1 Released
- IPOPP V1.7a Released
- H2G SPA V1.6a Released
- L2GEN SPA V6.2.5 Released
- MODISL1DB SPA V1.6 Released
- CRECBuilder V1.2 Released
- Simulcast V4.2 Released
- IPOPP V1.6b Released
- IPOPP Status Update
- CRECBuilder V1.1 Released
- L2GEN SPA V5.9.7 Released

Fri, 9 September 2011 Phase 3 of NPP/VIIRS Algorithm Implementation

The DRL now presents Phase 3 of the NPP/VIIRS algorithm implementation. The primary focus of Phase 3 is a maintenance model for creating an efficient approach for algorithm updates.

[+ Read More](#)

Wed, 15 June 2011 NPP Test Data Update

NPP Raw High Rate Data now available for testing.

<http://directreadout.sci.gsfc.nasa.gov/?r=viirs&product=aerosolparticleize>

<http://directreadout.sci.gsfc.nasa.gov/>

BEWARE OF PROCESSING ALGORITHM – REAL-TIME VS. “SCIENCE QUALITY”

VIIRS Active Fire Product Website

viirsfire.geog.umd.edu

VIIRS Active Fire - Windows Internet Explorer

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

File Edit View Favorites Tools Help

★ Favorites VIIRS Active Fire

Home About FAQ Download Contact Us

VIIRS Active Fire

JPSS
Joint Polar Satellite System
NPP: Land Product Evaluation and Testing Element
VIIRS Land Product Quality Assessment

VIIRS fire detections

The Visible Infrared Imager Radiometer Suite (VIIRS) sensor was launched aboard the Suomi National Polar-orbiting Partnership (NPP) satellite on October 28th, 2011 and on January 18th, 2012 cooler doors for the thermal sensor were opened. Within hours data were being retrieved and fire detections produced. The 84 second swath quicklooks presented here highlight recent fire detections superimposed on corrected reflectance RGB images (bands 5-4-3). VIIRS data are still preliminary and will continue to undergo testing and calibration over the coming weeks before being released for public use.

Active Fire Team

- Ivan Csiszar
- Wilfrid Schroeder
- Louis Giglio
- Evan Ellicott
- Chris Justice
- Krishna Vadrevu

Links

- JPSS
- VIIRS
- University of Maryland
- NOAA
- NOAA-STAR
- USFS RSAC

VIIRS vs MODIS

Fires in Russia and Kazakhstan: April 25th, 2012

VIIRS spotted many fires along the Russian-Kazakhstan border (eastern portion of the swath) at around 0920 UTC. Although purely anecdotal, there appears (visually) to be a connection between the lack of cloud cover and fire activity, with what could be described as a demarcation of clouds and fires. That said, despite cloud cover to the west, many detections are still apparent in this 5 minute swath.

The work is conducted by the JPSS and NASA Active Fire team at NOAA/NESDIS/Star and the University of Maryland, in cooperation with NASA LandPEATE and the US Forest Service.

Contact: viirsfire@hermes.geog.umd.edu
Website Developed by: Jon Nordling

SUOMI NPP DATA ACCESS: CLASS

<http://www.class.ncdc.noaa.gov>

“NPP products will be released to the user community over a time frame of several months. As products become available please go to the [Suomi NPP FAQ](#) to determine which products can be ordered. All newly released products will be 'beta'. Please see [Product Maturity Level page](#) to determine level of quality for each product.”

• ***Frequently asked questions (FAQ)***

• ***Product Maturity Levels***

• ***Tutorial on Data Access***

The screenshot shows the NOAA CLASS website interface. At the top, there's a browser window with the address bar showing the URL. Below the browser window, the NOAA logo and the title "COMPREHENSIVE LARGE ARRAY-DATA STEWARDSHIP SYSTEM (CLASS)" are visible. A navigation bar includes links like "CLASS Home", "Login", "Register", "Help", and "RSS". A search bar is present with the text "Please select a product to search". The main content area features a large satellite image of Hurricane Katrina with the text "Hurricane Katrina GOES 08/28/05". Below this, there's a "NEWS" section with an "Attention: regarding Suomi NPP data access:" notice. The sidebar on the left contains a "Around CLASS" section with links like "Home", "Search for Data", "Upload Search", "Search Results", "Shopping Cart", "Order Status", "Help", "User Account", "User Profile", "User Preferences", "Advanced Options", "Download Keys", "Release Info", "Version 5.5.3.4", "May 29, 2012", and "Other Links". The bottom of the page has a footer with various links like "Home", "Search for Data", "Upload Search", "Search Results", "Shopping Cart", "Order Status", "Help", "User Profile", "User Preferences", "Download Keys", "CLASS Help Desk", "Suggestions", "Privacy Policy", and "Disclaimer".

NPP EDR Product Maturity Levels

1. Beta

- Early release product
- Minimally validated
- May still contain significant errors.
- Versioning not established until a baseline is determined.
- Available to allow users to gain familiarity with data formats and parameters
- Product is not appropriate as the basis for quantitative scientific publications studies and applications

2. Provisional

- Product quality may not be optimal
- Incremental product improvements are still occurring.
- Version control is in affect
- General research community is encouraged to participate in the QA and validation of the product, but need to be aware that product validation and QA are ongoing
- Users are urged to consult the EDR product status document prior to use of the data in publications
- May be replaced in the archive when the validated product becomes available
- Ready for operational evaluation

3. Validated

- Product performance is well defined over a range of representative conditions
- Ready for use by the Centrals and in scientific publications
- There may be later improved versions
- There are three validation stages (see next column)

Stage 1 Validation: Product performance has been demonstrated to comply with the specification using a small number of independent measurements obtained from selected locations, periods, and associated ground-truth/field program efforts.

Stage 2 Validation: Product performance has been demonstrated to comply with the specification over a widely distributed set of locations and periods via several ground-truth and validation efforts.

Stage 3 Validation: Product performance has been demonstrated to comply with the specification and the uncertainties in the product well established via independent measurements in a systematic and statistically robust way representing global conditions.

NPP EDR PRODUCT MATURITY DEFINITIONS

***CLASS WILL START
DISTRIBUTION OF
PRODUCTS WHEN
THEY REACH
“BETA” MATURITY
LEVEL***

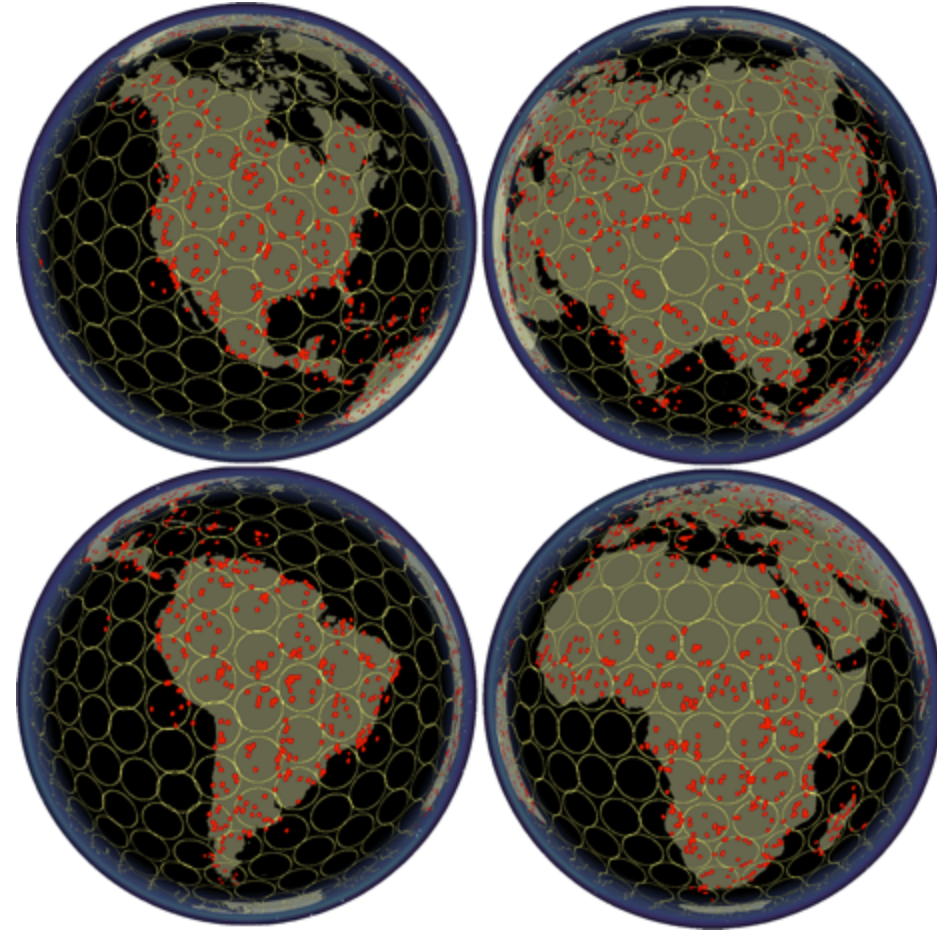
Explicit validation: MODIS heritage

Near-nadir pixels

(using ~2,500 coincident ASTER scenes)

17K MOD14 pixels sampled

120K MODIS pixels with 1+ ASTER fire pixel

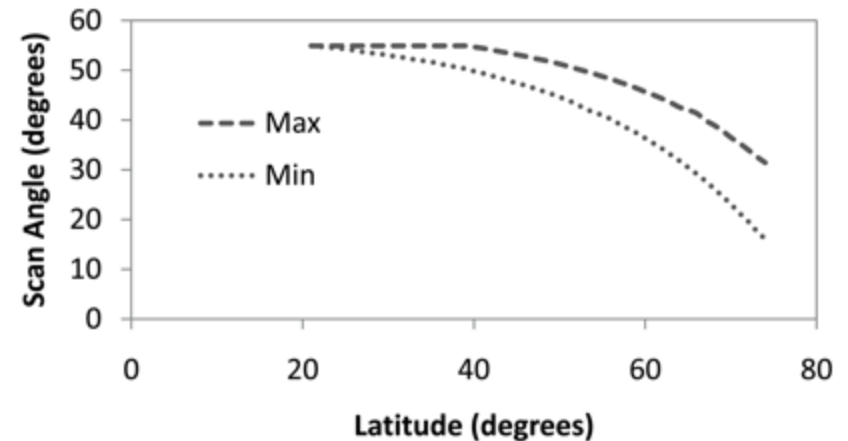
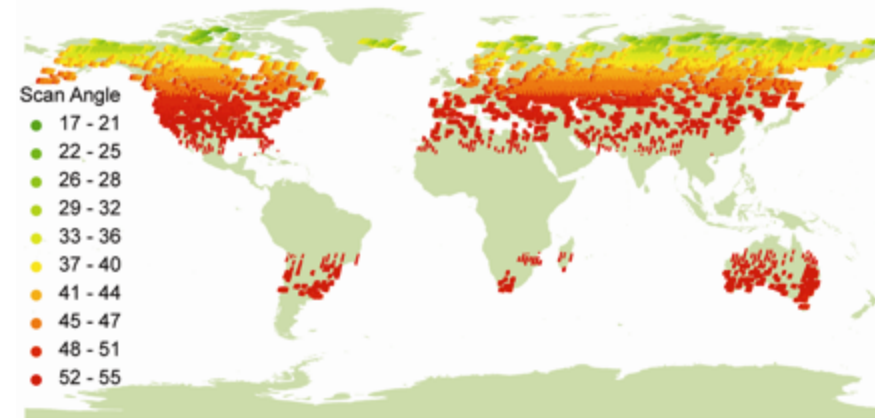


Off-nadir pixels

(using ~3,700 near-coincident TM scenes)

12K MOD14 pixels sampled

270K MODIS pixels with 1+ TM fire pixel



Explicit validation: MODIS heritage

Near-nadir pixels

(using ~2,500 coincident ASTER scenes)

ASTER 2001-2006

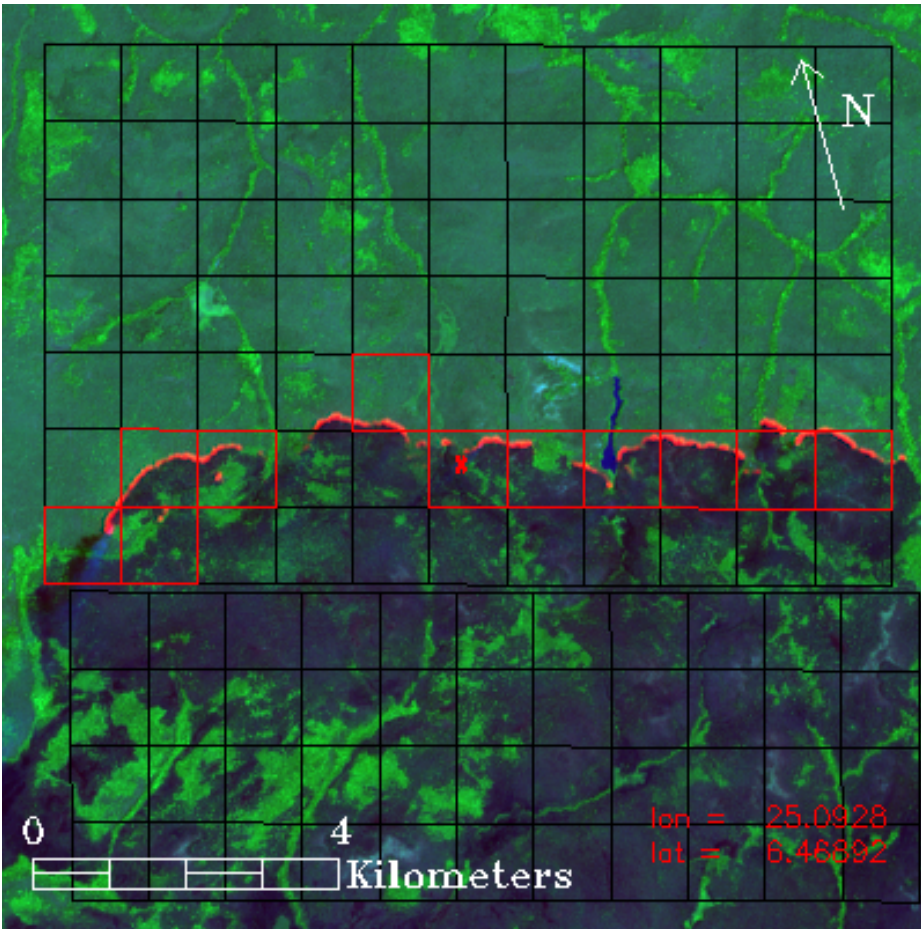
SWIR detector problem > May 2007

Off-nadir pixels

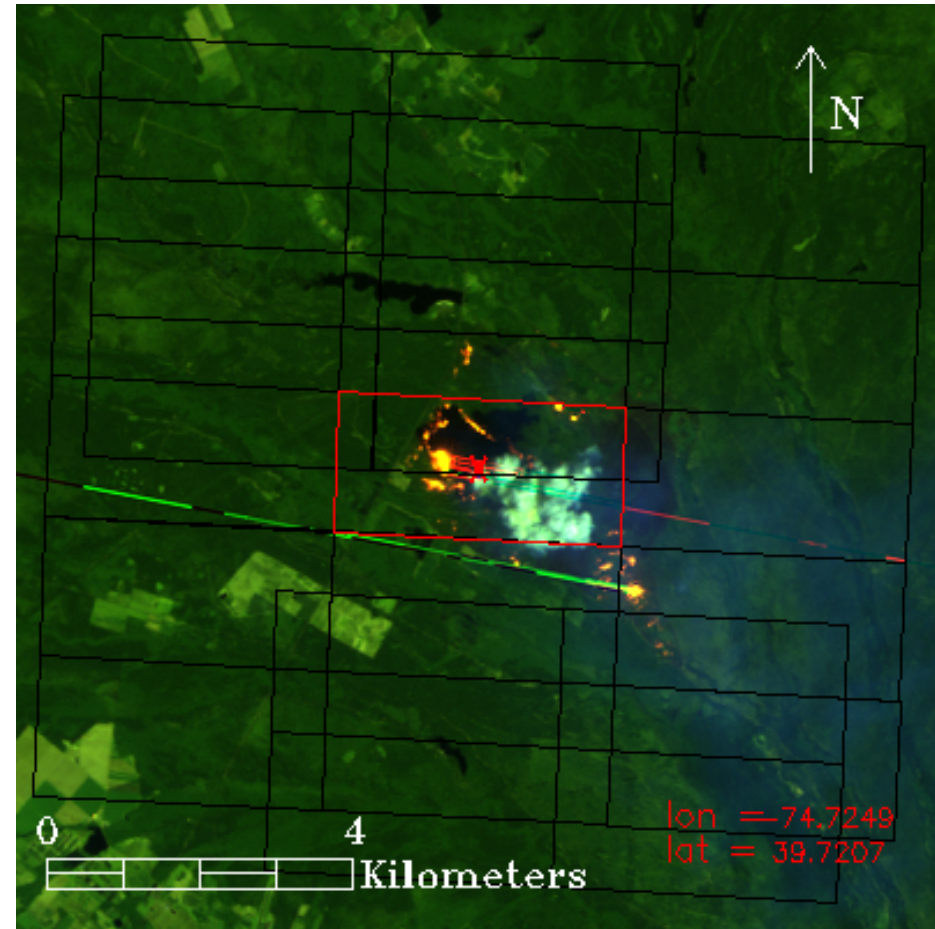
(using ~3,700 near-coincident TM scenes)

Landsat5 TM 2001-2010

Fire-related artifacts – saturation/bleeding



MODIS/ASTER 19 Jan 2006 0852UTC (near nadir)



MODIS/TM 04 Aug 2007 1533UTC (52° scan angle)

Explicit validation: MODIS heritage

Near-nadir pixels

(using ~2,500 coincident ASTER scenes)

ASTER 2001-2006

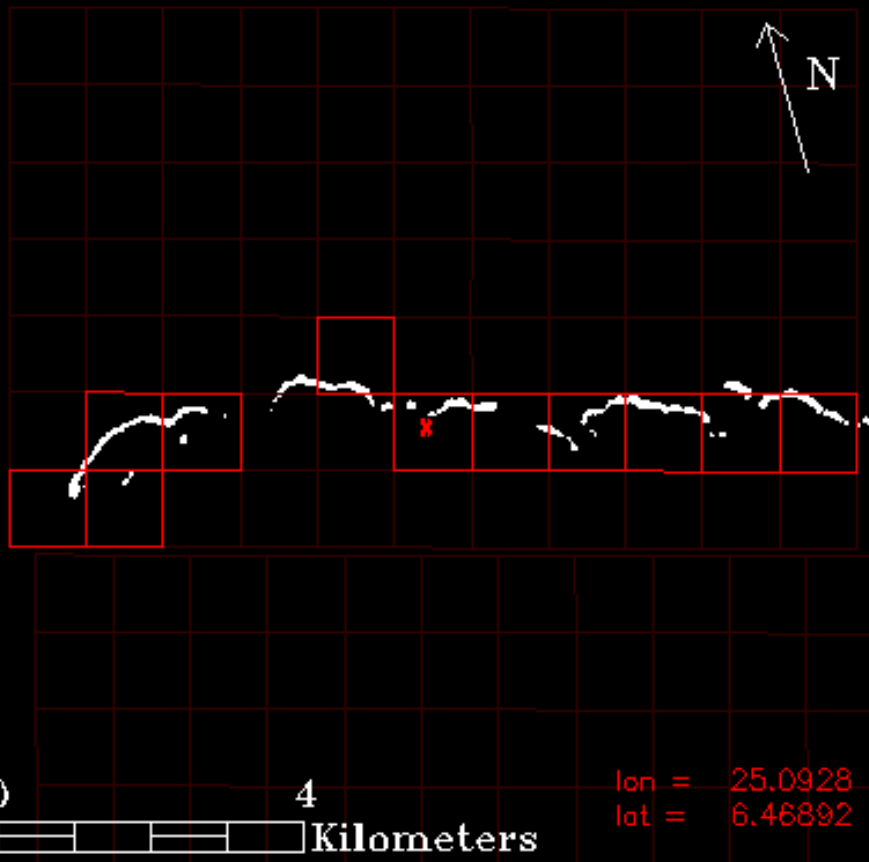
SWIR detector problem > May 2007

Off-nadir pixels

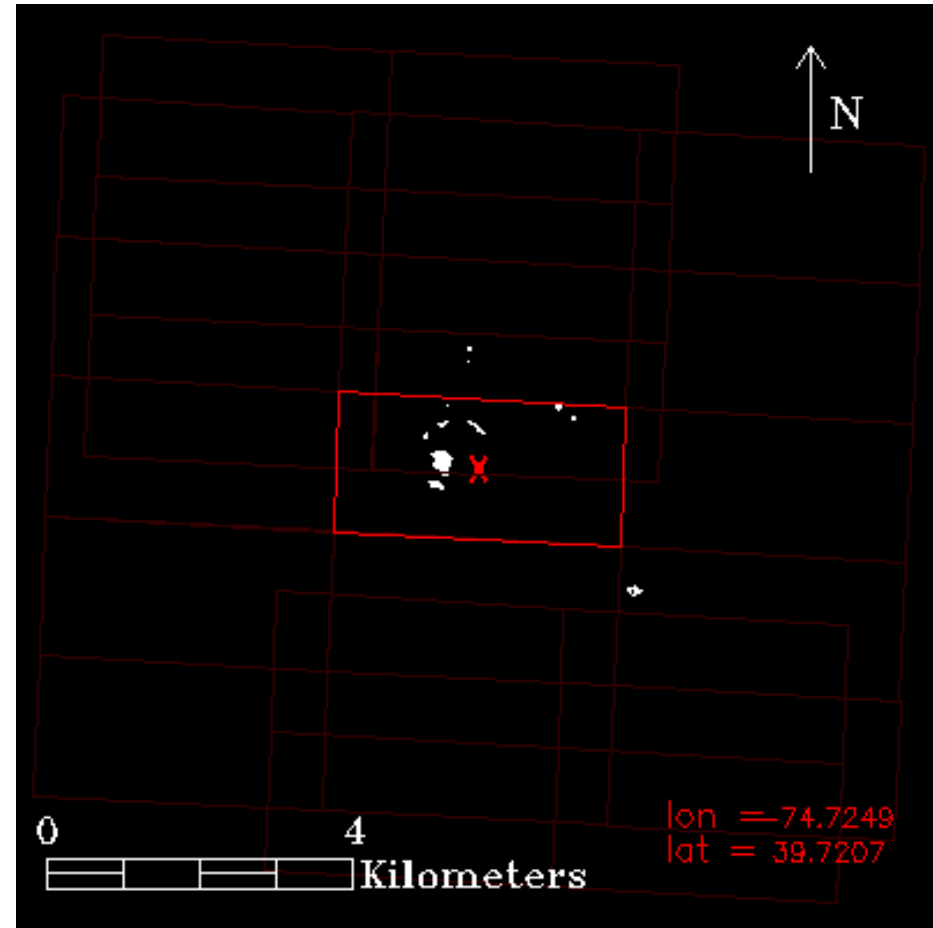
(using ~3,700 near-coincident TM scenes)

Landsat5 TM 2001-2010

Fire-related artifacts – saturation/bleeding



MODIS/ASTER 19 Jan 2006 0852UTC (near nadir)



MODIS/TM 04 Aug 2007 1533UTC (52° scan angle)

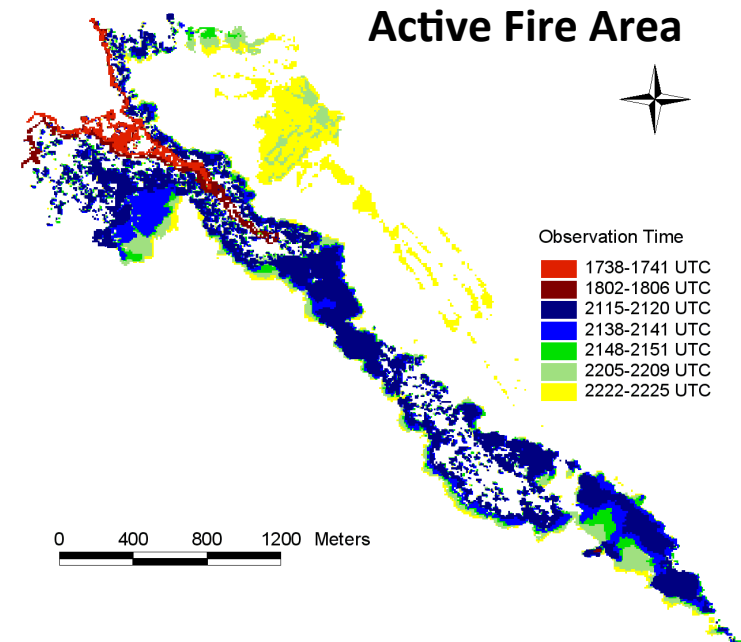
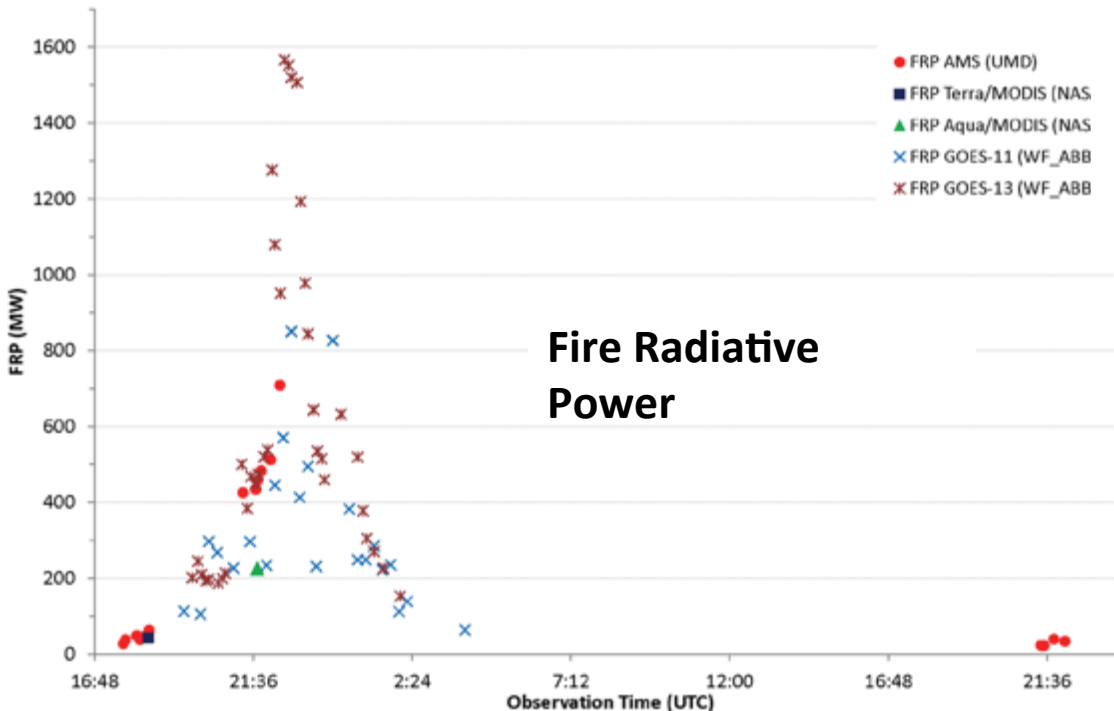
Validation Activities: airborne data

Airborne Validation – quantitative assessment

Use of fire-dedicated airborne sensors to map and characterize coincident Rx and wildland fires

Coordinated ground, airborne and spaceborne data acquisition

- USDA Forest Service
- NASA
- Universities and state agencies



18 Oct 2011

450 ha Rx fire at Henry Coe State Park/CA

Aerial coverage provided by NASA/Ames
AMS airborne sensor @10 m resolution

Coincident acquisition from MODIS (Terra
and Aqua) and GOES East/West

Validation Activities: in-situ data

Ground Verification – qualitative assessment

Use of coincident prescribed burns to verify active fire detection data using both I and M bands

Engaging:

- Individuals (private land owners)
- State agencies (fire/forestry departments)
- Federal agencies (USDA Forest Service)
- International community



2.2 ha grassland fire in
Chestertown, MD
23 March 2012



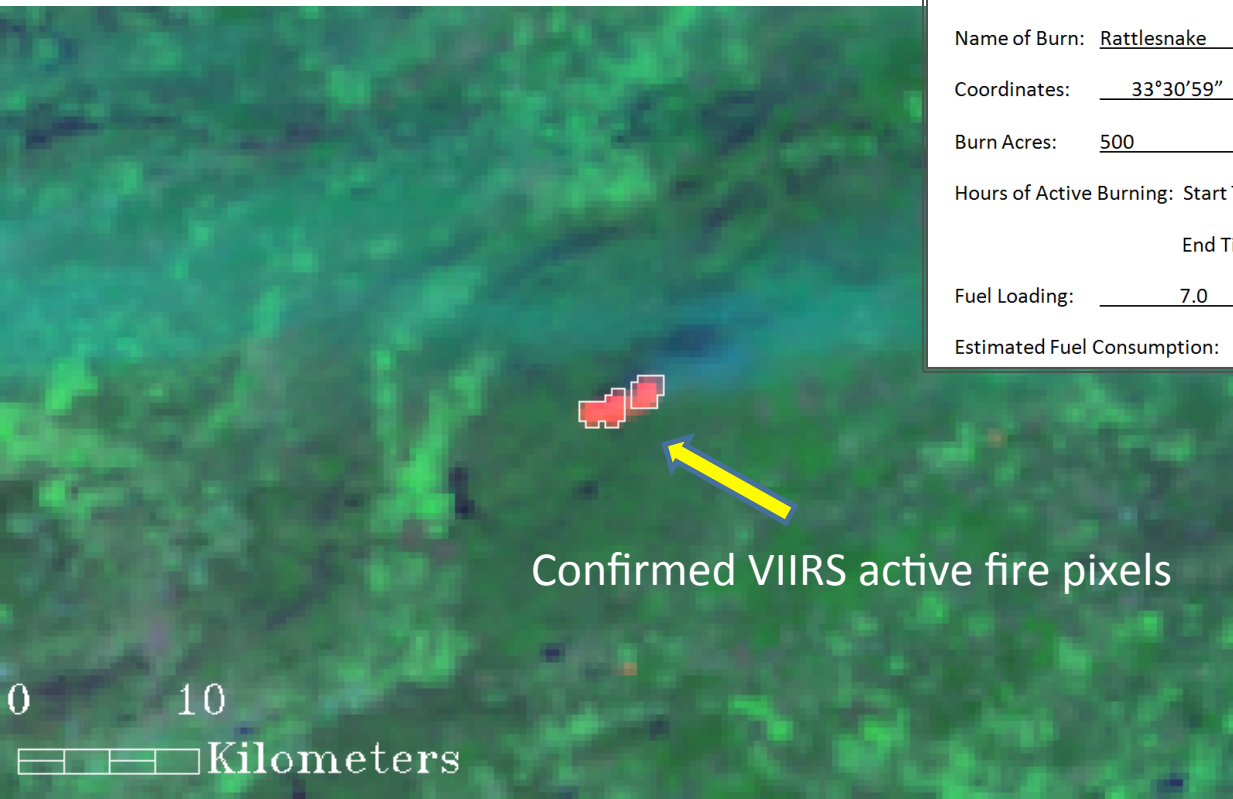
Validation Activities: in-situ data

Ground Verification – qualitative assessment

Use of coincident prescribed burns to verify active fire detection data using both I and M bands

Fire information provided by USDA personnel

- Date and location of burn
- Area burned
- Fuel load & fuel consumption



National Forests in Alabama			
2012 Rx Fire Smoke Monitoring			
Notification to NOAA NESDIS Satellite Analysis Branch			
The following information should be forwarded to the NOAA NESDIS team on each burn the morning of the burn:			
Date of Burn:	<u>3/27/2012</u>		
Name of Burn:	<u>Rattlesnake</u>		
Coordinates:	<u>33°30'59"</u> Lat	<u>-85°43'07"</u> Lon	(decimal degrees)
Burn Acres:	<u>500</u>		
Hours of Active Burning: Start Time -	<u>1000</u>	(CST)	
End Time:	<u>1800</u>	(CST)	
Fuel Loading:	<u>7.0</u>	(tons per acre)	
Estimated Fuel Consumption:	<u>5.0</u>	(tons per acre)	

Summary and conclusions

- Suomi NPP fire product is currently in the **Intensive Calibration and Validation** phase
- **Early assessment** of the NPP VIIRS fire product is **encouraging**
- **Continuing fire monitoring capability** in Northern Eurasia is expected
- **Differences in sensor characteristics** between MODIS and VIIRS are reflected in fire detections
- More work is needed to implementation of **new MODIS algorithm components** (implemented in Version 6) and **sensor-specific tuning** in the VIIRS product
- Explicit **validation** remains crucial