S-NPP/VIIRS Active Fire Data Sets

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NASA

NOAA NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION U.S. DEPARTMENT OF COMMERCE

Product Status

750m Data Set

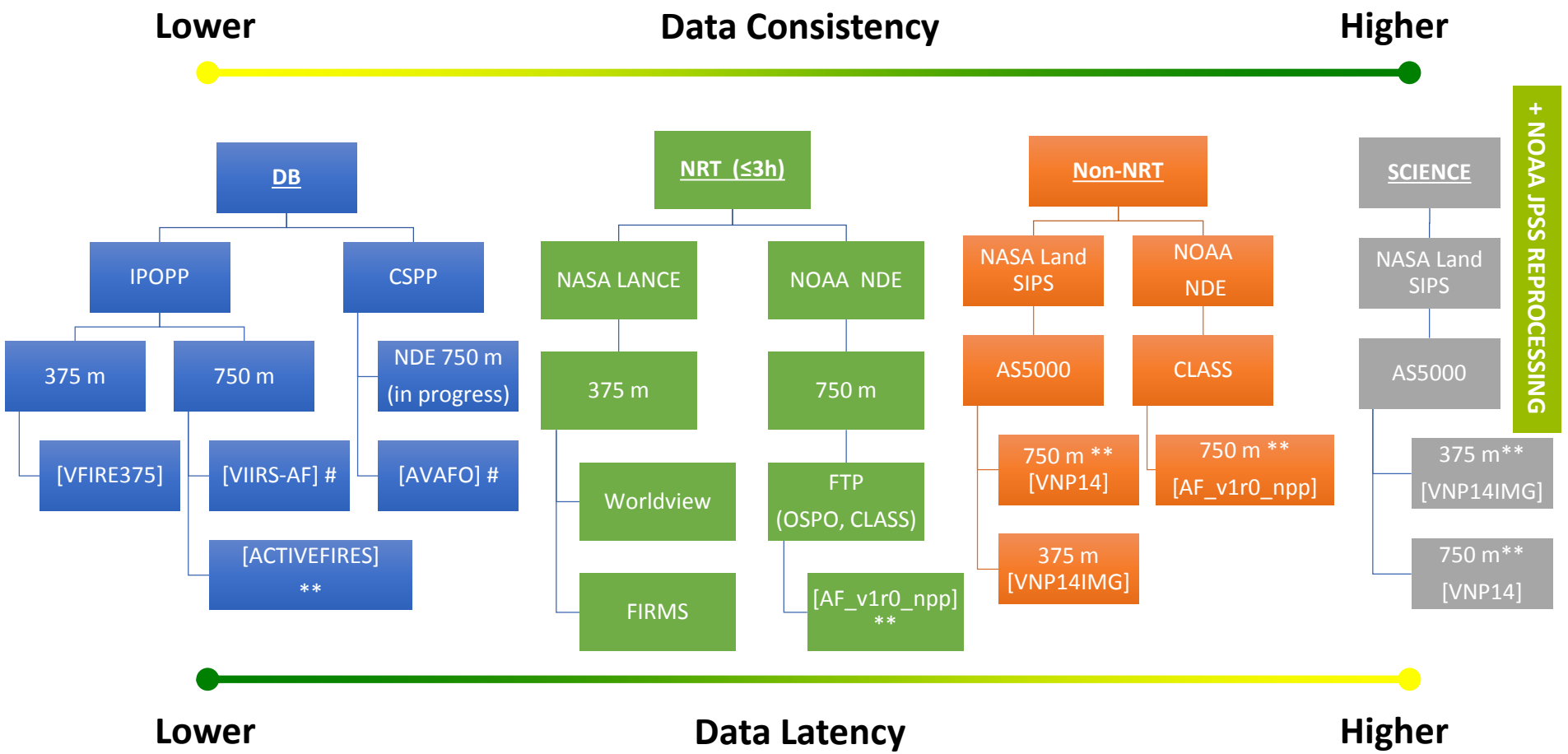
- Reprocessed Level 2 data (2012-2016) @ NASA/LandSIPS
  - **Algorithm version**: MODIS Collection 6 equivalent
  - **Input data**: Original Science Data Record (SDR) 6-min granules
  - **Output**: NetCDF format (HDF5 compatible) 6-min granules
  - **Caveat**: +180 corrupted SDR granules impacting output fire data (list available online)
  - **Availability**: Data archived at LPDAAC and LAADS
  - **Documentation**: ATBD and user's guide available online
- Forward Level 2 data processing @ NASA/LandSIPS and NOAA/NDE
  - **Algorithm version**: MODIS Collection 6 equivalent
  - **Input data**: NASA and NOAA running unique SDR versions
  - **Output data**: NetCDF of unique filename convention/granule size. **Caveat**: Small differences between NASA and NOAA-sourced files may occur due to unique input data
  - **Availability**: NASA data -> LPDAAC and LAADS, NOAA data -> CLASS (near-real time)
- Direct Readout
  - Available through IPOPP (CSPP??)

Product Status

375m Data Set

- Reprocessed Level 2 data (2012-2017) @ NASA/LandSIPS
  - **Algorithm version**: Hybrid I-M band algorithm
  - **Input data**: Original Science Data Record (SDR) 6-min granules
  - **Output**: NetCDF format (HDF5 compatible) 6-min granules
  - **Caveat**: +550 corrupted SDR granules impacting output fire data (list available online)
  - **Availability**: Data archived at LPDAAC and LAADS
  - **Documentation**: ATBD and user's guide available online
- Forward Level 2 data processing @ NASA/LandSIPS and LANCE
  - **Algorithm version**: Hybrid I-M band algorithm
  - **Input data**: Original Science Data Record (SDR) 6-min granules
  - **Output data**: NetCDF format (HDF5 compatible) 6-min granules
  - **Caveat**: few outstanding bad SDR data still observed
  - **Availability**: NASA LAADS ftp; near real time data at LANCE/FIRMS
- Direct Readout
  - IPOPP running slightly deprecated version of algorithm

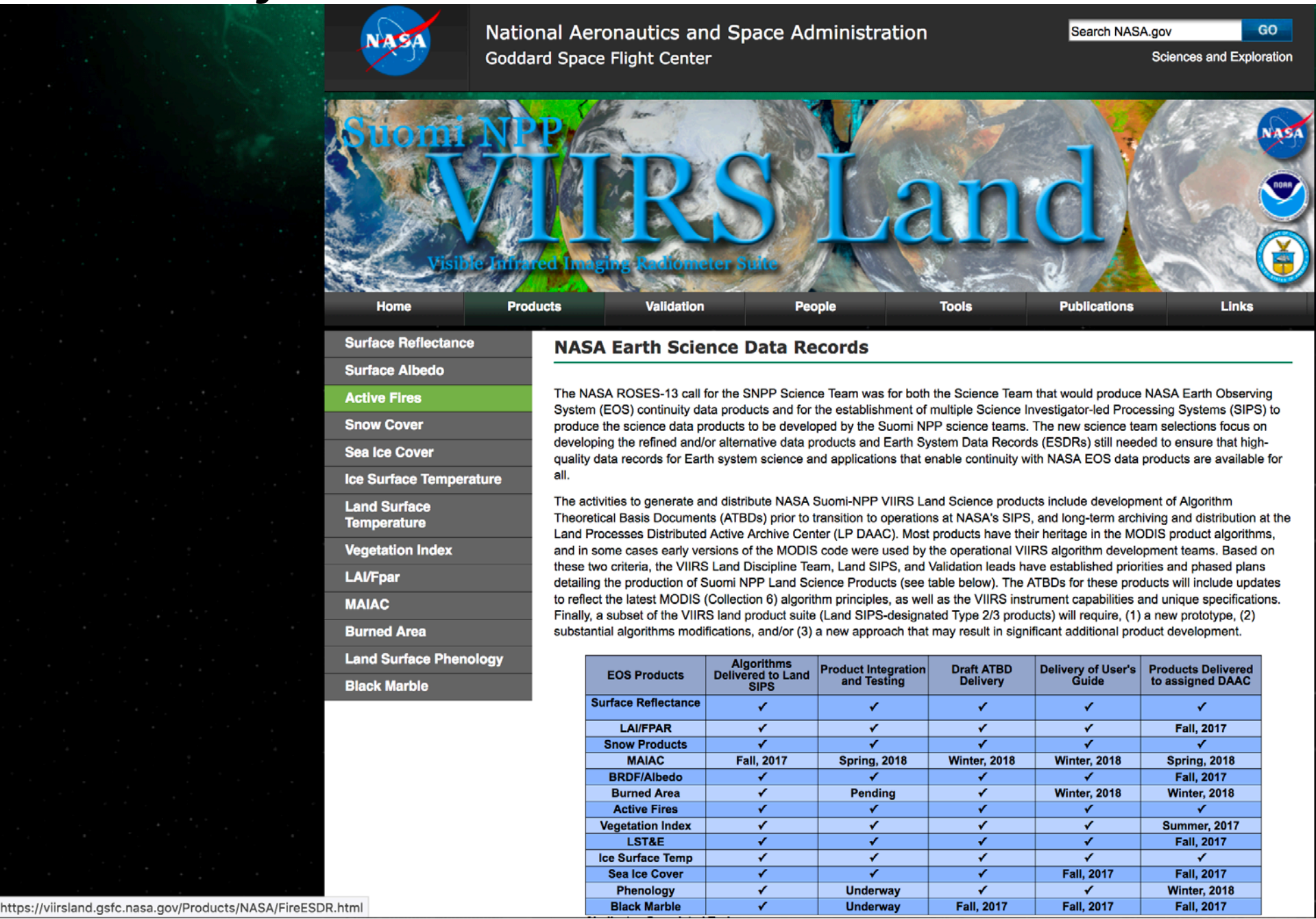
VIIRS Active Fire Product Lineage



pattern indicates this directory is outdated
** marked products include FRP retrieval
# marked products describe discontinued algorithm
[ ] indicate official product name

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

Product Information



EOS Products	Algorithms Delivered to Land SIPS	Product Integration and Testing	Draft ATBD Delivery	Delivery of User's Guide	Products Delivered to assigned DAAC
Surface Reflectance	✓	✓	✓	✓	✓
LAI/FPAR	✓	✓	✓	✓	Fall, 2017
Snow Products	✓	✓	✓	✓	✓
MAIAC	Fall, 2017	Spring, 2018	Winter, 2018	Winter, 2018	Spring, 2018
BRDF/Albedo	✓	✓	✓	✓	Fall, 2017
Burned Area	✓	Pending	✓	Winter, 2018	Winter, 2018
Active Fires	✓	✓	✓	✓	✓
Vegetation Index	✓	✓	✓	✓	Summer, 2017
LST&E	✓	✓	✓	✓	Fall, 2017
Ice Surface Temp	✓	✓	✓	✓	✓
Sea Ice Cover	✓	✓	✓	Fall, 2017	Fall, 2017
Phenology	✓	Underway	✓	✓	Winter, 2018
Black Marble	✓	Underway	Fall, 2017	Fall, 2017	Fall, 2017

JPSS EDRs LTM Site
- Personnel
- Instrument Descriptions
- STAR JPSS Home

EDR Products
- Active Fires >>
- Aerosols
- Albedo
- ATMS L-C TDR
- Clouds
- Cryosphere - Ice
- Cryosphere - Snow
- GCOM AMSR2 Products
- Imagery - DNB
- Land Surface Temperature
- MiRS Soundings
- NUCAPS Soundings
- Ocean Color
- Ozone
- Polar Winds
- Sea Surface Temperature
- Surface Type
- Vegetation Indices
- Vegetation Health

Browse: Active Fires

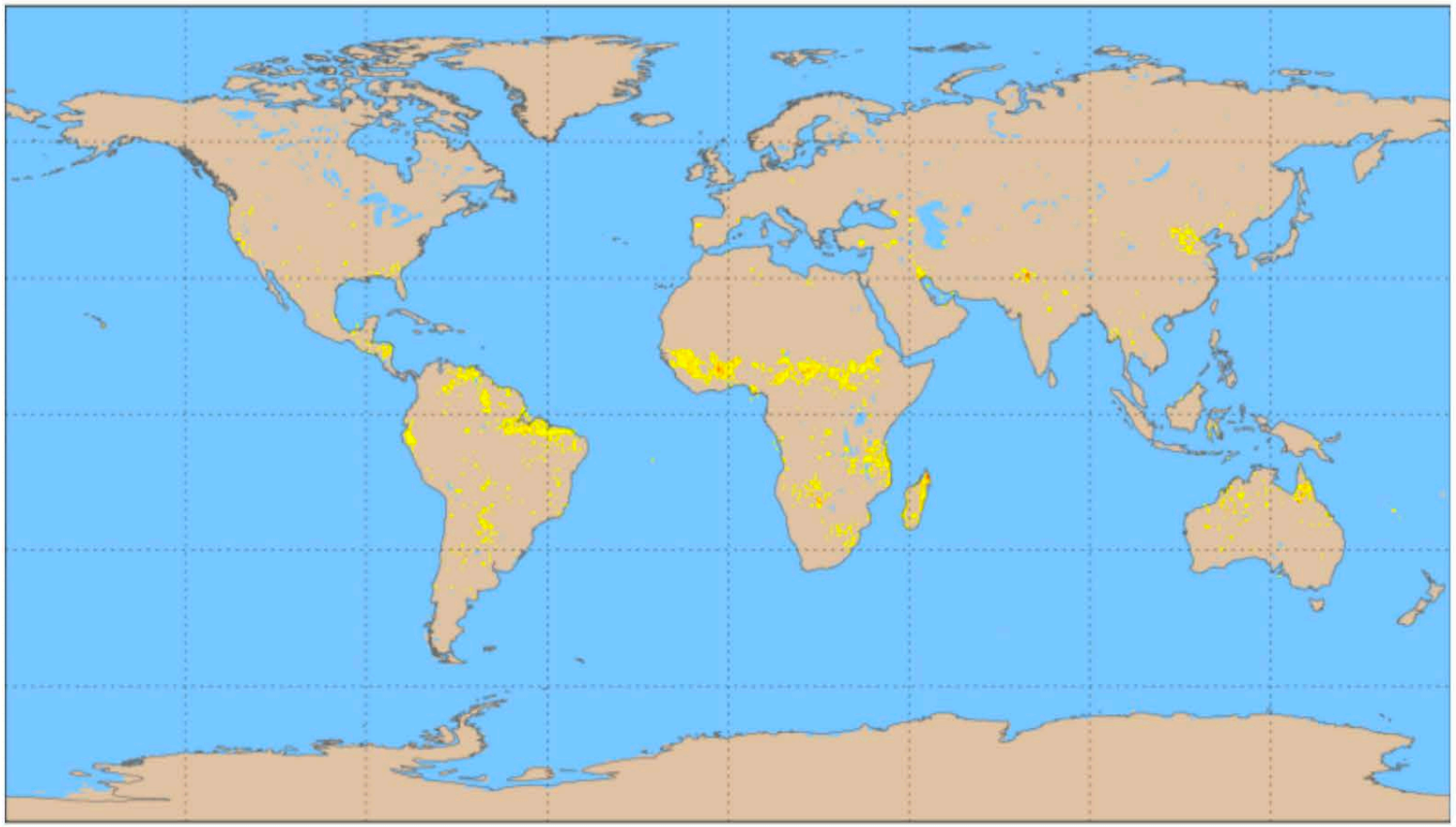
19 Nov 2017 - 11:27 ET / 16:27 UTC

Animate Selected Product | Animate All Products

Select a parameter: Active Fires Frequency Map | Active Fires Frequency Map: NDE - day-night composite | Select a Date: 11-18-2017

Suomi NPP VIIRS - NDE Active Fires

18 Nov 2017



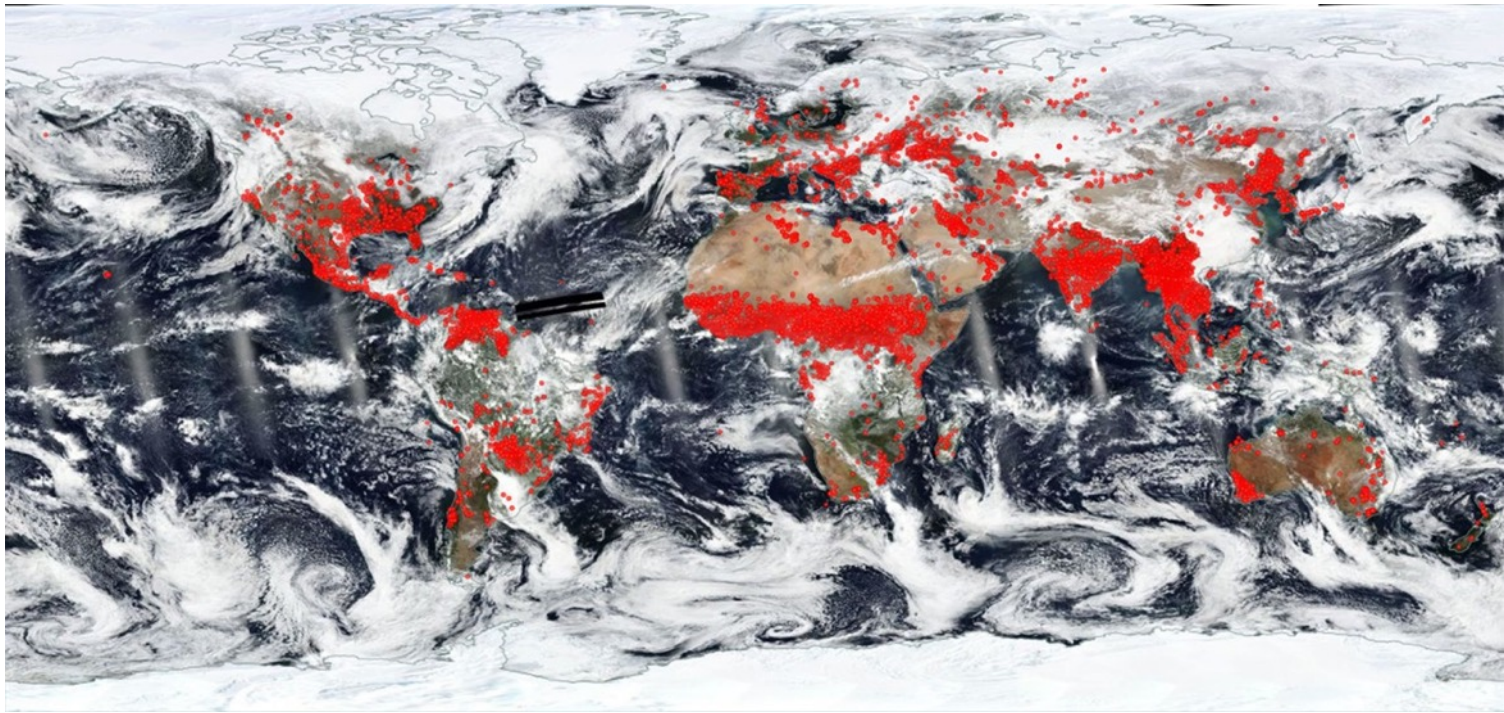
0 10 20 30 40 50 60 70 80 90 100

Fire Frequency

NASA Land, Atmosphere Near real-time Capability for EOS (LANCE)

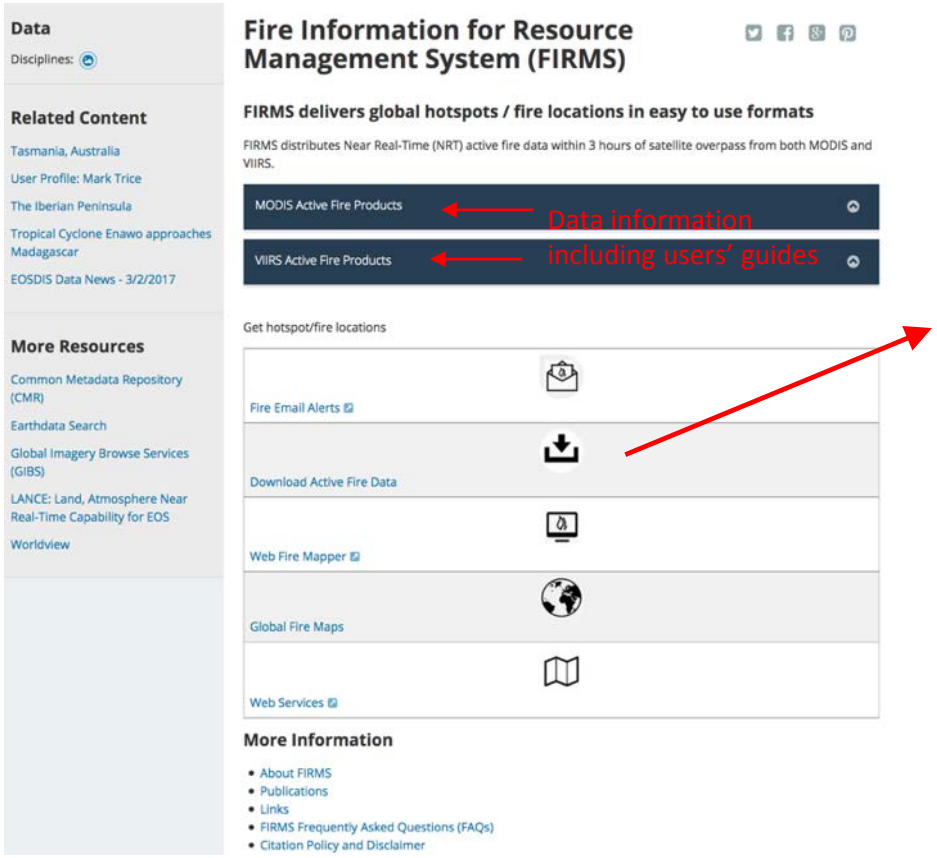
Global coverage
Approx. 3 h data latency
VIIRS and MODIS active fire data distributed via FIRMS & MODAPS FTP

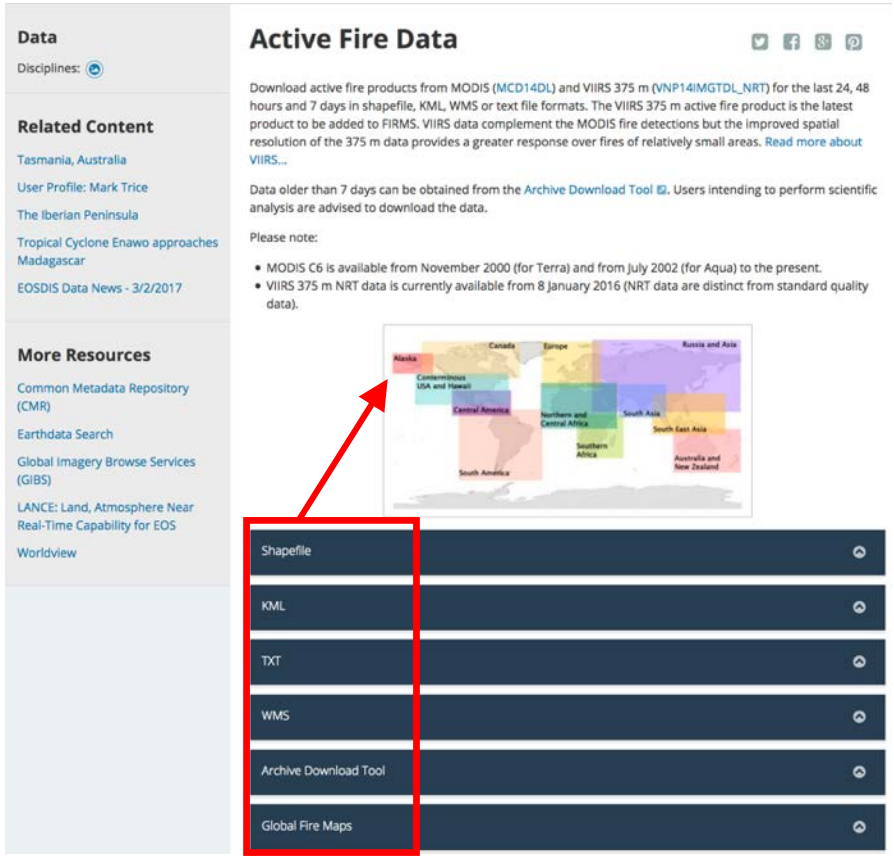
VIIRS 20170315



https://worldview.earthdata.nasa.gov

Fire Information for Resource Management System (FIRMS)

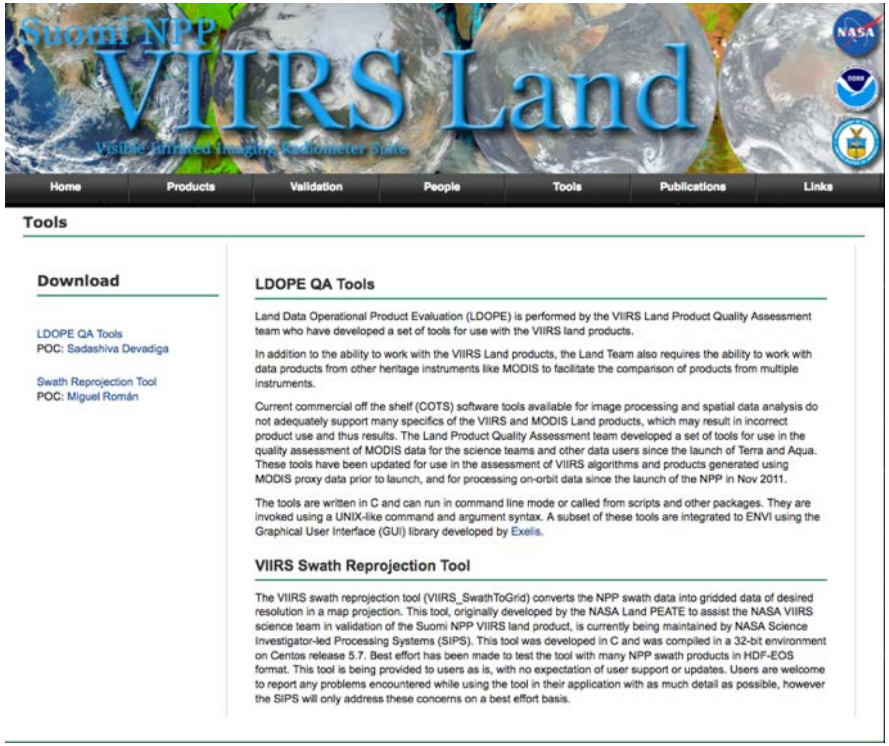




https://earthdata.nasa.gov/earth-observation-data/near-real-time/firms

VIIRS Data Resources

VIIRS Swath Reprojection Tool
(command line – Linux)
https://viirsland.gsfc.nasa.gov/Tools.html



Reprojection Tool Input Requirements:
VNP14IMG*.nc or VNP14*.nc fire data files
VNP02IMG*.nc or VNP02*.nc geolocation files
Data converter to HDF/EOS

VIIRS Fire University of Maryland website:
http://viirsfire.geog.umd.edu/

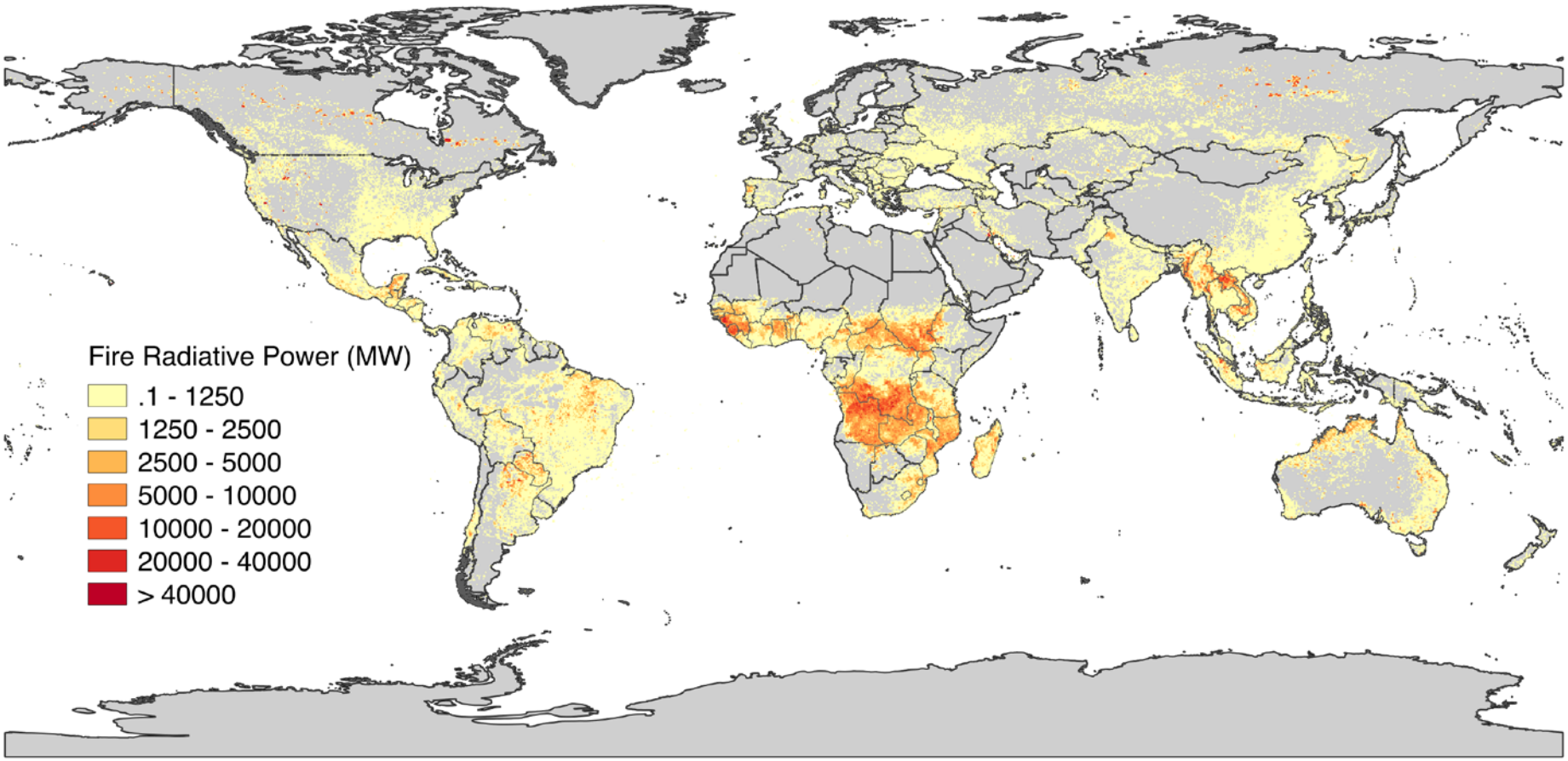
VIIRS Fire Data Users' Guide:
https://viirsland.gsfc.nasa.gov/Products/FireESDR.html

NRT data download options:

NASA MODAPS (registered users) **375m** fire data set:
https://earthdata.nasa.gov/earth-observation-data/near-real-time/download-nrt-data/viirs-nrt

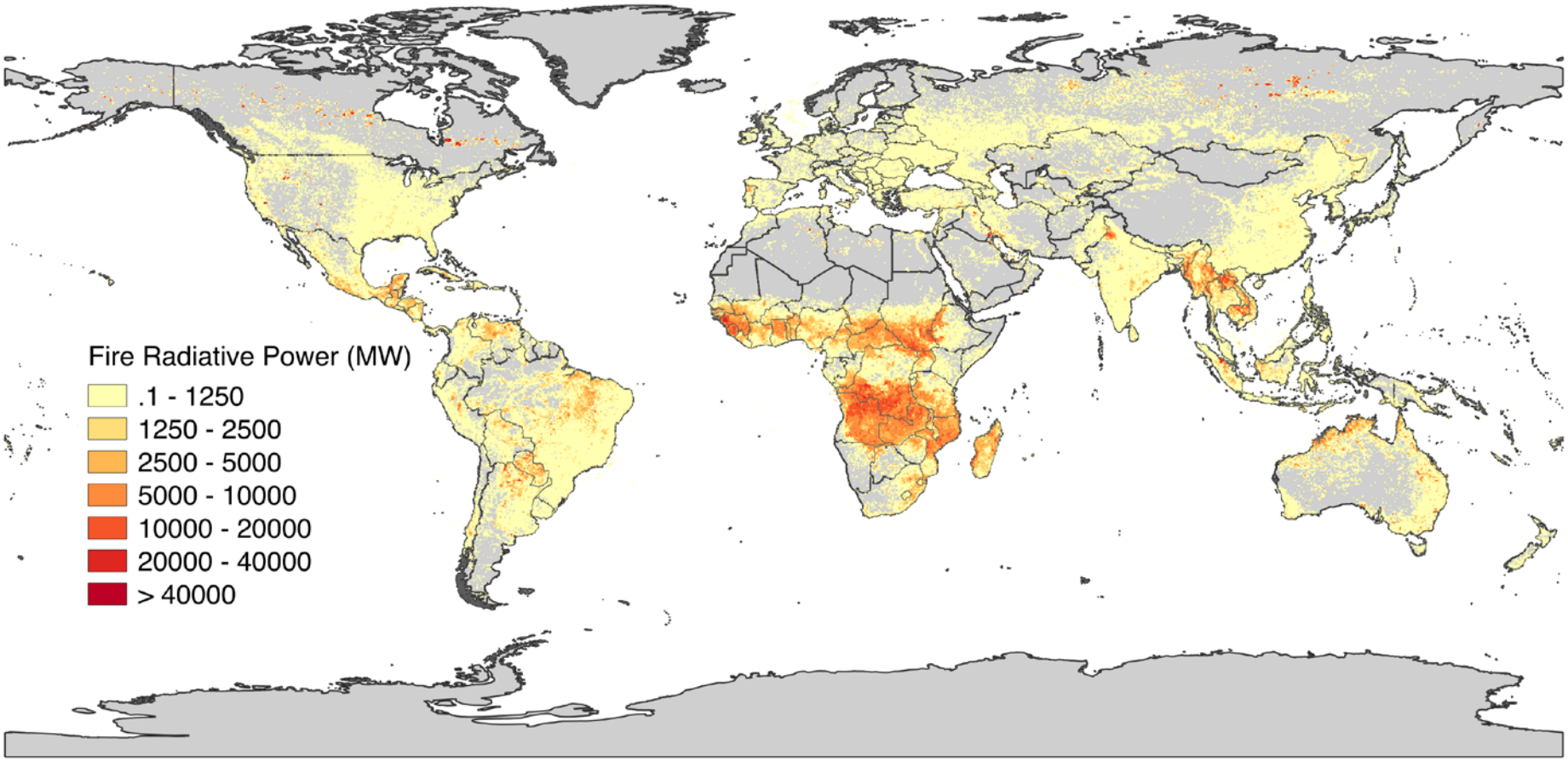
NOAA NDE (anonymous FTP) **750m** fire data set:
ftp://ftp-npp.class.ngdc.noaa.gov/
Select:
Date ->
NDE-L2 ->
VIIRS-Active-Fire-EDR-NOAA-Enterprise-Algorithm

Global FRP – Aqua/MODIS 1km



Aqua/MODIS 1km - 2013

Global FRP – S-NPP/VIIRS 375m



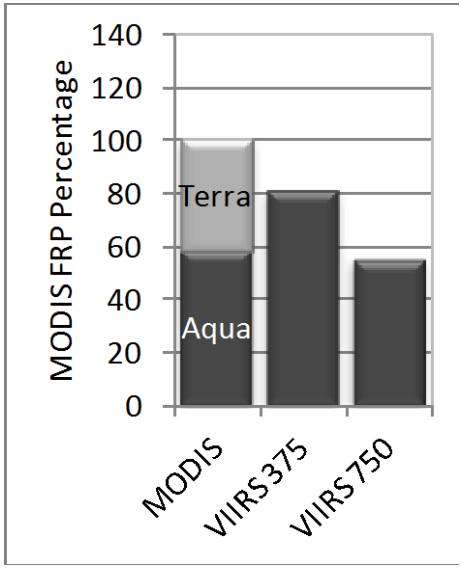
S-NPP/VIIRS 375m – 2013
50% higher FRP compared to Aqua/MODIS

VIIRS 375 m, 750 m and MODIS 1km Top-of-Atmosphere FRP

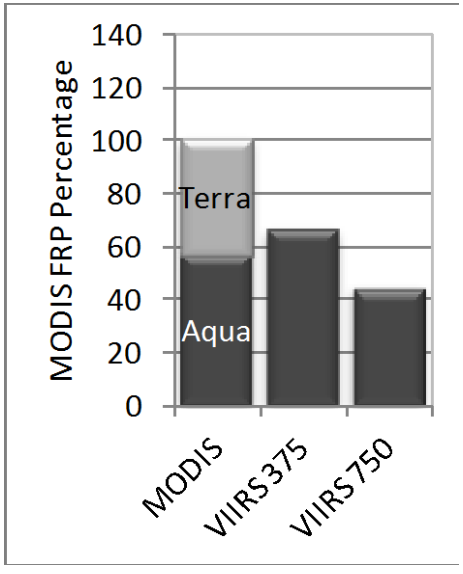
45% of daytime and 80% of nighttime VIIRS fire pixels have no match in Aqua/MODIS fire data

VIIRS systematically detecting more fires than same-day MODIS (Terra & Aqua) in areas dominated by small/low-intensity fires

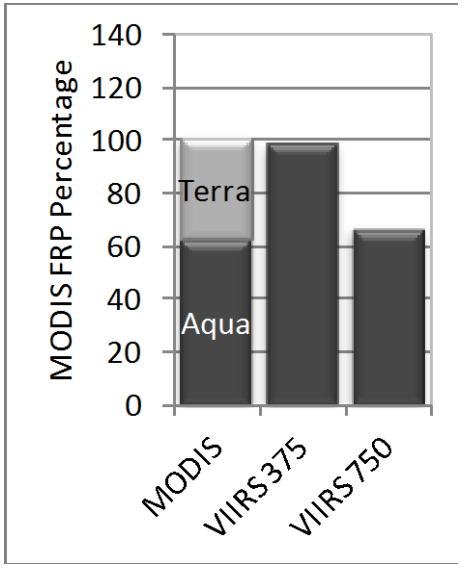
North America



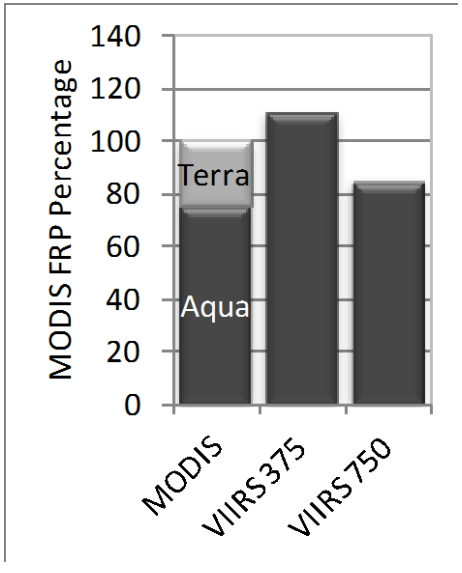
Russia



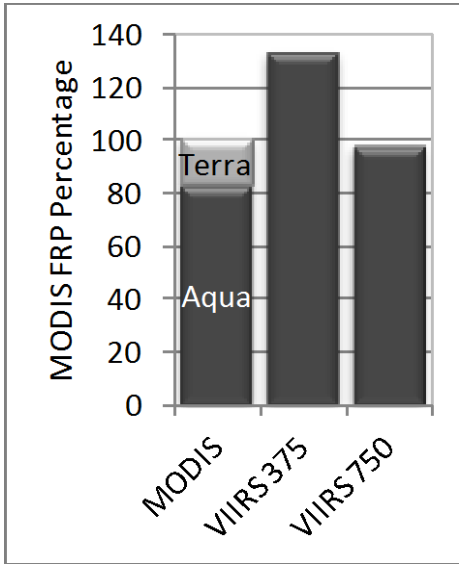
South America



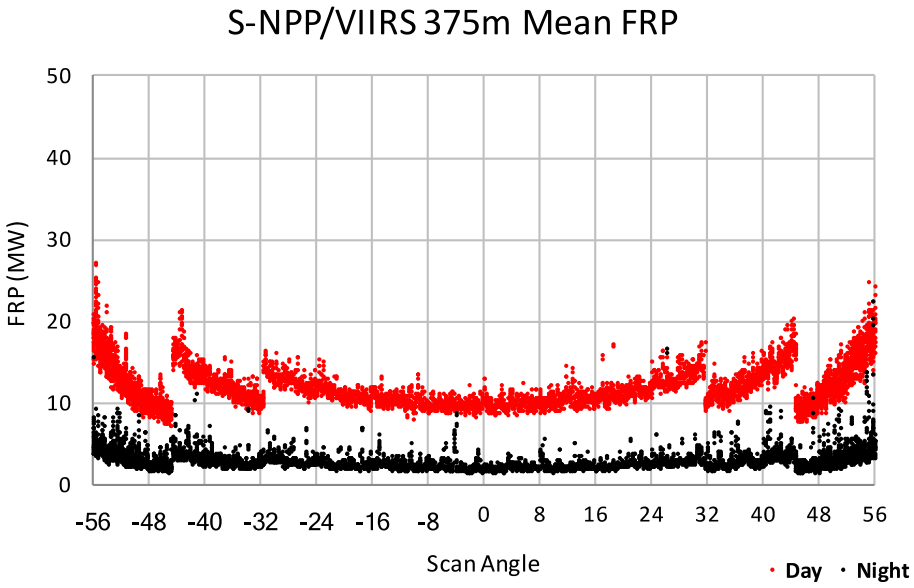
Africa



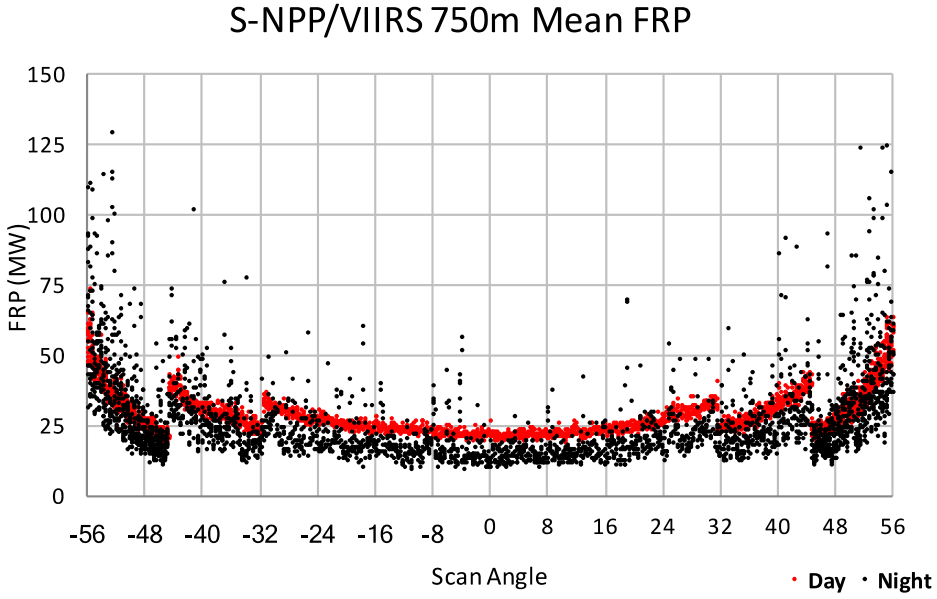
South East Asia

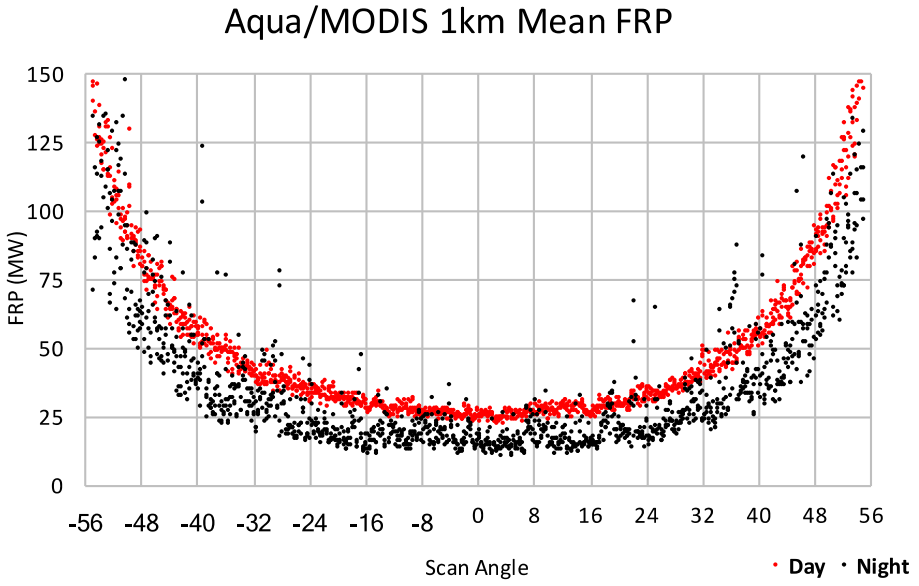


VIIRS 375 m, 750 m, MODIS 1km FRP



VIIRS data aggregation helps reduce detection performance differences due to changes in pixel size/scan-angle

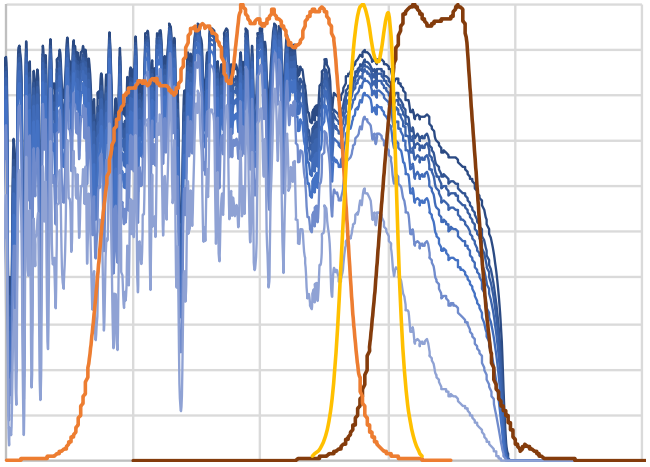




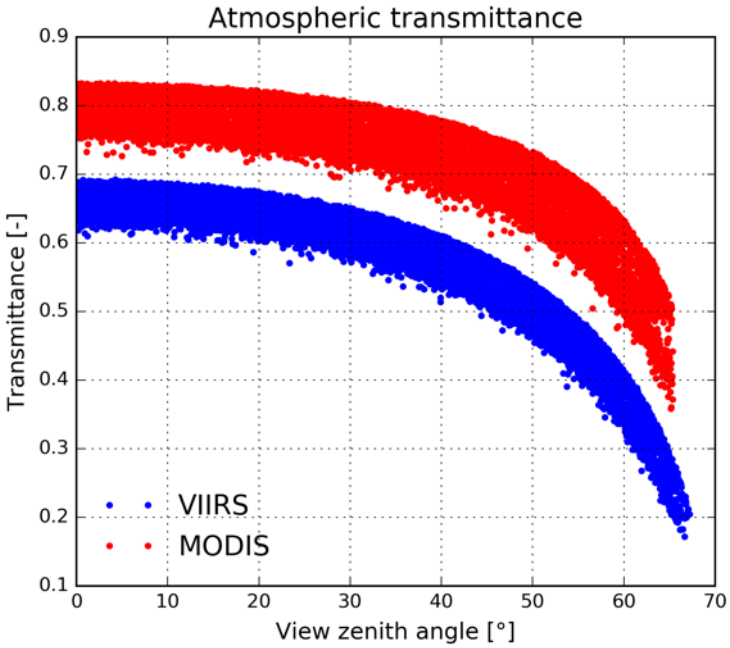
FRP Data Considerations

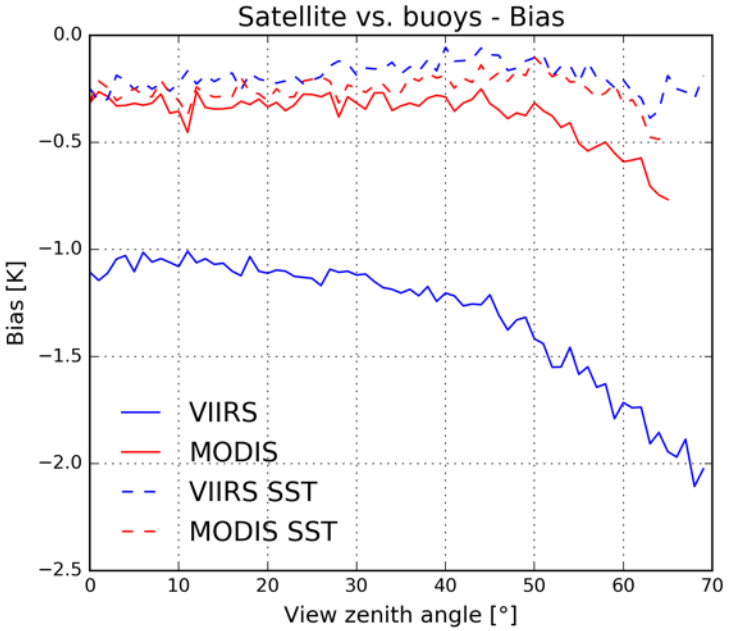
- Majority of VIIRS bowtie pixels are deleted onboard the spacecraft prior to data downlink. MODIS bowtie pixels are still present in Level 2 data resulting in potential double counting at far-off nadir angles

- VIIRS mid-IR band overlaps with CO_2 absorption band causing FRP underestimation
  - Provisions added to Level 2 data to facilitate atmospheric correction implementation



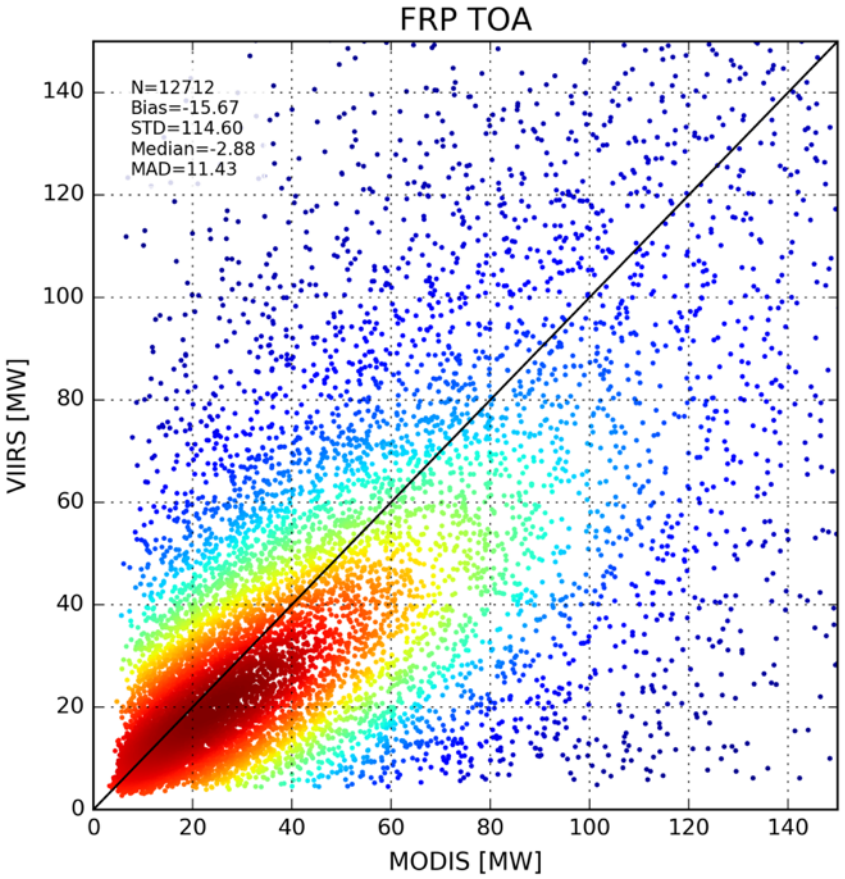
B-22 SRF



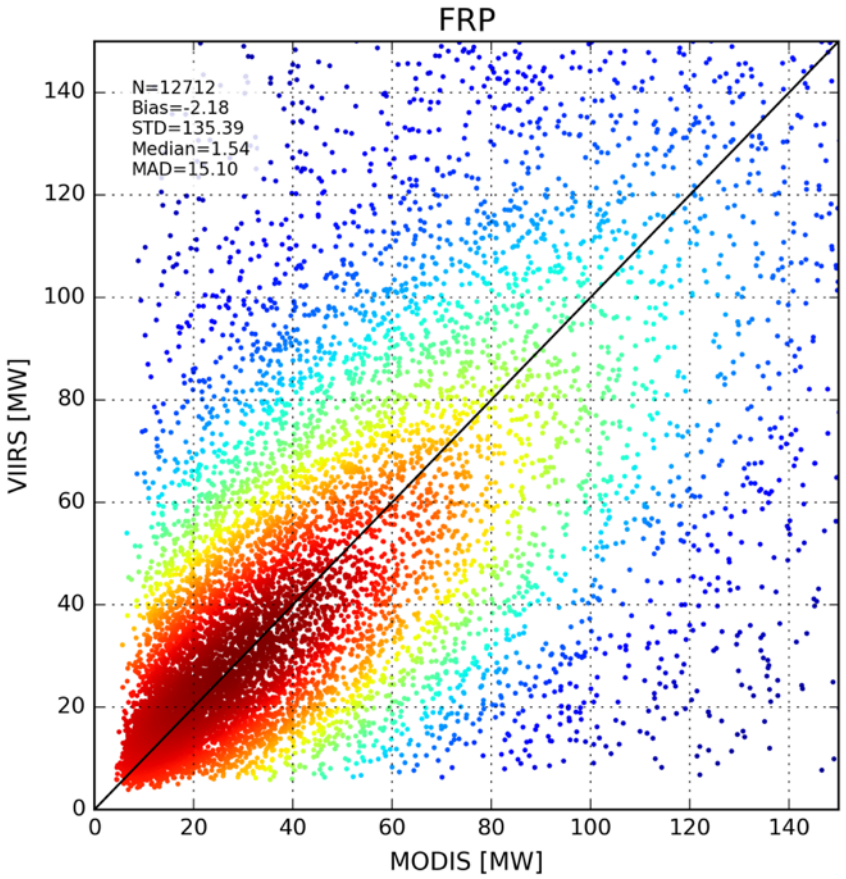


Cross-Validation of MODIS x VIIRS FRP Data

FRP retrievals corrected for atmospheric attenuation using
MODTRAN + MERRA-2 (0.625º x 0.5º)



Before atmospheric correction



After atmospheric correction

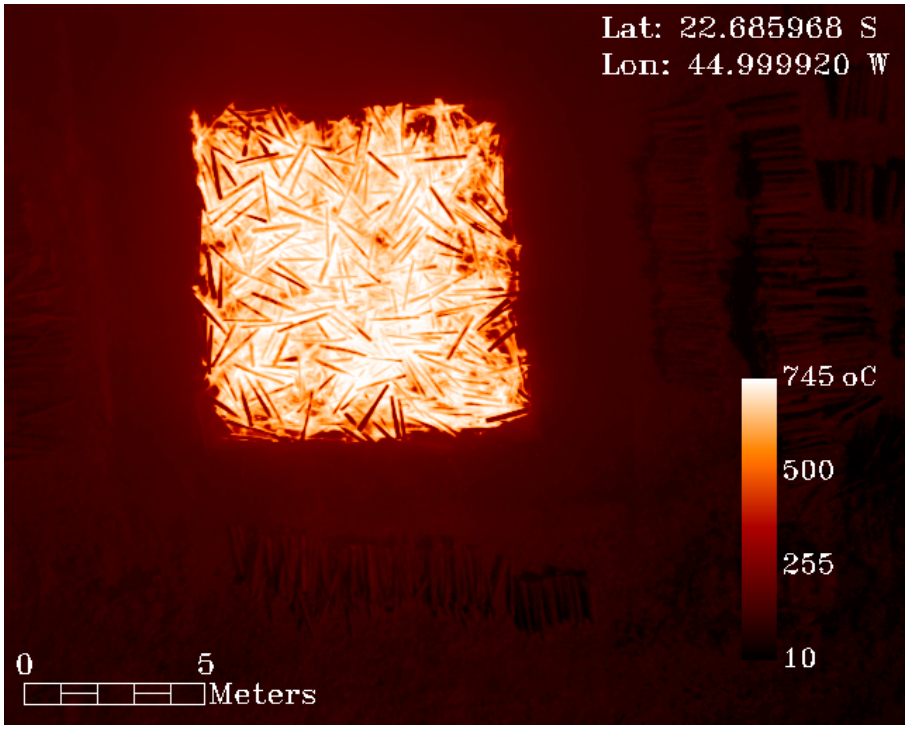
Data Validation –July 2017, Brazil

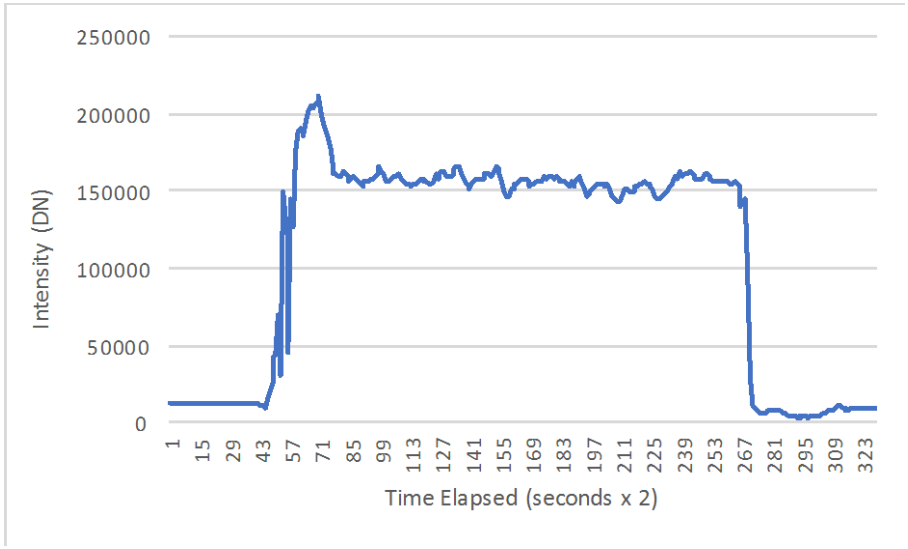
Two drones flying in tandem

Payload #1: 5-channel radiometer

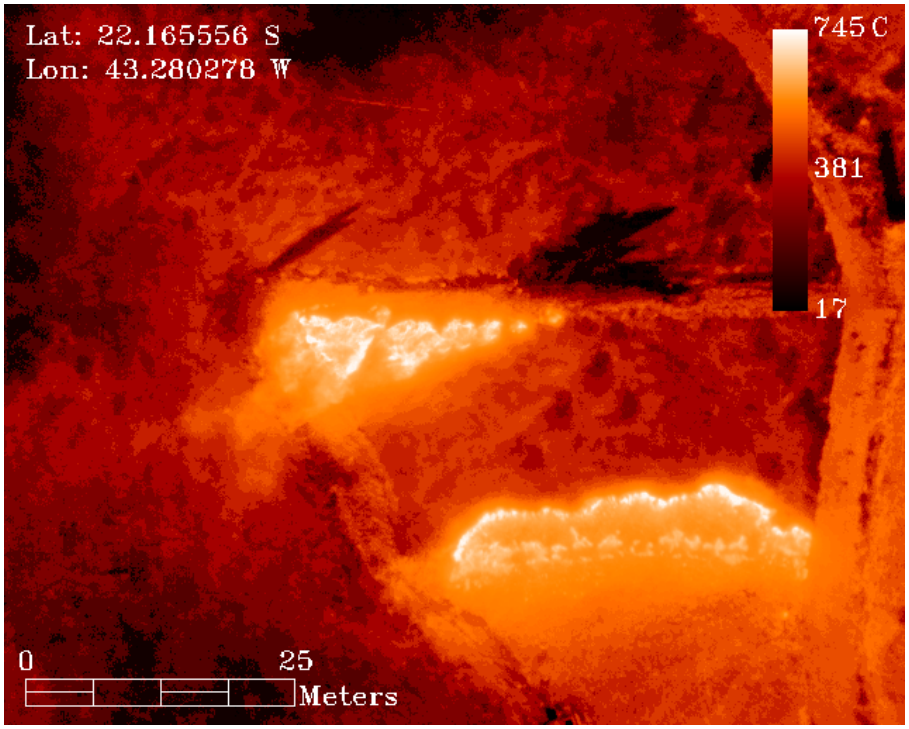
Payload #2: Infrared camera (FLIR Vue Pro R)

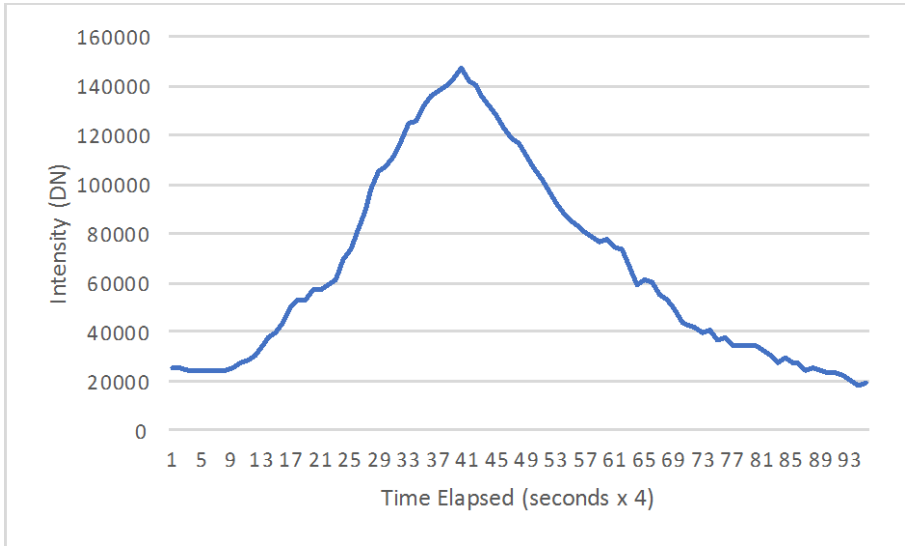
Pseudo-Static Heat Source



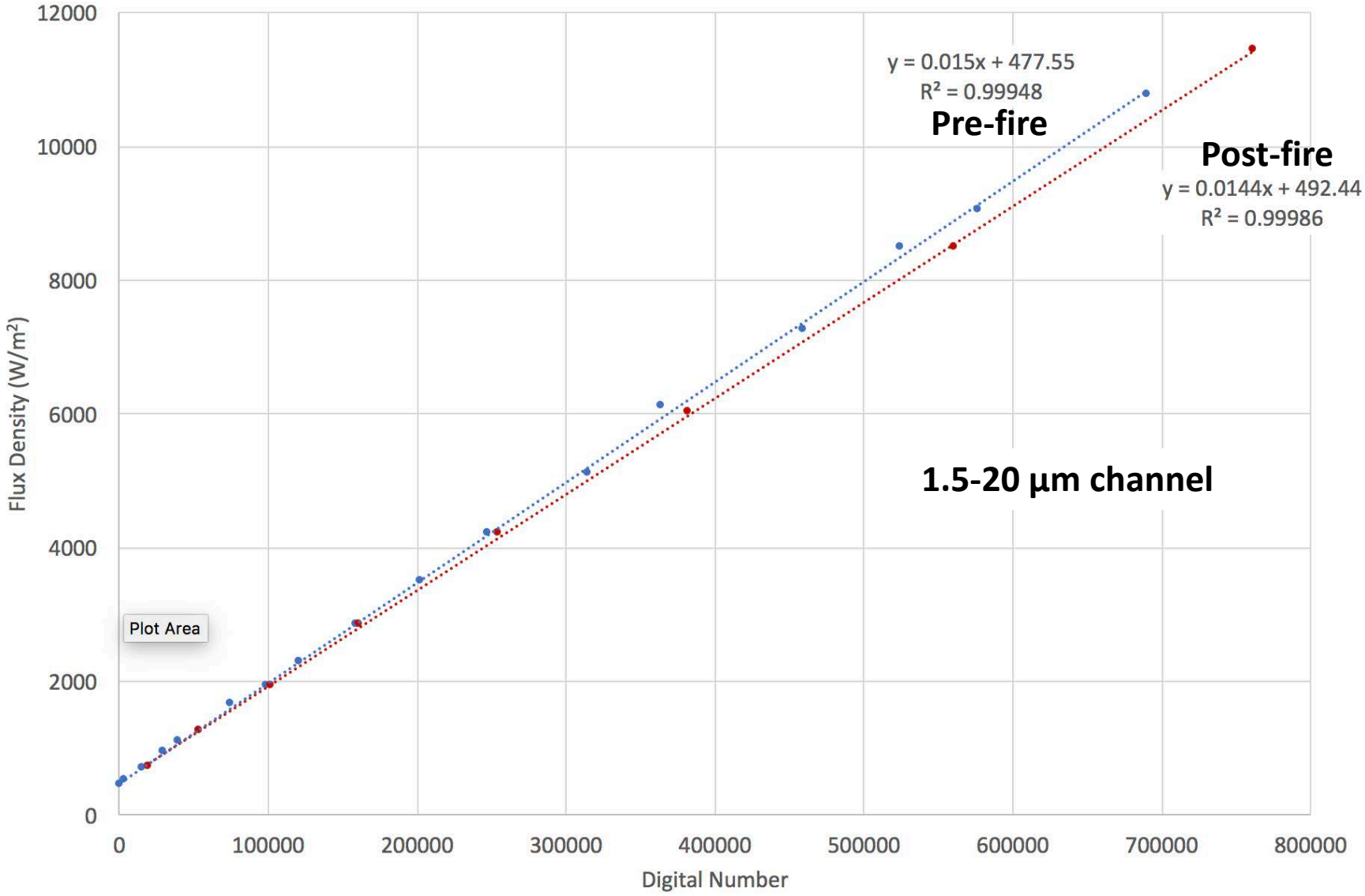


Grass Fire

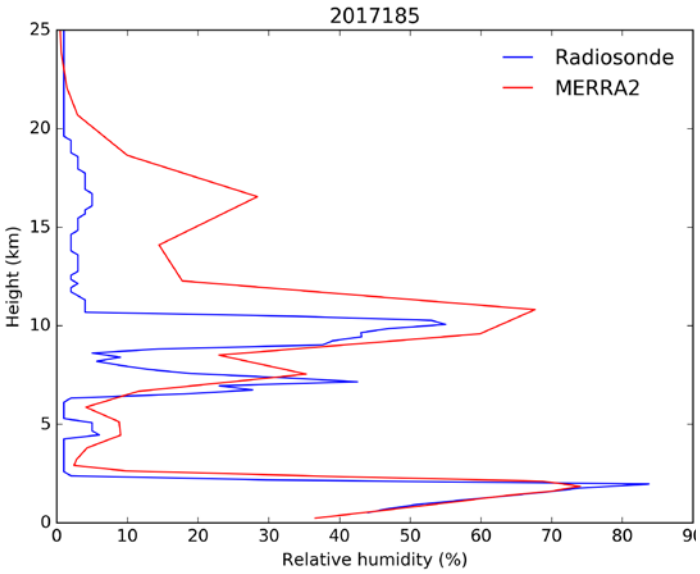


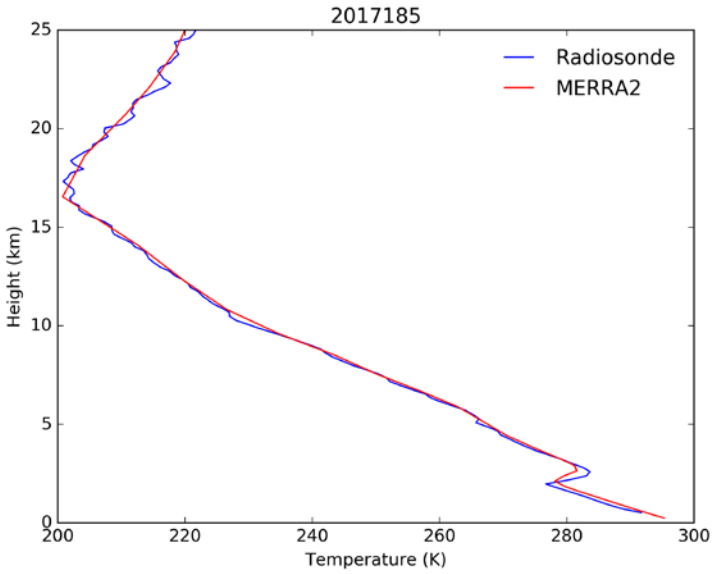


Multi-spectral Radiometer – Channel 4 Data Calibration



Radiosonde x MERRA-2 Data Comparison



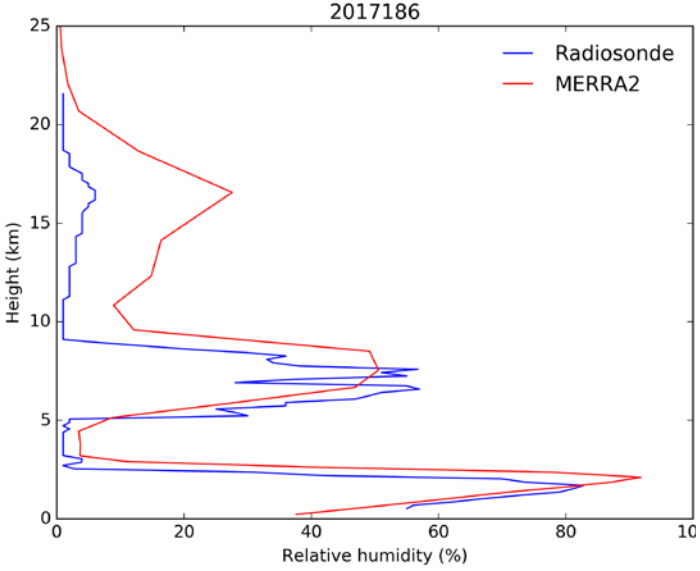


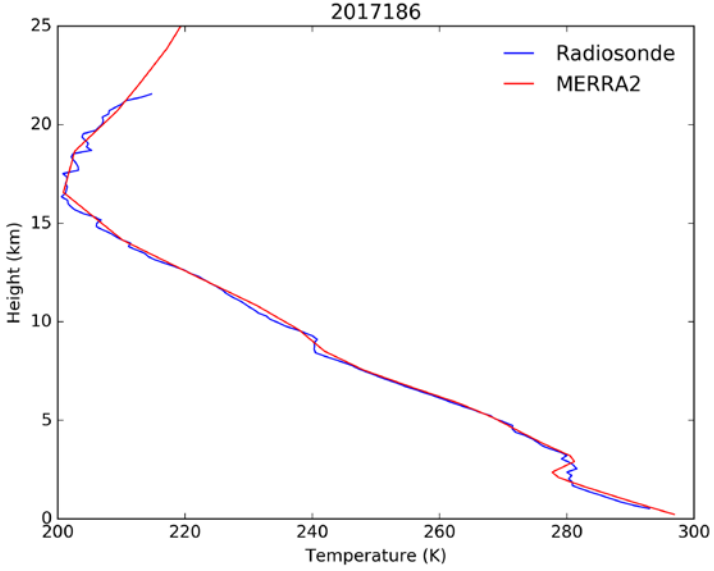
Calculated atmospheric transmittance:
Channel I4

Radiosonde	MERRA-2
0.869	**0.855**

Channel M13:

Radiosonde	MERRA-2
0.723	**0.727**





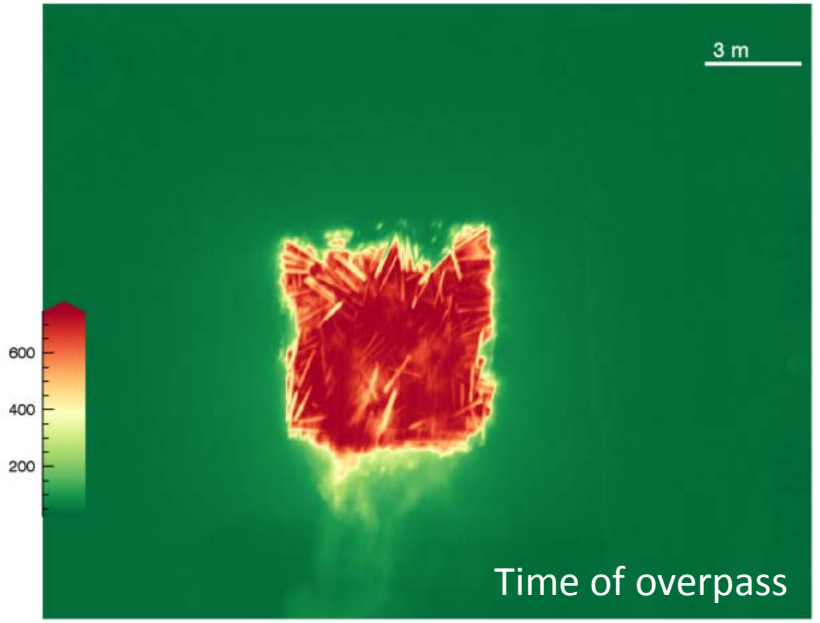
Calculated atmospheric transmittance:
Channel I4

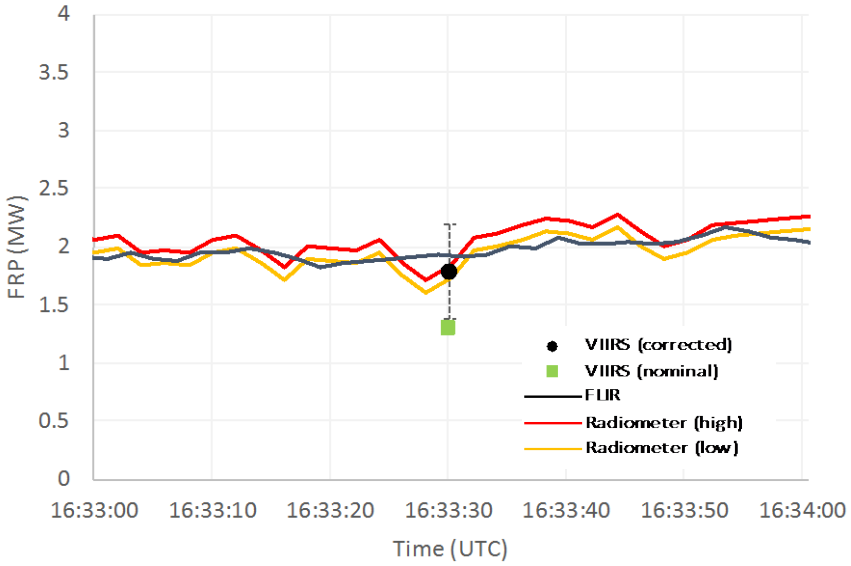
Radiosonde	MERRA-2
0.814	**0.798**

Channel M13:

Radiosonde	MERRA-2
0.660	**0.657**

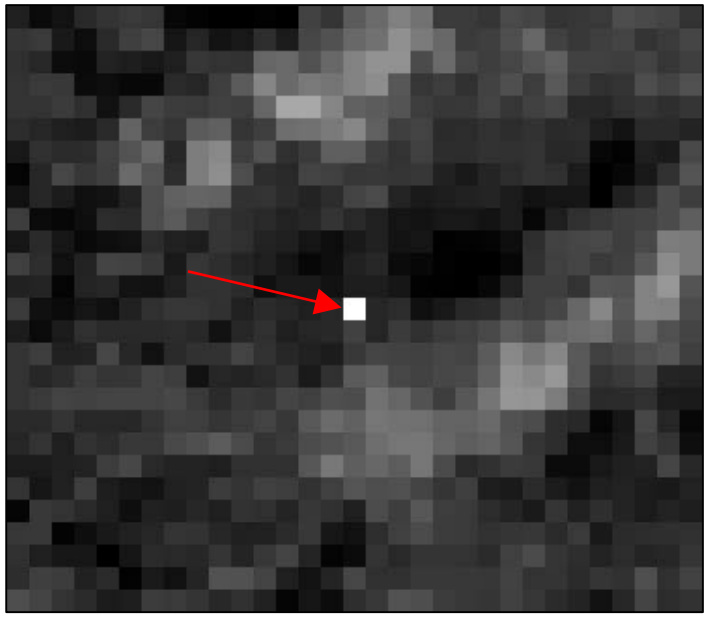
S-NPP/VIIRS - 04 Jul 2017 16:33:30UTC





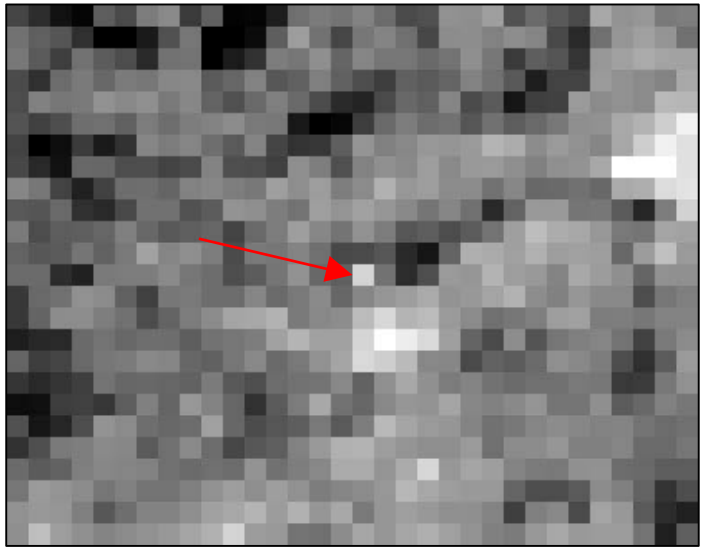
Scan angle: 10.8°
Sky: clear
Fire detection: **no**
Fire area: 54 m^2
Adjusted fire area: 43 m^2
Pixel size: 401 x 368 m
Pixel fraction: 0.036%
Estimated fire temp: 876 K
Fire ID#1

S-NPP/VIIRS - 04 Jul 2017 16:33:30UTC



375m data

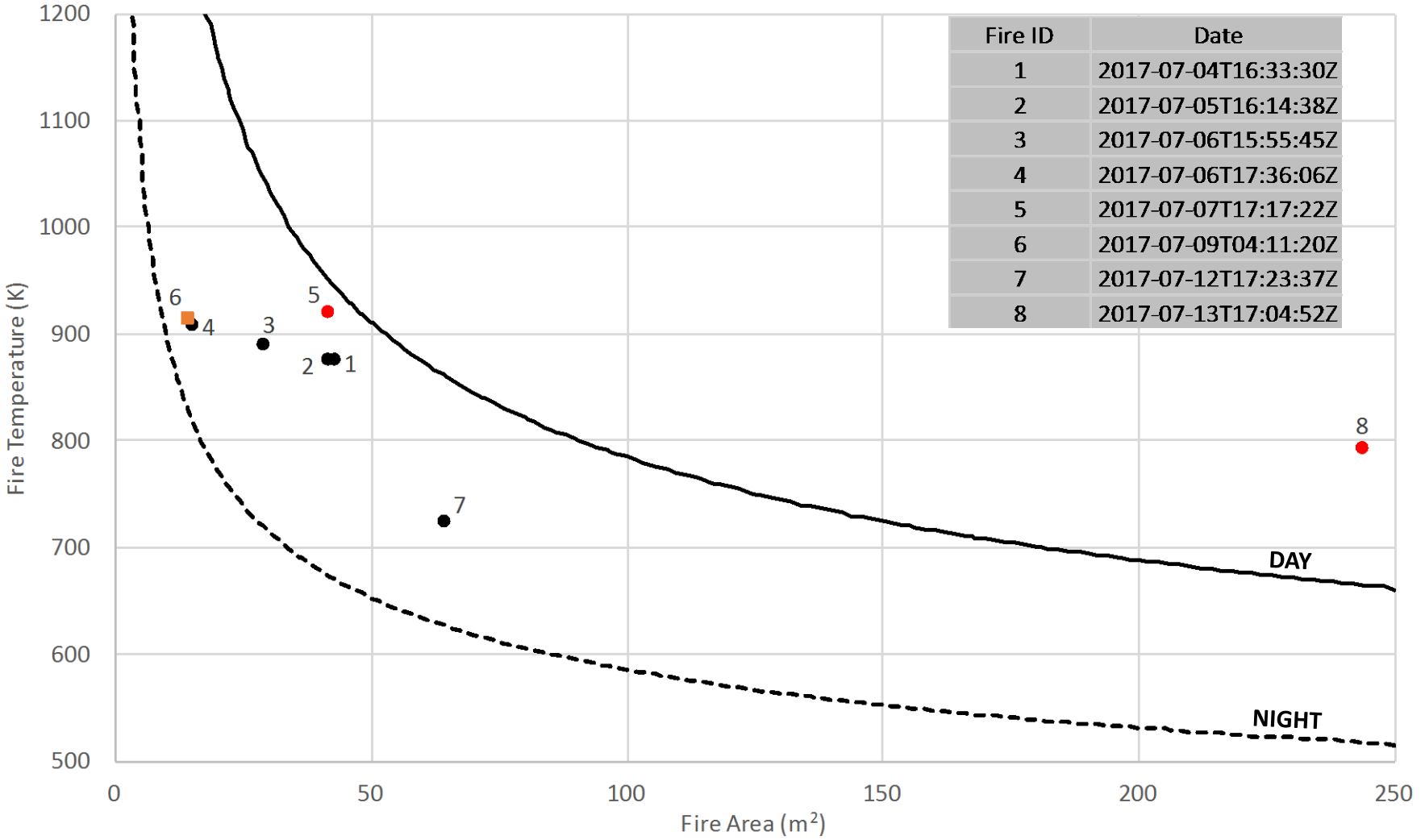
BT I04				
		Sample		
		3602	3603	3604
Line	3792	**293.82**	**295.02**	**295.08**
	3793	**296.15**	**323.05**	**296.04**
	3794	**296.20**	**299.10**	**295.88**



750m data

BT M13				
		Sample		
		1800	1801	1802
Line	1895	**289.52**	**289.59**	**290.02**
	1896	**290.40**	**295.15**	**291.11**
	1897	**290.68**	**291.96**	**292.56**

VIIRS 375m Theoretical Detection Envelope



Fire ID	Date
1	2017-07-04T16:33:30Z
2	2017-07-05T16:14:38Z
3	2017-07-06T15:55:45Z
4	2017-07-06T17:36:06Z
5	2017-07-07T17:17:22Z
6	2017-07-09T04:11:20Z
7	2017-07-12T17:23:37Z
8	2017-07-13T17:04:52Z

Final Remarks

- S-NPP/VIIRS 375m and 750m Level-2 (swath) fire products publicly available through NASA and NOAA, including near real-time access
- Continuation (NASA) proposal being reviewed. Main objectives:
  - Algorithm refinements (e.g., additional tuning, atmospheric correction of FRP retrievals)
  - Expand data validation
  - Level 3 & 4 data generation
- JPSS-1 successfully launched on 18 November 2017!!
  - Phased orbit (180^{o}), approx 50min apart (more near-nadir views)