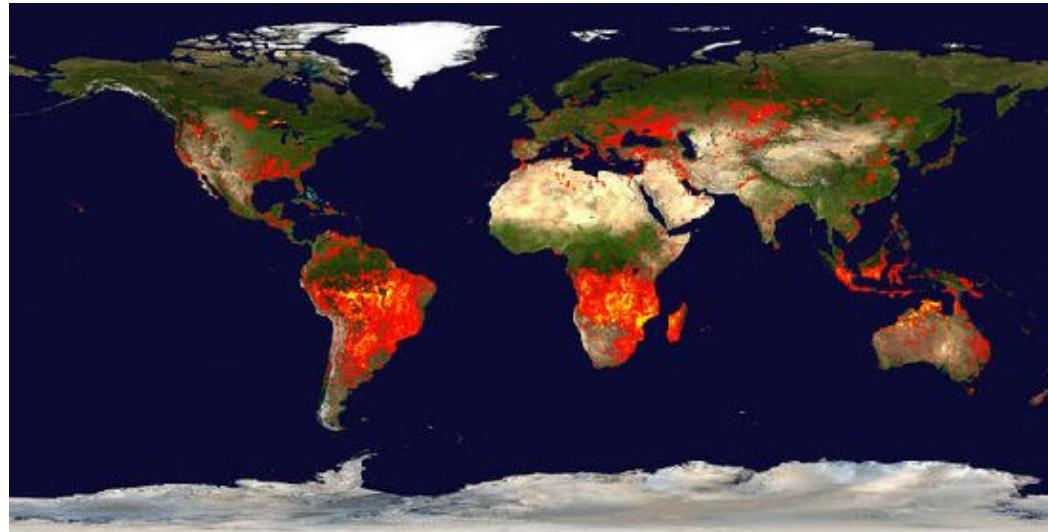


Satellite remote sensing of fires: principals, datasets, and Python programming

Jun Wang

Professor

University of Iowa



**NCAR ACOM/ACCORD Workshop:
Analysis of existing biomass burning datasets**

First fire detection from space was from visible light at night...

Burning Waste Gas in Oil Fields

I WAS recently amazed by some night-time spacecraft photographs, exemplified by Fig. 1, that present graphic evidence of waste and pollution. These were obtained by the United States Air Force DAPP system which has sensors in the visible 0.4 to 1.1 μm band and an infrared imaging system in the 8 to

• T. A. Croft, *Nature*, 1973.

Such agricultural “Fires, invisible by day, are seen ranging all around ... at night (when) we were literally surrounded by them; some smouldering, ... others fitfully bursting forth, whilst others again stalked along with a steadily increasing and enlarging flame...”
Hooker (in 1846), cited by Croft, 1973.



Nighttime Images of the Earth from Space

An unusual aspect of the earth is revealed in pictures recorded at midnight by U.S. Air Force weather satellites. The brightest lights on the dark side of the planet are giant waste-gas flares

by Thomas A. Croft

THREE MAJOR LIGHT SOURCES associated with human activities are visible in this nighttime satellite image ...

the upper third of this picture are the **city lights** of Europe.

The larger isolated lights near the middle and bottom arise from **gas flares** at oil fields in Algeria, Libya and Nigeria.

The uniform band of smaller lights scattered across Africa south of the Sahara appears to originate with **agricultural and pastoral fires**.

Scientific America, 1978.



One of the most-cited paper on remote sensing of fires

REMOTE SENSING OF ENVIRONMENT 11 221–229 (1981)

A Method for Satellite Identification of Surface Temperature Fields of Subpixel Resolution

JEFF DOZIER*

NOAA National Earth Satellite Service, World Weather

Plank function

$$\beta(\lambda, T) = \frac{c_1 \lambda^{-5}}{\exp(c_2/\lambda T) - 1} \quad (2)$$

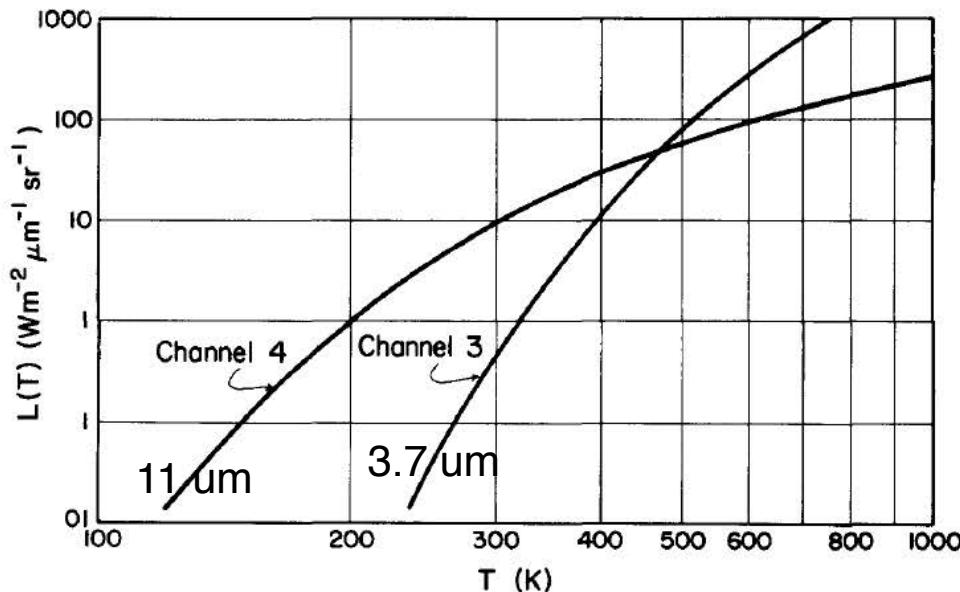


FIGURE 2 NOAA-6 radiances for channels 3 and 4 vs temperature, as calculated by Eq (1) with the spectral response functions in Fig 1

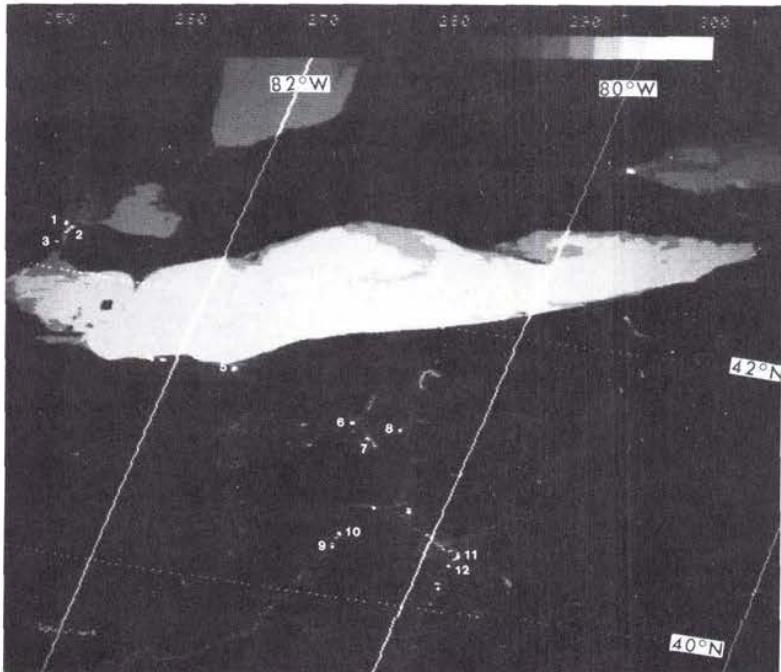


FIG. 1. NOAA-6 3.8- μ m image of the midwestern United States taken on 24 September 1979 at 0015 GMT. The high temperature areas appear white and are identified in Table 2. Imagery processed by NASA/GSFC, Code 942.

Early detection of fires using AVHRR MWIR

MICHAEL MATSON

NOAA National Earth Satellite Service
Washington, DC 20233

JEFF DOZIER

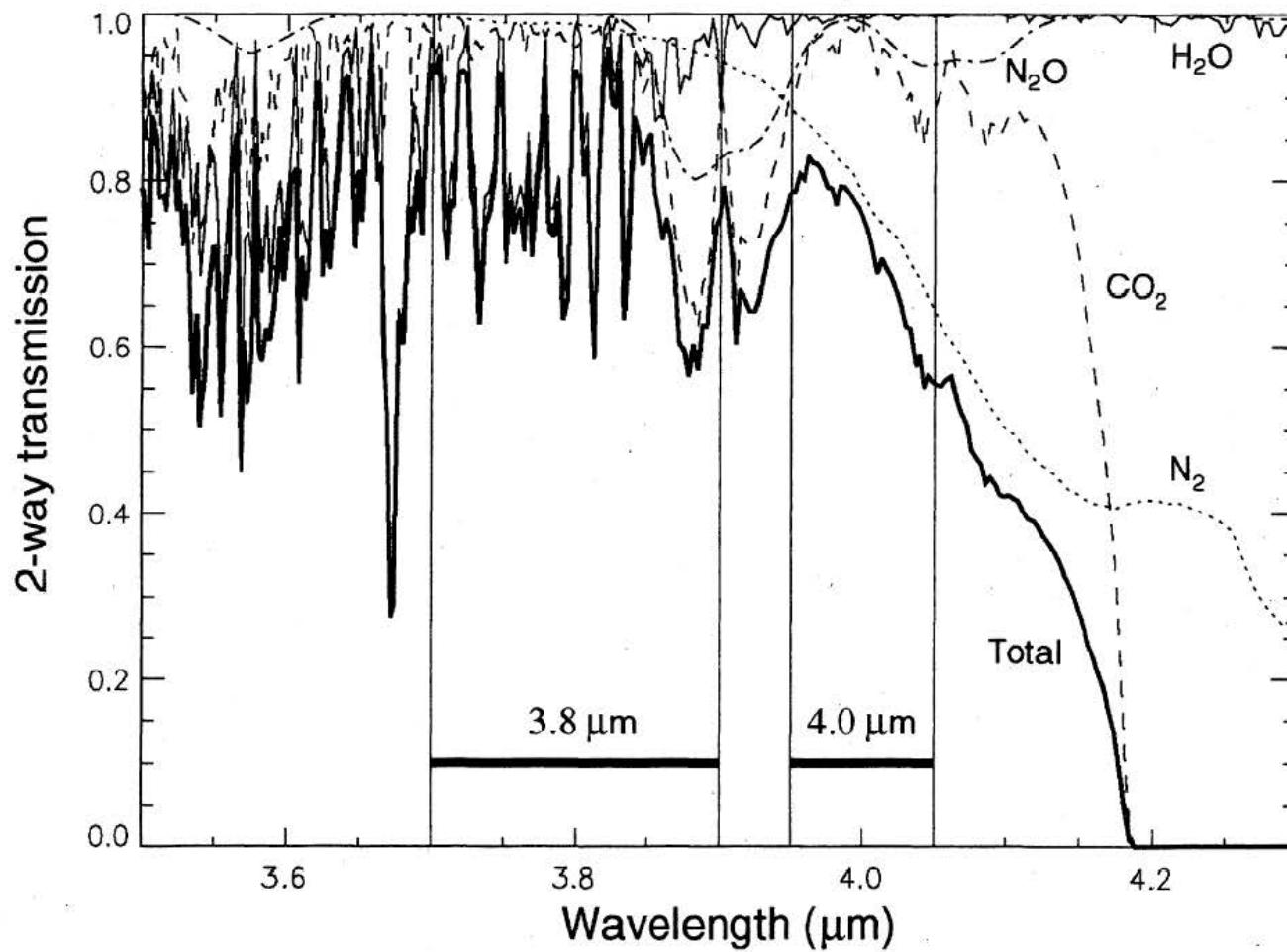
Department of Geography
University of California
Santa Barbara, CA 93106

Identification of Subresolution High Temperature Sources Using a Thermal IR Sensor

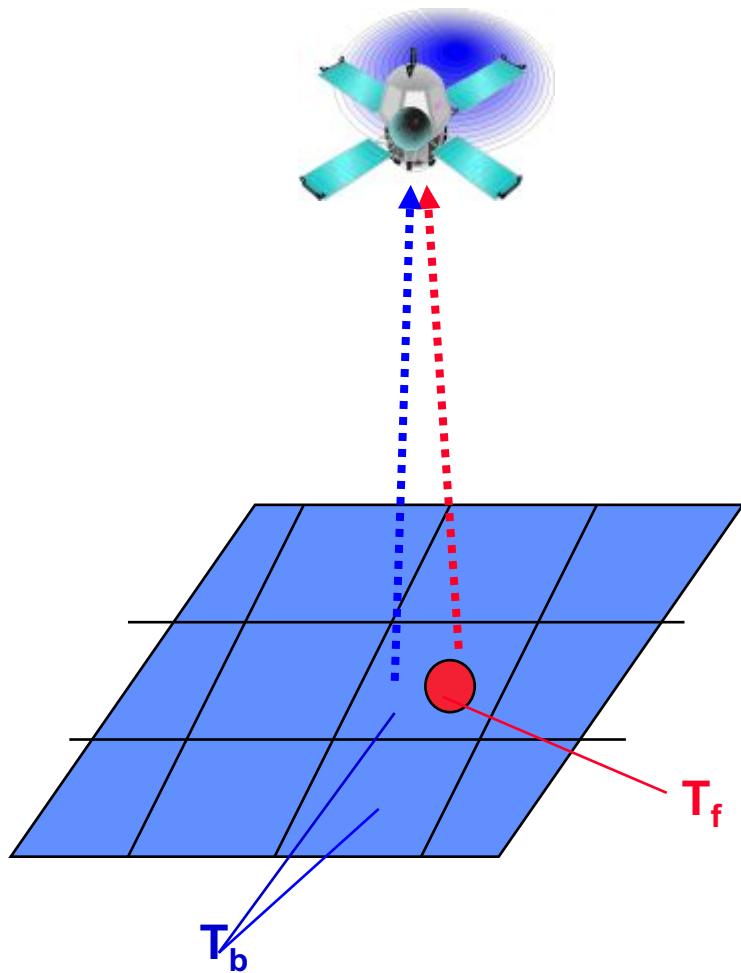
Steel mills, and gas flares from oil fields, were identified by using the 3.8- μ m and 11- μ m sensors on board the NOAA-6 satellite.

Photogrammetric Engineering and Remote Sensing, 47, 1311-1318.

US standard atmosphere (1976)



Dozier's method for fire detection fire size and temperature detection



Fire pixels: the IR temperature anomalies.
Fire size and temperature are retrieved simultaneously.

$$4 \mu\text{m}: B_4(T) = P L_4(T_f) + (1-P) L_4(T_b)$$

$$11 \mu\text{m}: B_{11}(T) = P L_{11}(T_f) + (1-P) L_{11}(T_b)$$

L: IR radiative transfer function;
P: fire area fraction.

Derived Information:

Fire location
Fire size
Fire temperature



Parameterization
(large uncertainties)

Smoke emission inventory

GOES-fire products

- <http://wfabba.ssec.wisc.edu/ftp.html>
- <ftp://ftp.ssec.wisc.edu/pub/abba/v65/>



Home Fire Data Case Studies Publications About Contact Us

WFABBA data via FTP

The most recent 7 days worth of data are available via ftp at [ftp.ssec.wisc.edu/pub/abba/v65/](ftp://ftp.ssec.wisc.edu/pub/abba/v65/).

Login with user name anonymous and an e-mail address as the password.

The directory structure is satellite/product-type/date/file. The satellites are a global constellation of geostationary satellites. The products include text files that provide information on fire locations and metadata, mask products that give a fire or non-fire code for every pixel location in the image, and netCDF files that integrate both text and mask data. Some products are available with and without a temporal filter, where the filtering requires at least 2 observations of a fire within .1 degrees lat/lon in an effort to remove short lived detections - which are prone to false detections.

For more product information, [README](#) files are available.

Prins, E. M., News from fire research: The GOES-8 Automated Biomass Burning Algorithm (ABBA) introducing new capabilities for monitoring diurnal fire activity in the Western Hemisphere, *International Forest Fire News*, 49-52, 1996.

ftp://ftp.ssec.wisc.edu/pub/abba/v65/goes-15/text/2017186/f20171860000.v65.g15

NOAA/NESDIS/ORA University of Wisconsin-Madison/CIMSS

GOES-15 WF_ABBA (vs 6.5.008) Experimental Fire Product

Note: This product is preliminary and has not been quality controlled

Date: 2017186 Time: 0000 UTC

Longitude	Latitude	Satzen(deg)	Pix Size(km2)	T4(K)	T11(K)	Fire Size(km2)	Temp(K)	FRP(MW)	Ecosystem	Fire Flag
-141.33	67.50	75.90	84.6693	302.3	284.4	0.5316	488.	689.	17	0
-141.16	67.33	75.80	83.4612	301.7	280.1	-9.0000	-9.	-9.	17	2
-130.93	66.35	74.60	76.4866	298.4	285.9	0.0188	790.	443.	17	0
-122.16	51.23	59.70	38.2548	306.4	297.9	-9.0000	-9.	-9.	52	5
-103.02	51.89	66.20	59.4047	314.4	292.8	0.0491	771.	1033.	30	0
-120.97	50.76	59.40	38.1424	307.0	300.5	-9.0000	-9.	-9.	40	5
-87.86	48.80	71.50	101.7021	282.9	194.4	-9.0000	-9.	-9.	21	5

New concept and development

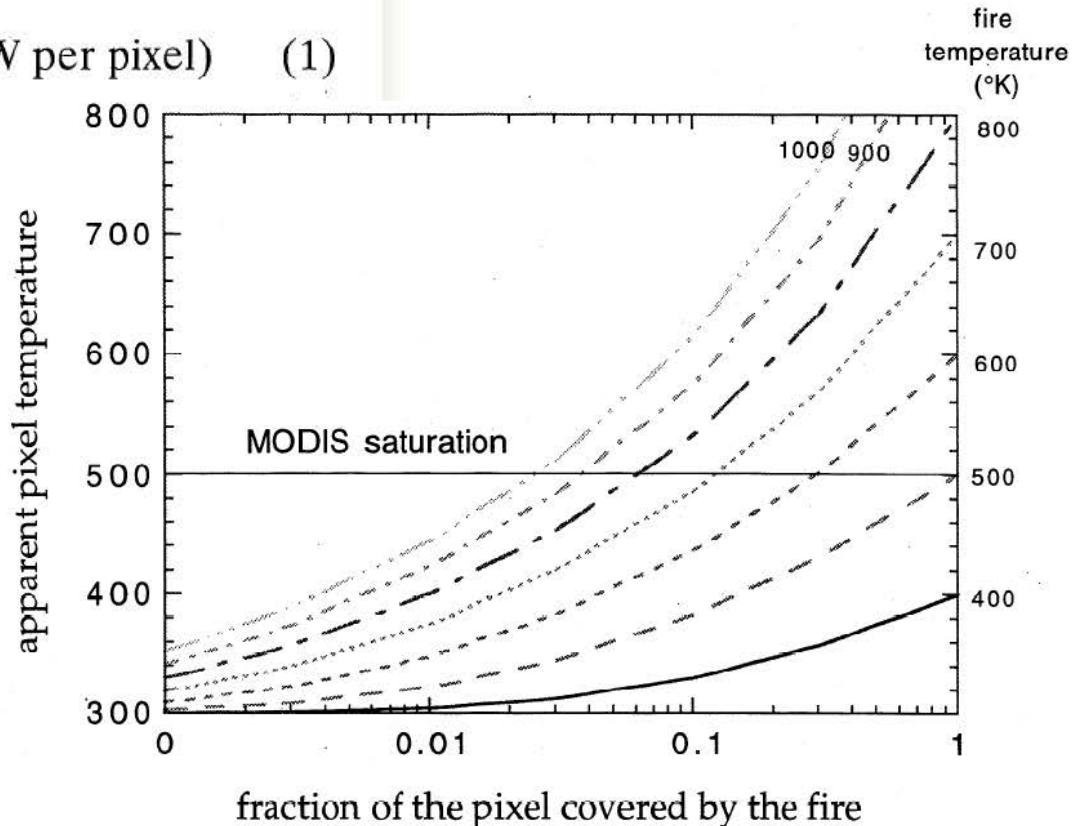
Potential global fire monitoring from EOS-MODIS

JGR, 1998

Yoram J. Kaufman,¹ Christopher O. Justice,² Luke P. Flynn,³ Jackie D. Kendall,⁴ Elaine M. Prins,⁵ Louis Giglio,⁴ Darold E. Ward,⁶ W. Paul Menzel,⁷ and Alberto W. Setzer⁸

$$E_f = 4.34 \times 10^{-19} (T_4^8 - T_{4b}^8) \text{ (W/m}^2 \text{ or MW per pixel)} \quad (1)$$

- **Fire Radiative Power**
- **Fire location/time**
- **1 km resolution**
- **Much higher saturation temperature**

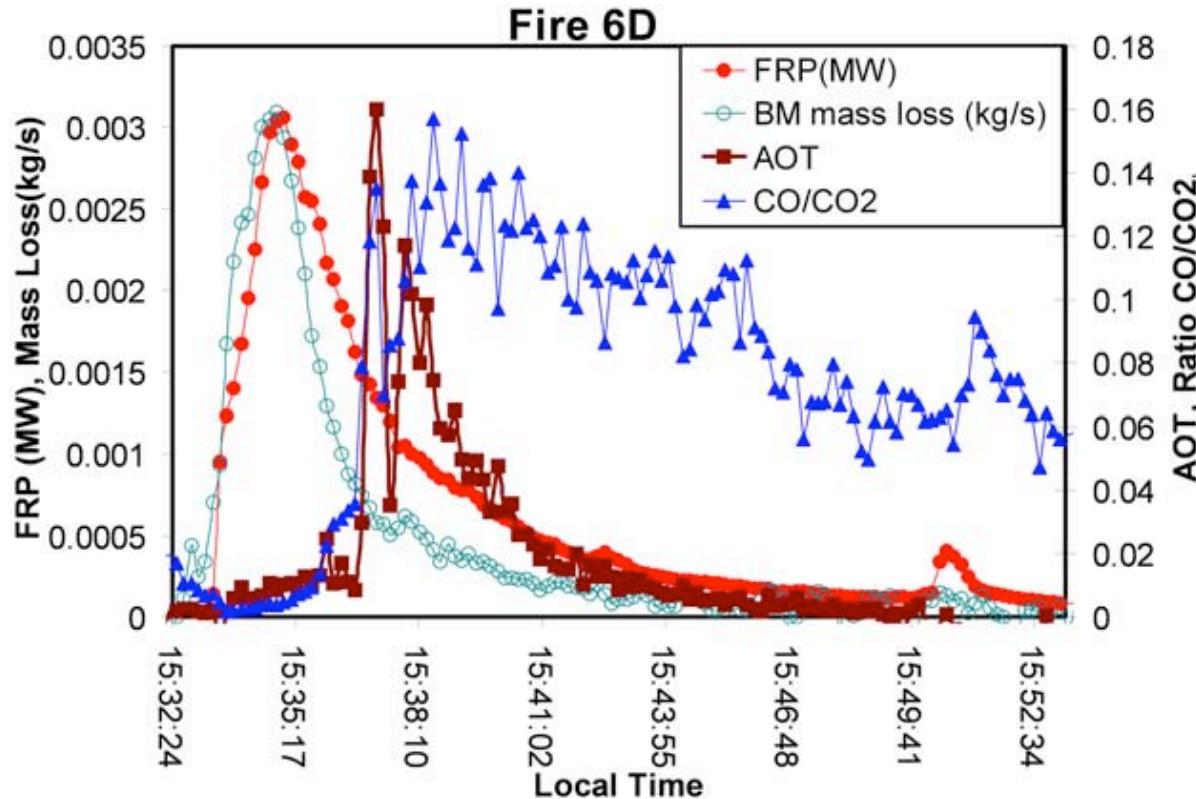


Laboratory investigation of fire radiative energy and smoke aerosol emissions

JGR, 113, D14S09,
doi:10.1029/2007JD009659, 2008

Charles Ichoku,^{1,2} J. Vanderlei Martins,^{2,3} Yoram J. Kaufman,^{4,5} Martin J. Wooster,⁶
Patrick H. Freeborn,^{7,8} Wei Min Hao,⁸ Stephen Baker,⁸ Cecily A. Ryan,⁸
and Bryce L. Nordgren⁸

Fire Radiative Power vs. Emission



MODIS Fire Radiative Power (FRP)

Slide from David Peterson, NRL

Advantages

- Quantitative indicator of fire intensity (Ichoku et al, 2008)
- Proportional to amount of biomass consumed (Wooster et al., 2005)
- Proportional to amount of smoke released (Ichoku and Kaufman, 2005)
- Related to the smoke plume height (Val Martin et al., 2010)



Sapkota et al. (2005)

Current FRP Limitation (collection 5)
FRP per 1 km²

These pixels have equal FRP?

MODIS Pixel #1

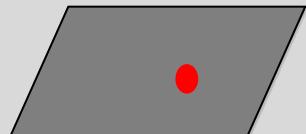
High fire temp.

Small fire area

MODIS Pixel #2

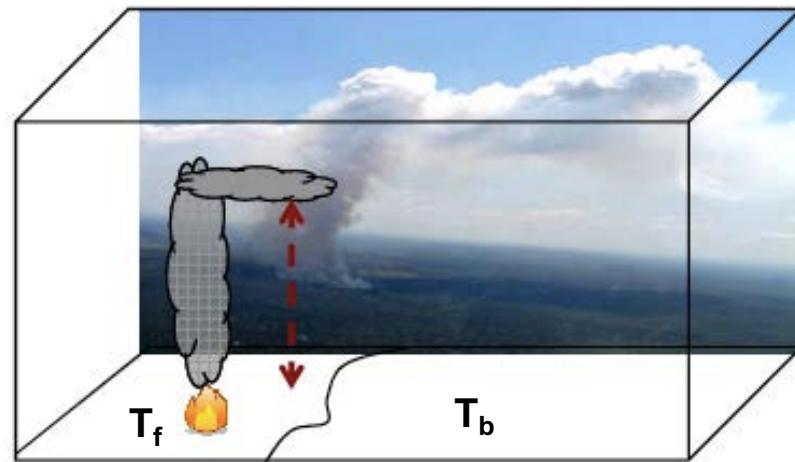
Cooler fire temp.

Large fire area



We need FRP per fire area!

$FRP = f(T_f - T_b)$ Units: MW per pixel area



Val Martin et al. (2010)

A sub-pixel-based calculation of fire radiative power from MODIS observations: 1 Algorithm development and initial assessment

David Peterson ^{a,*}, Jun Wang ^a, Charles Ichoku ^b, Edward Hyer ^c, Vincent Ambrosia ^d

^a University of Nebraska, Lincoln, Lincoln, NE 68588, USA

^b NASA Goddard Space Flight Center, 8800 Greenbelt Road, Greenbelt, MD 20771, USA

^c Naval Research Laboratory, 7 Grace Hopper Avenue, Monterey, CA 93940, USA

^d NASA-Ames Research Center, Mail Stop 245-4; Room 128, Moffett Field, CA 94035-0001, USA

A sub-pixel-based calculation of fire radiative power from MODIS observations: 2. Sensitivity analysis and potential fire weather application

David Peterson ^{*}, Jun Wang

Department of Earth and Atmospheric Sciences, University of Nebraska—Lincoln, Lincoln, NE 68588, USA



The principal for sub-pixel fire area and temperature is based on
Dozier (1981).

Journal of Geophysical Research: Atmospheres

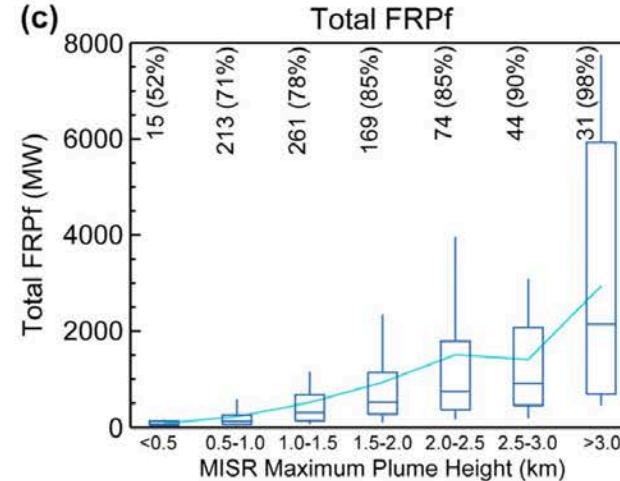
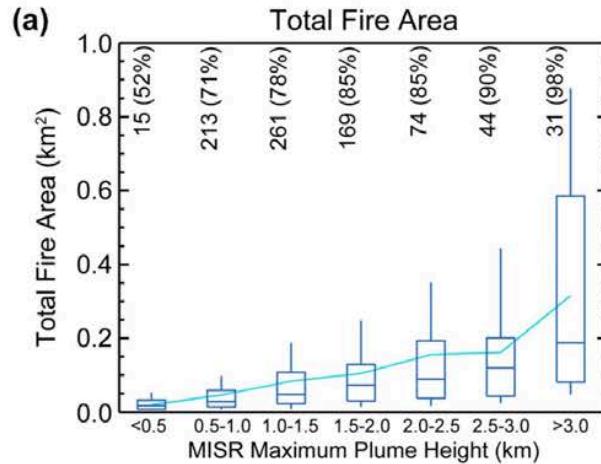
RESEARCH ARTICLE

10.1002/2013JD021067

Key Points:

- Combining pixel and subpixel fire data improves plume height characterization
- Increasing subpixel fire area and temperature correspond to higher injections
- Filtering and clustering improve the information content of subpixel outputs

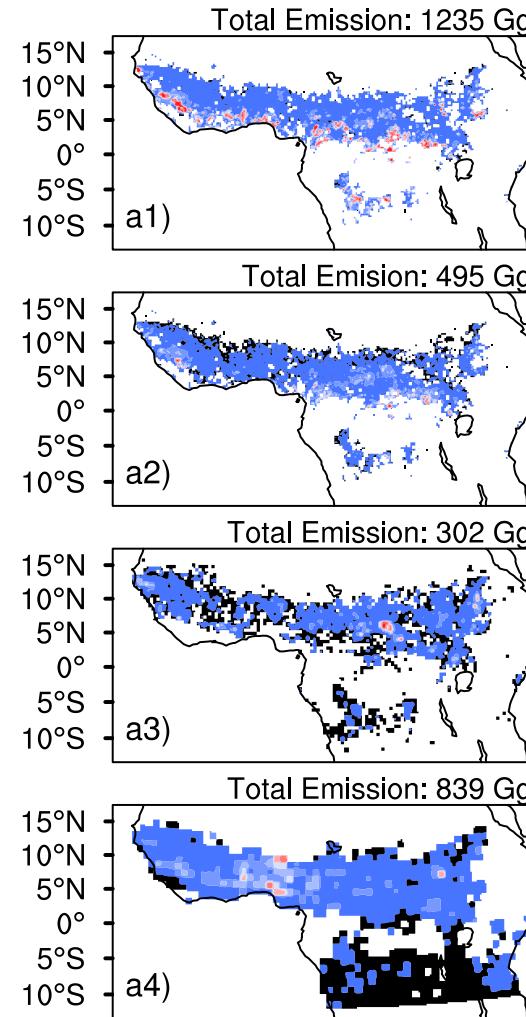
Quantifying the potential for high-altitude smoke injection in the North American boreal forest using the standard MODIS fire products and subpixel-based methods

David Peterson¹, Edward Hyer², and Jun Wang³¹National Research Council, Monterey, California, USA, ²Naval Research Laboratory, Monterey, California, USA, ³Department of Earth and Atmospheric Sciences, University of Nebraska–Lincoln, Lincoln, Nebraska, USA

“The probability of injection above the BL reaches 50% when the subpixel radiant flux (FRP flux) exceeds 20 kW/m², highlighting its potential for estimating plume buoyancy”.

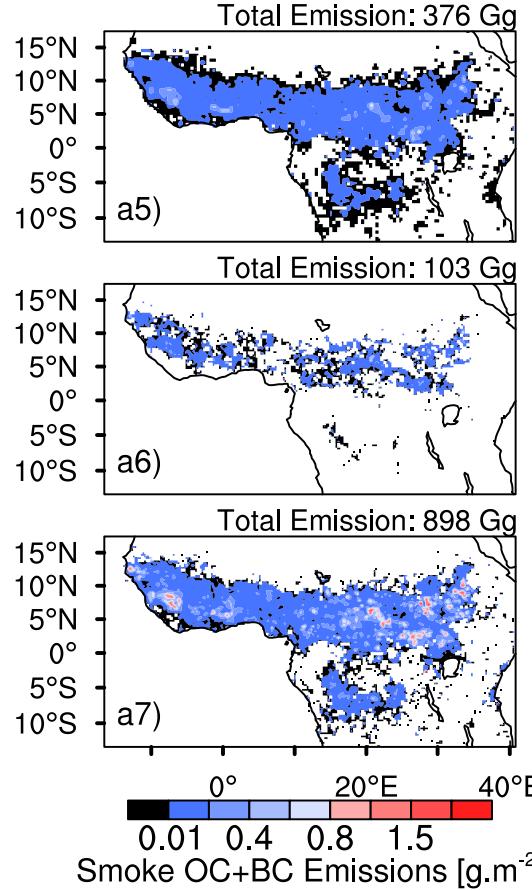
FEER-SEVIRI | GFED | FINN | FLAMBE

Smoke OC+BC Emissions



Emission Differences

GFAS | F | QFED



Feng ZHANG et al., ERL, 2014.

The large differences (a factor of 13) can be primarily attributed to the discrepancies in regions with high concentrations of fires.

VIIRS Fire Products

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

TABLE I
GENERAL SUOMI-NPP AND VIIRS SENSOR
CHARACTERISTICS [1], [2], [10]

Launch date	28 October, 2011
Orbit description	Near-circular, near-polar, sun-synchronous
Mean orbital altitude	840 km
Inclination	98.7°
Orbital period	101.5 min.
Ascending equator local crossing time	$13:30 \pm 10$ min.
Swath width	~3000 km
Number of bands	5 I-bands, 16 M-bands, 1 DNB
Nominal spatial resolution	375 m (I-bands), 750 m (M-bands, DNB)
Spectral range	0.411–11.87 μ m
Detectors per band	32 (I-bands), 16 (M-bands), 672 (DNB)
Lines per scan	32 (I-bands), 16 (M-bands, DNB)

VIIRS pixel size is preserved across the scan

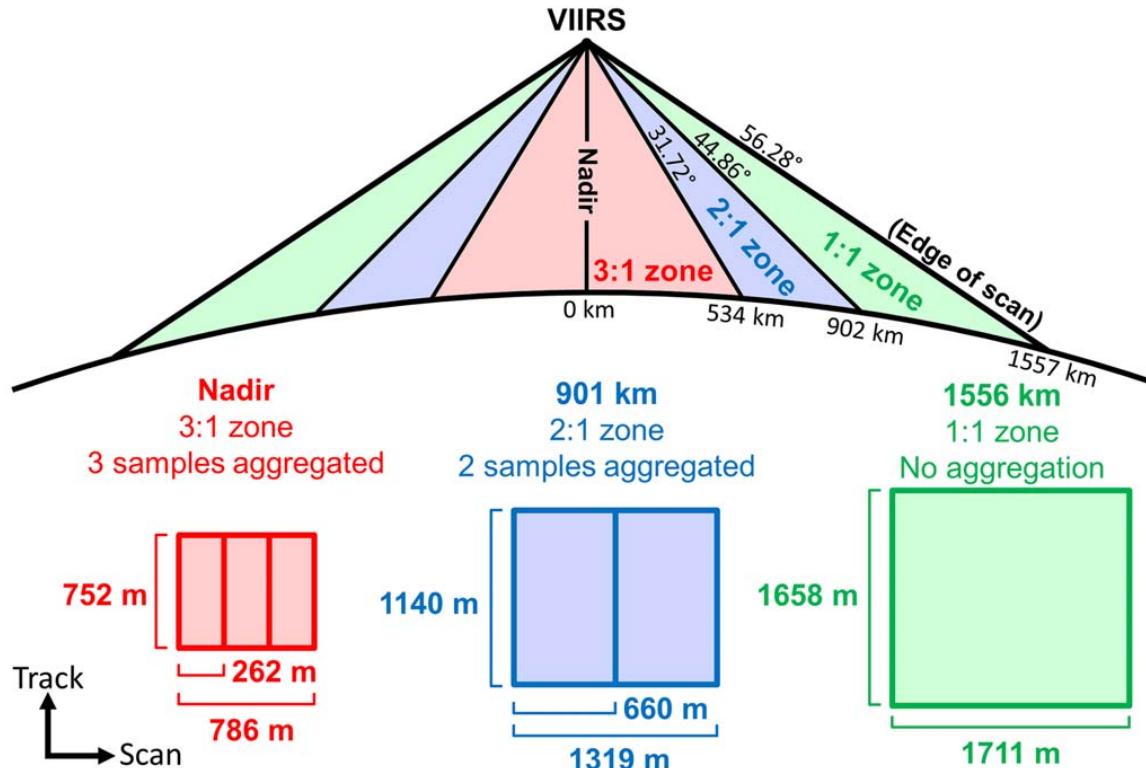
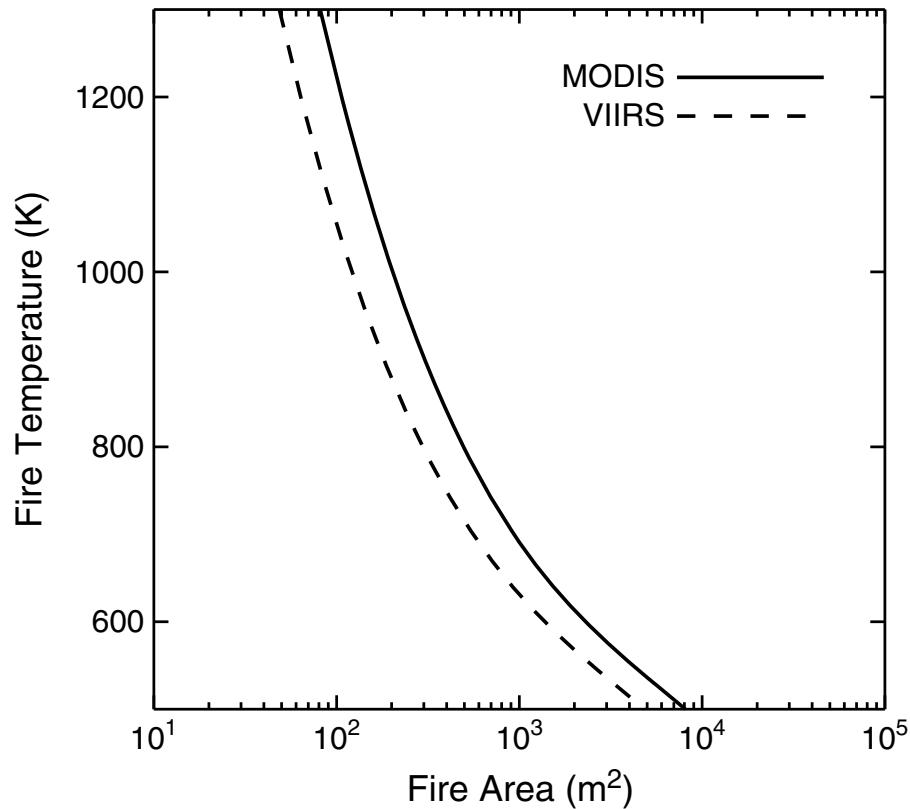


Fig. 1. VIIRS aggregation scheme (not to scale) and sample dimensions over the equator with an orbital altitude of 830 km [2]. The individual rectangles represent samples from an M-band detector, shaded by aggregation zone.

VIIRS is better suited for detecting small fires



Recent work of using 1.6 μm band for night fire detection

- C. D. Elvidge, M. Zhizhin, F.-C. Hsu, and K. E. Baugh, “VIIRS nightfire: 1333 Satellite pyrometry at night,” *Remote Sens.*, vol. 5, no. 9, pp. 4423–4449, 1334 Sep. 2013, doi: 10.3390/rs5094423.
- W. Schroeder, P. Oliva, L. Giglio, and I. A. Csiszar, “The new VIIRS 375 m active fire detection data product: Algorithm description and initial assessment,” *Remote Sens. Environ.*, vol. 143, pp. 85–96, Mar. 5, 2014, doi: 10.1016/j.rse.2013.12.008.

How about using visible + IR to detect night fire?

Hot & Light: Flaming; hot & dim: smoldering

IEEE TRANSACTIONS ON GEOSCIENCE AND REMOTE SENSING

1

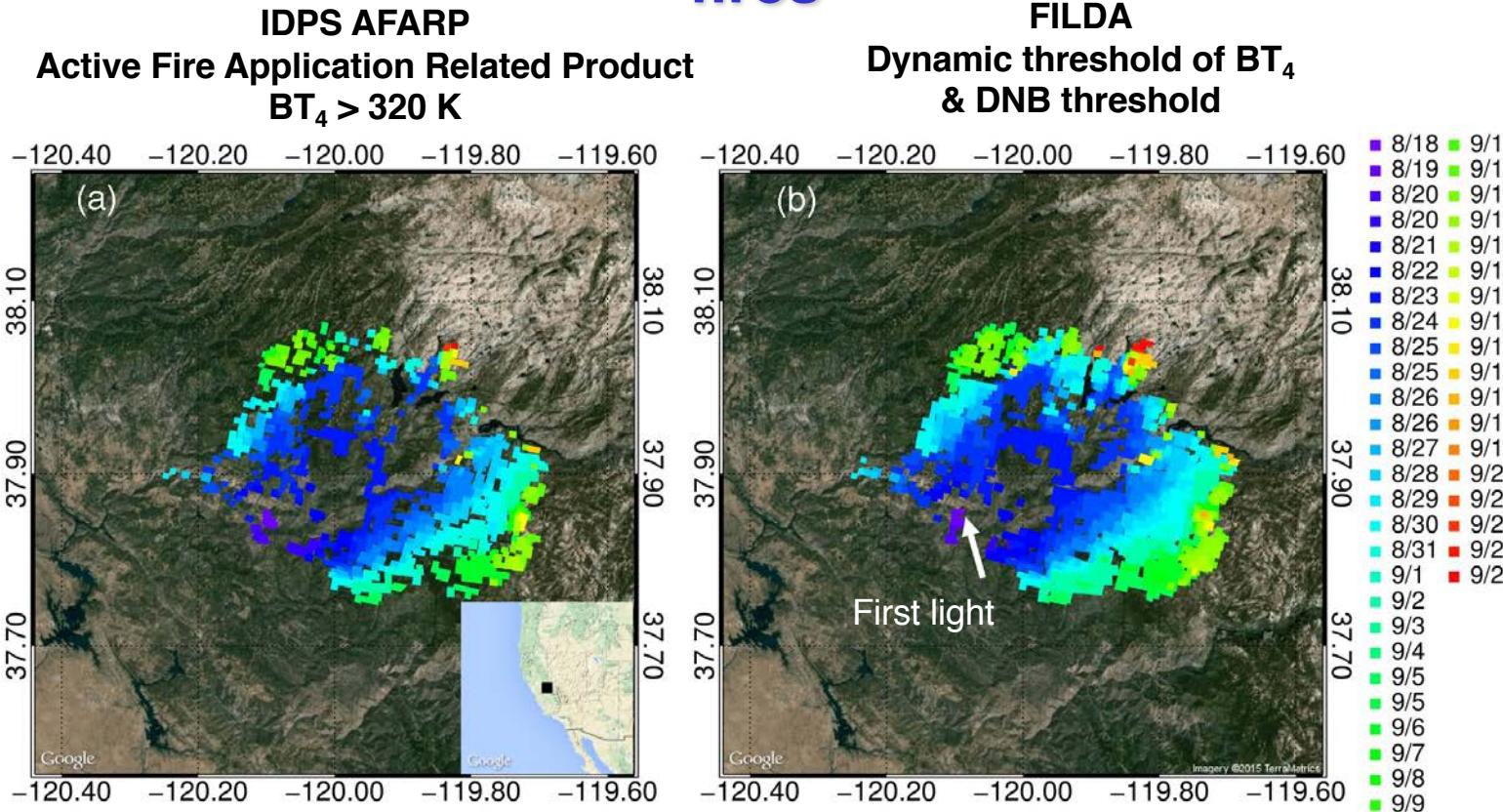


Improving Nocturnal Fire Detection With the VIIRS Day–Night Band

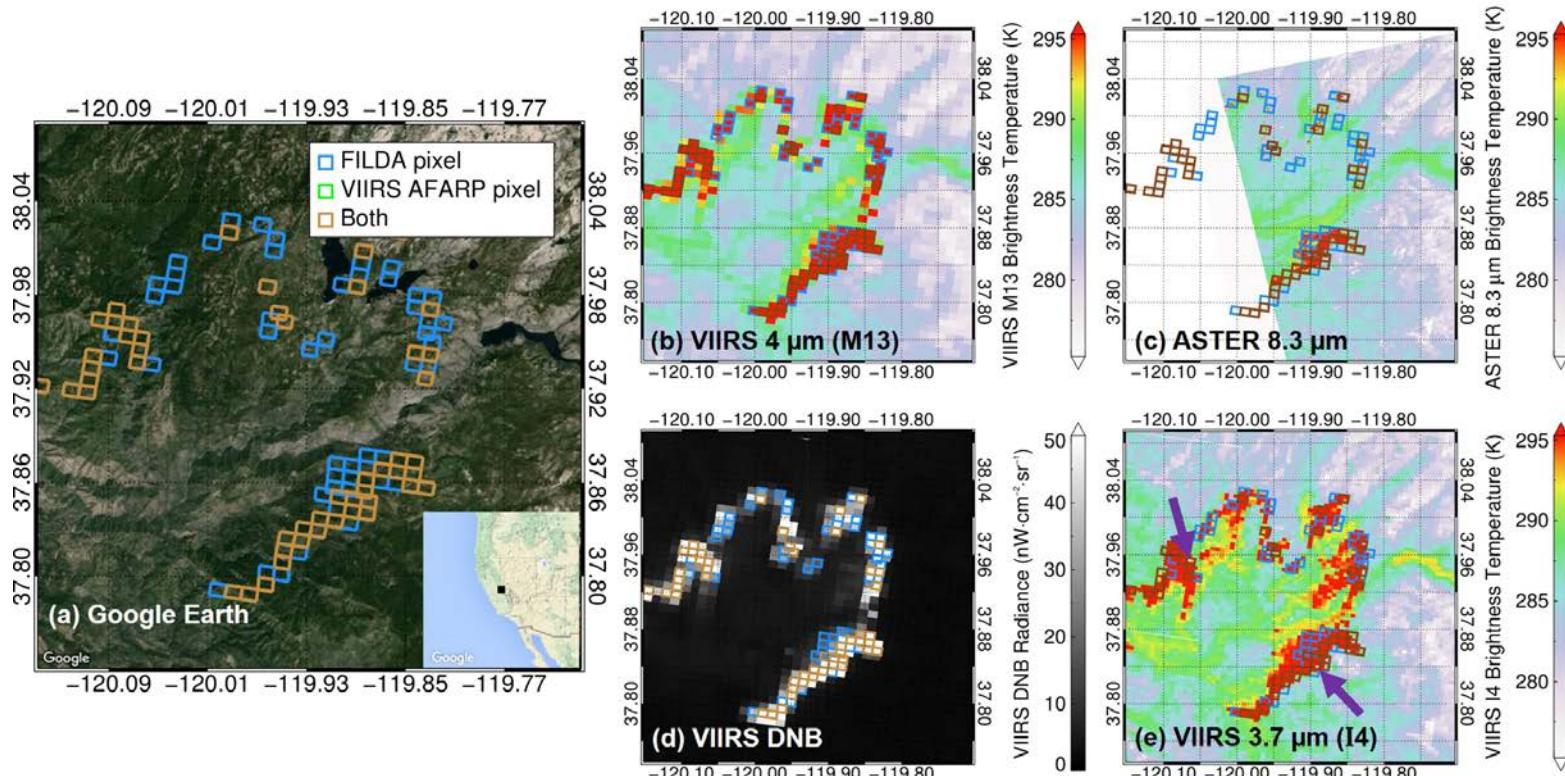
Thomas N. Polivka, Jun Wang, Luke T. Ellison, Edward J. Hyer, and Charles M. Ichoku

Firelight Detection Algorithm (FILDA)

Combined use of Vis + NIR + IR to detect fires

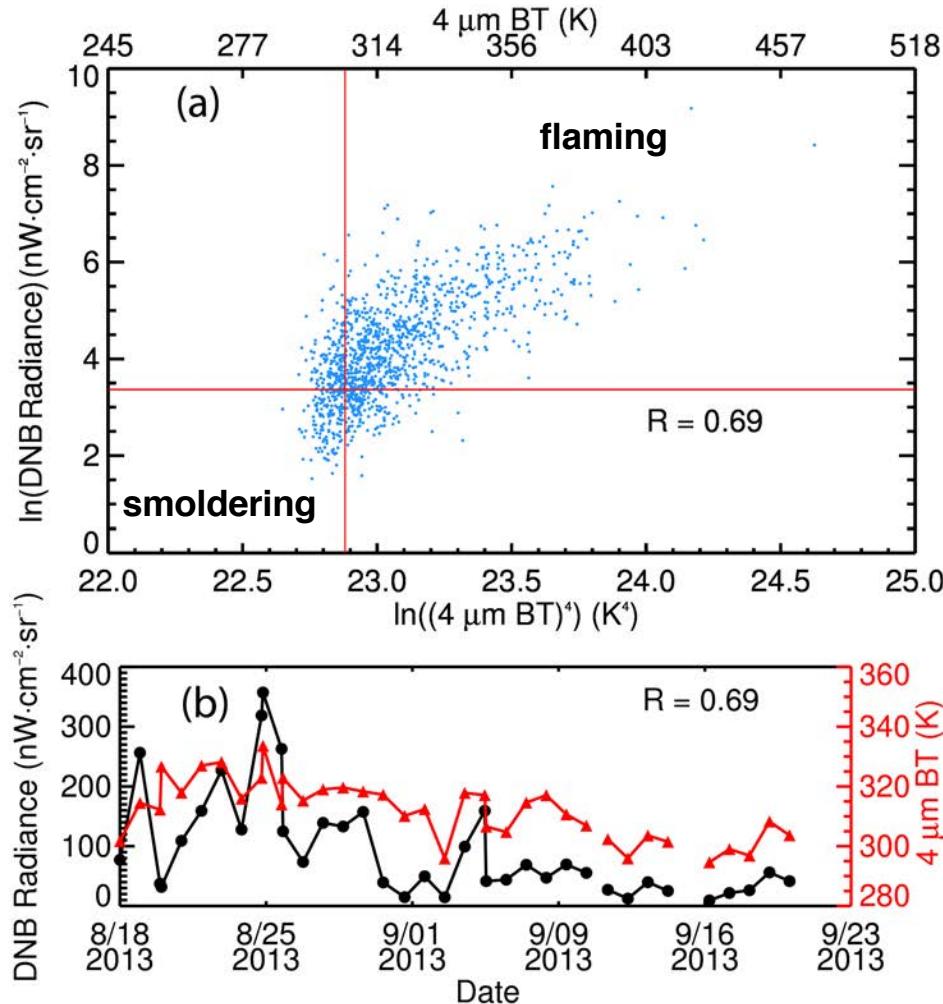


Evaluation with ASTER

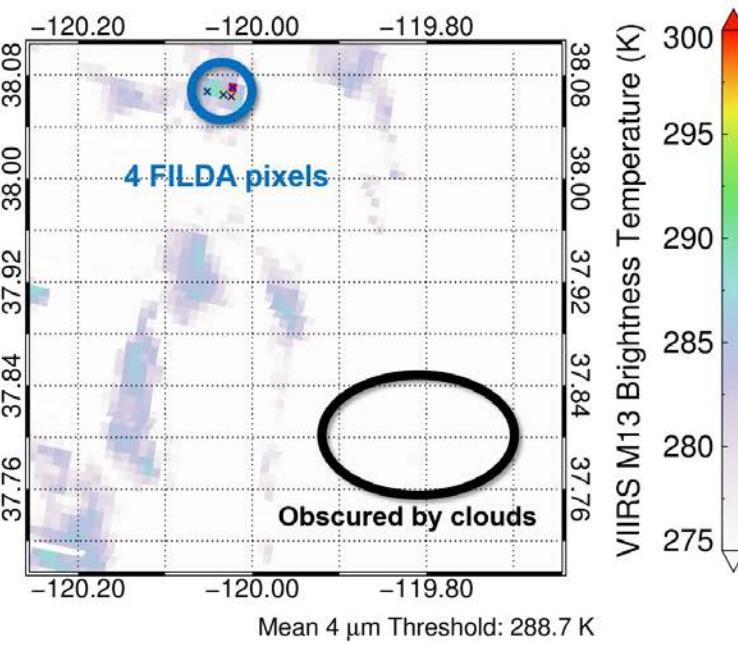
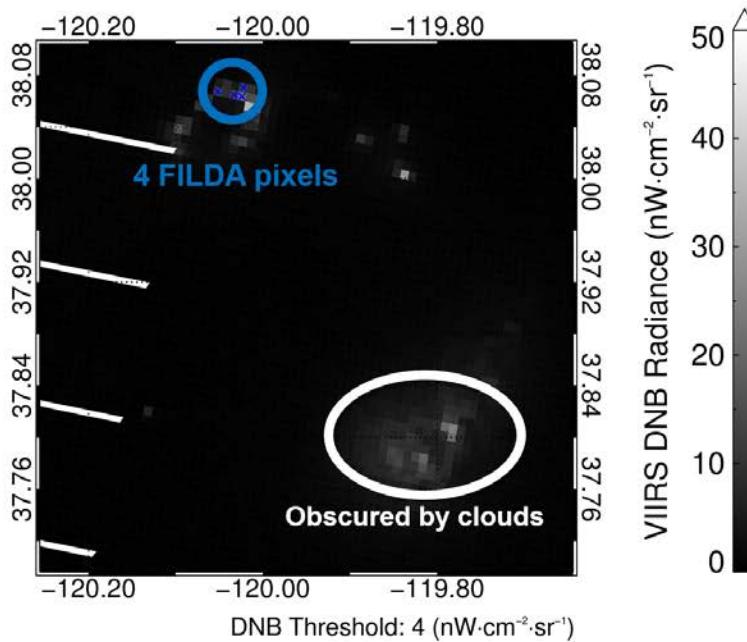


Multiband/sensor view of the Rim Fire taken at 2:29 AM PDT, 24 August 2013

Potential characterization of smoldering vs. flaming



Potential to detect fires through clouds



Access and Analysis of MODIS and VIIRS operational products for fires with Python

With help from Dr. Lorena Castro García

MODIS Operational Products for FIRE

Active fire products

The MODIS active fire product detects fires in 1km pixels that are burning at the time of overpass under relatively cloud-free conditions using a contextual algorithm, where thresholds are first applied to the observed middle-infrared and thermal infrared brightness temperature and then false detections are rejected by examining the brightness temperature relative to neighboring pixels (Giglio, L. et al. 2003).

Burn area products

Burned areas are characterized by deposits of charcoal and ash, removal of vegetation, and alteration of the vegetation structure (Pereira et al. 1997, Roy et al. 1999). The MODIS algorithm used to map burned areas takes advantage of these spectral, temporal, and structural changes (Roy et al. 2005a). It detects the approximate date of burning at 500 m by locating the occurrence of rapid changes in daily surface reflectance time series data. The algorithm maps the spatial extent of recent fires and not of fires that occurred in previous seasons or years.

<http://modis-fire.umd.edu/index.php>

Name convention of MODIS products

- **LEVEL**
 - Level-1, sensor-level data
 - Level-2, algorithm-level data, often instantaneous
 - Level-3, temporal-averaging data from level-2
- **COLLECTION**
 - After major updates/refinement of algorithms, all data products will be re-processed. The number of collections reflect the times that have been taken to conduct major re-processing.
 - Collection-6 means that the data is the result of 6th major updates.

Level-2 MODIS file name convention

MOD06_L2.AYYYYDDD.HHMM.VVV.YYYYDDDHHMMSS.hdf

MYD06_L2. AYYYYDDD.HHMM.VVV.YYYYDDDHHMMSS.hdf

Definitions:

MOD06_L2 = Earth Science Data Type Name

A = Data Date (A = Acquisition)

YYYYDDD = Data Year and Julian Date

HHMM = Data Hour & Minute Start Time

VVV = Collection Version

YYYYDDDHHMMSS = Production Date (& Time)

hdf = Suffix denoting HDF file

- all times are UTC time, not local time
- MOD06_L2 prefix is only an example (MYD04_L2, MOD05_L2, MYD05_L2, MYD06_L2, etc. could be substituted).
- MOD14: active fire product. 14 is the MODIS product #.
 - Example: MOD14.A2017001.1655.006.2017004111822.hdf
- MOD03: burn area products
 - Example: MOD03.A2017001.1655.006.2017003202340.hdf

Example of MODIS level-2 active fire products

- Where to get data?
- See step-by-step description from

https://esmc.uiowa.edu/fires_workshop

User's guide:

http://modis-fire.umd.edu/files/MODIS_C6_Fire_User_Guide_A.pdf

5.1.1 Fire Mask

The fire mask is the principle component of the Level 2 MODIS fire product, and is stored as an 8-bit unsigned integer Scientific Data Set (SDS) named “fire mask”. In it, individual 1-km pixels are assigned one of nine classes. The meaning of each class is listed in Table 2.

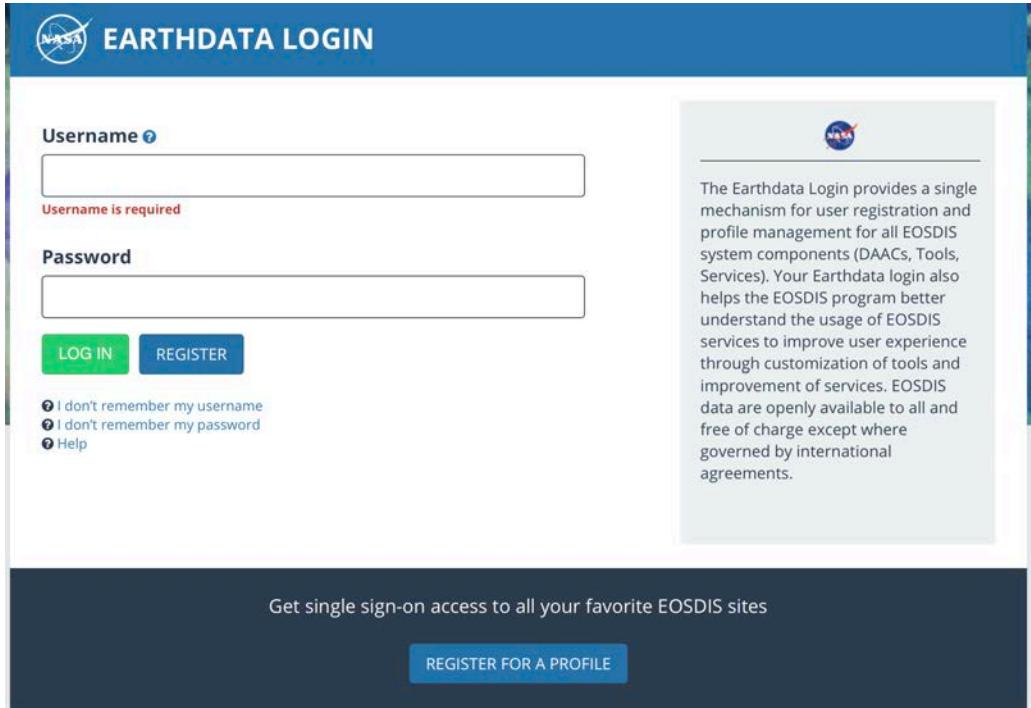
Table 2: MOD14/MYD14 fire mask pixel classes.

Class	Meaning
0	not processed (missing input data)
1	not processed (obsolete; not used since Collection 1)
2	not processed (other reason)
3	non-fire water pixel
4	cloud (land or water)
5	non-fire land pixel
6	unknown (land or water)
7	fire (low confidence, land or water)
8	fire (nominal confidence, land or water)
9	fire (high confidence, land or water)

User account

1. Create a user account at LAADS DAAC website

<https://urs.earthdata.nasa.gov>



The screenshot shows the Earthdata Login page. At the top, there is a blue header with the NASA Earthdata logo and the text "EARTHDATA LOGIN". Below the header, there are two input fields: "Username" and "Password", both of which have red error messages below them: "Username is required" and "Password is required". Below the password field are two buttons: "LOG IN" (green) and "REGISTER" (blue). To the right of these buttons is a link to "Forgot your password?". At the bottom of the page, there is a dark footer bar with the text "Get single sign-on access to all your favorite EOSDIS sites" and a "REGISTER FOR A PROFILE" button.

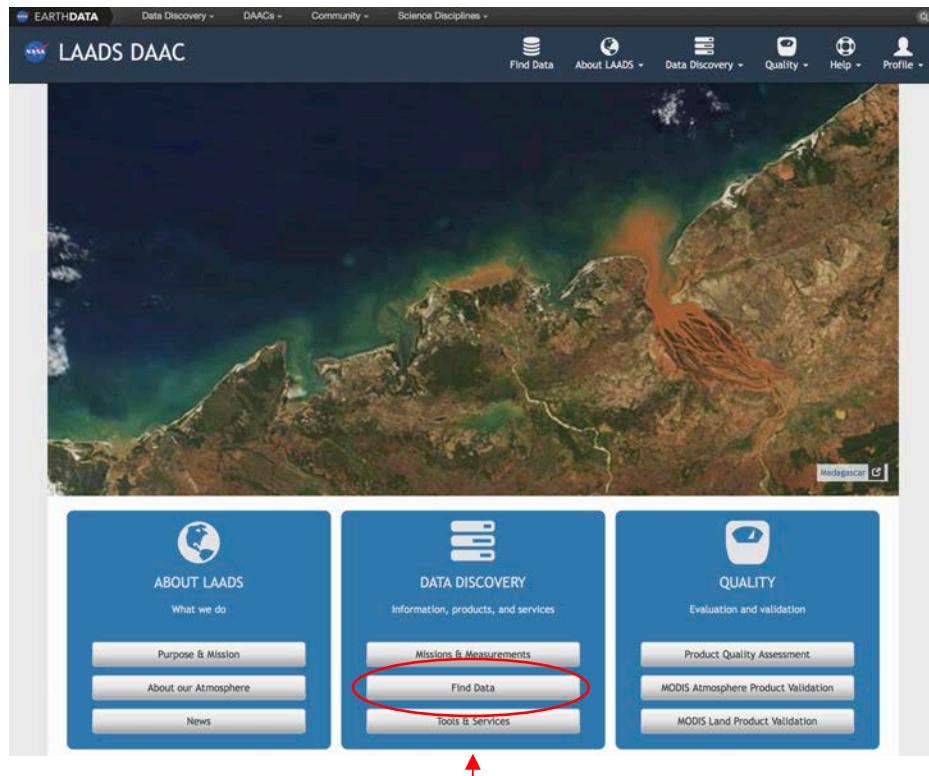
The Earthdata Login provides a single mechanism for user registration and profile management for all EOSDIS system components (DAACs, Tools, Services). Your Earthdata login also helps the EOSDIS program better understand the usage of EOSDIS services to improve user experience through customization of tools and improvement of services. EOSDIS data are openly available to all and free of charge except where governed by international agreements.

Discovery data

2. Visit the website of LAADS DAAC

<https://ladsweb.modaps.eosdis.nasa.gov>

and select “Find data”



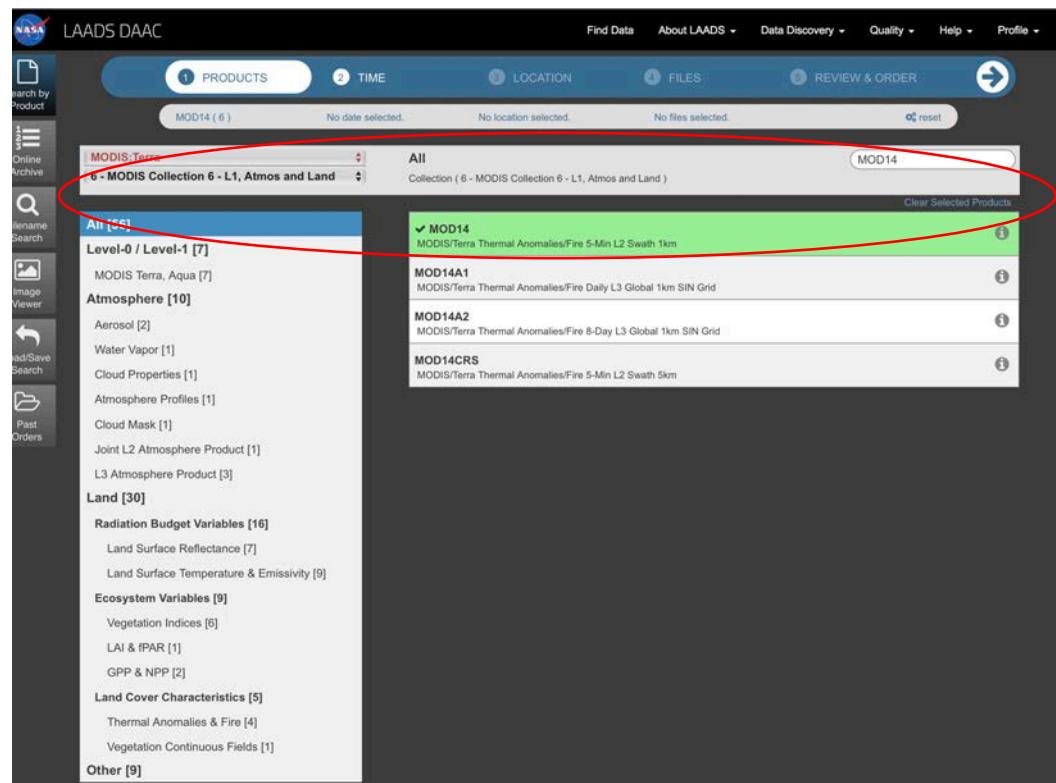
Products

3. Select interest product

sensor: MODIS terra

collection: Modis Collection6

product: MOD14 and MOD03



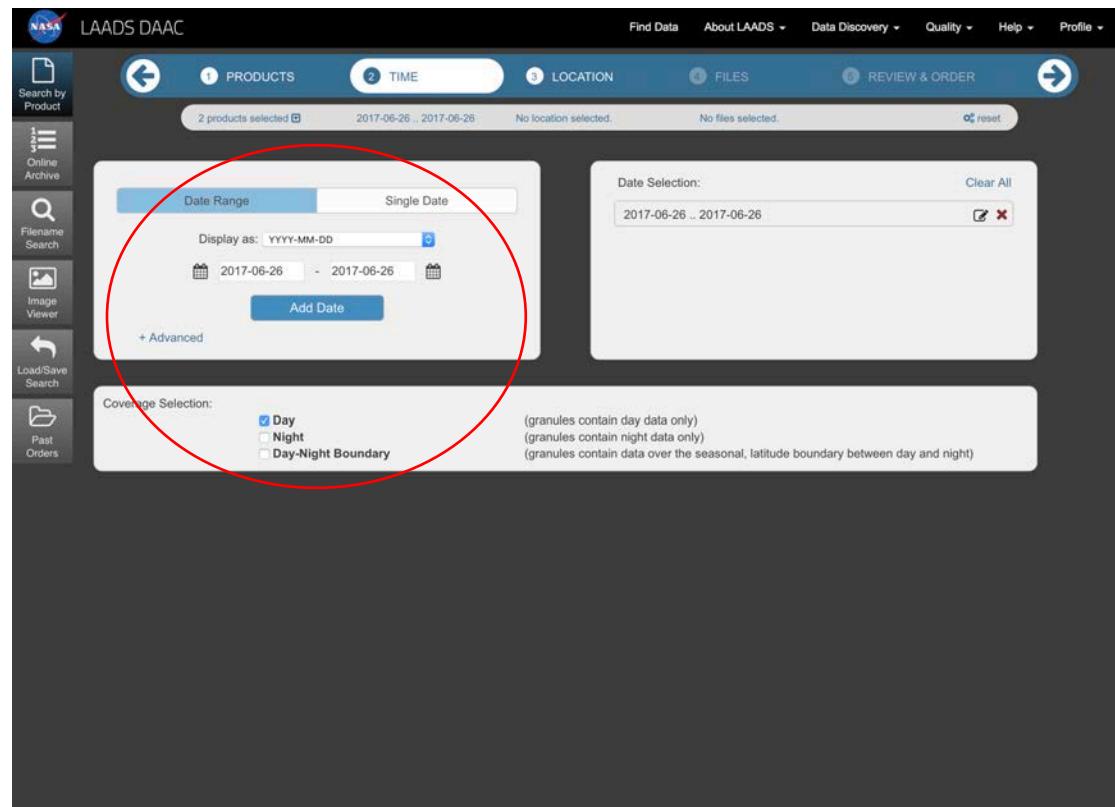
The screenshot shows the LAADS DAAC product search interface. The search bar at the top contains the text "MOD14 (6)". Below the search bar, the results list shows the following items:

- MOD14** (highlighted with a red circle)
MODIS/Terra Thermal Anomalies/Fire 5-Min L2 Swath 1km
- MOD14A1**
MODIS/Terra Thermal Anomalies/Fire Daily L3 Global 1km SIN Grid
- MOD14A2**
MODIS/Terra Thermal Anomalies/Fire 8-Day L3 Global 1km SIN Grid
- MOD14CRS**
MODIS/Terra Thermal Anomalies/Fire 5-Min L2 Swath 5km

On the left side of the interface, there is a sidebar with various search and browse options, including "Search by Product", "Online Archive", "Image Viewer", "Lead/Save Search", and "Past Orders".

Time

4. Select period of time and coverage

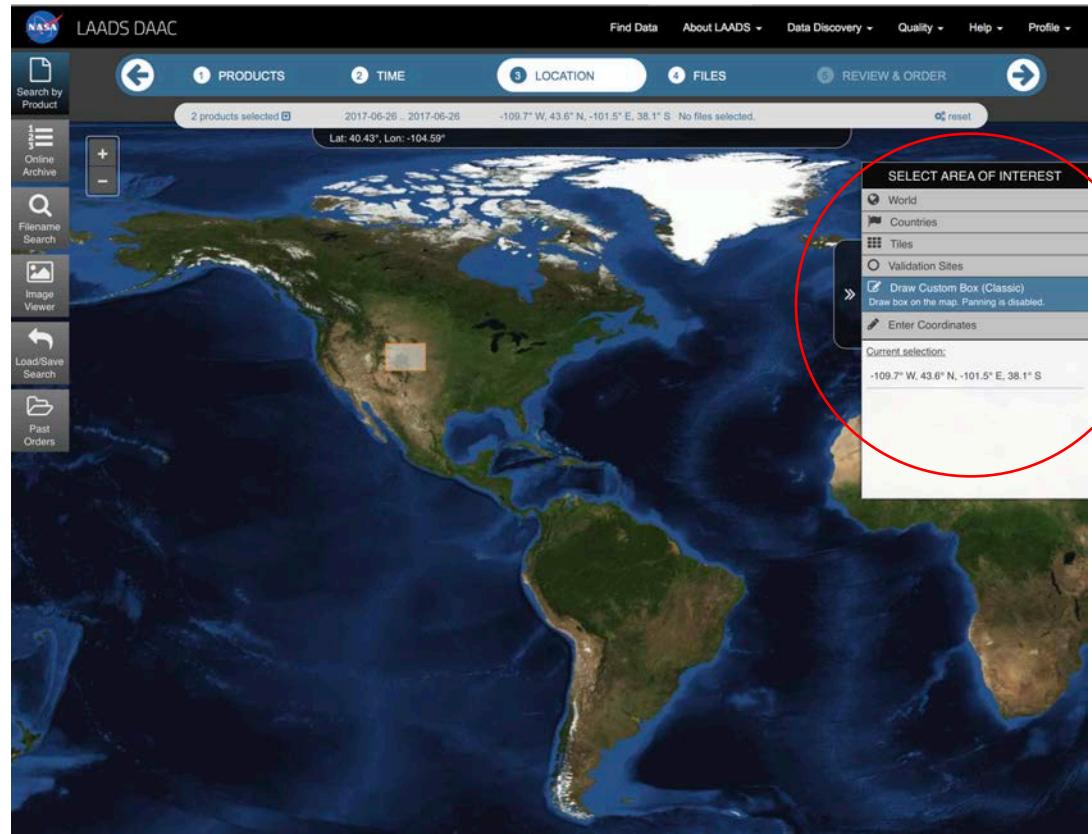


The screenshot shows the LAADS DAAC search interface. The top navigation bar includes links for Find Data, About LAADS, Data Discovery, Quality, Help, and Profile. The main search area has tabs for PRODUCTS, TIME, LOCATION, FILES, and REVIEW & ORDER. The TIME tab is active, showing '2 products selected' for the date range '2017-06-26 .. 2017-06-26' and 'No location selected'. A red circle highlights the 'Date Range' and 'Coverage Selection' sections. The Date Range section allows selecting 'Date Range' or 'Single Date' and choosing the display format as 'YYYY-MM-DD'. The Coverage Selection section includes checkboxes for 'Day' (checked), 'Night' (unchecked), and 'Day-Night Boundary' (unchecked). A note explains that 'Day' includes granules with day data only, 'Night' includes granules with night data only, and 'Day-Night Boundary' includes granules over the seasonal, latitude boundary between day and night.

Location

5. Select Area of interest

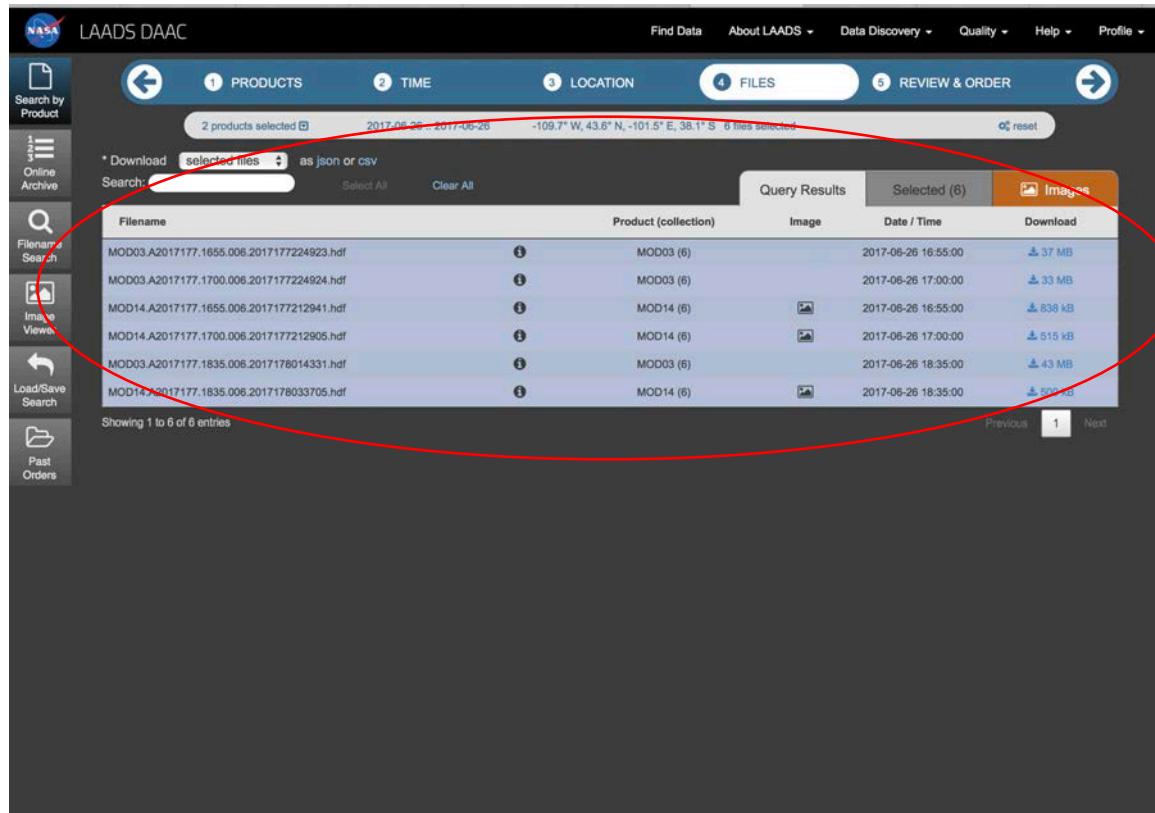
In this case, we opted by using the Draw Custom Box tool for selecting our area of interest



Files

6. Select files to download

At this point, you can download each file by separately , or you can order all the selected files to download them via FTP.



The screenshot shows the LAADS DAAC interface with a red box highlighting the 'FILES' tab in the top navigation bar. The 'FILES' tab is active, and the interface displays a list of selected files. The list includes the following data:

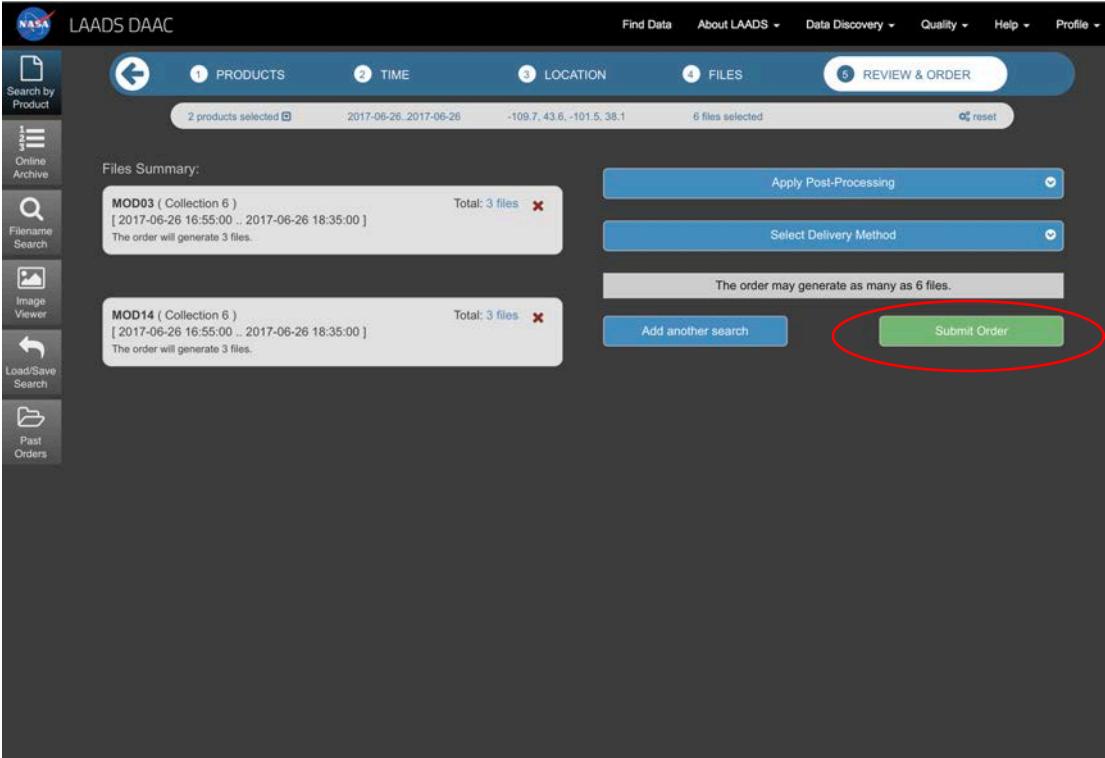
Filename	Product (collection)	Image	Date / Time	Download
MOD03.A2017177.1655.006.2017177224923.hdf	MOD03 (6)		2017-06-26 16:55:00	37 MB
MOD03.A2017177.1700.006.2017177224924.hdf	MOD03 (6)		2017-06-26 17:00:00	33 MB
MOD14.A2017177.1655.006.2017177212941.hdf	MOD14 (6)		2017-06-26 16:55:00	838 kB
MOD14.A2017177.1700.006.2017177212905.hdf	MOD14 (6)		2017-06-26 17:00:00	515 kB
MOD03.A2017177.1835.006.2017178014331.hdf	MOD03 (6)		2017-06-26 18:35:00	43 MB
MOD14.A2017177.1835.006.2017178033705.hdf	MOD14 (6)		2017-06-26 18:35:00	507 kB

Note that in the result appears files for MOD14 and MOD03, this is because MOD03 product contains geolocation data for MOD14 .

Order

7. Order files

You will receive an email with the information and instructions for retrieving the files using the command line.



The screenshot shows the LAADS DAAC order interface. On the left is a sidebar with icons for Search by Product, Online Archive, Filename Search, Image Viewer, Load/Save Search, and Past Orders. The main area has tabs for PRODUCTS, TIME, LOCATION, FILES, and REVIEW & ORDER. The REVIEW & ORDER tab is selected. It shows a summary for MOD03 (Collection 6) with a date range of 2017-06-26 16:55:00 .. 2017-06-26 18:35:00, totaling 3 files. The summary for MOD14 (Collection 6) shows a similar date range and 3 files. To the right are buttons for 'Apply Post-Processing', 'Select Delivery Method', and 'Submit Order'. A red circle highlights the 'Submit Order' button.

Email instructions

8. Retrieve files

apache user for nonltp servers
To: Lorena Castro Garcia
LAADS Web Order Notification

Your Order ID is: 501158967

The data you ordered will be staged (in about 10 minutes), and you can retrieve the data through anonymous FTP using:

```
ftp ladsweb.modaps.eosdis.nasa.gov
username: anonymous
password: lorena-castrogarcia@uiowa.edu

cd /orders/501158967
binary
prompt
mget *
```

Order 501158967 contains 3 file

- if your submission required additional post-processing you will be notified when these files become available

*NOTE: The files will be deleted after 5 days, please download the files before they get deleted.

For help, please contact us at modapsuso@lists.nasa.gov

Thank you,

The LAADS Support Team

VIIRS fire products

- <http://viirsfire.geog.umd.edu>
 - M-band product, 750 m resolution
 - I-band product, 375 m resolution

[Get Data](#)[VIIRS Data Tutorial](#)[FAQ](#)[News & Updates](#)

Active Fire Team

Ivan Csiszar
Chris Justice
Louis Giglio
Evan Ellicott
Wilfrid Schroeder

NOTE - CONUS map data is *NOT* current. This will be fixed shortly.

CONUS Active Fire Map



View active fire detections. The map also provides an icon to represent the center of each VIIRS granule, weather information (temperature and cloud cover), and RSS feeds for US active fire perimeters and Incident Information. RSS feeds provided by GEOMAC and InciWeb, respectively.

Global Active Fire Map



VIIRS daily global active fire detections.

Data Source: <ftp://npp.class.ngdc.noaa.gov>

GLOBAL / CONUS Data download

Select a Date

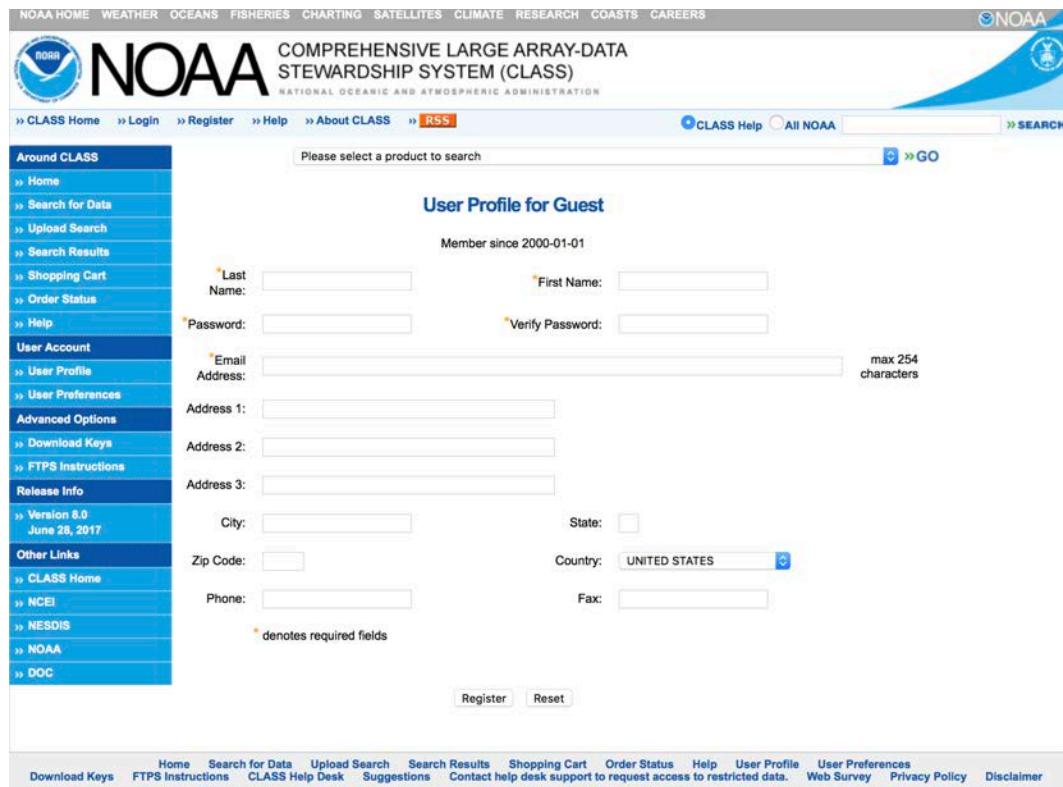
Where/How to get VIIRS M-band fire product?

- For M-band, hdf5 format
- https://esmc.uiowa.edu/fires_workshop/ppts/

User account

1. Create a user account at NOAA CLASS website and login it.

https://www.class.ngdc.noaa.gov/saa/products/user_profile

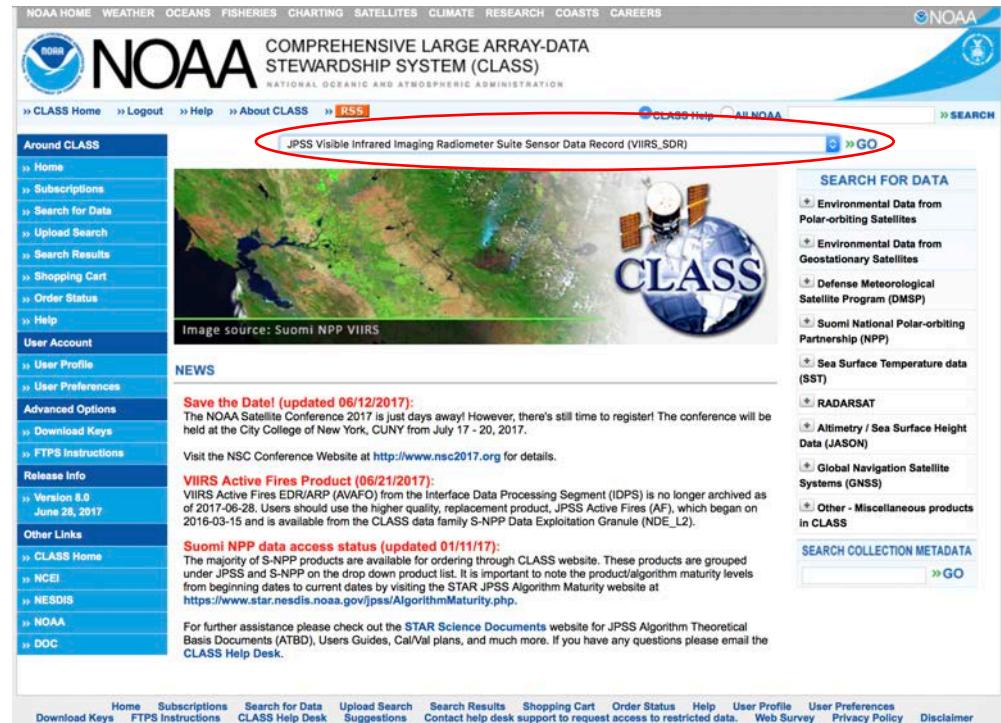


The screenshot shows the NOAA CLASS User Profile for Guest page. The page has a header with the NOAA logo and links for NOAA HOME, WEATHER, OCEANS, FISHERIES, CHARTING, SATELLITES, CLIMATE, RESEARCH, COASTS, and CAREERS. Below the header is a search bar with the placeholder "Please select a product to search" and a "GO" button. The main content area is titled "User Profile for Guest" and includes a message "Member since 2000-01-01". It features a sidebar with a "Around CLASS" menu containing links for Home, Search for Data, Upload Search, Search Results, Shopping Cart, Order Status, Help, User Account, User Profile, User Preferences, Web Survey, Privacy Policy, and Disclaimer. The main form fields include "Last Name" and "First Name" (both marked with a red asterisk), "Password" and "Verify Password" (both marked with a red asterisk), "Email Address" (with a note "max 254 characters"), "Address 1", "Address 2", "Address 3", "City", "State" (with a checkbox), "Zip Code", "Country" (set to "UNITED STATES" with a checkbox), and "Phone" and "Fax". A note "denotes required fields" is located near the bottom of the form. At the bottom are "Register" and "Reset" buttons, and a footer with links for Download Keys, FTPS Instructions, CLASS Help Desk, Search for Data, Upload Search, Search Results, Shopping Cart, Order Status, Help, User Profile, User Preferences, Web Survey, Privacy Policy, and Disclaimer.

Discovery data

2. Select a product for search

For this case, let's go to select
VIIRS_SDR



NOAA HOME WEATHER OCEANS FISHERIES CHARTING SATELLITES CLIMATE RESEARCH COASTS CAREERS

NOAA COMPREHENSIVE LARGE ARRAY-DATA STEWARDSHIP SYSTEM (CLASS)

CLASS Home Logout Help About CLASS RSS CLASS Help All NOAA SEARCH

JPSS Visible Infrared Imaging Radiometer Suite Sensor Data Record (VIIRS_SDR)

SEARCH FOR DATA

- Environmental Data from Polar-orbiting Satellites
- Environmental Data from Geostationary Satellites
- Defense Meteorological Satellite Program (DMSP)
- Suomi National Polar-orbiting Partnership (NPP)
- Sea Surface Temperature data (SST)
- RADARSAT
- Altimetry / Sea Surface Height Data (JASON)
- Global Navigation Satellite Systems (GNSS)
- Other - Miscellaneous products in CLASS

SEARCH COLLECTION METADATA GO

Image source: Suomi NPP VIIRS

NEWS

Save the Date! (updated 06/12/2017): The NOAA Satellite Conference 2017 is just days away! However, there's still time to register! The conference will be held at the City College of New York, CUNY from July 17 - 20, 2017. Visit the NSC Conference website at <http://www.nsc2017.org> for details.

VIIRS Active Fire Product (06/21/2017): VIIRS Active Fires EDR/ARP (AVAF0) from the Interface Data Processing Segment (IDPS) is no longer archived as of 2017-06-28. Users should use the higher quality, replacement product, JPSS Active Fires (AF), which began on 2016-03-15 and is available from the CLASS data family S-NPP Data Exploitation Granule (NDE_L2).

Suomi NPP data access status (updated 01/11/17): The majority of S-NPP products are available for ordering through CLASS website. These products are grouped under JPSS and S-NPP on the drop down product list. It is important to note the product/algorithm maturity levels from beginning dates to current dates by visiting the STAR JPSS Algorithm Maturity website at <https://www.star.nesdis.noaa.gov/jpss/AlgorithmMaturity.php>.

For further assistance please check out the [STAR Science Documents](#) website for JPSS Algorithm Theoretical Basis Documents (ATBD), Users Guides, Cal/Val plans, and much more. If you have any questions please email the [CLASS Help Desk](#).

Home Subscriptions Search for Data Upload Search Search Results Shopping Cart Order Status Help User Profile User Preferences Web Survey Privacy Policy Disclaimer

Download Keys FTPS Instructions CLASS Help Desk Search for Data Suggestions Contact help desk support to request access to restricted data.

Location and Time

3. Select area of interest and period of time

In this case, we opted by using the Draw Custom Box tool



NOAA Comprehensive Large Array-Data Stewardship System (CLASS)

JPSS Visible Infrared Imaging Radiometer Suite Sensor Data Record (VIIRS_SDR)

Search - VIIRS_SDR

Data Description

Visible Infrared Imaging Radiometer Suite (VIIRS) Data Records from Suomi NPP - This data family contains the raw, sensor and environmental data records from the Visible Infrared Imaging Radiometer Suite (VIIRS) on board the Suomi National Polar-orbiting Partnership (S-NPP) satellite. VIIRS is a scanning radiometer that collects visible and infrared imagery and radiometric measurements of the land, atmosphere, cryosphere, and oceans. VIIRS data is used to measure cloud and aerosol properties, ocean color, sea and land surface temperature, ice motion and temperature, fires, and Earth's albedo. VIIRS extends and improves upon a series of measurements initiated by the NOAA Advanced Very High Resolution Radiometer (AVHRR) and the NASA Moderate Resolution Imaging Spectroradiometer (MODIS).

Details - Metadata, Documentation

Notes

Spatial

Temporal

(maximum range is 366 days)

Start Date (format: YYYY-MM-DD) 2017-06-26

End Date (format: YYYY-MM-DD) 2017-06-26

Start Time (UTC) (format: HH:MM:SS) 00:00:00

End Time (UTC) (format: HH:MM:SS) 23:59:00

Specify the range of the times for: Each Day Or The Entire Range Of Days

Products and search

4. Select interest product (s)

sensor: SVDNB and GDNBO

5. Select the type of search

The screenshot shows the 'Advanced Search' interface for a dataset. The 'Sensor Data Record' section is expanded, showing a list of options. Two items are selected with blue radio buttons: 'VIIRS Day Night Band SDR (SVDNB) (public 02/07/2012)' and 'VIIRS Day Night Band SDR Ellipsoid Geolocation (GDNBO) (public 02/07/2012)'. These two items are circled in red. The 'Node' section shows 'Ascending' selected. The 'Satellite' section shows 'S-NPP' selected. At the bottom, there are buttons for 'Search' (circled in red), 'Quick Search & Order', 'Save Criteria', 'Load Criteria', 'Dataset Name/Granule ID/Beginning Orbit Number View', and 'Reset'.

Advanced Search

Datatype

Sensor Data Record

VIIRS Day Night Band SDR (SVDNB) (public 02/07/2012)

VIIRS Image Bands SDR (public 02/07/2012)

VIIRS Imagery Band 02 SDR (SVM02) (public 02/07/2012)

VIIRS Imagery Band 03 SDR (SVM03) (public 02/07/2012)

VIIRS Imagery Band 04 SDR (SVM04) (public 02/07/2012)

VIIRS Imagery Band 05 SDR (SVM05) (public 02/07/2012)

VIIRS Moderate Resolution Band 01 SDR (SVM01) (public 02/07/2012)

VIIRS Moderate Resolution Band 02 SDR (SVM02) (public 02/07/2012)

VIIRS Moderate Resolution Band 03 SDR (SVM03) (public 02/07/2012)

VIIRS Moderate Resolution Band 04 SDR (SVM04) (public 02/07/2012)

VIIRS Moderate Resolution Band 05 SDR (SVM05) (public 02/07/2012)

VIIRS Moderate Resolution Band 06 SDR (SVM06) (public 02/07/2012)

VIIRS Moderate Resolution Band 07 SDR (SVM07) (public 02/07/2012)

VIIRS Moderate Resolution Band 08 SDR (SVM08) (public 02/07/2012)

VIIRS Moderate Resolution Band 09 SDR (SVM09) (public 02/07/2012)

VIIRS Moderate Resolution Band 10 SDR (SVM10) (public 02/07/2012)

VIIRS Moderate Resolution Band 11 SDR (SVM11) (public 02/07/2012)

VIIRS Moderate Resolution Band 12 SDR (SVM12) (public 02/07/2012)

VIIRS Moderate Resolution Band 13 SDR (SVM13) (public 02/07/2012)

VIIRS Moderate Resolution Band 14 SDR (SVM14) (public 02/07/2012)

VIIRS Moderate Resolution Band 15 SDR (SVM15) (public 02/07/2012)

VIIRS Moderate Resolution Band 16 SDR (SVM16) (public 02/07/2012)

Geolocation

VIIRS Day Night Band SDR Ellipsoid Geolocation (GDNBO) (public 02/07/2012)

VIIRS Image Bands SDR Ellipsoid Geolocation (GIMGO) (public 02/07/2012)

VIIRS Image Bands SDR Ellipsoid Terrain Corrected Geolocation (GITCO) (public 02/07/2012)

VIIRS Moderate Bands SDR Geolocation (GMODO) (public 02/07/2012)

VIIRS Moderate Bands SDR Terrain Corrected Geolocation (GMTCO) (public 02/07/2012)

Node

Ascending

Either

Satellite

S-NPP

Quick Search & Order to place large order without reviewing inventory or granule (file) metadata.

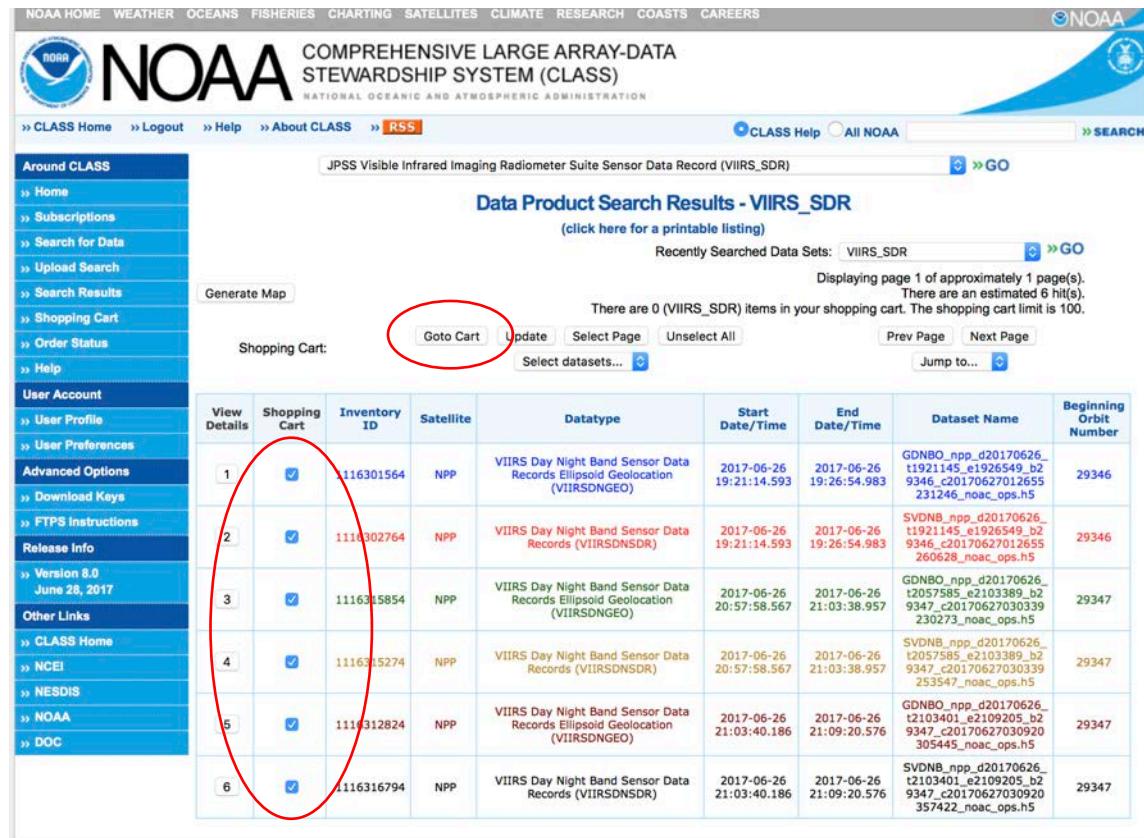
Search to place small order after reviewing inventory and granule metadata, including browse images when available.

Save Criteria Load Criteria Dataset Name/Granule ID/Beginning Orbit Number View Reset

Files

6. Select files to order

At this point, we have **selected** the files that we want to retrieve, now we need to press “**Goto Cart**” option



NOAA HOME WEATHER OCEANS FISHERIES CHARTING SATELLITES CLIMATE RESEARCH COASTS CAREERS 

NOAA COMPREHENSIVE LARGE ARRAY-DATA STEWARDSHIP SYSTEM (CLASS)
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

» CLASS Home » Logout » Help » About CLASS » RSS » CLASS Help All NOAA » SEARCH

Around CLASS

- » Home
- » Subscriptions
- » Search for Data
- » Upload Search
- » Search Results
- » Shopping Cart
- » Order Status
- » Help

User Account

- » User Profile
- » User Preferences
- » Advanced Options
- » Download Keys
- » FTPS Instructions
- » Release Info
- » Version 8.0 June 28, 2017
- » Other Links
- » CLASS Home
- » NCEI
- » NESDIS
- » NOAA
- » DOC

JPSS Visible Infrared Imaging Radiometer Suite Sensor Data Record (VIIRS_SDR) 

Data Product Search Results - VIIRS_SDR
(click here for a printable listing)

Recently Searched Data Sets: VIIRS_SDR 

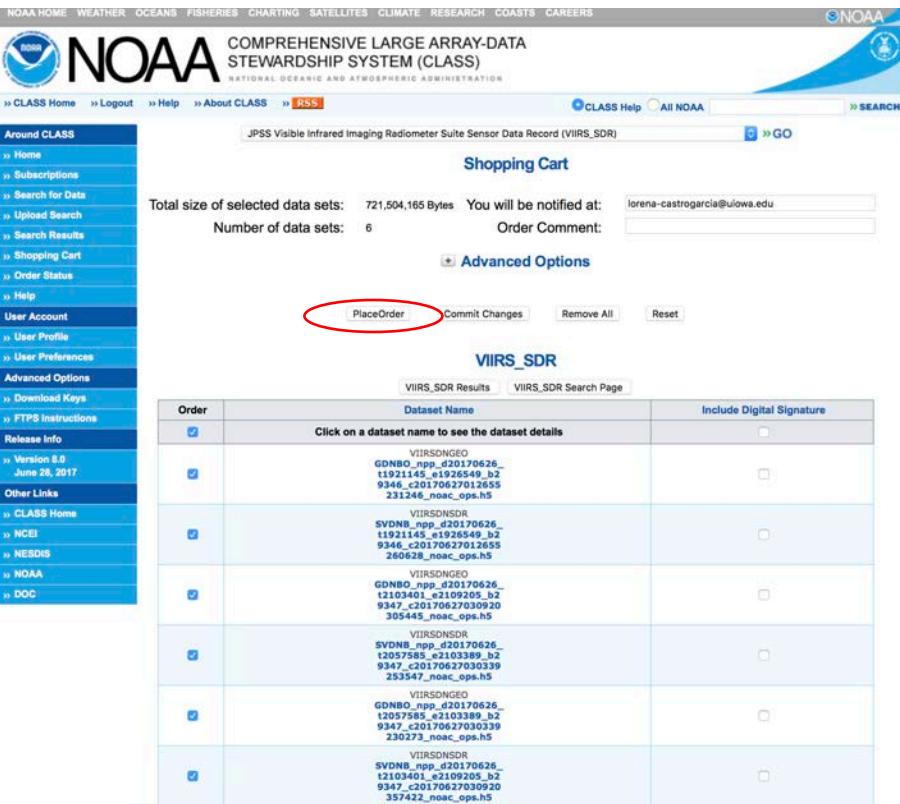
Displaying page 1 of approximately 1 page(s). There are 0 (VIIRS_SDR) items in your shopping cart. The shopping cart limit is 100.

Shopping Cart:        

View Details	Shopping Cart	Inventory ID	Satellite	Datatype	Start Date/Time	End Date/Time	Dataset Name	Beginning Orbit Number
1	<input checked="" type="checkbox"/>	1116301564	NPP	VIIRS Day Night Band Sensor Data Records Ellipsoid Geolocation (VIIRSDNGEO)	2017-06-26 19:21:14.593	2017-06-26 19:26:54.983	GONBO_npp_d20170626_t1921145_e1926549_b2 9346_c20170627012655 231246_noac_ops.h5	29346
2	<input checked="" type="checkbox"/>	1116302764	NPP	VIIRS Day Night Band Sensor Data Records (VIIRSDNSDR)	2017-06-26 19:21:14.593	2017-06-26 19:26:54.983	SVDNB_npp_d20170626_t1921145_e1926549_b2 9346_c20170627012655 260628_noac_ops.h5	29346
3	<input checked="" type="checkbox"/>	1116315854	NPP	VIIRS Day Night Band Sensor Data Records Ellipsoid Geolocation (VIIRSDNGEO)	2017-06-26 20:57:58.567	2017-06-26 21:03:38.957	GONBO_npp_d20170626_t2057585_e2103389_b2 9347_c20170627030339 230273_noac_ops.h5	29347
4	<input checked="" type="checkbox"/>	1116315274	NPP	VIIRS Day Night Band Sensor Data Records (VIIRSDNSDR)	2017-06-26 20:57:58.567	2017-06-26 21:03:38.957	SVDNB_npp_d20170626_t2057585_e2103389_b2 9347_c20170627030339 253547_noac_ops.h5	29347
5	<input checked="" type="checkbox"/>	1116313284	NPP	VIIRS Day Night Band Sensor Data Records Ellipsoid Geolocation (VIIRSDNGEO)	2017-06-26 21:03:40.186	2017-06-26 21:09:20.576	GONBO_npp_d20170626_t2103401_e2109205_b2 9347_c20170627030920 305445_noac_ops.h5	29347
6	<input checked="" type="checkbox"/>	1116316794	NPP	VIIRS Day Night Band Sensor Data Records (VIIRSDNSDR)	2017-06-26 21:03:40.186	2017-06-26 21:09:20.576	SVDNB_npp_d20170626_t2103401_e2109205_b2 9347_c20170627030920 357422_noac_ops.h5	29347

Order

7. Order files

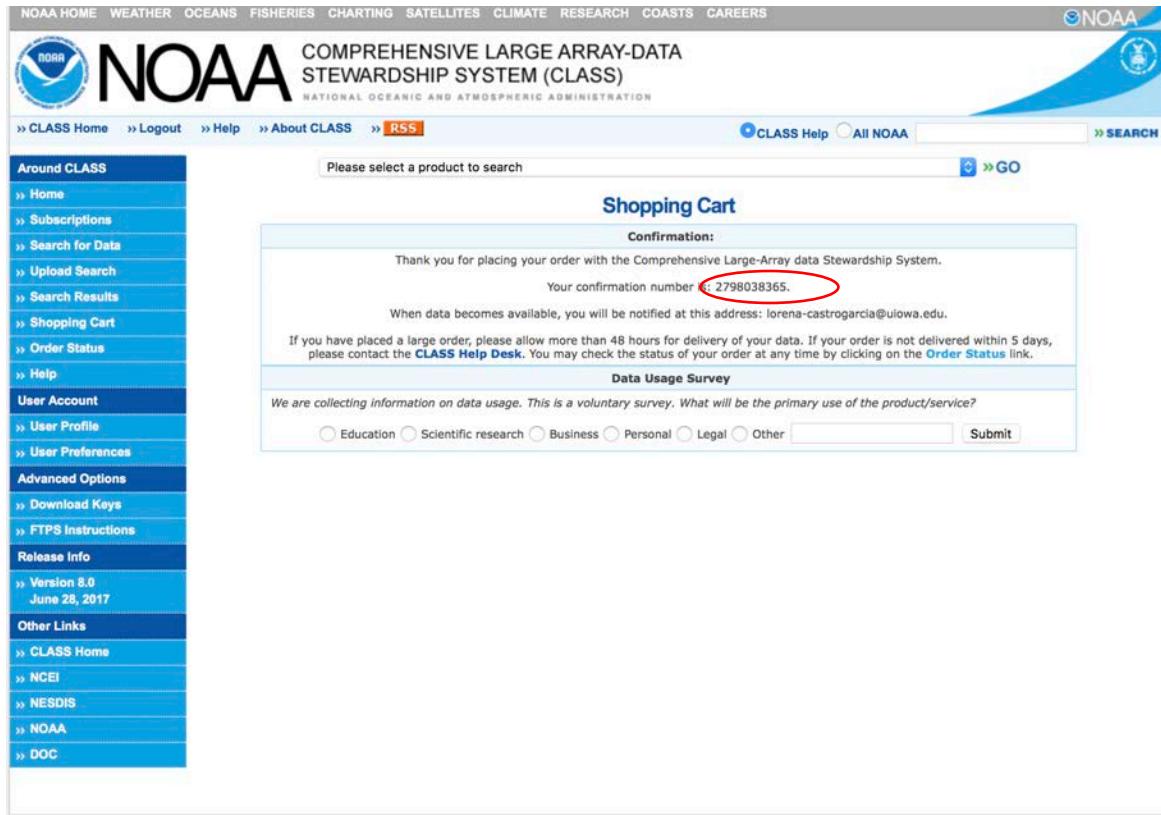


The screenshot shows the NOAA Comprehensive Large Array-Data Stewardship System (CLASS) website. The top navigation bar includes links for NOAA HOME, WEATHER, OCEANS, FISHERIES, CHARTING, SATELLITES, CLIMATE, RESEARCH, COASTS, and CAREERS. The main content area is titled "VIIRS_SDR Results" and shows a table of search results for VIIRS SDR data. The table has columns for Order (checkbox), Dataset Name (link), and Include Digital Signature (checkbox). The first row of results is highlighted with a red circle around the "PlaceOrder" button in the Order column. The dataset name for this row is "VIIRSINGEO_GDNBO_npp_d20170626_t1921145_e1926549_b2_9346_c20170627012655_231246_noac_ops.h5". The table continues with several other rows of similar data, each with a "PlaceOrder" button in the Order column.

Order	Dataset Name	Include Digital Signature
<input checked="" type="checkbox"/>	VIIRSINGEO_GDNBO_npp_d20170626_t1921145_e1926549_b2_9346_c20170627012655_231246_noac_ops.h5	<input type="checkbox"/>
<input checked="" type="checkbox"/>	VIIRSDNSDR_SVDR_npp_d20170626_t1921145_e1926549_b2_9346_c20170627012655_260628_noac_ops.h5	<input type="checkbox"/>
<input checked="" type="checkbox"/>	VIIRSINGEO_GDNBO_npp_d20170626_t2103401_e2109205_b2_9347_c20170627030920_305445_noac_ops.h5	<input type="checkbox"/>
<input checked="" type="checkbox"/>	VIIRSDNSDR_SVDR_npp_d20170626_t2057585_e2103389_b2_9347_c20170627030339_253547_noac_ops.h5	<input type="checkbox"/>
<input checked="" type="checkbox"/>	VIIRSINGEO_GDNBO_npp_d20170626_t2103401_e2109205_b2_9347_c20170627030339_230273_noac_ops.h5	<input type="checkbox"/>
<input checked="" type="checkbox"/>	VIIRSDNSDR_SVDR_npp_d20170626_t2103401_e2109205_b2_9347_c20170627030339_357422_noac_ops.h5	<input type="checkbox"/>

Order confirmation

We will receive a conformation number which we can use for checking the order status

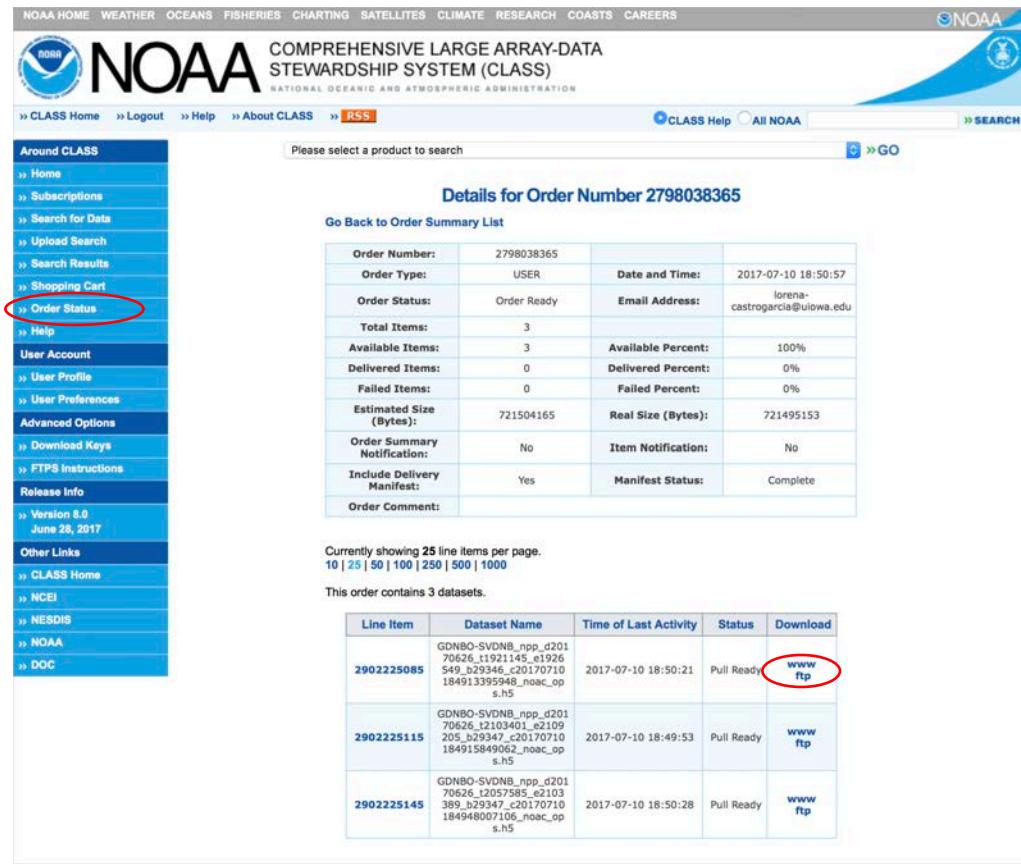


The screenshot shows the NOAA Comprehensive Large Array-Data Stewardship System (CLASS) website. The top navigation bar includes links for NOAA HOME, WEATHER, OCEANS, FISHERIES, CHARTING, SATELLITES, CLIMATE, RESEARCH, COASTS, and CAREERS. The main header features the NOAA logo and the text "COMPREHENSIVE LARGE ARRAY-DATA STEWARDSHIP SYSTEM (CLASS)" with "NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION" below it. The left sidebar contains a vertical menu with sections like "Around CLASS", "User Account", "Advanced Options", "Release Info", "Other Links", and "CLASS Home". The main content area is titled "Shopping Cart" and includes a "Confirmation" section with the message: "Thank you for placing your order with the Comprehensive Large-Array data Stewardship System. Your confirmation number is 2798038365." A red oval highlights the confirmation number. Below this, a message states: "When data becomes available, you will be notified at this address: lorena-castrogarcia@uiowa.edu." Further down, a "Data Usage Survey" section asks: "We are collecting information on data usage. This is a voluntary survey. What will be the primary use of the product/service?" with options for Education, Scientific research, Business, Personal, Legal, and Other, followed by a "Submit" button.

Order status and get files

8. Check the order status

When the order is ready, we have the options "www or ftp" for downloading the files.



The screenshot shows the NOAA CLASS website. The left sidebar has a blue background with white text, listing various links: Home, Subscriptions, Search for Data, Upload Search, Search Results, Shopping Cart, Order Status (which is circled in red), Help, User Account, User Profile, User Preferences, Advanced Options, Download Keys, FTPS Instructions, Release Info, Version 8.0 (June 28, 2017), and Other Links (CLASS Home, NCEI, NESDIS, NOAA, DOC). The main content area has a white background. At the top, it says "COMPREHENSIVE LARGE ARRAY-DATA STEWARDSHIP SYSTEM (CLASS) NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION". Below that is a search bar with the placeholder "Please select a product to search". To the right of the search bar are links for "CLASS Help", "All NOAA", and a "GO" button. The main content area is titled "Details for Order Number 2798038365" and includes a "Go Back to Order Summary List" link. The order details table shows the following information:

Order Number:	2798038365	Date and Time:	2017-07-10 18:50:57
Order Type:	USER	Email Address:	lorena-castrogarcia@uiowa.edu
Order Status:	Order Ready	Available Percent:	100%
Total Items:	3	Delivered Percent:	0%
Available Items:	3	Failed Items:	0
Delivered Items:	0	Failed Percent:	0%
Estimated Size (Bytes):	721504165	Real Size (Bytes):	721495153
Order Summary Notification:	No	Item Notification:	No
Include Delivery Manifest:	Yes	Manifest Status:	Complete
Order Comment:			

Below the order details, it says "Currently showing 25 line items per page." with links to page numbers 10, 25, 50, 100, 250, 500, and 1000. It also says "This order contains 3 datasets." and lists three line items:

Line Item	Dataset Name	Time of Last Activity	Status	Download
2902225085	GDNBO-SVOND_B_npp_d201 70626_1921145_e1926 549_b29346_c20170710 18491395948_noac_op s.h5	2017-07-10 18:50:21	Pull Ready	www ftp (circled in red)
2902225115	GDNBO-SVOND_B_npp_d201 70626_12103401_e2103 205_b29347_c20170710 184915849062_noac_op s.h5	2017-07-10 18:49:53	Pull Ready	www ftp
2902225145	GDNBO-SVOND_B_npp_d201 70626_12057585_e2103 389_b29347_c20170710 184948007106_noac_op s.h5	2017-07-10 18:50:28	Pull Ready	www ftp

Where/How to get VIIRS I-band fire product?

- For I-band, netcdf format.
- <https://earthdata.nasa.gov/earth-observation-data/near-real-time>
- ftp://nrt3.modaps.eosdis.nasa.gov/allData/5000/VNP14IMG_NRT/

Codes & Scripts

- https://esmc.uiowa.edu/fires_workshop/requisites.pdf

Thank you !

