

Fire Information for Resource Management System (FIRMS)

getting satellite-derived active fire data in to the hands of users



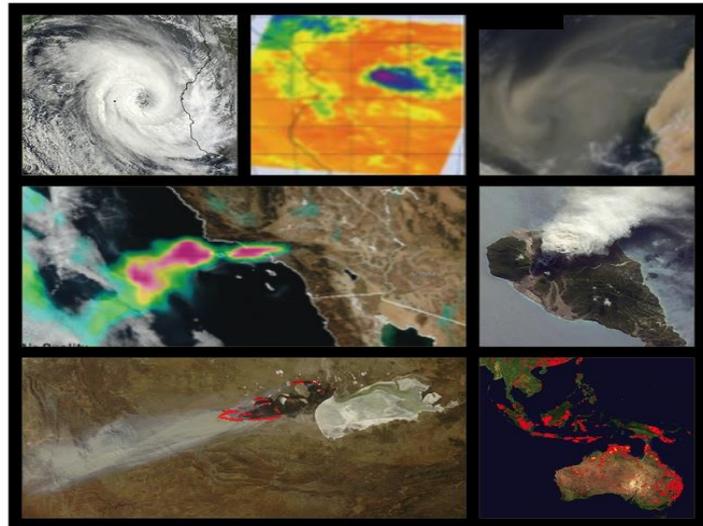
Presented by Diane Davies
Operations Manager for NASA LANCE
(Land Atmosphere Near real-time Capability for EOS)

diane.k.davies@nasa.gov

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

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

LANCE makes EOS data from AIRS, AMSR2, MISR, MLS, MODIS, MOPITT, OMI, OMPS and VIIRS available within three hours of satellite overpass to meet the timely needs of applications such as numerical weather and climate prediction; forecasting and monitoring natural hazards, ecological/invasive species, agriculture, and air quality; providing help with disaster relief; and homeland security.



LANCE Facilities



Satellite Detection of Fires Burning Last 19 days

MODIS Active Fire Detections 09/01 – 09/19 2017



Sept. 16, 2017

This Season, Western Wildfires Are Close By and Running Free

Extreme fire behavior — difficult to predict and dangerous to fight — has been the watchword for the year. And these fires are menacing more lives and property.

By KIRK JOHNSON



Sept. 16, 2017

As Wildfires Burn in West, Ash Rides Wind High Across U.S.

Wildfires in the Pacific Northwest have impacted the air quality in the region and sent plumes of smoke and ash across North America as far east as New York and Pennsylvania.

By TROY GRIGGS, K.K. REBECCA LAI, JEREMY ASHKENAS and JUGAL K. PATEL



Sept. 13, 2017

Fire on the Mountain: 2 Forests Offer Clues to Yellowstone's Fate in a Warming World

Increasingly frequent wildfires fed by a warming climate could turn the park's dense forests into sparser woodlands.

By MICHAEL PRICE



Sept. 9, 2017

OP-ED CONTRIBUTOR

Where There's Fire, There's Smoke

Out West, the ash in the air has literally changed how we look at the world.

By JASON MARK



Sept. 9, 2017

'The Lungs of Our Region Are on Fire:' Wildfires Exact a Punishing Toll on the West

Times readers share personal stories about the wildfires sweeping across arid lands.

By NANCY WARTIK



The need for active fire information

Terra/MODIS
2017/232
08/20/2017
18:45 UTC

Smoke from fires in
Oregon and
California

Pixel sizes:

1km
500m
250m

[More information](#)

[View this region
interactively with
Worldview](#)

[Download a world file
\(for GIS\)](#)

[Download a KML file
\(for Google Earth\)](#)

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Fire Information for Resource Management System (FIRMS),




Fire Email Alerts 

Download Active Fire Data

Web Fire Mapper 

Global Fire Maps

Web Services 

FIRMS provides active fire data from MODIS and VIIRS in easy to use, easy to access formats <https://earthdata.nasa.gov/firms>

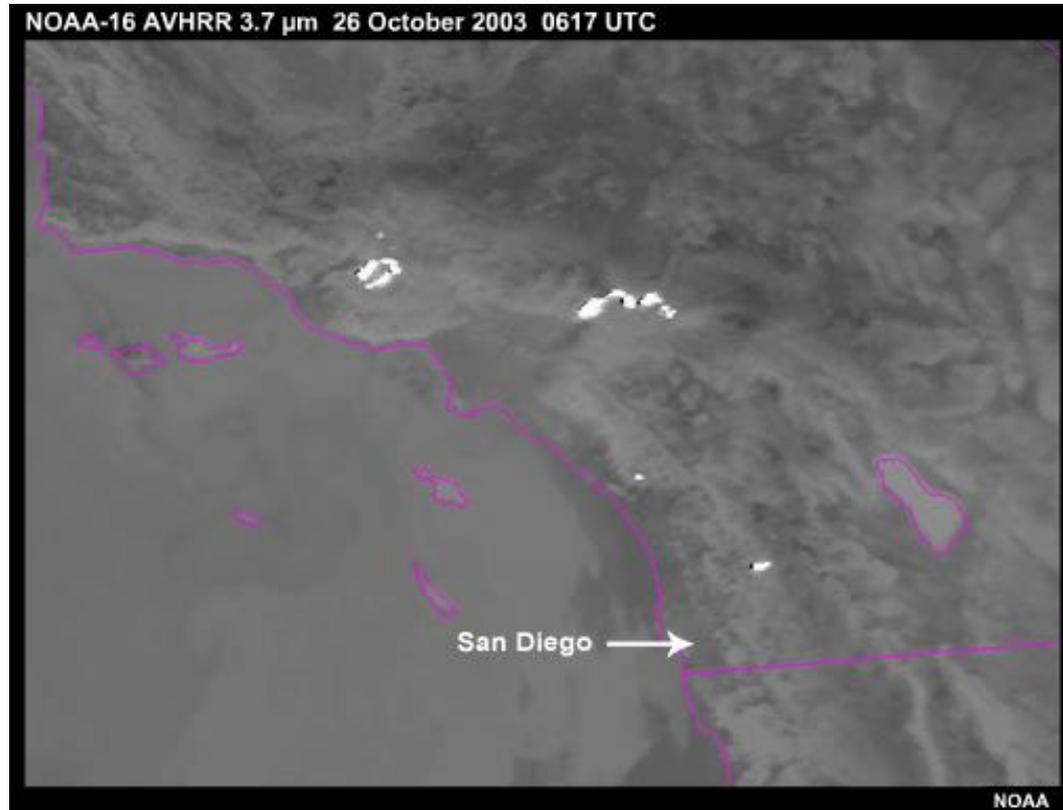
FIRMS

FIRMS has built on a number of science and technological breakthroughs and benefited from partnerships enabled the successful integration of satellite-derived fire information into FIRMS.



Prior to MODIS

- NOAA AVHRR First launched in 1978 to provide daily global coverage on clouds, snow and ice and surface temperature
- After launch RS community realized it could be used to detect fires
- No one algorithm performed optimally over all biomes
- Global AVHRR coverage had 4km resolution
- Efforts to get the finer 1km local area coverage data to users included direct broadcast stations



Direct broadcast of NOAA AVHRR



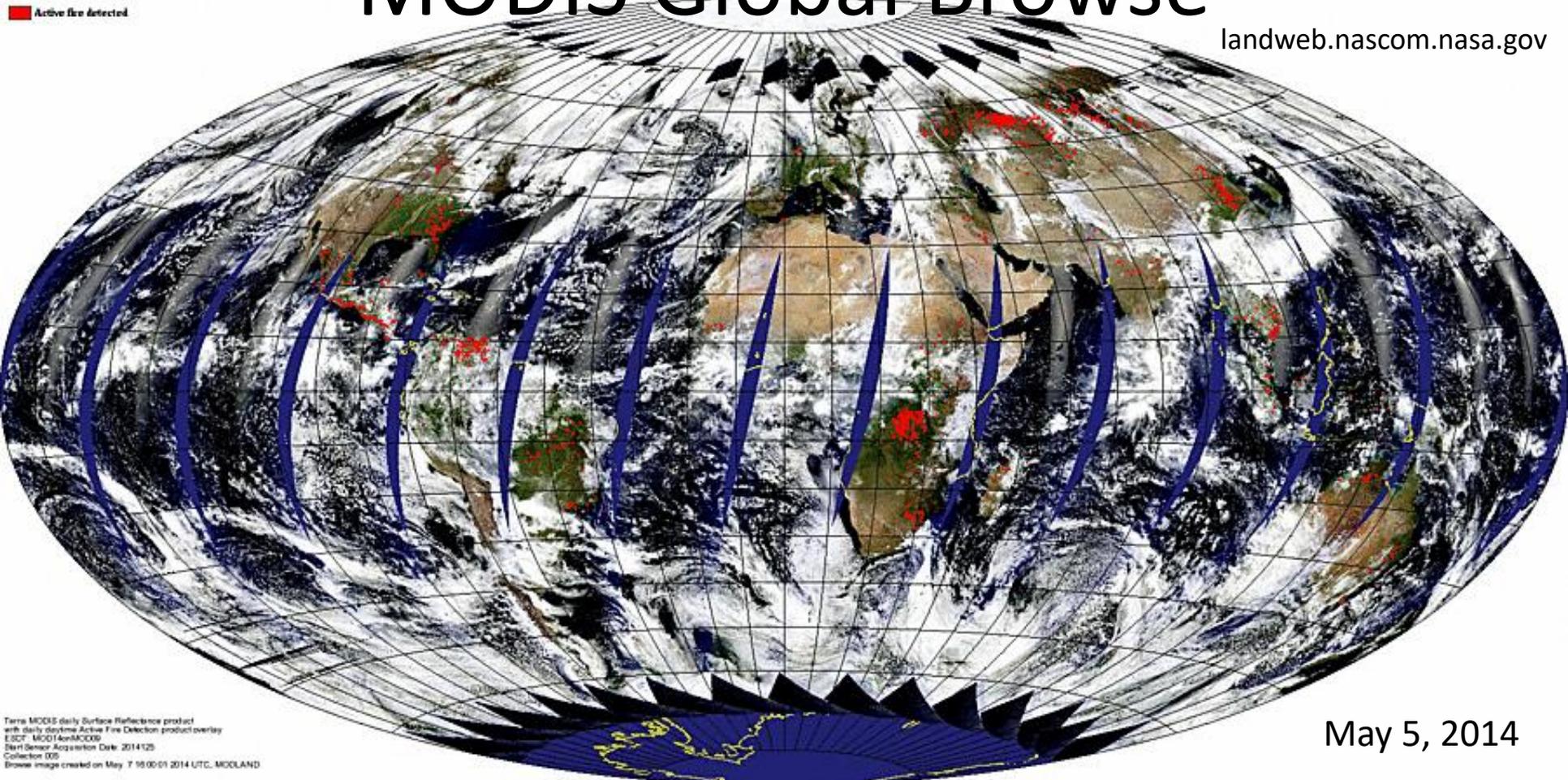
System provided by LARST - Local applications of Remote Sensing Technology with funds from the UK ODA (now Department for International Development (DfID)).

Satellites, Sensors, Algorithms and Field Campaigns

- AVHRR served an important role in fire remote sensing:
 - It revealed for the first time the global extent of biomass burning
 - AVHRR Direct readout stations enabled near real-time fire detection
 - AVHRR fire data created a community of researchers and operational users that developed a vision of the potential capabilities of future sensors
- Using AVHRR fire data, users were able to provide feedback to NASA that influenced the development of MODIS and supported efforts to design MODIS with fire-monitoring capabilities.
- Before launching MODIS NASA developed an airborne version of the instrument.
- Field campaigns (e.g. SAFARI 92 and 2000) brought together a community of scientists to test, develop and validate the algorithms.
- MODIS Fire Team (Yoram Kaufman, Chris Justice and Louis Giglio) were responsible for developing the MODIS fire algorithm.

MODIS Global Browse

landweb.nascom.nasa.gov



Terra MODIS daily Surface Reflectance product
with daily daytime Active Fire Detection product overlay
E3CF MOD14a1v009
Data Sensor Acquisition Date: 2014125
Collection 005
Browse image created on May 7 19:00:01 2014 UTC, MODLAND

May 5, 2014

Daily Daytime Active Fire Detection over Daily Land Surface Reflectance (MYD14 over MYD09)



Deer and wildfire, Montana Taken 6 August 2000 by *John McColgan, USFS*, via *Wikimedia Commons*.

MODIS Rapid Response

Source:
Sohlberg, R., J. Desclotres, et al.
(2001). "MODIS Land Rapid
Response: operational use of
Terra data for USFS wildfire
management." The Earth
Observer **13(5): 8-10,14.**

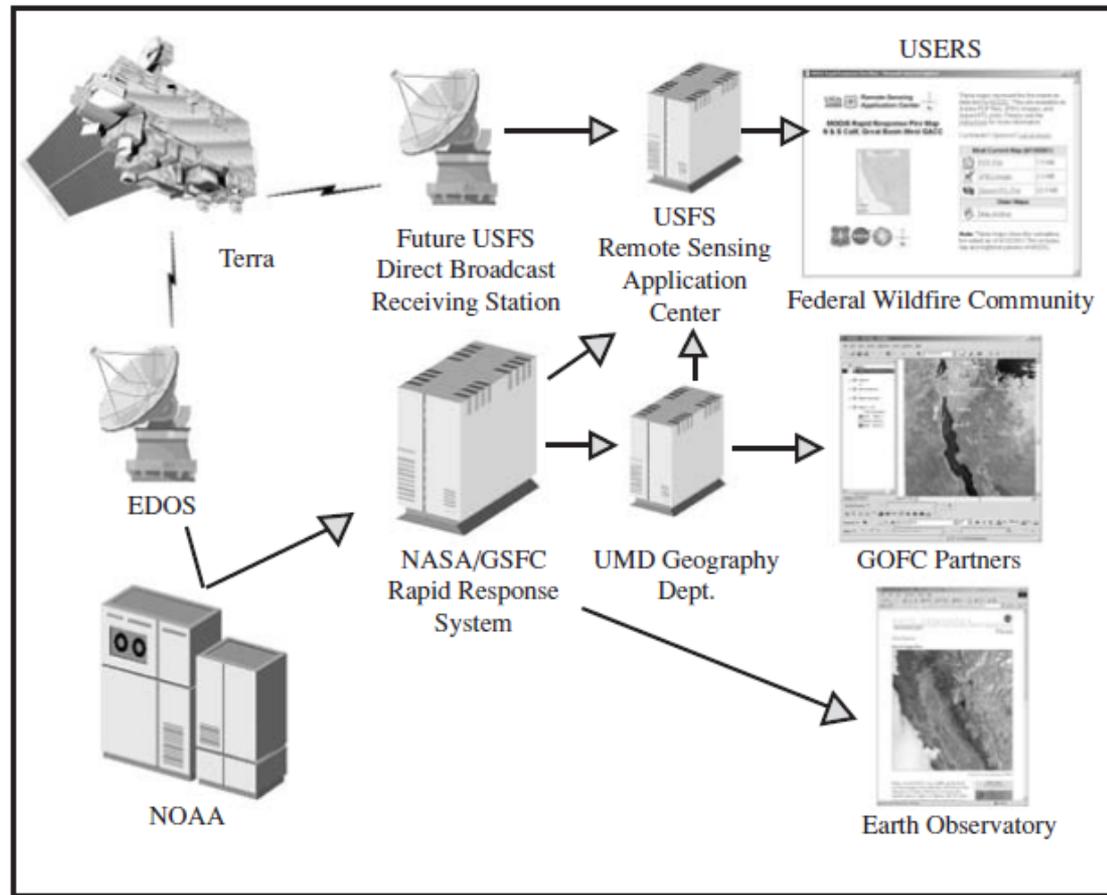
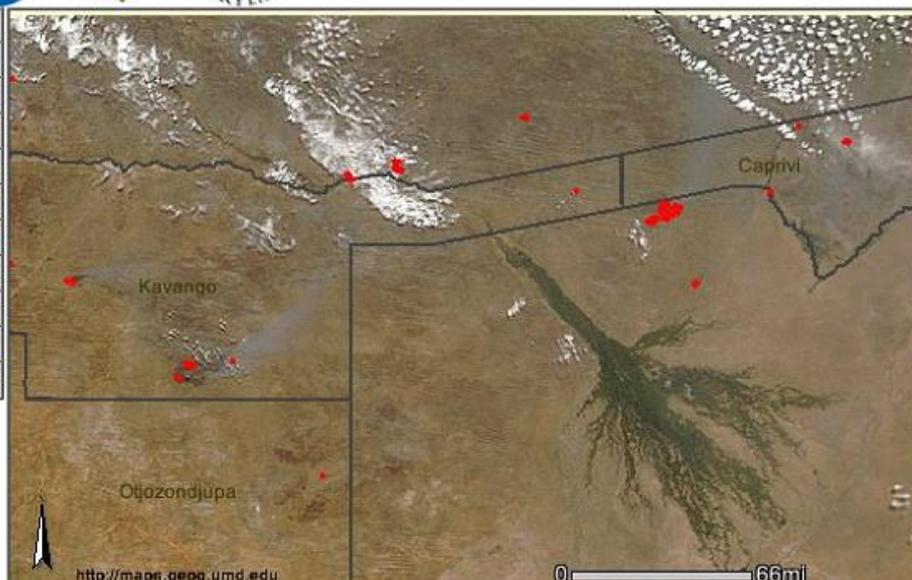


Figure 1. High-level data flows for Rapid Response. Input data flow from sources on the left of the figure, with processing in the center segment, and delivery to end users at the right.



Web Fire Mapper: Namibia



Layers

Visible Active

- Fires Last 48Hrs
- Fires Last 7 Days
- MODIS Active Fire Detections(2004)
- MODIS Active Fire Detections (Archive)
- Major Towns
- Towns
- Trunk Roads
- Roads
- Rivers
- Regions
- Protected Areas
- Biomes

Fires Last 48Hrs

Rec	Latitude	Longitude	Brightness: Temperature	Scan	Track	Acquisition Date	Acquisition Time	Satellite	Confidence	#SHAPE#	SI
1	-18.972	20.105	340.1	1.5	2.3	2004-09-23	0825	T	92	[polygon]	1
2	-18.975	20.126	337.2	1.5	2.2	2004-09-23	0825	T	89	[polygon]	1

Date Query [Help](#)

Enter the dates in
YYYY-MM-DD format.

Start Date End Date

Pan

NOTE: MODIS Fire detections are NOT available for the following dates: 6/16/2001 to 7/3/2001, 3/20/2002 to 3/28/2002, 4/15/2002.

Fire Information for Resource Management System



2006 FIRMS was funded under NASA Applied Sciences Program

- UMD in partnership with UN FAO and Conservation International
- Further develop prototype
- Assist Conservation International further develop their email alert service
- Establish operational system at FAO

NASA FIRMS: Daily Fire Alert (indonesia)

NASA FIRMS [noreply@earthdata.nasa.gov]

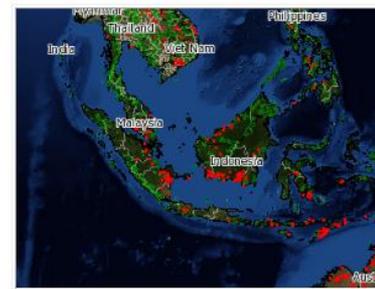
Sent: 27 October 2012 09:55

To: Davies, Diane K. (GSFC-6180)(SIGMA SPACE CORPORATION)

Attachments: FirePoints-102712-13030.csv (10 KB)

NASA FIRMS: Fire Email Alert

Please do not reply to this email. If you have questions/comments, please contact support@earthdata.nasa.gov. Should you wish to cancel or modify your email subscription please go to <http://earthdata.nasa.gov/data/nri-data/firms/email-alerts>



[View map image on NASA FIRMS server](#)

Your Area of Interest (Coordinates) : 87.19, -10.68, 132.19, 11.73

Fires detected over the past 24 hours in your area-of-interest : **302**

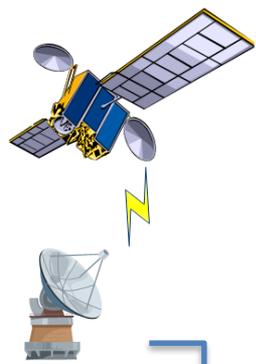
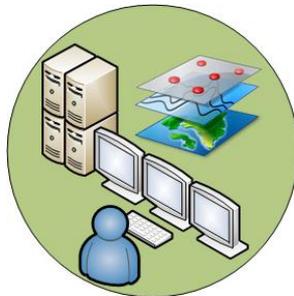
(NOTE: Cloud cover might obscure active fire detections. The fire points will be listed only when the total number of active fires detected is less than or equal to 50)

This email was generated on 2012-10-27, 08:55:58 UTC

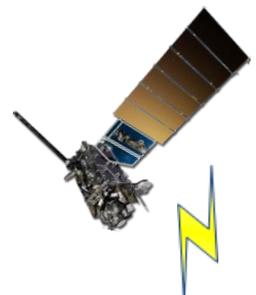
Disclaimer: The LANCE system is operated by the NASA/GSFC Earth Science Data Information System (ESDIS). The information presented through the LANCE Rapid Response system and the LANCE FIRMS are provided 'as is' and users bear all responsibility and liability for their use of data, and for any loss of business or profits, or for any indirect, incidental or consequential damages arising out of any use of, or inability to use, the data, even if NASA or ESDIS were previously advised of the possibility of such damages, or for any other claim for any or any other reason. ESDIS makes no

Overview of FIRMS

MODIS data from Terra and Aqua EO satellites



VIIRS data from Suomi NPP



JPSS SMD Hub (JSH)

EDOS LZPF

NRT version of MODIS (MxD14) and VIIRS 375M (VNP14IMGTDL) by LANCE MODIS and VIIRS

text file format

NRT HDF files processed by LANCE- MODIS / VIIRS

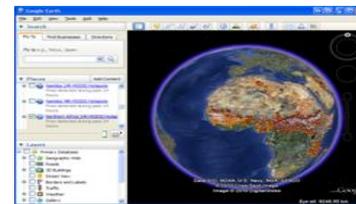
FIRMS



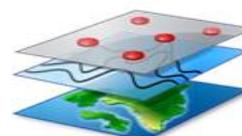
Email Alerts



Web Fire Mapper



KML files and Web Services



TXT and Shape files

NASA FIRMS: Fire Email Alert

239 fires/hotspots detected during the most recently processed satellite overpass

(Protected Area: Kafue [Zambia], including a buffer of 15 KM)



[View map image on NASA FIRMS server](#)

NOTE: Cloud cover might obscure active fire detections.

This email was generated on 2017-09-21 14:19:41 UTC

NASA FIRMS Data Source: VIIRS 375m

- CSV attachment with fire locations
- Link to view image on the server
- Links to important information e.g. FAQs

FIRECAST

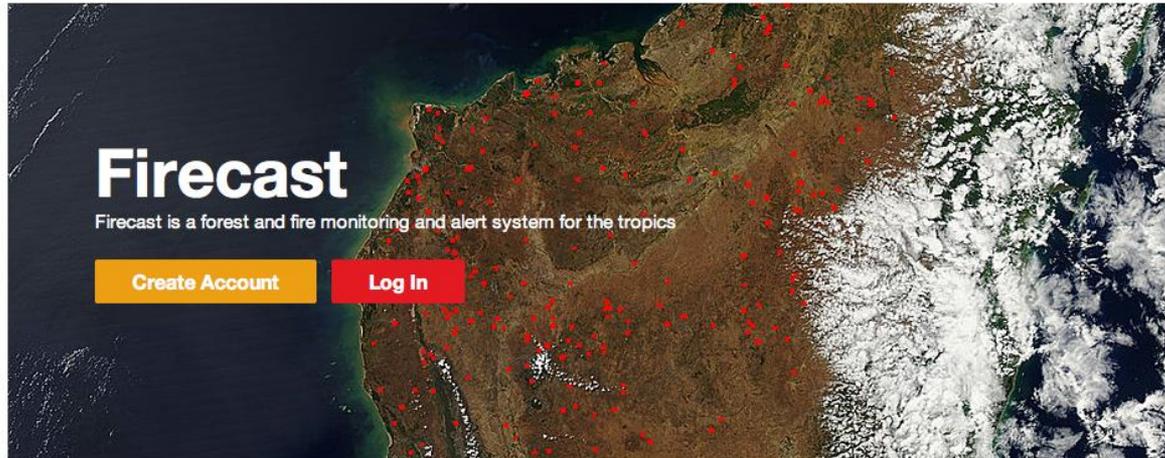
Forest and Fire Monitoring
& Forecast System

[Home](#)

[Data & Maps](#)

[Where We Work](#)

[About](#)



MADAGASCAR FIRES © NASA's MODIS Rapid Response Team

Firecast uses satellite observations to track ecosystem disturbances such as fires, fire risk conditions, deforestation, and protected area encroachment, and delivers this time-sensitive information to decision makers through email alerts, maps, and reports.

<http://firecast.conservation.org>

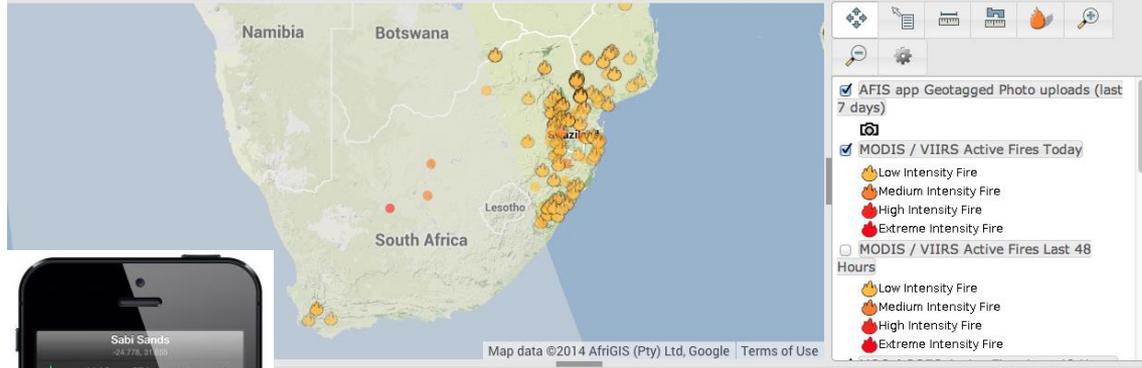


afis

Advanced Fire Information System

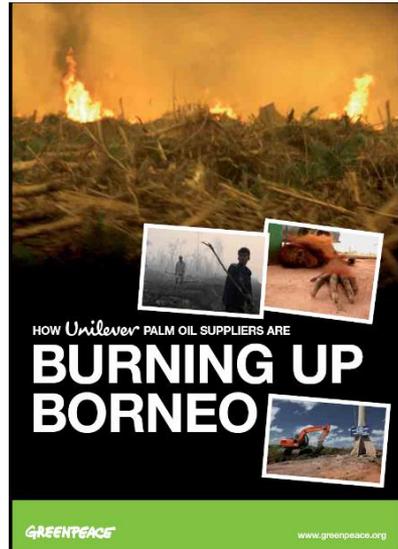


Fires close to Eskom transmission lines



Key factors in the uptake of MODIS active fire data

- User confidence in a product is key to uptake (refinement of algorithm and validation of products using ASTER)
- End user feedback
- Information not data
- Small, easy to use formats
- User friendly service
- Educating users about the pitfalls of using these data is key
- Importance of context and imagery



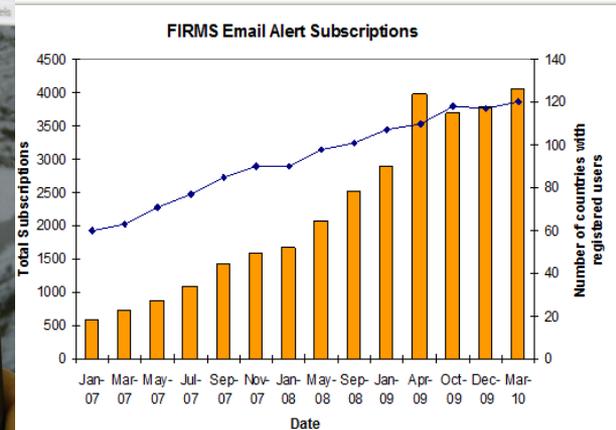
Outcomes from FIRMS

- FIRMS reaches users that would not otherwise access the data (i.e. field staff and users with little or no remote sensing / GIS skills)
- Data from FIRMS levels the playing field
 - once only available to 'experts' is now available to a wide range of users
 - promoting transparency between departments and institutions
- Increased understanding and awareness of fires (reports and media)



Measuring success

- Metrics and surveys
- Number and range of users
- Anecdotal feedback from users on:
 - Accessibility and ease of use
 - Confidence in the data - they are considered reliable
 - Examples of FIRMS data being routinely integrated in to fire management decisions
 - FIRMS data in the media
 - 'Brokers' adding value to the data and re-distributing it (e.g. SMS alerts in South Africa and India)
 - Benefits derived from using the data (e.g. detecting illegal logging, tactical support, better allocation of resources)



Applications of FIRMS

Email alert brokers

India - Forest Departments in Madhya Pradesh (SMS alerts) and Tamil Nadu
Thailand – DNP sends out notifications to all protected areas

Strategic Fire Management

NorthCom, FEMA

Atmospheric modeling and air quality - NCAR, Smog Blog, EPA Air Now

Conservation – surveillance, allocation of resources and fire management policy

Elephants without Borders, WWF , AWF, WCS,

Civil Society - Greenpeace, WWF, UNOSAT

Increase awareness of burning / challenge official figures e.g. Indonesia and Russia

Raising awareness –during large fire events

Social media , the press , news channels

GREENPEACE

StormCenter
COMMUNICATIONS, INC.

European
Union
Satellite
Centre

UNOSAT
satellite imagery for all

**The Nature
Conservancy**
Protecting nature. Preserving life.™



FEMA



**WILDLIFE
CONSERVATION
SOCIETY**



**CONSERVATION
INTERNATIONAL**



What made FIRMS Successful?

Prior to FIRMS

- There was an existing need. Fire managers need timely information on fires
 - *often large areas to monitor with limited resources*
- Hardware and Algorithms: the satellites, algorithms and associated programs led to the development and global processing of the MODIS Thermal Anomalies product (MCD14)
- Field Campaigns that developed and helped refine the algorithm and build confidence in the MCD14 product



What made FIRMS Successful?

- User driven
- FIRMS products are timely and in easy to use formats
 - small file sizes enable access in remote areas
 - geospatial context
- Manage expectations. Satellite-derived fire information provides is an important additional data source for fire monitoring. Not all fires are detected.
- Outreach and user support
 - responding to queries and interacting with users
 - capacity building (instructions on use / training sessions)
 - conferences, collaborations and partnerships to develop user communities -- focus groups, one on one interviews
- Use of Open Source software – enabled re-use and modifications



Currently updating FIRMS

- on the front end to give it a more updated look and feel
- on the backend to streamline processes to fit with MODAPS



Acknowledgements

The FIRMS slides presented here draw on the work: Gary Fu, Greg Ederer, Otmar Olsina, Jeff Schmaltz, Min Wong, Chris Justice and Shriram Ilavjahla.

MODIS Active Fire: Louis Giglio

VIIRS Active Fire: Wildfrid Schroeder, Louis Giglio, Evan Ellicot (Univ of Maryland)

Firecast: Karyn Tabor (Conservation International)

AFIS: Philip Frost (CSIR Meraka)

GOFC-FIRE: Krishna Vedrevu, Chris Justice (Univ of Maryland)

For more information

LANCE Near Real-Time webpages:

- FIRMS: <https://earthdata.nasa.gov/firms>
- LANCE: <https://earthdata.nasa.gov/LANCE>
- Worldview <https://earthdata.nasa.gov/worldview>
- Global Imagery Browse Services <https://earthdata.nasa.gov/gibs>

