Search

Home
About
Web Mapping Services
Email Alerts
Active Fire Data
MODIS Subsets
Resources
FAQs
Links

Frequently Asked Questions

Show All Questions | Hide All

General

What is FIRMS and who is it aimed at?

FIRMS integrates remote sensing and GIS technologies to deliver global MODIS hotspot/active fire locations to natural resource managers and other stakeholders around the World. FIRMS was developed by the University of Maryland with funds from NASA. FIRMS is currently being transitioned to an operational system at the United Nations Food and Agriculture Organization (UN FAO). Click here for more information.

At its core, the Web Fire Mapper web mapping interface displays near-real time hotspots/fires processed by the MODIS Rapid Response System. These data are also provided in other formats including email alerts, image subsets, WMS services and KML, shape and text files.

FIRMS is primarily aimed at supporting natural resource managers, researchers, planners and policy makers by helping them understand when and where fires occur and delivering the fire information in near real-time and in easy-to-use formats.

Each hotspot/active fire location represents the center of a 1km pixel (approximately) flagged as containing one or more actively burning hotspots/fires within that pixel. The hotspots/fires are detected using data from the MODIS (or Moderate Resolution Imaging Spectroradiometer) instrument, on board NASA's Aqua and Terra satellites, using a specific fire detection algorithm that makes use of the thermal band detection characteristics of the sensor.

The components of FIRMS are: Web Fire Mapper (open source web mapping service), Email Alerts, Text Files, Shape Files, KML Files, WMS (version 1.1.1), NASA WorldWind plugin and MODIS image subsets. For more information on these components, click here.

Back to top

Fire data status / MODIS Rapid Response System status

The MODIS hotspot/active fire data are processed by the MODIS Rapid Response System. Click on the following link for more information about MODIS Rapid Response and click here for information on the system status of MODIS Rapid Response.

If the Web Fire Mapper (open source web mapping service) does not work properly, or you have not received your email alerts, it is possible that the issue is either caused by the FIRMS system or by the source of the data, the MODIS Rapid Response System. Please check the system status if there is a lag in the update of the fire data.

Back to top

MODIS Fire User's Guide

For more information on the hotspot/active fire product and other MODIS fire products, please refer to the MODIS Fire User's Guide (version 2.4). Click here to open PDF (2.5MB).

Back to top

Citation Information

Please include a bibliographic citation for the hotspot/active fire data that you use in your publications. Such citations will enable others to find the data and see how they have been used.

The following reference is for the FIRMS website and project:
Davies, D.K., Ilavajhala, S., Wong, M.M., and Justice, C.O. (2009). Fire Information for Resource Management System: Archiving and Distributing MODIS Active Fire Data. IEEE Transactions on Geoscience and Remote Sensing 47 (1):72-79.

The following reference provides a brief description of Web Fire Mapper website:
Justice, C.O., Giglio, L., Korontzi, S., Owens, J., Morisette, J.T., Roy, D., Descloitres, J., Alleaume, S., Petitcolin, F., and Kaufman, Y. (2002). The MODIS fire products. Remote Sensing of Environment 83, 244-262

The following reference provides a brief description of the algorithm used to produce the MODIS active fire detections:
Giglio, L., J. Descloitres, et al. (2003). An Enhanced Contextual Fire Detection Algorithm for MODIS. Remote Sensing of Environment 87(2-3): 273-282.

Online reference:
NASA/University of Maryland. (2002) MODIS Hotspot / Active Fire Detections. Data set. MODIS Rapid Response Project, NASA/GSFC [producer], University of Maryland, Fire Information for Resource Management System [distributors]. Available on-line [http://maps.geog.umd.edu]

Please notify us of your publications that use the MODIS hotspot /active fire data. Using this information, we can provide information to the user community on how the fire data have been used, and we can keep our product-related references current. We request a bibliographic citation to your work and, if possible, a copy of the publication.

Back to top

Caveats when using data from FIRMS

Back to top

MODIS

What is MODIS?

MODIS stands for MODerate Resolution Imaging Spectroradiometer. The MODIS instrument is on board NASA's Earth Observing System (EOS) Terra (EOS AM) and Aqua (EOS PM) satellites. The orbit of the Terra satellite goes from north to south across the equator in the morning and Aqua passes south to north over the equator in the afternoon resulting in global coverage every 1 to 2 days. The EOS satellites have a ±55 degree scanning pattern and orbit at 705 km with a 2,330 km swath width.

For an artist's visualization of "MODIS scans the globe" go to: http://aqua.nasa.gov/doc/viz/media/aqua_modis_soren.mov. (Higher resolution movie files can be found at:http://aqua.nasa.gov/about/instrument_modis.php).

The MODIS instrument provides 36 spectral bands from wavelengths of 0.4µm to 14.4µm. For more information, please visit the NASA MODIS website.

Back to top

When were the Terra and Aqua satellites launched?

Terra (EOS AM) was launched 18 December 1999 and Aqua (EOS PM) was launched 4 May 2002. High quality hotspot/active fire observations are available from November 2000 onwards.

Back to top

What time does the satellite pass over my area?

Terra (EOS AM) passes over the equator at approximately 10:30 am and 10:30 pm each day, Aqua (EOS PM) satellite passes over the equator at approximately 1:30 pm and 1:30 am. The sun-synchronous orbit allows the satellites to pass over the same area at the same time in every 24 hour period (at every 99 minute orbit the satellites cross the equator at the above mentioned times; every other spot on Earth has similarly constant overpass times).The time of satellite pass will vary according to your location. To estimate when the satellite will pass over your area, you can use the satellite overpass predictor provided by NASA. Daily Terra and Aqua global and regional orbit tracks are provided by the Space Science and Engineering Center (SSEC) at University of Wisconsin-Madison. The maps show a series of white lines with tic marks showing what time the satellite will pass over a certain location on the Earth. The white lines represent the center of the swath and the tic marks and time show at what time in UTC the satellite has passed over that location. Click on the following links for Aqua Orbital Tracks or Terra Orbital Tracks.

(Please refer to the MODIS Rapid Response System FAQ for more information: http://rapidfire.sci.gsfc.nasa.gov/faq/#faq04 "What do the orbit track maps show?")

For an artist's visualization of "MODIS scans the globe" go to: http://aqua.nasa.gov/doc/viz/media/aqua_modis_soren.mov. (Higher resolution movie files can be found at: http://aqua.nasa.gov/about/instrument_modis.php).

If you wish to view the MODIS near-real time swath image that corresponds to the hotspot/active fire detections, please go to the following website:
http://rapidfire.sci.gsfc.nasa.gov/realtime/.
All times are in UTC (Coordinated Universal Time).

Back to top

How often are the hotspot / fire data acquired?

The MODIS instrument on board the Terra and Aqua EOS satellites acquire data continuously providing global coverage every 1-2 days. Therefore there are at least 4 daily MODIS observations for almost every area on the equator – with the number of overpasses increasing (due to overlapping orbits) the closer an area is to the poles. See What time does the satellite pass over my area?

It takes approximately 2 – 4 hours after satellite overpass for MODIS Rapid Response to process the data, and for FIRMS to update the website. Occasionally, hardware errors mean that it takes longer the 2-4 hours to process the data. For information on the system status of MODIS Rapid Response, see http://rapidfire.sci.gsfc.nasa.gov/status/.

Back to top

What is the plan after MODIS?

The designed life span for the Terra and Aqua satellites was 6 years. The Terra satellite is effectively coming to the end of its predicted lifespan, as has happened in the past with many other spacecraft. The Visible Imaging Infrared Radiometer Suite (VIIRS) is being developed to extend the measurement series of the MODIS sensor, currently flying aboard EOS' Terra and Aqua satellites. The VIIRS sensor is part of the National Polar-orbiting Operational Environmental Satellite System (NPOESS) Preparatory Project (NPP) - a joint NASA/IPO instrument risk reduction project. The success of MODIS, and of the Terra and Aqua platforms in providing earth observations, has set the bar for the next generation of instruments and spacecraft for the continuity of Earth observation.

The launch schedule for NPP is currently still under review.

Back to top

What is NPP?

NPP is the NPOESS (National Polar-orbiting Operational Environmental Satellite System) Preparatory Project. It is a joint mission between NASA and the NPOESS Integrated Program Office (IPO). NPP's mission is to collect and distribute remotely sensed data for the land, ocean and atmosphere for meteorological and global climate change studies. It allows for the transition from Earth observing (EOS) missions carried out by satellites such as Terra and Aqua to NPOESS. NPP will provide data such as atmospheric and sea surface temperatures, humidity soundings, land and ocean biological productivity, and cloud and aerosol properties. For more information, go to: http://npoess.noaa.gov/index.php

Back to top

What is VIIRS?

The Visible Imaging Infrared Radiometer Suite (VIIRS) is similar to MODIS, with somewhat fewer bands but with most having higher spatial resolution than their MODIS counterpart. Like MODIS, VIIRS has a high-dynamic-range band specifically for fire monitoring, from which several standard active fire products will be produced.

For more information: http://npoess.noaa.gov/index.php?pg=viirs

Back to top

MODIS Active Fire Data

What is a MODIS hotspot/fire detection?

A MODIS hotspot/active fire location represents the center of a 1km (approx.) pixel flagged as containing one or more actively burning hotspots/fires. The hotspots/fires are detected using data from the MODIS (or Moderate Resolution Imaging Spectroradiometer) instrument, on board NASA's Aqua and Terra satellites. In most cases, MODIS hotspots are vegetation fires, but sometimes it is a volcanic eruption or the flare from a gas well. There is no way of knowing which type of thermal anomaly is detected based on the MODIS data alone.

Back to top

How are hotspots/fires detected?

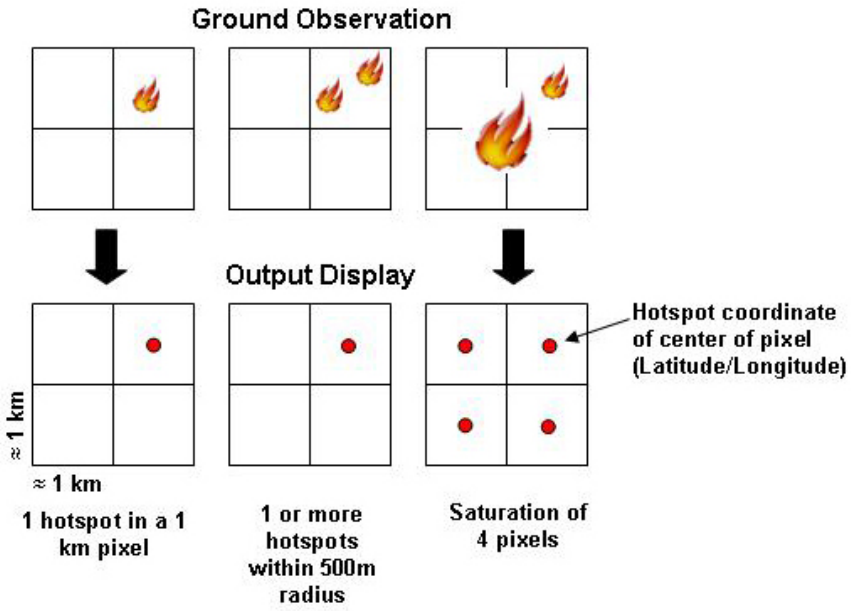
The hotspot/active fire detections are processed by the MODIS Rapid Response System using the same algorithm as the standard MODIS MOD14/MYD14 Fire and Thermal Anomalies product. Fire detection is performed using a contextual algorithm that exploits the strong emission of mid-infrared radiation from fires. The algorithm examines each pixel of the MODIS swath, and ultimately assigns to each one of the following classes: missing data, cloud, water, non-fire, fire, or unknown. More information can be found in Giglio et al. (2003).

Back to top

What does a hotspot/fire detection mean on the ground?

Each hotspot/active fire detection represents the center of a 1km (approx.) pixel flagged as

containing one or more hotspots/fires within that pixel. The "location" is the centre point of the pixel (not necessarily the coordinates of the actual fire). The actual pixel size varies with the scan and track (see: What does scan and track mean?). The hotspot/fire is often less than 1km in size (see: What size hotspots/fires can be detected?).We are not able to determine the exact hotspot/fire size, what we do know is that at least one hotspot/fire is located within that 1km pixel. Sometimes you will see several active hotspots/fires in a line. This generally represents a fire front.

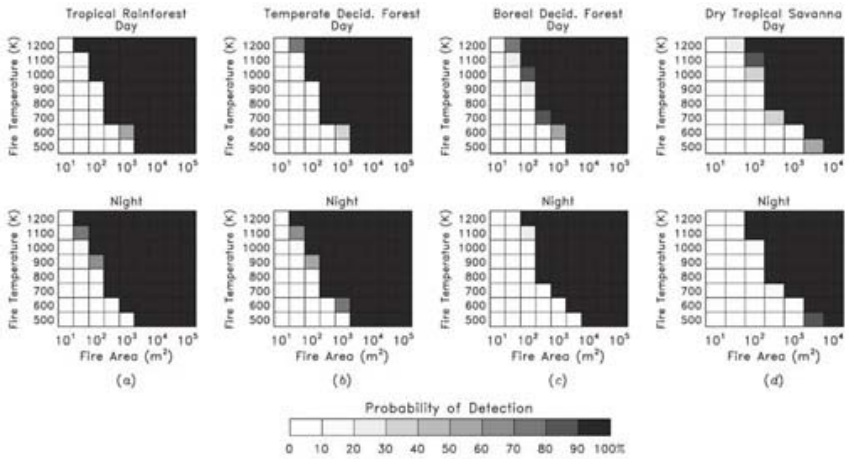


Back to top

What size hotspots/fires can be detected?

In any given scene the minimum detectable fire size is a function of many different variables (scan angle, biome, sun position, land surface temperature, cloud cover, amount of smoke and wind direction, etc.), so the precise value will vary slightly with these conditions. MODIS routinely detects both flaming and smouldering fires 1000 m² in size. Under very good observing conditions (e.g. near nadir, little or no smoke, relatively homogeneous land surface, etc.) flaming fires one tenth this size can be detected. Under pristine (and extremely rare) observing conditions even smaller flaming fires 50 m² can be detected.

Unlike most contextual fire detection algorithms designed for satellite sensors that were never intended for fire monitoring (e.g. AVHRR, VIRS, ATSR), there is no upper limit to the largest and/or hottest fire that can be detected with MODIS.



The above diagram show the day and night relationship of fire size and fire temperature, in different biomes, to the probability of being detected by MODIS (Giglio et al. 2003).

Back to top

I only see fire data available for the last 7 days on your website. How can I get older data?

A download tool is being developed which will automate the process of accessing data from the archive, but for now if the data you require are not available from our website (see data formats table for full list) then please contact us.

Back to top

Factors that affect fire detections

Why did MODIS not detect a particular fire?

There are several reasons why MODIS may not have detected a certain fire. The fire may have started and ended between satellite overpasses. The fire may have been too small or too cool to be detected in the 1 km² MODIS footprint. Cloud cover, heavy smoke, or tree canopy may completely obscure a fire. Occasionally the MODIS instruments are inoperable for extended periods of time (e.g. the Terra MODIS in September 2000) and can of course observe nothing during these times. To find out the status of MODIS and the MODIS Rapid Response system go to: http://rapidfire.sci.gsfc.nasa.gov/status/.

Back to top

How do I know if a hotspot/fire detection was missed due to cloud or missing data?

An indication of cloud cover or missing data is not yet included in FIRMS. If you want to know whether the MODIS Rapid Response system may have failed to report some hotspots/fires due to cloud or missing data, you can look on the MODIS Rapid Response Real-Time website. There you can view the MODIS near-real-time level 2 browse images which clearly show satellite coverage and cloud at the time of overpass. To take cloud and missing data in to account, it may be more appropriate to use one of the 1-km Level 3 or CMG fire products.

Back to top

Why do you not see the same fire twice in subsequent overpasses?

This is due to the dynamic and diurnal patterns associated with fire. Fires move across the landscape at varying rates, depending on multiple factors including, for example, the underlying vegetation type and the specific characteristics of the fire, and therefore may be present in different locations when the satellites pass overhead. In addition, the inherent diurnal burn-up and die-down patterns of a fire can impact whether one can see the same fire twice.

Back to top

Do cloud shadows affect hotspot/fire detections?

Cloud shadows do not significantly affect hotspot fire detections.

Back to top

Can MODIS detect fires below the forest canopy?

The likelihood of detecting a fire beneath the tree canopy is unknown, but likely to be very low. Understory fires are typically small, and with the tree canopy obstructing the view of the fire, detection will be very unlikely.

Back to top

How does the view angle of the MODIS instrument affect hotspot/fire detections?

The wider the view, the larger the pixel field of view (the ground space covered). As a result, you

would need a proportionately larger fire area to achieve the same likelihood of detection at nadir for most algorithms. This necessity is incorporated into quality control reporting.

Back to top

How does air temperature affect fire detection?

Differences in air temperature have a negligible effect on fire detection. Differences in surface temperature, however, have a much larger impact as warmer areas like sandbeds, rock outcrops, etc., can cause false positives. Filters incorporated into the algorithms attempt to correct for this.

Back to top

Using FIRMS Active Fire Data

How appropriate are the 1km MODIS hotspot/fire locations for my research?

The MODIS hotspot/fire locations are good for determining the location of active fires, providing information on the spatial and temporal distribution of fires and comparing data between years. The 1km (approx.) MODIS hotspot/active fire pixel locations may not always be the most appropriate source of fire related information. The data do not provide any information on cloud cover or missing data. Depending on the analysis you are performing, it is sometimes possible to derive misleading or even incorrect results by ignoring the other types of pixels. In some cases it is more appropriate to use one of the 1km Level 3 or CMG fire products. (For more information, refer to the MODIS Collection 5 Active Fire Product User's Guide).

Back to top

What is the Climate Modeling Grid (CMG) fire product?

The CMG fire products are gridded statistical summaries of fire pixel information intended for use in regional and global modeling. The products are currently generated at 0.5 degree spatial resolution for time periods of one calendar month (MOD14CMH/MYD14CMH) and eight days (MOD14C8H/MYD14C8H). Higher resolution 0.25 degree CMG fire products will eventually be produced as well. More information can be found in the MODIS Collection 5 Active Fire Product User's Guide).

Back to top

Fire Pixel Locations vs. Gridded Fire Products

We urge caution in using fire pixel locations in lieu of the 1-km gridded MODIS fire products (CMG fire product). The former includes no information about cloud cover or missing data and, depending on the sort of analysis that is being performed, it is sometimes possible to derive misleading (or even incorrect) results by not accounting for these other types of pixels. It is also possible to grossly misuse fire pixel locations, even for regions and time periods in which cloud cover and missing observations are negligible. Some caveats to keep in mind when using MODIS fire pixel locations:

• The fire pixel location files allow users to temporally and spatially bin fire counts arbitrarily. However, severe temporal and spatial biases may arise in any MODIS fire time series analysis employing time intervals shorter than about eight days.

• Known fires for which no entries occur in the fire-pixel location files are not necessarily missed by the detection algorithm. Cloud obscuration, a lack of coverage, or a misclassification in the land/sea mask may instead be responsible, but with only the information provided in the fire location files this will be impossible to determine.

Back to top

Can I estimate burned area using the active fire/hotspot data?

It is not recommended to use hotspot/active fire locations to estimate burned area due to spatial and temporal sampling issues. Determining this to an acceptable degree of accuracy is generally not possible due to nontrivial spatial and temporal sampling issues. For some applications, however, acceptable accuracy can be achieved, although the effective area burned per fire pixel is not simply a constant, but rather varies with respect to several different vegetation and fire-related variables. See Giglio et al. (2006) for more information. FIRMS will provide burned area data via Web Fire Mapper in the near future. Please refer to the following link for more information on the MODIS Burned Area Product and information on how to access the HDF files.

Back to top

How often are the hotspot/fire data acquired – what is the temporal resolution?

The MODIS instruments on board the Terra and Aqua EOS satellites acquire data continuously providing global coverage every 1-2 days. As polar-orbiting spacecraft, Terra and Aqua are synchronized with the sun, in order to pass over the same area at the same time every day. Terra's descending orbit (N-S) will cross the equator at 10:30 a.m. local time during each orbit—hence the original term "AM." in its formal name (EOS AM-1). Clouds typically form over tropical land in the afternoon as the surface warms, creating updrafts; hence, Terra's morning view will provide clearer images of the Earth's lands. The satellite will orbit the Earth once every 99 minutes at an inclination of 98 degrees relative to the equator, at a mean altitude of 438 nautical miles (705 kilometers). Aqua (EOS PM-1) flies with similar characteristics, but with a "PM" equatorial crossing time in an ascending orbit with a 1:30 p.m. equatorial crossing time, thus complementing and extending the temporal resolution of the MODIS sensor. Terra and Aqua subsequently also pass over the equator at around 10:30 pm and 1:30am, respectively.

For most parts of the Earth's equator, therefore, there are 4 overpasses in a 24 hour period (2 for Aqua and 2 for Terra – [Descending and ascending]). As the orbits of both satellites "overlap" at the poles, there is more coverage per given area the further north or south the area is from the equator. The precise number and timing of overpasses depends therefore on your geographic location. See "What time does the satellite pass over my area?.

For an artist's visualization of "MODIS scans the globe" see:
http://aqua.nasa.gov/doc/viz/media/aqua_modis_soren.mov.

Back to top

What is the time delay between satellite overpass and data provision on FIRMS?

The data feed from the MODIS sensors is continuous and at a download rate of +/- 1 terabyte per day. Thermal band information is received constantly from the ground receiving stations and processed by MODIS Rapid Response at NASA as soon as it is received.

Data processed by MODIS Rapid Response are made available as active fire data on the FIRMS website approximately 2 - 4 hours after local overpass.
Occasionally, hardware errors mean that it takes longer the 2-4 hours to process the data. For information on the system status of MODIS Rapid Response, see:
http://rapidfire.sci.gsfc.nasa.gov/status/
Please refer to the data formats table for detailed information on when each FIRMS service is updated.

Back to top

What are the attributes in the hotspot/active fire data?

• Latitude and Longitude: The center point location of the 1km (approx.) pixel flagged as containing one or more fires/hotspots (fire size is not 1km, but variable). See What does a hotspot/fire detection mean on the ground?
• Brightness: The brightness temperature, measured (in Kelvin) using the MODIS channels 21/22 and channel 31.
• Scan and Track: The actual spatial resolution of the scanned pixel. Although the algorithm works at 1km resolution, the MODIS pixels get bigger toward the edge of the scan. See What does scan and track mean?
• Date: Acquisition date of the hotspot/active fire pixel.
• Time: Time of the overpass of the satellite (in UTC).
• Satellite: Whether the detection was picked up by the Terra or Aqua satellite.
• Confidence: The detection confidence is a quality flag of the individual hotspot/active fire pixel.
• Version: Version refers to the processing collection and source of data. The number before the decimal refers to the collection (e.g. MODIS Collection 5). The number after the decimal indicates the source of Level 1B data; data processed in near-real time by MODIS Rapid Response will have the source code "CollectionNumber.0". Data sourced from MODAPS (with a 2 month lag) and processed by FIRMS using the standard MOD14/MYD14 Thermal Anomalies algorithm will have a source code "CollectionNumber.x". For example, data with the version listed as 5.0 is collection 5, processed by MRR, data with the version listed as 5.1 is collection 5 data processed by FIRMS using Level 1B data from MODAPS. See What is the difference between data sourced from MODIS Rapid Response and MODAPS Collection 5?
• Bright.T31: Channel 31 brightness temperature (in Kelvins) of the hotspot/active fire pixel.
• FRP: Fire Radiative Power. Depicts the pixel-integrated fire radiative power in MW (MegaWatts). FRP provides information on the measured radiant heat output of detected fires. The amount of radiant heat energy liberated per unit time (the Fire Radiative Power) is thought to be related to

the rate at which fuel is being consumed (Wooster et. al. 2005)

Back to top

What is the brightness temperature?

The brightness temperature of a hotspot/fire pixel is measured (in Kelvins) using the MODIS channels 21/22 and channel 31. Brightness temperature is actually a measure of the photons at a particular wavelength received by the spacecraft, but presented in units of temperature.

Back to top

What does scan and track mean?

It should be noted that the pixel size is not always 1km across the scan track. The pixels at the "Eastern" and the "Western" edges of the scan are bigger than 1km. It is 1km only along the nadir (exact vertical from the satellite). Thus, the values shown for scan and track represent the actual spatial resolution of the scanned pixel. The scan value represents the spatial-resolution in the East-West direction of the scan and the track value represents the North-South spatial resolution of the scan.

Back to top

What is the detection confidence?

A detection confidence is intended to help users gauge the quality of individual hotspot/active fire pixels. This confidence estimate, which ranges between 0% and 100%, is used to assign one of the three fire classes (low-confidence fire, nominal-confidence fire, or high-confidence fire) to all fire pixels within the fire mask. In the Collection 4 fire product, the confidence estimate did not adequately identify highly questionable, low confidence fire pixels. Such pixels, which by design should have a confidence close to 0%, were too often assigned much higher confidence estimates of 50% or higher. This was corrected for in Collection 5. The confidence field should be used with caution; it is likely that it will vary in meaning in different parts of the world. Nevertheless some of our end users have found such a field to be useful in excluding false positive occurrences of fire.

Back to top

What are Collections?

Reprocessing of the entire MODIS data archive is periodically performed to incorporate better calibration, algorithm refinements, and improved upstream products into all MODIS products. The updated MODIS data archive resulting from each reprocessing is referred to as a collection. Later collections supersede all earlier collections. For the Terra MODIS, Collection 1 consists of the first products generated following launch. Terra MODIS data were first reprocessed for the first time in June 2001 to produce Collection 3. Note that this first reprocessing was numbered Collection 3, rather than Collection 2, as one would expect. Collection 3 was also the first produced for the Aqua MODIS products. Collection 4 reprocessing was initiated in December 2002 for the Terra MODIS, and somewhat later for the Aqua MODIS, and it forms the current archive of the MODIS products. Collection 5 began reprocessing in early 2007, and it forms the current archive of the MODIS products. Collection 6 is scheduled to begin in 2009.

Back to top

What are the improvements with Collection 5?

The detection confidence was improved to more accurately identify questionable hotspot/active fire pixels (see: What is the detection confidence?). Fire Radiative Power (FRP) value was also added. See entry on Fire Radiative Power.

Back to top

Can you use the MODIS active fire product for detecting volcanoes or volcanic eruptions?

The algorithm routinely detects active volcanoes but the active fire product has not been validated against independent data for its ability to detect volcanoes. There is a separate near-real time MODIS product specifically for volcanoes: MODVOLC.

Back to top

What validation of the MODIS active fire products has been performed?

Validation of the Terra MODIS fire product has primarily been performed using coincident observations from the Advanced Spaceborne Thermal Emission and Reflection Radiometer (ASTER); see http://modis-fire.umd.edu/validation.asp, and publications by Morisette et al. (2005a, 2005b) and Csiszar et al. (2006) for details. A very brief discussion of the general validation procedure, with some preliminary results, can be found in Justice et al. (2002).

Back to top

Where can I get more information on the MODIS Fire Products?

For more information on the active hotspot/fire product and other MODIS fire products, please refer to the MODIS Fire User's Guide, Version 2.4. Click here to open PDF (2.5MB).

Back to top

What other types of hotspot/fire data are available?

AVHRR: Advanced Very High Resolution Radiometer. AVHRR is a passive optical sensor that measures electromagnetic radiation (light reflected and heat emitted) from our planet. AVHRR was originally intended only as a meteorological satellite system but it does have applications for fire monitoring. AVHRR remotely senses cloud cover and sea surface temperature, enabling its visible and infrared detectors to observe trends in vegetation, clouds, shorelines, lakes, snow and ice. The visible bands can detect smoke plumes from fires as well as burn scars. The thermal infrared band can detect actual hotspots and active fires. Its ability to detect fires is greater at night, since the system can confuse active fires with heated ground surfaces, such as beach sand and asphalt.
Active fire mapping on a global scale using a single satellite system has been coordinated by the International Geosphere Biosphere Program (IGBP) using AVHRR data for 1992-93 from international ground stations.
In addition, a small number of countries have developed their own regional AVHRR satellite fire monitoring systems using direct read-out; e.g., Brazil, Russia, and Senegal. Research groups have provided regional examples of trace gas and particulate emissions from fires for Brazil, Southern Africa and Alaska.
GOES: Geostationary Operational Environmental Satellite
The Geostationary Operational Environmental Satellites (GOES) house a five-channel (one visible, four infrared) imaging radiometer designed to sense radiant and solar reflected energy from sample areas of the Earth. They are stationed in orbits that remain fixed over one spot on the equator, providing continuous coverage of one hemisphere. GOES satellites acquire images every 15–30 minutes, at up to 1km resolution in visible light, for the detection of smoke, and 4km resolution in thermal infrared to directly detect the heat of fires.
MSG SEVIRI: Meteosat Second Generation (MSG) Spinning Enhanced Visible and Infrared Imager (SEVIRI)
The Meteosat Second Generation (MSG) satellite houses the optical imaging radiometer called the Spinning Enhanced Visible and Infrared Imager (SEVIRI). The sensor features 12 spectral channels and will provide cloud imaging and tracking, fog detection, measurement of the Earth surface and cloud top temperatures, tracking ozone patterns, as well as active fire monitoring. The nominal coverage of the satellite includes the whole of Europe, all of Africa and locations at which the elevation to the satellite is greater than or equal to 10°. The various channels provide measurements with a resolution of 3 km at the sub-satellite point. The High Resolution Visible (HRV) channel provides measurements with a resolution of 1km.

The service, which commenced operations in January 2004, is due to continue until at least 2018.

Back to top

FIRMS Web Fire Mapper

What is Web Fire Mapper?

Web Fire Mapper is an open source internet based mapping tool that delivers locations of hotspots/fires. You can view an interactive map of the world showing hotspots/fires for a specified time period, combined with a selection of GIS layers and satellite imagery.

Each hotspot/active fire location represents the center of a 1km (approx.) pixel flagged as containing one or more actively burning hotspots/fires within that pixel. The hotspots/fires are detected using data from the MODIS (or Moderate Resolution Imaging Spectroradiometer)

instrument, on board NASA's Aqua and Terra satellites.

Back to top

What open source components are used in Web Fire Mapper?

The Web Fire Mapper was developed using Open Source web-GIS technologies, including UMN Mapserver, Google Web Toolkit, PHP and PostgreSQL with the spatial database add-on, PostGIS. The Servers utilized at the University of Maryland have Linux operating systems and Apache/Tomcat web-servers, making the entire system completely based on free and open source software.

Back to top

Can I download the hotspot/fire data from Web Fire Mapper?

Hotspot/active fire data are not currently available for download via Web Fire Mapper. However, hotspot/active fire locations are available in text file format from the ftp site and as shape and KML files from http://maps.geog.umd.edu/firms/firedata.htm. The text files provide data for the last 2 months; the shape files provide data for the last 24 hours, last 48 hours and last 7 days for download.

Back to top

Can I get information on burned areas from Web Fire Mapper?

Not yet, but we plan to include a MODIS burned area product in the near future. Please refer to the following link for more information on the MODIS Burned Area Product and information on how to access the HDF files see: http://modis-fire.umd.edu/MCD45A1.asp

Back to top

What is the difference between the data sourced from MODIS Rapid Response and MODAPS Collection 5?

There are 3 key differences between data processed by MODIS Rapid Response (MRR) and MODIS Data Processing System (MODAPS). The first is the time taken to process the data: data from MRR are processed in near-real time (approx 2-4 hours after satellite overpass), while data from MODAPS will generally available after a two month lag. The second is the "quality assurance" of Level 1B data used to generate the fire product - data from MODAPS are quality checked, and sometimes reprocessed at a later date if some problems are found with specific granules (the reason for the 2 month lag in making the collection from MODAPS available via FIRMS is to allow for any reprocessing of granules before the fire product is generated). The third reason is that MODAPS Aqua data are processed with the definitive ephemeris downloaded from the satellite (this provides the actual location of the satellite, which in turn affects the geolocational accuracy of the MODIS granules). Aqua data processed by MRR uses a predicted ephemeris (updated daily using definitive data). The difference in geolocations from the definitive and predicted is checked daily by the MRR system. The difference is usually in the range of 50-100m. In cases where it exceeds 400m (only happens during certain spacecraft maneuvers), affected MRR data are reprocessed with the definitive data the next day. Users are encouraged to use MODAPS collection 5 for any historical analysis.

Back to top

What are the known issues with Web Fire Mapper?

November 2009: Fire density grid does not operate as expected.

The Web Fire Mapper (WFM) allows users to view historical fire data by entering custom dates. If the query returns a large number of fire points, WFM displays an aggregate summary of fires by displaying a fire density grid. This grid provides an overview of the density of fires in a given area rather than individual fire locations, thereby avoiding the need to query large number of fires from the server.

To display the fire density grid, WFM uses certain pre-calculated summaries where fire points are aggregated into specific spatial and temporal intervals. Having fire data aggregated at fixed intervals means that when a user enters a custom date range it may not match the fixed interval date range of the fires calculated for the grid displayed. As a result, the grid may include

summaries of fire points beyond the user-entered date range. This system flaw is currently being addressed and is a priority in the ongoing update of the FIRMS system.

In the interim, when a fire aggregate grid is displayed, please zoom in further until you see individual fire points. As long as the total number of fires being queried is relatively small for smaller spatial extents, the user query will be returned correctly as fire points instead of the fire density grid.

Please refer to the following link for known issues with Web Fire Mapper.

Back to top

FIRMS Email Alerts

Can you notify me when a hotspot/fire occurs in my area of interest?

We have developed a global hotspot/fire alert system to notify users when a hotspot/fire occurs in, or near, a specified area of interest, country or protected area. You can subscribe to receive near-real time, daily or weekly alerts in English or Spanish.

Click here to subscribe, or learn more about the email based alert system.

Back to top

Do you provide mobile/cell phone text messages?

No, we do not currently provide SMS text messages. In the past, we helped develop such a service in collaboration with ESKOM and CSIR Meraka in South Africa for the protection of power lines in remote areas from wildfires informing operators in the field about fire events in near-real time (Davies et al. 2008).

Back to top

What are the near-real time email alerts?

The near-real time alerts provide fire locations of fires that have occurred in your area of interest 2 - 4 hours after satellite overpass. They are subscribed to and managed by the user just the same way as the daily and weekly detection summaries, but the near-real time alerts are actually mailed to you directly from MODIS Rapid Response to minimize the temporal detection-to-inbox lag time.

Back to top

Why do I receive more than one near-real time alert in a short period of time?

The MODIS sensor is on board two satellites, Terra and Aqua. Each satellite generally makes at least 2 daily overpasses over every area on the earth's equator (and many more towards the poles). The sensor images the earth in 2330 km swaths, therefore if you subscribed to a large area, like the USA, you will receive multiple near-real time email alerts for a given overpass (e.g. Terra daytime overpass) as it takes several swaths to cover the whole of the US.
For an artist's visualization of "MODIS scans the globe" go to:
http://aqua.nasa.gov/doc/viz/media/aqua_modis_soren.mov. (Higher resolution movie files can be found at: http://aqua.nasa.gov/about/instrument_modis.php).

To determine where and when the overpass is going to occur, you may refer to the Terra and Aqua Orbit Tracks from the following websites.

Terra:http://www.ssec.wisc.edu/datacenter/terra/GLOBAL.html
Aqua:http://www.ssec.wisc.edu/datacenter/aqua/GLOBAL.html

The maps show a series of white lines with tic marks showing what time the satellite will pass over a certain location on the Earth. The white lines represent the center of the swath and the tic marks and time show at what time in UTC the satellite has passed over that location. (Please refer to the MODIS RR FAQ for more information:
http://rapidfire.sci.gsfc.nasa.gov/faq/#faq04)

If you wish to view the MODIS near-real time swath image that corresponds to the active fire

detections, please go to the following website:http://rapidfire.sci.gsfc.nasa.gov/realtime/.

Back to top

How do I subscribe or edit email alerts?

1. **Go to** FIRMS Fire Email Alerts Home at http://maps.geog.umd.edu/alerts/
2. Enter the email address where you want to receive the email alerts and click "Proceed".
3. If you have not yet subscribed you will be asked to enter your Name, Organization, and Country. Click on "Save" after you have entered your information.
4. **You will be taken to the subscription summary page**, where the user can create a new subscription or view the existing ones.
5. The user can create several subscriptions, and they will be added to his/her subscription summary profile.
6. Clicking on the "Create a New Subscription" link takes the user to the interface to subscribe to an email alert.

Creating a new subscription:
- **Choose your area of interest**: The user can choose to select an area from a map (by defining a rectangular area), from a political boundary drop down list or a drop down list of protected areas.
- **Customize your email alert** by changing your subscription preferences:

1. Name your alert (optional): The user can choose to give your alert a name for you to easily reference.
2. Output map size: The user may choose to receive a map in the email and different sized maps are available.
3. Background image: This refers to the background image on which the fires will be overlaid in the map in the email.
4. Language preference: Currently only in English and Spanish, this will be expanded initially to French, as part of FAO agreements.
5. Alert type: Daily, Weekly or Near-Real Time.
    1. Daily: All the received MODIS Rapid Response fire hotspots are sent in a summary email every morning ET (USA) with fire detections from the previous 24 hours.
    2. Weekly: A week's worth of fire points detected for the specified area are sent to the user on Monday mornings ET (USA).
    3. Near-real time: The fire points are sent out in an email as soon as they are processed by MODIS Rapid Response (approximately 2-4 hours after satellite overpass). The number of email varies depending on whether or not there was a fire in the specified area, whether or not it was detected, and the geographical location of the area (there are more frequent overpasses at high latitudes, and 4 daily overpasses for most places on the equator).

- **Email preferences:** The user can choose to receive an email with a map and text, or text only.
- **Attach .CSV file:** By default this option is flagged, meaning that the subscriber will also receive a CSV file containing the fire hotspots information.
- Help with subscription preferences: Clicking on the hyperlinked text of the subscription preferences will open pop-up messages containing the description and usage of the preference.
- **Email confirmation and final subscription:** The user can choose not to receive an email confirming that he/she has subscribed successfully to an alert. The final signoff is completed by clicking either "Subscribe" or "Cancel" (deletes all selections).

Subscription confirmations:
- The successful subscription is identified by two steps, the first of which is the confirmation page and a confirmation email (if this was selected).
- The confirmation page provides a link to let you return to the 'add, view or edit your subscription' page.

Back to top

My email has changed, how do I change it?

- Go to: FIRMS Fire Email Alerts Home at http://maps.geog.umd.edu/alerts/
- Enter the email address where you currently receive email alerts and click "Proceed".
- You will be taken to the Subscription Summary page where you can edit your information.
- Click on "Edit" in the Your Information box.
- Here you can change your email address to the new address where you would like the email alerts sent.
- Click "Save" to save the changes you made to your information.

Back to top

I can't see the administrative boundaries, where are they?

In order to see the administrative boundaries on the email alerts system, visit the FIRMS Fire Email Alerts page and log in with your email address.

Once you have logged in, proceed to the subscriptions page by either creating a new subscription or by editing one of your existing subscriptions. Then, choose the interactive map option, and zoom in using the zoom-in tool provided. Once you zoom in considerably to an area, you should be able to see the administrative boundaries.

Back to top

I have received a CSV file as part of my Email Alert, how do I add it as a layer in a Desktop GIS software?

A CSV or Comma Separated Value file, is a text file in which separate fields are delimited by commas. This type of file can be used to store simple tabular data efficiently, minimizing file size. CSV files are easily opened with DB administration software such as PostgreSQL or MS Access, or by spreadsheet software such as MS Excel. This type of file can also be used to easily plot point data on desktop GIS software, given, as the active fire data does, that the tabular data contains X and Y coordinate information. The active fire data contains latitude and longitude location coordinates and the attributes of the detected hotspots.

An example of plotting the fire points using ESRI ArcGIS 9.X ArcMap:

1. Open ArcMap and go to 'Tools' on the Main Menu
2. Select 'Add XY Data'
3. Navigate to the location of your CSV file and select the file
4. It should automatically select:
    a. X Field: Longitude
    b. Y Field: Latitude
5. Then you should select the Coordinate System
6. Click 'Edit...' then the 'Spatial Reference Properties' window will open
7. Click on 'Select'
8. Select 'Geographic Coordinate System' > 'World' > 'WGS 1984'
9. Click Add and click OK
10. To permanently save your hotspots/fires layer as a shapefile:
11. Right-click on the layer
12. Select 'Data' > 'Export Data' and enter the file name with the .shp extension
13. Click OK.

* **Please note**: ArcMap does NOT honor the time values in the CSV file and will default the time values to 12:00:00 AM. If you need the time values intact, please export the CSV file to a personal geodatabase.

An example of plotting the fire points using ESRI ArcView 3.X:

1. Re-name the extension of the CSV file to .txt
2. Open ArcView
3. Click on 'Tables' in the Project window and select 'Add'
4. Change 'List Files of Type' to 'Delimited Text (*.txt)' and navigate to the .txt file, select and click OK
5. Select the View window
6. Go to 'View' on the Main Menu > 'Add Event Theme'
7. The Add Event Theme window will open with the following automatically selected:
8. Table: The .txt file that you selected
    a. X Field: Longitude
    b. Y field: Latitude
9. Click OK and your hotspot/fire points will show up in the View window
10. To permanently save your hotspot/fire locations as a shapefile:
11. Select the fire points theme in the View window
12. Go to 'Theme' on the Main Menu > 'Convert to Shapefile...'
13. Give it a file name with .shp extension
14. Click OK.

* **Please note**: ArcView WILL honor the time values in the CSV files.

Back to top

Active fire data downloads

Overview of active fire data formats

Data	Type	Description	Coverage	Projection	Update frequency
Active Fire Text Files (.txt)	Daily Text files for the last 2 months	Location coordinates of the center point of 1km (approx.) fire pixel detected	Global and regional*	Geographic, WGS 1984	Near-real time updates. Text files are pushed from MODIS Rapid Response as they are processed from Level 2 data.
Active Fire Shapefiles (.shp)	Last 24 hours, last 48 hours, last 7 days	Point (Center point of approx. 1km fire pixel detected)	Global and regional*	Geographic, WGS 1984	Updated every hour, starting at 00:42 ET (USA)
Web Fire Mapper	Last 24, hours, 48 hours, 72 hours, last 7 days, and previous years	Interactive web fire map of the world. Data not yet downloadable.	Global	Geographic, WGS 1984	Updated every hour, starting 00:00 ET (USA)
KML (.kml)	Last 24 hours, last 48 hours	Center point of 1km (approx.) fire pixel detected	Global and regional*	Geographic, WGS 1984	Updated every hour, starting 00:42 ET (USA)
Web Map Service (WMS version 1.1.1)	Last 24 hours, last 48 hours	Allow local (desktop) or web GIS clients to access the Web Fire Mapper data without accessing website	Global and regional*	Geographic, WGS 1984	Same as Web Fire Mapper
Near-real time, daily and weekly Email Alerts (email, .csv)	Near-real time, last 24 hours, past week	Near-real time, daily and weekly email alerts of fires	Select area using map, or from list of countries and protected areas	Geographic, WGS 1894	Sent out starting at 04:30 ET (USA)
MODIS Image Subsets (.jpg or .tif)	Daily near-real time in various resolutions: 4km, 2km, 1km, 500m, and 250m	Images of certain regions of the world overlaid with red polygon outline of 1km (approx.) fire pixel detected	Select regions of the world	Plate Caree	Updated in near-real time from MODIS Rapid Response System.

* Regional datasets include: Australia and New Zealand, Alaska, Canada, North, Central and South America, Northern, Central and Southern Africa, Mozambique, Namibia, Europe, Russia, Asia, South and South East Asia.

Back to top

Text Files

How do I register to receive active fire / hotspot text files?

There is no charge to access the hotspot/ active fire text files for the last 2 months; but we would like to keep track of who accesses the ftp site and keep you up to dated with changes made to the site. Please email us the following information:
- Name
- Organization
- Address
- Country
- Email

Please also state:
- How often you access the site (i) daily, (ii) weekly, (iii) monthly OR (iv) occasionally?
- What do you use the data for?
- What is your region of interest?

You will be sent an email with a user name and password to enable you to access the ftp site.

Back to top

Shapefiles

How do I use the shapefiles?

A shapefile is a proprietary file format of ESRI. Shapefiles have de facto become a standard for the storage of vector geometry information and associated attribute information to be used in desktop GIS applications. This file format is composed by a minimum of three files, a .shp .shx and .dbf files which need to be kept together in the same directory for the file to be opened by GIS software. A shapefile can be opened and visualized by the vast majority of GIS software, including ESRI ArcGIS and free and open source software such as Quantum GIS (www.qgis.org)

Back to top

KML

How do I view the KML in Google Earth?

Once you have Google Earth downloaded on your computer, you can view the KML in Google Earth.

1. First, download the KML from the KML download page to a location on your computer.
2. Then, double-click the file. This will launch Google Earth and open the hotspots/fire points in the Temporary Places location.

Alternatively, open Google Earth, go to File… then navigate to the location of the KML on your computer and open the file.

Back to top

Things to be aware of when viewing MODIS active fire data in Google Earth

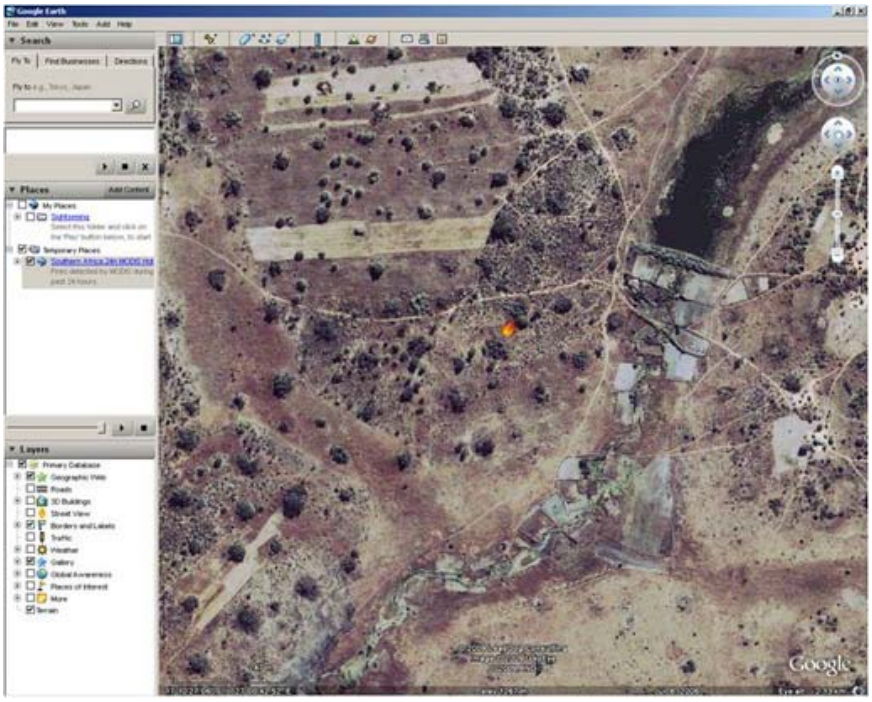
When viewing FIRMS hotspot/fire data in Google Earth you need to bear in mind that the FIRMS data will remain at 1km (approx.) resolution whereas the spatial resolution of the imagery in Google Earth will change as you zoom in. This is important to remember as when zoomed in the actual location of a hotspot/fire will not exactly where the fire icon is but rather anywhere within an approximate 1km pixel centering on the icon.

Back to top

The KML in Google Earth shows a hotspot/fire in a park nearby, but I did not see that fire, is it a real fire?

This maybe because you are viewing the 1km (approx.) hotspot/fire data on imagery that has much higher spatial resolution (at least 30m), such as the imagery provided in Google Earth. As explained earlier (What does a hotspot/fire detection mean on the ground?), the coordinates of a fire/hotspot are given as the center of an approximate 1km pixel. In actual fact, one or more hotspots/fires can occur anywhere within the 1km (approx.) pixel. When viewing higher resolution imagery it is easy 'see' the fire location as being inside a boundary, or on one side of the road – but it is important to remember the location you see when zoomed into the imagery is the center of the 1km fire pixel and the fire could have actually occured anywhere within that 1km pixel.

In the following image, the zoom is centered on the fire hotspot icon in the middle of the window. The actual fire could be anywhere in an area of 1km x 1km centered on that icon. The size of the fire is also variable depending on many factors.



Back to top

What is the KML Time series?

The MODIS KML time series is an experimental product that shows hotspot/active fire detections by animating the location of fires that have occurred in the region in the last 48 hours. The Time Series should be used with caution, taking into mind the caveats and issues with the temporal and spatial resolution of the MODIS fire pixel locations.

Back to top

WMS

How do I view the WMS?

The Web Fire Mapper WMS (version 1.1.1) offers Open GIS Consortium standard Web Map Service interface. Using the Web Fire Mapper WMS, you can allow your local (desktop) or web GIS clients to access the Web Fire Mapper data without accessing the Web Fire Mapper Website.
The two WMS requests currently available here are (i) the **GetMap** request, and (ii) the **GetCapabilities** request. Click on these links to obtain the corresponding result. If you want the request URLs, click on "Show URL" link and copy-paste the required URL into your desired GIS client.
If you want more information about the OpenGIS WMS specification, click here. For help with customizing the requests, read ESRI WMS and WFS Connector Help.

Back to top

NASA WorldWind

How do I view the WorldWind Plugin?

NASA World Wind can be downloaded from: http://worldwind.arc.nasa.gov/
FIRMS provides a plugin for NASA World Wind to display hotspot/ active fire detections for the last 48 hours for most of the globe. Click here to download the Zip file.

1. Extract the zip file and copy the firms-wms XML document and the fires.png file to: ($installation directory)\Config\Earth
2. For example, in Windows, the default path set for NASA World Wind Version 1.4 is: C:\Program Files\NASA\World Wind 1.4\Config\Earth

3. Open NASA World Wind and click on the "FIRMS Hotspots - Past 48 Hours" icon in the tool bar to see the active fire/hotspot detections.

Back to top

MODIS Image Subsets

What is an image subset?

An image subset is an image created by the MODIS Rapid Response team for a specific area of the globe. These images are available as true color composites as well as other band visualizations and ratios which illustrate different land characteristics. The images can be overlaid on the MODIS Rapid Response website with vector information such as fires detected and political boundaries, and can be downloaded as GeoTIFFs or JPEGs with associated world files containing the georeferencing information for loading into GIS software. Metadata are also available.

FIRMS subsets are available here: http://maps.geog.umd.edu/firms/subsets.htm

All MODIS Rapid Response subsets are available on the following website: http://rapidfire.sci.gsfc.nasa.gov/subsets/

Back to top

Can I get an image subset for my area of interest?

Please let us know if you are interested in setting up a MODIS image subset for the area you are interested in. Our objective is to provide users with a quick overview of their area. The JPEG or GeoTIFF images are kept small to enable users with slow or limited Internet access to still get the data. By improving access to these MODIS images we hope to enhance the capabilities of protected area managers to monitor fires and determine the extent of burn.

Back to top

Other Products

What other products are available?

FIRMS provides yearly global animations of monthly Terra hotspot/active fire pixel locations. The global animation is created from monthly subsets to provide a synopsis of the burning pattern. The global animation cycles through an entire year to show the spatial and temporal variation of the burning in different parts of the world. These images help provide an understanding of the global pattern of hotspots/active fires. All these images can be accessed from the Resources page.

Back to top

References

Csiszar, I., Morisette J., and Giglio, L. 2006. **Validation of active fire detection from moderate resolution satellite sensors: the MODIS example in Northern Eurasia**. *IEEE Transactions on Geoscience and Remote Sensing 44 (7): 1757-1764*.

Davies, D.K., Vosloo, H.F., Vannan, S.S. and Frost, P.E., 2008. **Near real-time fire alert system in South Africa: from desktop to mobile service**. In *Proceedings of the 7th ACM conference on designing interactive systems.* pp. 315-322 (Cape Town, South Africa ACM). http://doi.acm.org/10.1145/1394445.1394479.

Giglio, L., Descloitres, J., Justice, C. O., and Kaufman, Y., 2003. **An enhanced contextual fire detection algorithm for MODIS**. *Remote Sensing of Environment*. 87:273-282

Giglio, L., van der Werf, G. R., Randerson, J. T., Collatz, G. J., and Kasibhatla, P. 2006. **Global estimation of burned area using MODIS active fire observations**. *Atmospheric Chemistry and Physics, 6:957-974*.

Justice, C. O., Giglio, L., Korontzi, S., Owens, J., Morisette, J., Roy, D., Descloitres, J., Alleaume, S., Petitcolin, F., and Kaufman, Y. J. 2002. **The MODIS fire products**. *Remote Sensing of Environment*, 83:244-262.

Morisette, J. T., Giglio, L., Csiszar, I., and Justice, C. O. 2005a. **Validation of the MODIS Active fire product over Southern Africa with ASTER data**. *International Journal of Remote Sensing*, 26:4239-4264.

Morisette, J. T., Giglio, L., Csiszar, I., Setzer, A., Schroeder, W., Morton, D., and Justice, C. O. 2005b. **Validation of MODIS active fire detection products derived from two algorithms**. *Earth Interactions.* 9(9):1-25.

Wooster, M. J., G. Roberts, G. L. W. Perry, and Y. J. Kaufman. 2005. **Retrieval of biomass combustion rates and totals from fire radiative power observations: FRP derivation and calibration relationships between biomass consumption and fire radiative energy release**. *Journal of Geophysical Research*. 110, D24311. doi:10.1029/2005JD006318.

Back to top

This material is based upon work supported by the National Aeronautics and Space Administration under Cooperative Agreement No. NNS06AA04A issued through the Decision Support Program and from the United Nations Food and Agriculture Organization.

The MODIS active fire data is provided by the MODIS Rapid Response System. For more information about MODIS Rapid Response, see http://rapidfire.sci.gsfc.nasa.gov

DISCLAIMER

For questions or comments, contact us