

Painel do Fogo FAQ

1 - What is the Painel do Fogo?

The Painel do Fogo is a web platform that provides information about fires and burning in Brazil and in countries that have the Amazon biome in their territory (Bolivia, Colombia, Ecuador, Guyana, Peru, Suriname, and Venezuela). Its main focus is to support the activation of brigades or battalions during firefighting. The platform combines data from different satellites to inform the user of the 'perimeter' and the most recent "status" of a fire or fire so that an event is associated with an occurrence or team activations. With this focus, the Painel do Fogo integrates the intrinsic needs of the activation, such as:

- Obtain data in near real-time (or as quickly as possible);
- Associate fire events with occurrence/trigger;
- Prioritize events based on an indicator that allows comparison between events;
- Perform situational awareness based on environmental/territorial data as well as optical images to outline combat strategies by filtering events by territorial layers (state/municipality).

2 - What is a Fire Event?

The Painel do Fogo uses the Fire Event as its methodology (the term fire outbreaks is not used).

The Fire Event is a polygon formed by a grouping of at least 3 hot spots in rural regions of Brazil and member countries of ACTO (Amazon Cooperation Treaty Organization). Detections are generated by satellites that have VIIRS (S-NPP, NOAA-20 and NOAA-21) and MODIS (Aqua and Terra) sensors on board, then a buffer of 400 meters in radius is formed around each focus (detection). When at least 3 buffers intersect and this area is equal to or greater than 1 km², a fire event will be generated. This methodology has proven to be more appropriate when it comes to activating brigades and battalions to fight forest fires (Faria et al., 2022).

*In geoprocessing, buffering is an operation that creates a zone around a geographic feature, such as points, lines or polygons, at a previously defined distance.

What is the difference between a Fire Event and a Hot Spot?

- **Heat Focus:** is the point detected by satellite sensors where there is a high temperature, indicating a possible burn or fire. The heat source, in addition to being able to indicate a possible fire, can indicate other human activities or even natural phenomena, such as volcanism.
- **Fire Event:** it is formed when there are at least 3 hot spots close to each other in rural areas, forming an area greater than or equal to 1 km². In summary, while the Hot Spot is a potential detection of heat, the Fire Event is a reliable representation of a fire, forest, or agricultural fire.

For more details, see question [15](#).

3 - What is an Area of Influence?

When a fire event is detected, a buffer (area of influence) of 400 meters is generated around each heat source. This does not represent the exact area that is burning, but it covers the uncertainty in location caused by satellite resolution. For example:

- **VIIRS** has a resolution of 375 meters, so the buffer covers the pixel area.
- **MODIS** has a resolution of 1 km, so the hot spot will also be contained within the 400-meter buffer.

Why is the buffer 400 meters?

This radius was chosen because the resolution of the best sensor used in detections, the VIIRS, has a resolution of 375 meters. The 400-meter buffer ensures that hotspots are covered within the area of influence, even with small inaccuracies in location.

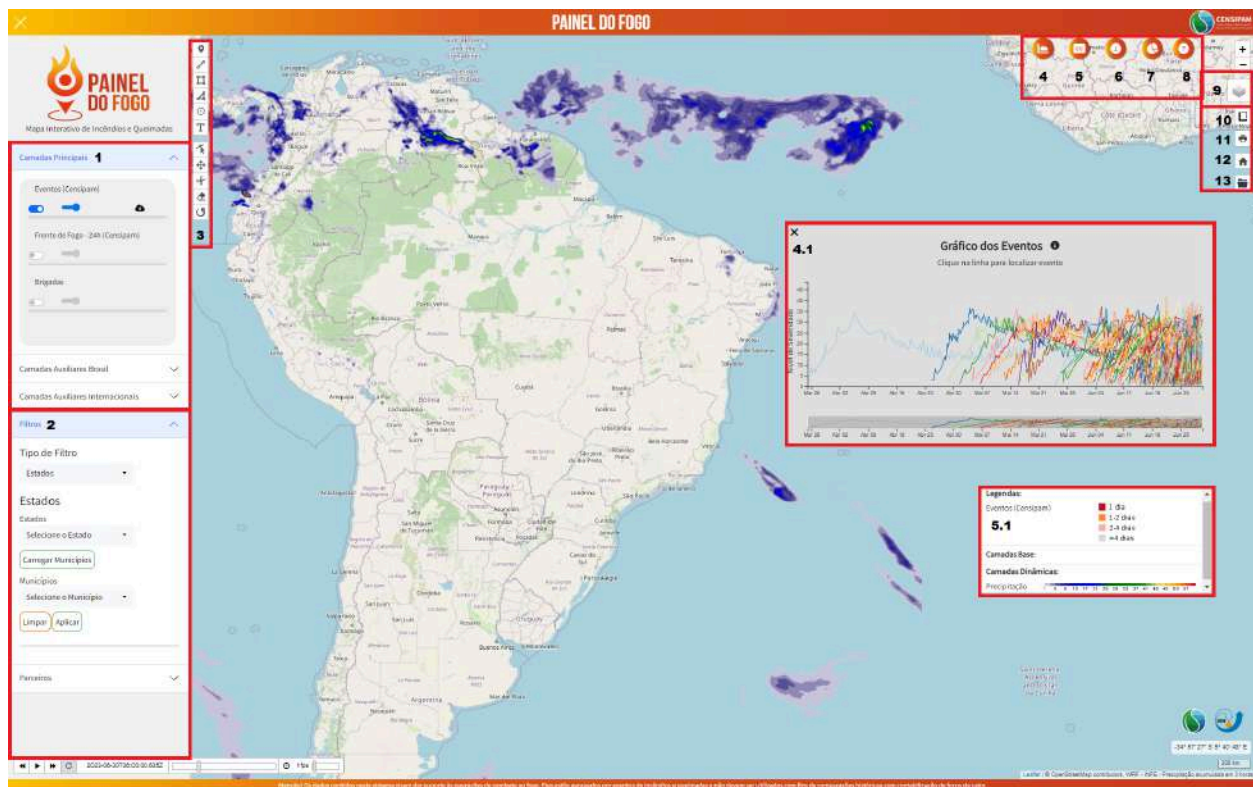
Why don't we talk about the Burnt Area?

The area of fire events in the Painel do Fogo is called the area of influence, as the satellites only detect hot spots, not the exact extent of the burned area. The burned area can only be consolidated later using other methods, such as those used by INPE, which carry out this analysis more accurately after the event. The detected heat source will always be in the center of the pixel and not necessarily correspond exactly to the actual location of the fire in the field. In other words, it indicates that there is a heat source within that area of influence, but not the exact position of the fire. Therefore, a buffer of 400 meters is applied around each hot spot, forming the area of influence of the fire event, to cover the uncertainty of the exact location.

4 - What are the main features of the Painei do Fogo?

The Painei do Fogo combines automated processing of earth observation data in near real-time with Geographic Information System - GIS tools to cross-reference this earth observation data with territorial layers. With the features already implemented in the current version, the user can quickly identify which events require greater attention from combat teams or deserve to be checked through a flyover or patrol.

There is a set of tool shapes in the Painei do Fogo, as shown in the figure below. Below, we detail some of them.



1. Activates layers (main and auxiliary):

The vector layers available in the Painei do Fogo are categorized into: Main - which consists of layers relating to monitoring occurrences, and; Auxiliaries - Vector layers of environmental and territorial classes that assist in the activation and combat strategy.

2. Search by area of interest (zoom or filter):

As soon as the Painei do Fogo is opened in the browser, it shows all active or

observed events within its scope. There are two ways to restrict the view of events to your area of interest (AI): zooming in on the map to the AI or using the event filter.

3. Edit viewer panel and external layers with Geoprocessing tools:

After selecting your area of interest (AI), you can mark points of interest, create polygons, and label such geometries with these Geoprocessing tools. It is also possible to cut and delete points, lines, and polygons created or imported using the import vector layers tool (item 13).

4. Opens the trigger severity indicator chart:

After clicking on button '4', graph 4.1 (see figure) shows lines that represent fire events and their respective severity value for triggering from the first detection. It is possible to use a scroll bar to choose the time of the graph and perform comparisons between events to select the event of greatest interest.

5. Activate subtitles:

This button activates the legend for the main and auxiliary layers. It also activates the legend of the 'base' and 'dynamic' layers as shown in the figure below (item 5.1).

6. Activate Warnings:

This button's function is to reactivate the dialog box with the warnings that are shown when the user accesses the Painel do Fogo.

7. Redirects to the Indicator Panel:

If the user wants to consult the statistics of fire events in a specific region, this button redirects to the Indicator Panel.

8. Redirects to FAQ:

By clicking this button the user is redirected to this Frequently Asked Questions page.

9. Enables 'base' and 'dynamic' layers:

Function of enabling 'raster' geospatial layers of optical images and/or products from climate and weather models that support the triggering and observation of fire events while active.

10. Activates distance and area measurement tool:

By clicking this button the user can use a tool to calculate distances or measure an area of interest.

11. Print the Preview Pane:

This tool is used to print the visualization panel in '.pdf' format.

12. Redirects to the overview of the Painel do Fogo coverage area:

By clicking this button, the user centralizes the zoom to the entire area covered by the Painel do Fogo.

13. Import vector layer:

The tool imports vector layers (point, line, and polygon) in '.kml', '.shp,' and '.geopackage' formats.

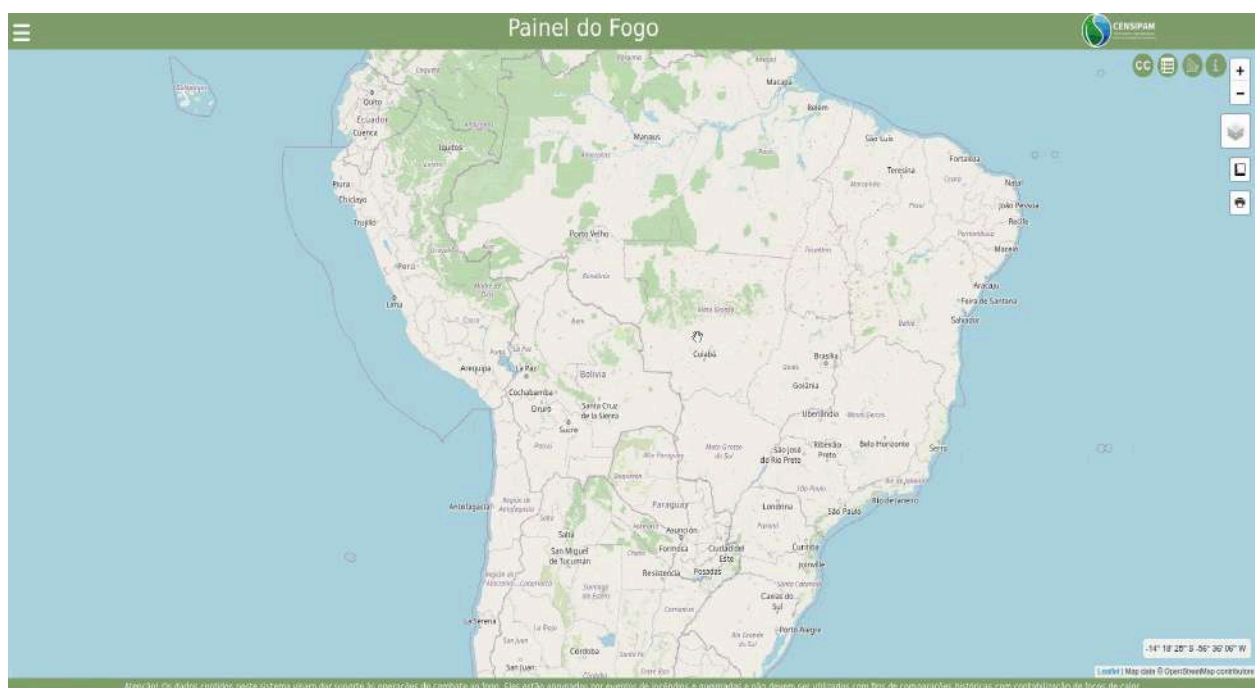
5 - How to search for the most severe events in the Panel?

Zoom in on the map to select your area of interest. To select events within this area of interest according to severity level, click on the graph icon available in the upper right corner (icon in the figure below).



As shown in the animation below, the chart screen will open. To restrict the graph to the current date, you must reduce the timeline below the graph until you reach the desired date. It is important to highlight that each line of the graph corresponds to a fire event and that the graph only shows the events viewed in the map zoom defined by the user at the time of the query.

To search for the event with the highest level of severity in the area of interest, you must restrict the time interval to show only the latest detections and click on the line in the graph that has the highest severity value. When you do this, the Painei do Fogo automatically directs the user to the event corresponding to the graph line.



6 - What are the criteria for considering events viewed on the Painei do Fogo?

The Painei do Fogo uses three criteria:

1. Accumulated area > 1 km²: It must necessarily contain more than two heat sources;
2. Spatial scope: Brazil and the Amazon biome of Bolivia, Colombia, Ecuador, Guyana, Peru, Suriname, and Venezuela. Disregards all spurious areas mapped in these regions (see question 8);

3. Active event or under observation: The event is considered active when detected in the last 48 hours and under observation when the last detection occurred between 2 and 4 days after the most recent detection. After this period, the event is considered extinct and leaves the panel.

7 - What is the coverage area of the Painei do Fogo?

Spatial scope: Brazil and the Amazon biome of Bolivia, Colombia, Ecuador, Guyana, Peru, Suriname, and Venezuela. Disregard all spurious areas mapped in these regions. (see question 8).

8 - Does the Painei do Fogo exclude any areas within the monitoring area (spurious areas)?

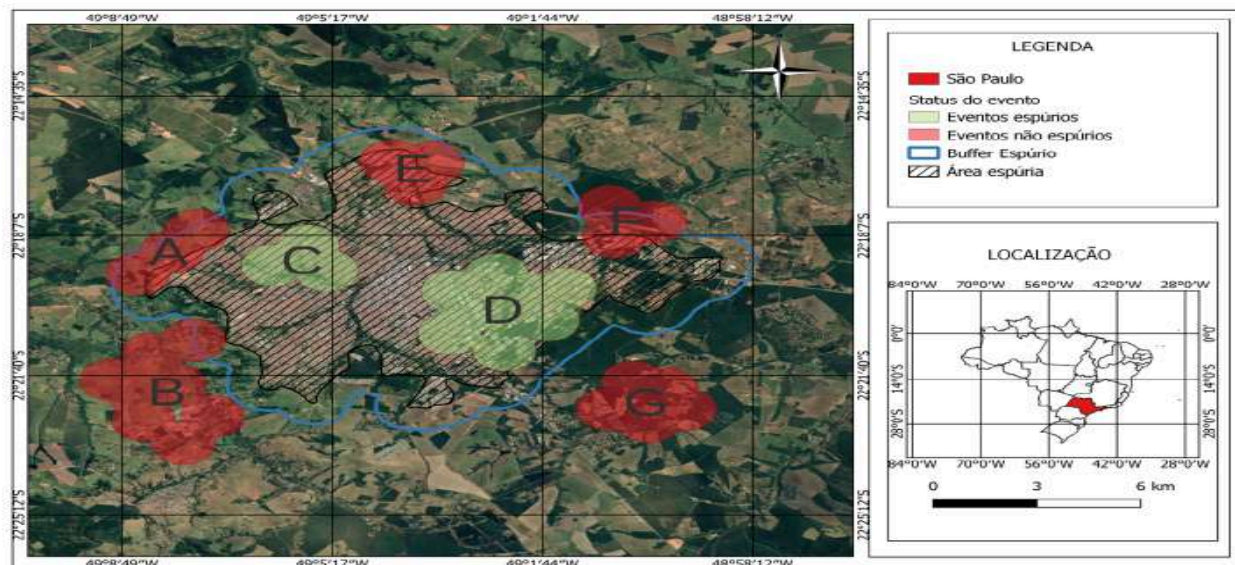
Yes. For application in the Painei do Fogo, events that arise in urban areas or false positives, i.e. spurious, need to be disregarded, depending on the platform's objective of monitoring fire in rural areas. To achieve this, a mask was created that eliminates spurious areas mapped from the spatial scope of the Painei do Fogo. Spurious areas are classified into six possible classes => industrial, built (or urban), oil, mining, volcanic, and sandbanks. The mapping of these areas uses different databases, which complement each other to generate the final result.

The first base used was the already consolidated spurious focus layer from INPE. Next, based on national geospatial data infrastructure bodies were used for the countries that make up the scope of the Painei do Fogo, as is the case of IBGE for Brazil. Finally, to complement the information on some classes of spurious areas and map built-up areas in countries for which this information was not found in the national geospatial data infrastructure entity, data from Open Street Map were used. The flowchart in the figure below describes the methodology used to generate the mask of spurious areas.

Base de dados	Open Street Map	INPE	Órgãos nacionais infraestrutura de dados geoespaciais*
Classes	Áreas Edificadas	Áreas Edificadas	Áreas Edificadas
	Áreas de Industriais	Áreas Industriais	Áreas Industriais
	Áreas Vulcânicas	Áreas Vulcânicas	
	Áreas de Mineração	Bancos de areia	Áreas de Mineração

*IBGE – Brazilian Institute of Geography and Statistics (Brazil), IDE – Geospatial Data Infrastructure (Chile), IGN – National Geographic Institute (Argentina) and IGAC – Agustín Codazzi Geographic Institute (Colombia).

Once mapped, a 1 km buffer is applied to the spurious areas layer. This was done to ensure that spurious events would be excluded by the mask since the fire event generation model extrapolates the real area of the fire/burn. Therefore, the events disregarded in the Panel are those contained in the spurious area with the addition of the buffer, as shown in the figure below.



Exemplification of events in spurious built-up areas within the municipality of Bauru, in São Paulo.

[Antunes et al. \(2023\)](#) presented the methodology used to map spurious areas and analyzed the results obtained in 2021 with the application of the mask on the Painel do Fogo. He concluded that, of the 33,312 km² of spurious areas mapped in Brazilian territory in 2021, the majority corresponded to built-up areas (94%). The results showed that in 2021 the number of spurious events detected and eliminated by the mask represented 1.5% of the total fire events monitored by the Painel do Fogo, with the majority of spurious events occurring in built-up (68%) or industrial (28%) areas, as shown in the table below.

SPURIOUS EVENTS RECORDED BY TYPE OF SPURY AREA IN 2021			
TYPE	TOTAL SPURIOUS EVENTS	AVERAGE PERSISTENCE (DAYS)	MAXIMUM PERSISTENCE (DAYS)
BUILT AREAS	973	3,4	217
INDUSTRIAL AREAS	395	17,7	261
MINING AREAS	52	4,6	36
SANDBANK AREAS	6	1,7	6

The long persistence of events in built, industrial and mining areas can return undesirable lines in the trigger severity graph, which would represent long-lasting fire events as in the figure below. This is the behavior pattern of some types of spurious events.

Gráfico do evento espúrio

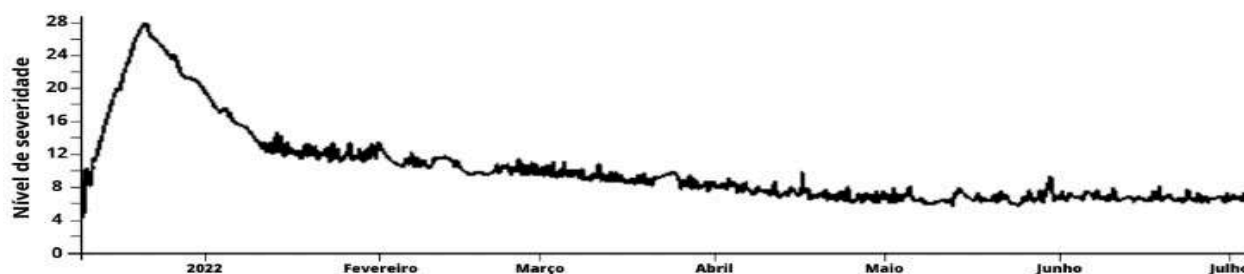
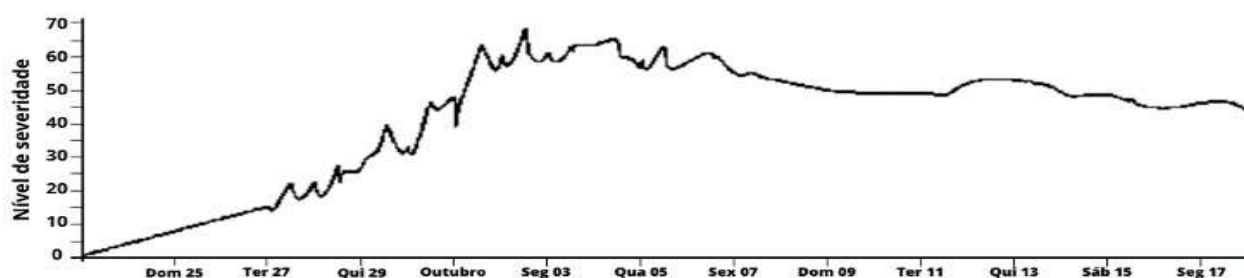


Gráfico do evento não espúrio



The empirical distinction between spurious and non-spurious events through severity level graph

It is important to emphasize that the results are not static and that the process of mapping spurious areas must be carried out continuously. If you want to report a spurious event and pass it on to the Painel do Fogo team, send an email to the panel and inform us of the event ID so that we can update our mask. paineldofogo@sipam.gov.br

9 - What is it and what are the main “base” layers of the Painel do Fogo?

The 'base' layers have this reference because they are used as background when carrying out the context analysis of a given fire event. They are 'raster' or 'image' type layers in static mode, that is, only one image per activated base layer. We emphasize that these products aim to support context analysis based on the technique of visual interpretation of images. In the case of optical imaging products, updates are made according to the satellite's resolution, except for the Planet product, which consists of a monthly mosaic. A general description of these products is in the table below.

Base Layer	Description	Context analysis (Interpretation Key)	Scale	Update frequency	Source
Open Street Map	Open Street Map Standard Layer	Location	-	-	Volunteer Fire Department
Google Satellite	High-resolution Standard Layer	Definition of the land	Submetric	-	Google
NASA: MODIS (EARTH - True Color Composition)	True color optical imaging	Burnt area and smoke plume	250 m	Daily	NASA
NASA: MODIS (EARTH - Scar + Active Fire)	False color optical image R(7), G(2), B(1)	Scar and active fire	250 m	Daily	NASA
NASA: MODIS (AQUA - True Color Composition)	True color optical imaging	Burnt area and smoke plume	250 m	Daily	NASA
NASA: MODIS (AQUA - Scar + Active Fire)	False color optical image R(7), G(2), B(1)	Scar and active fire	250 m	Daily	NASA
NASA: VIIRS (NOAA-20 - True Color Composition)	True color optical imaging	Burnt area and smoke plume	375 m	Daily	NASA
NASA: VIIRS (NOAA-20 - Scar + Active Fire)	False color optical image R(7), G(2), B(1)	Scar and active fire	375 m	Daily	NASA
NASA: VIIRS (S-NPP - True Color Composition)	True color optical imaging	Burnt area and smoke plume	375 m	Daily	NASA
NASA: VIIRS (S-NPP - Scar + Active Fire)	False color optical image R(7), G(2), B(1)	Scar and active fire	375 m	Daily	NASA

NASA: VIIRS (S-NPP - Nighttime imagery)	True color optical imaging	Active fire luminosity at night	375 m	Daily	NASA
PLANET	True color optical imaging	Type of vegetation/land use	4m	Monthly mosaic	PF
SENTINEL-2: Active Fire	Optical image composition R(11) G(8A) B(4)	Identification of scar and active fire (fire front)	10-20 m	5 days*	THAT
SENTINEL-2: True Color Composition	True color optical imaging	Type of vegetation and smoke plume	10-20 m	5 days	THAT
INPE: Smoke in the Atmosf Column.	-	-	-	Daily	COMMIT
INPE: Observed Precipitation (Pluv. + Sat.)	Global Forecast System - GFS	Natural condition for attenuating or extinguishing fire	10 km	Daily	COMMIT
INPE: Predicted Precipitation (for today)	Global Forecast System - GFS	Natural condition for attenuating or extinguishing fire	10 km	Daily	COMMIT
INPE: Predicted Precipitation (for 1 day)	Global Forecast System - GFS	Natural condition for attenuating or extinguishing fire	10 km	Daily	COMMIT
INPE: Observed Fire Risk	Presents the susceptibility of vegetation to burning, from a meteorological point of view	Possibility of the event continuing	1 km	Daily	COMMIT
INPE: Predicted Fire Risk (for today)	Presents the susceptibility of vegetation to burning, from a meteorological point of view	Possibility of the event continuing	1 km	Daily	COMMIT
INPE: Predicted Fire Risk (1 day)	Presents the susceptibility of vegetation to burning, from a meteorological point of view	Possibility of the event continuing	1 km	Daily	COMMIT

INPE: Observed Relative Humidity	Global Forecast System - GFS	Natural conditions favorable to the event	25 km	Daily	COMMIT
INPE: Predicted Relative Humidity (for today)	Global Forecast System - GFS	Natural conditions favorable to the event	25 km	Daily	COMMIT
INPE: Predicted Relative Humidity (1 day)	Global Forecast System - GFS	Natural conditions favorable to the event	25 km	Daily	COMMIT
INPE: Clearsky Daily	Estimate of open skies (no clouds) on the day, generated from the footprint of polar satellites and the GOES-16 satellite	Image quality of polar satellites	1 km	Daily	COMMIT
INPE: Accumulated Clearsky (7 Days)	Accumulated estimate of open sky days (no clouds) in the last 7 days, generated from the footprint of polar satellites and the GOES-16 satellite	Image quality of polar satellites	1 km	Daily	COMMIT
INPE: Accumulated Clearsky (Monthly)	Accumulated estimate of open sky days (without clouds) in the last month, generated from the footprint of polar satellites and the GOES-16 satellite	Image quality of polar satellites	1 km	Monthly	COMMIT

10 - What is it and what are the main “dynamic” layers of the Painel do Fogo?

DYNAMIC LAYER	DESCRIPTION	CONTEXT ANALYSIS (KEY TO INTERPRETATION)	SCALE	UPDATE FREQUENCY	SOURCE
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HUMIDITY	Estimation of humidity in the atmosphere from the Weather and Research Forecast model - WRF	Natural conditions favorable to the event	7 KM	EVERY 3 HOURS	CPTEC / INPE
PRECIPITATION	Precipitation estimation from the Weather and Research Forecast - WRF model	Natural conditions favorable to the event	7 KM	EVERY 3 HOURS	CPTEC / INPE
WINDS	Estimation of near-surface wind direction and speed from the Weather Research Forecast - WRF model	Natural conditions favorable to the event	7 KM	EVERY 3 HOURS	CPTEC / INPE
WATER SURFACE IN ONE MONTH	Identifies water areas such as rivers, lakes, dams, and reservoirs	Definition of bodies of water	30 M	MONTHLY	MAPBIO MAS
FIRE TEMPERATURE	Indicates the temperature of fire and burning flames from the ABI sensor on board the GOES-16 geostationary satellite	Location of intense fire	2 KM	EVERY 10 MIN	AWS
DAY LAND AND CLOUD FIRE	Provides information about forest fires, bushfires, and other heat sources in near real-time from the ABI sensor onboard the GOES-16 geostationary satellite	Vegetation, cloud and smoke plume	2 KM	EVERY 10 MIN	AWS
NATURAL TRUE COLOR	Color image that combines data from different spectral channels of the satellite to create an image that looks closer to the real world from the ABI sensor on board the GOES-16 geostationary satellite	Burnt area and smoke plume	2 KM	EVERY 10 MIN	AWS

11 - What is it and what are the main and auxiliary layers of the Painel do Fogo?

The main and auxiliary layers are vector-type geospatial data and are categorized into main and auxiliary according to the monitoring context. We call 'main' layers that refer to the phenomenon in which it is monitored, in the case of the Painel do Fogo they are fire events and their dynamics. Therefore, we consider “Events”, “Fire Front” and 'brigades' as the main layers as we understand that they are inherent to the activation. The auxiliaries serve to understand the local/regional context in which a particular fire occurrence occurs. The table below aims to discriminate each layer as well as their use in context analysis.

TYPE	LAYER	TYPE	DESCRIPTION	SOURCE
MAIN LAYER	EVENTS	POLYGON	Individual fire and burning events that are active or under observation. The colors of the polygons represent how long ago the last hot spot detection was observed for each event (1 day; 1-2 days; 2-4 days and over 4 days).	I'll take it
MAIN LAYER	FIRE FRONT - 24H	POINT	Hot spots observed in the last 24 hours, highlighting the active fire front of each event	I'll take it
MAIN LAYER	BRIGADES	POINT AND POLYGON	Location of the Fire Brigades, represented by the point of the brigade and the polygon of the area of operation of each brigade.	FIRE DEPARTMENT, ICMBio AND OTHER COMBAT INSTITUTIONS
BRAZIL AUXILIARY LAYER	FEDERAL HIGHWAY	LINE	Federal highways with and without paving	DNIT
BRAZIL AUXILIARY LAYER	INDIGENOUS LAND	POLYGON	Indigenous Land Polygon	FUNAI
BRAZIL AUXILIARY LAYER	MUNICIPAL LIMIT	POLYGON	Polygons indicating municipal boundaries	IBGE

BRAZIL AUXILIARY LAYER	FEDERAL CONSERVA TION UNIT	POLYGON	Federal Conservation Units Polygons	GOOD
BRAZIL AUXILIARY LAYER	FEDERAL SETTLEME NT	POLYGON	Federal Settlement Polygons	INCRA
BRAZIL AUXILIARY LAYER	QUILOMBO	POLYGON	Quilombo Polygons	INCRA
BRAZIL AUXILIARY LAYER	AGRICULTU RAL CENSUS PATHS	LINE	Local lines were obtained from the routes taken by census takers during data collection for the 2017 Agricultural Census. This layer assists in logistical planning for the movement of field teams	IBGE
BRAZIL AUXILIARY LAYER	TRANSMISS ION LINES	LINE	Location of transmission lines	WE
BRAZIL AUXILIARY LAYER	DRAINAGE NETWORK	LINES	Hydrographic Lines of the Water Drainage Network.	IBGE
INTERNATIONAL AUXILIARY LAYER	INDIGENOU S LAND	POLYGON	Indigenous Land Polygon in the international region	AMAZON MAPBIOMES
INTERNATIONAL AUXILIARY LAYER	FEDERAL CONSERVA TION UNIT	POLYGON	Polygons of Federal Conservation Units in the international region	AMAZON MAPBIOMES
INTERNATIONAL AUXILIARY LAYER	STATE CONSERVA TION UNIT	POLYGON	Polygons of State Conservation Units in the International Region	AMAZON MAPBIOMES
INTERNATIONAL AUXILIARY LAYER	MUNICIPAL LIMIT	POLYGON	Polygons that indicate municipal limits in the international region	ECLAC

12 - Does the Painel do Fogo show past events?

No, the objective of the panel is to activate teams for combat. Additionally, we use the historical series contained in the database to generate statistics on the [Indicator Panel](#).

13 - What are GOES Alerts and how do they work?

GOES Alerts are a predictive tool integrated into the Fire Panel that uses high-frequency temporal data from the GOES-16 and GOES-19 geostationary satellites to anticipate the emergence of fire events. While fire events are based on confirmed detections of heat sources (VIIRS and MODIS), GOES Alerts function as an early warning system, identifying thermal anomaly patterns that may develop into significant wildfires.

How are alerts for potential new events generated?

GOES Alerts are formed through the spatiotemporal clustering of recurring thermal detections from the ABI (Advanced Baseline Imager) sensor on the GOES satellites, which capture images every 10–15 minutes. An alert is generated when:

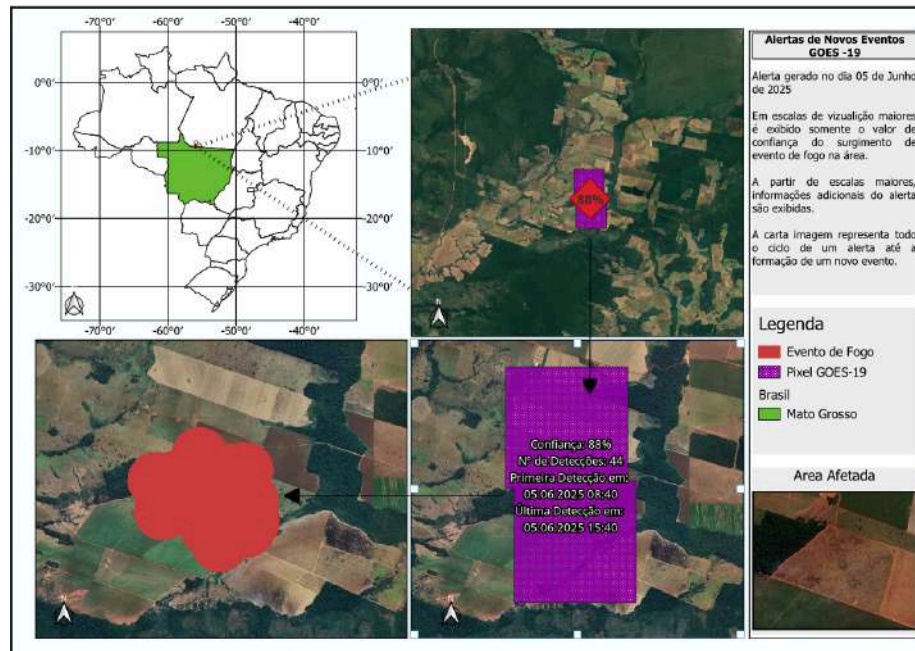
1. At least two thermal detections occur in the same area (2 km pixels)
2. The detections exhibit specific characteristics of temperature, estimated area, and radiative power
3. The system classifies the detection pattern and assigns a confidence level

What does the alert confidence value mean?

The confidence value (displayed as a percentage) represents the probability that the alert will develop into a confirmed fire event within the next 12 hours. This value is calculated using a machine learning algorithm (K-Means) that analyzes historical patterns of alerts that evolved into validated fire events. For example, an alert with 88% confidence indicates that, historically, 88% of alerts with similar characteristics were followed by confirmed fire events within 12 hours.

How to interpret the alerts on the map?

At lower zoom levels, only the confidence value is displayed within a purple polygon representing the GOES pixel. As you zoom in, additional information becomes available, such as the number of detections and the date of the first and last detection.



The image above illustrates the complete cycle from alert to fire event formation: In the upper left panel, we see the location map highlighting the state of Mato Grosso. In the upper right panel, we view the GOES-19 pixel with an 88% confidence value. In the lower left panel, we observe the subsequently confirmed fire event (in red). In the lower right panel, we see a zoomed-in view of the GOES pixel with its confidence level.

What happens to low-confidence alerts?

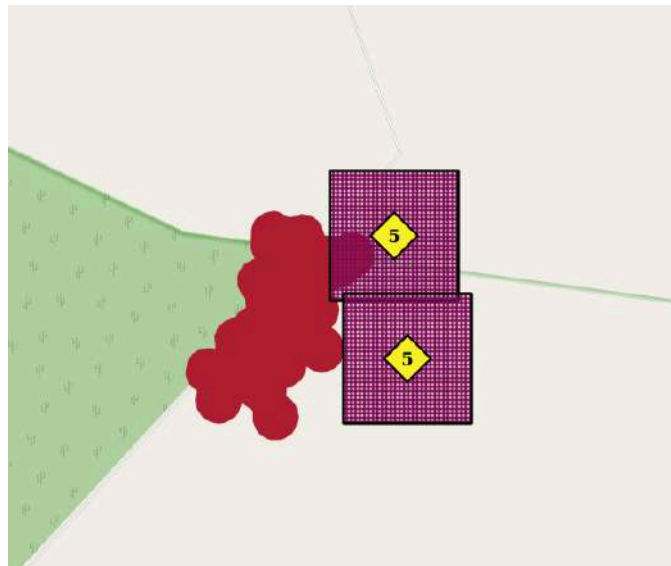
Alerts with confidence below 40% are treated as “temporary alerts” by the system. These alerts are monitored, but if no new detections occur within one hour, they are no longer displayed on the screen. This approach reduces visual noise on the Fire Panel.

How does the Activity Alerts in Events layer work?

This layer monitors fire activity near or within already consolidated fire events. By

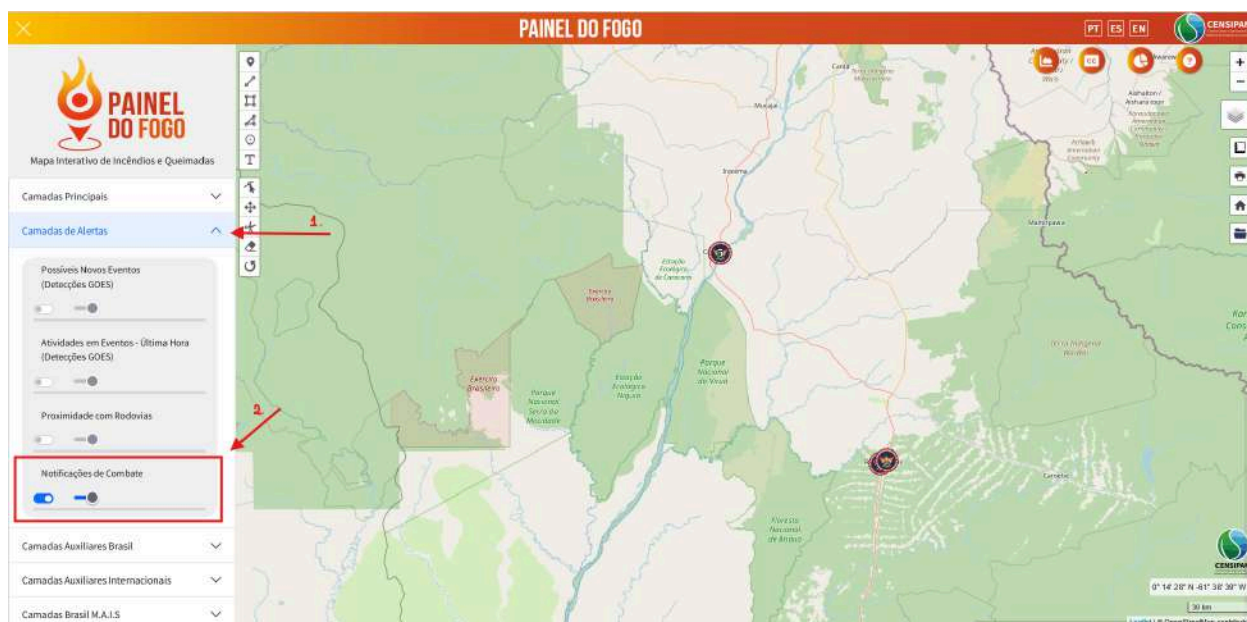
also leveraging the extremely high spatial resolution of the GOES-19 satellite, it monitors thermal anomalies detected in the past hour where the GOES pixel intersects with a fire event. This alert provides information on how many times fire activity was detected in the same area, near or within a fire event. Therefore, the number shown on the screen represents the number of recurrences.

The alert aims to indicate the approximate location in near real time where fire was active during the past hour, assisting in the development of more effective firefighting strategies and prioritizing the dispatch of field teams.



13 - Is it possible to know which events were or are being fought?

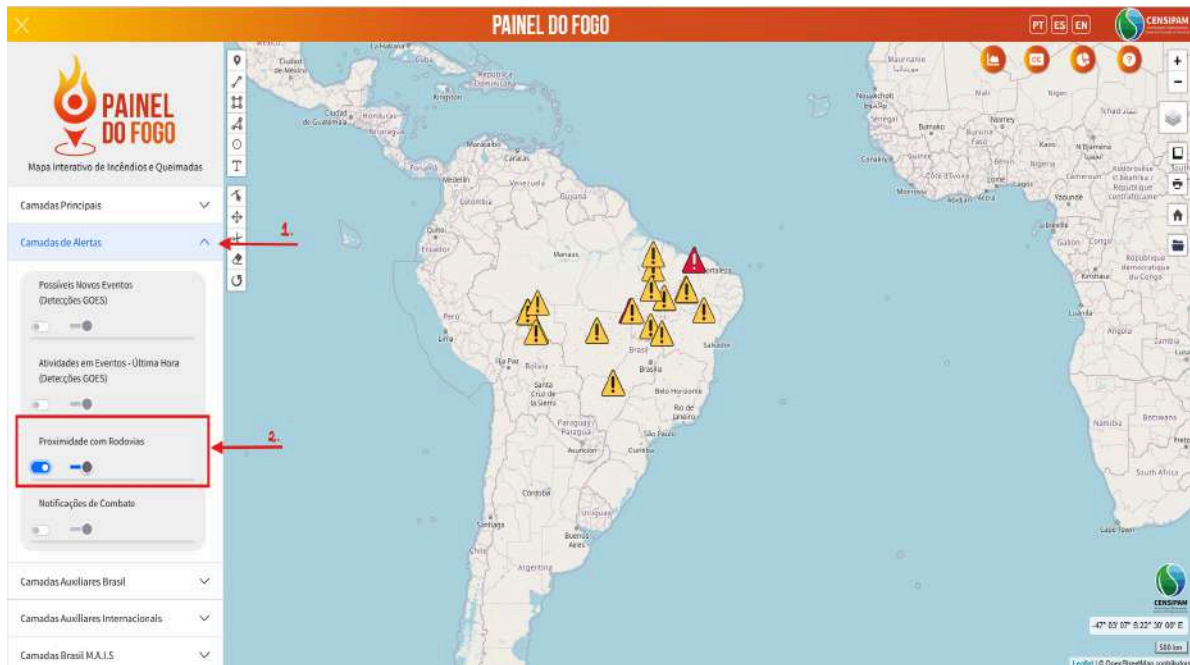
It is possible to monitor the presence of firefighting teams in the last 24 hours at fire events in the state of Roraima through a geospatial data layer. This layer is the result of the partnership between the Management and Operational Center of the Amazon Protection System (**Censipam**) and the Roraima Military Fire Department (**CBM-RR**). The initiative is part of the project **IGNIS**, conducted by CBM-RR, which organizes and provides spatialized data on actions to combat forest fires, including records of dates and times of activities carried out in the field.



The IGNIS project constitutes a significant advance in real-time monitoring of combat operations, in addition to generating essential information for analyzing the events attended. This data makes it possible to create strategic indicators that help plan more effective actions to mitigate and prevent forest fires. The layer presents the combat notifications registered by the CBM-RR teams and processed by the IGNIS system in the last 24 hours, showing the actions of the teams in the affected locations, with details on the dates and times of each record. For now, it is not possible to identify precisely which events were fought, but this functionality is under development and should be implemented soon. Censipam seeks to expand the initiative through collaborations with other forest firefighting bodies, including Military Fire Brigades from different regions of Brazil. The goal is to expand the reach of the tool, providing, together with CBM-RR, the necessary means for records to be carried out quickly, simply, and standardized by teams in the field.

14 - How does the Highway Proximity Alert work?

The Highway Proximity Alert (whether Federal or State) is a feature that identifies sections of highways close to an event or that overlap with it, generating an alert informing the situation.



What types of alerts can be generated?

There are two types of alerts generated by the system:

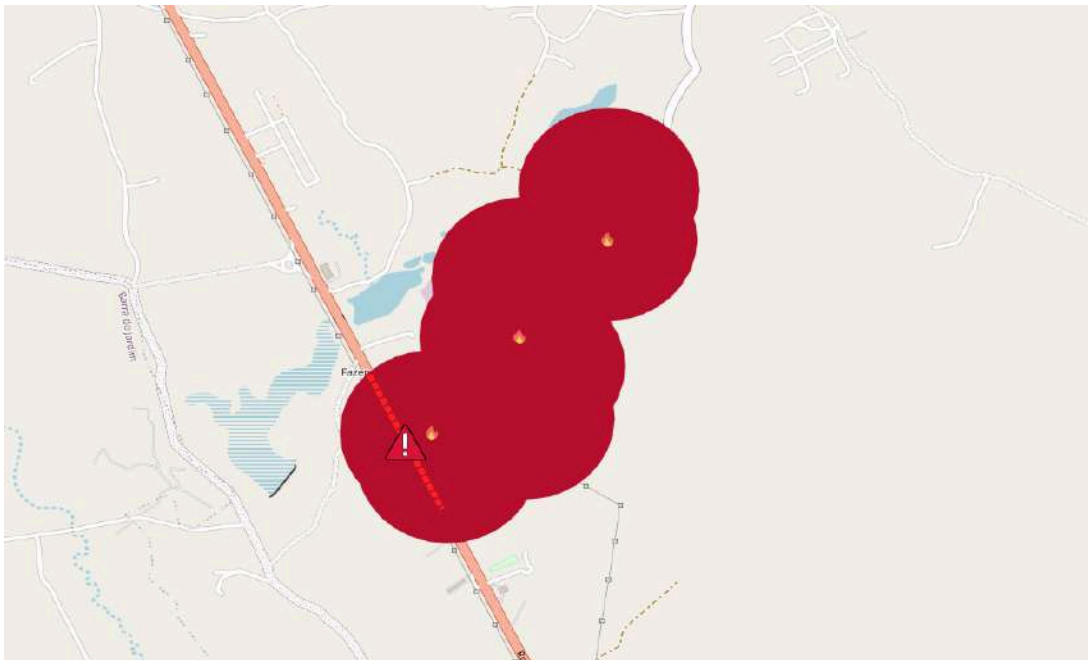
- **Event near the highway:**

The alert is activated when the fire front of the event is at least 3 km from a highway.



- **Highway event:**

The alert is activated when the geometry and fire front of the event is over the highway.



15 - What information about the fire event is available on your table?

The event table brings together qualified information about the event properties and their fire detections, which are tabulated in close to real-time. You can access the table by clicking on the event shown on the map.

The definition of available data is presented in the table below. Information whose source is the fire event is considered intrinsic to the event.

Information	Definition	Source
Event ID	The identifier number generated when the algorithm generates a fire event	fire event

Domain	Classifies event location as private land or public land type	SFB
Soil use and coverage	Informs the type of land use and coverage based on a search of the event coordinates in Mapbiomas Collection 6 for the year 2020	Mapbiomas
Coordinates	Coordinates from mouse click	fire event
Status	Informs the most recent date/time when there was an active fire within the event recorded by one of the following satellites AQUA, TERRA, S-NPP, NOAA-20 and GOES-16.	fire event
Date of detections	Grouped heat source acquisition date	fire event
Accumulated area	Total event area at time of detection	fire event
Number of focuses	Number of hot spots at each detection	fire event
Event duration	Accumulated time since first detection	fire event
Expansion speed	The difference in event area in the last two detections, divided by the time interval between detections	Fire Event

16 - Considering an active event, how many times per day will it be updated?

As previously mentioned, an event can be updated with each pass of the four polar-orbiting satellites, which updates the intrinsic properties of the event as well as its vector form available on the panel. Considering that each passage is repeated twice a day, we have 8 possible detections. Considering that the event is formed from the availability of primary data (heat focus) the event layer is reprocessed at 02:00, 04:00, 06:00, 08:00, 10:00, 12:00, 14:00, 16:00, 18:00, 20:00, 22:00 and 22:00 (GMT-3). Additionally, in events where GOES-16 hotspots overlap, the status may be updated every ten minutes.

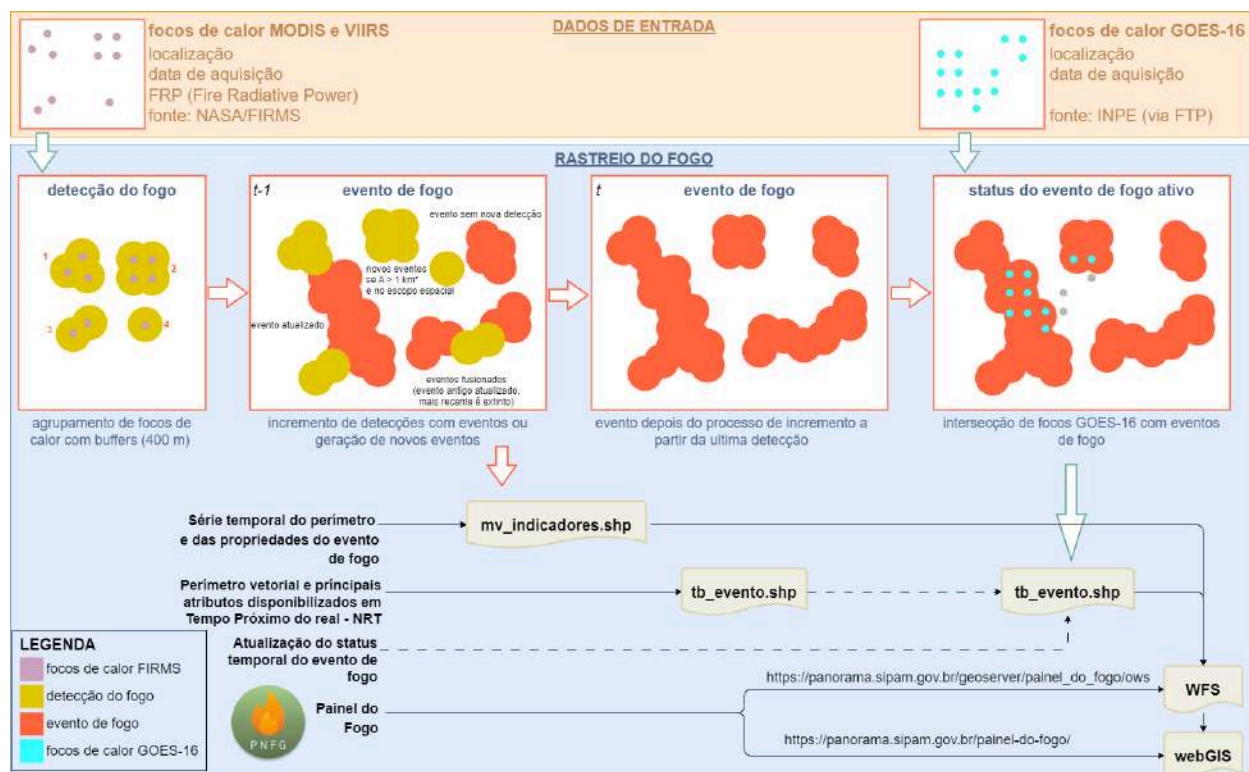
17 - How is the vector shape of the Fire Event layer produced and determined?

A fire event is defined as a 'geo-object' formed by the grouping of hot spots, based on detections from satellites in polar orbit, as shown in the conceptual diagram in the figure below.

Data input: Based on observations from the VIIRS orbital sensors (NOAA-20 and Suomi NPP satellites) and MODIS (Aqua and Terra), a vector layer of hot spots is obtained containing points in locations where active fires are detected. The spatial resolution of the images that originate from this layer of points is around 375 m (VIIRS) and 1 km (MODIS). We use the FIRMS system as a data source.

Fire detection: The diagram also shows that around each of these heat sources a 400 m radius buffer called “fire detection” is generated. The choice of a radius of 400 meters takes into account two premises: 1 - It cannot be smaller than the minimum spatial resolution of the VIIRS sensor; 2 – It is not intended to represent spatial resolution, but rather a geometric artifact to group heat sources, which made it possible to combine VIIRS sensors with MODIS. Some works have discussed the ideal value to perform the grouping and determine the vector form of the event. A recent article proposed by Chen. et al (2022), who studied the parameterization of a value to determine the vector form, suggested that 1 km was ideal to balance the delimitation between small, medium, and large fire events in California, a value close to 800 meters in diameter established by the Fire Event algorithm.

Spatial rule: In frame 't-1' of the diagram, we can observe that fire detection generates clusters that intersect existing events and, from this intersection, the connection is made that will form a new area increment in the existing event. Events are initiated only by hot spots from the VIIRS sensor. Hot spots from the MODIS sensor are only considered when they fall within existing fire events (active or under observation), to increase the event without excessively increasing the extrapolation of area and location. We can see in the example diagram that the 'updated event' has an increment divided into two detections. In the same framework, we can observe that, in a given detection, it is also possible that a new grouping may offer the condition of spatial fusion between two existing events. When this occurs, the algorithm deletes the most recent event and updates the oldest. Finally, it is observed that when a fire is detected without any spatial intersection with another fire event, a new event is formed. These new events must also meet some specific activation and combat conditions as per question 5.



Temporal Resolution: In a second step, to increase the temporal resolution of the events, the algorithm crosses the updated fire events (frame 't') with hot spots from the ABI sensor on board the GOES-16 geostationary satellite provided by the BD Queimadas program (see question 15).

The time series of geometries and properties of each fire detection are stored in a layer 'mv_indicadores.shp', in which we can query a given fire event and its detections separately. The result can be seen in table 't', where the events appear updated and made available in the form of a vector layer (tb_evento.shp) with each update of the Painel do Fogo or through 'Map Service' protocols see (question 22). An overview of the 'tb_evento' and 'mv_indicadores' data layers are described in question 14.

18 - What attributes are contained in the 'tb_evento' and 'mv_indicadores' layers?

The algorithm that produces the fire event layer is partitioned into two as explained in the previous question.

We will highlight the attributes of both layers in this topic. We will start with the 'tb_evento' layer, which currently has its attributes partitioned into two classes. The event property classes relate to the intrinsic aspects of that event and the status class informs parameters in time used to inform the user of the Painel do Fogo as well as attributes that serve to filter events in time, such as the temporal filter in the indicator panel

Attribute Classes	Attributes	Description / Units	Function on the Painel do Fogo for combat activation
Event Properties	id	Unique identification number of the fire event while it is active between brigades	Used to filter and share the fire event while it is active between brigades
	persistencia_dias	Duration (in days)	Used to filter and share the fire event while it is active between brigades
	qtd_detectoes	Number of detections observed since the start date.	Presented as 'number of active fires (by detection)' in the fire events table.
	area_km2	Vector perimeter representing the total size of the fire event since the start date (km ²)	Used to calculate the level of the severity indicator and inform the table of fire events during the occurrence.
	id_tipo_fogo	Type of fire event: 1 - no deforestation; 2 - deforestation according to Faria et al (2023)	Used to improve awareness of the occurrence and send a safety alert for firefighting.
	is_recorrente	Boolean True/False for the intersection between active fire events (id_status 1 and 2) with previous fire events (id_status 3 and 4, since 2020)	Used to understand whether vegetation offers fuel conditions and sends a safety alert for firefighting.
Status	id_status_evento	1 - active (there are detections in the last 24 hours); 2 - on hold (more than 24 hours since the last detection); 3 - extinct (no detections for 5 days); 4 - extinguished by merger (event that connected with another older event)	Used to filter active and standby fire events updated in the Fire Dashboard

	dt_minima	Start date of first detections and clusters of fire events.	-
	dt_maxima	Date of last detection and grouping of the fire event.	-
	dt_ultima_v isao	Last status update date considering the combined temporal resolution between polar and geostationary according to Bernini et al. (2023) during fire events with id_status = 1.	Used to update the date and time of the fire event's active status in the fire event table during the occurrence.

The table below shows the attributes as well as theirs from the 'mv_indicators' layer.

In this table, we provide a column referring to the equivalent attribute in 'tb_evento'.

It is important to highlight that this layer contains the attribute class responsible for calculating the severity indicator for activation and combat.

Attribute Classes	Attributes	Description / Units	Equivalent attribute 0a7q to tb_event	Function on the Painei do Fogo for combat activation
Event Properties	area_total_evento	Layer primary key that identifies each satellite pass for each fire event	-	-
	area_total_evento_ha	Unique identification number of the fire event.	id	Used to filter and share the fire event while it is active between brigades.
	area_acumulada	Number of active fire spots detected in the corresponding satellite pass.	-	Presented as 'number of active fires (by detection)' in the fire events table.
	area_acumulada_ha	Detection numbers observed from start date to corresponding satellite pass.	-	-

	delta_area	Average FRP (Fire Radiative Power) of all active fires detected for that fire event in the corresponding satellite pass.	-	Used to calculate the severity indicator for triggering.
	delta_area_ha	Total vector perimeter size of the event (in m²) at the most recent detection, regardless of satellite pass area_km2 (different unit).	area_km² (different unit)	-
	delta_t	event_total_area in ha (hectares)	area_km² (different unit)	-
	delta_t_horas	Accumulated size of the vector perimeter of the event (in m²) from the first detection to the moment of the corresponding satellite pass.	-	-
	tempo_acumulado	passage_area in ha (hectares)	-	-
	tempo_acumulado_horas	Difference in size (in m²) of the vector perimeter of the event between the corresponding satellite pass and the previous one.	-	-
	ve_expansao	delta_area em ha	-	-
	ve_expansao_ha_hora	Time difference (interval) between the corresponding satellite pass and the previous one	-	-
	id_status_evento	delta_t in hours (hours)	-	-
	id_status_evento_atual	Duration of the fire event interval from its start date to the corresponding satellite pass.	-	-
	dt_passagem	accumulated_time in hours (hours)	-	Displayed as “event duration” in the fire event table. Used to calculate

				the trigger severity indicator level.
	dt_min_evento	Event propagation rate (m ² /h) between the corresponding satellite passage and the previous one	-	-
	dt_max_evento	ve_expansion in ha/h	-	Presented as “spread index” in the fire event table. Used to calculate the trigger severity indicator level.
Status	pont_area	Event status at the time of the corresponding satellite passage. 1 – active; 2 – standby; 3 – extinct; 4 – extinguished by merger	-	-
	pont_frp	Event status updated based on the most recent detection. 1 – active; 2 – standby; 3 – extinct; 4 – extinguished by merger	event_status_id	Used to filter 'active' and 'standby' fire events that have been updated in the Fire Dashboard.
	pont_tempo	Date and time of event detection in the corresponding satellite pass.	-	Displayed as 'detection date' in the fire events table.
	pont_vel	Start date of first detection and grouping of a fire event.	dt_minima	-
	pont_delta_area	Date of the last detection of the fire event at the time of the corresponding satellite passage (equal to 'dt_passagem').	-	-
Severity level	pont_q_focos	Score between 0 and 100 for accumulated area in the corresponding satellite pass	-	Used to calculate the severity indicator for triggering the event.
	pont_area_passagem	Score between 0 and 100 for frp_medio on the corresponding satellite pass	-	Used to calculate the severity indicator for triggering the event.

	peso_global_passagem	Score between 0 and 100 for the time_accumulated in the corresponding satellite pass	-	Used to calculate the severity indicator for triggering the event.
	area_total_evento	Score between 0 and 100 for the ve_expansion in the corresponding satellite pass	-	Used to calculate the severity indicator for triggering the event.
	area_total_evento_ha	Score between 0 and 100 for the delta_area in the corresponding satellite pass	-	-
	area_acumulada	Score between 0 and 100 for the q_focos in the corresponding satellite pass	-	-
	area_acumulada_ha	Score between 0 and 100 for the area_passage in the corresponding satellite pass	-	-
	delta_area	Multivariate score between 0 and 100 for fire severity level in the corresponding satellite pass	-	Event severity indicator time series displayed on a graph used to assist with fire prioritization.

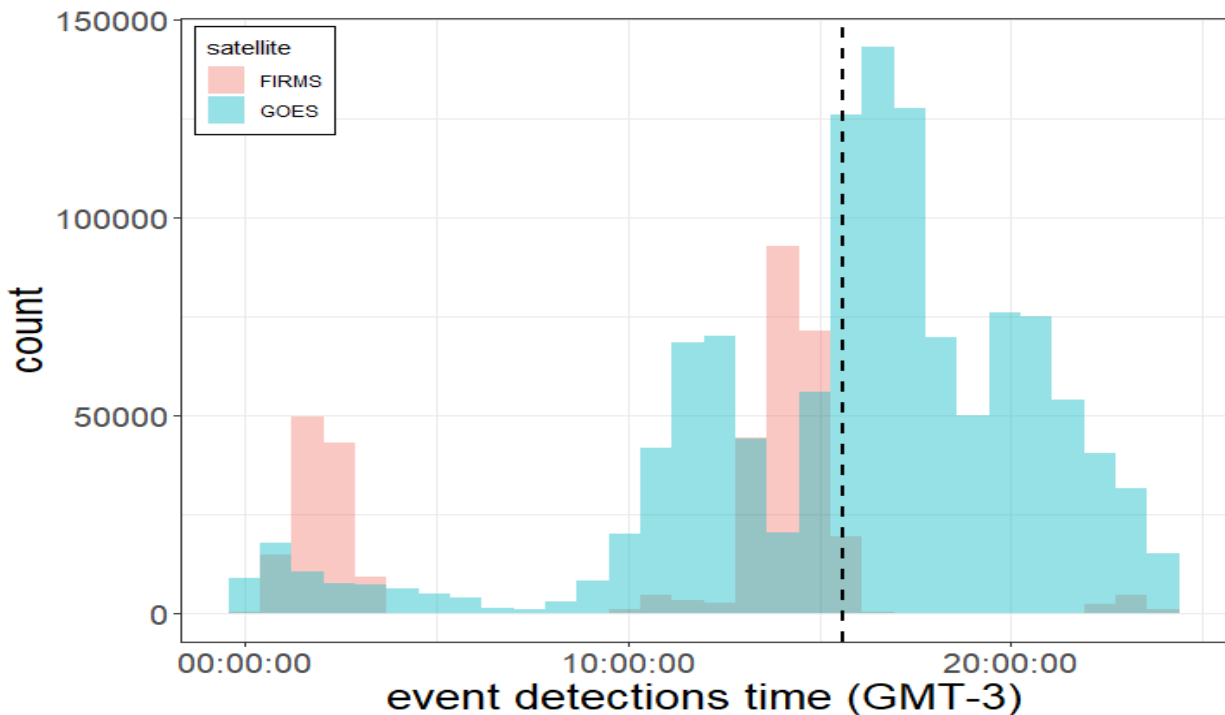
19 - How is the combined temporal resolution (polar orbiting and geostationary satellites) of the Fire Event determined?

As previously mentioned, the perimeter of the Censipam fire event is derived from the MODIS and VIIRS heat source, which provide 8 fire detection possibilities when integrated over a 24-hour period. This configuration generates a delay of 2 to 6 hours between detection and update in the Painel do Fogo webgis. In order to reduce the window without fire detection between polar orbit satellite passes, Censipam received the GOES-16 database from INPE via FTP link, with 5 minutes of latency between detection and the availability of information on the Painel do Fogo. Once GOES-16 data is received, the Fire Dashboard processing stream checks for active GOES-16 hot spots that are contained within fire events. If confirmed, the last detection time for each intercepted event is updated to the GOES-16 time without changing the perimeter of the event vector (see conceptual diagram in question 13). Due to the 2 km

spatial resolution, our assumption of using GOES-16 benefits from temporal resolution without increasing the fire event influence area error. As a consequence, this method exhibits fire size dependencies, in line with previous studies (Li et al. 2020). Larger-sized events are more likely to cross GOES-16 hot spots. The analysis performed in this study shows how size affects the frequency performance of GOES-16.

Bernini et al. (2023) set out to understand how combined temporal resolution (geostationary plus polar satellites) improves the frequency of fire detection in the Brazilian Amazon. Using more than 57,000 fire events throughout 2022, they were able to understand the diversity of fire and showed that its detection frequency is affected by the size of the fire event. Overall, the average fire detection performance was able to provide a frequency update of 5 hours for small-medium events, 2 hours for medium events, and 1 hour for large and very large events. Events with a size of up to 8.6 km² were responsible for 95% of the total number of events and only 10% of the events were intersected by GOES-16 foci, highlighting spatial dependence. However, even small events can be updated hourly. Some extreme cases have exceeded 50 times a day (30-30 min), when combining polar and geostationary satellites. For medium to large events (events considered priority), almost 100% of events had their status updated by GOES-16.

The figure below shows that GOES-16 detections have served the purpose of generating updates on events between the passage of polar-orbiting satellites. The combined temporal resolution performance has high repeatability starting in the late morning, peaking in the early evening, and declining in the early morning.



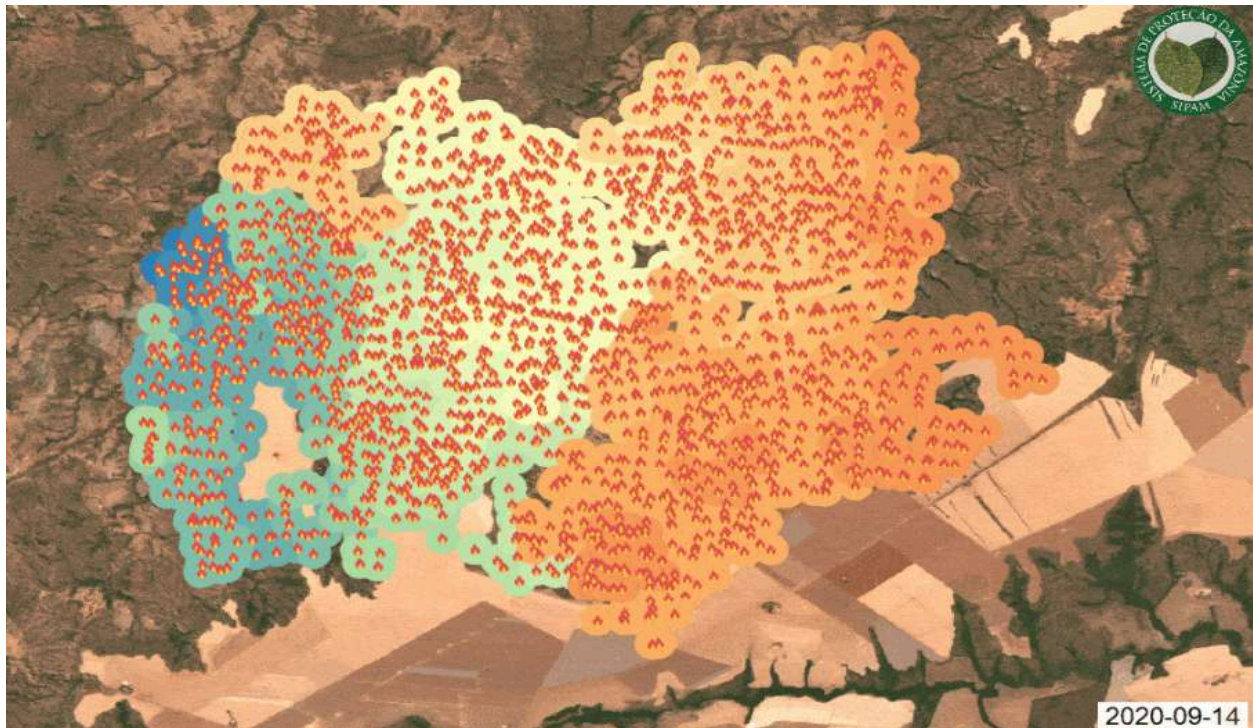
20 - What is the impact of the grouping methodology on the area calculation?

Smaller fire events will be considerably overestimated, while for larger magnitude events the overestimation is low. Therefore, the accumulated area value shown on the Painel do Fogo should only be used to compare events when prioritizing and making decisions. For other interests, we recommend the ALARMES system. The Censipam team is preparing a systematic study to understand this methodological limitation and propose improvements.

21 - Why use a fire event and not hot spots to activate combat teams?

The relationship between heat source and fire/burning is not direct and for this reason, it is not associated with an occurrence/activation in a simple way. During operations Verde Brasil I and II within the scope of the Guarantee of Law and Order (GLO) decreed by the president in force in 2019 and 2020, Censipam identified that it was necessary to create an approach that was associated with the standard of activating combat teams. The approach that best suited the need was to group hot

spots to reduce the excess of information caused by several hot spots in a given passage. Additionally, the fire event concept allows the user to get a sense of tracking the fire as it occurs as can be seen in the animation below.



22 - Are there other fire event products?

As explained (Chen. et al. 2022) since the late 1970s, satellite remote sensing instruments have been used as an alternative and reliable data source for mapping fire area and severity. In many early applications fire detections were often reported as a series of independent pixel-level events on a spatial grid, which often ignored the spatial and temporal links between them. Recent studies have used ideas from object-oriented classification and contextual growth to track the properties of individual fires using pixel-level fire data (see table). The most widely used data in these studies are burned area products from medium-resolution infrared image sensors (e.g. MODIS). However, these products are often not suitable for generating a rapid assessment of fire events. This is because a sustained interval of post-fire surface reflectance observations is required in the change detection algorithm used to estimate the burned area.

Study	Region	Time period	Satellite fire detection	Spatial Resolution	Temporal Resolution	Geospatial approach (spatial, temporal)	Product in Near Real Time	External perimeter required	Vector Output	Fire Size	Product
Lobeoda and Csiszar (2007)	Northern Eurasia	2001 - 2009	Heat Sources (MODIS)	1 km	Daily	Spatiotemporal (2.5 km, 4 days)	No	No	No	Everything/ Everyone	-
Archibald and Roy (2009)	Southern Africa/Southern Africa	2000 – 2008	Burnt Area (MODIS)	500 m	Daily	Spatiotemporal (rang, 8 days)	No	No	No	Everything/ Everyone	-
Veraverbeke et al. (2014)	Alaska and Western US	2007 – 2012	Burnt Area and Hot Spots (MODIS)	500 m to 1 km	Daily	Kriging Model	No	Yes	No	Selected Large Fires	-
Loepfe et al. (2014)	Europe	2001 – 2010	Heat Sources (MODIS)	1 km	Daily	Propagation Algorithm (11 km, 1 day)	No	No	No	> 2 hot spots	-
Nogueira et al. (2017)	Savannas of Brazil	2002 – 2009	Burnt Area (MODIS)	500 m	Daily	Space-Temporal (Touched, 8 days)	No	No	Yes (Mounted Ellipses)	Everything/ Everyone	-
Laurent et al. (2018)	Global	2005 - 2011	Burnt Area (MODIS and MERIS)	500 m e 300 m	Daily	Space-Temporal (rang, 3 days, 5 days, 9 days, 14 days)	No	No	Yes (Mounted Ellipses)	> 5 Burned pixels (Pixels Queimados)	FRY

Arts et al. (2019)	Global	2000 – 2018	Burnt Area (MODIS)	500 m	Daily	Spatio-Temporal (Touched, 5 days, 16 days)	No	No	No	Everything/Every one	Glob Fire
Andela et al. (2019)	Global	2003–2016	Burnt Area (MODIS)	500 m	Daily	Local Minimum and Fire Persistence Thresholds	No	No	No	Everything/Every one	Fire Atlas
Balch et al. (2020)	CONUS	2001 - 2019	Burnt Area (MODIS)	500 m	Daily	Space-Temporal (2315 m, 11 days)	No	No	Yes	Everything/Every one	FIRE D
Chen et al. (2022)	California	2012–2020	VIIRS AF (band I)	375 m	Midday	Progressive Spatio-Temporal Aggregation (LCT-Dependent Spatial Thresholds, 5)	Yes	No	Yes	Everything/Every one	FED ERAL
COUNTRY (2021)	Brazil	2015 - Current	Heat Spots (MODIS and VIIRS)	0,3 - 1 km	-	Spatio-Temporal Aggregation (800 m > 50 min. < 6 hrs)	Yes	No	Yes	1km²	Pain el do Fogo

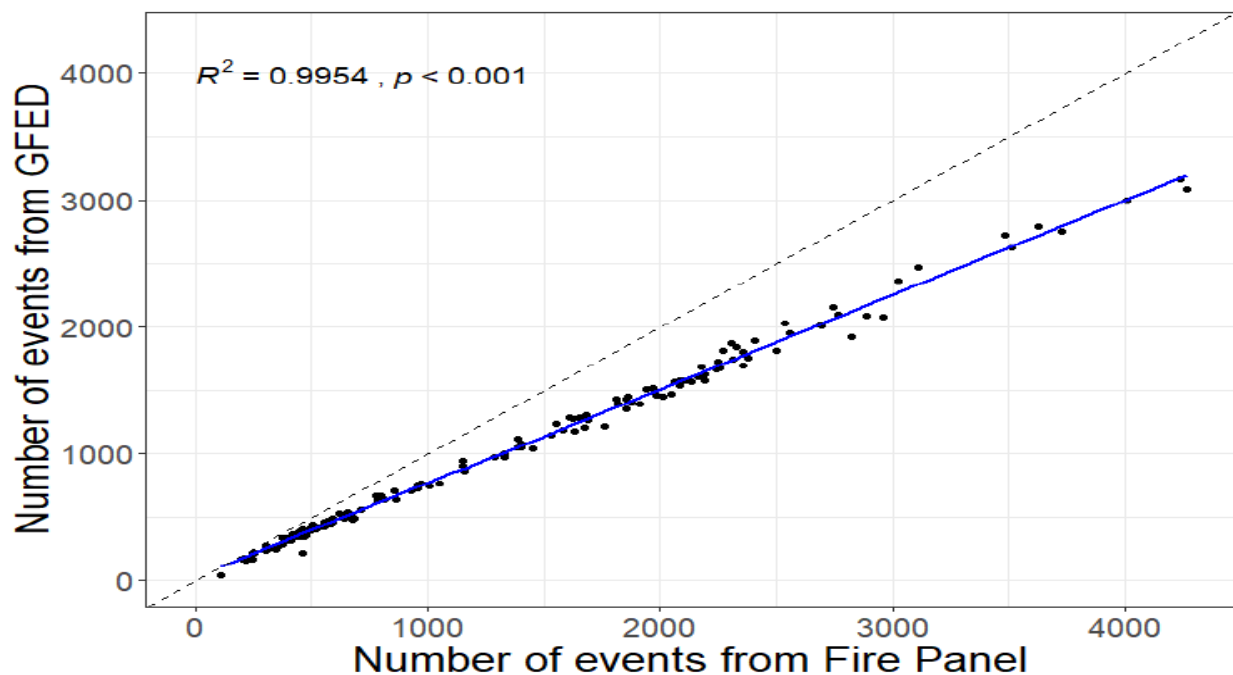
23 - Have the fire events been validated?

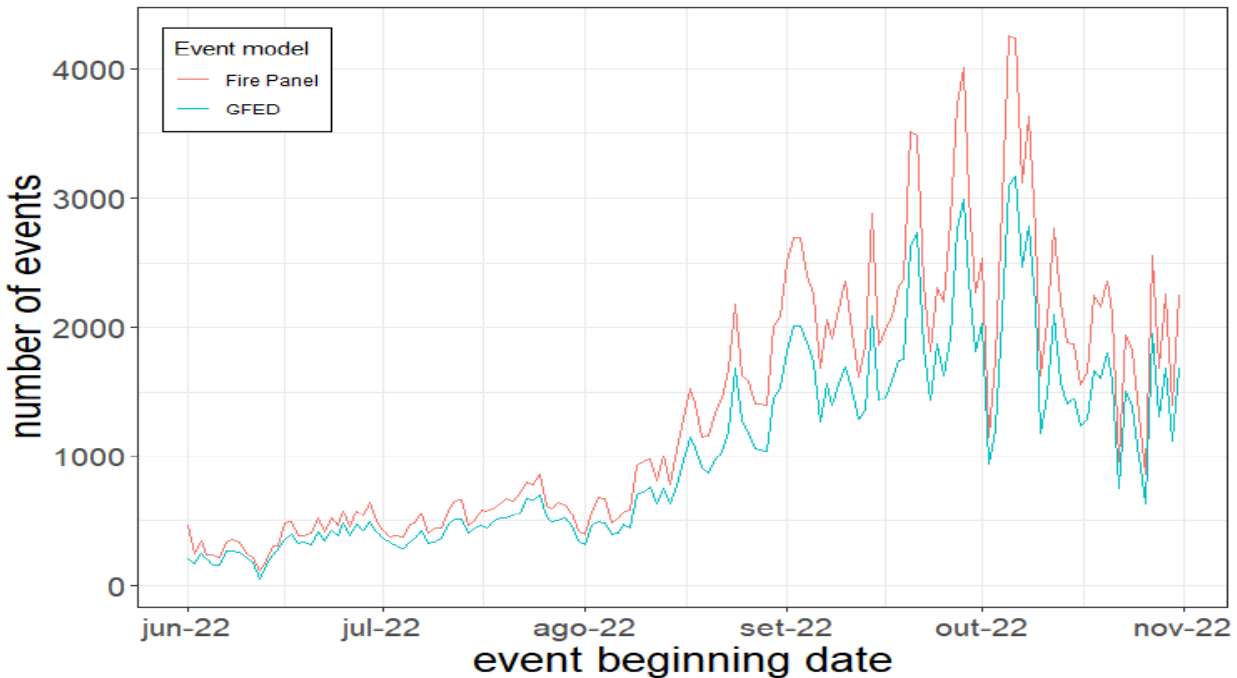
Yes. They were qualitatively validated with the support of firefighters from the state of Rondônia. During Operation Verde Rondônia in 2021, it was possible to fly over the selected events, understand their magnitude, and eliminate the possibility of false positives. After the flyby, the nearest firefighters were sent to fight the fires within hours,

when it could have taken days. The results were published at the International Geoscience and Remote Sensing Symposium (IGARSS) 2022 - by Faria et al. (2022).



Quantitative validation was performed by comparing the daily number of Fire Events from the Amazon Dashboard in the period from June to October 2022 for the Legal Amazon. The scatter plot indicates a positive degree of quantity per event, while the line graph illustrates that both products modulate the same trend in the number of events per day.





24 - How was the severity indicator used to activate combat teams constructed?

Censipam developed an indicator of the severity level of the activation to facilitate the tracking of events depending on the level of attention they require and, thus, subsidizing the activation and distribution of firefighting teams. For the indicator to be useful for activation, it was necessary to establish two premises: 1 – Plot in graph form so that the severity levels of events in a given area of interest can be compared; 2 – Reevaluate severity over time as fire dynamics are variable. Thus, when an event reduces the trigger severity, it is possible to prioritize another combat.

As commented by Faria et al. (2022), the severity indicator was modeled using the MACBETH multi-criteria decision method, based on properties inherent to the detected phenomenon. The event properties, defined based on extensive consultation with those fighting the fire, were: (I) accumulated area of the event buffer; (II) duration of the event; (III) increase in area between the current event detection and the previous one; and (IV) fire intensity (FRP - fire radiative power).

The indicator is recalculated with each new event detection, generating a time series of the severity level of the events that can be viewed on the graph. By considering the constellations of VIIRS and MODIS sensors, the event detection capacity varies according to the satellite passage times, with a minimum interval of

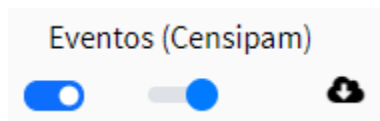
around 1h and a maximum of 8h, which means that the indicator is updated in almost real-time.

The interpretation of the indicator must be done comparatively, in order to identify more severe events within the same area of interest or to track the evolution of the severity of an event over time.

The indicator modeling did not consider factors extrinsic to the event, which must be analyzed by the user based on an analysis of the event context with the information, images, and layers available.

25 - Can I download the event layer? What are the layer attributes?

You can download the events layer in '.kml' format by clicking the cloud icon next to the main layer.



It is important to note that, when using this option to download data, the user will only have access to events that are active or under observation in the Painel do Fogo ('id_status_evento' 1 and 2.). In other words, the user will not have access to fire events that happened in the past and are now extinct.

The attributes available in the layer are listed and described in the following table:

Attribute Class	Attribute	Description
Event Properties	id_evento	Unique identifier number of the burning and fire event
Status	id_status_evento	Event properties
	dt_minima	Date of First Event Detection
	dt_maxima	Date of last event detection

	Dias	Time elapsed since the last time the event was detected (fraction of days)
Event Properties	persistencia_dias	Event Duration (Days)
	qtd_detecoes	Number of detections observed since the beginning of the event
	area_total_evento	Geometric device that represents the total size of the event from the beginning to the last detection, grouping the buffer of all hot spots contained within this event (km ²)
Location	nome_municipio	Municipality in which the event is located
Domain	cod_terra_indigena	Indigenous Land Identification Code
	nome_terra_indigena	Name of the indigenous land that intersects the event
	cod_unidade_conservacao	Conservation Unit identification code
	nome_unidade_conservacao	Name of the Conservation Unit that intersects the event
	cod_quilombola	Quilombo identification code
	nome_quilombola	Name of the Quilombo that intersects the event
	cod_projeto_assentamento	Federal settlement project identifier code
	projeto_assentamento	Name of the federal settlement project that intersects the event

26 - Is there any way to access Painel do Fogo products in a Geographic Information System (GIS)?

The General Coordination of Information Technology team together with the Geoinformatics Coordination makes the data available to the user through 'web services'. These are features that allow the user to access geospatial data and metadata through internet communication protocols.

Users can access data using GIS software, free or purchased, or simply web browsers allowing access to WebSIG-type interfaces (such as Painel do Fogo).

It is currently possible to consume data through two types of geo services:

WMS (Web Map Service) - allows reading only (responds in the form of images - consult and view georeferenced maps).

https://panorama.sipam.gov.br/geoserver/painel_do_fogo/wms

WFS (Web Feature Service) - allows reading and modification (responds in the form of vectors - download of the discrete geographic phenomenon represented in vector format).

https://panorama.sipam.gov.br/geoserver/painel_do_fogo/wfs

ATTENTION: The above addresses cannot be opened directly in browsers such as Firefox, Chrome, etc.

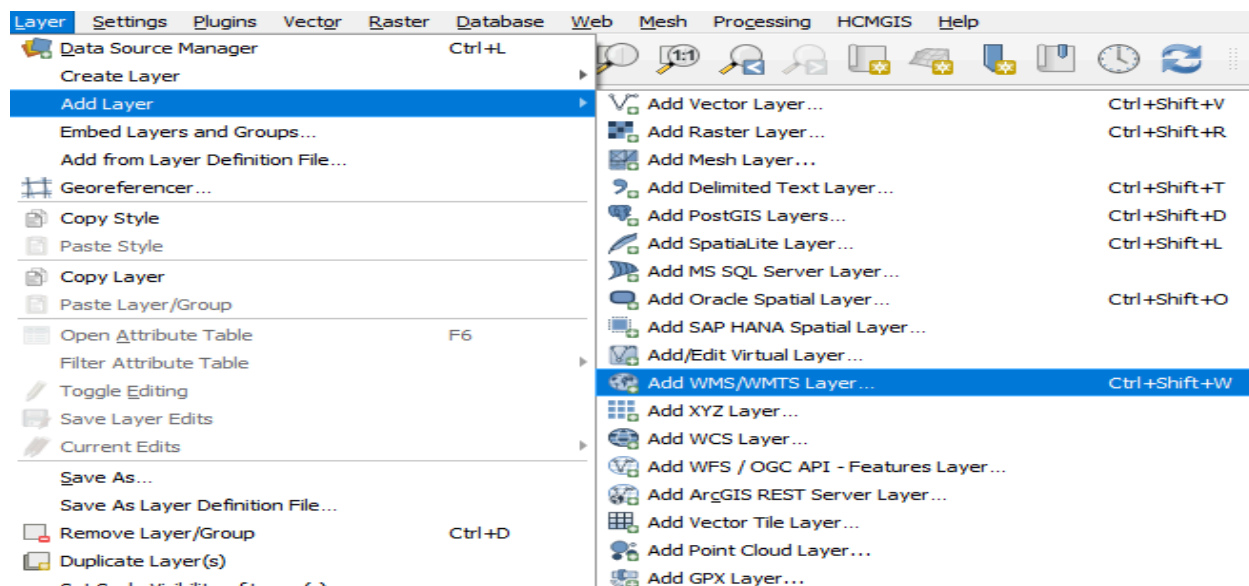
To view and use the data provided by this link, we recommend using Geographic Information System (GIS) software, such as QGIS.

For more information on how to use QGIS, follow the guidelines below.

Step 1: Open QGIS

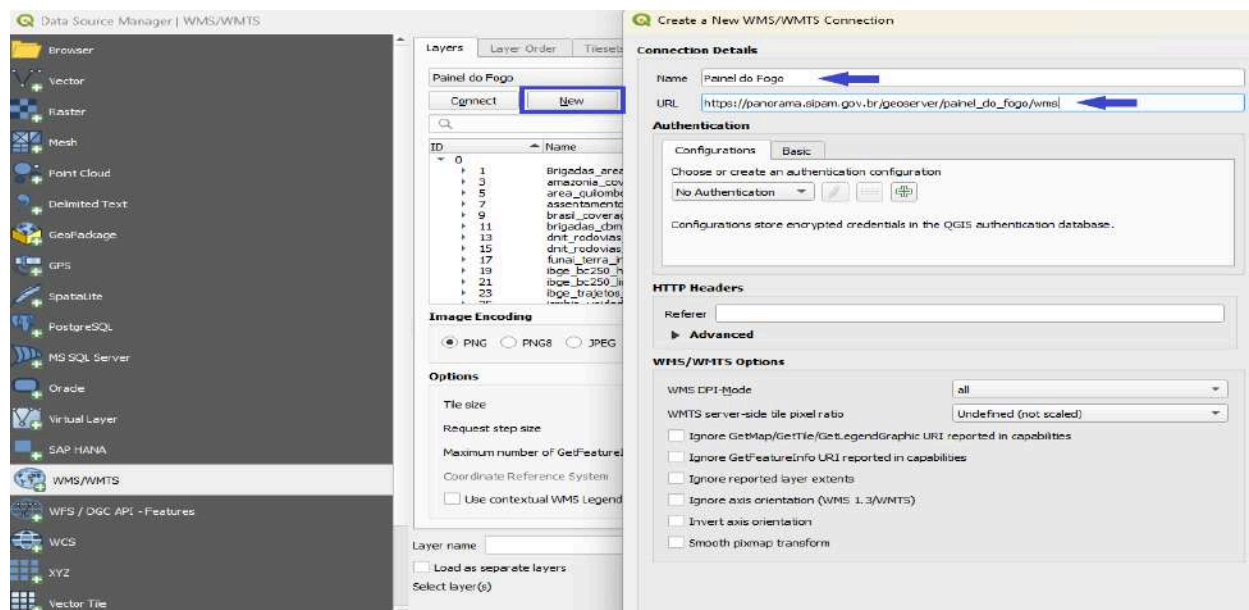
Step 2: Add a WMS/WMTS Layer

- In the top menu, go to Layer.
- Select Add Layer.
- Click Add WMS/WMTS Layer.



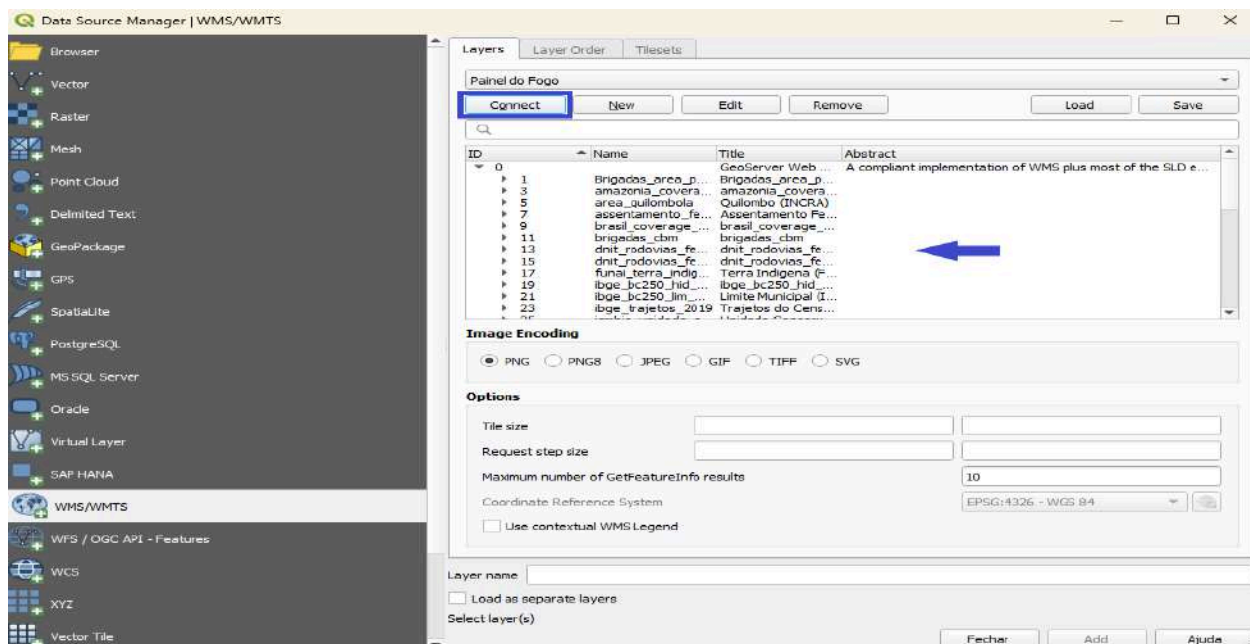
Step 3: Configure the WMS Connection

- In the window that opens, click New to create a new WMS connection.
- Enter a name for the connection.
- In the URL field, enter the link to the WMS service you want to access.
- Click OK to save the connection.



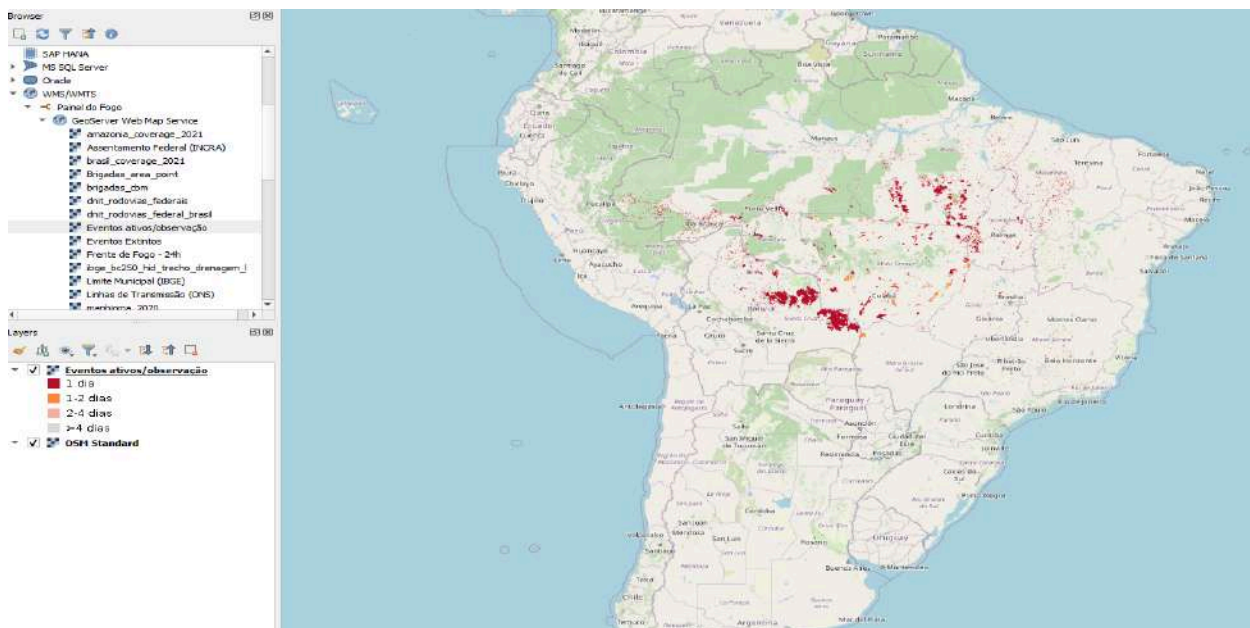
Step 4: Connect to the WMS Service

- After configuring the connection, select it from the list and click Connect.
- Wait while QGIS connects to the service and lists the available layers.



Step 5: Select and Add Layers

- After connecting, you will see a list of layers available in the WMS service.
- Select the layers you want to add to your project.
- Click Add to import the selected layers into QGIS.

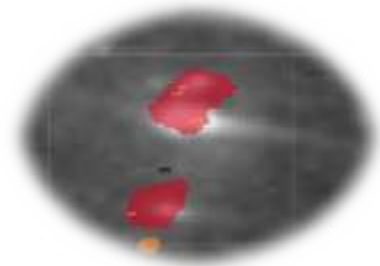


Step 6: View the Layers in QGIS

The selected WMS layers will now appear in the QGIS layers panel and will be displayed on the map.

27 - How can I use nighttime images to identify an active fire?

Optical images at night highlight the luminosity of some phenomena on the Earth's surface. If there is light in remote areas without recurring frequency and overlapping a fire event, it is understood that there is an association between the two pieces of information. However, it is necessary to check that there are no urban conglomerates or settlements around the event, as these land use classes are subject to urban light conditions. Nor should a relationship be made between the luminosity of the nighttime image and the fire front of the event due to contamination of the luminosity pixels with neighboring pixels, as can be seen in the image below.



28 - How can I view my institution's brigades on the Painel do Fogo?

To add your organization's brigades, you must send the following data to the Painel do Fogo email:

(paineldofogo@sipam.gov.br)

1. Location of operational units

The layer of points that represents the location of operational units. The file must

be in shapefile (shp) or KML format. Your attribute table should preferably contain a field specifying the name of each operating unit.

2. **Areas of operation of the brigades**

There are two possible ways to view the area of activity of each brigade on the Panel:

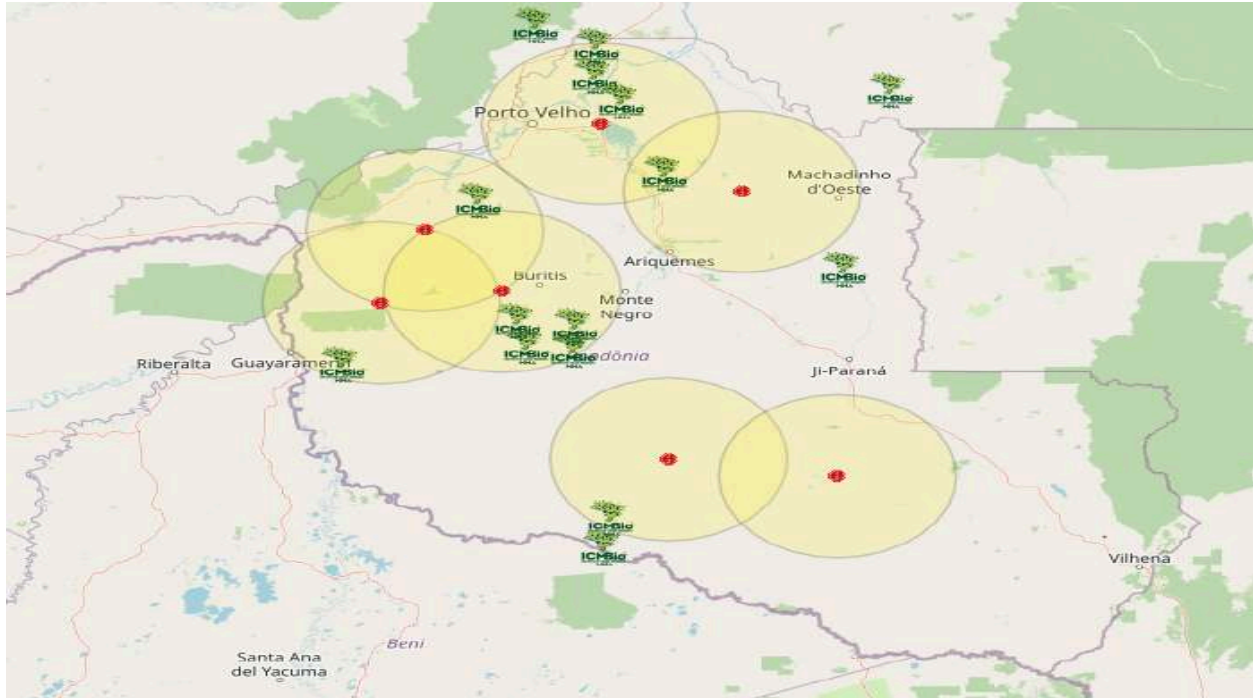
1. **By Area of Activity:**

Layer of polygons that represents the areas of activity, as in the image below. The file must be in shapefile (shp) or KML format. Your attribute table should preferably contain a field specifying the name of each area of activity.



2. **By Area of Operation:**

If the operational units do not have a specific area of activity, it is possible to create a radius of action, as in the image below. In this case, this information must be communicated in the email, together with the size (in km) desired for the operating radius.



If there is an update on the quantity, area, or location of the brigades, send us a new email with the updated file.

29 - What is the best way to use Sentinel-2 images in the Painel do Fogo?

Sentinel-2 images are updated every day for the whole of Brazil, although the revisit lasts five days. However, if the passage coincides with the time when a fire event is active, it is possible to observe the fire front and the scar of the already burned area from the 'active fire' layer and the smoke plume and the type of fuel (vegetation).



30 - How can I ask other questions about the Paine! do Fogo?

Just send an email to paineldofogo@sipam.gov.br.