SpitFire

Spanish-Portuguese Meteorological Information System for Trans-Boundary Operations in Forest Fires

ECHO/SUB/2014/693768

Project founded by the European Commission

www.adai.pt/spitfire

SPITFIRE USER MANUAL

INDEX

1. Introduction

SPITFIRE offers very high resolution meteorological and forest weather forecasts. This information is presented in a GIS environment, to allow its joint management with other information used daily by users of the service (protected spaces, surveillance posts, roads, water points, distribution of material and human resources, etc.).

The meteorological variables contemplated by the service are those with the greatest influence on the forest fire phenomenon. In addition SPITFIRE incorporates useful meteorological variables in the prediction of adverse meteorological phenomena and probabilistic alerts on the occurrence of this type of phenomena. To guarantee the reliability and utility of the service, SPITFIRE feeds on high-quality weather forecasts.

These weather forecasts serve as the basis for the calculation of weather indices in forests. The modeling of fire parameters is well documented. Most of the indices have their origin in the BEHAVE model, developed by the US Forest Service. This model simulates the evolution of a fire according to meteorological and topographic factors, as well as the state of the fuel, based on the Frandsen-Rothermel equations. The fuel characterization is done according to the models defined by the Missoula Forest Fire Laboratory, Montana, of the United States Forest Service.

The system presents the contents in graphical form although it allows consulting the numerical values of the different variables and obtaining reports on the evolution of said variables.

2. Contents

The contents are grouped in different sections accessible from the initial screen through the main menu, the mosaic window and the map window.

The main screen is divided into 5 sections.

- The main menu at the top.
- Two maps showing the updated rainfall situation of the Common Hazard Index and the wind and temperature variables of Arome. It can be customized for each user.
- Two windows that allow access to the graphical system information.
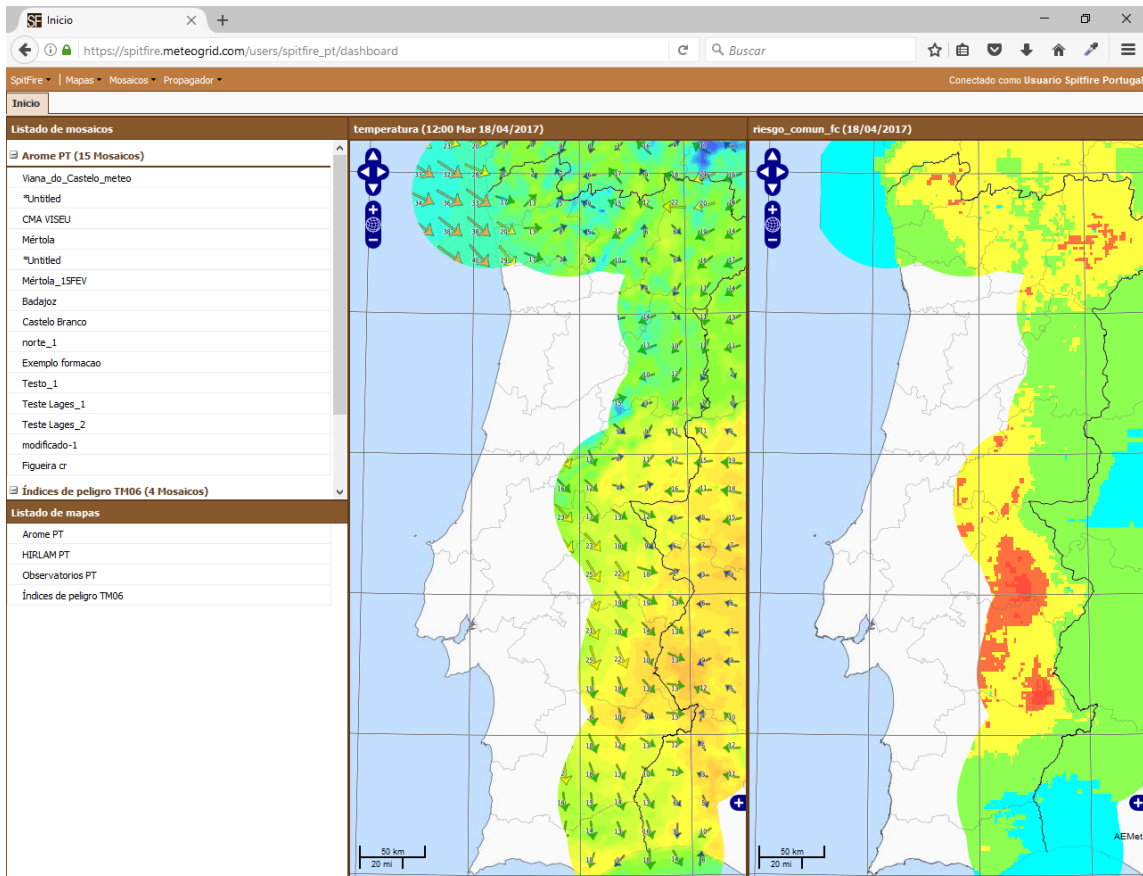
- The main menu at the top of the screen allows access to all system information through scrollable items. The elements available in this menu are: maps, mosaics and propagator.

- List of Mosaics. At the top right of the main screen of the program a window that allows access to the mosaics defined in the application for the active user is displayed. The listing shown can be modified by registering new mosaics or deleting existing ones.

The default mosaics are:

- ○ Danger Index Environment: Based on the indexes obtained by AEMet, By IPMA and the Common Spanish-Portuguese index.
- ● List of Maps. At the bottom right of the main screen of the program a window that allows access to the maps defined in the application for the active user is shown. The list shown can only be modified from the systems administration and can be customized for each user.
  - ○ AROME (both TM06 and UTM29)
  - ○ HIRLAM (both TM06 and UTM29)
  - ○ Risk indices (in both TM06 and UTM29)
  - ○ Observations (in both TM06 and UTM29)

Organization of contents

Internally the contents are grouped in tabs with different temporal resolution and within these by thematic areas:

- ● Time Variables. Within this group are variables with time horizon from the Hiram system of Aemet and Arome of IPMA, variables and indices derived from these and fixed layers. In general, the prediction horizon ranges from +0 to +36 hours in the case of Hirlam with hourly resolution, and from +0 to + 72 hours in the case of Arome.
- ● Daily Variables. Within this group are variables with daily horizon from the MeteoGrid statistical prediction system, variables and indices derived from these and fixed layers. It also incorporates observations of some of the variables. Logically the timing to update the predictions and observations is different, so the observation fields are not available for the current day. In general, the forecast horizon ranges from the first (day of receipt of the information) to the tenth day, except for the 12h precipitation variables (which are only offered for the first 2 days). The predictions of temperature, humidity, wind, and forest-weather indices are offered according to two criteria:
  - ○ Information for a specific time: it is used to know the predicted conditions for a certain moment, and its evolution in the following hours, generally in emergency situations, like fire cones, or to actions planned for that moment (controlled burns). Time information up to D + 1 ("morning") is offered at 12 solar hours, and every 6 hours until the end of D + 2.
  - ○ Information on the most unfavorable situation of the day, associated with the maximum temperature. The analysis of this information for several days gives an idea of what will be the most conflicting days.
- ● Atmospheric Variables. Within this group are variables with a 6 hour horizon from the ECMWF prediction system, indexes derived from these and fixed layers. In general, the prediction horizon ranges from +6 to +120 hours with a 6-hour resolution.

Space Resolution

The spatial resolution to represent these variables is 500x500m for all of them, with the exception of the atmospheric variables and the Haines index that have resolution 0.5º of

length by 0.5º of latitude. In the propagator a resolution in more detail-30x30m-is used, recalculating the necessary variables to that resolution.

This resolution is achieved by applying "intelligent" interpolation techniques, which consider the effects of the topography, to the specific predictions for observatories.

3. General navigation of the application:

The SPITFIRE architecture allows the display of the information on the main screen as well as floating or sliding windows. These share some functions that will be seen next:

Tabs

Tabs contain different views of information so you can switch from one to another without losing any changes or content while doing so. These are very similar to those used in web browsers to organize the different pages that are open. To change from one tab to another just place the mouse over it and click the left button.
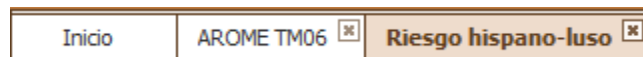
To close a tab we will use the icon: : Closing a tab will automatically open the last tab that was selected. The tab is special and therefore cannot be closed, it contains the initial information.

Each time that we select an option of the application it normally opens in a new tab, you can open as many tabs as necessary but it is advisable to close the tabs that are no longer necessary to optimize the resources of the server.
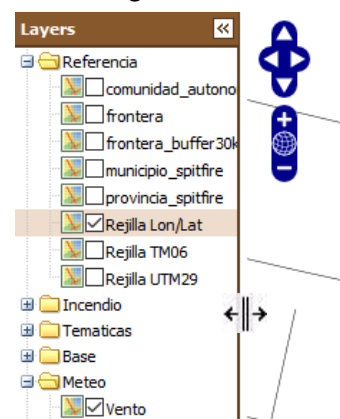
Sliding windows

They show auxiliary information to the main page of the application, its information is dependent on the tab that is selected. Not all tabs contain the same sliding windows or may not contain any similar to the first tab.

Resize sliding windows:

The windows can be enlarged or contracted to improve the visualization of the content. The resizing of the windows has a maximum or minimum established limit that prevents to modify them outside of these to guarantee the correct visualization of the data and to avoid shifting the organization of the information that they show.

To resize a window margin, follow these steps:

1. Move the cursor over the margin until the cursor icon changes to:

2. Press and hold the left mouse button
3. Move the mouse to wherever you want the margin to be positioned
4. Release the left mouse button you had pressed.

Hide sliding windows:

To maximize the information displayed in the background of the application you can hide the sliding windows; these can be displayed again when you want. To hide a sliding window click these icons [«] [»] the window will be collected to the left or right respectively leaving all the space they occupied on the main window visible. You will see that the bar that represents the margin stays on the side that corresponds with the following icon:

To re-display information that contains a sliding window that is hidden, follow these steps:

- Move the cursor over the hidden window margin until the cursor icon changes to:

- Double click on the bar or click on: or

Floating windows:

Floating windows allow you to display data separately to the main application screen with a larger area than the sliding windows that display information associated with the main screen.

These can be resized to fit the information they contain. To resize them, follow these steps:

1. Move the cursor over the floating window margin until the cursor icon changes to:

2. Press and hold the left mouse button
3. Move the mouse to wherever you want the margin to be positioned
4. Release the left mouse button you had pressed.

To close the window just click on the icon ⊠ located at the top right of it. To move it to another side the following steps must be followed:

Move the cursor over the top bar of the floating window; the cursor icon should change to this: ✛

1. Press and hold the left mouse button
2. Move the mouse to the position where you want to move the window
3. Release the left mouse button you had pressed.

Maps Viewer

The map viewer contains the basic navigation tools on the map such as scrolling, zooming, place-name search and coordinate search.
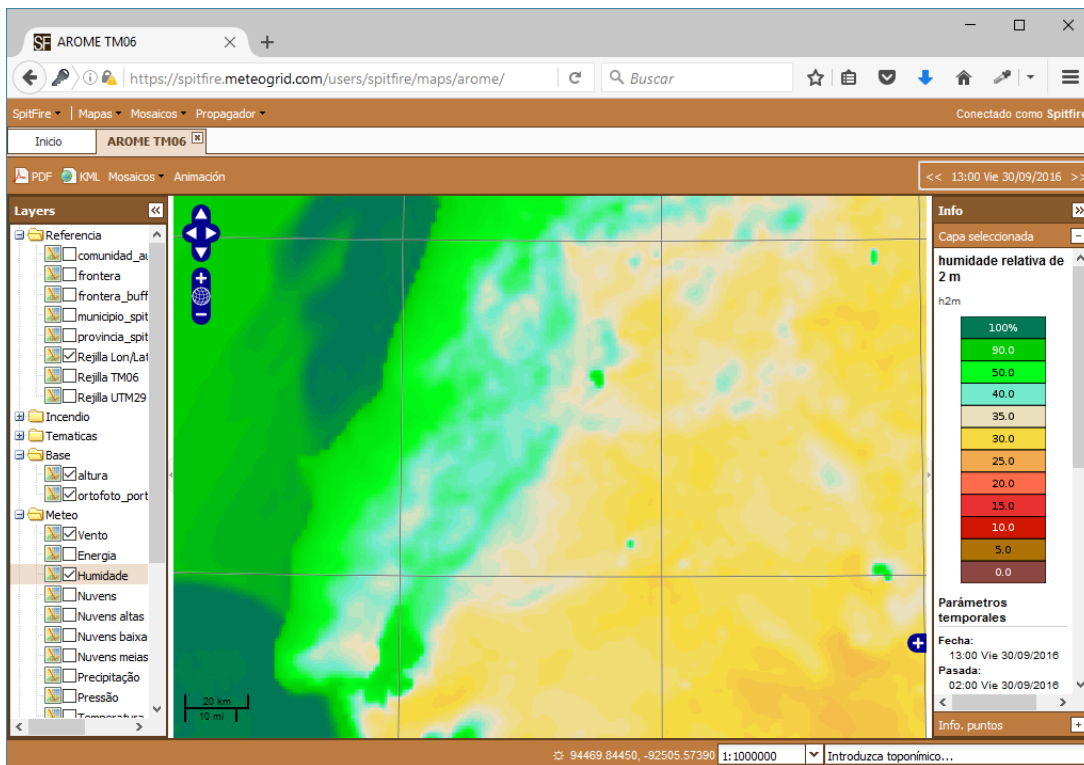
The map viewer contains the main screen and two sliding windows.

Map navigation

To facilitate the navigation on the map, in the upper left part of the main panel of the map viewer you can find the buttons:

• Zoom in:: ➕

• Zoom out: ➖

- Go to the full map scale:

- Arrows, to move on the map

- Move through the map using the mouse: Use the mouse on the map directly using the center wheel to zoom in and with the right mouse button to move on the map.

- A hidden Minimap under an icon is displayed at the bottom of the layer window to help know at all times the area of the map being displayed. The red frame indicates the box currently being displayed. You can hide it again by clicking on the icon

One with the layers and another with the information associated with the layer or points will be seen in detail below.
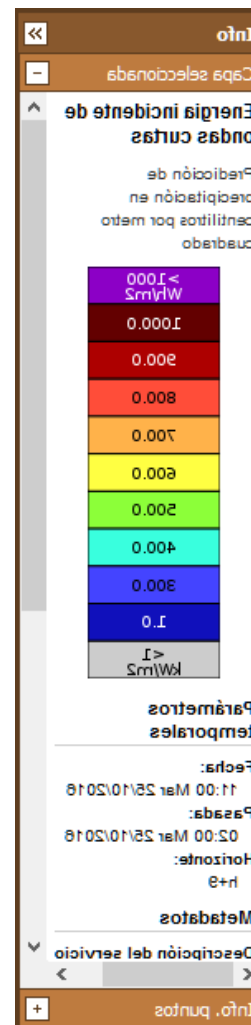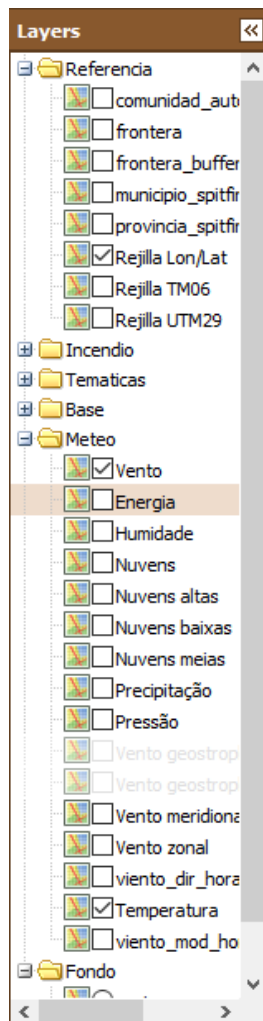
Layers window

In this window you can select and deselect the layers you want to display. You can sort them by dragging them to organize them in a more comfortable way. To drag just click on the layer and drag it to the desired area:

You can also define the transparency of a layer to simultaneously see the other overlapping layers; to make a layer more transparent and define the degree of transparency, just right click on the layer whose opacity you want to modify and select properties in the menu displayed:
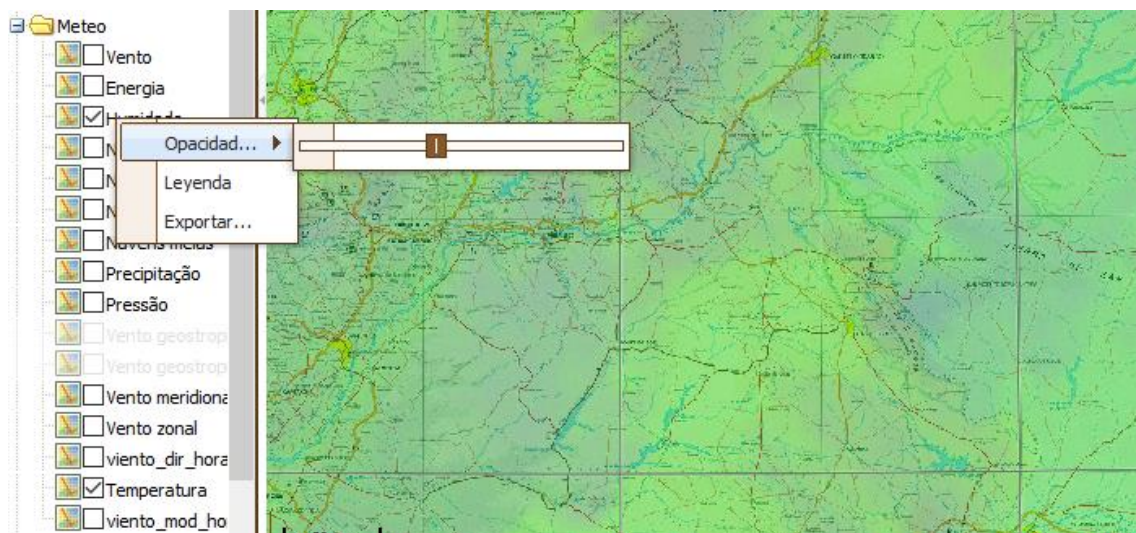
You can now move the bar to the desired transparency level, seeing the effect of the changes dynamically.

Raster layers can be exported to work with data from another application or store them. To export them place the cursor on the layer to export and press the right button of the mouse and select export in the menu. This will open a form in which the following fields must be completed:

- **Projection:** Projection in which you wish to export the image.
- **Format:** GeoTIFF is currently the only given option because it is the most widespread format, it can be consumed by many applications.
- **Method of interpolation:** Method to determine each of the variables in ways that can be played and how they affect the result, based on their statistical relationship and their causality.
- **Resolution:** Coordinate System. It is important to indicate that depending on the projection it can be in one unit or another.
- **Box coordinates:** coordinates of the area that you want to export.

When completing the data of the form the "Export" button can be pressed to generate the file.

Information Window

This window contains the information associated with a layer and depending on the layer this may contain some fields or others; they are displayed as text and are not editable. One of the data it contains is the URL to consume the layer using the WMS protocol.

It also shows a list with the points in which information has been requested; these can be consulted again by clicking on the link in the list when it is needed again:
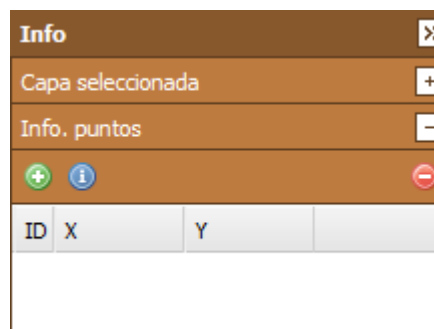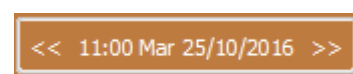

The way to obtain the information of a point is explained in the general navigation description.
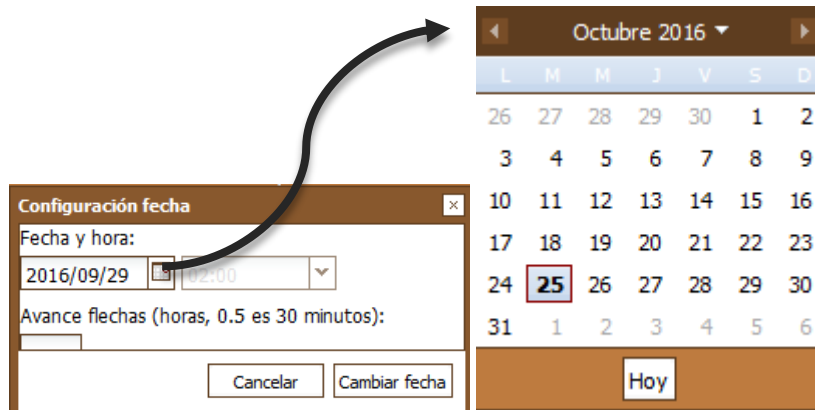
Other Functions

Horizon

It is possible to change the horizon of a map using the horizon change tool, located at the top right of the main panel of the map viewer:

Using this is simple; you can alter the horizon date using the daily scroll arrows: `<<` , `>>` or by clicking on the date to display the complete date change menu:

In this menu you can use the calendar to indicate a date. If the variable is time, it is also possible to indicate the time of the representation, otherwise the field will be protected as in the upper shot.

Scale

In the lower left part of the main panel of the map viewer we can find the scale with a representation of the scale size and a combo that allows selecting the scale of the viewer.

Search engine

Next to the scale is the search engine that allows going directly to a part of the map by indicating its name. It is a very practical tool to move quickly from one point to another.
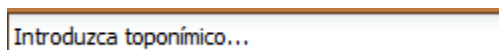
Coordinates

In the lower right of the main panel of the map viewer we can find the coordinates of the position where the pointer is located; the coordinates are only valid when the mouse pointer is located inside the map area. These are shown in the default map projection which is indicated in the title but we can change it by right clicking on them and selecting another coordinate system.
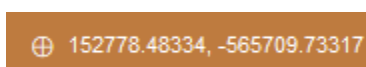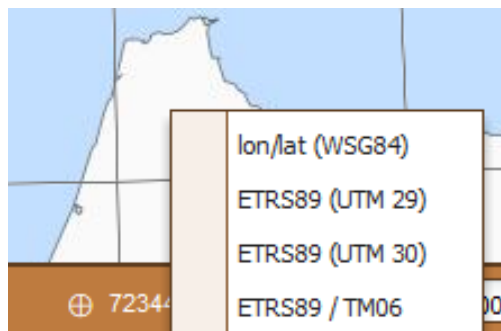
The coordinate viewer also allows you to go directly to a given coordinate, by clicking on the area in which the coordinates are displayed, the tool allows you to enter the data of the point to which you want to go. The coordinate length, x, a space character ", and the latitude coordinate must be entered; pressing enter will zoom to the desired area and highlight the indicated coordinates.

You can also modify the type of coordinates that the system displays on the screen by right-clicking on the type of coordinate to be modified in the list of available systems. By selecting one of them, the system will show the new type of coordinates.

You can also display on the screen the coordinate in which the user is at that moment by pressing the icon ⊕ located next to the coordinates. After accepting a message that, depending on the browser, will be different, it will allow to share the coordinates offered with the system or by a GPS device with the SPITFIRE application. The map will then show the user's location in the center of the map area.

Measures of areas and surfaces

When you right-click on any point on the map, the system displays a menu with several options. These include the Distance Measure and Surface Measure tool.

By selecting one of these tools and selecting successive points on the map, the system shows the total distance of the segments defined by the selected area. The distance or area information is displayed in a floating window.

ⓘ	Info. del punto
	Leyenda... ▶
🔧	Medir distancia
🔧	Medir superficie
🔍	Zoom in

Medida ✕

1106.454 km²
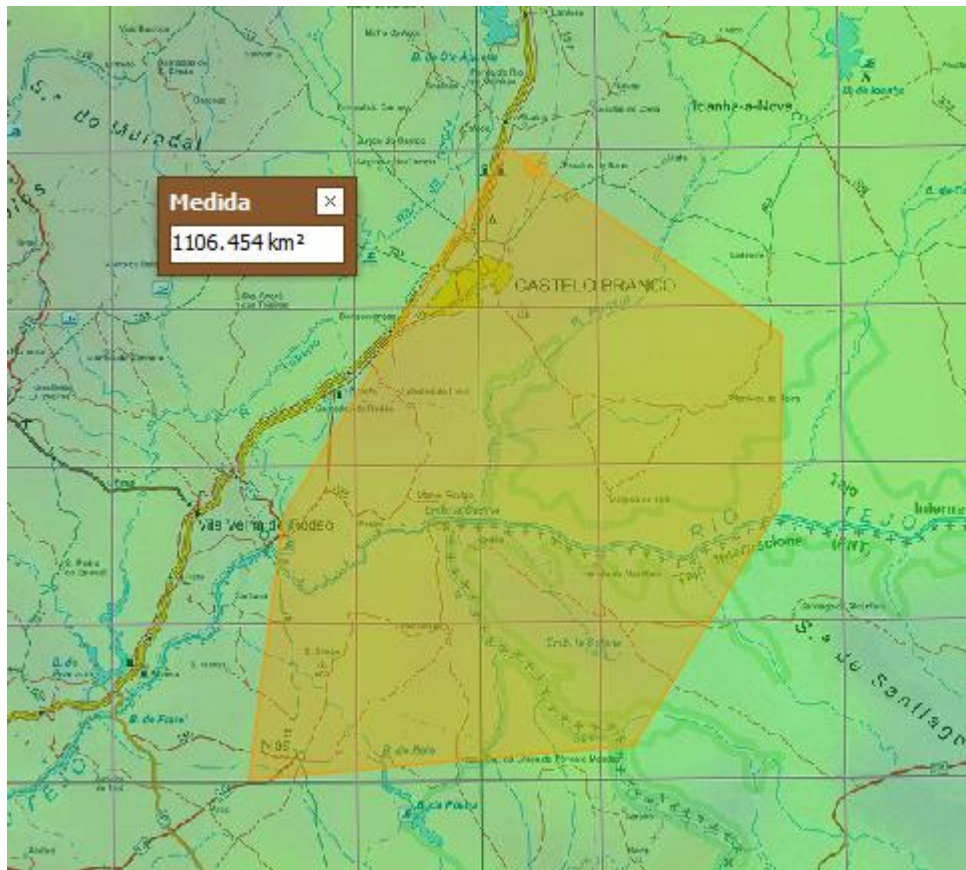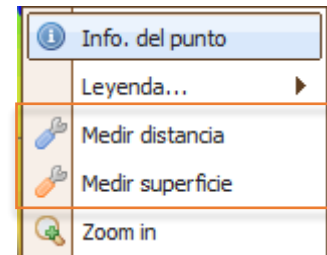
Information of a point

When you select "Info of the point ", a floating window with the information that the system has associated with that point is shown. The information shown is the one associated with active layers at the time of selection. 🔵

You can also see a graph of the time evolution of the active layer sat that point. To do so, simply select the Temporary evolution tab available in the dialog box.
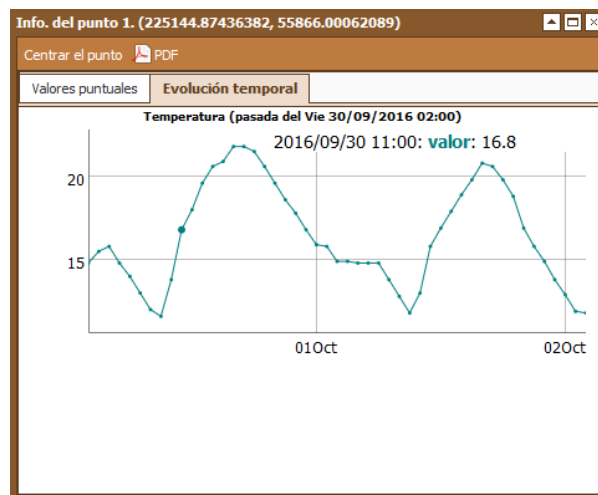
This information can be exported to PDF format by pressing the "PDF" button on the popup screen. In doing so the system displays a document in PDF format similar to the one below.

humidade relativa de 2 m

Temperatura 2 m
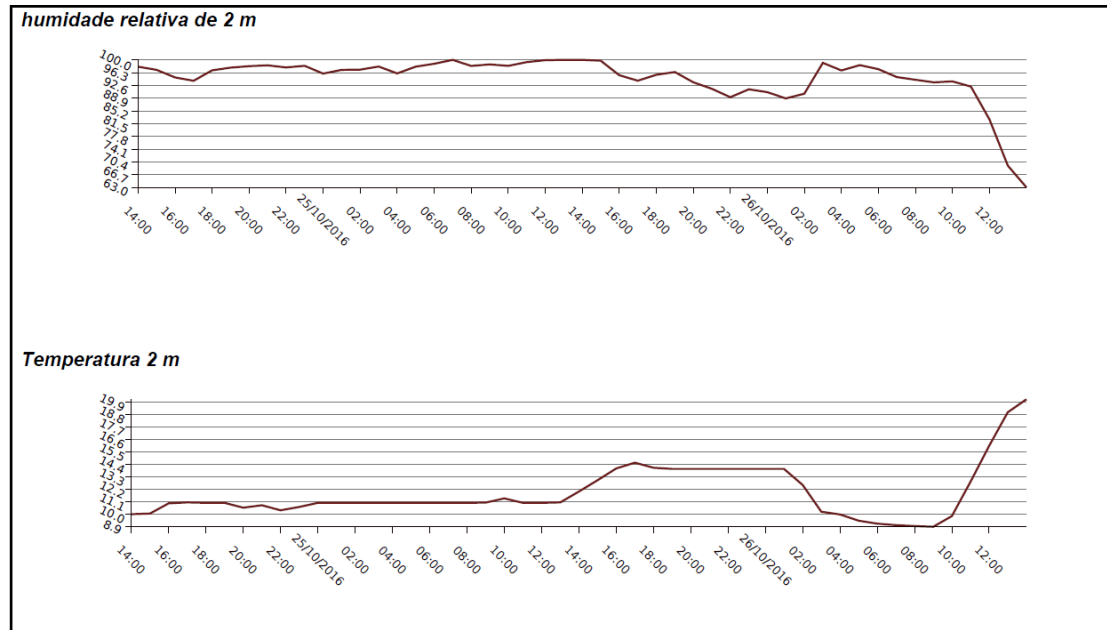
Tabla de datos

	tcc	slp	lcc	tmax2m	geopotencial_500
15:00	35.7	32767.0	33.7		
16:00	41.7	32767.0	37.0		
17:00	40.8	32767.0	33.1		
18:00	39.1	32767.0	0.0		
19:00	13.3	32767.0	0.0		
20:00	12.9	32767.0	12.9		

Mosaics

The mosaics are sets of images that allow studying the evolution of one or several layers in a visual way. These can be stored to later carry out the study by moving the time axis or leaving it fixed.

This way of presenting the information is designed so that users can access the most common information queries quickly and easily.

Open a mosaic

Access to this information can be done from three different points of the system:

1. From the top-left panel of the main page.
2. From the Mosaics option available in the panel of the different Maps defined in the platform.

New mosaic

From the Mosaics option available in the panel of the different Maps defined in the system, a new mosaic can be created.
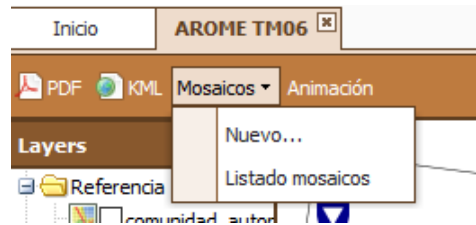
The options available are the same as those described above, except that when entering Mosaic from this option the left panel where the variables and available horizons are displayed is already displayed, facilitating their access.

Structure of the information in the mosaics

The mosaic menu allows you to create mosaics that represent different measurements with displacements on the horizon. These are presented as a sequence of images followed by each other and allow comparing and analyzing the data they represent very easily.

When you open a predefined mosaic, the system displays the previously selected horizons and variables and allows you to modify:

- The size of the maps shown
- The organization of on-screen maps
- The selected horizons and variables
- The Mosaic Print Options
- The mosaic name
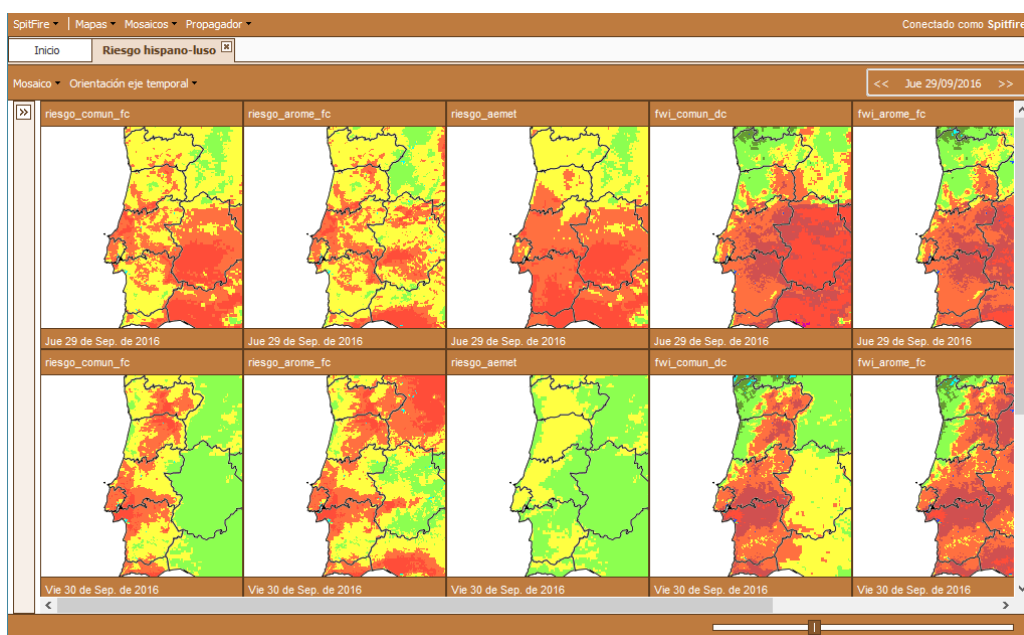
Modification of the characteristics of the maps shown

To easily modify the size of maps, a ruler is available at the bottom right of the panel. Simply drag the control to the right or left so that the size of the maps increases or decreases.

Maps can be organized so that each variable occupies a row and each time-horizon a column or vice versa. A menu option is available for this purpose.

If the selected option is horizontal, option selected by default, the system displays in each row different horizons of the same variable.

If Vertical is selected, the system displays in each row different variables for the same time horizon.

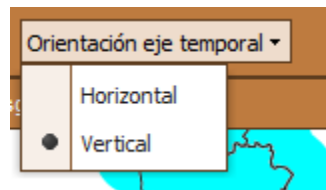It is possible to modify the area of interest shown in the maps. To do this you need to select any of them with the left mouse button. At that moment, the zoomed and pam controls are activated for the selected map, being able to move within the map to another area of interest with different levels of detail. Once the selection is finished, if the synchronization option is pressed (shown in blue in the following figure), the system will show in all the maps the new area selected. If, on the other hand, the map is left without pressing this option, the system returns the active map to its old view so that it is displayed on all maps.

Another possibility is to modify the X / Y ratio of the selected area, ie the width / height ratio of the maps. To do this, it is necessary to select the bottom corner of any map with the left mouse button. Holding down the button and dragging the mouse, the system modifies the mentioned relationship.

You can also modify the order in which the variables are displayed by simply selecting one of the maps of the variable you want to move and drag it to the place where you want to relocate it. It is convenient to minimize the size of maps before making this option, to make it easier to display as many variables as possible on the screen.

See Legend

You can check the legend of any of the maps shown in the mosaic by clicking on the map with the right mouse button and selecting the option Legend.

You can open several legends at once and drag each one of them into the screen to place it above the preferred zone.
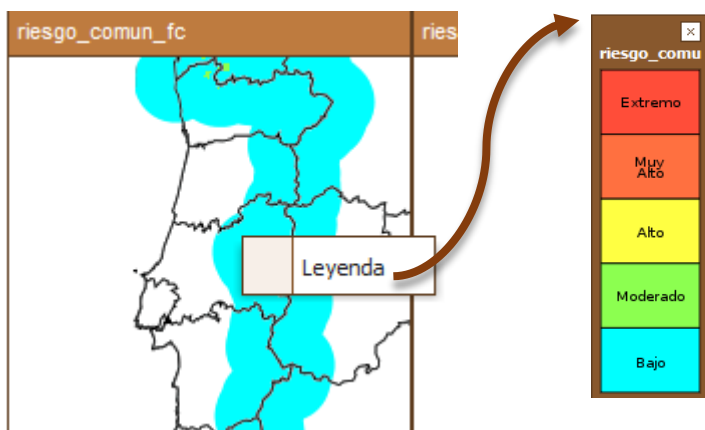
It is possible to finally modify the variables, horizons and reference layers that define a mosaic by clicking on the double arrow that appears at the top of the bar located on the left side of the panel.

Selecting this option displays the available options for generating a mosaic as well as the variables and horizons that define it.
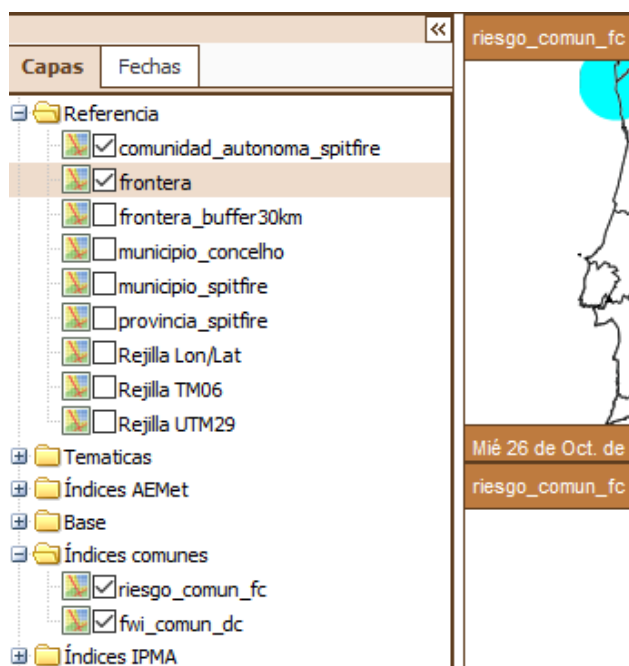
Advanced Modification

Modify variables

To add or remove a variable to the mosaic, simply select or remove the selection in the left panel where the available layers are displayed. Each layer has a geographic and temporal scope associated, so not all layers are available for all mosaics. The information is grouped according to its origin in a way that is as coherent as possible. In this way the information from the prediction systems with hourly resolution is available for the mosaics grouped under the heading of Time, while the one of daily resolution systems is grouped under Daily. There are other groups that can be highlighted:

Observations, Now-Casting, Monthly, etc.
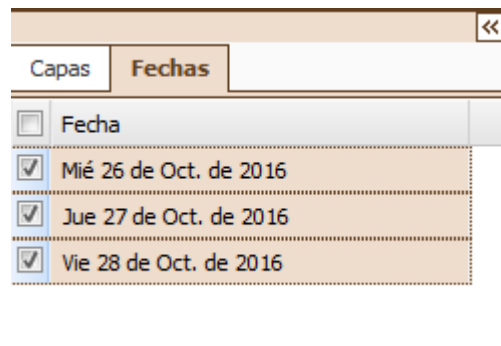
Modify horizons

By selecting the Dates tab, the system will show the available horizons for the set of available variables.

Depending on the area in which we are, some horizons or others are shown.

It is important to note that in the mosaic configuration time intervenes twice in most cases: on the one hand we find the prediction horizons and on the other the base date on which the prediction was made.

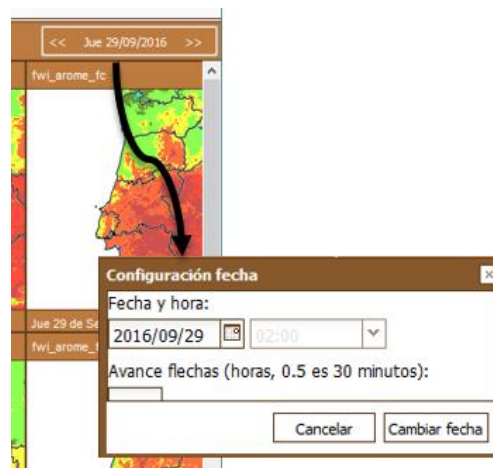The base date is displayed in the top right of the panel. By modifying this date, either by means of the scroll arrows, or by the calendar that is displayed by clicking on this control element, the horizons available in the left panel are modified, showing only the available horizons for that base date. This allows that once a mosaic for a day has been defined, the system can calculate the same mosaic for any other date, so that the user does not have to define the information that he wants to access each day.

Modify Reference Layers

They are selected and removed from the mosaic in the same way as the variables, however it is important to note that for some reference layers there is a minimum zoom level for their representation, since they can cover the information of the variables of interest or saturate the memory capacity of the browser due to the detail of its representation.

In some cases it is enough to enlarge the size of the maps so that the selected reference layer becomes visible.

Save changes.

There is a menu option that allows you to:

- Modify the title of a mosaic.
- Save the modifications made to a mosaic.
- Save the modifications made to a new mosaic, so that the initial one is preserved and a new one is created. This makes it possible to make mosaics of similar characteristics but different geographical areas easily and quickly.
- Close the mosaic discarding the modifications made.
- Print the mosaic.

It is important to note that by default none of the modifications made are saved, so that it's only if the Save option is pressed that the Title or any other option will be modified.
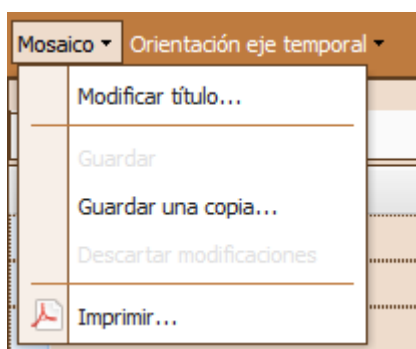

Not all users can modify the mosaics, depending on the configuration options that have been given to them, so if a message is displayed on the system indicating that it cannot perform such action, contact your system administrator.

Print mosaic

When you select the Print option available in the Mosaic menu option, the system displays a dialog box where you can define the orientation of the paper, the number of columns per page (attention if a high number is selected the system will prevent printing and ask to modify it) and if it is desired that the horizons of the same variable go on the next available line (grouped rows) or if on the contrary it is preferred that in the next row the next variable is shown with equal horizons to the first .
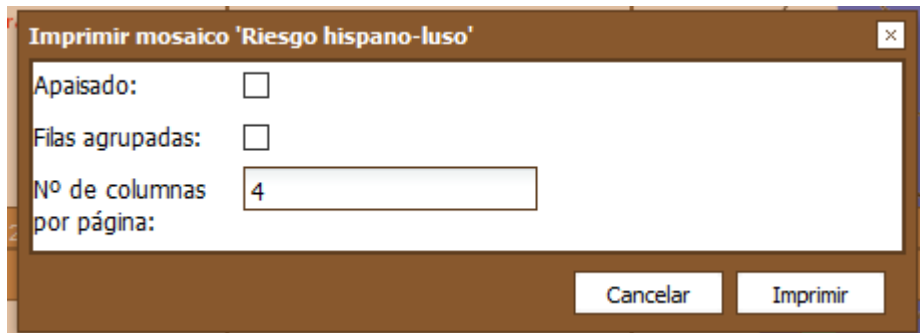
When you print a mosaic, the legend of the different variables defined is displayed.
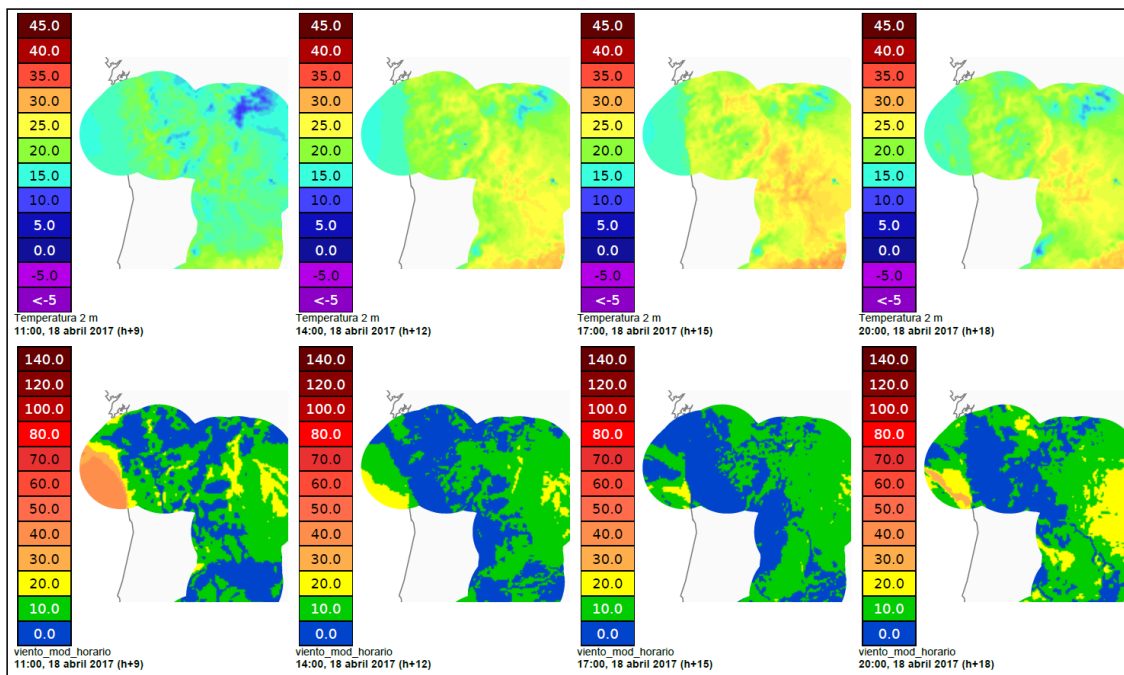

The report is generated in pdf format.

Delete a tile

It is possible to remove a mosaic that is no longer needed. To remove a mosaic go to the SPITFIRE homepage and right-click the mosaic that you want to remove from the mosaic list. A

menu will appear in which you can select "Delete". A context menu opens asking you to confirm that you want to remove the tile.

Animation

This tool shows a fast sequence of images such as a video that allows you to visualize the evolution of the data for comparison and analysis. Initially it takes a few seconds to calculate the images, after this process you can launch the animation indicating the desired frames and the speed at which they are displayed with the configuration bar.
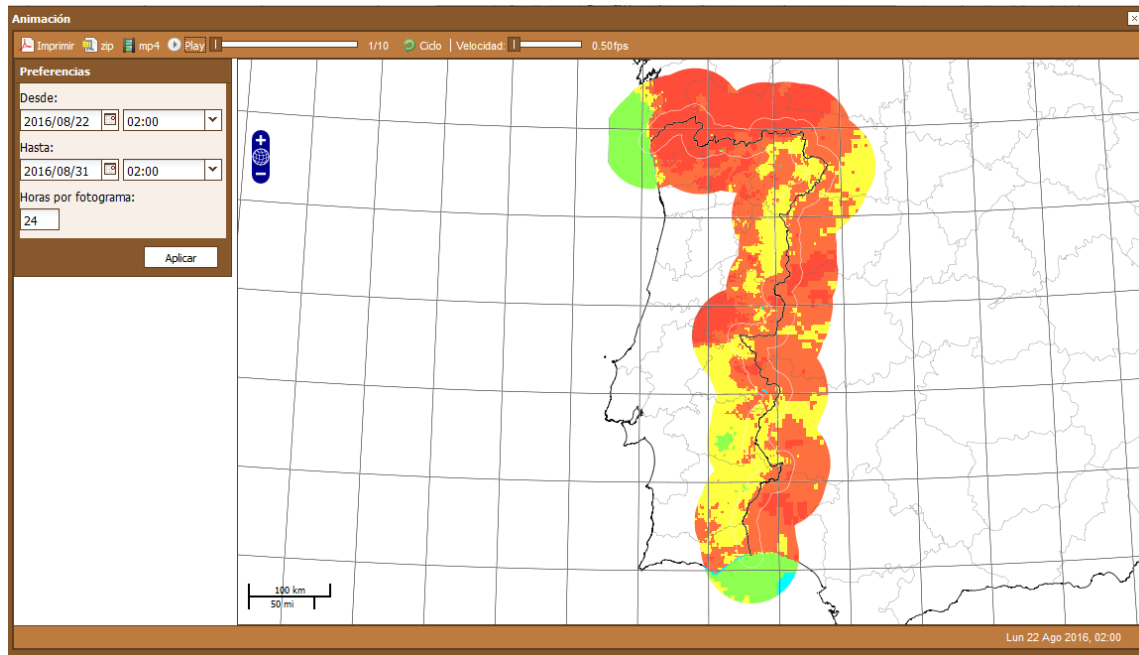
The tool has the navigational aids of the map and the scaling described below. It also has the tools of the animation located at the top and left sidebar:

- **Play:** Start animation

- **Stop:** Stop playing

- **Speed:** Frames per second that are played

- **Progress:** bar showing the playback progress

- **Date and Time:** Permits to select the start and end date to display.
- **Hours per frame:** Permits to specify the times for each frame.

Preferencias

Desde:

2016/08/22 02:00 ▼

Hasta:

2016/08/31 02:00 ▼

Horas por fotograma:

24

Aplicar

Reports

On any layer of the application you can request information about the value of the variable displayed in a point, and a pop-up is displayed with information of the value of the variable and static information of the point such as: Municipality, Province, Autonomous Community (if defined), altitude, slope, orientation, fuel model ...

One of the greatest benefits of the system is that it allows obtaining immediately a report that synthesizes the local conditions for a given area. This tool has been designed so that when there is an occurrence at any point in the territory, any information stored in the system can be accessed. Depending on the map in which we are, the system allows the generation of reports with predictions for all available horizons and for the selected variables on the screen, being able to obtain a great variety of reports:

- Daily report with the predictions for the next days of the average conditions of all the cells from the selected point except the radius entered by the user.
- Starting hypothesis used in the calculation of fire parameters: mean slope, orientation and fuel model of the analyzed area, together with evolution of meteorological variables and associated BEHAVE indices.
- Hourly report: similar to the previous one, but with hourly forecasts

All report data can be exported in PDF and its adaptation to export them to CSV (spreadsheet compatible format) is easy.

To select the desired point, it is recommended to zoom in on the area in order to locate the exact point of interest. The form requests the following information:

- The coordinates of the point, if you wish to adjust or modify
- The radius of the area of interest. By default, a radius of 1,000 m

As known, fire parameters depend to a great extent on the slope, orientation and fuel model used in their simulation. Unfortunately, the latter's data are sometimes of poor quality. For this reason, it has been considered necessary to allow a map of the environment in which the fuel model can be included in the report together with the starting assumptions used in calculating the fire parameters. Thus, the manager can check if the data used correspond to

the reality he sees in the fire itself, or if the fuel model does not coincide (because there have been changes in land uses, silvicultural treatments, etc., that have modified the quantity and distribution of the combustibles), or the slope and orientation of the report, which is the average of the pixels that are far less than the selected radio, does not correspond with the area that is burning at that time. Thus the degree of credibility that can be awarded to the predictions of fire parameters will be easily estimated.

On the other hand there is the possibility, as described above, to generate mosaics showing the evolution of several variables at different time horizons, if each user can preset the most used mosaics for easy generation or generate the mosaics by demand at any time.

A predefined report is also available in the area of spread to analyze the magnitude and characteristics of the scheduled fire with the information from the burned area and with the evolution of the parameters of the fire.

Also in the rays department it is possible to generate a report with rays registered during the period by the user, both on the current and previous days.
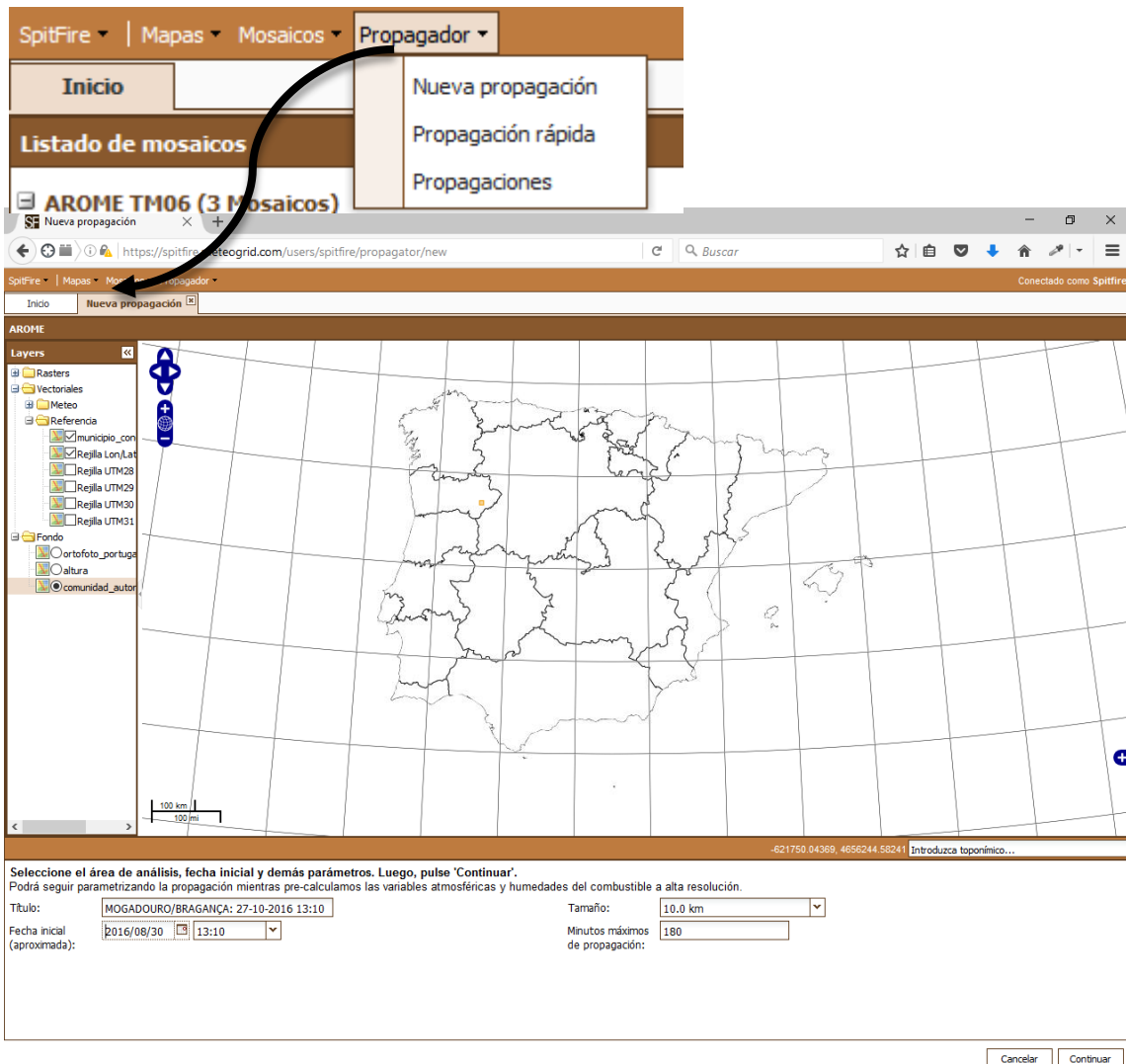
It should be noted that for all types of reports mentioned, you can generate reports for both the current scheduled situation as well as historical situations, thus being able to generate information for forensic use or to analyze past situations of interest.

All reports can be exported to PDF format, thus allowing you to file or print them.

4. Propagator

SPITFIRE provides a powerful tool for simulating fires. This allows you to see their progression and the study of the measures taken to extinguish it. It is intended both for forensic use as prediction and the study of strategies during the development of a fire.

 To access this functionality you must press on the "propagator" control in the system menu bar.

In doing so a floating window opens, it contains a display with the usual navigation tools on the map, search for regions by the place name and search for UTM coordinates. It may be helpful to display the mini-map as shown in the capture by pressing the "+" button at the bottom right of the map.

You can drag the frame that determines the area where the fire is simulated to adjust it easily to the area of interest.

Once the map and framework in the area are centered where they will simulate fire, the only remains part is to give it a title, an approximate starting date and the duration of the propagation.

After completing the data and pressing the "Continue" button, the system displays full screen with all the tools of the propagator and the fuel model within the framework of propagation. You can access other layers by selecting them in the sidebar as usual.
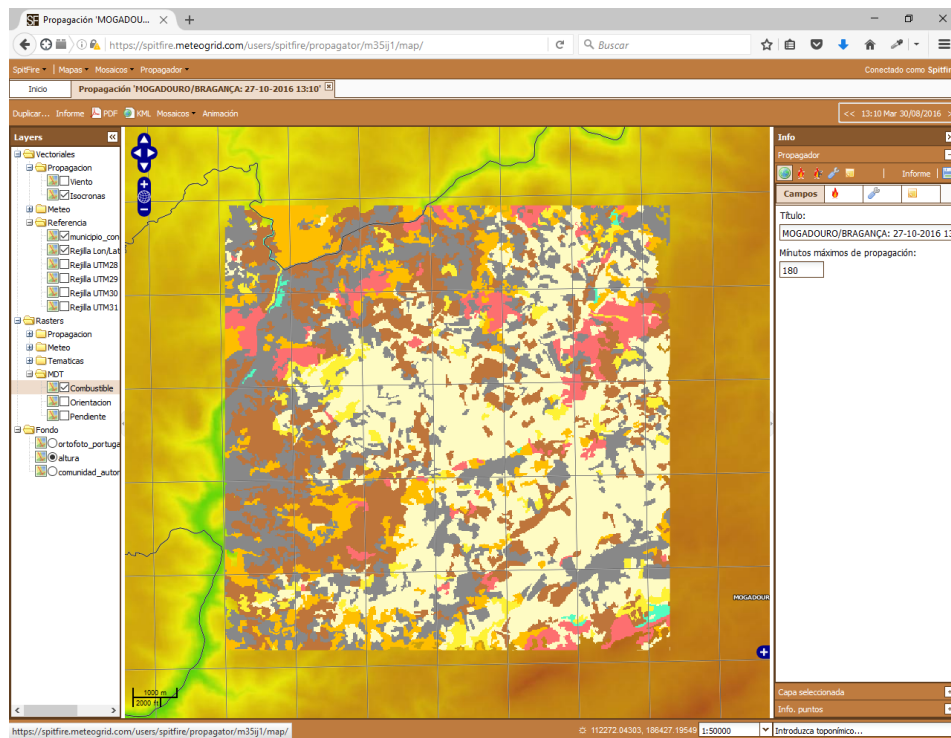
Navigation controls and Modification

There are several controls, located on the top left of the map that let you navigate this. You can also turn on and off layers using the left sidebar, filtering the information of interest.
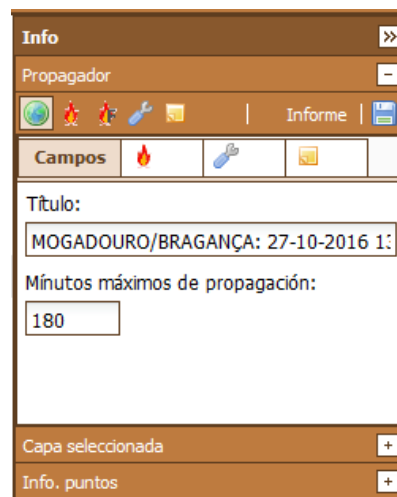
We must take into account a major constraint: the geographical area shown when entering the propagator is the active area for the simulation to perform, so if there are outbreaks outside this area they will not be taken into account in the simulation. Similarly fire spread is calculated only for points inside the area.
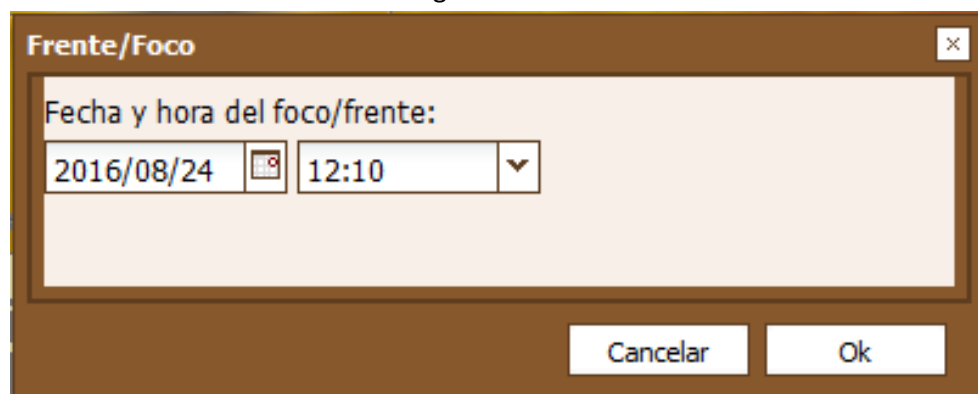
In the right sidebar are several tabs and in one are the parameters of the propagator as we will see in detail in the following sections.

Main bar of the propagator

In the main bar are the buttons that allow the realization of the following actions:

- **Disable the propagation tools or go back to those of negation:** This is when a propagation tool activated previously is no longer needed.
- **Draw new outbreak:** This tool allows to insert a dot representing a focus on the map. To insert the point you just have to move the mouse over the place on the map where you want to insert and click the right button. After a window where you have to input the approximate time of start of the outbreak will open. This will spread during the simulation starting from the initial time indicated when inserting the point.
- **Draw a new front:** Tool to insert a front in the simulation. There are two ways to use it: the first is clicking multiple times with the left button tracing the vertex of a polyline and pressing double click the same button to end the path. The second way is to press the SHIFT key and then draw a polyline leaving the left mouse button, releasing when the path is terminated. After a window where you have to input the approximate start time of the front will open. This will spread to the simulation starting from the initial start time indicated when inserting the focus.

- **Draw a new setting area:** This tool allows you to draw a polygon with as many vertices as clicks to the right mouse button are made, covering the desired area. When a double click is made, the layout of the polygon will be completed and the form of adjustments that affect the area covered by the polygon drawn will open. The form of adjustments is detailed in the "Settings" point described in the lines below.
- **Draw a new note:** A tool that allows you to insert an entry in a point on a map can be viewed later by any user accessing the spread.

- **Apply changes and relaunch propagation:** This button stores the changes made and makes the spread.

Information

The information tab allows us to modify the maximum propagation minutes. The maximum value is 1440 minutes as the simulation would be too costly and reliability of the results could be impaired.

Can also found in the right sidebar the selected information layer and the information with their listings; the use of these is the same as explained above therefore it will not be discussed again here.

Spotlights and fronts

This tab shows the list of the lights and fronts inserted in the simulation; the bar tab provides us the following tools:
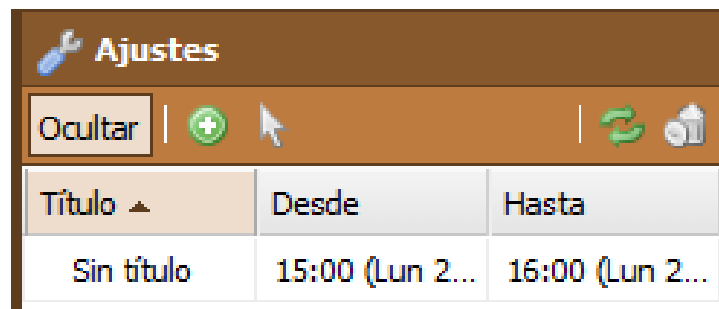

- **Hide / Show:** Selecting a focus or front of the list you can hide or show this.
- **Add a focus for coordinates:** If you know the coordinates of a point you can insert them using this tool.
- **Select focus or front:** Using this tool you can use the mouse to select a focus or forehead on the map.
- **Discard last modifications:** Allows to reverse the changes made in error.
- **Remove focus / front:** Allows to Remove from the list the selected focus or front.

Settings

This tab shows the list of settings of the areas and the entire simulation; the bar tab provides us the following tools:

- **Hide / Show:** Selecting a focus or front of the list you can hide or show it.
- **Add all the adjustment to area of simulation:** Allows you to define settings that affect the entire area.

- **Select setting:** Using this tool you can use the mouse to select a setting on the map.
- **Discard last modifications:** Allows to reverse the changes made in error.
- **Remove adjustment:** Allows to Remove from the list the selected setting.

The settings form can insert changes in values that alter the calculation of the spread, this being practical to adjust to peculiarities of the terrain that does not reflect the simulation or other peculiarities that are difficult to collect without a very high knowledge of the area. They also simulate other behaviors such as the alteration of the soils moisture by using a fire prevention system or fuel terrain by creating a trench or firewall during the development of a fire; these and other modifications are contemplated by the propagator giving it a great power and endless possibilities.

Annotations

This tab shows the list of entries; the bar tab provides us the following tools:
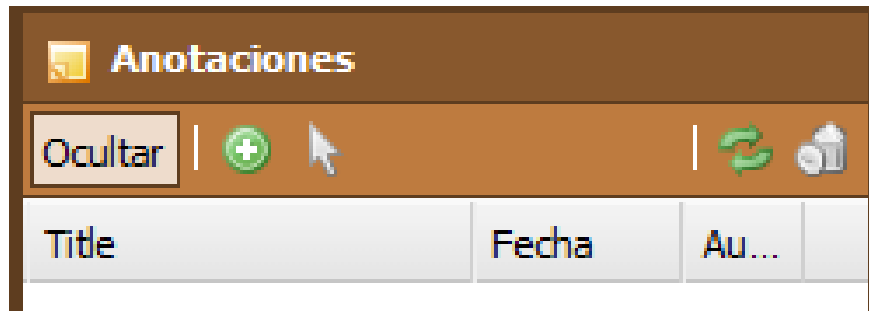
- **Hide / Show:** Selecting an entry from the list you can hide or show it.
- **Add note of coordinates:** Inserts a note using the coordinates.
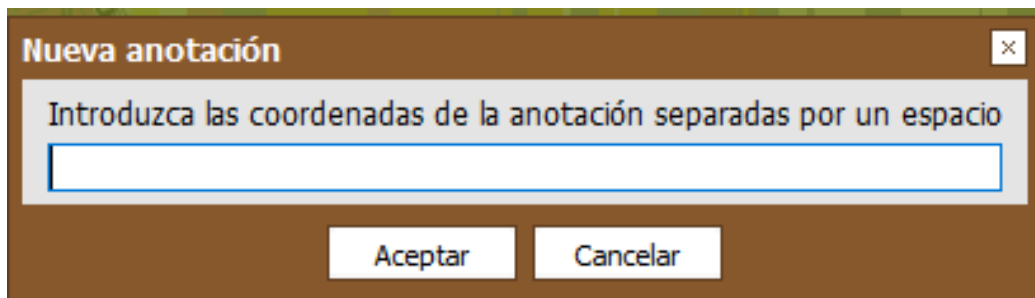
- **Select note:** Using this tool you can use the mouse to select a note on the map.
- **Discard last modifications:** Allows to reverse the changes made in erroneously.
- **Delete Note:** Deletes the selected note.

The system re-calculates the parameters of fire in the area defined with a 20x20 meters spatial resolution, interpolating meteorological variables at the same resolution.

Finished the calculation, the system presents in full screen all the propagators tools and fuel model within the framework of propagation. You can access other layers by selecting them in the sidebar as usual.

Report

From the menu bar to the right of the tab you can generate the report on the affected area and the evolution of the parameters of the fire.

Clicking on the button Report, a floating screen with graphs of the development of the fire opens. Three representations of the evolution of the layers exist; linear intensity, heat per area unit, maximum propagation speed, length of flame and fuel.

Differential:
Representation at 15 minutes intervals in which only the value of those 15 minutes is shown for each variable.
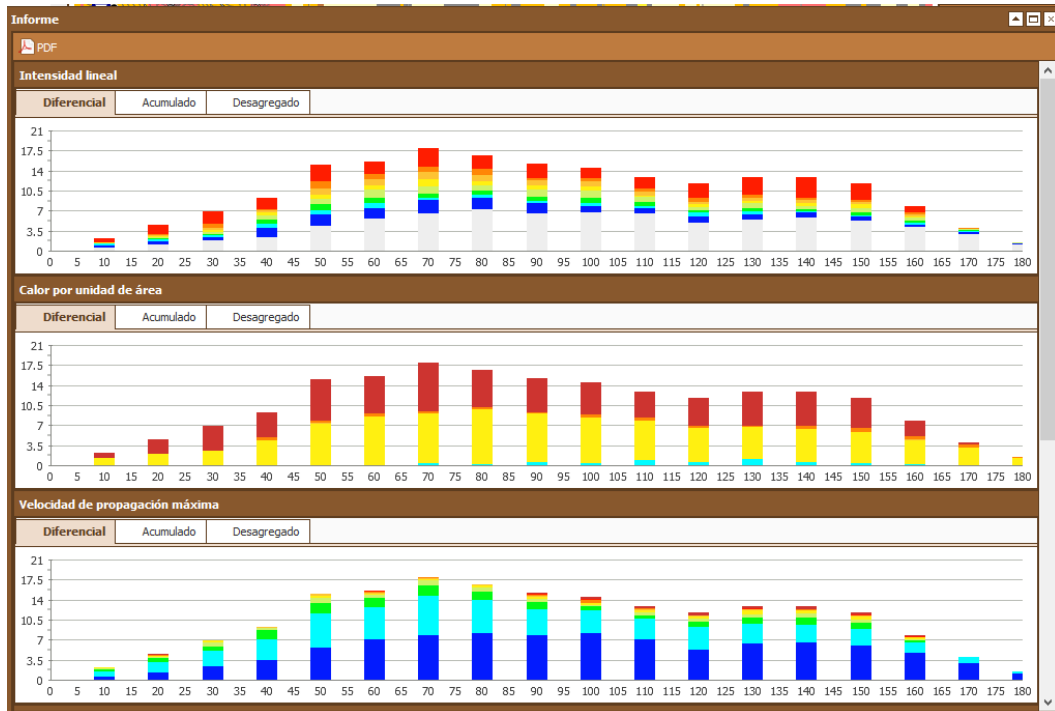
Accumulated:

Representation that accumulates the value of the above range to the value of the current; this
is always growing.

Disaggregated:

Bar representation of each range of values per layer.
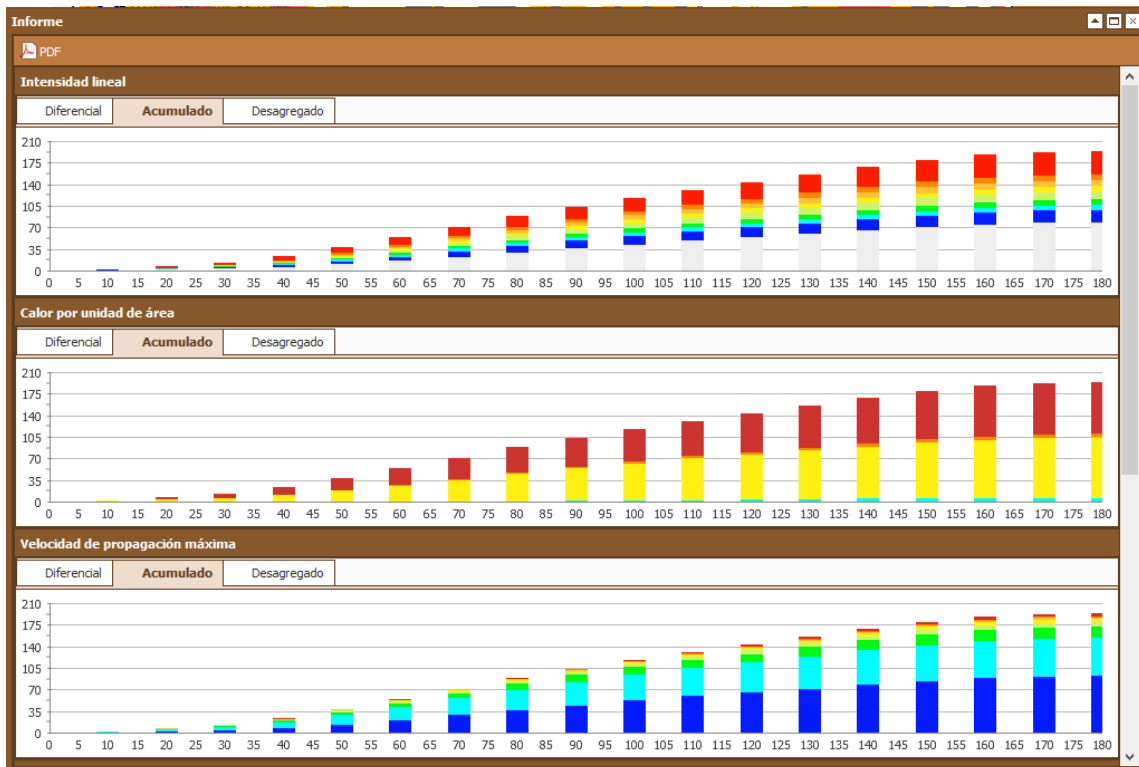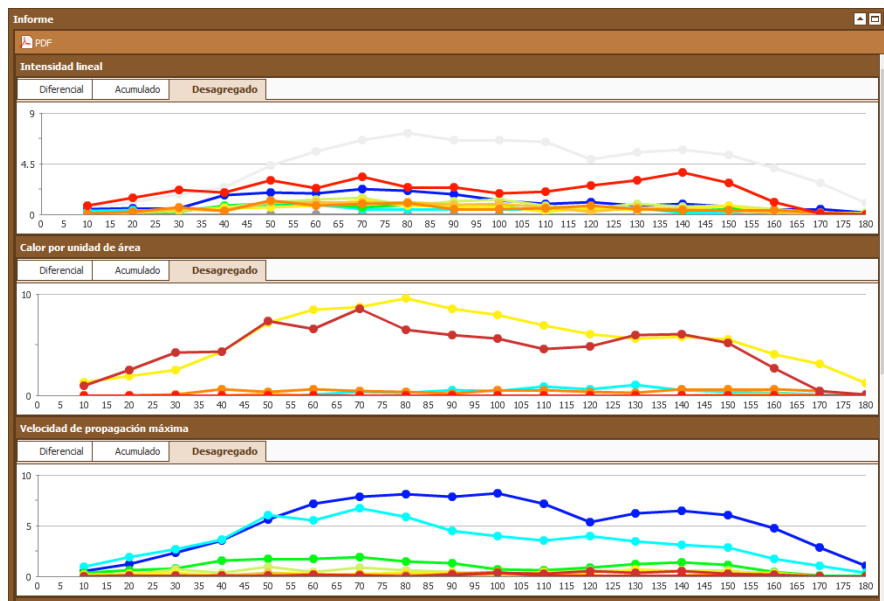

Animation

In the menu bar area of the active map is available the image animation, which works the same way as the map animations explained above. This option lets you generate sequences of images of the fire evolution. It is important to select the variables you want to see in the animation before. It is recommended that between selected variables are both Isochronous and times, so that the animation shows at what time the fire reaches every area.

It is also important to check that the date and time of the active map is appropriate since otherwise the utility of the animation is not activated.

Clicking on the button Animation the system displays a pop-up and if you click on the bar to the left of it, a dropdown where you can select the desired period of animation and the interval between images is displayed. It is necessary for the start time to be the same as the

one we initially simulated and the final time the one also indicated in the calculation of time of the minutes that we dedicated to the simulation. For example, if it was decided that the start time was 15:30 with a total simulation time of 180 minutes, we should put 18:30 as the maximum time. The layer that will be animated will be the "Times" one.
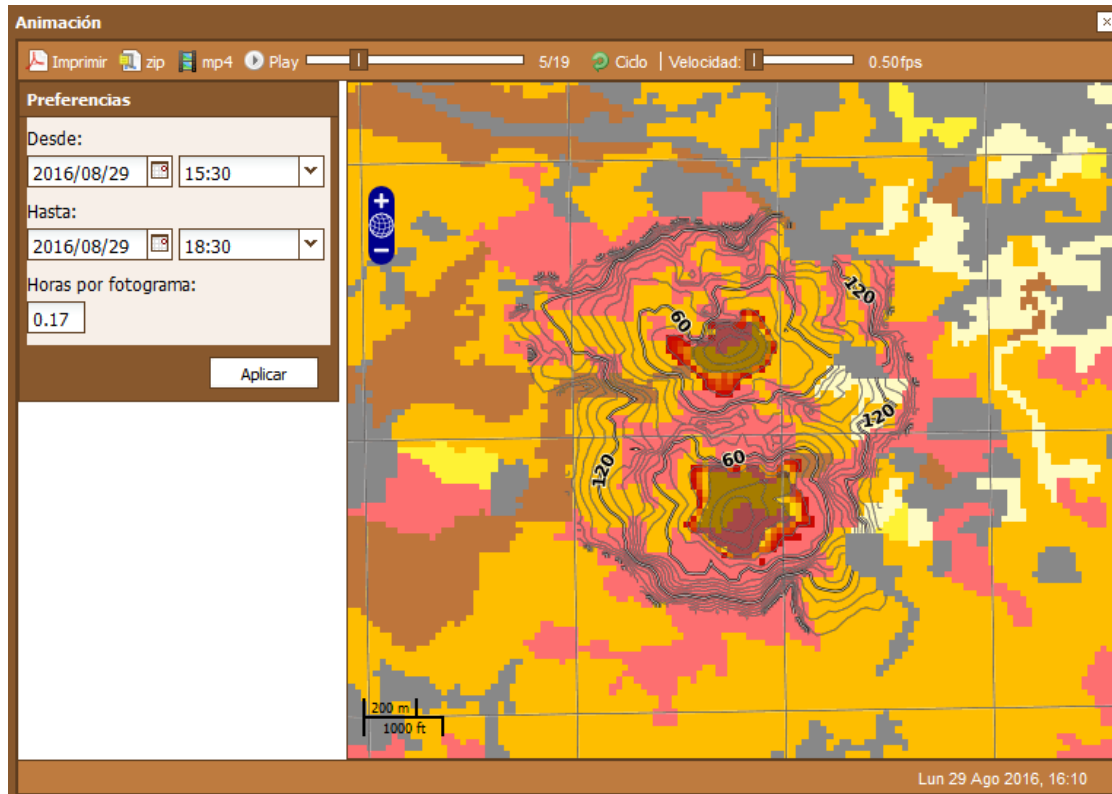
 By pressing the Apply button and after that the Play button, the system obtains the images to be displayed and then displays them on the screen. It is recommended to press the Cycle button so that when the images finish loading they are automatically displayed, otherwise you need to press the play button a second time to view the images.

At any time you can press the Stop button to stop the image or change the speed in which they are shown.

Access to Generated Propagations

The access to the propagations stored in the system is done from the option propagator/propagations of the menu.

You then reach the selection screen spread. The system displays a screen where the propagations stored in the system are listed.

Pressing (with a double click) on any of them you can access the propagator screen with the generated simulation.

Delete a spread

From the Propagation list you select the spread you want to delete with the right mouse button and click delete from the pop-up menu. A context menu will be displayed requesting confirmation.

Título	Fecha inicio
MOGADOURO/BRAGANÇA:	Mon Aug 29 2016 15:30:00 GMT+0200
La Vídola/Salamanca: 20-10	Eliminar...	Mon Oct 03 2016 12:03:00 GMT+0200
El Cañavate/Cuenca: 10-10-2016 22:46	Mon Oct 10 2016 23:46:00 GMT+0200

5. 5. External Interfaces:

You can access the system data without using the SPITFIRE web interface. The following services are available for that:

WMS

The Maps Publishing Service (WMS) produces maps dynamically from the geographic information vector or raster presenting the information as digital images that can be displayed on screen. The display image is usually in raster format: PNG, GIF or JPEG, and occasionally represented as vector data format *Scalable Vector Graphics* (SVG) or *Web Computer Graphics Metafile (*WebCGM). The displayed maps can overlap each other, as long as the geographic parameters and output size are the same. Using formats that allow transparent background (eg GIF or PNG) allows simultaneous display of these maps. Through overlapping maps obtained from different servers it is possible to create a network of distributed services, whose clients will make custom made compositions.

Operations

This international standard defines two kinds of modes of operation, one for a basic WMS and another for a consultation WMS. In turn each has two subclasses, one for customers and one for servers.

The basic WMS must support basic service elements (version, HTTP requests and responses, numeric and boolean values, specific output formats, coordinate systems, query parameters and response, and exceptions), the *GetCapabilities operation* and the *GetMap* operation. It sorts the information held in "Layers" and offers a number of "Styles" with which you can display those layers. This International Standard only supports defined Layers and Styles, which does not include definition of symbols mechanisms by the user.

The consultation WMS must meet all the requirements of a basic WMS and support the *GetFeatureInfo* information.

To personalize the symbolization, OGC has defined the [Styled Layer Descriptor (SLD)](#) specification, or description of layers styles, which allows the temporary or permanent definition of symbolization to view data via WMS.

WCS

This service allows the collection of geospatial data as "coverage", that is, digital spatial geographic information that represents spatial variation phenomenon (continuous distribution), so that they are useful for representation or as input of scientific models.

Like the *OGC Web Map Service (WMS)* and *Web Feature Service (WFS)*, this allows the customer to select some of the information, owned by the server, based on different criteria, such as space restrictions.

The main difference with the WMS is that the WCS service provides data with its original semantics, which allows them to be interpreted, extrapolated, etc., and not only represented statically.

The main difference with the WFS is that it returns discrete geospatial phenomena, while the WCS provides coverage that reflects spatial variation phenomenon and relates the space-time domain with a range of properties (possibly multidimensional).

This specification version is limited to requests and descriptions of coverage of regular grids (grid coverage). Although the interface has been designed so that in future versions it will be possible to develop other types of defined coverage in *OGC Abstract* *Specification.*

The coverage of regular grids have a domain composed of regularly spaced locations along 0, 1, 2 or 3 axes of a system of spatial coordinates. Said domain may also have temporal dimension, which can be regularly or irregularly spaced. Coverage defines, for each location in the domain, a set of fields that can be scalar values (as elevation) or vector values (such as brightness values in different parts of the electromagnetic spectrum). These fields and their values are known as coverage ranges.

Operations

The WCS service provides three operations whose implementation is mandatory by the server. These operations can use HTTP GET with KVP codification or HTTP POST with XML or SOAP codification; it is through the capabilities document that they indicate what type of POST codification the WCS server supports.

The parameters defined below belong to 1.1.1 of this standard, while the examples given are performed with WCS 1.0.0, being the ones implemented to this day. The differences in notations and basic variations possessed by the 1.1.1 regarding the 1.0.0 are:

1. Using *GridCRS* in coverage requests descriptions
2. hierarchical description of the coverage
3. Multiple fields by coverage
4. XML responses and optionally asynchronous responses (storage of responses)

Get Capabilities

It permits to get the XML capabilities document, which describes the characteristics of the service and which normally includes a brief description of the coverage offered. In case the returned XML document does not contain a description of the coverage it contains, similar information must be available on a separate source, such as an image catalog.

Describe Coverage

It returns an XML document with a detailed description of one or more coverage supplied by the service.

The XML document returned to the description of coverage must contain:

1. *Identifier*: unique identifier of the coverage.

2. *Domain*: Definition of the spatial and/or temporal domain for the localization of the coverage.
3. *Range*: Defines the value range and the type of properties (categories, measures, etc.) assigned to each location in the domain.
4. *Supported CRSs*: base CRS ratio defined for each GridCRS used by the *GetCoverage* operation to express the coverage it contains.
5. *Supported Formats*: Formats in which the coverages can be returned in response to a *GetCoverage* (eg GeoTiff, HDF-EOS, NITF, CF-Net-CDF).

Get Coverage

This allows a coverage or part of it. It is therefore necessary to indicate any or all the basic features that define the subset of data required, ie, the domain, the range of values, type of resampling, the data format and method of delivery of the result. This first requires you to know what the definition of the type of coverage that has the service through the *Describe Coverage* operation.

By default, all coverage components requested through this operation are returned directly in the response. Optionally the service can implement the possibility to store coverage components as a resource accessible via the Web, in which case the answer would include reference URL to this resource, as long as indicated in the petition that the results must be stored.

Processing a *GetCoverage* operation can be understood conceptually as a sequence of operations whose fundamental scheme would be:

1. Perform a coordinate transformation (including spatial scaling) in the CRS desired, by resampling with spatial interpolation.
2. Generate a subgroup of spatial data.
3. Generate a subgroup of temporal data.
4. Generate a subgroup of properties (range).
5. Convert the data to the requested format. Depending on the format, it may be necessary to interpolate the values that each location has in the original coverage, as a result it is likely that loss of precision occurs.
6. Output results of a sample of coverage.