

# FOREST FIRES IN SOUTHERN EUROPE

## Bulletin of the 2000 fire campaign

European Forest Fire  
Information System:  
*Forest Fire Risk Forecasting*  
*Forest Fire Damage Assessment*

DG Environment: Dir. B  
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## I. INTRODUCTION

The public awareness on the issue of natural hazards is increasing every day. The EU and international organizations are realizing that there are means to reduce or minimize the damage caused by natural disasters. The first step in this direction is the characterization of areas subject to suffer damages. This involves the use of analytical tools to infer the risk of natural or human induced hazards.

In particular, in the case of forest fires, the EU has suffered in the last years enormous losses in terms of human life and environmental damage. Forest fires are the result of strong tensions in landscape use and management. The high densities of population in suburban or tourist areas increase the risk of fires due to negligence or accident. Rural exodus and extensification of agriculture and livestock breeding increases agricultural and pastoral burning in order to contain natural re-afforestation. Economically not very profitable, the forests are often used for waste dumping and quarries. Forests are also crossed by electricity cables, railways and roads networks increasing the risk of fires. All these reasons explain the increasing trend of the number of forest fires in the last years. The growth of cities in their neighbor natural areas has also increased the number of fires in the urban-forest interface.

Indicators of forest fire risk are normally developed at the local or national levels. Until recently no mechanisms existed to estimate the risk of forest fires at the EU scale. This was due to the lack of regional data sets for the estimation of fire risk and to the lack of regional information of forest fires that would necessarily be used for the calibration and validation of the proposed fire risk indices. Experts on forest fires know by experience that the distribution of forest fire events is not random. Fires tend to occur where they have historically taken

place. However, the impact of recurrent forest fires on the EU Mediterranean regions has never been evaluated. No harmonized cartography of forest fires for the EU Mediterranean region exists. European data sets come from the aggregation of heterogeneous local and national databases, in which data are collected in different ways with very diverse methods. Although the EU data permit observing some insights of the fire phenomenon, they do not permit a harmonized assessment of forest fire damage.

Aware of this problem, the European Commission (EC) and the Standing Forestry Committee decided in 1990 to set-up a Community forest-fire information system in order to monitor the forest fire phenomena at EU level. The European Commission reinforced this action in 1997 by setting up a research group to work specifically on the development and implementation of methods for the evaluation of forest fire risk - and for the estimation of burnt areas at the European scale. This group is since 1999 working as part of the Natural Hazards project of the Space Applications Institute of the EC DG Joint Research Centre. The work has focused both on the development of systems to provide forest fire risk forecast on the basis of existing fire risk indices, and on the development of new integrated forest fire risk indicators. Five types of forest fire risk indices, from long-term (static) risk indicators to short-term (dynamic) risk indicators have been implemented. All these indices permit the harmonized assessment of forest fire risk at the European scale. These may be used as tools for the assessment of risk situations in cases in which international cooperation in the field of civil protection is needed. In addition to evaluating the fire risk, an activity to estimate the annual damage caused by forest fires in the south of the EU was established. This activity has produced the first cartography of forest fire damages in the south of the EU. In the year 2000, all the burned areas larger than 50 ha, which account for about 73 % of the total area burnt every year, were mapped using satellite imagery. Further, the analysis of which types of land cover classes were affected was performed.

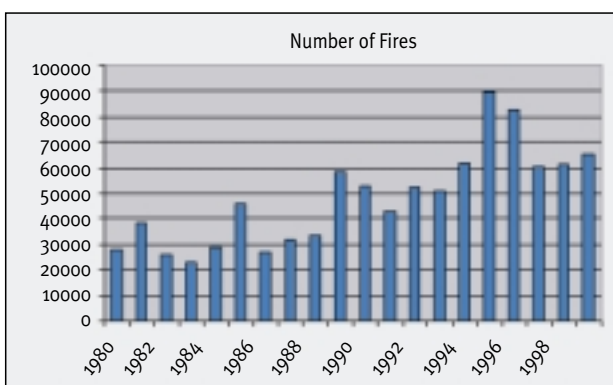


Figure 1. Number of fires in southern Europe per year.

## II. LEGAL FRAMEWORK

Pursuant to the Council Resolution on improving mutual aid between Member States in the event of a natural or a man-made disaster<sup>1</sup>, the Commission was called for improved means for prevention and detection of forest fires and for a better exchange of information in that field. The Council resolution on Community cooperation on civil protection of 23 November 1990 also called upon the Commission to develop such actions<sup>2</sup>. These requests have been underlined in 1998 by the European Parliament calling the Commission to draw up a strategy for preventing and fighting forest fires with measures to secure greater coordination and cooperation between Member States<sup>3</sup>.

Pursuant to Council Resolution on a forest strategy for the European Union<sup>4</sup> the Council noted that research activities on forestry help to encourage innovation.

In addition, in the context of Community cooperation in the field of civil protection<sup>5</sup>, the Commission, in agreement with the national administrations involved, took initiatives in the field of forest fire-fighting. A specific initiative has been formulated in order to improve the preparation of the various players involved in combating forest fires and to create and maintain a framework where Member States can cooperate in the most efficient and rapid manner. Among the actions taken, procedures have been implemented since 1992 to exchange daily information on risk levels in the Southern Member States of the Union as a basis for Community cooperation in this field. During the 1998 'Forest Fire Expert meeting' of Directorate general Environment, the representatives of the Mediterranean countries expressed the need to develop a common approach to harmonize the risk indices so far used by the individual Member States and to improve the dissemination lines between them. The European Union contributes with the "European Forest Fire Risk Forecast System" (EFFRFS) that has been developed by the Natural Hazards project of Directorate General Joint Research Centre.

From 1979, the Community started to make a financial contribution to forest fire protection measures under rural development policies through the EAGGF. Furthermore, Regulation (EEC) n° 3529/86<sup>6</sup>, specific to the protection of forests against fires, was adopted by the Council in 1986 to ensure co-financing of forest fire actions presented by Member States. In 1992, the council decided to strongly reinforce this specific action through the Regulation (EEC) n° 2158/92<sup>7</sup>, which foresees:

- To concentrate Community contributions in the areas of fire risk, which implies Member States communicating their lists of areas of high and medium fire risk,
- To call on Member States to present their general forest-fire protection plans to the Commission, describing the systems of protection, the account of fires, the analysis of the causes and the means to eliminate them, as well as the objectives to be attained,
- To reserve the Community's finance to programs and projects included in the plans, according,
- To make the financing of forestry measures in high and medium risk areas conditional upon the adoption of the plans,
- To create a forest fire information system to monitor and evaluate the effectiveness of the measures taken.

Renewed for five years in 1997, these regulations permit to allow more than 110 millions Euros to forest fire projects and programs.

In addition, and according to the Regulation (EEC) No 2158/92, the Commission adopted in 1994 Regulation (EC) No 804/94<sup>8</sup>, introducing a Community system of information on forest fires which made the collection of a minimum set of data on each fire (the 'common core') a matter of routine for all risk areas in the Member States. Now, the information system covers 320 provinces in six Member States (Germany, Portugal, Spain, Italy, France and Greece) and contains information about more than 600.000 fires recorded from 1985 to 1999.

<sup>1</sup> OJ No C 315, 14.12.1990, p.3.

<sup>2</sup> OJ No C 315, 14.12.1990, p.1.

<sup>3</sup> OJ No C 313, 12.10.1998, p.

<sup>4</sup> OJ No C 56, 26.2.1999, p.1.

<sup>5</sup> OJ No L 8, 14.1.1998, p. 20 and

OJ No L 327, 21.12.1999, p.53.

<sup>6</sup> OJ No L326, 21.11.1986

<sup>7</sup> OJ No L217, 31.7.1992

<sup>8</sup> OJ No L93, 12.4.1994



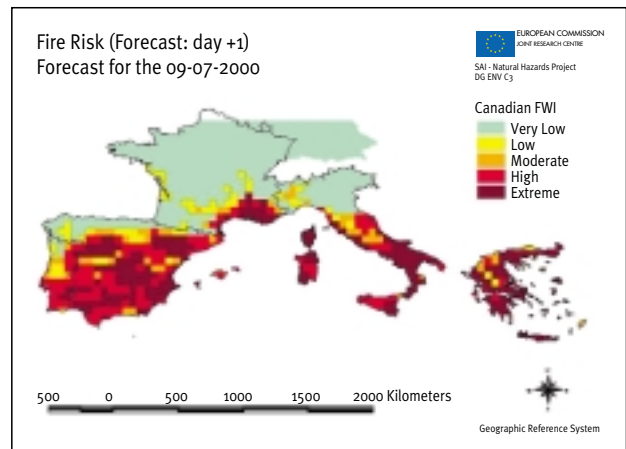
### III. FOREST FIRE CAMPAIGN 2000

#### Forest Fire Risk forecasting

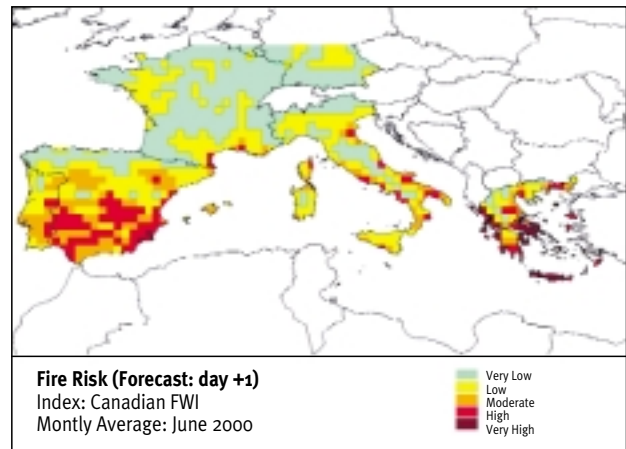
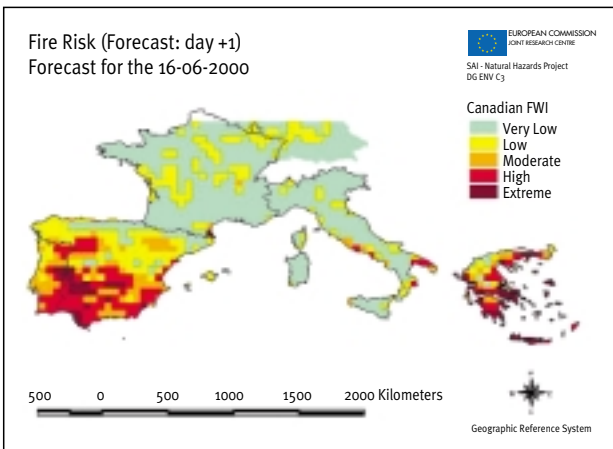
The provision of forest fire risk forecast started in June 15, 2000 and ended on September 30. Daily forest fire risk forecast for 1 and three days was delivered in the form of images to Portugal, Spain, France, Italy and Greece. Individual country maps in addition to EU maps were delivered every day to the DG ENV civil protection unit, and to each Member State.

Since this is the first year in which European maps of meteorological fire risk are provided, comparison with fire seasons in the precedent years is not possible. The analysis will concentrate in the fire risk trend in the different regions. The Canadian Fire Weather Index, which was requested by all countries, will be used for the purpose of this report.

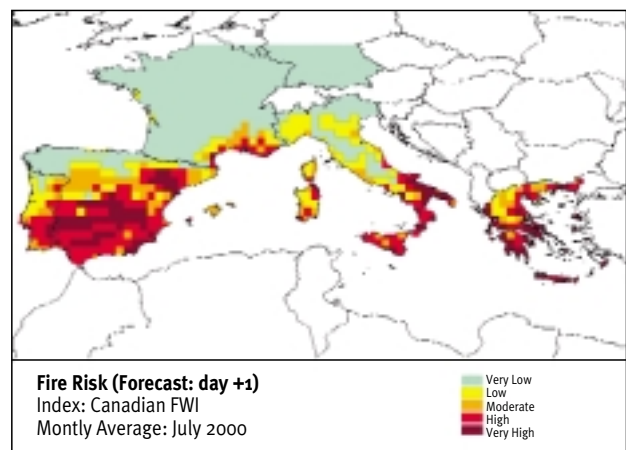
The situation at around mid-June presented a moderate fire risk for most of the Mediterranean basin.



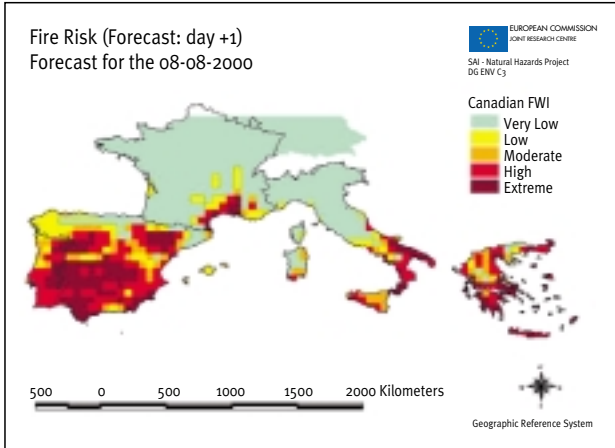
Favorable meteorological conditions helped to a better situation in the second half of July. The average fire risk map for the months of June and July are presented below.



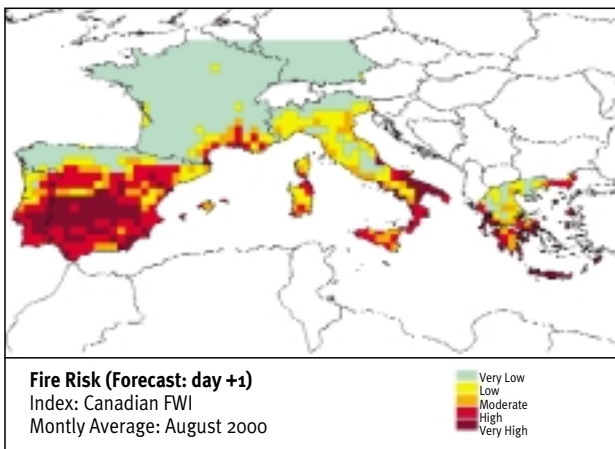
There was however extreme risk in some areas of Greece, principally in the south, and along the southeast coast of Spain. This risk situation was due to windy and dry conditions in these areas. At the beginning of July the fire risk situation had not changed significantly except for the fact that the fire risk in southeast France and the west coast of Italy was increasing. The trend of increasing risk continued during the first weeks of July in these areas leading to very high risk all along the Mediterranean basin. Extreme risk can be observed on the coast of Spain, southern France, Italy and Greece. The fire risk increased also in areas of center and south of Portugal due to high-speed winds. A large number of fires took place in these days on Eastern Spain, center and southern Italy, and Greece.



At the beginning of August, meteorological conditions worsened in most of the Iberian Peninsula, northeastern Spain and southeast France, with persistent extreme risk. Conditions were also critical along the southern coastal areas of Italy and Greece.

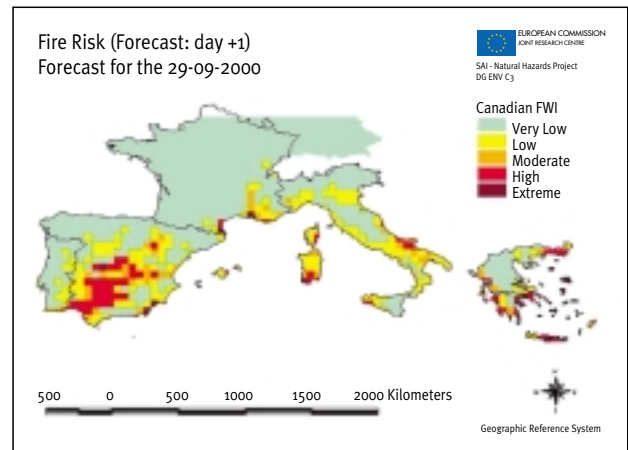


The trend continued until August 11<sup>th</sup>, in which most of the Iberian Peninsula was at extreme risk. Conditions on the Eastern part of the Mediterranean basin improved, lowering the meteorological fire risk conditions in northern Greece and in most of the Italian peninsula. In Italy, extreme conditions only persisted in the southeast. During the following days the fire risk situation improved slightly leading to more favorable conditions. However this period only lasted about a week, since by the 20<sup>th</sup> of August, conditions worsen again. The average risk situation in the Mediterranean region is shown by the following image. Even though average values are not the best statistic because contrast between extreme risk and very low risk is eliminated, the August average risk map shows persistent high risk on most of the Iberian peninsula, the south coasts of France, Italy, and Greece.



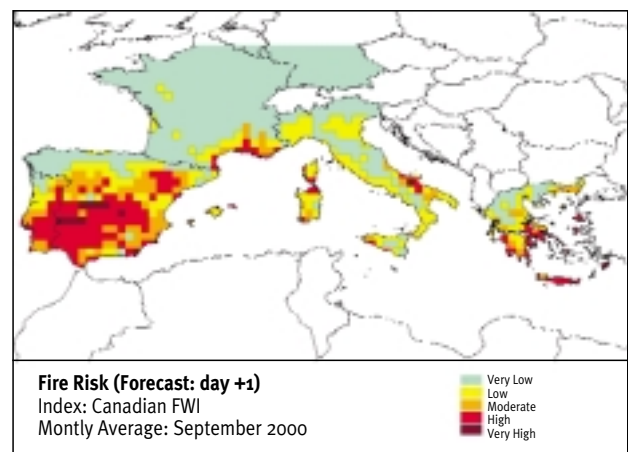
In the last ten days of August the overall fire risk diminished in continental areas, but all the coastal areas remained at high or extreme risk.

At the beginning of September, the fire risk situation showed a general improvement in most areas. However, the risk on the coastal areas of France and Greece rose in the following days. Although the overall risk for the region was lower, areas of France and Greece were still at high or extreme risk.

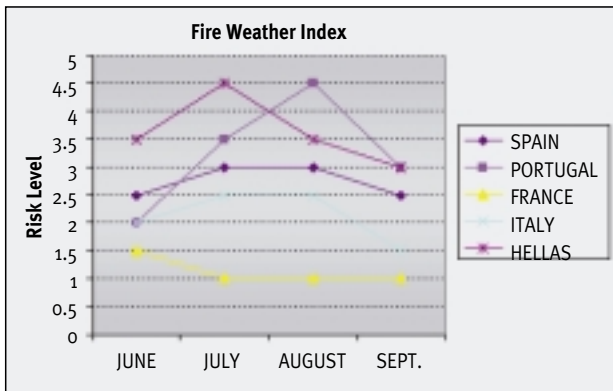


The situation on the 8<sup>th</sup> of September showed high risk only in some areas of Spain and France, and Greece. The risk decreased in the second week of September and this improvement continued until the end of the month. The situation by the end of September showed low risk in most of the Mediterranean region.

The average fire risk for the month of September is presented below.



A summary of forest fire risk by country from June to September is presented below.



## Burnt area mapping and damage assessment

The information on areas burned by fire at the European level is normally aggregated at administrative level and ignores the exact spatial location and extent of fires. Each country has its own methodology to assess burned areas, which leads to a lack of harmonization of the burned area statistics.

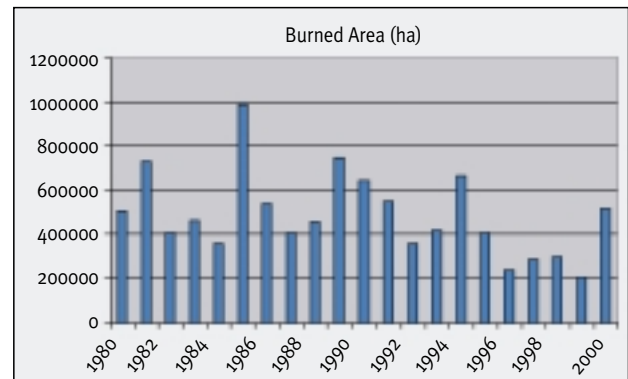
In order to improve this harmonization a classification map of burned areas was done using satellite images from near the end of the year 2000 fire season. This burned area map was used in conjunction with the EU-CORINE land cover (CLC) database to estimate the damage to forests and other land cover types. This methodology has the advantage of giving fast up to date evaluations of the burned areas just after the end of the fire season. It can also be used as a basis to compare individual reports from each of the countries of the European Union.

This activity has produced the first cartography of forest fire damages in the south of the EU for the year 2000. All fires larger than 50 hectares were mapped. Burned areas larger than 50 ha account, in whole Mediterranean region, for 73% of the total area burnt every year. However, this percentage varies from 53% in Italy to 86% in Greece.

The burned area, as detected by the analysis of the satellite imagery, resulted in a total surface of 386 697 hectares. The distribution by the five countries considered was as follows:

Country	Surface burned (hectares)
Portugal	107 063
Spain	112 720
France	15 078
Italy	45 101
Greece	106 735
<b>Total</b>	<b>386 697</b>

According to statistics by country from previous years, it can be inferred that the total burnt area in the year 2000, i.e. including all fires, was approximately 519334 hectares. This figure is near the average for the last decade.



**Figure 2.** Surface burned by forest fires per year.

The intersection of the burned area map with the CLC map provided the information on the land cover classes that burned. Table 1 shows the distribution of the area burnt by the Level 1 CLC classes. Approximately three quarters of the total area burned corresponds to *Forests and Semi-natural Areas*. The Agricultural Areas accounted for approximately 20% of the total burned area although most of these areas were occupied by *Land principally occupied by agriculture with significant areas of natural vegetation and Agro-forestry areas*. The *Unclassified land surface* accounted for 4.68% of the total burned. Visual analysis of the satellite images of these areas suggests that most of this unclassified area is covered by forests and shrubs

**Table 1.** Distribution of the burned area by land-cover classes.

CORINE land-cover class	Burned area (ha)	(%) of total burned area
Artificial Surfaces	1160	0.30
Agricultural Areas	76976	19.91
Forests and Semi-natural Areas	289855	74.96
Wetlands	612	0.16
Unclassified Land	18094	4.68
<b>Total</b>	<b>386697</b>	<b>100</b>

As an example of the burnt area mapping activity, the images of burnt areas for Portugal and Greece are provided in the figures below.

## IV. OUTLOOK 2001

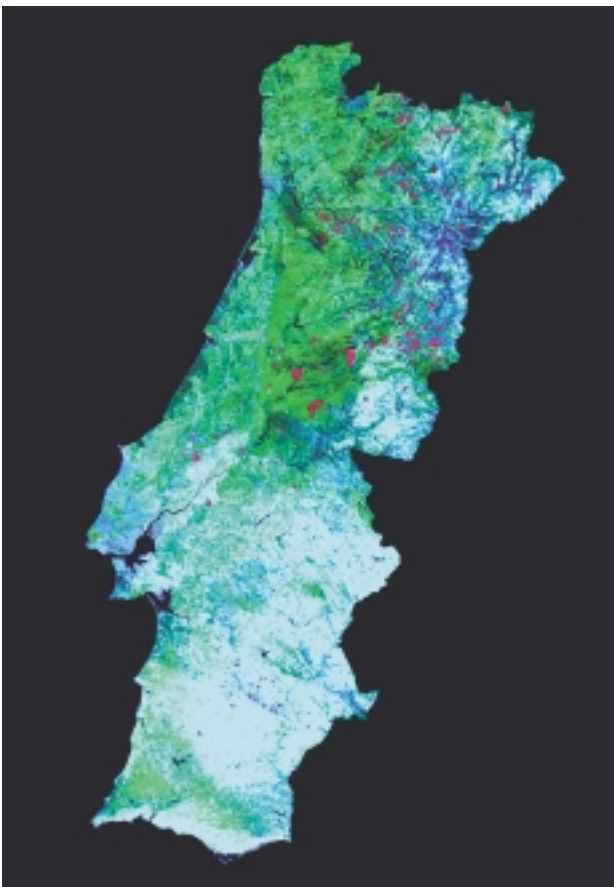
In 2001 the European Forest Fire Information System will undergo several updates and improvements:

Forest Fire Risk Forecasting will be performed for the whole territory of European union. In addition to the forest fire risk indices provided in the year 2000, a new integrated index, the Fire Potential Index (FPI), will be provided. This index takes into account information coming from meteorology, fuel or vegetation types, and satellite imagery. The extension on the evaluation of forest fire risk to pre-accession countries is foreseen for 2002.

The Forest Fire Damage Assessment system will perform the analysis of forest fire damage in the years 1998 and 1999 in order to build a historical database of fire influence of fires in the Mediterranean region. The production of the burnt area maps and damage assessment will be fully automated.

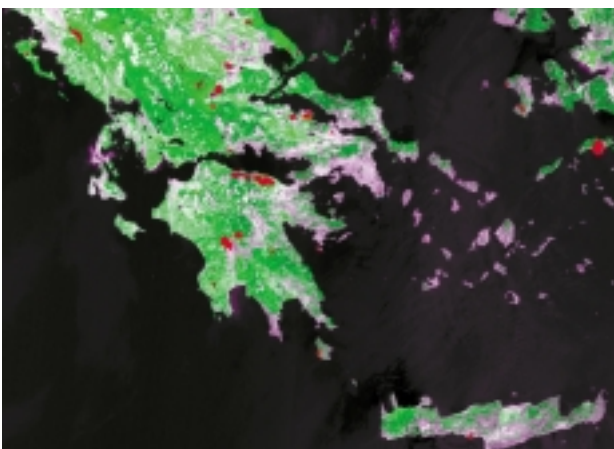
The analysis of the historical burnt area maps will allow the study of:

- the detection of hazardous areas after forest fires, which become prone to other types of degradation and hazards such as soil loss and landslides.
- the estimation of the contribution of forest fires to global CO<sub>2</sub> emissions in Europe.
- the regeneration of the vegetation after a fire.



Burnt areas are shown in red over a color-composite of the satellite images. As shown on the image, fires in Portugal concentrate on the center and northern regions. The southern part of Portugal, which is mainly dedicated to agriculture, is less affected by forest fires. The image of Greece is a close up of southern Greece, which shows the large fires that took place in the Peloponnesus peninsula and some of the fires in the Greek isles of Samos and Corfu.

Although not shown on this synthetic document, similar maps of the burnt areas were produced for Spain, France and Italy.



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