Forest fires in Portugal, summer 2005

Introduction

The summer of 2005 for the Iberian peninsula was characterized by extreme drought conditions. Severe fire weather conditions reappeared at the beginning of August and went on during most of the month causing widespread occurrence of forest fires. The situation was quite critical in some regions of Spain but mostly the central and northern part of Portugal was affected.

Meteosat-8 time series analysis

Meteosat-8 is recording both shortwave and thermal infrared using the SEVIRI instrument. Although these channels have a sub-satellite spatial resolution of 3 by 3 kilometres, which even further increases at higher latitudes and longitudes, the shortwave infrared channel (centered around 3.9 micron) is very susceptible to hot spots, e.g. like those caused by forest fires. Although a pixel roughly represents 15 km2 over northern Portugal, the pre-sunrise images presented here show remarkable anomalies (in red, of over 30 °Kelvin) between fire affected areas and background. A simple threshold technique (>300 °Kelvin) is applied to extract the fire affected pixels and within the time series these areas are retained, thus representing the total area affected. The High Resolution Visible (HRV) channel, recording the visible part of the electromagnetic spectrum, can be used to identify the smoke plumes, further increasing the reliability of the classification if both smoke plumes and thermal anomalies appear (see both the images of 21 August 2005).

Validation of the results

At the time of analysis only a rapid burnt area assessment in Portugal, prepared by the European Forest Fire Information System (EFFIS, http://inforest.jrc.it/effis/), was available. The EFFIS update of 23rd of August used is based on MODIS images, having a spatial resolution of 250 meter which should represent the large majority of the fires affected areas(MODIS Rapid Response System). The data is aggregated for each affected district and for each time period analyzed. Comparison of these statistics with the Meteosat time series processed show roughly the same total area affected by forest fires, about 1500 km2 for the corresponding time period. When plotting the extracted Meteosat pixels over the district map of Portugal, the classified pixels correspond to the affected districts.

Conclusion

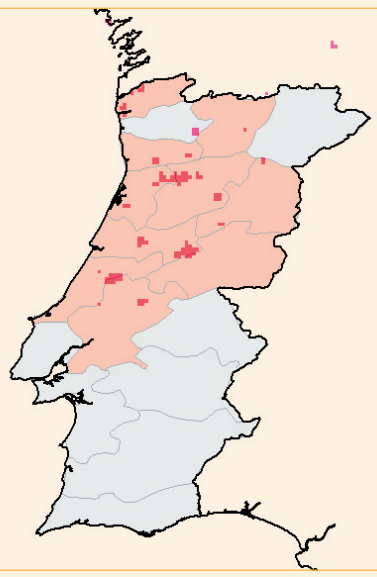
Although more detailed location information of fire affected areas should be used to validate these initial results obtained, from this analysis it is clear that despite the low spatial resolution, Meteosat's IR3.9 micron channel can be used for detection of hotspots such as forest fires.

MODIS, 4 August, resolution 250 meter.

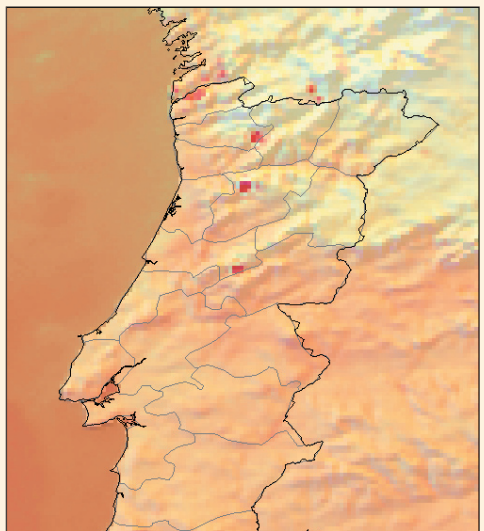
MODIS, 21 August, resolution 250 meter.

District	Burned areas (hectares)		
	Until 31 July	Until 15 August	Until 22 August
EVORA	784	1,075	1,075
AVEIRO	3,958	15,382	15,518
BEJA	871	989	989
BRAGA	2,601	4,160	6,205
BRAGANÇA	4,747	5,408	6,369
CASTELO BRANCO	8,227	12,232	16,509
COIMBRA	10,150	15,409	31,768
FARO	1,457	1,457	1,457
GUARDA	14,858	19,635	20,340
LEIRIA	4,423	17,839	22,645
LISBOA	316	316	316
PORTALEGRE	245	1,135	1,135
PORTO	8,538	11,072	11,244
SANTARÉM	1,536	9,772	20,052
SETUBAL	180	180	180
VIANA DO CASTELO	2,920	5,330	19,160
VILA REAL	4,787	12,197	24,071
VISEU	5,639	13,931	22,028
Total	76,238	147,521	221,062

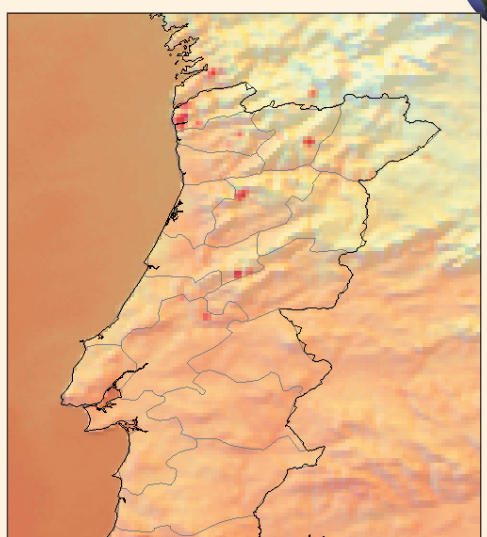
Forest fire areas per district.



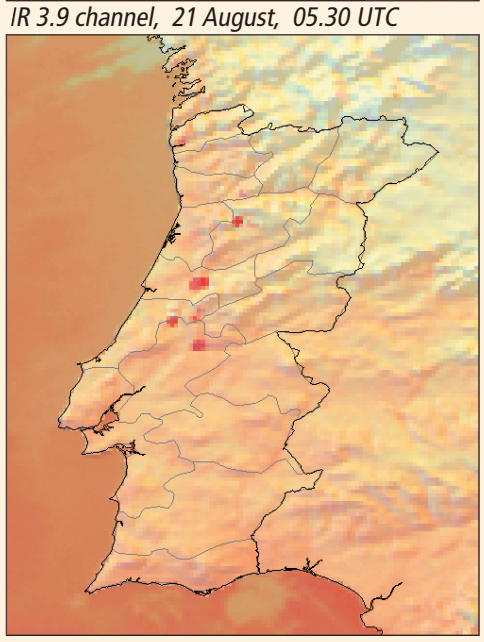
Hot Spots from Meteosat and affected districts.



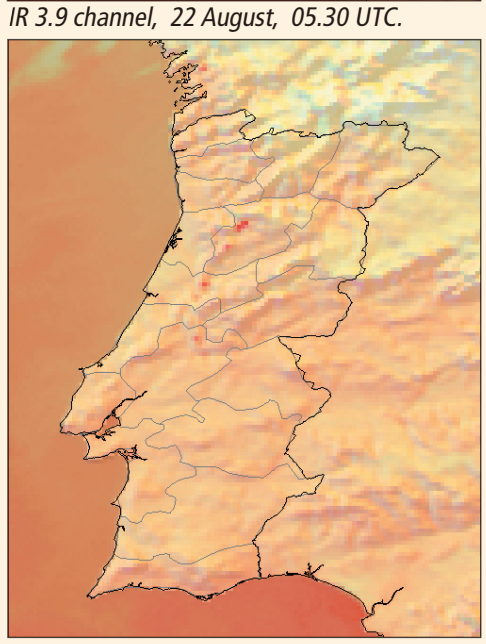
IR 3.9 channel, 21 August, 05.30 UTC



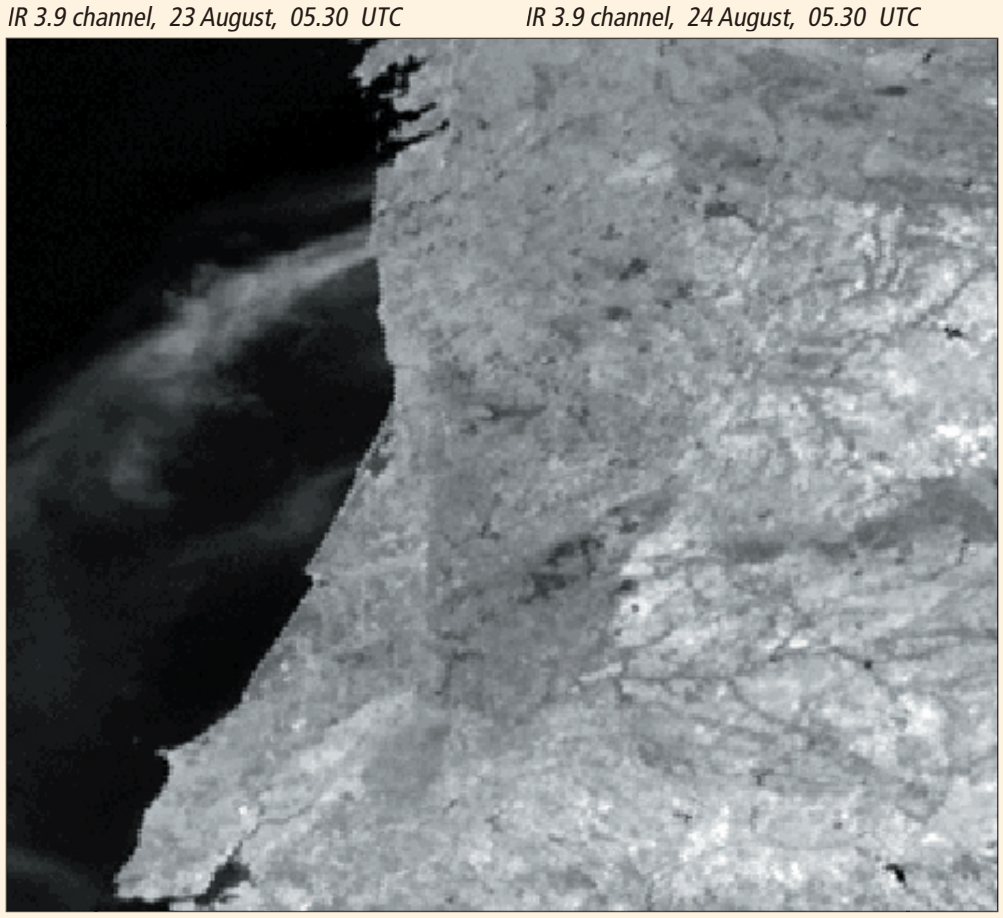
IR 3.9 channel, 22 August, 05.30 UTC.



IR 3.9 channel, 23 August, 05.30 UTC



IR 3.9 channel, 24 August, 05.30 UTC



HRV image 21 August, 12.00 UTC.

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http://intranet.itc.nl/support/it/support/Documents\Expertise and Knowledge\Earth Observation Systems\Meteosat Second Generation.htm

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