

MODIS Reception Antenna at the University of Oviedo (Spain): Online free Products and Services related to Forest Fires

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INTRODUCTION

The "MODIS data reception system" of the University of Oviedo, acquired in 2007 (Figure 1), enables us to obtain **MODIS data in real time**. Daytime and night-time MODIS data from Terra and Aqua passes over our location in the North of Spain are obtained: **Terra: 10:00-12:30 and 21:00-23:30 GMT; Aqua: 12:30-15:00 and 01:00-03:30 GMT**; Figure 2).

The raw data (Level 0) received by our antenna are then analysed with the freely distributed software **IMAPP** (Huang et al. 2004; <http://cimss.ssec.wisc.edu/imapp>), allowing us to **create several basic products** at different levels, as MOD02 (calibrated and geolocated radiances for 36 bands from VIS to TIR; 250-1000 m of spatial resolution; Level 1B), MOD14, NDVI, LST (Level 2 Land products), etc. **From these basic products, our system automatically generates other operative products, which are freely served to users via internet.**

The MODIS products and services related to Forest Fires are summarized in the following sections.



Figure 1: Antenna MODIS at the University of Oviedo (Diameter = 2.4 m).



Figure 2: First Terra-MODIS image received by our antenna. (at 10:58 GMT of 7 November 2007).

MODIS PRODUCTS AND SERVICES

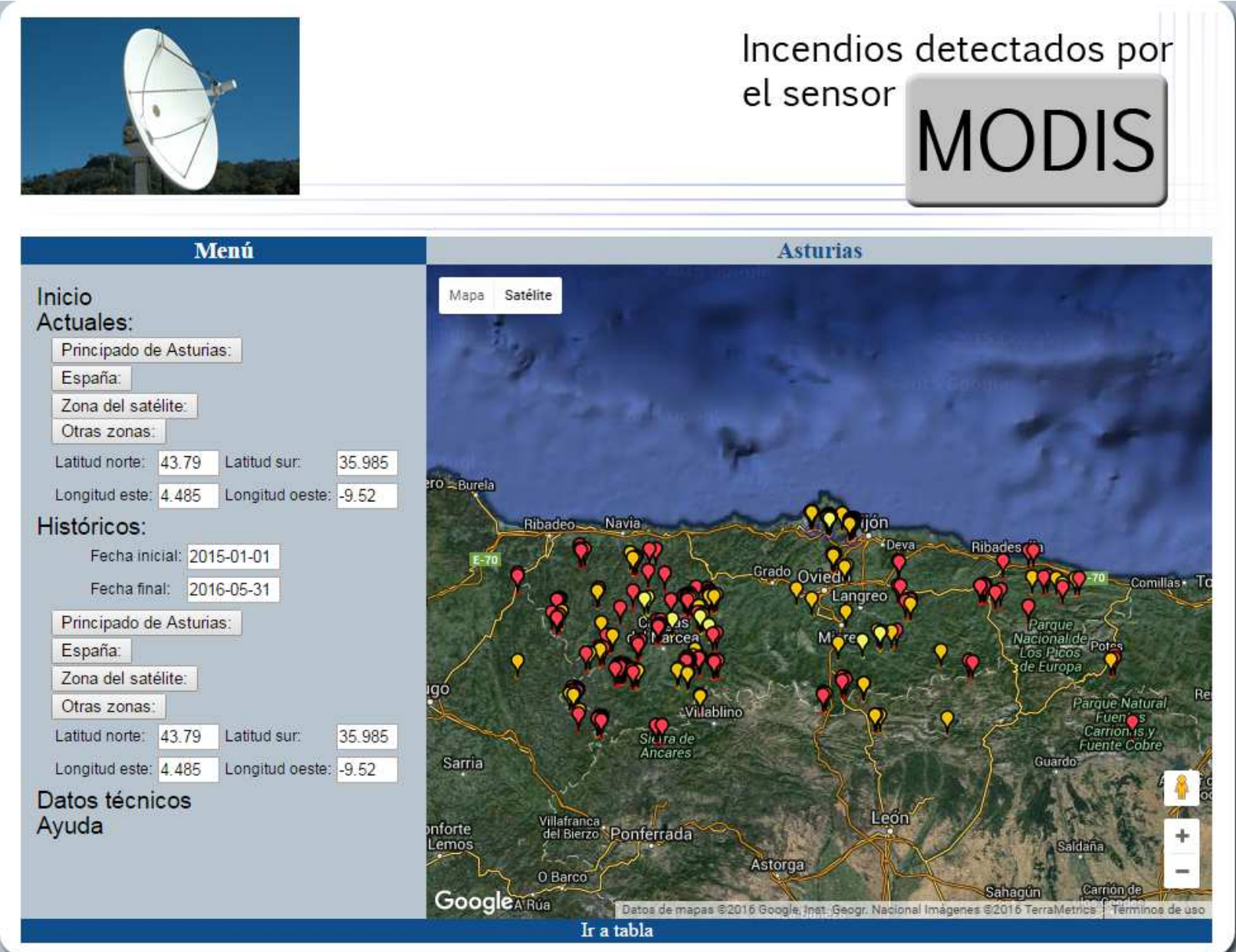
Fire Alerts Website

MODIS *hot spots* product is based on NASA's standard product MOD14 (*Thermal Anomalies/Active Fire*; Giglio et al. 2003), which is obtained from the thermal bands (pixel size: 1 km²=100 ha), especially from bands 21-22 and 31.

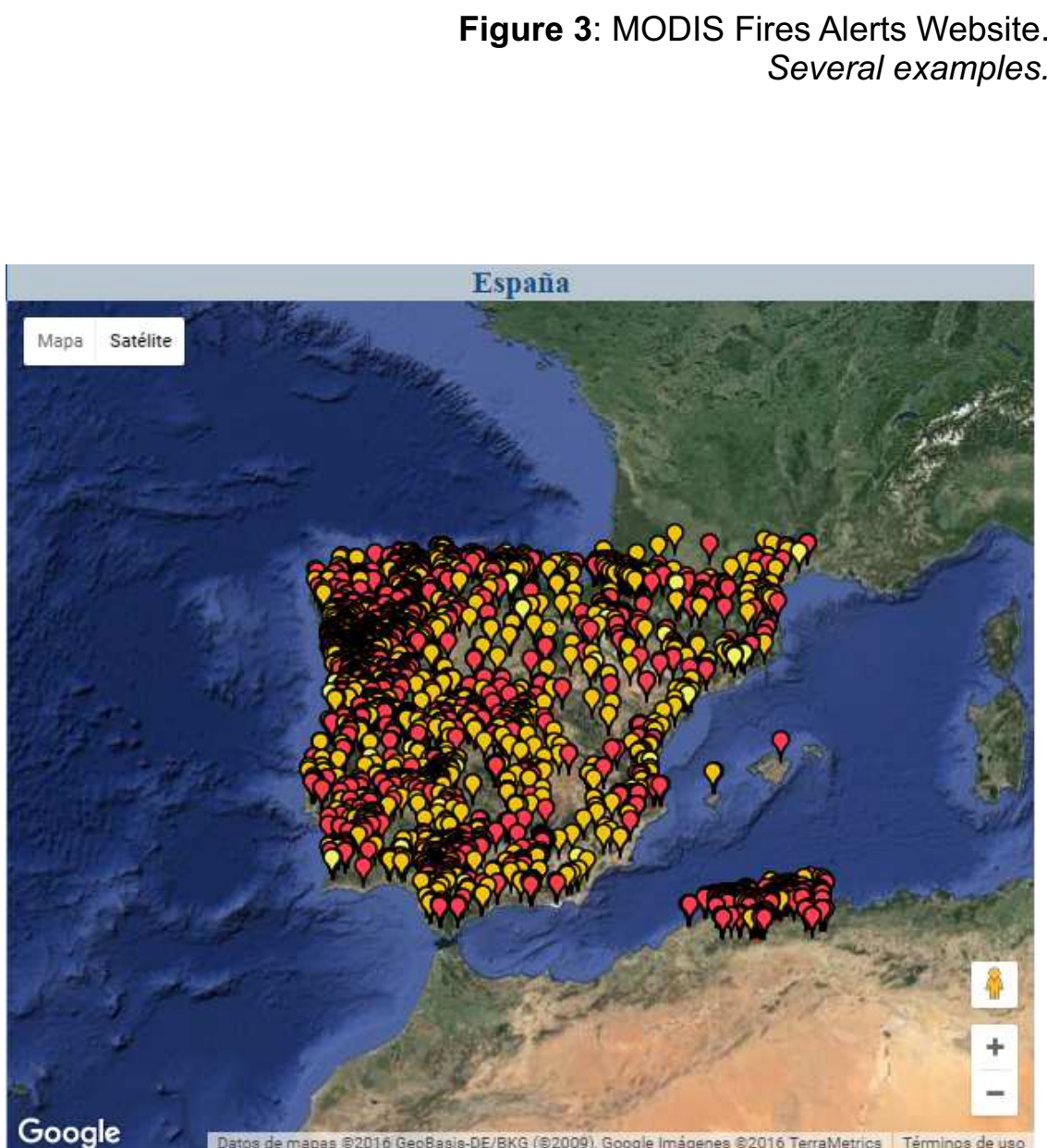
Validation of the MOD14 product in the Principality of Asturias (North of Spain) shows that it is fairly reliable for fires above 50-100 ha (Recondo et al., 2011). **The original product MOD14 has been refined in Asturias, removing usual false alarms** (e.g., marking the location of the steel plants' furnaces and their radius of action; Figure 3a (blue circles). **Similar works in the rest of Spain, would be very useful** to validate the product in our country and mark false alarms areas.

The MODIS Fire Alerts generated in real time are accessible via the WWW (<http://alertas.indurot.uniovi.es/inicio.php>; Corrales, 2011; Figure 3). They are displayed on **Google Maps** using three different colors according to their confidence (red¹, orange and yellow²). The date, the time and geographical coordinates (latitude and longitude) of each alert are also showed. Four rectangular areas can be chosen for the display (Principality of Asturias, Spain-Iberian Peninsula, Spacecraft zone and Other zones) (Figures 3a, 3b, 3c and 3d, respectively). The displayed alerts can be, the current or the historical ones (selected by the choosing the initial and final dates). **A table with the information of each alert is also provided.**

The service also allows monitoring large fires, providing detail information of the different focus (Figure 3d).



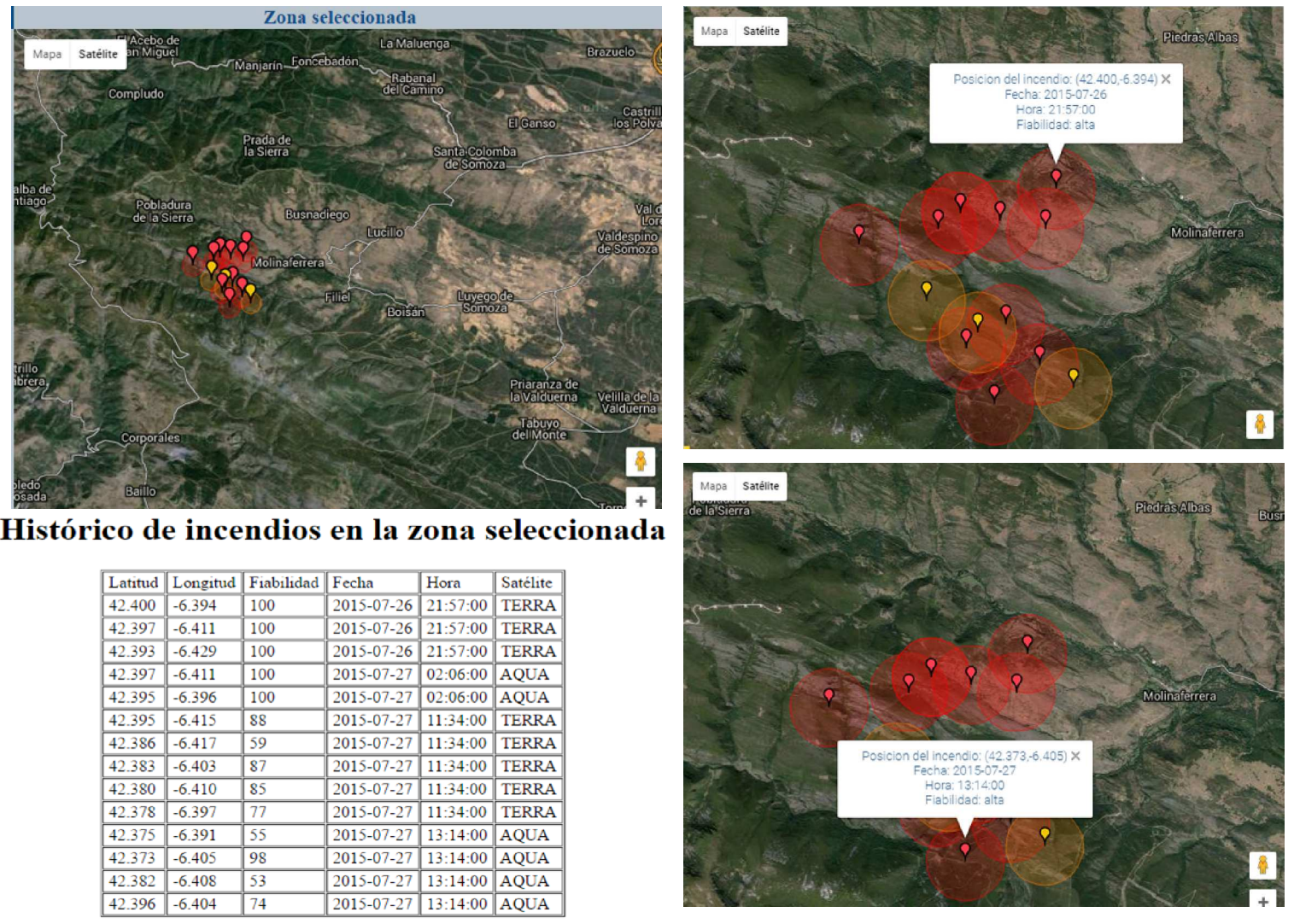
3a) Historical Alerts (1 January 2015 - 31 May 2016) for Asturias.



3b) Historical Alerts (1 January 2015 - 31 May 2016) for Spain.



3c) Current Alerts (5-6 June 2016) for the spacecraft zone.



3d) Current Alerts (26-27 July 2015) for the selected zone (42.3-42.4 N; 6.3-6.5 W; Sierra del Teleno) and Table generated in this case. Some the detailed focus.

Fires Alerts notification system via email

This system is based on a GIS, and **generates reports for each alert**, including alert data itself (coordinates, date, time and confidence) as detailed geographic information (country, province, municipality, distance from the nearest towns/villages and location maps).

These reports are automatically sent via email to the emergency agencies interested, depending on the location of each alert (Figure 4).



Figure 4: Example of a report generated by the Fires Alerts notification system: Report for Regional Operations Centre for the Combat against Forest Fires (Castilla-La Mancha).

MODIS Web Map Service (WMS) ...> NDVI and RGB=721

In order to monitor the spatial and temporal dynamics of vegetation, and their potential risks (drought, fires and burnt areas), **two daytime MODIS products, the NDVI index and the RGB=721 composition, are freely distributed (at a spatial resolution of 250 m) via a Web Map Service (WMS)** (<http://wms.indurot.uniovi.es>; Fernández-Iglesias, 2013; Figure 5a).

This information is accessible through any browser (GIS Web Viewer; Figure 5b) or GIS software that supports the standard protocol WMS.

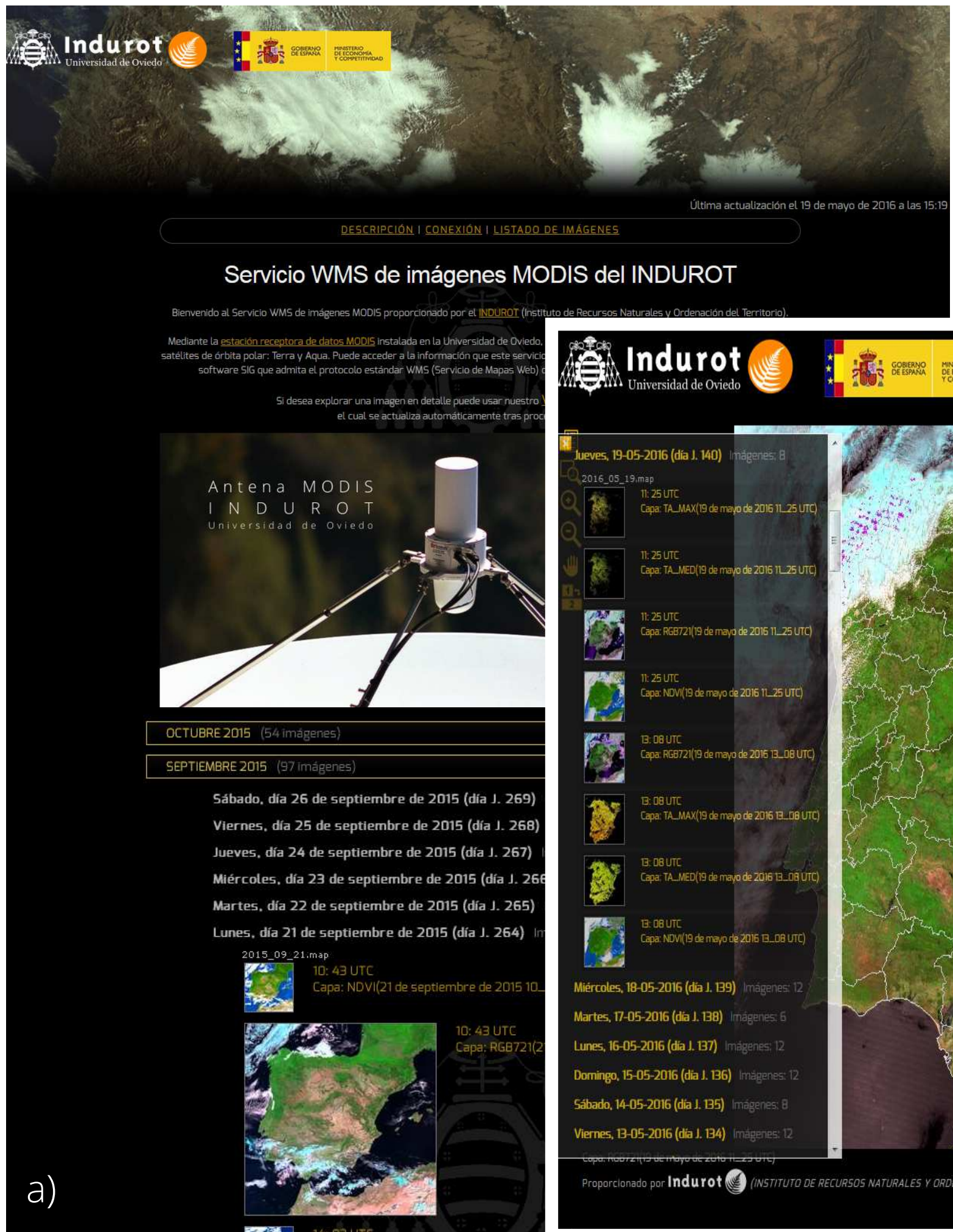


Figure 5: Figure 5: MODIS Web Map Service (WMS) managed by INDUROT.

a) Main website of the MODIS WMS.

b) Detail of the GIS Web Viewer, showing the RGB=721 composition of the image obtained at 11:25 GMT of 19 May 2016

MODIS Web Map Service (WMS) ...> Air temperature and Humidity

The meteorological variables such as surface air temperature (T_s) and surface relative humidity (RH) (or surface water vapour pressure, e_s) are crucial in environmental risk models, for example, the fires risk models.

The models by Recondo et al. (2013b) and Peón et al. (2014) for estimating daily T_s over peninsular Spain are based on LST (*Land Surface Temperature*), W (*Total precipitable water*) and NDVI from MODIS and the spatiotemporal variables of longitude (λ), Julian day (JD) and height (h). **The models by Recondo et al. (2013a) for estimating daily e_s are based on W , distance to the coast (d_{coast}) and JD. RH is obtained from T_s and e_s . The best estimations are for T_s (errors ~2 K) and the worst estimations for RH (errors ~10%). **SEE DETAILS OF THE PROPOSED ALGORITHMS AND ITS VALIDATION on Recondo et al.'s POSTER (2016) IN THIS CONFERENCE.****

By using the proposed algorithms and the MODIS products LST, W and NDVI generated in real time by our antenna, we can **generate maps of T_s , e_s and HR** (daily mean, maximum, and minimum values) (over cloud-free land areas) over peninsular Spain with 1 km² spatial resolution.

At the present time, our MODIS WMS offers the daily *maximum and mean T_s* (the most interesting T_s for the fires risk models) after the first Terra overpass (between 10-12:30 GMT).

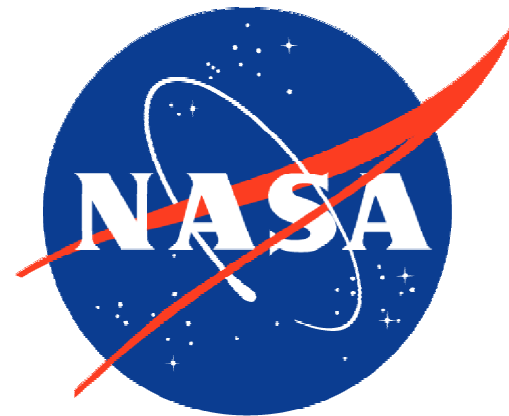
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