

Using VIIRS Direct Readout Capabilities for the Improvement of Mexico's Wild Fire Alert System

Juan M. Escamilla Mólgora ¹

National Commission for Knowledge and Use of Biodiversity
CONABIO - Mexico ¹

CSPP/IMAPP USERS' GROUP MEETING

May, 21 th, 2013



CIMSS/SSEC,
University of Wisconsin-
Madison

CONABIO

- National Commission for Knowledge and Use of Biodiversity.
- Established since 1992
- 250 employees
- Mission: Promote, coordinate and support activities related to the knowledge of biologic diversity, its conservation and sustainable use.
- Main functions:
 - Operation and development of the National System of Biodiversity Information.
 - Coordination of national and international exchange of knowledge related to biodiversity.
 - Real time alert systems for decicion makers.



Wild Fire Alert System [Milestones]



1999

- Beginning of the Wild Fire Alert program.
- Data from DMSP.



2000

- Upgrade: AVHRR receiving antennae
- Use Fire Detection Algorithm (Flasse-Ceccato, 1996).

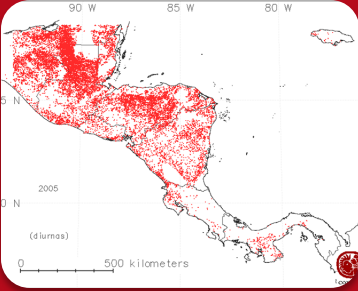


2003

- Upgrade: MODIS receiver system mounted.
- Automated operational products.
- Use of MOD14 products (Giglio et.al., 2003)

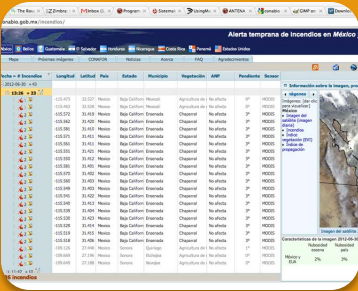


Wild Fire Alert System [Milestones]



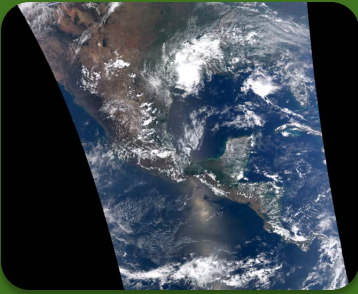
2004

- Service extension to Central America.



2009

- Deployment of the current webpage:
- www.conabio.gov.mx/incendios



2012

- Development of the new version.
- VIIRS receiving and processing capabilities



Current operational processes (MODIS)

Raw data acquisition and processing

L0 (Terascan – RT-STPS)

Level1 Products (Seadas 6 & standalone software)

MOD03 (GEO)

MOD07
(Atmosphere)

MOD09
(Reflectances)

MOD13 (NDVI)

MOD14 (Fire mask)

Oceans Monitoring program

Higher level products

Swath reprojected
QL and composites
[MODIS
swath2grid]

Hotspot
characterization

Anomalies on
vegetation index

Moisture content on
fuel

End-user products

Shapefiles and KML

Web page
publication

Email alert

W*S Services

Burned area
afection *



Current operational processes (VIIRS)

Raw data acquisition and processing

L0 (Terascan – RT-STPS [patched])

RNSCA-RVIRS

Level1 Products

(CSPP 3.1.
SDR_1_3
EDR_1_0)

GDNBO's

Day Night Band

SVI's

SVM's

AVAFO

IICMO

Higher level products

Npp.points
(homemade)

Hotspot
characterization

GEOTIFs

End-user products

Shapefiles and
KML

Web page
publication

Email alert

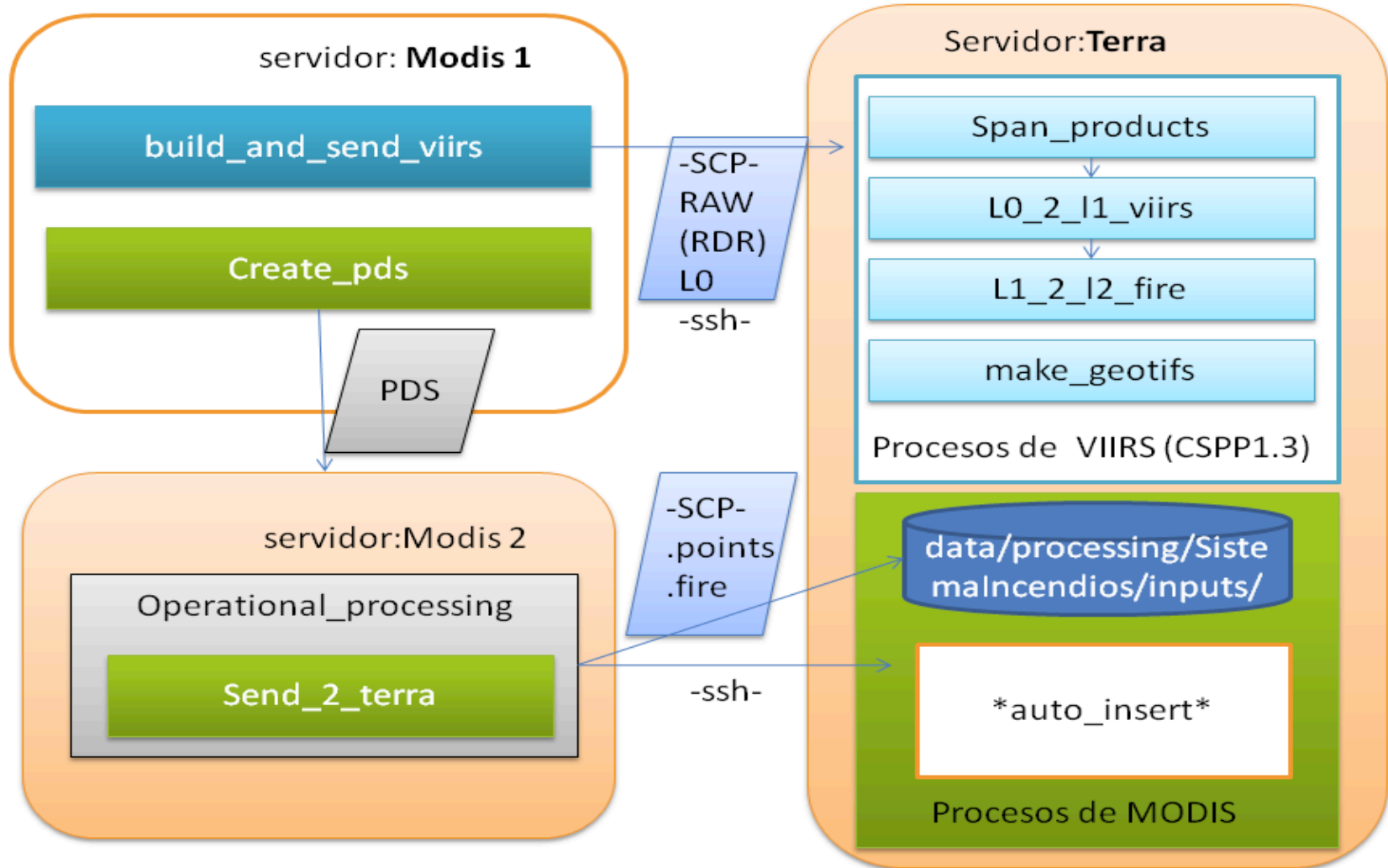
W*S Services

Burned area
afection *



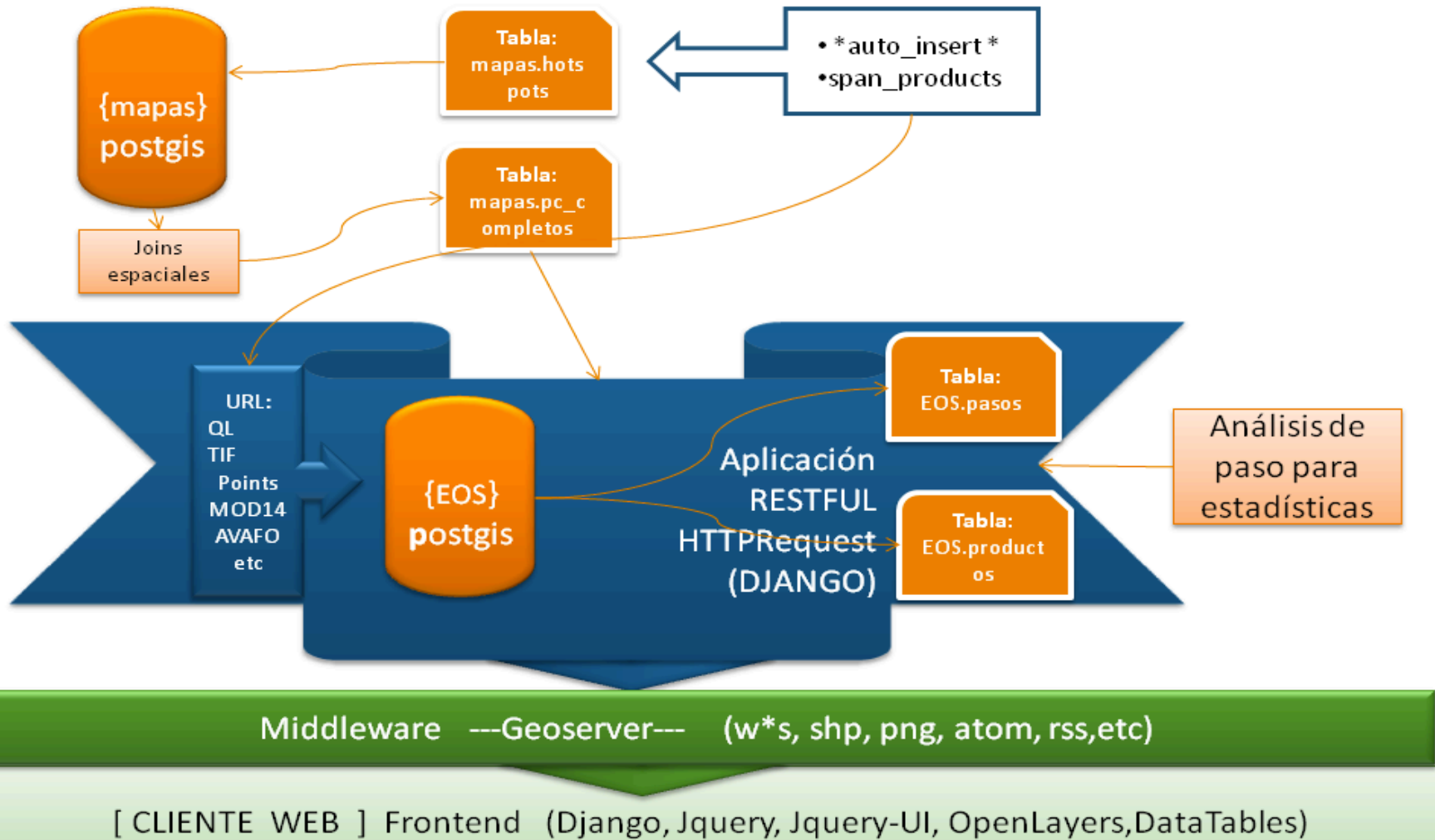
Current Viirs and legacy Modis operational processes

Esquema de procesos y transferencia de archivos para generar productos del L0 a incendios (MOD14 y ActiveFires)



Restfull services (Representational State Transfer)

Esquema general de procesos @SistemaIncendios



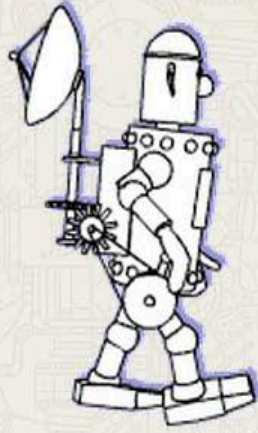
e.g. Pass inserter

- Satellite : npp
- Telemetry : nppdb
- Date : 20130506
- Time : 200010
- Passnumber : 52
- Number of lines : 7502
- Pass duration : 00:15:30
- Sun azimuth : 67
- Satellite elevation : 55 ...

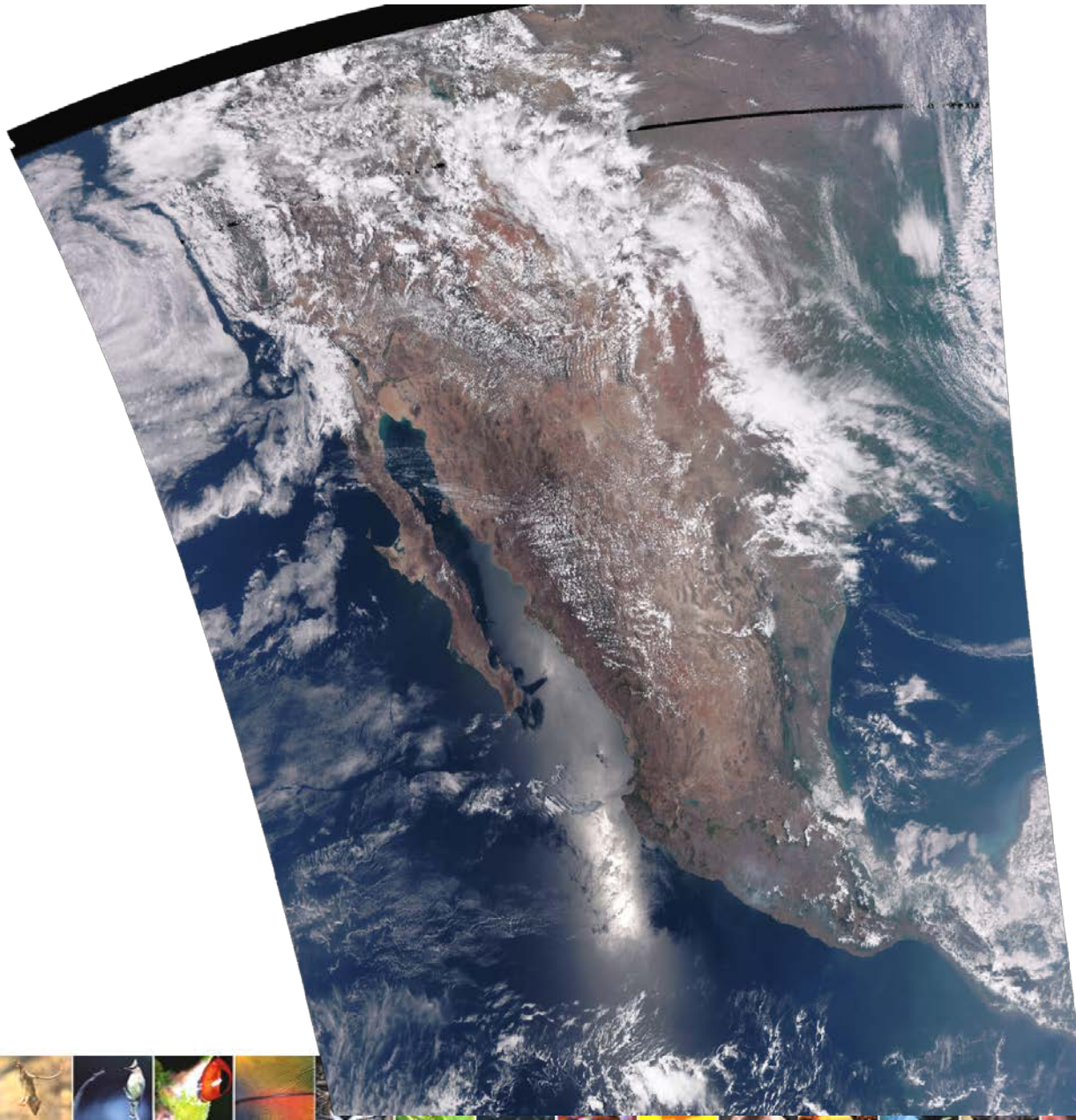


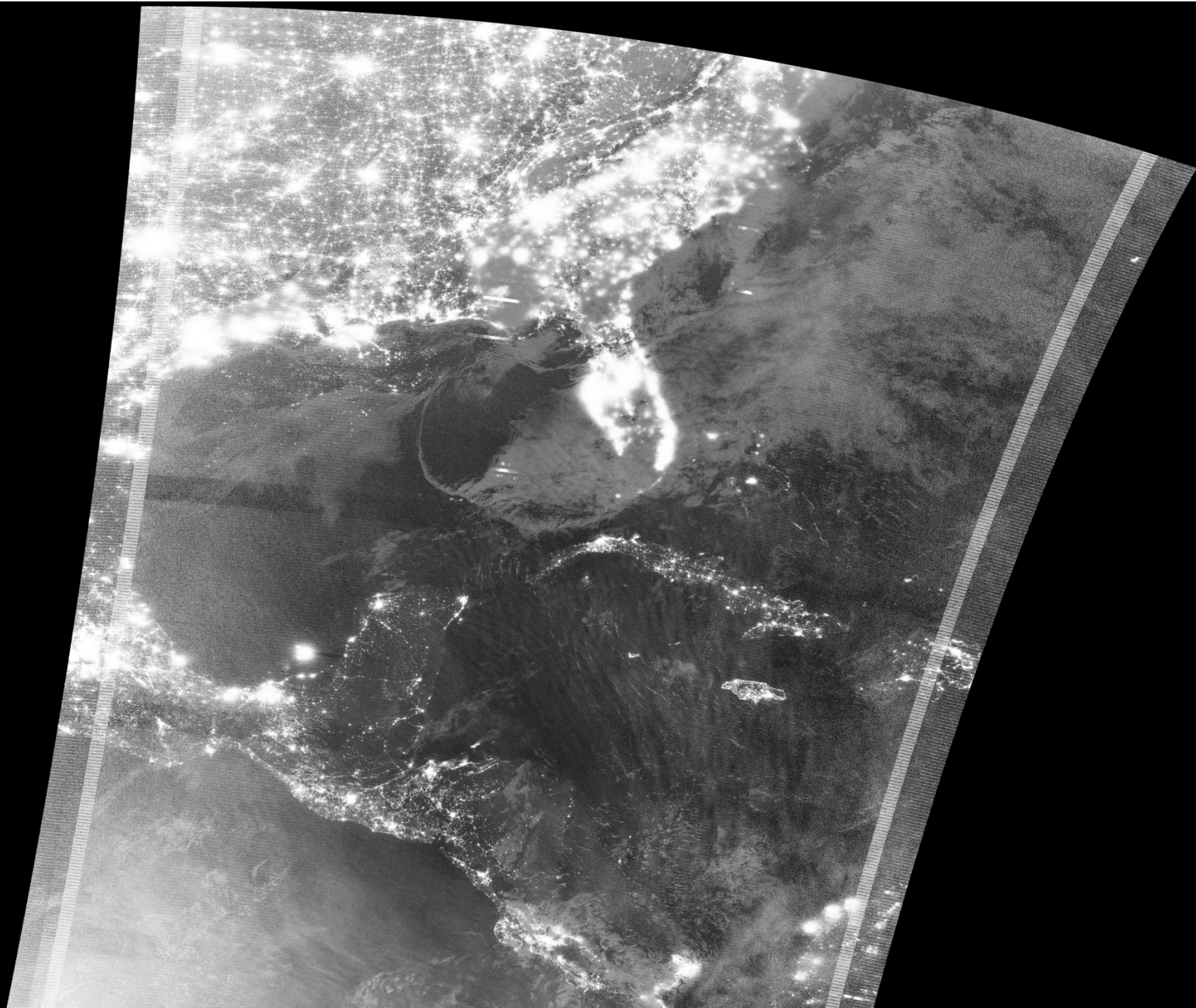
Recursos Disponibles en el SistemaIncendios

Total	Utilizado	Disponible
10079 GB	7652 GB	1915 GB

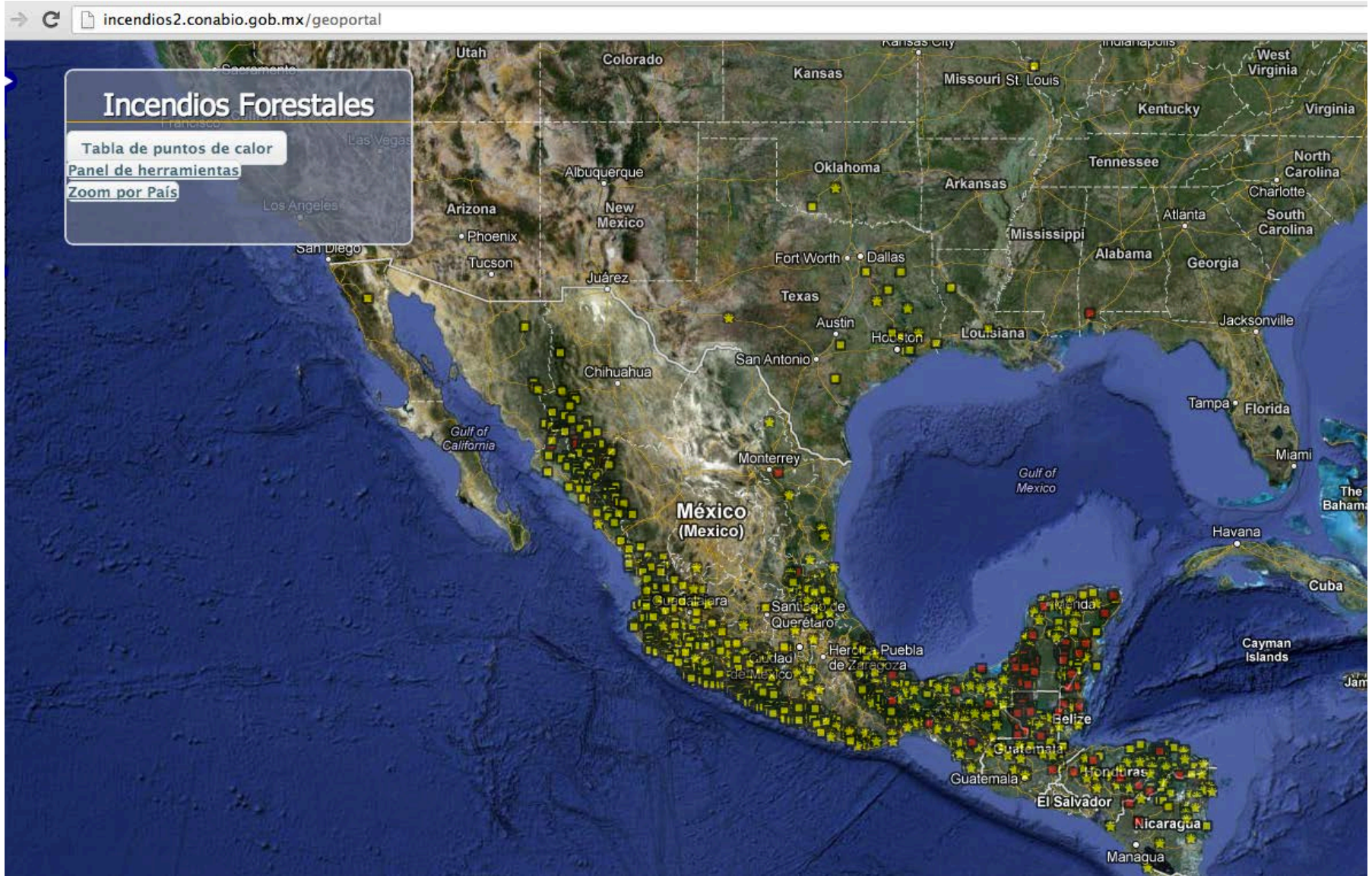


Operational products

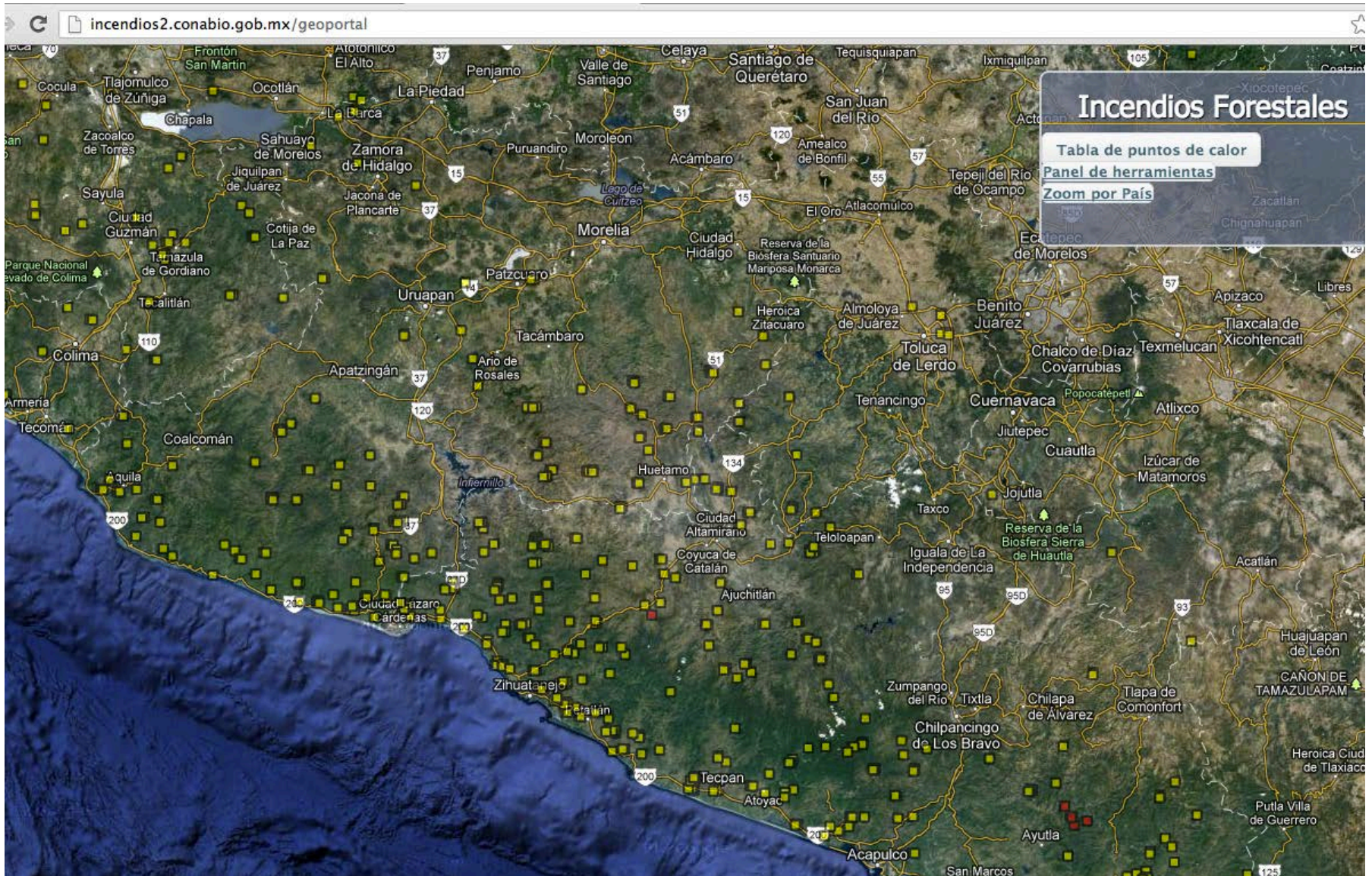




Viirs and Modis Active Fires

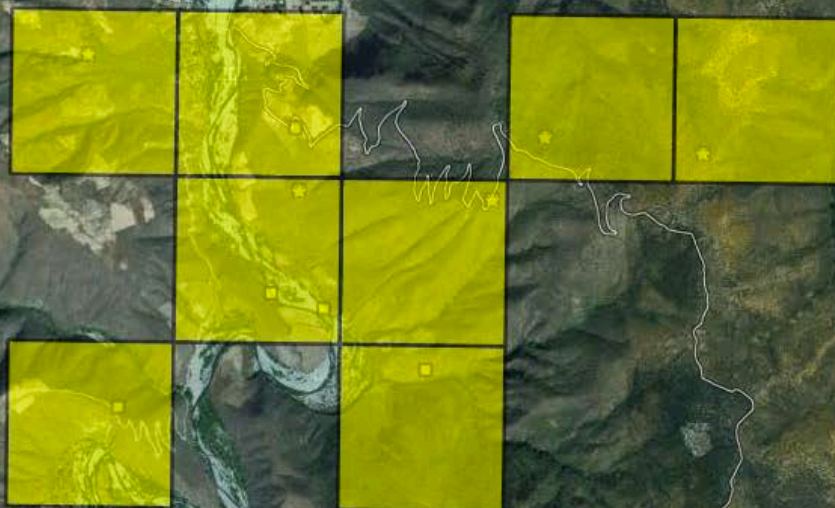


MODIS MOD14 V.



Featurized hotspots

← → ↻ incendio2.conabio.gob.mx/geoportal



Incendios Forestales

[Tabla de puntos de calor](#)
[Panel de herramientas](#)
[Zoom por País](#)

Puntos de calor detectados en este lapso de tiempo: ✕

Buscar:

Id	Paso	País	Estado	Municipio	Vegetación	Área Natural	Pendiente	Satélite
2435222	2013-05-19T20:25:00Z	Mexico	GUERRERO	General Heliodoro Castillo	SELVA BAJA CADUCIFOLIA VEGETACION SECUNDARIA NINGUNO	No afecta ANP	25.8234615325928	A1
2434444	2013-05-19T19:16:30Z	Mexico	GUERRERO	General Heliodoro Castillo	BOSQUE DE ENCINO VEGETACION SECUNDARIA ARBUSTIVA	No afecta ANP	45.5726776123047	NPP
2434446	2013-05-19T19:16:30Z	Mexico	GUERRERO	San Miguel Totolapan	PASTIZAL INDUCIDO VEGETACION SECUNDARIA NO DISPONIBLE	No afecta ANP	40.5895195007324	NPP

- [Recargar datos](#) [⚠ Descargar Shapefile](#) [⚠ Ver en GoogleEarth \(puntos\)](#) [⚠ Ver en GoogleEarth \(polígonos\)](#) [⚠ Descargar CSV](#)



Export to various formats

The screenshot displays the Google Earth desktop application. The menu bar at the top includes 'Google Earth', 'Archivo', 'Editar', 'Ver', 'Herramientas', 'Añadir', 'Ventana', 'Ayuda', and system status icons. The search bar on the left contains a search box with the text 'Buscar' and a 'Buscar' button. Below it, there are suggestions for search terms and a list of 'Lugares' (Places) with checkboxes for 'Mis sitios' and 'Lugares temporales'. The main map area shows a satellite view of a mountainous region with several yellow polygons overlaid on it. The 'Capas' (Layers) panel on the left is open, showing a list of layers with checkboxes for 'Base de datos principal', 'Fronteras y etiquetas', 'Lugares', 'Fotografías', 'Carreteras', 'Edificios 3D', 'Océanos', 'Tiempo', 'Galería', 'Concienciación global', and 'Más'. The bottom status bar shows coordinates '17°48'39.10" N 100°08'07.17" O', elevation '1265 m', and distance 'alt. ojo 7.72 km'. Copyright information for Google, Cnes/Spot Image, DigitalGlobe, and INEGI is visible in the bottom right of the map area.

Google Earth

Archivo Editar Ver Herramientas Añadir Ventana Ayuda 00:14:34 45% lun 01:27 Juan M. E...Mólgora

Search

Buscar

por ejemplo: Tokio (Japón)

Obtener indicaciones Historial

Lugares

Mis sitios

Tour de lugares destacados
Asegúrate de que la capa de edificios 3D está

Lugares temporales

conabio-poligonos_cal...

Capas

Galería de Earth >>

Base de datos principal

Fronteras y etiquetas

Lugares

Fotografías

Carreteras

Edificios 3D

Océanos

Tiempo

Galería

Concienciación global

Más

© 2013 Google
© 2013 Cnes/Spot Image
Image © 2013 DigitalGlobe
© 2013 INEGI

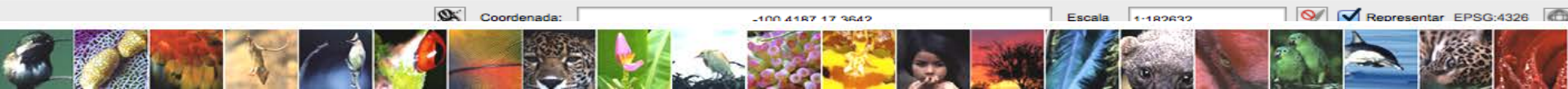
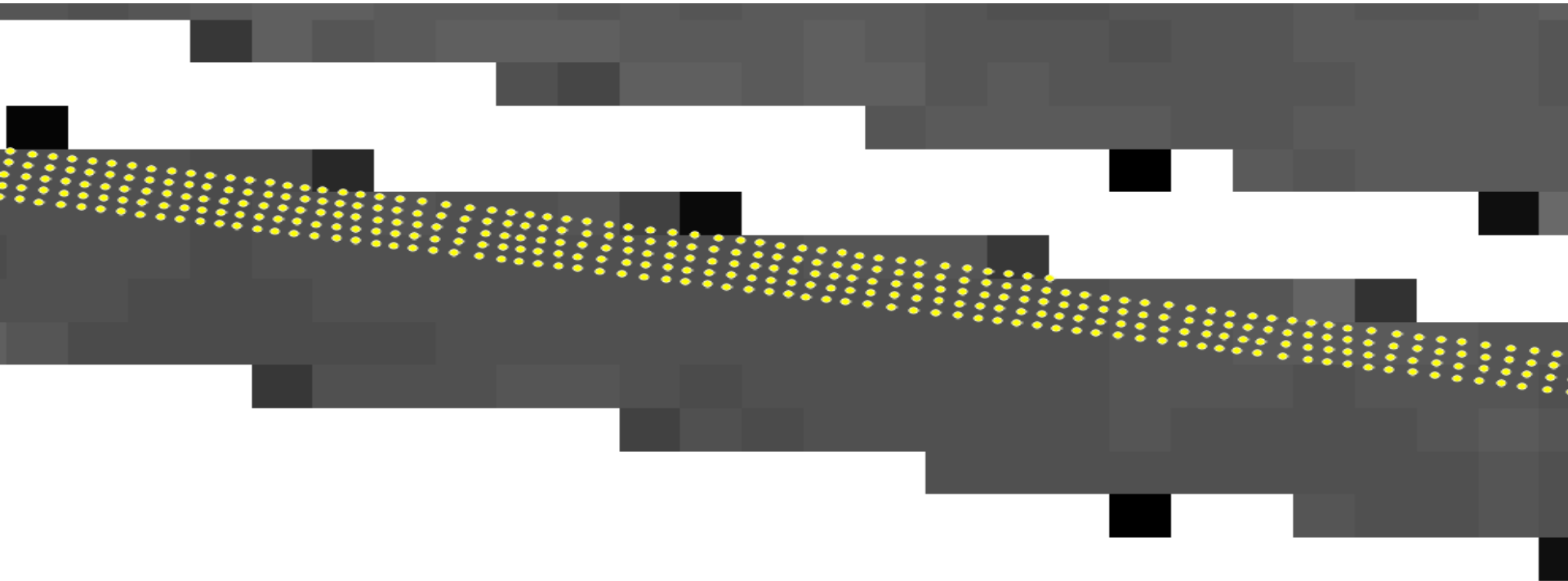
Google earth

Guía turística 17°48'39.10" N 100°08'07.17" O elev. 1265 m alt. ojo 7.72 km



False positives with no data strips

- Fixed with:



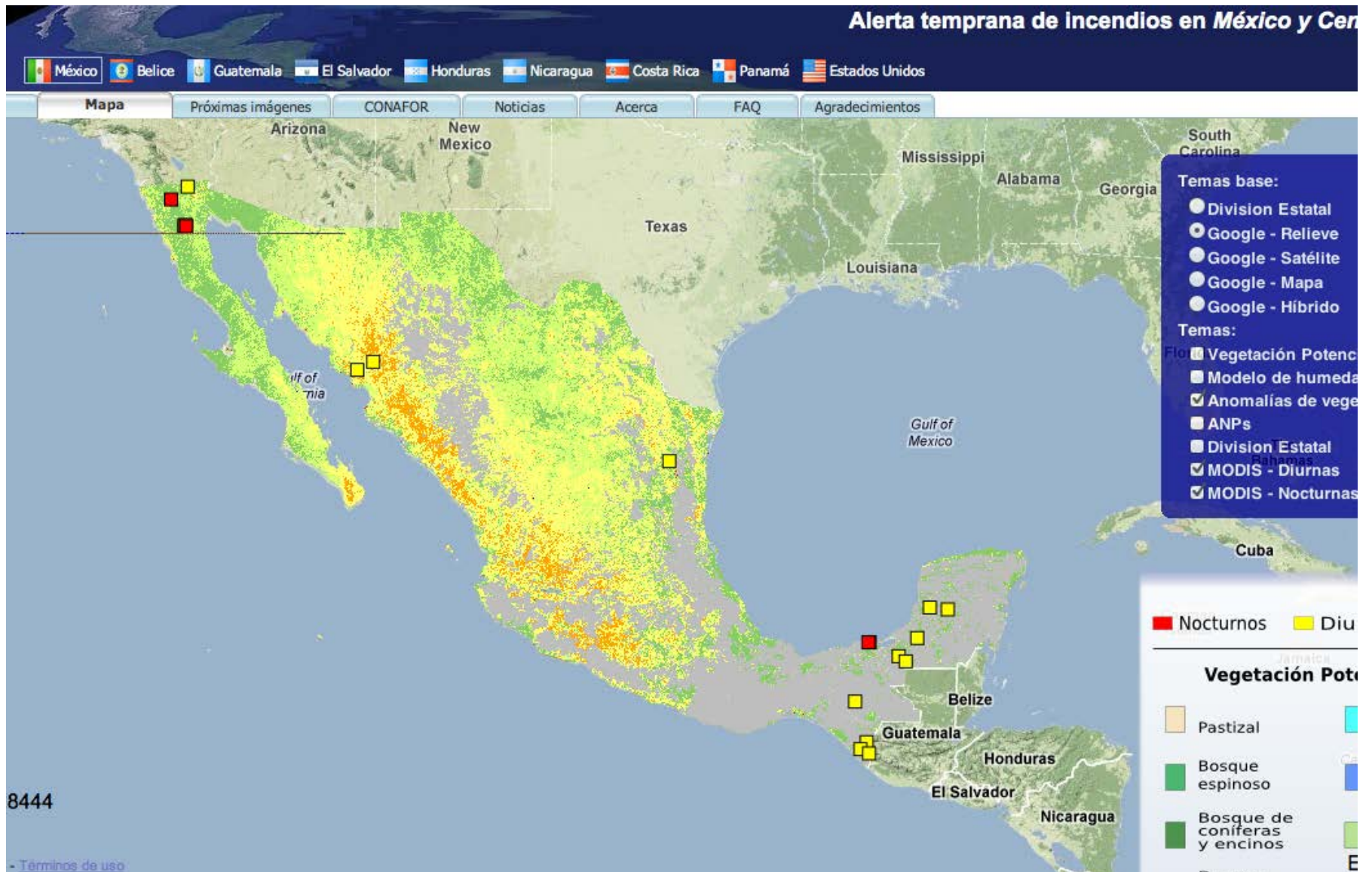
```

24 Esta función extrae la información del archivo "archivo" en formato hdf5 y escribe un archivo de texto con las c
25 ""
26 #puntos = open(archivo+"pc.txt", "w")
27 lista_puntos = []
28 f=h5py.File(archivo)
29 x=f.get("/All_Data")
30 s=x.values()
31 w=s[0]
32 try:
33     lat=w['Latitude']['Latitude_0'].value
34     #lat = lat['Latitude_0'].value
35     lon=w['Longitude']['Longitude_0'].value
36 #     lon = lon['Longitude_0'].value
37     calidad = w['QF4_VIIRSAFARP']['QF4_VIIRSAFARP_0'].value
38     for i in range(len(lon)):
39         lista_puntos.append((lon[i],lat[i],calidad[i]))
40         #puntos.write(str(i)+", "+str(lon[i])+", "+str(lat[i])+"\n")
41     # Filtrado de puntos con confianza mayor de 0
42     UMBRAL = 0
43     lista_puntos = filter(lambda tupla: tupla[2] > UMBRAL,lista_puntos)
44     # Pasa a str
45     lista_puntos = map(lambda x: str(x[0])+', '+str(x[1])+', '+str(x[2]),lista_puntos )
46     #puntos.close()
47     return lista_puntos
48 except ValueError:
49     return lista_puntos
50

```



WMS services: Anomalies on NDVI



Version 2.0 features

Spatially enabled
database

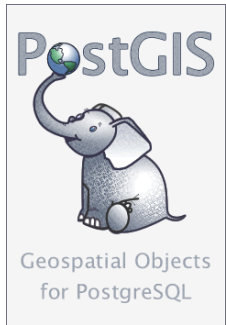
Object Mapper API

Objectified
wild fire

Web services
(JSON,XML)

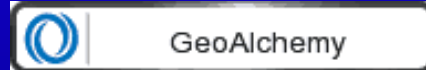
Advanced
statistical and
numerical modules





Postgres
POSTGIS
2.0

SQLAlchemy



SQLAlchemy
The Database Toolkit For Python

Django

Scipy,
Numpy,
GNU-R



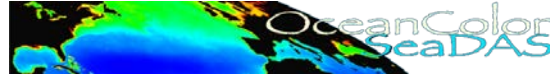
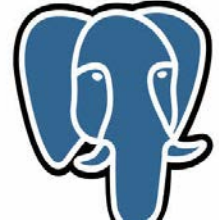
django



Supported by Free and Open Source Software



PostgreSQL



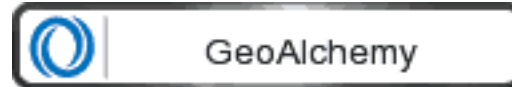
PostGIS



GeoServer



Geospatial Objects
for PostgreSQL



Quantum



GIS



BeautifulSoup



DEBIAN



Wishlist for CSPP EDR

- Include Fire Propagation Rate field (as MOD14) .
- “white-noise” blurring on DNBs
- Aggregate granules on IICMO products.
- Is it possible to reproject IICMO files with polar2grid
- Parallel processing ?
- E.g. per granule. Perhaps with CGI.



References

- S. P. Flasse, P. Ceccato. “A contextual Algorithm for AVHRR fire detection.” International Journal of Remote Sensing Vol 17., Iss. 2 (1996).
- L. Giglio, J. Descloitres, C. Justice, J. Kaufman. “ An Enhanced Contextual Fire Detection Algorithm for MODIS.” Remote Sensing of the Environment Volumen 87, Issue 2-3 (2003).
- Chuvieco, E. Aguado, I. Dimitrakopoulos, A. “Conversion of fuel moisture content values to ignition potential for integrated fire danger assessment”, Canadian Journal of Forest Research, 2004, vol. 34 (11), pp. 2284-2293



References

- Nieto, H., Aguado, I. Chuvieco, E and Sandholt, I. “Dead fuel moisture estimation with MSG–SEVIRI data. Retrieval of meteorological data for the calculation of the equilibrium moisture content.” *Agricultural and Forest Meteorology*, Volume 150 (2010) 861–870
- G. J. Roerink, M. Menenti, W. Verhoef "Reconstructing Cloudfree NDVI composites using Fourier analysis of time series." *International Journal of Remote Sensing*. Vol. 21, Iss. 9, (2000)



-
- Thank you for listening

- Wild Fire System Crew
 - Isabel Cruz
 - Laura Gonzalez
 - Humberto Munoa
 - Juan Escamilla jescamilla@conabio.gob.mx

