

# Geomatics and biodiversity

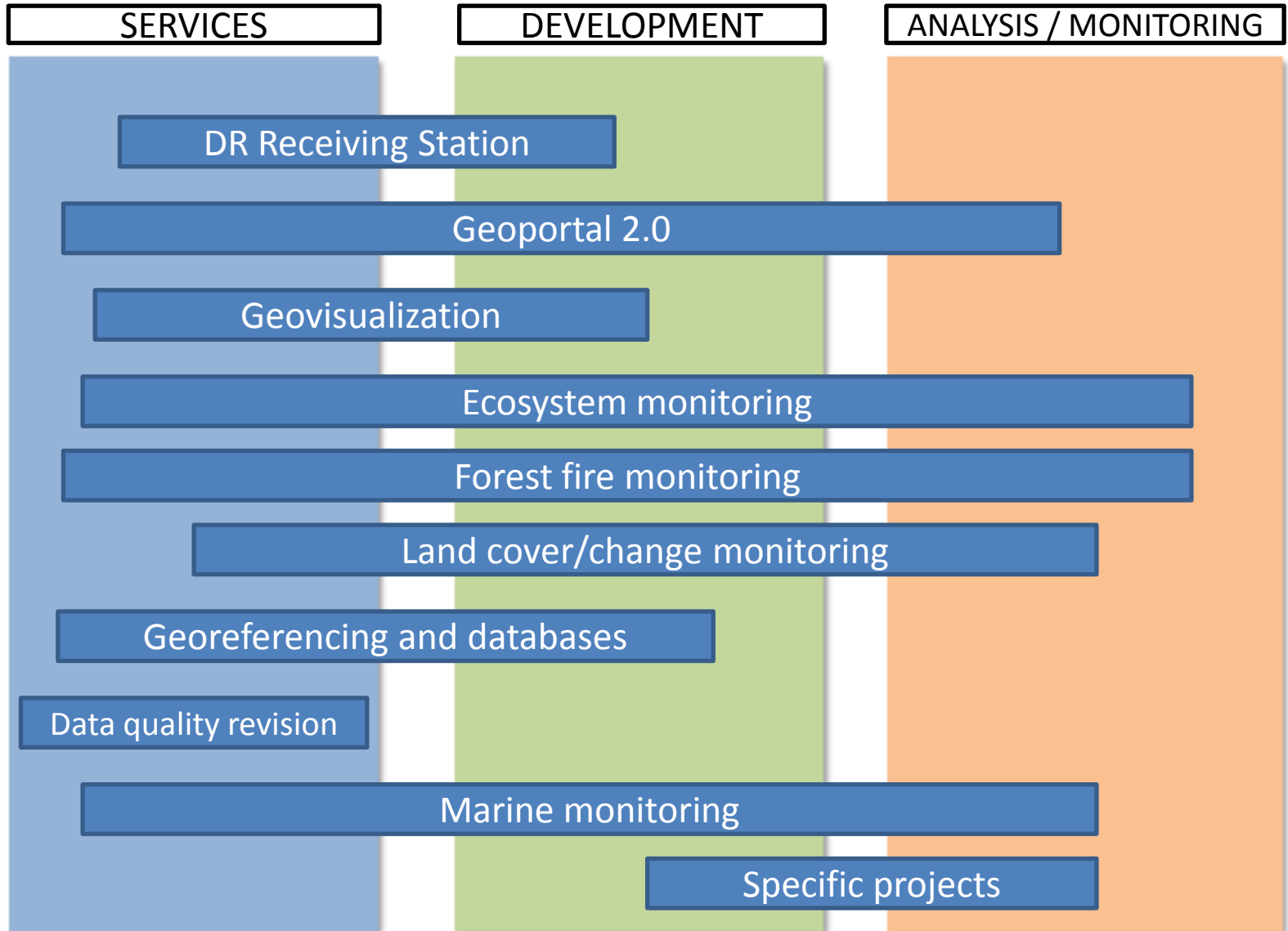


**CONABIO**  
COMISIÓN NACIONAL PARA EL  
CONOCIMIENTO Y USO DE LA BIODIVERSIDAD

**Rainer Ressler**  
Director General de Geomática



# GEOMATICS in CONABIO



# Information retrieval: Georeferencing of species point data



## Objective

- Assign geographical coordinates on basis of locality descriptions of scientific specimen collections



More than

**800,000**

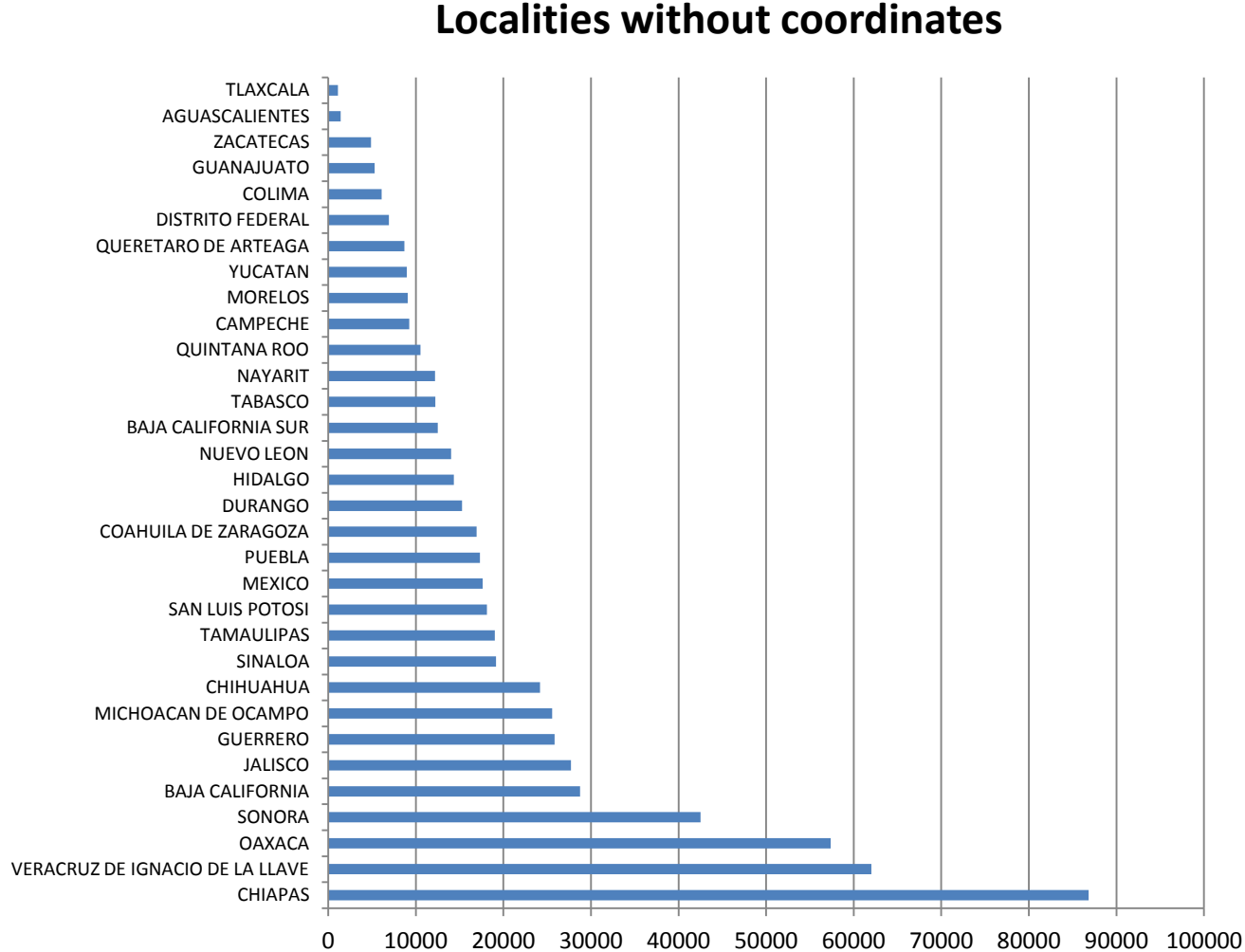
localities being georeferenced  
(SNIB 2015)





# Information retrieval: Georeferencing of species point data

## Localities without coordinates



■ localidades

Estimated time to  
georeference:  
**+/- 14 years**  
(5 analysts full time)



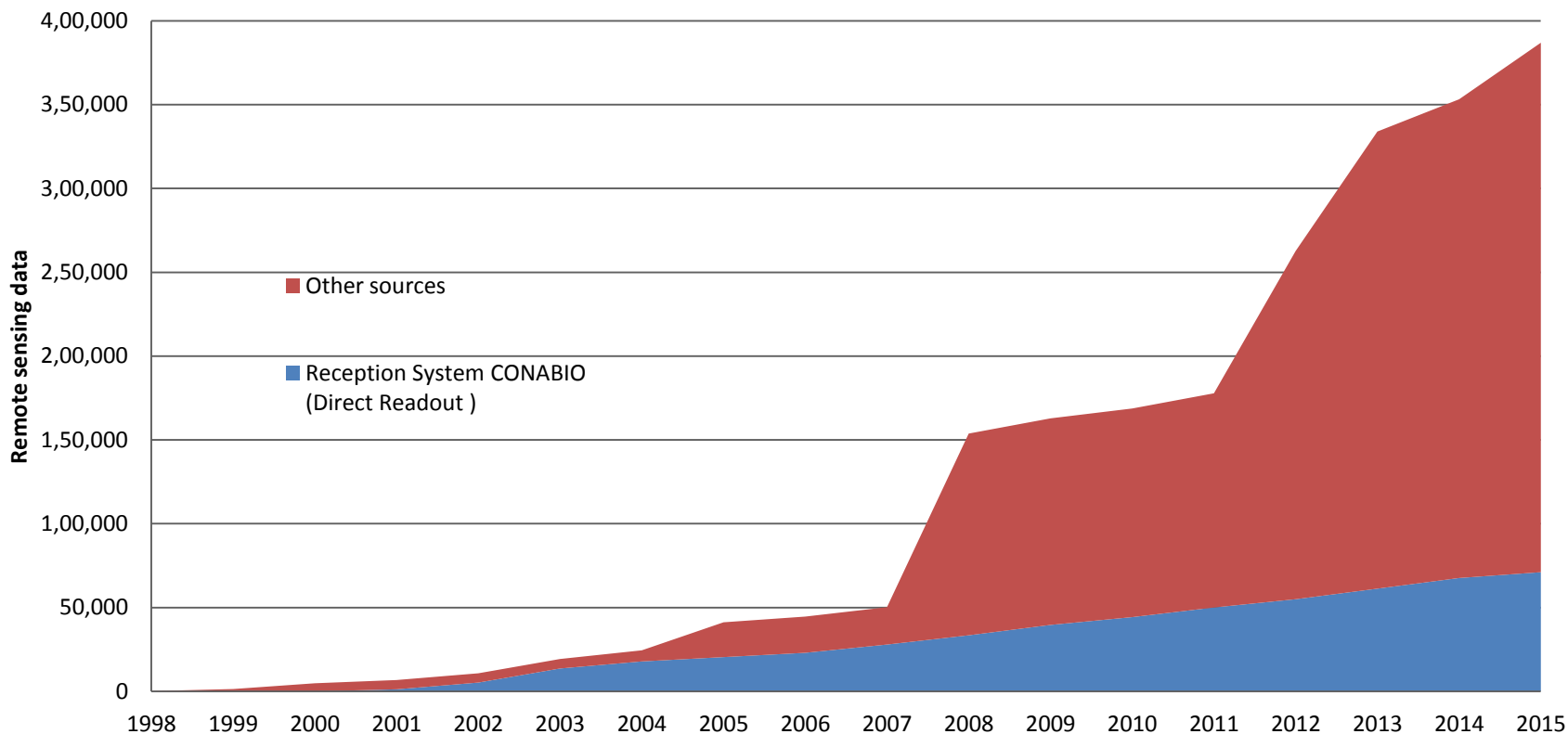
Cooperation with  
universities:

- Univ. de Toluca
- Univ. de Veracruz
- Univ. de Queretaro
- Univ. Auton. Chiapas
- Tec. de Mont. (GDL)

Approx. 500,000 collection sites



## Growth of CONABIO's remote sensing database



### Data type

- Optical images
- Analog Aerial Photography
- Digital Aerial Photography
- Ortophotos
- Hemispheric Photography
- RADAR images
- LIDAR data

### Satellite receiving station of CONABIO

Optical images:

- AVHRR
- MODIS
- VIIRS



# Data warehouse in CONABIO:

## Remote sensing data, products and online cartography

Remote sensing data archive	Total of images
Historical photo archive (1940-1996)	6564
Aerial photos - mangrove (2008 / 2015)	170247
Orthophotos - INEGI (2005)	13996
Landsat MSS (1975-1985)	439
Landsat TM y ETM+ (1990-2014)	58110
Radar (2010)	276
Quikbird *** (2008)	118
WorldView-2 (2010-2013,2015)	461
SPOT INEGI+ERMEXS (2004-2015)	9018
DMSP (1998-2001)	2482
RapidEye* (2011,2012,2013,2014,2015)	27901
IRS_AWIFS (2010 / 2011)	286
IRS_LIS-III (2010 / 2011)	279
<b>MODIS (Terra/Aqua) 2000-2015</b>	<b>34714</b>
<b>AVHRR (2000-2013)</b>	<b>37501</b>
<b>VIIRS (2012,2013, 2014,2015)</b>	<b>2460</b>
LIDAR	5110
Hemispherical photos (2012,2013)	13913
TRMM	3624
<b>Total</b>	<b>387499</b>

Geoportal / Cartography	Total
Biodiversity	3802
Climatology	32
Political division	22
Edafology	14
Geology	2
Hydrology	48
Infrastructure	17
Socio-demographic	83
Regionalization	84
Topography	23
Vegetation and land cover	44
Satellite products	228
<b>Total</b>	<b>4464</b>

First NPP-VIIRS satellite data received and processed in CONABIO 29/03/2012

Internal/restricted access: 1816 maps



# Operational land cover/change monitoring

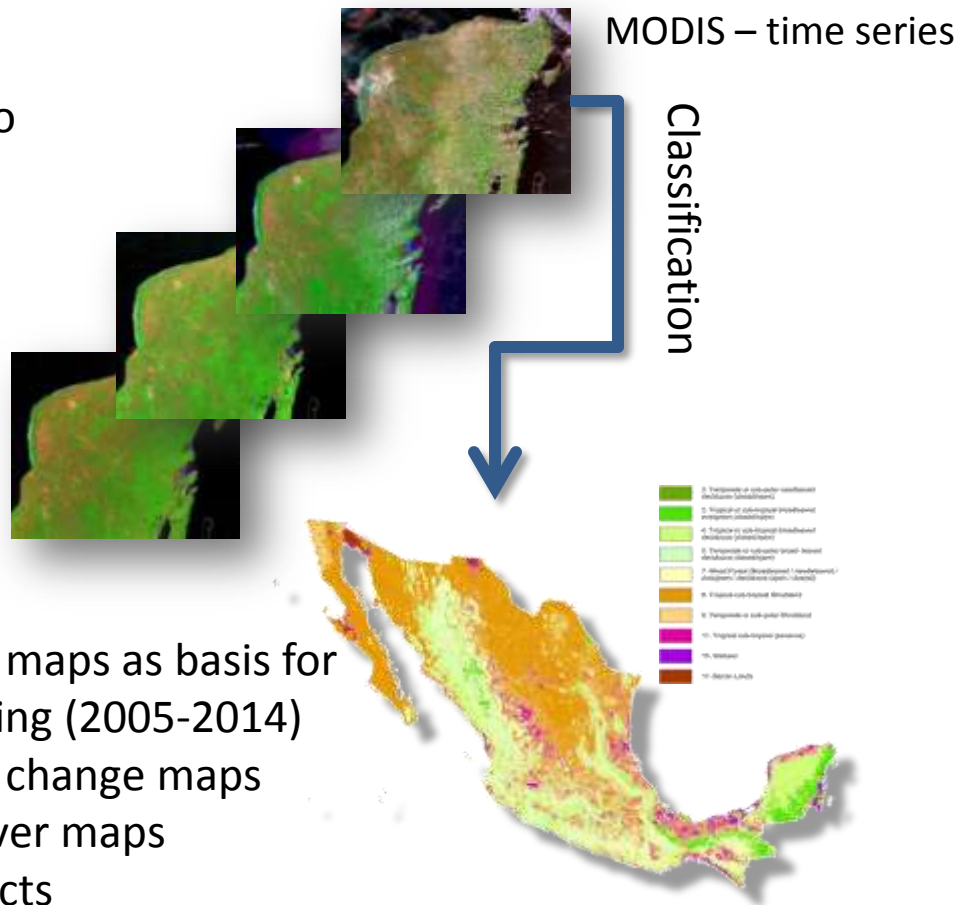
## Objective

Development of an operational system to monitor land cover and land cover change at national scale using satellite remote sensing data and GIS



## Products

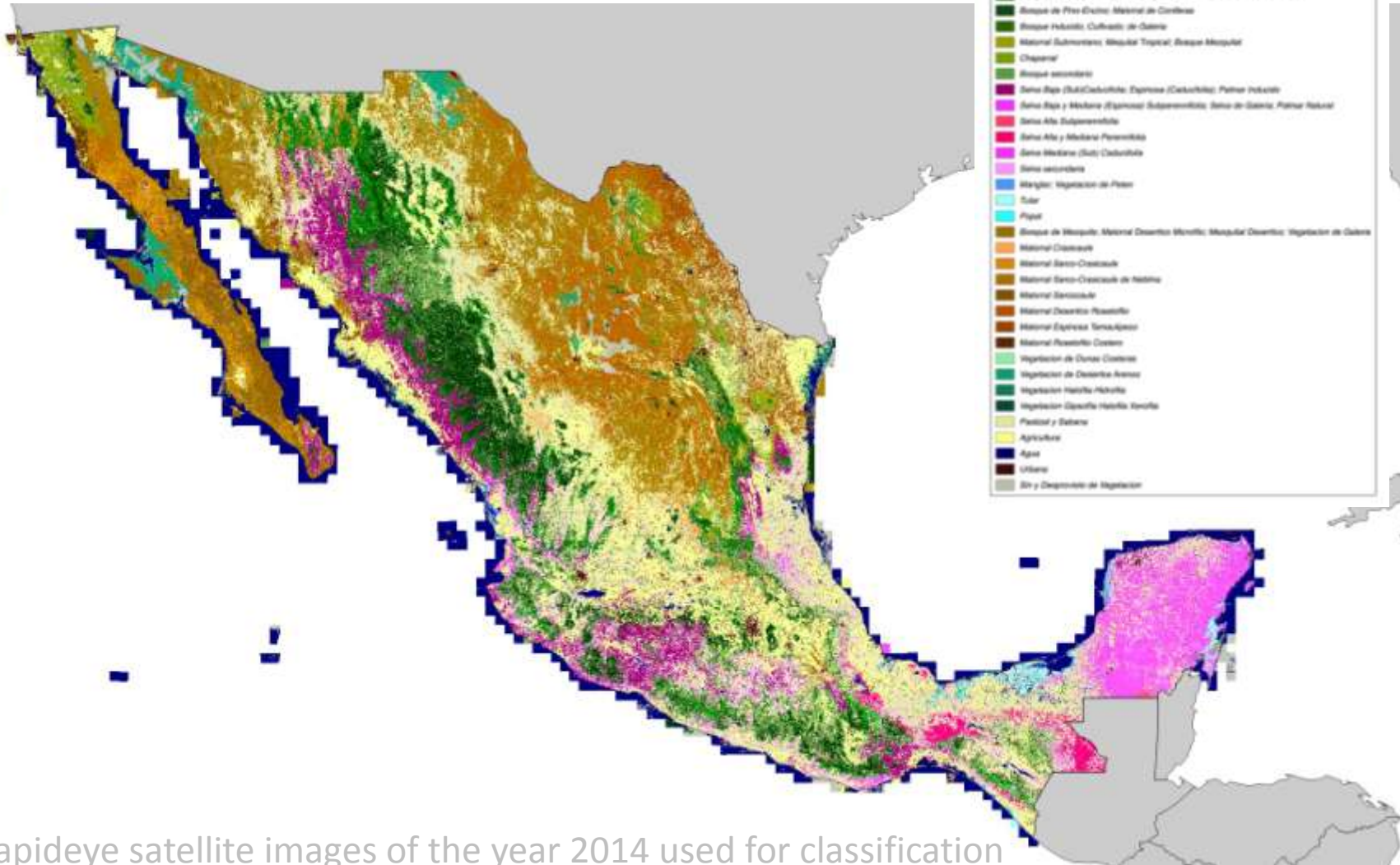
- Annual land cover maps as basis for continuous monitoring (2005-2014)
- Annual land cover change maps
- Fractional land cover maps
- Continental products



# REDD+ MRV-AD system of México (MAD-Mex)

México land cover 1:20,000

Land cover legend



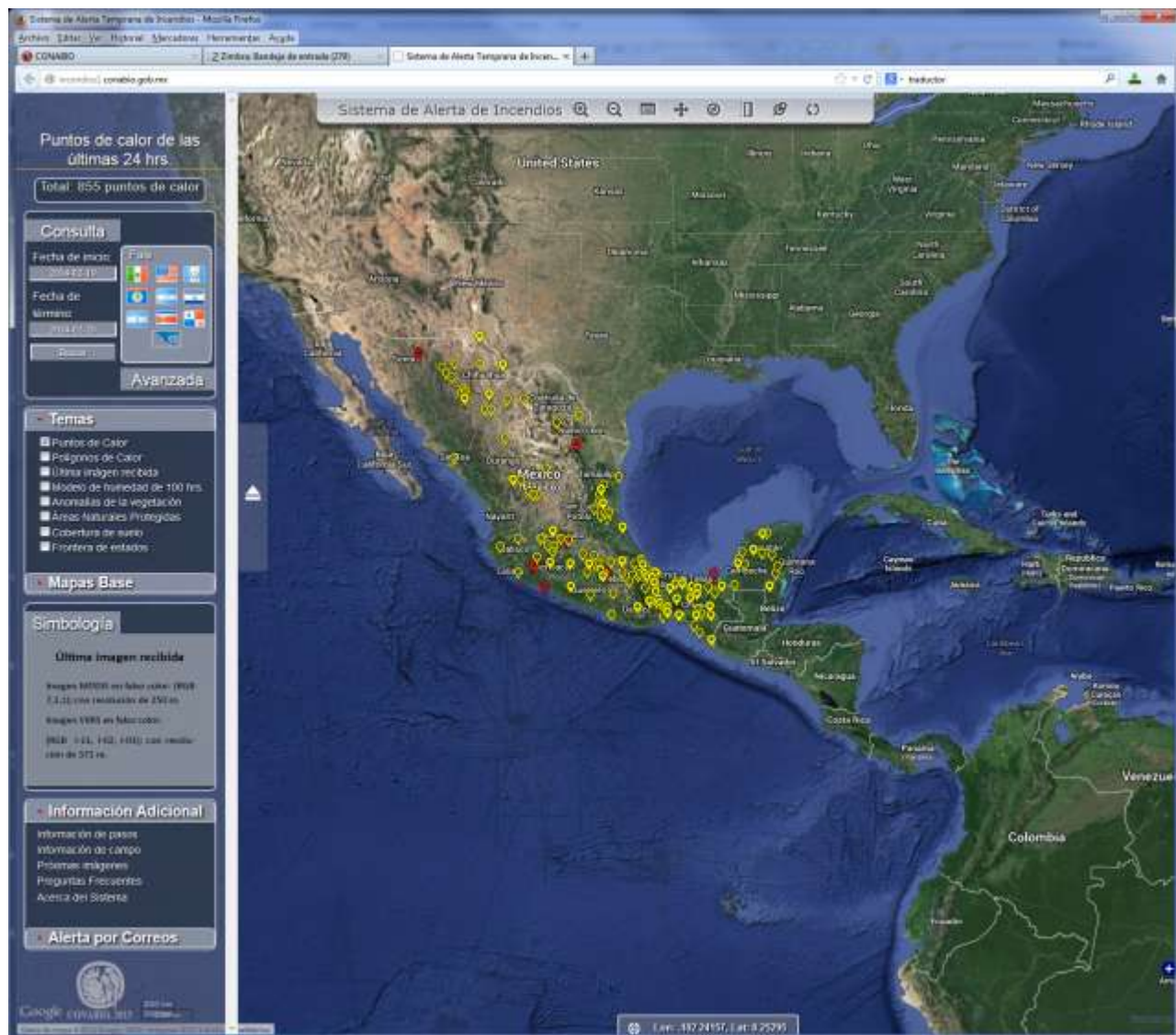
8000 Rapideye satellite images of the year 2014 used for classification



# Early alert system for forest fires

The operational system generates forest fire related information in near-realtime. Main data source is satellite data provided by CONABIO's Direct Readout station.

- ✓ “Hot spot” detection using MODIS and VIIRS satellite images
- ✓ Initial view shows “Hot spots” of last 24 hours
- ✓ Allows query of historical fires back to the year 2000
- ✓ Provides complementing cartographic information for fire characterization and fire propagation risk.
- ✓ Forest fire detection also for Central America countries

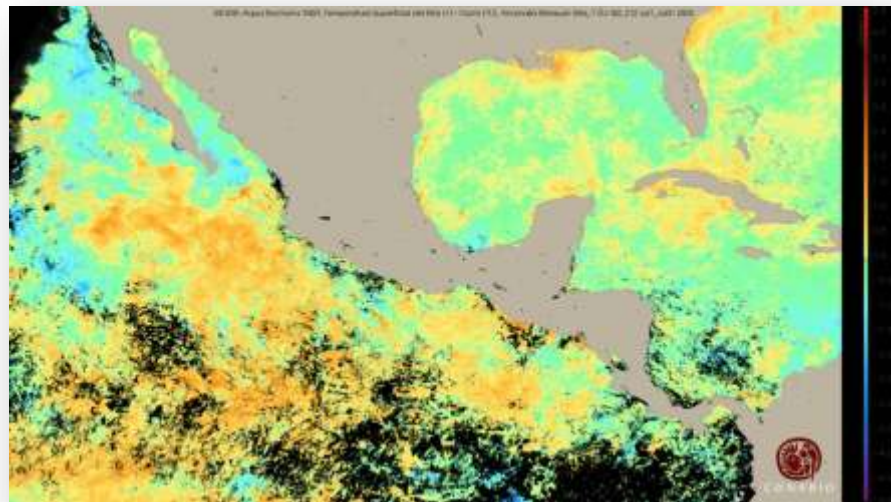
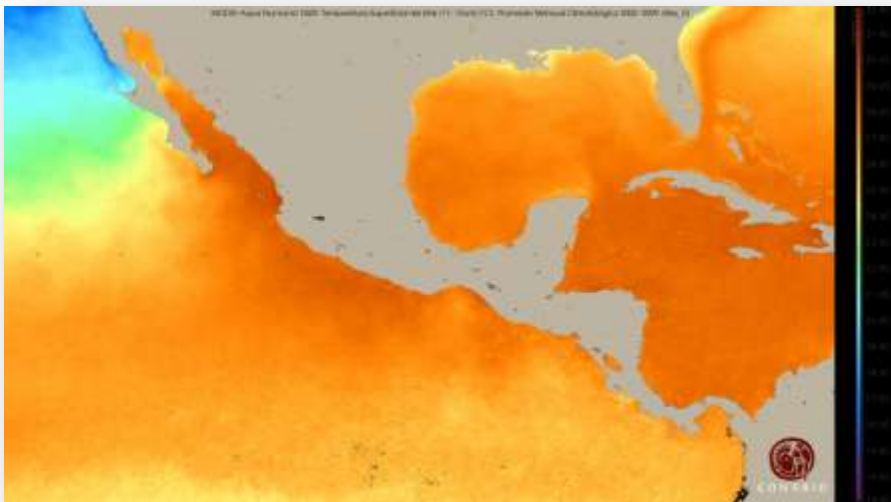


<http://incendios1.conabio.gob.mx/>

# Satellite System for Ocean Monitoring (SATMO)

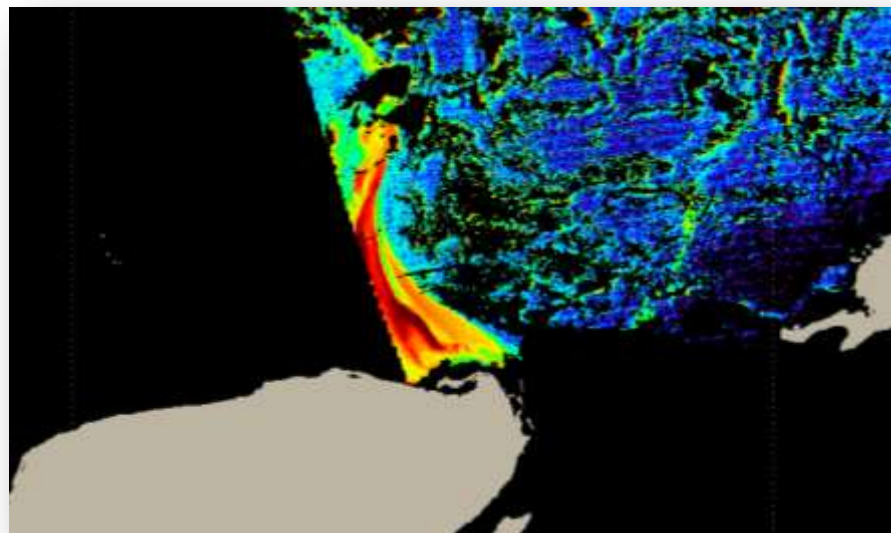
Satellite systems for ocean monitoring and early alert: Thermal stress (coral) and algae blooms

## Satellite System for Ocean Monitoring (SATMO)



Satellite Early Alert System for coral bleaching (SATcoral)

Satellite Early Alert System for algae blooms (SATFA)





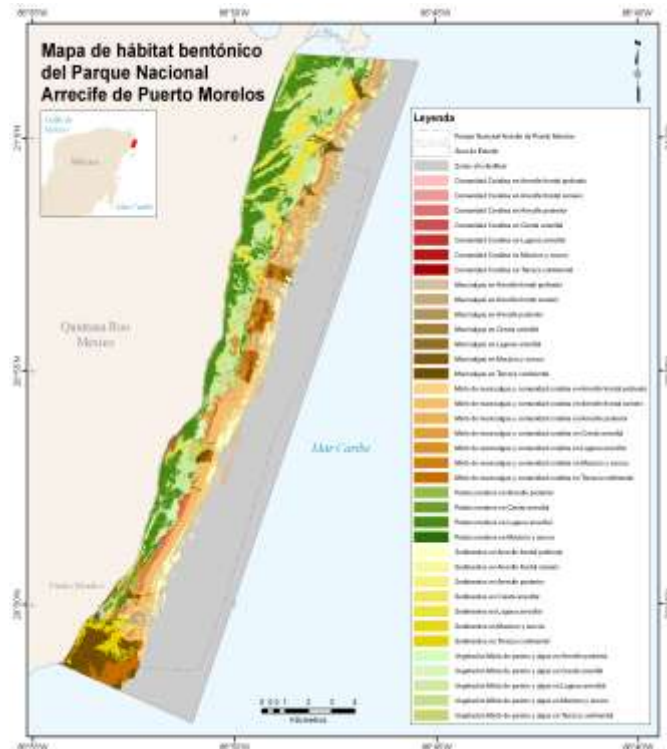
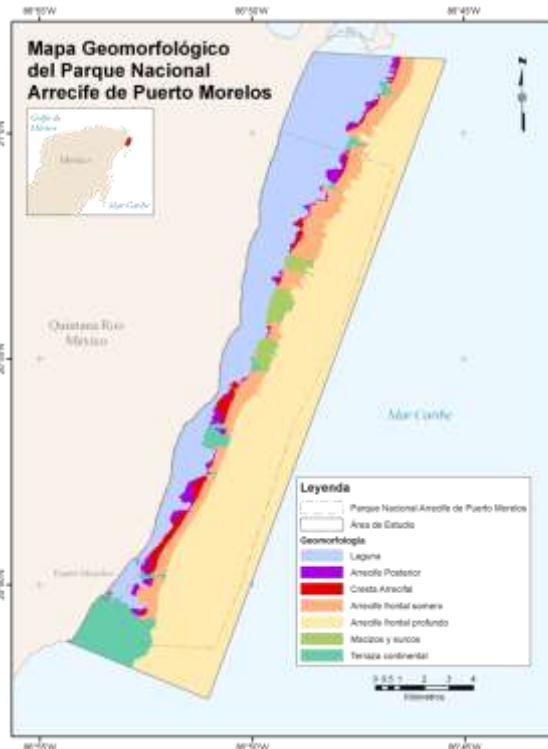
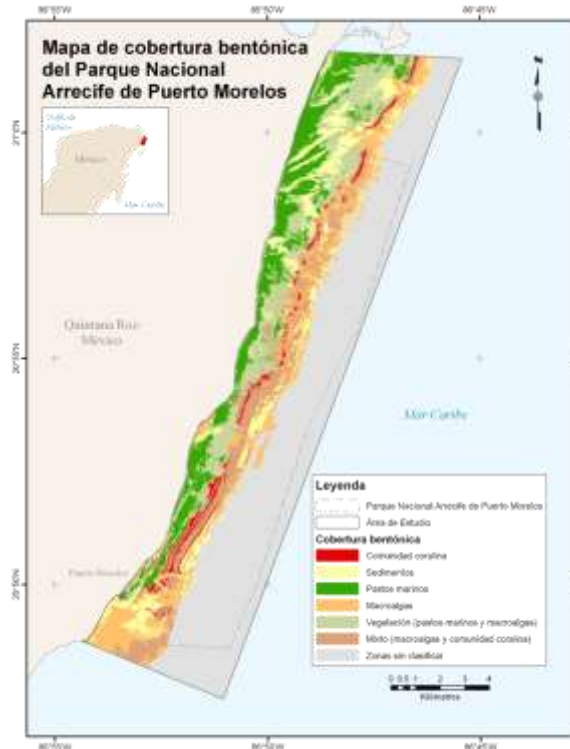
# Benthic habitat mapping using high resolution satellite data

## National coral reef park of Puerto Morelos (Sistema Arrecifal Mesoamericano (SAM))

Map of benthic classes

Geomorphology map

Benthic habitat map

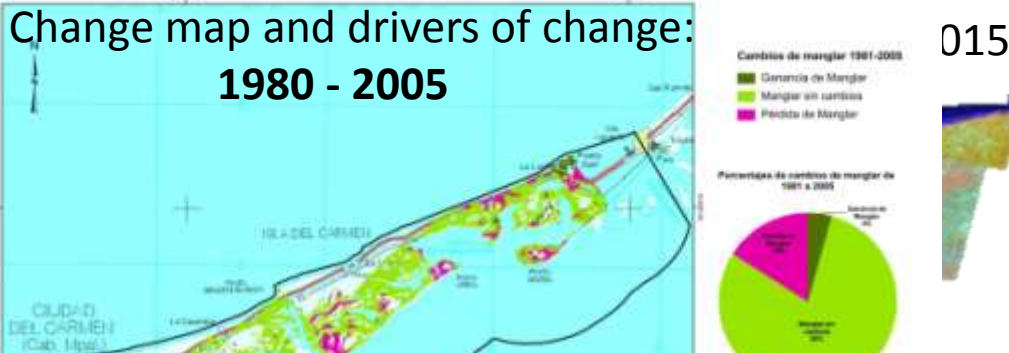


... using WorldView-2 multispectral data (4 m) and field data

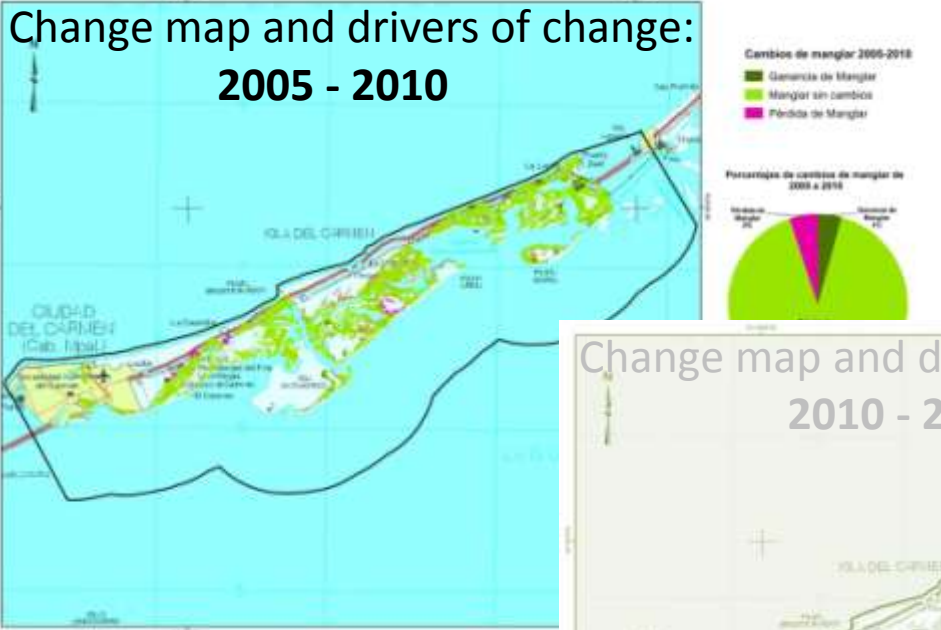
# National Mangrove Monitoring System

## Data sources

Change map and drivers of change:  
**1980 - 2005**



Change map and drivers of change:  
**2005 - 2010**



## Results

National mangrove maps (1:50,000) for:  
1970/80 – 2005 – 2010 - 2015



Change map and drivers of change:  
**2010 - 2015**

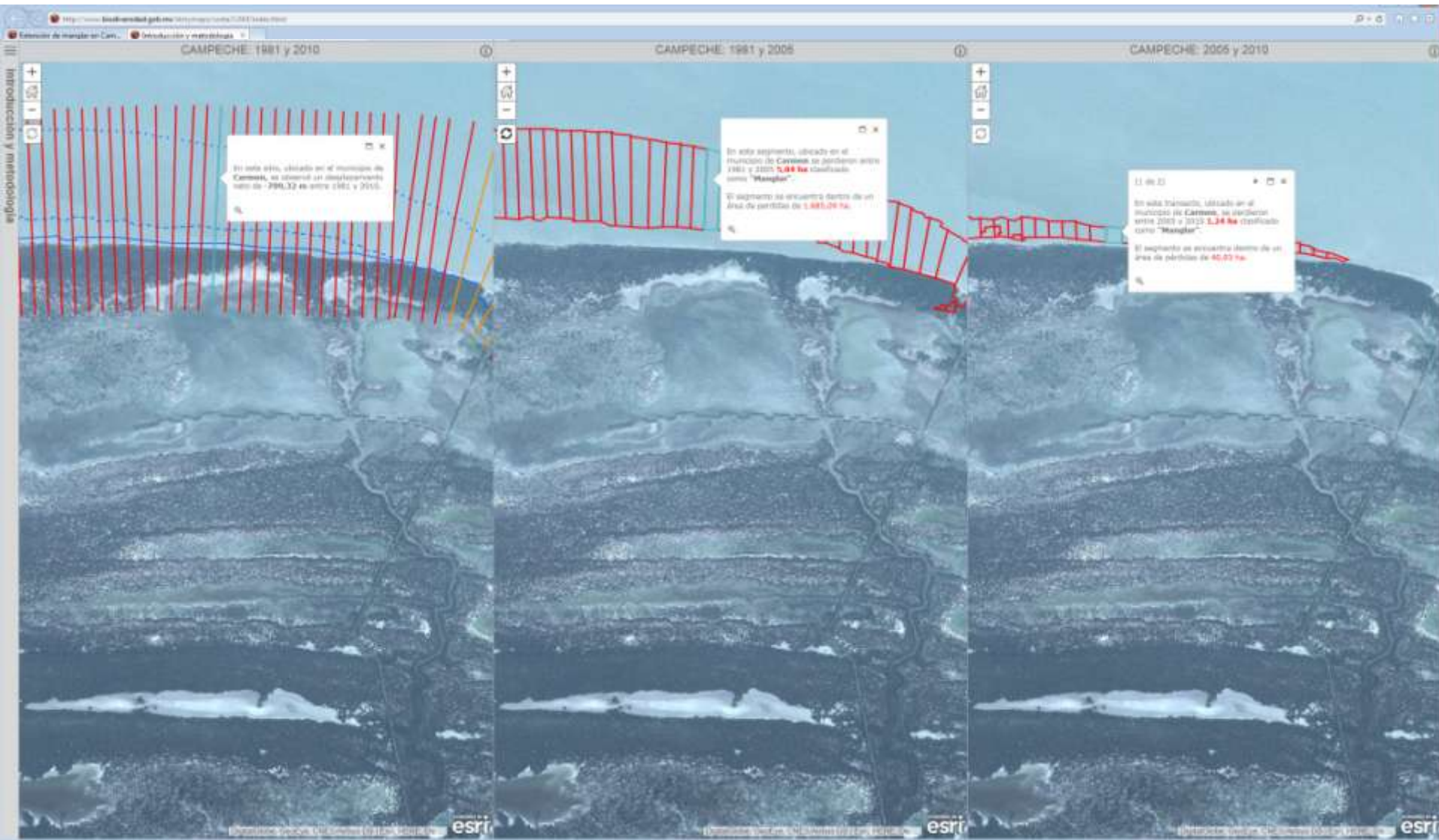




# More than 100,000 aerial photos 369,133 vertical views



Tampico Alto – Veracruz de Ignacio de la Llave





## Mapas con historia

Dimensión social de la biodiversidad - caracterización geoespacial



- Pd** Población y demografía
- PI** Población indígena
- As** Alimentación, salud y educación
- IA** Información ambiental
- Ep** Economía y producción
- P** Pobreza

México visto desde el espacio



Dimensión social de la biodiversidad



Manglares

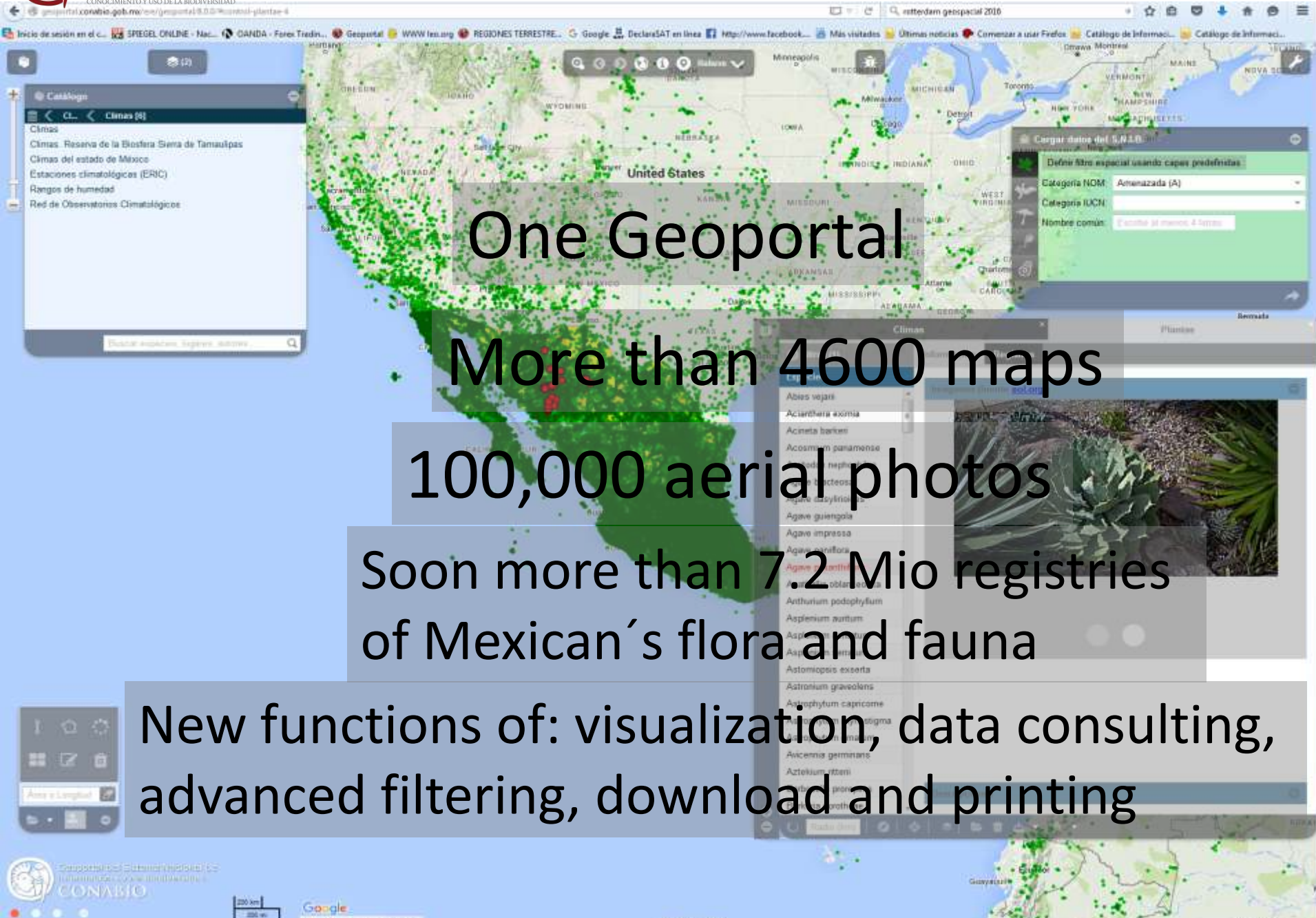


Línea de costa



Cobertura de suelo





One Geoportal

More than 4600 maps

100,000 aerial photos

Soon more than 7.2 Mio registries  
of Mexican's flora and fauna

New functions of: visualization, data consulting,  
advanced filtering, download and printing



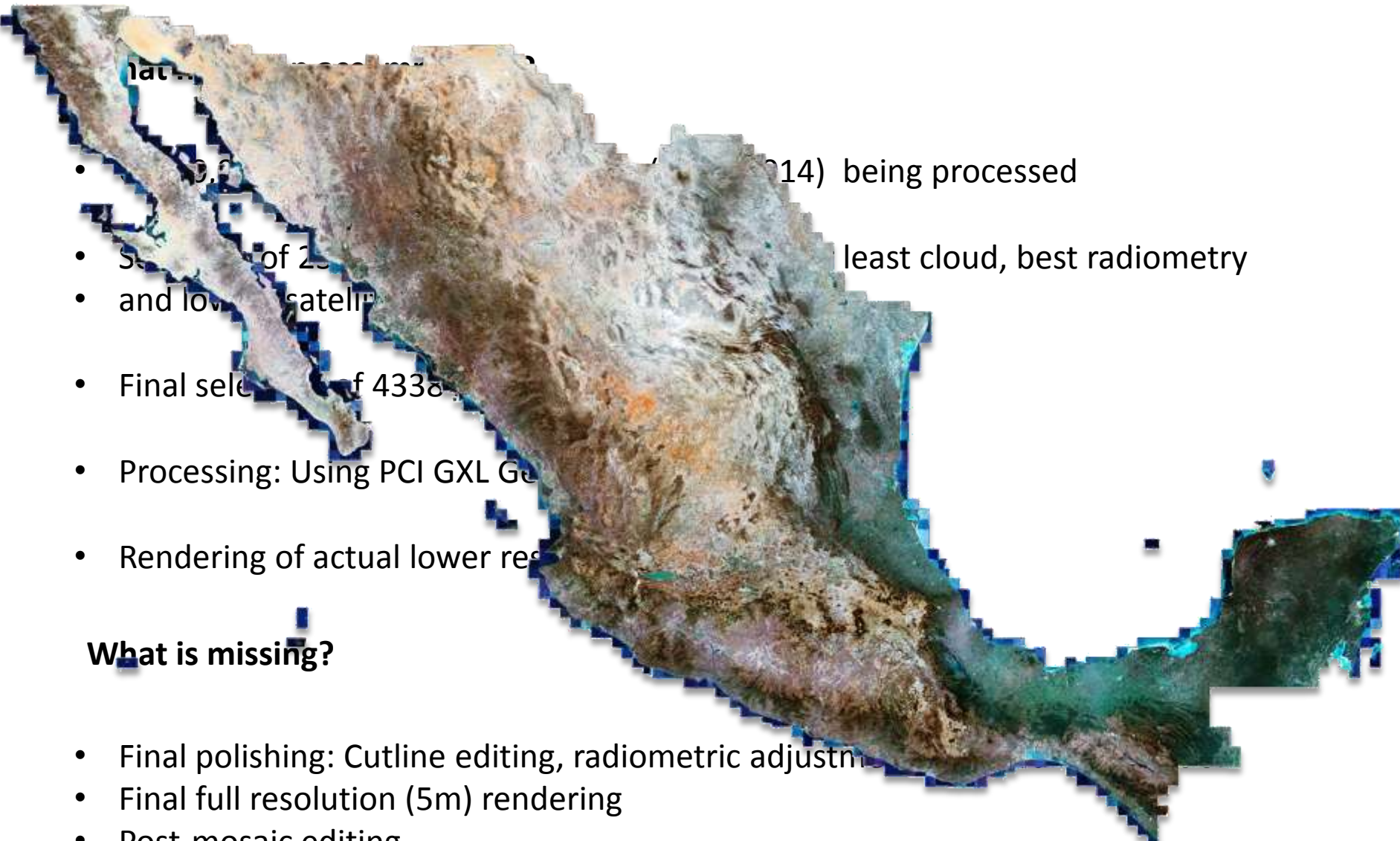


# Geovisualization: México cloudfree

- 9,600 (2014) being processed
- Selection of 25% (least cloud, best radiometry and low satellite)
- Final selection of 4338
- Processing: Using PCI GXL Geomatics
- Rendering of actual lower resolution

## What is missing?

- Final polishing: Cutline editing, radiometric adjustment
- Final full resolution (5m) rendering
- Post-mosaic editing
- Adding Digital Elevation Model (15m), bathymetry, coastal dynamic with Landsat data





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**First completely cloudfree, seamless 5m ground resolution satellite mosaic of México**

Prototype: [http://www.biodiversidad.gob.mx/storymaps/mosaico/CONABIO\\_MosMex\\_092015\\_leaflet.html](http://www.biodiversidad.gob.mx/storymaps/mosaico/CONABIO_MosMex_092015_leaflet.html)

## The final mosaic will/can be used for:

- Basemap for any kind of web-mapping application ( as CONABIO's geoportal)
- Texture for 3D and 4D animations with biodiversity related content
- Baseline satellite information for environmental studies for the academic sector
- Educational purposes (e.g. Secretaria de Educación Publica SEP)
- General cartography
- Cadastral applications
- Esthetic applications (videos, posters, large scale printouts)

➔ Public version available early 2016

**Thank you**