

Theia Land Data Centre

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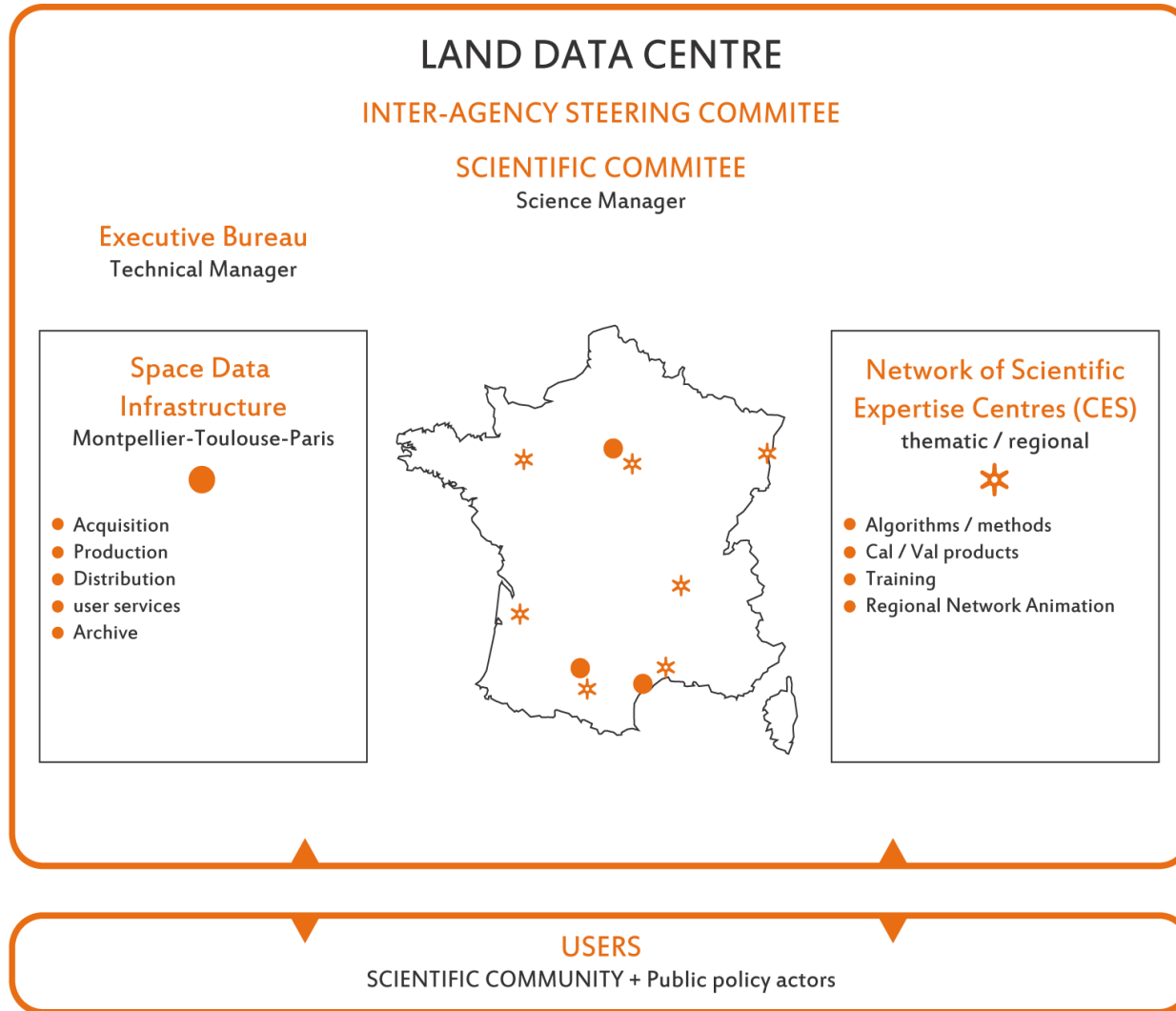
THEIA is a national structure funded jointly by 9 public institutions. Its objectives are

- to address the needs of the national scientific community in terms of products, methods and training linked to **the observation from space of land surfaces**
- to facilitate access and use of space data **for a large user community**
- to make national efforts visible at European and international level

THEIA relies on :

- a Space Data Infrastructure distributed on several sites whose components are developed at CNES, IGN and in the framework of GEOSUD
- a network of Scientific Expertise Centres
- a programmatic, scientific and technical organisation
- a Web site giving access to THEIA products and services (www.ptsc.fr)

Structure



TYPE	PRODUCTS	FREE ACCESS TO	PROCESSING
IMAGES VERY HIGH SPATIAL RESOLUTION	Pléiades images on ~100 cities France 2012-2015	National Public actors	Orthorectification
	Direct Reception images type Spot 6/7 after 2015	National Public actors	Programming capacity + real time
IMAGES HIGH SPATIAL RESOLUTION	Yearly cover France 5m res. 2009-2015	National Public actors	Orthorectification + mosaics (+ direct recept. Landsat 8)
	Series 2000-2012 Spot images and others on 4 sites	National Public actors	Orthorectification + Atmospheric correction
	Take 5 : Spot 4 images every 5 days, Feb - June 2013, 45 sites	All users	Orthorectification + Atmospheric correction
	Spot World Heritage Program : 400 000 images over the world 1986-2008	All users for a non-commercial use	Orthorectification
	S-2 France + other areas (10 times France) + Landsat 8 France	All users	Atmospheric corrections + monthly composites
BIOGEOPHYSICAL PRODUCTS, GLOBAL	Global LAI, fAPAR, AVHRR	All users	Biogeophysical processing
	Water level, lakes and rivers : Jason and others	All users	Biogeophysical processing

+ value-added products in preparation, based on Sentinel-2 :

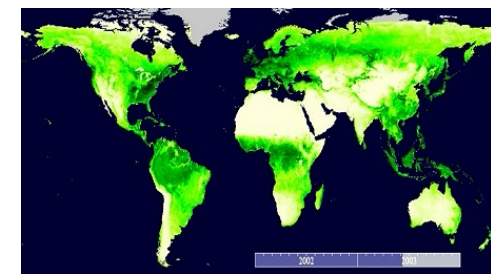
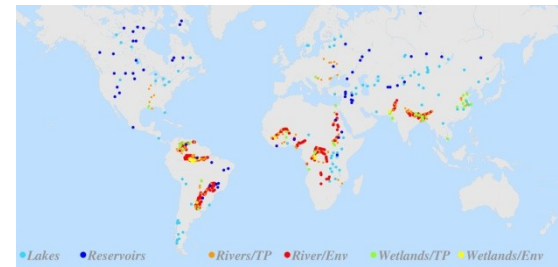
- Land cover maps with agriculture & land management focus

- Different types of products:

- SPOT Level 1C products (multispectral)
 - Sentinel-2 atmospheric corrections – Level 2A & 3A products
 - Lakes and rivers water level :
 - New service in preparation based on the Hydroweb platform of LEGOS
 - Goal: to have a demonstration of an operational service by mid-2015
 - Global vegetation variables already taken up by GIO Global Land
 - Additional R&D needed for some of the products
 - Land cover maps (in preparation)
- THEIA portfolio can be seen as supplementary to the Copernicus Services portfolio

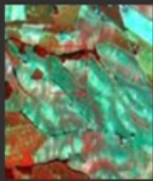


Niveau 1C: Niveau 2A: Niveau 3A:





NEWS



FIRST SPOT 4 / TAKE 5 IMAGES AVAILABLE

A first 5" exper...



SPOT... The last experim... It is with...



OPENING OF THE PTSC WEBSITE

The PTSC Web site has been opened to the public, under the address www.ptsc.fr, on April 15, 2013...

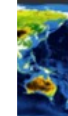
1 2 3 >

LAND DATA CENTRE (PTSC)

The Land Data Centre (PTSC) is a national inter-agency organization designed to foster the use of images coming from the space observation of land surfaces.

- Access to products & services : www.ptsc.fr
- Interoperability with other portals (GEOSUD, IGN Géoportail)
- Visualisation
- Download
- Perspectives: services of on-line processing (computer and software ressources)

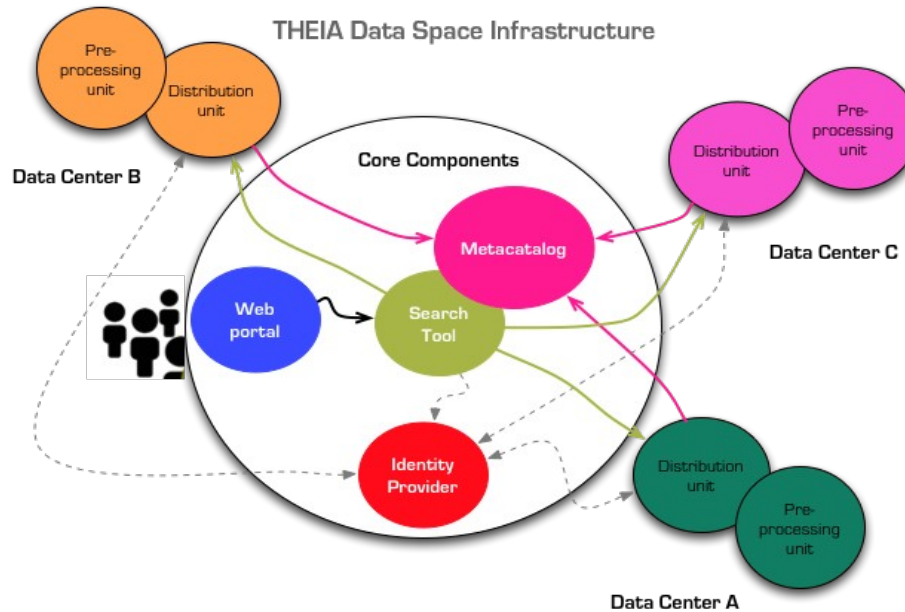
public policy for the... scales.
... on the ecosystems and... societies' evolutions and... understand the biodiversity



To achieve this goal the Centre develops, generates and makes available to the national scientific community, images, products, methods and services related to the space observation of land surfaces, from the ecosystem and territory scale to the global scale. The Centre relies on an infrastructure producing spatial data, the Management and Data Processing Centre (CGTD), built around EQUIPEX GEOSUD and Muscate production centre at CNES, and on scientific expertise centres located in different areas.

The products and services offered by the PTSC are quality controlled and cover large territories and long time periods: annual satellite coverage of the national territory, surface reflectance time series at high or very high resolution, time series of bio geophysical products on a global scale (e.g. biomass, water heights, surface moisture...), tools to assist the data visualization and processing, processing methods and algorithms and validation

- The THEIA Space Data Infrastructure (SDI) is seen as a federation of data centres distributed geographically, linked by a nucleus of mutualized services (core components)



- Such a SDI can be scaled up with other contributions, possibly European

THEIA at national level

Offer a platform of concertation to elaborate jointly national strategies

- Development of the Spot World Heritage project
- Use of Pleiades and Spot 6/7 data
- Use of Sentinel data (in particular Sentinel-2)

THEIA at European level

Interface national efforts with European Core Services

Network with other countries

- Frequent contacts with DLR
- Long standing cooperation history with Belgium (VITO, UCL), Austria (U. Wien), Portugal (IM)
-

Exemple of THEIA products and correction algorithms

Simulation of Level 1, 2, 3 products with FORMOSAT 2 images:



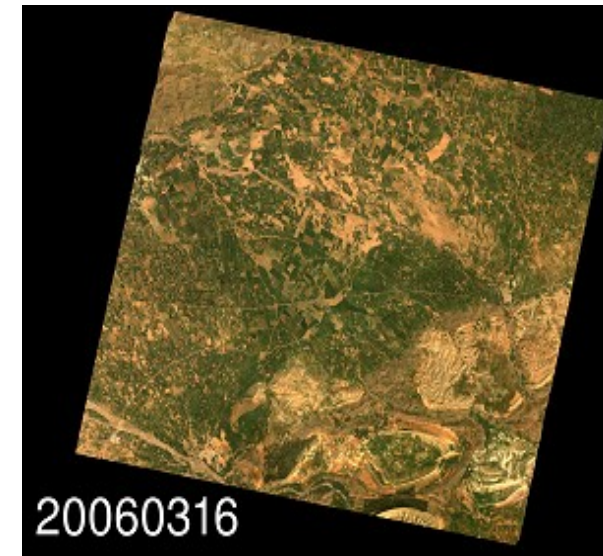
Level 1C:

Top of Atmosphere
Reflectance calibrated &
orthorectified



Level 2A:

- Surface reflectances corrected from
 - atmosphere effects (aerosols and water vapour...)
 - adjacency effects
 - topographic effects
- Clouds and clouds shadow

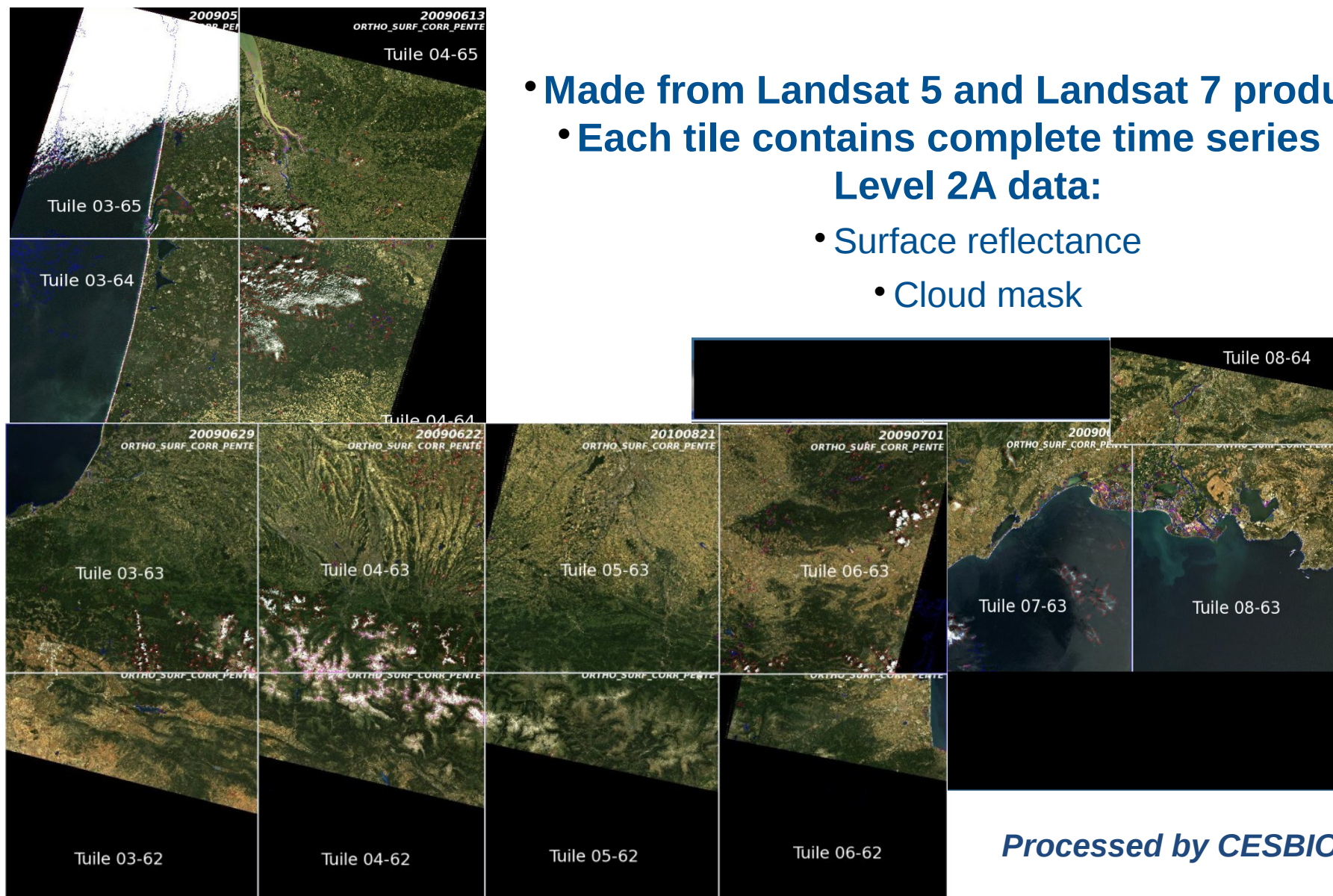


Level 3A:

Monthly composite of
level 2A products
Weighted average of
surface reflectance of
cloudfree pixels

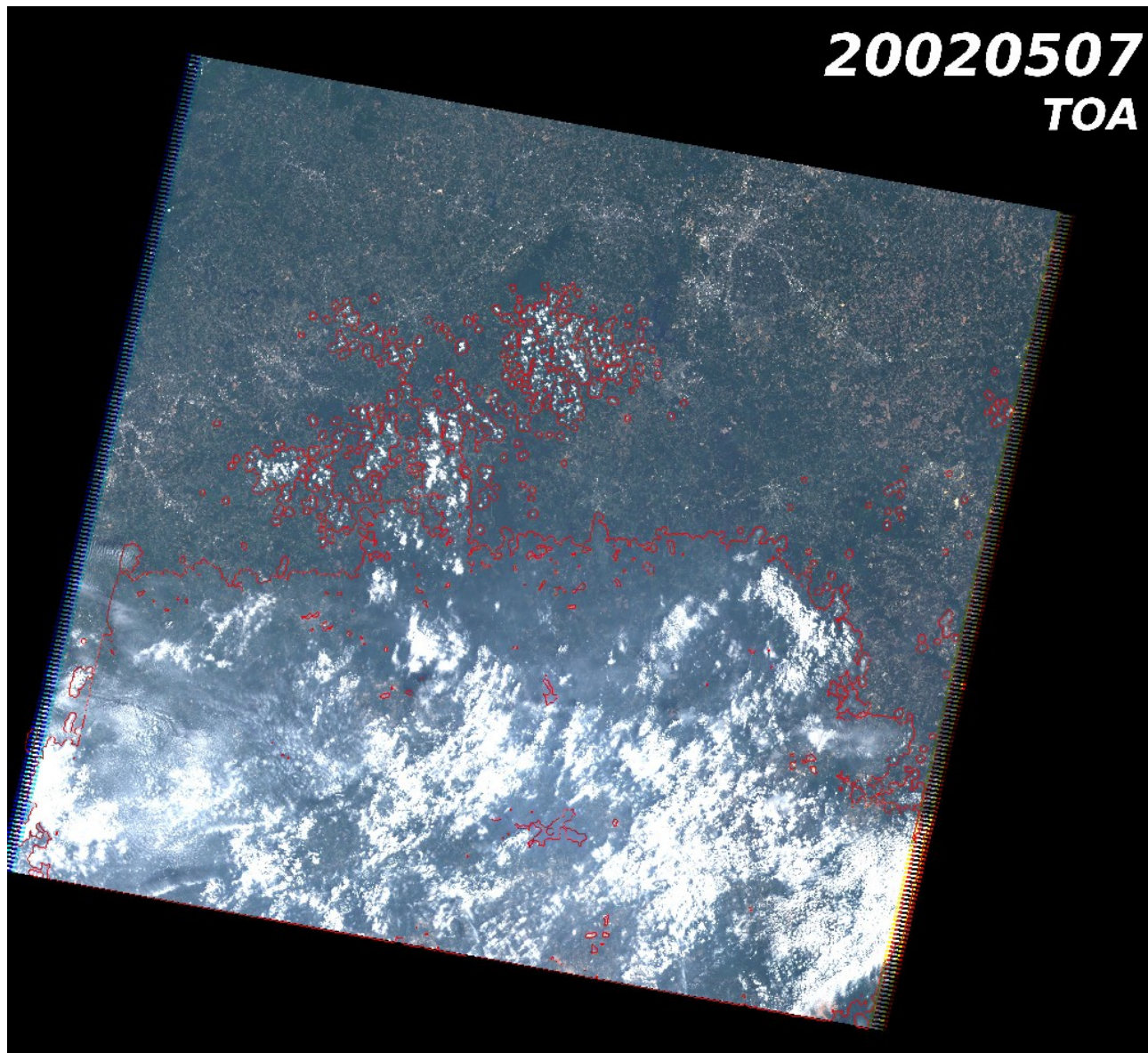
Example of output products

- Made from Landsat 5 and Landsat 7 products
- Each tile contains complete time series of Level 2A data:
 - Surface reflectance
 - Cloud mask



Processed by CESBIO

Cloud mask validation

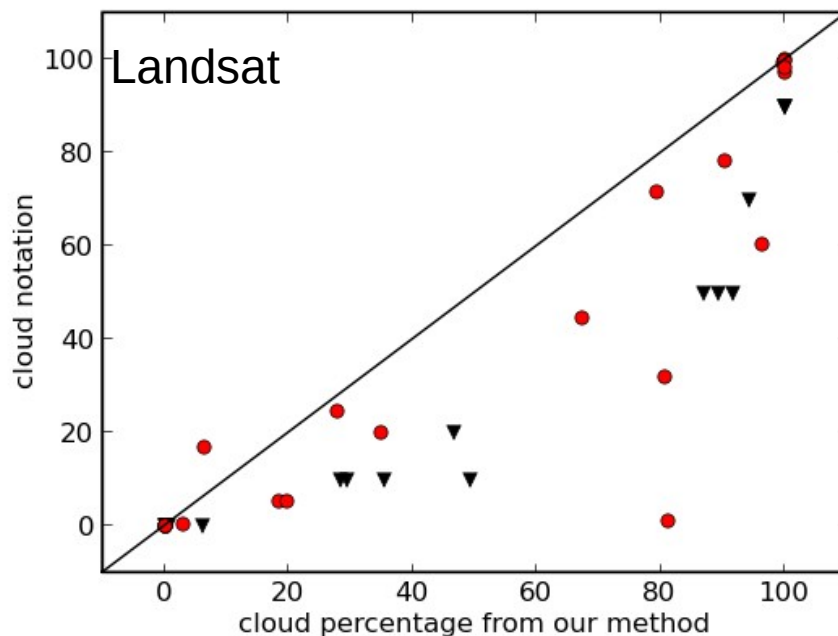
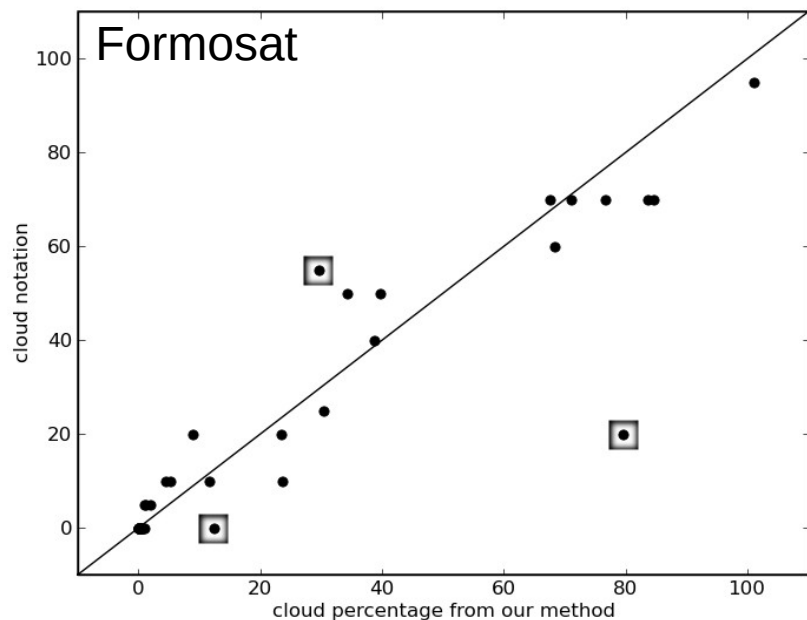


LANDSAT
Catalogue : 10%
Cloud mask : 49%

Processed by CESBIO

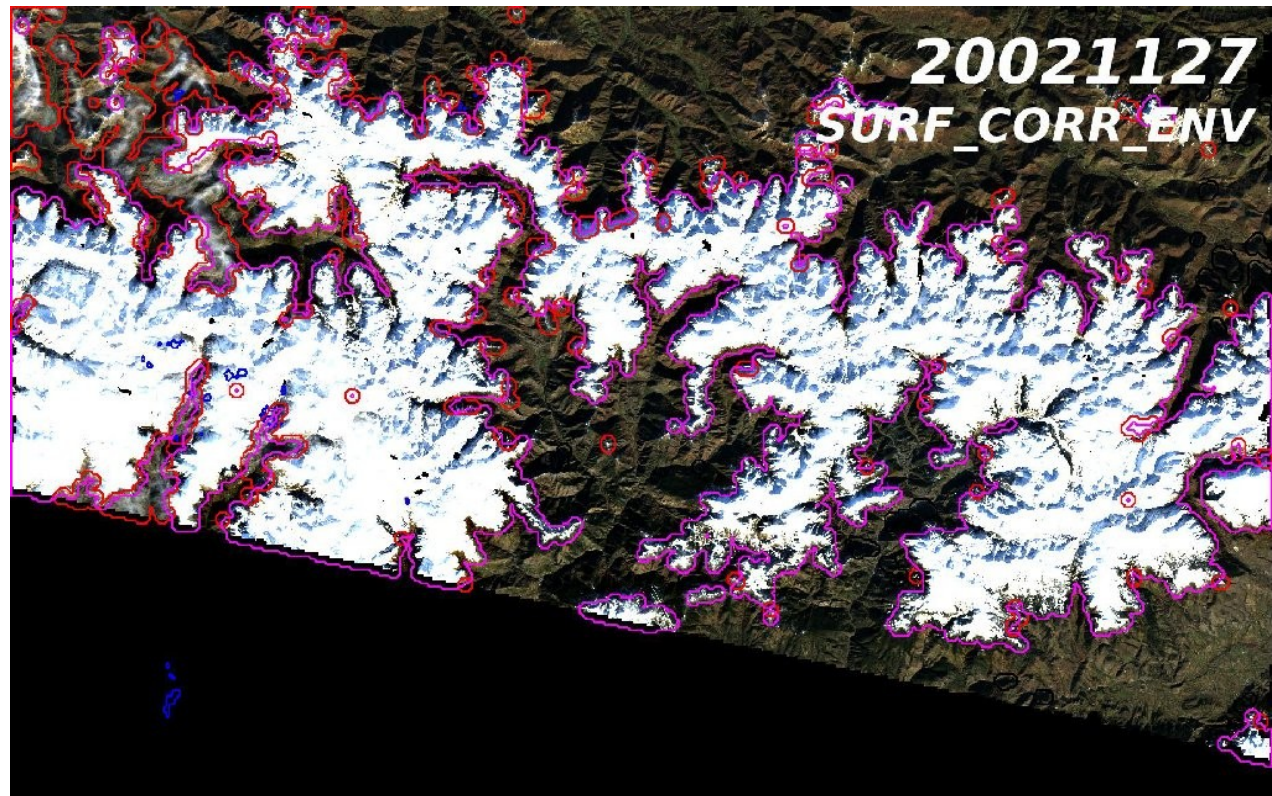
Cloud Mask validation

- Comparison with Formosat and Landsat notation from catalog:
 - Formosat: manual notation by NSPO operators
 - Landsat: automatic notation



Snow mask

- Simple thresholds work well
 - High reflectance in the red
 - Low NDSI (using SWIR)
 - No high cloud (using 1.38 μm band)
- Partial snow cover is detected as cloud
 - Could be enhanced at higher resolution
- Validated with MODIS Snow mask
 - 97% agreement



Atmospheric correction

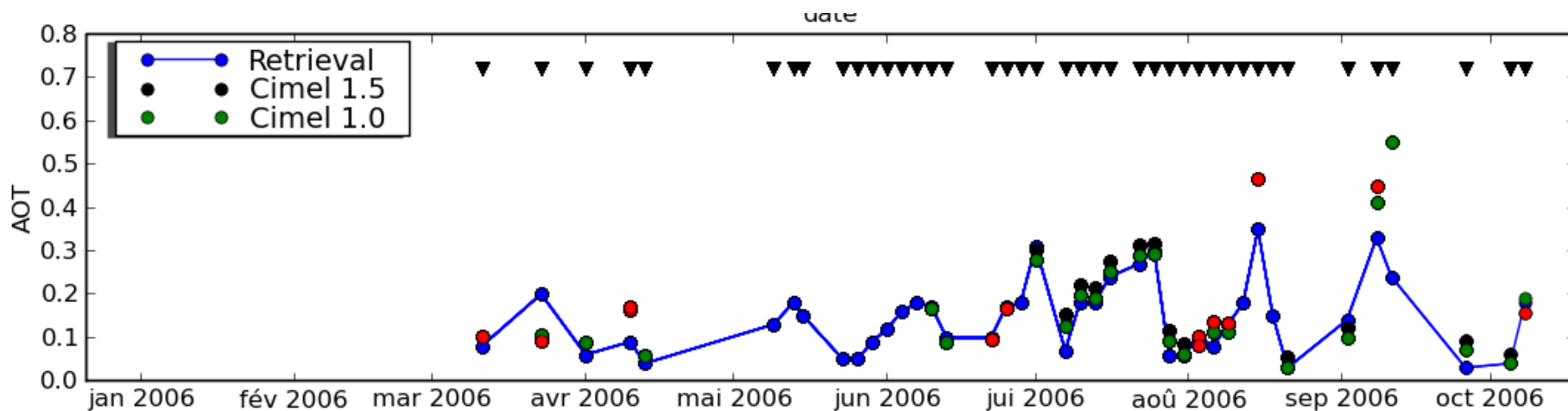
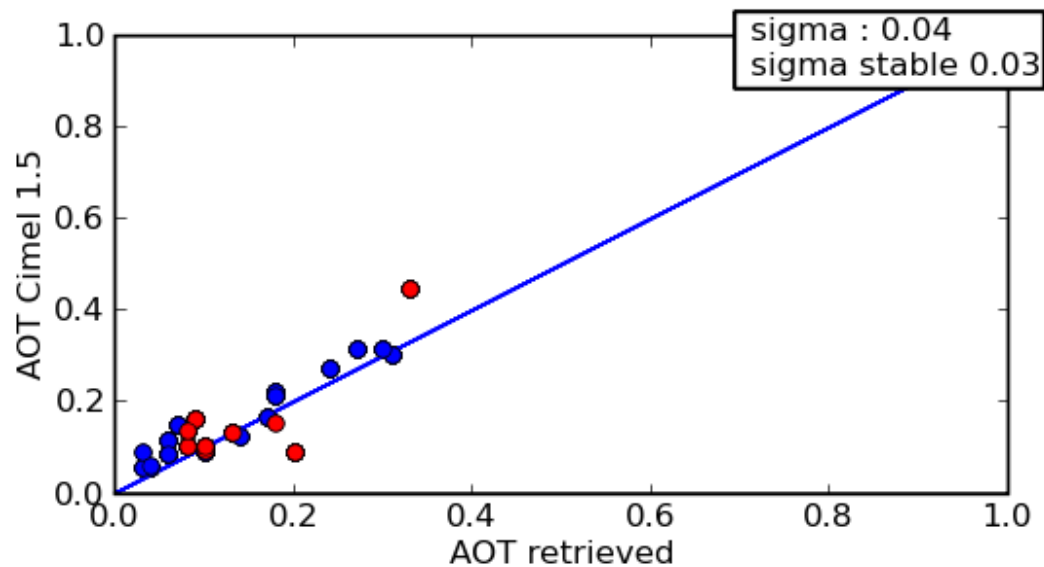
20050525

An aerial satellite image of a rural landscape, likely agricultural fields, with a cyan overlay. The image shows a grid of fields in various shades of brown, green, and red. A prominent road or canal runs diagonally from the bottom left towards the top right. A white rectangular box highlights a specific area in the lower-left quadrant, containing a small structure or building. The text '20050525' is overlaid in the bottom left corner.

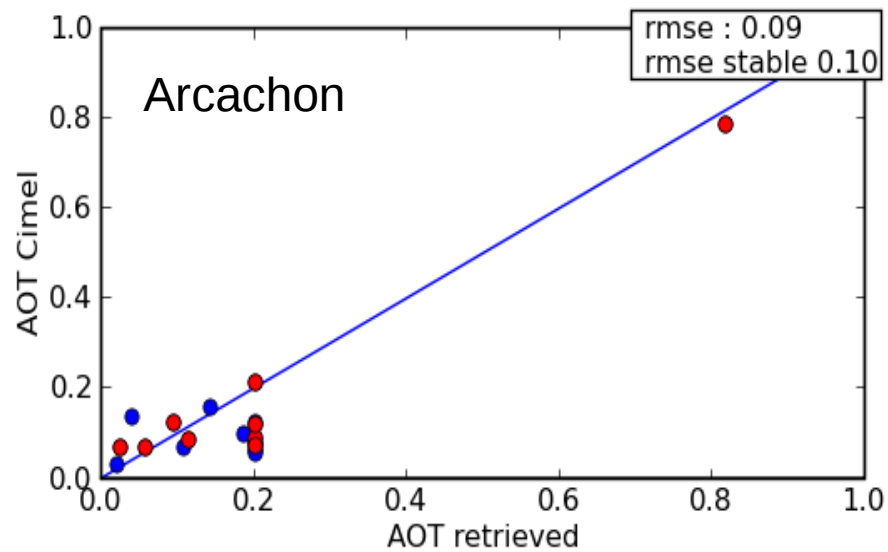
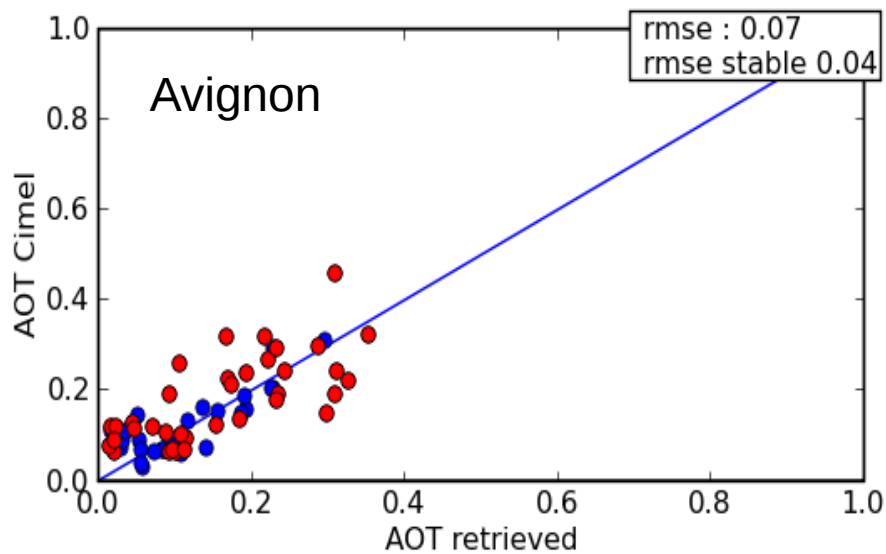
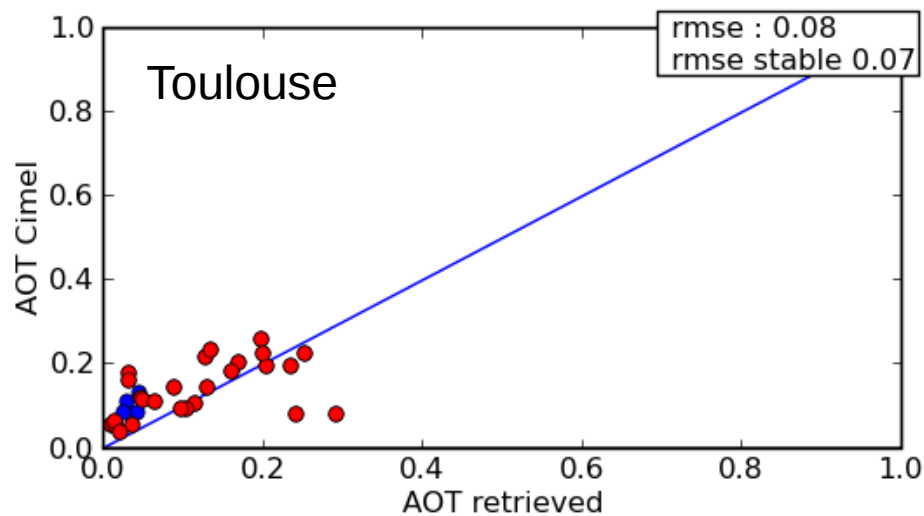
An aerial photograph showing a patchwork of agricultural fields in various colors (red, green, brown, blue). A white outline highlights a specific area in the lower-left quadrant. The number 20050526 is overlaid in white text in the bottom-left corner.

20050526

Aerosol estimates with Formosat-2 La Crau (France)

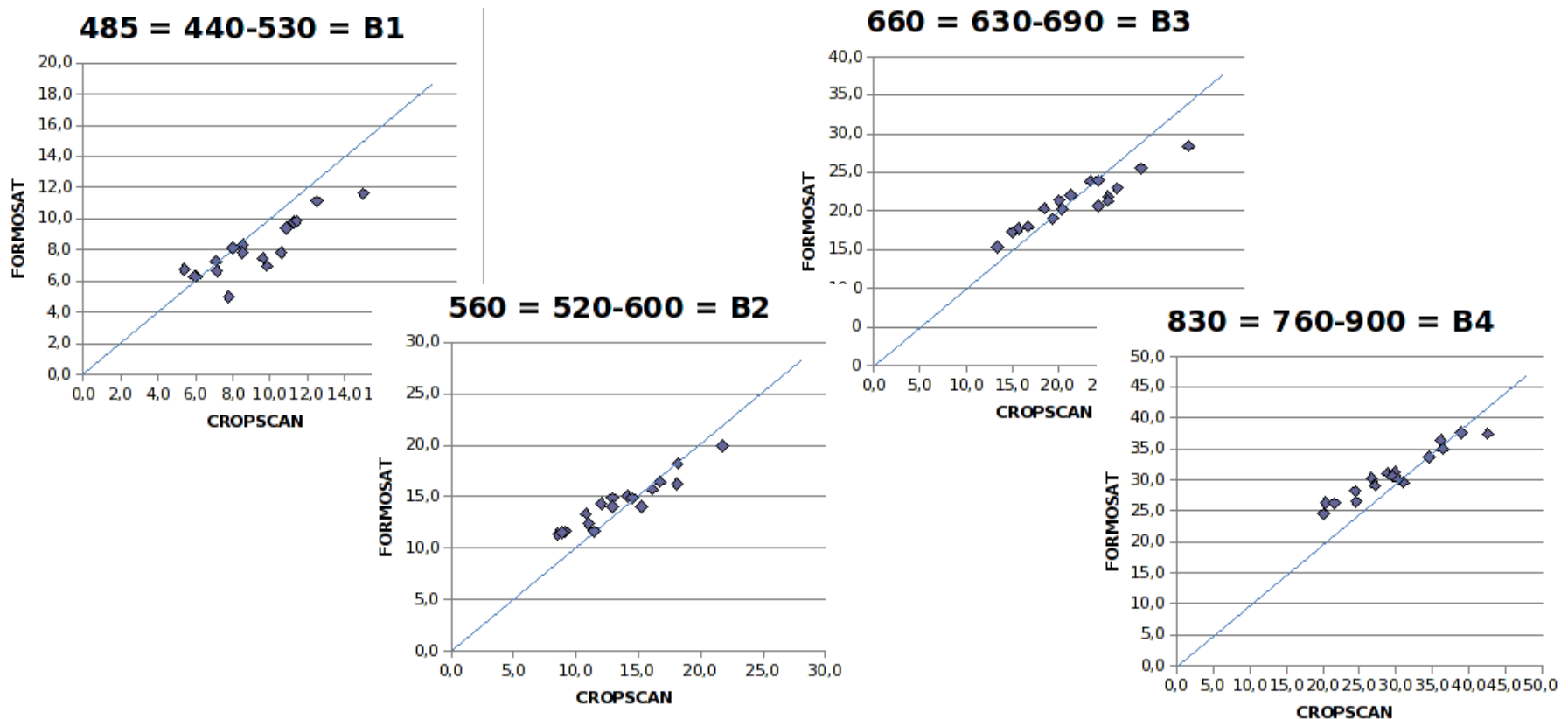


AOT validation, LANDSAT



Atmospheric correction validation

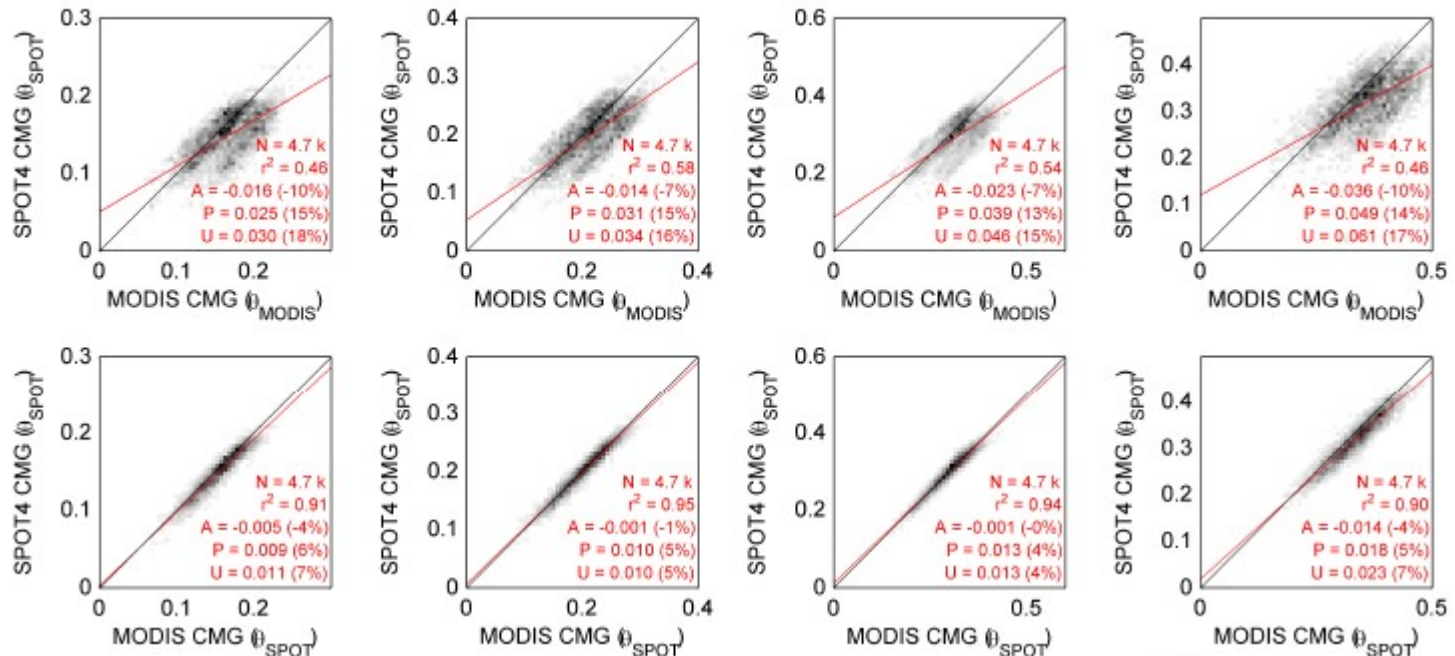
- Validation on Tensift (Morocco) site
 - Comparison with simultaneous in situ measurements
 - Various fields, 3 dates



NASA compared MODIS and SPOT-4 Take5 surface reflectance for cloudfree pixels on Maricopa site using 25 dates

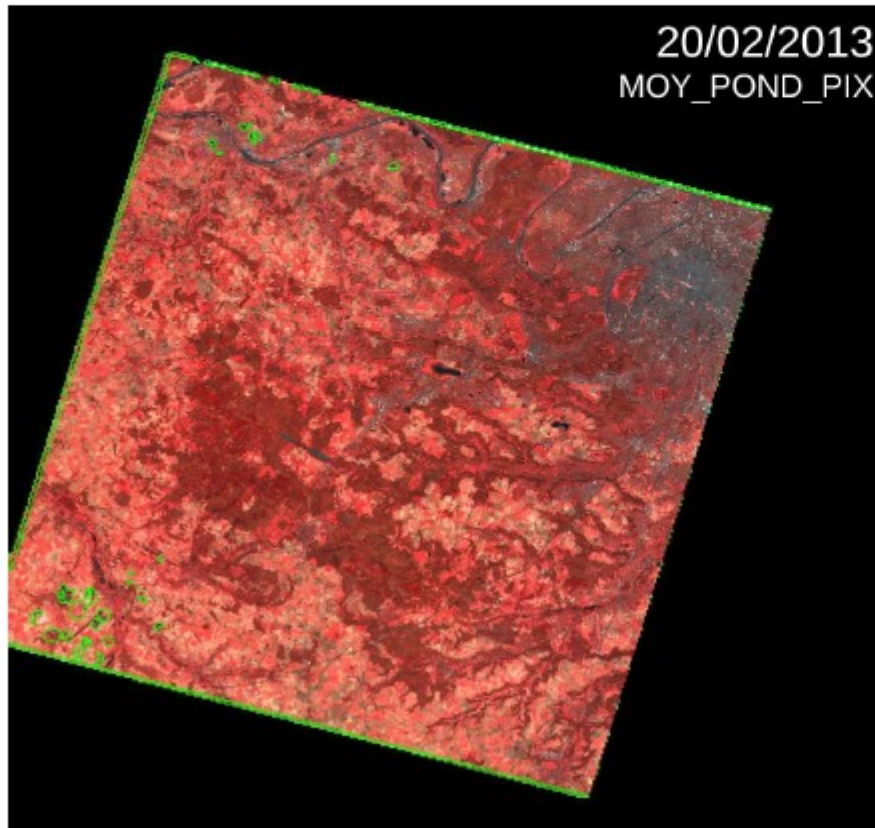
- Excellent agreement that validates atmospheric correction and cloud mask

M. Claverie, E. Vermote, J. Masek

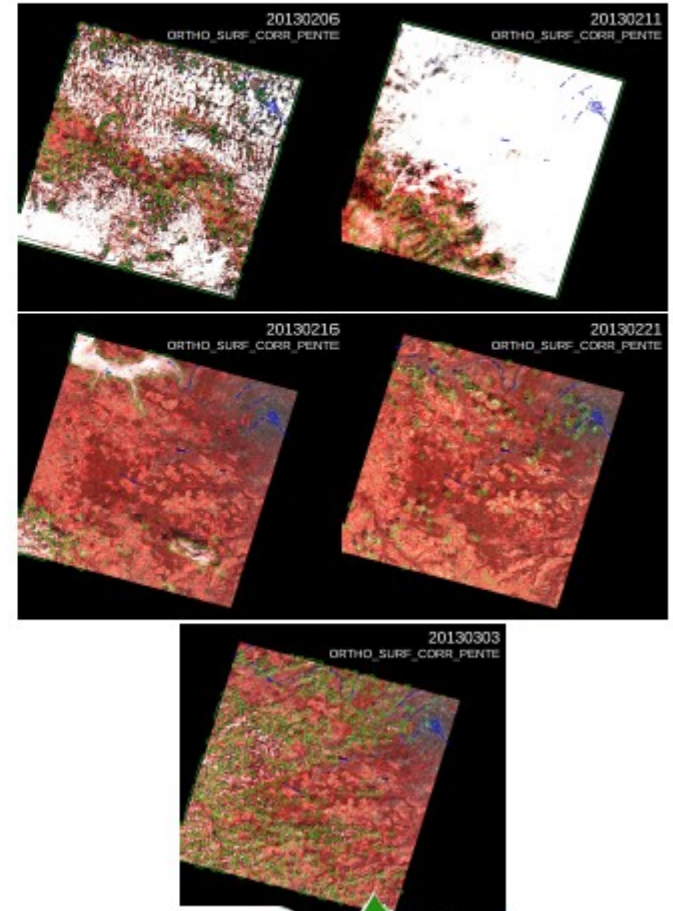


Level 3A algorithm validation over the Versailles area (Feb. 2013)

L3A February

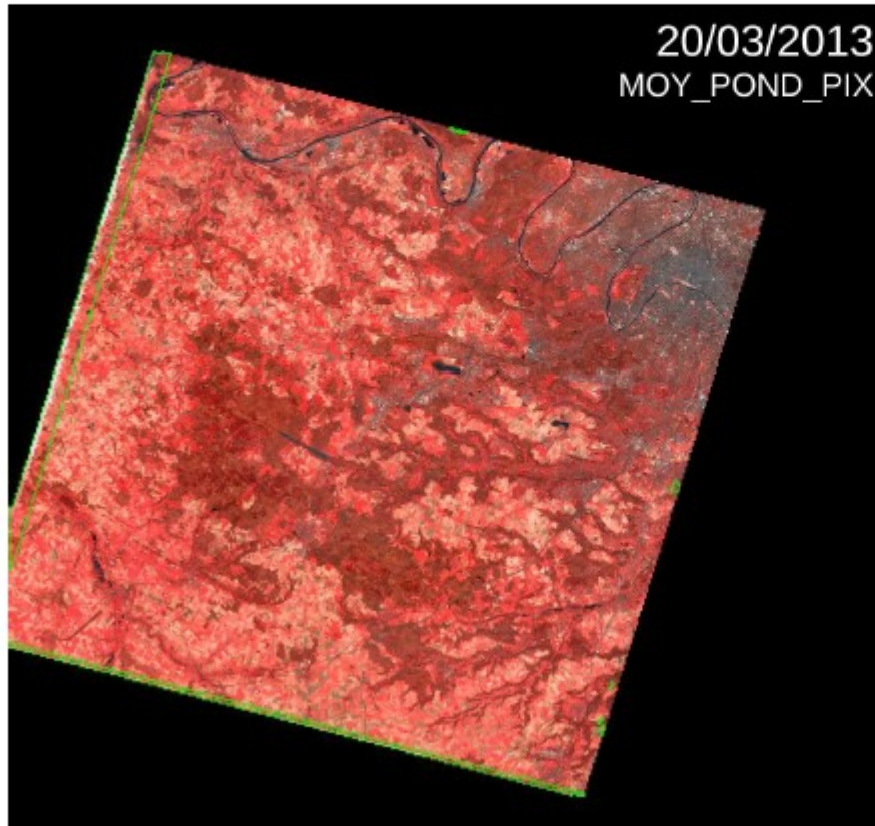


L2A

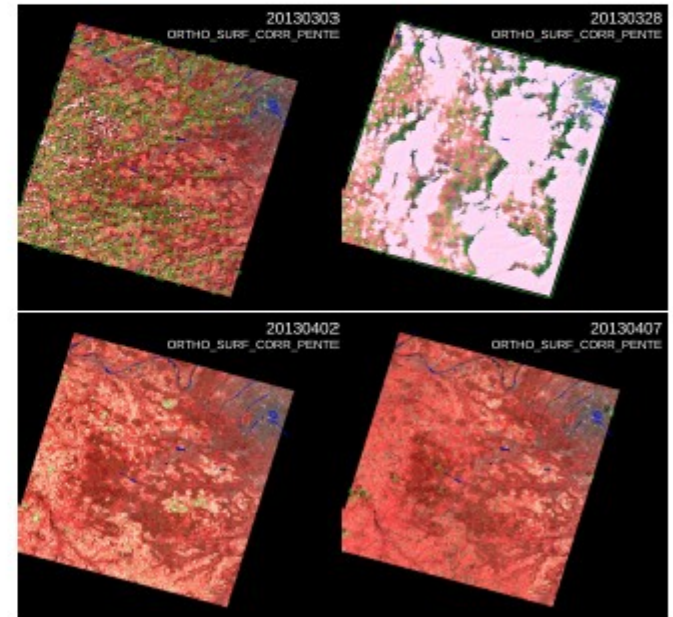


Level 3A algorithm validation over the Versailles area (March 2013)

L3A March

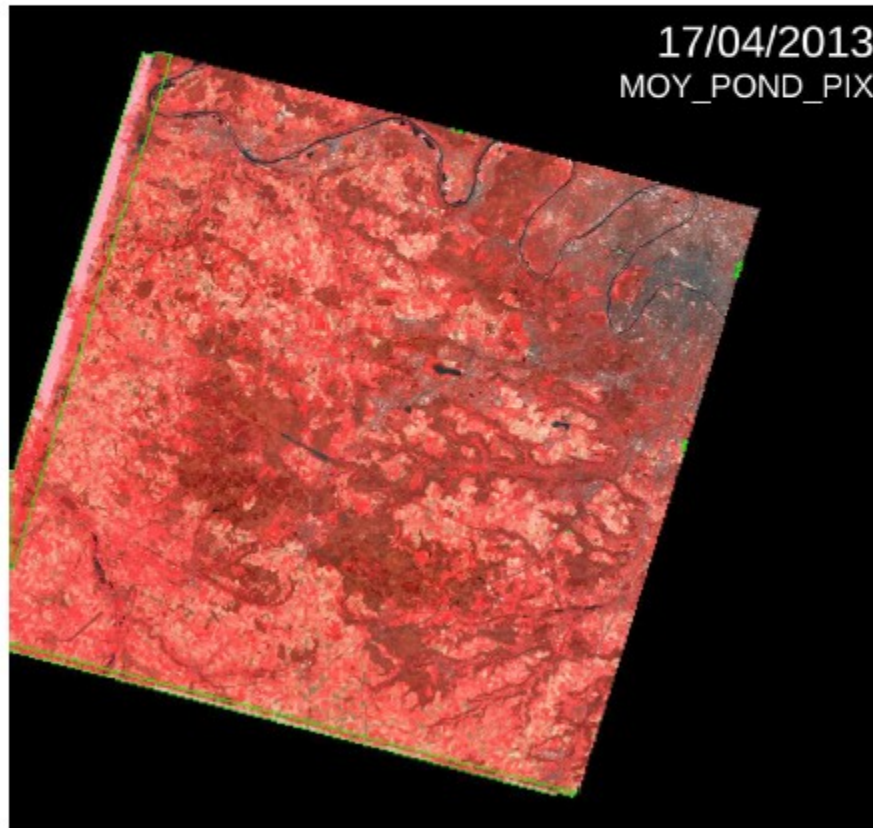


L2A

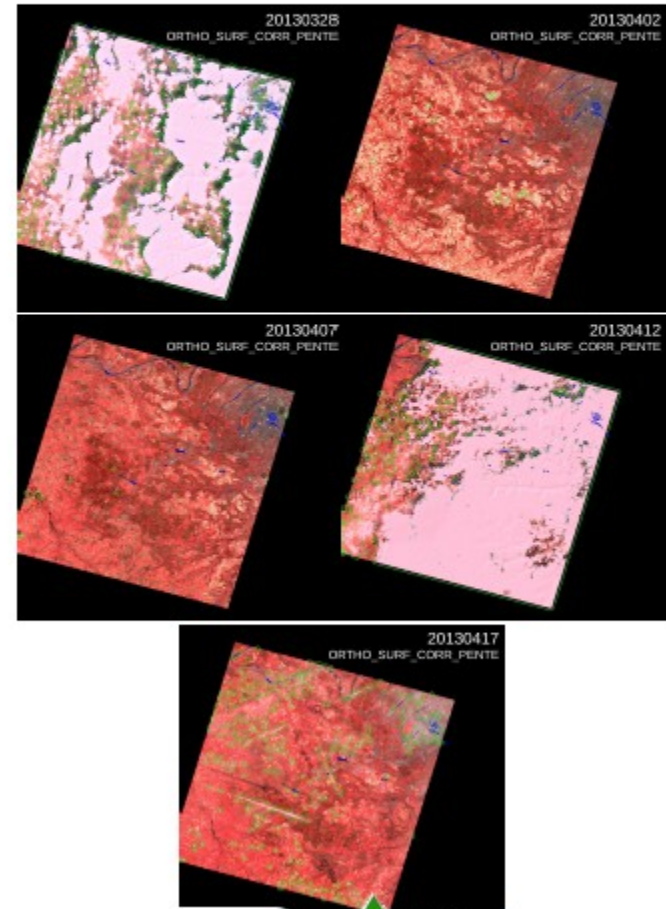


Level 3A algorithm validation over the Versailles area (April 2013)

L3A April

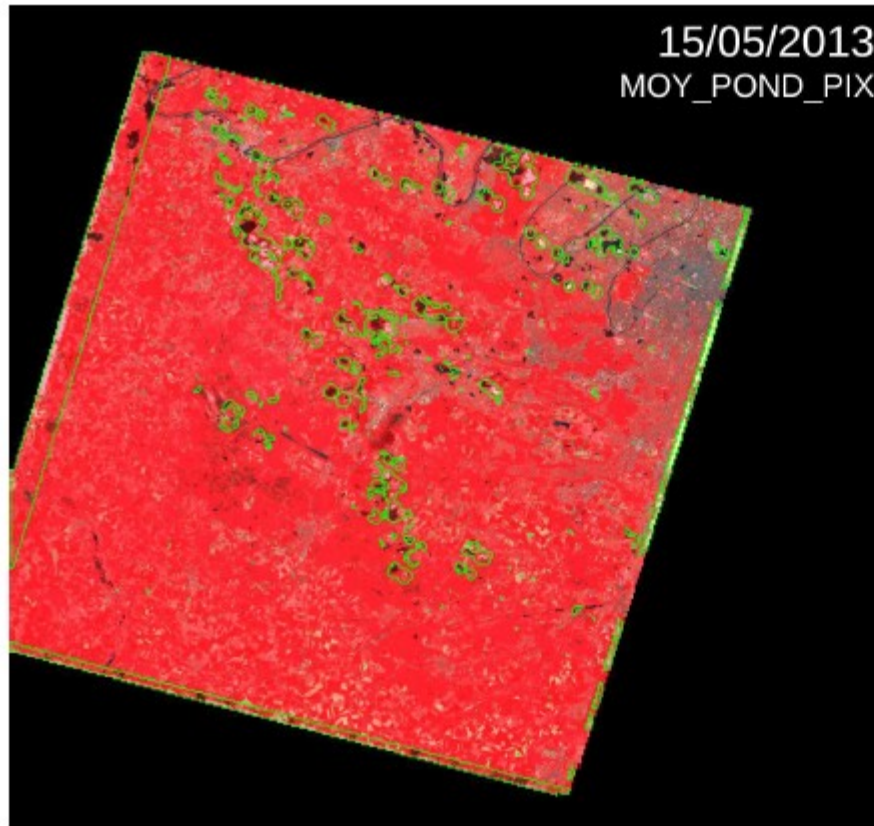


L2A

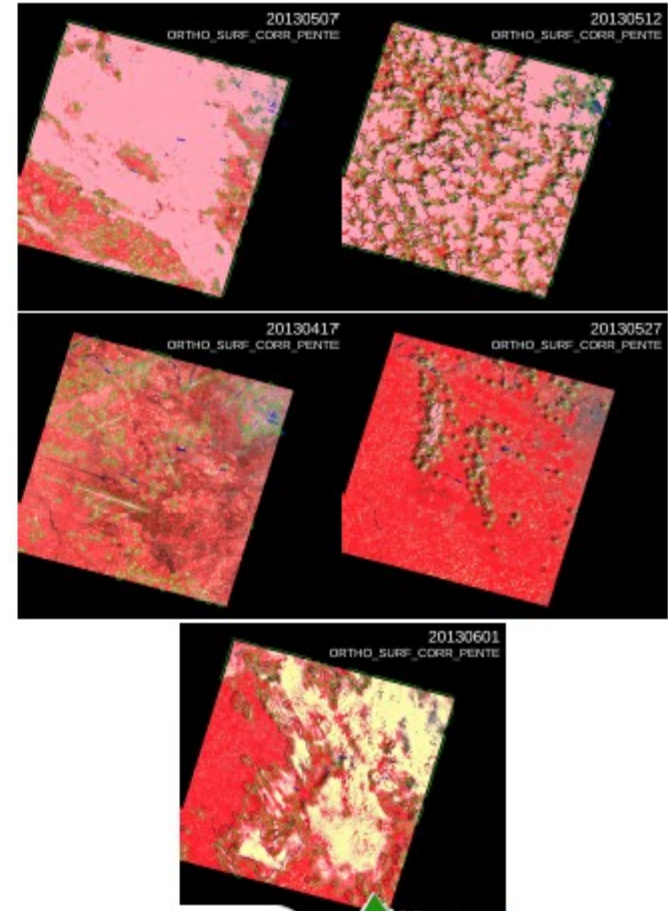


Level 3A algorithm validation over the Versailles area (May 2013)

L3A May

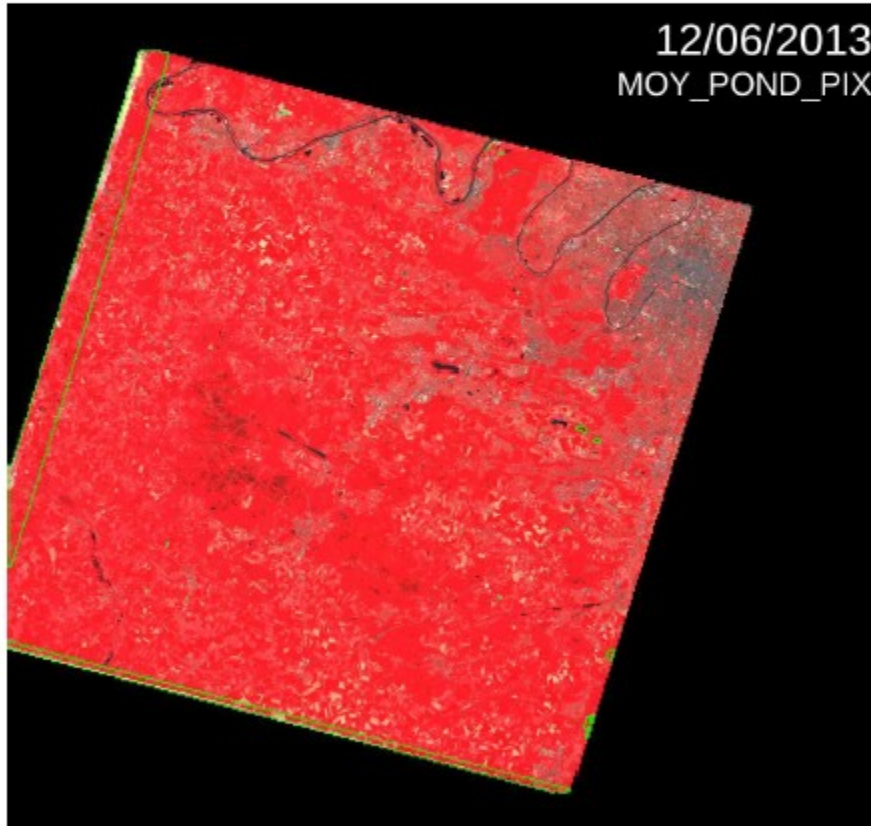


L2A

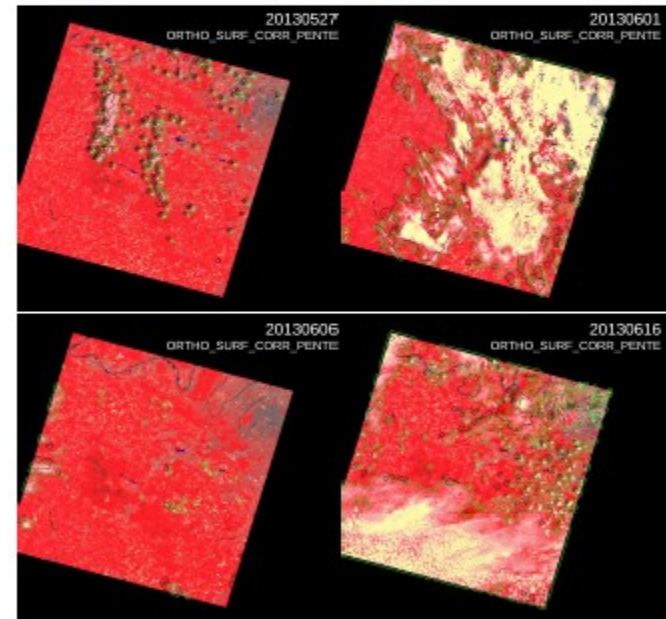


Level 3A algorithm validation over the Versailles area (June 2013)

L3A June



L2A



CNES's SPOT World Heritage programme to provide free SPOT satellite archive imagery for non-commercial uses

Officially announced at the plenary session of the Group on Earth Observations (GEO) in Geneva, on Friday 17 January

First goal: to process 400,000 multispectral images in 4 years

A first batch of 100,000 images will be made available at the end of this year

Processing: Level 1C – orthorectified TOA reflectance

Complete coverage of France plus other areas to be defined

THEIA paves the way for a wide use of remote sensing data by a larger community of users

Preparing the use of Sentinel data

Needs for long time series of data (consistent data set)

It stresses the need for a systematic and rigorous validation of the products

Development of automatic processes to validate the product quality (geometry and radiometry)

Supplemented by external validation (network of validation sites, scientific expertise teams)

