

The THEIA Land Data Centre

Context

Context : Satellite imagery is under-used by public actors (scientific community and policy makers)

- Bottlenecks : costs, processing, user support

Need of a new model to facilitate access to satellite imagery

- The GEOSUD project was launched to promote new concepts
 - Such as : Mutualisation, Multi-licence imagery, Free access to « Public actors » s

THEIA was born to federate projects / initiatives such as GEOSUD, and others (Kalideos, Pléiades, Postel, Spot World Heritage ...)

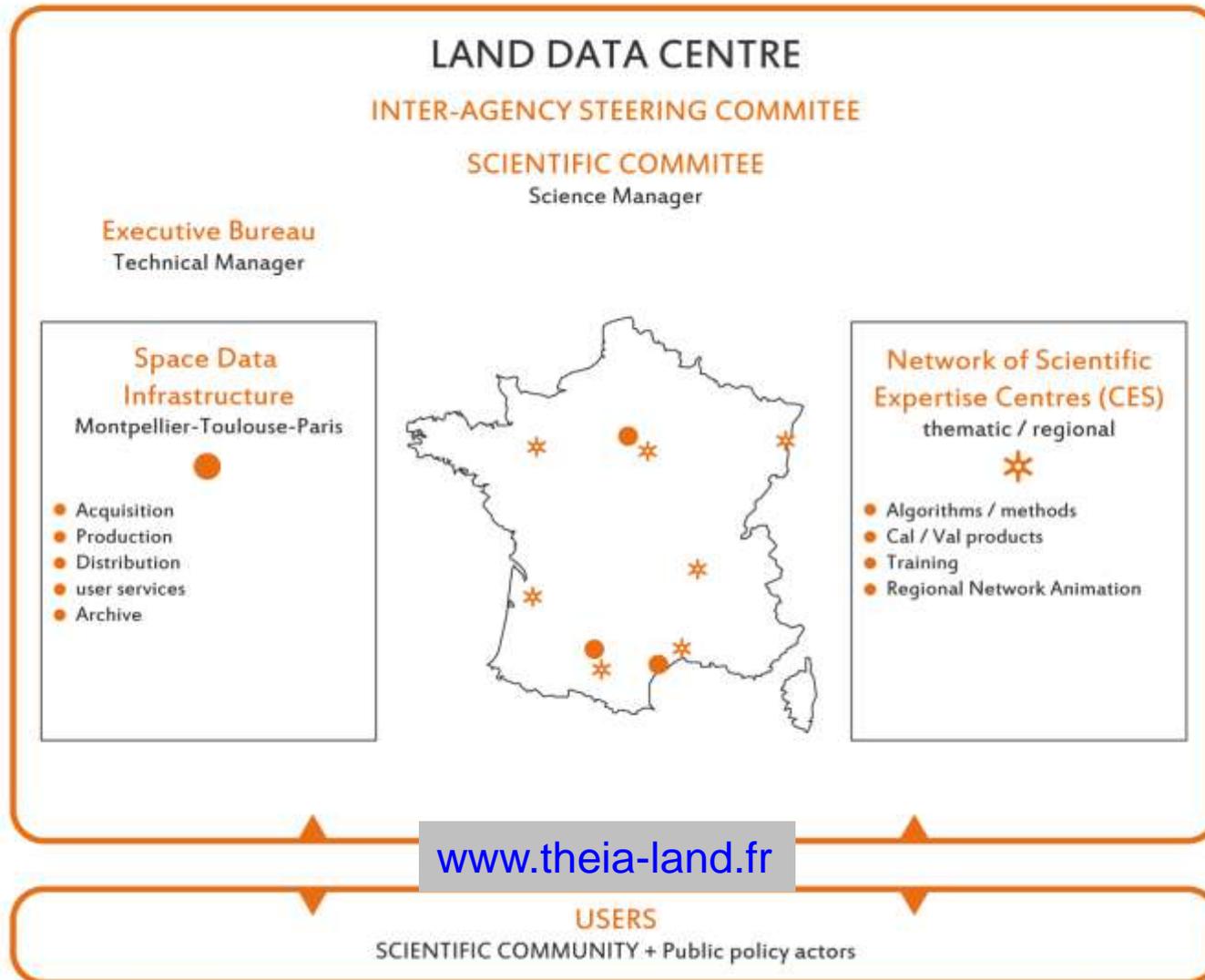
THEIA Land Data Centre is a national structure

- Scientific and technical
- Founded in 2012 jointly by 9 public French institutions

Objectives

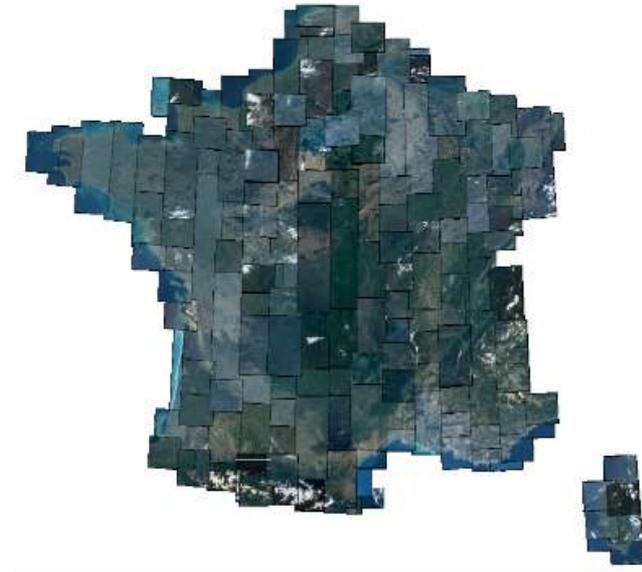
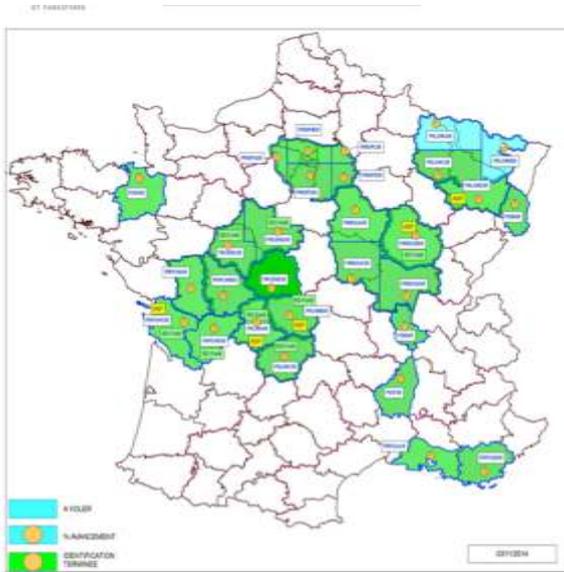
- Answer the needs of the science community and national policy-makers
 - in terms of products, methodologies, and training related to the observation from space of land surfaces
- Facilitate access and use of space data for a large user community
- Federate efforts at national level
- Make them visible at European and international levels

THEIA Structure



THEIA Products 2013 - 2016

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 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, albedo : 30 years AVHRR	All users	Biogeophysical processing
	Water level, lakes and rivers : Jason and others	All users	Biogeophysical processing

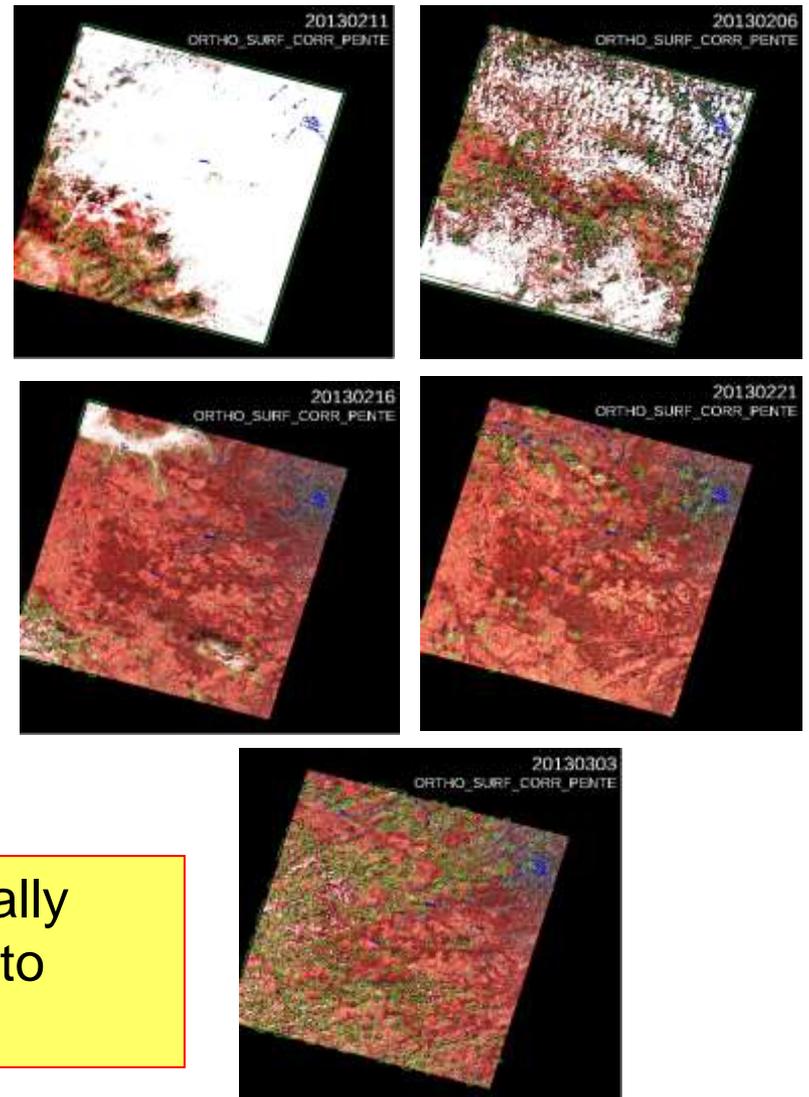


National geography policy:

- **Aerial surveys**
 - Cover 25 to 30% of the national territory every year at 25 to 35 cm GSD
- **SPOT 6-7**
 - Complete annual coverage at 1.5 m resolution to all public bodies / local authorities
 - Publish the orthoimages before the end of each year
- **PLEIADES**
 - Cover sensitive and urban areas every year at 70 cm resolution to speed up BD Topo® updating
 - Cover overseas regions

THEIA Products : Landsat & Take 5

Sample production made at CESBIO
5 years of Landsat data for each tile



Spot 4 / Take 5 atmospherically
corrected data over 45 sites to
simulate Sentinel-2

Pleiades stereo imagery used in IGN's BD TOPO® updating

3D capture of changes due to new infrastructure

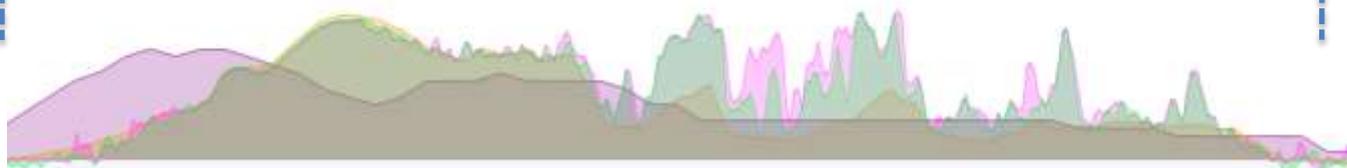
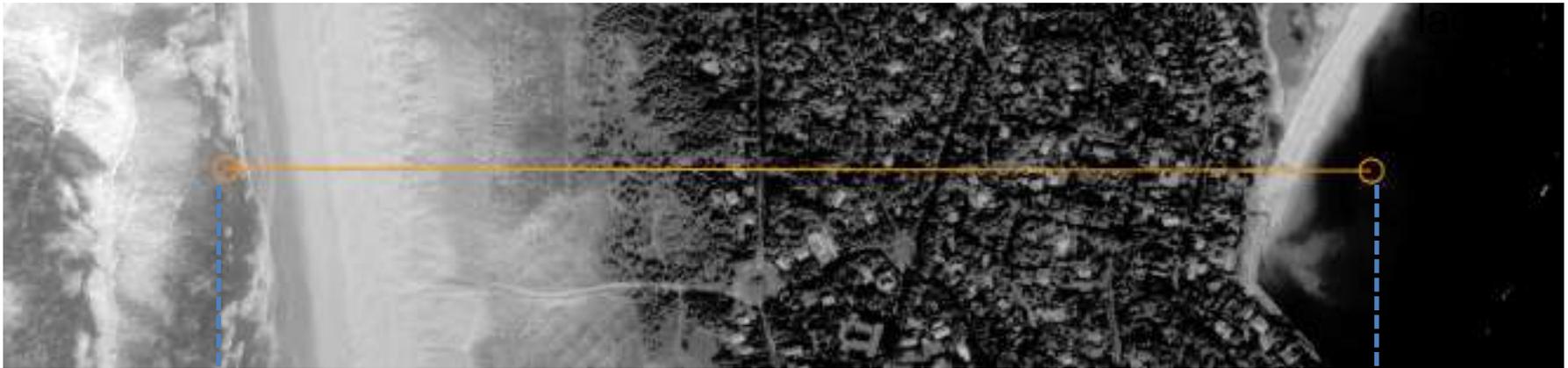


High Speed Railroad
under construction

Surveying coast line motion with Pleiades imagery

Atlantic ocean

Arcachon

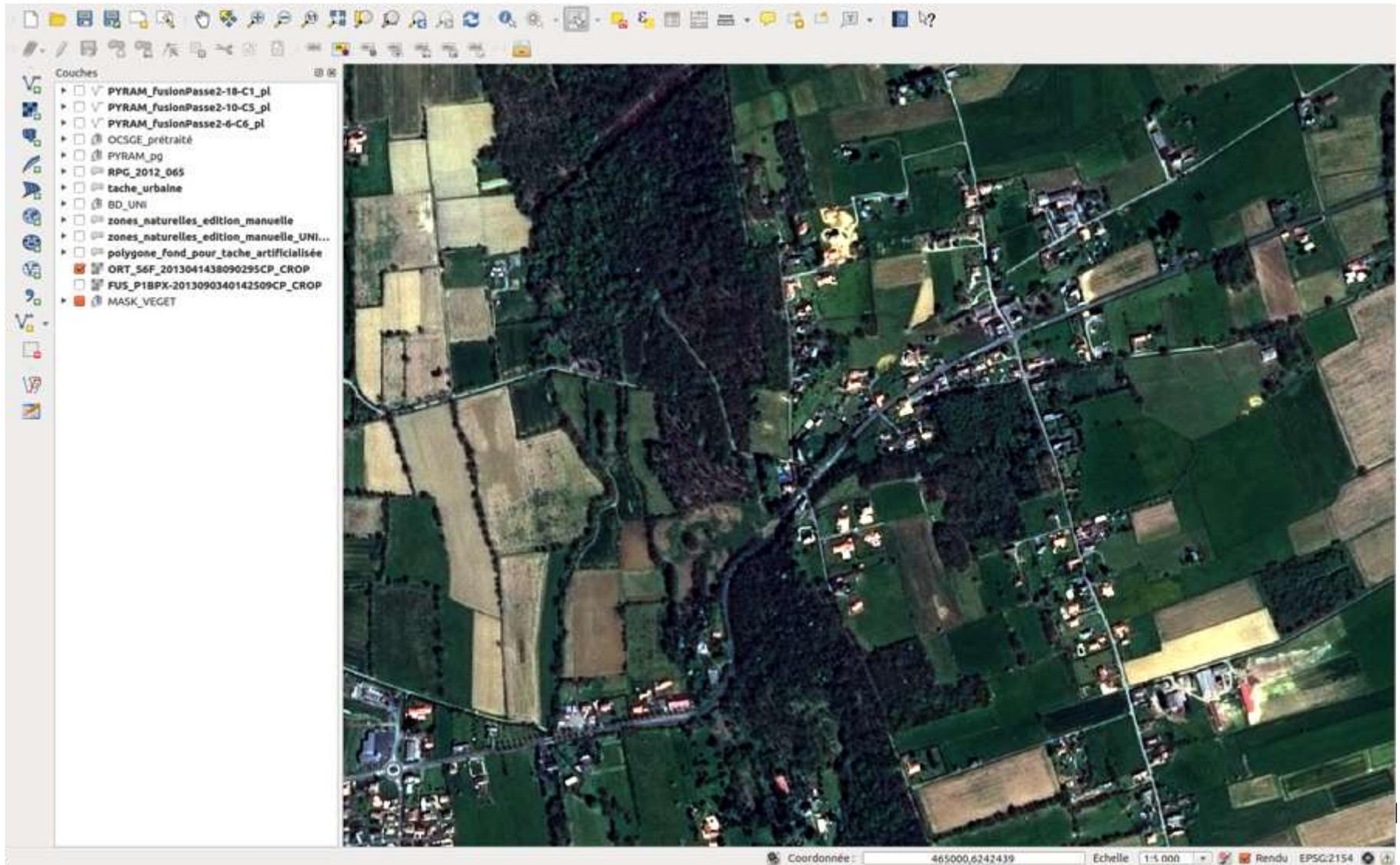


180 m displacement within 30 years

- Satellite 2013
- Satellite 2014
- Lidar 2011
- Air survey 1985



Mapping artificialized land, using SPOT6 images



THEIA Space Data Infrastructure

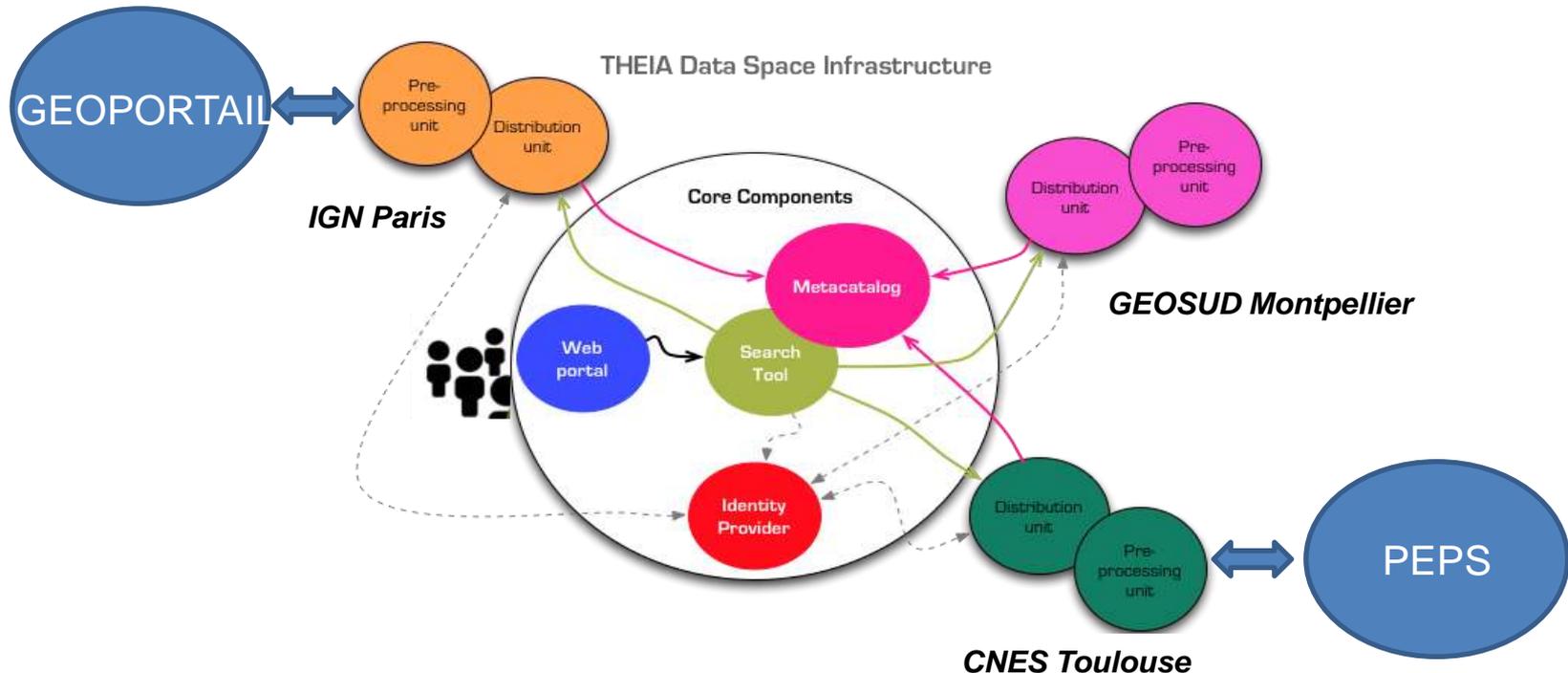
Missions

- Acquire, process, distribute space data products
- Provide tools and methodology user guides to the user community
- Assure data long term archiving
- Contribute to the operationalisation of thematic methods developed by the Science Expertise Centres
- Provide a user support to the user community

THEIA Space Data Infrastructure

Structure

- The THEIA SDI is a federation of data centres distributed geographically, connected by core mutualised services



- This architecture can evolve and include other Processing and Distribution units, possibly European

- THEIA is a major user of PEPS
- PEPS :
 - National mirror site of Sentinel data
 - Primary goal : distribution of the Sentinel data to the national community
 - Designed to mirror Sentinel data globally in the mid-term
 - Designed as a PaaS (Platform as a Service)
 - Increasing capacity with ramp-up phase, 3 Pbytes in 2016
 - Hosted by CNES in a first phase (2015 - 2017)
 - To be integrated in a European infrastructure in a second phase

Science Expertise Centre (SEC)

- Science Expertise Centres (SEC)
 - grouping of laboratories developing innovative methods on Land thematic area
 - two types of SEC identified : « thematic » and « regional »
- SEC « Thematic »
 - around a value-added product.
 - as of today around 20 propositions of such SEC
 - examples : Land Cover, HR Vegetal variables, Water areas, Snow areas, Evapotranspiration, Water height, Water quality, Soil moisture, Albedo, etc
- SEC « Regional »
 - mission : federate and animate the science community at the regional scale,
 - as of today 4 SEC « Regional » identified : Languedoc-Roussillon, Midi-Pyrénées, Alsace, Aquitaine

THEIA European policy (1/2)

- a THEIA Collaborative Ground Segment has been proposed to ESA
 - ESA has put in place a system of Collaborative Ground Segments to assure the distribution of the huge amount of Sentinel data in the Member States
 - The national science community has strong interest to S2 (HR optical imagery), but also to S1 (radar imagery), and S3 (LR optical imagery)
 - The THEIA Collaborative Ground Segment is linked to the national PEPS (Sentinel Product Exploitation Platform)
 - 3 components
 - **Component 1:** Processing of S2 (atmospheric corrections and monthly composites), on areas totalising 5 Mkm²
 - **Component 2:** provision of value added products on various regions worldwide, such as land cover, change detection, vegetal biogeophysical variables, albedo, water level,
 - **Component 3:** user support for the use of value added products

THEIA European policy (2/2)

- Act such that the products developed by THEIA SEC have a European future in Copernicus framework
 - Example : Vegetal biogeophysical variables
 - Example : Surface reflectance Sentinel-2
 - Example : Lake and river water level with Jason and Sentinel-3
- Insert THEIA in European network of Space Data Infrastructures
 - Work on SDIs interoperability when possible
 - As an example, THEIA liaised to EODC to apply to an ESA TEP project (Thematic Exploitation Platforms)
 - Possible future prospects in H2020 and other European Calls