



Rartel

Telespazio,
a Finmeccanica/Thales Company

*Space applications for security:
existing and future projects for the
Cheia Earth Station*

22/04/2016



- ❑ About RARTEL
- ❑ Existing security services in the Cheia Eath Station
- ❑ Future development and opportunities
 - ❑ SST Radar
 - ❑ IMINT services
 - ❑ Romania TLC sat



- ❑ RARTEL is a Romanian Italian joint-venture specialized in satellite services and applications since 1998
- ❑ The shareholders are **Telespazio SpA**, (a Finmeccanica-Thales Company) and **SNR**, having each 62% and respective 38% of the social capital
- ❑ Company's mission is to supply to Romanian and international customers all the services related to the use of satellite technology
- ❑ RARTEL SA has made significant investments in the Cheia Satellite Communication Centre for In-Orbit control services and for VSAT Telecommunication services

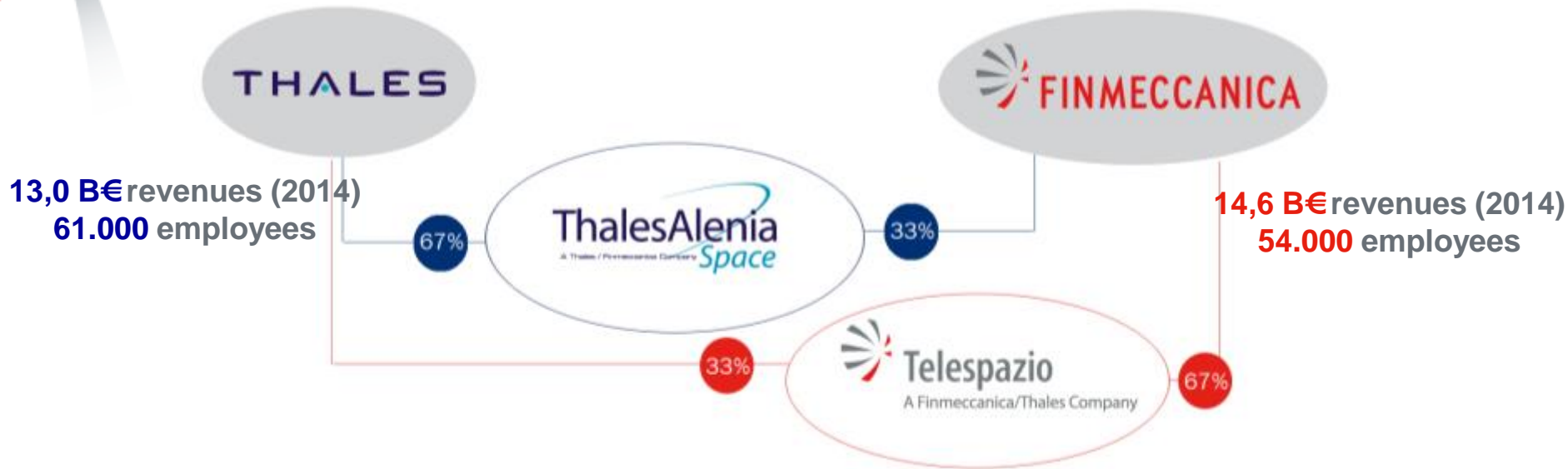


62 %

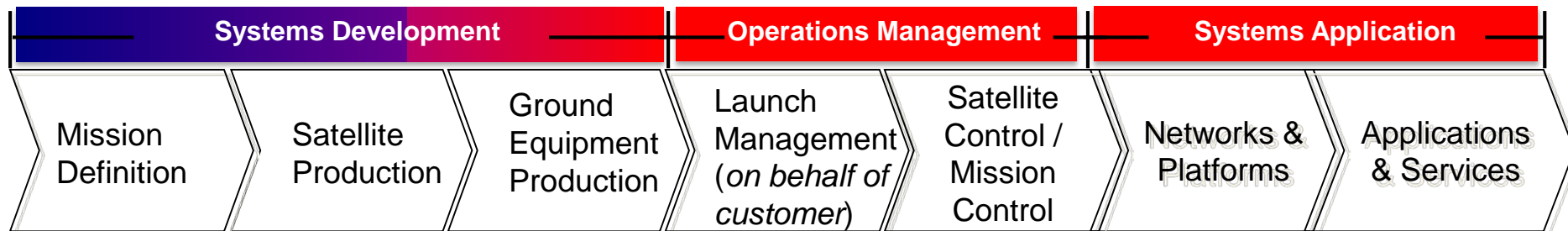
38 %



Space Alliance



Space Alliance presence in the Space Value Chain



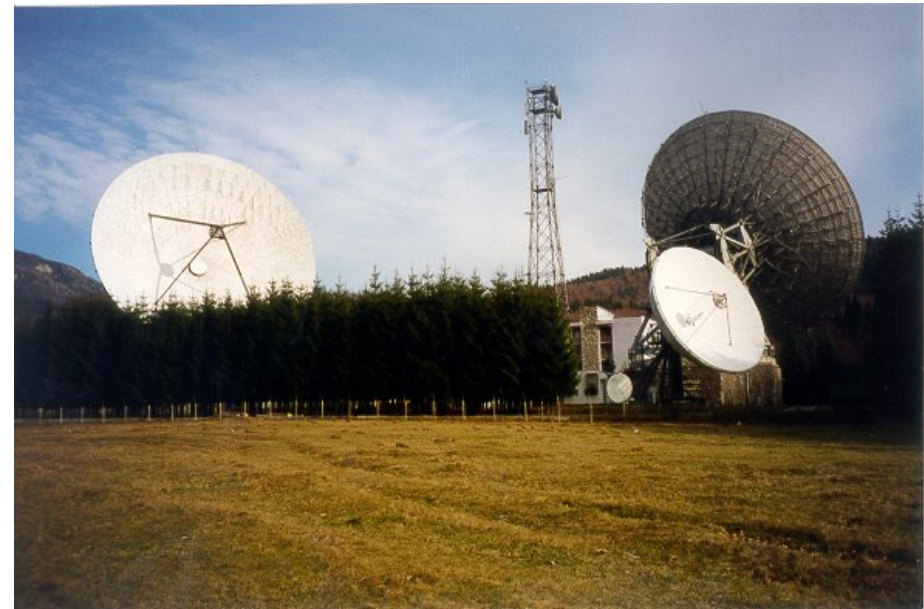
Satellite as a security asset

- ❑ Satellite has become more and more in the recent past a key element for managing the security aspects of the modern society
- ❑ Satellite utilization includes critical services like telecommunication, navigation, transportation, electricity, meteorology, environment
- ❑ Moreover, satellite is used today to provide governmental users with various services related to security, as, for example, secure military communications, connections with remote areas, images for intelligence activities.

- ❑ Romania has gained in the last years a significant role, resulted in:
 - ❑ a widespread utilization of satellite applications by the state institutions, which started to understand the benefits of this technology
 - ❑ an important implications in the satellite European industry, thanks to the full membership of Romania, through ROSA, in the European Space agency.
- ❑ A key element for the utilization of satellite applications in Romania is the Cheia Ground Station

The Cheia Ground Station

- ❑ The Cheia Ground Station is the national infrastructure for satellite communications
- ❑ It was set up in 1972, with the installation of two 32 meters antenna for international telephony
- ❑ The station further developed and is now equipped with 6 big antennas
- ❑ The station is owned by SNR (National Company for Radiocommunications)

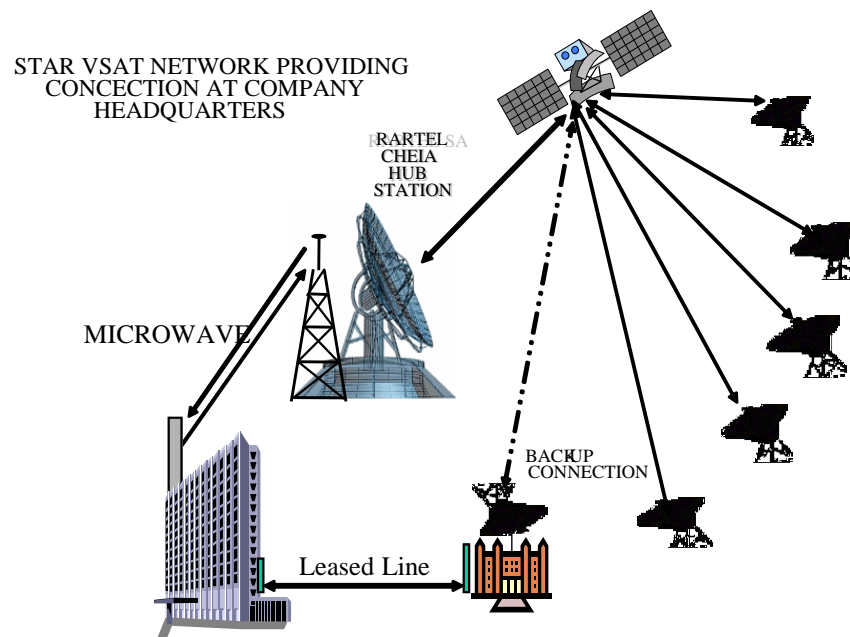


Cheia: VSAT SERVICES

The Hub Station in Cheia provides secure telecommunication services for various customers.

This service allows the coverage of any location in the country, and is used as a complement to the other telecommunication systems (GSM, fibre, etc).

This infrastructure is used also to serve the Romanian security Agencies active in the country and abroad.



Cheia: In Orbit control services

RARTEL installed in Cheia in year 2000 a 9 meters S-band station for the In Orbit control of various satellites.

It is presently used for:

- Eutelsat
- Meteosat Second Generation (MSG)
- Sicral (military Italian Satellite)

This antenna works in conjunction with other antennas in Europe (Italy, Germany) and is a **strategic asset** that must provide very high quality services, being a critical element for the in orbit management of satellites.



Cheia: Orbit control services

In 2015 Telespazio and RARTEL have been awarded the tender for the **Meteosat Third Generation (MTG)** control station, which is now under implementation (start of service 2017). The contract foresees a duration of 25 years.

The European Meteorological Organization (Eumetsat) has selected Cheia thanks for the installation of their important infrastructure in the long term.

The contract also includes an option for the second and third antenna.



Future developments: Antenna Retrofit for SSA (Space Situational Awareness)

RARTEL is developing a study for the European Space Agency to evaluate the possibility of retrofitting the 32 meters antennas to be used them as a radar for SSA-SST activities.

SST (Space Surveillance and Tracking) is one of the are of interest of SSA (Space Situational Awareness) devoted to the detection and monitoring of space debris (pieces of old satellites, pieces of rockets, etc).

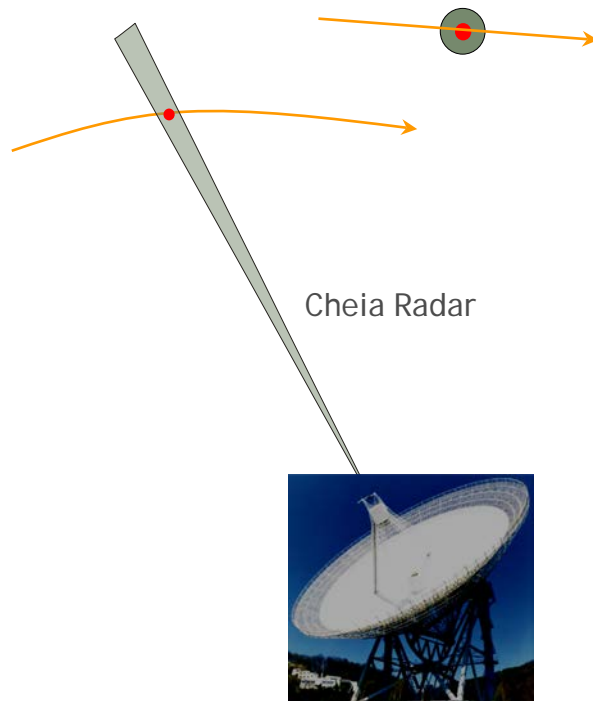
These objects are a continuous threat for our lives and the program is aimed at discovering new object and mitigating the effects of a o possible re-enter in the atmosphere.



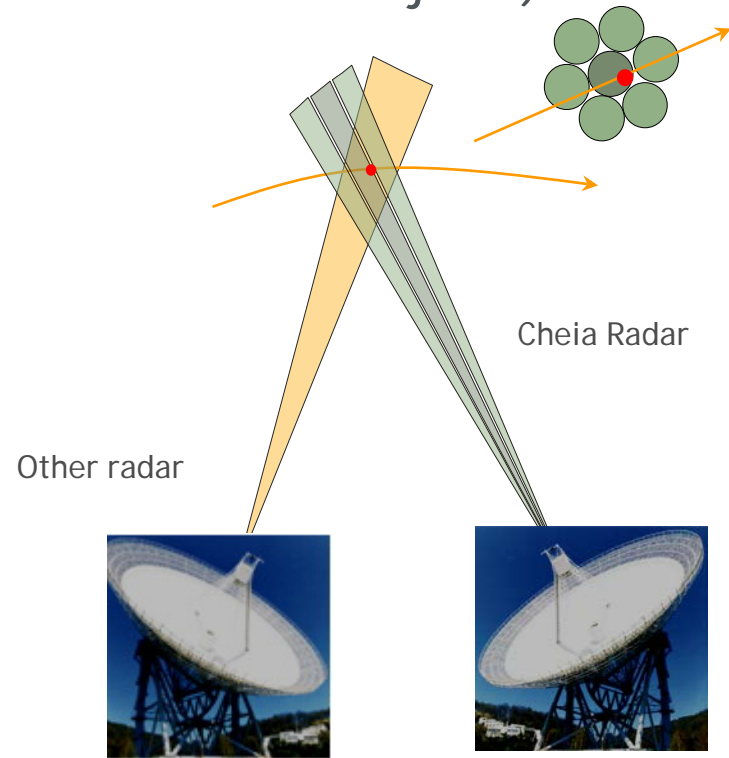
SST radar: types of operation

The operational mode can be mono-static (Cheia only) or bi-static (in collaboration with other antennas in Europe).

The radar can be useful for Surveillance (i.e. Detection of new objects) and tracking (for orbit refinement of known objects)



Monostatic operation



Bistatic operation

Future opportunities: Retrofit antenna for SSA (Space Situational Awareness)

The preliminary results of the study shows that it will be possible the detection of very small objects.

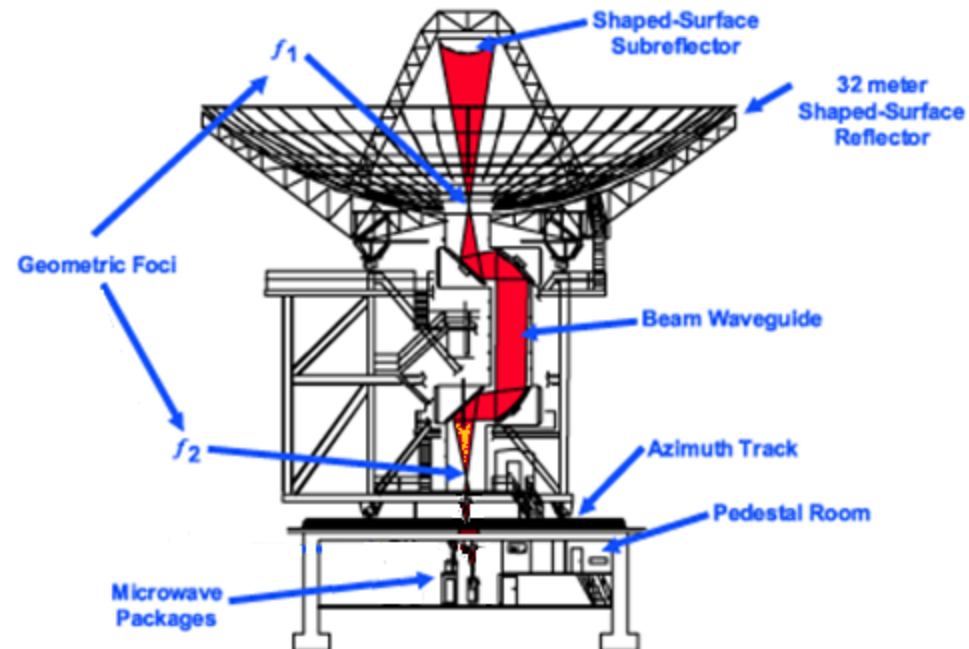
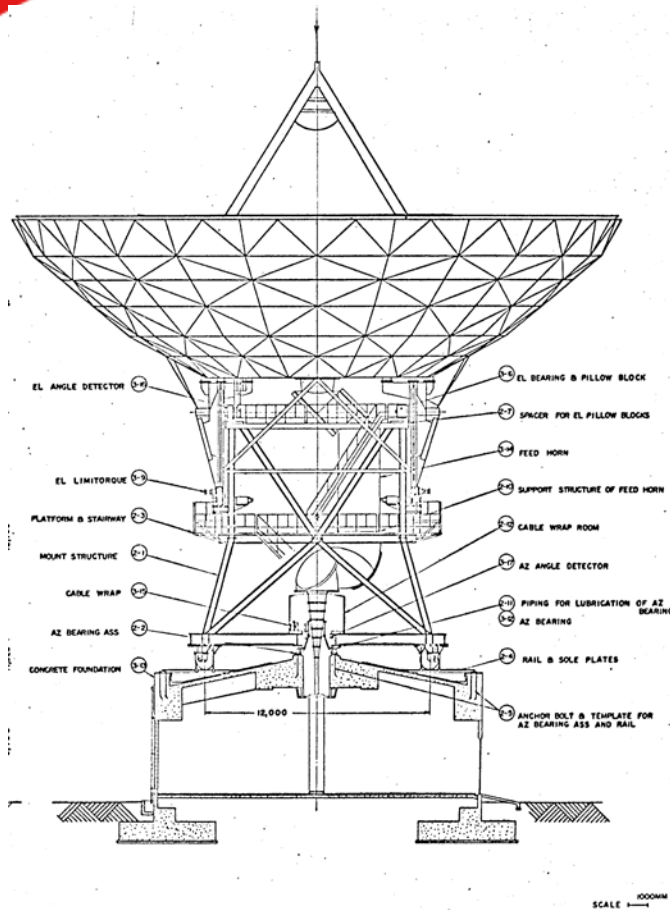
Range (km)	Minimum observable flat surface (cm ²)	
	CW	PC
200	0,0645	1,45
500	0,403	9,08
800	1,03	23,2
1000	1,61	36,3
1200	2,32	52,3
1500	3,63	81,7
1800	5,23	118
2000	6,45	145

Range (km)	Minimum observable flat surface (dm ²)	
	CW	PC
35000	6,25	44,5
36000	6,61	47,1
37000	6,98	49,7

GEO (Geostationary satellites)

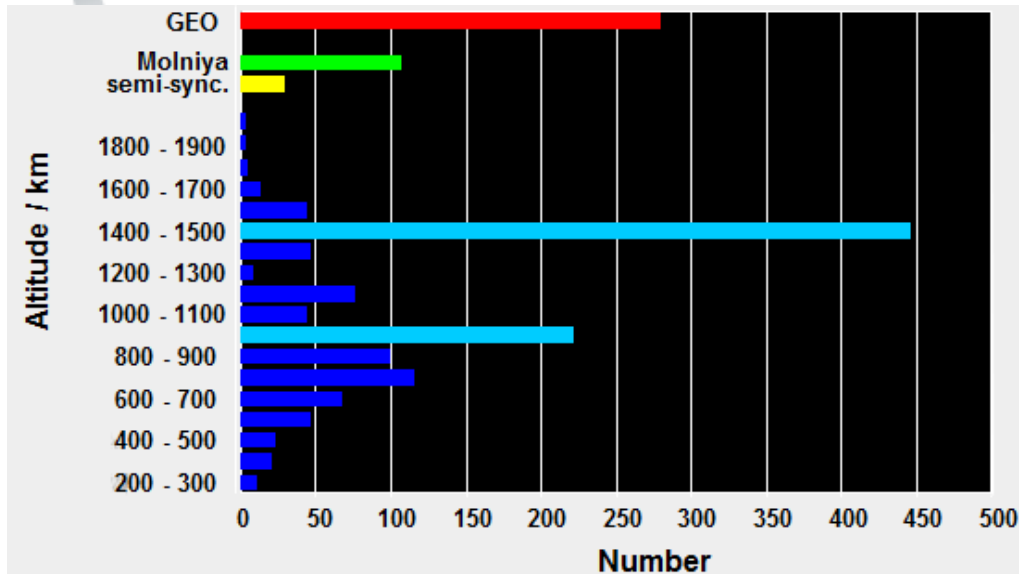
LEO (Low Earth Orbit satellites)

SST: The Cheia antennas



The Cheia antennas, presently in stand by, are 32 meters dish, working in C band 5-6 GHz

SSA: Distribution of the space objects



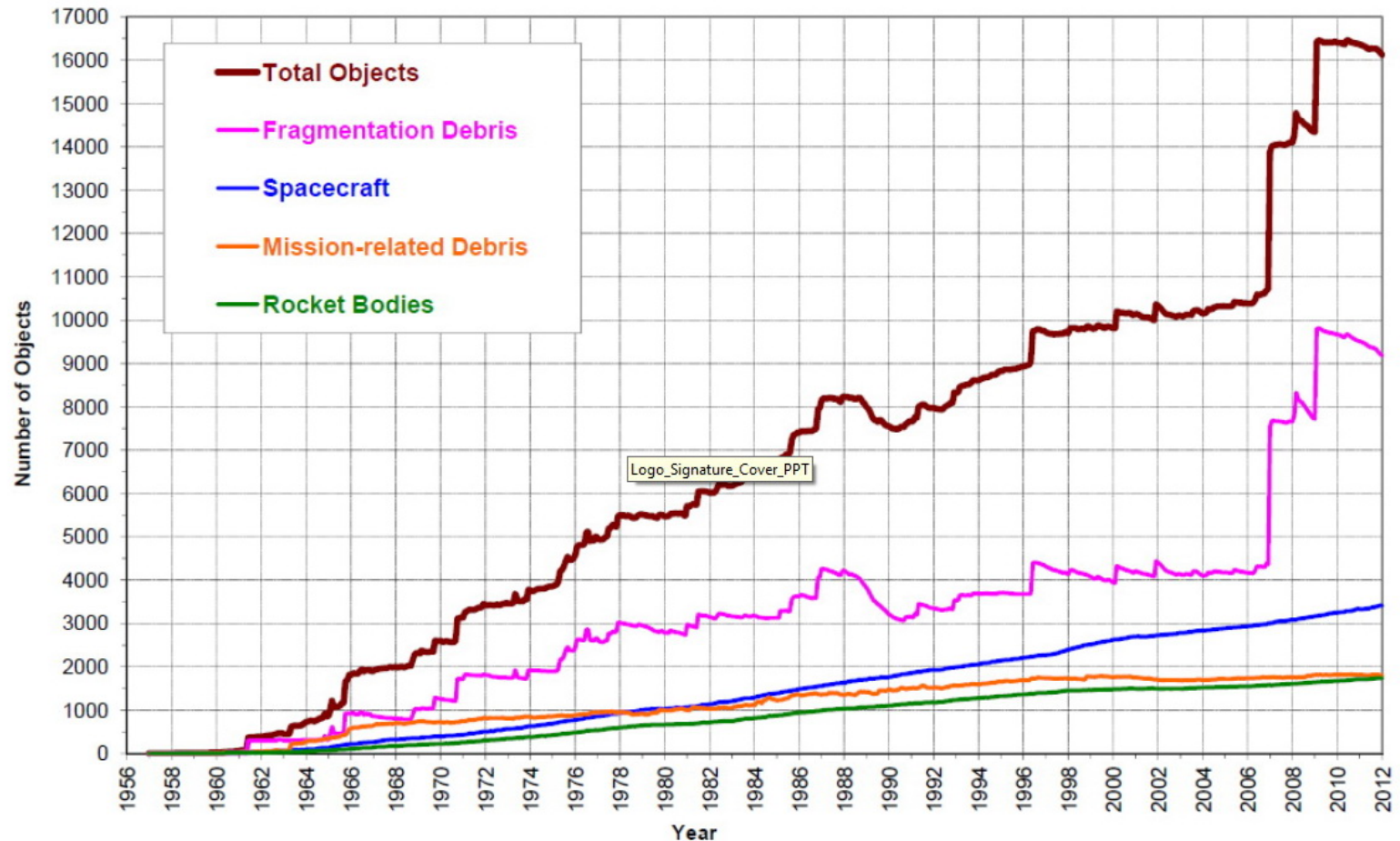
- ~ 12.000 > 10 cm in open US catalog
- ~ 32.000 cataloged since 1957
- ~ 75% in LEO, ~ 9% in GEO
- ~ 90% in (near-) circular orbits
- highest density: 800...1500 km
- highest collision risk: 800...1000 km

Through the ESA-EU SSA Programme, Europe intends to acquire the capability to detect and track space objects.

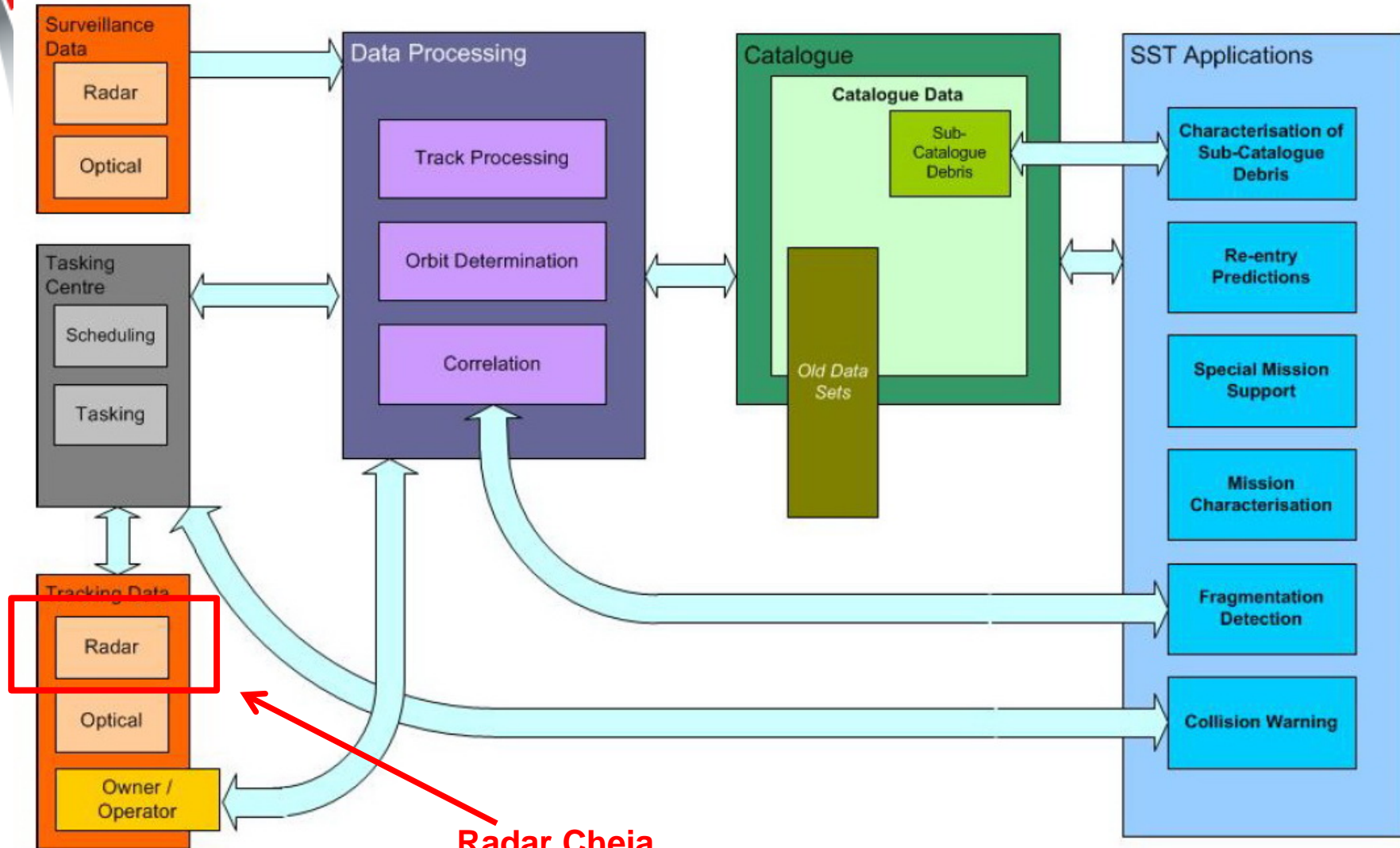
SSA-SST: Detected objects

source: NASA

Monthly Number of Objects in Earth Orbit by Object Type



ESA Concept for SST



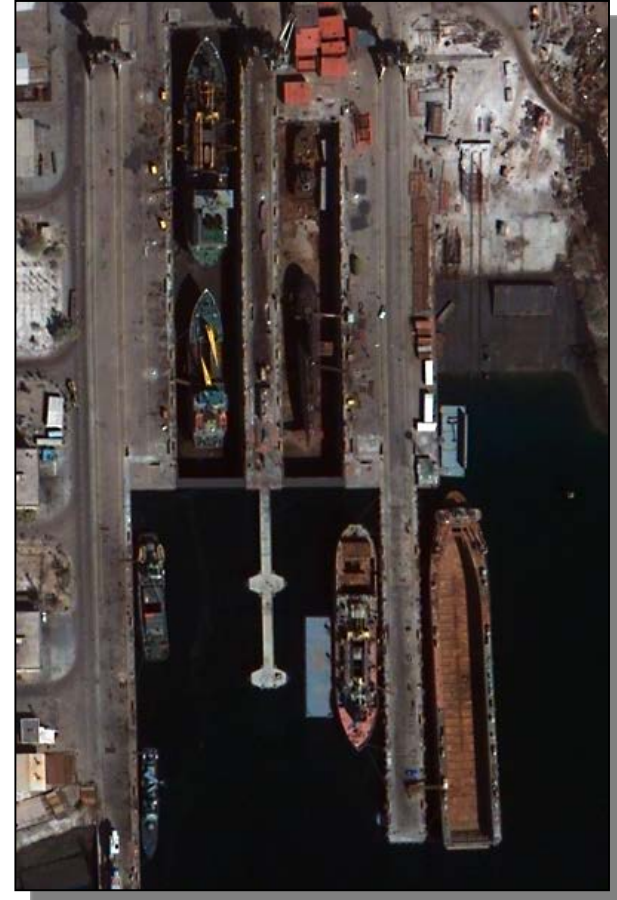
Future opportunities: IMINT applications

Satellites are today the key asset for supporting **IM**age **IN**teLLigence activities. In addition to “traditional” optical images, the **RADAR (SAR)** technology offers today the possibility to monitor a target every few hours, day and night, irrespective of cloud coverage.

This is possible thanks to radar constellations, allowing about 4 hours revisit time (medium latitude)

Cosmo SkyMed is a dual mode (Civil – Military) system with 4 satellites in orbit, supporting the IMINT operations of many countries, in Europe and outside.

Cheia can become the national facility for such services in Romania.



Future opportunities: IMINT applications

RARTEL is participating to a pilot project (**LEX EO**) financed by ESA, to promote verify the utilization of satellite imagery for law enforcement activities.

Romania partner are the Border Police and **SELEC (Southeast European Law Enforcement Centre)**, based in Bucharest.

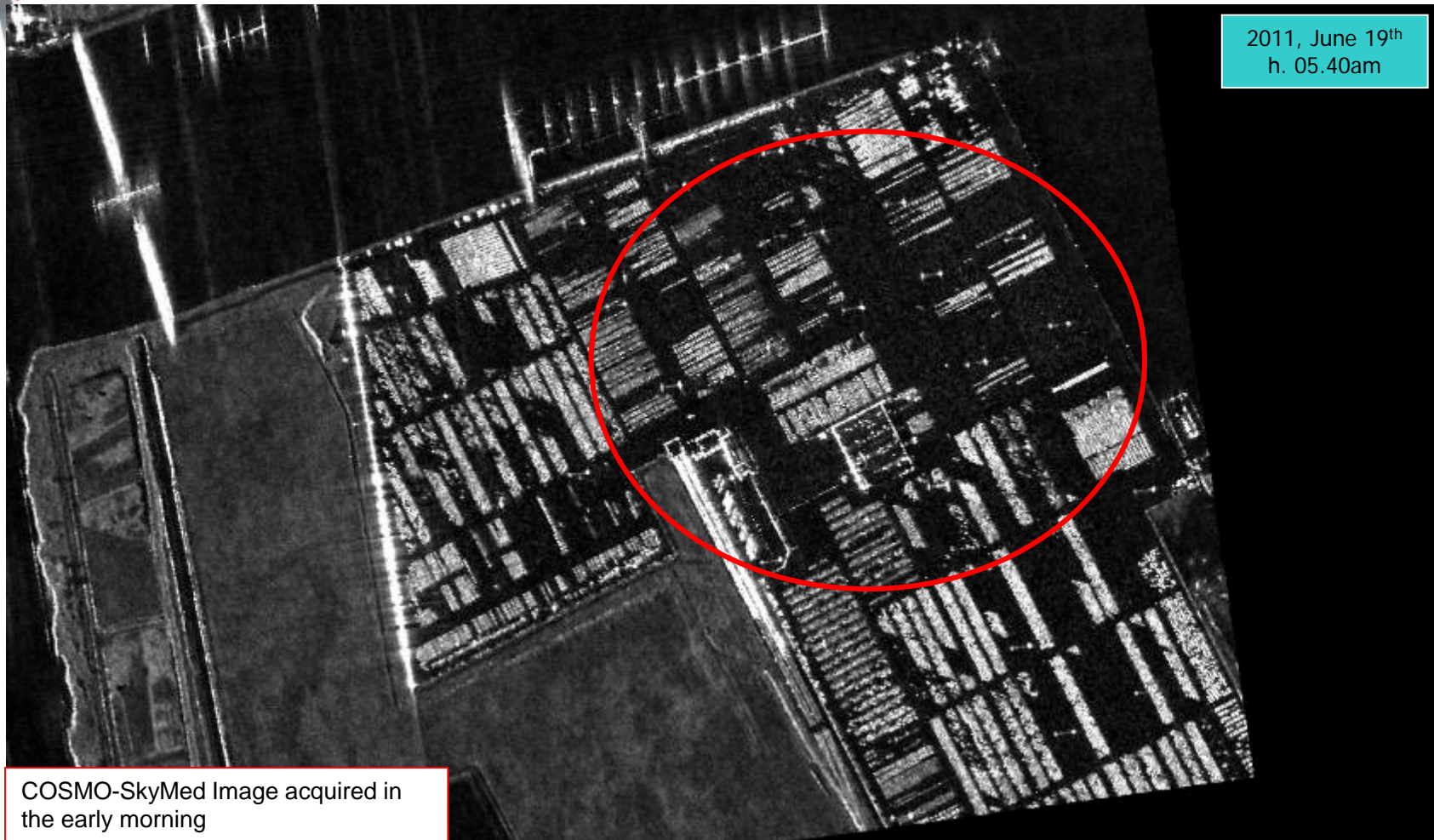
Next slides:

Change Detection over specific areas:

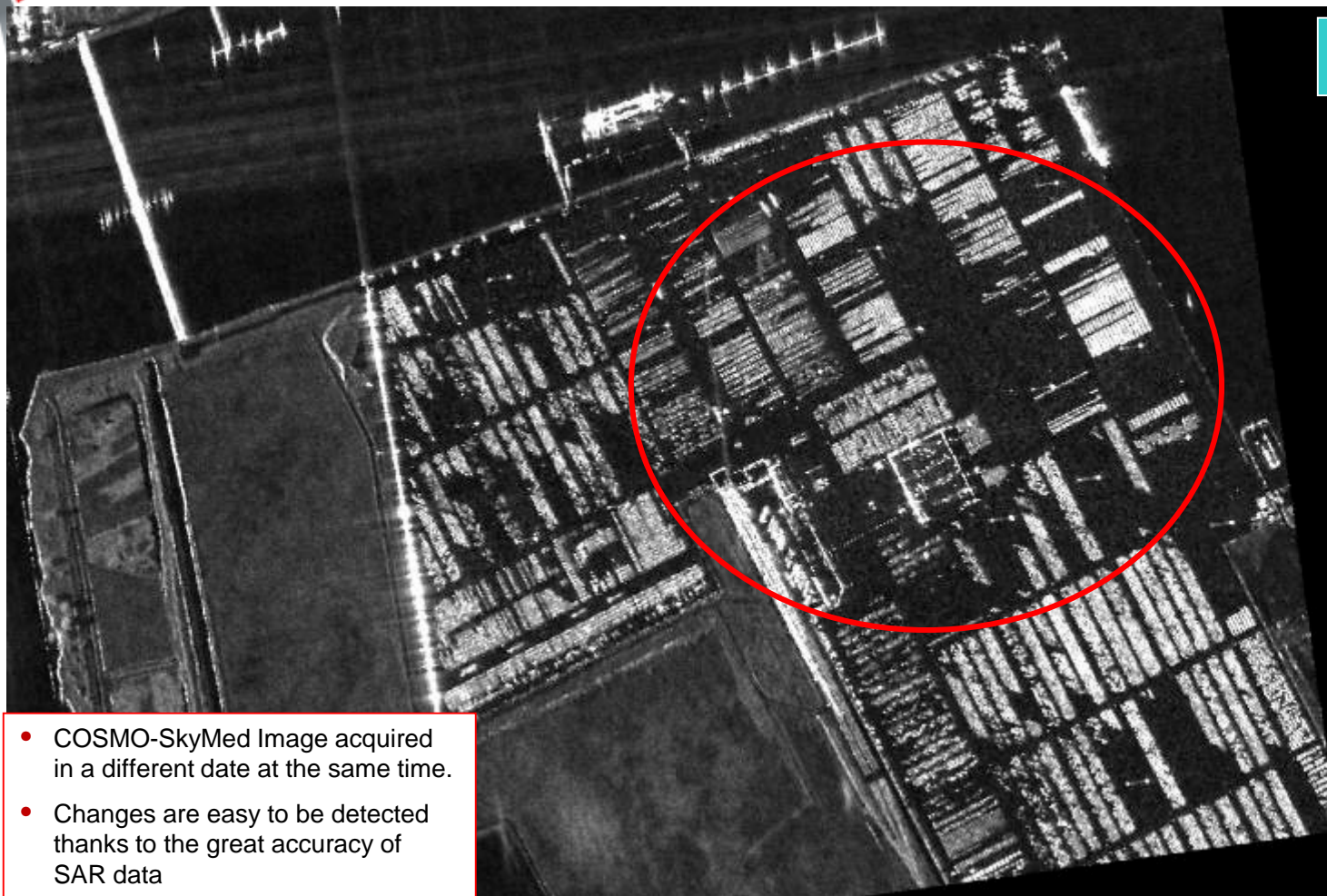
- Container depot
- Airplane "cemetery"
- Amazon forest and rivers



Activity Monitoring



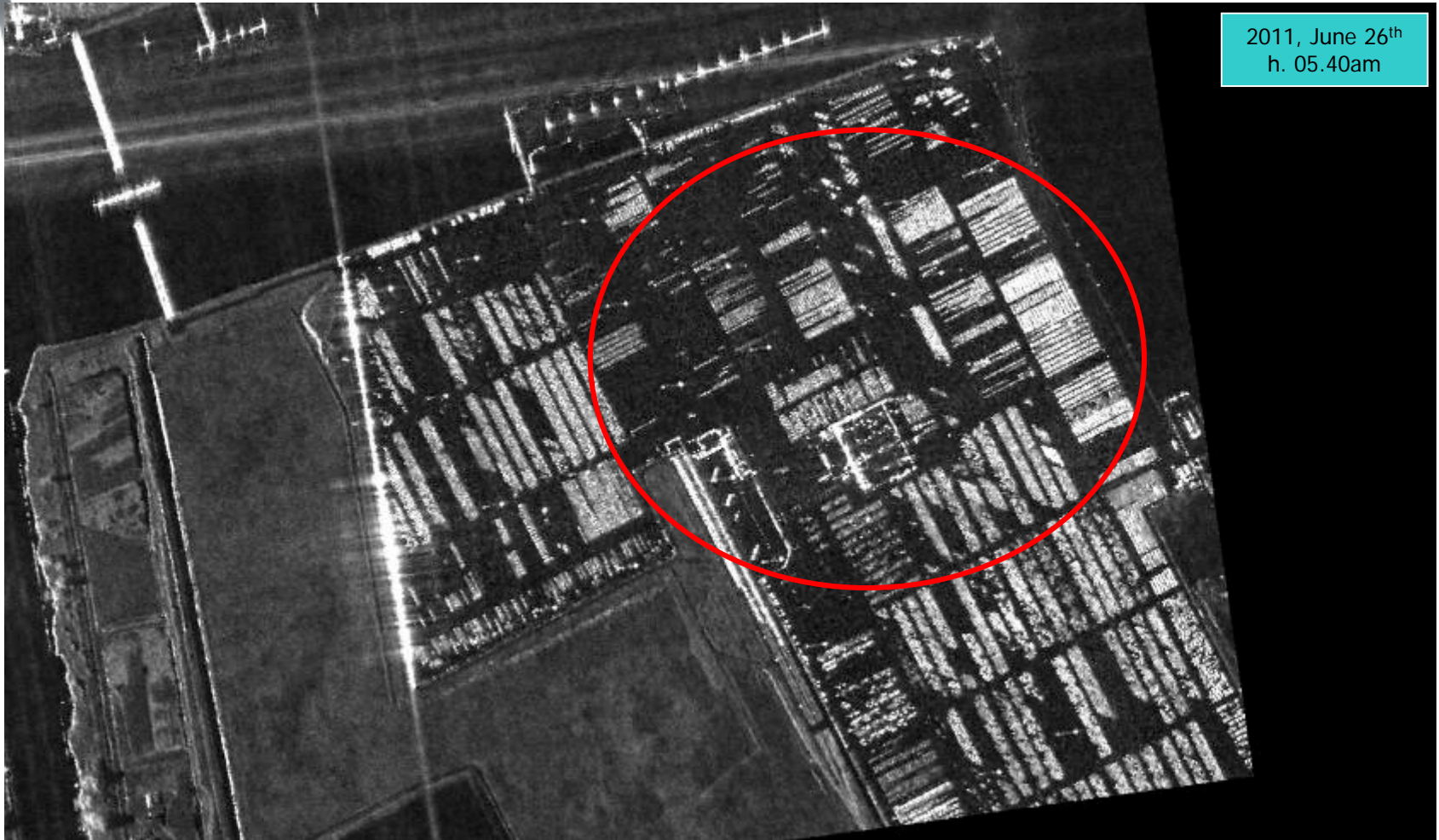
Activity Monitoring



2011, June 22th
h. 05.40am

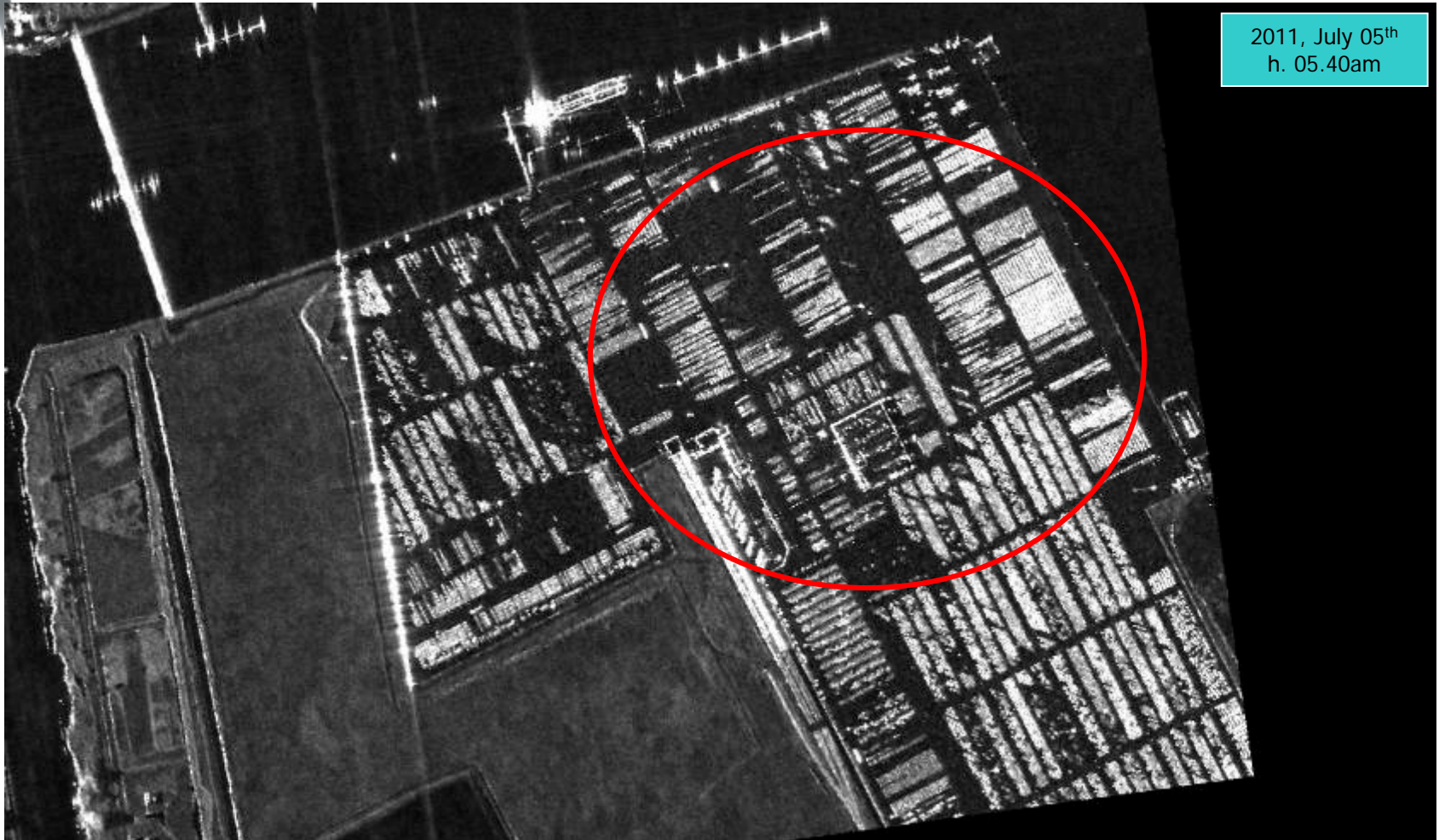
- COSMO-SkyMed Image acquired in a different date at the same time.
- Changes are easy to be detected thanks to the great accuracy of SAR data

Activity Monitoring



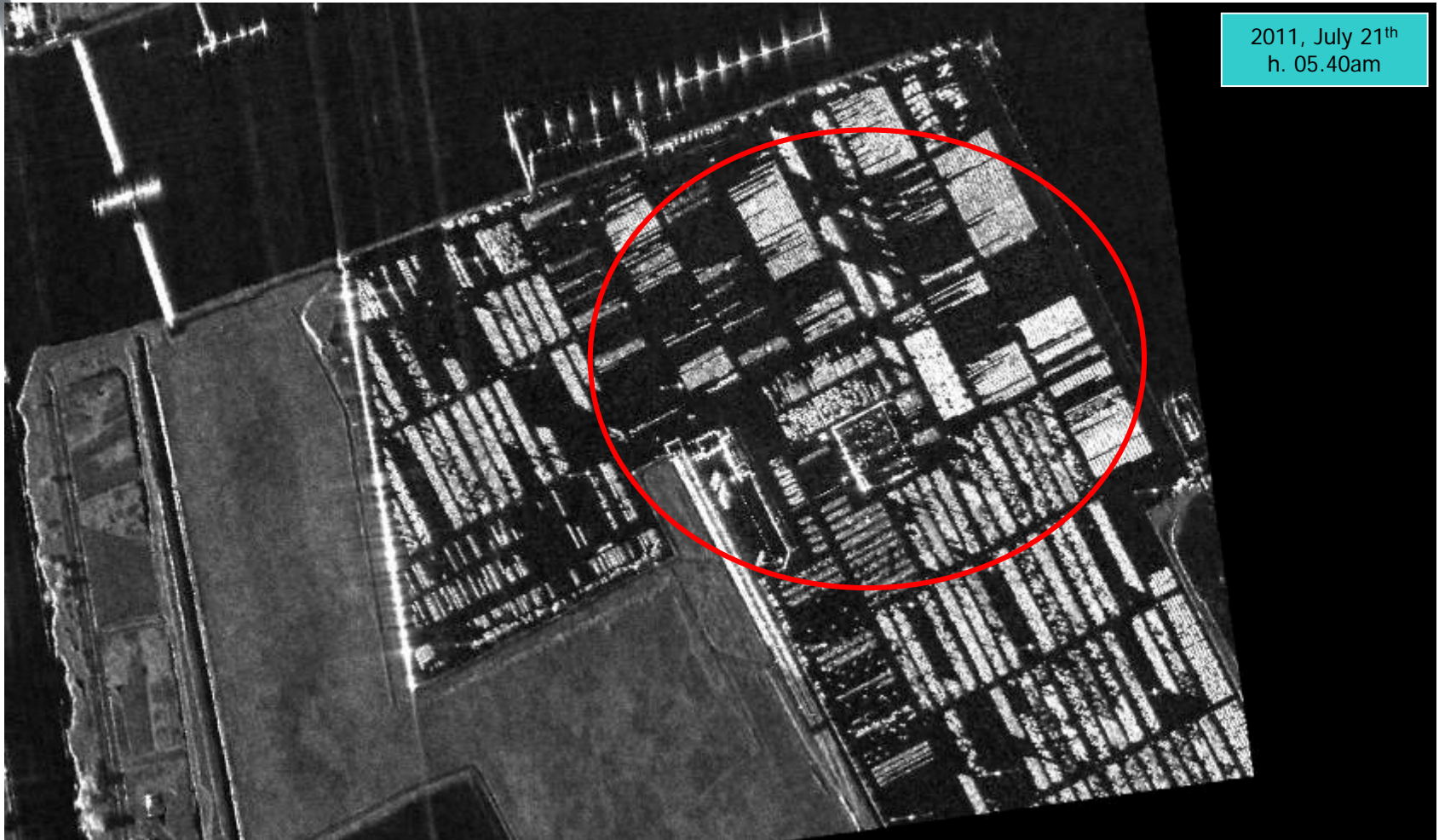
2011, June 26th
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Activity Monitoring



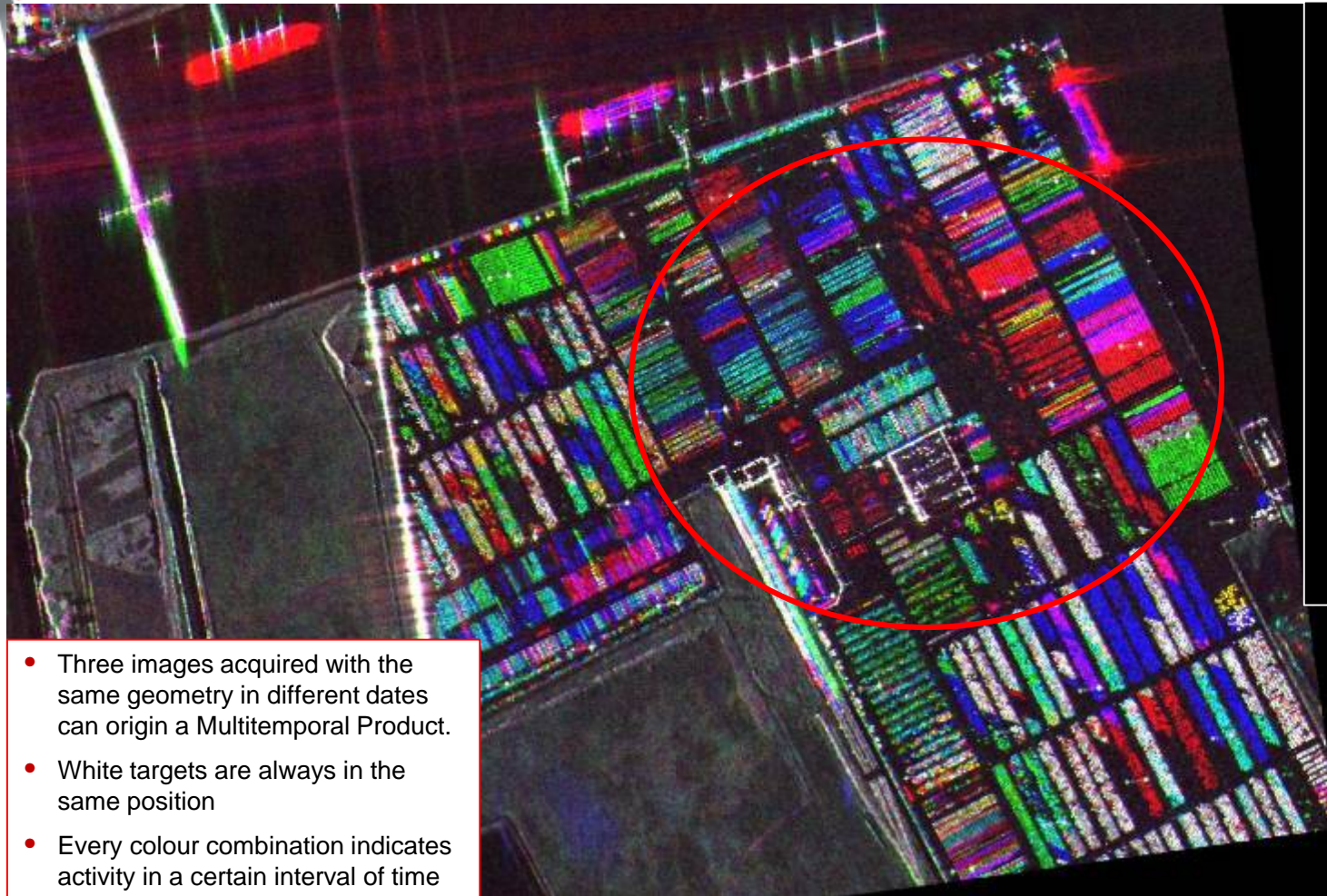
2011, July 05th
h. 05.40am

Activity Monitoring







2011, July 21th
h. 05.40am

Activity Monitoring



Color key

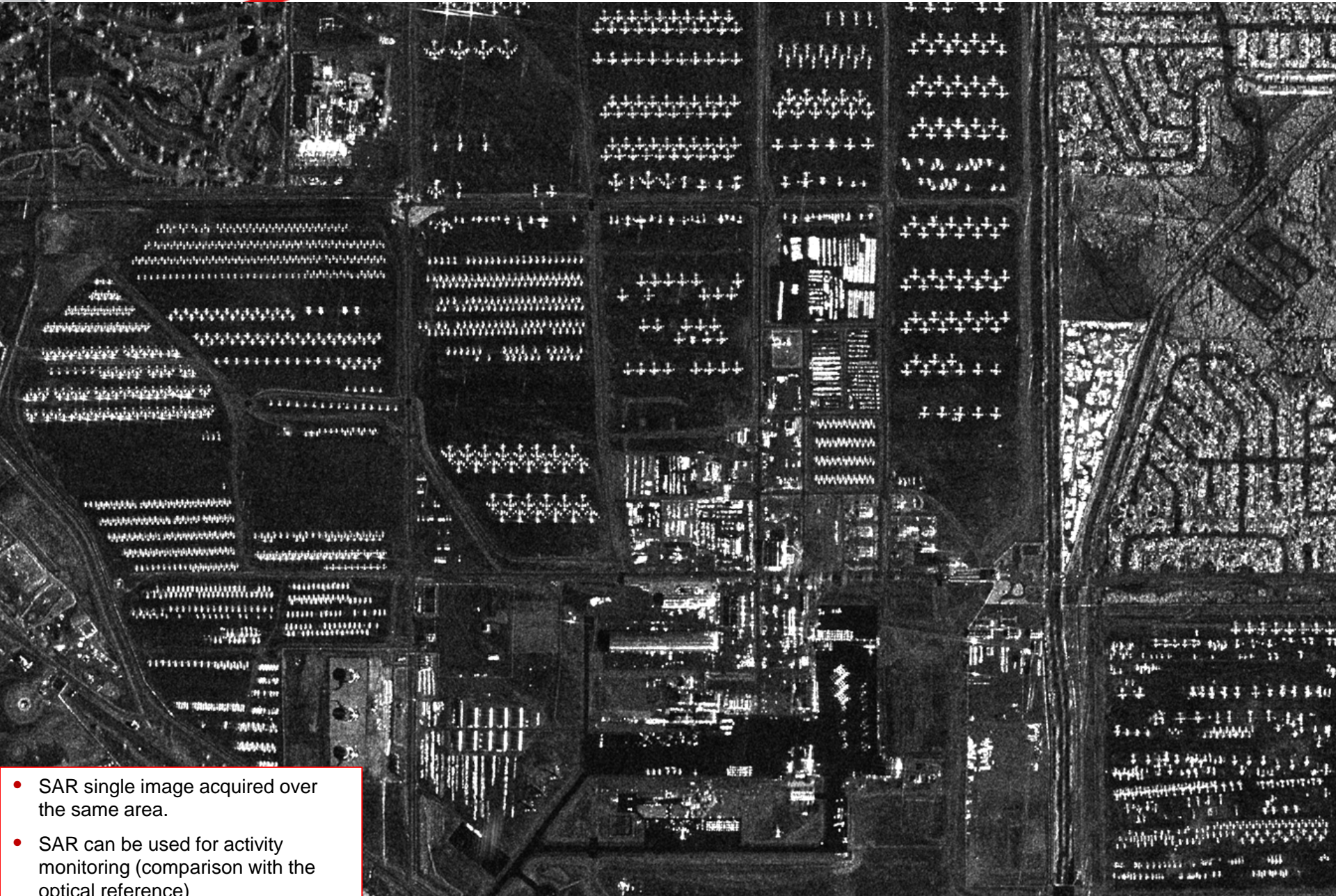
-  20110610
-  20110619
-  20110622
-  20110610 - 20110619
-  20110610 - 20110622
-  20110619 - 20110622
-  Vehicles in all of the dates

- Three images acquired with the same geometry in different dates can origin a Multitemporal Product.
- White targets are always in the same position
- Every colour combination indicates activity in a certain interval of time



- Optical image acquired on the aircraft cemetery in Tucson

Single Image, May 5, 2010



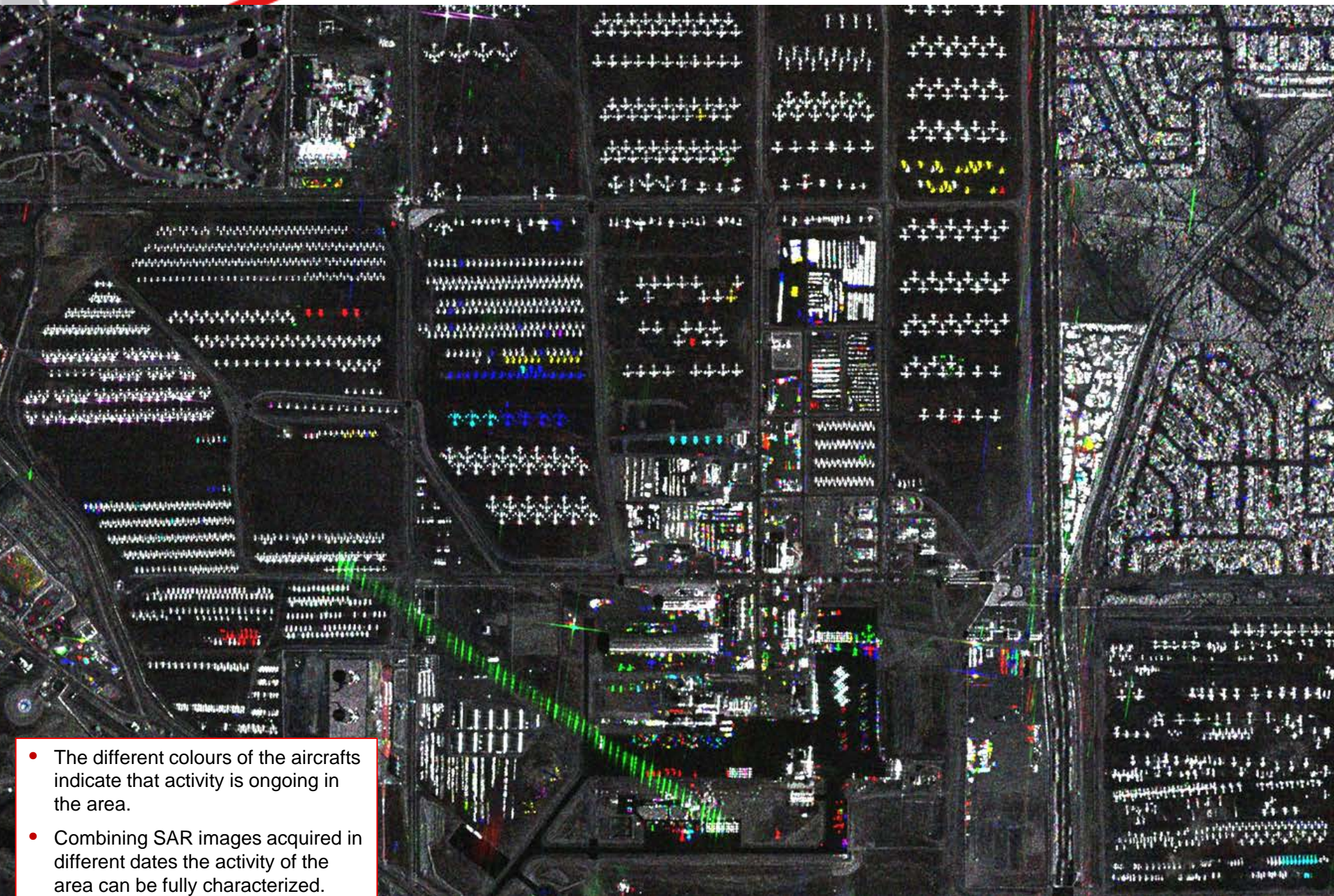
- SAR single image acquired over the same area.
- SAR can be used for activity monitoring (comparison with the optical reference)



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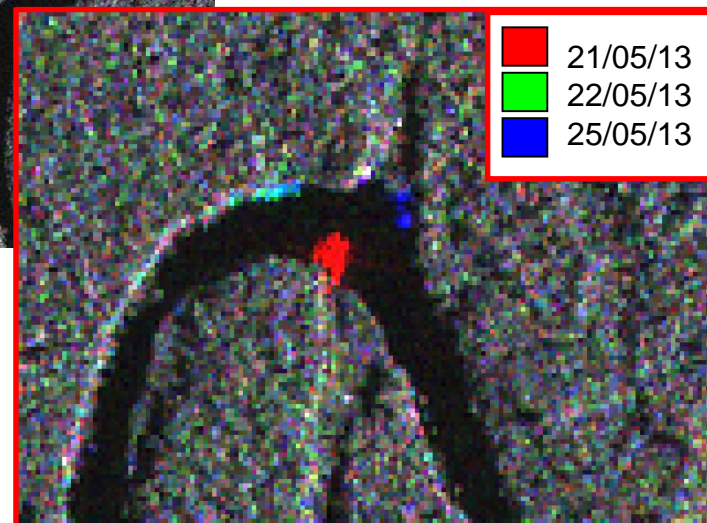
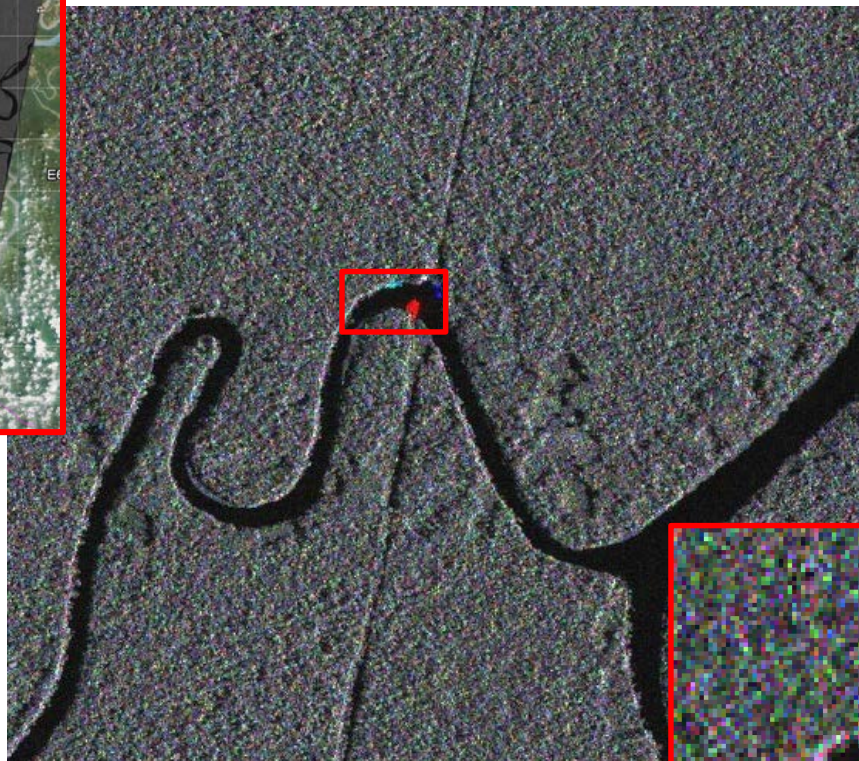
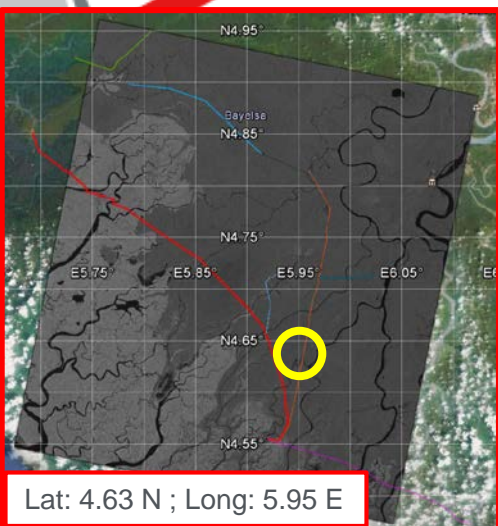
Multitemporal (RGB = May 5, May 21, June 20)




- The different colours of the aircrafts indicate that activity is ongoing in the area.
- Combining SAR images acquired in different dates the activity of the area can be fully characterized.

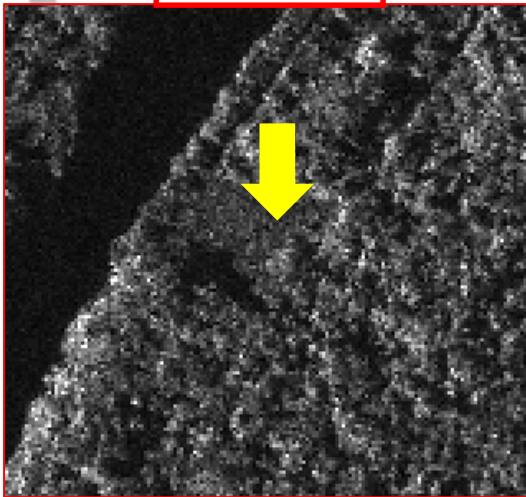
Change Detection analysis


- Boats very close to the river border changing their position are easily identified.

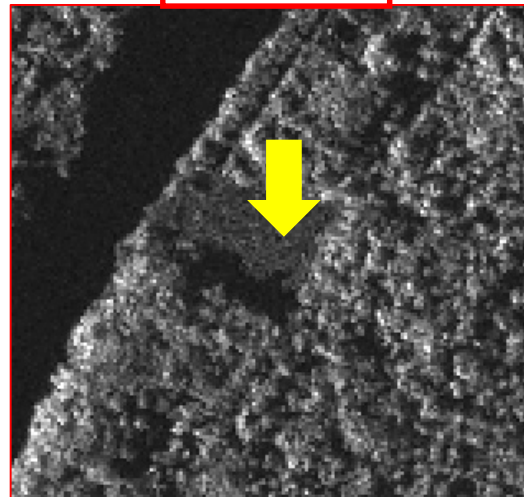


Change Detection analysis




 21/05/13

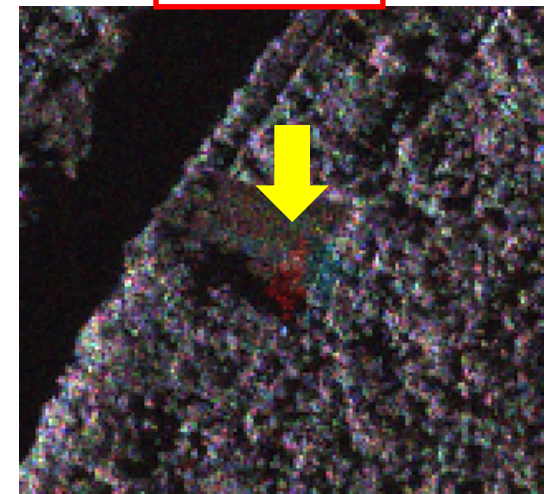


 02/06/13



- Due to the high sensitivity to surface and target variation, tree cutting is easily detectable.
- Tree cuttings are an indicator of activity in the area very close to the river

 21/05/13
 29/05/13
 30/05/13

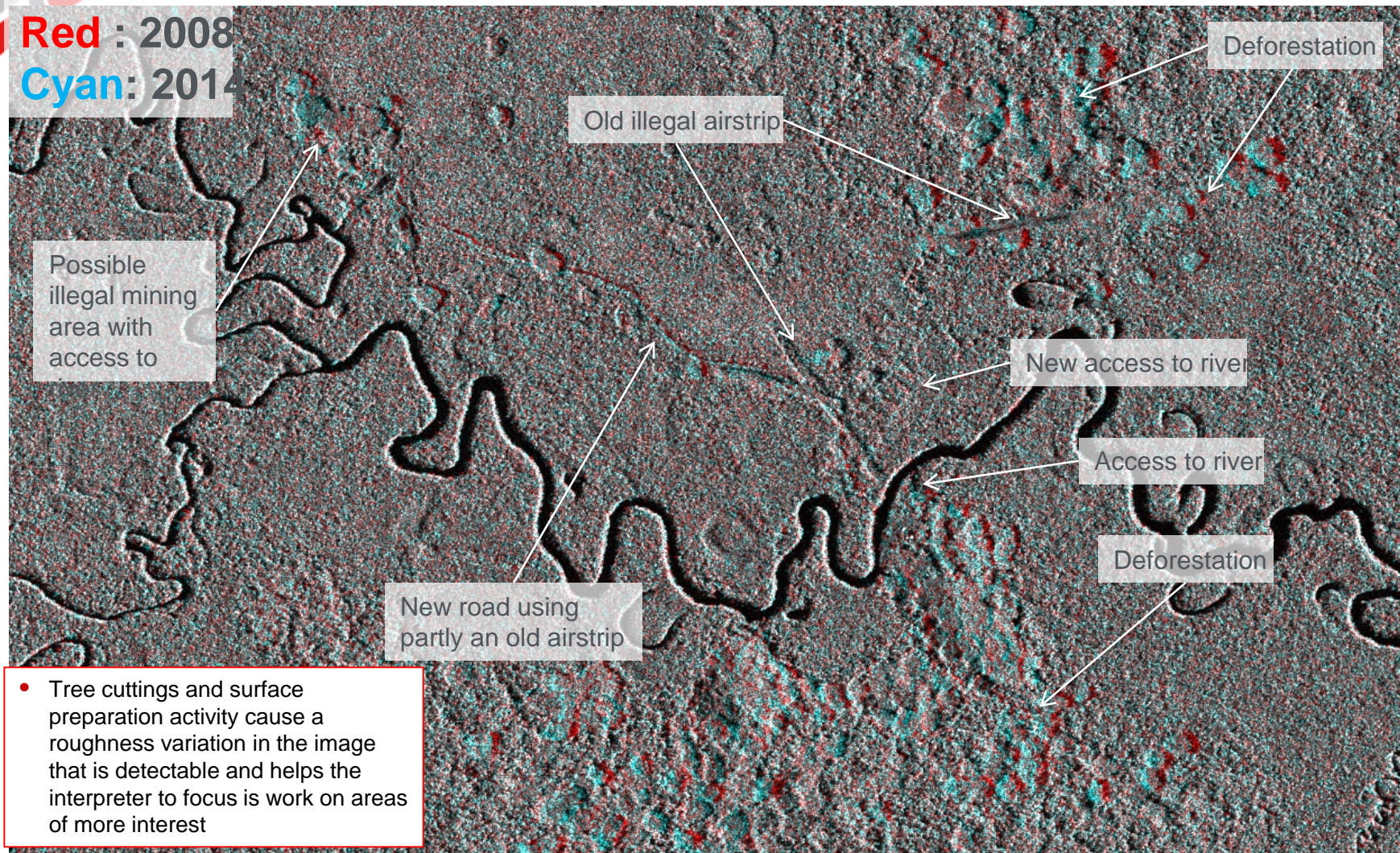


Airstrip Detection: Brasil – Dog's Head

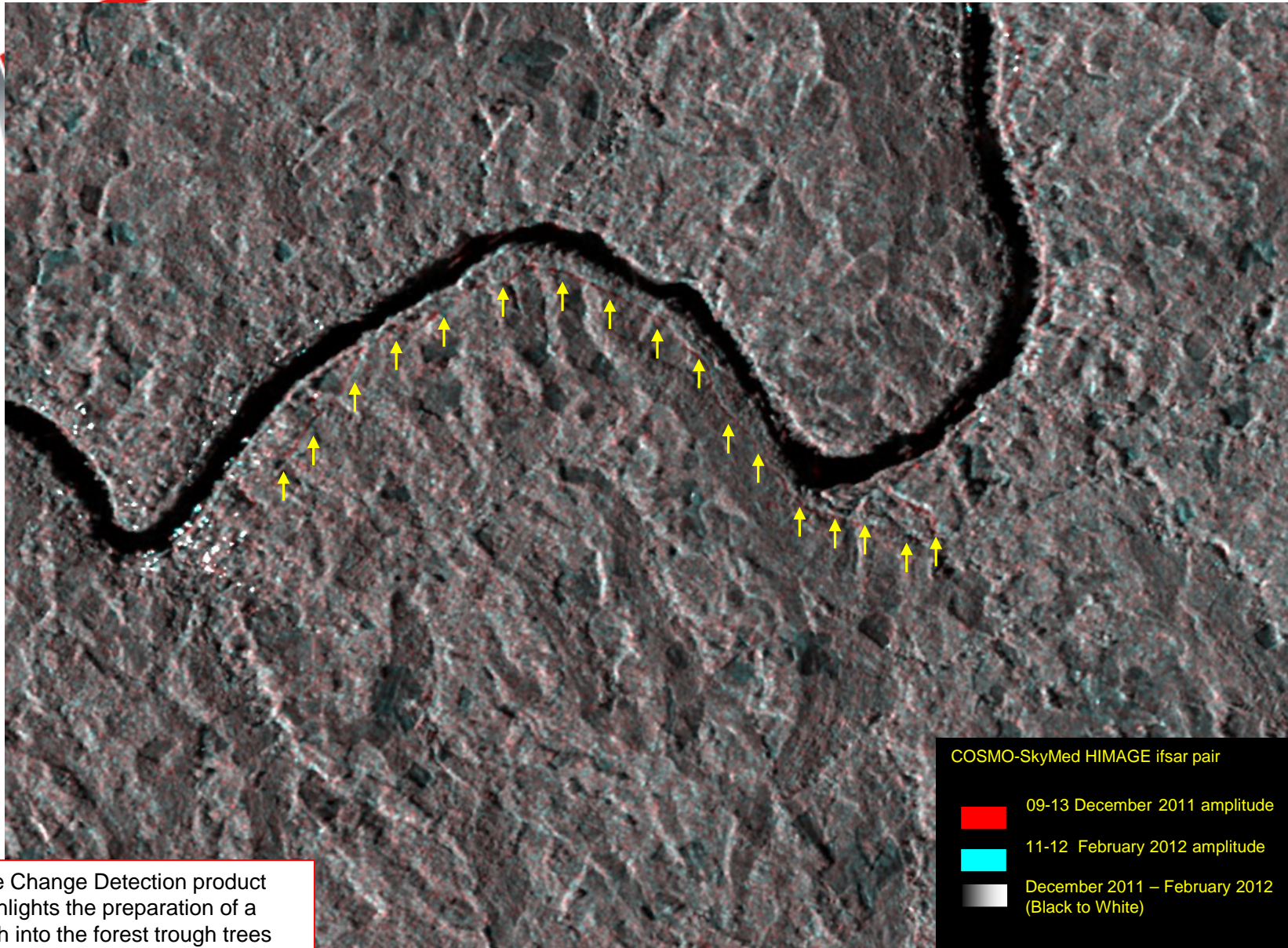
Change detection between 2008 and 2014

Red : 2008

Cyan : 2014



Path preaparation in the forest: Indonesia



New opportunities: Romanian satellite for Secure Communications

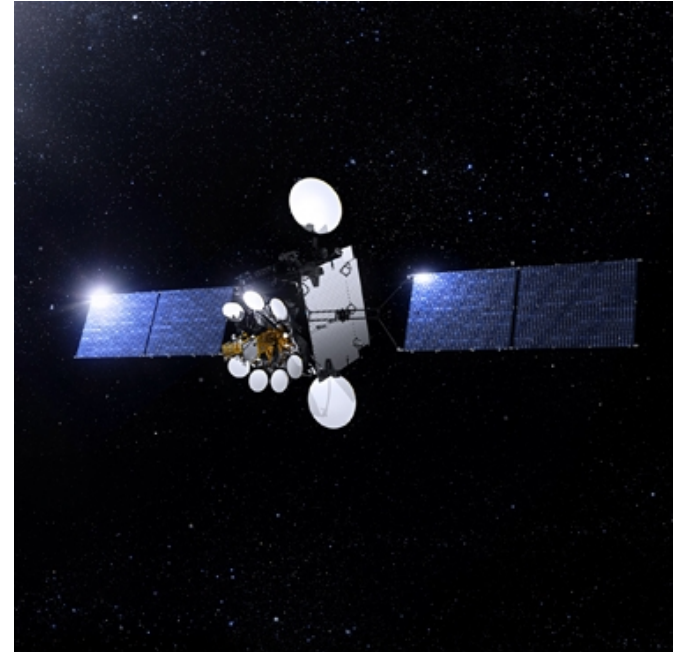
- Romania has filed at ITU level (International Telecommunication Union) an orbital position (50 deg east) for the launch of a telecommunication satellite
- The satellite could cover all the Romania Institutional needs, both civil and military
- Possible users of such an infrastructure are: Police, Jandarmerie, Information Services, Ministry of Defence, Ministry of Interiors, Ministry of finance, Romania Post and more in general all the entities with a large number of offices spread all around the country

This project could be implemented leveraging on the Cheia Ground Station infrastructure and could become the driver to strengthen the Romanian Space Industry in the manufacturing area, to improve the country participation to future European Space Programs



Romanian satellite: the case of Athena Fidus

- ATHENA FIDUS (**A**ccess on **T**heatres and **E**uropean **N**ations for **A**llied forces – **F**rench **I**talian **D**ual **U**se **S**atellite) is a French-Italian telecommunications system based on a geostationary satellite for dual broadband communication services.
- ATHENA FIDUS implements a telecommunications infrastructure that can support/complement the terrestrial networks in the event that the latter are unavailable or damaged.



The Athena Fidus system has been developed by ASI (the Italian Space Agency) and CNES (Centre National d'Etudes Spatiales) in the cooperation framework agreement signed by the Space Agencies and the Italian and French Ministries of Defense. The complete system has been manufactured and deployed by the Space Alliance (Thales & Finmeccanica)