

Il Settore spaziale di Copernicus e le infrastrutture nazionali

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Copernicus: Objectives



Copernicus

Monitor the environment

Foster downstream applications
in a number of fields



Protect people and
assets



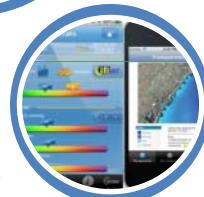
Increase general knowledge on the
state of the Planet



Improve environmental policy
effectiveness



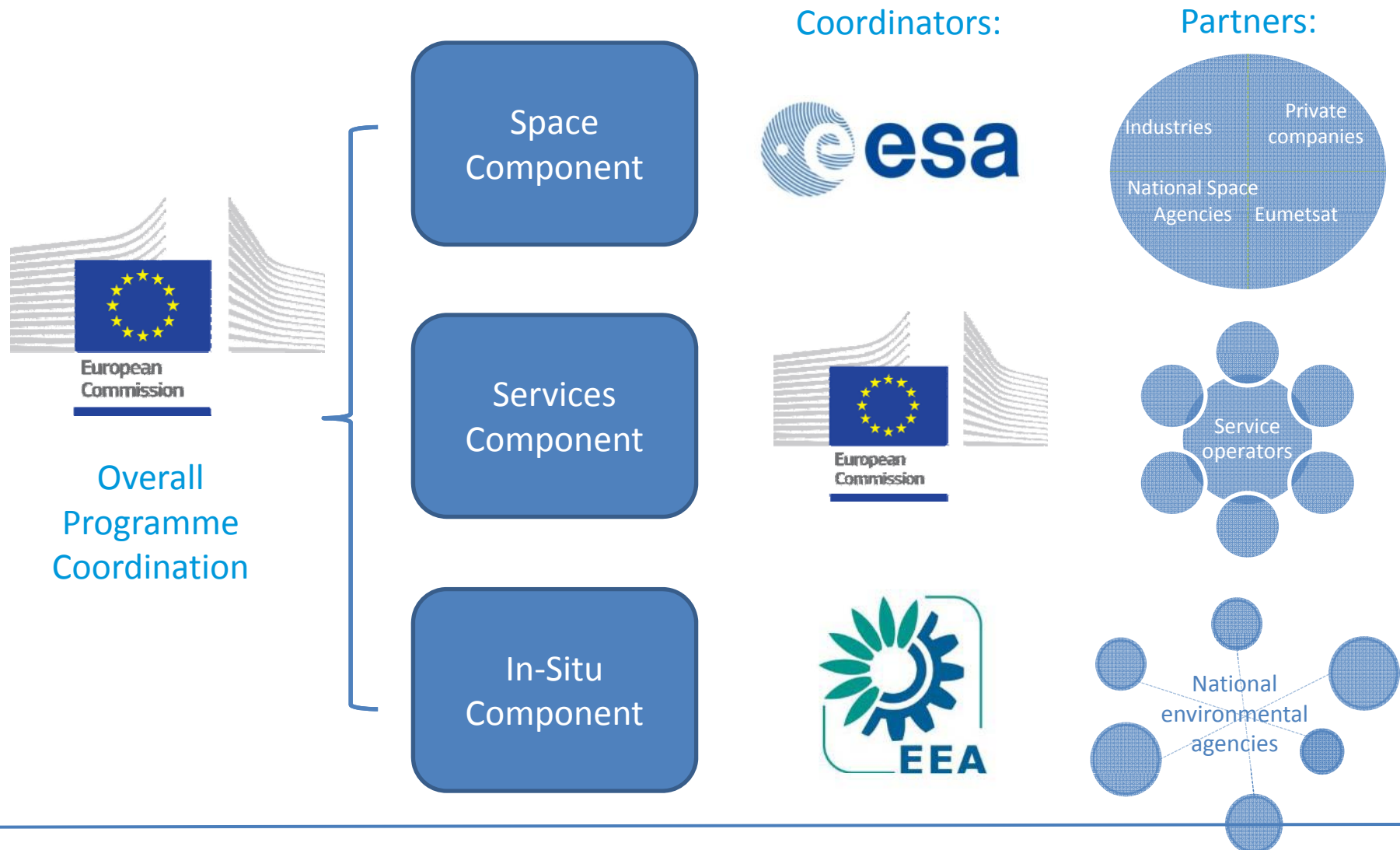
Facilitate adaptation
to climate change



Help managing emergency and
security related situations



Components & Competences





S1A/B: Radar Mission

2014/end 2015



S2A/B: High Resolution Optical Mission

2014/2016



S3A/B: Medium Resolution Imaging and Altimetry Mission

2014/2017



S4A/B: Geostationary Atmospheric Chemistry Mission

2019/2027



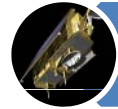
S5P: Low Earth Orbit Atmospheric Chemistry Mission

2015



S5A/B/C: Low Earth Orbit Atmospheric Chemistry Mission

2020/2027



Jason-CS A/B: Altimetry Mission

2019/2025

Launch Sentinel 1A

- 3 April 2014
- Kourou spaceport
- Soyuz-2 rocket
- New era of Earth observation



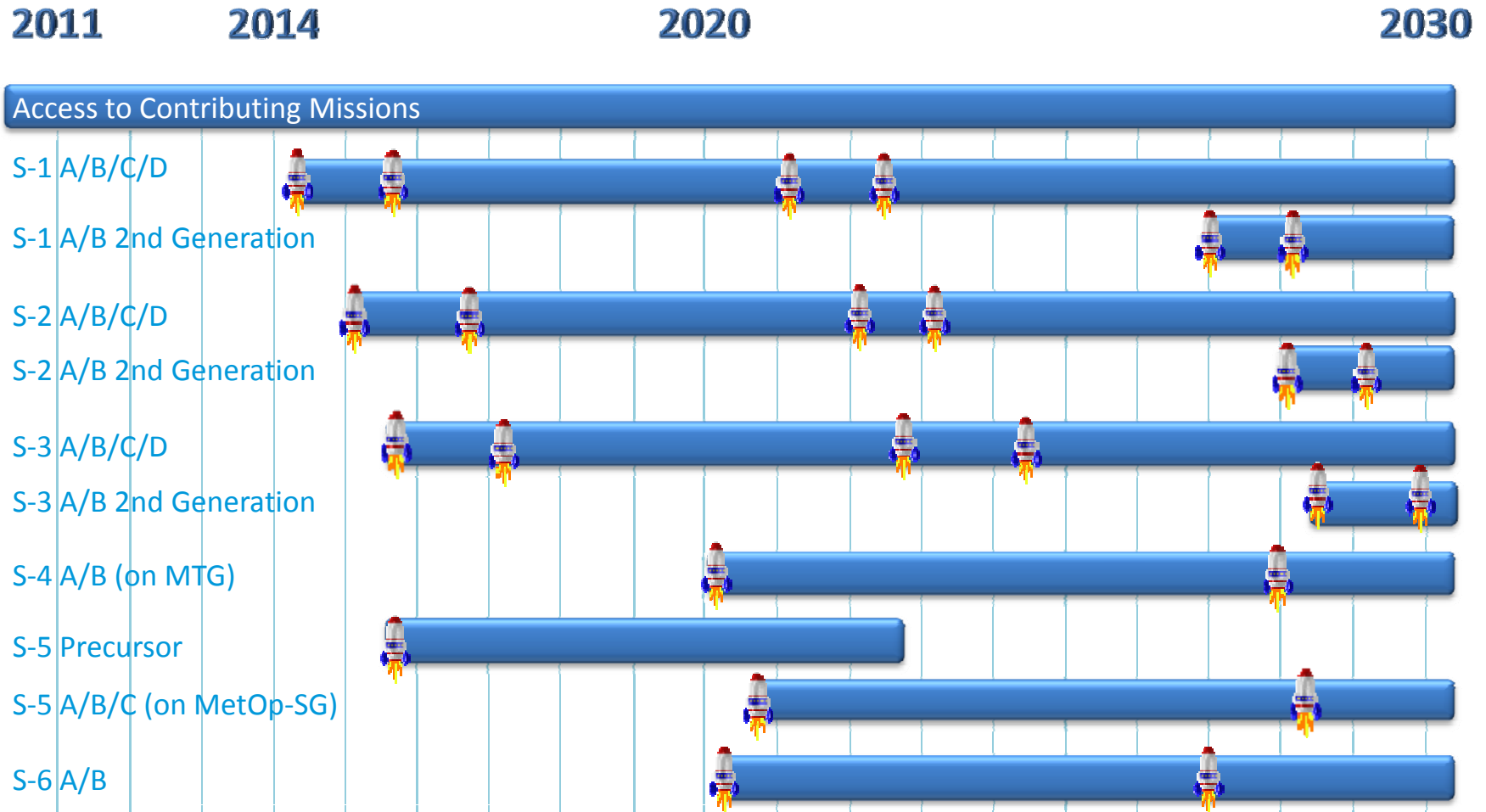
Copernicus



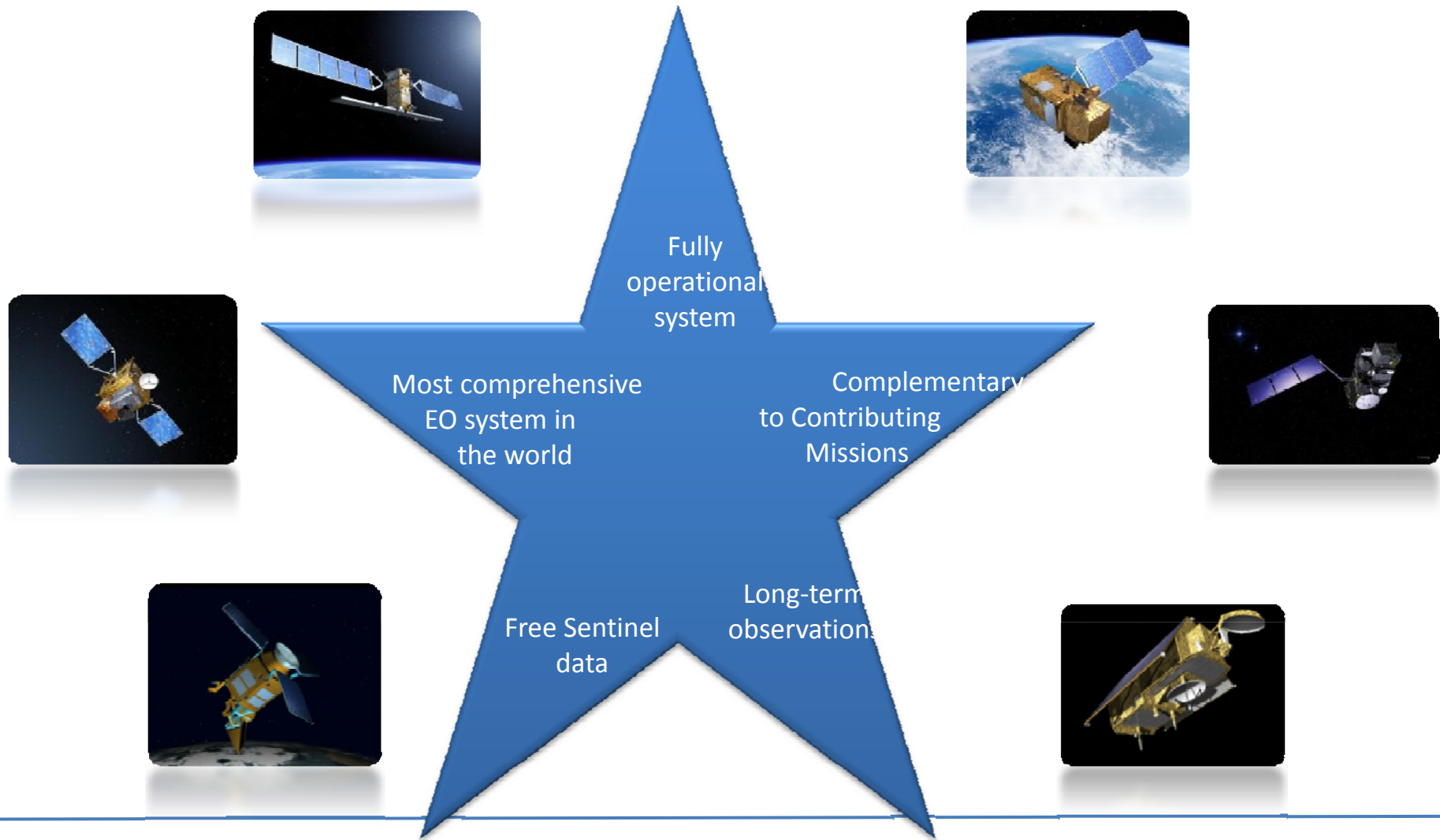
Copernicus Data Policy

Sentinel Data Policy = **FREE and OPEN access**

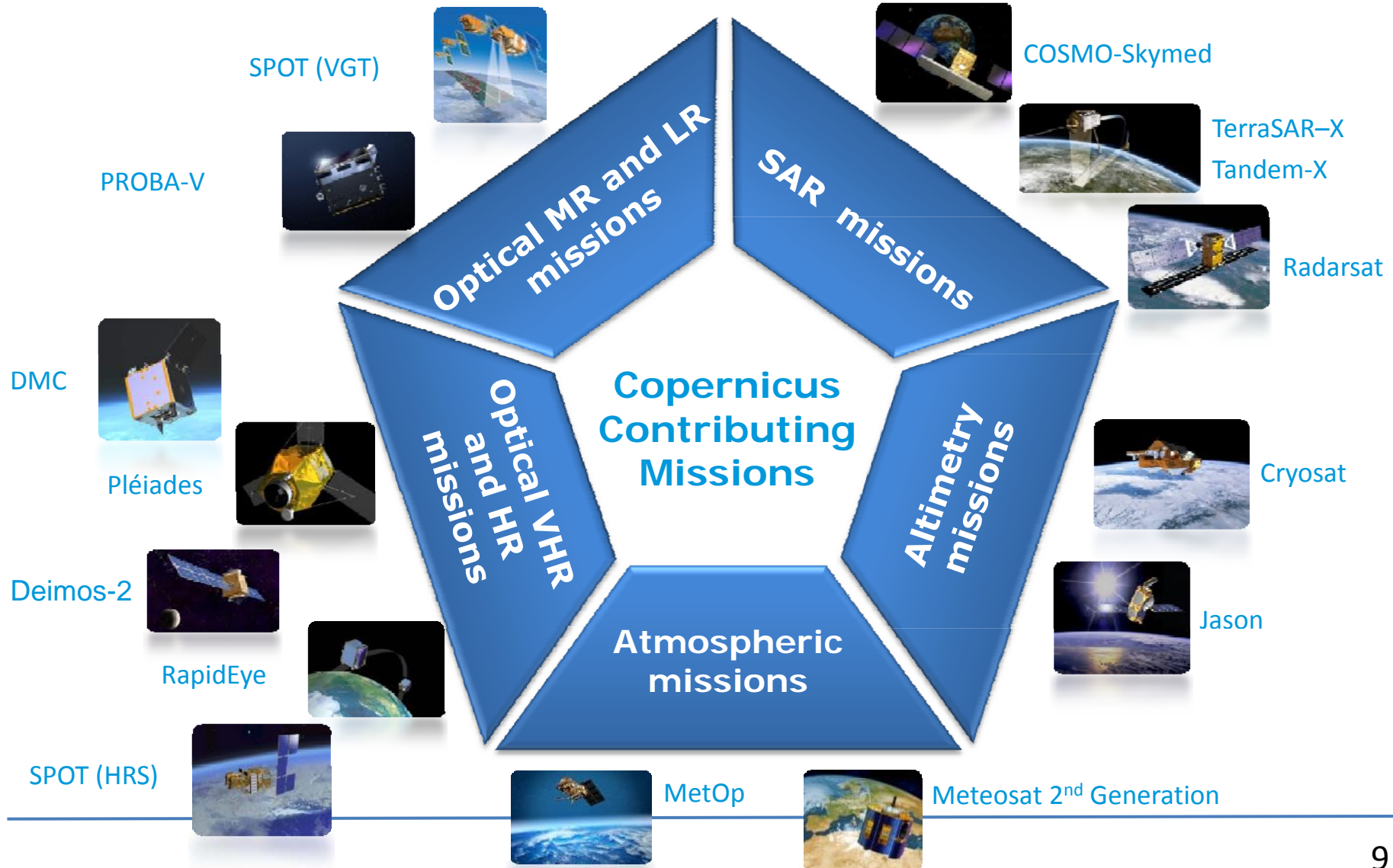
- **ESA Sentinel Data Policy** (Sep 2013) and **EU Delegated Act** on Copernicus Data and Information Policy (Dec 2013)
 - Main principles of Sentinel data policy:
 - **Open** access to Sentinel data by anybody and for any use
 - **Free** of charge data licenses
 - Restrictions possible due to technical limitations or for security reasons
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Advantages of Sentinel Satellites

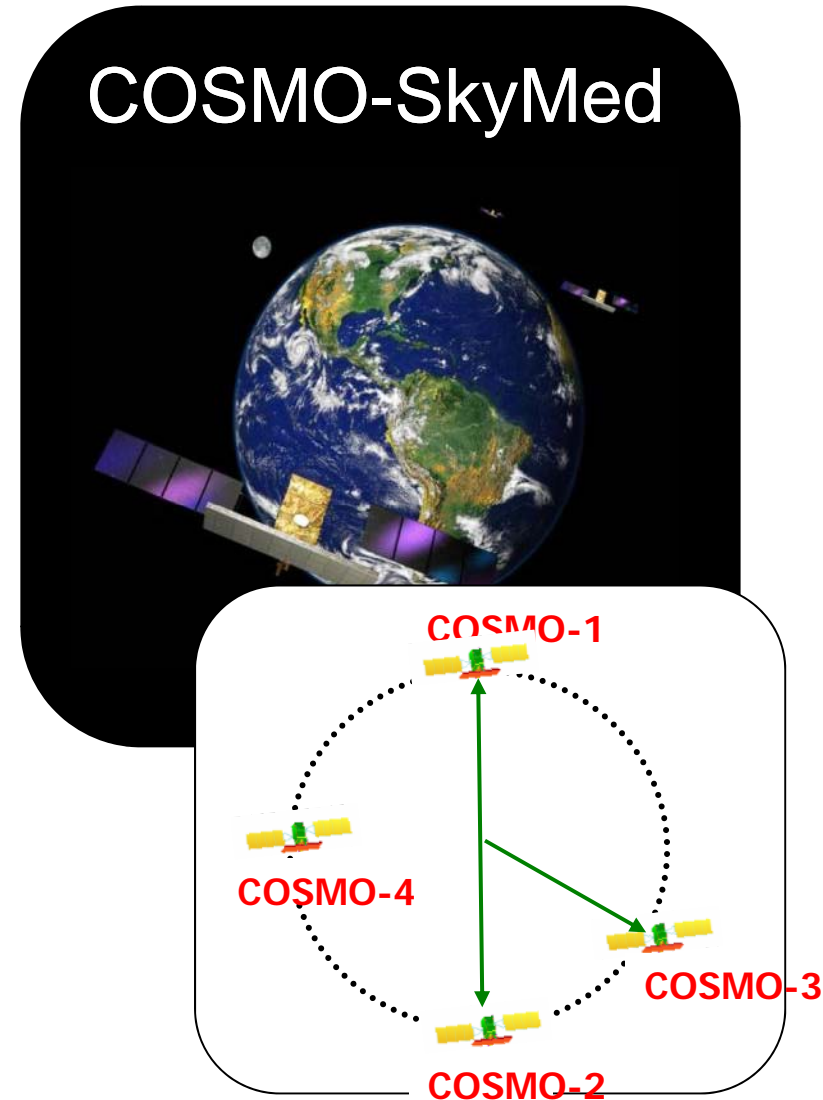


Copernicus Contributing Missions



COSMO-SkyMed Constellation

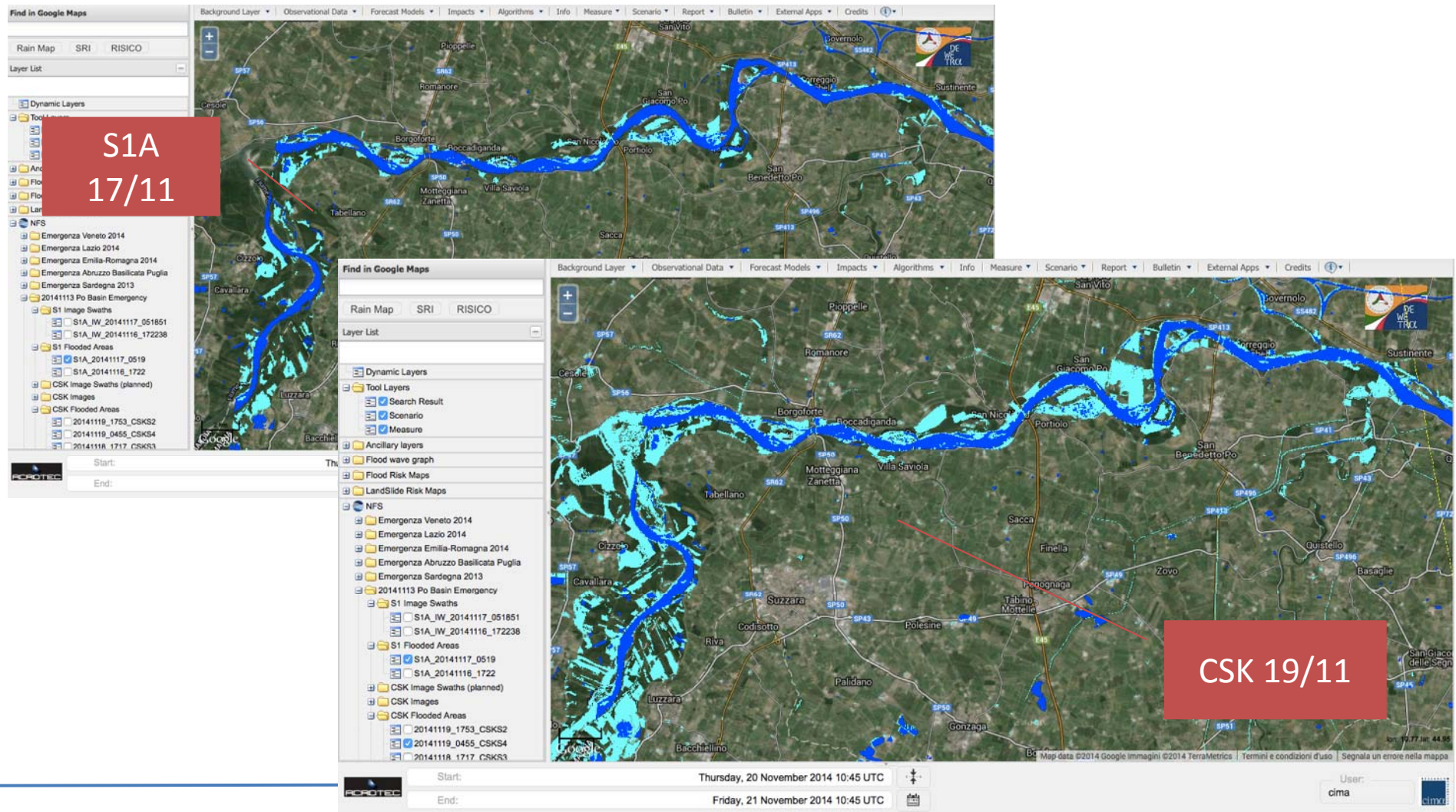
- Largest Italian Investment in EO
- 4 Satellites, X-band SAR
- No other 4 SAR satellites constellation today on the EO operational scenario
- Fully operative since 2011
- COSMO-SkyMed highlights:
 - Guaranteed Image Acquisitions (day/night & all weather)
 - Multiple imaging modes (variable resolution)
 - Very High Resolution and High quality images
 - Fast response
 - Large area collection
 - Unmatched revisit
 - Worldwide Accessibility
 - Interferometric and polarimetric capabilities



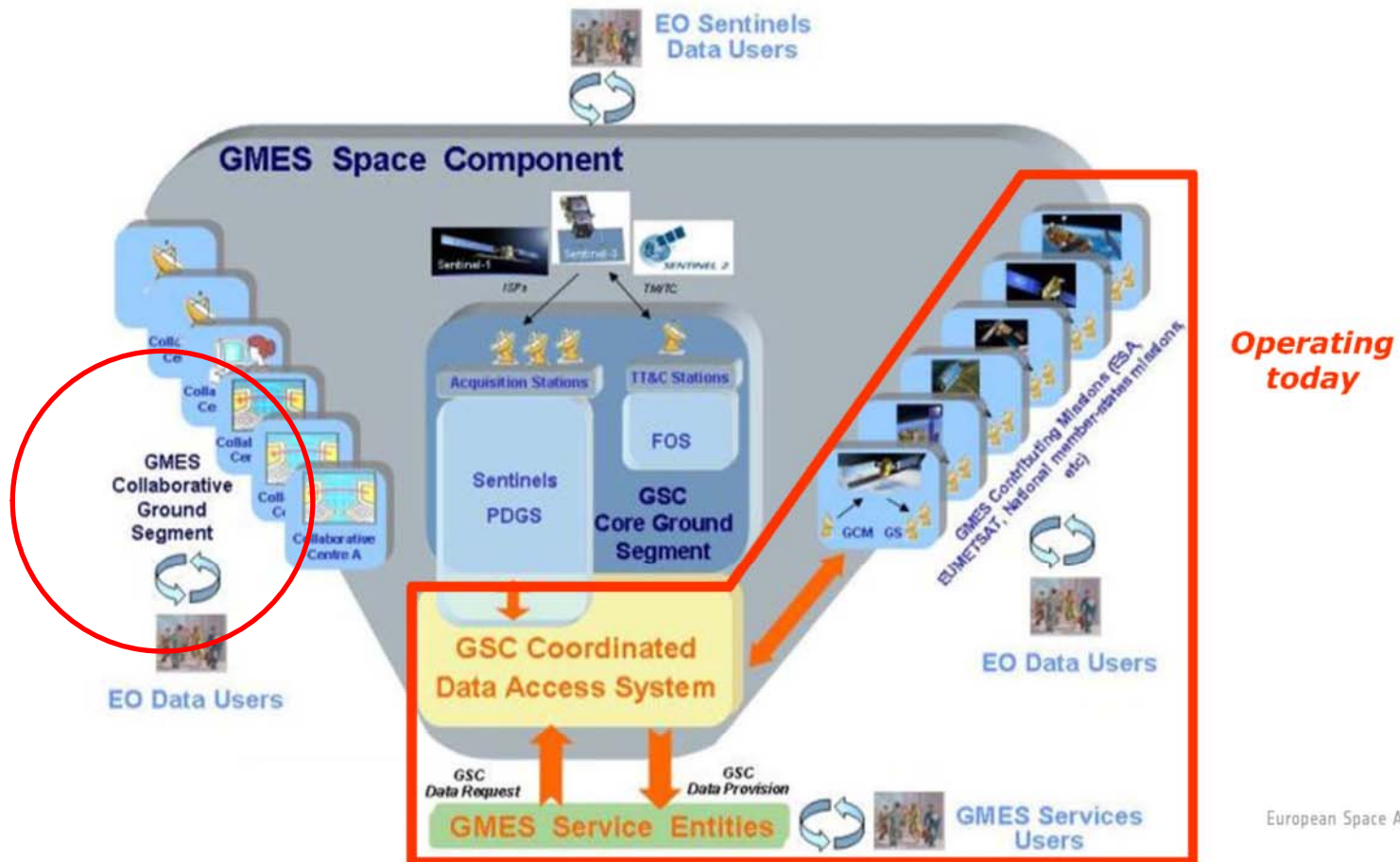


Spatial coverage of S1 (left) and CSK (right) acquisitions for the
AOI of the Po river in the period 13-20 November 2014

Sentinel 1 /COSMO-SkyMed Synergies



Ground Segment Architecture

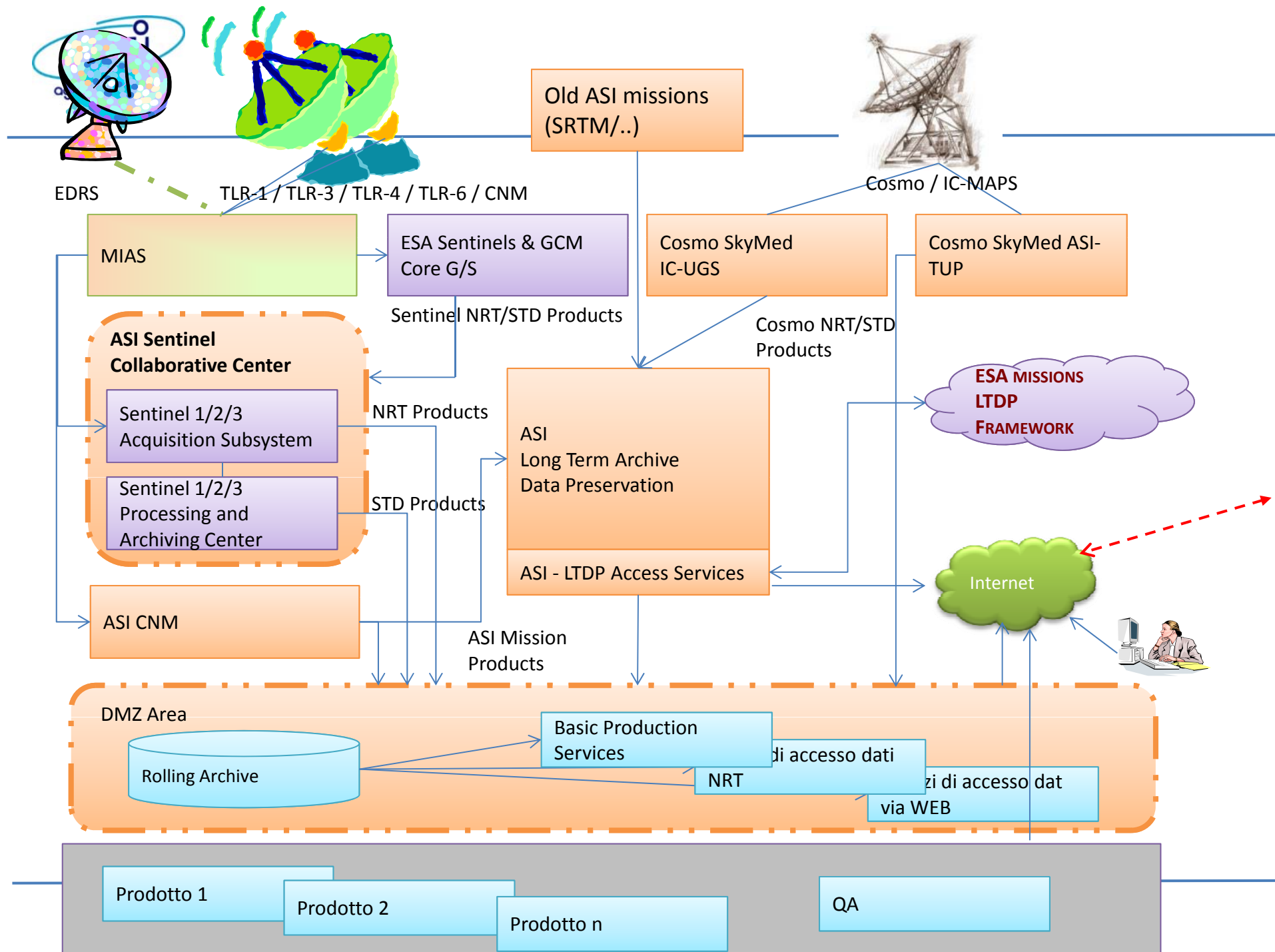


IT Collaborative GS

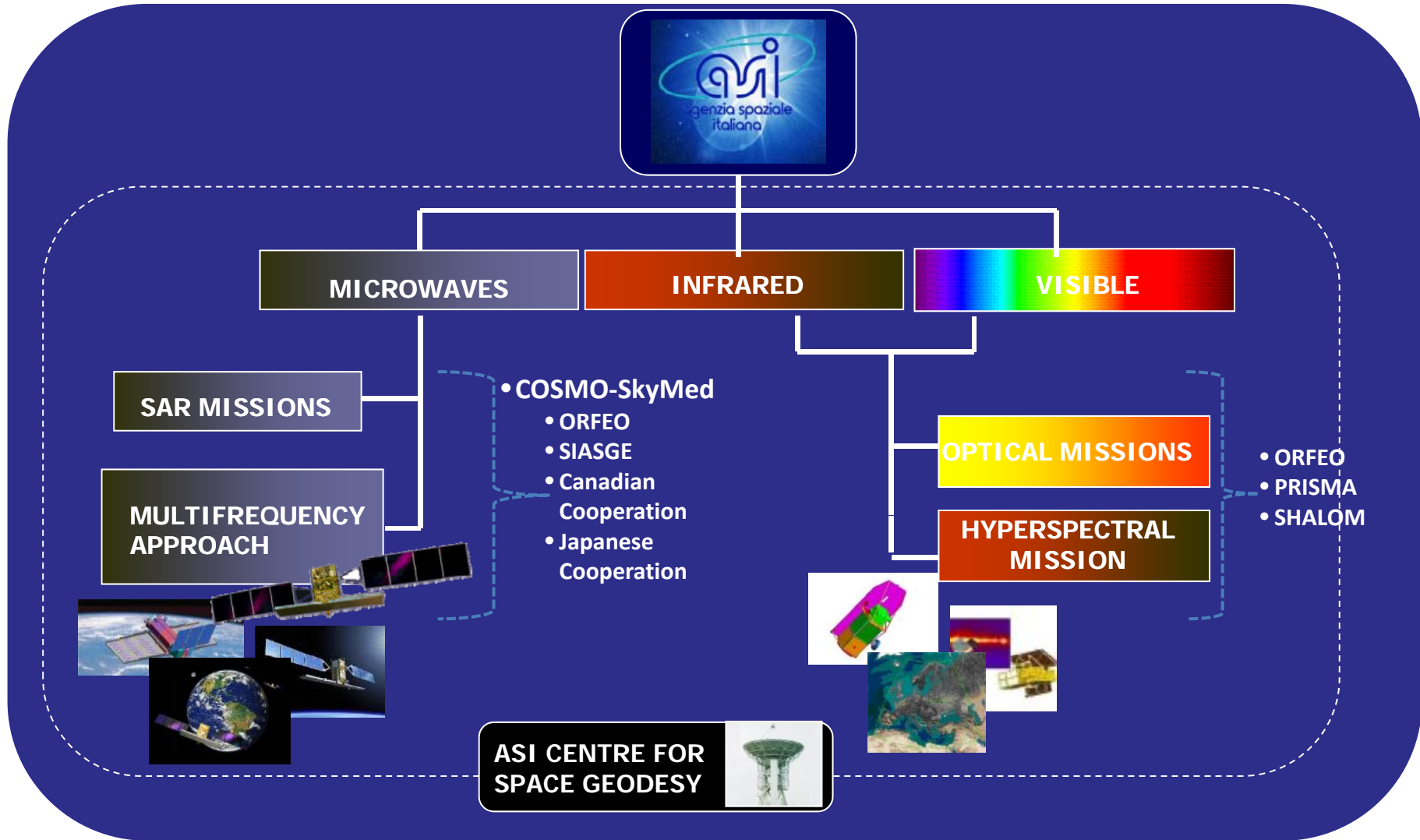
- The Sentinel Collaborative Ground Segment, has been introduced by ESA with the aim of further exploiting the Sentinel missions respect the Core Ground Segment functions, offering specialized solutions not being actually covered by the Core ground segment.
 - ASI / ESA Signature of the Italian Collaborative Ground Segment Agreement, October 6, 2014
 - Italian Users Community will benefit the ASI IT-Collaborative capabilities (data reception, processing, archiving and dissemination of S1 / S2 / S3 standard Lev 0, 1, 2 products with NRT / low latency performances).
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IT Collaborative GS

- The Collaborative Ground Segment is a National funded initiative. It is also supported by ESA in the framework of GSC-3 programme.
 - It is dedicated to national user community.
 - Sentinel Italian user community (institutional, scientific and commercial) expressed their requirements in terms of data, observation needs, area of interest, priorities...
 - It allows the direct take off of Sentinel data and - in a subsidiary way – of national missions (in Italy: COSMO-SkyMed).
 - Other national centres of competences can join it in the European network and contribute to enrich the Copernicus products portfolio through collaborative products and cal/val capabilities.
 - It allows to effectively grow the services capabilities and the business opportunities.
 - First Functions of the IT Collaborative GS:
 - Mirror archive for the Italian users areas of interest
 - Near Real Time access to Sentinel data
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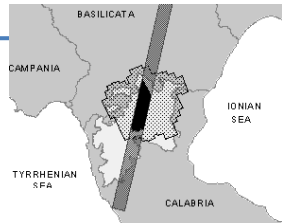


ASI Earth Observation Scenario

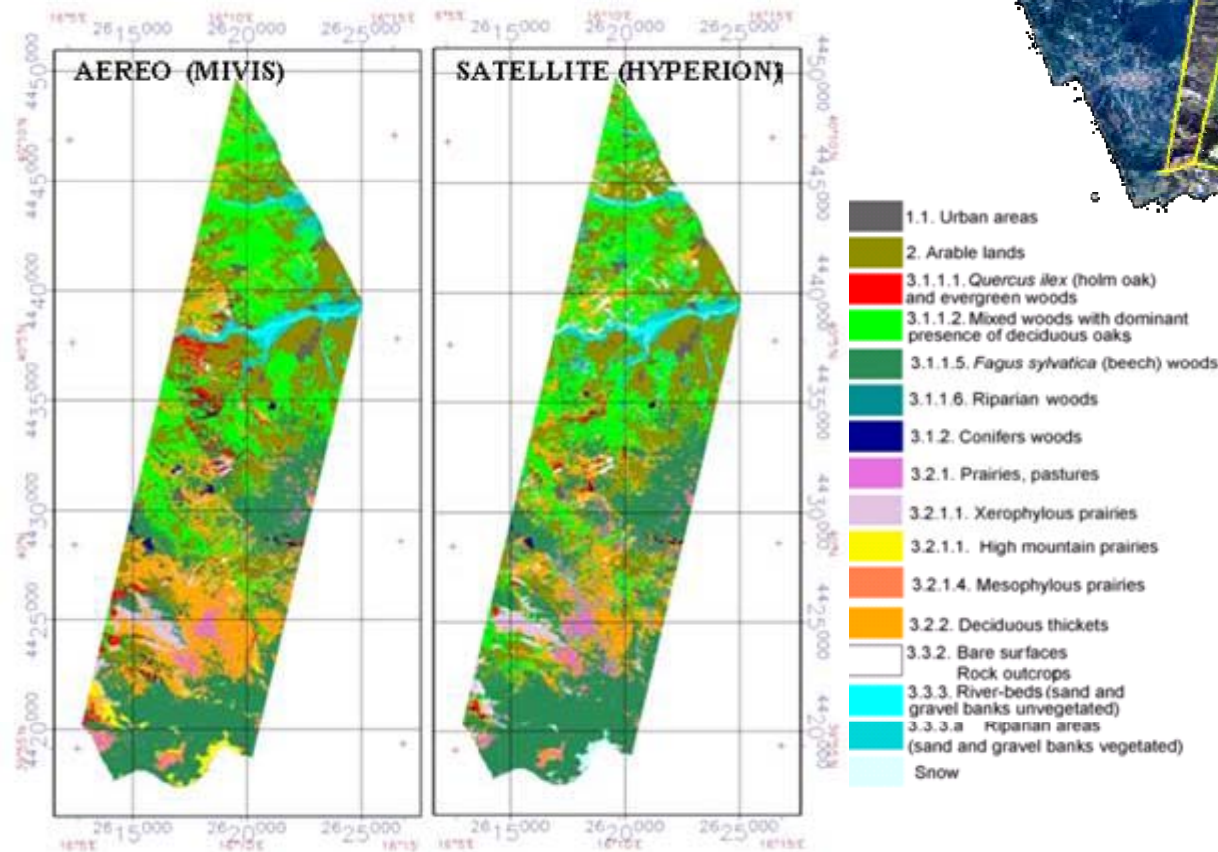
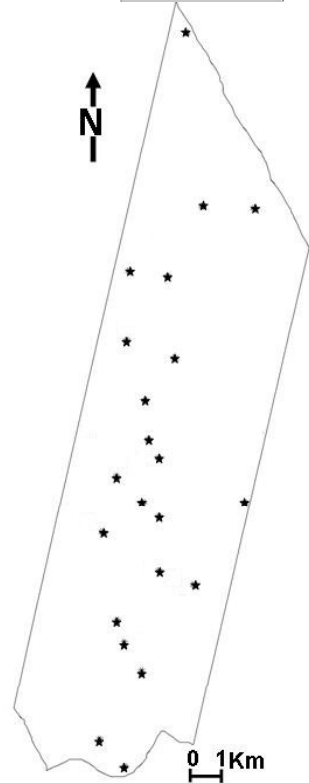
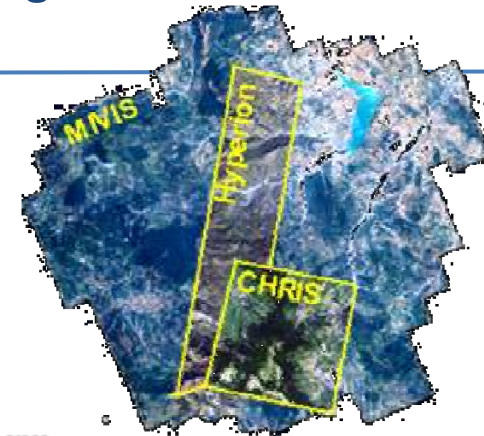


PRISMA Mission

- Mission Statement:
“... a pre-operative small Italian hyperspectral mission, aiming to qualify the technology, contribute to develop applications and provide products to institutional and scientific users for environmental observation and risk management ...”
 - Applicazioni per fenomeni di land degradation e stato di salute della vegetazione
 - Mappe di metriche di paesaggio
 - Mappe delle aree erose
 - Mappe di degrado del suolo
 - Applicazioni in aree agricole
 - Stima di variabili biofisiche e biochimiche delle colture agrarie (LAI, FPAR, clorofilla)
 - Stima di proprietà agronomiche del suolo da dati iperspettrali satellitari acquisiti su suolo nudo
 - Stima di variabili d'interesse agronomico ed ambientale, legate all'azoto, mediante assimilazione di dati telerilevati in modelli di funzionamento delle colture agrarie
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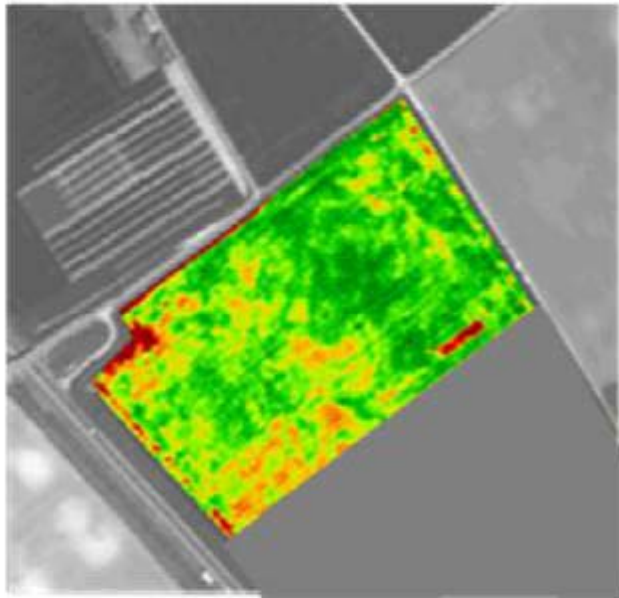


Parco Nazionale del Pollino

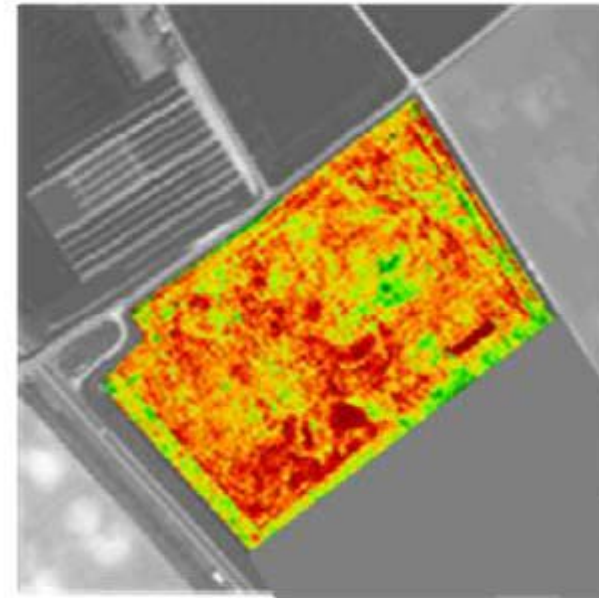


MIVIS and Hyperion classification maps obtained by applying the Minimum Distance (MD) method and considering 13 CORINE classes (up to the 4th level). MIVIS thematic map was spatially re-sampled to the Hyperion resolution.

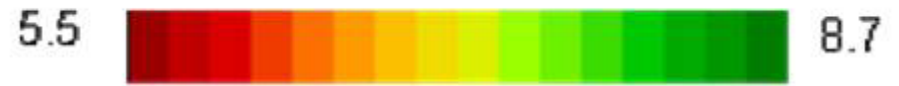
PRISMA: Applicazioni in aree agricole



Cab microg/cm²



LAI m²/m²



Mappe di contenuto di clorofilla nelle foglie (Cab) ed indice di area fogliare (LAI)
Ottenute da telerilevamento con sensore iperspettrale (CASI)

- GEO Global Forest Observation Initiative (GFOI)
- GFOI is being developed by GEO, led by: Australia, Norway, the USA, The Food and Agriculture Organization of the United Nations (FAO), and the Committee on Earth Observation Satellites (CEOS).
- CEOS has committed resources from the world's space agencies to provide a systematic contribution of observations to meet the needs of countries participating in GFOI.
- ASI, following also request from ISPRA, is involved through CEOS in GFOI initiative

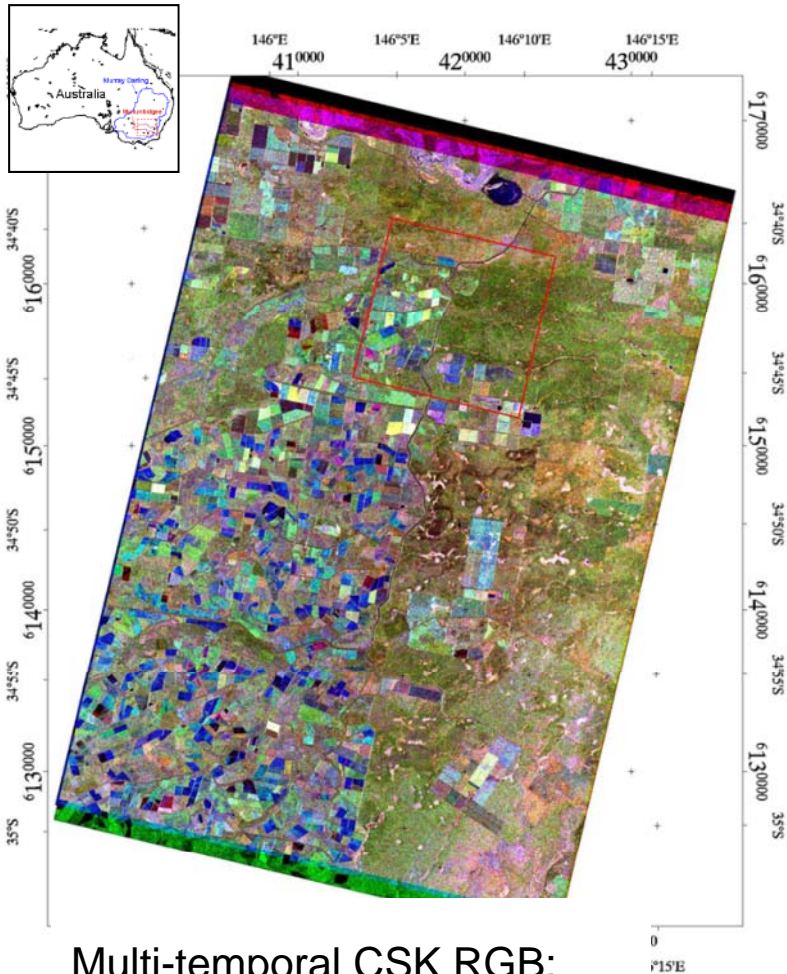


- GEO Global Agricultural Monitoring (GEOGLAM)
- GEOGLAM is being developed by GEO, with the objective to reinforce the international community's capacity to produce and disseminate relevant, timely and accurate forecasts of agricultural production at national, regional and global scales.
 - National capacities for agricultural monitoring
Strengthening, capacity building, experience sharing, research.
 - Global and regional agricultural monitoring systems Harmonizing, connecting and strengthening of existing systems, inter-comparing and disseminating their information.
 - Global observation system for agricultural monitoring : Developing an operational system : coordinated satellite and in-situ Earth Observation and weather forecasting
- ASI could support GEOGLAM initiative through CEOS, especially if there is an interest from italian users

Conclusions

- Copernicus has entered its operational phase
 - COSMO-SkyMed is working as a contributing mission
 - ASI is developing the Italian Collaborative Ground Segment to serve the Italian User Community
 - Dialogue is open between ASI and the Sentinel Italian user communities to gather their requirements in terms of data, observation needs, area of interest, priorities..
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STRIPMAP PING PONG CSK data for crop mapping



Multi-temporal CSK RGB:
R=11/10; G=11/26; B=12/12

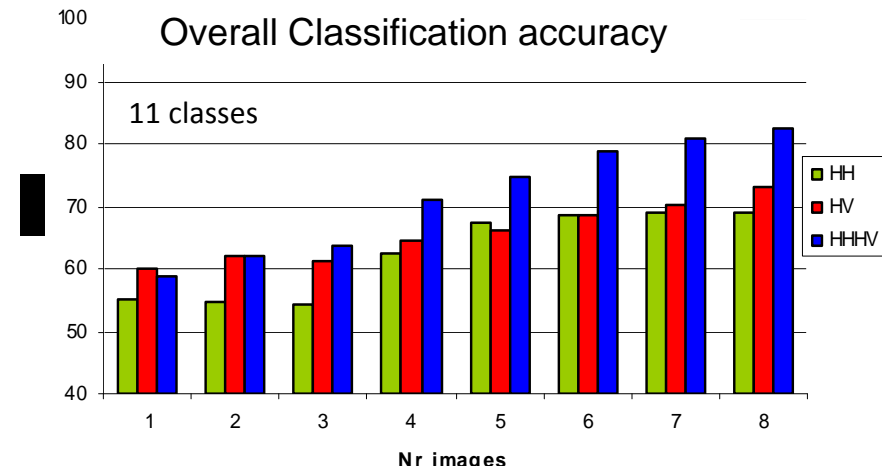


Yanco, Australia

SMAPEX & ASI COSMOLAND campaign

STRIPMAP PING PONG
HH & HV polarization
(spatial resolution 20m,
21° incidence)

Nr.	Date
1	2010 11 02
2	2010 11 10
3	2010 11 18
4	2010 11 26
5	2010 12 12
6	2010 12 28
7	2011 01 05
8	2011 01 21

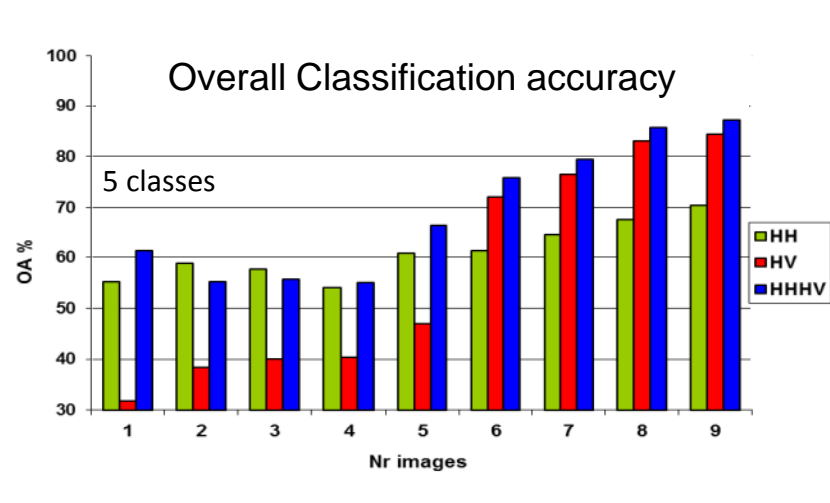


CSK data over the Capitanata plain, Italy



StripMap HH & HV
PING PONG
images 26° inc.

Nr.	Date
1	06/04/11
2	14/04/11
3	22/04/11
4	08/05/11
5	01/06/11
6	17/06/11
7	25/06/11
8	03/07/11
9	11/07/11



The best result (5 classes) is obtained by using 9 HH & HV CSK images (approx. 85% in test)

ASI COSMOLAND Project, final report, 2011

