Italian Space Agency:
Current and future SAR Missions.

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Italian Space Agency

ASI Earth Observation at glance: Our 8 major objectives

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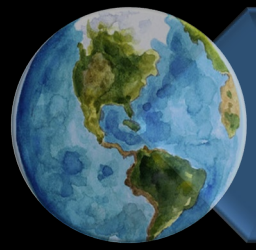


Earth science and applications

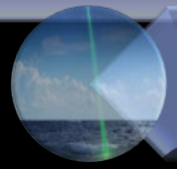
Involve the communities during all the mission development phases (from the concept to the exploitation);
Algorithms and Processors supporting the development of EO National Missions

Sustain development of new instruments

Radiometers, Quantum Gravimetry, etc..

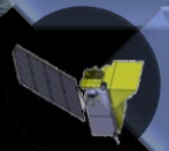
Achieve autonomy in HR systems

Miniaturized HR Payload and Technology Roadmap



Consolidating the Lidar capability

Lidar mission and Technology Roadmap



Strengthen developments in Thermal Infrared

ASI-NASA TIR mission, Miniaturized Payload and Technology Roadmap

Secure the leadership in Hyperspectral payload

Hyperspectral Next Generation, Miniaturized Payload and Technology Roadmap

Sustain the Future of Synthetic Aperture Radar

New SAR instruments and constellations (X/L/P Bands) and Technology Roadmap

Pull users towards our applications and services layers

Facilitate access to data and information and processing capabilities.
National Downstream development Program: Innovation for Downstream Preparation
“MateraLab”: On-Earth and In-Orbit Space Lab (PNRR)

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SURFACE BIOLOGY AND GEOLOGY

- Surface biology and geology
- Ground and water temperature
- Terrestrial and aquatic ecosystems

SURFACE DEFORMATION AND CHANGE

- Surface change monitoring
- Ice-sheet dynamics

AQUATIC-COASTAL BIOGEOCHEMISTRY

- Chlorophyll/organic carbon estimation
- Phytoplankton biomass estimation

SURFACE TOPOGRAPHY AND VEGETATION

- Land/ice topography
- Vegetation structure

OCEAN ECOSYSTEM STRUCTURE

- Biomass estimation
- Primary productivity
- Particle biomass/size

ATMOSPHERIC WINDS

- Wind mapping

MASS CHANGE

- Groundwater storage mass change
- Land-ice mass change
- Ocean mass change
- Earthquake mass displacement

SOIL MOISTURE

- Soil root zone moisture
- Evapotranspiration
- Gross primary production

GREENHOUSE GASES

- Global/regional CO2 land fluxes
- Global/regional methane emissions
- Quantification of point sources

AEROSOL VERTICAL PROFILES

- Aerosol extinction profiles
- Column integrated cloud properties

CLOUDS CONVECTION AND PRECIPITATION

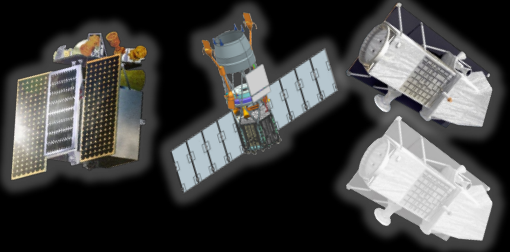
- Cloud coverage and optical properties
- Solid and liquid precipitation rate
- Liquid and ice water path
- Convection and cloud dynamis

AEROSOL AND CLOUD RADIATIVE PROPERTIES

- Aerosol optical depth, size, speciation
- Cloud optical depth

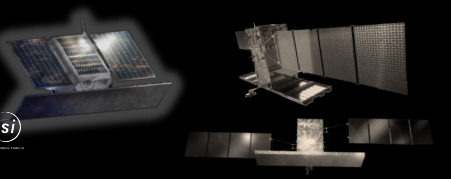
HYPERSPECTRAL

PRISMA 2018
PRISMA SG 2025
SHALOM 2026
PLATiNO-4 2024



SAR X-Band

CSK 2007-2010
CSG 2019-2023
COSMO FUTURO 2027
PLATiNO-1 2023

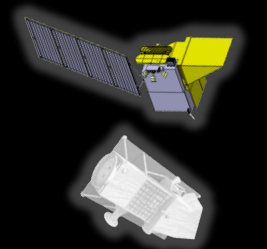


SAR L-Band

SAOCOM 2018-2020
NATIONAL L-BAND MISSION 2026

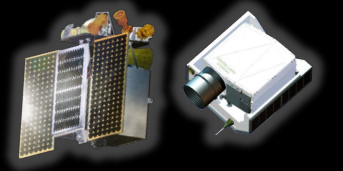
TIR

SBG TIR FREEFLYER 2027
PRISMA SG TIR 2025



PAN-VNIR

MAIA 2024
PLATiNO-3 VHR 2025
EAGLE 2025



LIDAR

GEOSAR

HIGH REVISIT CONSTELLATION (PNRR)

The SAR Building Blocks for the Future SAR System of Systems

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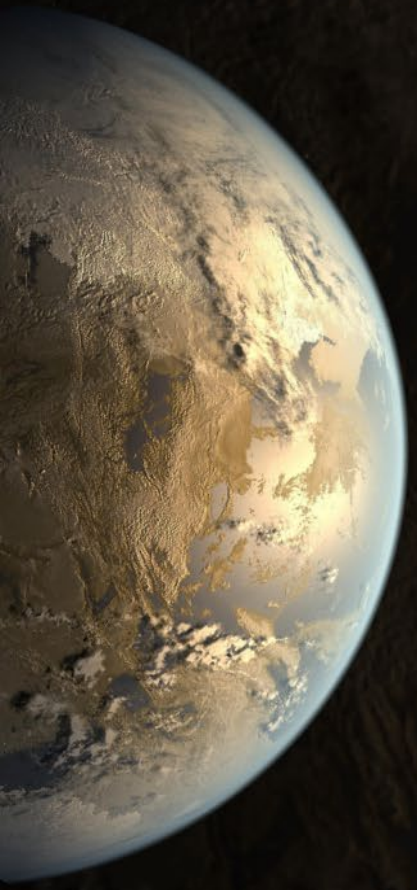
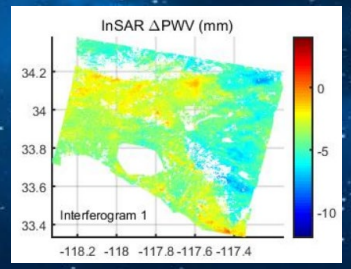


- The GEOSYNCRONOUS SAR Mission
- The BI-STATIC SAR Mission
- The L-Band SAR Mission
- The X-Band SAR Mission
- The SAR technology developments

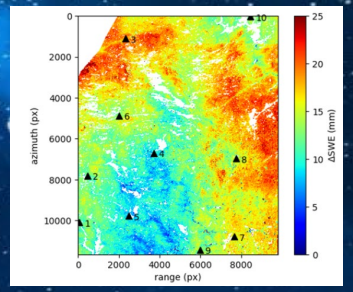
The GEOSYNCRONOUS SAR Mission: GEOSAR

- Geosynchronous satellites are suitable for the applications that require constant coverage of a specific spot on the Earth surface.
- Such platform can be equipped with a Synthetic Aperture Radar that requires relative motion with respect to the observation target.

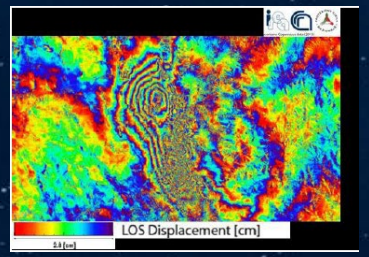
Atmosphere



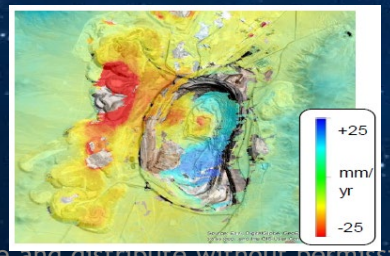
Climate Change

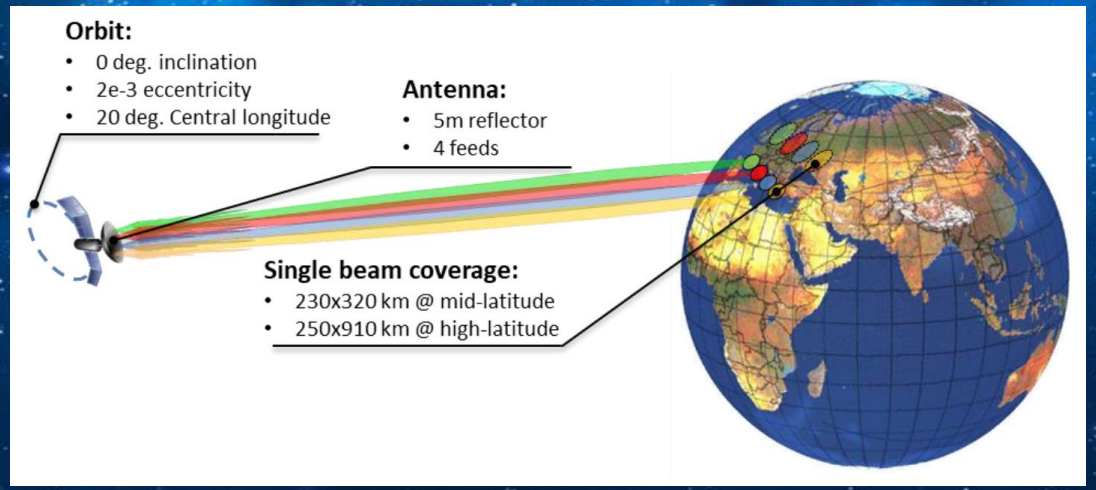


Emergency



Land





The BI-STATIC SAR Mission: PLATiNO-1

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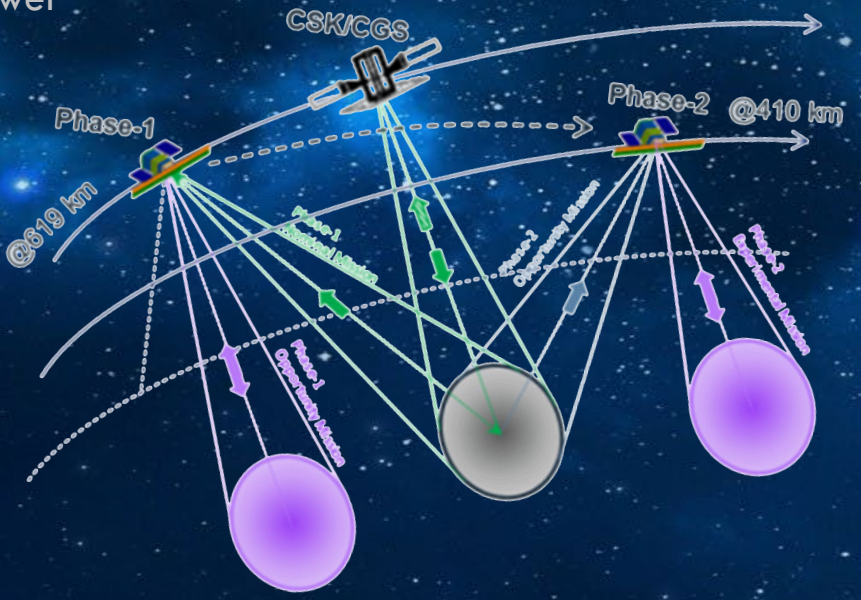
Mission Phases are:

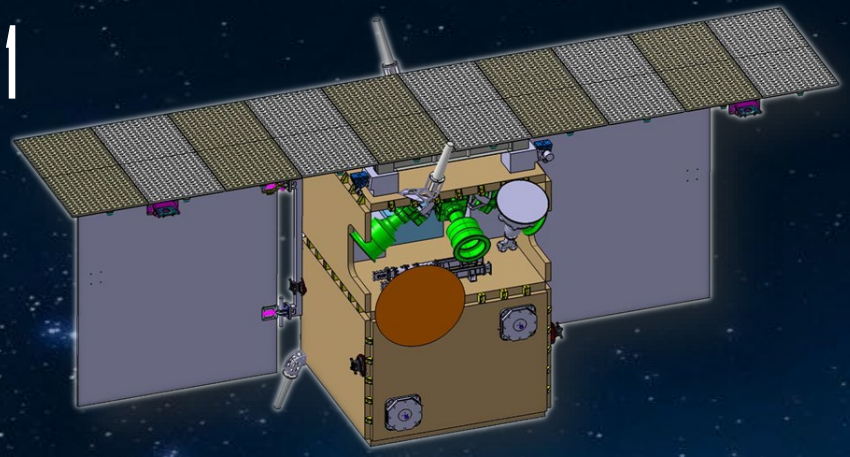
- Commissioning (LEOP and Commissioning) 3 months;
- Phase-1 (@619 km, formation flying with CSK/CSG) 1 year;
- Re-orbit phase (orbit transfer with HET) 6 months;
- Phase-2 (@410 km, monostatic acquisition) 1.5 years;
- De-orbiting phase 6 months.

Selectable Formation-Flying configurations:

- Leader-Follower
- Pendulum
- Cartwheel
- Helixmonths



PLT-1 shall be sized to provide the capacity to acquire, downlink and archive images totaling **20000 km2 daily**.



During Phase-1 PLT-1 will mainly work as a receiver acquiring from Earth the signal generated by CSK/CSG

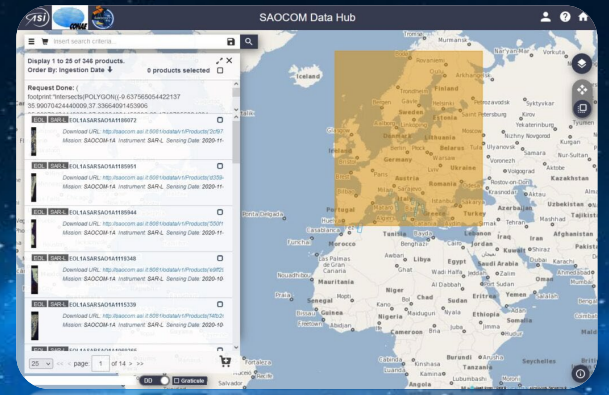
Bistatic performances (Phase-1)	
Altitude	619 km
Swath	40 km
Resolution	3 m
Target Experimental Resolution	1 m
Imaging mode	CSK/CSG Stripmap
Continuous stripmap	Up to 1000 km

Monostatic performances (Phase -2)	
Altitude	410 km
Swath	15 km
Resolution	3 m
Target Experimental Resolution	1 m
Imaging Mode	Stripmap
Continuous stripmap	Up to 800km

The L-Band SAR Mission: SAOCOM, in the frame of SIASGE

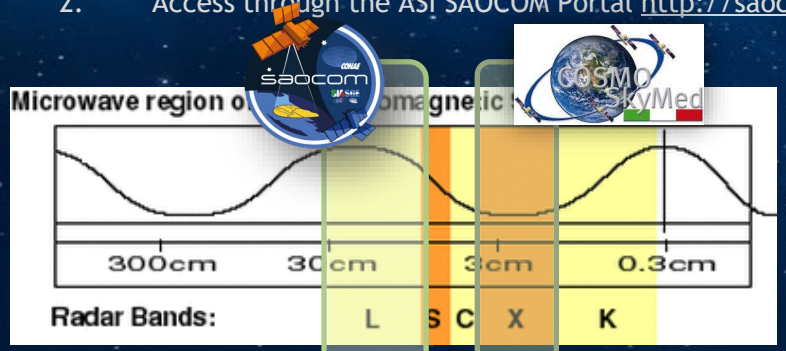
- 2 Argentinian SAOCOM satellites (1A and 1B) with an L-Band SAR sensor onboard.
- Same orbit of COSMO-SkyMed satellites.

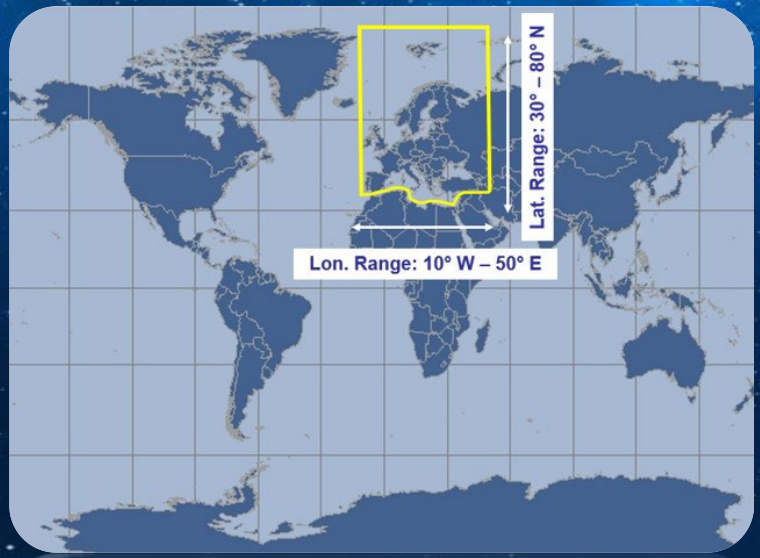
- ASI has full utilization rights on its Area of Exclusivity AoE (approximately all the Europe territory).
- Users:
  - ✓ Scientific, institutional and commercial
  - ✓ Italian and International
  - ✓ only for non-commercial purposes



Access to data on ASI AoE:

1. Registration following the instruction at: https://www.asi.it/en/earth-science/saocom/
2. Access through the ASI SAOCOM Portal http://saocom.asi.it:8081





The X-Band SAR Mission: COSMO-SkyMed

COSMO-SkyMed Second Generation (CSG) will:

- Ensure operational continuity to the currently operating constellation
- Achieve a step ahead in terms of functionality, performances and system services for the Earth Observation users

The 4 CSG Satellites will have an operational lifetime of at least 7 years.

COSMO-SkyMed is the Italian end-to-end System for Earth Observation, funded by:

COSMO-SkyMed First and the Second Generation

Agenzia Spaziale Italiana

	CSK	CSG
	Very High Resolution VHR *(sub-metric)* Governmental Use	Ultra-High Resolution (UHR) Governmental Use
SPOTLIGHT	Resolution: 1 m Single Polarization Size 10 km x 10 km Civilian and Defence use	Spot-2 *VHR and Dual Pol.* (**) Sp-2A res. ≤ 0.35 x 0.55 m Swath ≥ 3.1 x 7.3 Km Sp-2B res. ≤ 0.63 x 0.63 m Swath ≥ 10 x 10 Km Sp-2C res. ≤ 0.80 x 0.80 m Swath ≥ 5 x 10 Km Civilian and Defence Use
STRIPMAP	Resolution: 3 m Single Polarization Swath Size 40 km Civilian and Defence use	Resolution : 3m x 3m Swath Size Dual Pol 40 km Swath Size QUADPOL 15 km Civilian and Defence use
SCANSAR	Resolution: 30 m Single Polarization Swath Size: 100 km or Resolution : 100 m Single Polarization Swath Size: 200 Km Civilian and Defence use	Resolution : 4 x 20 m Double Polarization Swath Size : 100 km or Resolution : 6 x 40 m Double Polarization Swath Size: 200 Km Civilian and Defence use

(**) in azimut and range

SAR technology developments to sustain the future of SAR Systems

- Evolution of Cosmo-Skymed constellation: high resolution, high revisit time, enhanced acquisition capabilities

- SAR technology roadmap
  - GaN and Silicon components
  - Digital and optical beam-forming capabilities
  - Developments to enhance multi-polarization, frequency bandwidth, radiated RF power
  - Photonics components
  - On-board power generation (High efficiency solar cell, deployable and steering solar panels)
  - Edge-computing and early warning capabilities

Future COSMO-SkyMed: Beyond the Second Generation

- New architectures: a system of systems based on several building blocks:
  - GEO and LEO elements
  - Multi-Sensor capabilities (X and L band SAR)
  - Multi modes: mono and bi-static SAR
- Enhanced performances
- New on-demand services
- Improved data access (towards real-time)
- Ready to use product archive over Italy


Agenzia Spaziale Italiana
THANK YOU FOR YOUR ATTENTION
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