01:00 pm

E5.09.1 International Coordination for Spaceborne Synthetic Aperture Radar Data Acquisition, Processing and Analysis for Earth Science and Applications - 1

Chair(s)

Dr. Maurice Borgeaud (European Space Agency (ESRIN))
Dr. Paul Rosen (Jet Propulsion Lab)

Room:
Plenary

Topic:
Plenary Session

Form of presentation:
Plenary Oral

Duration:
100 Minutes

International coordination of future Spaceborne SAR missions - An Overview

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Over the next decade, more than twenty space borne SAR missions are being planned or proposed by many space agencies and commercial entities. Understandably each mission is designed and optimized (orbit, crossing time, coverage, frequency, polarization, etc.) to meet the user needs and objectives of the sponsoring organization. An ideal situation will be to have an integrated capability to provide multi-frequency, multi-polarization, well calibrated interferometric global coverage at very frequent rate to monitor both slow and rapid changing surface features. Even though this will be hard to achieve by one or two missions, it would be possible to do if the dozens of planned missions can be coordinated as a “constellation”. By coordinating the characteristics of the different missions and properly selecting their exact orbit and nodal crossing, a very powerful integrated capability for users can be achieved that far exceed what can be achieved one or a combination of uncoordinated mission.

The idea about an international coordination of future SAR missions was first explored in a workshop held in May 2018 at Caltech and attended by 50 participants from all the agencies flying, or that will shortly launch space borne radar missions. There was a strong consensus that a coordinated effort will be of great value and a number of specific recommendations. Subsequently, in May 2019, a session on the same topic was organised at the ESA Living Planet Symposium (LPS-19) in Milano, Italy, attended by more than 250 persons [1] indicating the strong interest for this type of activities. The second “International Coordination of future Spaceborne SAR Missions” was supposed to take place in 2020/21 but has been postponed due to COVID-19 to September 2022 and will be organised by ESA at ESRIN, Frascati, Italy.

The work has been organised in three international working groups (WG) covering:
• WG-1: Present and future data-visibility and access
• WG-2: Future imaging systems, challenges and opportunities
• WG-3: Data exploration, Cal/Val, fusion and assimilation.
The outcome of the activities of the 3 WG’s are regularly reported in workshops since 2018 as indicated in the previous sections. Since 2021, three thematic areas (TA) have been added to further deepen the collaboration across the WG topics and cover the following domains:
• TA-1: Whole-earth system science and data mining
• TA-2: Targeted science and applications
• TA-3: Programme coordination

The presentation will go in the details and the main results obtained so far in the frame of this activity to coordinate future Spaceborne SAR missions.

International Coordination Activity for Spaceborne Synthetic Aperture Radar to improve data visibility and accessibility

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On May 30, 31 and June 1, 2018, a workshop was held at the California Institute of Technology to explore the interest in, and value of a more coordinated approach between the different organizations to achieve higher value to the user community. One of the main topic of this workshop is to make a recommendation to improve data visibility and accessibility of spacebornes SAR under the international coordination.

To understand the issues related to data discovery and data access, a working group 1 (WG-1) was established and compiled two tables. Table 1 relates to the discovery/accessibility of past archive data and Table 2 relates to discovery, tasking, and access to present and future data. WG-1found that it is feasible to construct a search engine to discover most data, past and present. Through this exercise, WG-A found that all agencies flying spaceborne SAR systems either provide all the data free of cost, or subsets of them for specific purpose or by inter agency agreements. However, if all the data has standard geometric and radiometric formats, their value will be significantly enhanced. As this result, WG-1 recommend that archival, present and future data should be easily accessible with a standard and common format, and can be easily requested and acquired electronically, free or at minimal cost. On the other hand, because the discovery of planned acquisitions is more problematic, WG-1 recommend developing a mechanism to coordinate future data acquisition and coverage by present and planned systems, as well as ground reception and processing systems for mutual benefit. In several cases, coordination between systems have led to significant benefit particularly in case of polar ice studies (Polar Space Task Group) and rapid response for natural hazards. It will be of great value if a mechanism can be put in place to extend this coordination to a larger number of applications which can benefit from expanded coverage, shorter repeat time and multiple frequency/polarized observations.

On the other hand, a critical element is to develop common standards for data formatting, geodetic projection and radiometric calibration. Another important element is to have the ability to simply search for data available from all the systems in a common app, as well as insight of planned future data acquisitions and, with appropriate credentials, be able to request future new acquisitions. In addition, there is a strong need for a high resolution, high accuracy elevation model with accurate time stamp for improved SAR processing and data inter-comparison.

This paper explains about the overview of this WG-1 analysis and recommendations to improve data visibility and accessibility of spacebornes SAR under the international coordination

International SAR Coordination – Thematic Area Considerations

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A number of national and international space agencies and space organisations that operate Synthetic Aperture Radar (SAR) sensors have come together to improve coordination between SAR missions with interoperable and/or complementary characteristics. In the shorter-term the coordination focuses on currently operational and near future missions (e.g. Sentinel-1, ALOS-2/4, SAOCOM-1, NISAR, BIOMASS, TSX-NG, CSK-2G), and for the next decade, takes into consideration missions still to be defined. Working groups are tasked to address the visibility and access to SAR data products (WG1); opportunities and challenges of future imaging systems (WG2); and the exploration of multi-mission SAR data, including Cal/Val, data fusion and assimilation aspects (WG3).

Three Thematic Area (TA) subgroups have been established to support the working group activities with cross-cutting topics relating to science and applications:
• TA-1 – Polarimetric and Multi-frequency SAR – covers applications where polarimetric or multi-frequency backscatter intensity and/or polarimetric phase constitute the main measurements. TA-1 addresses applications such as Forestry, Agriculture, Wetland and Other Land Uses (i.e. the IPCC "AFOLU" themes), plus such relating to Ocean and Sea Ice.
• TA-2 – Interferometric SAR – covers applications where interferometric phase constitutes the main measurement. TA-2 covers the traditional InSAR driven applications such as Solid Earth (incl. crustal deformation, volcanoes), Glaciers/Ice Caps, Geo-hazards, and Permanent Scatterers
• TA-3 – Program and mission coordination.

The TA subgroups are to work closely with the relevant science communities to identify SAR coordination actions that could be taken in the near/mid-term (in 2020s) that would improve science/applications overall, as well as to identify gaps and missing critical elements with current and near-future missions. Looking beyond the missions currently in operation or development, the TA subgroups are to identify and prioritize the goals and objectives for SAR coordination that would vastly improve science by coordinating long-term (2030+) Earth observing SAR missions.

A first cut gap study was undertaken in 2021 to assess the SAR information requirements for six application areas: Glaciers and Ice Caps; Solid Earth Science; Hazards; Forest and Biomass; Wetlands; Agriculture and Soil Moisture [1]. The study resulted in a number of observations:
1. The most important requirement highlighted in all cases is the need to reduce observation revisit times to the order of days, or less. For the applications that rely on SAR interferometry, temporal decorrelation constitutes a major limiting factor, preventing, e.g., the tracking of fast-moving glacial or seismic events. Temporal decorrelation is also the main obstacle to the use of InSAR for forestry applications.
2. For the glacier and solid Earth applications, it was noted that systematic observations from at least 3 viewing angles are required to characterise the displacement field in three dimensions, while maintaining a zero interferometric baseline for each imaging geometry in the temporal stack. While such data can be obtained by observations from ascending and descending orbits, and alternating right- and left-looking platform roll, no mission currently comprises such plan.
3. For forestry applications, a variety of interferometric baselines would enable tomographic retrieval of forest structural parameters. This can be achieved by relaxing the orbit control, which however affects other InSAR applications.
4. Polarimetric (full scattering matrix) observations constitute a critical requirement for measurements of soil moisture, and is desired also for agriculture (crop identification). It was acknowledged that PolSAR and Pol-InSAR applications are under-developed due to the lack of global polarimetric time-series data, and that basic research in this field should be stimulated.
5. Each SAR frequency contributes with unique and complementary measurements, but multi-frequency applications also are under-developed due to lack of data for research. Simultaneous or near-simultaneous multi-frequency observation campaigns, in particular for land cover related applications, are therefore strongly encouraged.
6. It was finally noted that open data policies and free public access is vital for data democracy and science development.

The TA activity for 2022 includes undertaking a more comprehensive SAR user survey and a public open online questionnaire is available on the International SAR Coordination group website [2]. The results will be summarised to identify information gaps associated with each thematic application area, and subsequently, provide recommendations to the working groups on how these gaps can be mitigated by coordination of current and already planned missions, and for the next decade, with a vision for a comprehensive constellation system that would address the outstanding scientific requirements.

References:

[1] Rosenqvist A., Jones C., Rignot E., Simons M., Siqueira P. and Tadono T., 2021. A Review of SAR Observation Requirements for Global and Targeted Science Applications. International Geoscience and Remote Sensing Symp. (IGARSS'21). FR3.O-5.3, Virtual, 16 July, 2021.

[2] https://nikal.eventsair.com/NikalWebsitePortal/second-workshop-on-international-coordination-for-spaceborne-synthetic-aperture-radar/esa/ExtraContent/ContentPage?page=10

International coordination and collaboration as an essential element of the Earth Observation Service Continuity

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International coordination and collaboration as an essential element of the Earth Observation Service Continuity

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The Earth Observation Service Continuity (EOSC) initiative aims to identify successor solutions for Canada's next generation RADARSAT program. Due to the wide range of user needs, the EOSC initiative is considering a diversified portfolio of access to imagery: free and open data, commercial purchase of data, international cooperation, and a dedicated Synthetic Aperture Radar (SAR) system. This paper will present an overview of the options analysis that led to the identification of international partners and their respective Earth Observation (EO) programs, highlight the current status, and path forward.

It is anticipated that certain user department needs can be met through existing or planned international space-based data assets. Potential collaboration scenario(s) to meet Canada's Harmonized User Needs (HUN) can refer to, but is not limited to, bartering of data, harmonize requirements/technical solutions for missions, harmonization of data products, prototyping with sample Areas of Interest (AOI) to address downlink feasibility, access to infrastructure, etc.

In leveraging international capabilities for the purposes of augmenting Canada's earth observation capabilities the following key benefits arise:

• Strengthen international relationships with key partners
• Facilitation of the harmonization between nations and their respective EO programs
• Stimulation of social and environmental benefits from the use of EO data
• Increase resilience through access to multiple source of data
• Improve compliance to end user requirements by providing the optimal mix of multi-frequency data.
• Increase resilience through access to multi-frequency capabilities

The economic potential of space based data has grown significantly in recent years. The Canadian Space Agency (CSA) is committed to continuing to progress strong partnerships with international stakeholders to best deliver data that meets the needs of the community and government priorities such as climate change.

German Spaceborne SAR Program Status and Outlook

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Since the 1980s, Germany has built up considerable expertise in spaceborne SAR missions. The Shuttle Imaging Radar Missions SIR-C/X-SAR in cooperation with NASA/JPL consisted of two flights in April and September 1994 aiming to demonstrate the potential of fully polarimetric radar systems in three different frequency bands for a variety of applications. Germany developed the X-SAR radar system in cooperation with Italy, the USA developed the radar systems in C and L band. The combination of L, C and X-band, as well as the different polarizations of the acquired data takes over selected test sites are unique until today. SRTM, the Shuttle Radar Topography Mission, was a highlight in Germany's radar activities in cooperation with NASA/JPL. Space Shuttle Endeavour took off on February 11, 2000, with the goal to map the topography of the Earth's surface using two radar systems. Secondary antennas mounted at the end of a 60 m long boom allowed a topographic mapping of 80% of the Earth's land surface with a height accuracy of 10 m. Germany participated in the mission with an interferometric X-band radar system (X-SAR) that acquired approximately 40% of land surface with the increased accuracy of approximately 6 m.
The actual highlight of the German spaceborne radar program is the successful implementation of the TanDEM-X mission. The first formation flying radar system was built by extending the TerraSAR-X mission by a second, almost identical satellite TanDEM-X. The resulting large single-pass SAR interferometer features flexible baseline selection enabling the acquisition of highly accurate cross-track interferograms not impacted by temporal decorrelation and atmospheric disturbances. The so-called Helix formation combines an out-of-plane (horizontal) orbital displacement by small differences in the right ascension of the ascending nodes with a radial (vertical) separation by different eccentricity vectors resulting in a helix-like relative movement of the satellites along the orbit. The primary objective of the mission, the generation of a global Digital Elevation Model (DEM) with unprecedented accuracy, was achieved back in 2016. The obtained results confirm the outstanding capabilities of the system, with an overall absolute height accuracy of just 3.49 m, which is well below the 10 m mission specification. Excluding highly vegetated and snow-/ice-covered regions, characterized by radar wave penetration phenomena and consequently strongly affected by volume decorrelation, it improves to 0.88 m. Also, the relative height accuracy, which quantifies the random noise contribution within the final DEM, is well within specifications. Finally, the product is also virtually complete with 99.89% coverage. Comparisons of the TanDEM-X DEM with SRTM or among multi-temporal TanDEM-X data revealed dramatic changes and the high dynamic in the Earth's topography especially over ice and forests. It has been therefore decided to acquire data for a global change layer that will become available in 2022. Despite being well beyond their design lifetime, both satellites are still fully functional and have enough consumables for several additional years. Therefore, bistatic operations continue with a focus on changes in the cryosphere and biosphere. The TanDEM-X mission has been and still is the first distributed SAR system in space. It demonstrates the DLR's capabilities in the development of highly innovative mission concepts in response to demanding mission objectives, in leading the project realization facing a number of challenges, and in directing and monitoring the entire generation process from global data acquisition through to the final digital elevation model (DEM).
TanDEM-X can be seen as a precursor for Tandem-L, a pioneering mission for climate and environmental research. Tandem-L is built on a very strong science case developed in a joint effort by eight Helmholtz research centers and an international team of more than 100 scientists. Aiming at the observation of dynamic processes in the bio-, geo-, hydro- and cryosphere, this mission requires a novel SAR instrument concept based on digital beamforming in combination with a large reflector antenna. A swath width of up to 350 km enables weekly global coverage as a precondition to observe Earth's system dynamics. The Tandem-L mission concept is based on the two SAR satellites operating in L band allowing for innovative imaging modes like polarimetric SAR interferometry and multi-pass coherence tomography for determining the vertical structure of vegetation and ice. A unique feature and major challenge of the Tandem-L mission is the systematic generation of higher-level products, including forest height, structure and biomass, various surface deformation and displacement products, as well as digital elevation models. Additional products for applications in the hydro- and cryosphere are expected to be developed by the scientific community in the course of the mission.
Given the great success of TanDEM-X, a novel concept for an X-band SAR mission denoted as High-Resolution Wide-Swath (HRWS) mission has been proposed. It consists of a powerful main satellite acting as an illuminator as well as three much smaller receive-only relay satellites to be used in formation flight. The main satellite features up to 1200 MHz bandwidth, a frequency scanning functionality (F-SCAN) combined with multiple azimuth phase centers (MAPS) enabling high-resolution wide-swath imaging. The small satellites, following the MirrorSAR concept, operate as radar transponders and allow an effective, low-cost implementation of a multistatic interferometric system for high-resolution DEM generation and for secondary mission objectives as, for example, along-track interferometry. With HRWS, nearly 40 years of successful X-band SAR development in Germany will continue. Thus, the mission will provide data continuity for scientific, institutional and commercial users.

03:00 pm

E5.09.2 International Coordination for Spaceborne Synthetic Aperture Radar Data Acquisition, Processing and Analysis for Earth Science and Applications - 2

Chair(s)

Dr. Paul Rosen (Jet Propulsion Lab)
Dr. Maurice Borgeaud (European Space Agency (ESRIN))

Room: Plenary

Topic: Plenary Session

Current Status of NASA's Surface Deformation and Change Designated Observable Architecture Study

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The United States National Academies of Sciences, Engineering, and Medicine 2017 Earth Decadal Survey recommended a new NASA “Designated” program element to address a set of five high-value Targeted Observables during the next decadal period. In response to that recommendation, and based on guidance from NASA’s Earth Science Division, a team has been formed to perform an architecture study associated with the Surface Deformation and Change (SDC) Targeted Observable. Surface deformation measurements are critical for studies related to earthquakes, volcanoes, landslides, and changes in groundwater levels and corresponding subsidence or uplift, as well as measuring ice sheet and glacial stability and their contributions to sea level rise, permafrost thaw, surface change. The Decadal Survey report recognizes this criticality for its Earth Surface and Interior objectives, and also for a number of Hydrology and Climatology objectives, identifying twenty-three surface deformation-related objectives throughout the report.

While the Decadal Report Surface Deformation and Change Targeted Observable is focused on surface geodesy (i.e. change in position of the surface), NASA has directed that the scope of the study include some architectures that intrinsically support research- and applications-grade measurements of observables such as soil moisture, vegetation structure, disturbance, agricultural monitoring, wetlands processes, coastal processes, ocean processes, sea ice hazards monitoring (e.g. icebergs and polar sea-lane variability). Based on this, the SDC architecture study will explore architectures that are optimized for phase-based geodetic performance and architectures that also support amplitude-based radiometrically accurate imagery. A science and applications traceability matrix (SATM) has been developed for this expanded set of geophysical observables and is online for public comments.

SDC’s observational requirements for many of these objectives cover a number of performance parameters such as spatial resolution, deformation precision and repeat interval. In reaching its final recommendation on a cost-effective strategy for the SDC observable, the Decadal Survey Committee presumed that the measurement implementation will involve Synthetic Aperture Radar (SAR) and Interferometric SAR (InSAR) technologies. The Decadal Survey references the NASA-ISRO SAR (NISAR) Mission design performance of 12-day repeat interferometry, and calls for shorter repeat cycle (sub-weekly to daily), potentially at the expense of spatial resolution if necessary to stay within the recommended development cost.

The SDC Study has three main objectives: 1) Identify and characterize a diverse set of observing architectures, including innovative observing systems that can disrupt the norm for interferometric SAR observations; 2) Assess the ability of each of the architectures to meet SDC objectives, including cost effectiveness; 3) Perform sufficient in-depth design study of one selected architecture to enable initiation of a Phase A concept study. To accomplish these objectives, the study team is engaging US national expertise in Earth Science research, applications, technology, mission formulation and implementation. The team comprises NASA centers with relevant expertise and is engaging the international community, government, academia, and industry.

The SDC architecture study will examine the research and applications benefits of the data sets derived from these existing and planned systems, which may be complicated by different data access modalities for various satellites, ranging from free and open data to commercial but restricted data sets. In this study, we are working with other agencies (space agencies and data sponsors), and commercial providers to understand and quantitatively assess the ways in which the variety of data can be applied to scientific research and other applications. The study team has developed a simulation tool to quantitatively assess the performance of the existing and planned SAR constellations, which will be considered as an observing system. This will allow research and applications community members to gain a more quantitative understanding of the critical gaps in our observations from the government Programs of Record and the commercial sector that NASA must fill to meet the SDC science and application objectives.

The results generated from the simulation tool and the SATM parameters form the inputs to the value framework (VF). The VF assesses the benefits, costs, and risks of each architecture for the science and applications communities, as captured in the Decadal Survey. The needs of the applications community are documented in a study report focusing on the entire value chain of non-research, Earth observation data users. The study found that the applications community will also benefit from an interferometric SAR with ~10m resolution, global coverage, and multi-polarization data with a weekly sampling plan collected over a decadal time frame. Some community members also expressed interest in multi-band observations. A community assessment report is being developed expanding this initial study.

In summary, the SDC Study commenced in October 2018 and is planned to run for five years. In the initial two years, community needs were collected and parsed into the SATM. Technology readiness and partnerships opportunities were assessed, and about forty architectures were identified. These architectures are now being evaluated against the needs, and a down-selection will be conducted this year using the value framework. The remaining time will be spent in more detailed studies of the down-selected architectures, with a final down-selection and report at the end in preparation for mission implementation. In this paper, we will describe the status of the study and how potential partners can become involved.

Co-flier Concepts for NISAR and ROSE-L

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The National Aeronautics and Space Administration (NASA) and the European Space Agency (ESA) are both developing future L-band SAR missions to address key science questions and application needs relevant to solid Earth, ecosystems, cryosphere, and hydrology. The NASA-ISRO SAR (NISAR) mission is a dual-frequency L-/S-band SAR satellite scheduled for launch in late 2023 and recently identified as a pathfinder for the NASA Earth System Observatory. NISAR will acquire global dual-polarimetric L-band data with 20 MHz range bandwidth every 12 days (6 days ascending and descending), delivering unprecedented dense time-series at L-band and new Geocoded Single Look Complex products. The Radar Observation System for Europe at L-band (ROSE-L) is one of the ESA's High-Priority Candidate Missions scheduled for launch after 2028 with the goal of augmenting the Copernicus constellation to address important information gaps and enhance existing Copernicus services and related applications. In the current design, ROSE-L is a two-spacecraft system that will operate in the Sentinel-1 orbit and be phased to achieve a repeat interval of 6 days.

Both NISAR and ROSE-L are designed to make repeated observations from a narrow orbital tube in order to generate time-series with nominal zero interferometric baselines. While this design choice has several benefits, it cannot address some of the measurements recommended by the 2017-2027 Decadal Survey for Earth Science and Applications. Two of these measurements are (1) 3D surface deformation vector and (2) vegetation vertical structure, for which long along-track and cross-track baselines, respectively, are required. NASA has been conducting dedicated studies to develop science and application traceability matrices (SATMs) as well as identify technology gaps and candidate architectures for Surface Deformation and Change (SDC) and Surface Topography and Vegetation (STV) measurements. The question is whether diverse science needs with potentially competing system requirements can be met more easily by coordinating international efforts for future SAR mission development.

This paper discusses concepts involving satellites flying in formation with satellites such as NISAR and ROSE-L in order to augment the observation capabilities of these missions through denser coverage, multi-squint or multi-baseline measurements. Additional satellites spaced in time in the same orbital plane as NISAR or ROSE-L can improve the temporal sampling density of each. Receive-only co-fliers are attractive thanks to their simplified hardware architecture and to the ability to coherently combine their images without relying on a tight cooperation with the mothership SAR satellite. The talk addresses challenges and opportunities of proposed free- and co-flier concepts for NISAR and ROSE-L by leveraging previous ESA's SAOCOM-CS studies and current NASA's SDC and DARTS IIP efforts in the context of on-going international collaborations between NASA and ESA.

The RADARSAT Constellation Mission

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Session: B6.01 National EO satellite missions

Building upon RADARSAT-1 heritage, RADARSAT-2 was launched in 2007 with added beam modes and polarizations that helped develop new operational applications and increased SAR data consumption within the Government of Canada by a factor of five (5). Launched in June 2019, the RADARSAT Constellation Mission (RCM) aims to ensure continuity of operational SAR imagery for RADARSAT-2 users, as well drawing from the constellation approach to enable new applications. Now more than one year of operations, the RCM is becoming the Canadian Government's premier mission to provide all-weather day and night data in support of Canadian sovereignty and security, environmental monitoring, natural resources management and other government priorities such as Northern development. As a three-satellite constellation, it can cover most of Canada and its surrounding waters on a daily basis. Compared to previous RADARSAT missions, coverage increases significantly in Canada's North, for example providing coverage of the Northwest Passage three to four times daily. With the increased frequency of revisit, emerging applications such as measurement of land deformation and operational disaster management can be further exploited.

The RCM is designed to respond to core needs, which at the highest level can be summarized as:
• Daily coverage of Canada's territorial and adjacent waters for maritime surveillance, including ship detection and monitoring of ice, marine wind, and oil pollution; and,
• Monitoring of all of Canada for disaster mitigation on a regular basis (monthly to twice-weekly) to assess risks and damage-prone areas; and,
• Regular coverage of Canada's land mass and inland waters, up to several times weekly in critical periods, for resource and ecosystem monitoring.

ASI current and future SAR Missions

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Introduction

In order to ensure the Italian leading role in the remote sensing sector, The Italian Space Agency intends to promote in the next years several technology developments in both active and passive space born sensors (through the acquisition of capabilities in new frequency bands as well as the process of miniaturization in traditional bands), the development of radar programs, such as COSMO-SkyMed Second Generation (CSG), GEOSAR (in collaboration with the Russian Federation space agency), PLATiNO-1 and P-Band.
To this aim several Italian industries will sustain and develop technologies associated with the PLATiNO, whose 1st mission will be deployed in 2022, mini multi-purpose standard platform which will be capable of embarking a whole range of payloads covering a wide set of programmatic sectors (such as those relating to Telecommunications, Earth Observation and Exploration just to name some) in scientific or applicative field. In a similar way several other initiatives will start in the course of this year including the development of missions and technologies for nano-satellites up to 25 kg.

COSMO-SkyMed Second Generation
The CSG program, started in 2009 in cooperation with the Ministry of Defense, guarantees to Italy a dual national infrastructure for "all-weather, 24/7 " satellite observation of the Earth. The deployment of the Second Generation of COSMO-SkyMed represents a technological leap in terms of performances and operational life of the system and consequently provides Italy with a leadership role at world level in the Earth Observation sector with SAR technologies. The first CSG satellite was launched in December 2019 while the launch of the second one is scheduled in January 2022. In the next few years the constellation will therefore be completed with the development of the following third and fourth.

GEOSAR
A joint Italian-Russian technical-scientific geosynchronous SAR Mission feasibility study is currently underway. The GEOSAR system is planned to be based on the use of the geosynchronous orbit for SAR applications. This highly innovative concept allows obtaining a new capacity complementary to the assets currently deployed in LEO, guaranteeing therefore a continuous availability of data in selected areas, allowing particularly promising applications in the field of monitoring and emergency management, agriculture, natural resources and meteorology.

PLATiNO-1
PLATiNO 1 will be the first mission using the multi-purpose, high-performance PLATiNO minisatellite platform. For the first Mission, the Agency will develop a compact radar for both bistatic and monostatic operation, with sub-meter resolution, in order to fill the growing market segment of low-cost compact SAR instruments for future constellations. The payload capitalizes what has been developed in Italy to date in the field of X-band SAR technology.
With a development phase started in 2017 the project is now completing the phaseC and its launch is planned by end of 2022.