Synthetic Aperture Radar Virtual Constellation (SAR-VC)

Terms of Reference v1.0

Mission Statement

To coordinate observations from space-borne SAR missions and facilitate planning of future missions to optimize global coverage and ensure continuity across all frequency bands and modalities.

Objectives

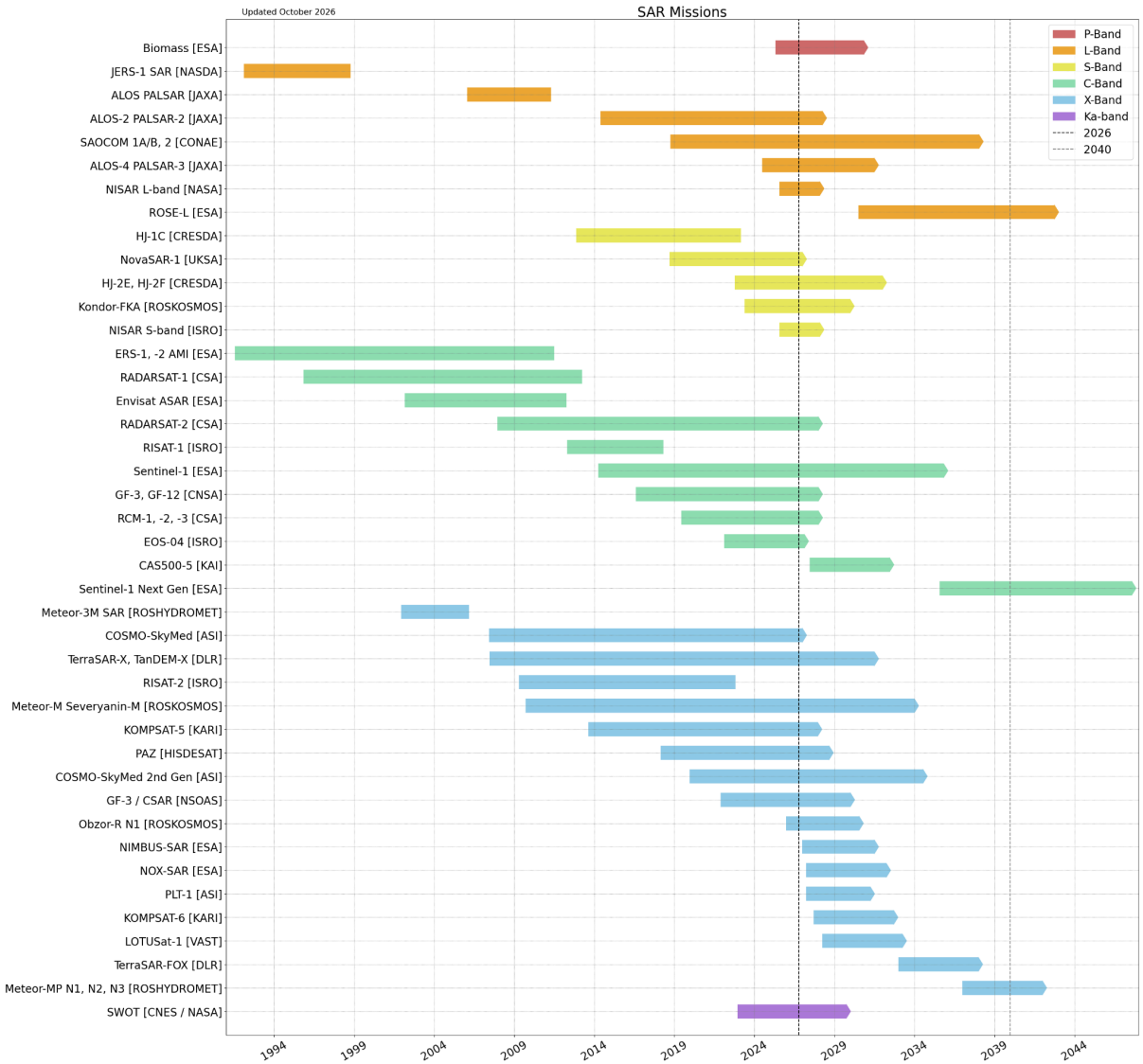
1. Coordinate acquisition plans to improve collection of spatially gap-free and temporally dense SAR data sets by multiple missions operating at all available SAR frequency bands with the goal to:
    a. Improve scientific and application value and efficiency (e.g., common areas targeted for campaigns or disjoint areas where multiple coverage would be redundant).
    b. Support response to natural disasters such as earthquakes, landslides, volcanic eruptions, typhoons/cyclones/hurricanes and floods, as well as manmade disasters such as oil spills.
2. Assess how to maximize scientific/user exploitation of present and planned SAR missions (for example, open data for scientific research, expanded ground receiving stations).
3. Review planned SAR missions across all frequency bands to identify critical gaps.
4. Follow and leverage new trends in spaceborne SAR missions (e.g. multistatic, constellations, micro-SAR, PolSAR/PolInSAR) to further science and applications goals of agencies.
5. Identify challenges and opportunities in leveraging all spaceborne SAR systems to achieve scientific application objectives.
6. Identify critical techniques and technologies which are relevant for current and future missions and coordinate agency development strategies.
7. Coordinate and further develop CEOS Analysis Ready Data (CEOS-ARD) Product Family Specifications (PFS) for SAR products.
8. Coordinate with the CEOS Working Group on Information System and Services (WGISS) regarding data interoperability and sharing.
9. Coordinate with the CEOS Working Group on Calibration and Validation (WGCV) SAR Subgroup regarding calibration and validation activities from imagery through science and applications products.
10. Engage and coordinate with the commercial SAR sector on all above aspects.

Characterisation of the Measurements and Data Collections Within Scope

The scope is limited to missions or observing systems that comprise instruments defined as Synthetic Aperture Radar (SAR) and all observations and products they produce. All SAR modalities, including but not limited to polarimetry, interferometry, multistatic instruments, multi-satellite virtual constellations (e.g. onboard processing, smart tasking, data interoperability and sharing, etc.), are in scope.

Characterisation of the Space Segment Concerned

The below timeline, generated using the CEOS Mission, Instruments and Measurements (MIM) Database in October 2026 shows SAR missions operated by CEOS Agencies, categorised by their waveband.



Activities, Outcomes and Deliverables

Further detail on the activities are provided in the Implementation Plan. The IDs reference the tasks outlined in the SAR-VC Implementation Plan.

	2027-2029	2030+
Space Segment *For the missions concerned, see timeline above.*	[SG2-2] Coordination of multi-static systems and companion satellites [SG2-3] Cross-validation of mission planning simulation tools [SG3-3] PolSAR task [SG4-3] Companion satellite white paper	[SG2-1] Tracking and exchanging information on agency trends and plans for missions [SG5-2] Commercial data acquisition policies
Ground Segment & Information Systems	[SG1-1] Explore feasibility of an automated tasking tool for disaster applications	[SG4-4] Waveband protection advocacy [SG5-1] Coordinate commercial policy with agency level usage policies
Products & Services	[SG3-2] Performance model validation framework for vector deformation and other observables [SG4-1] CEOS-ARD SAR product family specifications [SG4-2] SAR Interoperability Assessment	[SG1-2] Validation protocols for higher-level products [SG3-1] Implement recommendations from ICGS-SAR Thematic Areas paper

Membership

All organisations (both CEOS Agencies and non-CEOS organisations) with SAR programs or interest in SAR programs are welcome to participate in SAR-VC. SAR-VC is currently composed of members from ASI, CONAE, CSA, CSIRO, DLR, ESA, ISRO, JAXA, NASA and VNSC.

SAR-VC Leadership

SAR-VC will be led by a minimum of two and a maximum of four CEOS Member or Associate representatives or their delegates. At a minimum, Co-lead positions will be reviewed every two years by SAR-VC members, to reconfirm existing leadership or

nominate new leads. There are no limits on how many terms an individual may serve as a Co-lead.

New Co-leads shall be self-nominated, and approved by SAR-VC membership by consensus. The commencement of new leads should be staggered to foster continuity.

Co-leads are responsible for the implementation of SAR-VC's objectives as identified above, reporting to the Strategic Implementation Team (SIT), and serving as a contact point for SAR topics for the broader CEOS community.

SAR-VC will initially be led by NASA, JAXA, ESA and DLR.

Subgroups

SAR-VC comprises 5 subgroups, each with the following objectives:

1. Current Mission Coordination:
    - Enable data sharing
    - Coordinate acquisitions from existing systems
    - Support calibration and validation of SAR products, in particular for higher-level science products

2. Future Mission Coordination:
    - Review planned SAR missions to identify potential future data gaps
    - Exchange information and future mission plans well in advance to identify possible overlaps and synergies
    - Leverage insights from the SAR technology subgroup to identify opportunities for integration into planned or prospective future missions

3. Science and Applications Needs:
    - Review user needs for SAR data
    - Coordinate SAR data products to meet user needs
    - Coordinate acquisitions for science products (including interferometric and polarimetric SAR products)

4. Products, Techniques and Technologies:
    - Support CEOS-ARD SAR specification development and product assessments
    - Enable interoperability of current and future products
    - Review and discuss upcoming techniques and technologies
    - Coordinate the implementation and testing of the techniques and technologies in future and existing missions

5. Commercial Data Systems and Providers:
    - Track the capabilities of commercial systems and identify civil application benefits

- Track current and future commercial SAR satellite services and data providers and coordinate commercial policies with agency level usage policies

These subgroups are expected to act in a matrix fashion, where subgroups 3, 4 and 5 feed information and requirements to subgroups 1 and 2. The SAR-VC may rearrange subgroups to adapt to changing needs at any time by consensus, called for by the current VC leads.

Examples of Cross-cutting Aspects of the Subgroup Structure

	Core Coordination Activities	
Cross-cutting Elements	**SG1: Current Mission Coordination**	**SG2: Future Mission Coordination**
SG3: Science and Applications needs	*E.g. Observational requirements as input to coordination of operations, cal/val, data formats and dissemination.*	*E.g. Observational requirements as input to performance simulations and constellation design*
SG4: Products, Techniques, and Technologies	*E.g. Harmonization of products of current missions through ARD standards*	*E.g. Identification of technology and methods to be recommended for future missions*
SG5: Commercial Data Systems and Providers	*E.g. Understand the commercial landscape to foster coordinated data-buys*	*E.g. Integrate commercial SAR into the constellation architecture of future SAR missions*

Areas of Coordination with Other CEOS Entities

The support of the Strategic Implementation Team (SIT) is requested to enable coordination with the groups outlined below.

Subgroup	**CEOS Entities to Coordinate with**
Cross Cutting	**MIM Database Team** - SAR mission capabilities and gap analyses
SG1: Current Mission Coordination	**WGCV SAR Subgroup** - image calibration, SARCalNet **WGCV Land Product Validation subgroup**

	WGCV Terrain Mapping Subgroup - Digital Elevation Model products produced by SAR sensors **WGDisasters** - Landslides, Seismic Hazards, Disaster Charter, Recovery Observatory, and more
SG3: Science and Applications Needs	**WGCV Land Product Validation subgroup** **WGCV Terrain Mapping Subgroup** - Digital Elevation Model products produced by SAR sensors **LSI-VC** - thematic land surface products, including biomass and mangroves **Ocean VCs**
SG4: Products, Techniques, and Technologies	**CEOS-ARD Oversight Group** - CEOS Analysis Ready Data specifications and product assessments **WGISS** - Interoperability of SAR products
SG5: Commercial Data Systems and Providers	**WGDisasters** - Landslides, Seismic Hazards, Disaster Charter, Recovery Observatory, and more

Resources

SAR-VC activities will be sponsored by member agencies in-kind, on a best efforts basis. CEOS Agency support is requested to host workshops, and allow for travel to said workshops.