EO Science for Society Info Days 2024

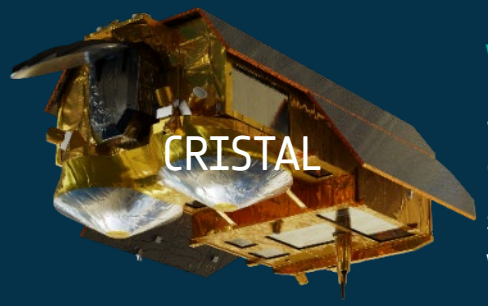
Sentinel User Preparation

EOP-SG

28/03/2024

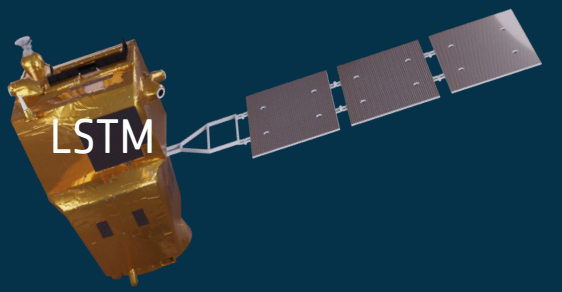
Sentinel User Preparation (SUP) ESA EOP Initiative

Activity in collaborative synergy with the EC



WHAT

SUP is a preparatory program for the use of Copernicus Expansion/NG data. Strong support by MS and EARSC.
With a multi-mission approach.

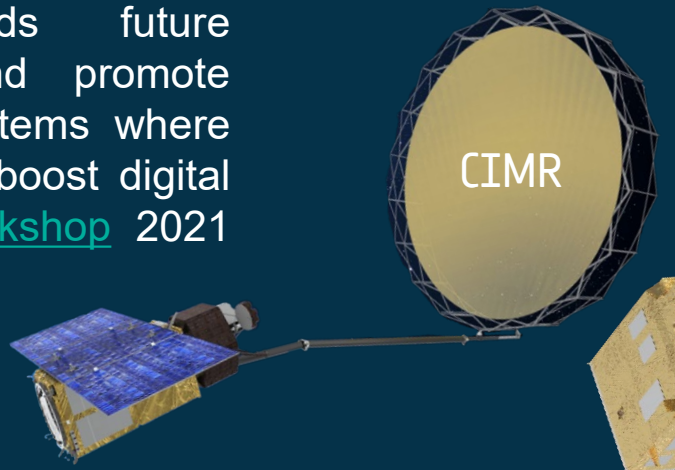


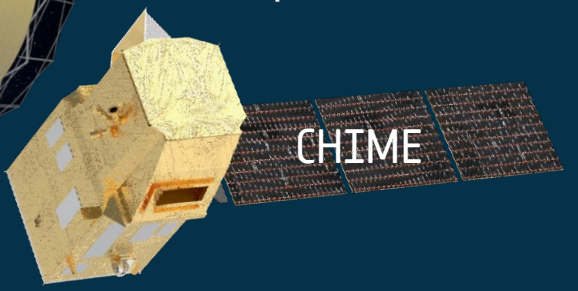
WHY

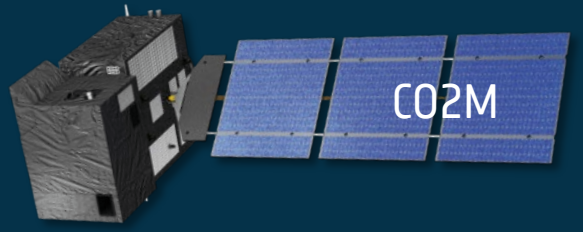
Supporting the integration of new Copernicus Expansion/NG datasets towards future operational working practices and promote European leadership for space systems where competitors are already active and boost digital commercialisation (ref. EARSC workshop 2021 with D-EOP).

HOW

- Build the necessary expertise in the various science and application domains and sectors (academia, value adding companies) to prepare future downstream services.
- Ensure readiness for rapid uptake by users and stakeholders of derived information products.



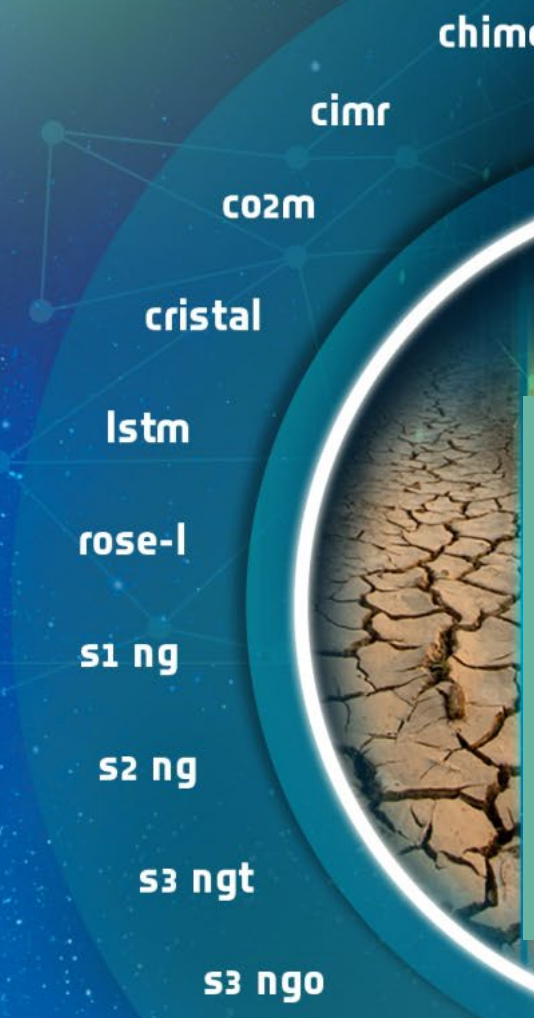




EFFECTS

- Readiness of science and downstream analytics to address societal/environmental challenges.
- Act as ‘de-risking’ factor and incentive for growth to maximise return-on-investment.

SENTINEL USERS PREPARATION



ESA Invitation to Tender on :

“SUP Applications preparedness with stakeholder and end-users participation.”

15 ME – 800kE each contract – 2-year implementation.

https://esastar-publication-ext.sso.esa.int/ESATenderActions/details/69097

Deadline 9th April 2024.

[SUP-1] - Applications preparedness with stakeholder and end-users participation
Fixed Call for Proposals – 15ME overall – 800kE each contract – 2year implementation.

- Develop and validate **novel advanced** EO application/information-product, demonstrating the value of the **Copernicus Expansion multi-mission approach** (i.e., selecting at least two missions) and the synergy with the existing Copernicus Sentinel missions. Interoperability and reusability shall be ensured.
- The contractor shall ensure the **proactive involvement of stakeholders/end-users** in the co-design, development and validation phases, and highlight expected future benefits of the developed solution.
- Consolidate and deliver the **Representative Dataset** (e.g., revisit time, spatial resolution, spectral characteristics) of the selected Copernicus Expansion missions, in order to simulate an operational scenario suitable to the selected application over the areas of interest. This Representative Dataset can be achieved through: proxy-data from non-ESA missions (e.g., national, international partners, commercial), and/or simulated/synthetic data with the aid of models, and/or in-situ/validation/campaign data.

Examples	CHIME	CMIR	CO2M	CRISTAL	LSTM	ROSE-L
Food systems and agriculture (e.g., crop indices, operations monitoring, yield estimation, water productivity with soil moisture, irrigation, evapotranspiration, eco-schemes)	x		x		x	x
Ecosystem and biodiversity monitoring (e.g., ecosystem structural and functional traits, habitat mapping, protected areas conditions monitoring)	x		x		x	x
Soil management (e.g., composition, organic carbon, degradation, restoration)	x	x			x	x
Inland water management (e.g., hydrology services and pollution)	x			x	x	
Coastal management (e.g., eutrophication, SST, currents)	x				x	x
GHG and air quality (e.g., XCO2, XCH4, NO2, SO2, ozone, aerosols, VOC)	x		x			
Forest management (e.g., classification, biomass/carbon, health, disturbances)	x				x	x
Urban resilience and insights (e.g., UHI)	x		x		x	
Critical infrastructures management (e.g., energy infrastructure, road and rail networks, ports)	x		x		x	
Mining and extractives (e.g., site selection ,operations support, waste management, environmental protection, site remediation)	x		x		x	x
Arctic operations (e.g., safe navigation, arctic policies)		x		x		x
Natural hazard management (e.g., geological hazards, multi-hazards, green transition risk exposure, post-event monitoring).	x	x			x	x

SUP - Training/Toolboxes and open science support

Set of activities to support the community to prepare for the coming missions including dedicated tools, training an education actions with major focus on young generations.

- **(2x100KEuro) SNAP Evolution Study to cope with new Sentinel Expansion and NG missions.**
- **(300kEuro) SNAP+ Expansion to address Hyperspectral, Passive Microwave, dedicated multi-frequency SAR processing aspects.**
- **Set of SUP dedicated training events and activities focus on universities preparing young scientist and students: e.g.,** fostering familiarity of students with complex multi-frequency SAR data; dedicated training on hyperspectral, preparing for CO2M,…;

SUP Fundamental research and algorithm/products development/validation

- **ITT (~2x300KEuro) - SWOT Data analysis and synergistic study for S3NG preparation:** Assessment SWOT capabilities (imaging interferometer dedicated) in preparation for S3-NG and exploration of synergies with SAR nadir altimeters. Data will be available at Launch + 9 months. This study will access and process SWOT mission data in synergy with other datasets to investigate the scientific content of the measurements available and develop innovative approaches to exploit the measurements for ocean, inland waters, cryosphere (sea ice) and other new scientific domains. Q3, 2024

- **ITT (~800KEuro) Foundational multi-data (CHIME, LSTM, S2NG, S3NG) costal integrated experiment for costal ecosystems, carbon and biology.** In collaboration with TREC (Traversing European Coastlines) campaign to ensure wide coverage of in-situ biological information, HR Hyperspecial analysis for coastal ocean color and biology including ocean carbon parameters, 4-dimensional ocean phytoplankton abundance and composition. The results will also contribute to the verification of the proposed additional water bands in Sentinel-2 Next Generation. Q4, 2024

- **ITT (~800KEuro) Polar Science Foundational Experiment Multi-mission (S1, ROSE-L, CMIR, CRISTAL) sea ice integrated study** to explore opportunities for the development of advanced synergistic products and investigate the interplay between sea ice extend, sea ice deformation and sea ice thickness (snow on sea ice) including the potential to develop a community model based on an open source modular approach to enhance ocean, sea-ice and snow multi-mission simulations. Q3 2024.

SUP Fundamental research and algorithm/products development/validation

- **SUP Terrestrial Biosphere Foundational Experiment (1500K): Multi-mission campaigns and studies (CHIME/LSTM/S2NG/S1/ROSE-L/CMIR/…) to** advance in the exploration of synergistic aspects to better characterise the terrestrial biosphere with focus on novel synergistic vegetation products/dynamics including vegetation and forest health, stress, productivity, structure, water content…**(e.g.,** OSE Experiments in modular carbon/vegetation/forest models) and synergistic SAR and HR Optical Forest observations with focus on synergies of both SAR and optical data for enhance joint characterisation of structure and functioning. Q4 2024

- **SUP Soils, Water and Agriculture Foundational Experiment (800K): HR Multi-mission (S1/ROSE-L/S2NG/CHIME/LSTM) advanced soil, water and agriculture synergistic multi=scale multi-mission experiment, aiming at exploring novel and synergistic products including soil carbon and crop nutrients, crop health experiment, evaporation, water fluxes, irrigation,… Q4 2024**

- **SUP Atmosphere Science Foundational Experiment (8000K): Multi-mission atmosphere retrieval opportunities;** Generate a community reference benchmarking dataset to simulate combinations of Sentinel-5, Sentinel-4, CO2M and HR missions (CHIME, S2, S3); Modelling TOA radiances over a representative set over areas and exploring novel opportunities for new products and science results. Q4 2024

SUP Fundamental research and algorithm/products development/validation

SAR SUP - Open ITT: several studies to support early studies and development of advanced algorithms and products with focus on SAR multi-frequency synergic aspects and advanced polarimetry studies (recommendations from POLINSAR, SeaSAR, FRINGE) …. E.g.,

- Multi-frequency SAR study of novel soil moisture and vegetation water content C-L band products and study of potential for identifying water content at different depths (C-band for surface and L and P-band (Biomass) for sub-surfaces)
- Glacier mass balance (velocity, mass loss, dynamics) multi-frequency study with focus on the synergy S1/ROSE-L/HARMONY (from POLAR science week) exploring potential for L-band to bridge incoherent measurements at C-band for fastest glacier (where C-band decorrelate strongly).
- Multifrequency SAR snow products including dry/wet extend, liquid water content at different depths, snow density, snow depth and related products: including SWE
- Novel synergic opportunities for SAR ocean retrievals with focus on synergistic sea state, wave, winds and currents…
- Advanced multifrequency polarimetric SAR vegetation dynamics and biophysical retrievals

Budget: 2-2.5MEuro, Q2 2024

Ocean SUP - Open ITT: study addressing synergic aspect of novel ocean retrievals and Ocean data gap to be covers by the synergistic use of CMIR, S6NG, S3NG, SAR missions to address ocean dynamics, sea-atmosphere interactions and ocean biology, ocean heat content,..

Budget: ~1MEuro, Q4 2024