

FutureEO-1 Segment 2 Workplan 2024

Der FutureEO-1 Segment 2 Workplan 2024 ist nun verfügbar und umfasst Arbeitspakete zur Vorbereitung potenzieller zukünftiger Missionen oder Projekte im Einklang mit den Programmzielen. Zusätzlich zu den neuen Aktivitäten werden bereits genehmigte, noch nicht abgeschlossene Aktivitäten aus dem vorherigen D&E-Arbeitsplan von FutureEO-1 Segment 2 in den kommenden Jahren fortgesetzt. Für Fragen zu Projektideen, ITT-Partnersuche, Evaluierung, Ausschreibungen oder allgemeinen Anliegen steht Ansprechpartner [Michael Bock](#) zur Verfügung. Bei Fragen zu den einzelnen Programmen können Sie die jeweiligen Ansprechpartner direkt kontaktieren:

- Earth System Science → [Diego Fernandez](#)
- Applications → [Giuseppe Ottavianelli](#)
- Industry Competitiveness, → [Gordon Campbell](#)
- Digital Innovation → [Günther Landgraf](#)
- Foresight → [Pierre-Philippe Mathieu](#)
- Sentinel User Preparation → [Giuseppe Ottavianelli](#)

Der Workplan 2024 ist am Ende des Newsletters zu finden, direkt im Anschluss an die Informationen zu den bereits konkret geplanten ITTs.

Veranstaltungen

Jährliche Pressekonferenz des ESA-Generaldirektors in der ESA-Hauptverwaltung in Paris

Am **12. Januar** wird ESA-Generaldirektor Josef Aschbacher gemeinsam mit den ESA-Direktoren in Paris die jährliche Pressekonferenz abhalten. Die Veranstaltung wird Einblicke in Europas Ambitionen für eine umweltfreundliche und nachhaltige Zukunft im Weltraum bieten, darunter Themen wie Weltraumzugang, Erforschung, wissenschaftliche Bemühungen, Sicherheit und Weltraumkommerzialisierung. Die Veranstaltung wird auch auf esawebtv.esa.int gestreamt, wobei nur registrierte Medienvertreter Fragen stellen können. Die Anmeldung ist vor Ort oder [hier](#) bis zum 07. Januar 2024 12:00 Uhr MEZ möglich. Weitere Informationen finden Sie [hier](#).

Pale Blue Dot: Visualization Challenge

Bis zum **26. Januar** läuft der "Pale Blue Dot: Visualization Challenge", ein Wettbewerb der NASA, UNOOSA und UNVIE. Die Herausforderung besteht darin, mithilfe von Erdbeobachtungsdaten Visualisierungen zu gestalten, die eines der nachhaltigen Entwicklungsziele (SDGs) wie Kein Hunger, sauberes Wasser und Sanitärversorgung oder Maßnahmen zum Klimaschutz fördern. Die Teilnahme ermöglicht nicht nur die Einbindung in die NASA-Initiative zur Transformation in Open Science, sondern trägt auch dazu bei, Erdbeobachtungsdaten für die breite Öffentlichkeit zugänglich zu machen. **Anmelden** können Sie sich [hier](#). Weitere Informationen finden Sie [hier](#).

Proba-1 CHRIS End of Mission Workshop

Die ESA plant im Januar einen speziellen Workshop zum Abschluss ihres langjährigen CHRIS-Sensors an Bord des PROBA-1-Satelliten. Der PROBA-1 CHRIS End of Mission Workshop findet am **18. bis 19. Januar 2024** in Gent, Belgien, statt. Hierbei sollen Wissenschaftler und Datenbenutzer die Ergebnisse der über 20 Jahre dauernden Mission besprechen und präsentieren. Der Workshop thematisiert unter anderem die allgemeinen Präsentationen zur PROBA-1 CHRIS-Mission, die Ergebnisse mit PROBA-1 CHRIS-Daten und den Vergleich mit anderen hyperspektralen Missionen. Ein Schwerpunkt liegt auf der Zukunft der CHRIS-Daten, die mit über 20 Jahren historischem Datensatz wertvolle Informationen für Klimastudien bieten könnten. Die Teilnehmer werden während des Workshops Feedback zur zukünftigen Neuverarbeitung des CHRIS-Archivs geben, um die CEOS Analysis Ready Data (ARD) Spezifikationen für Oberflächen- und Wasserrückstrahlung zu erreichen. Die **Anmeldung** ist bis zum **09. Januar 2024** möglich. **Anmelden** können Sie sich [hier](#). Weitere Informationen finden Sie [hier](#).

Third HAPS4ESA Workshop

Vom **12. bis 14. Februar 2024** findet in Leiden, Niederlande, der dritte HAPS4ESA-Workshop statt. Dieser folgt auf den HAPS4ESA-Workshop von 2019. High Altitude Pseudo Satellites (HAPS) sind unbemannte Plattformen, die in einer Höhe von etwa 20 km in der Stratosphäre operieren. Der Workshop zielt darauf ab, den Stand der Technik von HAPS zu bewerten, zukünftige Perspektiven in Europa zu identifizieren, Synergien zwischen HAPS und Satelliten zu erarbeiten sowie Empfehlungen für zukünftige ESA-Programme zu sammeln. Alle Interessierten aus Industrie, Wissenschaft, Akademie und anderen Bereichen sind zur Teilnahme eingeladen. Die **Anmeldung** ist bis zum **29. Januar 2024** möglich. **Anmelden** können Sie sich [hier](#). Weitere Informationen finden Sie [hier](#).

ESA Symposium on Earth Observation for Soil Protection and Restoration

Das ESA Symposium on Earth Observation for Soil Protection and Restoration, das vom **6. bis 7. März 2024** im ESA-ESRIN in Frascati, Italien, stattfindet, wird die entscheidende Rolle von Böden in den Lebensfunktionen der Erde und der EU-Soil-Mission behandeln. Mit einem Fokus auf dem EU-Bodenüberwachungsgesetz zielt das Symposium darauf ab, die konkreten Anwendungen von Erdbeobachtungstechnologien zur Erfüllung der Anforderungen des internationalen und des EU-Bodenschutzes zu erkunden. Zu den Zielen gehören die Präsentation des WORLDSOILS Soil Organic Carbon Monitoring System, die Diskussion von Entwicklungsanforderungen für bodenbezogene Erdbeobachtung, und die Vorstellung der Kapazitäten der Satellitenfernerkundung für die Berichterstattung über Bodengesundheit. Das Symposium steht im Einklang mit der EU-Bodenstrategie für 2030 und dem Engagement der ESA für die Überwachung von Bodenrestaurierungsbedürfnissen. Eine **Anmeldung** ist bis zum **02. Februar 2024** möglich. **Anmelden** können Sie sich [hier](#). Weitere Informationen finden Sie [hier](#).

EO4Soil Protection Hackathons 2024

Die ESA und die OpenGeoHub Foundation veranstalten die EO4Soil Protection Hackathons vom **2. bis 26. März 2024**, bei denen Forscher, Studenten und EO-Experten innovative Überwachungslösungen

für den Klimaneutralitätsbereich entwickeln können. Die Themen umfassen die Vorhersage von organischem Bodenkohlenstoff (SOC) und Bodenabbauraten. Die Gewinner haben die Chance, ihre Ergebnisse auf dem ESA Symposium vom 6. bis 7. März 2024 in Frascati, Italien, zu präsentieren und erhalten attraktive Preise, darunter Voucher für Cloud-Verarbeitung und lebenslange Mitgliedschaften in Open Access PeerJ-Zeitschriften. Eine Voranmeldung sowie ein Upload eines Abstracts ist notwendig für die Teilnahme am Hackathons. Die Frist für die Einreichung des Abstracts ist der 31. Dezember 2023. Eine **Anmeldung** ist bis zum **02. Februar 2024** möglich. Anmelden können Sie sich [hier](#). Weitere Informationen finden Sie [hier](#).

Stellenausschreibungen

System and Operations Manager for the MetOp-SG Project | ESA

ESA schreibt eine Stelle als System and Operations Manager for the MetOp-SG Project bei ESTEC in Noordwijk in den Niederlanden aus. Bewerbungsschluss ist der **01. Januar 2024**. Weitere Informationen finden Sie [hier](#).

Internal Research Fellow (PostDoc) in Quantum Remote Sensing | ESA

ESA schreibt eine Stelle als Internal Research Fellow (PostDoc) in Quantum Remote Sensing bei ESTEC in Noordwijk in den Niederlanden aus. Bewerbungsschluss ist der **03. Januar 2024**. Weitere Informationen finden Sie [hier](#).

Internal Research Fellow (PostDoc) in POD for High Altitude GNSS Exploitation and Moon Missions | ESA

ESA schreibt eine Stelle als Internal Research Fellow (PostDoc) in POD for High Altitude GNSS Exploitation and Moon Missions bei ESOC in Darmstadt aus. Bewerbungsschluss ist der **04. Januar 2024**. Weitere Informationen finden Sie [hier](#).

Internal Research Fellow (PostDoc) in Optical and Quantum Communication | ESA

ESA schreibt eine Stelle als Internal Research Fellow (PostDoc) in Optical and Quantum Communication bei ESOC in Darmstadt aus. Bewerbungsschluss ist der **04. Januar 2024**. Weitere Informationen finden Sie [hier](#).

Strategy Implementation Plan Lead - Consultant | WMO

WMO schreibt eine Stelle als Strategy Implementation Plan Lead - Consultant in Genf, Schweiz aus. Bewerbungsschluss ist der **08. Januar 2024**. Weitere Informationen finden Sie [hier](#).

Informationen zum Erdbeobachtungsprogramm der ESA

Open Invitations To Tender der ESA (ITTs)

(Für weitere Informationen zu den auf ESA Star verfügbaren ITTs besuchen Sie bitte die einzelnen ITTs über die unten stehenden Links.)

Activity	Budget	Closing date
EO-INFORMED AGENT BASED MODELS FOR DIGITAL TWINS APPLICATIONS - EXPRO+	> 500 K€	21/12/2023 13:00 CET
GDA AID: FOREST MANAGEMENT - EXPRO+	> 500 K€	18/01/2024 13:00 CET
AGRICULTURE ATMOSPHERIC EMISSIONS	> 500 K€	05/02/2024 13:00 CET
FUTURE EO-1 SEGMENT 2 OPEN CALL FOR PROPOSAL FOR EO INNOVATION	n.a.	31/12/2025 13:00 CET

Intended Invitations To Tender (ITTs)

(Alle in Planung stehenden ITTs)

Activity	Description	Budget	Open date
ADVANCED DATA ACCESS AND PROCESSING SERVICES FOR COLLABORATIVE EARTH OBSERVATION GROUND SEGMENT	In the past years, leveraging on the fast IT technologies developments, the Earth Observation (EO) scientific community has expressed the strong need for an intuitive mission independent access to EO data and for user-friendly services enabling EO data sharing and scientific collaboration to accelerate EO products improvement and enable simplified autonomous processing. In response to this need and building on the experience matured in the ESA/NASA BIOMASS/NISAR/GEDI Multi-mission Algorithm and Analysis Platform (MAAP), ESA intends to procure Advanced Data Access and Processing Services for collaborative EO Ground Segment (ASCEND)	> 500 K€	n.a.
PROTOTYPE PROCESSOR FOR ARD OF COPERNICUS SAR MISSIONS - EXPRO+	The proposed activity aims at identifying ARD products that are relevant for the ROSE-L mission and for joint use of ROSE-L and Sentinel-1, and at implementing some prototypes for the identified ARD products. The identification of ARD products relevant for the ROSE-L mission (and for joint use with Sentinel-1) consists in an assessment of the characteristics, potential usefulness, usability, and achievable performance of candidate products in relation the mission objectives and the mission requirements.	> 500 K€	n.a.
Earth System Science			
Carbon Science Cluster – Research Opportunities 2023	ITT including 2 separated activities (1Million Euro each on a) EO based HR assessment of impacts of land use on carbon cycles, pools and fluxes b) carbon data benchmarking tool.	~2M€	expected Q1/2024

4DIonosphere	Set of parallel studies addressing different aspects of ionosphere physics and dynamics by the exploitation of SWARM	~1.7M€	expected Q1/2024
S5P CO2 open retrieval and synergy with CO2M	Development of an open CO2 retrieval algorithm and code for S5P including the exploration of synergistic multi-mission products with CO2M	500K€	expected Q1/2024
4DBlack-Sea/Danube	New ITT on science for the Black Sea and the Danube region. Activities will focus on advancing towards a 4D multi-variate reconstruction of the Black Sea and Danube system.	600K€	expected Q1/2024
Applications			
World Ecosystem Extent	This activity line will focus on the development and demonstration of globally solutions (tools) for mapping the extent of ecosystems and monitoring their changes, with demonstrations at European and global levels, in accordance with the Ecosystem Accounting standards adopted at UN and European levels.	1,5 M€	expected Q1/2024
World Coast Lines	On the experience of Coastal Erosion projects and the recommendation of the Climate Modelling User Group, this activity will scale-up the algorithms and methods for coastline mapping at global level. The final product and related analytics tools should take into consideration tidal changes and erosion/accretion processes. Primary data source will be Sentinel-2 complemented with Sentinel-1.	1 M€	expected Q1/2024
World Forest	The project aims to develop methodologies for Adaptive and Sustainable Forest Management, aligning with the EU Forest Strategy and global requirements, including UN initiatives. It will produce innovative information products and tools for forest monitoring, covering parameters like forest types, structure, disturbances, fires, restoration, and vulnerability risk. The project will utilize a wide range of space-borne sensors, meteorological data, and modeling, while integrating existing datasets and exploring potential synergies with commercial Earth Observation data to enhance its capabilities.	1.4 M€	Planned Q1 2024
EO for Nature-Finance	This project focuses on utilizing Earth Observation (EO) data and tools to support Nature Finance within the framework of Environmental, Social, and Governance (ESG) and Natural Capital Valuation (NCV). The primary end-users and stakeholders are financial and economic entities as well as operators in selected industrial sectors. The project involves two key activities: developing methodologies to quantify and monitor the impacts on nature within supply value-chains of industries and pioneering EO-integrated solutions for finance and economic scenarios, including nature-debt swap mechanisms and integration of NCV in GDP reporting. Key stakeholders like EC DGs and UNEP-FI will be involved in the project's Advisory Board.	1.5 M€	expected Q1/2024
Blue Economy	The Blue Economy project aims to leverage satellite data in conjunction with in-situ and model outputs to support Blue Economy activities and assess their impact on the marine environment. The project aligns with key international and European policies and involves specifying, developing, validating, and demonstrating	1.9 M€	expected Q1/2024

	innovative products and high-level indicators in collaboration with relevant stakeholders such as permitting and regulating authorities, financial investors, and operators in the Fisheries, Aquaculture, Renewable Energy, and Tourism sectors.		
World Agri-Commodities	This activity is focused on addressing the EU Deforestation-Free Supply Chain Regulation, which mandates extensive product origin information for certain crops/products, including cattle, soy, palm oil, cocoa, coffee, rubber, and timber/wood. The project aims to develop new methods using high spatial and temporal resolution data from Sentinel-1 and Sentinel-2 to support the annual checks on operators, as well as tools accessible to all stakeholders. It will establish a constructive approach with authorities and sectorial operators to ensure compliance with the regulation.	1.2 M€	expected Q1/2024
EO for Climate and Seasonal Adaptive Agricultural Decision Support	This activity aims to develop innovative EO-integrated decision support solutions to help farmers adapt to changing climate and weather patterns. It will implement multi-scale and multi-sensor solutions that support the ongoing growing season and integrate interdisciplinary data mining. The solutions will address various agricultural aspects such as low carbon emission practices, production forecasts, resilient crop varieties, and adaptive land management strategies for different agricultural systems.	600K€	Planned Q1 2024
EO for Essential Biodiversity Variables & GBF indicators	This activity focuses on integrating Essential Biodiversity Variables (EBVs) enabled by satellite remote sensing into the monitoring framework of the Kunming-Montreal Global Biodiversity Framework (GBF) and its Targets, as adopted at the COP 15 of the Convention on Biological Diversity. The project aims to develop state-of-the-art EO solutions for producing a range of EBVs in terrestrial, freshwater, and marine ecosystems, addressing different EBV classes. It will collaborate closely with organizations such as GEO BON, the European Knowledge Centre for Biodiversity, and others in this effort.	800K€	Planned Q1 2024
EO Engines for SDG Target and Indicator Dashboard	The goal of this activity is to customize and integrate advanced EO methods into a dedicated platform to produce national statistics on Sustainable Development Goals (SDG) Targets and Indicators. The platform will support the cost-effective integration of EO solutions into national systems and processes for SDGs, catering to National Statistical Offices and supporting agencies responsible for SDG statistics. This project will collaborate with authoritative organizations and entities such as Custodian Agencies, UNSD, IAEG-SDGs, EUROSTAT, and GEO EO4SDG.	800K€	expected Q1/2024
SDG 2.4 & 6.4 Pathfinder Agri-Water productivity	Develop and showcase a set of agri-water indicators related to irrigated agriculture to ensure that food production moves toward sustainable water use practices. Such indicators shall enable the various stakeholders to understand crop and water use conditions and allow performance evaluation across agriculture production systems and crops.	300 K€	Planned Q1 2024

SDG 14.1 Pathfinder Coastal Eutrophication	In partnership with UNEP, CEOS and GEOBlue Planet, develop, validate and showcase innovative indicators on coastal eutrophication at appropriate scales with demonstration of method scalability and transferability. The novel indicators shall support countries to monitor eutrophication of coastal waters and reduce nutrient pollution from land-based anthropogenic sources.	300 K€	Planned Q1 2024
SDG 15.4 Pathfinder Mountain Forest and Grassland ecosystems	In partnership with FAO, develop innovative EO approaches for the production of indicators on the extent, changes and conditions of mountain Forest and Grassland ecosystems with demonstration pilots in diverse mountainous areas. The indicators shall allow countries to assess the status of conservation and restoration of these mountain ecosystems.	300 K€	Planned Q1 2024
Industry Competitiveness			
Innovative EO processing Methods: VideoSAR and SAR integrity verification	Building on prototype capabilities to generate the required processed SAR layers, this ITT will initiate 2 contracts aimed at expanding the analysis performed using VideoSAR data and inferring irregular activity status based on the level of detected interference in SAR data	800 K€	expected Q1/2024
EO and Agent Based Modelling	Stimulation of industrial capabilities to provide analytic services characterizing commercial, economic or industrial processes and their resilience to climate change driven long time scale perturbations. This will prepare a set of industry led consortia to be better placed to exploit European Earth capabilities and other Digital Twin developments.	600 K€	expected Q1/2024
Digital Innovation			
OGC Pilot on Reproducible Open Science	Persistent environment with ESA, NASA and National contributing environments for interoperable reproducible open science	~500K	expected Q1/2024
[DI-7.1] Information-as-a- Service pathfinders	Showcase the propagation of ESA-funded open-source processor developments (e.g. Sen4CAP, Sen2like) to a self-sustainable on-demand usable service for the community.	600 K€	expected Q1/2024
[DI-7.2] Science Result Long- Term Availability & Reusability Demonstrators	Explore and demonstrate how open science project workflows and results can be packaged into standard platform environment technologies (docker, openEO, etc., ...) resulting in the science workflow, algorithm, etc. being fully reproducible and reusable by the community. The finding shall constitute the basis for a dedicated support service to support future open science projects to plan for reproducibility from the start	150K/ science project	expected Q1/2024
[DI-7.3] Continental- scale	Explore how an existing continental/global product can be industrialised as a pay-per-use service, allowing call-off on-demand	300 K€	expected Q1/2024

products as a service	with regional, continental, or global scale with customised parametrisation and resolution.		
Forsight			
AI-26: Large Language Models for EO	This activity explores Natural Language Processing (NL) and Large Langue Models to interact with EO	n.a.	expected Q1/2024
FS-01 EO Foresight Maker	This activity aims to create an agile environment to rapidly design and prototype a suite of highly innovative EO solutions (series of small contracts), capitalizing on the latest development in digital technologies such as AI, internet evolution and blockchain.	n.a.	Planned Q1 2024
FS-02 xAI Explainability for large-scale EO analytics	The activity aims to foster uptake of AI-based EO solutions by quantifying better uncertainties and integrating explainability in the machine learning black box.	n.a.	expected Q1/2024
FS-04 Cognitive Computing in Space for SAR	This activity aims to explore a suite of innovative “tiny” machine learning apps for ultra-low latency monitoring of our planet, with focus on SAR for edge computing.	n.a.	expected Q1/2024
FS-06 Immersive Visualisation & Metaverse	This activity will review and use new techniques such as Virtual Reality (VR) and Augmented Reality (AR) to offer a totally immersive but realistic virtual experience to the user.	n.a. n.a.	expected Q1/2024
FS-07 Quantum and Hybrid Computing for EO	This activity aims to explore further the potential (and limitations) of new computing techniques, such as quantum computing to deploy scalable machine learning techniques for EO.	n.a.	Planned Q1 2024
Sentinel User Preperation			
SUP-1 Applications preparedness with stakeholder and end-users participation	This is a competitive tender for multiple contracts with values ranging from 500 to 800 KEuros per contract, with the possibility of having parallel contracts on the same topic if needed. The objective is to consolidate high-priority applications by proactively involving stakeholders and end users. The topics covered include agriculture, ecosystem and biodiversity monitoring, soil management, methane point sources, forest management, resilient cities, critical infrastructures, mining, and extractives, among others.	Around 15 M€	expected Q1/2024
SUP-2: SUP Sharing and Collaboration Environment	Provision of an environment where proxy data can be collected and ingested in data cube format, and where science and application algorithms can be collaboratively and shared long-term.	500K/ year 2 years	expected Q1/2024
SUP-3: SUP Fundamental research and algorithm, products	Development and validation of novel methods and products with focus on synergistic opportunities across different scientific domains (Polar, carbon, coastal processes, hydrology) beyond core objectives of single missions. This will include a set of parallel projects on different priority areas identified through the SUP related consultant events.	~4M 2 years	expected Q1/2024

development, and validation			
SUP4: Novel Processing Methods for Sentinel Expansion class datasets	Competitive tender to industrialize innovative processing approaches for L- band SAR, Mid/Thermal IR and Hyperspectral datasets. Opportunities for bidders to propose their own areas will also be included to ensure opportunity for other relevant datasets for which the innovative processing methods are less mature (eg CO2)	1.5M€ (5 contracts)	expected Q1/2024
Global Development Assistance (GDA)			
Public Health	n.a.	n.a.	expected Q1/2024

FutureEO-1 Segment 2 Workplan 2024

Earth observation Science for Society

Science	
Main objective in 2024	Main objectives of 2024 are to 1) further advance novel EO methods, products and techniques to maximise the scientific impact of current missions with focus on Earth Explorers (Cryosat, SWARM) and prepare for the new ones (EarthCARE, BIOMASS, FLEX); 2) provide a respond to the recommendations of the latest scientific consultation workshops to address key science challenges, especially on key domains of collaboration with EC and selected Horizon Europe calls; 3) maintain the continuous consultation process with the Scientific community through a series of new events and maintain the level of effort in training and capacity building specially focusing on the next generation of scientists.
Description of activities in 2024	<p>[SC-1] Carbon Science Cluster - Research Opportunities 2024:</p> <ol style="list-style-type: none"> 1) Large community effort: Coordinated Horizon Europe call for a multi-mission assessment (Sentinels 1, 2, S5P, BIOMASS, FLEX, NISAR, GEDI) of the terrestrial carbon cycle, focusing on climatic extremes and community reference dataset collection. 2) Advanced EO-based observation and characterization of extremes in the terrestrial carbon cycle. 3) Development of terrestrial carbon integrated datasets for key regions in the Global Carbon Project (GCP). 4) Advance understanding and characterization of wildfires in the Earth system. <p>[SC-2] Ocean Science Cluster - Research Opportunities 2024:</p> <ol style="list-style-type: none"> 1) Advanced studies on novel observation capabilities, methods, and techniques in response to SeaSAR workshop recommendations, including synergistic methods for joint retrievals of sea state wave/wind/currents. 2) Advancement of observation capabilities and understanding of essential ocean variables and key processes, such as Ocean Heat Content and Buoyancy, integrating data from ESA-WCRP workshops. 3) Development of an ocean open science integrated dataset over key regions (e.g., Atlantic, Mediterranean, Baltic) as a benchmark for further research and scientific activities, capturing main advances in the Ocean science cluster.

[SC-3] Polar Science Cluster - Research Opportunities 2024:

- 1) Integrated assessment of the Greenland Ice Sheet, emphasizing observation and understanding of its response through interconnected processes like SMB, supraglacial and englacial hydrology, subglacial hydrology, ice flow, iceberg calving, and calving front retreat.
- 2) Study of Arctic freshwater impacts on the ocean, focusing on quantifying contributions and assessing impacts on local, regional, and global ocean systems, including effects on ocean circulation, sea ice distribution and thickness, marine biological productivity, and carbon flux.
- 3) Assessment of state and stability of Arctic icecaps and glaciers, contributing to GLAMBIE (Global Land Ice Measurements from Space).
- 4) Expansion and evolution of IMBIE (Ice Sheet Mass Balance Inter-comparison Exercise) and global assessment of ice mass changes.
- 5) Development of an open Polar Science Cluster Integrated dataset for the scientific community, serving as a benchmark for future research activities.

[SC-4.1] Atmosphere Science Cluster - EarthCARE Scientific Exploitation:

Set of innovative studies for EarthCARE, focusing on novel methods and scientific advances to facilitate rapid exploitation of the mission after its expected launch in 2024.

[SC-4.2] Atmosphere Science Cluster - Research Opportunities 24:

Following ATMOS recommendations, including: 1) Advanced air quality retrievals for NO₂ surface concentration from satellites, high-resolution ground-based data, and models; 2) Development of health/exposure assessment methods, with a focus on urban areas; 3) Continued evolution of the TROPOMI water isotopologues retrieval; 4) Development of a COCCON δD retrieval and support for ongoing processing of NDACC δD data.

[SC-5] Water Cycle and Hydrology Science - Research Opportunities 24:

Set of activities responding to the recommendations of HYDROSPACE 2023, to take place in Lisbon in November 2023.

[SC-6] Extremes and Natural Hazards - Research Opportunities 24:

new call for innovative activities on novel observations, new methods and scientific studies with focus on climate disruptions and adaptation to hydro-climatic extremes including floods, wild-fires, heatwaves and draughts and the related compound and cascade event (activities will be based on the recommendations from the EC-ESA Earth System Science Initiative workshop).

[SC-7] Soil and Agriculture Science Cluster - Research Opportunities 24:

New call for open innovative activities on novel observations, new methods and scientific studies with focus the assessment of vegetation/crop stress under multiple stressors and yield forecasting studies under climate change (activities will be based on the recommendations from the EC-ESA Earth System Science Initiative workshop).

[SC-8] Biodiversity - Research Opportunities 24:

	<p>New call for open innovative activities on novel observations, new methods and scientific studies with focus the assessment of impacts of climate extremes and major anthropogenic hot spots on biodiversity (ecosystems collapse early warning). Activities will be based on both the scientific agenda developed by the Biodiversity-Precursor projects and the recommendations from the EC-ESA Earth System Science Initiative workshop.</p> <p>[SC-9] Solid & Magnetic Earth 24: Advance the science on Deep Earth dynamics along the scientific roadmap set by the 4D Deep Earth: Core study and focus on enhancing the prediction of the magnetic signal from stochastic and deterministic re-analyses as well as the use of short period dynamics in the core to constrain wide geodynamical issues (e.g., the mantle conductance in the deep mantle, the degree of stratification at the top of the core, the viscosity of the inner core). Activities will be based on Swarm, the MSS Chinese mission recently launched, and potentially NanoMagSat.</p> <p>[SC-11] Early preparation for the fast exploitation of the coming Earth Explorers with focus on BIOMASS and FEX scientific Innovation: Set of BIOMASS and FLEX related studies to expedite mission exploitation post-launch for carbon-related activities: 1) Optimized merging of sensors for global biomass retrievals; 2) Advanced tree height algorithm and product; 3) Enhanced forest degradation products; 4) Ice sheets and Ice Shelves tomography; 5) Ocean biophysical retrievals (e.g., SSS); 6) Sub-surface geological and man-made structure assessments.</p> <p>[SC12] Advances in Polarimetry: Set of advanced studies and activities on polarimetric methods (e.g., optical polarimetry) and techniques based on the recommendations of POLINSAR fostering the synergistic exploration of existing and new Quad-pol and Multi-frequency data from e.g., BIOMASS, NISAR, SAOCOM, ALOS.</p> <p>[SC13] New Advanced Earth Science Studies: Set of new advances studies in new domains in preparation for larger activities: 1) Assessment of El nino 2024 impacts; 2) Urban Science; 3) AI for Science with focus on integration of EO and socioeconomic information across domains; 4) MTG and novel HR land data products synergistic landatmosphere interactions studies: Heat Waves, precipitation and hydrology.</p> <p>[SC-14] Education, Training & Open Science 24: Living Planet Fellowship call, a set of advance training events.</p> <p>[SC-15] Community Consultation: set of scientific consultation events on Ocean Science, Biodiversity, European Polar Science Week, ATMOS 24.</p>
Applications	

<p>Main objective in 2024</p>	<p>Main objectives of 2024 are to: 1) focus on highpriority international and European policies on the environment and sustainable development in close coordination with relevant stakeholders; 2) invest on the dialogue and pro-active involvement with the endusers, to accelerate the integration of the developed solutions into their operational practices; 4) continue the capacity development and communicate actions with the different user communities; 5) strengthen the EO AFRICA Initiative.</p>
<p>Description of activities in 2024</p>	<p>[AP-1] Ecosystem Accounting. In line with Ecosystem Accounting (EA) standards, including new EU regulations and UN SEEA EA, and following guidelines from EUROSTAT and IUCN Global Ecosystem Typology, the 2024 activity will: 1) Pioneer and consolidate EO-integrated information products for Ecosystem Conditions and Services Accounting.</p> <p>[AP-2] Biodiversity and Ecosystem Conservation and Restoration. Following the recent UN Kunming-Montreal Global Biodiversity Framework (GBF) agreement, the EU Regulation on Nature Restoration and Zero Pollution, and ESA stakeholder consultations, this activity line will include procurements on: 1) Consolidation of Ecosystem Restoration activity aligned with GBF Target 2; 2) EO for Essential Biodiversity Variables and GBF indicators, in collaboration with partners like GEO BON, Biodiversa+, and GBIF; 3) Addressing UN Ocean Decade challenges and Essential Ocean Variables developments; 4) Consolidation of World Soil activity related to top soil organic carbon.</p> <p>[AP-3] Vulnerability, Adaptation and Resilience. Responding to specific consultations, this activity will address complex environment-socio-economic topics through procurements on: 1) EO for Nature-based Solutions; 2) EO-integrated support methods, tools, and solutions for Carbon Markets, in line with workshop recommendations; 3) Development of novel products for Urban Resilience needs based on workshop recommendations; 4) Consolidation of the WorldEmissions activity with a stronger capacity-building element.</p> <p>[AP-4] Food systems. To address key European and international food-related policies, this activity line will involve procurements on: 1) Development of an adaptive agricultural decision support system for farmers and land managers, utilizing an interdisciplinary multi-scale multi-variate analysis approach; 2) Consolidation of the Sen4STAT activity with an emphasis on increased capacity development actions; 3) Implementation of advanced analytics for yield and water productivity information products and related tools, integrating meteorological, irrigation, evapotranspiration, and runoff modeling.</p> <p>[AP-5] Sustainable Development Goals (SDG) Targets and Indicators. Advancing efforts to achieve the UN Sustainable Development Goals for 2030 and deploy specific EO-based products in response to the SDGs Targets and Indicators, this activity will involve procurements on: 1) Development of novel indicators, specifically related to agri-water productivity (SDG 2.4 & 6.4) and Mountain forest and grassland ecosystems (SDG 15.4) as outlined in Pathfinders Lot.3.</p>

	<p>[AP-6] EO AFRICA Initiative. Within the ESA EO AFRICA Initiative, in close coordination with the African Union Commission (AUC), this activity line will procure: 1) Extension of the R&D Facility contract to ensure continuity of capacity development activities and European-African collaborative research efforts; 2) Initiation of a new Continental Demonstrator project with a focus on addressing smallholders' needs.</p> <p>[AP-7] Stakeholder Engagement. The pro-active stakeholder engagement is a core function of the Applications element. This activity will include procurements on: 1) dedicated action for user-needs mapping and engagement for National Statistical Offices and Environment Protection Agencies.</p> <p>[RA-2] GTIF activities. In the framework of GTIF-related actions, this line will include procurements on: 1) Development of new capabilities for high-priority matters related to Adaptation Policies, aiming to enhance the potential of Green Transition Information Factories (GTIFs), such as Renewable Energy Subsidy Monitoring, Renewable Energy Nowcasting, Building insulation & heat emission monitoring, and Information provision for the bioenergy sector; 2) Consolidation of GTIF-Demonstrator functionalities based on recommendations from a dedicated workshop, including the consolidation of the air quality activity and upscaling of monitoring capabilities.</p>
<p>Industrial Competitiveness</p>	
<p>Main objective in 2024</p>	<p>In 2024, main objectives include: 1) Continuing the industrialization of novel processing and analysis methodologies for diverse EO systems, 2) Expanding industrial capabilities in the fusion of EO and non-EO data, and 3) Integrating with customized modeling and analysis tools to support expanded uptake of EO-derived information in priority sectors such as carbon trading, tourism, and manufacturing.</p>
<p>Description of activities in 2024</p>	<p>[IC-1]: New techniques and new opportunities – next generation processing methods Extension of development activities initiated in 2023 ITTs, including new super-resolution methodologies for hyperspectral and optical/IR video data, enhancements to ISAR and VideoSAR analysis capabilities, and AI feature extraction from raw SAR data, along with image/video fusion methods.</p> <p>[IC-2]: Industrialization of Innovative Analytics – New methods for economic activity analysis: Developing and validating methods to integrate Earth Observation (EO) data, transponder information, IoT sensor network data, and telecommunications network information for improved characterization of economic activities, such as manufacturing, construction, and resource extraction.</p> <p>[IC-3]: Industrialization of Innovative Analytics – NewSpace Satellites Fitness for Purpose Verification: Specifying, setting up, and conducting exercises in collaboration with strategic partners to validate the utility of small satellites for new applications and service opportunities.</p>

	<p>[IC-4]: Industrialization of Innovative Analytics – integration of EO and Domain Specific Subsystem Emulators: Developing and testing customized capabilities within Industrial Green Transition Analytics Support Tools.</p> <p>[IC-5]: Embed and Expand EO – testing industrial cooperation approaches for export opportunities: Frame contract to support a set of small actions by start-ups/SMEs to conduct cooperative developments with partner entities outside of Europe. This will build on ESA cooperation with UNIDO.</p> <p>[IC-6]: Embed and Expand EO – Expanded regional platform-based services for Baltic and Atlantic: Two parallel contracts to expand initial regional actions initiated in 2023: 1) Atlantic Region: <ul style="list-style-type: none"> - Expand national contributions to infrastructure monitoring. - Stimulate new applications within innovation clusters in the region. 2) Baltic Region: <ul style="list-style-type: none"> - Expand service portfolios, integrating capabilities from Member States not effectively integrated. - Extend the service portfolio to cover new application domains. </p> <p>[IC-7]: Embed and Expand EO – EO Veracity proof of concept verification: Elaborating on priority issues and verifying analysis methods to support the validation of end-to-end information generation processes. The focus is on ensuring the credibility, relevance, and trustworthiness of information derived from Earth Observation (EO) data.</p> <p>[IC-8]: Embed and Expand EO - Embedding EO services within International Agencies: Invitation to Tender (ITT) for initiating a set of parallel Earth Observation (EO) application developments aimed at addressing priority interests for new operational services for European and international institutions.</p> <p>[IC-9]: Embed and Expand EO – enhanced methods for EO and open-source information integration: Invitation to Tender (ITT) to expedite the integration of Earth Observation (EO) derived information layers with non-EO open-source information. Target users include commercial intelligence providers and media operators.</p>
Digital Innovation	
Main objective in 2024	<p>In 2024, the primary focus is to sustain dashboard-based outreach with external partners and member states. Additionally, efforts will be directed towards establishing a federation for hosting reusable project results in science (EarthCODE) and applications (APEX), with a global promotion of the concept. The initiation of open-source building blocks for the environment and the G/S, along with a seamless transition of the Network of Resources Process to the new contract, is underway. Further exploration includes the</p>

	<p>concept of Information Factories, with a commitment to demonstrating benefits through early adopter examples.</p>
Description of activities in 2024	<p>[DI-0] Demonstration and Outreach: Continuing joint activities with NASA/JAXA (https://eodashboard.org/), the "Rapid Action for Citizens with Earth Observation" dashboard (https://race.esa.int/) with DG DEFIS, and expanding the Green Transformation Information Factory demonstration (https://gtif.esa.int/) to a regional scale.</p> <p>[DI-1] Interoperable Building Block Evolution: After procuring the system architecture frame contract, building blocks will be chosen, and open-source development teams selected for implementation. The European strategy will be promoted through OSGeo and OGC, using interoperability testbeds and pilots to choose a standard datacube interface and improve the Persistent Reproducible Open Science Demonstrator.</p> <p>[DI-2] Network of Resources: After establishing coordination and portal activities in 2023, the focus will shift to selecting providers for the Network of Resources and initiating activities to contribute to the implementation/evolution of interoperable interfaces across the ecosystem.</p> <p>[DI-3] Application Propagation Environment: The next step involves selecting providers for specialized environments, such as dashboards, and for open-source toolboxes accessible as web services on cloud infrastructure.</p> <p>[DI-4] Reproducible Open Science Environment (EARTH-CODE): The ongoing activity involves selecting computational resources for scientific workflows in ESA Science Cluster projects. The focus is on integrating tools for researchers to manage workflows in line with FAIR and Open Science principles. The goal is to establish shared best practices across the Science Hub and ESA Science Clusters, promoting consistency in research development. Additionally, there will be a strong emphasis on community management within this initiative.</p> <p>[DI-5] Information Factory Pathfinders: Exploration of different strategies to link EO and nonEO data operationally at regional and national level.</p> <p>[DI-7] R&D result FAIR availability Demonstrators, Pathfinders and Guidelines: Efforts are underway to encourage the creation of reproducible and reusable science project examples. The aim is to transition toward information-as-a-service, scalable on-demand at continental or global levels. Guidelines are being defined to achieve fully reusable open-source solutions that actively engage the community.</p>
Sentinel User Preparation	
Main objective in 2024	In 2024, the primary goals are to continue consultations with diverse stakeholders and user groups, invest further in developing globally representative datasets, support the creation of multimission science and application algorithms, and provide an

	<p>environment for collecting proxy data and maintaining project results for the community.</p>
<p>Description of activities in 2024</p>	<p>[SUP-1] Applications preparedness with stakeholders and end-users: This initiative, leveraging multi-mission approaches, involves the following actions and procurements: 1) Supporting stakeholder consultations for the Sentinel Expansion and Next Generation Missions, consolidating new recommendations. 2) Developing representative datasets with a global or specific area of interest, utilizing proxy data from non-ESA missions, simulated/modelled data, and campaign/in-situ data. 3) Creating specific products addressing high-priority issues identified through stakeholder consultations. 4) Supporting the development of entirely new geophysical and information products.</p> <p>[SUP-2] SUP Sharing and Collaboration Environment: Creating an environment for collecting proxy data in data cube format and facilitating collaborative, long-term sharing of science and application algorithms.</p> <p>[SUP-3] Fundamental research and algorithm/products developments/validation: This initiative encompasses the following actions and procurements: 1) Foundational multi-data integrated experiments for: - Multi-frequency SAR and optical HR data for carbon pools and fluxes in terrestrial ecosystems. - Ecosystem assessment under multiple stressors using a combination of EO data and biodiversity evolutionary models. - High-resolution hyperspectral experiments for nutrients in soils and crops, as well as crop assessment under multiple stressors. - Very high-resolution agriculture experiments, including water balance at the crop field level. 2) Issuing a Second Call for proposals, focusing on novel studies in Land and coastal areas, such as novel CMIR land products and synergistic Thermal and hyperspectral retrievals. 3) Exploring multi-mission atmosphere retrieval opportunities, including generating a community reference benchmarking dataset for simulations involving Sentinel-5, Sentinel-4, CO2M, and complementary instruments like MetOp-SG: IASI-NG, 3MI, MetImage. This involves modeling TOA radiances over areas with high and low abundance of chemical species (e.g., NO₂, aerosol, SO₂ for volcano research, and air quality; CO, O₃, CH₄, H₂O, and isotopologues, VOCs).</p> <p>[SUP-4/5] New processing methods for Sentinel Expansion class datasets: This initiative includes actions and procurements for developing and verifying advanced methods in deep learning for feature identification and characterization. Up to five contracts will be awarded to optimize models using multi-dataset inputs, sub-pixel techniques for hyperspectral data, and integration of bistatic SAR information for enhanced feature/process characterization.</p> <p>[SUP-6] Training, toolboxes and education:</p>

	The education and training initiative aims to prepare the community with enhanced toolboxes and dedicated actions. This includes expanding SNAP to cover multimission SAR, hyperspectral, passive microwave, and thermal datasets, extending the Living Planet Fellowship for relevant post-docs in the Sentinel for Urban Planning (SUP) domain, and introducing dedicated education activities on multi-frequency SAR, hyperspectral, and related topics.
EO Open Call	
Main objective in 2024	In 2024, the focus is on initiating innovative actions based on submissions received under the three deadlines throughout the year.
Description of activities in 2024	The EO Science for Society Permanently Open Call in 2024 offers an extended opportunity for various entities to rapidly develop and verify innovative ideas linked to short-term exploitation of EO data. The call aims to minimize administrative overheads and encourage participation, especially from those new to ESA. It covers all aspects of Future EO segment 2 block 4, including Core elements and Cross-Cutting elements such as Rapid EO Solutions, Regional Initiatives, Sentinel User Preparation, and Foresight. Three submission deadlines are scheduled for 2024, aligning with Future EO1 segment1.
Foresight	
Main objective in 2024	In 2024, the main goals include accelerating innovation through the exploration of Generative AI and distributed AI learning for diverse EO applications, ranging from rapid prediction to fast classification of hyperspectral and radar data, as well as cloud and edge computing. The focus is also on empowering the AI4EO and QC4EO communities by developing new tools, frameworks, and AI-ready datasets. Additionally, efforts aim to promote the adoption of disruptive technologies in mainstream activities, enhancing confidence in using AI algorithms through the implementation of explainability AI (xAI) for improved error quantification.
Description of activities in 2024	<p>[FS-08] Generative AI for EO data: Generative AI, representing the forefront of machine learning, is the focus of this activity. The objective is to explore the potential of cutting-edge generative AI techniques for EO, particularly in the rapid generation of synthetic data, filling data gaps, enhancing resolution, and simulating agent modeling. The aim is to leverage these techniques for the swift detection and classification of features in extensive EO datasets from multiple satellites (e.g., Hyperscout, Prisma, EnMap, Earth Explorer) and predict their evolution.</p> <p>[FS-09] Distributed AI for federated EO learning: This initiative explores decentralized AI techniques to harness the collective power of mega-constellations. Each network node contributes to a large integrated AI model, enhancing scalability, reducing latency, and improving privacy/security by keeping data localized. The focus includes privacy machine learning and AI safety, ensuring continued operation in large constellation systems, even if some nodes fail.</p> <p>[FS-10] xAI Explainability and Trust for Climate: This activity is part of a series focusing on understanding the AI blackbox, essential for ensuring trustworthiness in predictions from increasingly large AI models. With the rise of mega Foundation Models, the initiative specifically explores AI for Climate activities, aiming to provide insight into Earth planetary action domains. The goal is to apply AI to</p>

public health by generating technological solutions that quantify the impact of climate change on human health. Emphasizing AI safety and robustness, the initiative utilizes uncertainty quantification techniques to enhance confidence and trust in AI applications for Earth observation.

[FS-11] Edge Computing for Cognitive Space:

This activity is within a broader focus on edge computing. It specifically delves into enabling continuous learning at the edge by integrating diverse data types such as optical and radar. The goal is to implement a process that starts from raw data and incorporates the latest measurements to update machine learning models in real-time.

[FS-12] Blockchain for EO:

This call is a continuation of a study on web3, focusing on the evolution of the internet and blockchain. The objective is to develop a suite of use cases, including proof of concepts, to demonstrate the added value of distributed ledger technologies for Earth Observation. These use cases aim to showcase benefits such as ensuring data traceability, creating digital assets, and fostering new business models.

[FS-13] AI4EO framework for Sensor Enhancement:

This activity aims to promote the creation of a versatile AI-based framework and toolboxes for sensor fusion and enhancement. The goal includes features like pre-trained software, specialized AI-ready training datasets, and benchmarking tools. Additionally, it envisions automatic coding functionalities, akin to a GitHub co-pilot for Earth Observation, facilitating the swift fusion of data from diverse sources such as optical, radar, hyperspectral, IoT, and model simulations.