

→ EO SCIENCE FOR SOCIETY

EOEP5–Block4 Industry Info Day

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12/05/2017

AGENDA



- 10:00 Welcome By ESA
- 10:15 Introduction of the overall EOEP 5 Block 4
- 10:30 Scientific Exploitation
- 11:00 Exploitation Platforms:
Federated Collaborative Platform, Public Benefit, Regional Initiatives, Industry Growth,
- 12:00 Sustainable Development
- 12:15 Block 4 Open Call Mechanism
- 12:30 Question/Answer Session
- 13:00 Lunch
- 14:00 Meeting & Networking opportunity
- 17:00 Close

OBJECTIVES

- *Foster scientific excellence*
- *Pioneer new EO applications*
- *Stimulate downstream industry growth*
- *Support international responses to global societal challenges*

EO Science for Society (EOEP5 Block 4) built on successes of previous exploitation activities:

- *adapting them to the new European EO context*
- *responding to recommendations of EOEP4 programmatic and scientific review.*



- **All activities** shall respond to needs of authoritative international user communities and downstream industries, who shall be consulted systematically and participate in co-design, implementation and assessment
- **All activities** shall be designed to complement, seed, cross-fertilize and enrich relevant activities of ESA Member states' national programmes, H2020 and Copernicus.
- Access and utilization of EO data shall be massively enhanced and democratized by accelerated use of ICT, bringing users to data and scalable hosted processing (*i.e. Network of Platforms*)

Scientific
Exploitation

EO Exploitation
Platforms

EO for Sustainable
Development

Public Sector
Applications

Industry Growth
New Partners

Federated Collaborative Platforms

New: Some 10% of the total budget will be assigned via
open calls to support industry/users initiatives.

SCIENTIFIC EXPLOITATION

Addressing the needs of the scientific community in terms of novel observations, new methods, innovative product and leading edge scientific results maximizing the scientific return of ESA and European missions

Engaging international
Science community

Expanding dialogue with the international scientific community with focus on the young generations

Developing Open Science
Practices-Tools

Developing Open Science activities and practices using latest tools and techniques

Advancing EO methods
and Techniques

Launching state-of-the-art **R&D studies** for maximizing scientific exploitation of EO missions (methods and products);

Advancing Earth
System Science

Addressing open questions in **Earth system science** in collaboration with major international science initiatives

Translating Exploitat. Results in
New Mission concepts

Reinforcing the role of **exploitation** results as a **driver** for **future missions**

Projects under this line will accelerate scientific research and application development by making shared resources discoverable and easily usable according to the “bring the user to the data” paradigm

Network of EO Resources

Integrate existing capabilities into an integrated network, ensuring administrative and technical interoperability

- Data Providers & Services
- Data Analytics Tools
- Visualisation Tools
- Collaboration Tools

Shared Architecture

Evolve standards and best practises in OGC and CEOS and provide reusable open source components for

- Federated Identity Management
- Workflow Management
- Information Extraction
- Data Management

Evolving Capabilities

Build new innovative platform services to support science or application developers, e.g.

- Data Mining Environments
- Datacube
- AI Platforms
- Crowdsourcing Platforms

Primary Users: Application Developers, Science Community

Projects under this line will, in conjunction with committed end-user organizations, define, develop, demonstrate and validate new applications and precursor services at Global, Regional and National scales

GLOBAL

Development of global EO-based Applications to support major international initiatives.

- Intl. Env. agreements
- GEO Initiatives
- Global Environment Programs

REGIONAL

Enhance and integrate EO within existing regional monitoring and assessment systems in cooperation with regional/ national authorities.

- In Europe and neighbor countries.
- Over Atlantic, Baltic, Black Sea, Mediterranean, Alps.

NATIONAL

Foster new EO capacities and demonstrate EO applications that have public impact and visibility to decision makers and ministries:

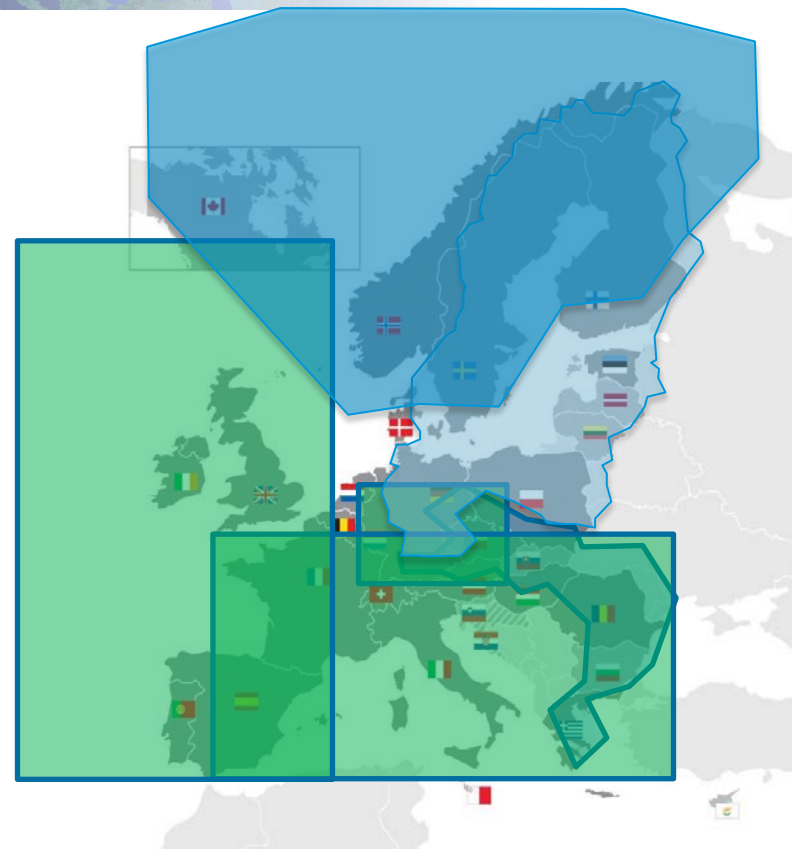
- In countries without EO national programs.
- In new and small ESA Member States

Activities will build on **user dialogue** and **engagement methods** that were successful in DUE projects.

Users: international organisations, inter-governmental bodies, national governments and agencies, civil society, NGOs

REGIONAL INITIATIVES

- Set of coordinated activities: **science, public sector, industry growth and infrastructure components**;
- **Focus on regional priorities** with high interest for Member States;
- Initial regions: **Baltic, Black-sea/Danube**, Atlantic, Arctic, Mediterranean, Mainly driven by interest of Member States;
- **Link with existing regional institutions, H2020 activities and initiatives:** e.g., Baltic Earth, BONUS, Black Sea Commission, Danube Delta Commission, etc...



Projects under this line will foster growth in commercial EO information industry through the development of new user-demand and the generation of marketable EO-based products and services that respond to this demand.

Expand Demand

User sectors that offer significant potential to grow the use of EO enabled by step-increase in operational demonstrations (eg. Large-scale, NRT, massive computing, Data Analytics).

New Opportunities & Actors

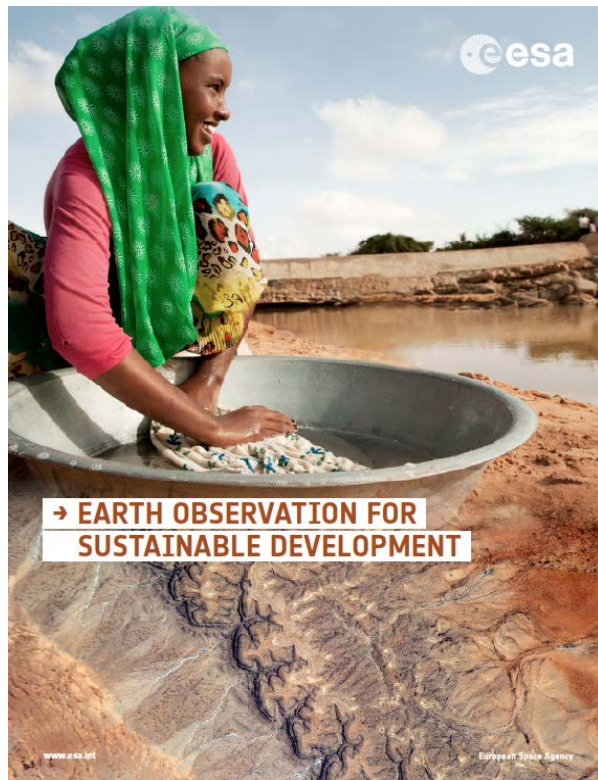
Stimulate entrepreneurship/innovation by exploring many small-scale disruptive ideas, Develop a network of Earth Lab Accelerators (ELA), Develop outreach / MOOC portfolio.

Best-Practices

User sectors initial use of EO has been made, but comprehensive understanding of the EO potential needs to be established through trade associations/organizations.

Making use of European National Missions (VHR Radar & Optical)

Primary Users: Industrial Private-Sector



- **Phase 1** (3 years, EOEP-5): **Consolidate Requirements**, engage stakeholders (IFIs & Client States) via regional demonstrations of EO.
- **Phase 2** (5 years, EW TBD, C-MIN19): **Mainstream & Transfer EO** into operational working processes & financing of ODA as 'best-practice' source of environmental information in Environmental Safeguards Systems and Monitoring & Evaluation methodologies, SDGs of highly relevant.
- **Priority thematic areas :**
Urban, Marine & Coastal, Agriculture, Risk Management, Energy & Extractives, Water Resources, Forest, Ecosystems Services, Fragile & Conflict States, Climate Resilience & Proofing.

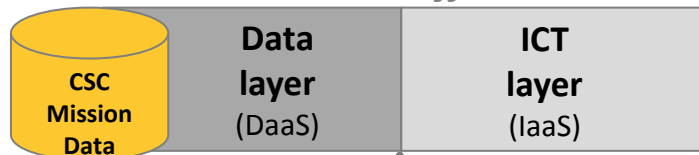


European EO data ecosystem

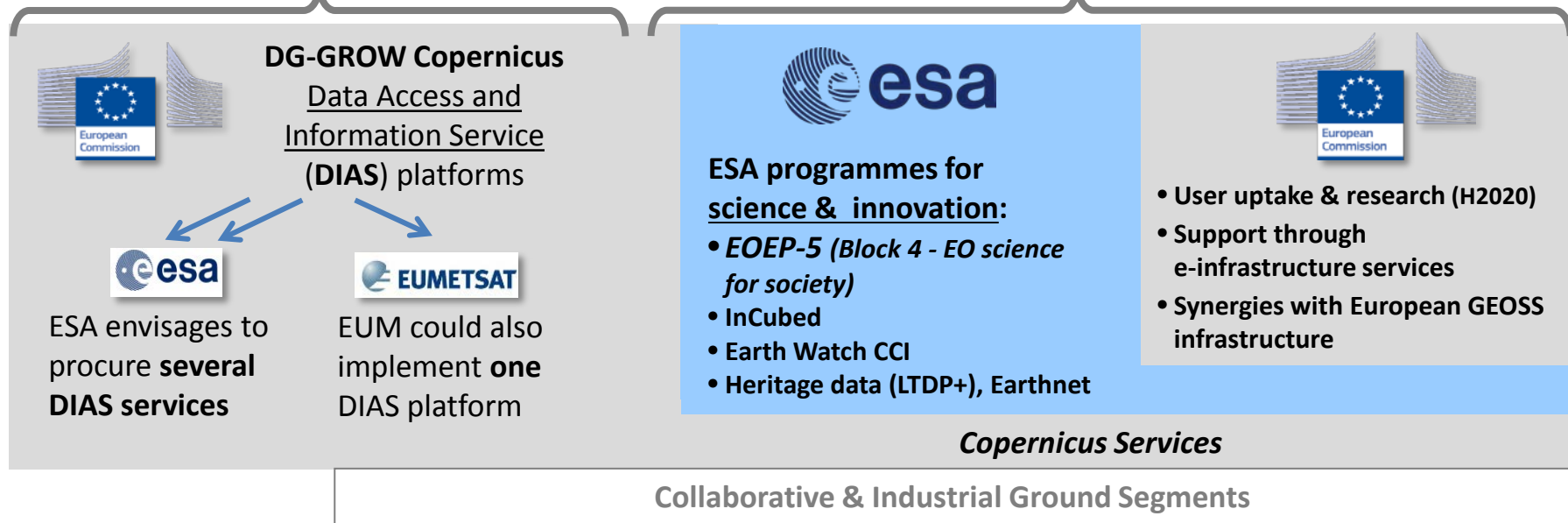
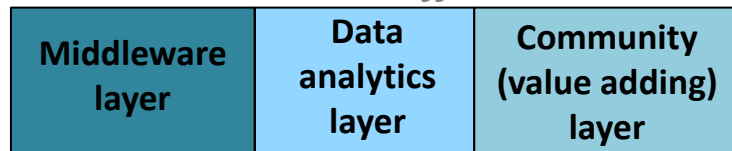
Copernicus & "EO Innovation Europe" - implementation



"Back office"



"Front office"



OPEN CALL FOR PROPOSALS



- Objective to maximize innovation opportunities for industry and science
- 15 MEuros of EOEP5 Block 4 total will be procured via a Permanently Open Calls for Proposals scheme
- Proposals can be submitted at any time
- Proposals can be submitted under any Block 4 topic/element
- Max Size: 150 k€/Max Duration: 1 year
- Proposals must have a clear focus on innovation!

→ EO SCIENCE FOR SOCIETY

EOEP5–Block4 Industry Info Day

Scientific Data Exploitation

OBJECTIVES

- Federate, support and **expand the EO research community**
- Enable the science community to **benefit from Open Science** practices
- **Maximise the scientific return of ESA and European Missions** in terms of novel methods, new products and innovative science results
- Ensure ESA contributes to **major international scientific efforts**
- Translate science exploitation results into consolidated requirements and new methods to **stimulate novel mission concepts**
- **Communicate** scientific results to the general public and international media

Target Communities:

- **EO Scientists;**
- **Earth System Scientists;**
- **Data Scientists;**

The programme will also serve:

- **Early Adopters;**
- **Young Scientists;**
- **EO Industry;**
- **General Public/Citizen Scientists/Society;**

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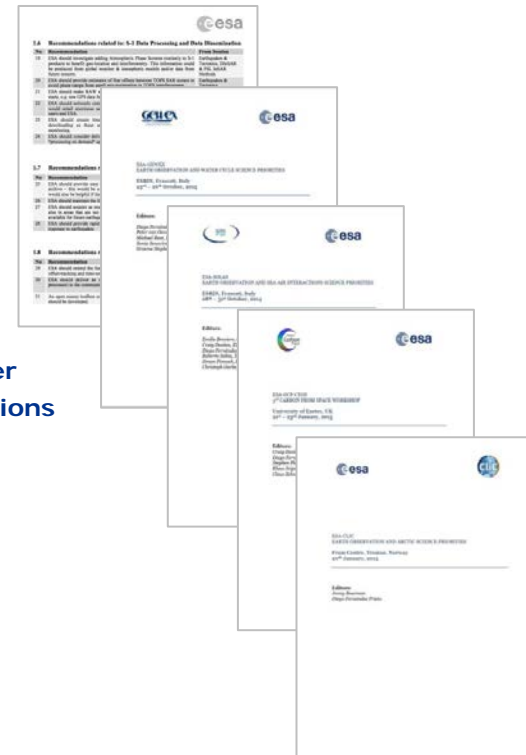
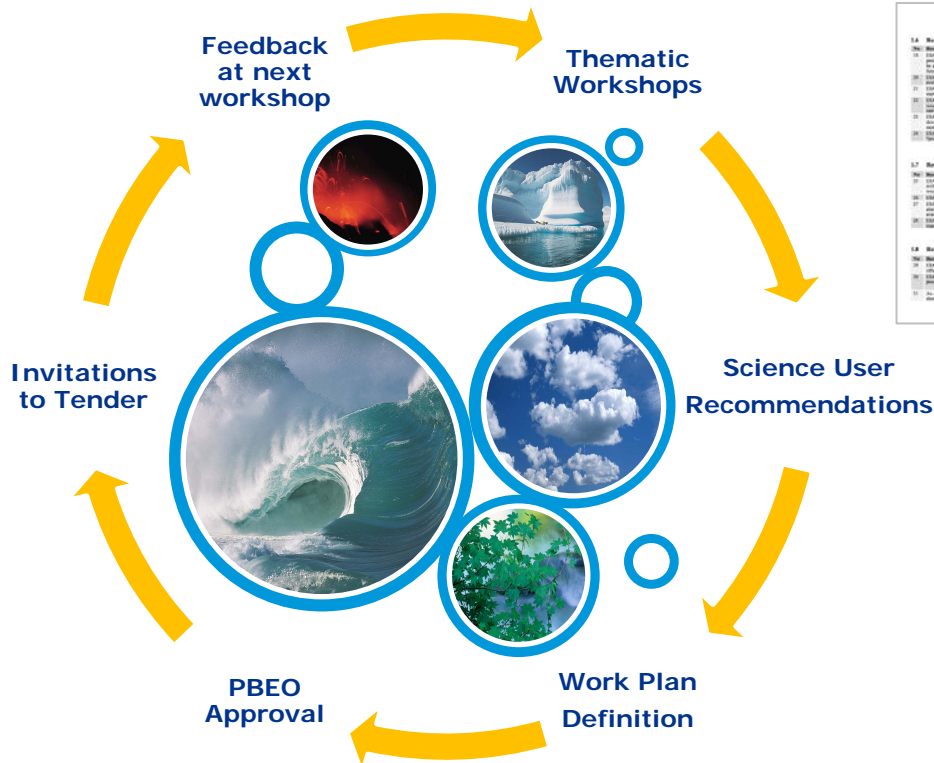
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Engaging Science communities



Young Scientists FELLOWSHIP



Procurement title	ESA LIVING PLANET FELLOWSHIP
OBJECTIVES	<p>The Living Planet Fellowship</p> <ul style="list-style-type: none"> • For young scientists at post-doc level; • Leading edge research activities for 2 years in a co-funding scheme; • Promoting fast scientific results and demonstrating the value of ESA data; • Foster concrete research actions on ESA science strategy challenges; • Promote interactions between ESA and scientists via periods in ESA centres.
DELIVERABLES	<ul style="list-style-type: none"> • project outputs in terms of assets: scientific results, data sets, products, models and targeted publications. • the participation of the Candidate to review meetings, international conferences and symposiums to present the research work.
Amount /DURATION	1.5 Meuros (15 projects) / 24 Months
ITT /Kick Off	Q3 2017 / Q4 2017

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Procurement title	CITIZEN SCIENCE Lab
OBJECTIVES	<p>Develop 5 citizen science projects based on extensive use of free EO data, tools and ICT and benefiting EO missions objectives Address sustainability-continuity and also having multiplying effect (re-use). Demonstrate validated data, or fit for purpose.</p> <p>Encourage a participatory approach to solve a given problem and Create partnership with entities in Europe.</p> <p>Use existing resources infrastructure (e.g. platforms)</p>
DELIVERABLES	<p>1) Demonstration Project/APP for citizens to be involved in the data collection, analysis, visualization and educational outreach.</p> <p>2) Open Science Lab environment, community animation report, strategy and roadmap documents</p>
Amount /DURATION	500 KEuros K / 24 Months
ITT /Kick Off	Q4 2017 / Q1 2018

SCIENTIFIC TOOLBOXES

SNAP open source toolbox

for Radar/Optical/Thermal data exploitation

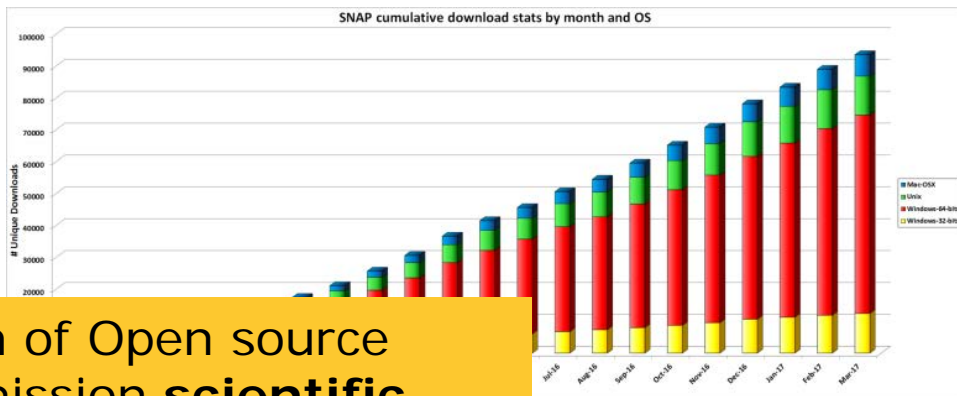
used in 190 countries

*-> more than **90 000+** downloads*

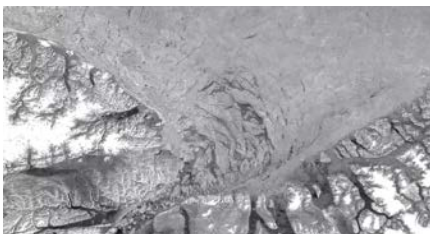
SNAP5.0 @ <http://snapp.esa.int>



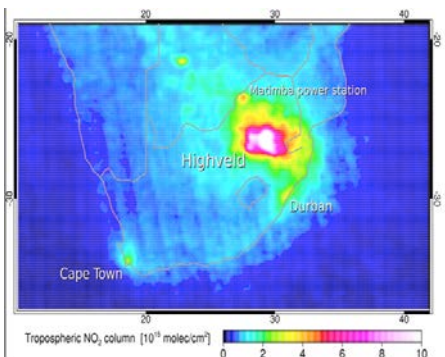
Further **extension** of Open source
S1/S2/S3 multi-mission **scientific**
toolboxes and communities animation



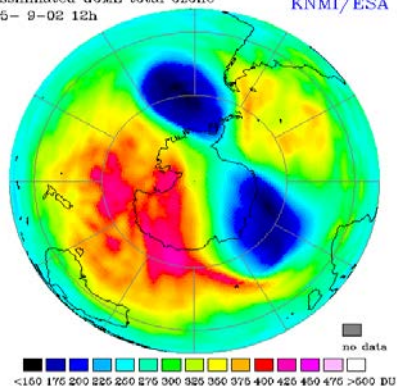
- *EO science collaborative portal*
- *Technical forum and community animation*
- *Gathering user feedback and usage*
- *Communicating on results*
- *On line tutorials*
- **200 000+ visitors**



Procurement title	MOOC CRYOSPHERE Remote Sensing
OBJECTIVES	<p>Develop an interactive MOOC on EO data from Space, fostering the use of EO data, for Cryosphere scientific studies , societal applications and services</p> <p>Provide basic information about EO data in the Cryosphere context , its uses, types and challenges.</p> <ul style="list-style-type: none"> • Reduce perceived 'barriers' for non-technical users. • Provide practical examples of usage of EO data. • Demonstrate the benefits of its use in real-world scenarios.
DELIVERABLES	Two MOOC Runs on MOOC platform promotion on the course to various communities, Requirements consolidation , Educational content, Course report
Amount /DURATION	100 K Euros / 12 Months
ITT /Kick Off	Q4 2017 / Q1 2018



Assimilated GOME total ozone
25- 9-02 12h KNMI/ESA



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Procurement title

MOOC ATMOSPHERE Remote Sensing

OBJECTIVES

Develop an interactive MOOC on EO data from Space, fostering the use of EO data, for Atmosphere scientific studies , societal applications and services

Provide basic information about EO data, its uses, types and challenges.

- Reduce perceived 'barriers' for non-technical users.
- Provide practical examples of usage of EO data.
- Demonstrate the benefits of its use in real-world scenarios.

DELIVERABLES

Two MOOC Runs on MOOC platform
promotion on the course to various communities,
Requirements consolidation , Educational content, Course report

Amount /DURATION

100 K / 12 Months

ITT /Kick Off

Q1 2018 / Q2 2018



Procurement title	EarthSnap: Scientific Snapshots of our Earth
OBJECTIVES	Global gridded data sets preclude fundamental scientific study of processes at the sea surface. EarthSnap will establish a daily feed of single "snapshot" images with "complex and amazing content" that is "not obviously explained from a scientific perspective", one each for the Ocean, Land, Atmosphere, and Cryosphere.
DELIVERABLES	<ol style="list-style-type: none"> 1. Hackathon to develop main user interface with a new generation of open science discovery, visualisation and evaluation tools 2. Each day, one stunning visualization will be made of daily domain images (Ocean, Land, Atmosphere, and Cryosphere) 3. Stimulation of an open science community debate to assess and develop a full scientific discussion of each visualisation case. 4. Development of thematic science issues discovered within Earth snap archives 5. Journal articles on scientific discoveries
Amount / Duration	500K / 24 Months
ITT/ Kick Off	Q3 2017



Procurement title	CRYOSPHERE VIRTUAL LAB – Svalbard Observatory
OBJECTIVES	<p>Develop a virtual research environment (VRE) to allow scientists to discover and then to handle jointly and to analyse, in a convenient, flexible and intuitive way, the various co-located EO datasets over the SVALBARD archipelago with EO facilities, regular in situ campaigns and University accessible to scientist</p> <p>CVL will be populated with latest data to further investigate the following topics: Snow, Sea Ice, Ice Caps, Glaciers, Glacier Albedo, Rock glaciers while benefiting from ESA latest developments and state of the art products</p> <p>Developed tools on the VRE shall foster the emergence of new methods prototype and products making use of the complementarity between sensors to study Cryosphere related processes.</p> <p>The tool shall also provide the relevant product from ESA, Copernicus Sentinels and third party EO missions, co located with in situ observations, local models and field campaigns data.</p>
DELIVERABLES	On-Line Cryo Virtual Lab tool, user support and project documentation
Amount /DURATION	500 K Euros / 24 Months
ITT /Kick Off	Q3 2017 / Q4 2017

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SENTINEL SYNERGY STUDIES



Procurement title	Sentinel-3 Tandem End-to-End (S3-TEE)
OBJECTIVES	End to end assessment of data products from all instruments aboard S3A and S3B during the entire Sentinel-3 Tandem mission activity
DELIVERABLES	<ol style="list-style-type: none">1. Scientific assessment plan for S3-Tandem Mission2. E2E assessment of SRAL, MWR, OLCI, SLSTR from S3A and S3B3. Novel products based on joint use of S3A and S3B in Tandem4. Journal articles5. Lessons Learned and advice on S3C and S3D tandem activities
Amount /DURATION	300K / 18 Months
ITT /Kick Off	Q2 2017 / Q3 2017

SENTINEL SYNERGY STUDIES



Procurement title	S3/S5P COLOR
OBJECTIVES	To derive global Phytoplankton Functional Types PFTat 300m scale using synergy between S3 and S5P optical data.
DELIVERABLES	1. Algorithm theoretical Basis Document (ATBD) 2. Open Source Processor plugin for SNAP
Amount /DURATION	200K Euros/ 24 Months
ITT /Kick Off	Q2 2017 / Q3 2017

Procurement title	S1/S2 HYDRO-AGRI MODELLING
OBJECTIVES	Monitoring of the agro-hydro biophysical variables involved in intensive farming areas with highly constrained water resources.
DELIVERABLES	1. Methodology for the preparation of operational services 2. Validation Report, Platform Experimental tests, Impact Assessment
Amount /DURATION	200K Euros/ 24 Months
ITT /Kick Off	Q2 2017 / Q3 2017

SENTINEL SYNERGY STUDIES



Procurement title	SENTINELS FOR EVAPOTRANSPIRATION: SEN-ET
OBJECTIVES	<p>to address the need of the agricultural and scientific communities for accurate and timely estimates of evapotranspiration derived at different spatial scales, including at local/field scale.</p> <p>Develop of an open-source software application for modelling of instantaneous evapotranspiration at high (tens of meters) and medium (1 km) spatial resolutions with the synergistic use of observations coming from Sentinel-3 (medium resolution thermal and optical) and Sentinel-2 (high resolution optical) satellites.</p>
DELIVERABLES	<ol style="list-style-type: none"> 1) Reviewing of existing methodologies for estimation of ET and for bridging the spatial gap between Sentinel-2 and Sentinel-3 observations; 2) Prototyping and benchmarking the most promising approaches and evaluating the outputs in a number of ecosystems; 3) Fully implementing the best performing approach as an open-source software application.
Amount /DURATION	Status: Tender open Budget: 200 K€ / 24 Months
ITT /Kick Off	ESA Open Invitation To Tender AO8962 Closing Date: 09/06/2017/ Q3 2017

SENTINEL-1 STUDIES



Procurement title	Sentinel-1 Change Detection
OBJECTIVES	<p>Due to the high temporal revisit frequency S1 is a unique instrument to track change. So far change algorithms typically used simple threshold approaches based on difference images. In SAR Change a method developed by Nielsen should be implemented and tested. The approach is based on the proper treatment of the statistical properties of the SAR data and has the advantage that it also provide statistical significance levels. The algorithm shall be tested for deforestation and flood mapping applications. For this purpose it should be extended to correct for natural variation in the signal (e.g. the natural seasonal cycle).</p>
DELIVERABLES	ATBD, Validation Report, Platform Experimental tests, Impact Assessment, Prototype software module
Amount /DURATION	200K Euros/ 18 Months
ITT /Kick Off	Q4 2017 / Q4 2017

SENTINEL-3 STM STUDIES



Procurement title	COASTAL ALTIMETRY
OBJECTIVES	Develop innovative Delay-Doppler processing algorithms, Improve the error characterization in the Coastal Zone
DELIVERABLES	Prototypes of innovative algorithms, Datasets, Publications
Amount /DURATION	300~350 K Euros/ 24 Months
ITT /Kick Off	Q3 2017 / Q4 2017
Procurement title	INLAND WATER - RIVER DISCHARGE
OBJECTIVES	SAR Altimetry for River Discharge in synergy with OLCI and SLSTR. Error characterization. Investigate River Discharge in global estuaries as a contribution to the sea level budget closure
DELIVERABLES	Prototypes of innovative algorithms, Datasets, Publications
Amount /DURATION	300~350 K Euros/ 24 Months
ITT /Kick Off	Q3 2017 / Q4 2017

SENTINEL-3 STM STUDIES



Procurement title	ICE SHEET SAR ALTIMETRY
OBJECTIVES	Develop innovative Delay-Doppler processing algorithms, radar wave interaction with the snowpack, error characterization for Ice Sheets
DELIVERABLES	Prototypes of innovative algorithms, Datasets, Publications
Amount /DURATION	200~250 K Euros/ 24 Months
ITT /Kick Off	Q3 2017 / Q4 2017

Procurement title	SEA ICE SAR ALTIMETRY
OBJECTIVES	Develop innovative Delay-Doppler processing algorithms for Sea Ice freeboard, error characterization
DELIVERABLES	Prototypes of innovative algorithms, Datasets, Publications
Amount /DURATION	200~250 K Euros/ 24 Months
ITT /Kick Off	Q3 2017 / Q4 2017

ADVANCING EO METHODS AND TECHNIQUES



Title	SARIN-Coastal
Objectives	Consolidate the algorithms and methods for the use of SarIn Cryosat data for coastal altimetry. The project will consolidate and validate new algorithms and methods and generate a new set of costal altimetry products exploiting the new SarIn acquisition mask expected for 2018.
Deliverables	ATBD, Validation Report, Experimental Dataset, Impact Assessment
Amount / Duration	300-400K€ / 24 Months
ITT / Kick-off	Q3 2017 / Q4 2017
Title	SARIN-Hydrology
Objectives	Consolidate the algorithms and methods for the use of SarIn Cryosat data for inland waters altimetry. The project will consolidate and validate new algorithms and methods and generate a new set of water level altimetry products.
Deliverables	ATBD, Validation Report, Experimental Dataset, Impact Assessment
Amount / Duration	300-400K€ / 24 Months
ITT / Kick-off	Q3 2017 / Q4 2017

ADVANCING EO METHODS AND TECHNIQUES



Title	CRYOSAT+ Antarctica
Objectives	Develop and validate novel algorithms for the retrieval of sea ice thickness over complex sea ice conditions (e.g., wet sea ice, marginal sea ice) with focus on Antarctica exploiting Cryosat data also in combination with other EO datasets.
Deliverables	ATBD, Validation Report, Experimental Dataset, Impact Assessment
Amount / Duration	200-300K€ / 24 Months
ITT / Kick-off	Q3 2017 / Q4 2017
Title	ADM+ Pathfinders
Objectives	Ensure a fast exploitation of ADM through a set of parallel short feasibility projects advancing beyond the primary products of ADM (e.g., vertical winds, boundary layer winds, gravity waves, ADM signal over oceans,...) in preparation for larger activities in 2018/19;
Deliverables	ATBD, Validation Report, Prototype Dataset, Impact Assessment
Amount / Duration	6/7 parallel studies up to approx. 1Million€ overall/12-18 months
ITT / Kick-off	Q4 2017 / Q1 2018 <i>(depending on ADM launch)</i>

ADVANCING EO METHODS AND TECHNIQUES



Title	ADM+ Aerosols
Objectives	Develop and validate novel retrieval methods for aerosol characterisation in view of creating new products also in synergy with other EO datasets.
Deliverables	ATBD, Validation Report, Experimental Dataset, Impact Assessment
Amount / Duration	350K€ / 24 Months
ITT / Kick-off	Q4 2017 / Q1 2018 <i>(depending on ADM launch)</i>

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Baltic Earth

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Title	4DEarth - DeepEarth
Objectives	Contribution to the 4DEarth initiative addressing the deep earth modelling from lower mantle to core complementing the on-going 3DEarth project (crust-upper mantle)
Deliverables	ATBD, Validation Report, Experimental Dataset, New Models, Impact Assessment
Amount / Duration	500K€ / 24 Months
ITT / Kick-off	Q4 2017 / Q1 2018
Title	4DIonsphere
Objectives	New activity to exploit the Swarm data in synergy with additional dataset to provide a better characterisation of the ionosphere processes, structure and dynamics.
Deliverables	ATBD, Validation Report, Prototype Dataset, New Models, Impact Assessment
Amount / Duration	500K€ / 24 Months
ITT / Kick-off	Q4 2017 / Q1 2018



Baltic Earth

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Title	Couple Ionosphere-Lower Atmosphere Pathfinder
Objectives	Contribution to the 4DEarth initiative addressing the deep earth modelling from lower mantle to core complementing the on-going 3DEarth project (crust-upper mantle).
Deliverables	ATBD, Validation Report, Experimental Dataset, New Models, Impact Assessment
Amount / Duration	500K€ / 24 Months
ITT / Kick-off	Q4 2017 / Q1 2018

Title	Arctic+ Ocean
Objectives	Contribution to the Arctic+ Initiative in collaboration with CLIC and EC-RTD to study ocean circulation and ocean-sea ice-atmosphere interactions in the Arctic ocean. An additional smaller activity will be dedicated to salinity in the Arctic and the feasibility to characterise fresh water fluxes.
Deliverables	ATBD, Validation Report, Prototype Datasets, Science results, Impact Assessment
Amount / Duration	Ocean Circulation: 400-500K€ / 24 Months; Ocean Salinity: 150-200K€ / 18 Months
ITT / Kick-off	Q3 2017 / Q4 2017



Baltic Earth

Title	Carbon+ Ocean
Objectives	New activities responding to the recommendations from the 3 rd Carbon from Space Workshop, Exeter (UK), January 2015, and the EO for sea-air interactions science conference, Frascati (IT), 2014, with focus on the CO ₂ ocean cycle: 1) CO ₂ fluxes and 2) Acidification.
Deliverables	ATBD, Validation Report, Experimental Dataset, Science Results, Impact Assessment
Amount / Duration	2 x 400-500K€ / 24 Months
ITT / Kick-off	Q4 2017 / Q1 2018
Title	Ocean Extremes
Objectives	New activity responding to the needs of the SOLAS community, to explore the potential of EO data in the characterisation of extreme ocean conditions (e.g., strong winds) and its impacts in terms of momentum, energy and mass fluxes.
Deliverables	ATBD, Validation Report, Prototype Datasets, Science results, Impact Assessment
Amount / Duration	400-500K€ / 24 Months
ITT / Kick-off	Q4 2017 / Q1 2018

→ EO SCIENCE FOR SOCIETY

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EO Exploitation Platforms Federated Collaborative Platform

Common Architecture, Network of EO Resources, Evolving Capabilities



- Main objective is to define an **architecture** and associated **implementation**, based on **open standards** and open (source) solutions.
- These will become the **reference architecture** and **reference implementation** which can be used by any organisation (e.g. ESA, industry, other institutions, etc.) to kick-start their related activities as well as to assess their own implementations;
- OGC (and similar bodies - CEOS) will be used for stakeholder coordination, **OGC Testbeds** will be used to drive and test solutions;
- The contract will also **operate** the implementation **on top** of the DG-GROW **DIAS** infrastructure as a **third-party service** and provide **support to third-parties** (e.g. mission operators) using the architecture and implementation.

EO Exploitation Platforms

Common Architecture - Approach

Initial ITT:
Open Competition

BP ITT:
Open Competition

BP ITT:
Open Competition

BP ITT:
Yearly Open
Competition adapted
to OGC Policies

Prime
System Team

Domain Teams

Operator Team

OGC Testbed
Team

Key aspects - organisation

- System Team → End-to-End Aspects
- Domains Teams → Experts in single area
- Operator → Runs a service on DIAS
- All Contribute to single DevOps Team
- Yearly feedback loop with OGC Testbed

Key aspects - architecture

- Open architecture
- Interoperable standards
 - Alignment with OGC, CEOS, GEO
- Consensus driven

Key aspects - implementation

- Agile/Lean processes
- Open Source re-use / evolution
- Continuous Integration / Continuous Delivery



Common Architecture Frame Contract

Procurement objective and short description	<p>DEVOPS contract for full duration of Exploitation Platform Programme:</p> <ul style="list-style-type: none"> • Definition of an Architecture based on standard interfaces (OGC based). • Definition and implementation of middleware for: <ul style="list-style-type: none"> ◦ Federated identity management ◦ Processing & chaining (Scheduling/Orchestration, Workflow) ◦ Data provisioning, management & accounting • Operations of a standard interoperable service for Sentinels and ESA missions as 3rd party service on top of DIAS. • Support to mission providers to integrate their mission hosted processing/data analytics services into the network of platforms and qualification of their services.
Main Deliverables	<p>Evolved OGC standards Reference Architecture and Implementation (reusable middleware components) Operational service for Sentinels and ESA missions in accordance with standard I/Fs Support to 3rd party service integration into network of platforms Standard Qualification suite (Based on Reference Implementation)</p>
Planned Amount	>5M
Procurement Type	Open ITT with Best Practise Actions to select subcontractors
Procurement Schedule	Q3 2017
Contract Duration	2+2 years



IPR Protection Study

Procurement objective and short description	Analyse activities to be executed to protect data and analysis algorithm owners on the cloud
Main Deliverables	<ul style="list-style-type: none">- study report- draft service agreement for Network of EO resources- implementation plan
Planned Amount	200K
Procurement Type	Open ITT
Procurement Schedule	Q4 2018
Contract Duration	6 months

The **Network of EO Resources (NoR)** aims to support application developers in minimizing cost and time to “market”, supporting the full build-up cycle from initial conception, research, demonstration, up to full scaled operations for world-wide users.

It is a set of interconnected services offered by collaborating organizations, under **transparent T&Cs**, and according to the network's '**Charter of Values**':

- Both **commercial and scientific** exploitation
- Service provisioning via clear and fair T&Cs, protecting IPR owners

Services are **provided by** NoR partners - **industry and public entities** – ESA is just one (of many) customer

Users of the NoR are application developers and the science community.



Network of EO Resources Onboarding

Procurement objective and short description	Integrate new resources into the Network of EO Resources, based on <u>existing</u> (at least pre-operational) services operated by industry/public entities for use by 3 rd party application developers or scientists. <i>Examples: hosted processing services operated by data owners, 3rd party services on top of IaaS (e.g. WMS/WCS services, data analytics services, etc.)</i>
Main Deliverables	<ul style="list-style-type: none">- New services available for science or application projects with standard terms or reference guaranteeing data and application owners and with interoperable technical interfaces- Resources available to exploitation projects- Contributions to Standardisation & OGC Testbeds
Planned Amount	150K each for onboarding; extensions for use in exploitation projects or OGCs testbeds
Procurement Type	Open Call/ITT for specific needs
Procurement Schedule	Q3 2017
Contract Duration	typically 6 months + extensions of up to 3 years



Helpdesk for Network of EO Resources

Procurement objective and short description	Support Exploitation Projects in how to best use the Network of EO Resources
Main Deliverables	Administrative and technical brokering
Planned Amount	300-500K/year
Procurement Type	Open ITT
Procurement Schedule	Q2 2018
Contract Duration	3 years

Build-up platform services and tools to foster the massive use of EO data.

Selected services/tools shall be operated by industry/public entities and aim to be self-sustainable by service provisioning to a wide range of customers; this could include ESA, EC, national public entities and commercial customers.

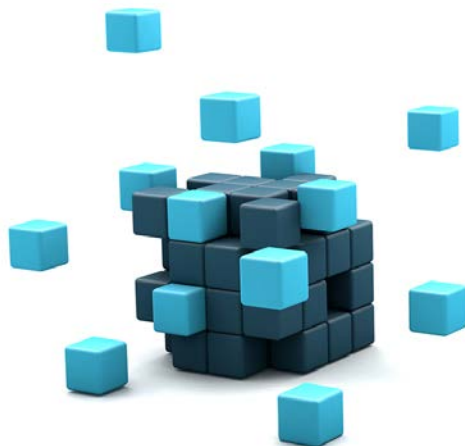
They will cover one or more of the followings (non-exhaustive) technological drivers:

- *Big data i.e. for **Volume**, but also about **Velocity** and **Variety** (e.g. connecting to IoT)*
- *Data Fusion / combination between different sensors / non-EO data*
- *Machine / Deep Learning for classification, patterns recognition, correlation, forecasting*
- *Time series Computation and Visualization*
- *Stream processing for real-time analytics (i.e. live discovery and monitoring)*

Resulting services/tools should be

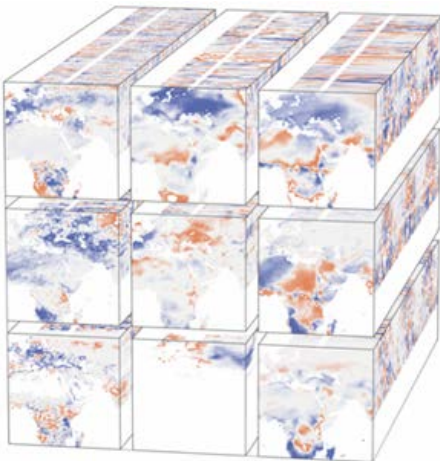
- Ready for integration into existing environments, e.g. TEPs, MEPs or toolboxes or
- Be operated as self-standing services available to external (web)client via APIs

Users of the Evolving Capability results are application developers and the science community (*in some cases limited to beta-testers only*).



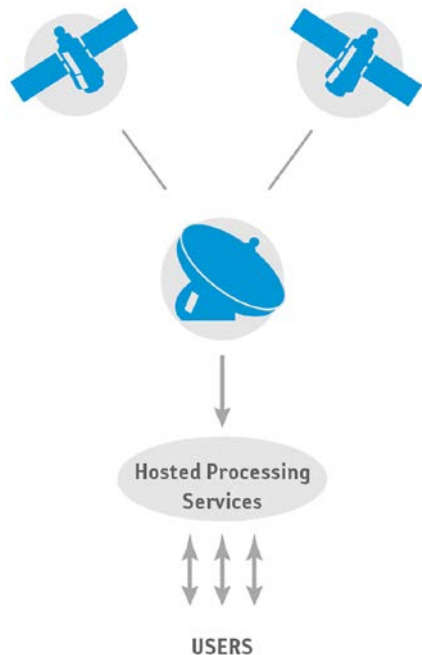
Evolving Capabilities Open Call

Procurement objective and short description	Support industrial initiatives for build-up tools and services supporting EO application development or scientists that should reach pre-operational stage and could in future be either be integrated into the Network of EO Resources or enhance an existing capability (e.g. a TEP or MEP).
Main Deliverables	Working Service/Function with APIs, new modules for existing Toolboxes, ready for <u>on-boarding</u> to the Network of EO Resources
Planned Amount	150K each
Procurement Type	Open Call/ITT for specific needs
Procurement Schedule	Q3 2017
Contract Duration	typically 6 months to 1 year (for initial build-up contract)



Datacube Facility Service

Procurement objective and short description	Provide an public datacube service, used by ESA for <ul style="list-style-type: none"> - TEP generated data layers - EOP-S project generated data layers - Selected mission coverages
Main Deliverables	<ul style="list-style-type: none"> - Operational datacube service offering on the web, usable by 3rd party data owners - Operational datacube populated with data as indicated by ESA - Evolution of datacube interoperability layer
Planned Amount	>3M
Procurement Type	Open ITT
Procurement Schedule	Q3 2017
Contract Duration	3+2 years



NRT Exploitation Platform

Procurement objective and short description	Provide a <u>hosted processing service</u> on a cloud environment where space data are guaranteed to be available within "few minutes" from acquisition start and where commercial application operators can host their applications
Main Deliverables	<ul style="list-style-type: none"> - NRT hosted processing environment, also focussing on regional needs - Pipeline production up to L1
Planned Amount	2-4M
Procurement Type	Open ITT selecting multiple providers
Procurement Schedule	Q3 2018
Contract Duration	3+1 years

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EOEP5–Block4 Industry Info Day

EO Exploitation Platforms Public Sector - Applications

Projects under this line will, in conjunction with committed end-user organizations, define, develop, demonstrate and validate new applications and precursor services at Global, Regional and National scales

GLOBAL

Development of global EO-based Applications to support major international initiatives.

- Intl. Env. agreements
- GEO Initiatives
- Global Environment Programs

REGIONAL

Enhance and integrate EO within existing regional monitoring and assessment systems in cooperation with regional/ national authorities.

- In Europe and neighbor countries.
- Over Atlantic, Baltic, Black Sea, Mediterranean, Alps.

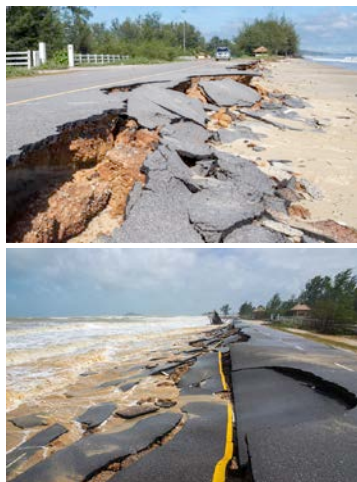
NATIONAL

Foster new EO capacities and demonstrate EO applications that have public impact and visibility to decision makers and ministries:

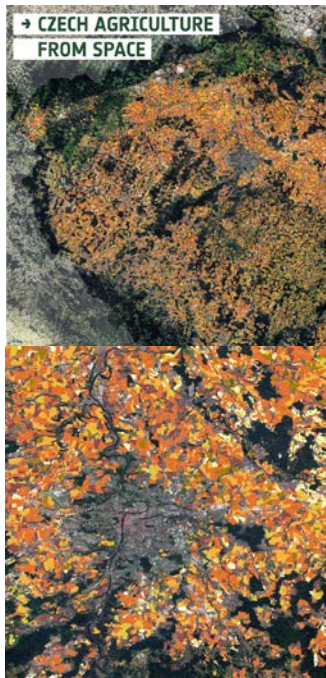
- In countries without EO national programs.
- In new and small ESA Member States

Activities will build on **user dialogue** and **engagement methods** that were successful in DUE projects.

Users: international organisations, inter-governmental bodies, national governments and agencies, civil society, NGOs



Procurement title	COASTAL EROSION
OBJECTIVES	With a stabilisation of gas emission, IPCC plan for 1 meter sea level raise by the end of this century. By processing ERS/Envisat archives and using S1A and S1B recently launched, one should develop the appropriate algorithm and processing chain to derive the products in 3 different member states. Radar data data may be complemented with Landsat/SPOT and S2A and S2B for recent years
DELIVERABLES	Coastal Erosion maps in 3 ESA member states for a total of 1000 km coastline in between 1991 and 2019: appropriate scientific papers and communication. Algorithm, Product Specification, Products, Tools
Amount /DURATION	1500K Euros/ 24 Months
ITT /Kick Off	Q4 2017 / Q1 2018

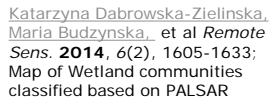


Procurement title	SEN4CAP
OBJECTIVES	The project focus on providing evidence how Sentinel-1 and Sentinel-2 derived information can support the modernization and simplification of the Common Agricultural Policy (CAP) in the post 2020 timeframe. The SEN4CAP project will be developed in close collaboration with DG-Agri, DG-JRC, DG-Grow and in particular with a selected number of national Paying Agencies.
DELIVERABLES	Development of S1 & S2 open-source algorithms for timely crop type maps, grassland management, Demonstration in EC member states representative for different agro ecological settings, field sizes and agricultural practices Production during demonstration should be run on a cloud processing platform (e.g. IPT in preparation for DIAS)
Amount /DURATION	Status: Tender open Budget: 1.2 M€ / 24 Months
ITT /Kick Off	ESA Opened Invitation To Tender AO8905 closing date 12-05-2017./ Q3 2017

PUBLIC SECTOR APPLICATIONS



Procurement title	GOFC-GOLD Land Cover Project Office
OBJECTIVES	<p>The GOFC-GOLD Land Cover Project Office will act as focal point for forest and land monitoring from space, to link better the global land cover community with the policy sector. Its project overarching activities are:</p> <ul style="list-style-type: none"> • Global and regional landcover, validation and accuracy assessment; • Land monitoring issues related to SDGs; • R&D coordination for GFOI and organisation of expert workshops; • Biomass estimation (GlobBiomass, ECV Biomass, EE7 user preparation).
DELIVERABLES	<p>Technical notes to the four activity lines (as mentioned above); Quarterly activity reports and annual reports; Expert workshops on GFOI R&D priority topics; GOFC GOLD plenary;</p>
Amount / DURATION	500K Euros / 48 Months
ITT / Kick Off	Q2 2017 / Q3 2017



European Space Agency

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EO Exploitation Platforms Regional Initiatives

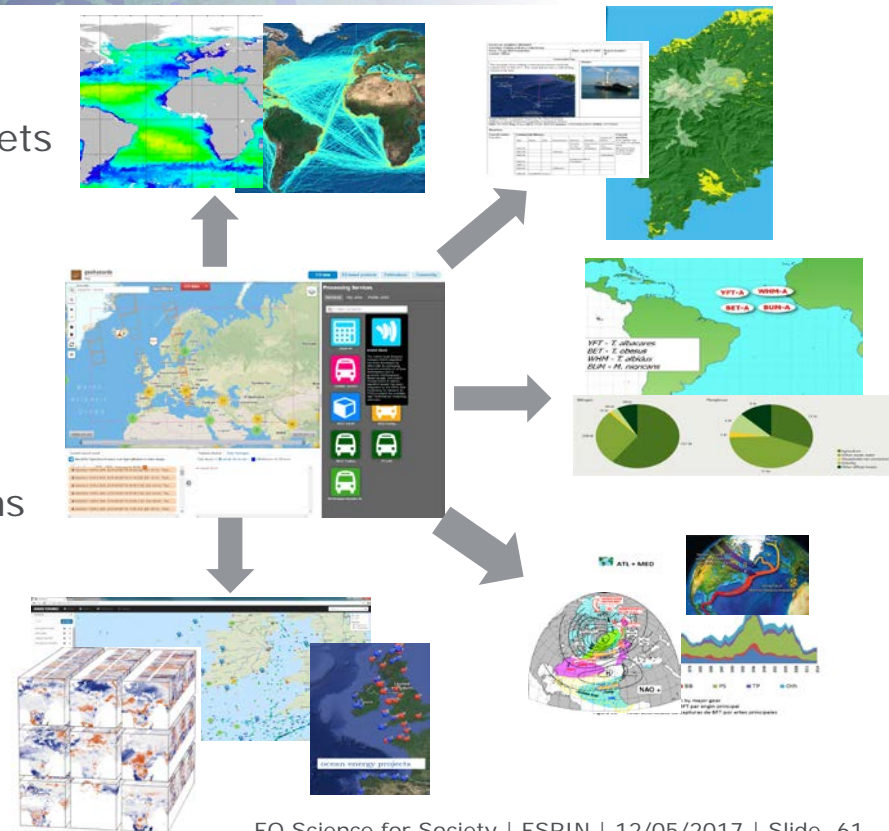
OBJECTIVES



- Expand use of EO within regional development strategies and programmes
- Enable step change improvement in analysis within regional Earth Science and environmental monitoring
- Embed customized access to EO data and derived information within regional data collection, exchange and analysis infrastructure
- Optimize exploitation and impact from already available capabilities, on-going developments and planned new developments
- Create opportunities for European companies (in particular SMEs) to expand business addressing regional priorities and developments
- Leverage non-EO regional development funding programmes by promoting access to relevant funding sources (eg RDFs, etc)
- Enable coordinated programming between EO and other development funding linked to MS Regional priorities

ELEMENTS

- Data Access, Management & Processing
- Routine Monitoring, Analysis & reference data sets
- Support to national & regional reporting
- Support to regional Strategies/Action Plans
- Support to regional Projects/Programmes
- Support to cooperative regional Earth Science Research
- Development of customized regional applications & services
- Innovative elements for communication, education & citizen engagement



PROCUREMENT APPROACH



- **Stakeholder workshops establish priority requirements for each region**
- **Core activities for each region:**
 - Establishment of **Project Office** for each Regional Initiative (3 years duration)
 - **Data Infrastructure** - Network of platforms contract for regionally optimized data access, customized processing, fusion of EO and non-EO datasets
 - **Scientific Data Exploitation** – dedicated contracts to develop & make available customized data processing algorithms, customized data/information addressing regional Earth science priorities & innovative use of EO within regional Earth science initiatives
 - **Expanding Public Sector Benefits** – dedicated contracts to develop customized EO based information products, innovative analysis capabilities addressing priority regional issues (eg effective analysis supporting MFSD, MSP and ecosystem based management)
- **Complementary development contracts:**
 - On-boarding of additional regional datasets and capabilities and innovative support tools
 - Customized Earth Science analyses and support tools
 - National and regional geospatial information services and support tools



Title	Baltic+
Objectives	Set of dedicated activities responding to the recommendations of the Baltic from Space workshop, Helsinki, 29-31 March 2017: e.g., new dedicated products for the Baltic (sea level, salinity, ocean colour,...), exploring the potential of S2 for Baltic physical and biochemical processes, ocean 3D circulation, new tools (e.g., Baltic box concept);
Deliverables	ATBD, Validation Report, Experimental Dataset, Science Results, Impact Assessment
Amount / Duration	1000-1500K€ / 24 Months
ITT / Kick-off	Q4 2017 / Q1 2018

Title	Black-Sea/Danube+
Objectives	Set of dedicated activities responding to the recommendations of the Black-Sea from Space workshop, Costanza, 28-30 September 2016: e.g., new dedicated products for the Black Sea and Danube basin region (e.g., coastal altimetry), deoxygenation, Danube basin water cycle extremes, new tools (e.g., Black-Sea box concept);
Deliverables	ATBD, Validation Report, Prototype Datasets, Science results, Impact Assessment
Amount / Duration	500-700K€ / 24 Months
ITT / Kick-off	Q4 2017 / Q1 2018

REGIONAL PROGRAM OFFICES



Procurement title	Regional Initiatives Programme Offices for Baltic, Atlantic and Black Sea/Danube Regions (3 Contracts)
Procurement objective and short description	Set up a dedicated support for each Regional initiative to address stakeholder engagement, cooperation with Regional Agreements, Networks etc and elaborate roadmap for embedding EO into regional priorities
Main Deliverables	<ul style="list-style-type: none">• Documents: stakeholder priorities characterization, cooperation frameworks elaboration, regional EO exploitation strategies, Regional Initiative Roadmap• Workshops and workshop reports
Planned Amount	300 k€ per contract
Procurement Type	ITT
Procurement Schedule	Q3 2017
Contract Duration	36 Months

BALTIC INFRASTRUCTURE ASSESSMENT



Procurement title	Baltic Regional Infrastructure Assessment
Procurement objective and short description	Study contract to review existing and planned ICT capabilities and developments and elaborate priorities for dedicated new developments
Main Deliverables	<ul style="list-style-type: none">Documents: analysis reports, development roadmap
Planned Amount	150 k€
Procurement Type	ITT
Procurement Schedule	Q3 2017
Contract Duration	12 Months

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EO Exploitation Platforms Industry Growth

Projects under this line will foster growth in commercial EO information industry through the development of new user-demand and the generation of marketable EO-based products and services that respond to this demand.

Expand Demand

User sectors that offer significant potential to grow the use of EO enabled by step-increase in operational demonstrations (eg. Large-scale, NRT, massive computing).

New Opportunities & Actors

Stimulate entrepreneurship/innovation by exploring many small-scale disruptive ideas, Develop a network of Earth Lab Accelerators (ELA), Develop outreach / MOOC portfolio, Data Analytics.

Best-Practices

User sectors initial use of EO has been made, but comprehensive understanding of the EO potential needs to be established through trade associations/organizations.

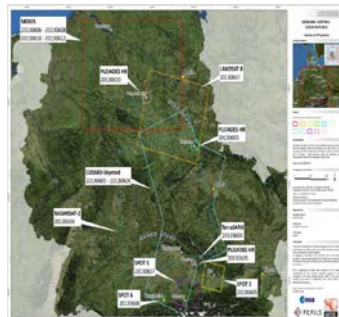
Making use of European National Missions (VHR Radar & Optical)

Primary Users: Industrial Private-Sector

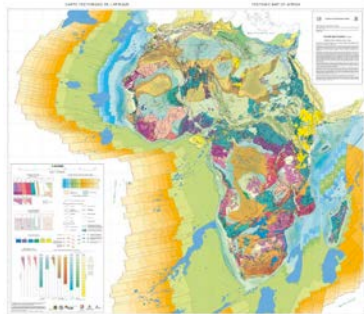
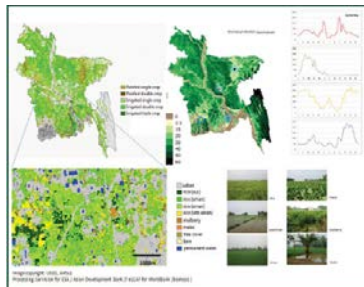
EO Exploitation Platforms Enabling Industry Growth



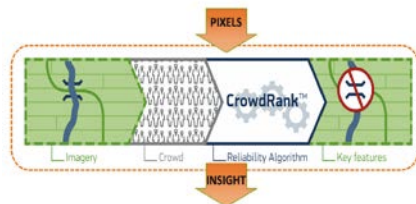
Procurement title	Expand Demand : Oil and Gas
Procurement objective and short description	Demonstrate mature and available EO capabilities to stakeholders in the oil and gas sector , building upon previous developments like EO4OG and the EO broker. Thematic exploitation platform capabilities shall be used to produce custom-made browse products to showcase EO products for specific areas of interest and to compare offerings from different providers.
Main Deliverables	An on-line interactive environment including market information, and provision of standardized (non-bespoke) demonstration EO products
Planned Amount	700 K€
Procurement Type	ITT
Procurement Schedule	Q3 2017
Contract Duration	24 Months



Procurement title	Expand Demand : Disaster Risk Financing & Transfer (DRF)
Procurement objective and short description	The contribution of Satellite EO and new ICT approaches to make impact assessment and risk information accessible in data poor environments, with primary focus on flood response in South East Asia & South Asia . Main users: Governments (Min. of Finance) and private insurance and reinsurance markets.
Main Deliverables	A large scale on-line demonstration based on hosted processing. Report of current limitations & challenges for EO services; Demonstration readiness review report; Report of enhanced service Demonstration ; Action plan for deployment; promotion material.
Planned Amount	700 K€
Procurement Type	ITT
Procurement Schedule	Q3 2017
Contract Duration	24 Months

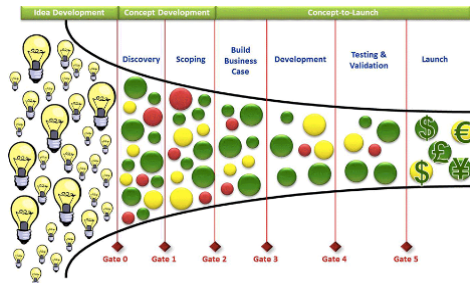


Procurement title	Best Practices : Agri-Insurance, Mining (2 contracts)
Procurement objective and short description	Based upon a careful examination of the sector business processes, establish industry specific geo-information requirements and challenges in close dialog with key representatives from the sector. Develop and document how mature and available EO based services can respond to these requirements including well documented case studies demonstrating the impact and benefits associated with exploiting EO based solutions.
Main Deliverables	Documented industry best practice for the use of EO based products and services within selected market sectors.
Planned Amount	500 K€ (per contract)
Procurement Type	ITT
Procurement Schedule	Q3 2017
Contract Duration	18 Months



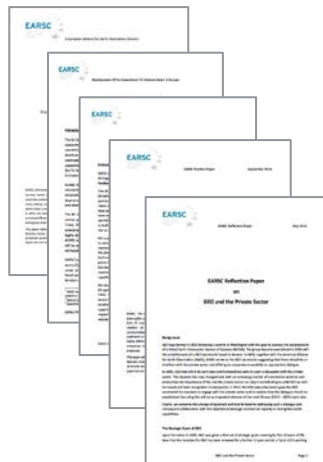
Procurement title	New Opportunities & Actors: EO Big Data Analytics
Procurement objective and short description	To foster the use of Artificial Intelligence and machine learning to maximise the value of large multi-variate data sets, in particular from Copernicus missions.
Main Deliverables	Open source workflows, use cases portfolio and documents (specifications)
Planned Amount	500 K€
Procurement Type	ITT
Procurement Schedule	Q3 2017
Contract Duration	18 Months

EO Exploitation Platforms Enabling Industry Growth



Procurement title	New Opportunities & Actors: Earth Lab Accelerator
Procurement objective and short description	To foster the development of the new generation of EO services by enabling entrepreneurs and innovators to rapidly prototype innovative information services
Main Deliverables	Open Innovation environment and ecosystem, innovation platform, strategy and roadmap documents
Planned Amount	500 K€
Procurement Type	ITT
Procurement Schedule	Q4 2017
Contract Duration	18 Months

EO Exploitation Platforms Enabling Industry Growth



Procurement title	Support the EO Service industry : eoVox-5
Procurement objective and short description	Together with EARSC, continue the efforts to establish a competitive European EO services industry as a market leader in the global market via strategic and targeted initiatives and developments involving the EARSC members. Such initiatives will include gathering statistics on the industry and market, development of promotion and communication tools and platforms, export market expansion actions etc.
Main Deliverables	A sustainable EO service industry representative trade body (EARSC)
Planned Amount	300 K€
Procurement Type	ITT
Procurement Schedule	Q4 2017
Contract Duration	24 Months

EO Exploitation Platforms Enabling Industry Growth



Creating a
European Marketplace
for Earth Observation Services



Procurement title	Support the EO Service industry: e-Marketplace
Procurement objective and short description	Develop an on-line Marketplace for the EO Service sector, as defined by EARSC study (MAEOS). Known as eoMALL, the platform will enable the interactive promotion of downstream EO-based products & services focused on the needs of a global user-base. Specific attention will be given to 2 or 3 market segments with customer stakeholder involvement to ensure a use-oriented solution.
Main Deliverables	Online platform environment for hosting the e-Marketplace EOMall
Planned Amount	350 K€
Procurement Type	ITT
Procurement Schedule	Q3 2017
Contract Duration	12 Months

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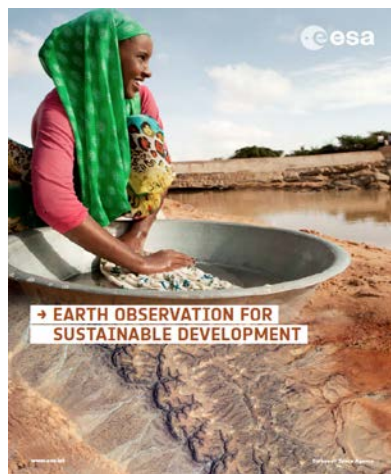
Sustainable Development

UN SUSTAINABLE DEVELOPMENT GOALS



...Earth observing satellites/Copernicus help to tackle many SDGs

SUSTAINABLE DEVELOPMENT



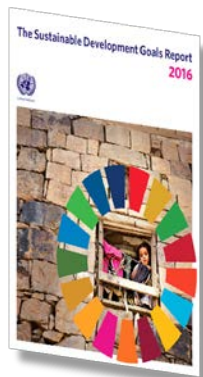
Procurement title	Larger-Scale Regional Demonstrations of EO-based information for Bank Programmes (4 Contracts)
Procurement objective and short description	Perform 2-3 regional demonstrations (each region 2-3 countries) of EO-based information that delivers benefit to key Bank projects /Programmes, with emphasis on World Bank, IFAD, ADB and IADB. 4 Domains: Marine resources & Coastal environment, Fragile & Conflict States, Disaster Risk Reduction, Climate Resilience & Proofing.
Main Deliverables	Documents : eg. Strategic Plan, Service Specifications, Capacity Building Plan, Stakeholder engagement, Communications Package, Service Utility and Impact, Stakeholder engagement review, Mainstreaming Roadmap, ...EO products & information services.
Planned Amount	2 M€ per contract
Procurement Type	ITT
IPC Meeting Date	03-04 May 2017
Procurement Schedule	Q2 2017
Contract Duration	36 Months

SUSTAINABLE DEVELOPMENT



Procurement title	EO Walk-In Clinic
Procurement objective and short description	Enable the small-scale, exploratory uses of innovative EO information in a wider range of development bank projects/activities. Emphasis on quick turnaround (weeks) of small but relatively frequent (2 per month, each 40K€) EO support queries raised by the banks. Procurement based on pre-qualification of a number of European EO service providers (grouped in at least two competing consortia) for a predefined set of EO thematic areas.
Main Deliverables	EO Information products
Planned Amount	2 M€
Procurement Type	ITT
IPC Meeting Date	28–29 November 2017
Procurement Schedule	Q1 2018
Contract Duration	24 months

SUSTAINABLE DEVELOPMENT



Procurement title	Earth Observations for the Sustainable Development Goals (SDGs)
Procurement objective and short description	Extensive analysis & demonstration of the role of EO information in the SDG framework
Main Deliverables	<ul style="list-style-type: none"> • In-depth review of the SDG Global Indicator Framework to assess current and potential use of EO for the full realization of the 2030 agenda on Sustainable Development; • Review the monitoring guidelines prepared by the UN system for a number of key indicators where EO is essential; • Showcase the value of EO for a number of SDG Indicators by performing a country demonstration in partnership with National Statistical Offices and relevant ministries;
Planned Amount	400 K€
Procurement Type	ITT
Procurement Schedule	Q2 2017
Contract Duration	18 Months

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EOEP5–Block4 Industry Info Day

Open Call for Proposals

- To maximize innovation opportunities under EOEP5-Block 4 up to 10% of total spend will be via a Permanently Open Calls for Proposals (15 MEuros / 5 years)
- The Permanently Open Call for Proposals will ensure:
 - Maximum support to innovation
 - Fast response, short turn-around times
 - Simple, straightforward access
 - Constant availability of resources over EOEP5 timeframe

MAIN ELEMENTS



- Single call for proposals covering all Block 4 elements
- Call open for entire EOEP5 period with regular submission deadlines (every 3 months)
- Proposals can be submitted at any time
- **Max Size: 150 k€/Max Duration: 1 year**
- **About 100 innovative projects to be selected over EOEP5 lifetime**
- Proposals must clearly demonstrate the nature of the innovation!
- ESA will review the call procedure in 2019 to determine any need for update/evolution

IMPLEMENTATION APPROACH



- **Minimize administrative effort by bidders:**
 - Proposal Submission based on a standard template, max 20 pages
- **Make maximum use of standard tools, including:**
 - ESA-STAR – electronic proposal submission, tender administration etc.
 - Procurement rules for small contracts (e.g. EXPRO)
 - Single process covering all Block 4 domains/elements
- **Maintain continuous capability to respond to innovative ideas:**
 - Spending plan ensures availability of funding for entire EOEP5 period
 - Rapid proposal evaluation process ensures timely response by ESA

KEY ELEMENTS/SELECTION CRITERIA

Activity Line	Main Focus	Primary Selection Criteria
Scientific Data Exploitation	Open Science Practices & Tools Advancing EO Methods & Techniques Advancing Earth System Science	Scientific Excellence
Exploitation Platforms - Enlarge Public Sector Benefits	Transfer new R&D to public users Major international initiatives Mainly national needs but also consider local, regional, etc...	Demonstration of user engagement & commitment
Exploitation Platforms - Expand Private Sector Uptake	Rapid prototyping of new products/services Customization of innovative analytics capabilities	Relevant stakeholder engagement Clear, credible follow-on prospects
Exploitation Platforms - Developing Network of Platforms	Small onboarding initiatives to integrate datasets and tools and address capability gaps with minimal engineering development	Demonstrated impact of proposed development
Exploitation Platforms - Evolving Shared Technical Capabilities	Rapid prototyping to support new analysis/fusion methodologies & state of the art visualization Development of innovative analytics capabilities to expand beyond EO specialist users	Clear, credible exploitation prospects
EO for Sustainable Development	New application concepts in Developing Countries Demonstrate EO applications to new IFIs	Relevant stakeholder engagement Clear, credible follow-on prospects