

## ESA EO Actions 2023-25:

Science, applications and preparing for Sentinel Expansion Missions

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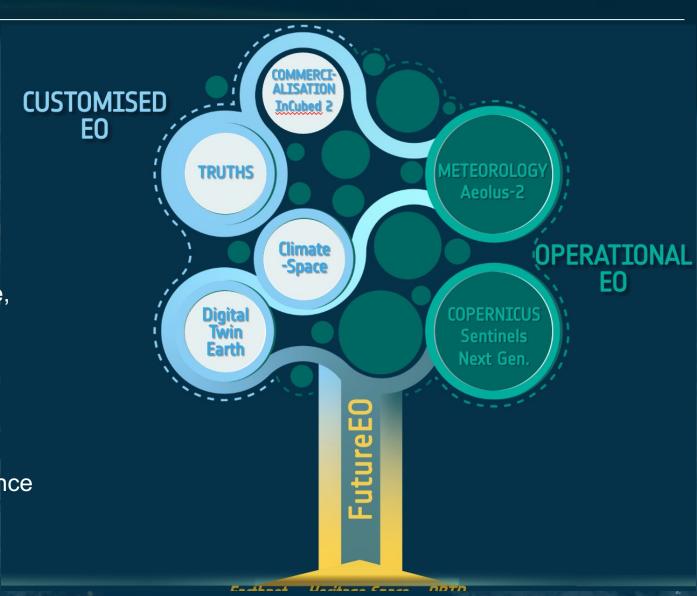
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## **Programmatic Background**



- Future EO is core development action that generates all other EO programmes
- Structured as four blocks:
  - Block 1 Foundations and Concepts
  - Block 2 Research Missions
  - Block 3 Mission Management
  - Block 4 EO Science for Society
- Block 4 (EO Science for Society) structured as several component action lines covering science, applications, industrial competitiveness, next generation digital environments, etc
- Strong scope for cross-fertilization with other funding opportunities, eg:
  - InCubed/TIA BASS
  - Climate-Space/Global Development Assistance
  - Civil Security from Space
  - Horizon Europe



# FutureEO-1 Segment 2 – Key highlights



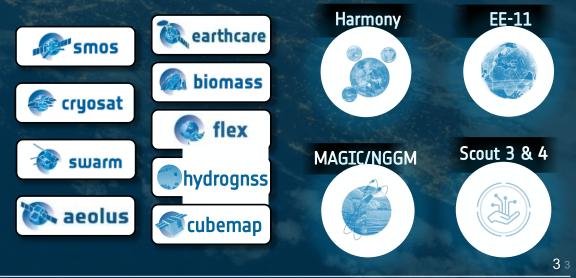


## Paving the way to the future

- Combining Mission Feasibility with enabling Technology & Science and Campaigns
- Prepare the whole EO family of missions
  - The Research Missions
  - Copernicus Sentinel Next Generation missions
  - Meteosat Fourth Generation and MetOp Third Generation missions
- Further science, applications and downstream industrial competitiveness
- + Enhanced "Generic Preparation of the Future" and "Instrument Pre-development"

### The Research Missions

- Implement BoostFutureEO early phases
- Implement Harmony as Earth Explorer 10 (pending successful UCM and PB-EO decision)
- Prepare candidate missions for Earth Explorer 11
- Issue and prepare call for EE 12 & 13 respectively
- Implement Next Generation Gravity Mission
- 2<sup>nd</sup> Scout challenge and implementation
- Operate and manage growing amount of EEs in orbit



# So what are we going to do in Future EO1 segment 2?



### Block 4 activity lines

- Science exploitation
- Applications
- Indusrial Competitiveness
- Digitial Innovation
- Regional Initiatives
- Permanently Open Call
- Sentinel User Preparation

Caveat: Future EO1 segment 2 is heavily under-subscribed



## **Science priorities**



Maximize the scientific impact of the Earth Explorers, the Sentinel missions and the huge synergies offered by the international EO panorama:

- Activities structured as a set of Science Clusters focused on major domains of Earth sciences
- collaborative research across teams and fostering a community approach towards common scientific goals
- collaboration with Horizon Europe through the EC-ESA Joint Earth System Science Initiative

Further enhanced collaborative research through the new Earth System Science Hub:

- an open science facility in ESA
- young and seniors scientist from MS and international top class researchers as visiting scientists

Open science at the core of the programme through:

- Fostering data sharing workflows and knowledge sharing though dedicated community tools (e.g.SNAP, Virtual Labs)
- Fostering wide dissemination of science results including advanced education and training

## Applications priorities – response to policy drivers



#### Mechanisms:

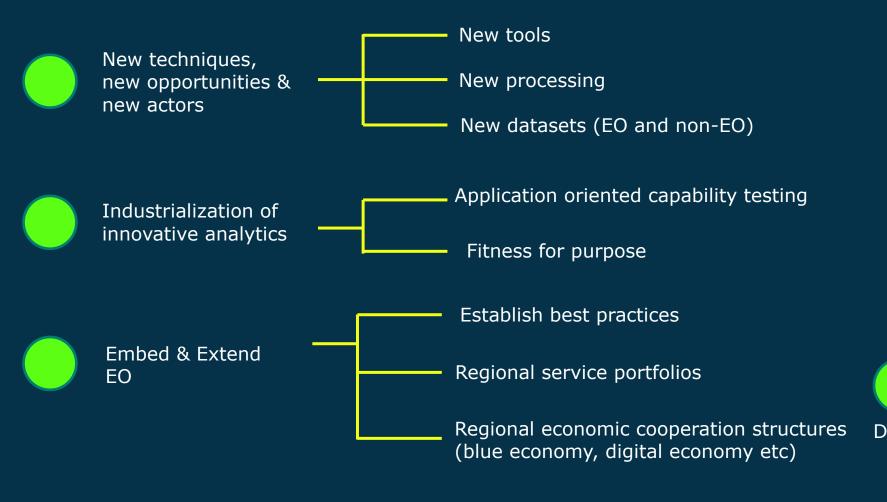
- rapid applications and fast-prototyping tests over representative local areas
- large-scale deployment and scaling-up of validated algorithms in a pre-operational context

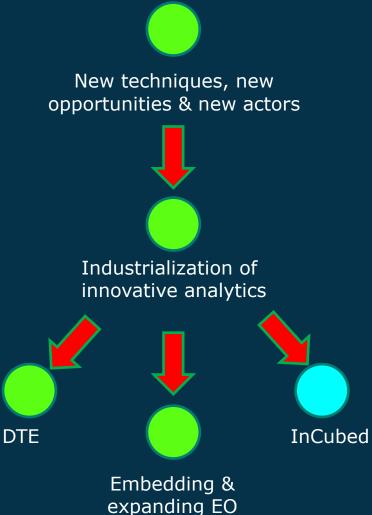
#### Target Policies per thematic domain

- Ocean: SDG 14 "Life below water", UN Ocean Decade (2021-2030), EU Marine Strategy Framework Directive
- Atmosphere European Monitoring and Evaluation Programme, EMEP (EMEP) Air Pollution, CLRTAP
- Food: UN SDG 2 & 6, EU newCAP and FarmtoFork, G20 Agriculture.
- Wetland: Ramsar Convention, SDG Target 6.6 on water-related ecosystems
- **Biodiversity**: Convention on Biological Diversity (CBD), Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES), EU Biodiversity Strategy for 2030.
- Ecosystems: EU directive on ecosystem accounting, UNCCD Land Degradation Neutrality (LDN), SDG 15.3, Natura 2000, UN
  Decade of Ecosystem Restoration.
- Urban: UN Habitat III New Urban Agenda, SDG 11 on sustainable cities and communities
- Water: UN International Decade for Action on 'Water for Sustainable Development', SDG 6, EU Water Framework Directive
- Soil and land cover: Sustainable Development Goals, UNCCD Land Degradation Neutrality, RAMSAR Convention, EU Thematic Strategy for Soil Protection, EU newCAP, UNFCCC and IPCC, WRI, CIFOR, FAO, GEO BON, GEO GLAM
- Forestry: SDG 15.2 on "sustainably manage forests", UNFCCC Paris Agreement REDD+, EU Forest Strategy, etc.

## **Industrial Competitiveness Overview**







## Industrial Competitiveness main activities



### **New Techniques, new opportunities & new actors:**

- Next generation processing methods customize & verify new processing methods, new data collection modes & enhanced integration of EO & non EO data (both algorithm/methodology industrialziation and verification in actual use cases( with stakeholders)
- Integration of EO and Agent Based Modelling develop & verify methods for effective fusion/integration of EO datasets (time series etc) with ABM of priority socio/economic processes (resource management, risk mitigation, transportation, urban design etc)

### **Industrialization of Innovative Analytics**

- Augmenting Industrial Services for Green Transition Address emerging opportunities for Green Transition related industrial applications and services in priority economic sectors (energy, transport, health, water, etc),
- Development & verification of innovative urban analytics tools prototype/verify methods for integrating diverse EO and non-EO (in particular mobile network & IoT) data streams with representative stakeholders
- Industrialization of Al Methods development and verification of methods to integrate EO data and advanced
  Al (eg Causal Al, Graph Al) in domains such as resource management/risk management as well as Al based
  methods to fuse EO and unstructured datasets for enhanced activity monitoring.

### **Embed & Expand EO**

- Establishment of Best Practices for EO exploitation in priority markets
- Establish regional portfolios & partnerships for priority regions (central America & Atlantic)

## Digital Platforms priorities



Ensure mid- and long-term credibility of the European platform ecosystem

Continuously enhancement of ecosystem as new ICT technologies become mature for full operational use by science and application communities

Evolve and maintain a competitive, interoperable federated environment, built on standard and open interfaces, Platform based "heavy lifting" as an enabling element for:

- science at global scale
- accelerating time to market for the downstream SME industry

## Permanently Open Call overview



### **Background**

 Open call mechanism requested by Member States to accelerate Future EO capacity to address new ideas from industry/science communities

### **Objectives**

- Rapid verification of innovative proofs of concept
- Scope covers entire activity spectrum for Future EO block 4 ie EO exploitation

### **Implementation Approach**

- Proposal template submitted according to regular deadlines
- TEB review against standard ITT criteria including innovation/impact WRT state of the art

#### **Experience to date for lessons learned**

- ~700 proposals received, >170 contracts started, average success rate ~ 1 in 4
- Consistently high quality of new proposals each batch means many good proposals not being selected
- Success rate for new actors basically the same as for experienced bidders
- Significant success rate for resubmitted proposals
- Rethinking of domain specific requirements (in particular user engagement)
- Need for rapid communication and debriefing with unsuccessful bidders

## FutureEO segment 2 EO4 Society Open Call



### Scope of new Call:

- All elements of Block 4 (science, applications, industry competitivens, digital innovation, regional initiatives, sentinel user preparation, foresight)
- Core of activity is EO data exploitation

### **Implementation**

- New implementation approach with two types of activity possible:
  - Conventional innovative project as for previous calls
  - Smaller, more rapid actions (eg earlier levels of maturity)
- 3 Submission batches per year but possibility to select increased number of proposals per batch
- Certain batches may include priority foci per batch to complement generic block 4 scope (eg new sensor availability, response to time limited issues etc)
- Rapid communication to unsuccessful bidders and improved debriefing (but limit on number of resubmissions)

### Financial aspects:

- Conventional projects max value 200k Euro
- Rapid verification and testing max value is 75k Euro

## Open call – summary of hints, tips, dos and don'ts



### The call is competitive

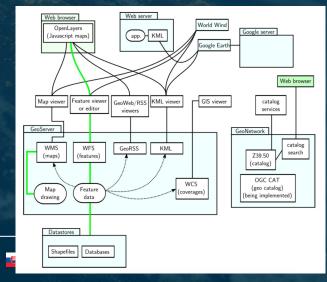
- The better you make your case, the more likely your proposal is selected:
  - What is the innovation content and why is this important
  - Do you demonstrate a good understanding of the problem areas to be addressed
  - Have you provided a credible technical development methodology (and have you explained it clearly)
  - Do you have relevant stakeholders engaged effectiively?
- Ensure the scope of the activity is clear- the main focus is concept verification

### Things to remember:

- Focus on what needs to be verified in the initial testing
- Al does not mean magic happens
- If WP1 is to agree the content of the remaining WPs then this not a proposal
- Your proposal is evaluated by technical ESA staff, not venture capitalists or technology journalists
- Your proposal should include a critical mass of EO exploitation
- There are other funding opportunities for ideas that do not fit the call

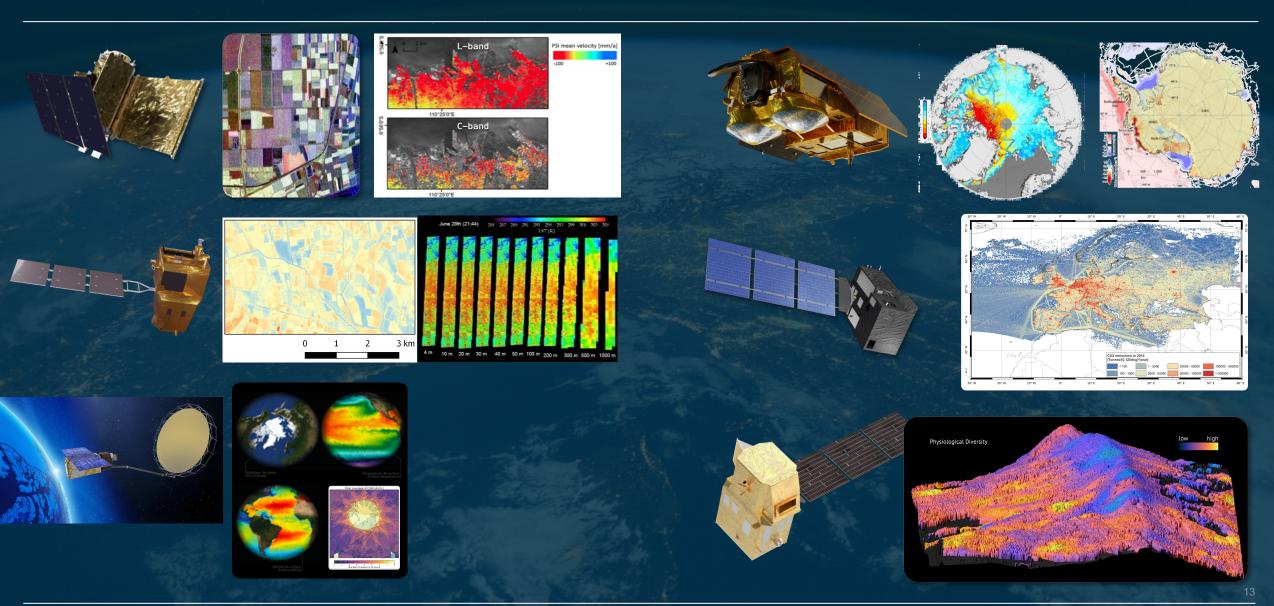






# **Sentinel Expansion Missions**





## **Sentinel User Preparation priorities**



Ensure European entities are optimally placed to exploit the opportunities associated with the future availability of data from the Sentinel Expansion missions.

#### These developments will:

- Address basic scientific developments of algorithms etc to ensure user specified information can be generated
  effectively and credibly from new data provided by Sentinel Expansion/NG missions
- Build expertise in research and downstream industry sectors for new instruments and their exploitation
- Construct pre-commercial industrial portfolio of applications and services ready to exploit Sentinel Expansion
  mission data as these become available. This builds on state of the art algorithm and processing capability
  developments and ensures European companies gain privileged position to exploit new export markets
- Support and stimulate users' and stakeholders' readiness to rapidly uptake derived information products within their operational activities

#### Planned ITTs:

- Basic Research & Algorithm development/validation –multi-mission focus for different scientific domains to address recommendations from community consultation process
- Application Capability Development & Verification multi mission enhanced application content/scope etc
- Novel processing methods for Sentinel Expansion class datasets

Plus training, toolbox expansion etc

# **Digital Twin Earth (DTE)**



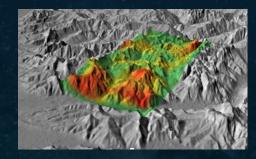
## "From ESA Space Data to the ESA Data Space"

### An ESA reference, dynamic and interactive representation of processes on Earth and beyond by:

- Systematically integrating diverse state-of-the-art Earth Observation-, Space Science- and other data sets
- Providing easy access to the data, processing & analysis resources and interactive platform functions
- New insights and discoveries through interdisciplinary research based on simulations & predictive modelling
- Utilising Cloud-, HPC- Al-technologies

### **Application Domains:**

- Societal Challenges
- Open Science and Innovation
- (Pre-) Commercial Services
- ESA Programme Support
- Unified ESA Space Data Management
- Education and outreach







Visualisation, reasoning and understanding of natural and human-induced phenomena on Earth and in Space by transforming data into information on an unprecedented scale.

## Conclusions/Take-home messages



- Hungary has invested in all ESA programmes related to EO exploitaiton
- This is significant funding and significant technical opportunity
- Hungarian organizations should capitalize energetically on this opportunity alone, with other Hungarians, with
  other regional partners and with partners in other ESA member states
- Our suggestions:
  - Use the different programmes effectively
  - Discuss opportunities with the relevant ESA staff and the national delegation
  - Participate to workshops etc to ensure your priority interests are noted and there is a framework for them to be addressed
  - Come to the briefings to bidders (first one is on 15/16 March 2023)
  - Submit proposals

## And finally...closing the loop



IPTF represents a "foot in the door" for short term enhanced competitiveness:

- Strengthen/customize capabilities to ensure "value for money" participation in the upcoming ITTs
- Address gaps in current work plan with complementary developments at national level (to then be taken forward in ESA actions)
- Not just downstream what is the space hardware agenda in HU (newspace/traditional space)

RPA represents an opportunity to develop totally new capabilities:

- start thinking about structured approaches to address national priorities
- RPA supports longer term planning



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