A Future Scenario of interconnected EO Platforms

How will EO data be used in 2025?
European EO data asset

- **Heritage missions**
  - Heritage Core GS (data preservation, curation & discovery)
  - *Third presentation*

- **ESA missions**
  - ESA Core Ground Segment
  - *Second presentation*

- **Sentinel missions**
  - Copernicus Core Ground Segment

- **National missions**
  - Core Ground Segments
    - ASI, CNES, DLR, UKSA, CSA

- **Industry missions**
  - Core Ground Segment industry

- **Meteo missions**
  - Core Ground Segment Eumetsat

EO-Innovation Europe

This presentation
What is an Exploitation Platform?

"Move User activities to the Data"

An innovative operations concept: users access a work environment containing the data and resources required, as opposed to downloading and replicating the data 'at home'.

→ An R&D scenario for data intensive exploration gradually complementing the traditional operations concept for the ground segment.

Exploitation platform (or community platform) = Virtual open and collaborative environment

bringing together:
- data centre (EO and non-EO data)
- computing resources and hosted processing
- collaborative tools (processing tools, data mining tools, user tools, ...)
- concurrent design and test bench functions
- application shops and market place functionalities
- communication tools (social network) and documentation
- accounting tools to manage resource utilisation

Exploitation platform = Community platform = EO platform = Applications platform
Different types of Exploitation Platforms

Examples at ESA of different types of Exploitation Platforms:

**Thematic exploitation platform (TEP) → Focusing on a geophysical theme (e.g. forestry)**

Current ESA Thematic Exploitation Platforms (TEPs):
- Geohazards (consortium prime: TerraDue)
- Hydrology (consortium prime: Isardsat,)
- Urban (consortium prime: DLR),
- Coastal environment (consortium prime: ACRI-ST),
- Polar (consortium prime: PolarView),
- Forestry (consortium prime: VTT),

**Regional (multi-thematic) exploitation platform:**

→ Focusing on a regional theme (e.g. West Africa)

Could be developed with ESA funds (no plans yet)
Not intended to be operated by ESA

**Technological exploitation platform:**

→ To assess new technologies to be rolled out to the exploitation platforms

Could be developed and operated with ESA funds,
Could be shared with national space agencies

**Mission/Sensor exploitation platform (MEP):**

→ Tailored to a particular mission/sensor community (e.g. an Earth Explorer user community)

e.g.
- BIOMASS mission community (exploitation) platform
- Proba-V mission exploitation platform

To be developed with ESA EOEP funds,
To be operated with ESA EOEP funds (as part of mission operations)

Exploitation platforms are also being developed outside ESA context
Interconnected Exploitation Platforms

The best worldwide
EO data asset
Europe EO

Operational public
EO data
(Sentinel, Meteo)

Heritage EO data
(e.g. Spot-1, Envisat)

R&D EO data
(e.g. Earth Explorers)

Commercial
EO data
(e.g. RapidEye, Deimos)

Airborne &
in-situ data

Increasing data
volume &
diversity

“traditional” data delivery

Network of
exploitation
platforms

“EO-Innovation
Europe”

“Big Data”

Evolving
user expectations

Vivid global user communities

5 interconnected user groups

Users public
services

Users R&D
remote sensing

Users profit-making
services

Users
geosciences

General public,
education, media

Objectives of the network concept:

✓ Enabling large scale exploitation of EO data
✓ Stimulating the innovation with EO data
✓ Maximising impact of European EO assets and preserving European independence

How:

✓ Interoperable/interconnected platforms around a core enabling element
✓ Open to multi-source funding initiatives
✓ Common governance rules
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A network of exploitation platforms

Outreach element

Stimulating element

Enabling element (common to all platforms)

Connect to other big data ecosystems

→ a key to empower European users
Technical aspects for interoperability, e.g.:

- federated user interfaces subsystems (e.g. interlinked EO data catalogues), interface & standards definition and agreement
- federated user management (i.e. user registers only once and is recognized by all exploitation platforms within EO-Innovation Europe)
- promotion of powerful data centres, supercomputing facilities and clouds capable of processing petabytes of data
- establishment of data transfer capabilities between the data centres
- development of common value-creation techniques (research in data analytics, information visualization, data mining, fusion of in-situ data with geo-information, etc.)

Economic aspects for interoperability, e.g.:

- a common EO data pool from all EO missions in Europe
- an optimised joint observation strategy amongst EO missions
- a processing capability management (sharing of resources and cloud services for processing)
- capturing requirements of scientific, operational and commercial users
- user management of user affiliation, user sponsorships and payments
- sustainable access to all resources (data, intellectual properties, enabling technologies / computing) by means of underlying implementation principles based on brokerage within an open environment.
Mission Exploitation Platforms (e.g. Proba-V MEP, Biomass MEP, etc.) animated by the DISCs (Data Innovation and Science Clusters):

- DISCs for Earth Explorers (animating their respective MEP)
- DISCs for EO sensor groups, e.g.:
  - Altimetry data expertise
  - Medium Res SWIR-TIR optical data expertise
  - Medium Res VNIR optical data expertise
  - Active microwave (SAR) data expertise
  - Scatterometer data expertise
  - Atmospheric composition UV-Vis data expertise
  - Atmospheric composition profile data expertise
  - etc.

The DISCs ensure that world-class knowledge of a particular sensor type is maintained and further developed in Europe. This spans from sensor technology to science or application user requirements.
• Thematic Exploitation Platforms (Geohazards, Urban, Hydrology, Polar, Coastal, Forestry, Food Security, etc.)

• Regional Exploitation Platforms (e.g. Baltic, Africa, etc...)

• Education Exploitation Platforms

• Strong link with non-EO data platforms, e.g. Geohazards TEP and European Plate Observing System (EPOS)

• All elements together support the implementation of exploitation initiatives, e.g. future EOEP Data Exploitation and relevant EC and national activities

Connecting EO communities and non-EO communities

EO-Innovation Europe for the world

Outreach element

Users geosciences

Users public services

Users profit-making services

General public, education, media

Big Data
EO Innovation Europe

linked with large science networks and ecosystems

European EO data asset

- ESA missions data
- Copernicus missions data
- Meteo missions data
- National missions data
- Commercial missions data
- Heritage missions data
- Airborne & in-situ data

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EO enabling element = Technical & economical interoperability
EO stimulating element = Remote sensing expertise
EO outreach element = Thematic expertise

Science network #1
Policy community
General public, media

Science network #2

Potential new networks / ecosystems which may thrive on EO Innovation Europe

Science network e.g. European Plate Observing System (EPOS) [H2020]
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**European EO data asset**

- ESA missions data
- Copernicus missions data
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- Heritage missions data
- Airborne & in-situ data

**“Data to Users”**

**“Users to the Data”**

**EO enablers**

- Technical & economic interoperability

**EO stimulating elements**

- Remote sensing expertise

**EO outreach elements**

- Thematic expertise

"Data to Users" and "Users to the Data" are connected through EO Innovation Europe, showcasing the flow of data and the engagement of users.
EO Innovation Europe → a potential architecture vision

Core ground segments

- ESA Core GS
- Copernicus Core GS
- Meteo Core GS
- National Core GS
- Commercial Core GS
- Heritage Core GS
- Airborne & in-situ data

Enabling element = Technical & economic aspects of interoperability

Technical standards

- EO data
- Processing power
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Rules

- EO platform
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Data transfer

Agreements

“Market place”

Non-EO data

Security

Standards, rules

European Space Agency
→ open to multi-source funding initiatives

EO-Innovation Europe is a key concept of the ESA EO Envelop Programme and provides a robust framework for “innovation and science” → an open concept, inviting initiatives of partners, at EC, national and industrial level.

→ a common set of enabling governance rules

• Open, non-discriminative access to platforms and resources
• Implementation approaches allowing EO Exploitation platforms to offer a mix of free services, sponsored services and paying services
• A clear and stable delineation of scope for institutional and commercial activities with a focus on encouraging commercial initiatives while making good use of existing capacities in the institutional domain where this is appropriate.
• Protection of IPR and data
• System and data security
• A clear level of commitment on business continuity
• A participative model for any evolution of the governance rules involving all stakeholders, including industry.

The EO-Innovation Europe values:

→ collaboration, sharing, networked governance, affiliation, “open for business”
Next steps

Preparation of next ESA Ministerial Conference (December 2016):

✓ A specific element addressing EO-Innovation Europe concept will be proposed to ESA Member States within the *EO Envelope Programme 5th period (2017-2021)*

✓ This EOEP-5 element is currently called “*EO Applications Platforms*”

Foreseen activities of the above EOEP-5 element:

- Establish reference architecture, interoperability, standards, protocols and governance (data and IPR policies) and Federated User Management framework
- Development of open platforms for user communities (thematic, national/regional, mission, technology platforms)
- Deployment of EO Big Data infrastructure, in partnership with ICT and geospatial industries

Approach:
- Integrate new research results, data sets, open science tools, from other ESA programmes
- Foster disruptive technologies e.g. big data analytics, crowdsourcing, etc...
- Facilitate coordination with non-ESA programmes: EC-DGs, Member States, GEO, WCRP, ....
- Close technical coordination with Member States and industry (support national and commercial initiatives and services)