Value of Open Science and Innovation

- **Advance Science**
  - Shared best-practices for science and R&D
  - Access to a wider pool of knowledge and resources
  - Sustainable research and development

- **Trusted and FAIR Science and Innovation**
  - More participation of underrepresented communities
  - Compensate for lacking resources and assets, reduce inequality
  - Trusted quality of research that is transparent and open for scrutiny

- **Reach the Wider Society**
  - Wider and more effective Communication and Collaboration
  - Spills-over in non-space domains

- **Foster Commercialization**
  - Access to complementary or lacking assets and capabilities
  - Shorter development cycles and lower costs
**EO Open Science and Innovation Vision**

**Full Free Open Data**
All input and output project data

**Fully documented Open-Source algorithms**
All code developed in Scientific Exploitation Projects

**Linked and executable code and data**
All data & code used and produced in scientific exploitation projects

**Open Access**
End-to-end open access Workflows and Documentation

**Open Science Practice**
Shared best practice across ESA-funded Science and Innovation activities

**Open Science Education**
Open educational resources and guidelines endorsed by ESA made available on an ESA Open Science and Innovation Portal

**Fully Reproducible on Platforms**
End-to-end Reproducible Workflows on infrastructure of ESA, NASA, national space agencies, industry and academia
Visualization, Exploration, and Data Analysis

Why?

- Interdisciplinary science depends on large amount of Earth science data and computational resources
- Working with these datasets is non-trivial
- Big data science requires advanced distributed computing knowledge

What?

VEDA is an open platform that brings key Earth science datasets next to open source tools for data processing, analysis, visualization, and exploration in a managed and more accessible computing environment
Finding relevant data products

Exploring data to identify interesting features
Developing advanced data products and analysis

Carrying out calculations "in place" without the need to download data

Dynamically allocating resources for computationally demanding processing
Conveniently delivering data through existing interfaces

Providing automatic access to interactive visualization capabilities

Allowing users to analyze your products within the environment
User friendly data-driven storytelling

Enrich science and applications narratives with interactive exploration
Earth Science Collaborative Open Development Environment

ITT to be published June 2023, 2M EUR

EARTH-CODE

Access

Linked

Code

Data

Edu

FAIR

ESA Science Clusters

Contributors and users

Scientific Community

Users

Industry

Providers of technology and services
Interoperability layer across infrastructures

Concept:
Integrate a variety of heterogeneous data and processes
Integration, training, provenance, and visualizations
Compliment current initiatives while pioneering advance solutions

Results:
Evolve spatial data, technologies, and related capabilities into valuable information for decision makers, science researchers, policy makers, data providers, and service providers to make informed decision and improve science and societal data usage and understanding.
Strategic joint ESA NASA, MS agencies initiative to drive digital innovation in Science

Reproducible Open Science Persistent Demonstrator

- Beyond "FAIR" - Reproducibility and Reusability at core
- Demonstrates Interoperability in Action -> OGC standards and openEO API
- Hosted and coordinated by OGC relying on partners' in-kind contributions (open data or open infrastructure)
- “Outside-In model of Open Innovation” Exploring innovative technologies

STATUS

- Agreement OGC-NASA-ESA formalised
- OGC Testbed-19 on datacube access tech. - KO 11 May
  https://www.ogc.org/initiatives/t-19/
- Specific use cases and pilot activities under definition

NEXT STEPS

- Partnership with MS and industrial actors
- Pilot on Reproducibility Q4/23
- Pilot on Visualisation Q1/24
Objectives

- Ensure a long-term framework - persistent Open Science Demonstrator where agencies / organizations contribute with data, tools, and infrastructures in a coordinated approach, building on existing investments

- Demonstrate end-to-end reproducibility on platforms for Earth Observation and Earth System Science workflows

- Create opportunities for cross-discipline scientific research in a neutral, web-based, permanently available Open Science framework

- Fully leverage on-premises and in-cloud capabilities, digital twins and newly accessible platforms through FAIR principles

- Create Analysis Ready Data (ARD) for diverse communities and accelerate standardization of ARD and Geo Data Cubes (GDC)

- Leverage visualization platforms for enhanced scientific communication and participation of research community, society and high-level users into the Open Metaverse.

- Define manageable Open Science processes and best practices for communities conducting geoscience research with heterogeneous data and tools on a distributed infrastructure

- Enable collaboration within and across communities and align on standards, vocabularies, and ontologies for data and workflows and develop community-wide Open-Source Science mechanisms.

- Compliment current initiatives, where possible include additional initiatives in this approach.
## (Tentative) Schedule

<table>
<thead>
<tr>
<th>Project month</th>
<th>Description</th>
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<tbody>
<tr>
<td>June - August '23</td>
<td>Development of a Call for Participation (CFP) for the Open Science Demonstrator Design Experiment and public release</td>
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<tr>
<td>September '23</td>
<td>Proposals review, participants selection, and contracting</td>
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<tr>
<td>Sept- October '23</td>
<td>Kick-off meeting implementation phase</td>
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<tr>
<td>Sept. – Dec '23 (Mar ‘24)</td>
<td>Implementation phase Design Experiment</td>
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<tr>
<td>Dec ‘23 – Mar ‘24</td>
<td>Open Science Demonstrator prototype operational</td>
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<tr>
<td>Feb ‘24</td>
<td>Development of a Call for Participation (CFP) for the Open Science Environment and integration experiments and public release</td>
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<tr>
<td>Apr ‘24</td>
<td>Proposals review, participants selection, and contracting</td>
</tr>
<tr>
<td>May – Aug ‘24</td>
<td>Implementation phase Pilot-1</td>
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<tr>
<td>Sept‘24</td>
<td>Delivery of results</td>
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