Hyperspectral Remote Sensing: A Key Pillar of Earth Observation Cooperation for Capacity Building Among European Space Agencies

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EXPERT: Vision, Collaboration, and Goals

ROSA

Founded in 1995 and based in Bucharest, **ROSA** coordinates Romania's space activities and represents the country in key European and international programs, including ESA (member since 2011), EUSPA, Galileo, Copernicus, and the UN. It leads national efforts in satellite navigation, space situational awareness, and partnerships with agencies like NASA and CNES.

ASI

Established in 1988 and headquartered in Rome, **ASI** manages Italy's space activities and represents the country in European and global space programs. ASI leads satellite missions, scientific research, and innovation, playing a key role in ESA and other collaborations.

DLR

Founded in 1969 and based in Cologne, with additional centers such as Oberpfaffenhofen, **DLR** is Germany's national research center for aerospace and space. It advances satellite technology, Earth observation, space exploration, and aeronautics, playing a key role in European and international space programs.

The Horizon Europe project EXPERT (June 2024 – May 2027) aims to strengthen the Romanian Space Agency's (ROSA) capacity in hyperspectral remote sensing by transferring knowledge and best practices from the leading space agencies ASI (Italy) and DLR (Germany). Focusing on applications in agriculture, cultural heritage, and mineralogy, the project combines training, field campaigns, and infrastructure development to enhance ROSA's data analysis and research capabilities. Partners will support ROSA through courses, seminars, and joint use of satellite data from missions like PRISMA and EnMAP, while also improving research management and integrating open science and social sciences aspects. The ultimate goal is to enable ROSA to independently lead hyperspectral research activities, increasing national and European collaboration and innovation in this field.

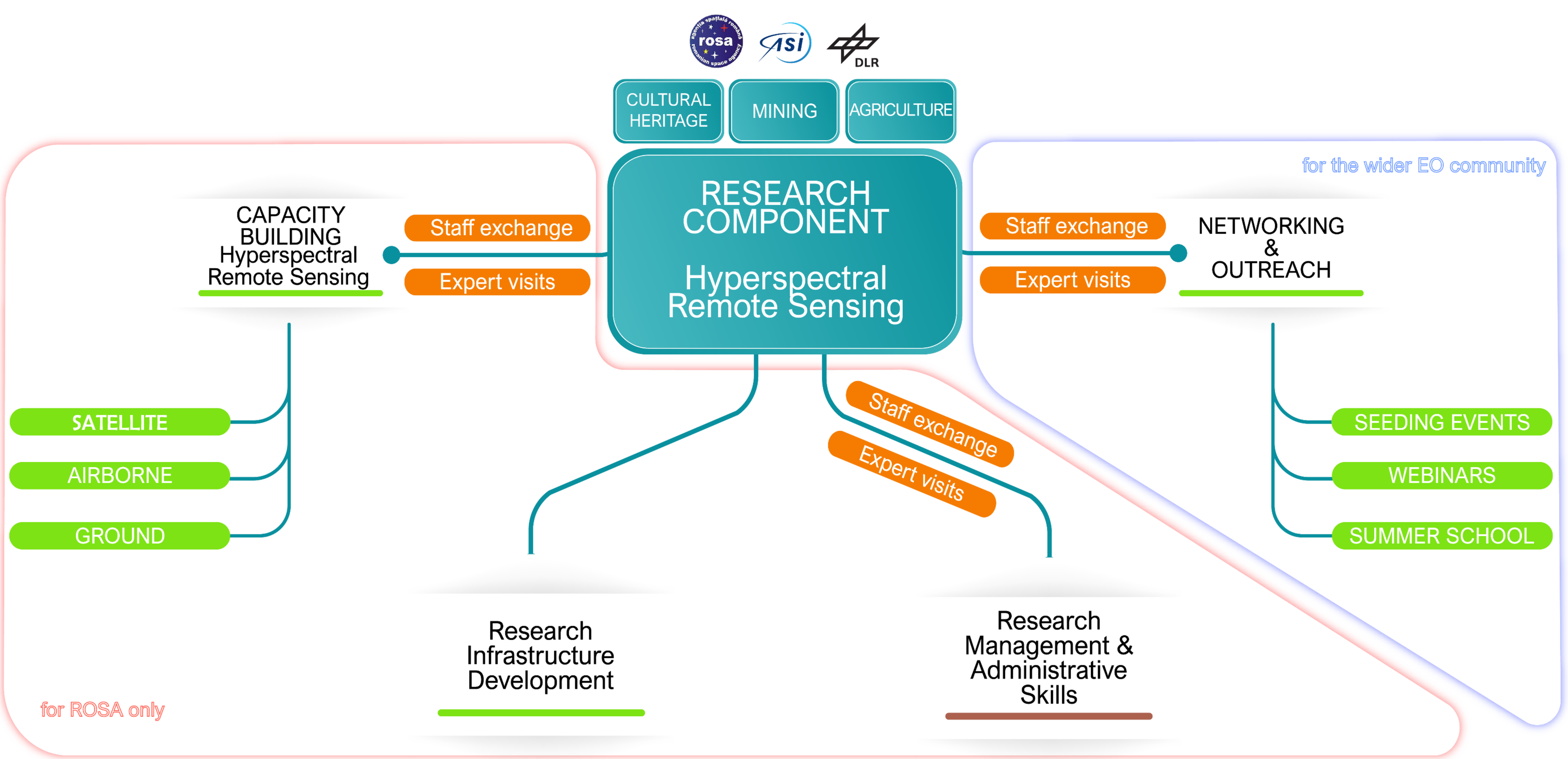

Figure 1 – *The EXPERT concept, with the research component at the core of the project*

Capacity Building

Objectives of capacity building

1. Enhance expertise in hyperspectral (HS) remote sensing at ROSA by advancing knowledge and developing specialized research infrastructure.
2. Leverage twinning partnerships with ASI and DLR to facilitate effective knowledge transfer and stimulate scientific excellence within the consortium.
3. Expand ROSA's network of collaborators by strengthening its role as the national coordinator of space activities.
4. Establish sustainable research capabilities at ROSA through the procurement and utilization of essential HS remote sensing equipment, enabling ongoing innovation and R&D beyond the project duration.

Actions implemented

1. Training at least 50% of ROSA's Earth Observation experts in hyperspectral remote sensing, leveraging existing expertise in multispectral and SAR domains.
2. Organizing 2 intensive capacity-building sessions led by ASI and DLR, including short-term staff exchanges, expert visits, and virtual training workshops to ensure knowledge transfer.
3. Conducting 3 practical research use-cases that demonstrate the application of hyperspectral remote sensing across diverse fields.
4. Developing and deploying dedicated research infrastructure at ROSA, including essential software and hardware tailored for hyperspectral remote sensing activities.

Case Studies

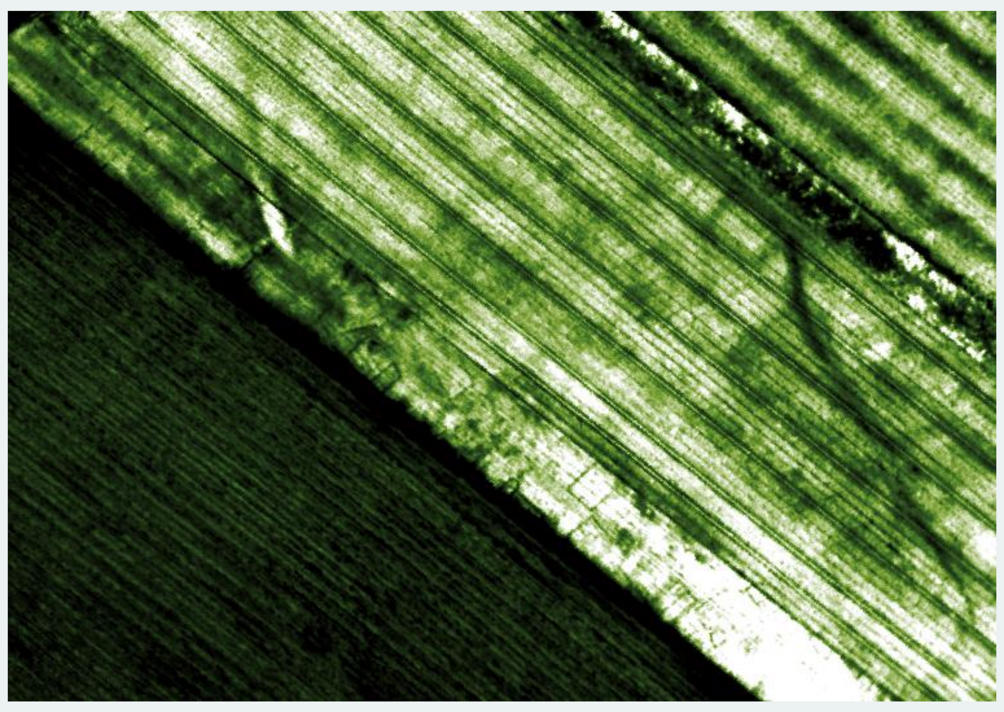

Figure 2 – ***Cultural Heritage Case Study*** *– Aisa Eagle Sensor Image with Transformed Chlorophyll Absorption in Reflectance Index (TCARI) applied*

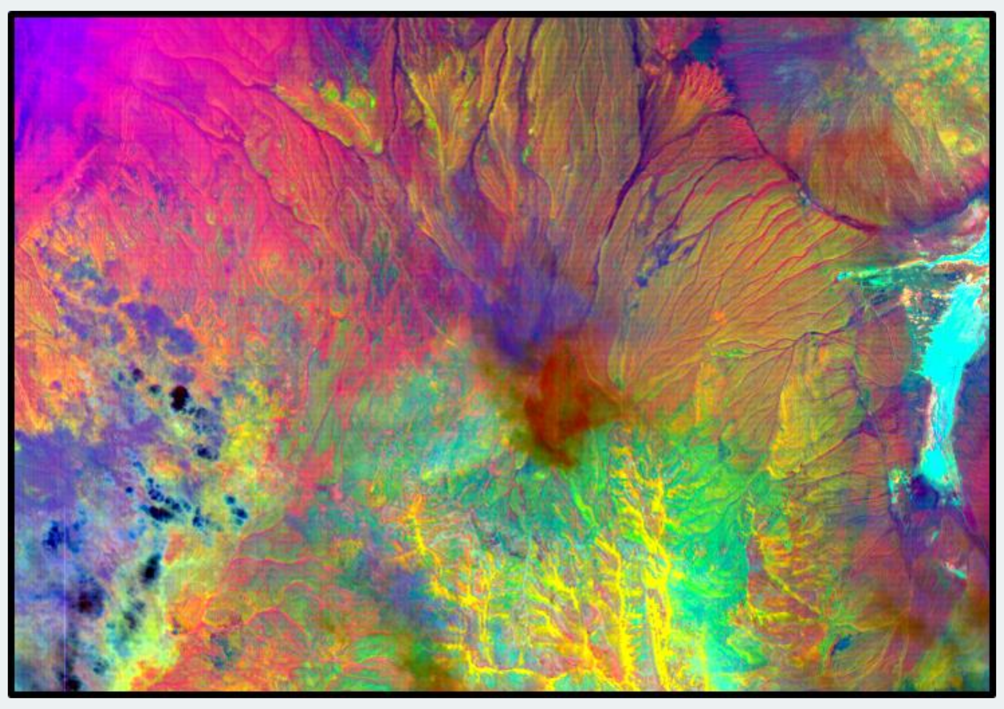

Figure 3 – ***Mining Case Study*** *– EnMAP Image with SWIR Principal Component Analysis (PCA)*

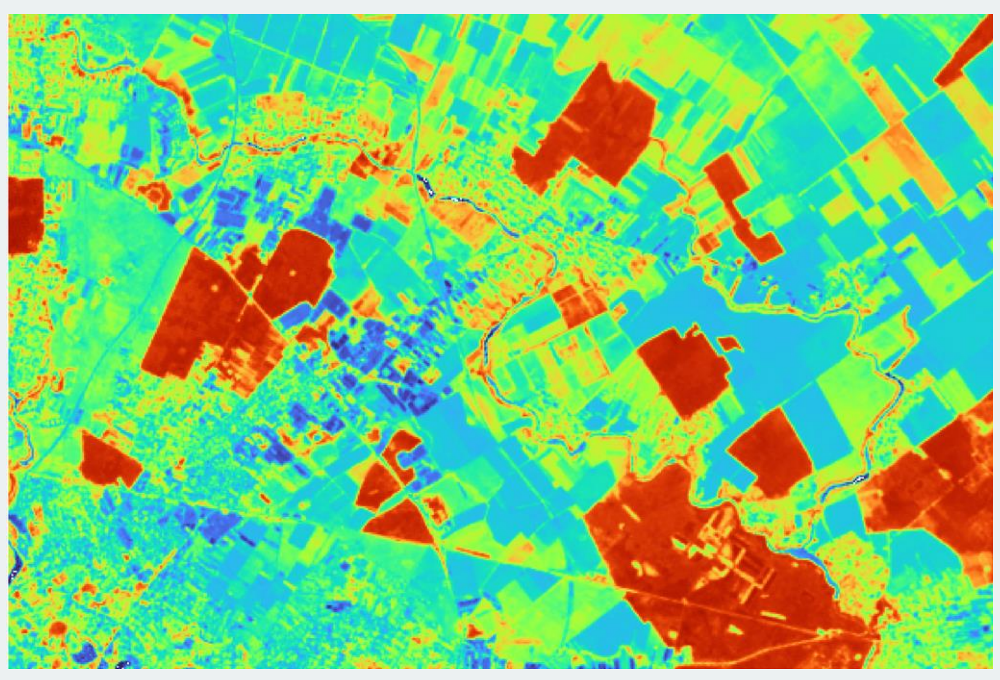

Figure 4 – ***Agriculture Case Study*** *– Moara Domnească Site, PRISMA Image, NDVI Index*

Expected results

1. Expert knowledge on HS remote sensing.
2. An extended network of potential collaborators.
3. Training materials.
4. Guidelines regarding the use of HS remote sensing for cultural heritage/ mining/agriculture R&D activities.
5. Publications in scientific journals (high-ranked).
6. Best practices for research management.
7. Enhanced research management roadmap.
8. New research management office in ROSA.

Dissemination and communication

1. Project website, social media accounts (e.g., LinkedIn, ResearchGate, Facebook), at least 1 press release/year, at least 1 media article/year, 1 e-newsletter/year.
2. Organisation of at least 3 networking seeding events (one virtual, two with physical participation), at least 2 outreach training webinars (to transfer the knowledge to a wider community), 1 joint summer school organised in Romania.
3. At least 3 joint papers published in high-impact scientific journals, at least 3 prestigious events actively attended (oral or poster presentations) at European level.
4. At least 2 capacity building training sessions for enhanced research management & administration skills, at least 2 training sessions focused on the exchange of best practices between the space agencies.

Point, scan, explore!

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