The Open Earth Monitor data processing for the Green Deal Data Space

Tom Hengl & Leandro Parente

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OPEN EARTH MONITOR

eurac research
Institute of Atmospheric Pollution Research
National Research Council of Italy
European Commission

OPEN EARTH MONITOR

€ Funding: 12,701,292.84 EUR

1 June 2022 - July 2026

Call: (HORIZON-CL6-2021-GOVERNANCE-01)

Project consortium

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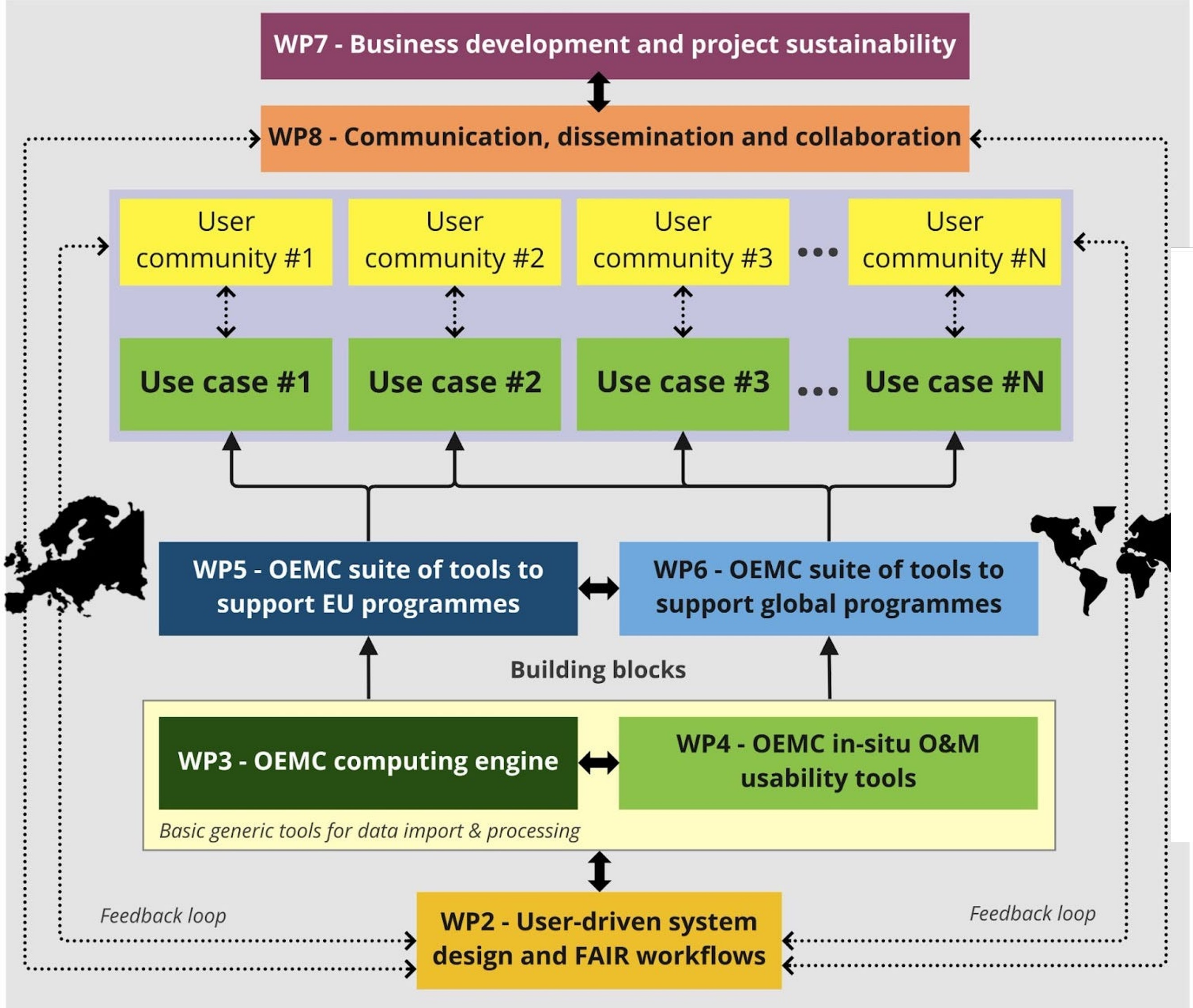
vizzuality.



Open-Earth-Monitor Cyberinfrastructure project 2023–2027: open environmental data to support EU's Green Deal

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Prepared by: Tom Hengl (OpenGeoHub), Leandro Parente (OpenGeoHub), Luca Brocca (CNR), Gregory Duveiller (Max Planck Institute for Biogeochemistry), Martin Herold (GFZ), Santiago Ferrer (Vizzuality)

> *OEMC project was kick-started in June 2022. The first six months of the project were used to build a detailed implementation plan outlined in this document. The project in general aims at continuous development and release of a number of building blocks (back-end, front-end, software and data solutions) components of pan-EU and global monitors and that serve concrete use-cases i.e. diversity of user communities. The main development principles of the*

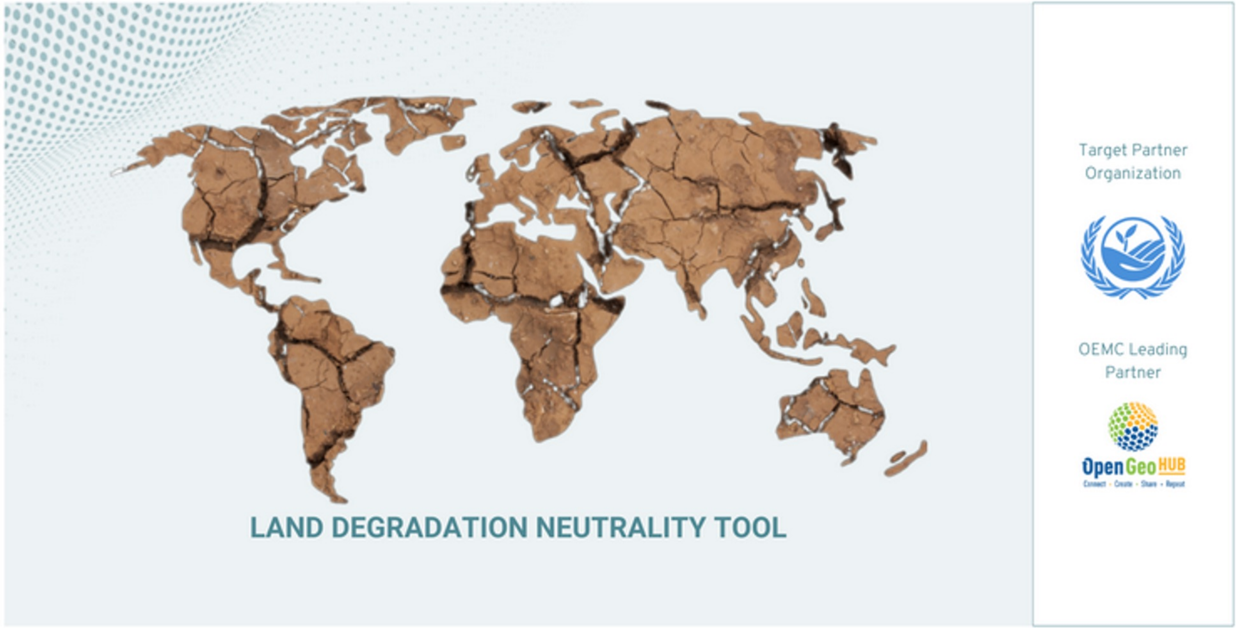
To enable a federated decentralized developments, we are organizing work under a 3-tier approach:

1. **Tier 1: the central EarthMonitor.org App** / viewer with quality-controlled layers and monitors;
2. **Tier 2: partner-based monitors** and building blocks (federated approach);
3. **Tier 3: on-demand monitors** that users can build rapidly with few lines of code i.e. by using out-of-box FOSS solutions such as G3W, Lizmap, xcube viewer, Rshiny apps or similar;

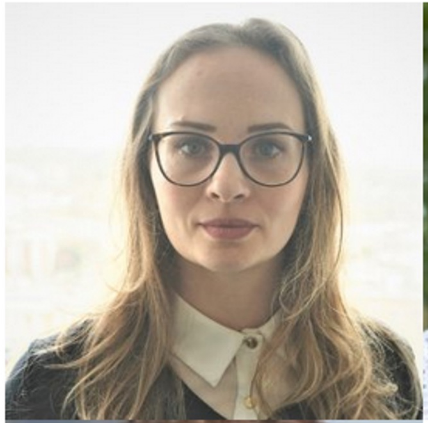
Scope: Global

- **Land Degradation Neutrality tool**
- **Biodiversity monitoring and reporting tool**
- **Soil carbon accounting system for world mangroves**
- **Large-area estimation of forest carbon emissions**
- **Planet health index**
- **SIF-based high spatial resolution GPP flux estimations**
- **Global drought monitoring at high resolution**
- **Meteo support for modeling of carbon sequestration tool**
- **Global topographic and hydrological service**
- **Development of the World-reforestation monitor**

GEO LAND DEGRADATION NEUTRALITY



The UNCCD currently measures land degradation neutrality at 300 m spatial resolution, while the modern open EO data is available publicly at finer resolutions even up to 10 m resolution. To make LDN data more usable and matching the field conditions, OEMC project aims at developing opensource tools for measuring land potential and productivity at higher resolution (up to 30 m) and providing analysis ready data in a distributed system with Cloud-Optimized GeoTIFFs.

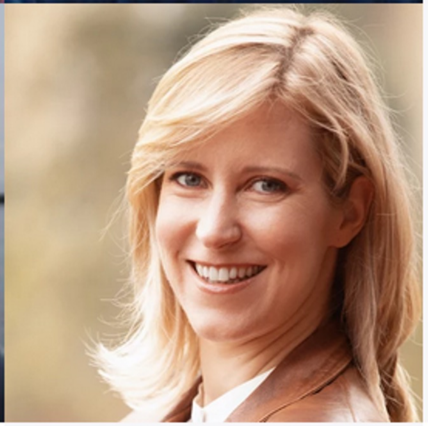



Peter Strobl

Senior Scientific Officer at the Joint Research Centre of the European Commission







Barron Joseph Orr

Lead Scientist for the United Nations Convention to Combat Desertification (UNCCD)


Goals of the use-case: UNCCD LDN

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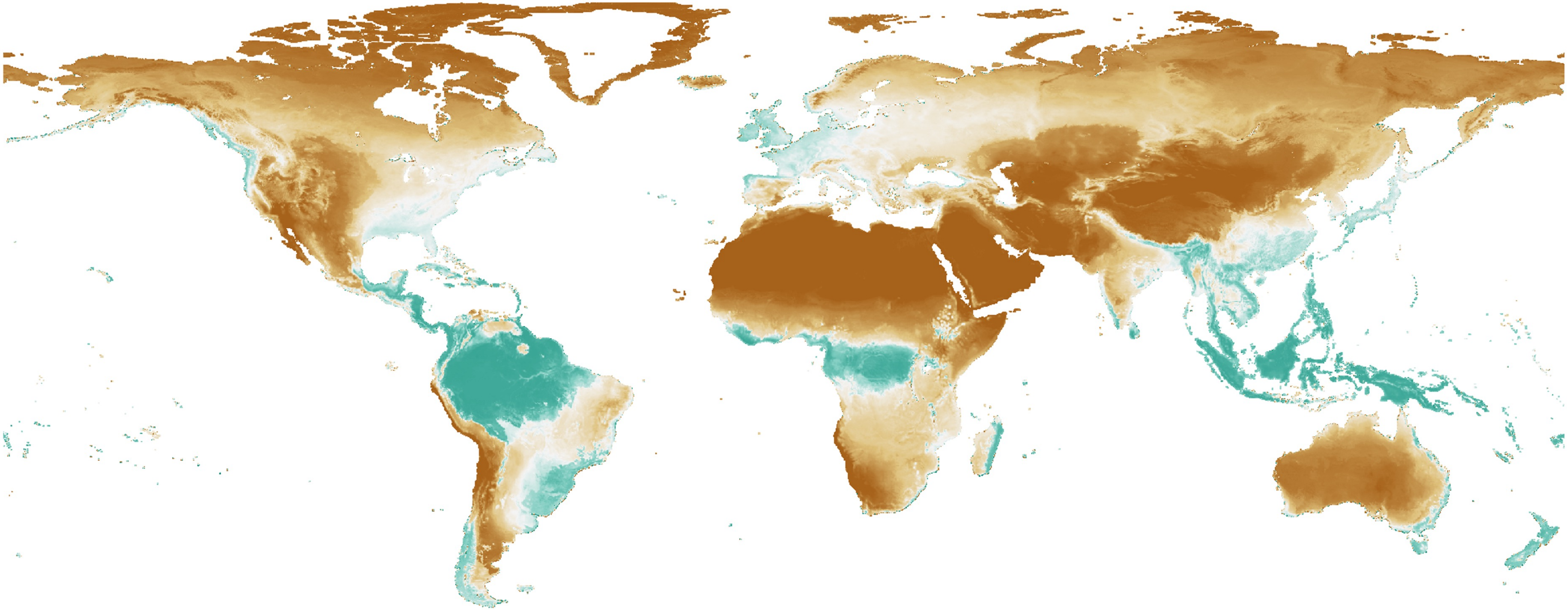
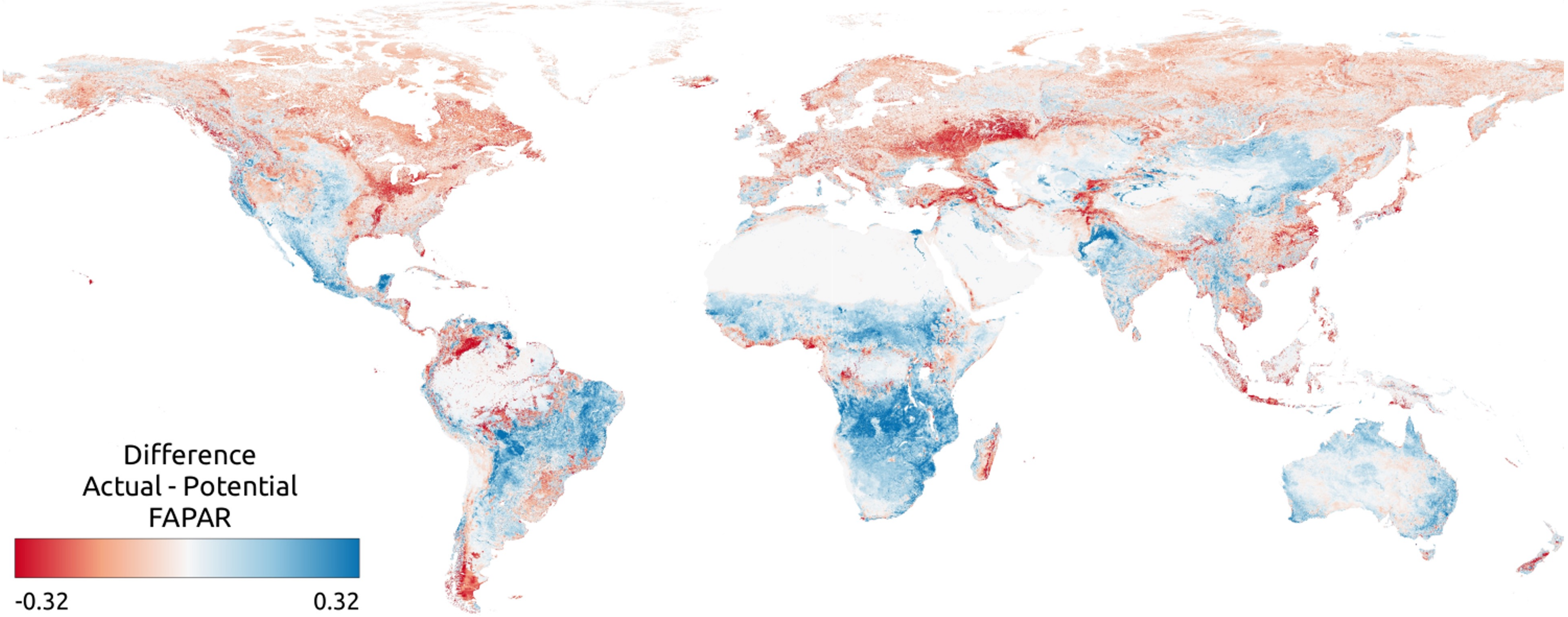
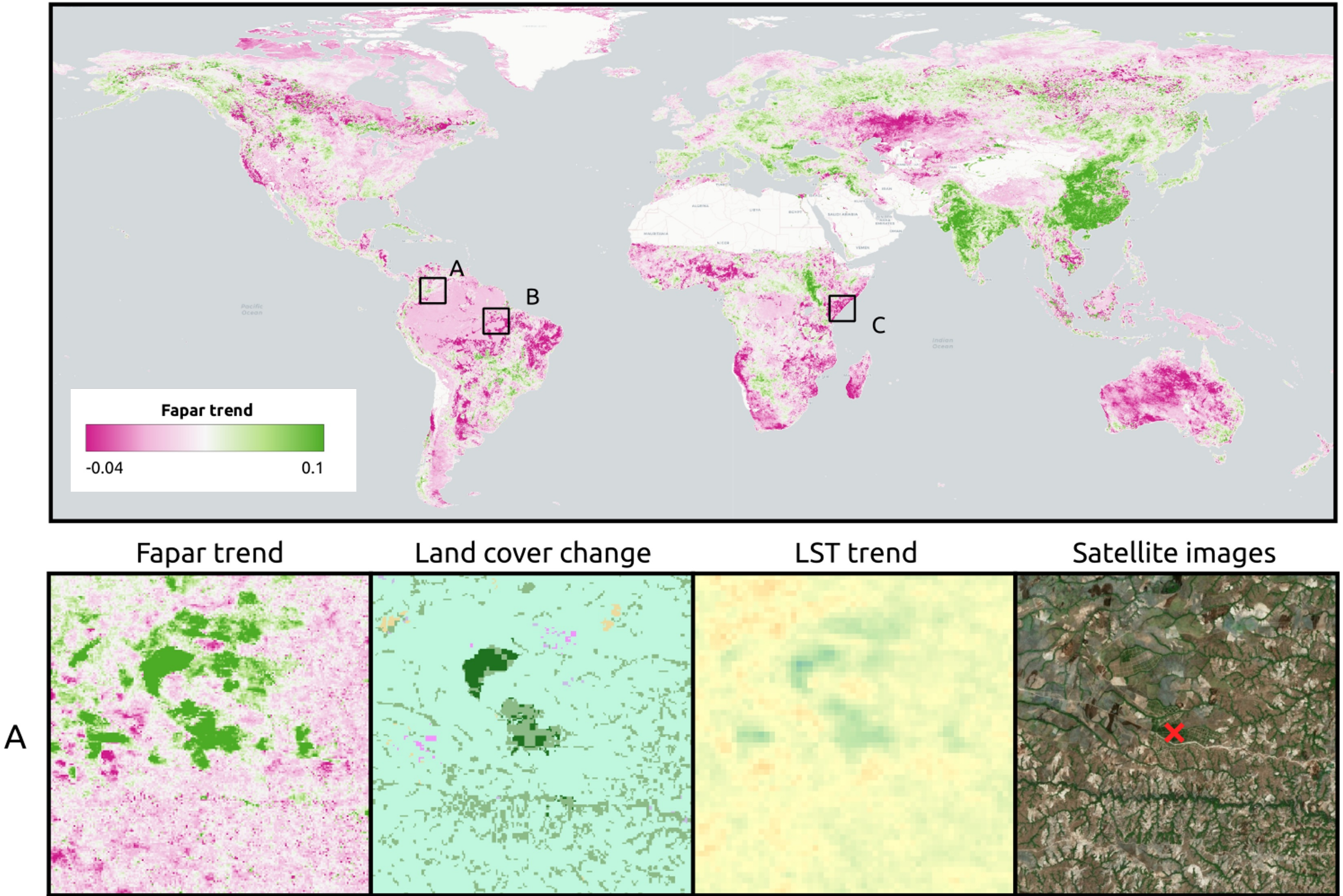
1. Help prepare state-of-the-art environmental data for UNCCD.
    a. 30m spatial resolution land cover / land use (1985–2022+) e.g. https://zenodo.org/record/8239305
    b. 30m spatial resolution time-series canopy height / monthly GPP (kg/ha/yr),
    c. 30–100m spatial resolution soil organic carbon stocks (kg/ha for 0–100 cm depth),
2. Develop / propose novel, more objective methods for land cover degradation assessment.
    a. E.g. FAPAR / GPP time-series analysis combined with gap-filling.
    b. Map potential FAPAR / GPP (map gap between potential and actual).
    c. Provide estimate of prediction errors per pixel.
3. Make data more easy-to-use (STAC, QGIS plugin, data portals…)

Potential monthly FAPAR for 2021 (250m)



Actual vs potential




Fapar trend
-0.04
0.1
A
B
C
Fapar trend
Land cover change
LST trend
Satellite images
A

Land potential assessment and trend-analysis using 2000–2021 FAPAR monthly time-series at 250 m spatial resolution

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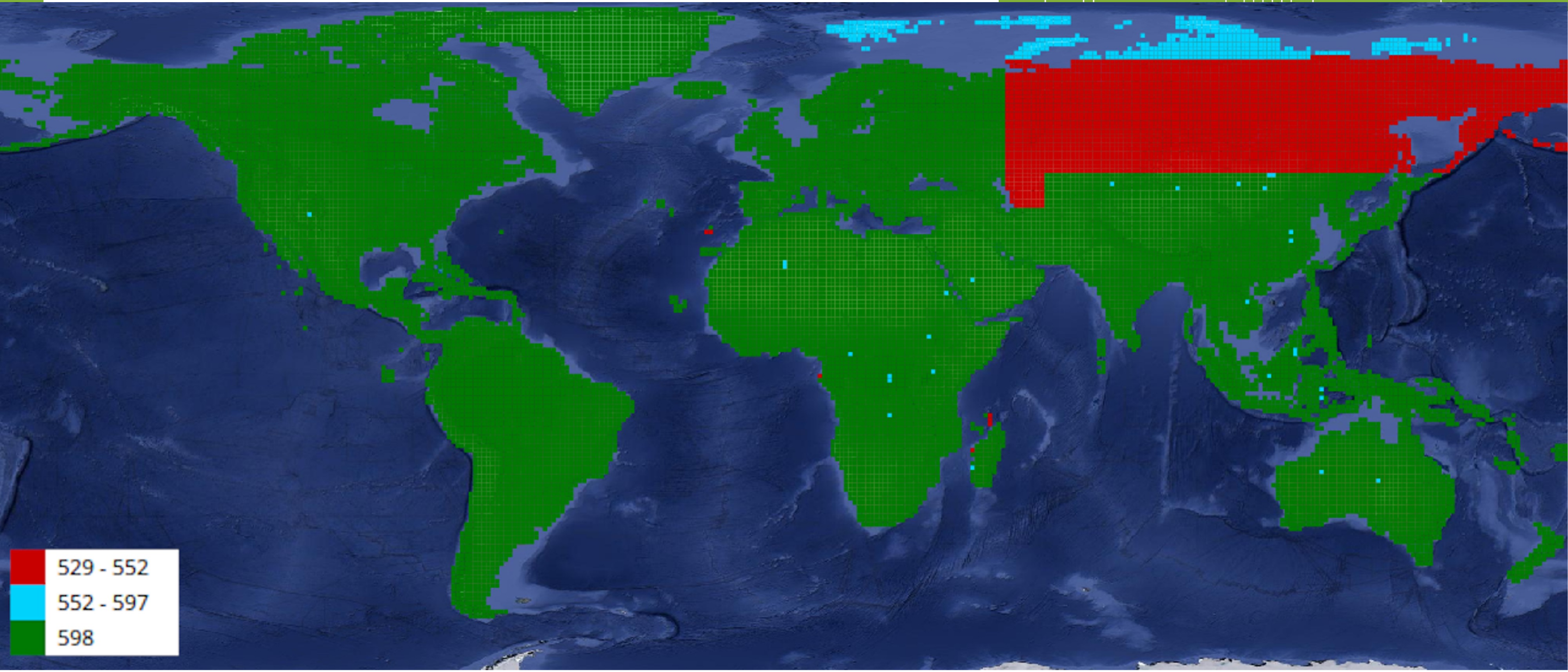
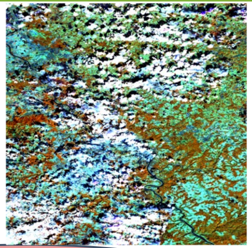
The data and code are available from: https://doi.org/10.5281/zenodo.8381409; code used to produce analysis and visualizations is available at https://github.com/Open-Earth-Monitor/Global_FAPAR_250m

Landsat ARD time-series



26 years (1997 - 2022) x 23 composites (16-day each) => **598 images**

Landsat ARD-2 — Processing pipeline



ARD-2 Imagery (1.3 PB)

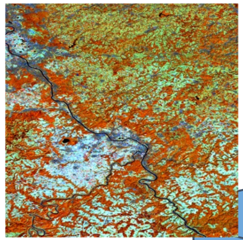
Cloud-screening
(using QA band)

Bi-monthly aggregation
(weighted by cloud_cover)

Intermediate output

Temporal gapfilling
(Seasonal convolution)

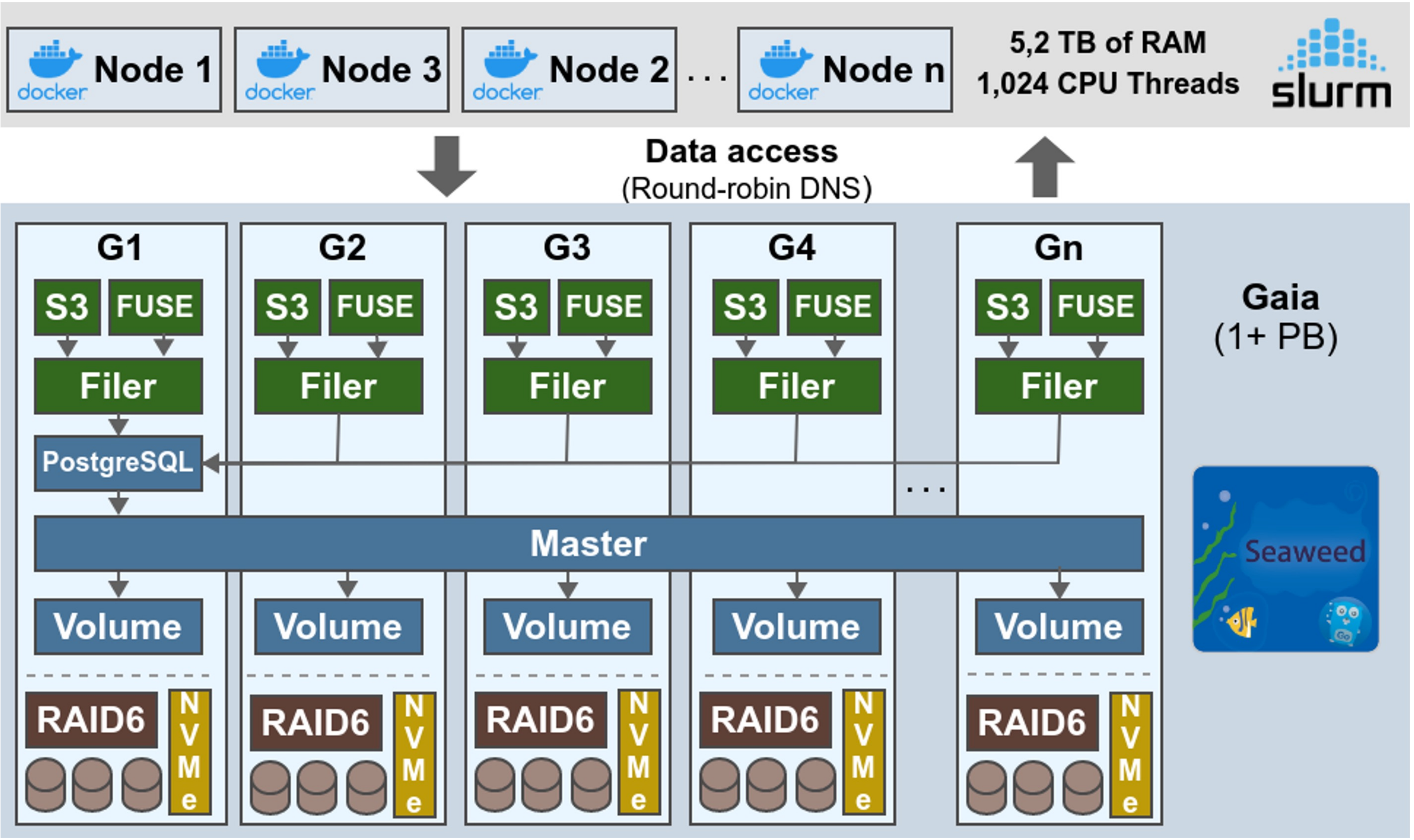
Mosaicking
(Analysis-ready & cloud-optimized)



ARD-2 ARCO (400 TB)

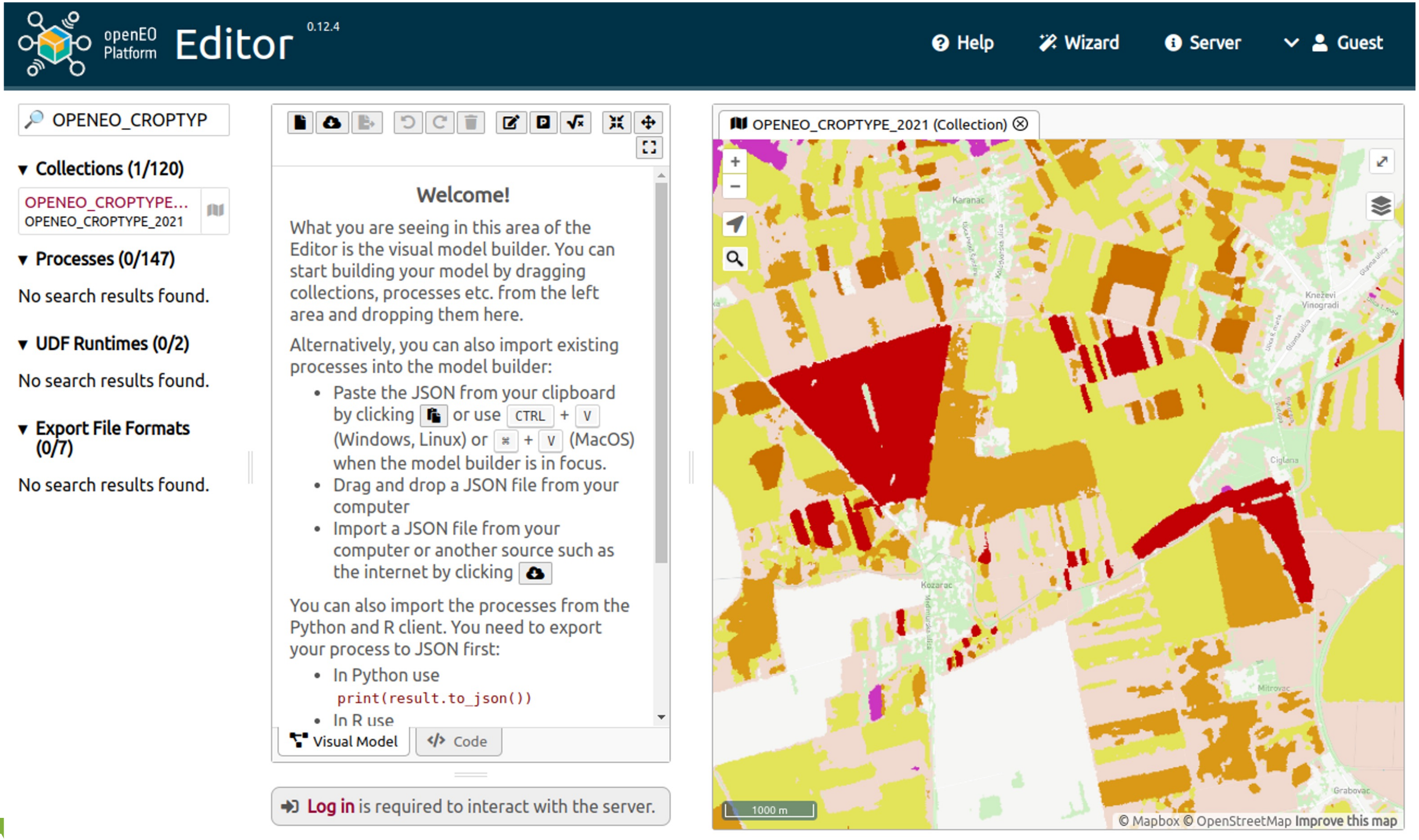
- Conversion from **Uint16** to **Byte**
- Reduction of **598** to **312** timesteps
- **No gaps** at all & per-pixel metadata

Our back-end solution: SeaweedFS



- **Load balancing** across all storage nodes (G1-n)
- S3 and file **metadata** stored in PostgreSQL
- **BLOB metadata** stored in NVMe
- **BLOB data** stored using RAID6 (HDD)
- If a storage node is **offline** the cluster might become inconsistent

Crop-type mapping using OpenEO.cloud



Task 5.7: Development of EU-crop monitor

Utility of AI4Boundaries and EuroCrops as training datasets for field delineation

Leveraging GSAA datasets for field delineation

EO Research · Follow
Published in Sentinel Hub Blog · 14 min read · Aug 2

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Written by Sara Verbič. Work performed by Devis Peressutti, Nejc Vesel, Matej Batič, Žiga Lukšič, Jan Geršak, Matic Lubej, Nika Oman Kadunc and Sara Verbič.

Automatic field boundary delineation in agriculture requires high-quality and diverse input data to train accurate and robust machine learning models. In this blog post we will describe our analysis of the AI4Boundaries and EuroCrops datasets. We will delve into the data preparation steps taken to optimize these datasets for training a field delineation model, highlighting their strengths and weaknesses.

A crop field serves as the fundamental management unit in agriculture, and accurately delineating its boundaries enables capturing crucial information regarding their size, shape, and spatial distribution. Efficient and precise delineation of field boundaries holds significant implications for a range of

Fig 1. Polygon vectors defining agricultural parcels based on Sentinel-2 imagery.