



Land Monitoring

Copernicus Land Monitoring Service - Products & data access

01/10/2024 – Copernicus Land Monitoring Workshop

Joanna Przystawska & Lorenzo Solari, EEA



PROGRAMME
OF THE EUROPEAN UNION

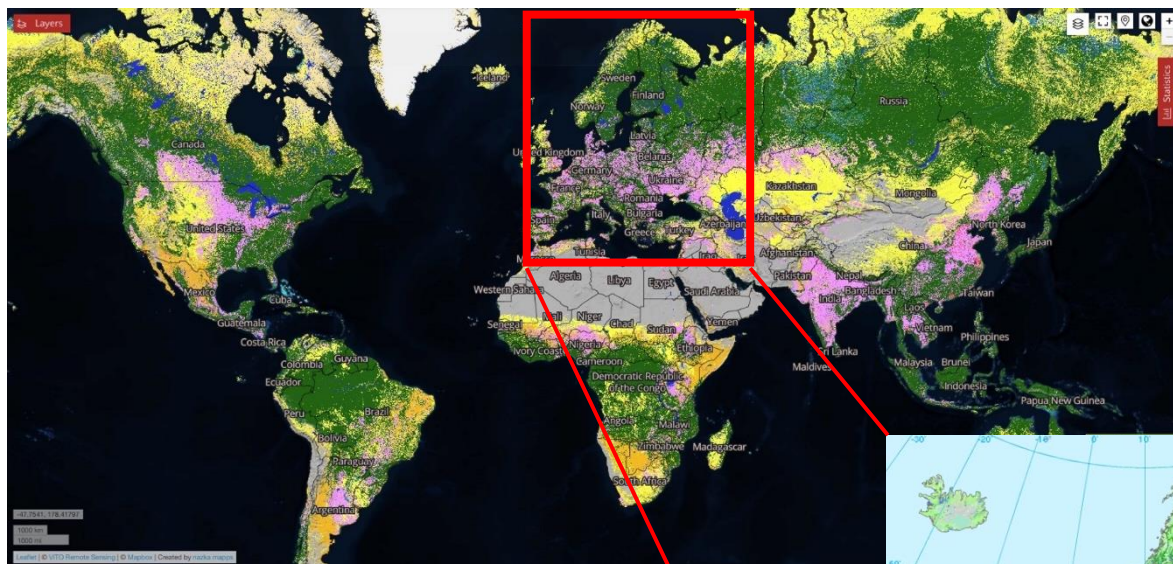


Implemented by



European
Environment
Agency

The 3 components of CLMS

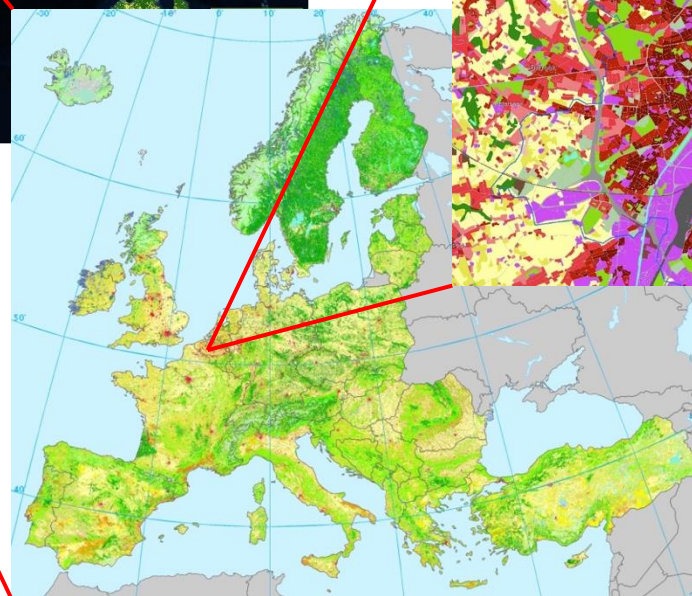


CLMS global (JRC)

CLMS local component (EEA)



CLMS pan-European (EEA)



PROGRAMME OF THE
EUROPEAN UNION



Land Monitoring

Implemented by



European
Environment
Agency



Land Monitoring

The CLMS-EU Portfolio



PROGRAMME OF THE EUROPEAN UNION



Implemented by

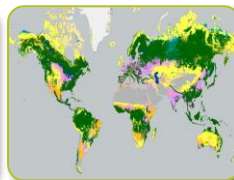
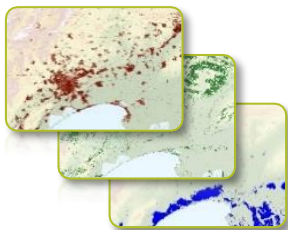


European Environment Agency

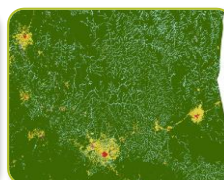
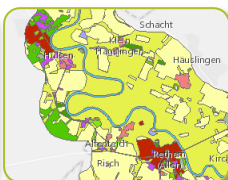
CLMS portfolio: Categories of products



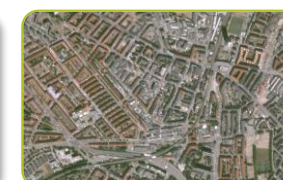
Land Cover and Land Use Mapping



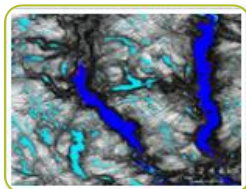
Priority Area Monitoring



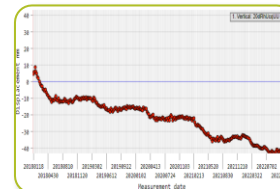
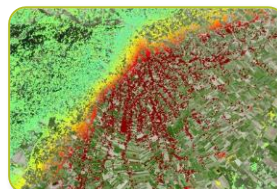
Satellite Data



Bio-geophysical Parameters



Ground Motion Monitoring



Reference and Validation Data





Land Monitoring

Land Cover & Land Use



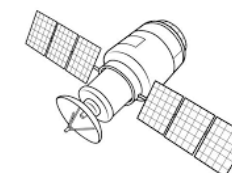
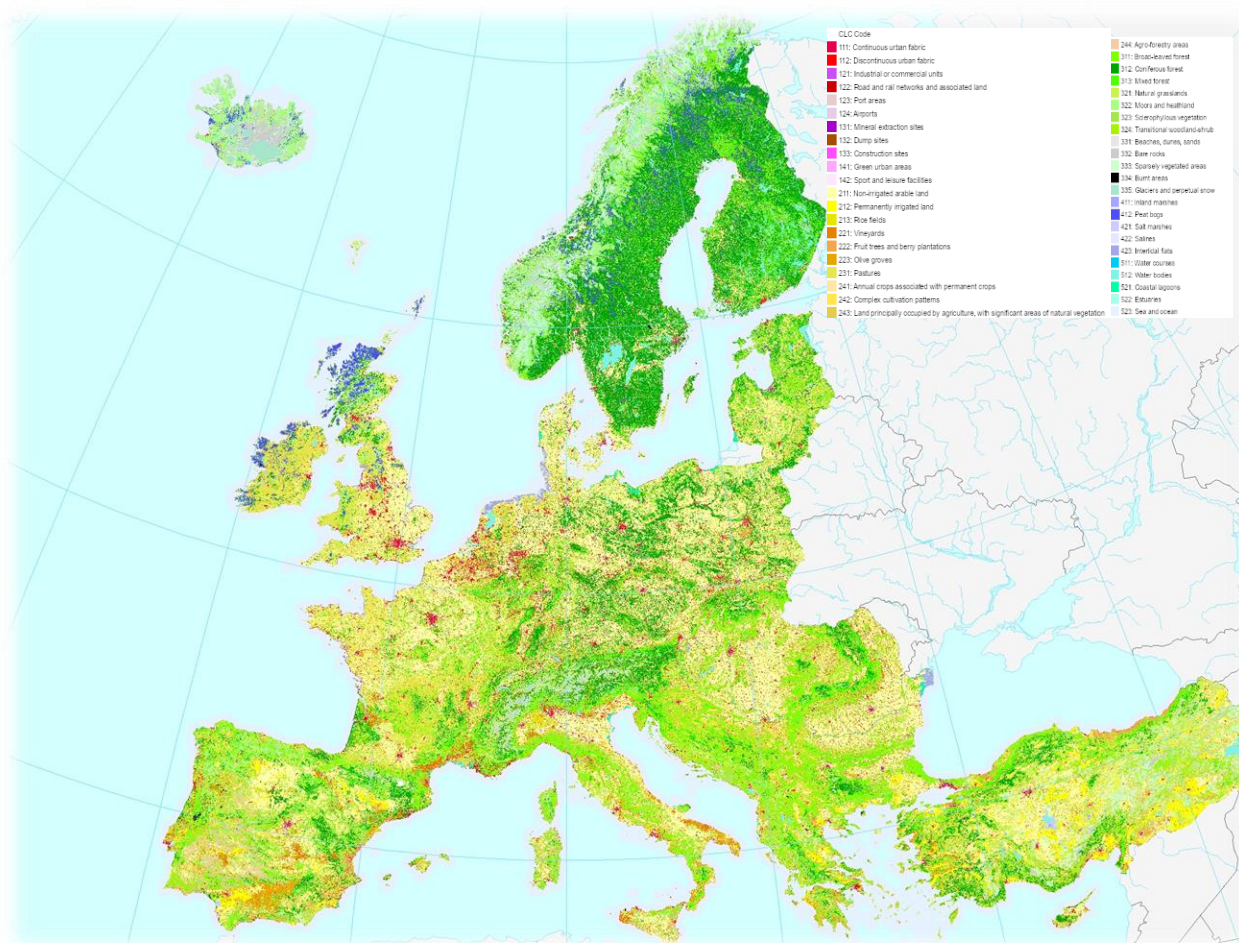
PROGRAMME OF THE EUROPEAN UNION



Implemented by  European Environment Agency

Land Cover and Land Use – Corine Land Cover

MMU
25 ha



**Sentinel-2
from 2018
onwards**

1990
2000
2006
2012
2018
2024



PROGRAMME OF THE
EUROPEAN UNION



Land Monitoring

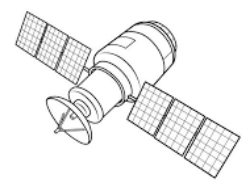
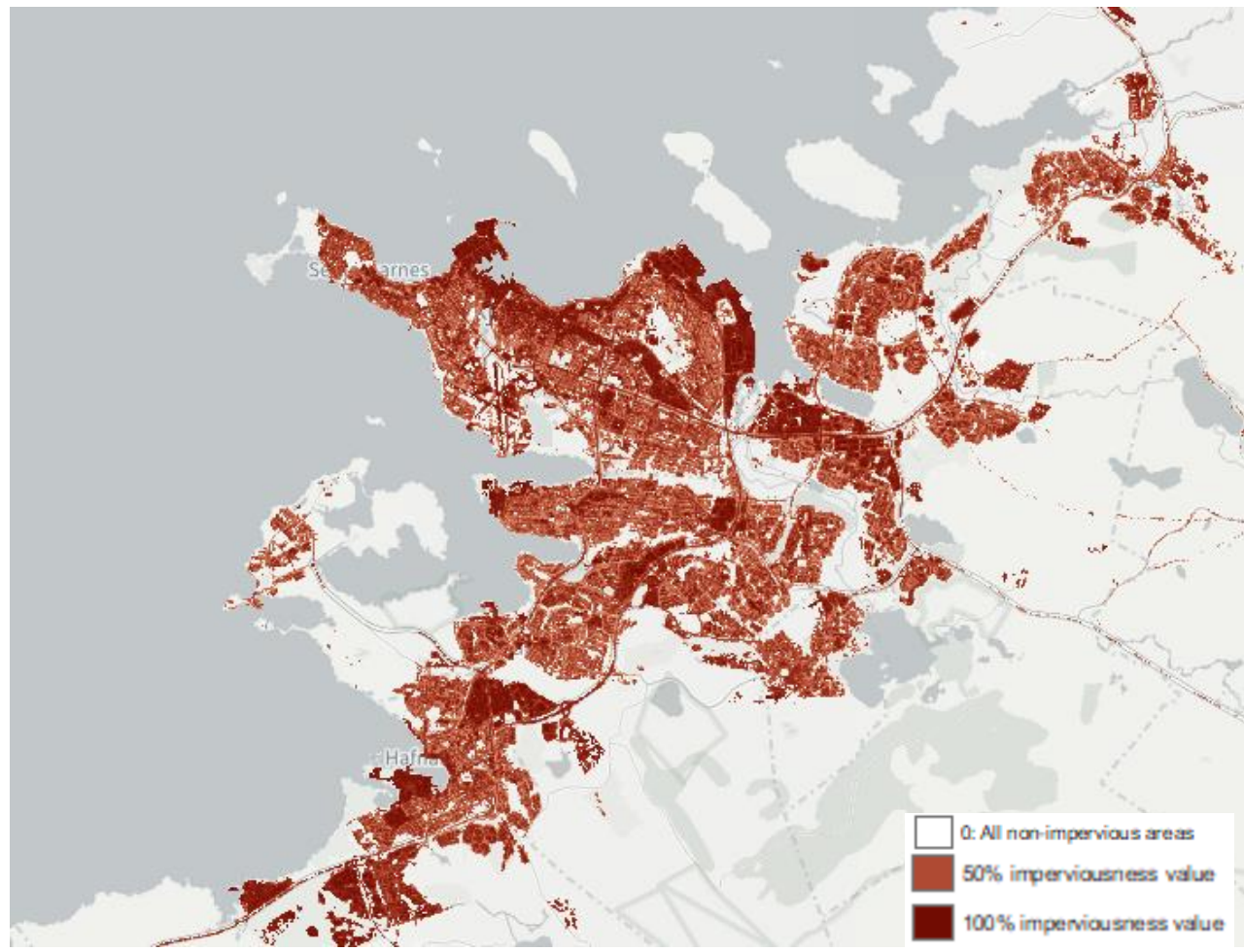
Implemented by



European
Environment
Agency

Land Cover and Land Use – Imperviousness

10 m,
20 m,
100 m

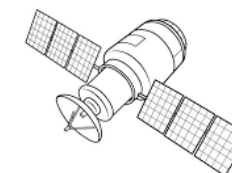
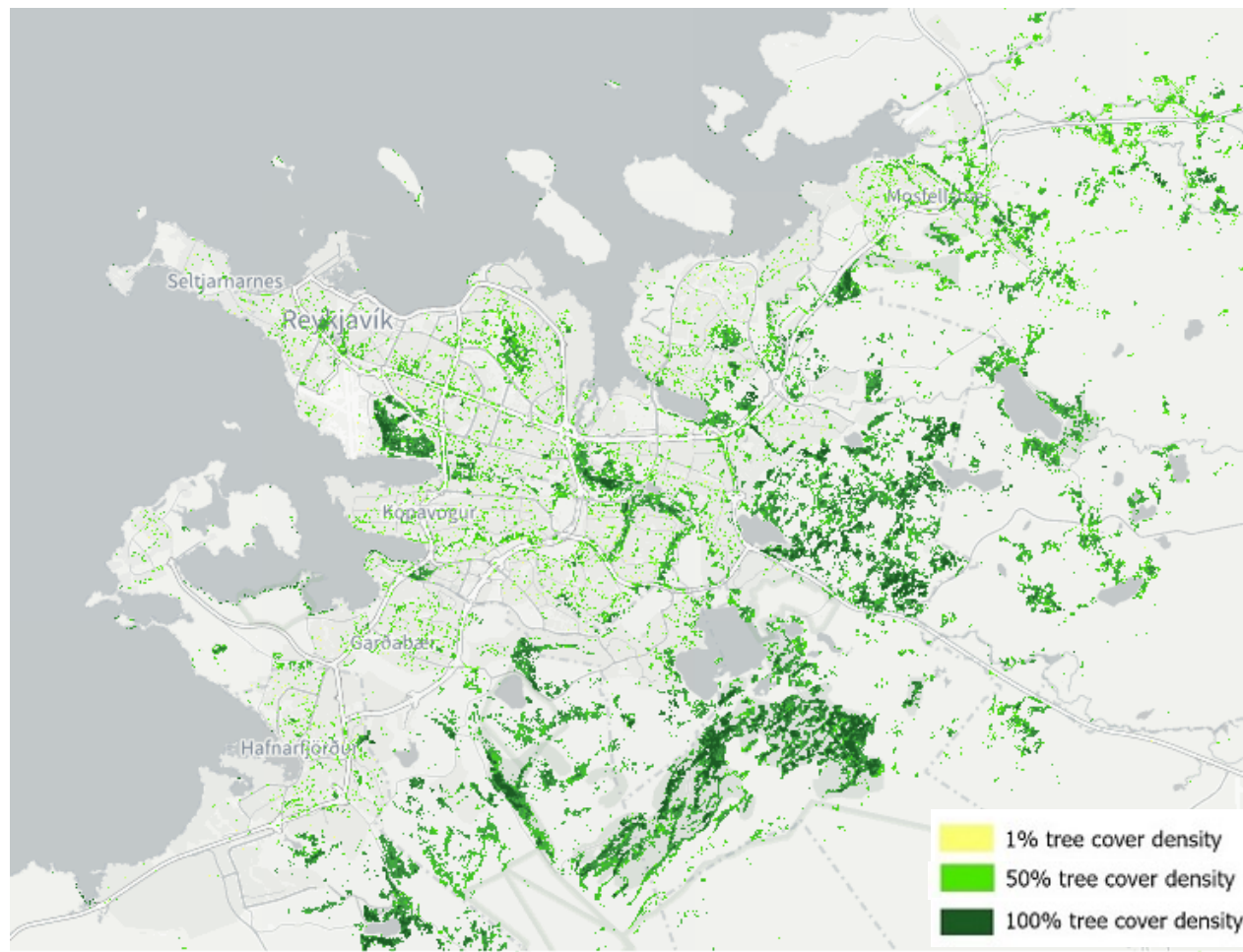


**Sentinel-2
&
Sentinel-1**

2006
2009
2012
2015
2018
2021

Land Cover and Land Use – Tree Cover Density

10 m,
20 m,
100 m



**Sentinel-2
&
Sentinel-1**

2012

2015

2018

2019

2020

2021

...



PROGRAMME OF THE
EUROPEAN UNION



Land Monitoring

Implemented by



European
Environment
Agency



Land Monitoring

Priority Area Monitoring



PROGRAMME OF THE EUROPEAN UNION



Implemented by  European Environment Agency

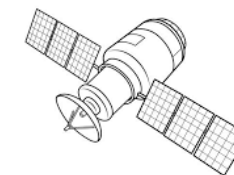
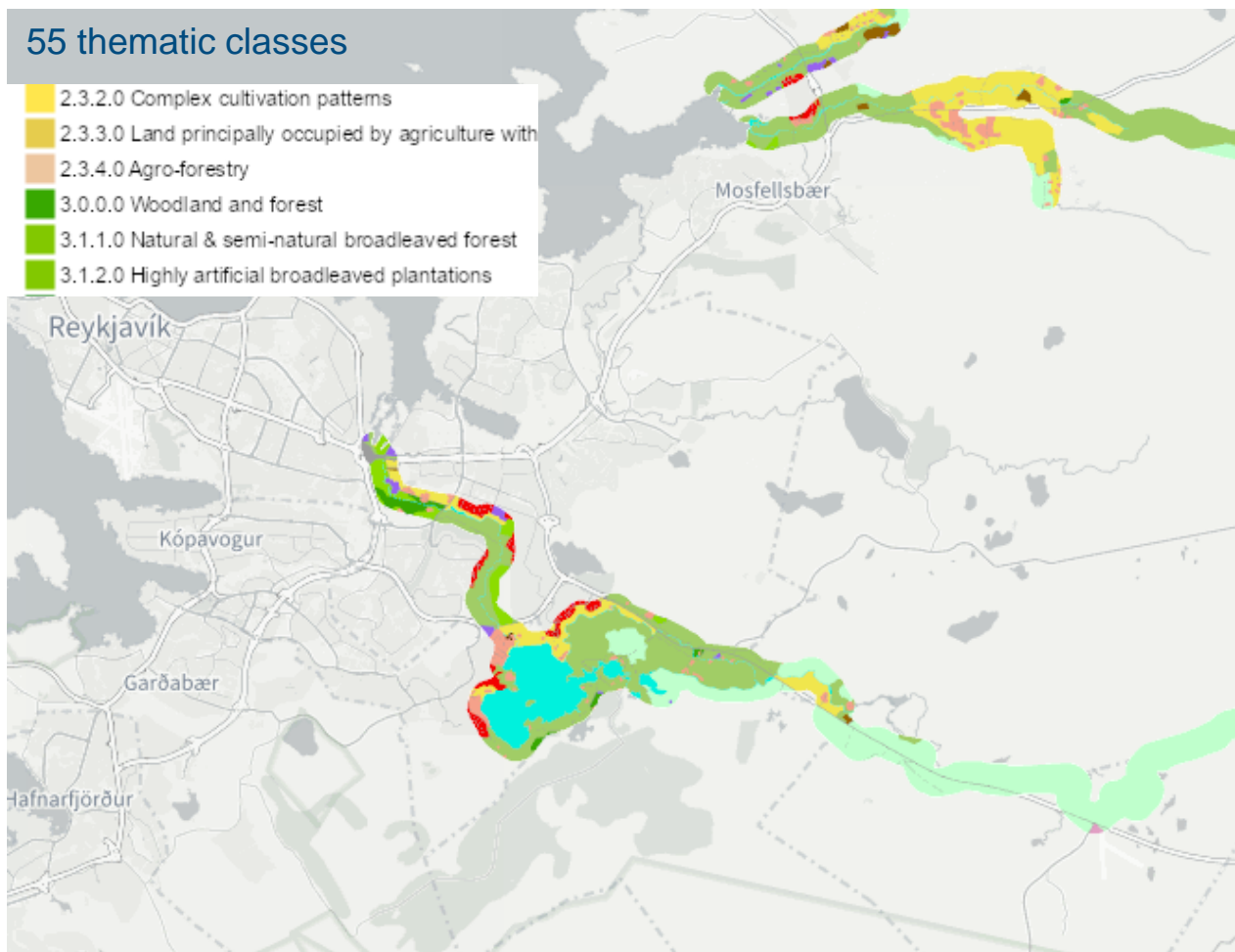
Riparian Zones

MMU
0,5 ha



55 thematic classes

- 2.3.2.0 Complex cultivation patterns
- 2.3.3.0 Land principally occupied by agriculture with
- 2.3.4.0 Agro-forestry
- 3.0.0.0 Woodland and forest
- 3.1.1.0 Natural & semi-natural broadleaved forest
- 3.1.2.0 Highly artificial broadleaved plantations



SPOT

2012
2018
2024



PROGRAMME OF THE
EUROPEAN UNION



Land Monitoring

Implemented by



European
Environment
Agency

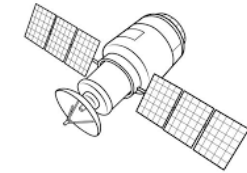
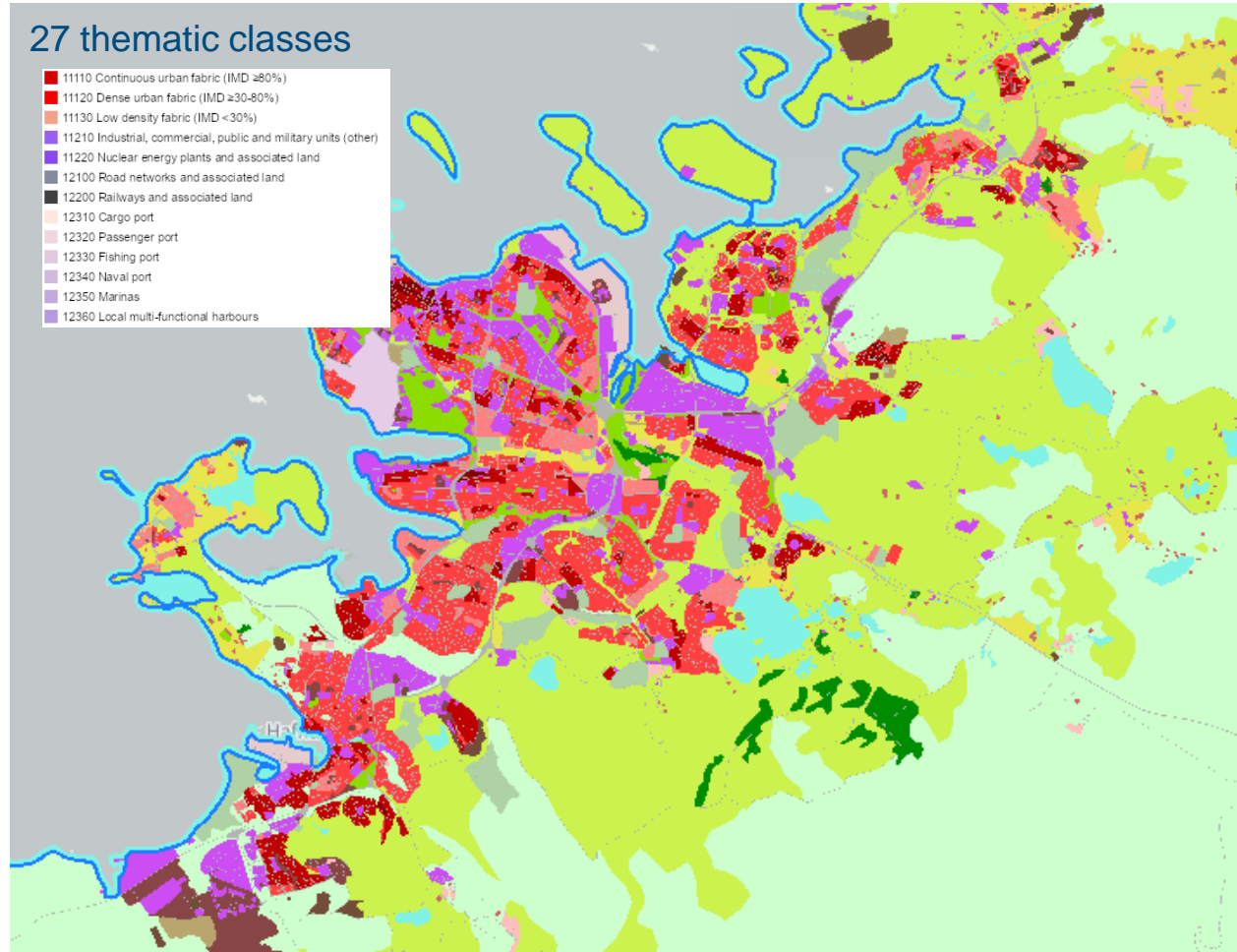
Urban Atlas

MMU
0,25 ha



27 thematic classes

- 11110 Continuous urban fabric (IMD ≥80%)
- 11120 Dense urban fabric (IMD ≥30-80%)
- 11130 Low density fabric (IMD <30%)
- 11210 Industrial, commercial, public and military units (other)
- 11220 Nuclear energy plants and associated land
- 12100 Road networks and associated land
- 12200 Railways and associated land
- 12310 Cargo port
- 12320 Passenger port
- 12330 Fishing port
- 12340 Naval port
- 12350 Marinas
- 12360 Local multi-functional harbours



**SPOT,
Formosat**

2006
2012
2018
2021
2024



PROGRAMME OF THE
EUROPEAN UNION



Land Monitoring

Implemented by



European
Environment
Agency



Land Monitoring

Bio- geophysical Parameters



PROGRAMME
OF THE EUROPEAN UNION



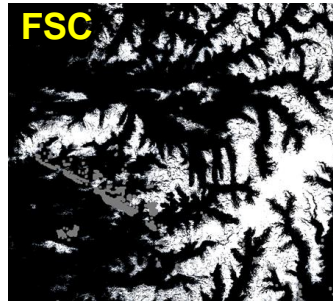
Implemented by



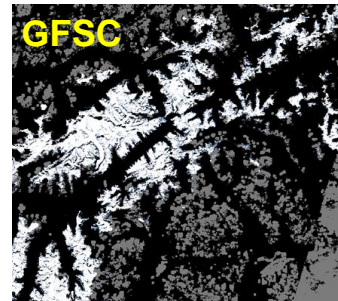
European
Environment
Agency

High Resolution Snow and Ice (HR-S&I) products

Fractional Snow
Cover (FSC)



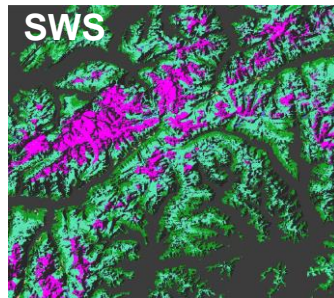
Gap-filled FSC
(GFSC)



Persistent Snow
Area (PSA)



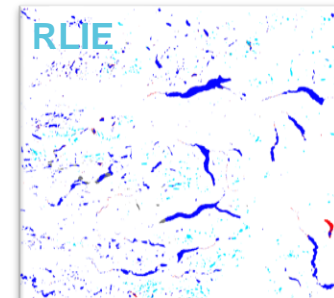
SAR Wet Snow
(SWS)



Wet/Dry Snow
(WDS)



River and Lake
Ice Extent (RLIE)



Aggregated River
and Lake Ice Extent (ARLIE)



2016

CONTINUOUS

2024



PROGRAMME OF THE
EUROPEAN UNION



Land Monitoring

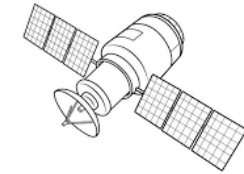
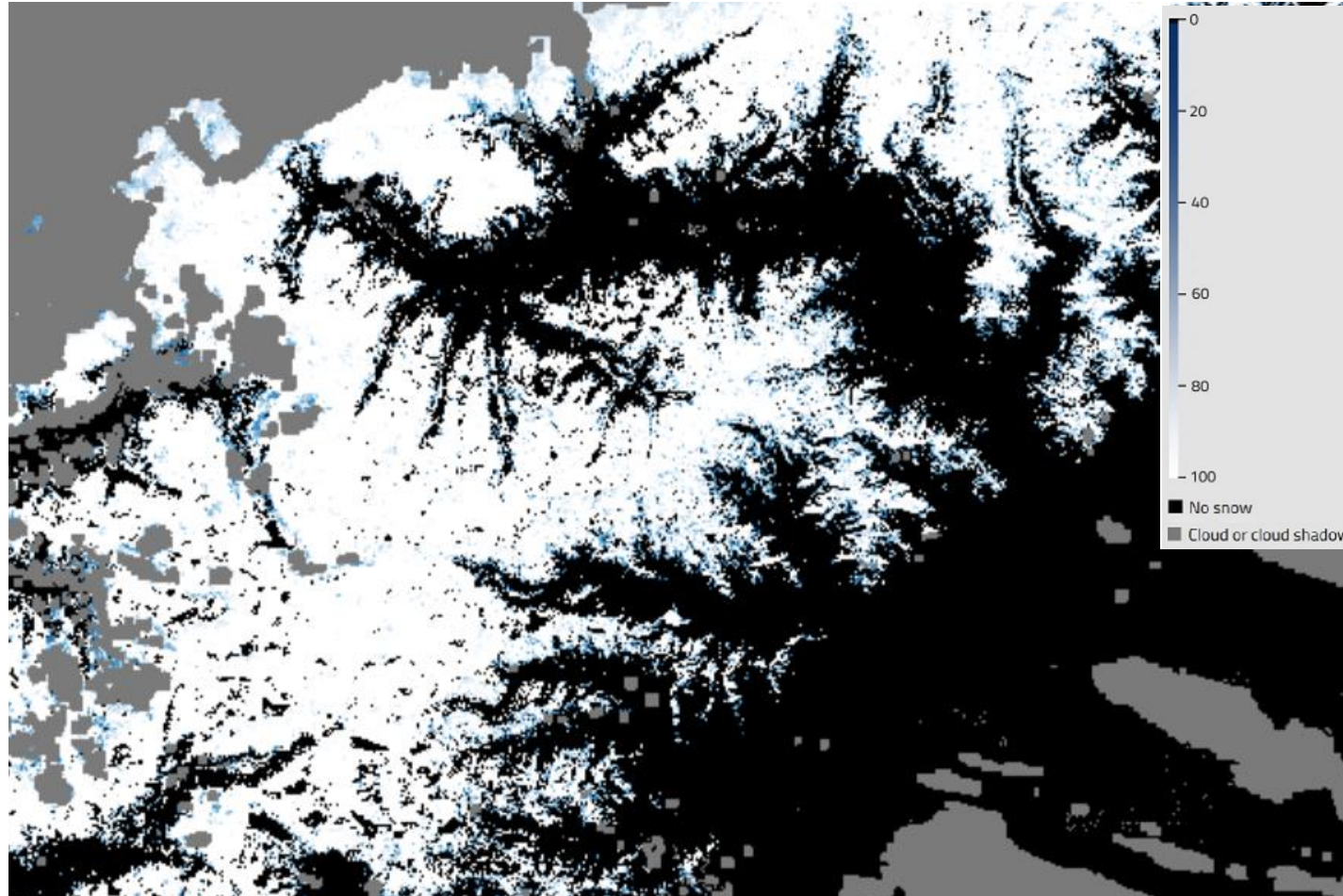
Implemented by



European
Environment
Agency

Snow cover – Fractional Snow Cover

20 m



Sentinel-2

NRT
(2016 – now)



PROGRAMME OF THE
EUROPEAN UNION



Land Monitoring

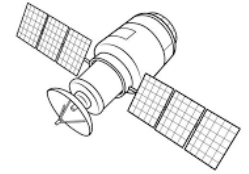
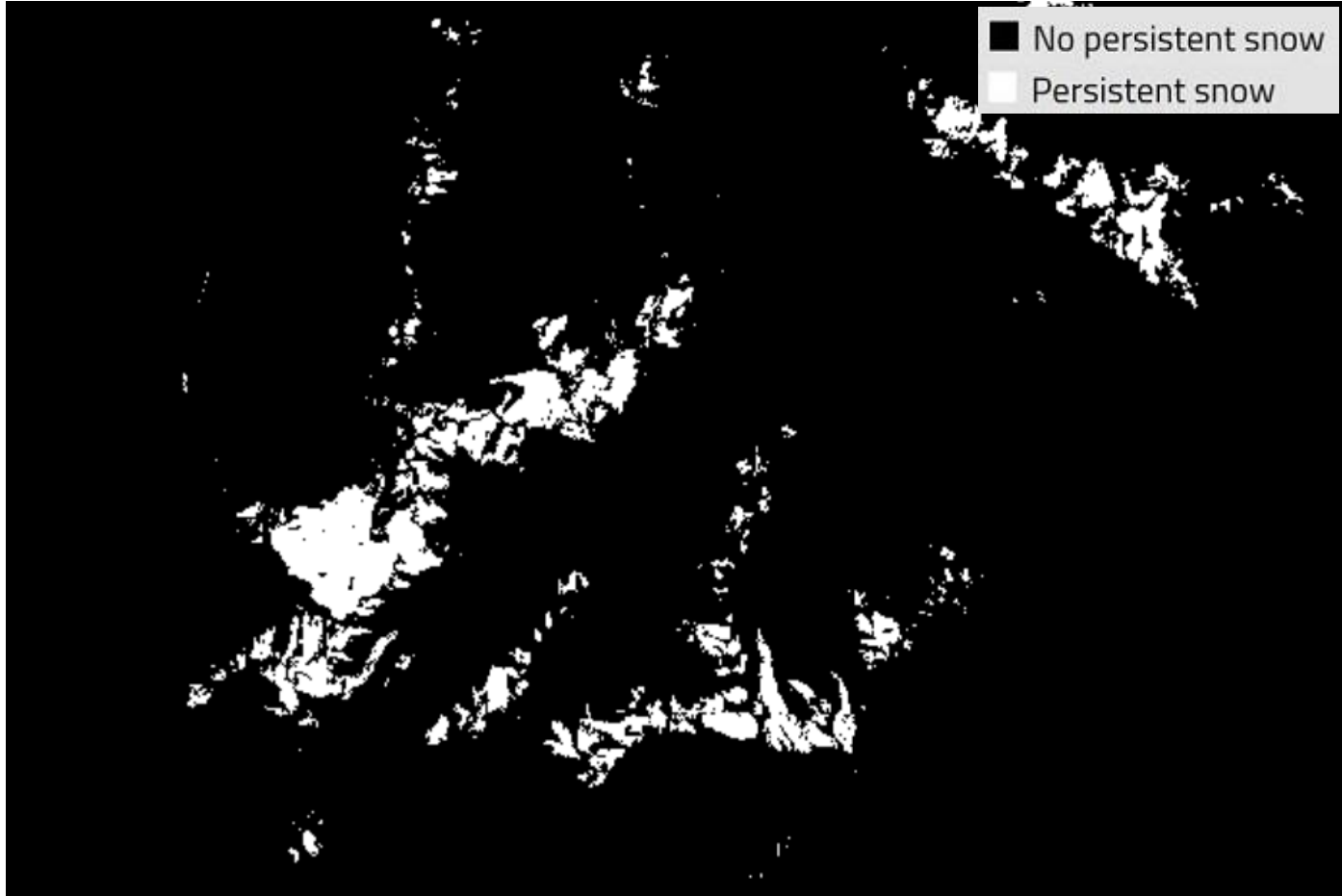
Implemented by



European
Environment
Agency

Snow cover – Persistent Snow Area

20 m



Sentinel-2

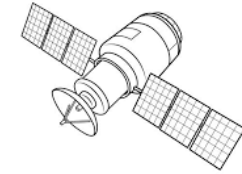
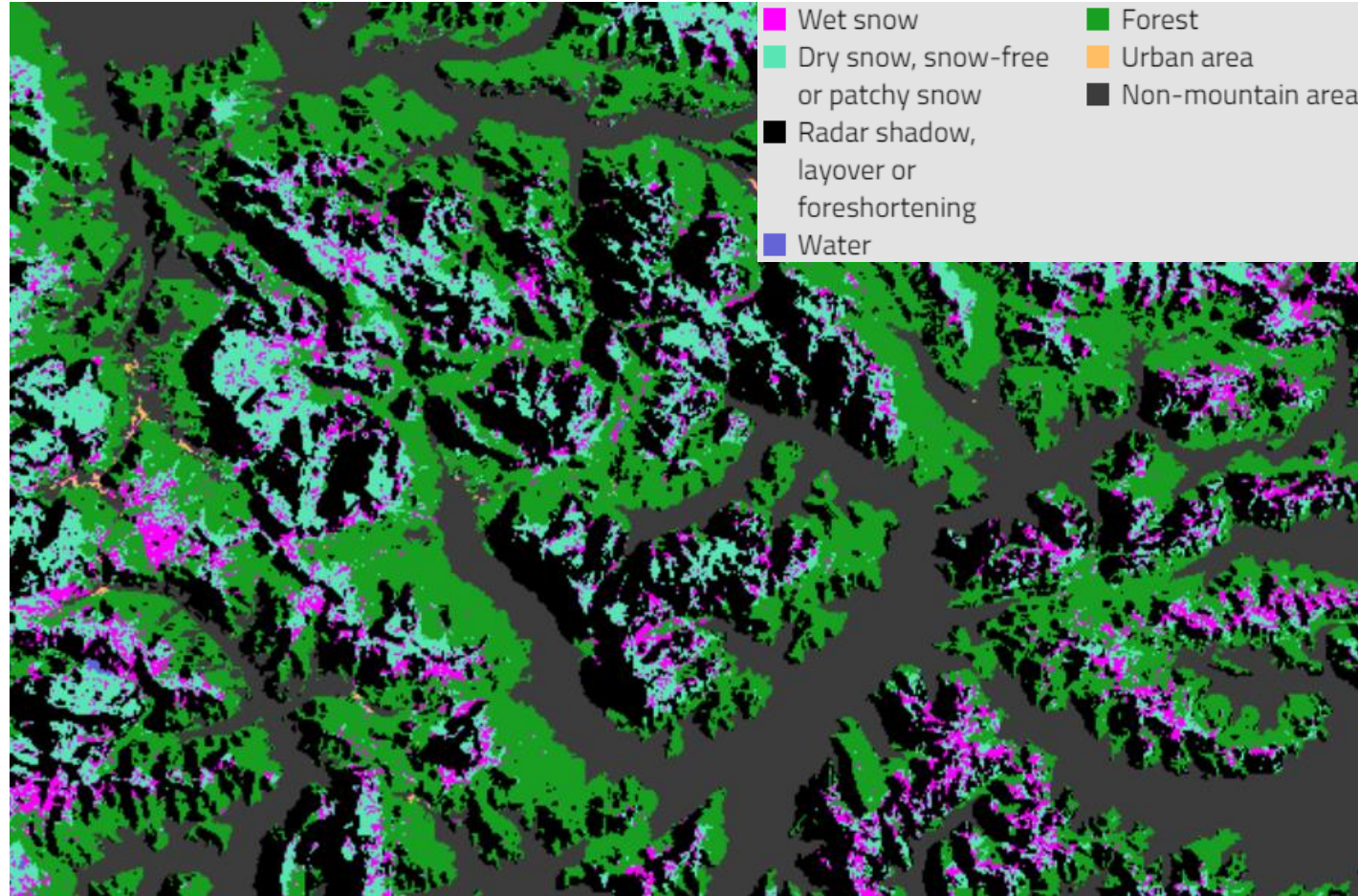
Yearly
2016
2017
2018

-
-
-



Snow state – SAR Wet Snow

60 m



**Sentinel-1
+ FSC**



**NRT
(2016 – now)**



PROGRAMME OF THE
EUROPEAN UNION



Land Monitoring

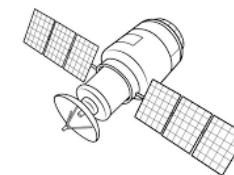
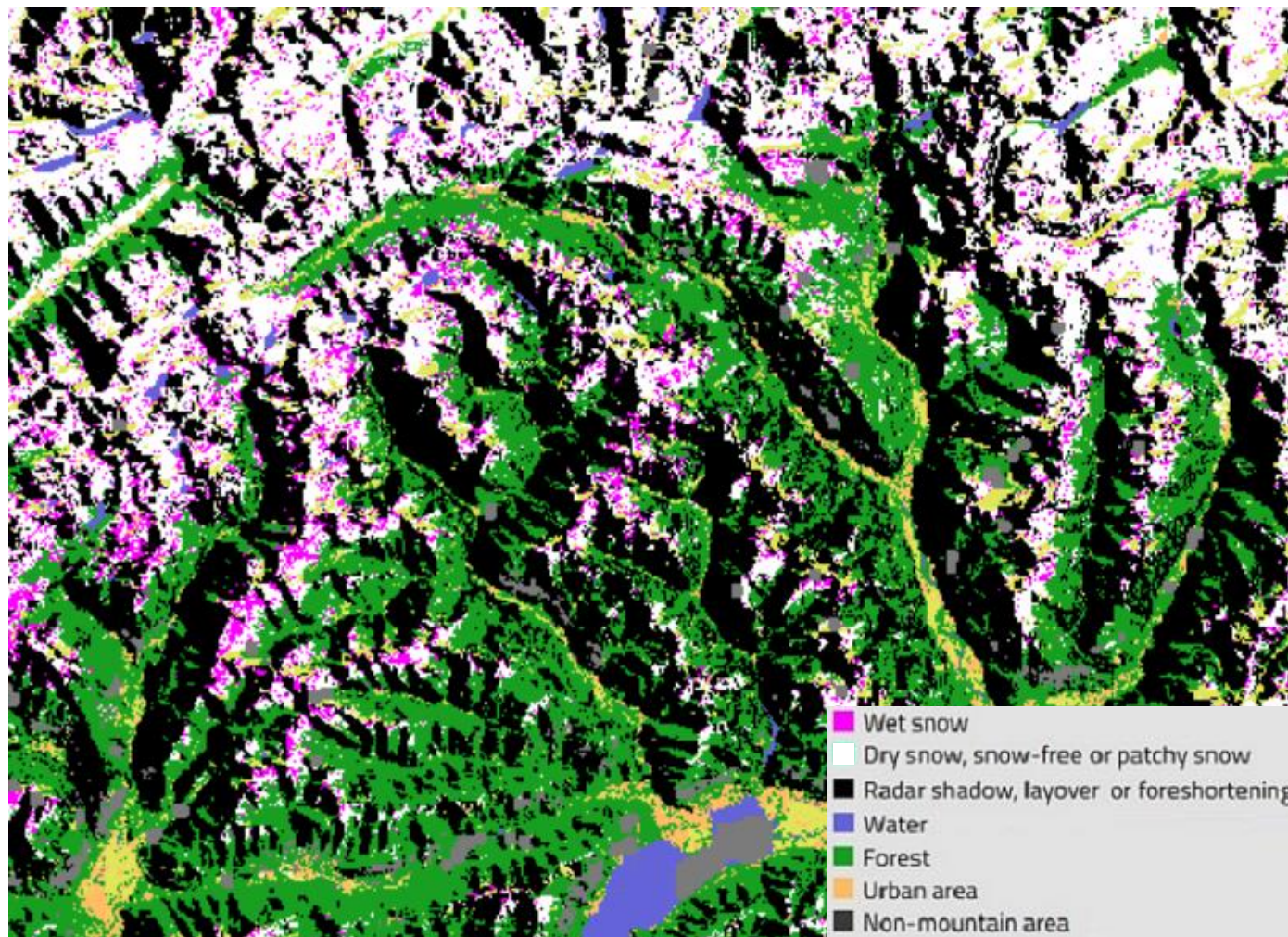
Implemented by



European
Environment
Agency

Snow state – Wet/Dry Snow

60 m



Sentinel-1

NRT
(2016 – now)



PROGRAMME OF THE
EUROPEAN UNION



Land Monitoring

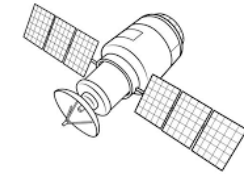
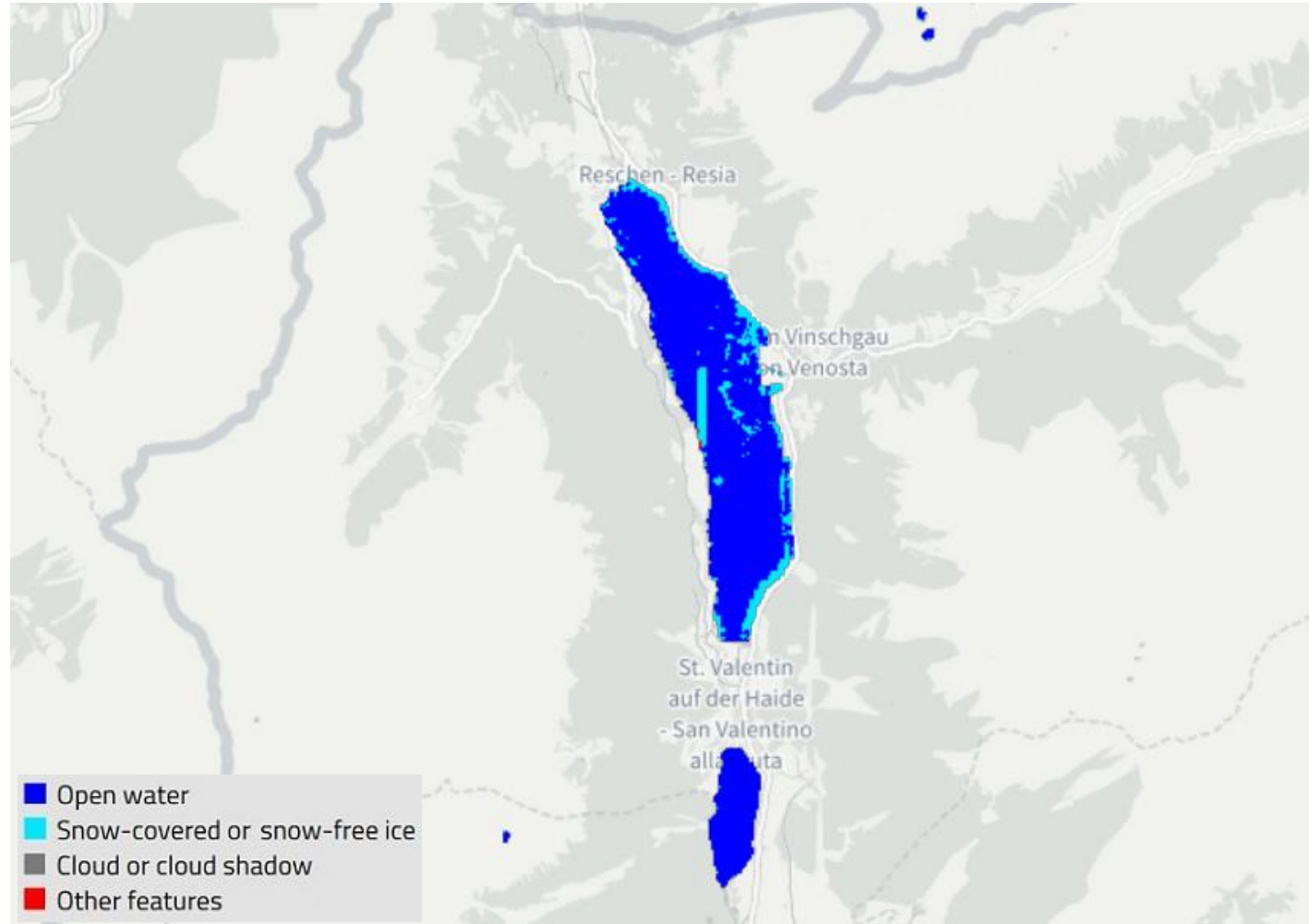
Implemented by



European
Environment
Agency

Ice cover – River and Lake Ice Extent

20 m



**Sentinel-1
&
Sentinel-2**



**NRT
(2016 – now)**



PROGRAMME OF THE
EUROPEAN UNION



Land Monitoring

Implemented by



European
Environment
Agency

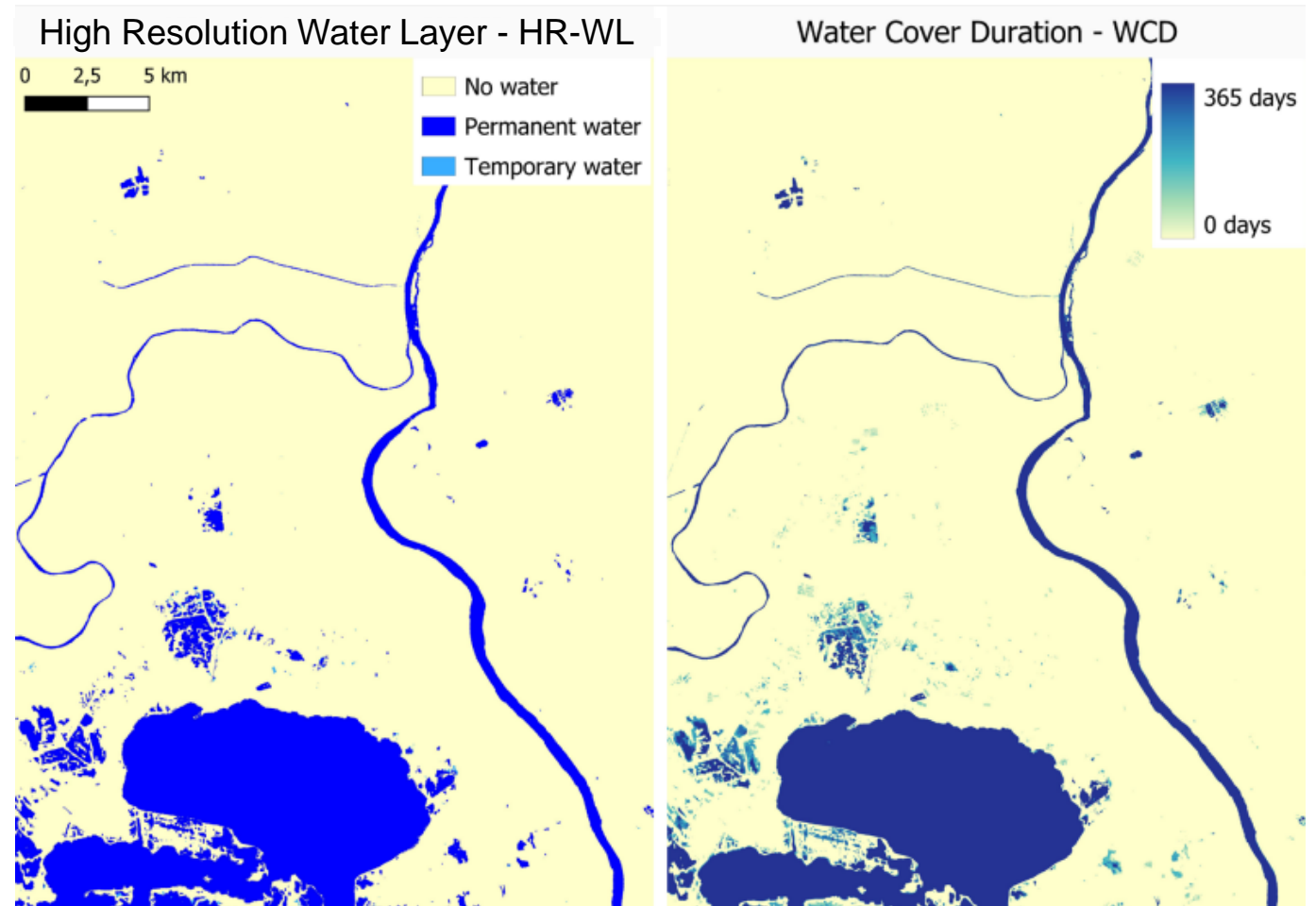
New water products in Q1 2025

- High Resolution Water Layer (HR-WL)

Aggregated 7-year information on the characteristic of the presence of open water surfaces.

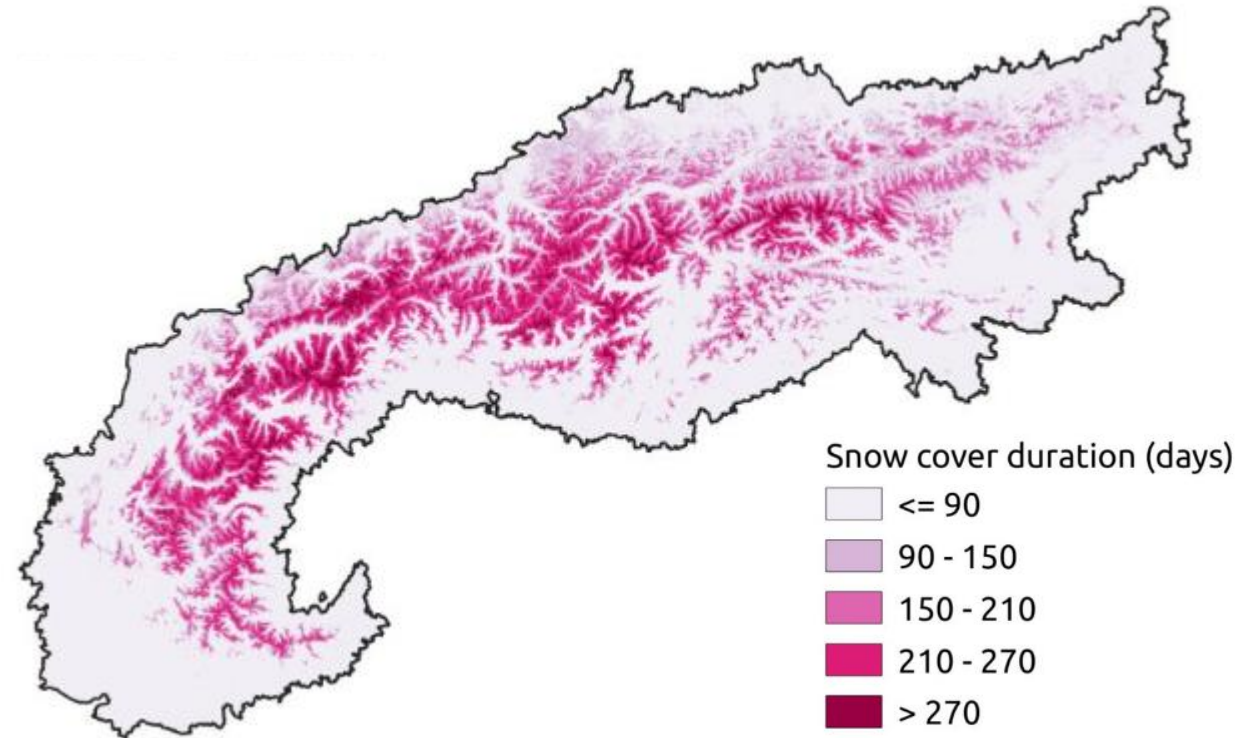
- Water Cover Duration (WCD)

Duration of surface water occurrence as the number of days per hydrological year.



New snow phenology products in Q4 2024

- **Snow Cover Duration (SCD)**
Duration of snow cover as the number of days per hydrological year.
- **Snow Cover Onset (SCO)**
Beginning of the snow season.
- **Snow Cover Melt-out (SCM)**
End of the snow season.



**Snow Cover Duration (SCD) in number of days per hydrological year.
The Alps, 2018-2019**



PROGRAMME OF THE
EUROPEAN UNION



Land Monitoring

Implemented by



European
Environment
Agency

New ice products in Q1 2025

- Water & Ice Cover (WIC)

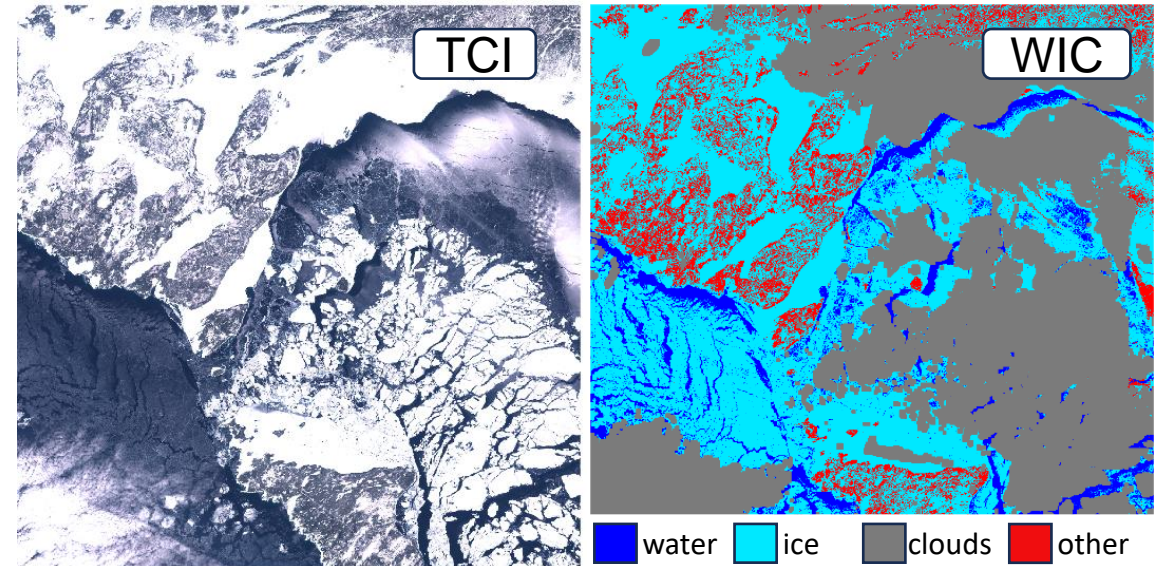
Presence of ice over lakes and river network (based on EU-Hydro).

- Aggregated Water and Ice Cover (AWIC)

Vector product that merges observation of the previous day (WIC) into a database.

- Ice Cover Duration (ICD)

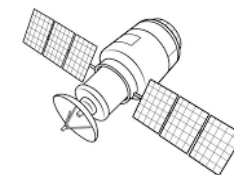
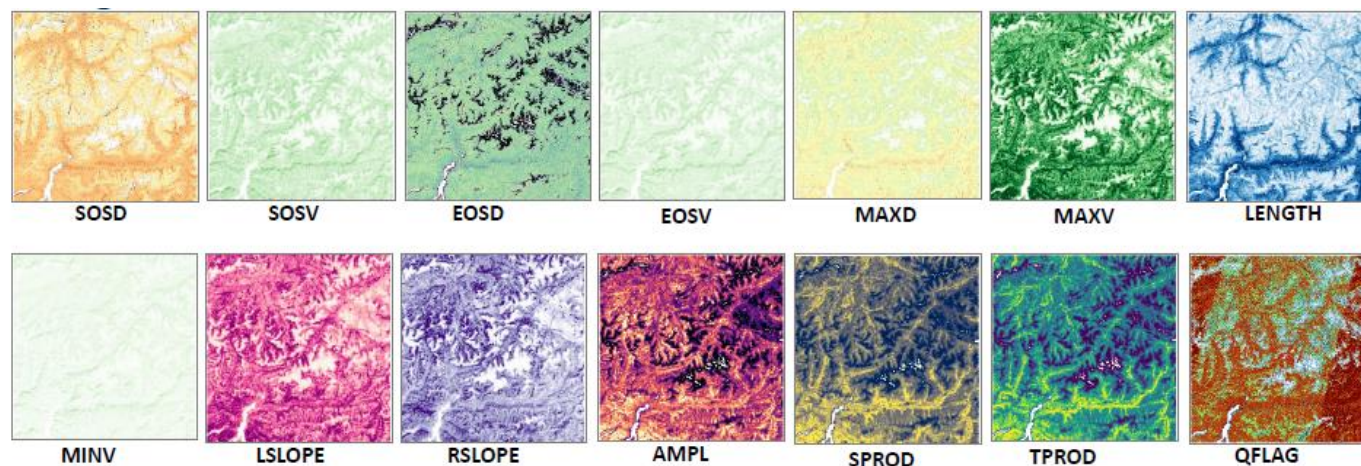
Duration of ice cover over lakes and river network as the number of days per hydrological year.



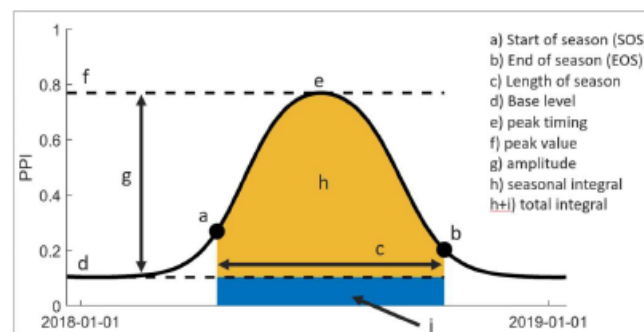
**Water Ice Cover (WIC) provides information about the presence of water and ice on rivers and lakes.
Georgian Bay, Canada 2020**

High Resolution Vegetation Phenology and Productivity

10 m



Sentinel-2



Yearly
2017
2018



PROGRAMME OF THE
EUROPEAN UNION



Land Monitoring

Implemented by



European
Environment
Agency



Land Monitoring

European Ground Motion Service (EGMS)



PROGRAMME
OF THE EUROPEAN UNION



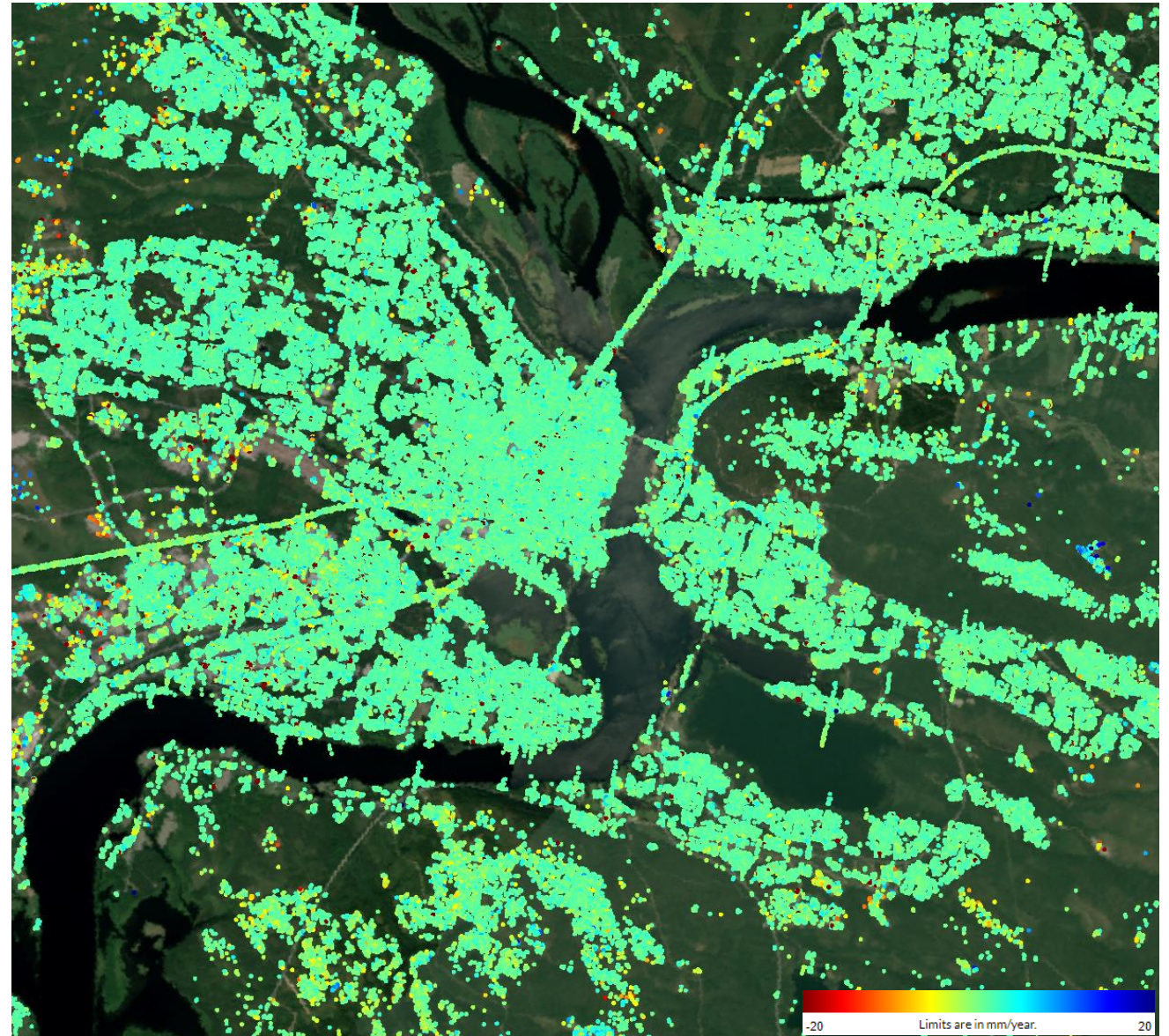
Implemented by



European
Environment
Agency

What is EGMS?

- EGMS is produced using data collected by the **Sentinel-1** radar satellite mission.
- The EGMS products provide a **high-density, continental-scale** map of ground motion.
- It is a vector product.
- Each measurement point has a value of ground motion velocity and a time series covering the last five years



Rovaniemi, Finland



PROGRAMME OF THE
EUROPEAN UNION



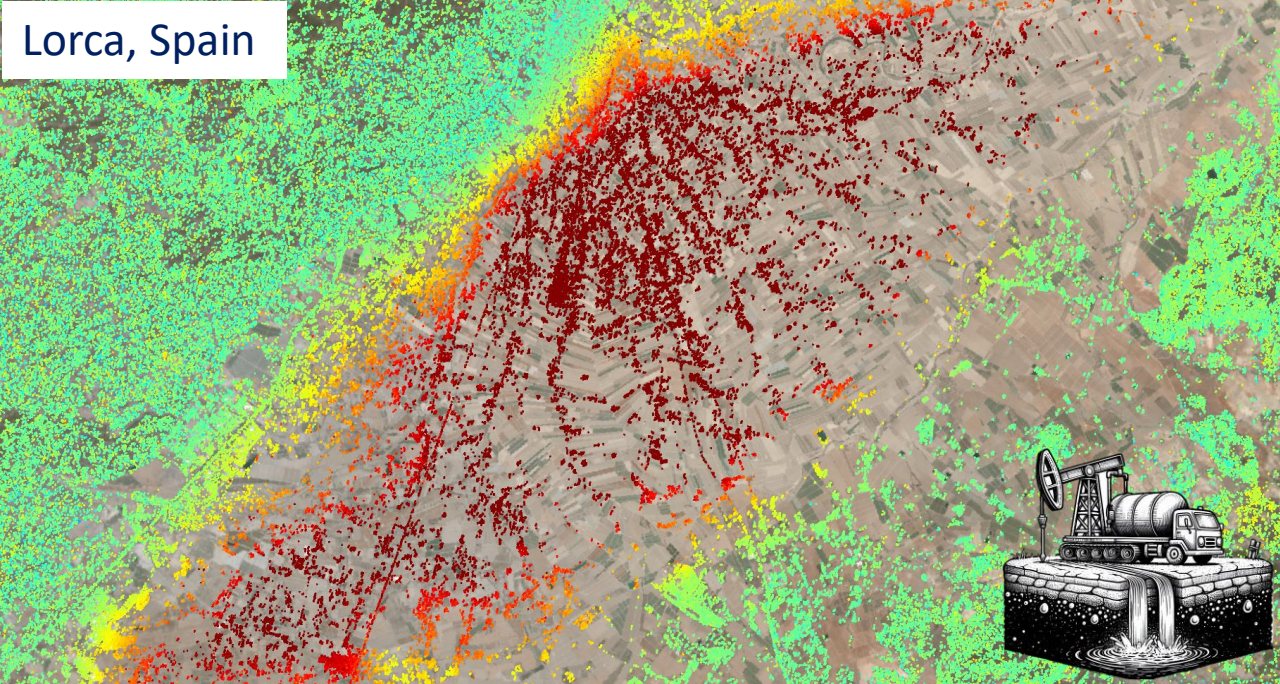
Land Monitoring

Implemented by

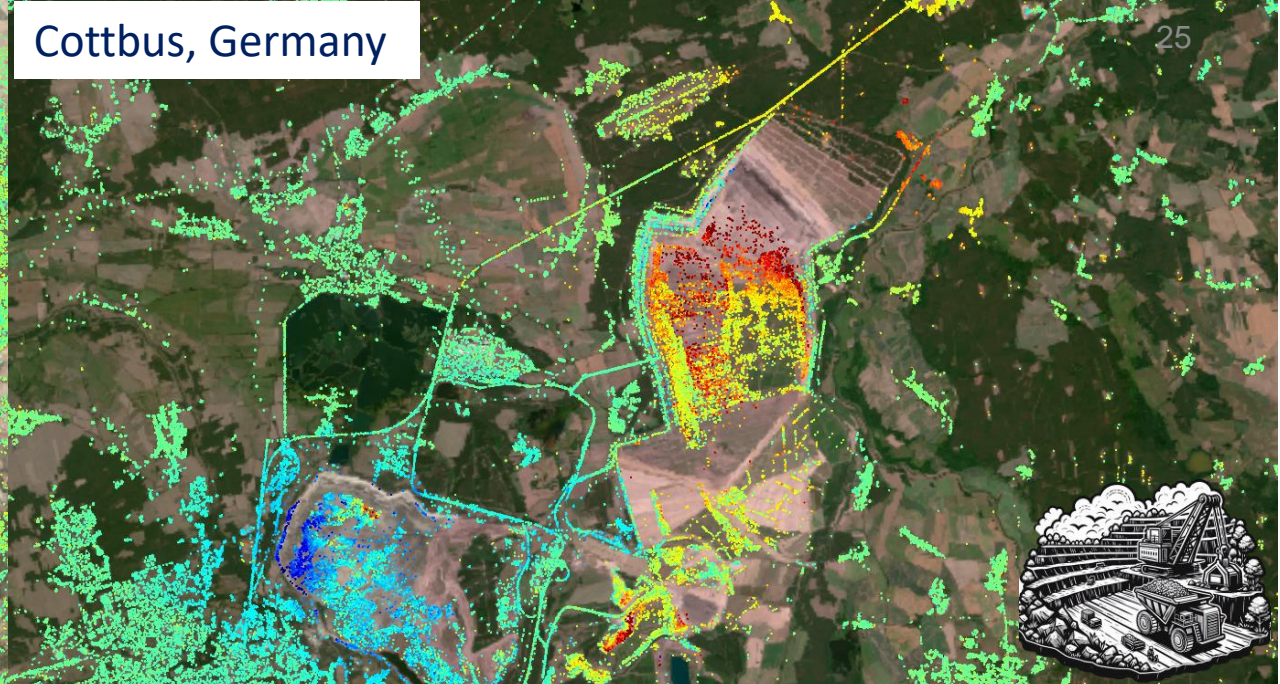


European
Environment
Agency

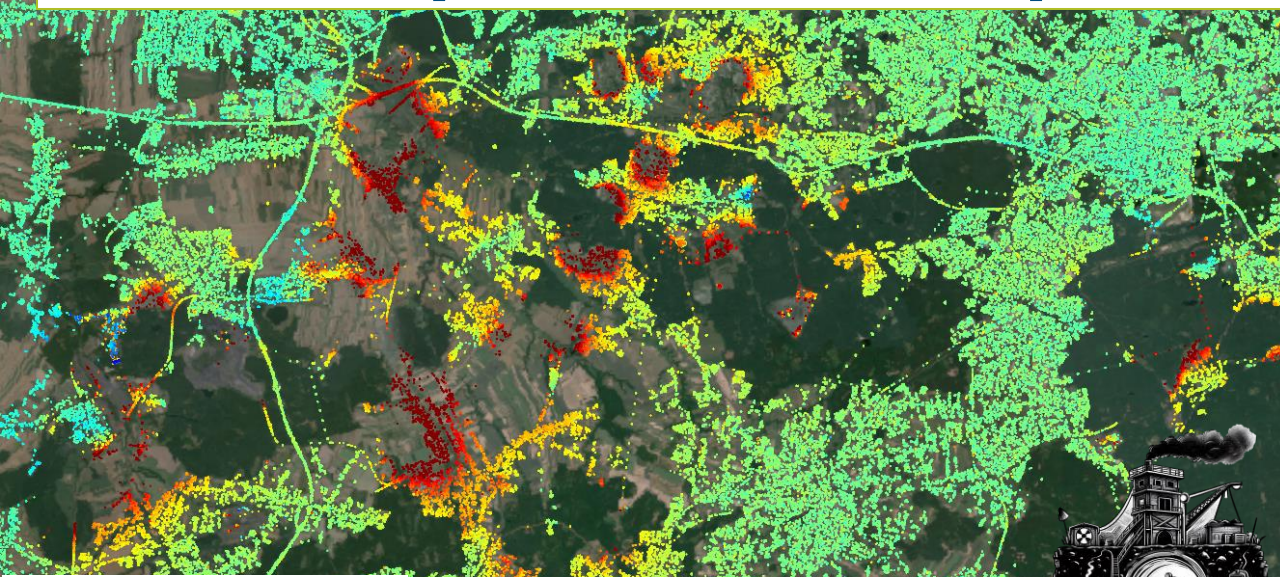
Lorca, Spain



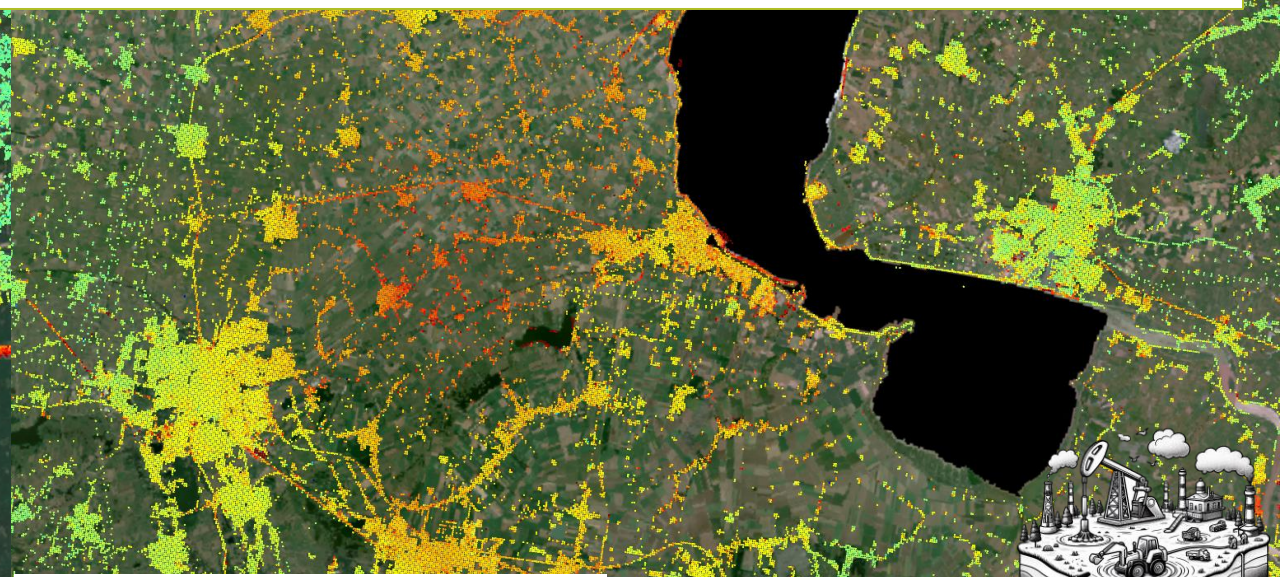
Cottbus, Germany



Map & monitor exploitation of natural resources

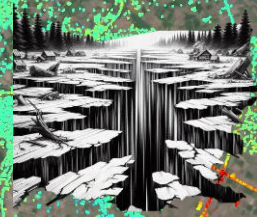
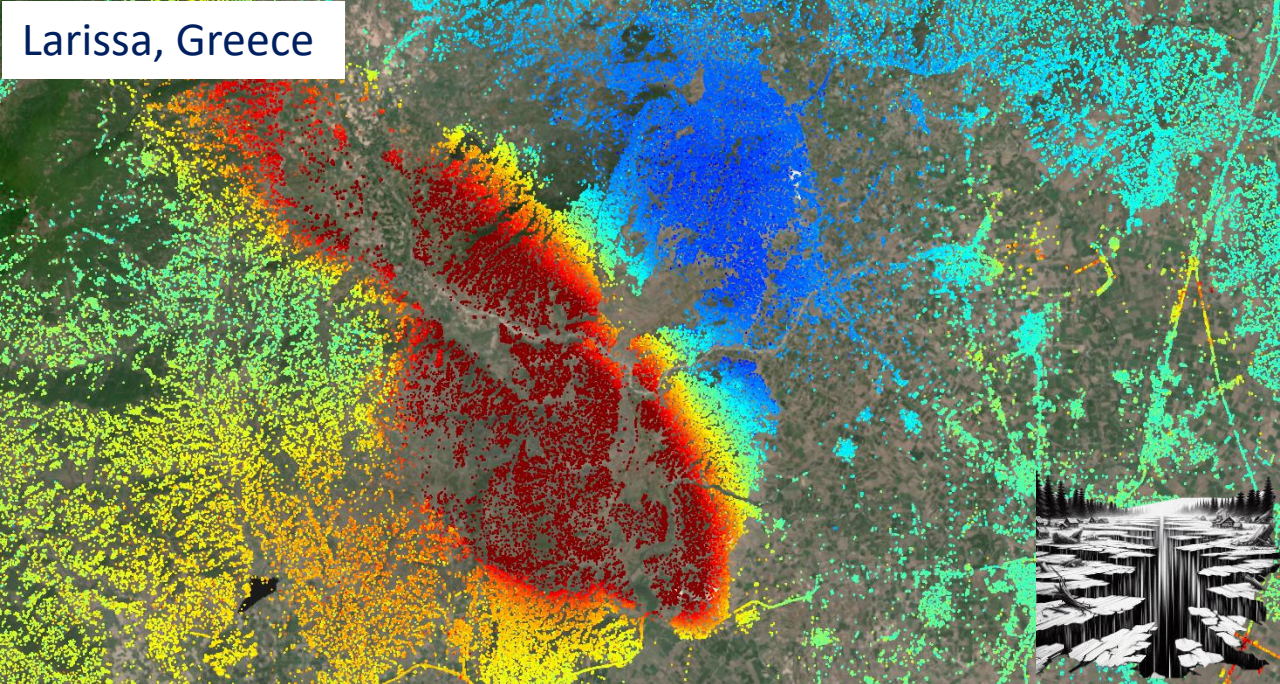


Katowice, Poland

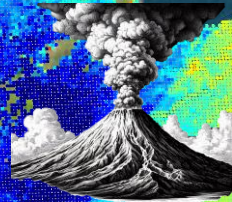
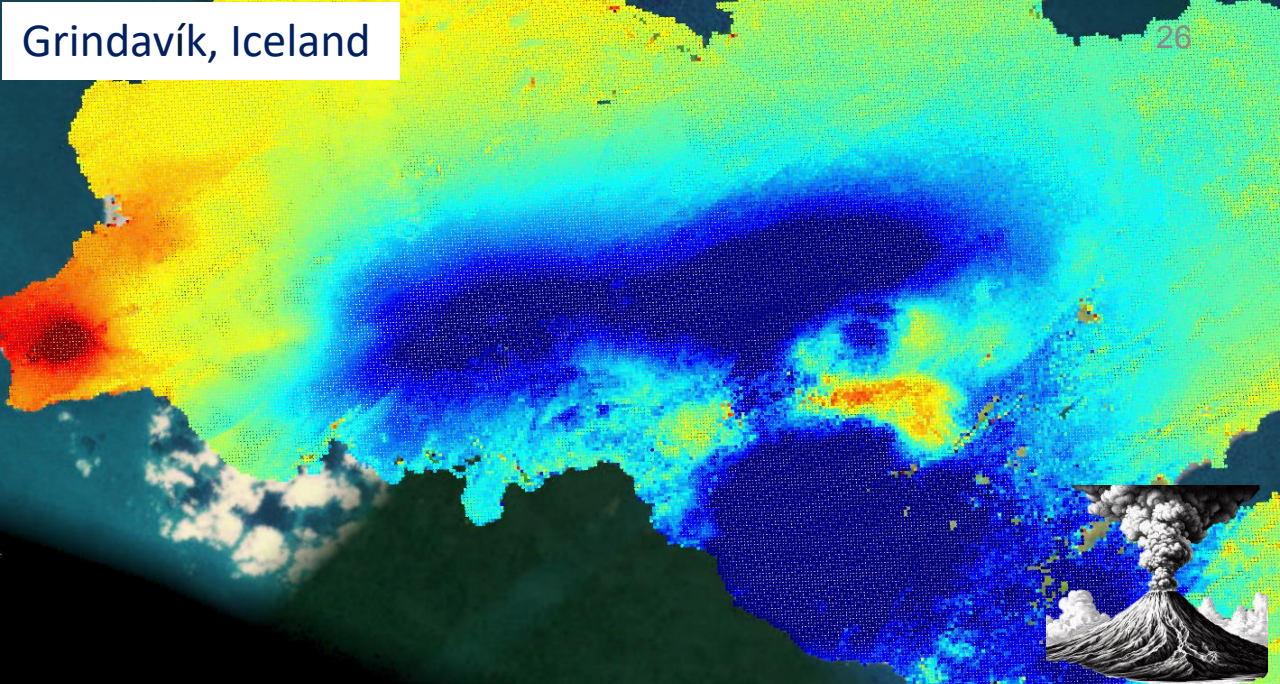


Groningen, The Netherlands

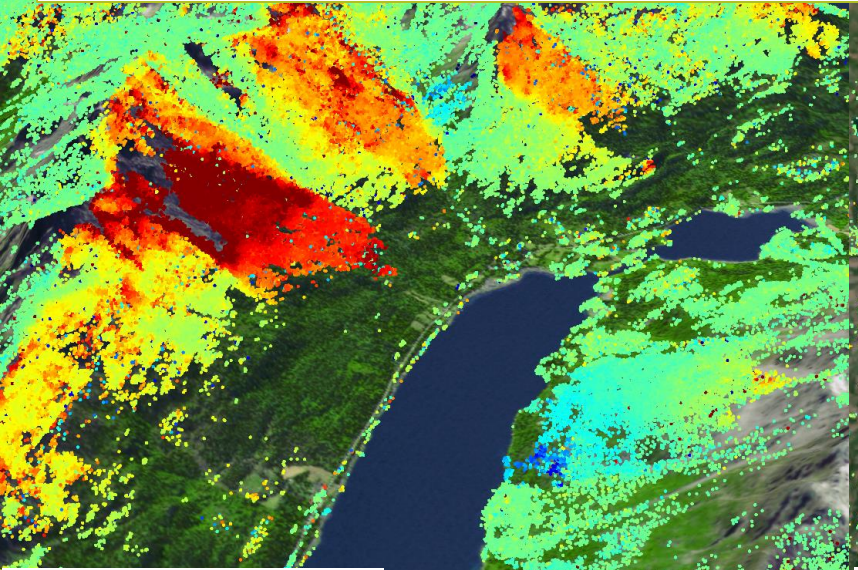
Larissa, Greece



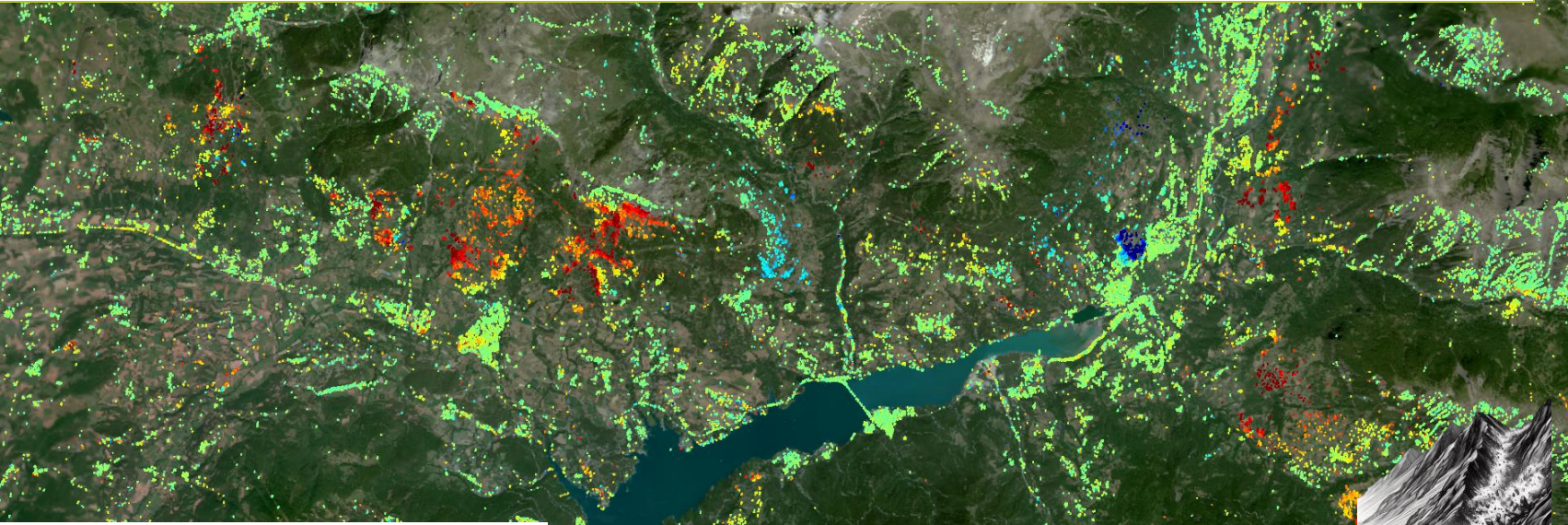
Grindavík, Iceland



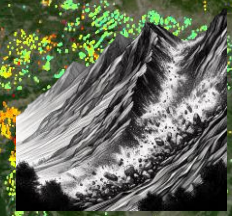
Map and monitor natural phenomena



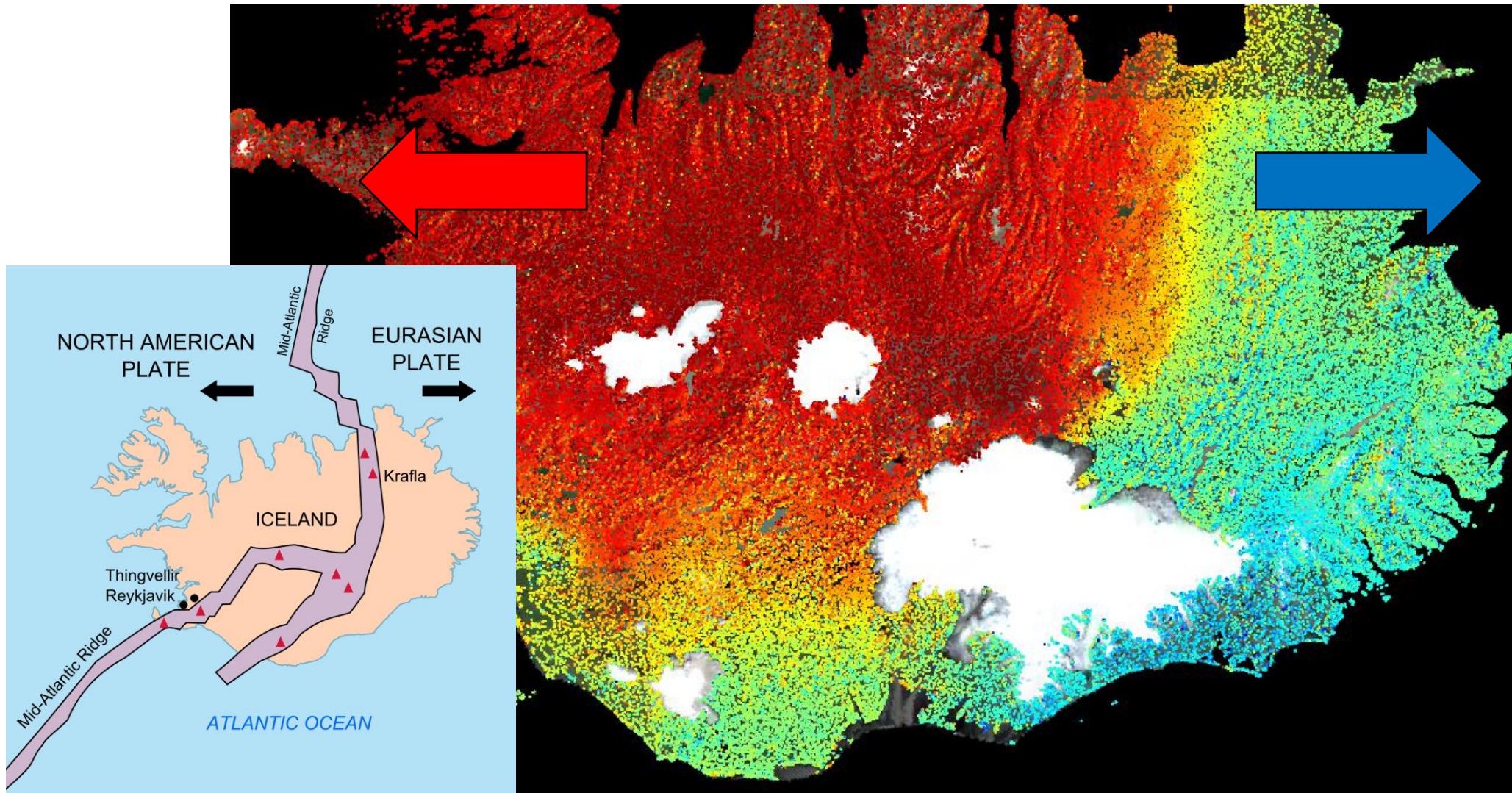
Tromsø, Norway



Lac de Serre Ponçon, France



Focus on Iceland



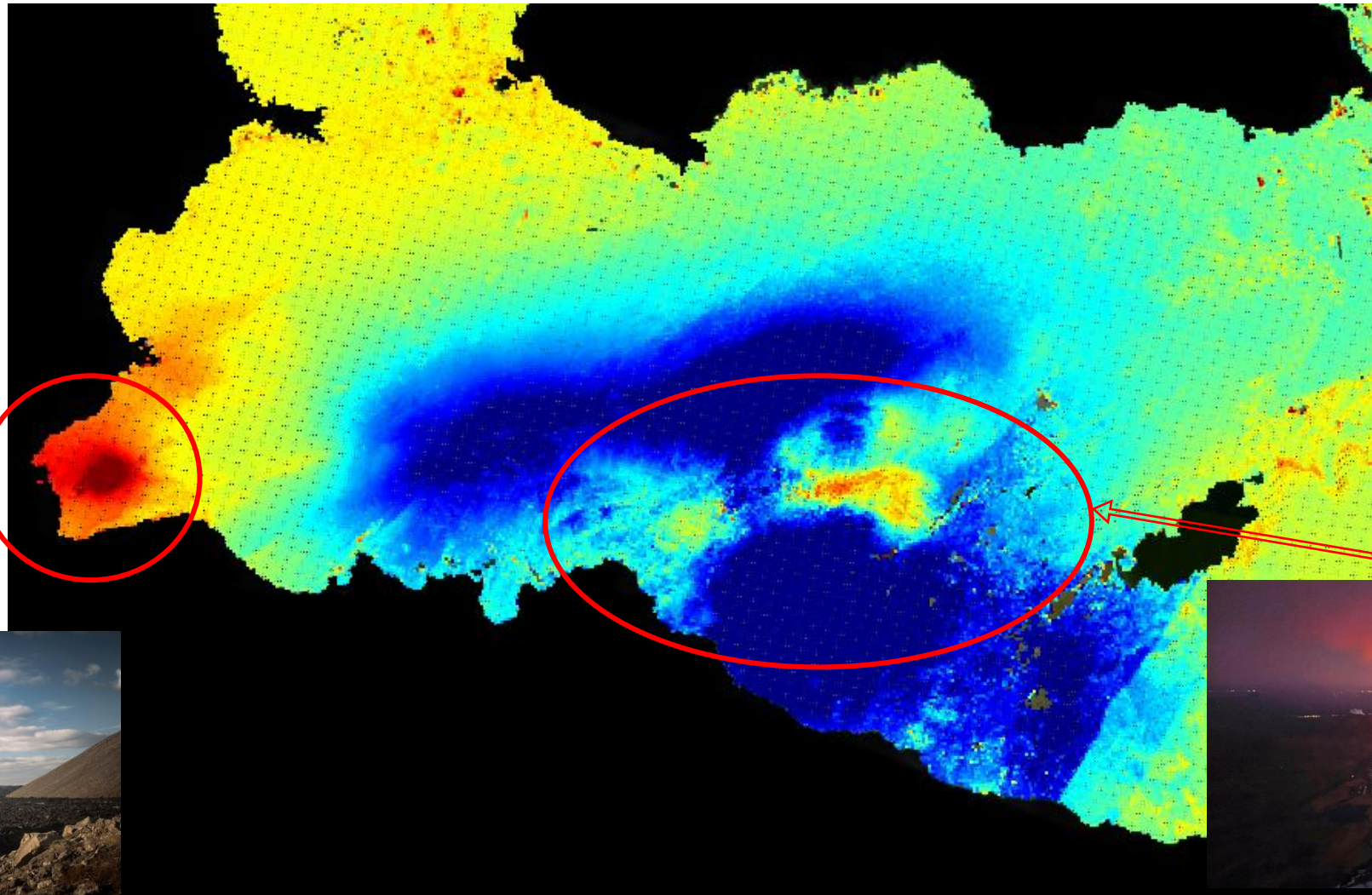
PROGRAMME OF THE EUROPEAN UNION



Implemented by



Focus on Iceland



Aftermath of 2022 Fagradalsfjall eruption

Onset of 2024 Grindavik eruption

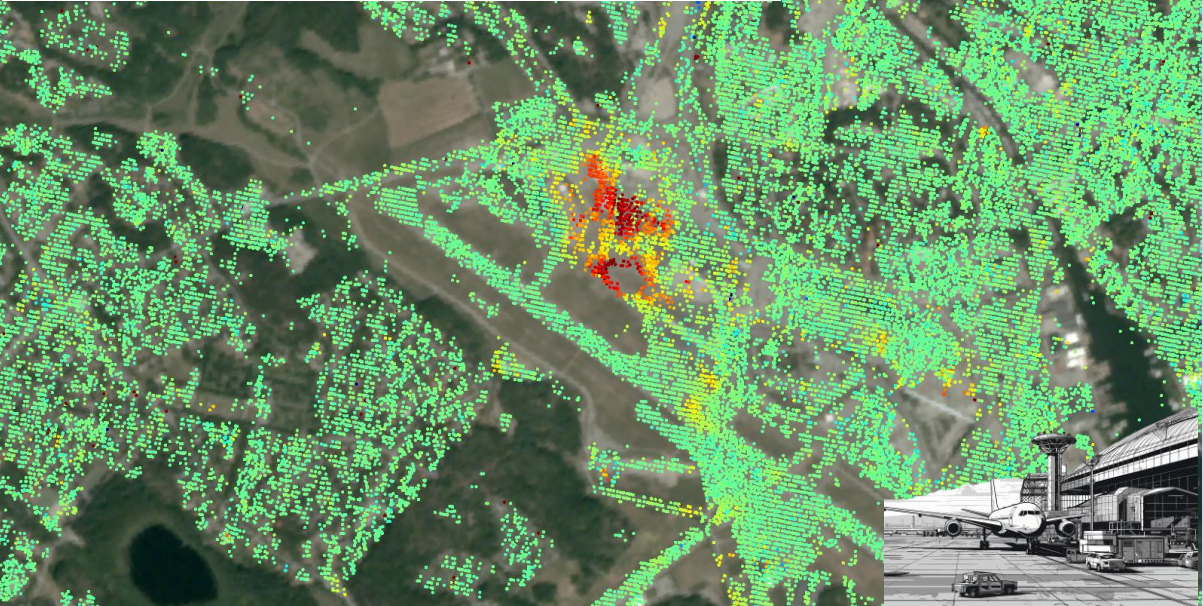


PROGRAMME OF THE EUROPEAN UNION



Implemented by  European Environment Agency

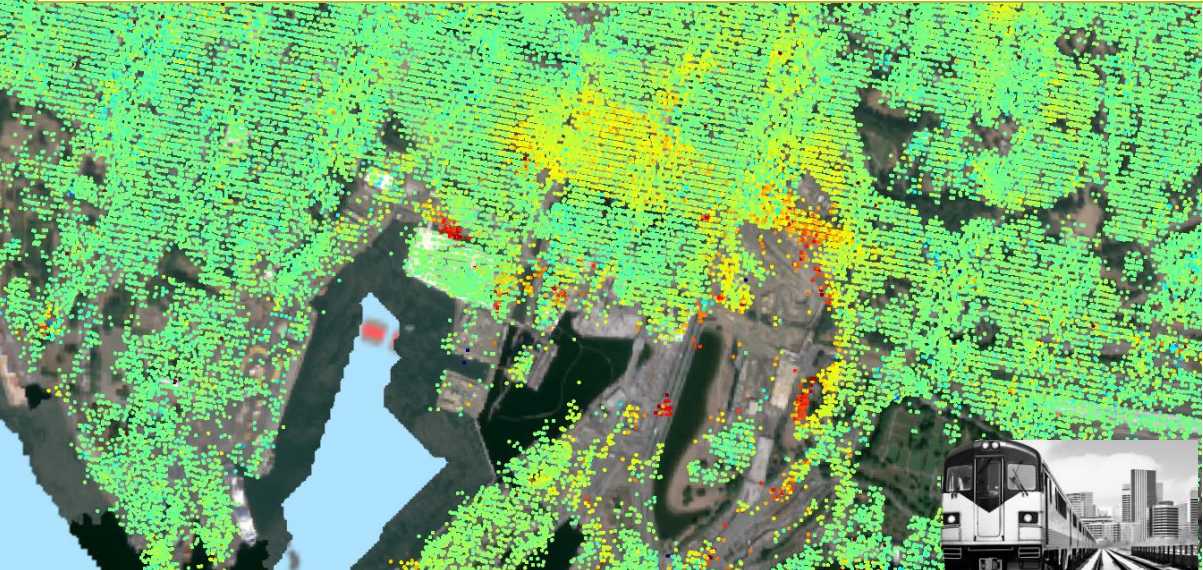
Bromma Airport, Stockholm, Sweden



New port of A Coruña, Spain



Measure motion in urban areas

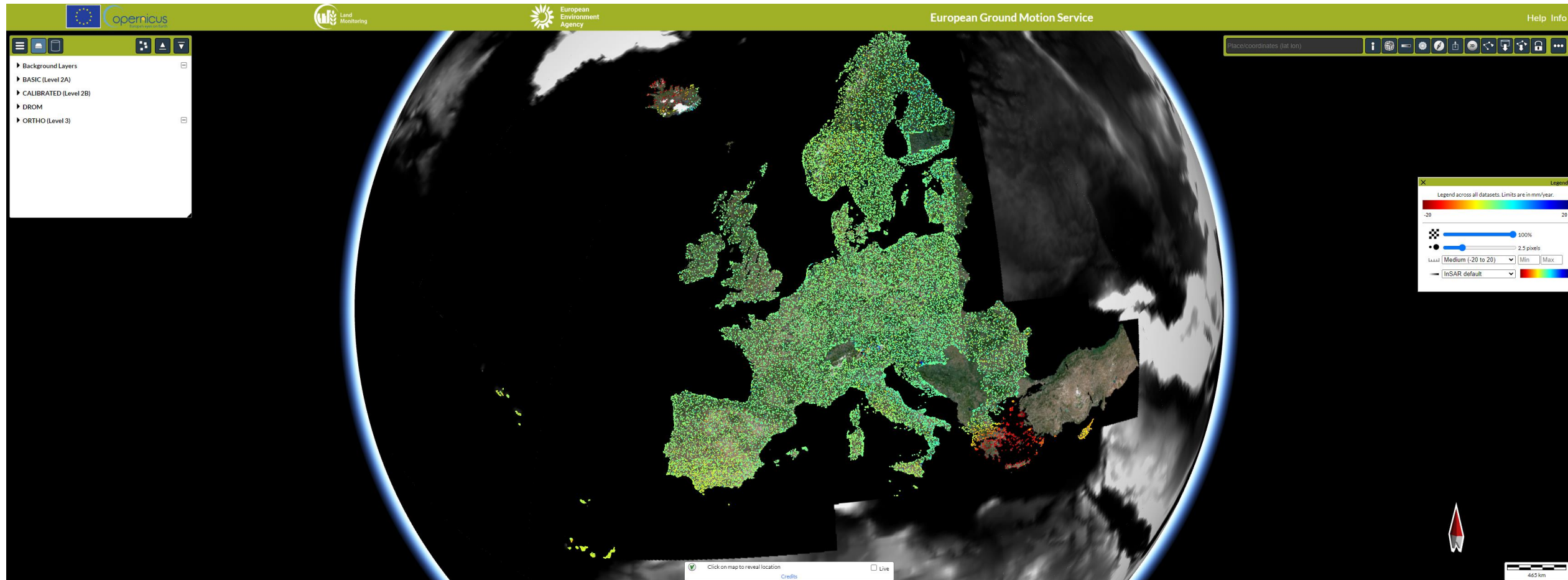


Train station in Oslo, Norway



Amsterdam, The Netherlands

EGMS Explorer



<https://egms.land.copernicus.eu/>



Land Monitoring

Data Access



PROGRAMME
OF THE EUROPEAN UNION






Implemented by



The main entry point to CLMS data



Technical assistance ▾ News and Events ▾ Work opportunities | Register/Login | 🔍

[CLMS portfolio](#)
[Dataset catalogue](#)
[Data viewer](#)
[Use cases](#)
[About us](#)

Copernicus Land Monitoring Service (CLMS)

We provide geographical information on land cover and its changes, land use, ground motion, vegetation state, water cycle and earth surface energy variables for both Europe and the entire globe.

All products are free of charge and can be used for any purpose.

Copernicus Land User Event 2023 - 28 September 2023 - REGISTRATION IS OPEN [Credits](#)

<p>Land Cover and Land Use Mapping</p> <p>Land cover classifications complemented by detailed layers on vegetated and non-vegetated land cover characteristics</p>	<p>Priority Area Monitoring</p> <p>Tailored land cover and land use information with a higher level of detail for specific areas of interest prone to environmental changes</p>	<p>Bio-geophysical Parameters</p> <p>Qualified bio-geophysical products on the status and evolution of the land surface complemented by the long term time series</p>	<p>Ground Motion Monitoring</p> <p>Information on the natural and anthropogenic ground motion throughout Europe with millimeter accuracy</p>	<p>Satellite Data</p> <p>Satellite image mosaics from Copernicus and commercial satellite missions monitoring land surface conditions</p>	<p>Reference and Validation Data</p> <p>Ground-based observations, geospatial reference data used in CLMS product creation or validation</p>
---	--	--	---	--	---

<https://land.copernicus.eu/en>



PROGRAMME OF THE
EUROPEAN UNION



Land Monitoring

Implemented by



European
Environment
Agency



The central data viewer

- Multiple layers in a WebGIS
- Navigation tools
- Multiple basemaps
- Pixel by pixel information
- Printing options
- Download capability – entire layer and area of interest

Technical assistance ▾ News a

CLMS poi

Home > Data viewer

Products and datasets Active layers

Land Cover and Land Use Mapping

- Dynamic Land Cover
- CORINE Land Cover
- CLC+Backbone
- High Resolution Layer Imperviousness
- High Resolution Layer Impervious Built-up
- High Resolution Layer Dominant Leaf Type
- High Resolution Layer Forest Type
- High Resolution Layer...

2000 km
1000 mi



Data catalogue



- European (EEA) and global (JRC) data
- INSPIRE compliant
- Free text search
- Data filters:
 - Resolution
 - Format
 - INSPIRE themes
 -

Technical assistance | News and Events | Work opportunities | Register/Login | Search

CLMS portfolio | Dataset catalogue | Data viewer | Use cas

[Home](#) > Dataset catalogue

Dataset catalogue

Search

Hint: you can use double quotes to search for exact phrases. Ex: "High resolution vegetation"

Search results: 165 Sort on:

CORINE Land Cover 2012 (vector/raster 100 m), Europe, 6-yearly

Provides pan-European CORINE Land Cover inventory for 44 thematic classes for the 2012 reference year. The dataset has a Minimum Mapping Unit (MMU) of 25 hectares (ha) for areal phenomena and a Minimum Mapping Width (MMW) of 100 m for linear phenomena and is available as vector and as 100 m raster data.

[View more](#) [Download](#) [View in the data viewer](#)

Urban Atlas Land Cover/Land Use 2012 (vector), Europe, 6-yearly

Provides detailed land cover and land use data with the integrated population estimates in 785 Functional Urban Areas (FUA) with more than 50,000 inhabitants in EEA38 countries and the United Kingdom for the 2012 reference year. The dataset maps land cover and land use for 17 urban classes with the Minimum Mapping Unit (MMU) of 0.25 ha and for 10 rural classes with the MMU of 1 ha and is available as vector data.

[View more](#) [Download](#) [View in the data viewer](#)





How to download the data?

Technical assistance ▾ News and Events ▾ Work opportunities | Eugenija SCHUREN ▾ 1 | Search Site

CLMS portfolio Dataset catalogue Data viewer Use cases About us

Home > Data viewer

Products and datasets

- N2K Land Cover/Land Use 2012 (vector), Europe, 6-yearly
- N2K Land Cover/Land Use 2006 (vector), Europe, 6-yearly
- N2K Land Cover/Land Use Change 2012-2018 (vector), Europe, 6-yearly
- N2K Land Cover/Land Use Change 2006-2012 (vector), Europe, 6-yearly
- Riparian Zones

Click on the download icon on "Products and datasets" to add to cart

Active layers

Area selection

For areas of interest in the candidate countries or to choose NUTS classification, choose a NUTS classification on the map.

- NUTS 0
- NUTS 1
- NUTS 2
- NUTS 3

For areas of interest outside the candidate countries, choose a country on the map.

- Country
- Draw by rectangle

EU-Login to authenticate



PROGRAMME OF THE
EUROPEAN UNION



Land Monitoring

Implemented by



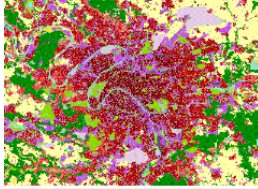
European
Environment
Agency

How to download the data?

- Download by AOI:
 - NUTS (Nomenclature of Territorial Units for Statistics) classification and bounding box in Europe
 - Bounding box, country selection outside Europe
- Pre-packaged data collections
- Guidance to access the data in external platforms

General Info

Download



View in the data viewer

Download by area

Use this option if you would like to download the dataset for area(s) of interest.

[Go to download by area](#)

Download full dataset

You can download the full dataset, using the CLMS download API. Click [here](#) to learn more about the CLMS download API.

Download pre-packaged data collections

Pre-packaged Urban Atlas 2018 dataset can be downloaded for each functional urban area (FUA) (including a compressed file containing the data from all FUAs) in vector (SQLite geodatabase) format.

Search in the pre-packaged data collection

0 selected file(s)
[Select all](#)

<input type="checkbox"/>	File	Format
<input type="checkbox"/>	AL001L1_TIRANA_UA2018_v013	GPKG
<input type="checkbox"/>	AL003L1_ELBASAN_UA2018_v013	GPKG
<input type="checkbox"/>	AL004L1_SHKODER_UA2018_v013	GPKG
<input type="checkbox"/>	AL005L0_VLORE_UA2018_v013	GPKG
<input type="checkbox"/>	AT001L3_WIEN_UA2018_v013	GPKG



PROGRAMME OF THE
EUROPEAN UNION



Implemented by  European
Environment
Agency



How to download the data?

- Select [multiple] data to download
 - Review selected downloads:
 - Choose a different resolution, if available
 - Choose a different file format, if applicable
 - Select desired projection
 - Select time interval, if applicable
- Start download
- Monitor download request processing

... or you can use our API

<https://land.copernicus.eu/en/how-to-guides/how-to-download-spatial-data/how-to-download-m2m>

The screenshot shows the 'Cart' page of the Copernicus Land Monitoring Service. At the top, there is a navigation bar with links for 'Technical assistance', 'News and Events', 'Work opportunities', and a user profile for 'Eugenija SCHUREN'. Below the navigation bar are logos for the European Union, Copernicus, and Land Monitoring Service. The main content area is titled 'Cart' and contains a 'Note' section with instructions on how to download data. Below the note is a 'My cart' section with a table of selected items. The table has columns for 'Static info', 'Configurable', 'Projection', and 'Timeseries'. A 'Start downloading' button is located at the bottom right of the cart area.

Static info	Configurable	Projection	Timeseries
<input type="checkbox"/> Name: Urban Atlas Land Cover/Land Use 2012 (vector), Europe, 6-yearly Source: Map viewer Area: Makroregion północno-zachodni	Type: VECTOR Collection: - Format: GDB	EPSG:4326	-

Start downloading

Where to find use cases

!!Submit a use case!!
<https://land.copernicus.eu/en/use-cases/submit-use-case>

Browse our use case catalogue

Search

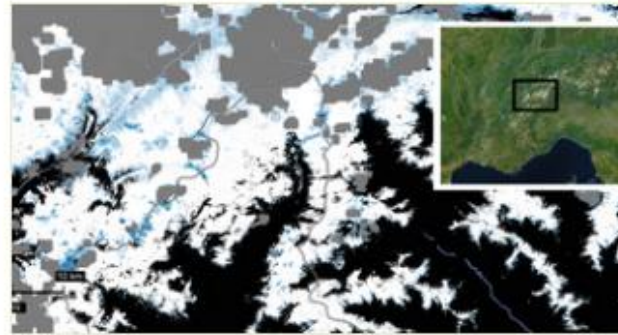
Hint: you can use double quotes to search for exact phrases. Ex: "High resolution vegetation"

Search results: 24



LaRiMo - a simple and efficient GIS-based approach for large-scale morphological assessment of large European rivers

A methodology assessing large rivers' morphology (LaRiMo) based on free



On thin ice? Understanding snowfinch behaviour with high resolution snow data

Using the Copernicus Land Monitoring Service's snow data, PhD student Carole Niffenegger was able ...



Sentinel-2 Mosaic over Finland

The Finnish Meteorological Institute is using Sentinel-2 Global Mosaic Service to produce dekad ...



PROGRAMME OF THE
EUROPEAN UNION



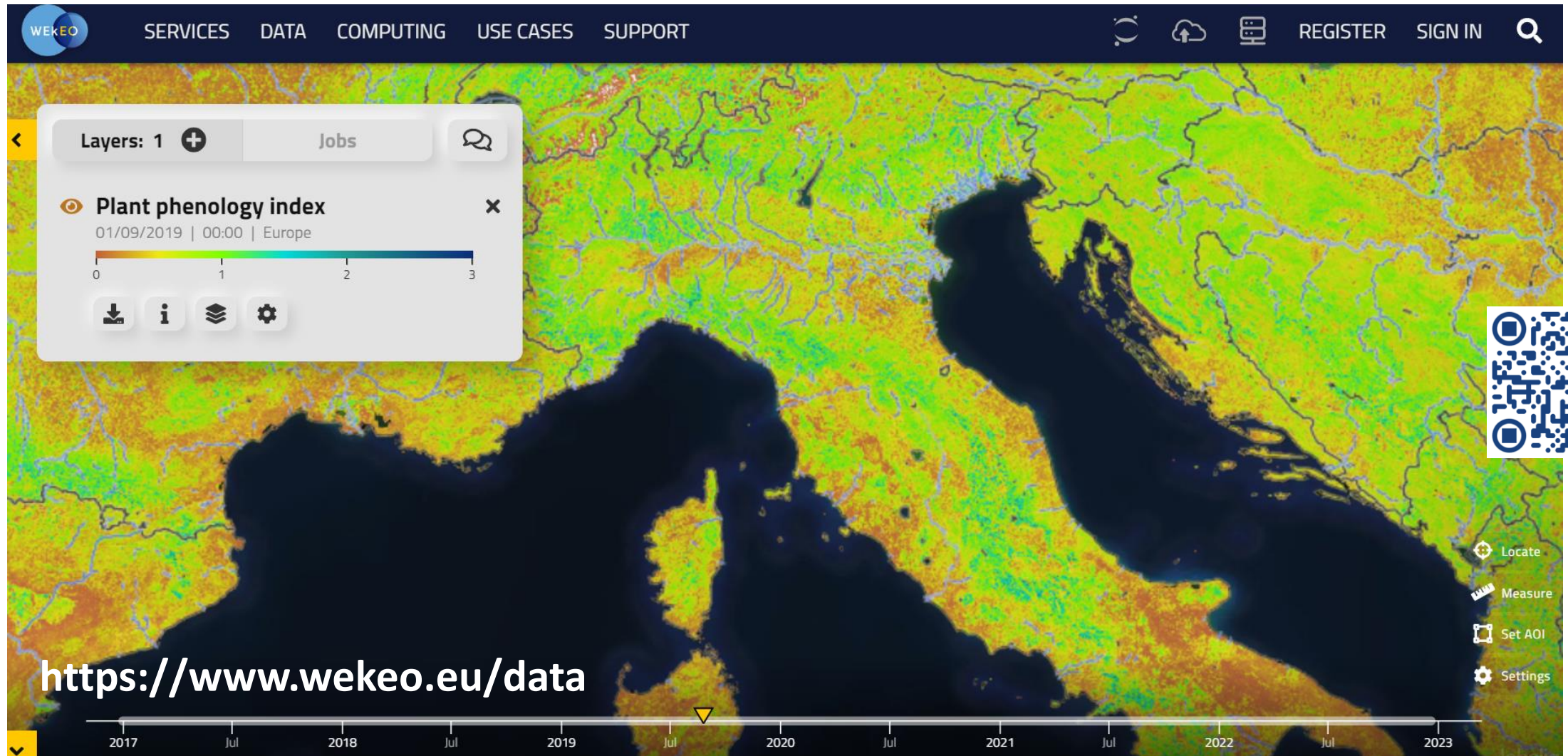
Land Monitoring

Implemented by



European
Environment
Agency

Wekeo viewer



PROGRAMME OF THE
EUROPEAN UNION



Land Monitoring

Implemented by



European
Environment
Agency



Land Monitoring

Learning Materials



PROGRAMME OF THE EUROPEAN UNION



PROGRAMME OF THE EUROPEAN UNION



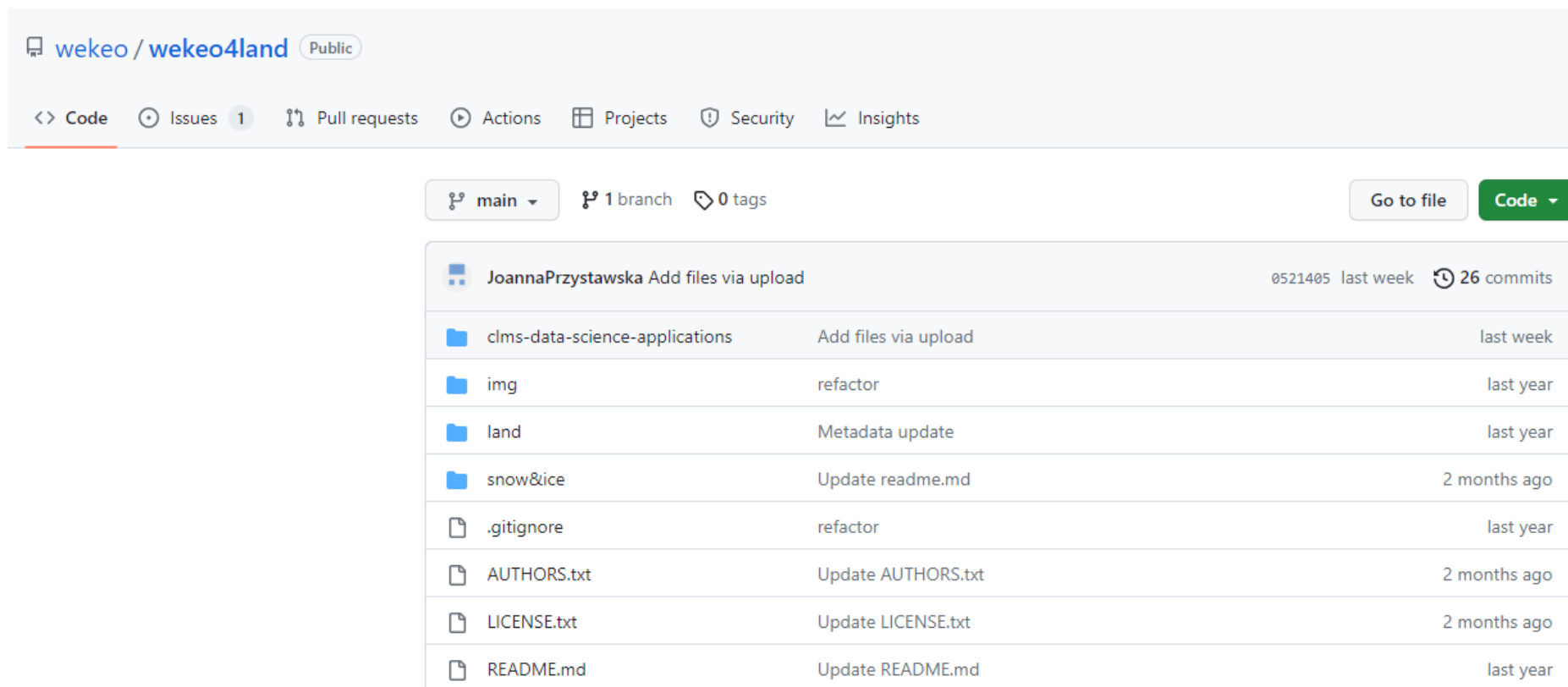
Implemented by



European Environment Agency

GitHub repositories

- <https://github.com/wekeo/wekeo4land>
- <https://github.com/eea>



wekeo / wekeo4land Public

<> Code Issues 1 Pull requests Actions Projects Security Insights

main 1 branch 0 tags Go to file Code

JoannaPrzystawska Add files via upload 0521405 last week 26 commits

clms-data-science-applications	Add files via upload	last week
img	refactor	last year
land	Metadata update	last year
snow&ice	Update readme.md	2 months ago
.gitignore	refactor	last year
AUTHORS.txt	Update AUTHORS.txt	2 months ago
LICENSE.txt	Update LICENSE.txt	2 months ago
README.md	Update README.md	last year



PROGRAMME OF THE
EUROPEAN UNION



Land Monitoring

Implemented by



European
Environment
Agency

Wekeo4land GitHub repository

main [wekeo4land / snow&ice /](#) Go to file

JoannaPrzystawska Update readme.md f2a39fd on Apr 11 [History](#)

..

img	Add files via upload	2 months ago
clms_hrsi_gfsc_demo.ipynb	Add files via upload	2 months ago
getWSMElevStats-template.ipynb	Add files via upload	last year
getWSMaspectStats-template.ipynb	Add files via upload	last year
readme.md	Update readme.md	2 months ago

readme.md

Welcome to High Resolution Snow and Ice monitoring repository!

You can find here:

HRSI GFSC Demo

`clms_hrsi_gfsc_demo` is a Python based tool to introduce you to the use of the Daily Cumulative Gap-filled Fractional Snow Cover (GFSC) product on the [WEKEO DIAS \(Data Information and Access System\)](#) and its Jupyter Lab. The notebook demonstrates how to use the Harmonised Data Access (HDA) API to download the products, read product data and metadata, visualize and manipulate raster data. The tutorial is using data from the Copernicus Programme that are available on WEKEO platform under High Resolution Snow and Ice Monitoring framework contract implemented by European Environment Agency (EEA), written by by expert trainers from Finnish Meteorological Institute and Magellium.



PROGRAMME OF THE
EUROPEAN UNION



Land Monitoring

Implemented by






European
Environment
Agency

CLMS data science applications

main ▾ wekeo4land / clms-data-science-applications / Go to file

JoannaPrzystawska Add files via upload 0521405 last week History

..

 datacubes-snow-monitoring	Add files via upload	last week
 ml-grassland-classification	Add files via upload	last week
 README.md	Add files via upload	last week

☰ README.md

Data Science for Copernicus Applications

Overview

This repository contains Jupyter Notebooks developed to demonstrate the use of data science technologies in workflows with CLMS data.

The Notebooks were developed by the [European Topic Centre on Data Integration and Digitalization \(ETC/DI\)](#) consortium partner [Sinergise](#) in the context of service contract to support implementation of CLMS -2022/2023.



PROGRAMME OF THE
EUROPEAN UNION



Land Monitoring



Implemented by



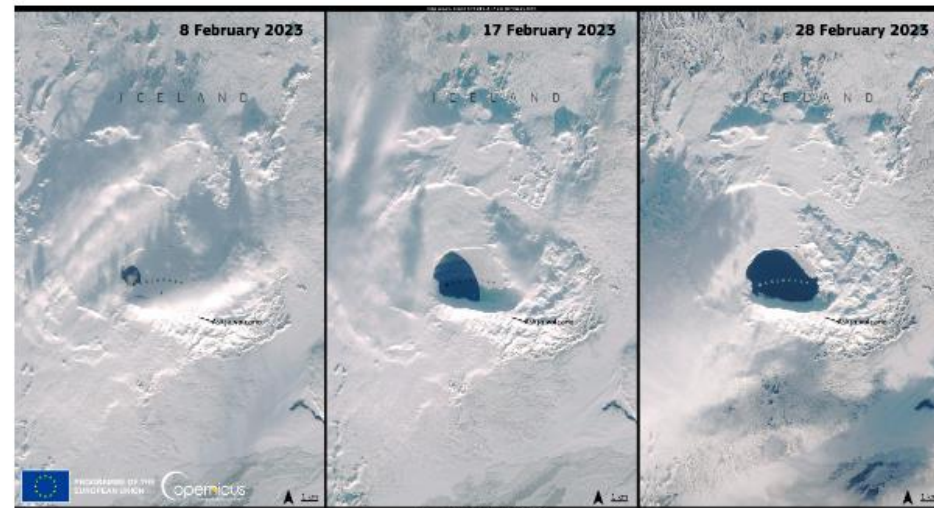
European
Environment
Agency

Ice product use case

- <https://github.com/eea/clms-hrsi-arlie-use-case/>

Use case 2  

Unexpected melting of Öskjuvatn, Iceland



This notebook demonstrates how ARLE data can be used to study an unexpected melting event in the volcanic lake Öskjuvatn. Located in the crater of the active volcano Askja in the central highlands of Iceland, the lake usually stays frozen until June or July. Yet, in February 2023, Copernicus Sentinel-2 satellite images revealed an early melting of the lake. The actual reason behind the melting event is not fully clarified but likely due to increased geothermal activity of the Askja volcano.



PROGRAMME OF THE
EUROPEAN UNION




Land Monitoring

Implemented by



European
Environment
Agency

EGMS guidelines - data download & QGIS usage

See product documentation here 

Search in the following items

Product specifications – European Ground Motion Service	1.2 MB
Publication date: 25.10.2023 Version: 2.0	
End user requirements – European Ground Motion Service	981.2 KB
Publication date: 20.12.2021 Version: 1.0	
Interface manual – European Ground Motion Service	3.6 MB
Publication date: 16.11.2023 Version: 3.0	
Product user manual – European Ground Motion Service	4.7 MB
Publication date: 17.05.2022 Version: 1.6	
User manual – Guidelines for European Ground Motion Service data download, import and visualization	
Publication date: 15.01.2024 Version: 1.1	
Algorithm theoretical basis document – European Ground Motion Service	3.7 MB
Publication date: 25.10.2023 Version: 3.0	
GNSS calibration data – European Ground Motion Service	273.1 KB
Publication date: 15.04.2023 Version: 1	

<https://land.copernicus.eu/en/products/european-ground-motion-service>

[https://land.copernicus.eu/en/technical-library/guidelines-european-ground-motion-service-product-analysis-in-qgis/@ @download/file](https://land.copernicus.eu/en/technical-library/guidelines-european-ground-motion-service-product-analysis-in-qgis/@@download/file)



PROGRAMME OF THE
EUROPEAN UNION



Land Monitoring

Implemented by



European
Environment
Agency

EGMS guidelines - data download & QGIS usage

The guidelines will explain how to:

- Download the EGMS data:
 - The single data tile
 - Multiple data tile (expert users/big data users)
- Import the data in QGIS
- Modify the attribute table depending on the user needs



PROGRAMME OF THE
EUROPEAN UNION



Land Monitoring

Implemented by



European
Environment
Agency



Land Monitoring

Thank you for your attention

Contact us @:

joanna.przystawska@eea.europa.eu

lorenzo.solari@eea.europa.eu

<https://land.copernicus.eu/en/contact-service-helpdesk>



PROGRAMME
OF THE EUROPEAN UNION



Implemented by

