

#EUSpace 

EU SPACE WEEK 2023

7 - 9 November - Sevilla, Spain

User Consultation Platform: Agriculture introduction

Stefan Schneider

07/11/2023 Sevilla



European
Commission



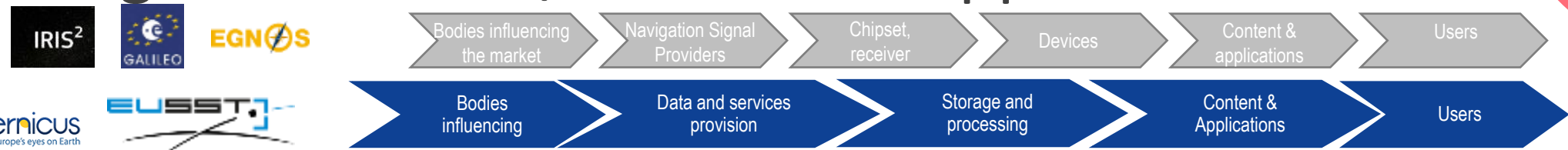
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2023

User Consultation Platform

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All EU Space Program components with an integrated market/user driven approach



8 parallel sessions

Agriculture and Forestry

Environment

Road and Automotive

Rail

Public Transport

Resilient societies

Space

SST

Market & User Knowledge



Extended **Market and technology** monitoring and forecasting

Extended and synergic **User Consultation Platform**

Better understanding the **MS needs** and adding Copernicus Other Users satisfaction survey

Demand Support & users



A common **market segments** approach for all EU space downstream

Extended key account with **main players** of the value chain

Offer Creation



Creation of new "made in Europe" products and services.

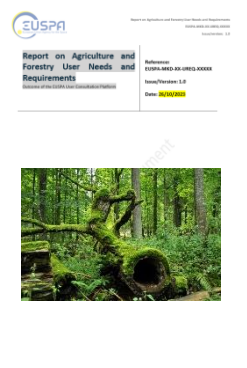
Large implementation of end-to-end solutions leveraging synergies.

Supporting entrepreneurship, SME and start-ups

Report on Agriculture and Forestry User Needs and Requirements

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Applications covered in 2023 edition



Sub-segments	Applications	Types of Applications Level of Investigation	
Environmental monitoring	Carbon capture & content assessment	C	○
	Environmental impact monitoring	C	○
Natural resources monitoring	Biomass monitoring	B	◐
	Crop yield forecasting	A	●
	Soil condition monitoring	B	◐
	Vegetation monitoring	C	○
Operations management	Asset monitoring	C	○
	Automatic steering	A	●
	CAP monitoring	B	◐
	Farm machinery guidance	B	◐
	Farm management systems	B	◐
	Field definition	B	◐
	Livestock wearables	B	◐
	Pastureland management	C	○
	Precision irrigation	A	●
	Variable rate application	A	●
Weather services for agriculture	Climate services for agriculture	C	○
	Weather forecasting for agriculture	C	○

- Legend**
- EO only application (light blue circle)
 - GNSS only application (purple circle)
 - Hybrid/synergetic application (combined use of EO and GNSS) (green circle)
- A** ● An in-depth investigation
- B** ◐ A partial specification
- C** ○ Will be analysed in next versions

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Session Guidelines

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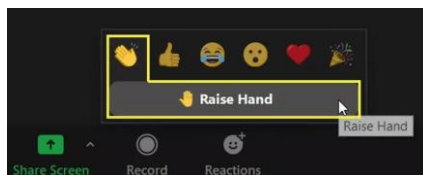
Agriculture Session - Guidelines

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ZOOM rules

- **Raise your hand** for questions (menu bar - “Reactions” button – “Raise Hand”) and simultaneously write your question in the chat (“To everyone”)
- Wait for one of the sessions’ **moderators to give you the floor**. Please note: due to time constraints, only some questions will be selected by the moderators
- Please remind to **mute yourself once finished** the intervention and **lower your hand** (“Lower Hand”)
- If you are not a speaker, please **do not share your screen without moderators’ consent**

How to raise hand:



Timing rules

- We kindly invite all participants to **respect the timing** indicated in the agenda. Not respecting our time constraints would have major impacts on the overall event
- To this end, we will let **speakers** know when their **interventions** shall be ending
- **Q&A/debate** sessions duration may vary depending on the time available. Please feel free to kick-off and feed the debates as soon as the floor will be open, to take advantage of the time at our disposal
- **Reminder**
- Please remember to fill in your information on the **list of participants** that is being circulating in the room

Thank you for your cooperation!

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Agriculture session - Agenda

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10:00	<i>Session Agenda presentation</i>	Stefan Schneider , EUSPA
10:10	<i>EU Space Programme Components current state and future services for users</i>	Javier de Blas , EUSPA
10:25	<i>Horizon Europe EGNSS Mission and Service related R&D activities and Contribution to Ionospheric Prediction Service</i>	Javier Ostolaza , EUSPA & Leo Bibollet , Hanaa ALBITAR, TAS
10:35	<i>Copernicus for Agriculture: CLMS for Agriculture</i>	Usue Donezar , EEA
	<i>C3S/CAMS for Agriculture</i>	Cristina Ananasso & Delphine Deryng ECMWF
11:05	<i>Developing requirements from automation to autonomy & discussion</i>	Georg Larscheid , Claas
11:25	<i>GALIRUMI R&D project – EGNSS based robots for organic farming & discussion</i>	Esther López , Acorde - GALIRUMI H2020
11:45	<i>The EU SPACE opportunity for small and medium size farmers & discussion</i>	Maurizio Laterza , Planetek
12:05	<i>EU SPACE role within Regenerative Agriculture & discussion</i>	Tamme Van Der Wal , Aerovision
12:25	<i>SPACE4GREEN R&D project - EU Space and block chain for traceability and sustainability & discussion</i>	Juan Pablo García , Integrasys
12:50	<i>Conclusions and next steps</i>	Stefan Schneider , EUSPA
13:00	<i>Lunch</i>	

KEY AREAS

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EU Space Programme Components Status and future services for users

UCP Agriculture

Javier De Blas (EUSPA)



European
Commission



A new EU Space Programme

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EU space activities **under one umbrella**



EGNOS

EGNOS “Makes navigation signals more accurate and trustable for Safety-critical applications”
Operational in **400+ airports** & helipads in 23 countries



Galileo

Global satellite navigation and positioning system (GNSS)
More than 3 billion Galileo receivers worldwide



Copernicus

Earth Observation (EO) and monitoring based on satellite & non-space data
Nr.1 world provider of space data and information (>20TB/day)



GOVSATCOM

Secure satellite communications for EU governmental actors
Rapid support over crisis areas



Space Situational Awareness (SSA)

Space Surveillance and Tracking (SST)
Space Weather Events (SWE)
Near-Earth Objects (NEO)



Others

Access to Space
Research & Innovation
Entrepreneurship
Certification & standardisation
Capacity Building

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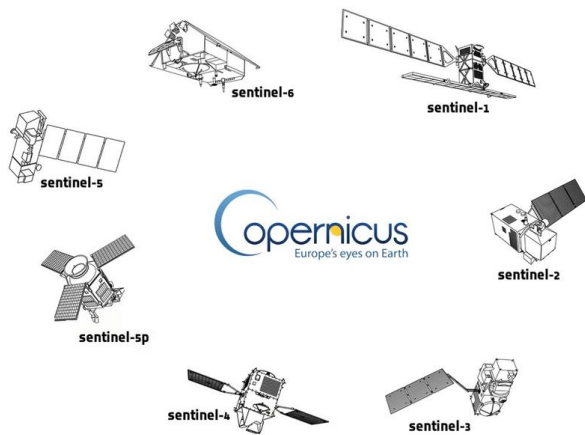
Copernicus

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Copernicus components

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IN SITU



SERVICES



Copernicus services

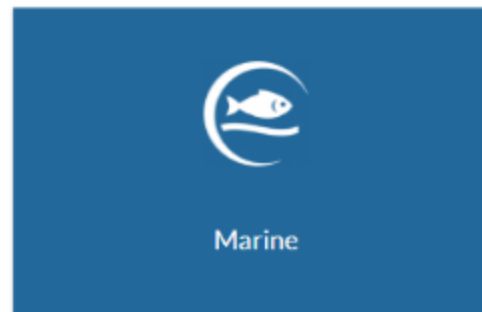
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<https://atmosphere.copernicus.eu/>



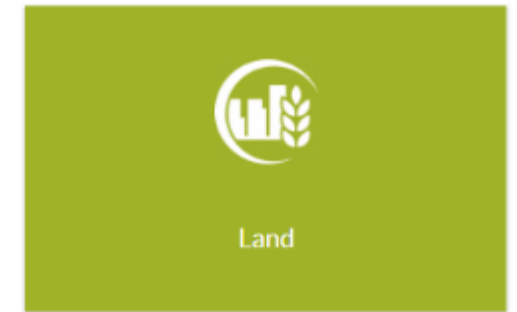
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 ECMWF

<https://marine.copernicus.eu/>



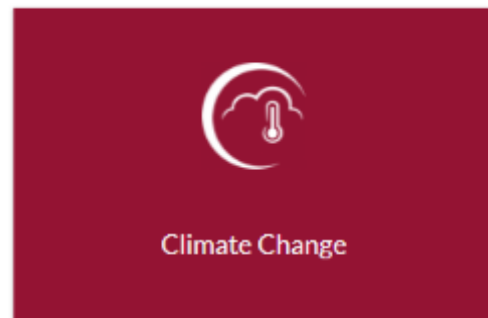
**MERCATOR
OCEAN**
INTERNATIONAL

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



**European
Environment
Agency**
 **Joint Research Centre
JRC**

<https://climate.copernicus.eu/>



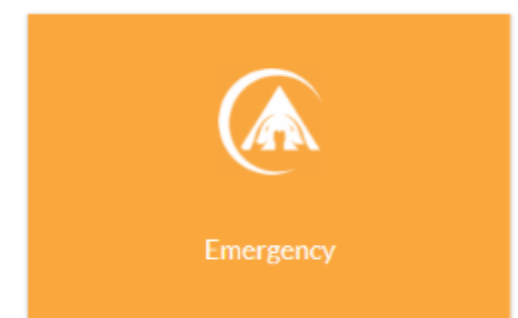
IMPLEMENTED BY
 ECMWF

<https://www.copernicus.eu/en/copernicus-services/security>



SatCen
European Union Satellite Centre
 FRONTEX
EUROPEAN BORDER AND
COAST GUARD AGENCY
 EMSA
European Maritime Safety Agency

<https://emergency.copernicus.eu/>



**Joint Research Centre
JRC**
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GALILEO and EGNOS

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Climate Change

Galileo and EGNOS Services



Galileo Initial Services are provided to worldwide users since **December 2016**

Open Service (OS)

Freely accessible service for positioning and timing*

Public Regulated Service (PRS) – Governmental Service

Encrypted service designed for greater robustness and higher availability – secure satellite communication

Search and Rescue Service (SAR)

Locates people in distress and acknowledges that the distress signal has been received

High Accuracy Service (HAS)

Delivers high accuracy services, freely accessible

Under preparation

Commercial Service Authentication (CS)

Delivers authentication services for commercial applications



EGNOS services are provided to users since **October 2009**

Open Service (OS)

Improving GNSS accuracy, intended mainly for high-volume satellite navigation applications for use by consumers

Safety of Life Service (SoL)

Providing a high level of integrity for users for whom safety is essential (e.g. civil aviation, in accordance with ICAO standards)

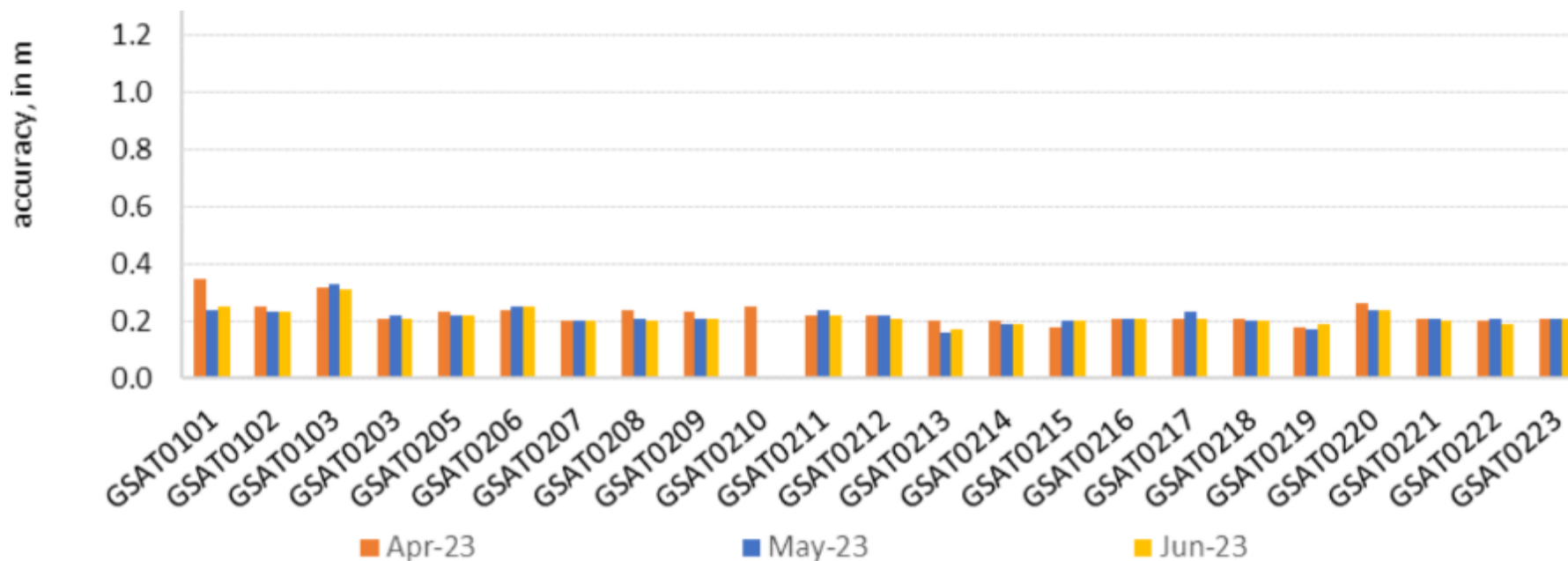
Data Access Service (EDAS)

Offering EGNOS data with greater added value through internet, intended mainly for professional or commercial use

* OS Navigation Message Authentication (OSNMA) is currently under testing

Galileo Open Service

- Galileo entered Initial Operational Capability (IOC) phase in 2016. Since then, anyone with a Galileo-enabled device is able to use its signals providing free of charge outstanding seamless performance worldwide, in terms of ranging, positioning and timing.
- The Open Service ranging performance ranks first among all GNSS service providers.



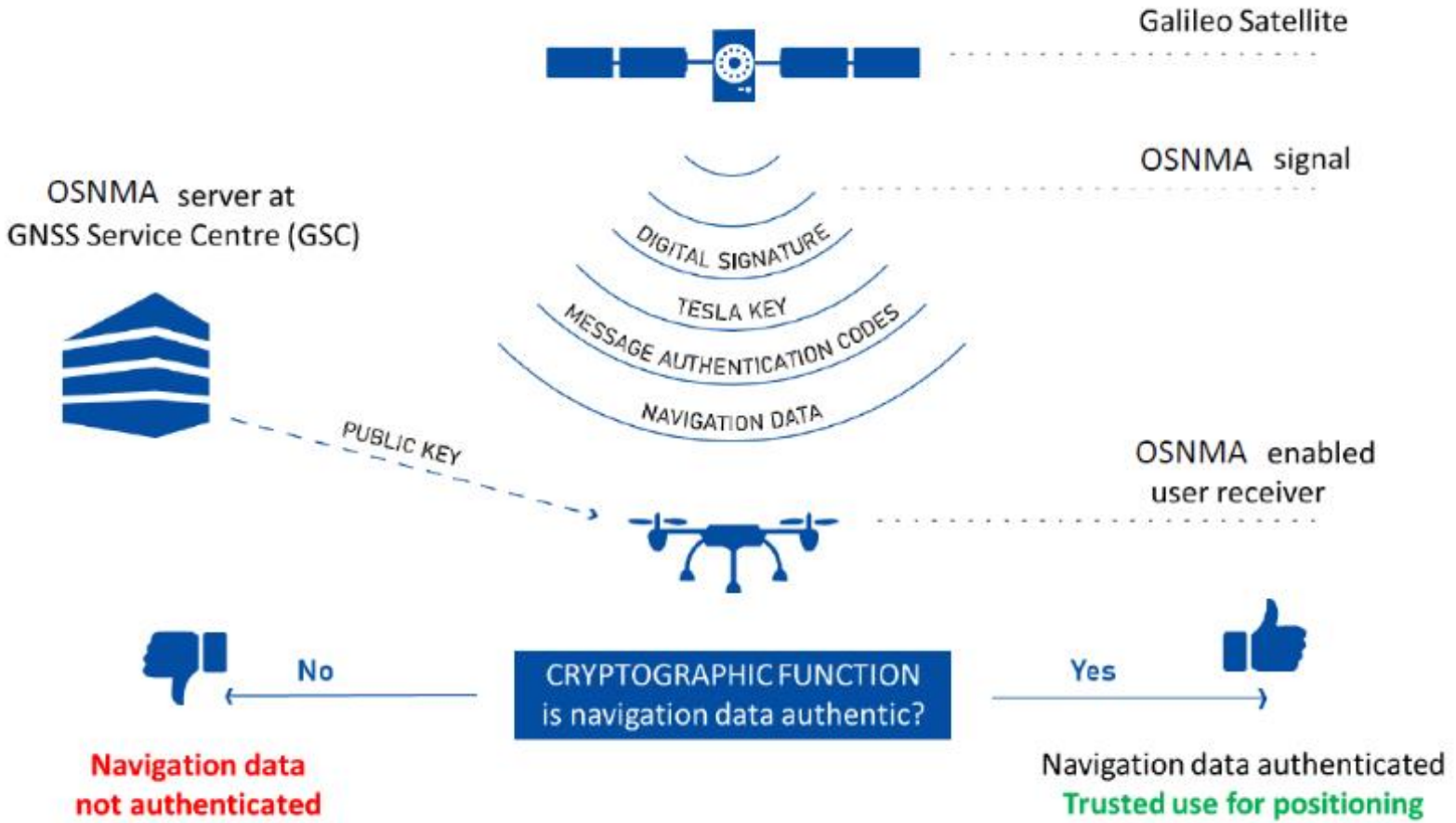
Galileo Open Service

- Galileo OS users can already benefit from an improved navigation message, being broadcast by the Galileo constellation since mid-2023, which considerably boosts their performance in terms of robustness and Time To First Fix (TTFF)
- An update of the Galileo Open Service (OS) Service definition Document (SDD) is planned for the end of this year.
- This fourth issue of the OS SDD will bring to the users:
 - new MPLs (e.g. Ranging rate accuracy, Ranging accuracy at high percentiles)
 - improvements of existing MPLs, such as the timeliness of certain Notice Advisory to Galileo Users (NAGU)
- This updated OS SDD will also introduce the OS Extended Operation Mode, which is characterized by a gradually degrading ranging accuracy with respect to the nominal operational mode, even in case the Galileo Ground Segment is affected by certain issues, thus increasing the robustness of the OS.



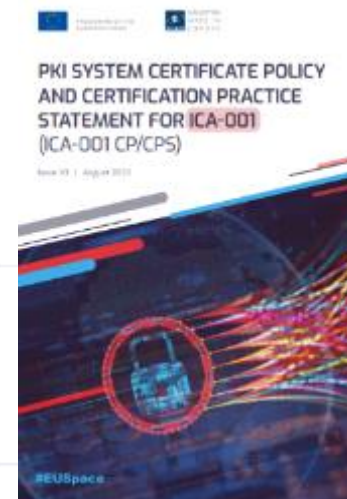
Galileo OSNMA

Scope



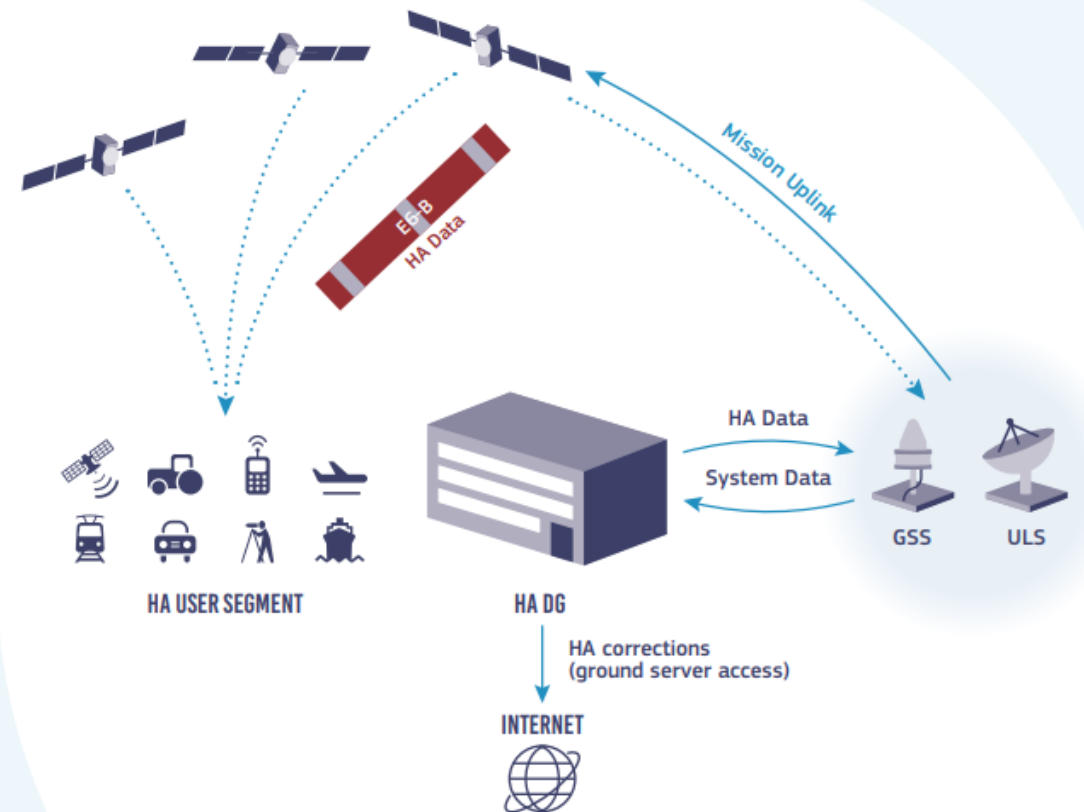
OSNMA status and roadmap

- OSNMA SiS ICD (final format) and Receiver Guidelines published in Dec'2022
- Transmission of SiS as per OSNMA SiS ICD (final format) since August 2023
- Operational cryptographic data to be published by end 2023
- Initial Service Declaration (Service Definition Document publication and signal switch to 'operational' mode) foreseen by Q1'24



What is the Galileo HAS

- Galileo HAS provides precise corrections for satellite orbit, clock and signal biases
- Galileo HAS corrections distributed via
 - Galileo satellites, E6-B signal (1278.75 MHz)
 - Internet
- Typical accuracy in the decimetre level (after convergence), with Precise Point Positioning (PPP) receivers
- (Almost*) global coverage and free



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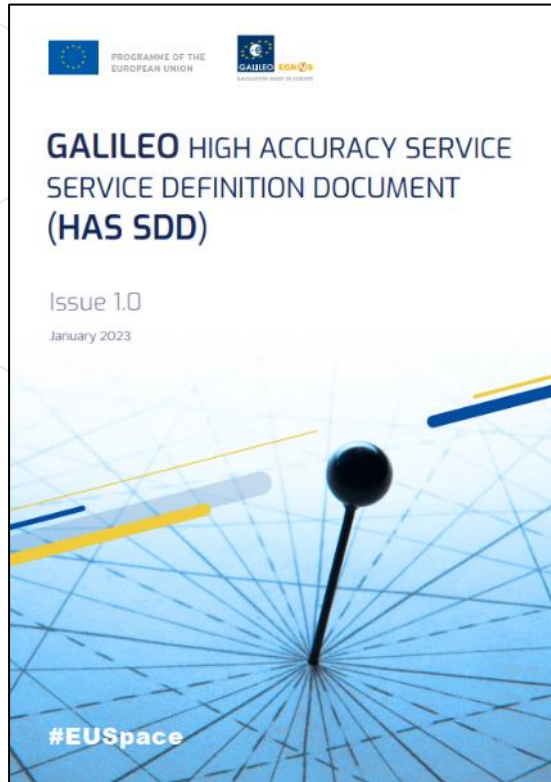
**global coverage of corrections but no global performance commitment yet*

#EUspace

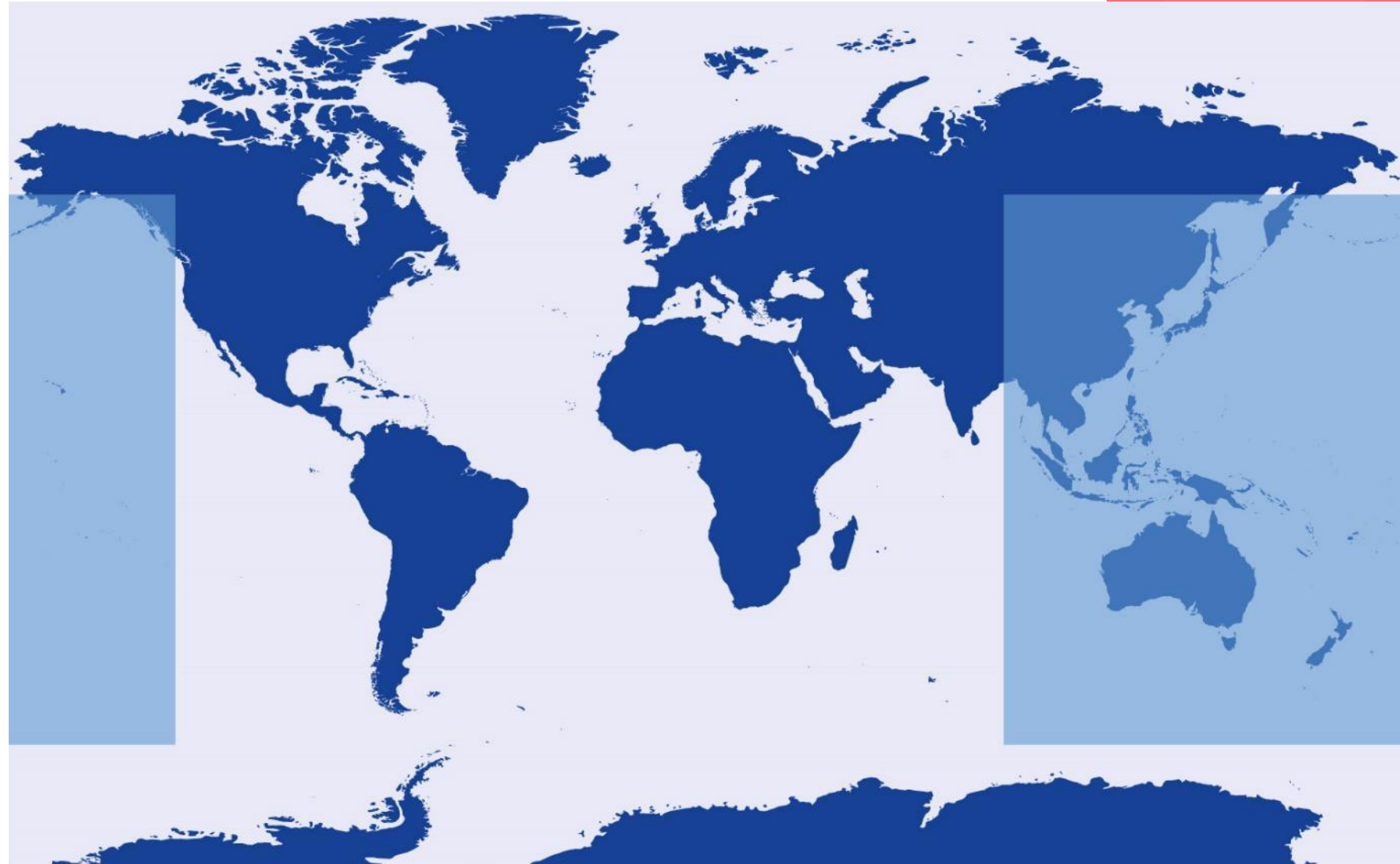


What is HAS – Initial Service Area

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**European Union Agency for the Space Programme
(EUSPA), HAS SDD [Online]:**
[https://www.gsc-
europa.eu/sites/default/files/sites/all/files/Galileo_H
AS_SDD.pdf](https://www.gsc-europa.eu/sites/default/files/sites/all/files/Galileo_HAS_SDD.pdf)



Galileo HAS service area



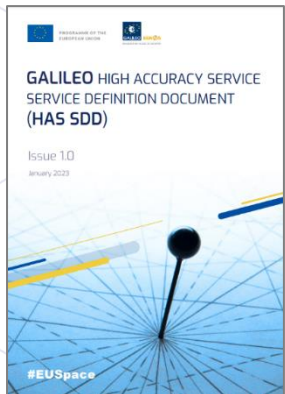
Area currently excluded from Galileo HAS service area



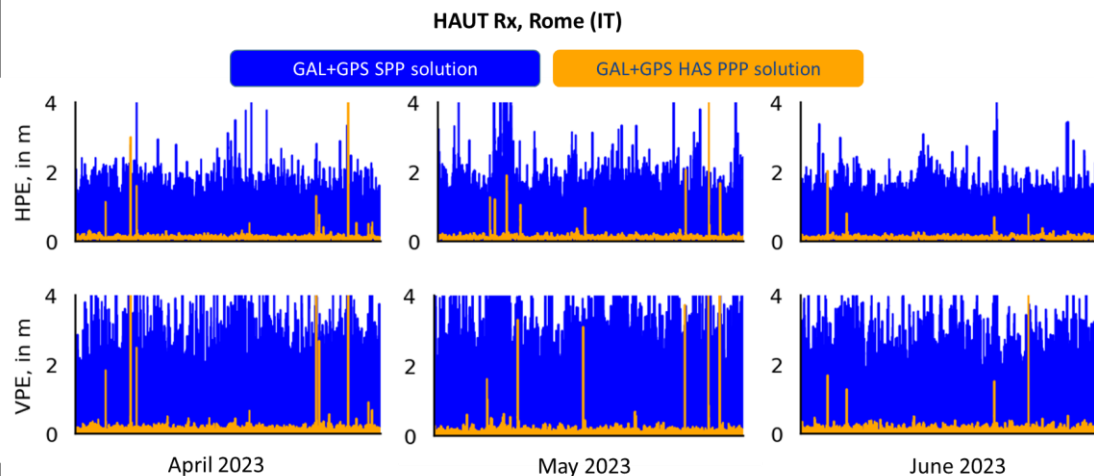
What is HAS - Initial Service Performance



- **Full compliance** to HAS SDD MPLs since HAS service declaration.



HAS MPLs	target	2023				
		February	March	April	May	June
accuracy of HAS corrections, in m						
orbit						
Galileo	≤ 0.20	■ ■	■ ■	■ ■	■ ■	■ ■
GPS	≤ 0.33	■ ■	■ ■	■ ■	■ ■	■ ■
clock						
Galileo	≤ 0.12	■ ■	■ ■	■ ■	■ ■	■ ■
GPS	≤ 0.15	■ ■	■ ■	■ ■	■ ■	■ ■
code bias						
Galileo	≤ 0.50	■ ■	■ ■	■ ■	■ ■	■ ■
GPS	≤ 0.50	■ ■	■ ■	■ ■	■ ■	■ ■
availability of HAS corrections, in %						
Galileo only (≥ 5 corrected satellites)	≥ 87	■ ■	■ ■	■ ■	■ ■	■ ■
Galileo and GPS (≥ 8 corrected satellites)	≥ 95	■ ■	■ ■	■ ■	■ ■	■ ■
service coverage, in %						
availability of corrections	100	■ ■	■ ■	■ ■	■ ■	■ ■
		■ ■ SiS Dissemination IDD Dissemination				



- **HAS Quarterly Performance Reports** regularly published at the GSC website (<https://www.gsc-europa.eu/electronic-library/performance-reports/galileo-high-accuracy-service-has>)

Galileo HAS

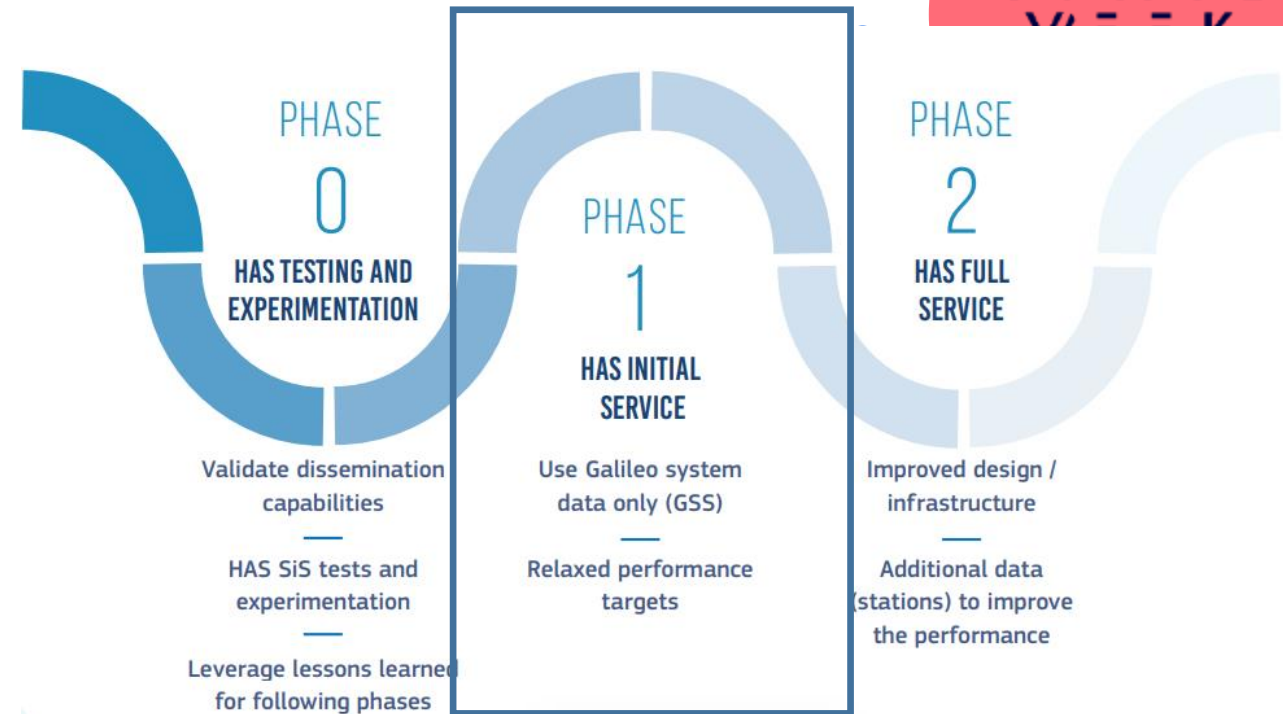
What comes next?

▪ Short-term: use it!

- User segment development
 - More HAS-enabled receivers
 - HAS R&D actions
 - HAS Reference Algorithm publication
- HAS based applications development

▪ Mid / long-term: HAS Full Service

- Increased global performance (e.g. better accuracy)
- Faster positioning in EU (atmospheric corrections)
- HAS authentication and error characterization



EGNOS Services

EGNOS services are provided to users since October 2009

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EGNOS services foreseen evolution

Primary means of navigation for Aviation in 2030

- Performance Based Navigation (PBN)
- Better availability (99.9%), more resilience, EU autonomy (with Galileo)
- New Airspace users (helicopters, small aerodromes, drones, ...)

Maritime

- Initial service in 2023 for maritime and in-land navigation
- Towards autonomous vessels navigation and zero-emissions shipping
- Not only EGNOS: end to end solutions using HAS/OSNMA and Copernicus

Rail

- Making ERTMS accessible on all lines
- R&I substantial investment to prepare railway operators and signalling industry
- A new service under preparation, facing the challenge of Rail safety standards

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Secure Satcom

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IRIS²

Infrastructure for Resilience, Interconnectivity and Security by Satellite

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Regulation 2023/588 in force since 20 March 2023

Signature of the Regulation by EP President and Swedish Presidency



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Space Surveillance and Tracking (SST)

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Space Surveillance and Tracking (SST) Front Desk

- EUSPA manages and operates the **EU Space Surveillance and Tracking (SST) Front Desk**
- The Agency cooperates with the **SST Partnership** to provide **space safety services**:
 - **Collision Avoidance (CA)**: risk assessment of collision between spacecraft or between spacecraft and space debris
 - **Re-entry Analysis (RE)**: risk assessment of uncontrolled re-entry of artificial space objects into the Earth's atmosphere
 - **Fragmentation Analysis (FG)**: detection and characterization of in-orbit fragmentations, break-ups or collisions



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Users

200

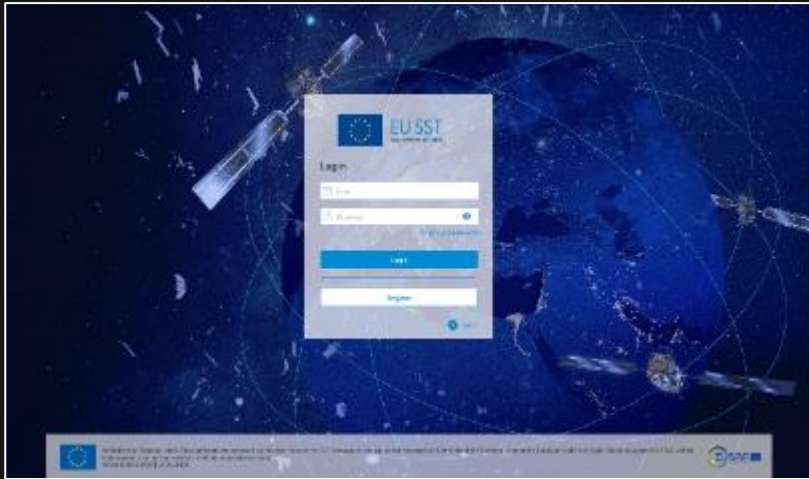
ORGS



402

Satellites

Space Surveillance and Tracking (SST) Front Desk



- Services and Coordination Platform
portal.eusst.eu
- Performance Reporting



- SST Helpdesk
sst.helpdesk@euspa.europa.eu
- SST Taskforce



- User Consultation Platform
7th Nov 2023 afternoon
- Communication

Agriculture session - Agenda

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KEY AREAS

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EU SPACE WEEK 2023

7 - 9 November - Sevilla, Spain

Horizon Europe EGNSS Mission and Service related R&D activities + Contribution to Ionospheric Prediction Service

Leo BIBOLLET, Hanaa AL BITAR (TAS-F)

Javier OSTOLAZA (EUSPA)



Horizon Europe EGNSS Mission and Service related R&D activities

- In 2022, European Commission entrusted EUSPA with technical supervision of 2 non-delegated projects under Horizon Europe EGNSS Upstream ‘Mission and Service (MAS)’:
 - Applied R&D on EGNSS Authentication → [E-GIANTS](#)
 - EGNSS Additional dissemination means → [IDEEAS](#)

E-GIANTS

European GNSS Improved Authentication Solutions



- T0 (signature of the contract): 05/05/2023
- Duration 18 months
- Budget 720 k€

❑ **Objective:** to assess potential EGNSS authentication solutions that exploit the synergies between EGNOS and Galileo

Focus on:

- Improving the **performance and security** of the authentication services provided by EGNSS
- Supporting the definition of optimal **authentication solutions for EGNSS**, measure the **level of protection** achieved and the **impact** on the EGNSS service for non-aviation users


The solution must be validated by a proof of concept



Thales Alenia Space

- Prime contractor of the project
- In charge of the coordination of the consortium at management and technical level
- Leads the SBAS and OSNMA key management study (WP1) and the SBAS Authentication for non-aviation users (WP3)

Thales Services Numeriques

- Leads the additional dissemination and improvements to OSNMA work package (WP2)
- Particularly in charge of the design of the OSNMA improved service, the Proof-Of-Concept and the roadmap

Thales SIX GTS

- Expertise in key management and security analysis
- Supports the SBAS and OSNMA key management study (WP1) and the SBAS Authentication for non-aviation users (WP3)

Valdani Vicari & Associati

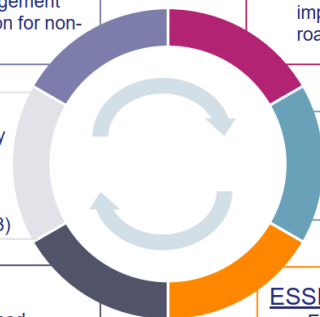
- Leads the user requirement assessments for all the work packages of the project

FDC

- Evaluates the impact of the proposed improved EGNSS authentication solutions at receiver level, assessing the induced cost and complexity

ESSP

- Expertise of EGNOS service provision
- Support for the consolidation of the SBAS key management and authentication provision scheme



IDEEAS

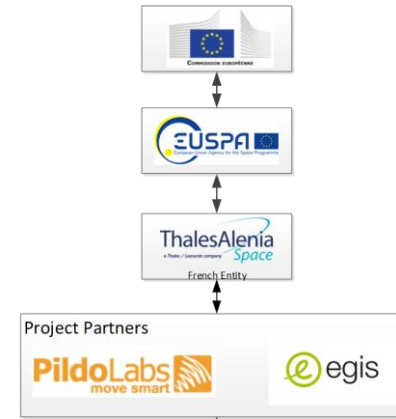


INNOVATIVE DISSEMINATION MEANS AS ENABLERS FOR EGNSS AUGMENTATION SERVICES

- T0 (signature of the contract): 14/03/2023
- Duration 18 months
- Budget 620 k€

Scope:

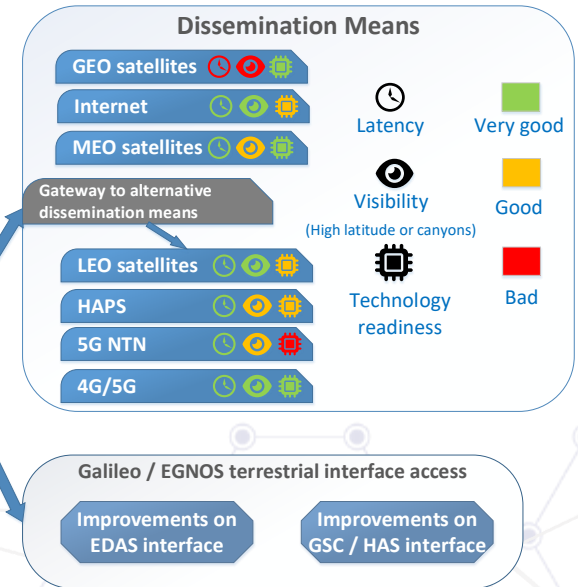
- analyze and define the **cost-effective potential data delivery means complementary / alternative to the current EGNOS and Galileo HAS ones** either from space and/or from ground/air
- **improve the current dissemination capabilities** in terms of potential users and enhanced commitments (e.g. provision of integrity through EDAS)
- propose a meaningful timeframe for the proposed dissemination mean, taking into account standardization and user terminal activities
- perform a **proof of concept of the service**



End users – targeted use cases



User needs, and KPIs



VALIDATED
The solution must be validated by a proof of concept



The results of both projects (e.g. user needs, concepts proposed, costs and benefits, implementation roadmaps) shall be validated by a representative set of stakeholders across different sectors.

To participate or if you have any question, please feel free to contact us:

Contacts	E-GIANTS	IDEEAS
TAS	Leo.Bibollet@thalesaleniaspace.com	Hanaa.AlBitar@thalesaleniaspace.com
EUSPA	javier.OSTOLAZA@euspa.europa.eu	javier.OSTOLAZA@euspa.europa.eu

Contribution to Ionospheric Prediction

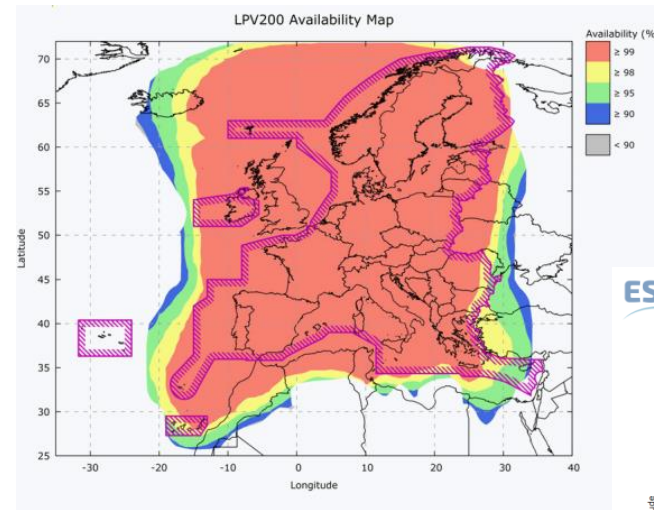


YES

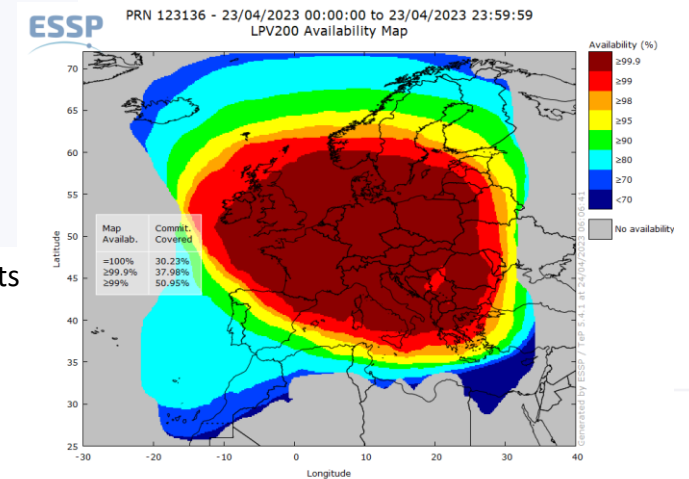
BUT



<https://www.discover-the-world.com/>








EGNOS SoL SDD commitments



EGNOS SoL real performance

Contribution to Ionospheric Prediction

Next steps

-  Assess main contributors to space weather impact on EGNSS (EGNOS and Galileo)
-  Assess feasibility of predictions/forecast
-  Assess impact on user operations
-  Assess how to inform users on potential EGNSS underperformance
-  Define an operational service concept

To participate or if you have any question, please feel free to contact us:

javier.OSTOLAZA@euspa.europa.eu

Agriculture session - Agenda

10:00	<i>Session Agenda presentation</i>	Stefan Schneider , EUSPA
10:10	<i>EU Space Programme Components current state and future services for users</i>	Javier de Blas , EUSPA
10:25	<i>Horizon Europe EGNSS Mission and Service related R&D activities and Contribution to Ionospheric Prediction Service</i>	Javier Ostolaza , EUSPA & Leo Bibollet , Hanaa ALBITAR, TAS
10:35	<i>Copernicus for Agriculture: CLMS for Agriculture C3S/CAMS for Agriculture</i>	Usue Donezar , EEA Cristina Ananasso & Delphine Deryng ECMWF
11:05	<i>Developing requirements from automation to autonomy & discussion</i>	Georg Larscheid , Claas
11:25	<i>GALIRUMI R&D project – EGNSS based robots for organic farming & discussion</i>	Esther López , Acorde - GALIRUMI H2020
11:45	<i>The EU SPACE opportunity for small and medium size farmers & discussion</i>	Maurizio Laterza , Planetek
12:05	<i>EU SPACE role within Regenerative Agriculture & discussion</i>	Tamme Van Der Wal , Aerovision
12:25	<i>SPACE4GREEN R&D project - EU Space and block chain for traceability and sustainability & discussion</i>	Juan Pablo García , Integrasys
12:50	<i>Conclusions and next steps</i>	Stefan Schneider , EUSPA
13:00	<i>Lunch</i>	

KEY AREAS

#EUSpace 

EU SPACE WEEK 2023

7 - 9 November - Sevilla, Spain

Copernicus for agriculture - products

UCP Agriculture

Usue Donezar Hoyos, European Environment Agency



European
Commission



Copernicus Land Monitoring Service

- Geographical information on **land cover and its changes, land use, vegetation state, water cycle** and Earth's **surface energy variables** on European and global levels for environmental applications
- **Harmonized** and **consistent** in time and space
- Products and manuals are free and open
- Implemented by JRC and EEA
- Website: <https://land.copernicus.eu/>

Land cover and land use mapping

Priority area monitoring

Bio-geophysical parameters

Ground motion monitoring

Satellite data

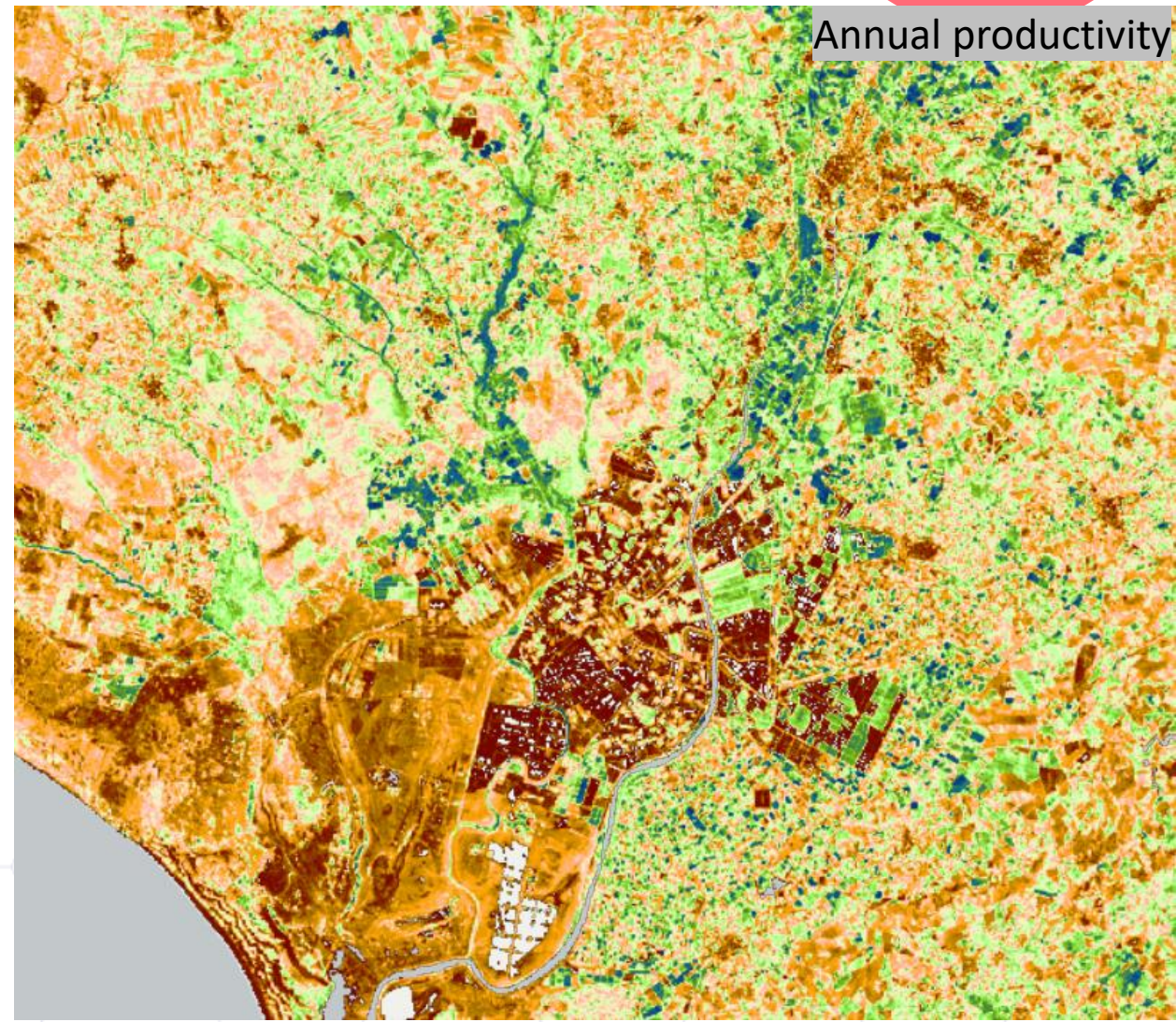
Reference and validation data

HR Vegetation Parameters

- Spatial resolution: 10 m, no MMU
- Update frequency: Daily/10-daily/Yearly
- Most recent reference layer: 2022/2023
- Examples of applications:
 - Mapping peatlands and modelling their CO₂ emissions
 - Assessing and adapting to drought impact
 - Biodiversity conservation

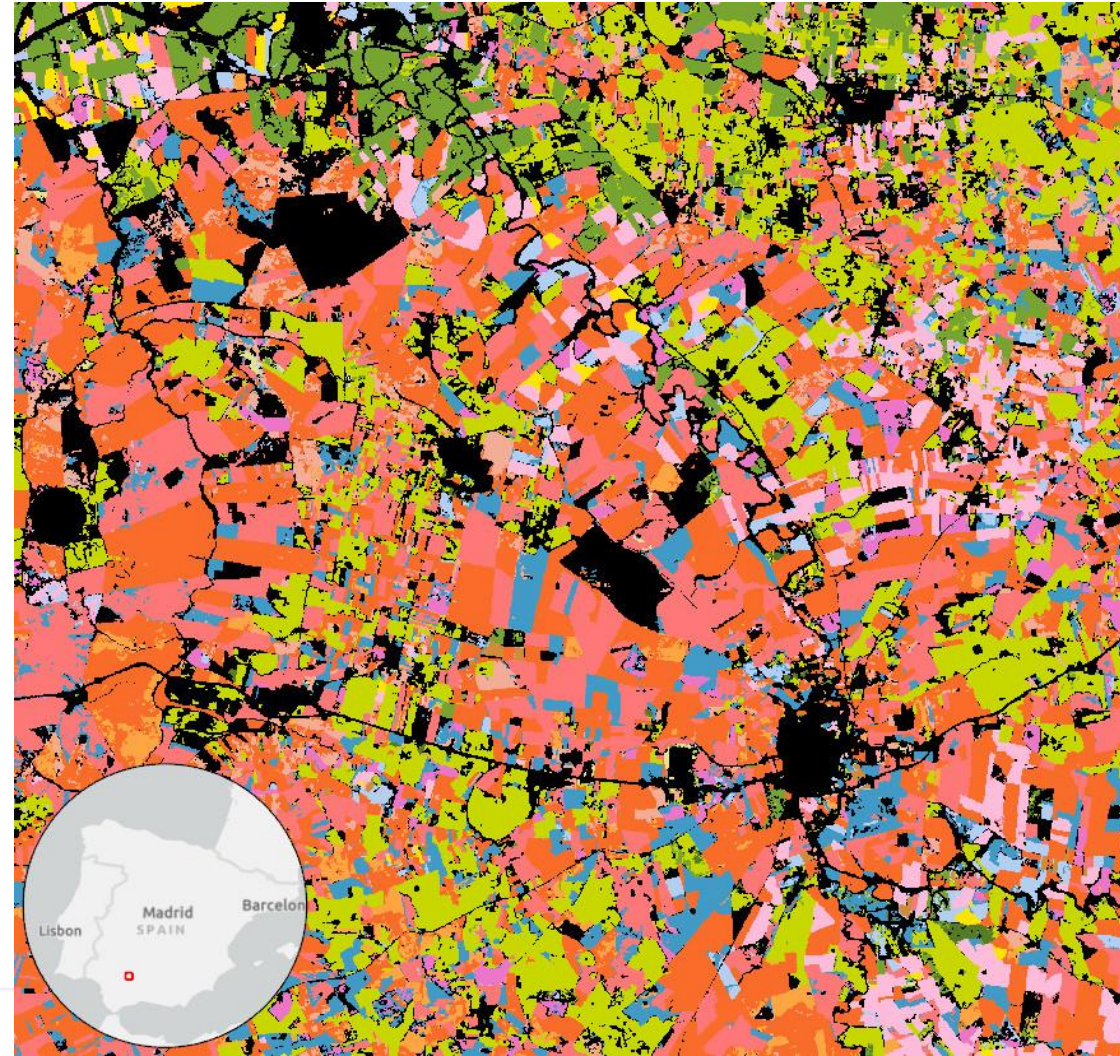
Upcoming webinar series:

<https://land.copernicus.eu/en/events/high-resolution-phenology-and-productivity-for-drought-impact-assessments>



HRL Vegetated Land Cover Characteristics

- Spatial resolution: 10 meter
- Update frequency: Annual
- Most recent reference layer: 2021
- Examples of applications:
 - CAP
 - LULUCF

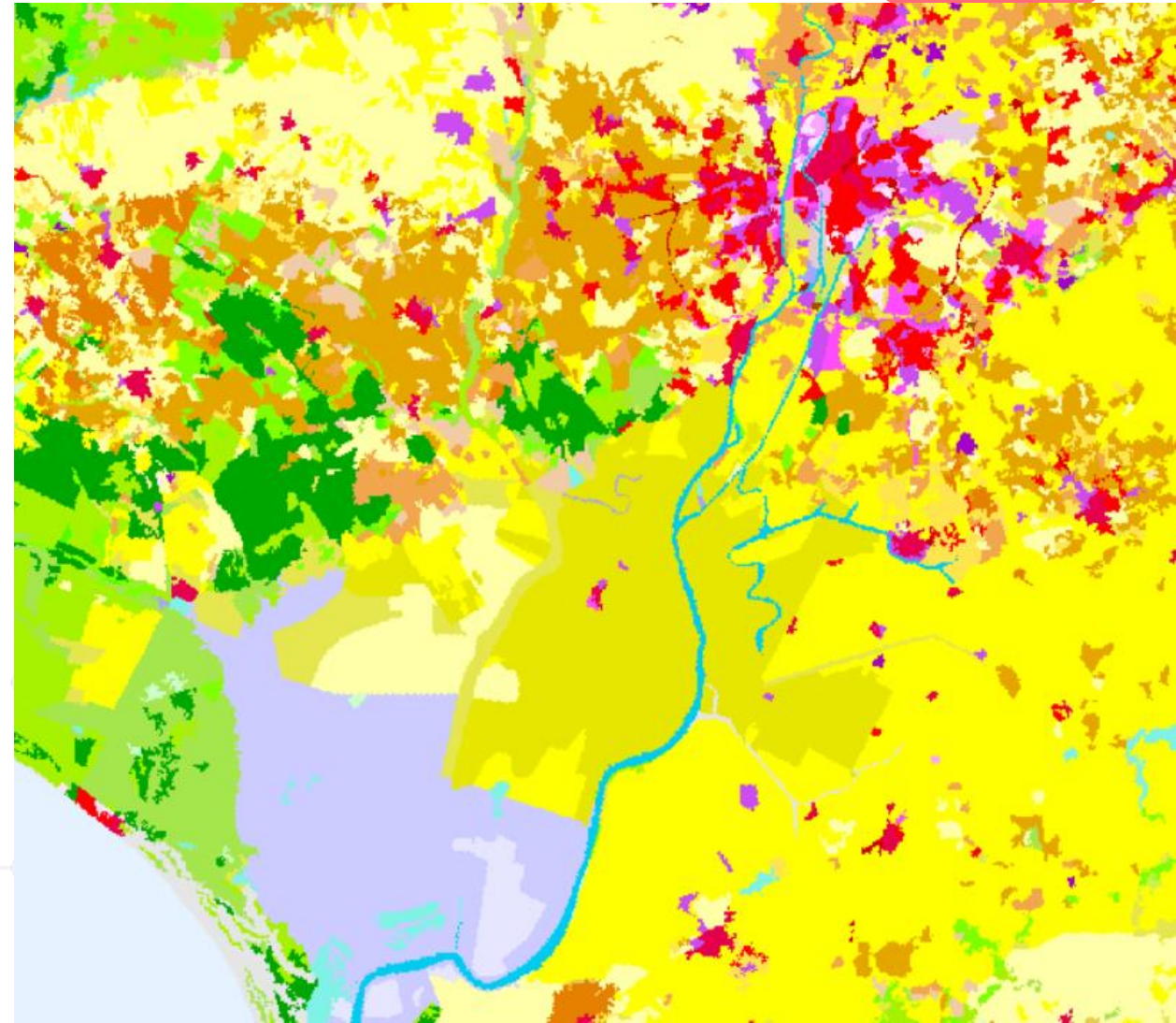


Crop Types 2018

0:	No Cropland
1110:	Wheat
1120:	Barley
1130:	Maize
1140:	Rice
1150:	Other Cereals
1210:	Fresh Vegetables
1220:	Dry Pulses
1310:	Potatoes
1320:	Sugar Beat
1410:	Sunflower
1420:	Soybeans
1430:	Rapeseed
1440:	Flax, cotton and hemp
2100:	Grapes
2200:	Olives
2310:	Fruits
2320:	Nuts

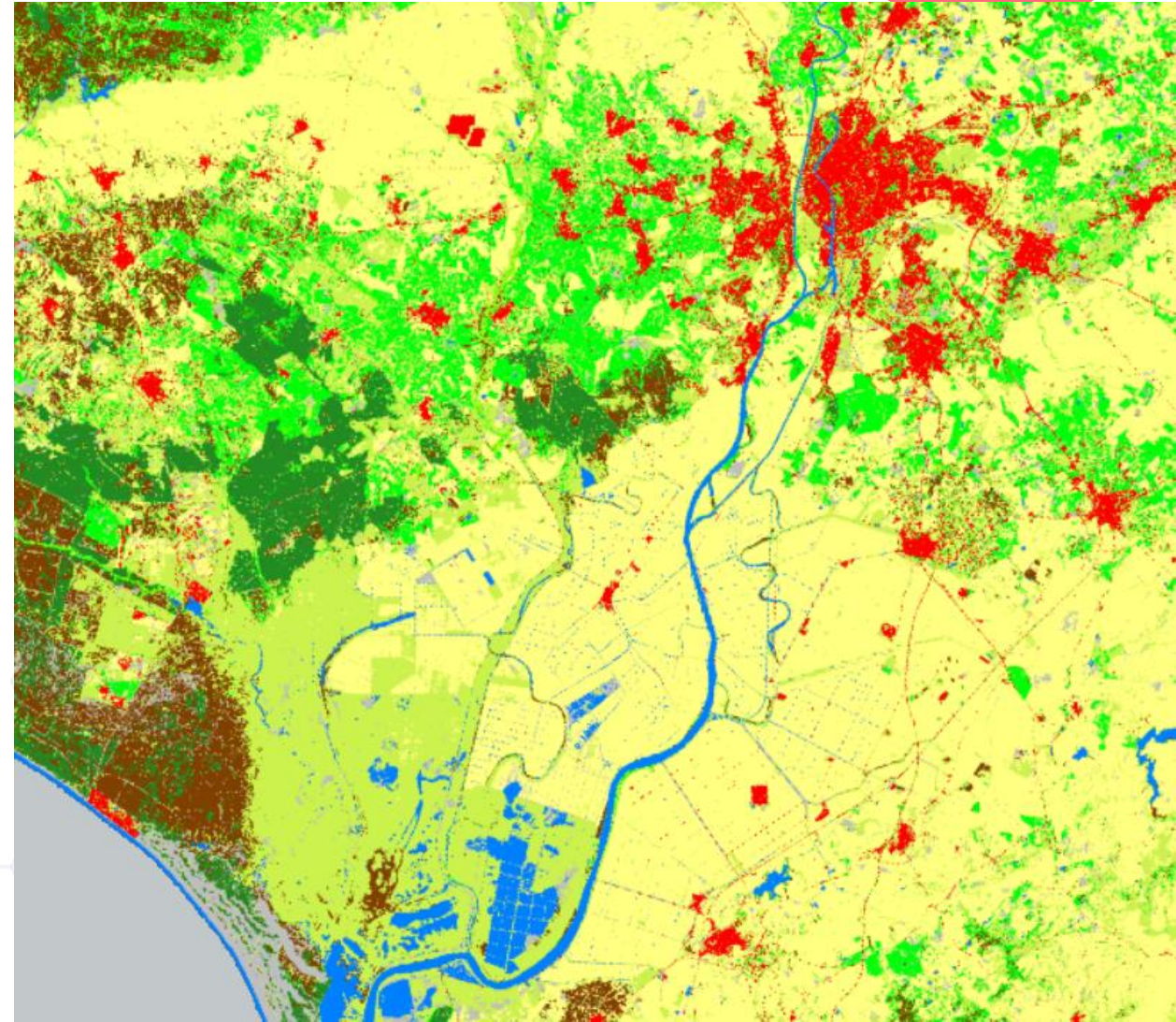
Corine Land Cover

- Spatial resolution: 25/5 ha MMU
- Update frequency: 6 years
- Most recent reference layer: 2018
- Examples of applications:
 - Habitat mapping
 - Impact assessment



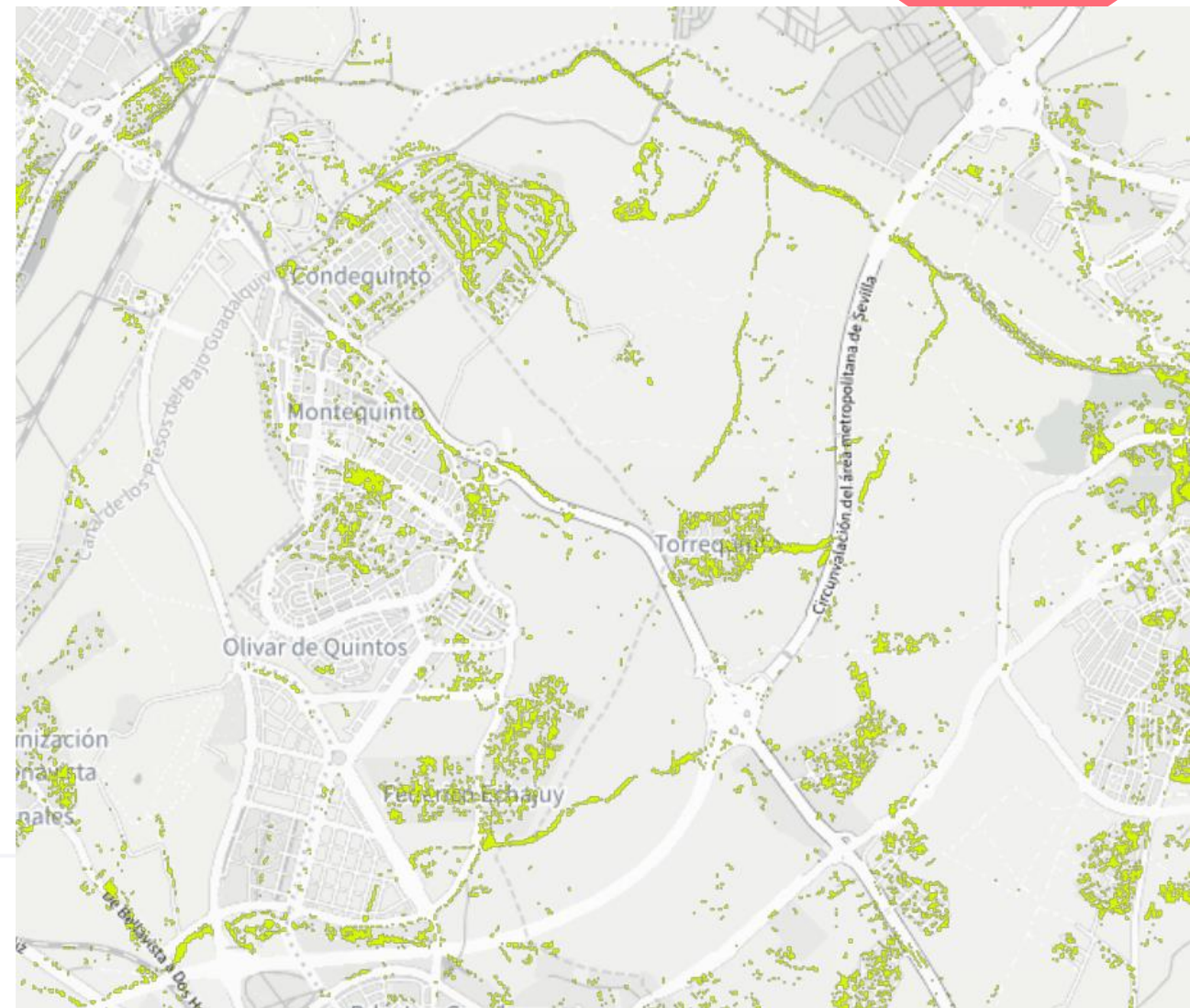
Corine Land Cover+ Backbone

- Spatial resolution: 10 m, pixel based
- Update frequency: 3 (soon 2) years
- Most recent reference layer: 2018
- Examples of applications:
 - Land cover classification
 - Impact assessment



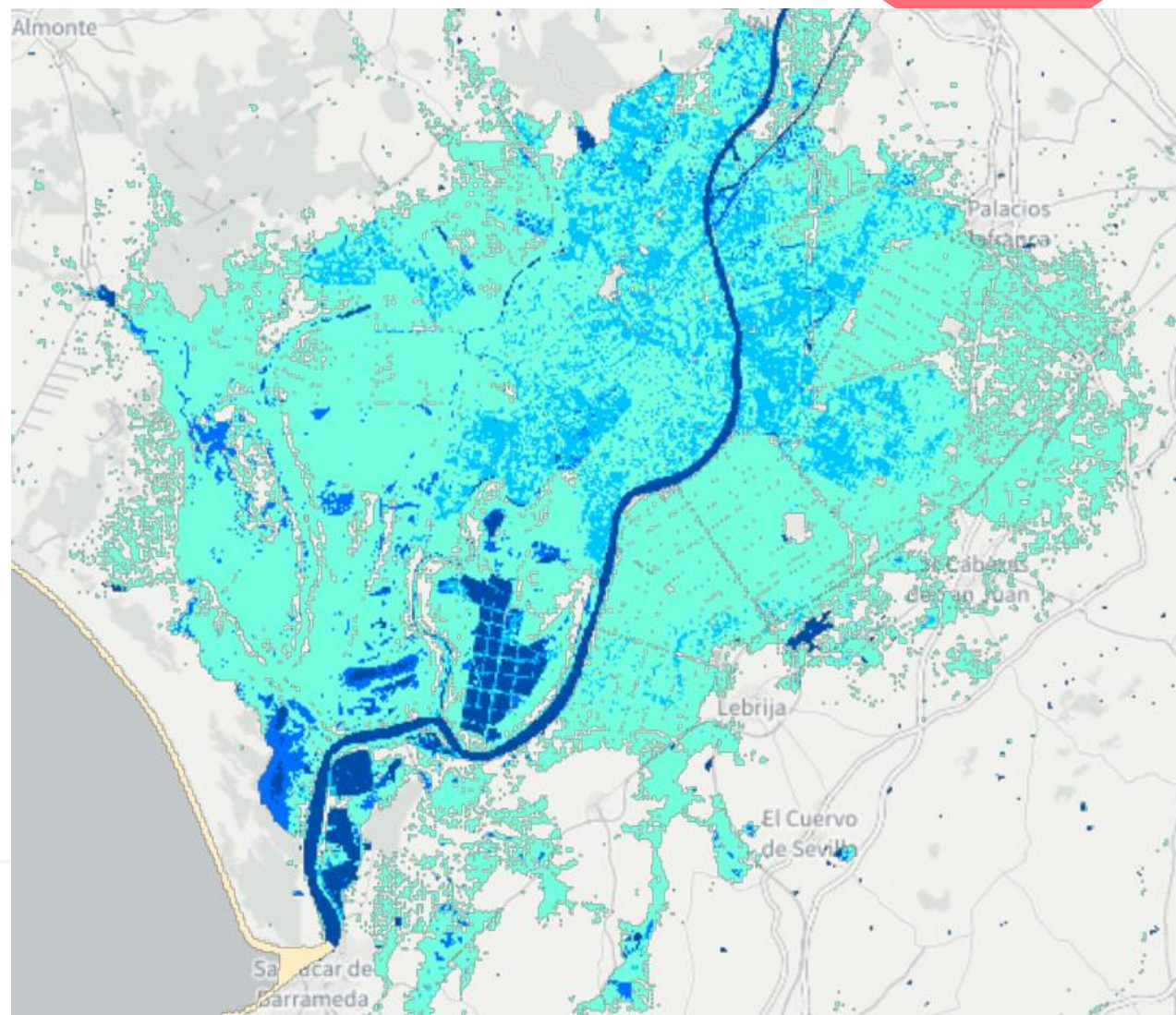
HRL Small Woody Features

- Spatial resolution: 5/100 m, vector layer
- Update frequency: 3 years
- Most recent reference layer: 2018
- Examples of applications:
 - CAP monitoring of Good Agro Ecological Conditions
 - Urban Greening



HR Water, Snow, Ice

- Spatial resolution: 10m, pixel based, no MMU
- Update frequency: 3 years, moving to NRT starting on 2017
- Most recent reference layer: 2018
- Full integration of Snow and Ice and former HRL Water and Wetness
- Examples of applications:
 - Water reservoirs,
 - Drought monitoring,
 - Flood assessment

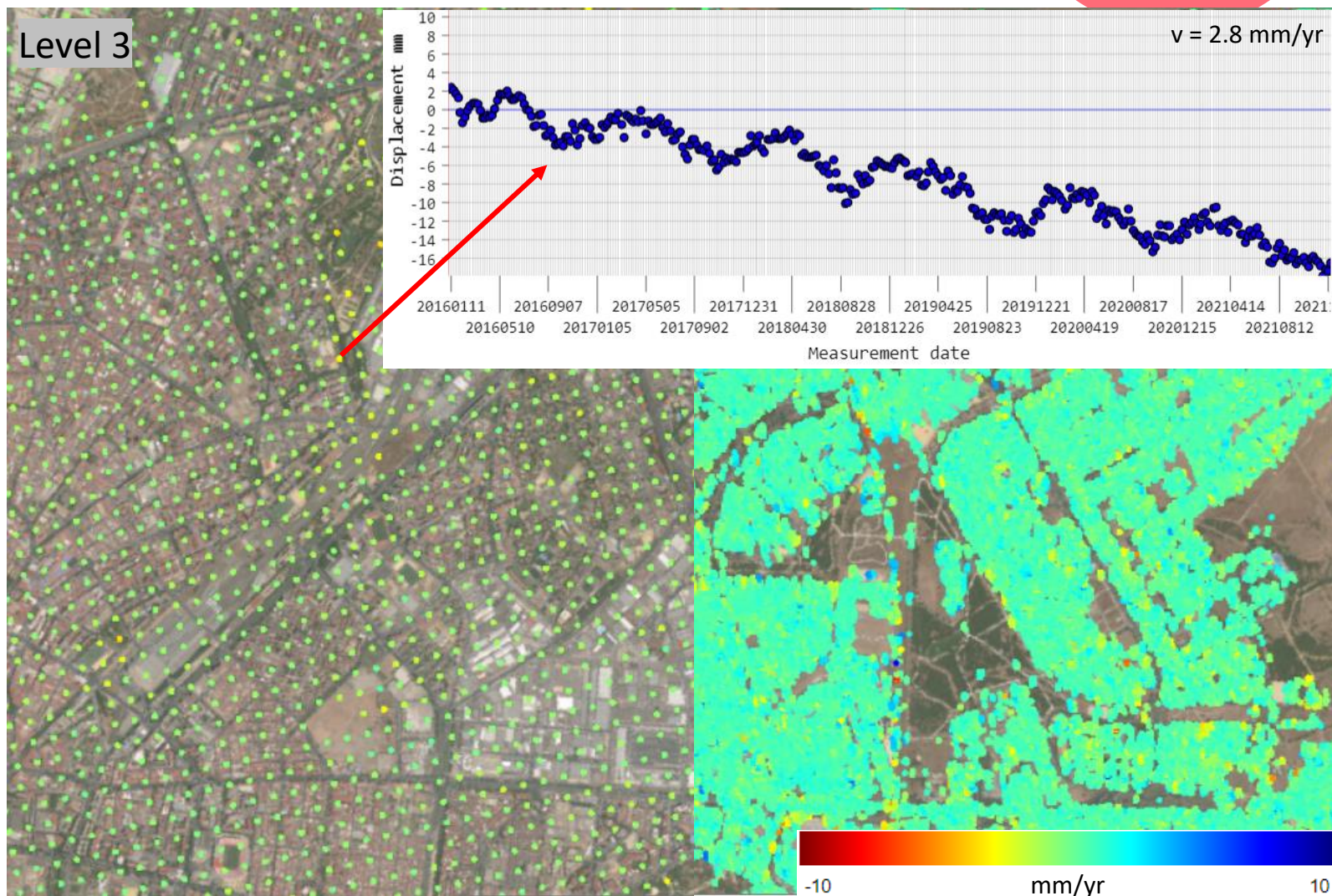


European Ground Motion Service

- Spatial resolution: 5x20/ 100x100 m
- Update frequency: Yearly, with time series
- Most recent reference layer: 2015 – 2022
- Example of applications:
 - Monitoring evolution → asset management and impact assessment

Webinar:

https://land.copernicus.eu/en/products/european-ground-motion-service?tab=user_outreach



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Thank you!

Usue.Donezar@eea.europa.eu
<https://land.copernicus.eu/>

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EU SPACE WEEK 2023

7 - 9 November - Sevilla, Spain

Copernicus Climate Change Service For Agriculture

Cristina Ananasso

Delphine Deryng (on line)

European Centre for Medium Range Weather Forecasts

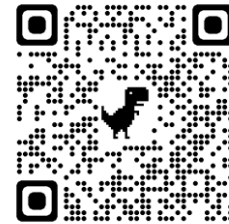
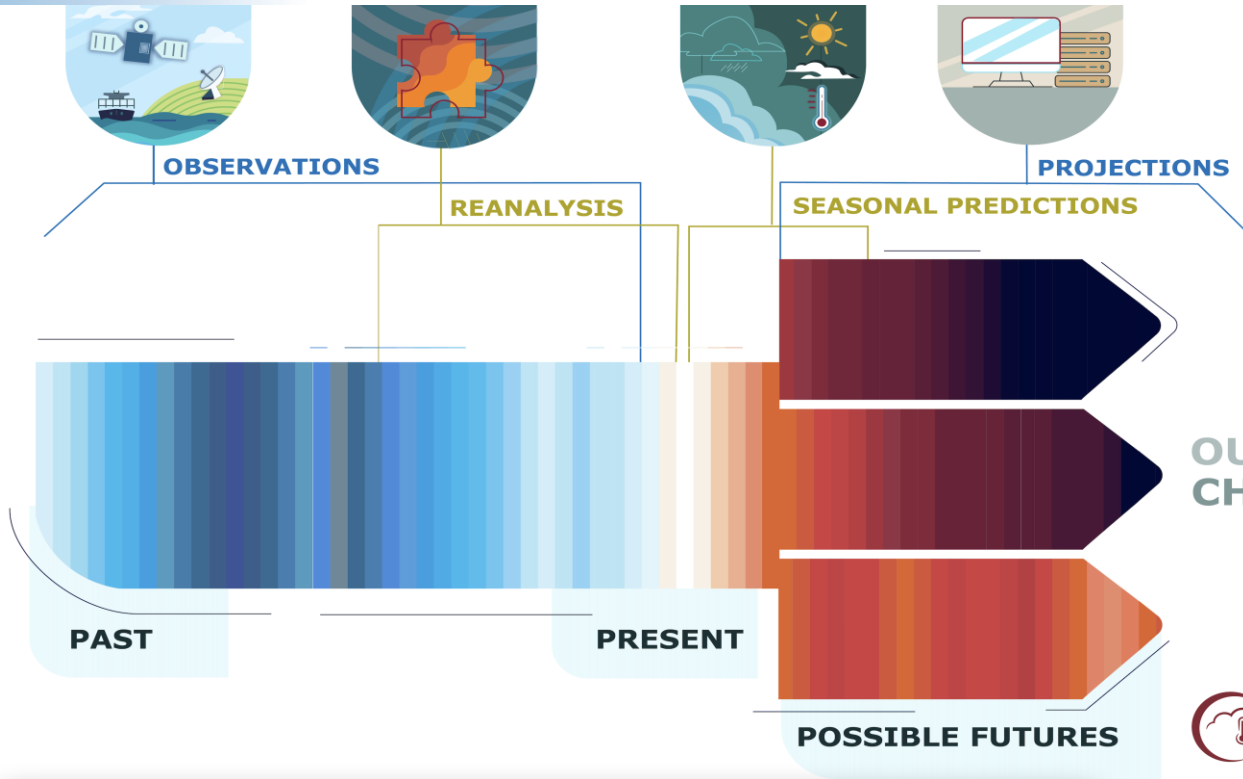


European
Commission





... all climate data you had always dreamed of and never dared asking



climate.copernicus.eu
cds.climate.copernicus.eu

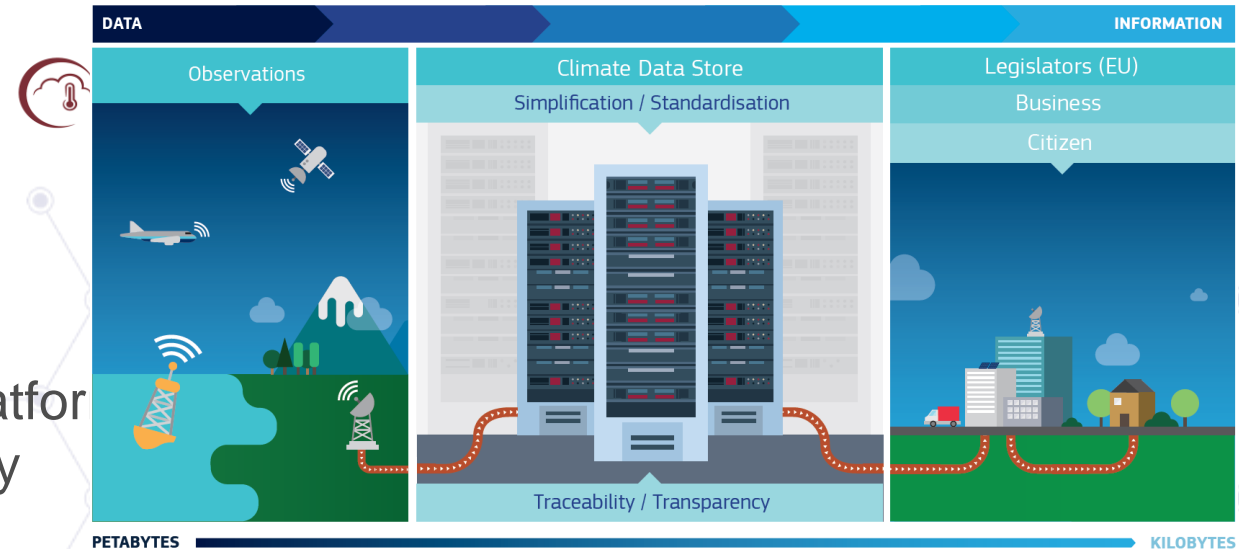
Operational (not research)
Unrestricted **OPEN AND FREE**

OUR CHOICES

Typical download: ~100 TB /day

Typical number of requests: 500k/day

- Regional climate datasets
- Sectoral datasets (energy, water, agriculture, extremes,..)
- Open source applications running on a cloud platform and able to generate tailored indicators on the fly





Climate Change

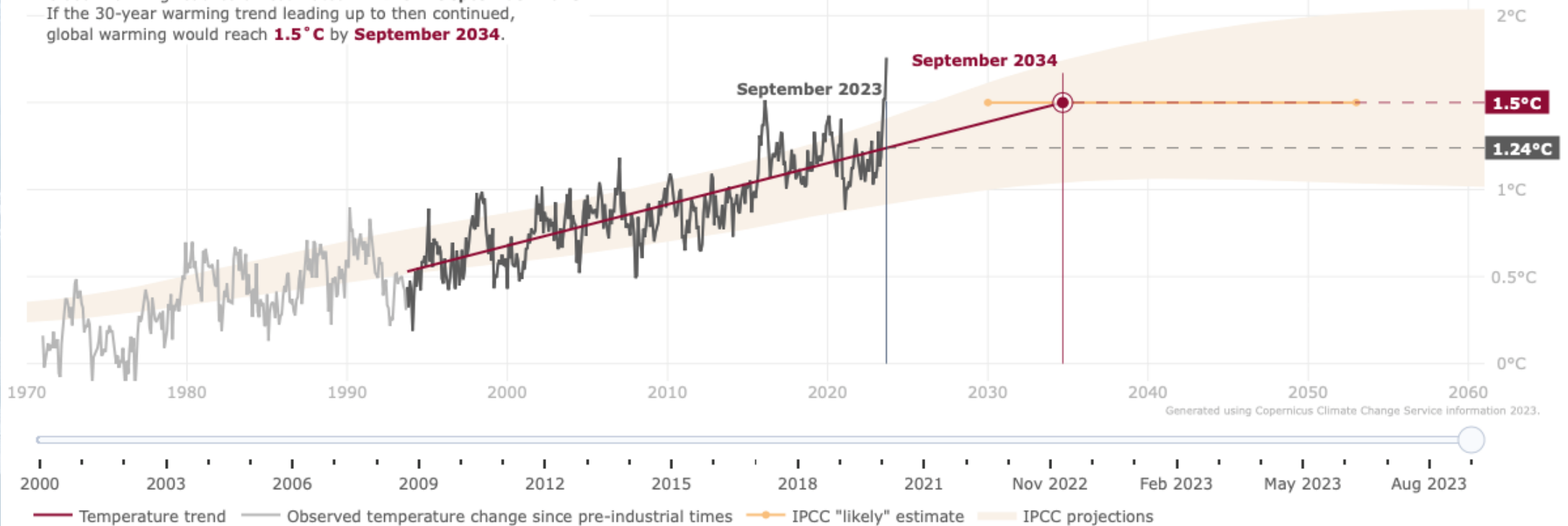
Trends in global mean temperatures

EU
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WEEK
2023



Warming trend

Global warming reached an estimated **1.24°C** in **September 2023**.
If the 30-year warming trend leading up to then continued, global warming would reach **1.5°C** by **September 2034**.

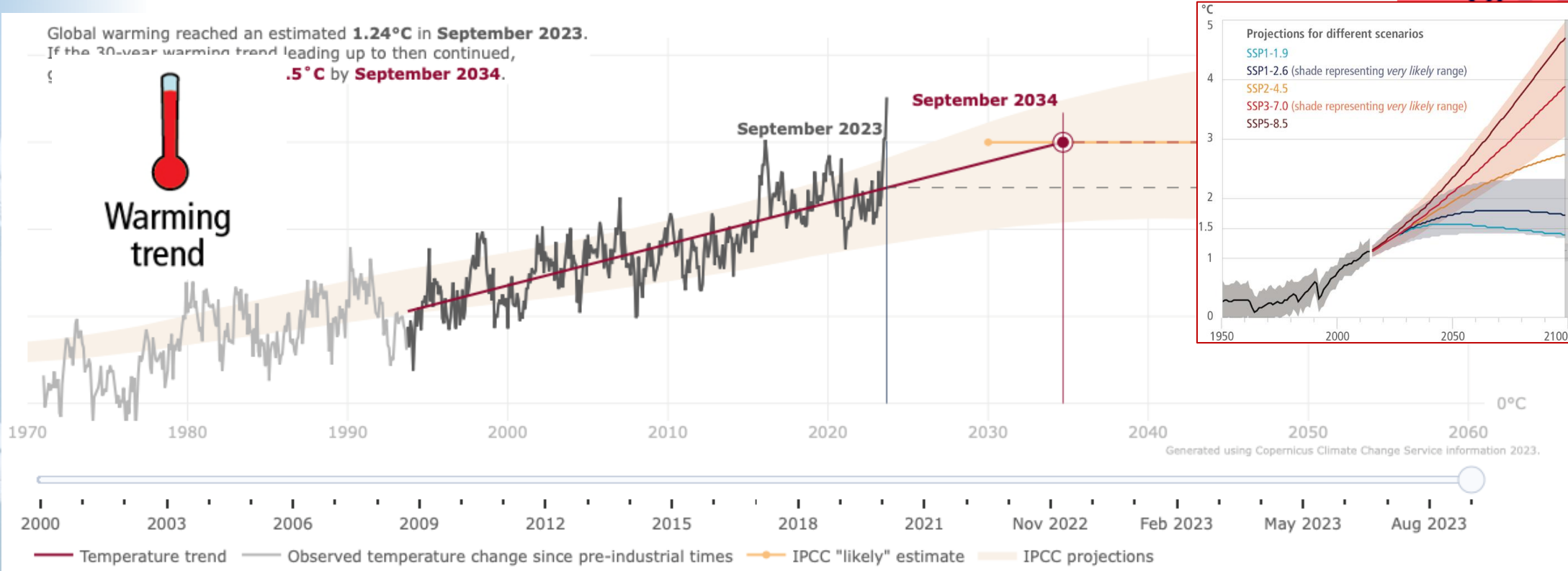
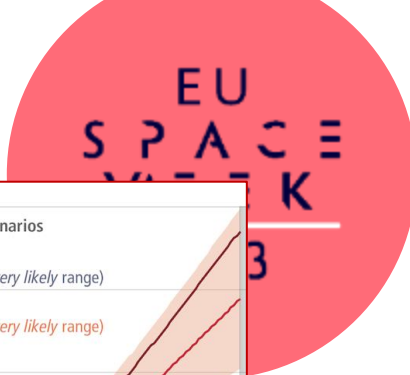


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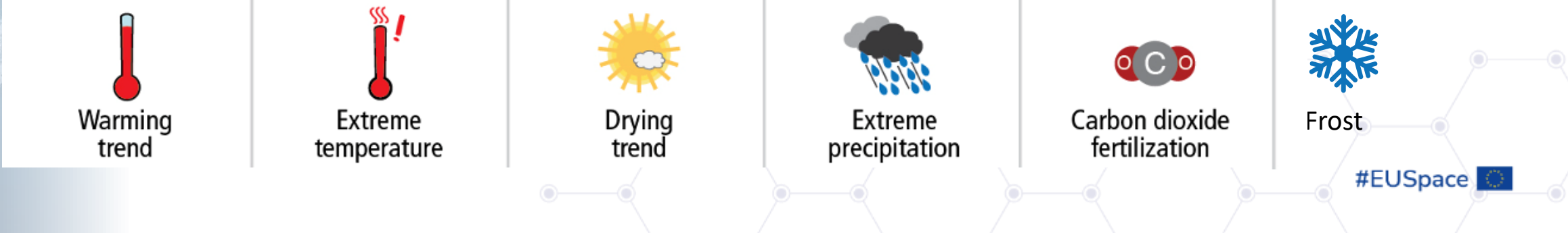


Climate Change

Trends in global mean temperatures



Climate-related drivers of impacts on crops



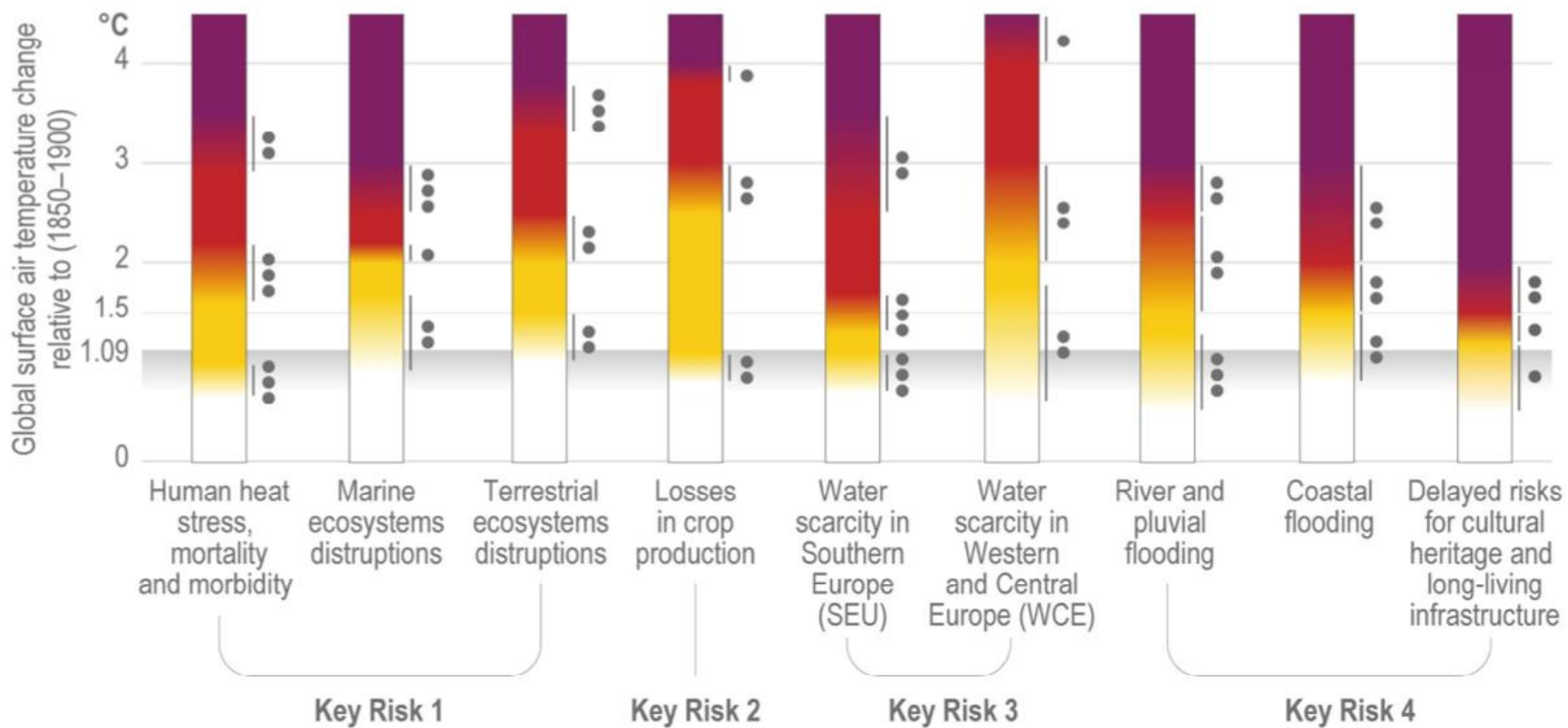


Climate Change

Climate change risks on European agriculture

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WEEK
2023

Key risks for Europe under low to medium adaptation



Level of risk

- Very high
- High
- Moderate
- Undetectable

Confidence

- Low → High

The ember colour gradient indicates the level of additional risk to society and ecosystems as a function of global temperature change. Confidence is provided for the change of risk level at given temperature ranges.

#EUSpace

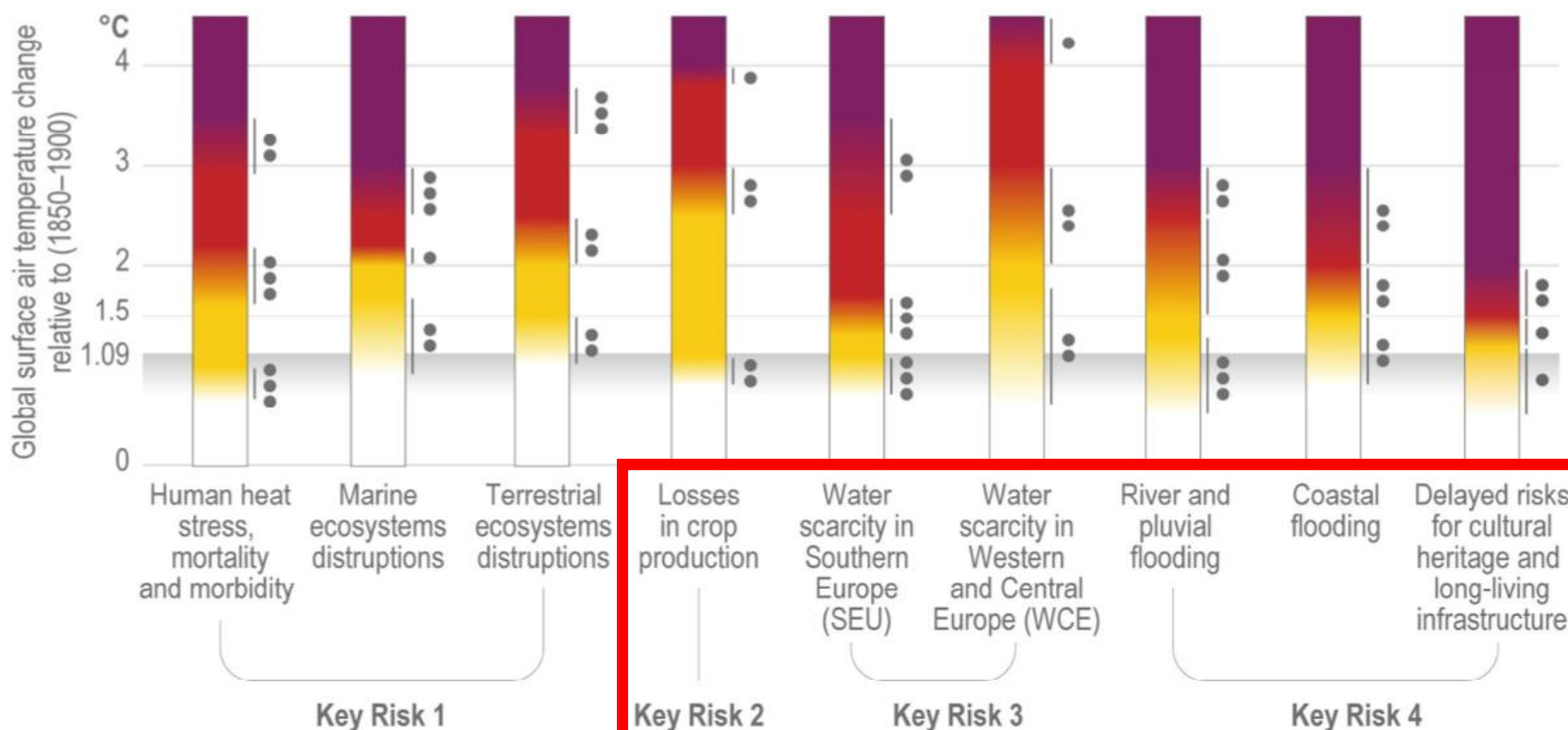


Climate Change

Climate change risks on European agriculture



Key risks for Europe under low to medium adaptation



Level of risk



Confidence



The ember colour gradient indicates the level of additional risk to society and ecosystems as a function of global temperature change. Confidence is provided for the change of risk level at given temperature ranges.



Climate
Change

Indirect drivers of climate change impacts on agriculture

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- Pests, diseases
- Land degradation, soil erosion
- Sea level rise and coastal erosion
- Fires from extreme heat and droughts



Water Alternatives Photos_CC BY-NC 2.0



Shailendra Pratap_ imaggeo.egu.eu



Climate
Change

Adaptation

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2023

- Agronomic practices:
 - fertiliser, irrigation
 - shift in planting dates, cultivars
 - change in cropping density
- Agroecological practices:
 - tillage
 - diversification
 - agroforestry
- Technological innovation: genetic improvement
- Risk transfer strategy: insurance
- Planning with better information -> climate services (Copernicus)



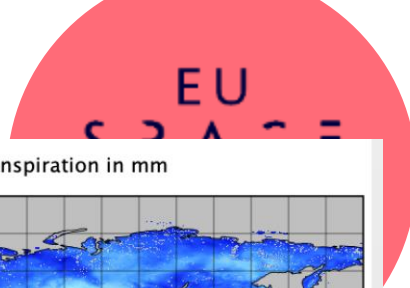
steve-harvey-unsplash

#EUSpace 



Climate
Change

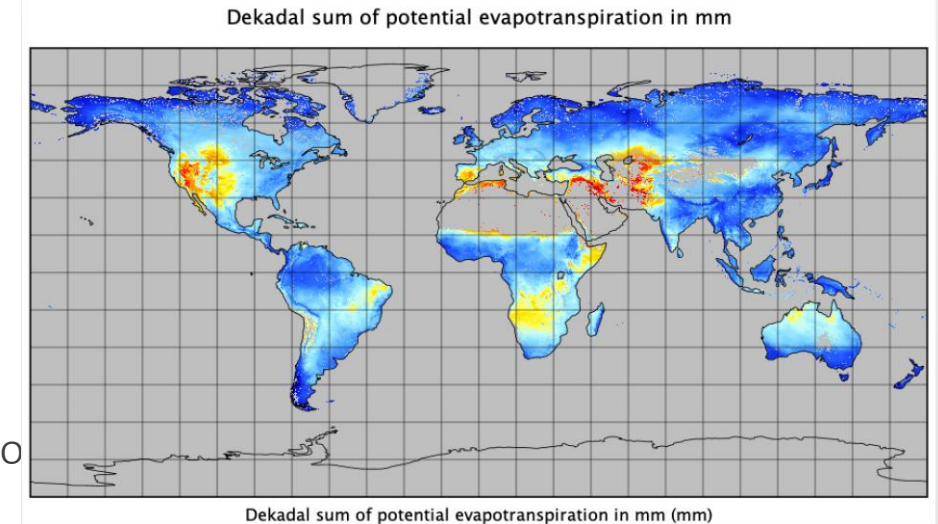
Climate Indicators for Agriculture



3 data product groups

4 :

1. Climate forcing data for crop models
 - all time scales, downscaled, bias corrected, model adapted
2. Agroclimatic indicators (generic & crop specific)
 - Growing degree days, huglin index, cold/heat stress days, insect flight index
3. Climate enhanced Earth Observation based indicators
 - Dry Matter Productivity (crop specific), ET_{actual} , ...



**All aggregated to
crop specific**

- phenological calendars
- growing areas

<https://climate.copernicus.eu/global-agriculture-project>



Climate
Change

Climate Data Store: Agri Adapt application

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- Agroclimatic indicators explorer for Europe from 1970 to 2100 : the application is the evolution of the EU [LIFE AgriAdapt](#) project
- Objective : explore agro-climate indicators present climate conditions (1970-present) and as well as comparing future climate scenarios (2011-2100)
- Spatial resolution : European continent, 0.25° x 0.25°
- ERA5-Land reanalysis : Historical time series and anomaly times series, 1981-2022
- Climate projection : 9 climate models, bias-adjusted CORDEX regional, RCP4.5 or 8.5,
- Indicators :
Heat stress, Average temperature, Precipitation, Frost days, Days above 25°C, Date of last spring frost.
Adjustable threshold and/or period
- Documentation available



The screenshot shows the web interface for the Agri Adapt application. At the top, there are logos for Copernicus, ECMWF, and Climate Change Service. A navigation bar includes links for Home, Search, Datasets, Applications, Toolbox, and Support. The main heading is "Agroclimatic indicators explorer for Europe from 1970 to 2100". Below this, there is a survey prompt: "To improve our service, we need to hear from you! Please complete this very short survey. Thank you." The interface is divided into sections: Overview, Application, Documentation, and Source code. The Application section contains a detailed description of the tool's purpose and capabilities, along with a list of user-selectable parameters such as Variable, Scenario, Threshold, Start, Stop, and Aggregation. A Help section on the right provides links for Get help, Licence, Publication date, and Related data.



Climate

Agri Adapt application: interface

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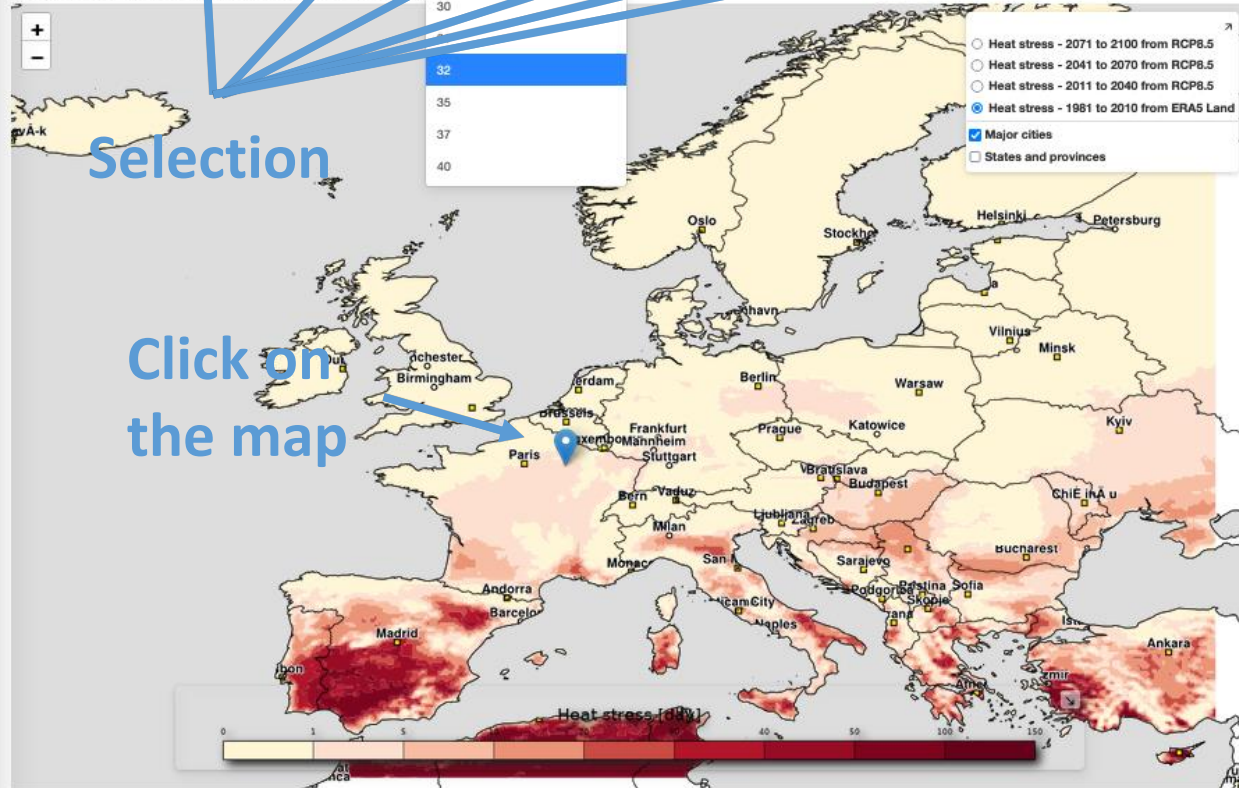
Climate Data Store - Agroclimatic indicators explorer for Europe from 1970 to 2100

This application compiles the most relevant agroclimatic indicators measured across Europe and their trends in the last decades. It also allows the user to assess the projected evolution of these indicators in the coming decades under different climate scenarios. Therefore, this application intends to facilitate decision-making processes at farm level. At a larger scale, it can contribute to agricultural planning for adaptation to climate change. - Please click on the European map below to select a location of your interest.

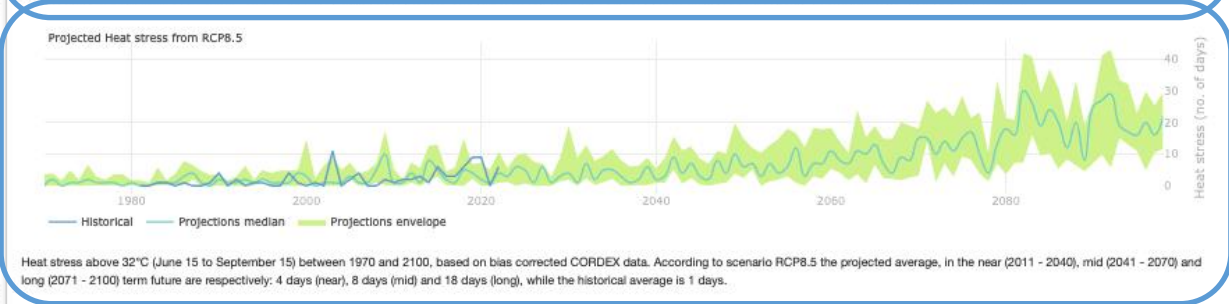
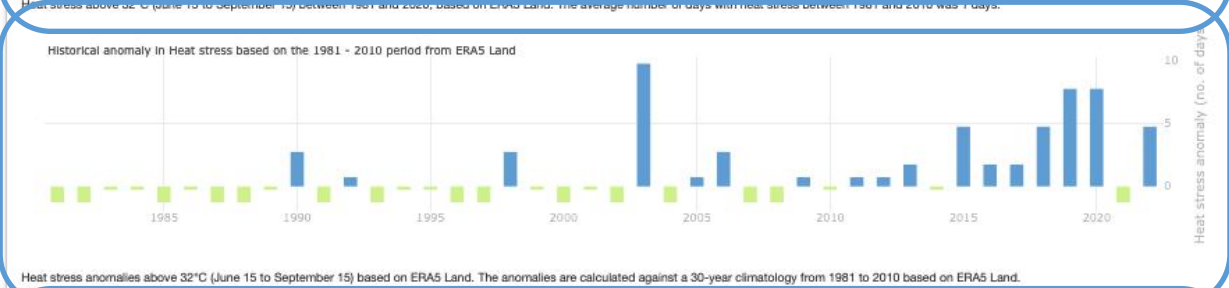
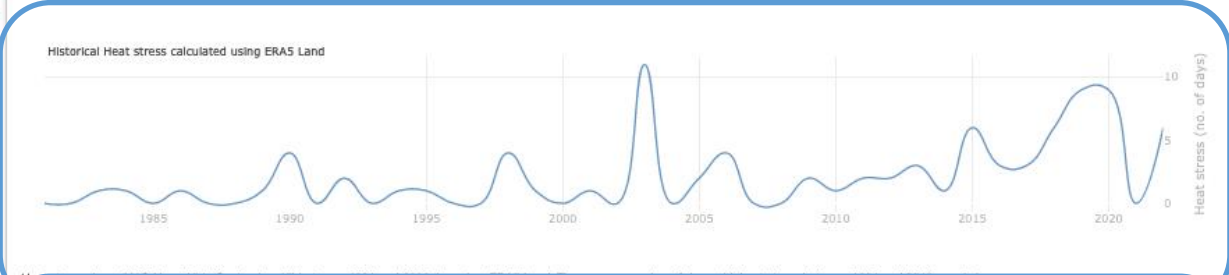
Variable: Heat stress | Scenario: RCP8.5 | Threshold (°C): 32 | Start: June 15 | Stop: September 15 | Run

Heat stress at some specific phenological stages (flowering or ripening phase) and extreme events likely to have strong impact on crops. It is relevant to yield losses and decrease quality of fruits. This indicator is particularly useful to highlight the extreme events likely to have strong impact on crops.

Heat stress above 32°C (June 15 to September 15)



Position: 48.75°N, 4.25°E
Heat stress above 32°C (June 15 to September 15)



Heat stress above 32°C (June 15 to September 15) between 1970 and 2100, based on bias corrected CORDEX data. According to scenario RCP8.5 the projected average, in the near (2011 - 2040), mid (2041 - 2070) and long (2071 - 2100) term future are respectively: 4 days (near), 8 days (mid) and 18 days (long), while the historical average is 1 days.



Climate Change



Copernicus EU



Copernicus ECMWF



@CopernicusEU
@CopernicusECMWF



@copernicusecmwf



Copernicus EU
Copernicus ECMWF



www.copernicus.eu
climate.copernicus.eu

Thank you for your attention



Agriculture session - Agenda

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KEY AREAS

Digital Solutions

Developing Requirements
from Automation to Autonomy

EU SPACE WEEK 2023_7-9 NOV, Sevilla, Spain



Georg Larscheid
Vice President,
Global Digital Business,
CLAAS

CLAAS Product Portfolio.



Combine Harvesters



Forage Harvesters



Tractors



Mowers



Balers



Telescopic Loaders



Wheel Loaders



Software & Systems



Service & Parts



Today's living conditions are changing expectations of agricultural machinery engineering

World population is growing.



Agricultural area is shrinking.



Eating habits are changing.



People are mobile and globally networked.



Climate change is steadily proceeding.



Renewable energy sources are in demand.





Our Vision

**We enable farmers to be
the best in their field.**

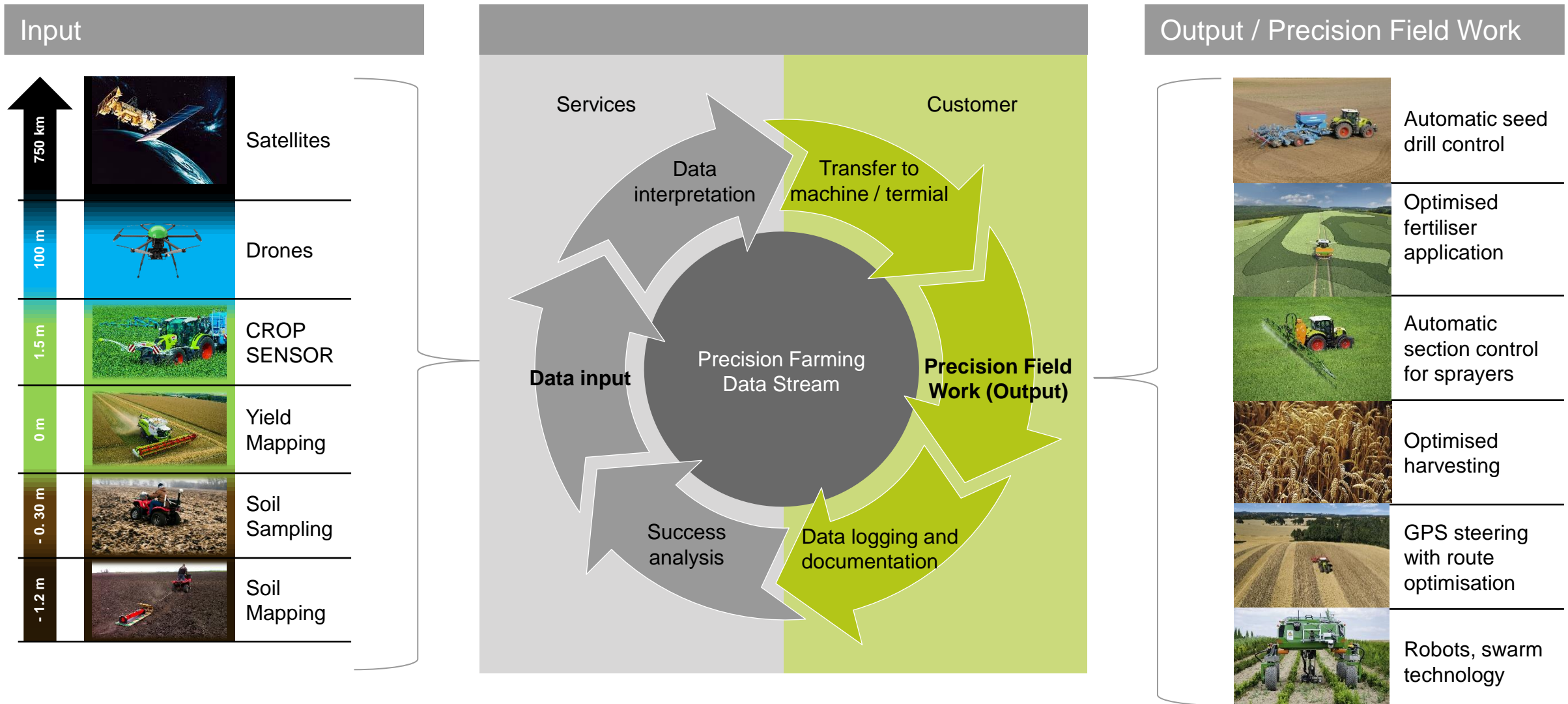
Precision farming applications during the year

Precision farming offers more possibilities with increased efficiency and sustainability.



What is Precision Farming?

Precision Farming is all about managing spatial- and temporal variability, in a field (outdoors)



It's a Journey

CLAAS has been a pioneer in Precision Farming and will continue to invest



Yield Mapping

1995



AGROCOM



CEBIS

2003



GPS PILOT



AUTO FILL



CROP SENSOR



FLEET VIEW

2017



NEW CEBIS

2010



365FarmNet



CropView



TELEMATICS



CEBIS MOBILE

2022



CLAAS connect



CEMIS 1200

The background is a dark gray field filled with a complex network of light gray lines connecting small white dots. These connections form various sized triangles and polygons, creating a mesh-like or molecular structure. The overall effect is a sense of interconnectedness and digital complexity.

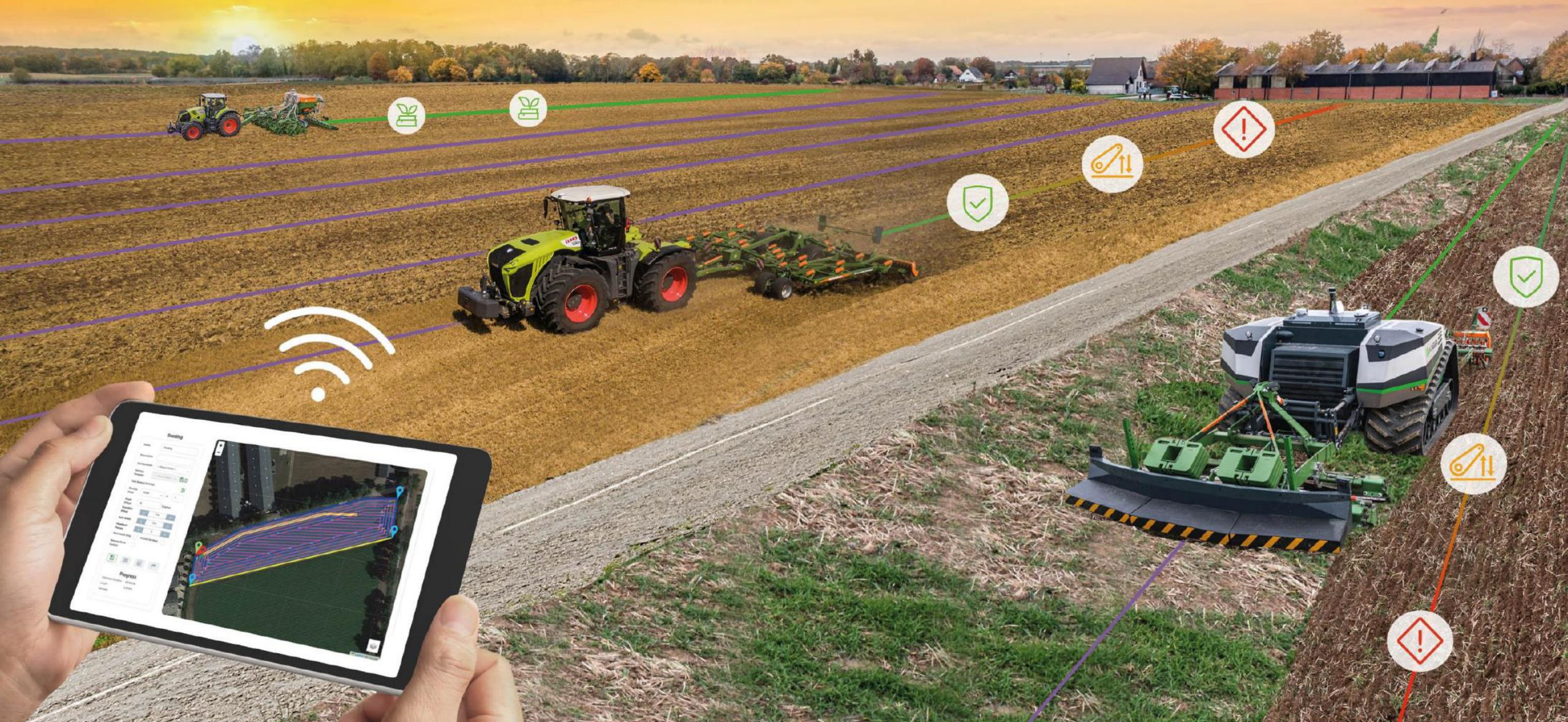
Precision

Automation

Autonomy

3A - ADVANCED AUTOMATION AND AUTONOMY

The open partnership for more efficiency

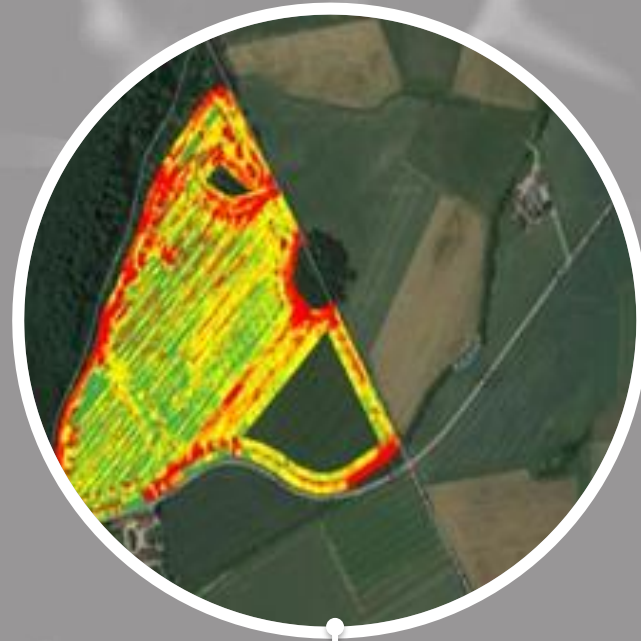


AMAZONE

CLAAS



Precise Positioning (GNSS)



Remote Sensing (Observation)

Communication (SATCOM)



Our Requirement:

- Globally available, in-field, reliable and repeatable, cm-level accuracy positioning through GNSS established
 - through differential correction **cm-level accuracy** is obtained, either via satellite (i.e. EGNOS) or local terrestrial (RTK)
 - as mobileRTK becomes standard, outages occur due insufficient to cell-phone coverage in rural areas
 - driving need for supplemental SATCOM solution at affordable price point to ensure reliability
 - through sensor fusion, which is required to reach **mm-level accuracy** i.e. for single-plant localization (treatment)

Our Need:

- Continued, stable operation of GNSS network, as prof. farmers are fully relying on it
- More affordable SATCOM availability to improve RTK availability and stability
- Subsidy programs to encourage retrofit installations of older machine population



Our Achievement:

- est. > 50% of arable farm land is treated with GNSS-based auto steering and/or section control appl. technology
- accountable for higher application precision in fuel, fertilizer and chemical usage, leading to reductions of 5-15%

Our Requirement:

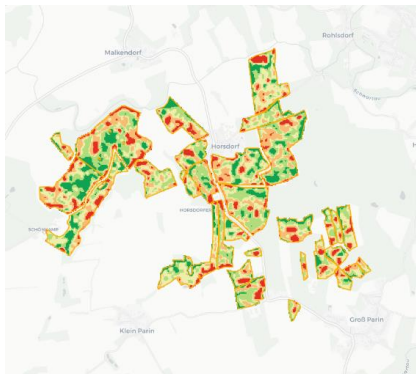
- Easy access to reliable, highly repetitive satellite imagery through Sentinel 2 (mainly via NDVI) available and proven, but:
 - Image repetition too low (i.e. every 5 days)
 - High risk of image disturbance due to cloud coverage

Our Achievement:

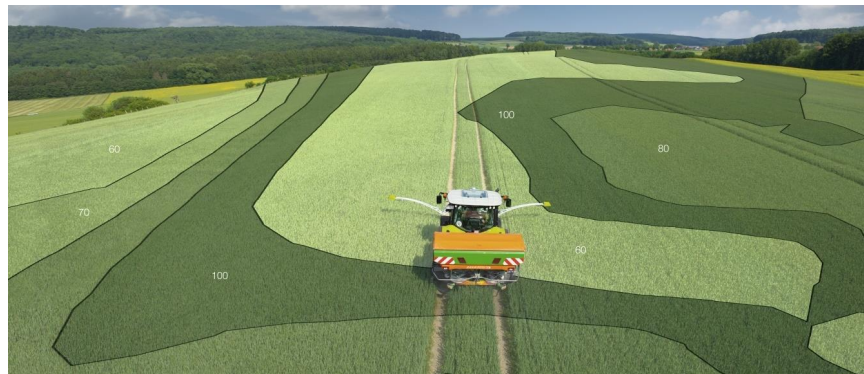
- est. > 10-20% of arable farm land is treated with GNSS-based VRT appl. technology
- lead to an est. < 5% reduction in application volume but slightly higher yields

Our Challenge:

Step1: Identifying spatial variability



Step2: Creating a variable rate (VRT) prescription based on crop- and/or field attributes



Our Need:

- Higher image repetition (i.e. every 1-2 days)
- More research in image interpretation related to plant growth/health indicators

Communication, core-capability # III required for the Precision, Automation and the Autonomy journey

Our Requirement:

- Stable data communication, incl. rural areas, infrastructure to enable continues machine tracking at avordable price levels
 - currently mainly relying on mobile-/cell phone technology (4G) with too many outages in rural areas



Our Need:

Stable data communication infrastructure to enable continues machine tracking at avordable price levels for farmers

- coverage beats bandwidth
- required for broad adoption of autonomous machines in Ag

1. The availability of GNSS and Earth Observation programs from the EUSPA have enabled Agriculture & Forestry in the EU to become more efficient & sustainable over the past 20 years.
2. There is further potential identified to improve the efficiency and sustainability of Agriculture & Forestry, by enhancing the adoption of Precision & Automation solutions in the market.
3. Autonomous solutions are on the horizon, which in particular require SATCOM as a key enabler.

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2023

Developing Requirements for Growing Automation and Autonomy: Open Debate

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KEY AREAS

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EU SPACE WEEK 2023

7 - 9 November - Sevilla, Spain

R&D project – EGNSS based robots for organic farming

User Consultation Platform Agriculture

Esther López Casariego (ACORDE Technologies S.A.)

esther.lopez@acorde.com



European
Commission



UE23
PRESIDENCIA ESPAÑOLA
CONSEJO DE LA UNIÓN EUROPEA

GALIRUMI H2020 Project

Galileo-assisted robot to tackle the weed rumex obtusifolius and increase the profitability and sustainability of dairy farming.

(partially funded by EC-EUSPA under GA 870258)



Main objective

Harness the possibilities that GALILEO brings...

... to deliver robot weeding for **herbicide-free weed control** in dairy farming

*Robotic weeding will **eliminate herbicide use and reduce exposure** of farm workers (remove obstacle for organic production).*

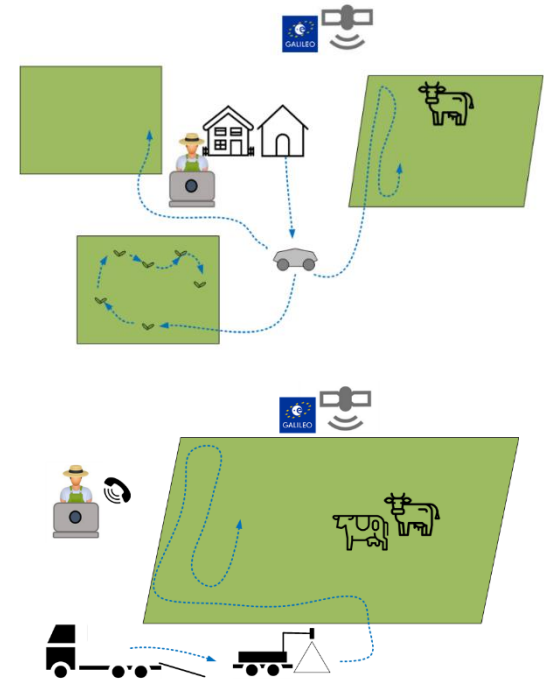
*Broad-leaved dock (*Rumex obtusifolius*) is a **problematic weed** that expands and cover large parts of t' farm if uncontrolled.*

Objectives

- Integrate **GALILEO** receiver
- Improve **weed** detection
- Construct electrocuting and laser prototype **robot**
- Software for robot **navigation** and mission planning and control
- **Field-test** robots in operational environment
- Evaluate **business** model

Benefits: will reduce...

- **Labour** for weeding
- Weed management **cost**
- **Damage** to grass from the application of herbicide
- **Impact** of dairy farming on the environment
- Dairy cow **discomfort**



Consortium

End users KOO, PEK and IDE will provide **user requirements as well as operational scenarios**. This input will be forwarded to ACO, DTU, WR and STE who are responsible for **design and development** of the robotic systems.



Area of expertise	ACO	WR	DTU	KOO	PEK	STE	IDE
Hardware integration	X	X	X				
Embedded systems	X		X				
Robotics		X	X				
EGNSS	X						
Vision algorithms			X				
Agriculture machinery				X	X	X	X
Weeding machinery						X	
Lasers		X					
Farm sites				X	X		X
End user				X	X		
Market access						X	X



Benefits from GALILEO adoption

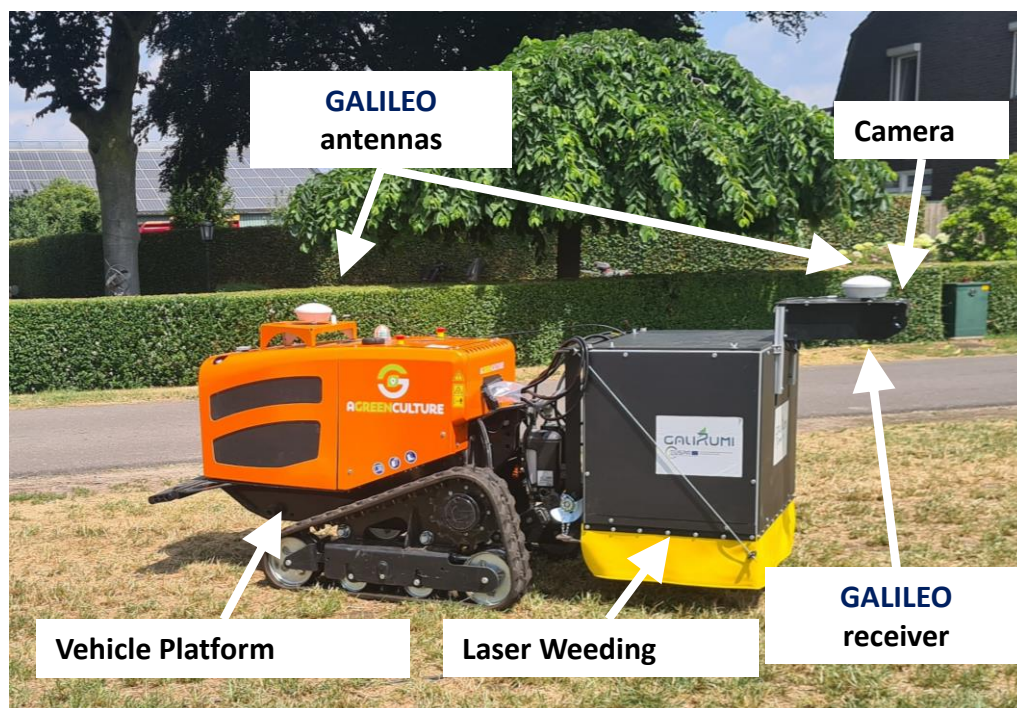
- GALILEO **differentiators** (multiple frequencies with modern modulations) enable robust navigation for autonomous agricultural robots even in locations where other GNSS do not work sufficiently well.
- GALIRUMI **benefits** from GALILEO adoption:
 - Better **resilience to multipath** due to more robust modulations, appropriate for scenarios without a clear vision of the sky due to near obstacles
 - An improvement of the **availability of satellites** in sight when used in combination with other GNSS constellations
 - **Sub-metric position** accuracy using E1+E5 (AltBOC) frequency bands without RTK corrections
- New GALILEO **improvements**:
 - High Accuracy Service (HAS). <20 cm **accuracy** without using RTK corrections
 - OS Navigation Message Authentication (OS-NMA). **Authentication** of navigation data: resilience to spoofing



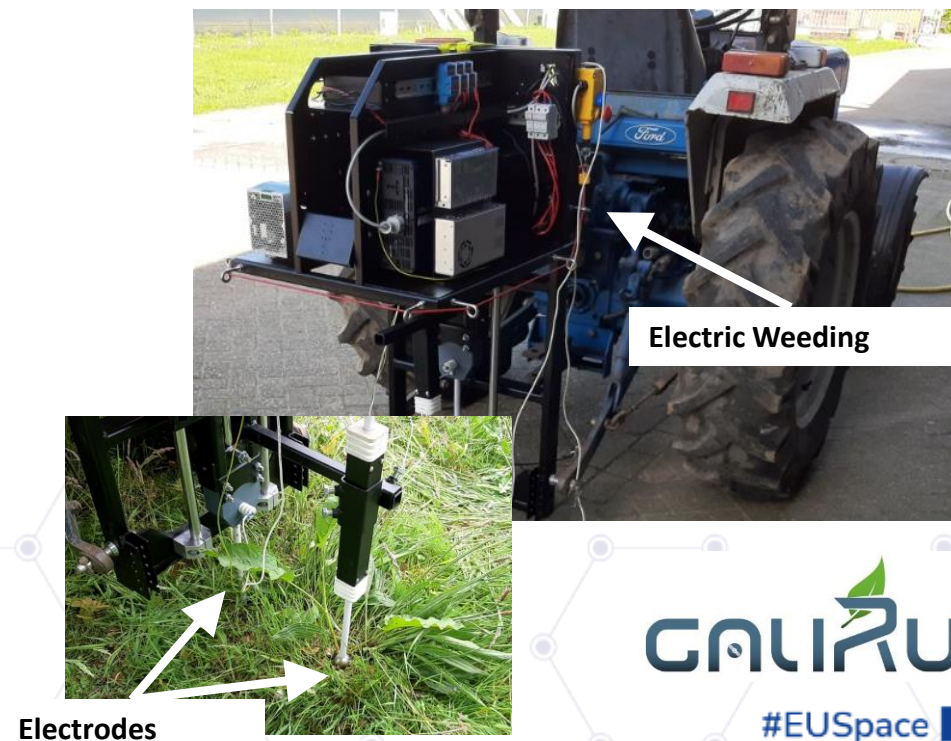
GALILEO integration

- Laser and electric weeding platforms developed
- Navigation and positioning based on GALILEO dual-receiver (heading)

Laser Weeding in GALILEO based navigation platform



Electric Weeding tool



Field test in operational environment

Demonstrations in Netherlands, France and Denmark, attended by farmers



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KEY AREAS

EU SPACE WEEK 2023

7 - 9 November - Sevilla, Spain

The EU Space Opportunity for Small and Medium Sized Farmers

User Consultation Platform Agriculture

Maurizio Laterza, Planetek Italia



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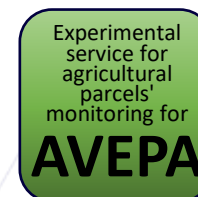
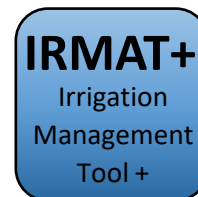
The Overview

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Agriculture activities

Agriculture is one of the business sectors of Planetek Italia since years.

Some projects in which we took part:





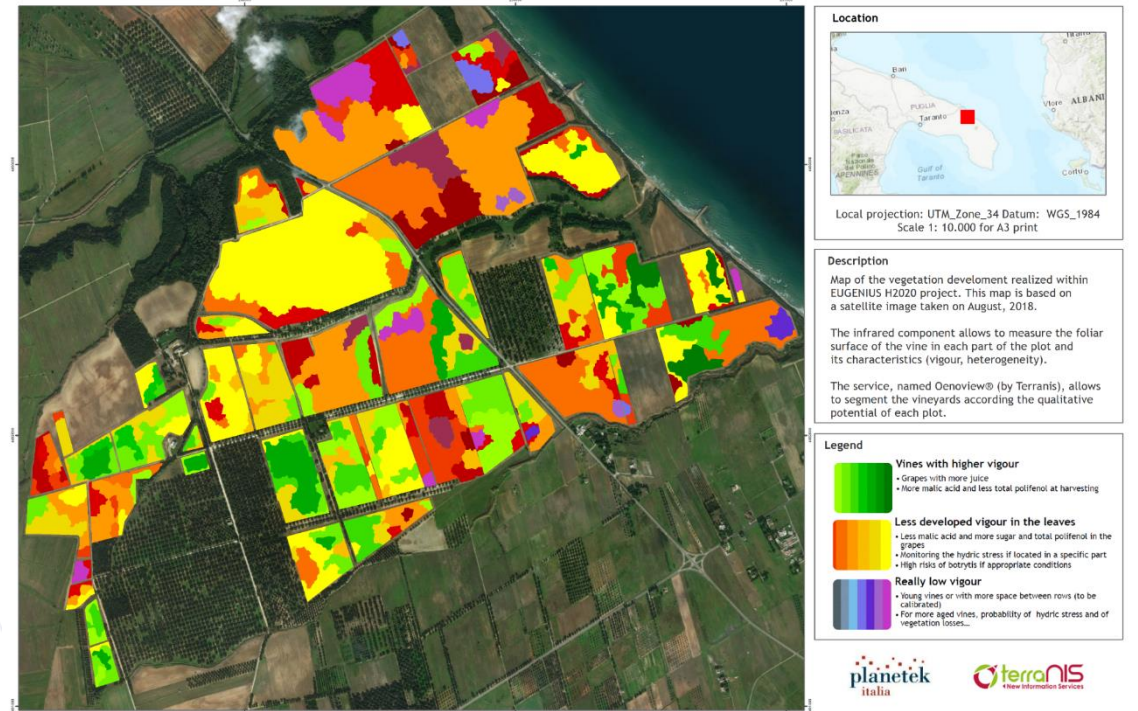
The Story



- EUGENIUS « European Group of Enterprise for a Network of Information Using Space »
- **Market:** Precision Farming for viticulture
- **PARTIES INVOLVED:** Planetek Italia (EO data provider) and Tormaresca (the winery)
- **OBJECTIVE:** The goal is to understand
 - how gradually incorporating Space data into their work can help the winery support their growers in optimising the process and resources through the adjustment of what is needed against what is available (**costs**)
 - how the level of interconnection and interdependence between the users and the project promoting EO data

- The market target:
 - Agronomic consultant, Italy
 - The winery (the market actor in Italy), and
 - The association of farmers in Italy (the vineyard)
- The technical actions are:
 - Support for the selection of sampling points for laboratory analysis, cost-effectively and efficiently
 - Support with agronomic advice on fertilization and irrigation
 - Identification of other structural criticalities

Map of vegetation development - Veraison stage



COMMERCIALISING TECHNOLOGY IN SMEs: THE ROLE OF EUROPEAN R&I PROJECTS

Raffaele SILVESTRI, Francesco PETRUCCI, Savino SANTOVITO

Dipartimento di Economia e Finanza University of Bari

- ✓ the present research has primarily focused on the **project relationship emerged** between *Planetek* and *Tormaresca* to understand:
 1. how the **new technology** has been progressively **implemented** in the user's setting through progressively developing and adapting both project resources and firms' resources;
 2. how the **project context** has **influenced**, and has been influenced by, **the emerging relationship** and the underlying process of resource interaction.

The study conclusion

It successfully works if

the customer:

- Has clear goals
- Is open to change
- Has the needed resources
- Manages the value chain production, transformation, commercialization



The bottlenecks and the mitigation actions

Capacity of innovation

- **The bottleneck:** small farmers have limited capacity of innovation:
 - the average value of Utilised Agricultural Area (UAA) per farm in Italy was 11,1 hectares in 2020 (although growing) [1];
 - almost two-thirds of the EU's farms were less than 5 hectares in size in 2020 [2]
- **The mitigations:**
 - work together with agronomists and associations of farmers
 - act on the whole agricultural supply chains



[1] [7°Censimento generale dell'agricoltura: primi risultati.](#)

[2] [Farms and farmland in the European Union - statistics. Farms in 2020.](#)

Credit facilities

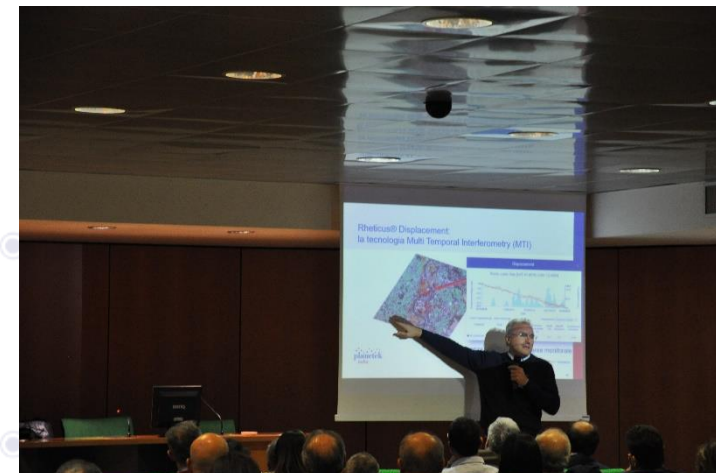
- **The bottleneck:** smaller agri-food innovators that focus on digital, data-driven offerings find it particularly difficult to access financing in order to grow ([1]), also because credit facilities related to buying digital services are very few or absent
- **The mitigation:** provide farmers' associations with effective means to lobby for having more opportunities of credit facilities related to digital services



[1] [European Investment Bank. Feeding future generations. How finance can boost innovation in agri-food – Executive summary. 2019.](#)

Awareness

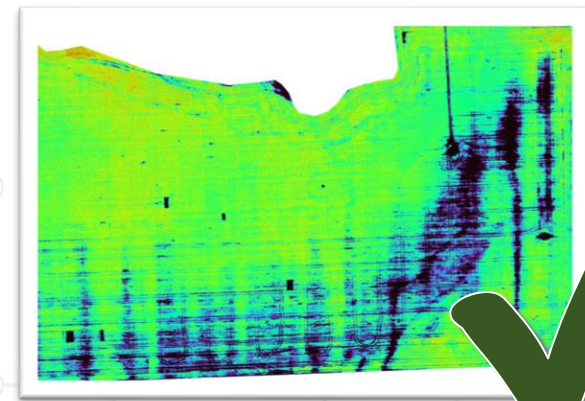
- The bottlenecks:
 - often farmers are not fully aware of satellite capabilities
 - often farmers are not able to choose the best solutions for them
 - training actions are needed
- The mitigations:
 - provide training opportunities
 - provide farmers with pilot cases and success stories



Certifications from independent parties

- **The bottleneck:** there is lack of certifications about service accuracy and reliability by a third party (different from the vendor)
- **The mitigation:** identify independent actors and collaborate with them to get a third-party certification of the service

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The Success Stories

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Professionals training: ISMEA open school

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- ISMEA (*Istituto di Servizi per il Mercato Agricolo Alimentare*) organized in 2022 the Copernicus open school to train Italian agronomists in Campania and Veneto
- Planetek Italia participated as a trainer presenting some use cases for precision farming and CAP, and organized a 1-day hackathon



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The Story



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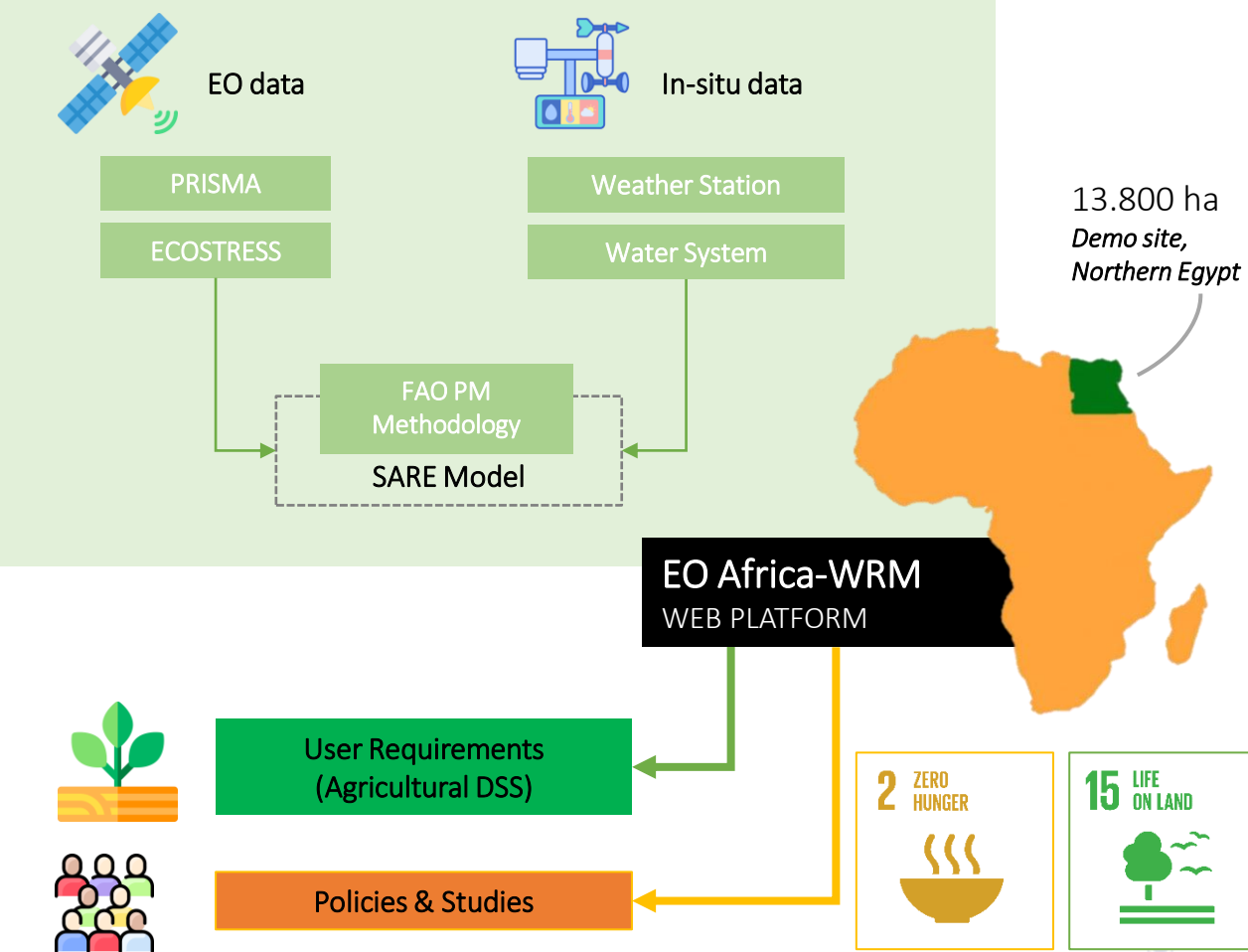
- **TITLE:** EO AFRICA Water resource management – *A support to farmers and planners to improve irrigation water management.*
- **PARTIES INVOLVED:** Planetek Italia (Space data provider), Planetek Hellas (partner), International Centre for Advanced Mediterranean Agronomic Studies Bari (CIHEAM Bari) (partner), National Authority for Remote Sensing & Space Sciences, Egypt (NARSS) (stakeholder), and October sixth for agricultural projects company (stakeholder).
- **OBJECTIVE:** To estimate crop water stress and evapotranspiration, exploiting ECOSTRESS and PRISMA data by experimental EO analysis techniques



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One of the main bottlenecks is water loss due to the failure to rationalize water consumption in an all-consuming sectors like agriculture. In this context, the goal is to employ thermal Earth Observation data to accurately estimate the effective crop water consumption represented by the actual evapotranspiration.



Objective

To estimate crop water stress and evapotranspiration, exploiting ECOSTRESS and PRISMA data by experimental EO analysis techniques. Sentinel-2 data are used as support for comparative purposes.

Outcomes

Prediction and mitigation of crop stress as a result of water losses (evapotranspiration)

Precision irrigation planning and scheduling as a result of data-driven water use optimisation

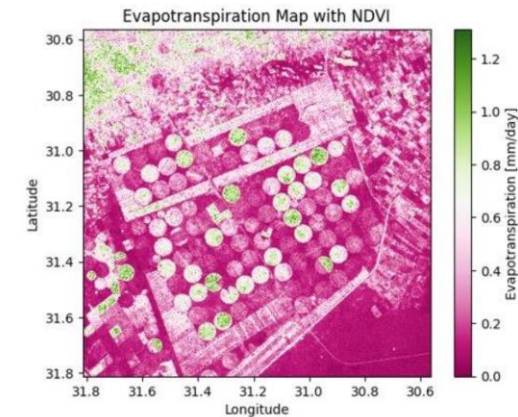
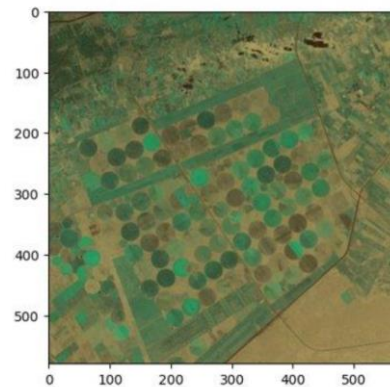
Better policies on regional water management, allocation, and distribution

Specific objectives

- Crop growth monitoring;
- Stressed crop monitoring;
- Yield prediction;
- Water productivity;
- Water use efficiency.

Engaging small farmers with space data requires a holistic approach that combines technology, training and support. It is essential to adapt the approach to the local context and the specific challenges faced by small-scale farmers in the targeted region.

The main objective of engaging small farmers to space data can be summarized in enhancing sustainability and farmers income based on data-driven decision making.



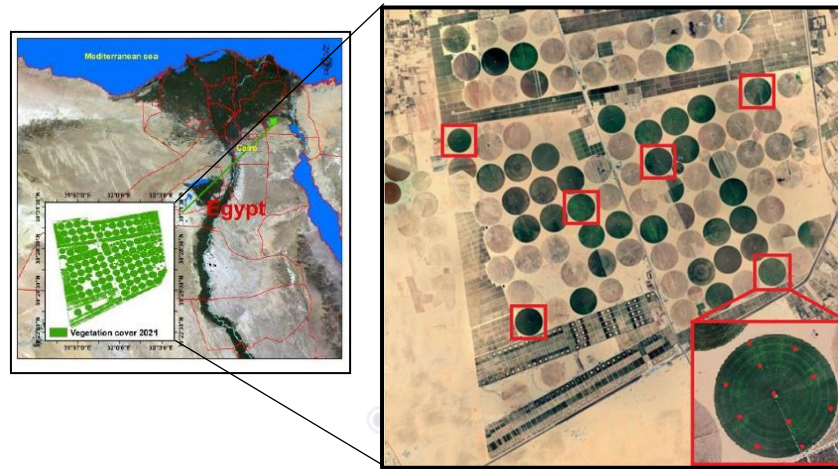
Demo site:

(Left) Initial area of interest captured on June 2023.

(Right) Prototype of evapotranspiration map for crops calculated with Prisma and Ecostress data (June 2023), depicting several pivots.

Planetek Italia with the support of CIHEAM Bari made **important steps to engage small farmers with space data**, including:

- Understanding the specific needs of small farmers, faced challenges
- Organizing workshops and training sessions to educate farmers about the benefits of space data
- Offering basic training on how to access and interpret space data and integrate it into their farming practices
- Presenting real-cases examples of improved yields with reduced water consumption;
- Strengthen the technical and analytical skills of local agricultural advisors to effectively use space data and support small farmers



Demo site:

“October sixth for agricultural projects” company in El Salheya El Gedida, a city in Sharqia Governorate, in the north of Egypt

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KEY AREAS

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EU SPACE WEEK 2023

7 - 9 November - Sevilla, Spain

SPACE and REGENERATIVE AG

UCP Agriculture

Tamme van der Wal



European
Commission



Take away message

- Transition to regenerative farming is taking off;
- Protecting soil quality and improving carbon levels is essential;
- Data is essential to re-balance ecology and economy for farmers (and other stakeholders);
- Monitoring and benchmarking are crucial data analyses tasks supporting the transition;
- Space data is relevant to make objective and scaled data monitoring solutions;
- 3 important steps to make that happen.

Regenerative Agriculture

Mainstream farming (extractive agriculture):

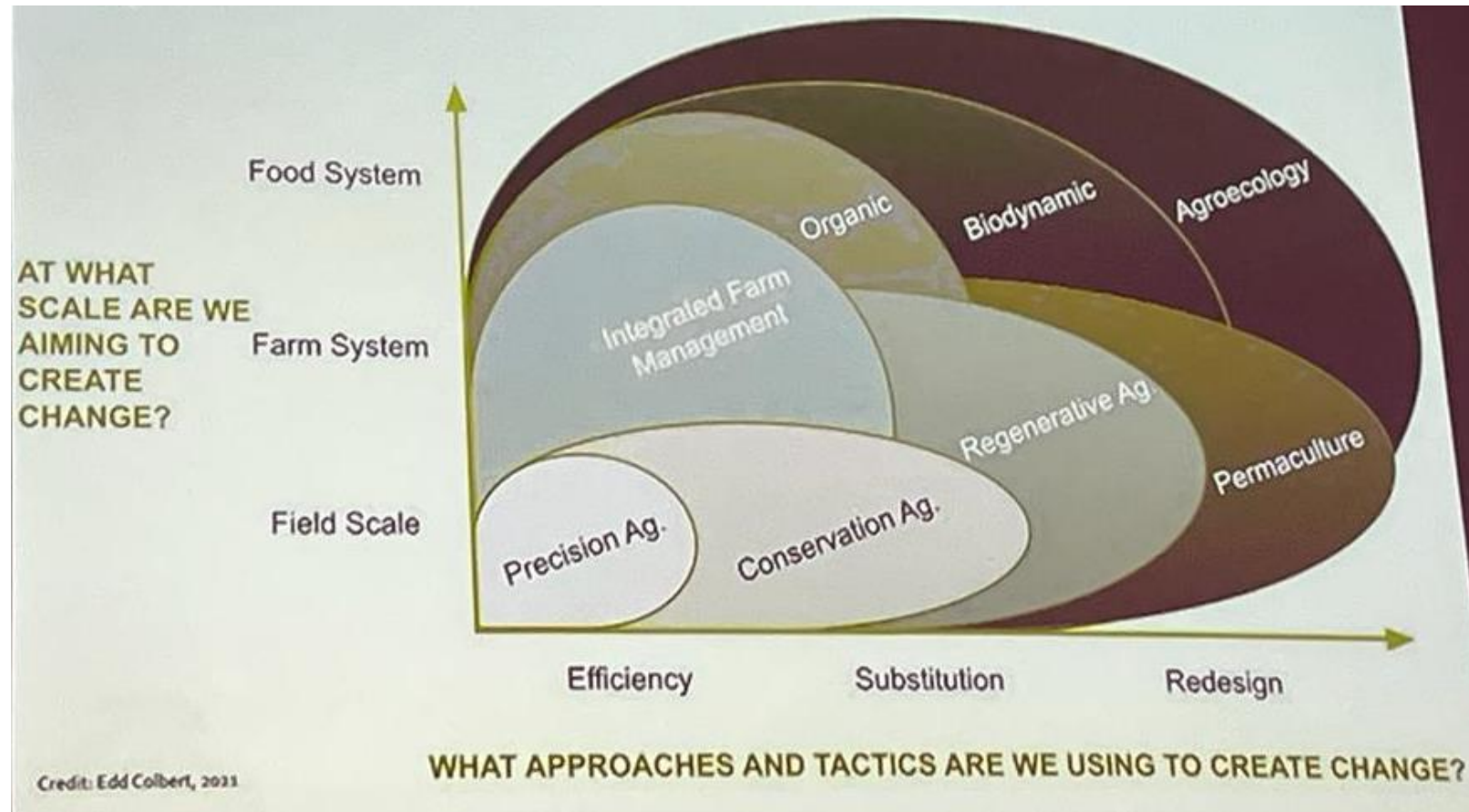
- Declining yield levels
- Increasing risks
- More and more machines, fertilisers, PPP

Regenerative farming:

- Conservation of soil / soil health
 - Climate smart practices
 - Stable yields → better margins
-
- Technology can help to make the transition (IoT, data, AI, robotics, etc.) to agro-ecological practices.

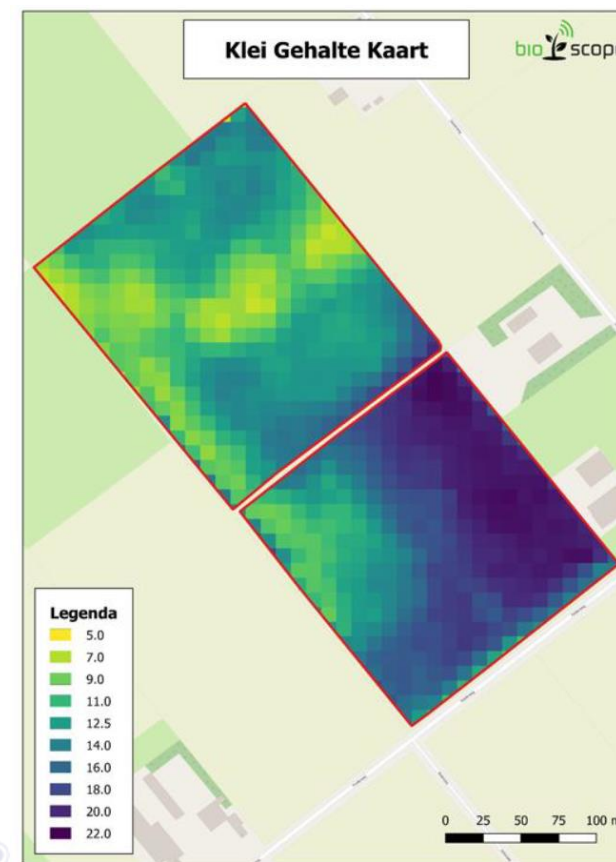


Regenerative Agriculture

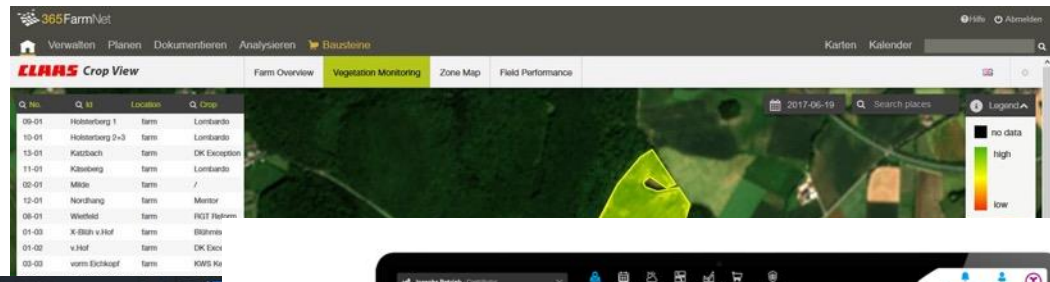


Role of EO in transition to ReGen Ag

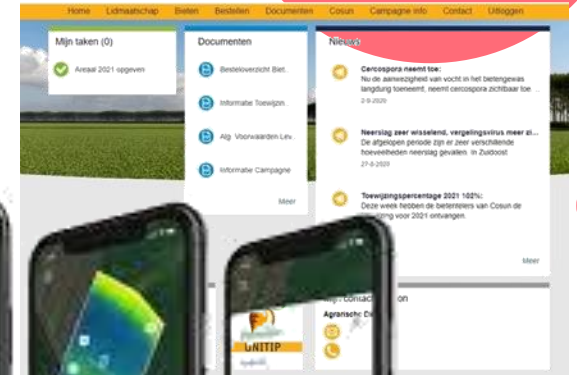
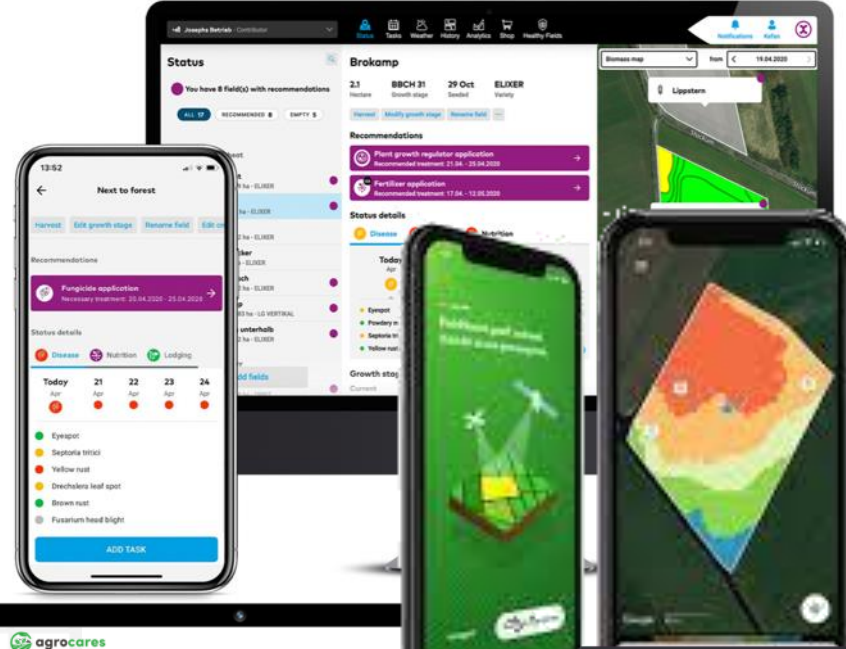
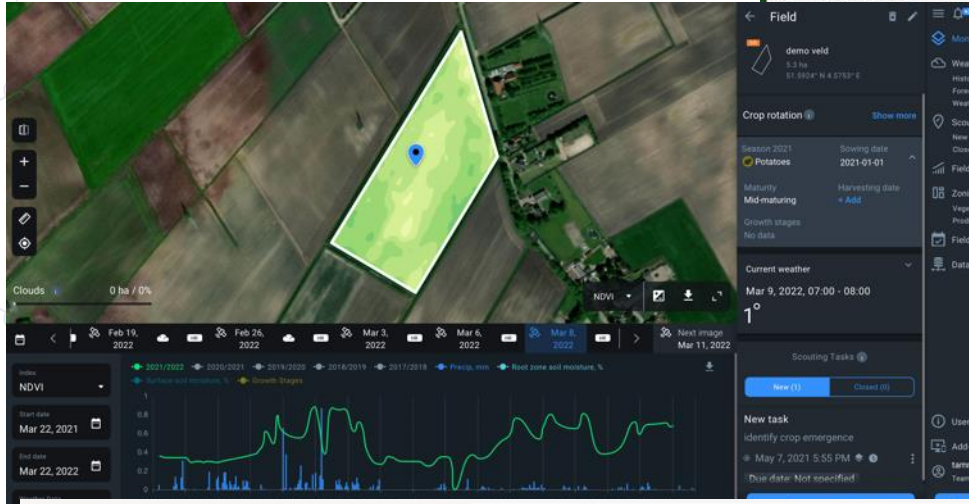
- Monitoring of fields, farms, regions, countries
 - Scouting, Benchmarking, Performance indicators
- Applications maps
 - Translate spatial differences in applications differences
- Monitoring of practices (e.g. for certification / insurance)
 - Crop Rotation;
 - Tilling; Harvest; Cover crops;
 - Applications (manure/water).



Many platforms

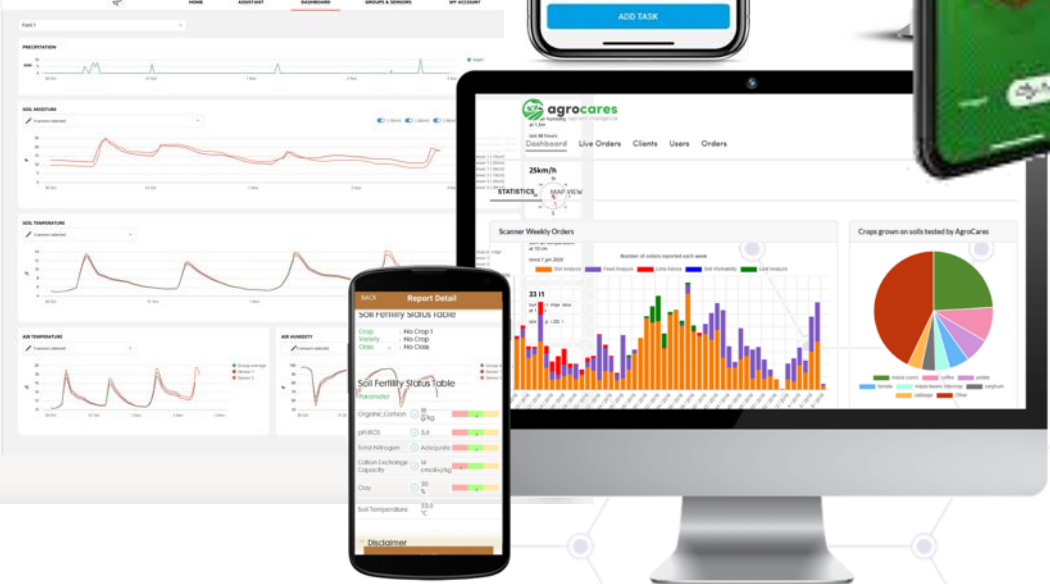


Cosun LEDENPORTAAL



Make better farming decisions with the Farm21 assistant

- Actions and warnings
- Decision-making support
- Analyze your data with widgets
- AI assisted predictive analysis
- Share data with crop consultants
- API integration with other platforms



3 steps to support farmers with space

- 1. Start quick and small → involve farmers (awareness)
 - Demonstrate
 - Collect feedback / criticism
- 2. Think data / information → Beat the farmer in information value (attitude)
 - Set clear monitoring goals
 - Scope (what's in and what's out)
- 3. Make monitoring valuable → change the farmer's frame (action)
 - Address farmer's entrepreneurship
 - Address the agricultural ecosystem



1. Involve the farmer

Easy and affordable tools



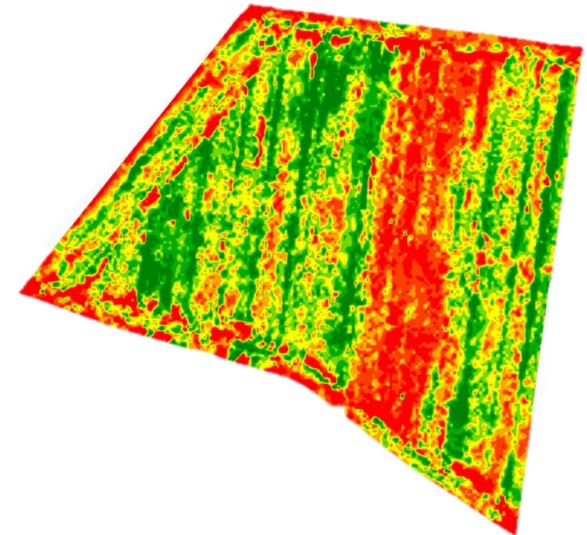
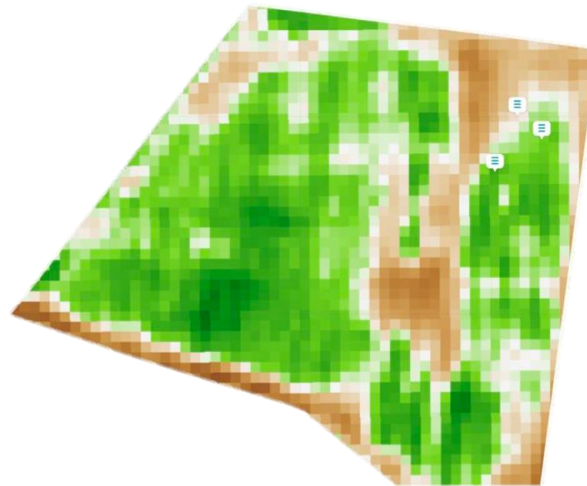
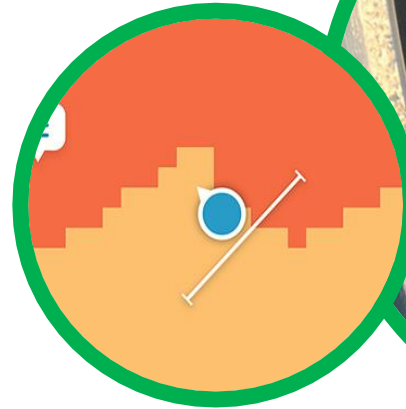
2. Beat the farmer in information value

Benefits of EO

- Overview
- Whole spectrum
- Timely / Low latency

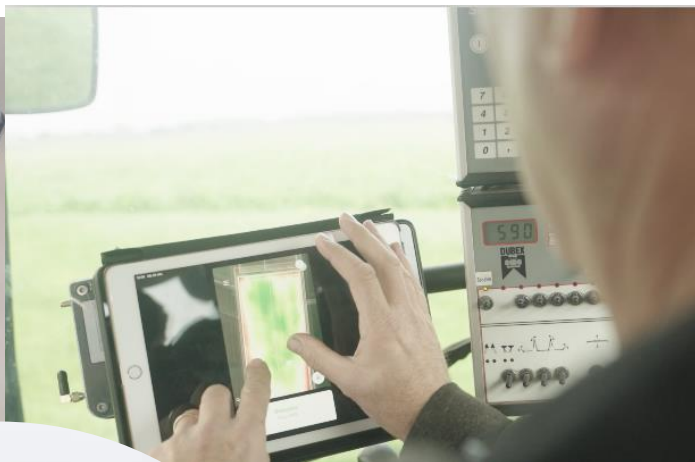
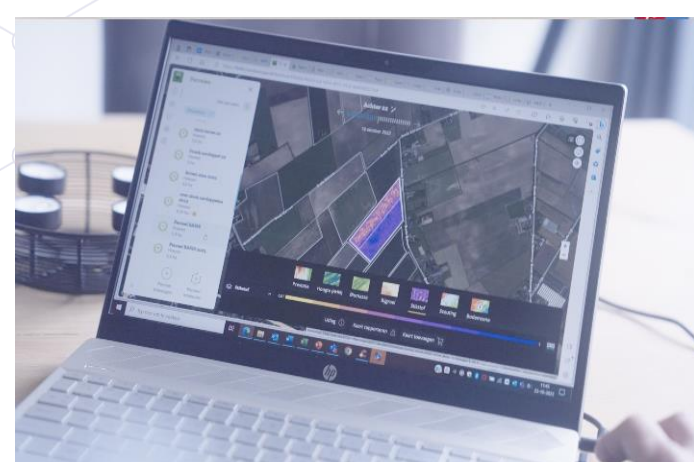
Do not bother farmers with:

- Cloud cover
- Atmospheric disturbances
- Geometric errors



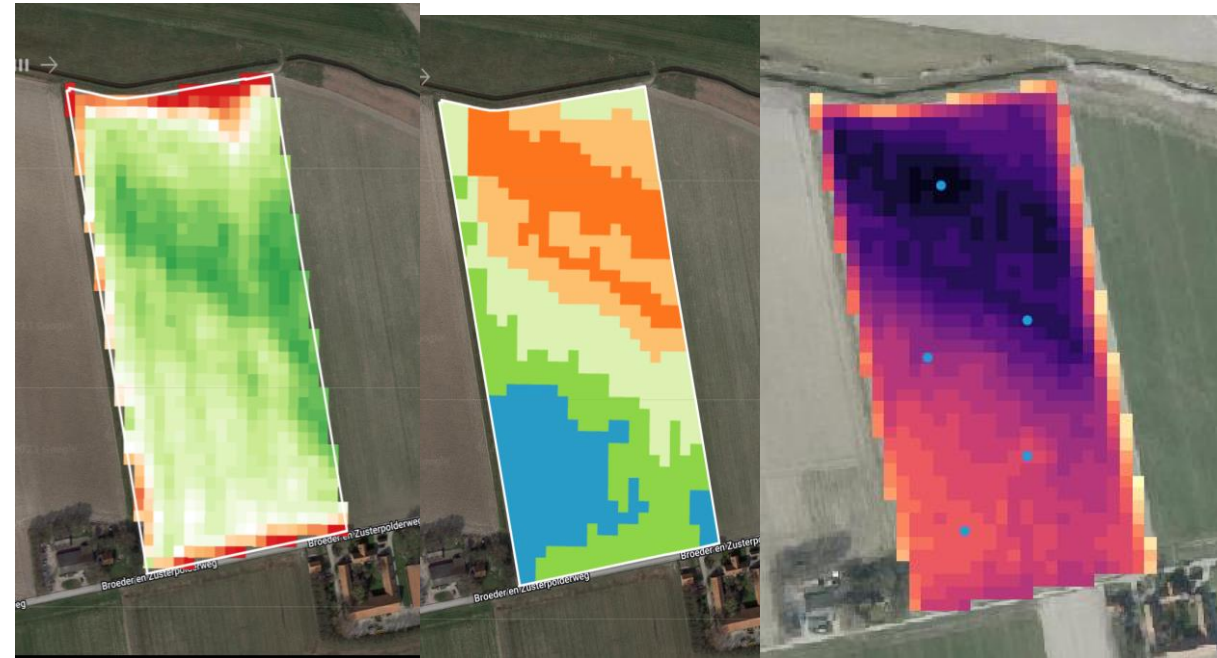
3. Change the farmer's frame

Use data in daily processes



Soil carbon monitoring

- Advancements in 'measuring' carbon
- EO only looks at 'topsoil'
- What is relevant? 30cm? 100cm?
- Carbon dynamics → when to measure
- Annual increase in carbon levels = uncertainty level in lab analyses



Take away message

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EU Space Role within Regenerative Agriculture: Open Debate

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KEY AREAS

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EU SPACE WEEK 2023

7 - 9 November - Sevilla, Spain

SPACE4GREEN (HE Project)

EU Space & Blockchain for traceability and sustainability

UCP Agriculture

Juan Pablo García – INTEGRASYS S.A.



European
Commission



Outline

- SPACE4GREEN Project: General concept
- Use cases and demonstrators
- Current implementation and integration
- Conclusion

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SPACE4GREEN Project: General Concept

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SPACE4GREEN: Overview

EGNSS applications for the Digital Age (HORIZON-EUSPA-2021-SPACE-02-53)

Planning	Consortium	Budget	Funding rate	Statistics
GA signature 17th Oct. 2022 Project start 1st Nov. 2022 Project end 31st Oct. 2024	9 partners 5 countries	2.95 Millions €	~79% [avg.]	Call 50 proposals Topic 10 proposals

HE Innovative Action

SPACE4GREEN: Overview

EGNSS applications for the Digital Age (HORIZON-EUSPA-2021-SPACE-02-53)

Consortium

9 partners

5 countries



COORDINATOR

Spain



Spain



Greece



Estonia



ITC
INOVACIJSKO TEHNOLOŠKI GROZD
INNOVATION TECHNOLOGY CLUSTER

Slovenia



Greece



Cyprus



Spain



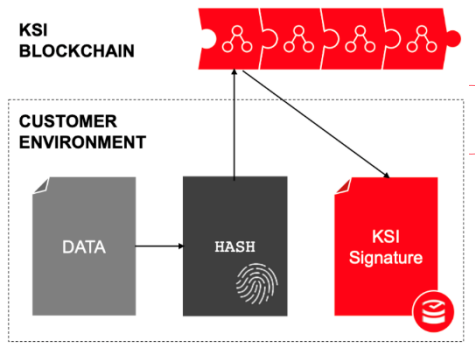
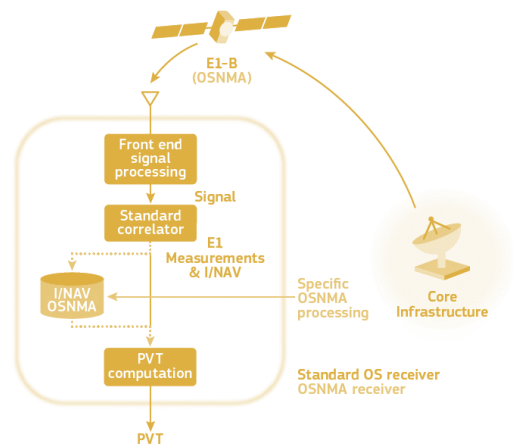
Spain



SPACE4GREEN: Core Concept

SPACE4GREEN seamlessly combines blockchain technology and Galileo OS-NMA signals to provide a comprehensive solution that effectively tackles common challenges across multiple sectors.

This harmonious fusion of technologies serves to boost operational efficiency, reduce costs, and empower a more self-reliant and dependable certification process within the framework of SPACE4GREEN.



B2B platform



Key technologies



SDK



Operational Scenarios



Distributed Ledger



2 Use Cases

6 Pilots

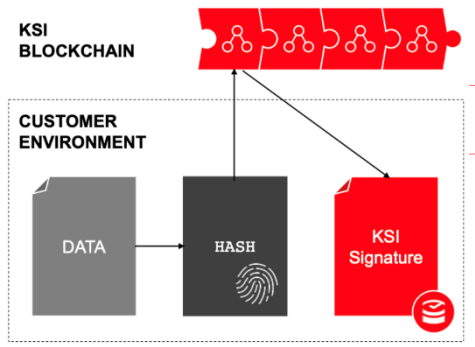
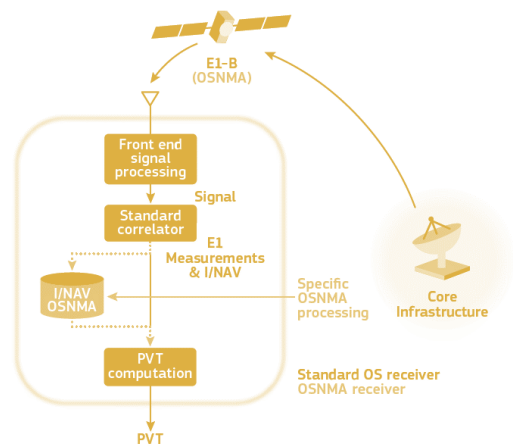
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B2B platform + **Key technologies** + **SDK** + **Operational Scenarios**



2 Use Cases

6 Pilots

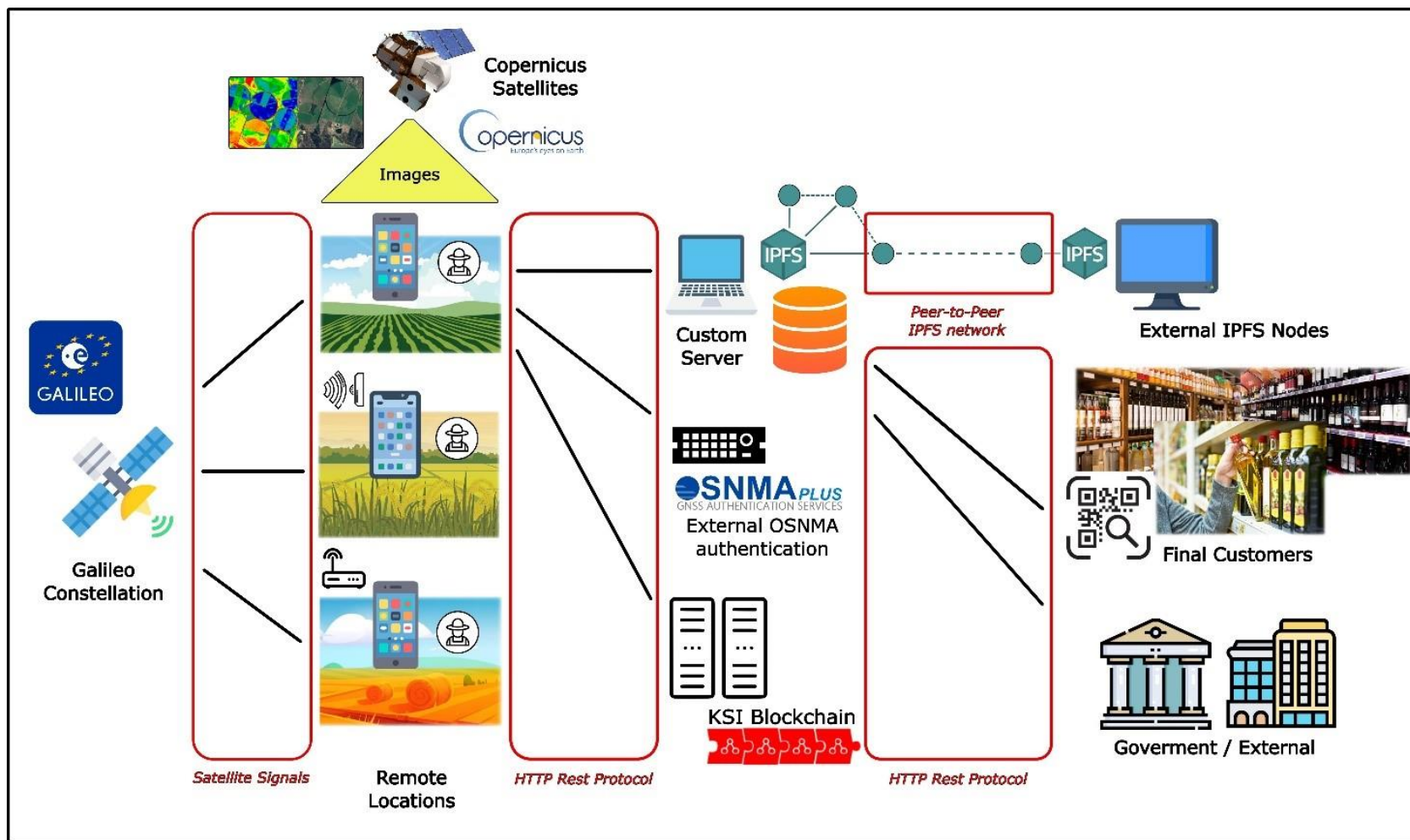
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SPACE4GREEN: Use Cases and Demonstrators

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General Scheme of the Use Cases



Demonstration Case 1: Transparency, Traceability and Trust in Local Food Production [Slovenia, ITC]

“SPACE4GREEN introduces and demonstrates an advanced traceability system that leverages the power of blockchain technology while enhancing its records with verified information of position and time, thanks to the cutting-edge Galileo OS-NMA.”

- **Enhanced Transparency:** Integration of blockchain technology and Galileo OS-NMA for unparalleled transparency in local food production.
- **Consumer Empowerment:** Access to accurate and trustworthy information empowers consumers to make informed food choices.
- **Support for Local Economies:** Increased consumer trust drives demand for local products, supporting local businesses and agriculture.
- **Food Safety and Quality:** Verified information ensures safe and high-quality food products for consumers.
- **Environmental Benefits:** Promoting local production reduces carbon footprint from long-distance transportation.

Demonstration Case 2: Enhancing Common Agriculture Policy Rules Monitoring and Auditing [Spain, CAAND]

“SPACE4GREEN introduces and demonstrates the enhancement of monitoring and auditing of the common agricultural policy’s schemes.”

- **Efficiency and Accuracy:** Improved CAP monitoring processes enhance efficiency and accuracy in data collection and analysis.
- **Faster Audits:** Streamlined audit procedures lead to quicker identification of compliance issues and more timely aid disbursements.
- **Enhanced Transparency:** Better data traceability and validation processes increase transparency in CAP monitoring.
- **Better Policy Decision-Making:** Real-time, accurate data empowers data-driven policy decisions to address agricultural challenges.
- **Cost Savings:** Efficient audits and reduced administrative burdens result in cost savings for the CAP program.
- **Sustainable Agriculture:** The system supports sustainable farming practices by targeting incentives and interventions effectively.
- **Compliance Assurance:** Improved monitoring capabilities reduce the risk of non-compliance, benefiting farmers and the CAP program.

Demonstration Case 3: Transparency and Traceability of Olive Oil [Spain, LUCENA]

“**SPACE4GREEN** demonstrates how the advanced traceability system allows consumers to have convenient access to the most pertinent and authenticated details regarding extra-virgin olive oil production.”

- **Enhanced Brand Integrity:** advanced traceability enhances the reputation and integrity of Appellation of Origin Lucena's Olive Oil.
- **Quality Assurance:** powered by blockchain and Galileo OS-NMA, ensures the accuracy of Extra Virgin Olive Oil's origin and quality.
- **Market Competitiveness:** LUCENA gains a competitive advantage by offering verifiable product authenticity.
- **Consumer Confidence:** Buyers can trust in the authenticity and quality of the product, fostering loyalty.
- **Regulatory Compliance:** The system helps in meeting and exceeding regulatory requirements and standards.
- **Data-Driven Decisions:** Valuable data assists in making informed decisions and responding to market trends effectively.

Demonstration Case 4: Traceability and Authenticity of Wine [Cyprus, OMNIA]

“SPACE4GREEN introduces and demonstrates how the enhanced traceability increases the added value of the local wines and opens new market horizons for the benefit of the producers and the local and national economy.”

- **Enhanced Traceability:** By facilitating accurate documentation of the origin of Cypriot wines, enhancing transparency and consumer trust.
- **Quality Assurance:** Improved traceability and sustainability measures result in higher-quality Cypriot wines.
- **Competitive Edge:** Cypriot wines gain a competitive advantage by emphasizing their unique origins, sustainability, and quality.
- **Promotion of Local Culture:** By helping the preservation and promotion of the cultural identity of the region through its wines

Demonstration Case 5 : Environmental Sustainability Index of Cotton & Vineyards Cultivation [Greece, ACP & AgroApps; Cyprus, OMNIA & AgroApps]

“SPACE4GREEN introduces and demonstrates a ground-breaking solution – ESI (Environmental Sustainability Indicator)- that revolutionizes the assessment, monitoring, and improvement of sustainability practices within the agricultural sector.”

- **Data Precision and Integration:** Space4Green ensures precise location data integration through Galileo and EGNOS, enhancing sustainability assessments for ESI.
- **Blockchain Integration:** Space4Green strengthens ESI's data security and transparency via blockchain, safeguarding supply chain sustainability records.
- **Environmental Sustainability Compliance:** ESI facilitates compliance with stringent environmental sustainability standards by providing biodiversity, soil, water, and greenhouse gas indicators.
- **Transparency and Supply Chain:** ESI offers supply chain traceability to meet consumer demand for sustainable products, building trust and tapping into growing markets.
- **Data-Driven Decision-Making:** ESI provides accurate and up-to-date agricultural data for informed decisions, optimizing resource use, increasing efficiency, and reducing operational costs.

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SPACE4GREEN: ESI module case

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Environmental Sustainability Index of Cotton & Vineyards Cultivation

- > User logs in the S4G App
- > Selects a parcel to register an activity
- > Selects the activity
- > Fills in the requested details
- > Submits the activity

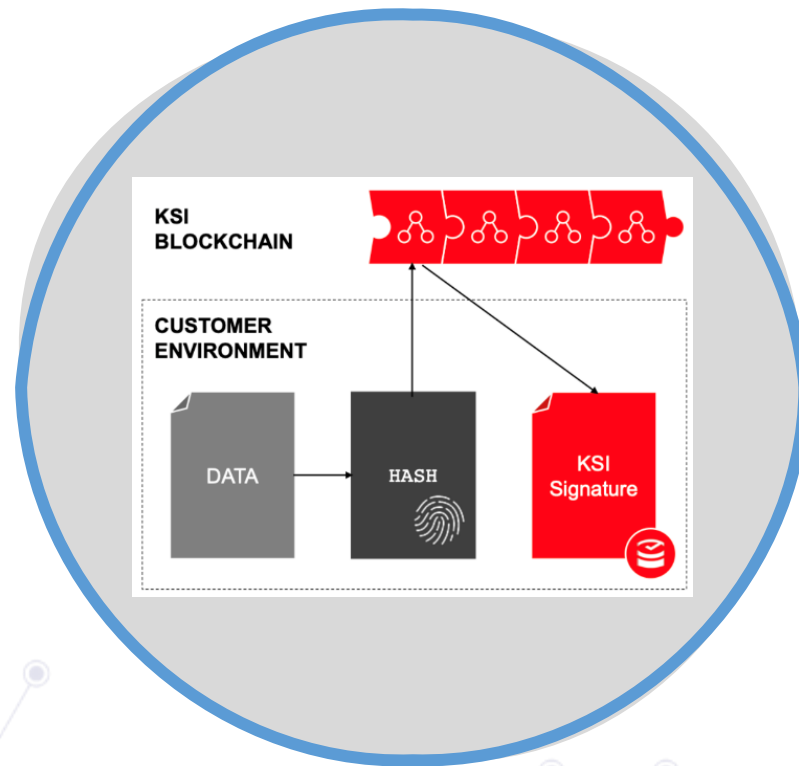


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Environmental Sustainability Index of Cotton & Vineyards Cultivation

-> S4G App geolocates and timestamps the activity and makes the respective register on the blockchain

-> At the same time in the ESI Platform



Environmental Sustainability Index of Cotton & Vineyards Cultivation

->The parcel specific calendar is being populated with every incoming activity

The screenshot displays a software interface for managing agricultural actions. The main content is a table with the following data:

Action Type	Parcel	Crop type	Date
Irrigation	TERZIS PATS	Cotton	27 Sep, 2023
Harvest	TERZIS PATS	Cotton	31 Oct, 2023
Fertilization	TERZIS PATS	Cotton	31 Oct, 2023

Below the table, there is a search bar with the location 'Giannitsa' and the user 'terzist'. A detailed view of the 'Fertilization' action is shown, including the description 'Basal Fertilization with sowing' and the specific details 'Complex NPK 15-15-15, 80 kg per 10m²'. The interface also features a sidebar with navigation icons, a top navigation bar with filters for 'TERZIS...', 'Action Type', and 'Owner', and a date range filter set to '3 Aug, 2023 - 3 Nov, 2023'. There are buttons for 'Add action', 'Add Observation', and 'Export'.

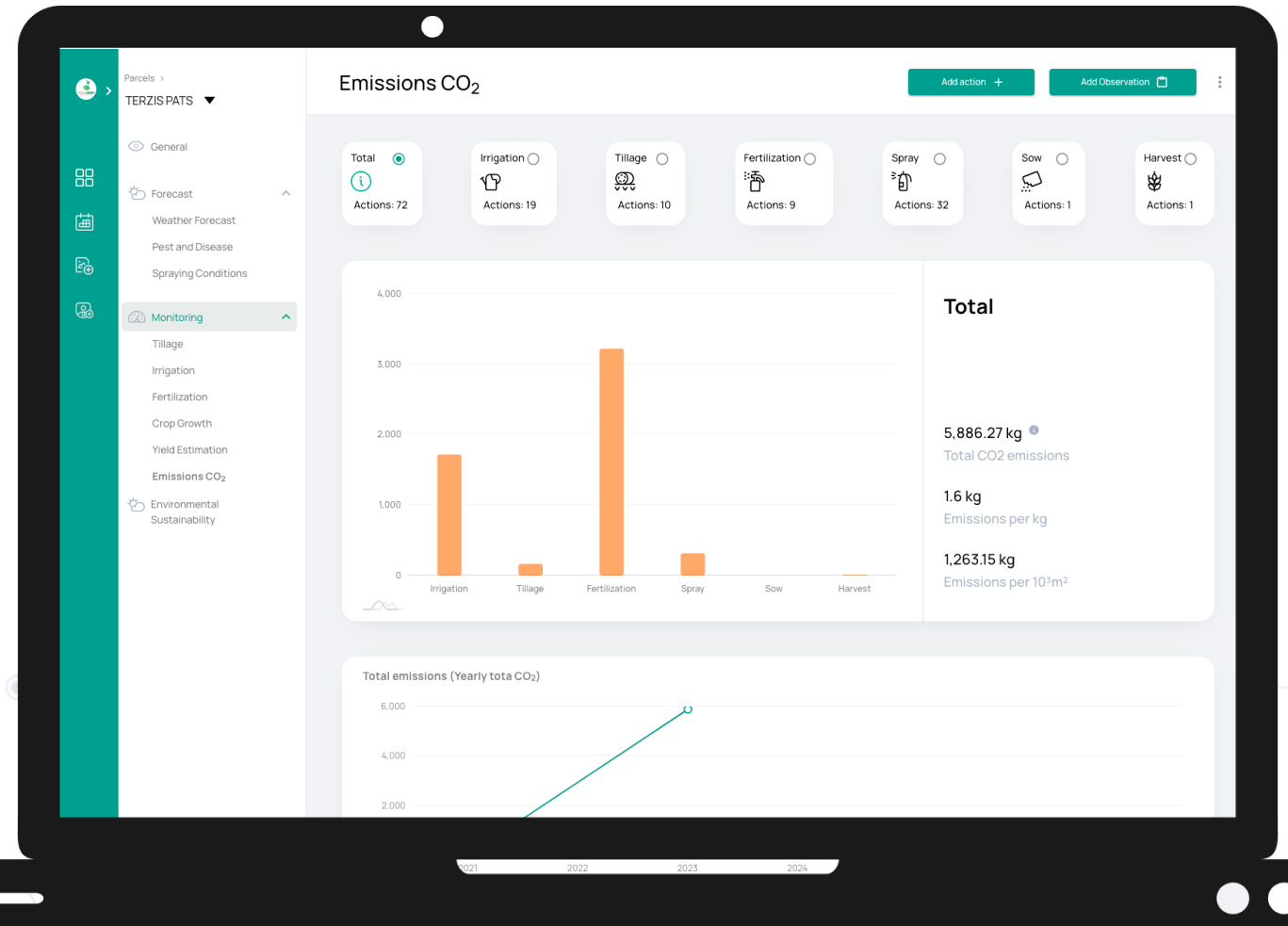
Environmental Sustainability Index of Cotton & Vineyards Cultivation

->Activities are aggregated, and the full calendar for each of the parcels appears

Action Type	Parcel	Crop type	Date ↑
Irrigation	TERZIS PATS	Cotton	05 Aug. 2023
Fertilization	TERZIS PATS	Cotton	09 Aug. 2023
Spray	TERZIS PATS	Cotton	10 Aug. 2023
Irrigation	TERZIS PATS	Cotton	11 Aug. 2023
Fertilization	TERZIS PATS	Cotton	11 Aug. 2023
Irrigation	TERZIS PATS	Cotton	13 Aug. 2023
Irrigation	TERZIS PATS	Cotton	20 Aug. 2023
Irrigation	TERZIS PATS	Cotton	31 Aug. 2023
Spray	TERZIS PATS	Cotton	31 Aug. 2023
Fertilization	TERZIS PATS	Cotton	01 Sep. 2023
Spray	TERZIS PATS	Cotton	01 Sep. 2023
Irrigation	TERZIS PATS	Cotton	06 Sep. 2023
Irrigation	TERZIS PATS	Cotton	13 Sep. 2023
Irrigation	TERZIS PATS	Cotton	20 Sep. 2023
Irrigation	TERZIS PATS	Cotton	27 Sep. 2023
Harvest	TERZIS PATS	Cotton	31 Oct. 2023
Fertilization	TERZIS PATS	Cotton	31 Oct. 2023

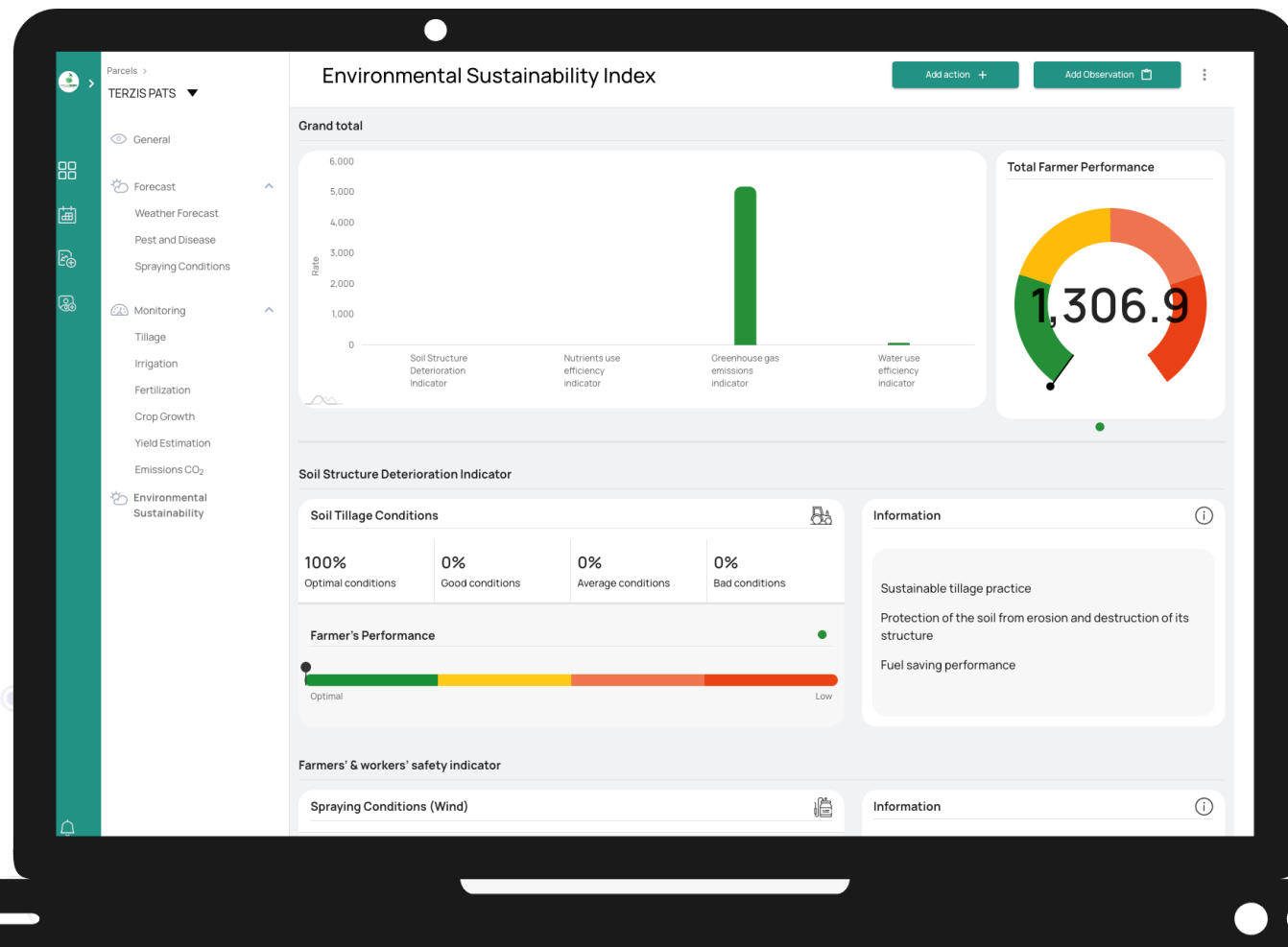
Environmental Sustainability Index of Cotton & Vineyards Cultivation

-> With every activity the respective CO2 emissions are calculated



Environmental Sustainability Index of Cotton & Vineyards Cultivation

->And finally at the end of the crop season the ESI Score is calculated

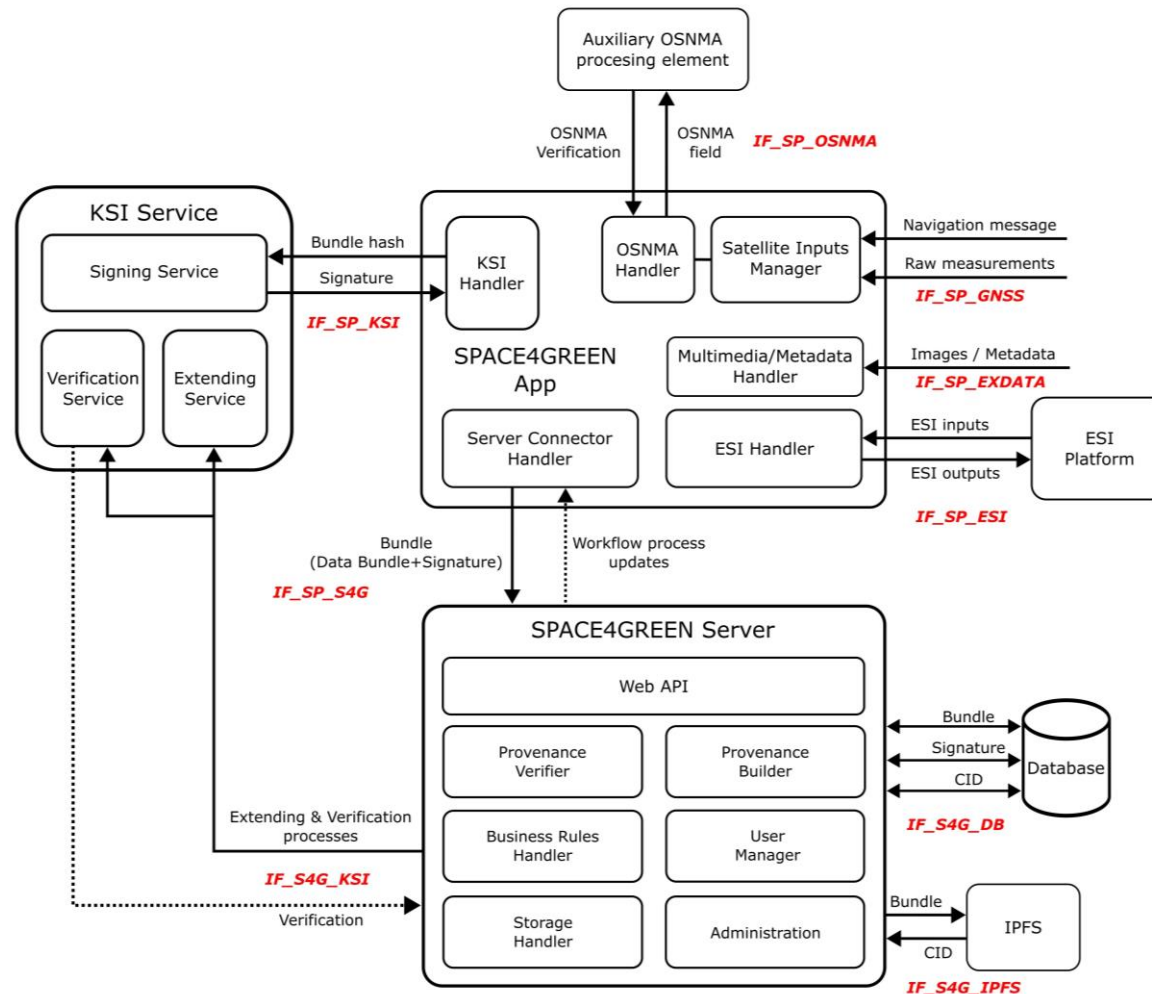


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SPACE4GREEN: Current implementation and integration

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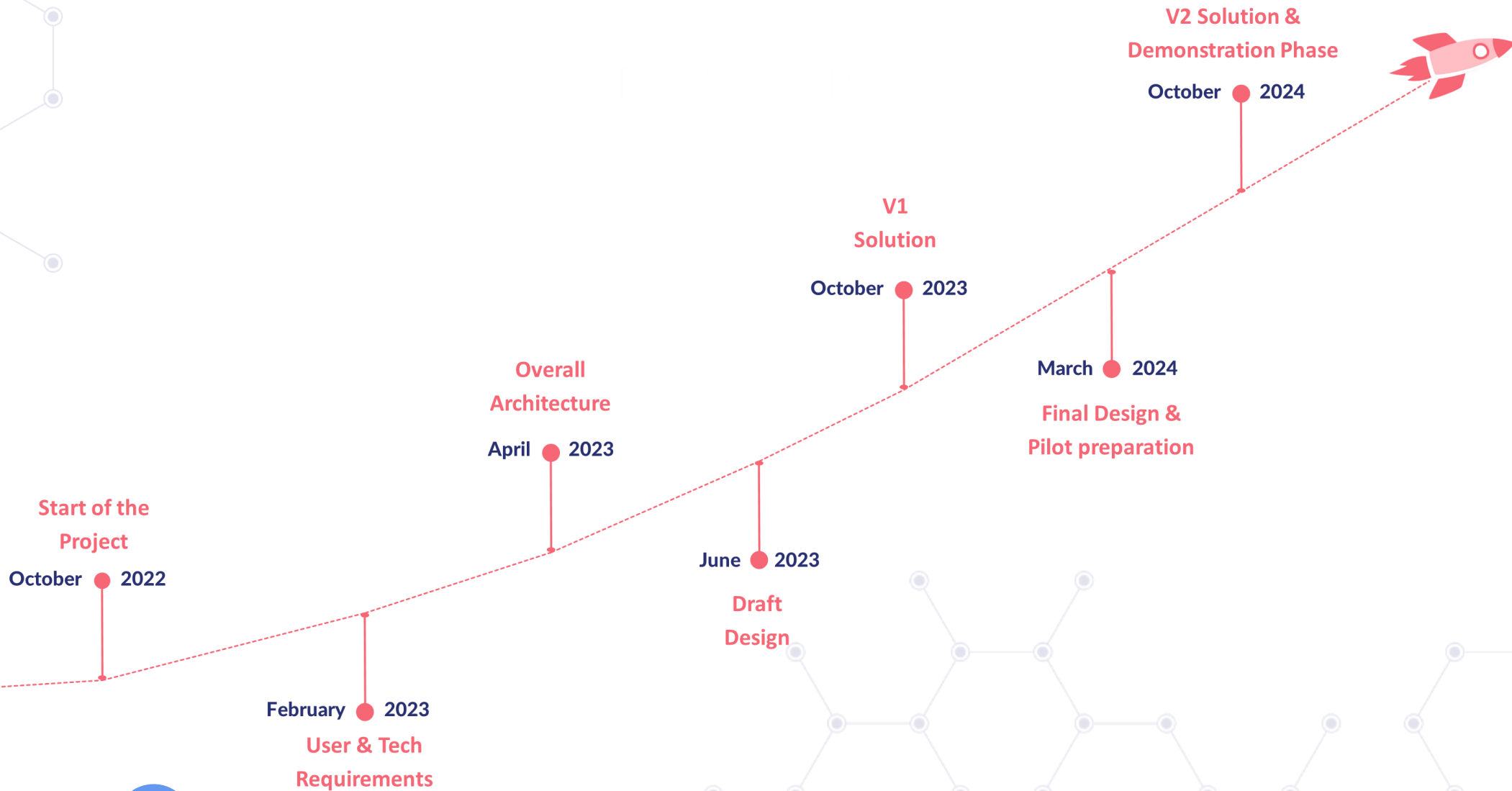
Implemented SPACE4GREEN architecture



- SPACE4GREEN App V1
- SPACE4GREEN Server V1
- KSI Service: Blockchain
- Auxiliary OSNMA processing element: Galmon device.
- ESI Platform V1
- IPFS preliminary tests
- Spoofing tests

SPACE4GREEN Roadmap

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Conclusion

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To sum up...

- Galileo OS-NMA & Copernicus enable more accurate navigation and timing
- Galileo OS-NMA & Copernicus support traceability and sustainability
- Versatile solution with multiple applications in the agrifood industry: short food supply chains, CAP management, olive oil & wine production, sustainable crops.
- Trusted information that can be easily shared among agri-food stakeholders.
- Smartphones are incapable of fully decoding OSNMA fields near real-time: Auxiliary OSNMA processing element.
- Demonstration phase from March 2024 to October 2024.

Agriculture session - Agenda

10:00	<i>Session Agenda presentation</i>	Stefan Schneider , EUSPA
10:10	<i>EU Space Programme Components current state and future services for users</i>	Javier de Blas , EUSPA
10:25	<i>Horizon Europe EGNSS Mission and Service related R&D activities and Contribution to Ionospheric Prediction Service</i>	Javier Ostolaza , EUSPA & Leo Bibollet , Hanaa ALBITAR, TAS
10:35	<i>Copernicus for Agriculture:</i>	
	<i>CLMS for Agriculture</i>	Usue Donezar , EEA
	<i>C3S/CAMS for Agriculture</i>	Cristina Ananasso & Delphine Deryng ECMWF
11:05	<i>Developing requirements from automation to autonomy & discussion</i>	Georg Larscheid , Claas
11:25	<i>GALIRUMI R&D project – EGNSS based robots for organic farming & discussion</i>	Esther López , Acorde - GALIRUMI H2020
11:45	<i>The EU SPACE opportunity for small and medium size farmers & discussion</i>	Maurizio Laterza , Planetek
12:05	<i>EU SPACE role within Regenerative Agriculture & discussion</i>	Tamme Van Der Wal , Aerovision
12:25	<i>SPACE4GREEN R&D project - EU Space and block chain for traceability and sustainability & discussion</i>	Juan Pablo García , Integrasys
12:50	<i>Conclusions and next steps</i>	Stefan Schneider , EUSPA
13:00	<i>Lunch</i>	

KEY AREAS

Conclusions and next steps

CONCLUSIONS

Thank you for your active participation to the Agriculture User Consultation Platform!

Your feedback and inputs are of key importance to us, as they will feed into the **Report on Agriculture and Forestry User Needs and Requirements**. The report will be published in **early 2024** (on EUSPA website)

NEXT STEPS

- The **minutes** of today's session will be soon made available online
- From **14.00 to 17.00** today you are welcome to join the **Forestry User Consultation Platform**.

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Thank you!

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