

Copernicus4Regions

Information Session @ European Parliament

October 23rd from 11.00 to 13.30

European Parliament, Brussels

(Rue Wiertz 60, Brussels, Room number: ASP A5E1)



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Meeting Agenda

11:00	Welcome by MEP and introduction to EP Vision on Europe's policy challenges	Office of MEP J. Sole'
11:10	Round Table self-introduction of audience: assistants/staff of the EP highlight main policy interests and background knowledge of Copernicus	Audience
11:25	Introduction	
11:25	The Copernicus Programme (incl. introduction of Entrusted Entities)	COM
11:35	Copernicus Sentinels continuity and evolution	ESA
11:40	Copernicus4regions initiative	NEREUS
11:45	How can Copernicus support the Green Deal and EU policies? Carbon Neutrality and Net Zero Emissions Climate Monitoring and Adaptation Civil Protection and Natural Disasters Environment Protection and Biodiversity Sustainable Agriculture, Food Security and Water Security	COM, ESA, NEREUS, ECMWF, MOI, EEA, EUMETSAT
13:25	Conclusions and invitation to Copernicus4regions Lunch Event @ EP Take Home Messages	
13:30	End of Meeting	

*Logistics: There is no coffee-break: attendees are invited to help themselves with coffee and water and sandwiches.
 Slides will be made available after the Session at <https://www.nereus-regions.eu/copernicus4regions/>*

Moderates: R. Ayazi (NEREUS Secretary General)



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Meeting Objectives

- Promote the political and societal dimension of the Programme towards the operational staff of the European Parliament through tangible use cases and examples in a policy context;
- Enhance knowledge on the technical dimension of Copernicus as a tool for policies;
- Stimulate interest and encourage attendance to the Copernicus4Regions lunch debate on October 25.



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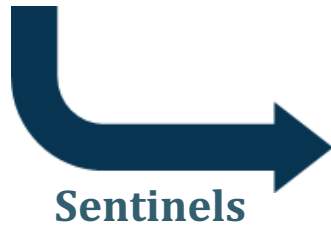
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Copernicus Architecture



FULL,
FREE
AND
OPEN

6 services use EO data to deliver...

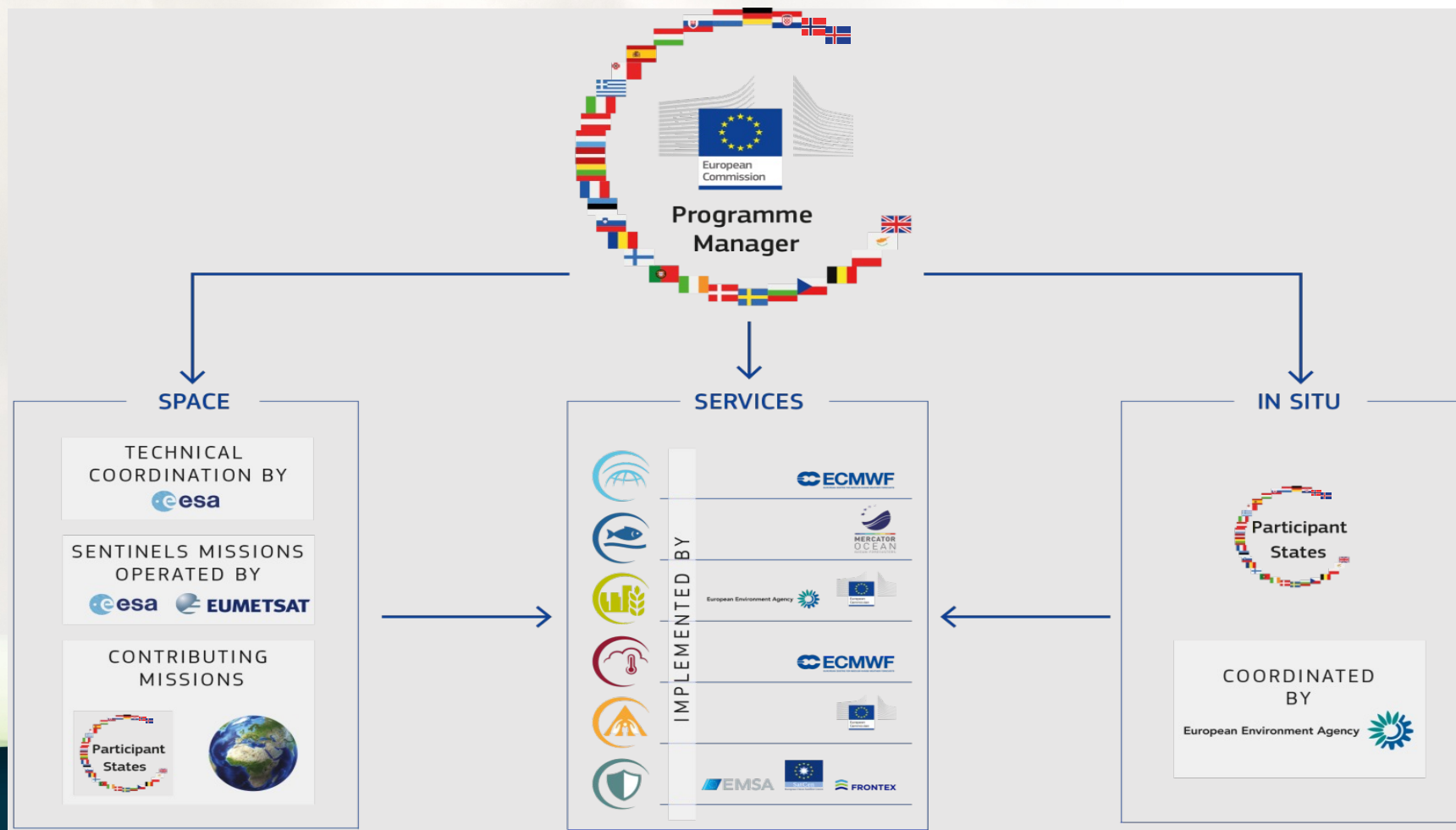


...added-value products

Contributing missions

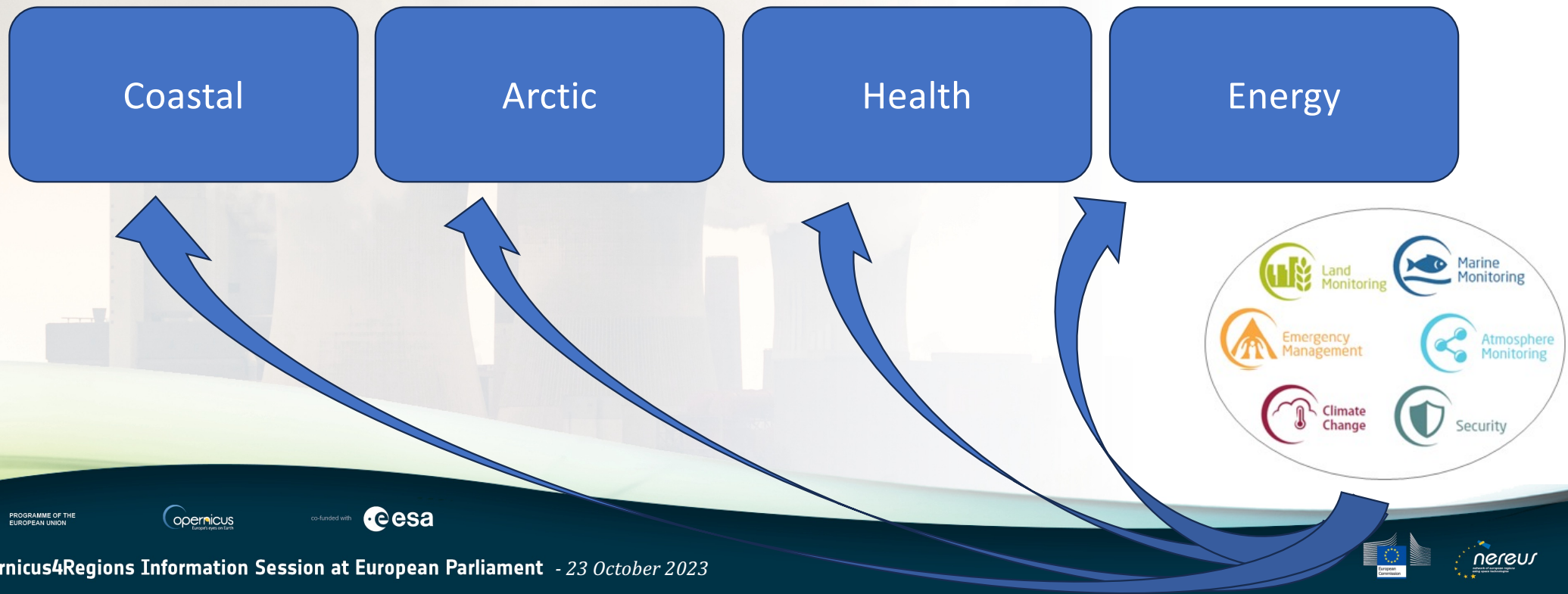


COPERNICUS PARTNERSHIPS



Copernicus Thematic Hubs

- Single-entry points for the ensemble of data, products and information generated by the Copernicus services and components for specific thematic or geographical areas

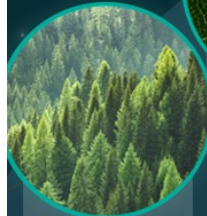




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EU Forest
Strategy
for 2030



European
Climate Law



Strategy on
adaptation to
climate change



Nature
Restoration
Law



A renewed
EU Arctic
Policy



EU Soil
Strategy
for 2030



Zero Pollution
Action Plan



Common
Agricultural
Policy



EU Action
to Protect
and Restore
the World's
Forests



Net-Zero
Industry Act



and
others...



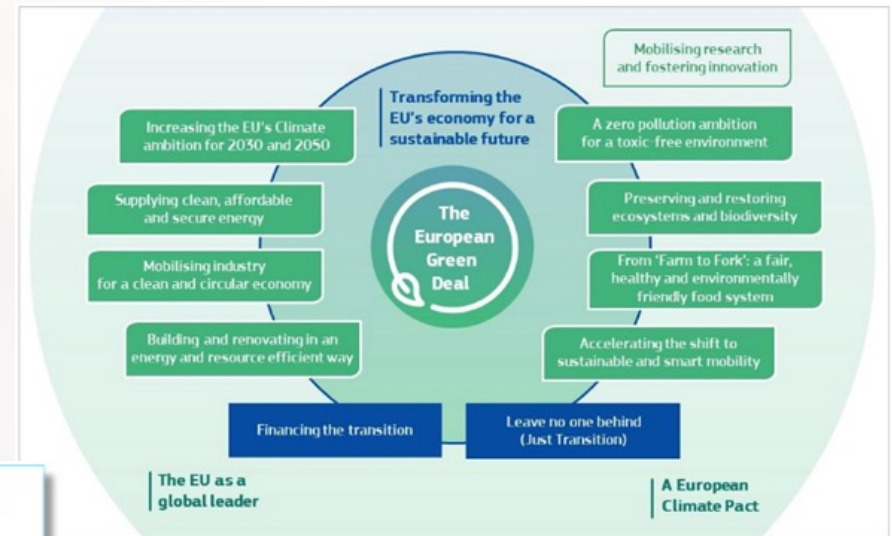
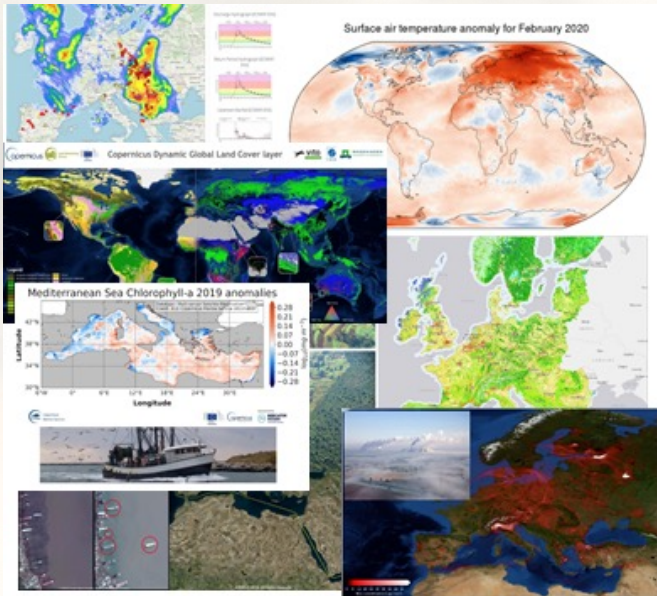
Copernicus
supports EU policies
and the Green Deal

From monitoring...

KCEO



...to understanding



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Policy Drivers – Global – EU – National - Regional

EO for the Next Green Transition

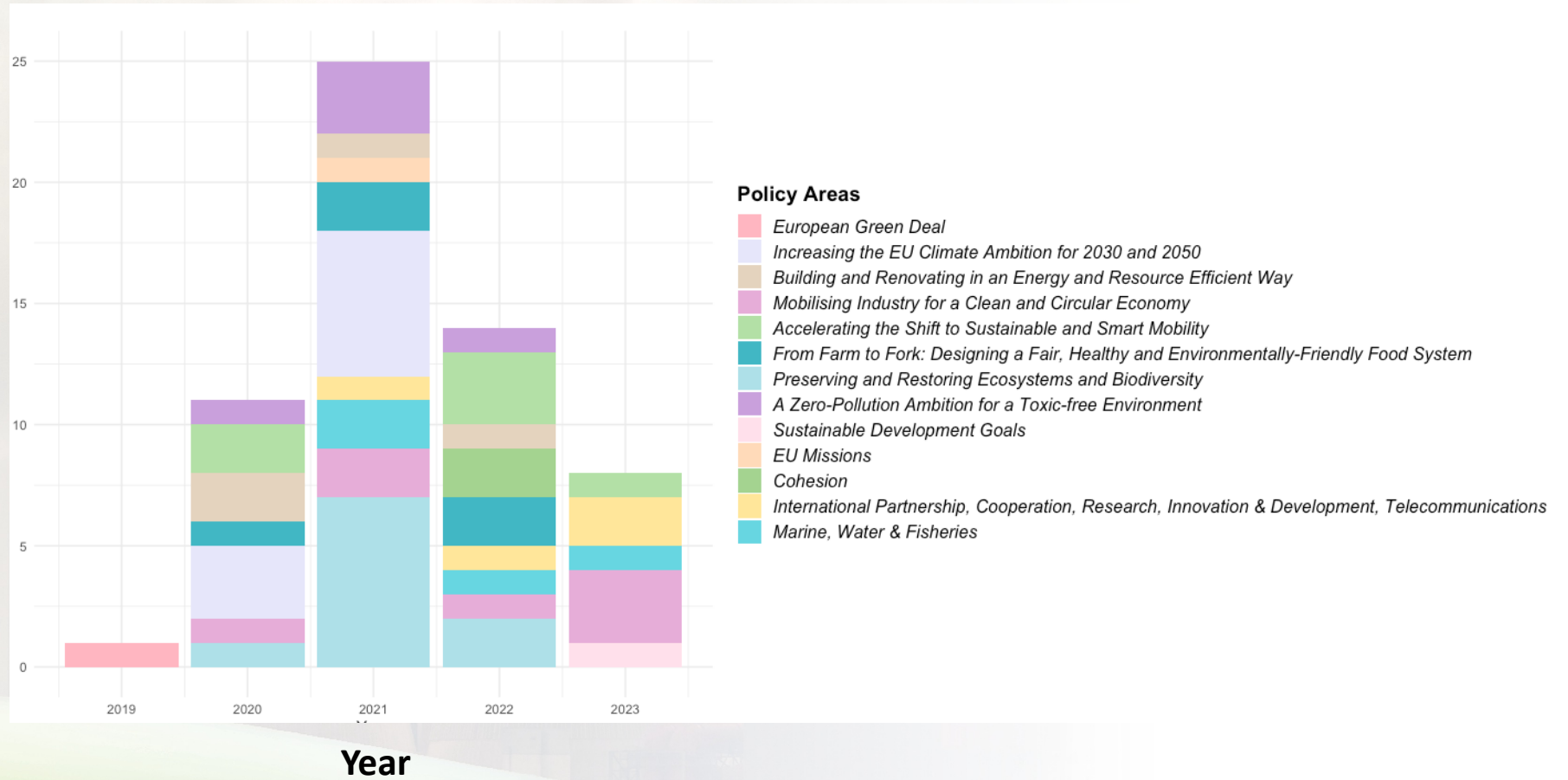
Optimize EO uptake European Green Deal & other Priorities

Next Generation EO

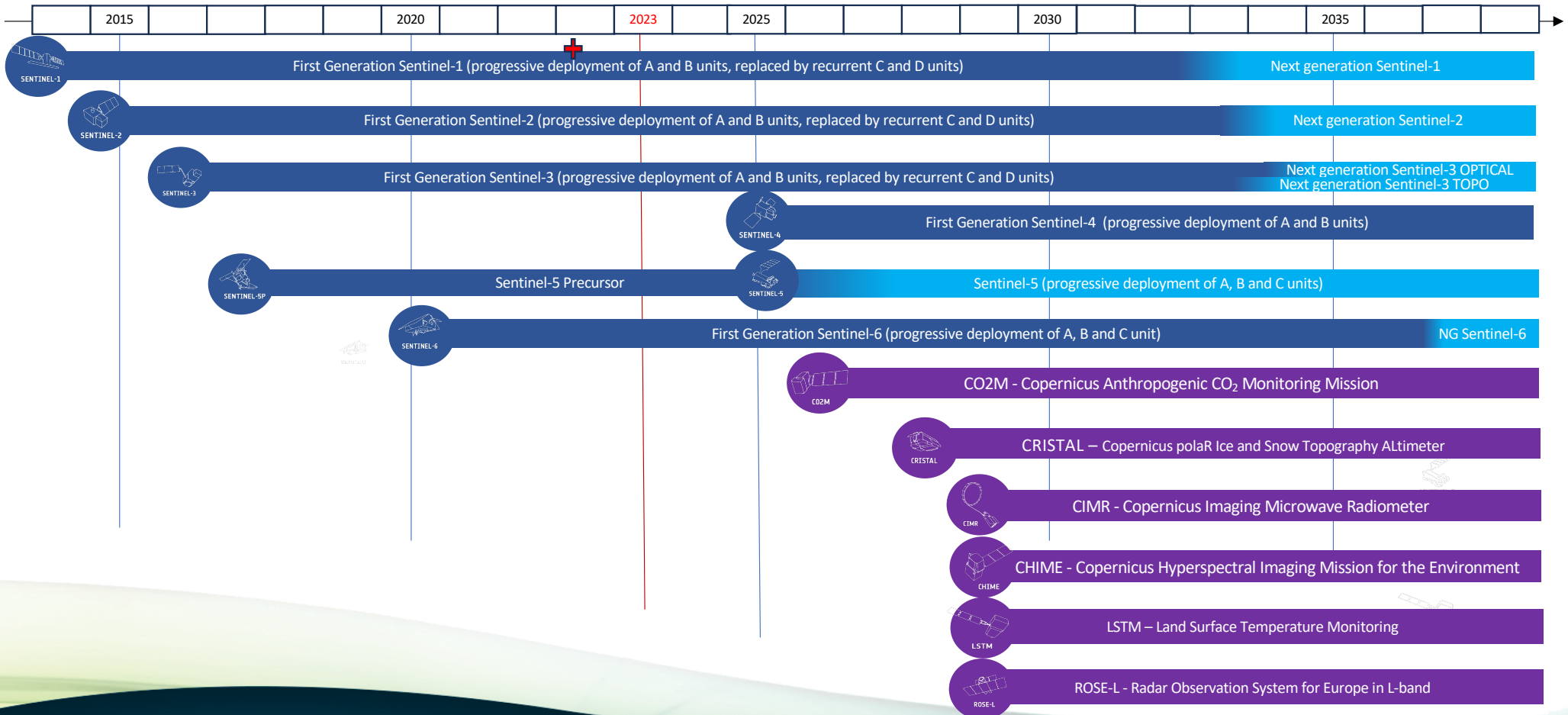


Broad interest and anticipation across Commission DGs: 17 on KCEO Steering Group - AGRI, CLIMA, CNECT, COMM, EAC, ECHO, EBAS, ENER, ENV, ESTAT, GROW, REGIO, HOME, INTPA, MARE, MOVE, REGIO, RTD, SANTE, SG

Policies and Commission documents



Sentinels indicative timeline



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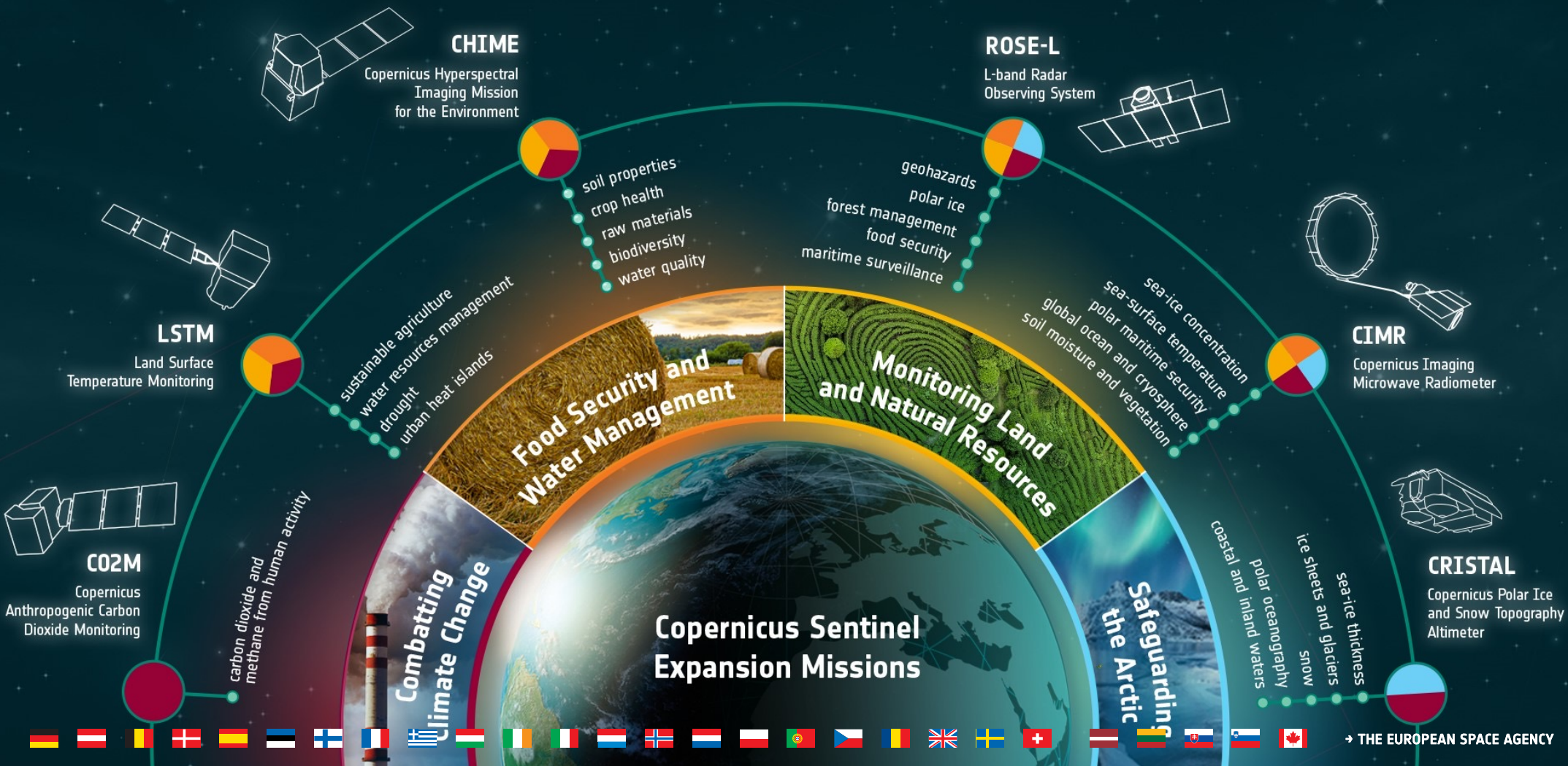


Copernicus Space Component – Evolution



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The Copernicus4Regions initiative



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copernicus Europe's eyes on Earth

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European Commission

nereus network of european regions using space technologies

SAVE-THE-DATE:

COPERNICUS4REGIONS

Information Session on the Copernicus Programme and its current and future contribution to EU policies.

23 October 2023 | 11:00–13:30
European Parliament, Brussels | Room Spinelli A5E1 - Rue Wiertz
Hosted by Jordi Sole', Member of European Parliament

THE GREENS/EFA in the European Parliament

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copernicus Europe's eyes on Earth

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nereus network of european regions using space technologies

SAVE-THE-DATE:

COPERNICUS4REGIONS LUNCH DEBATE

Wednesday 25 October 2023 | 12:30–15:00 Members' salons, European Parliament, Brussels

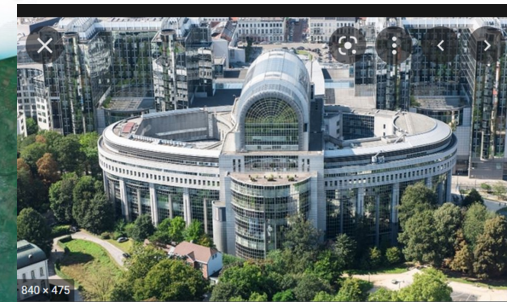
Adam JARUBAS, EPP Member of the European Parliament, invites you to attend a debate with Members of European Parliament, high-level representatives from European Public Authorities, the European Commission, the European Space Agency and the Network of European Regions Using Space Technologies (NEREUS).

European Commission

nereus network of european regions using space technologies

→ THE EVER GROWING USE OF COPERNICUS ACROSS EUROPE'S REGIONS

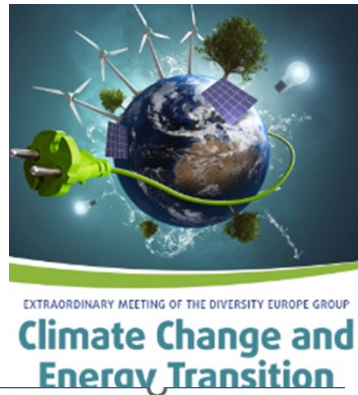
#Copernicus4regions



The Copernicus4Regions initiative



DIGITIZATION



- Copernicus4 regions teaser + videos
- Native language material
- Events
- Info-Sheets

Brochure
Search Engine on NEREUS-website

MEMBERS OF THE EUROPEAN PARLIAMENT



MEP Younous Omarjee, president of the EP-



MEP Jutta Paulus, Member of the EP-

Parliament Debates



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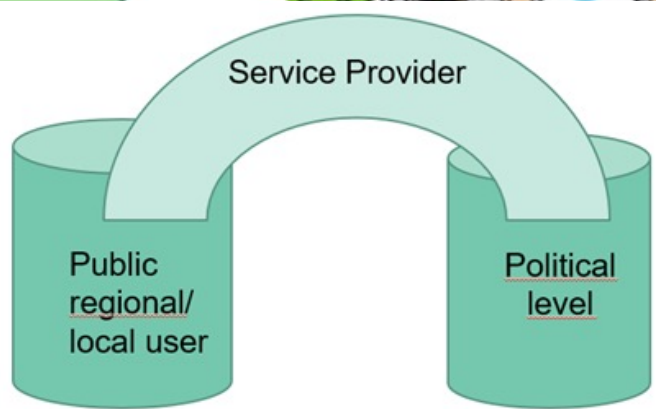


The Copernicus4Regions initiative



Bringing Copernicus to regional Ecosystems

Method



Increase awareness of public user and political decision maker

Copernicus: a tool for EU policies

Prepared by:



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How can Copernicus support the EU Green Deal and other EU policies?

A quick guide through some selected policy areas...



Carbon neutrality and net zero emissions



Climate change monitoring and adaptation



Civil Protection and disasters management



Environmental protection and biodiversity



Sustainable Agriculture, food security and water management



Carbon neutrality and net zero emissions

2021	Regulation EU 2021/1119	EU Climate law
2021	COM(2021) 572 final	EU forest strategy for 2030
2021	COM(2021) 800 final	COMMUNICATION on Sustainable Carbon Cycles
2020	COM(2020) 633 final	Communication on an EU strategy to reduce methane emissions
2020	COM(2020) 788 final	European Climate Pact
2022	COM(2022)230	Communication REPowerEU Plan
2022	COM(2022)240	Communication EU Save Energy
2021	COM(2021) 400	Communication EU Action Plan: 'Towards Zero Pollution for Air, Water and Soil'
2010	Directive 2010/75/EU	EU Directive on industrial emissions (integrated pollution prevention and control)
2022	COM/2022/542 final	Proposal for a Directive on ambient air quality and cleaner air for Europe (recast)
2022	SWD(2022) 545 final	COMMISSION STAFF WORKING DOCUMENT IMPACT ASSESSMENT REPORT Accompanying the document Proposal for a Directive of the European Parliament and of the Council on ambient air quality and cleaner air for Europe (recast)



***Darker background indicates policy documents mentioning Copernicus**



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Highlights on key policy aspects supported by Copernicus

The **Copernicus Services** play an essential role in monitoring the different facets of climate change:

- anthropogenic greenhouse gas emissions (CO2 and METHANE) through the **Copernicus Atmosphere Monitoring Service**, including the Methane **Super Emitter monitoring tool** mentioned in the EU Methane Strategy.
- status and trends of essential climate variables through the **Copernicus Climate Change Service**.
- through the **Copernicus Land Monitoring Service**, as a substantial percentage of GHG emissions come from Land Use, Land Use Change and Forestry (LULUCF).

Key Copernicus supporting elements



Atmosphere Monitoring Service
atmosphere.copernicus.eu



Land Monitoring Service



SENTINEL-5P



SENTINEL-5



SENTINEL-2



SENTINEL-1



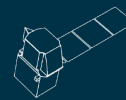
Copernicus Marine Service



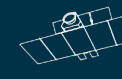
Climate Change Service
climate.copernicus.eu



CO2M



CHIME



ROSE-L



CIMR



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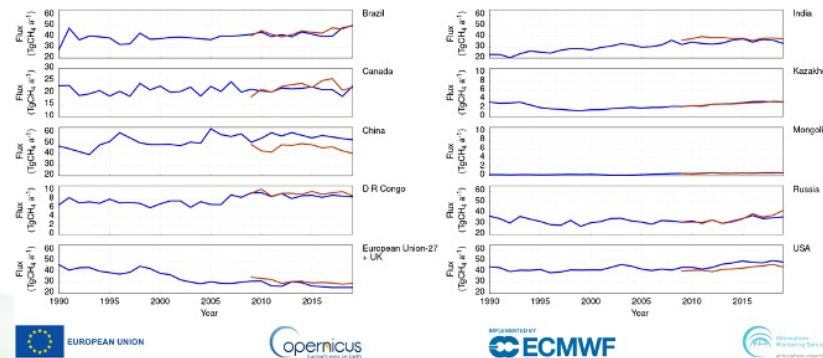
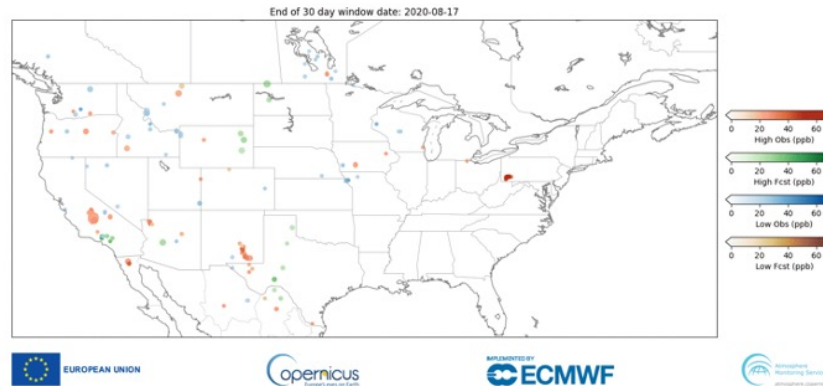
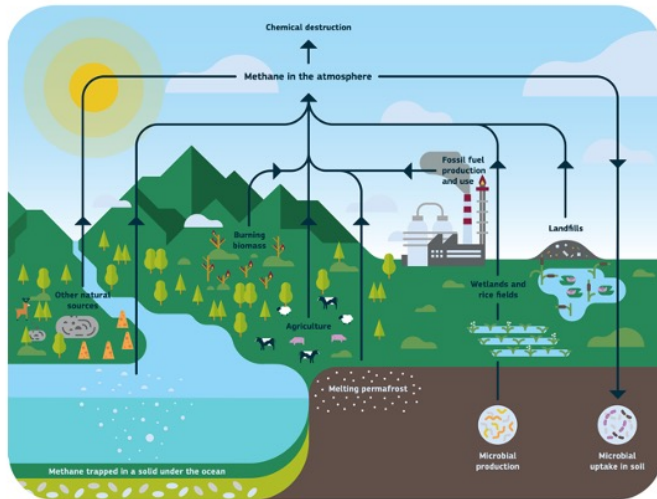


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Copernicus Atmosphere Monitoring Service and Methane (CH₄) emissions

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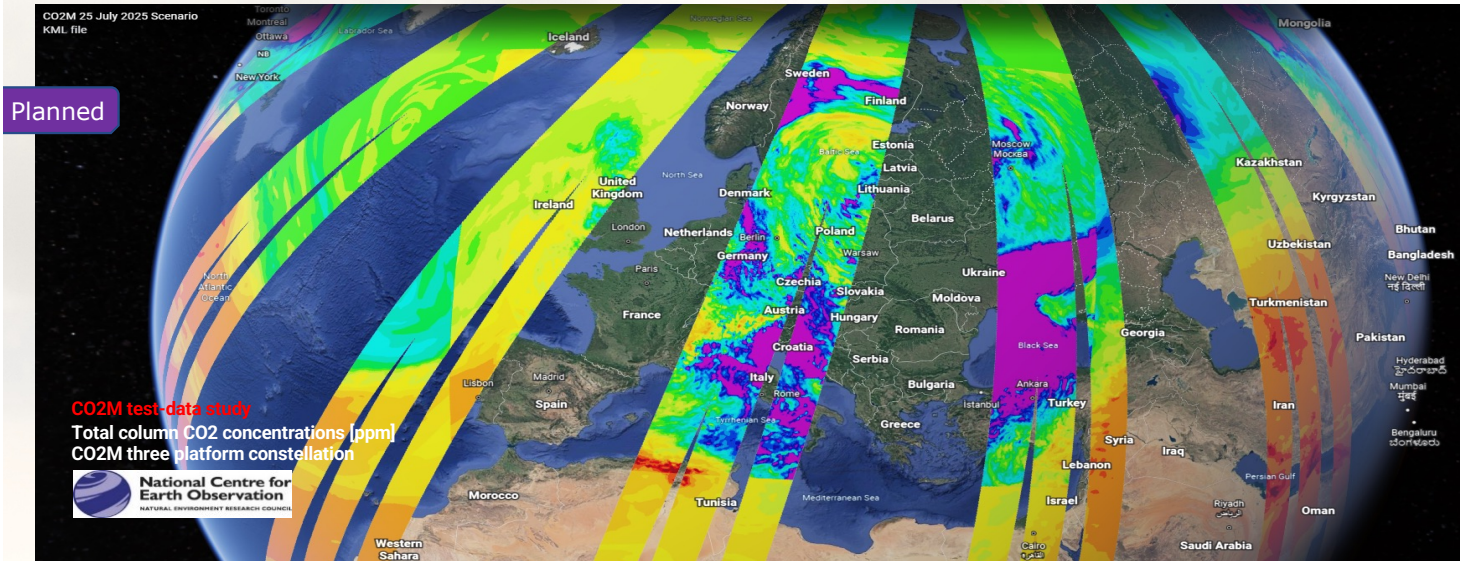
Explainer

- CAMS provides observation-based information on CO₂ and CH₄ natural fluxes and anthropogenic emissions and their trends in support of the Paris Agreement.
- In support of the EU strategy to reduce methane emissions (COM(2020)663 14/10/2020) and support private sector for adaptation to a green economy
- Detecting CH₄ anomalies: up-to-date model simulations of methane based on emission inventories, routinely compared with observations from the Sentinel-5.
- Link: <https://atmosphere.copernicus.eu/ghg-services>
- Contact person: Richard.Engelen@ecmwf.int



CO2M - Copernicus Anthropogenic CO₂ Monitoring Mission

The only way to provide for transparent CO₂ reduction policies



- ✓ CO2M is currently the only planned operational satellite mission worldwide to monitor anthropogenic CO₂
- ✓ It supports the implementation of Paris Agreement, Green Deal and Methane Pledge and is a key input to the UNFCCC Global Stock Takes through **objective and independent evidence on, and verification of, nationally reported anthropogenic CO₂ and CH₄ emissions worldwide**

Explainer

- CO2M will measure Total Column Carbon Dioxide (CO₂) and Methane (CH₄) in support to local as well as country-scale applications globally, with 4sqkm spatial resolution and 3-6 days repetitiveness.
- CO2M will be the core data provider for the EC-funded “Copernicus Anthropogenic CO₂ Emissions Monitoring & Verification Support Capacity” (“[Blue](#), [Red](#) and [Green](#) Reports”)
- The monitoring system will provide a policy support information by combining satellite and in-situ data with Earth system modelling to estimate anthropogenic CO₂ and CH₄ emissions and their trends.
- CO2M is a [Sentinel Expansion Mission](#). Two units are being developed and planned for launch in 2026. A 3rd unit, currently not funded, would improve the probability of detection of large CO₂ emitters (e.g. power plants and city scales)
- Know more [AT THIS LINK](#)



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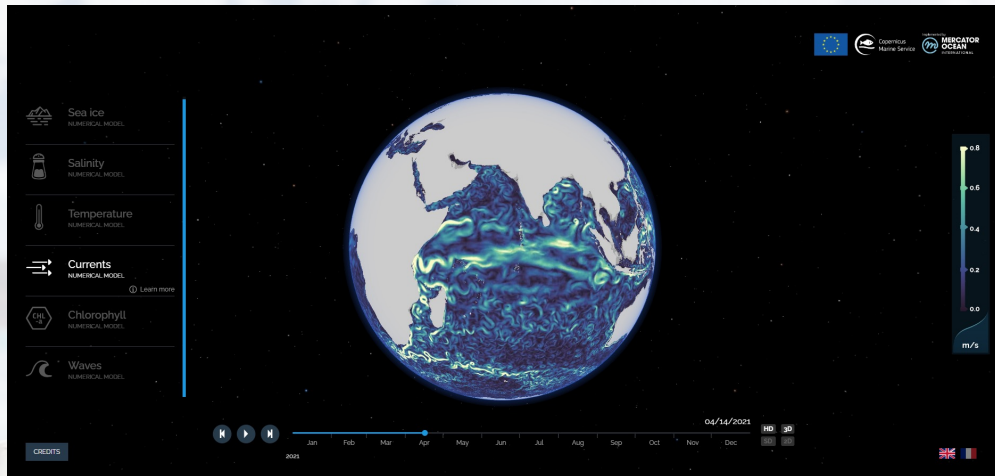
Copernicus Marine Service

It provides critical data for shipping route optimization, minimizing fuel consumption, and reducing emissions. Ocean Renewable energy (wave and ocean heat) contributes in transitioning to sustainable energy solutions.



Explainer

- **Key features:** Accurate and up-to-date oceanographic data, including information on wind, waves, currents, and sea ice cover. This data is crucial for optimizing ship routes and minimizing fuel consumption. Additionally, the data on wind, wave and currents is vital for planning, designing, and operating renewable energy projects and marine operations.
- **Added value:** By providing data for route optimization and navigation safety, Copernicus Marine contributes to reducing the environmental impact of shipping operations which aligns with efforts to decrease carbon emissions and reach net zero targets. With support it provides to different marine renewable energy projects, this data is crucial for the shift to sustainable energy solutions.
- **Main products:** [Global Ocean Physics Analysis and Forecast](#); [Global Ocean Waves Analysis and Forecast](#)
- **Main application:** [Optimal ship routing and control](#); [Met-Ocean conditions for Marine Renewable Energy test site](#)
- **Ocean Monitoring Indicators:** [Sea Ice Change](#)

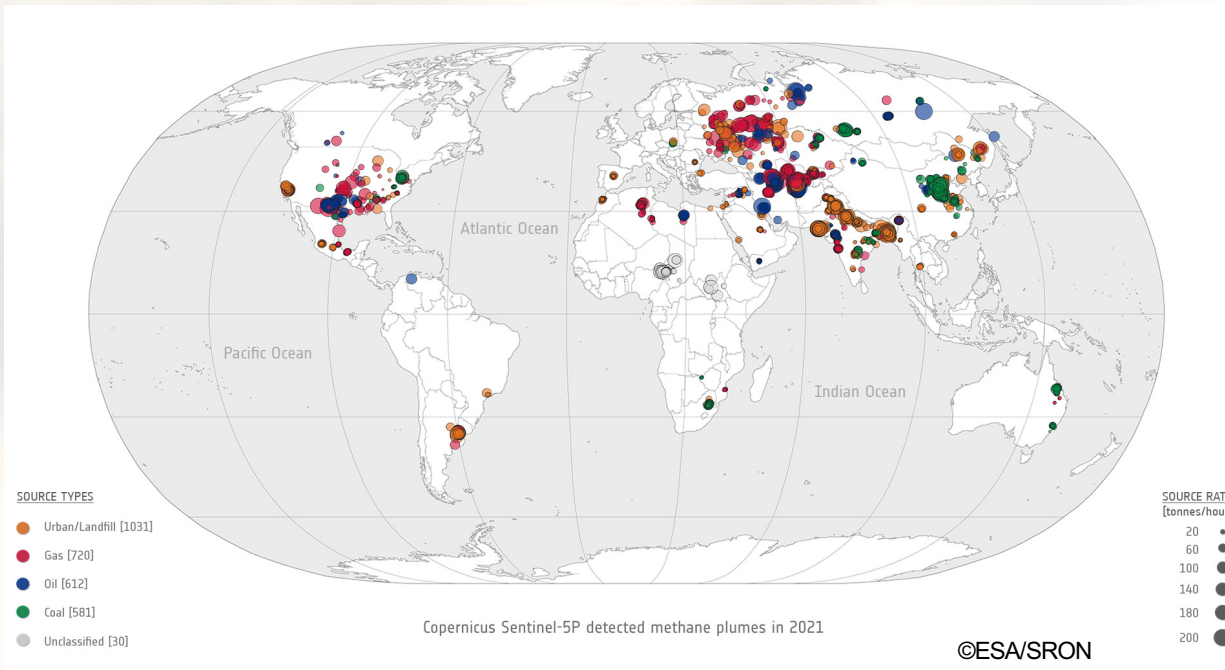


Parliament



Sentinel-5P

The only mission currently in space that maps Methane daily, globally



Explainer

- Sentinel-5P is the only satellite that produces a global map of Methane concentrations every day.
- Sentinel-5P's TROPOMI spatial resolution of 20sqm enables the detection of so-called super-emitters. Thanks to Sentinel-5P, for the first time we now get a good global picture of methane super-emitters.
- In addition to Methane, TROPOMI measures a range of chemical species crucial to the climate and other atmospheric processes (e.g. nitrogen dioxide, ozone and CO).
- Sentinel-5P is a precursor to Sentinel-5. Its continuity will be ensured by the Sentinel-5 series
- Know more [AT THIS LINK](#)

- ✓ Global overview of location and magnitude of all 2974 **methane super-emitter plumes** detected in 2021 using Sentinel-5P. From the map, it emerges that 45% of super-emitters originate from oil and gas facilities. Visible are also plumes from urban areas (35%) and coal mines (20%).



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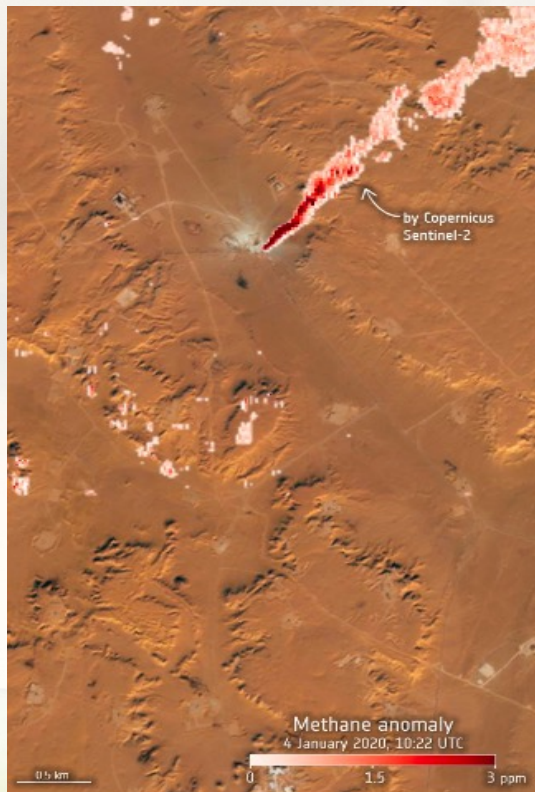
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Sentinel-2



An innovative support for pinpointing the precise location of major methane leaks



- ✓ Sentinel-2 derived information is already used by the United Nations' International Methane Emissions Observatory (IMEO) to find solutions to methane leaks, together with the responsible companies or authorities. Read more at this [LINK](#)



ESA (Data: GHGSat/contains modified Copernicus Sentinel data (2021), processed by ESA)

Explainer

- Sentinel-2 multi-band instruments are not designed to observe Methane concentrations but can identify precise locations of major methane leaks (emitting more than one tonne per hour) with a remarkable resolution of 20 m.
- Sentinel-2 lacks daily global coverage, however, so it might miss out on capturing crucial data during certain emission periods and volatile conditions.
- No observations are available during the night and through clouds
- Long-term continuity will be ensured through Next Generation Sentinels
- Know more [AT THIS LINK](#)

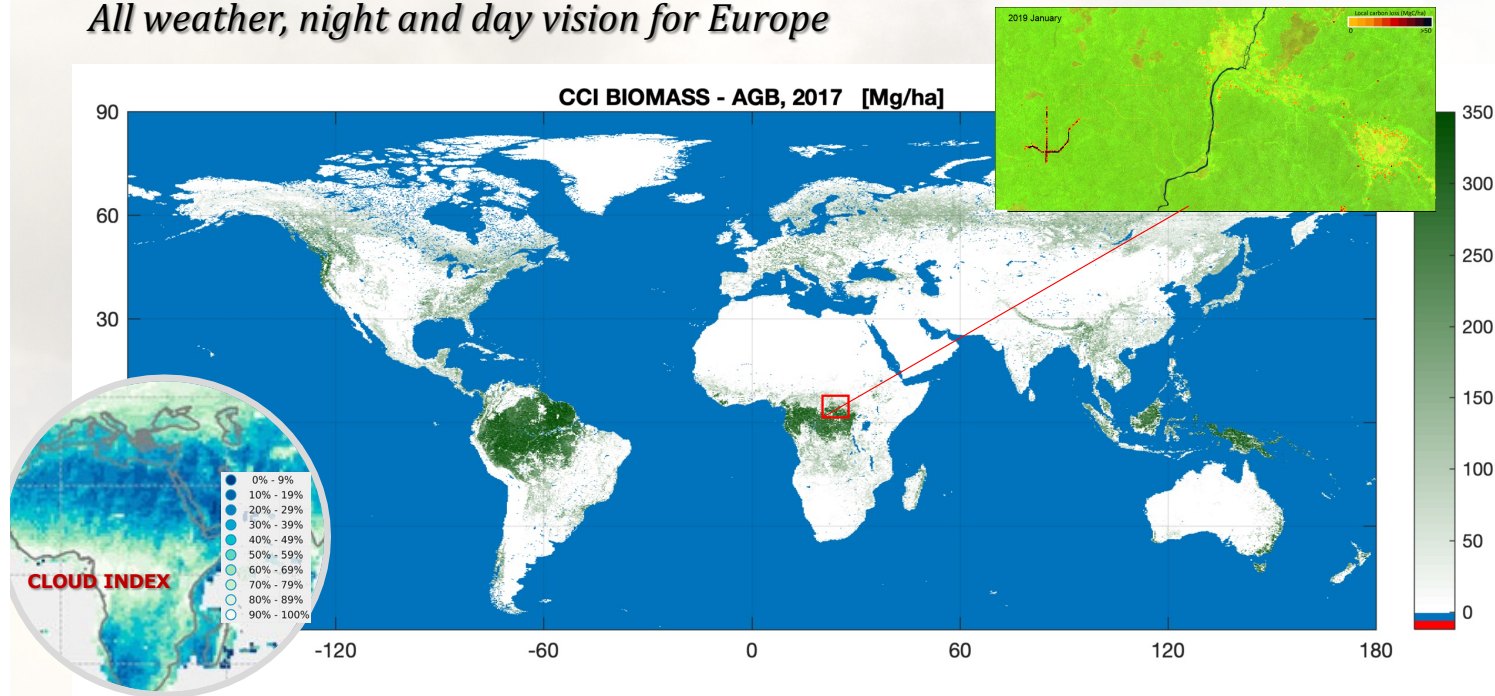


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Copernicus Sentinel-1

All weather, night and day vision for Europe



✓ About 30% of Earth's surface is covered by forests that are declining annually through small scale disturbances such as illegal logging, or conversion of forestland for agriculture, clearing to pastures for livestock and urban landscapes.

Explainer

- Sentinel-1 allows to monitor global forest biomass, which is vital to know how much carbon is being held in forest biomass and to measure changes in biomass carbon stock.
- Sentinel-1 mission allows to produce global forest above-ground biomass maps at a spatial resolution of 1 ha.
- Sentinel-1 C-band allows to measure biomass through the clouds, which is essential to have a gap-free coverage given the persistent cloudiness over large forested areas
- Sentinel-1C needs to be launched soon following Sentinel-1B unavailability
- Long-term continuity of Sentinel-1 and ROSE-L missions is the guarantee that these climate trends can be monitored
- Know more [AT THIS LINK](#)



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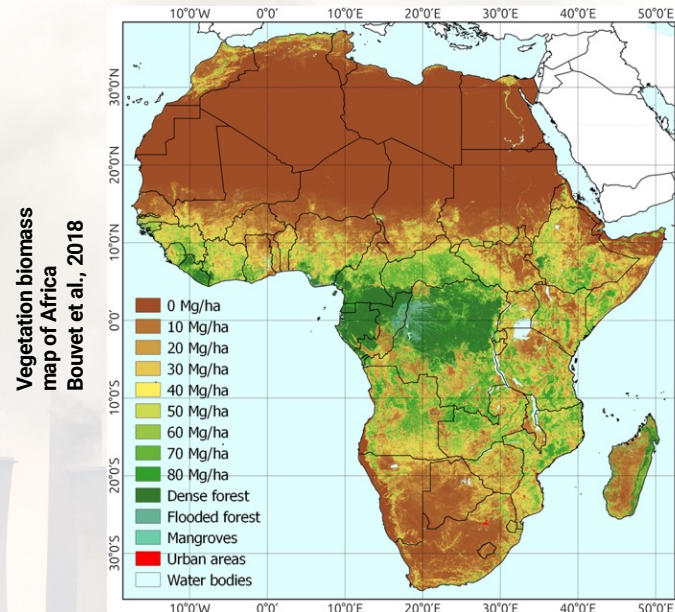
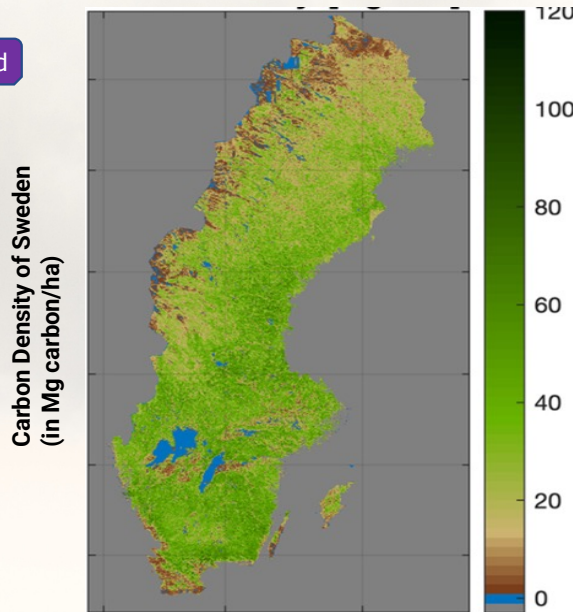
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ROSE-L - Radar Observation System for Europe in L-band

Monitoring global forest carbon stocks (and time changes) with no gaps

Planned



Explainer

- ROSE-L will be the only operational mission to allow **gap-free*** mapping of global forest carbon stocks over time, allowing an objective and independent assessments of land carbon stocks and how these change with time
- ROSE-L will provide high-resolution (50m) reliable assessments and long-term monitoring of forest disturbances, deforestation and reforestation rates at local, regional, national and global levels in all weather conditions
- ROSE-L capabilities in this area demonstrated based on pre-cursor missions
- ROSE-L is a [Sentinel Expansion Mission](#). Two units are being developed and the first satellite is planned for launch in 2028 pending budget availability.
- Know more at [THIS LINK](#)



- ✓ Forests are an important component of the global carbon cycle, and forest carbon stocks are a key indicator of sustainable forest management at the national, European and global level.
- ✓ Biomass monitoring supports the implementation of Paris Agreement and is a key input to the UNFCC Global Stock Takes

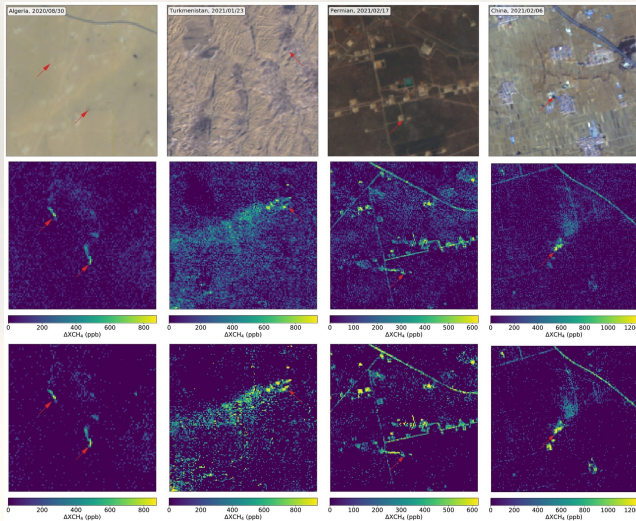
*With no gaps over densely vegetated areas thanks to L-band improved capability to deep-penetrate into vegetation (wrt C-Band)

CHIME - Copernicus Hyperspectral Imaging Mission for the Environment



A complementary tool for monitoring methane point emissions

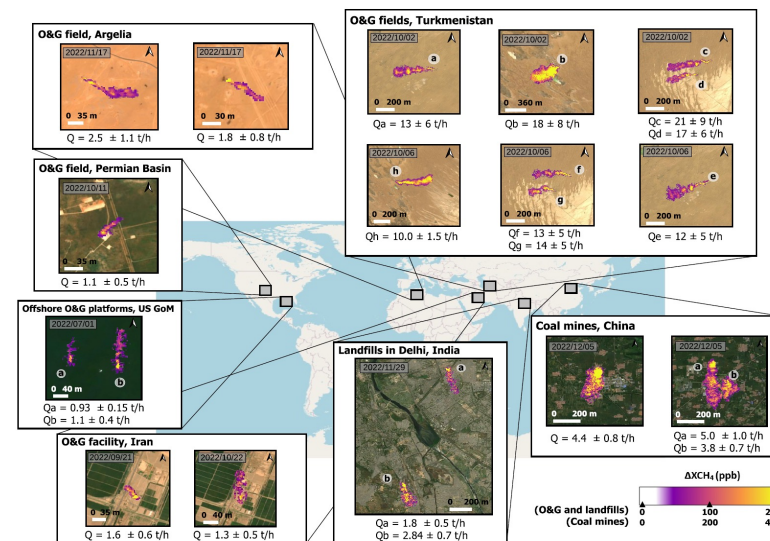
Planned



Guanter et. al (2021)

Information based on CHIME data will be also used by the UN-IMEO to find solutions to methane leaks, together with the responsible companies or authorities. Read more at this [LINK](#).

✓ Current hyperspectral satellite missions (PRISMA, EnMAP, EMIT) are already used to identify and map plumes of methane released by power plants, landfills, mines and oil & gas facilities.



Roger et. al (2023)

Explainer

- CHIME will help improve global efforts to quantify methane emissions, with its high 30m resolution and continuous spectral sampling (200+ bands) in the visible, near infrared and shortwave infrared, giving it more sensitive detection thresholds.
- Revisit of 11 days with 2 satellites (cloud free)
- CHIME follows heritage from existing missions PRISMA, EnMAP, EMIT
- Limited sensitivity to natural diffuse emissions
- CHIME is a [Sentinel Expansion Mission](#). Two units are currently being developed and will be available for launch as from 2028 subject to budget availability.
- Know more [AT THIS LINK](#)



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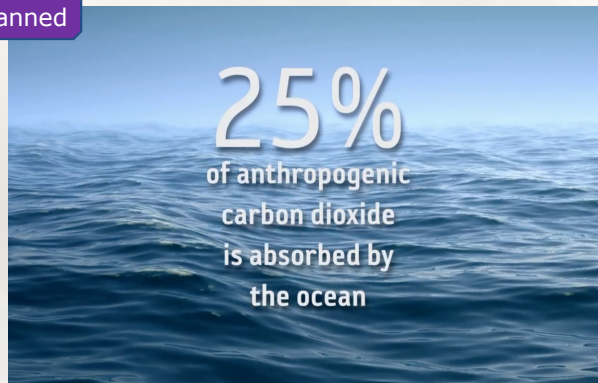


CIMR - Copernicus Imaging Microwave Radiometer

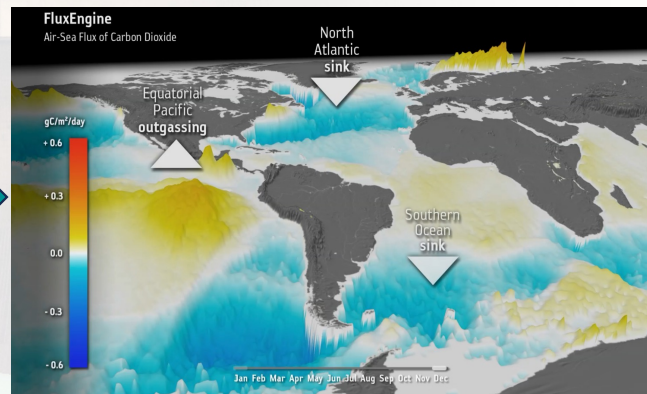
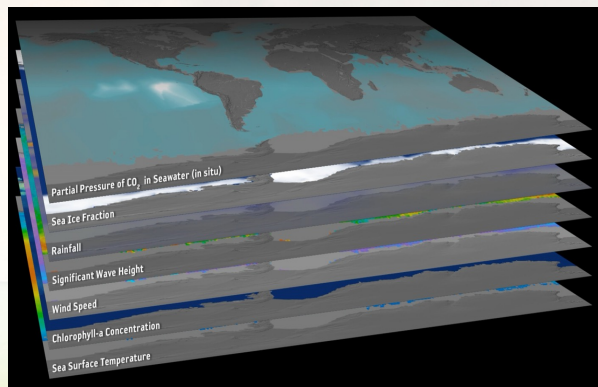


Understanding the exchange of CO₂ between the ocean and atmosphere

Planned



- ✓ CIMR will be unique in its ability to deliver colocated and contemporaneous measurements of sea ice concentration, ocean surface temperature and salinity, surface wind over the ocean and precipitation rate.
- ✓ When combined with chlorophyll measurements from Sentinel-3 and in situ observations of partial pressure CO₂ in the ocean, the location and dynamics of ocean CO₂ uptake can be derived.



<http://www.oceanflux-ghg.org/Products/FluxEngine>

Explainer

- CIMR will provide measurements that are fundamental to understanding the exchange of CO₂ between the ocean and atmosphere.
- CIMR is currently the only planned operational satellite mission worldwide to monitor sea surface temperature, salinity and wind speeds at the same time and location, with a daily revisit.
- Under the European Green Deal, CIMR will be a core data provider for new EC-led blue carbon initiatives dedicated to the role of our Oceans in carbon capture and storage.
- CIMR is a [Sentinel Expansion Mission](#). Two units are currently being developed and will be available for launch as from 2028 subject to budget availability.
- Know more [AT THIS LINK](#)



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Question Time!

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Climate change monitoring and adaptation

2021	REGULATION (EU) 2021/1119	Regulation on establishing the framework for achieving climate neutrality and amending Regulations (EC) No 401/2009 and (EU) 2018/1999 ('European Climate Law')
2021	REGULATION (EU) 2021/2139	supplementing Regulation (EU) 2020/852 of the European Parliament and of the Council by establishing the technical screening criteria for determining the conditions under which an economic activity qualifies as contributing substantially to climate change mitigation or climate change adaptation and for determining whether that economic activity causes no significant harm to any of the other environmental objectives
2020	COM(2020) 562 final	COMMUNICATION FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT, THE COUNCIL, THE EUROPEAN ECONOMIC AND SOCIAL COMMITTEE AND THE COMMITTEE OF THE REGIONS Stepping up Europe's 2030 climate ambition Investing in a climate-neutral future for the benefit of our people
2021	COM(2021) 82	Forging a climate-resilient Europe - the new EU Strategy on Adaptation to Climate Change
2021	SWD(2021) 25 final	COMMISSION STAFF WORKING DOCUMENT IMPACT ASSESSMENT REPORT Accompanying the document COMMUNICATION FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT, THE COUNCIL, THE ECONOMIC AND SOCIAL COMMITTEE AND THE COMMITTEE OF THE REGIONS Forging a climate-resilient Europe - The new EU Strategy on Adaptation to Climate Change
2021	SWD(2021) 123 final	closing the climate protection gap - scoping policy and data gaps
2020	SWD(2020) 176 final	IMPACT ASSESSMENT Accompanying the document COM(2020) 562 final Stepping up Europe's 2030 climate ambition. Investing in a climate-neutral future for the benefit of our people

* Darker background indicates policy documents mentioning Copernicus



Highlights on key policy aspects supported by Copernicus

Adaptation Strategy (2021): EU launches ambitious and comprehensive strategy to promote climate adaptation on all governance levels.

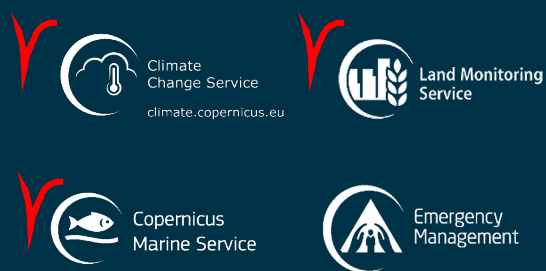


Impact Assessment Report (SWD(2021)25 final) **proposes actions**, drivers, problems and objectives supported by **Copernicus** geospatial and modelling data

Copernicus as an endorsed source of information contributing to

- regularly assess progress on climate-neutrality objective and climate mitigation/adaptation
- close knowledge gaps on climate impacts and resilience

Key Copernicus supporting elements



SENTINEL-1



SENTINEL-2



SENTINEL-3



SENTINEL-5P



SENTINEL-5



Copernicus Marine Service



Emergency Management



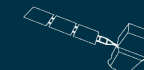
SENTINEL-6



CRISTAL



CIMR



LSTM



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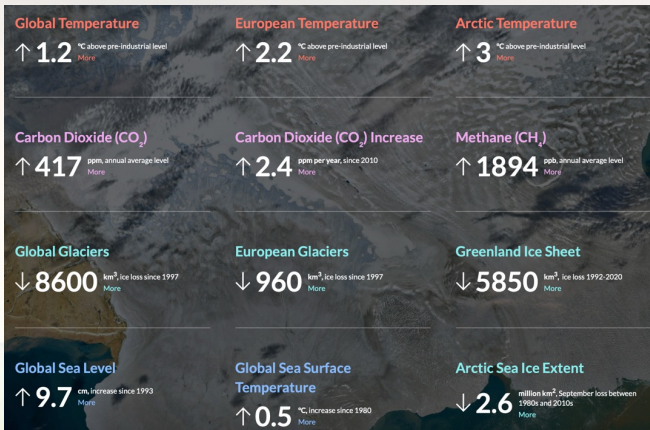


Copernicus Climate Change Service

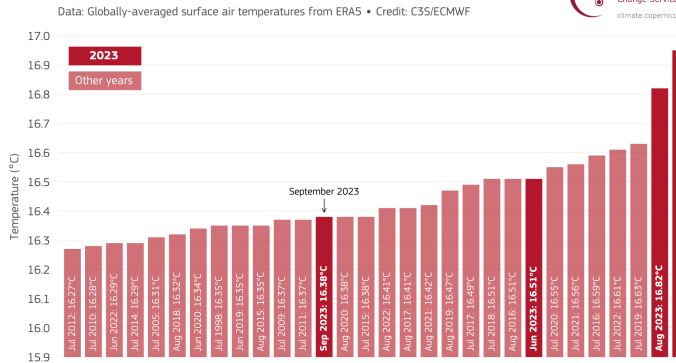
Support adaptation policies of the European Union by providing consistent and authoritative information about climate change



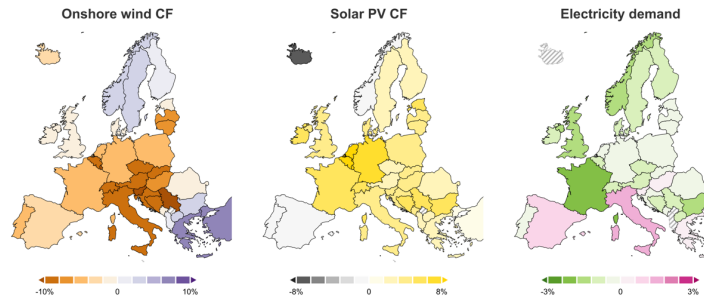
Read the full ESOTC 2022 report here



THE 30 WARMEST MONTHS ON RECORD GLOBALLY



Energy indicator anomalies for 2022



Data: C3S Climate & Energy Indicators for Europe • Reference period: 1991-2020 • Credit: C3S/ECMWF



Explainer

- C3S provides reliable access to state-of-the-art data available on the **past, present, and potential evolution of climate.**
- Services to EU and agencies on **climate monitoring, climate impact indicators** and **bespoke applications** in support of climate adaptation policies, incl. European Green Deal and transition to renewable energy.
- +255.000 users of **Climate Data Store** on **reanalysis (ERA5), seasonal forecasts, CMIP6 and CORDEX climate projections** and **observational data**
- Close engagements and partnerships with **EIB** and **EC DG CLIMA** as well as **EU Member States**. New policy workshop with DG CLIMA: Q1 2024
- *Know more* → [C3S](#)
- Carlo.Buontempo@ecmwf.int



Copernicus4Regions Information Session at European Parliament - 23 October 2023 (TBC)



Copernicus Land Monitoring Service

To provide timely environmental information on land cover and land use changes to monitor climate change



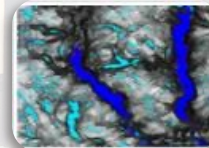
High Resolution Layer Imperviousness 2006-09-12-15-18-21



Urban Atlas 2006-12-18-21



HR-Water, Snow and Ice Near Real Time since 2017



Explainer

- **Need to account for carbon emission and removals - support EU LULUCF Regulation**
CLMS offer - High resolution land cover / land use mapping at pan-European scale (CLC+), and a tailored product based on that (LULUCF instance).
Status - CLC+ Land Use, Land Use Change and Forestry Instance first prototype is in testing. CLC exists since 1990.
- **Need to support urban climate adaptation and sustainability**
CLMS offer - very high-resolution land cover mapping of all EU urban agglomerations (Urban Atlas, every 3 y), supported by additional data layers, such as building height and street trees, and another product for sealed areas (imperviousness).
Status - Urban Atlas is available for 2006, 2012, 2018 years and is under production for 2021 and 2024.
- **Informing about state of water and water bodies**
CLMS offer - High Resolution Water, Snow and Ice will monitor water in near real time. It will support drought and water scarcity analysis
- **Supporting the regulation on Deforestation Free Commodities**
CLMS offer - Tree cover density maps will support the Global World Forest Observatory providing information forest cover change and deforestation risk
- Know more → <https://land.copernicus.eu/en>
- Contact point : <https://land.copernicus.eu/en/contact-service-helpdesk>

Corine Land Cover + System (CLC+)

CLC+ Core database and Web application



CLC+ instances
Tailor made 100m raster products



CLC+ Backbone (CLC+ BB)
Raster and vector land cover data



CLC+ BB
Raster 2018



CLC+ BB
Vector 2018



CLC+ BB
Raster 2021



CLC+ BB
Raster 2023, 2025,
etc. (every 2 years)

Forest cover and change for World Forest Observatory from 2020



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Copernicus Marine Environment Monitoring Service

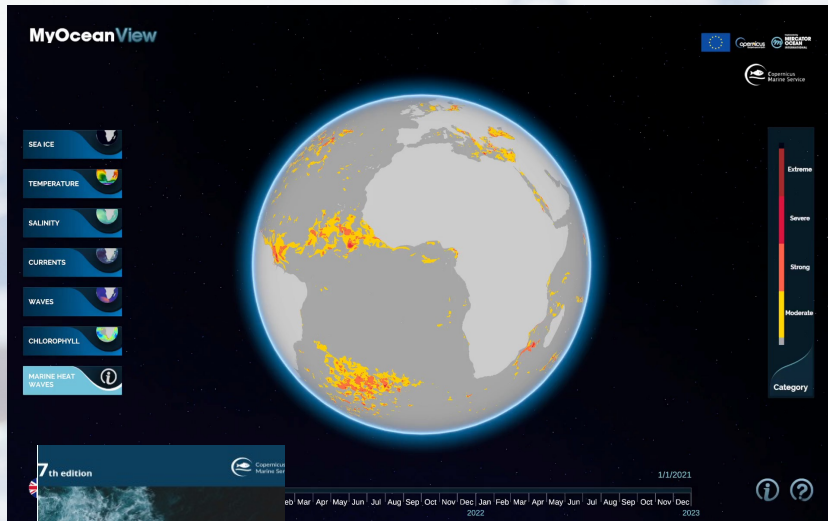


Copernicus
Marine Service



MERCATOR
OCEAN
INTERNATIONAL

Critical information about oceanic climate-induced variations



- ✓ CMEMS allows more comprehensive understanding of oceanic climate variations, enabling rapid response to changing conditions, a critical factor in climate adaptation.

Explainer

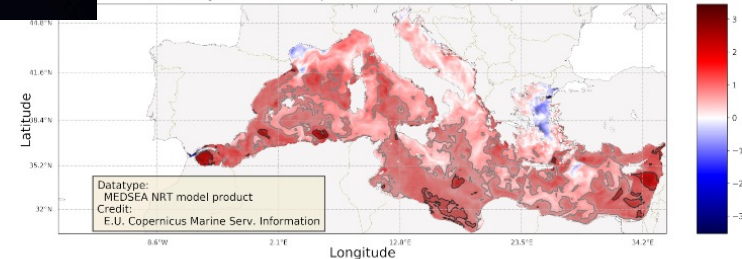
- CMEMS provides precise near real-time data for marine heatwaves and sea surface temperature anomalies; data mapping and visualization; and trend analysis and diagnostics.
- Long-term data trends are giving invaluable insights into vulnerable areas.
- CMEMS provides critical marine data, including sea surface temperature, which is indispensable for monitoring climate change and developing effective adaptation measures.
- **Main products:** [Global Ocean OSTIA Sea Surface Temperature and Sea Ice Analysis; Global Ocean Physics Analysis and Forecast](#)
- **Main applications:** Mercator Ocean: Marine heatwave bulletin; [Ocean Monitoring Indicators](#)
- Know more at [THIS LINK](#)



OCEAN STATE REPORTS

provide extensive annual analyses over the state of the ocean over nearly 20 years and severe/notable events.

Anomaly of 2020 99th percentile of Surface Temperature



Copernicus4Regions Information Session at European Parliament

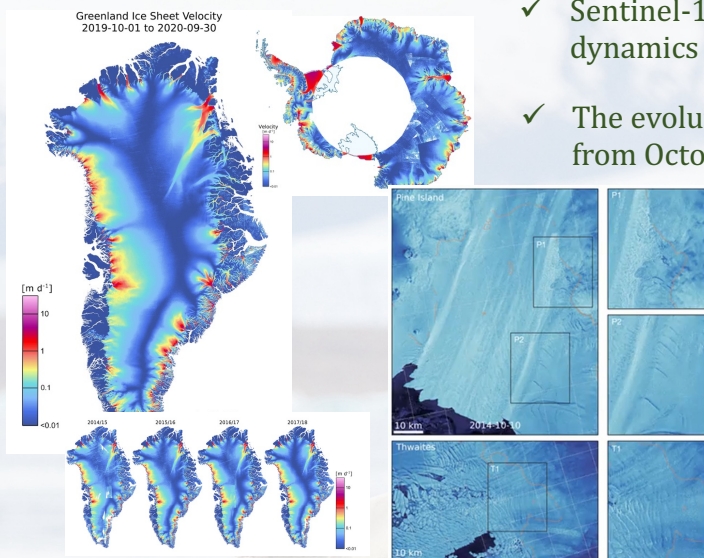


Sentinel-1

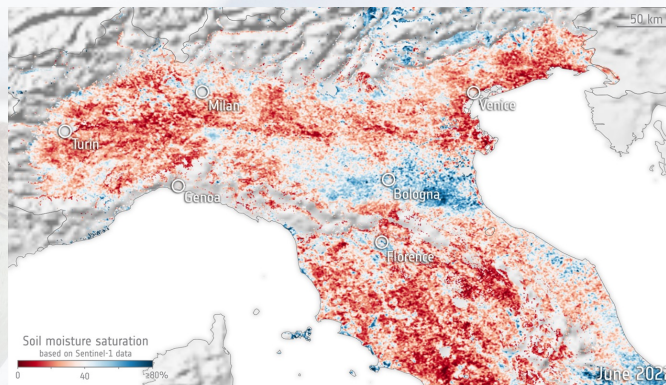
Watching glaciers shrink and the land drying up



- ✓ Sentinel-1 supports monitoring of glacier dynamics ([Read article here](#))
- ✓ The evolution of glacier damage in Antarctica, from October 2014 to July 2020.



© contains modified Copernicus Sentinel data (2014-20), processed by Stef Lhermitte (TUDelft)



- ✓ Measurements of actual soil moisture content of the surface are possible from from Sentinel-, as it is shown in this example in Central Italy ([source](#))

(©contains modifies Copernicus Sentinel data (2022), processed by TU Wien/ESA)

Explainer

- Only Sentinel-1 together enable a truly global all-weather day-and-night monitoring of our changing environment at high resolution
- Sentinel-1 monitors the large and rapid changes of the Arctic and Antarctic Ice Sheet and the melting of glaciers, ice caps and disappearing sea ice.
- Sentinel-1 monitor surface soil moisture over bare surfaces with a resolution of 1km helping map of water availability and water use
- Sentinel-1C needs to be launched soon following Sentinel-1B unavailability
- Long-term continuity of Sentinel-1 missions is the guarantee that these climate trends can be monitored
- Know more [AT THIS LINK](#)



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Sentinel-2

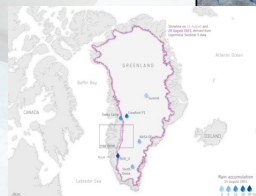
A sharp sight to monitor multiple impacts of global warming



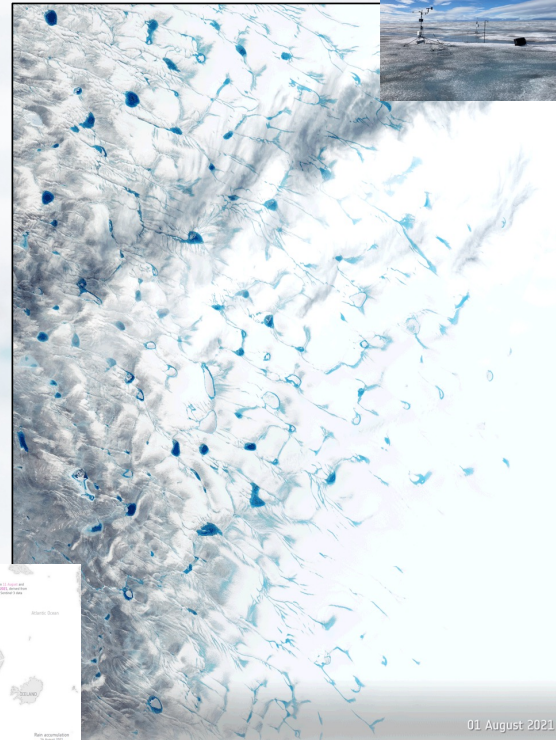
- ✓ When temperatures soar and rain does not fall, the scorched land is apparent. Especially when images are compared through time...



Agricultural fields in Denmark summer 2017 vs 2018
([Read more here](#))



Greenland snowline retreat and rainfall.



Meltwater and surface lakes on the Greenland ice sheet.
([Read more here](#))

Explainer

- Sentinel-2 images the planet in the visible part of the spectrum and in the near infrared, which enables it to spot multiple impacts of climate change: from glaciers and snow extent to vegetation health, from soil and land use changes to coral bleaching.
- Sentinel-2 systematically acquires over all landmasses up to 20km off-coast, and over Europe's internal seas.
- Sentinel-2 continuity with the USGS/NASA Landsat mission allows to take stock and complement the 50years+ time series.
- Long-term continuity will be ensured through the Next Generation Sentinels.
- Know more [AT THIS LINK](#)



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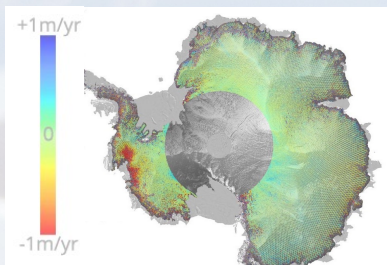


Sentinel-3 Mission (land)

Every day providing a largescale view of changing land and cryosphere conditions

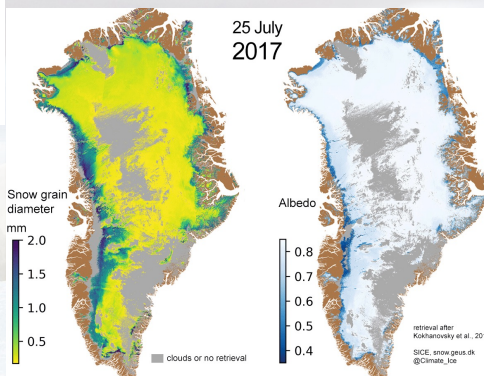


- ✓ Land ice mass loss is the largest source of global sea level rise. Measuring variations of ice sheets is a key element for understanding the trends in climate changes.



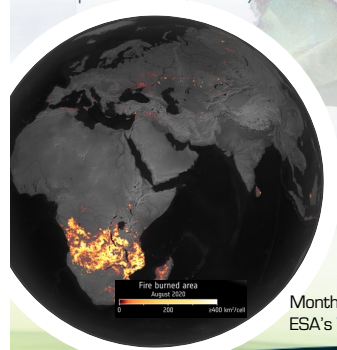
Antarctic Ice Sheet elevation change mapped by S3A altimeter between 2016 and 2018 (know more [AT THIS LINK](#))

Experimental Snow grain size & Albedo retrieved from S3 optical sensors

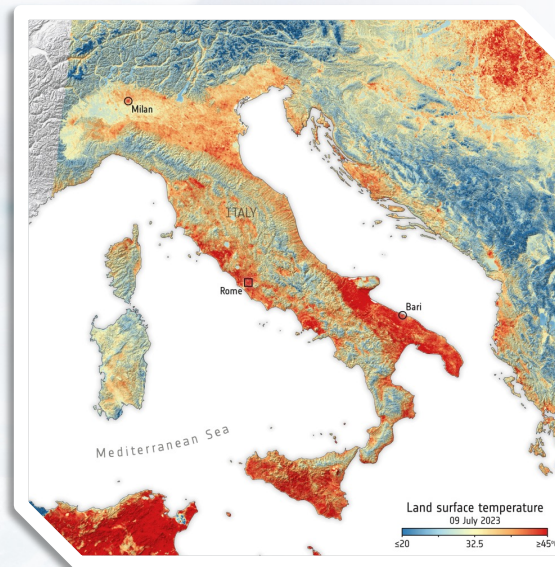


25 July 2017
Snow grain diameter mm

Albedo



Monthly Fire Burnt Areas from ESA's [World Fire Atlas](#) and [CCI](#)



Land surface temperature on 17 July 2023 as observed during last heatwave in Europe by the Sentinel-3 mission's radiometer instrument (SLSTR) (know more [AT THIS LINK](#)).

Explainer

- Sentinel-3 contributes to several Essential Climate Variables such as Landcover, Albedo, Fire, Land (and Sea) Surface Temperature, Ice sheets, Lakes, Sea Ice, Ocean Colour, Aerosols and Clouds.
- Sentinel-3 carries: an optical sensor to measure ocean and land surface colour with 21 bands at spatial resolution of 250m and large coverage; a SAR altimeter which provides high resolution measurements of the height of the ice sheet and of the sea ice, in continuity with ESA's Cryosat; and a thermal instrument measuring sea and land and ice surface temperature, at 1km resolution.
- Sentinel-3 large swath ensures high repetitiveness of the observations.
- Long-term continuity will be ensured through the S3C and S3D units and the Next Generation Sentinels.
- Know more [AT THIS LINK](#)



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Sentinel-3 (Ocean temperature)

Data to quantify environmental baselines and extreme events

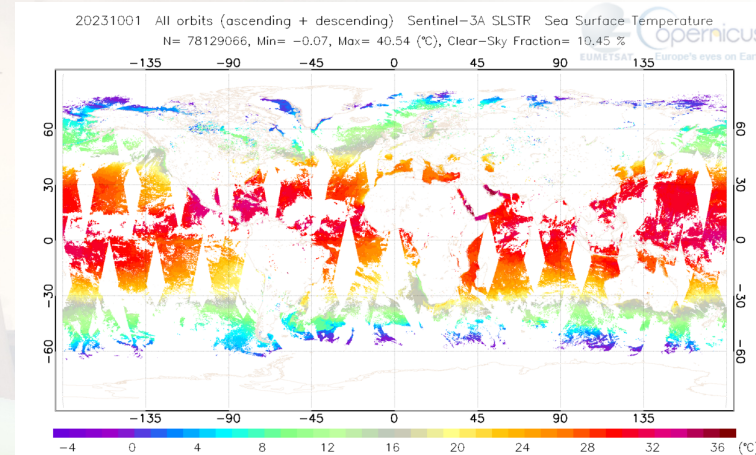
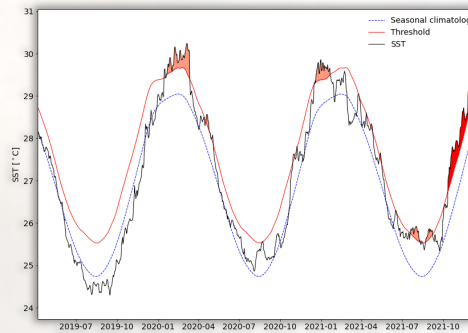
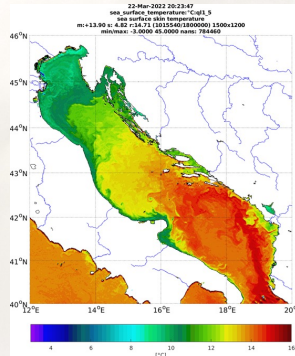
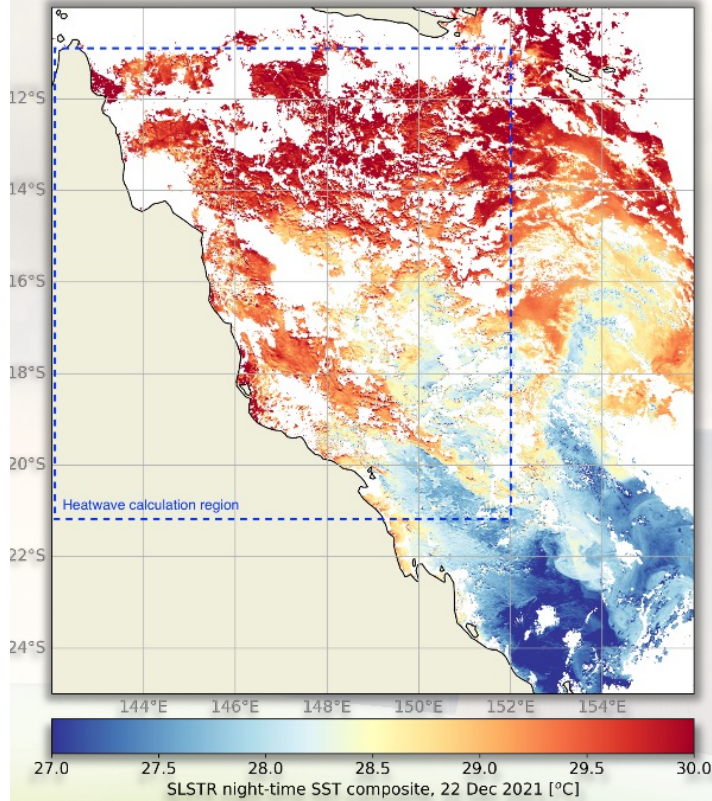


Explainer

- Sentinel-3 SLSTR data and downstream products derived from it can support the characterisation of (water) surface temperature.
- SLSTR is the reference sensor for **sea surface temperature**:
 - Fundamental measurement for quantifying ocean warming and heat content.
- Data can also quantify extreme events such as marine heatwaves.
- Contact: ops@eumetsat.int

Case study examples:

- <https://www.eumetsat.int/marine-heatwave-intensification-threatens-coral-reef-health>
- https://www.youtube.com/watch?v=40C03UJpdLM&list=PL00g9n6Apif1HPiOfv3u_9Zlm5o4MxhY3&index=43&t=8s
- https://www.youtube.com/watch?v=wFN7TSXrEmk&list=PL00g9n6Apif1HPiOfv3u_9Zlm5o4MxhY3&index=38
- https://www.youtube.com/watch?v=bVWZdb-riXk&list=PL00g9n6Apif1HPiOfv3u_9Zlm5o4MxhY3&index=39
- Know more [AT THIS LINK](#)



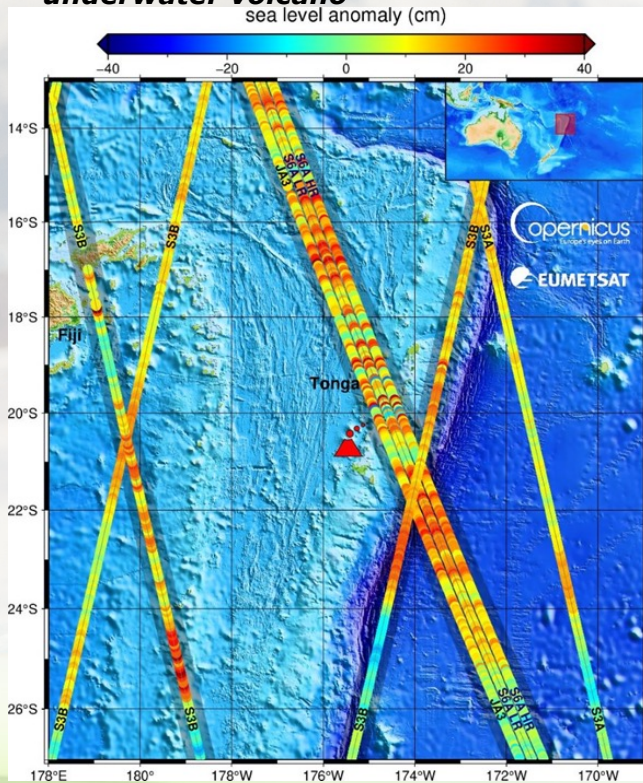
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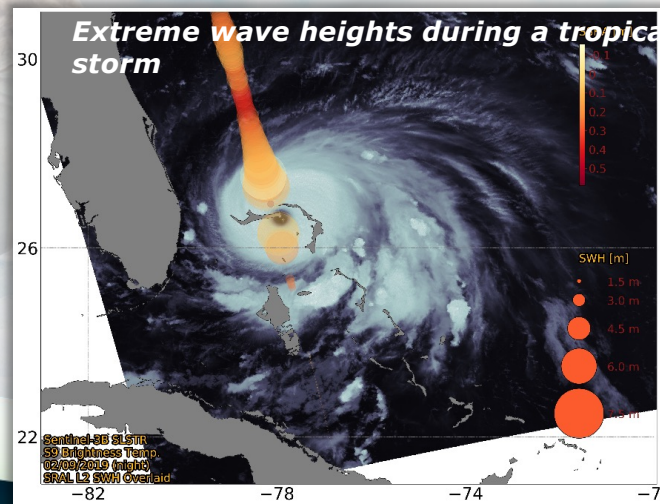
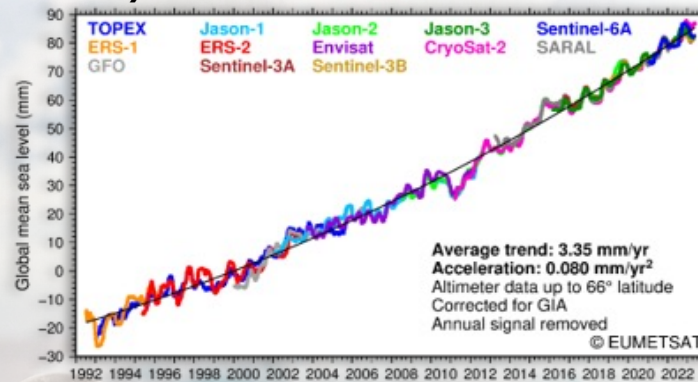
Sentinel-3 & 6

Monitoring Sea level rise, currents and waves

2022 Eruption of the Hunga Tonga underwater volcano



Sea-Level rise since the '90s, measured by satellites



Explainer

- Sentinel-3 and Sentinel-6 Altimeter data and downstream products can support the characterization of physical oceanography (waves, height, fronts, currents etc).
- **Altimetry data** – provides sea surface height, significant wave height, and wind speed measurements.
 - Utility for nowcasting, forecasting, and towards other metocean related variable derivation
- High-Precision Ocean Altimetry (Sentinel 6-MF) continues to monitor the key climate change indicator of **global sea level rise**

Case study examples:

- <https://www.eumetsat.int/multiple-perspectives-hurricane-dorian>
- <https://www.eumetsat.int/monitoring-tropical-cyclones-pacific-ocean-2013-2019>
- <https://www.eumetsat.int/tracking-tropical-cyclone-impacts-using-altimetry>
- Know more [AT THIS LINK](#)



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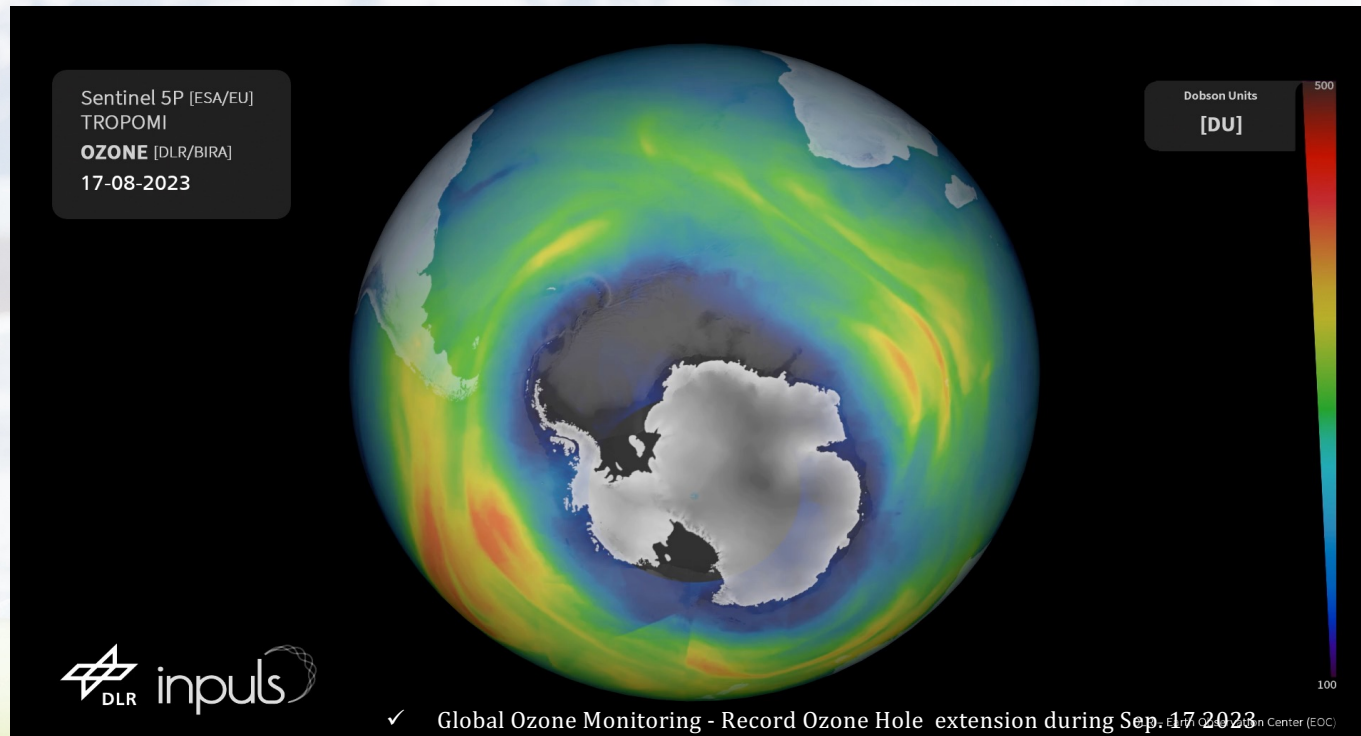


Sentinel-5P

The essential view on the stratospheric ozone layer and its hole



- ✓ Ozone is strongly linked to climate due to its influence on Earth's radiative budget, absorbing solar UV radiation in the stratosphere and terrestrial infrared radiation in the troposphere.



Explainer

- Sentinel-5P's TROPOMI provides estimates of ozone profiles as well as total columnar content and tropospheric ozone columns. The retrieved ozone profiles are used to monitor the evolution of stratospheric and tropospheric ozone.
- Sentinel-5P's TROPOMI total ozone measurements are extending Europe's capability of the continuous global ozone monitoring from space since 1995
- The stratospheric ozone layer protects life on Earth against harmful UV radiation.
- Sentinel-5P is a precursor to Sentinel-5. Its continuity will be ensured by the Sentinel-5 series
- Know more [AT THIS LINK](#)



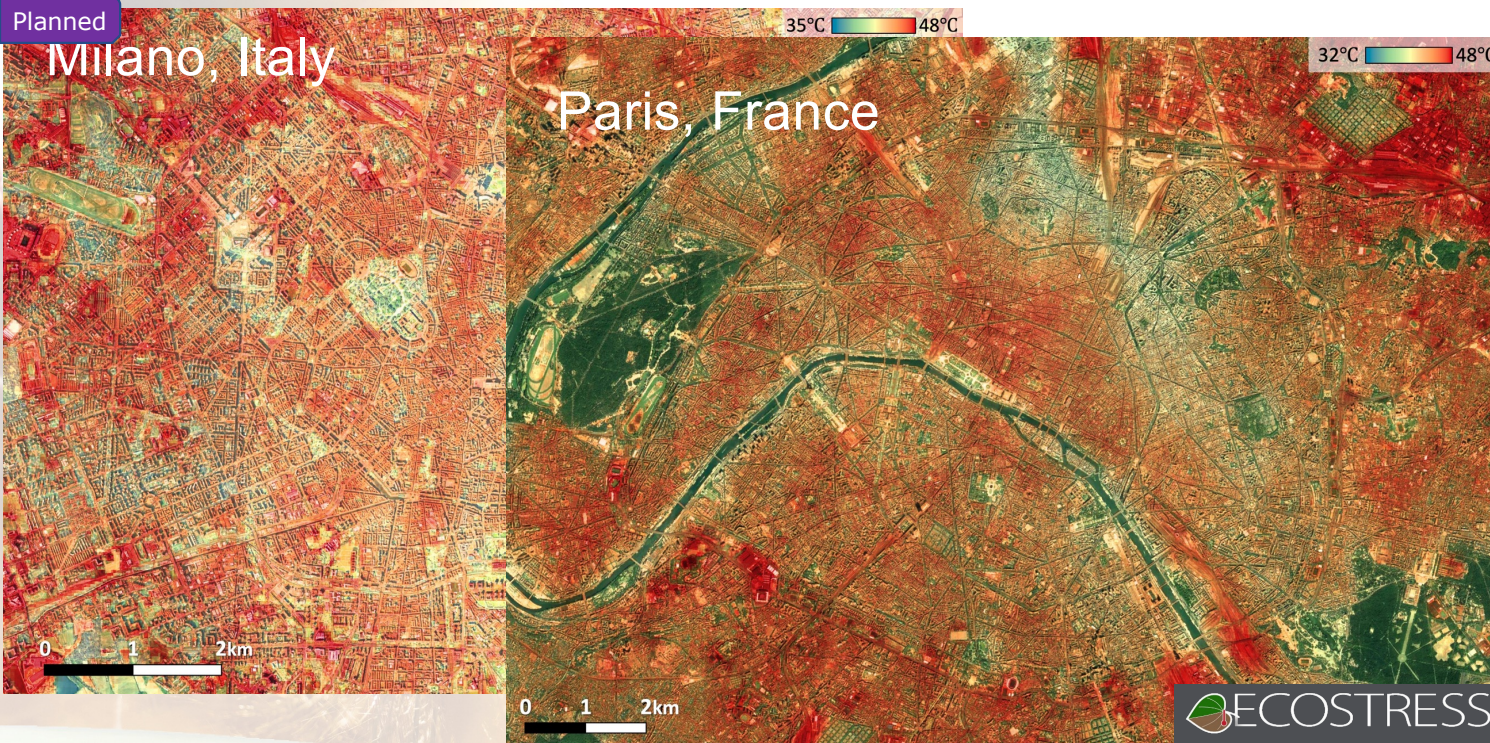
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LSTM – Land Surface Temperature Monitoring



The space-based thermometer for urban heat stress and heat waves



✓ Land Surface Temperature monitoring at high resolution supports for urban planning as part of climate adaptation measures (shading trees, green roofs, cooling pavements).

A [Nature Medicine publication](#) estimates over 60,000 heat-related deaths in Europe in the summer 2022

Explainer

- LSTM provides Thermal Infra-Red observations in **5 thermal bands with world-class radiometric accuracy (1-1.5K LST) with 2 days revisit** at Equator (with 2 satellites)
- LSTM measurements of Land Surface Temperature (LST), at an unprecedented **50 meter** resolution, are compatible with requirements for mapping urban hotspots at city scale.
- LSTM is a [Sentinel Expansion Mission](#). Two units are currently being developed and will be available for launch as from 2028 subject to budget availability. .
- Know more [AT THIS LINK](#)



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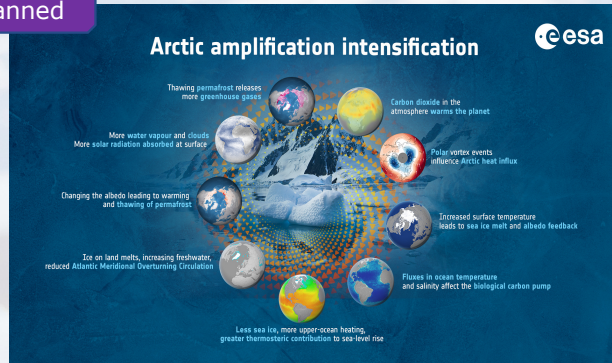
CIMR - Copernicus Imaging Microwave Radiometer



A step-change in Europe's ability to gather evidence of changes in the Arctic

- ✓ CIMR is dedicated to EU Actions on Safeguarding the Arctic and monitoring climate change expressed in the EU Arctic Policy for a safe, stable, sustainable, peaceful and prosperous Arctic.

Planned



Explainer

- CIMR will provide **unique** L- and Ka-band measurements to give decision-makers evidence of change and impact in the Polar Regions, with a focus on the Arctic in a global context.
- CIMR will employ a suite of low-frequency but high resolution measurements to determine spatial maps of sea ice concentration, sea ice thickness, sea surface temperature, sea surface Salinity, ocean wind vectors, ocean, snow and ice sheet surfaces with a sub-daily revisit in the Arctic region. No other sensor has the capability that CIMR brings to address the Integrated European Policy for the Arctic.
- CIMR is a [Sentinel Expansion Mission](#). Two units are currently being developed and will be available for launch as from 2028 subject to budget availability.
- Know more [AT THIS LINK](#)



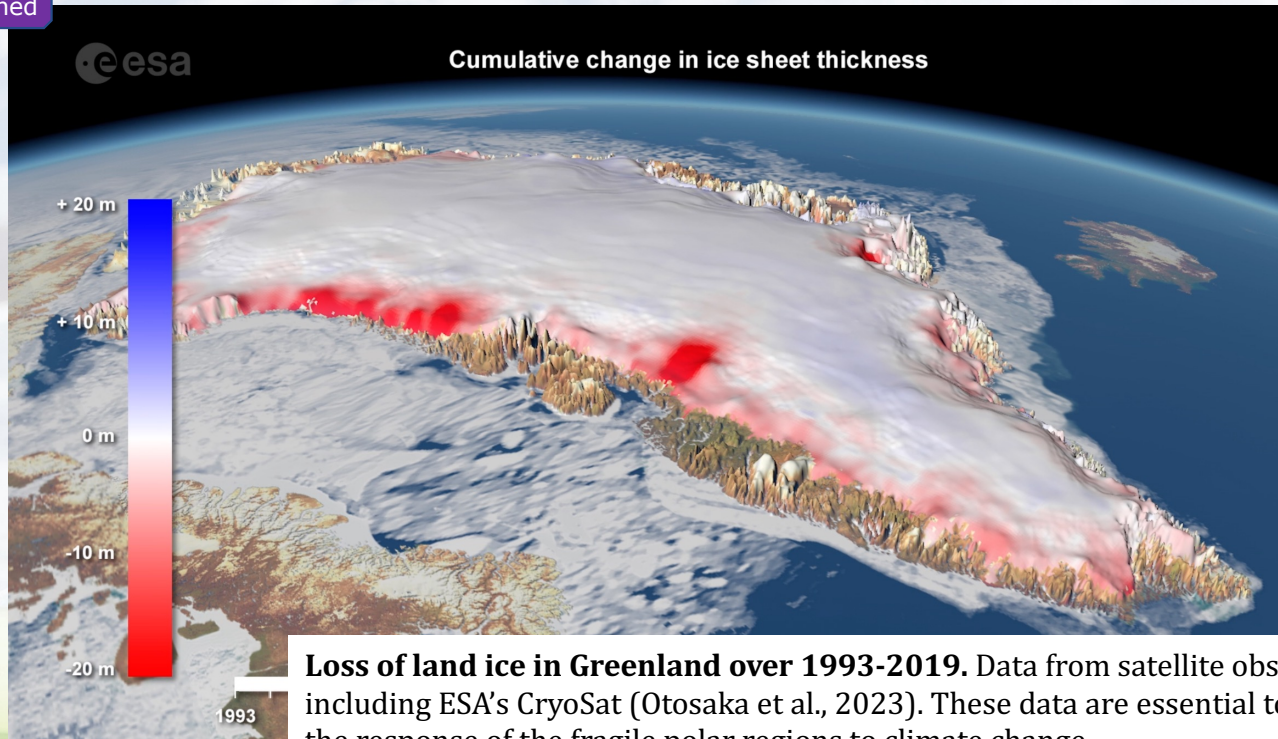
CRISTAL – Copernicus polaR Ice and Snow Topography ALtimeter



The cutting-edge radar altimeter mission to monitor land ice, sea ice and snow

- ✓ CRISTAL will respond to the needs for Safeguarding the Arctic and monitoring climate change expressed in the EU Arctic Policy

Planned



Explainer

- CRISTAL will build on the heritage of ESA's CryoSat mission, continuing and expanding its unique capability of monitoring sea ice thickness and land ice elevation changes in the polar regions, **covering up to 88°**.
- CRISTAL's cutting-edge dual-band radar altimeter will enable us to measure the snow layer as well, resulting in much more accurate estimates of sea ice thickness and volume.
- CRISTAL's products will also support polar and global oceanography and global river and lake studies.
- CRISTAL is a [Sentinel Expansion Mission](#). Two units are currently being developed and will be available for launch as from 2028 subject to budget availability.
- Know more [AT THIS LINK](#)



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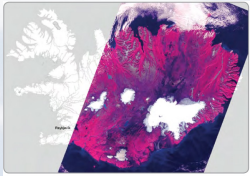


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Copernicus4regions User Stories

Selected user testimonials from European public authorities



Cloud-free Sentinel image obtained August 30th, 2017 roughly covers 2/3 of Iceland.
Credit: Contains modified Copernicus Sentinel data (2017)

Using the Sentinel images to update our (glaciers) map database has not only improved our data but also our productivity.”

Magnús Guðmundsson, General Director National Land Survey of Iceland ([LINK](#))

The WhereIsWater portal has made a significant contribution to increasing knowledge about water conditions and has helped to improve the flood alert warning system.”

Mojca Robič, hydrologist, Slovenian Environment Agency ([LINK](#))



General view of Mulargia reservoir in Sardinia.
Source: Ente acque della Sardegna (ENAS)

With SPACE-O water quality forecast service we can now be proactive and mitigate challenging water quality threats to the benefit of our water users.”

Maria Antonietta Dessena, Ente acque della Sardegna (ENAS) ([LINK](#))

The use of satellite data to enhance our knowledge and monitoring of marine ecosystems will contribute to the regional blue growth strategy we are currently launching.”

Marie-Agnès Dupouey, Blue Growth at Région Nouvelle-Aquitaine ([LINK](#))

User quotes from [NEREUS/ESA/EC 2018](#)



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Question Time!

[BACK TO
POLICY AREAS](#)

[BACK TO
MEETING
AGENDA](#)



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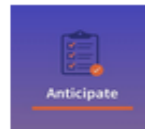


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Civil protection and natural disasters

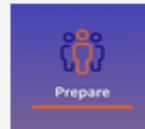
Union Civil Protection Mechanism (UCPM)



Anticipate

1. Anticipate

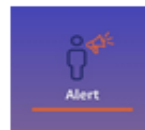
To improve risk assessment, anticipation, and disaster risk management planning. The complexity and interdependency of risks the EU faces makes it important to identify vulnerabilities in critical sectors, and anticipate hazards and threats.



Prepare

2. Prepare

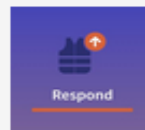
To increase risk awareness and preparedness of the population to reduce the impact of disasters.



Alert

3. Alert

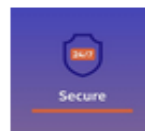
To enhance early warning. This ensures that warning messages across the national, regional and local levels reach the right people on time.



Respond

4. Respond

To enhance the EU Civil Protection Mechanism response capacity. Through this, the EU can provide more help to fill critical gaps and avoid further deterioration of the situation when the capacity of a country is overwhelmed.



Secure

5. Secure

To ensure a robust civil protection system. Civil protection systems must remain operational 24/7, during and after disasters, when they are most needed. Further actions include updating business continuity plans and procedures and ensuring coordination and information sharing across sectors, including with critical infrastructure providers.

2023 COM/2023/61 final

COMMUNICATION FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT, THE COUNCIL, THE EUROPEAN ECONOMIC AND SOCIAL COMMITTEE AND THE COMMITTEE OF THE REGIONS
European Union Disaster Resilience Goals: Acting together to deal with future emergencies



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Highlights on key policy aspects supported by Copernicus

Early warning

- **Global Disaster Alert and Coordination System**
- **European Flood Awareness System** and **Global Flood Awareness System**
- **European Forest Fire Information System** and **Global Wildfire Information System**
- **European and Global Drought Observatories**

Tracking disasters from space

- **Rapid Mapping**
- **Risk and Recovery Mapping**

Key Copernicus supporting elements



SENTINEL-1



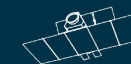
SENTINEL-2



SENTINEL-3



COPERNICUS CONTRIBUTING MISSIONS



ROSE-L



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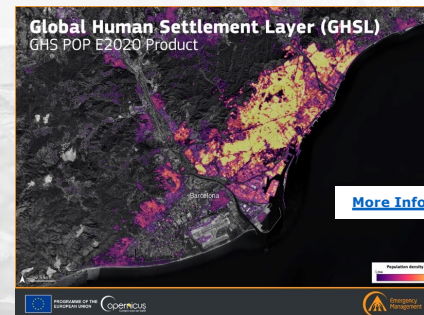
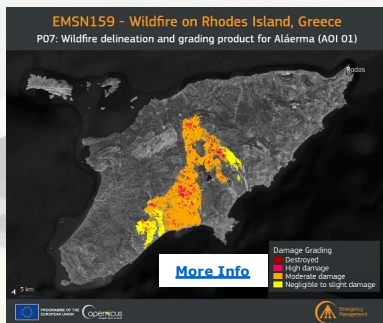
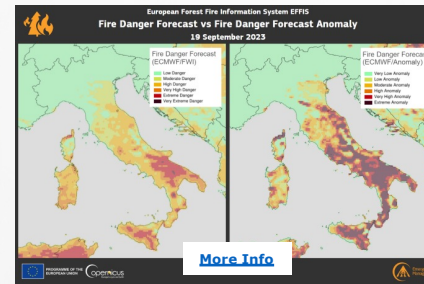
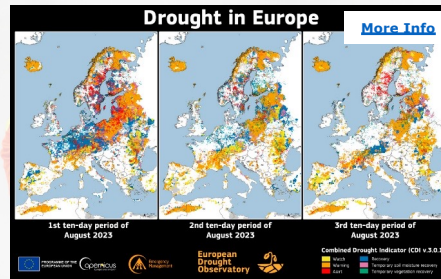
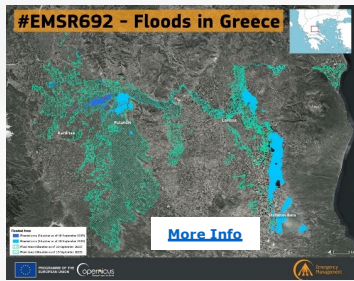


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Copernicus Emergency Management Service

The operational service providing actionable information for the management of different types of disasters



Explainer

- CEMS provides **timely and accurate geospatial information** (using satellite data in combination with models and in situ observations).
- CEMS is managed by the **Joint Research Center** of the European Commission in close coordination with DG DEFIS and DG ECHO.
- CEMS is a fully operational service (i.e. 24/7/365) and addresses **all phases of the disaster management cycle!**
- Know more [AT THIS LINK](#)



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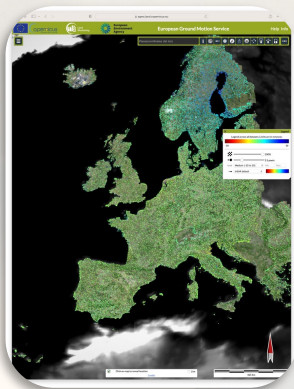


Copernicus Land Monitoring Service

To provide timely environmental information on land cover and land use



European Ground Motion Service
Yearly updates since 2017



EU-Hydro



Urban Atlas
2006-12-18-21

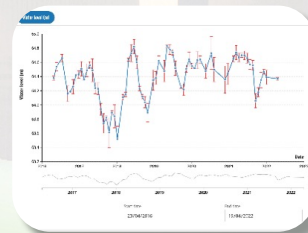


In situ

High Resolution Layer Imperviousness
2006-09-12-15-18-21



Inland bodies Water Level



Explainer

- **Stability of ground for construction and infrastructure, high precision monitoring of land subsidence and lateral movements**
CLMS offer - the *European Ground Motion Service* provides yearly updates on slow ground movements since 2017 with mm vertical accuracy. It is a unique product worldwide.
- **EU-Hydro** is the reference database including the hydrography network and coastline within Europe. Within the next update, to be initiated in 2024, it will include protective structures, to support better coastal planning.
- **Need to coordinate various data measurements on the ground**
CLMS offer - *cross-cutting coordination of in situ data for Copernicus services*; We support the Copernicus services by preparing licensing agreements with Meteorological and Hydrological Agencies or maintaining a catalogue of geospatial data.
- **Reliable and uniform reference data sets to support civil protection and disaster response**
CLMS offer - our products – river networks (*EU Hydro*), built up areas (*Urban Atlas, Imperviousness*)
- **Informing about water levels and water bodies extend variation**
CLMS offer - Water level information and water bodies extend support hydrological services, as well as drought or flood alert systems
- *Know more* → <https://land.copernicus.eu/en>, <https://insitu.copernicus.eu/>
- *Contact point* : <https://land.copernicus.eu/en/contact-service-helpdesk>, <https://insitu.copernicus.eu/contact>



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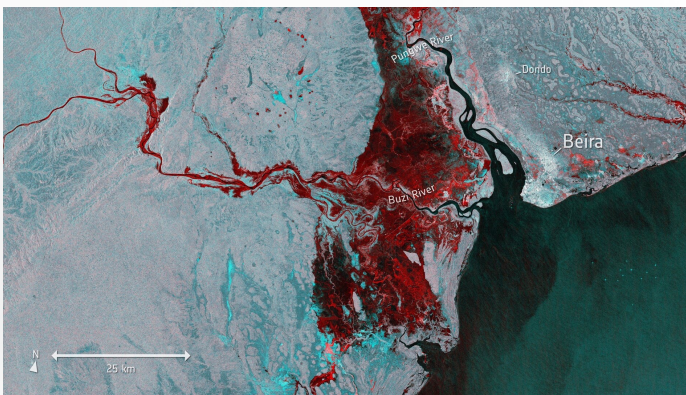


Sentinel-1

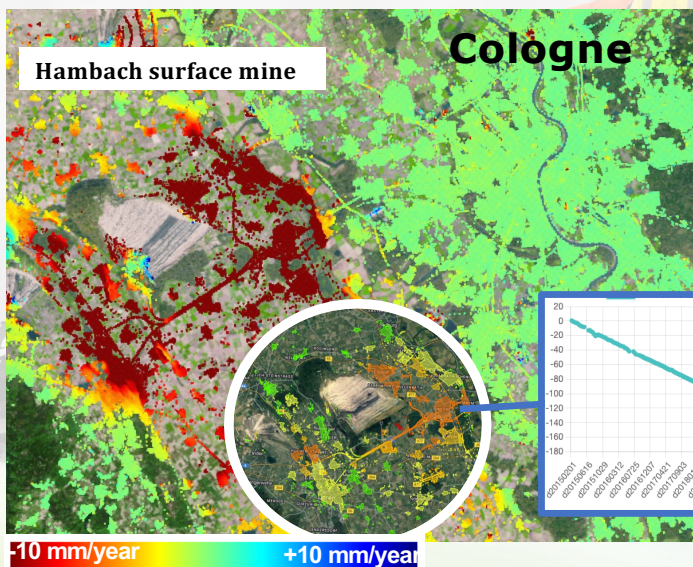
All weather, night-and-day measurements of terrain deformations and flood extents



✓ Flooded areas can be easily identified with Sentinel-1 radar which enables users quickly to map the extent of the areas covered by waters.



Extent of floods in Mozambique, June 2019 ([source](#))



✓ Interferometric measurements show movements in the land, with millimetre-level accuracy. They enable the assessment of risks such as landslides and subsidence, and threats to infrastructure such as roads and pipelines.

Explainer

- Sentinel-1 interferometric mode* enables an operational global all-weather day-and-night monitoring of terrain deformations over cities and built-up infrastructure in Europe and hotspots globally with millimetre level accuracy
- Sentinel-1 observation scenario and its unprecedented revisit over Europe allow to measure urban areas, infrastructures several times per month since 2015.
- Sentinel-1 allows to map flooded areas clearly even through rain, clouds and darkness.
- Sentinel-1C needs to be launched soon following Sentinel-1B unavailability
- Long-term continuity will be ensured through Next Generation Sentinels
- Know more [AT THIS LINK](#)

Interferometry is a technique that allows to detect motions of the ground and of overlying infrastructure with millimetre-level accuracy.



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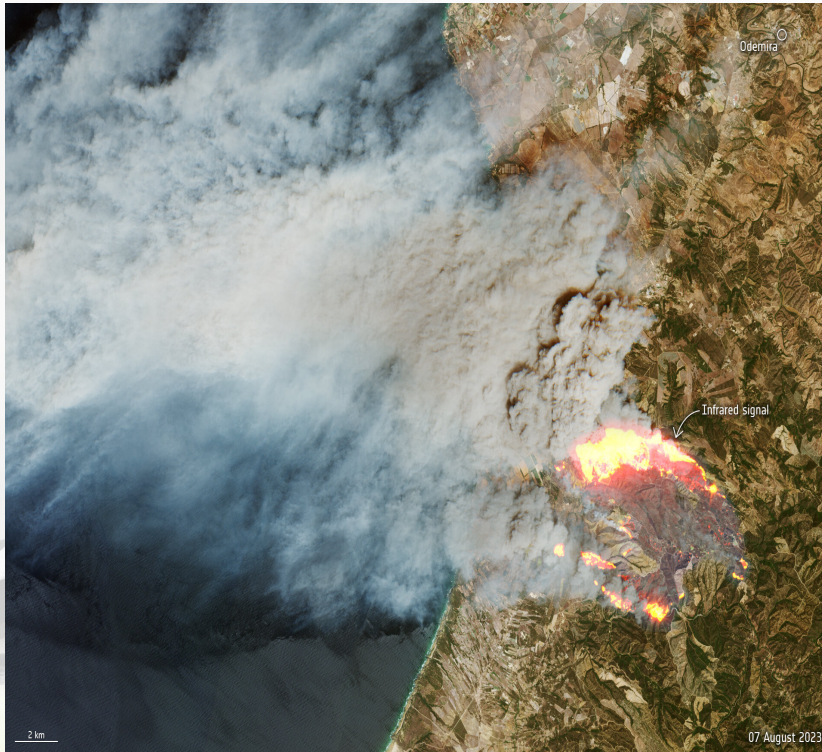
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Sentinel-2



Providing quick, large-area maps for disaster monitoring



- ✓ High spatial resolution up to 10m allows to derive precise maps of the forest fires and to assess the extent of burnt areas.
- ✓ The frequency of the observations also allows to monitor the situation along time (in clear sky conditions)



S2 image of a fire over Odemira in the Alentejo region in southern Portugal on 7 August 2023. (See at [LINK](#))

Explainer

- Sentinel-2 supports post-event assessment and monitoring for a range of different types of disasters, from forest fires to floods and earthquakes.
- Sentinel-2's frequent coverage (every 3-5 days in Europe) means data is almost always available, except when prevented by cloud coverage, to pinpoint areas that need further investigation and on-the-spot support.
- Sentinel-2 short-wave infrared bands enable the intensity of the fire at a certain location to be determined.
- Long-term continuity will be ensured through Next Generation Sentinels
- Know more [AT THIS LINK](#)



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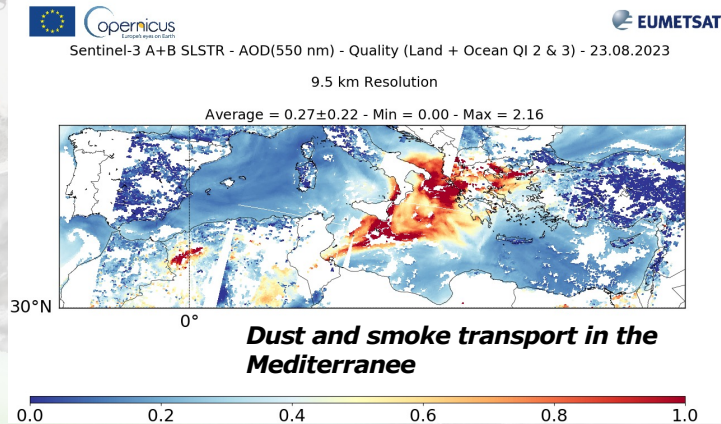
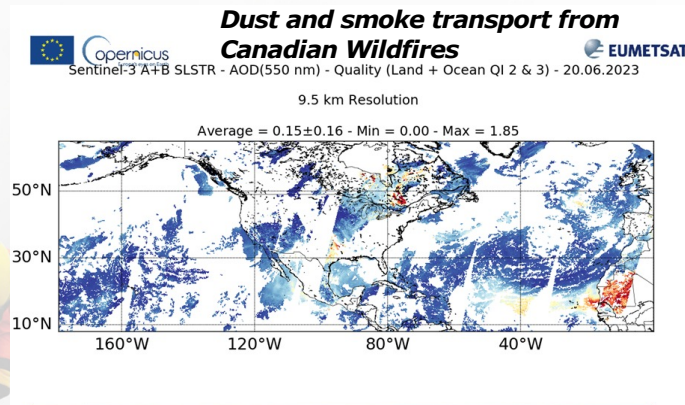
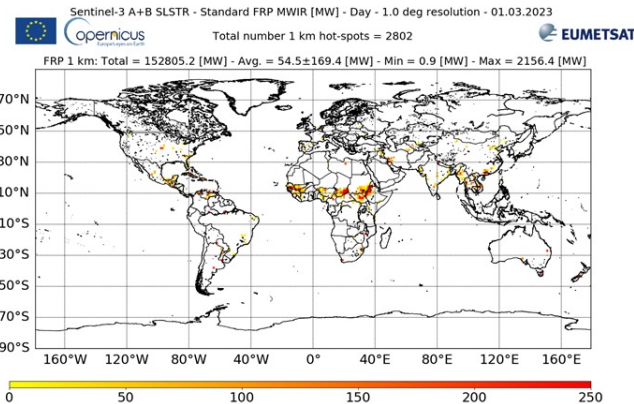


Sentinel-3 (fires and dust)

Detection of Wild fires and smoke plumes movements



Map of Global Wildfires, March 2023



Explainer

- Sentinel-3 SLSTR and OLCI data and downstream products derived from it provide information on Aerosols and Fire Radiative Power
- Detection and monitoring of wildfires and smoke/dust plume transport
- Data most suitable for event scale – fast availability, high spatial resolution. Also contributes to downstream products (forecast models, derived ocean currents etc).

Case study examples:

- <https://www.eumetsat.int/devastating-fires-parts-mediterranean-during-unprecedented-heatwave>
- <https://www.eumetsat.int/canadian-wildfire-monitoring-over-atlantic-and-europe>

Know more [AT THIS LINK](#)

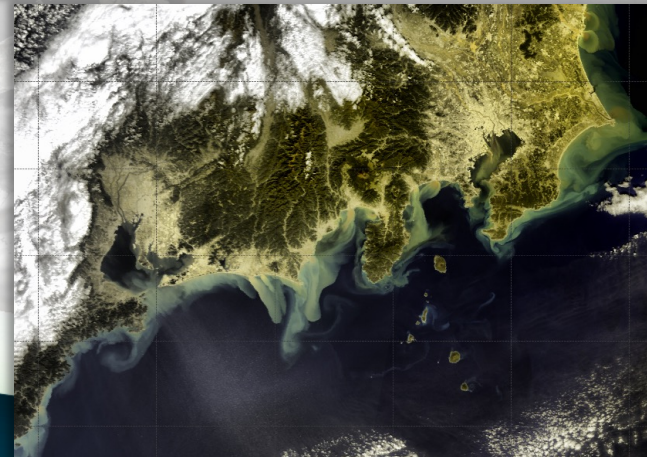
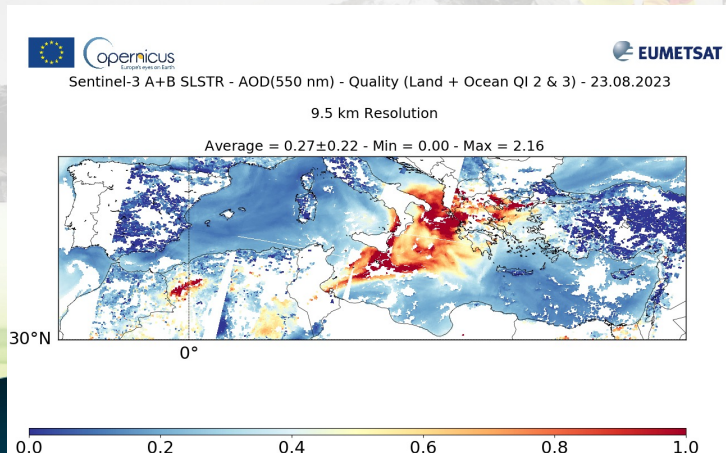
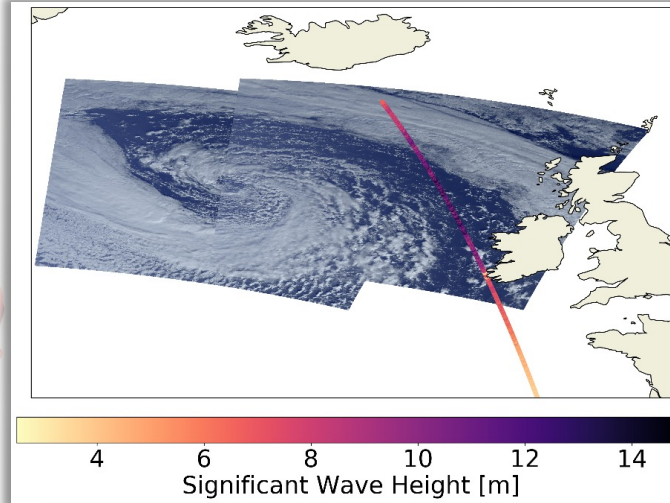
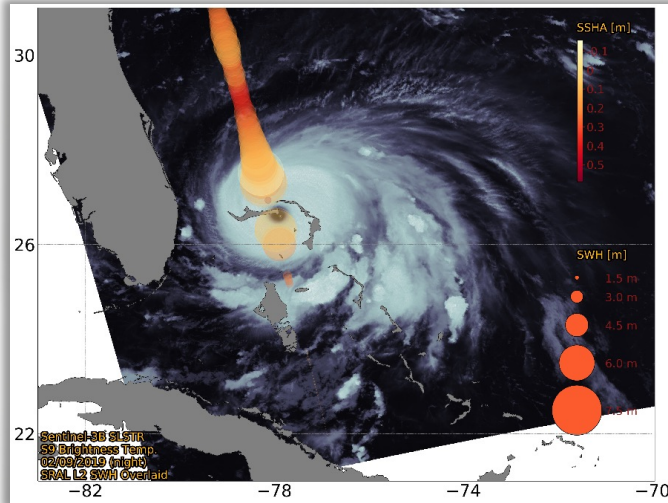


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Sentinel-3 & 6

Important contributions to wildfire and extreme events monitoring



Explainer

- **Altimetry data** – provides sea surface height, significant wave height, and wind speed measurements.
 - Utility for nowcasting, forecasting, and towards other metocean related variable derivation.
- Optical data can also show impacts e.g. of sediment outflows and flooding/coastal damage.
- Detection and monitoring of wildfires and smoke/dust plume transport
- Data most suitable for event scale – fast availability, high spatial resolution. Also contributes to downstream products (forecast models, derived ocean currents etc).

Case study examples:

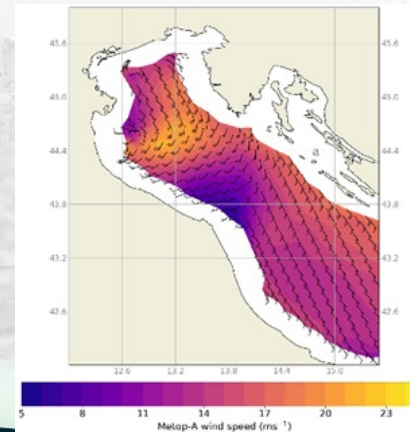
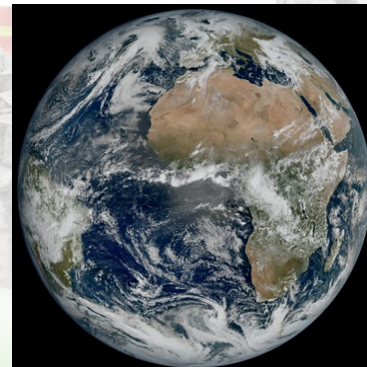
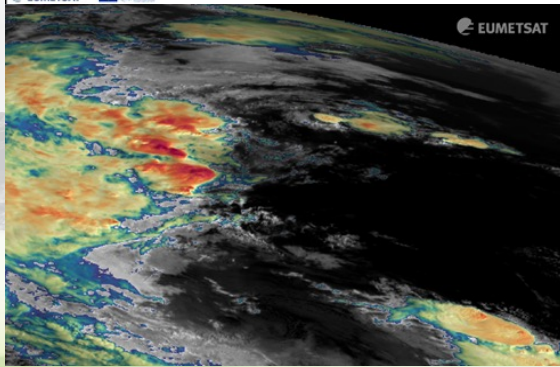
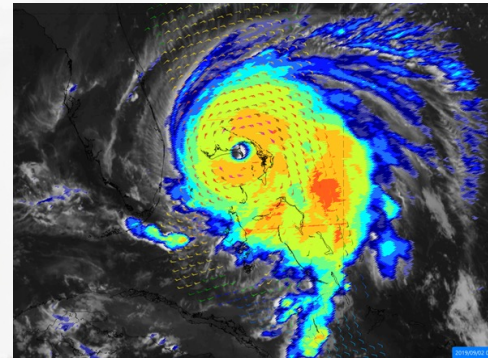
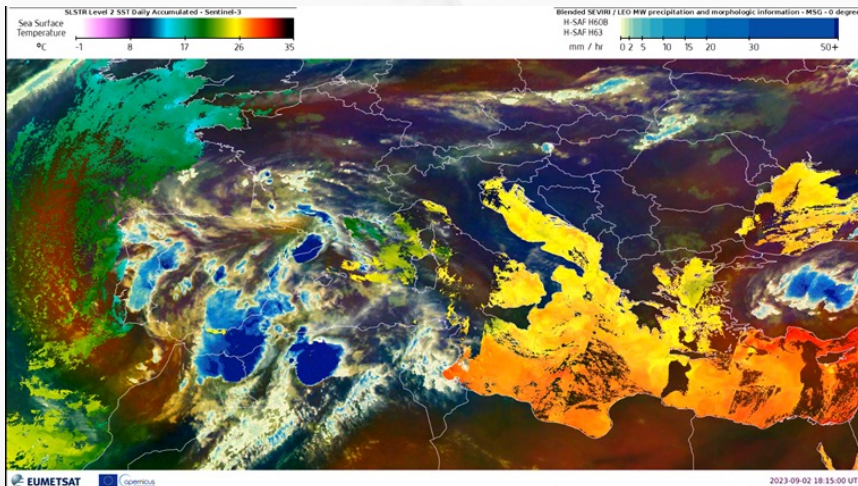
- <https://www.eumetsat.int/multiple-perspectives-hurricane-dorian>
- <https://www.eumetsat.int/monitoring-tropical-cyclones-pacific-ocean-2013-2019>
- <https://www.eumetsat.int/tracking-tropical-cyclone-impacts-using-altimetry>
- <https://www.eumetsat.int/devastating-fires-parts-mediterranean-during-unprecedented-heatwave>
- <https://www.eumetsat.int/canadian-wildfires-monitoring-over-atlantic-and-europe>



Copernicus Contributing Missions: Meteo



The essential assets to predict and warn from impending high impact weather



Explainer

- EUMETSAT operates the key European Programmes in support of operational weather forecasting, namely the Meteosat and Metop fleet of satellites, as Copernicus Contributing Missions.
- **Combined usage** of daily Sentinel 3 Sea Surface Temperature data with 15-Minute Meteosat data, allow close monitoring of high impact weather situations, such as the high-intensity rainfalls situations fueled by elevated Sea Surface temperatures around the Mediterranean (top left) in Sep. 2023.
- All forms of convective **storms** are monitored closely from their early stages of formation to better provide Nowcasting services (bottom left)
- **Tropical cyclones** are monitored from their earliest stages of development around the globe including in EU Member State's overseas territories (top right).



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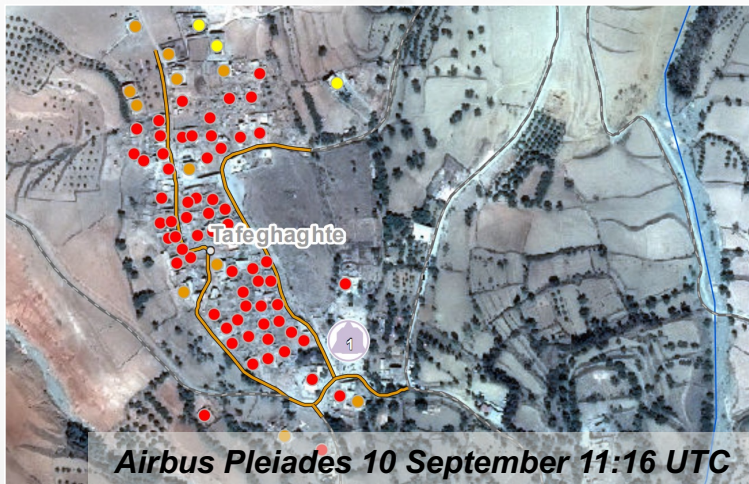
Copernicus4Regions Information Session at European Parliament - 23 October 2023



Copernicus Contributing Missions



The essential assets to scrutinize the street-level impacts of natural disasters



Airbus Pleiades 10 September 11:16 UTC

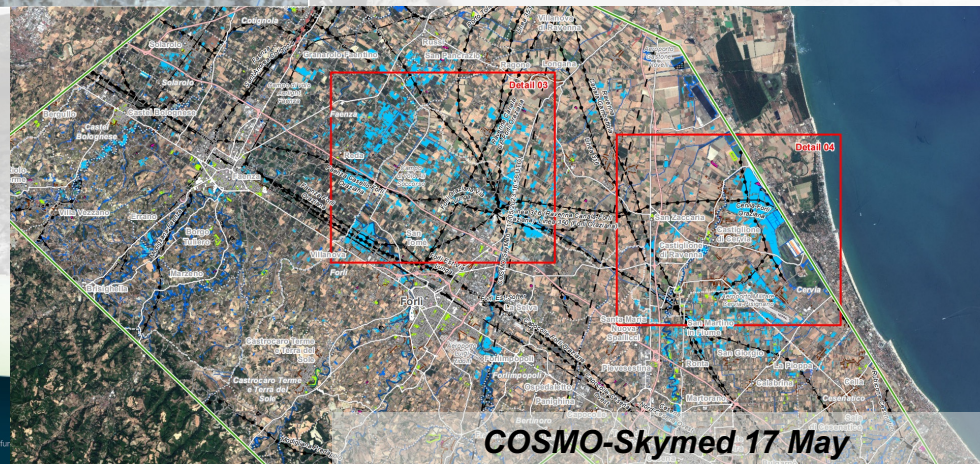
Earthquake in Morocco

- 8 Sept. at 22:11 UTC
- 9 Sept. morning
 - activation EMSR695 (large area)
- 10 Sept. morning
 - first VHR data:
 - Planet SkySat at 08:18 UTC
 - Airbus Pleiades at 11:16 UTC
 - Maxar Worldview-3 at 11:24 UTC
- 12 Sept. morning
 - analyses maps produced

Explainer

- CCMs are tasked upon request from the CEMS to cover the disaster area, multiplying opportunities for **rapid data acquisition** in complement to the Sentinels. This is essential for ensuring a **timely response** and for **monitoring dynamic situations** as disasters unfold (e.g. for floods, wildfires, etc.).
- CCMs provide **very high spatial resolution** (e.g., Pleiades NEO 30cm multispectral data), which enables the detection of small-scale changes before and after a disaster. This is important to scrutinize threats to infrastructure or rapidly changing natural landscapes.
- Efforts are on-going to **increase the number of suppliers (esp. European ones)** to improve the immediacy of the response.
- Know more [AT THIS LINK](#)

Activation EMSR664
Flood in Italy



COSMO-Skymed 17 May



cop-4



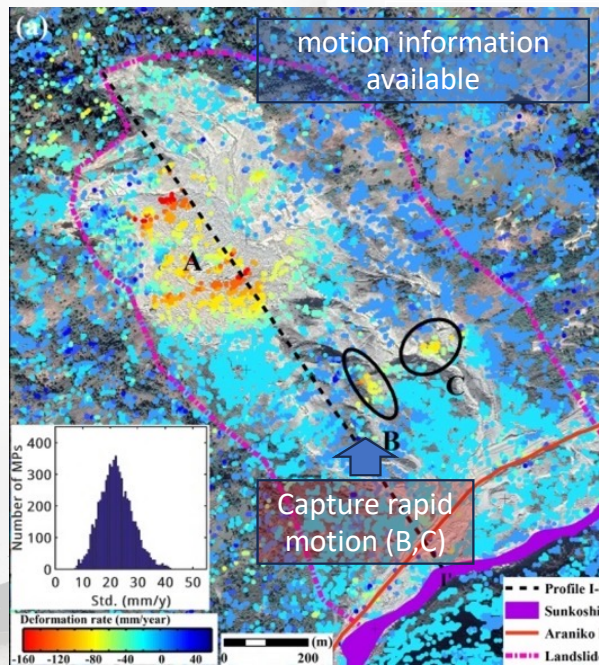
ROSE-L - Radar Observation System for Europe in L-band



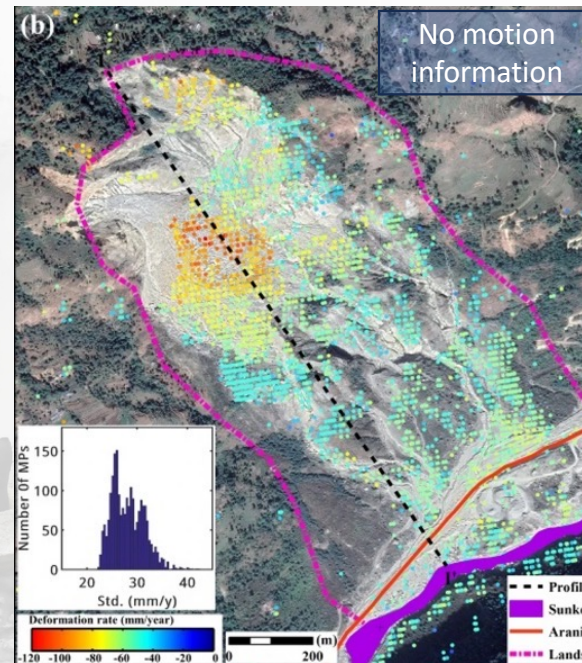
New surface motion information in previously inaccessible areas

Planned

L-band (e.g. ROSE-L simulation)



C-band (e.g. Sentinel-1)



Sunkoshi landslide 2017-2019

-10 mm/year

Explainer

- ROSE-L will be only operational source of surface motion information in extensive vegetated and snow covered areas which are inaccessible to C-band SAR missions such as Sentinel-1
- ROSE-L will extend the measurement of Sentinel-1 based terrain deformation information over urban areas and infrastructures to vegetated and snow covered areas currently inaccessible
- ROSE-L only operational source of information in areas of fast-moving surfaces e.g. due to rapid subsidence events, degrading infrastructure and active land slides
- Long-term continuity and ROSE-L missions guarantees that civil protection and natural disasters needs can be addressed.
- Know more [AT THIS LINK](#)

Interferometry is a technique that allows to detect motions of the ground and of overlying infrastructure with millimetre-level accuracy.



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Copernicus4regions User Stories

Selected user testimonials from European public authorities



The approach is filling a significant knowledge-gap on the pluvial floods' mechanism, analysis and risk-reducing measures' planning - an important contribution to the FRMP₁ update."

Rumeliya Petrova, Danube Region BD

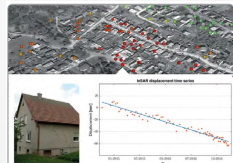
1Flood Risk Management Plan of the Danube river basin [\[LINK\]](#)



Sentinel-2 data shows not only the flooded area, but the area where the water was accumulated - thus allowing precise risk reduction measures on watershed level to be implemented.

Sentinel 1 data has transformed the way we monitor groundwater flooding in Ireland. It provides a practical method to monitor a complex problem."

Koen Verbruggen, Geological Survey Ireland [\[LINK\]](#)



Detail of Village Hradec in first figure: Displacement time series showing 3 cm/year subsidence over building disrupted by landslide. Each dot represents a satellite acquisition.
Credit: Contains modified Copernicus Sentinel data [2018]

Thanks to Sentinel-1 we can monitor landslides threatening citizens' homes more reliably and with unprecedented detail."

Dr. Pavel Liscak, Slovakia State Geological Institute [\[LINK\]](#)

The satellite data planning changes the way to prepare, plan and respond to an emergency, optimizing risk analysis and rescue operation efficiency."

Italian National Fire Corps [\[LINK\]](#)

The application of this method will greatly accelerate the fire extinguishing time and facilitate the movement of firefighters within the affected area."

Fire Department of the Split-Dalmatia county [\[LINK\]](#)

User quotes from
[NEREUS/ESA/EC 2018](#)



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Question Time!

[BACK TO
POLICY AREAS](#)

[BACK TO
MEETING
AGENDA](#)



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Protecting the environment and biodiversity

2020	COM(2020) 652	Proposal for a DECISION OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL on a General Union Environment Action Programme to 2030
2023	COM(2023) 1115	Regulation (EU) 2023/1115 of the European Parliament and of the Council of 31 May 2023 on the making available on the Union market and the export from the Union of certain commodities and products associated with deforestation and forest degradation and repealing Regulation (EU) No 995/2010
2021	COM(2021) 699	EU Soil Strategy for 2030 Reaping the benefits of healthy soils for people, food, nature and climate
2021	COM(2021) 572	EU Forest Strategy
2022	COM(2022) 304	Proposal for a REGULATION OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL on nature restoration
2023	COM (2023) 416	Proposal for a DIRECTIVE OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL on Soil Monitoring and Resilience (Soil Monitoring Law)
2023	COM (2023) 839	Regulation (EU) 2023/839 of the European Parliament and of the Council of 19 April 2023 amending Regulation (EU) 2018/841 as regards the scope, simplifying the reporting and compliance rules, and setting out the targets of the Member States for 2030, and Regulation (EU) 2018/1999 as regards improvement in monitoring, reporting, tracking of progress and review (LULUCF)
2022	SWD(2022) 167	COMMISSION STAFF WORKING DOCUMENT IMPACT ASSESSMENT Accompanying the proposal for a Regulation of the European Parliament and of the Council on nature restoration
2021	SWD(2021) 652	IMPACT ASSESSMENT REPORT Accompanying the Proposal for a Directive of the European Parliament and the Council amending DIR (EU) 2018/2001 of the European Parliament and of the Council, Regulation (EU) 2018/1999 of the European Parliament and of the Council and Directive 98/70/EC of the European Parliament and of the Council as regards the promotion of energy from renewable sources, and repealing Council DIR (EU) 2015/652
2009	DIR/2009/147/EC	on the conservation of wild birds (Birds Directive)
1992	DIR/ 1992/43/EEC	on the conservation of natural habitats and of wild fauna and flora (Habitats Directive)
2000	DIR/2000/60/EC	Water Framework Directive
2008	DIR 2008/56/EC	Marine Strategy Framework Directive

* Darker background indicates policy documents mentioning Copernicus



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Highlights on key policy aspects supported by Copernicus

- **Monitoring Terrestrial and Marine Ecosystems, Biodiversity, Habitats**
- **Land Cover, Land Use, Changes over time**
- **Forested Area, Forest Degradation, Deforestation**
- **Soil Health Indicators**
- **Quality of Rivers and Inland waters**
- **Indicators on State and Health of the Oceans**
- **Monitoring Air Quality, Air Pollution, Emissions**

Key Copernicus supporting elements



Copernicus Marine Service



Land Monitoring Service



SENTINEL-1



SENTINEL-2



SENTINEL-3



SENTINEL-5P



COPERNICUS CONTRIBUTING MISSIONS



Atmosphere Monitoring Service

atmosphere.copernicus.eu



SENTINEL-4



SENTINEL-5



CHIME



CIMR



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Copernicus Land Monitoring Service

To provide timely environmental information for ecosystem monitoring



CORINE Land Cover
1990-2000-2006-12-18-24



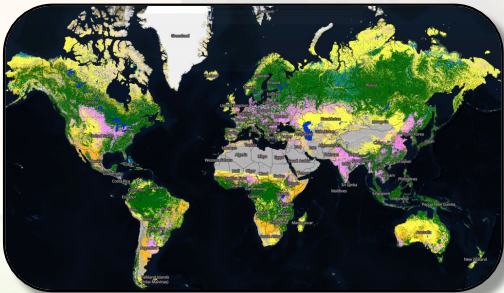
**High Resolution Layer
Vegetated Land Cover
Characteristics**
2015-17-18-19-20-21-22...



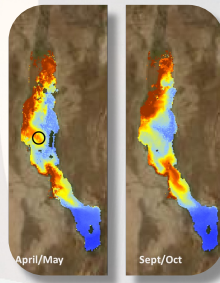
**High Resolution Layer
Small Woody Features**
2015-18-21



**Global Land Cover and Land Cover change
since 2015**



**Rivers and Lakes
water quality**



Explainer

- **Informing EU Biodiversity strategy 2030 and nature restoration efforts about the extent, condition and services of our forests, grasslands, wetlands and other ecosystems**

CLMS offer - the *CORINE Land Cover* continues to map European landscapes since 1990-s, representing a consistent and coherent time series of land cover, land use and observed changes. It is a key input to environmental indicators, land and ecosystem accounts at EU level.

- **Yearly characterization of vegetation is fundamental for ecosystems monitoring**

CLMS offer - *High Resolution Layer – Vegetated Land Cover Characteristics* combines a set of products on forests, grassland and agricultural ecosystems.

- **Information on connectivity/fragmentation of habitats with a direct potential for restoration**

CLMS offer *High Resolution Layer – Small Woody Features* shows detailed herbaceous features like hedgerows, shrubs, and small clusters of trees. Data set supports biodiversity analysis in agricultural landscapes and deployment of Green infrastructure.

- **Informing about water quality of inland water bodies**

CLMS offer - *water trophic state information for major lakes, reservoirs and rivers* help to monitor water quality on a ten-daily basis.

- **Informing about state of land cover and change at global level**

CLMS offer - *Land cover and land cover change maps produced at global level* will help countries to monitor key Sustainable Development Goals (SDG) indicators.

- Know more → <https://land.copernicus.eu/en>

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



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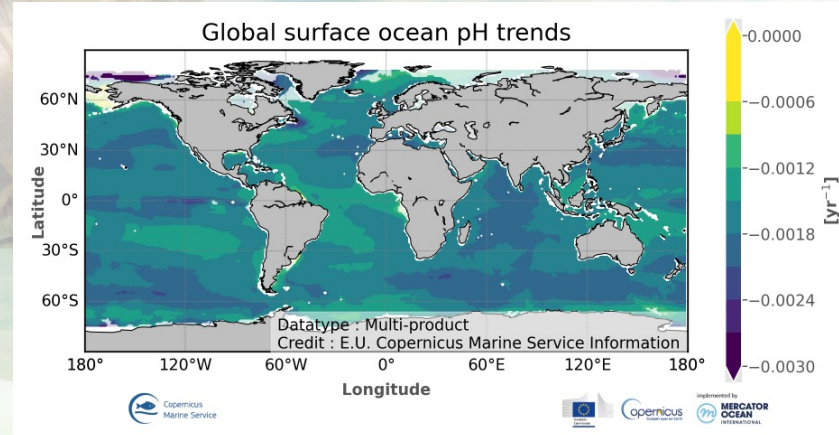
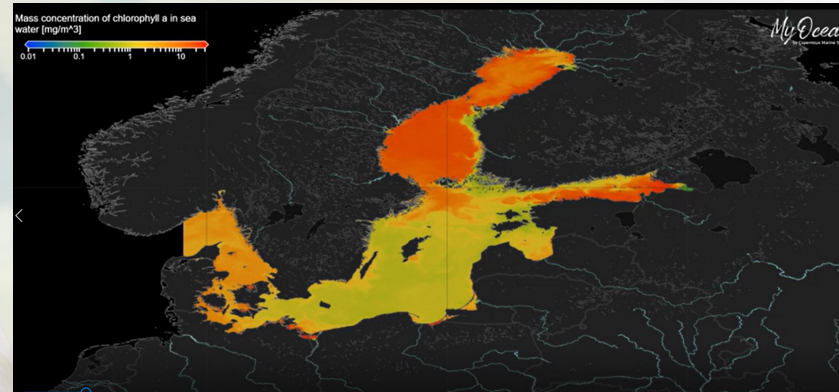
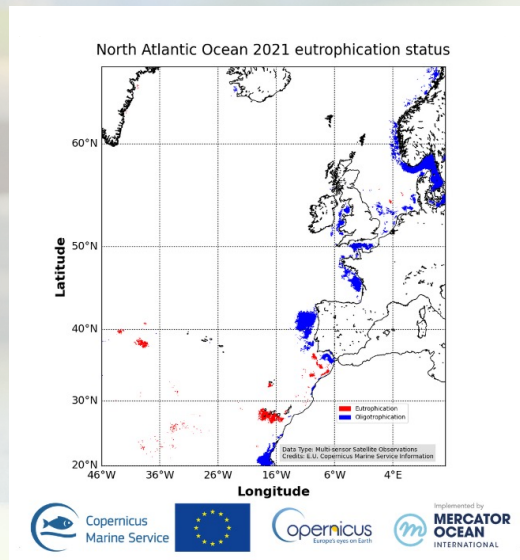


Copernicus Marine Service

Timely and accurate information about the marine ecosystems, in support of marine protection policies



- ✓ Copernicus Marine Data enables the monitoring of ocean health; supports the sustainable management of marine resources, contributes to early warning systems (e.g. harmful algal blooms)



Explainer

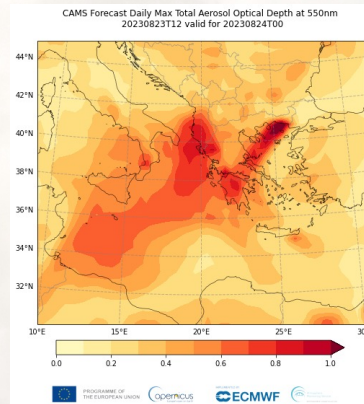
- CMEMS offers near real-time, historical, trends and forecasts of ocean data, aiding our understanding of ocean health (e.g. insights into water quality, plankton distribution, fish migration; tracking ocean acidification and sea temperature extremes; identifying critical habitats for marine species)
- **Main products:** Copernicus-GlobColour; Global Ocean Biogeochemistry Analysis and Forecast; Global Ocean acidification from Multi-Observations Reprocessing
- **CMEMS delivers info on main trends** Ocean Monitoring Indicators
- Main planned products' evolution NECCTON → new modelling products of fisheries, pollution, and benthic habitats
- Known more at [THIS LINK](#)

Copernicus Atmosphere Monitoring Service



Support policy makers in Europe by providing air quality forecasts and a range of policy tools and assessment reports

Have a look at the CAMS products to support your policy needs



© AFP

Explainer

CAMS provides consistent and quality-controlled information related to **air pollution** and **health, solar energy, greenhouse gases** and **climate forcing**, everywhere in the world.

Services to EU institutions and agencies on **air quality, dust, (wildfire) emissions, pollen and UV radiation** in support of environmental, energy and health policies

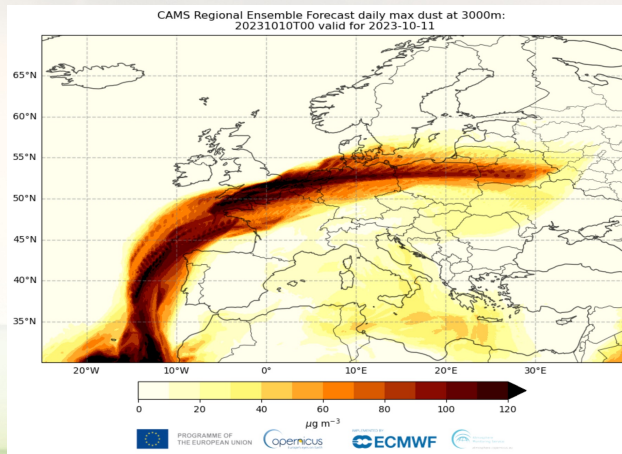
Based on models, in-situ observations and satellite observations (e.g. **S5-P**)

+30.000 users of **Atmosphere Data Store** on past, current and forecasts on global atmospheric composition, ozone layer, European air quality; emissions, policy tools and reports, etc.

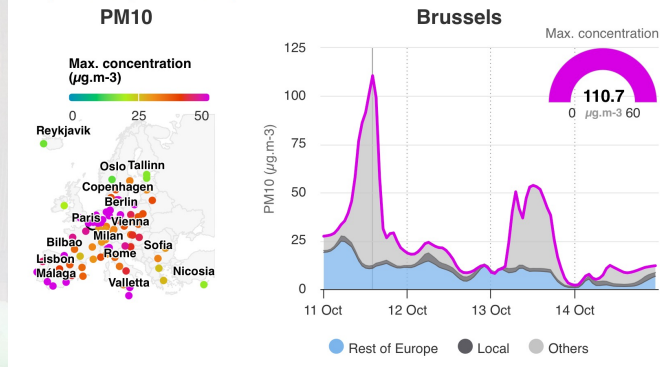
Close engagements with **EC DGs ENV, CLIMA, ENER** and **SANTE** as well as **EU Member States**. Latest policy workshop in Greece on 4.10.23

Know more → [CAMS](#)

vincent-henri.peuch@ecmwf.int



Air pollution at target cities
4-day forecast (EMEP model)

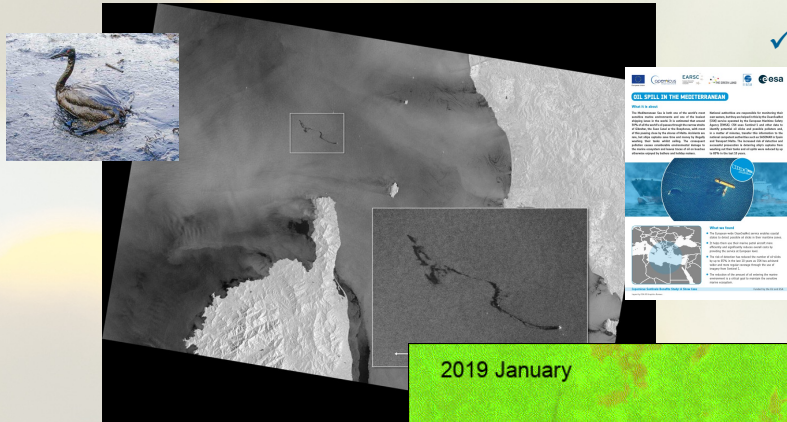


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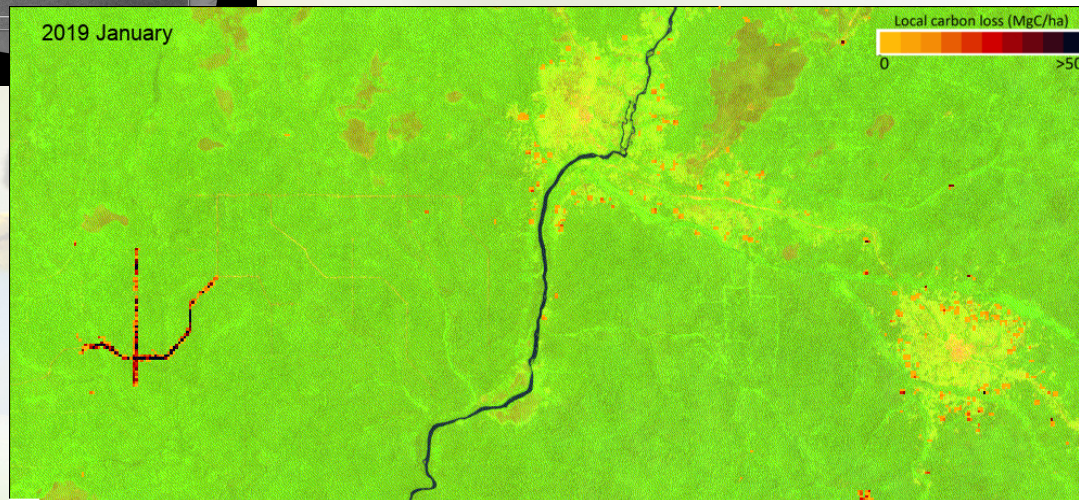
Sentinel-1

All-weather, day-and-night measurements to protect natural resources



- ✓ The European maritime Safety Agency's [CleanSeaNet](#) service uses Sentinel-1 and other data to identify potential oil slicks and possible polluters and, in a matter of minutes, transfer this information to the national competent authorities (See [SeBS use case report](#))

- ✓ About 30% of Earth's surface is covered by forests that are declining annually through small scale disturbances such as illegal logging, or conversion of forestland for agriculture, clearing to pastures for livestock and urban landscapes.



Forest disturbance alerts for the Congo Basin using Sentinel-1
[Reiche et al., 2021](#)

Explainer

- Sentinel-1 C-band polarimetric measurements enable the measurement of different land cover properties that are essential parameters for mapping ecosystems.
- For instance, forest losses can be monitored using times series created from Sentinel-1's dense data collection. The data provides reliable indicators generated by the SAR signals which are not affected by environmental effects, such as cloud cover or daylight availability. Sentinel-1 all-weather capability is crucial for measuring tropical forests that are frequently covered by haze (e.g. due to fires) or thick clouds.
- Sentinel-1 C-band also allows to detect oil slicks in the open seas: with its frequent revisit it provides a fundamental help to monitor the vast EEZ in Europe
- Sentinel-1C needs to be launched soon following Sentinel-1B unavailability
- Long-term continuity will be ensured through Next Generation Sentinels.
- Know more [AT THIS LINK](#)



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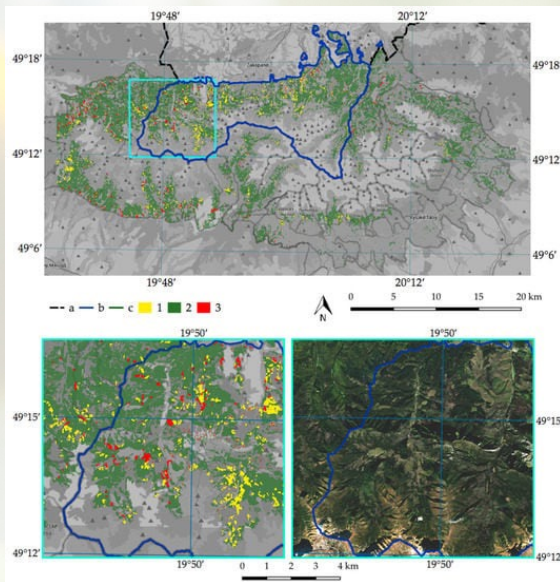


Sentinel-2



The go-to data source to manage natural resources over land and coastal water

- ✓ Sentinel-2 enables users to assess natural disturbances across large-areas and to map factors affecting the susceptibility of trees to destruction. For example, the bark beetle (*Ips typographus* L.), poses a great threat to tree stands which cover a large part of mountain areas, as well as the lowlands in Northern, Central and Eastern Europe.



Map of the bark beetle outbreak in 2017 at the Tatras.



Explainer

- Sentinel-2 supports non-invasive monitoring for a vast range of diverse applications related to the environment and biodiversity protection.
- Sentinel-2 multispectral imagery enables the detection of surface modifications related to e.g. vegetation health and water quality.
- Sentinel-2 resolution of 10m allows fine-grained assessments of parameters at a scale which is actionable by local and regional authorities.
- Sentinel-2's frequent coverage (every 3-5 days in Europe in clear sky conditions) enables it to provide frequently updated information, to monitor rapidly changing phenomena e.g. algal blooms.
- Long-term continuity will be ensured through Next Generation Sentinels
- Know more [AT THIS LINK](#)



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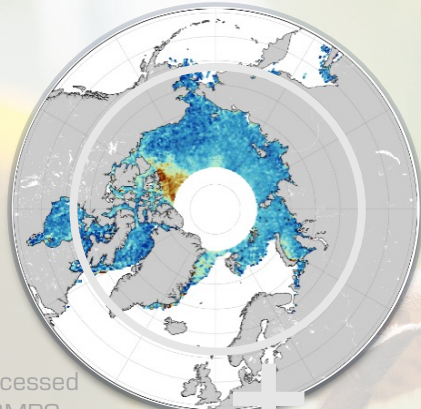


Sentinel-3 (land)

The large-scale and frequent measurements of multiple environmental parameters



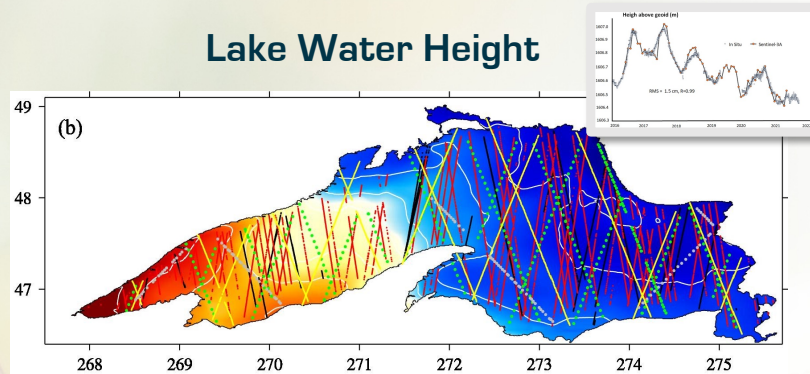
Sea ice thickness



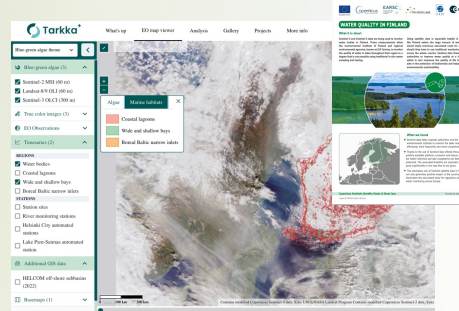
© processed by S3MPC.

- ✓ Monitoring changes in the Sea Ice thickness is fundamental for establishing adequate strategies to protect the Arctic environment and biodiversity. [Source](#)

Lake Water Height



- ✓ Mean surface and water height variations of the Issyk-Kul Lake detected from S3 altimetry and Tide gauge measurements. [Source](#)



- ✓ Lake Water Quality from TARKKA platform. [Source](#)

Lake Water Quality

Explainer

- Sentinel-3 carries instruments to measure sea surface topography, sea and land and ice surface temperature, and ocean and land surface colour with high accuracy and repetitiveness.
- Sentinel-3's major contribution to ice and inland water monitoring is due to the high along-track resolution of the SRAL altimeter and associated sampling of the 2 pairs, enabling the generation of sea-ice thickness and water height changes, and the set of complementary and collocated information which its four instruments provide from each pass, such as sea ice surface temperature, melt ponds and surface reflectance over lakes etc...
- Long-term continuity will be ensured through the S3C and S3D units and the Next Generation Sentinels.
- Know more [AT THIS LINK](#)



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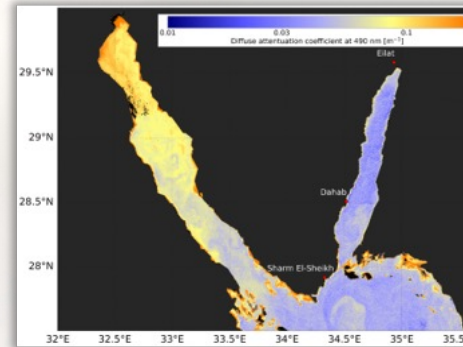
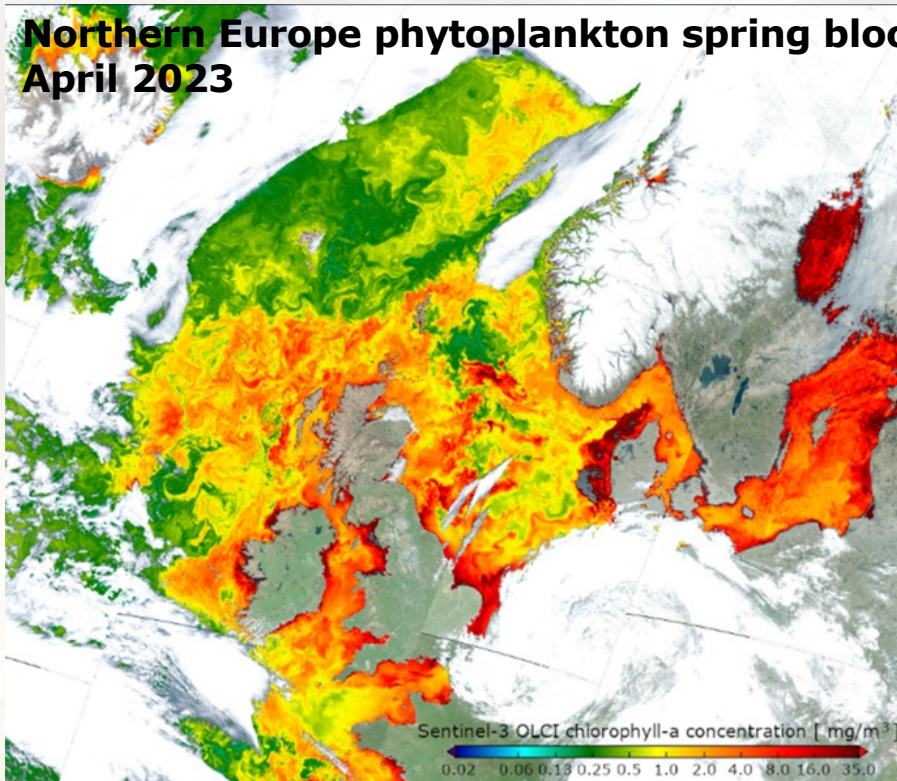


Sentinel-3 (dynamics of ocean biology)



Multiple instruments synchronously observing ocean biology and physics

Northern Europe phytoplankton spring bloom on 20 April 2023



Explainer

- Sentinel-3 OLCI data and downstream products can support the characterisation of environmental conditions relating to biology and light environment.
- This can be useful for understanding ecological niches, and towards tradeoff analysis for optimal protected area citing.
- **Ocean colour** data captures fundamental dynamics of ocean biology towards:
 - Monitoring changes that may affect fisheries and wider ocean food changes
 - Understanding carbon uptake and cycling (new studies planned)

Case studies

- <https://www.eumetsat.int/quantifying-particulate-organic-inorganic-carbon-ocean>
- <https://www.eumetsat.int/tackling-issues-underwater-imaging-using-sentinel-3>
- Know more [AT THIS LINK](#)

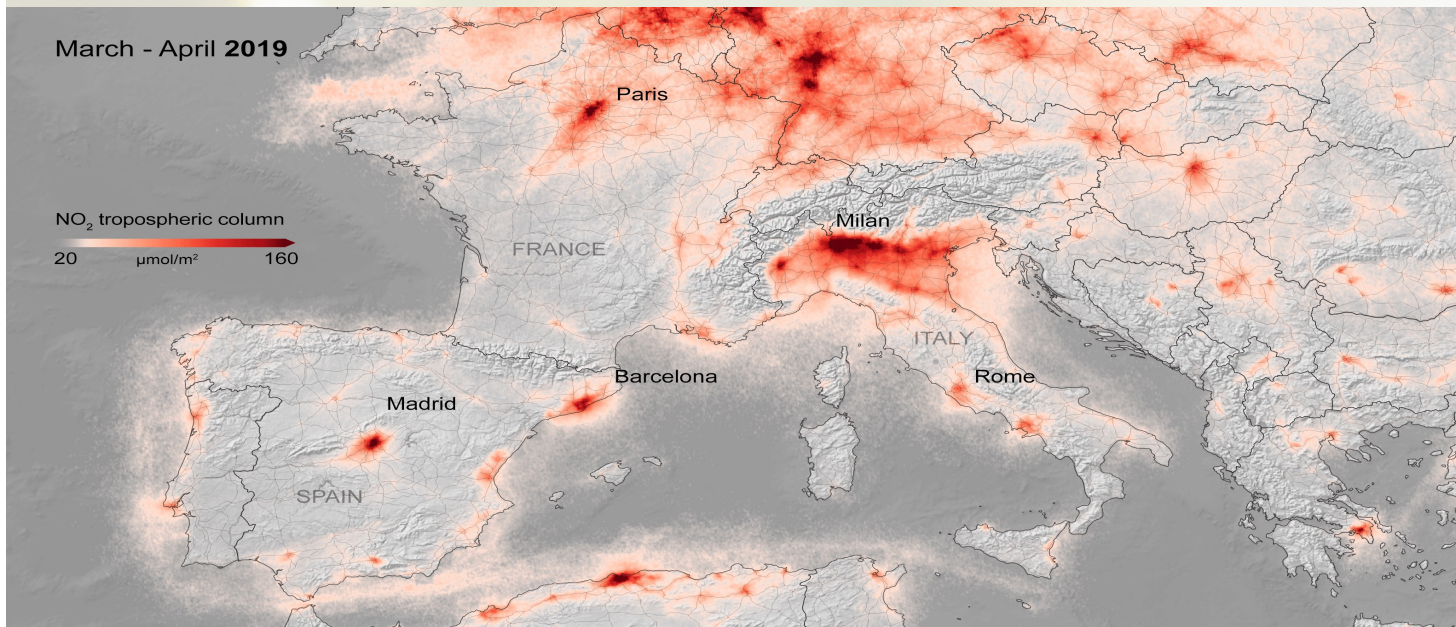


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Sentinel-5P

The view from the above in support of large scale integrated air quality monitoring



- ✓ Tropospheric columnar contents of nitrogen dioxide over western Europe from Sentinel-5P.
Get more from the [Copernicus Sentinel-5P Mapping Portal](#)

Explainer

- Sentinel-5P provides unique observations of atmospheric trace gases and aerosols at a high resolution of about 5 km, with near-daily global coverage, resolving individual sources like thermal powerplants, industrial complexes, and fires.
- Sentinel-5P maps a range of chemical species and air pollutants, such as NO₂ stratospheric and tropospheric columnar contents, and ash plumes.
- Sentinel-5P spatial and temporal resolution is higher than ever before and allows to map the details of these volatile and rapidly varying pollutants with unprecedented accuracy.
- Sentinel-5P is a precursor to Sentinel-5. Its continuity will be ensured by the Sentinel-5 series.
- Sentinel-5P is used by CAMS.
- Know more [AT THIS LINK](#)



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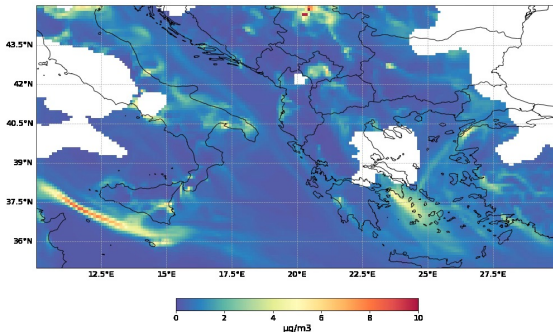
Sentinel-4

The game changer for operational satellite air quality information over Europe

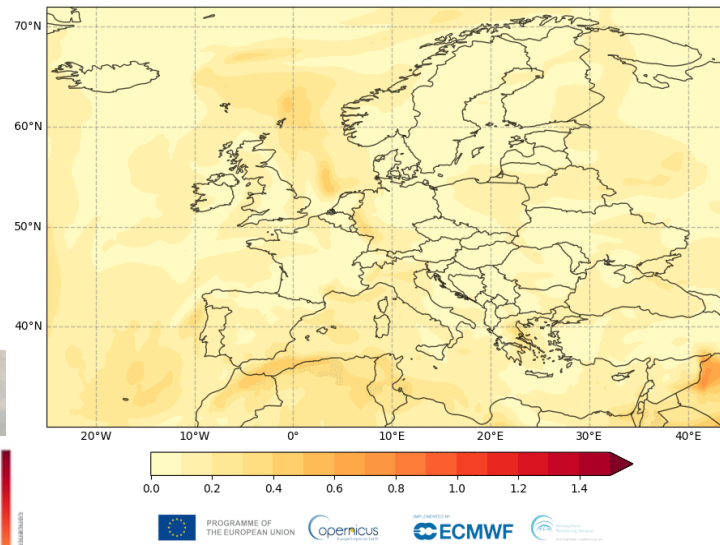


- ✓ Important input for air quality applications ('clean air') for citizens and policy development.

Simulated Sentinel-4 Nitrogen Dioxide
2021-08-07 at 00:00 UTC

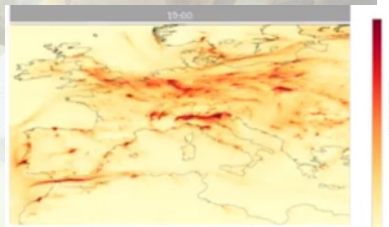
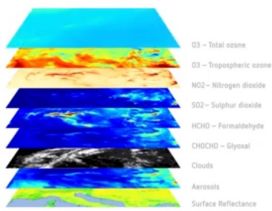


CAMS Analysis Total Aerosol Optical Depth at 550nm, 20220314T00



Meteosat Third Generation - Sounder

Copernicus Sentinel-4
Ultraviolet, Visible and Near-infrared Sounder
Geophysical products (level 2)



Explainer

- Sentinel-4 is an instrument on board the Meteosat Third Generation-S satellites that will observe **air quality parameters** over Europe on an hourly basis:
- NO₂ (nitrogen dioxide), O₃ (ozone), SO₂ (sulfur dioxide), HCHO, (formaldehyde), CHOCHO (glyoxal), and aerosols.
- The unprecedented frequency of the observations will allow actionable information to plan everyday actions for vulnerable citizens.
- Sentinel-4 data availability is scheduled for 2025/26

Case study examples (based on precursor satellites):

- <https://www.eumetsat.int/observations-atmospheric-composition-geostationary-satellites>
- <https://www.eumetsat.int/springtime-dust-outbreaks>

Know more [AT THIS LINK](#)



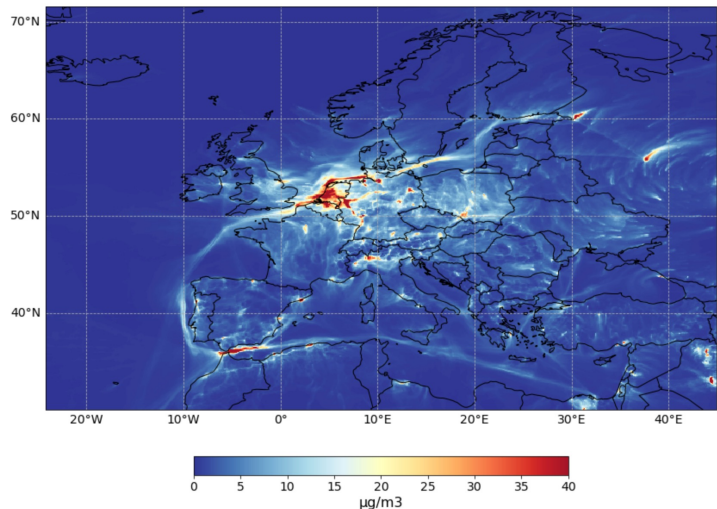
Copernicus4Regions Information Session at European Parliament



Sentinel-5

Data to quantify Air quality

mass_concentration_of_nitrogen_dioxide_in_air 2022-05-07T00:00:00.000000000



- ✓ Important input for air quality applications ('clean air') for citizens and policy development.
- ✓ Case study example (based on precursor satellites): <https://www.eumetsat.int/view-antarctic-ozone-2022>



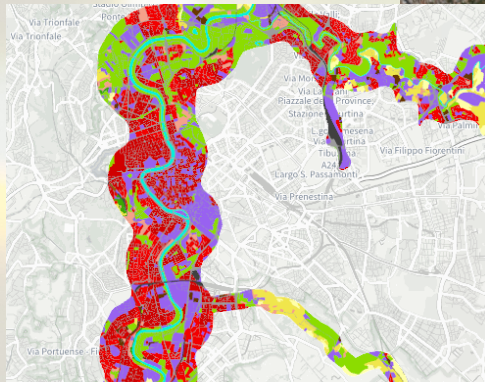
Explainer

- Sentinel-5 is an instrument on board Metop Second Generation-A satellites that will observe global air quality parameters on a daily basis
- Sentinel-5 continues and expands the capabilities of its precursor Sentinel-5P
- Sentinel-5 will enable the monitoring of key air pollutants such as NO₂ (nitrogen dioxide), O₃ (ozone), SO₂ (sulfur dioxide), HCHO, (formaldehyde), CHOCHO (glyoxal), and aerosols
- Sentinel-5 data availability is scheduled for 2025/26
- Know more [AT THIS LINK](#)



Copernicus Contributing Missions

A sharper sight to help authorities protect the environment and biodiversity



Riparian Zones Classification from the Copernicus Land Monitoring Service Tevere (Rome, Italy)

VHR image from PleiadesNEO (30cm resolution) Tevere (Rome, Italy)



Explainer

- CCM data are **essential** for producing **Europe's covers over land and coastal areas at a very high resolution (i.e. metric and sub-metric)** which is necessary to monitor small scale changes that are typical of some landforms, erosion patterns, vegetation analysis, habitat assessment, and more.
- VHR cover over large areas is only possible thanks to multiple **constellations (e.g. Pleiades, Worldview...)**.
- **Increasing the number of European suppliers** will enhance the frequency of acquisition to monitor environmental change. The **diversification of data** (thermal, hyperspectral) will open the door to **monitoring additional environmental parameters** until now, impossible to monitor from space.
- Know more at [THIS LINK](#)



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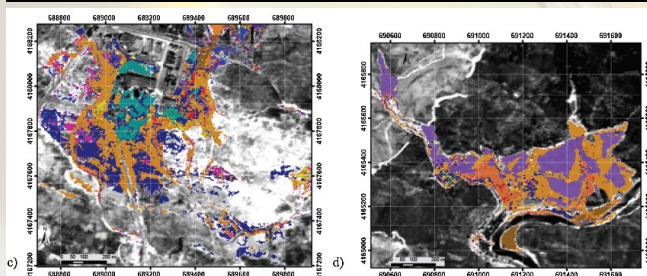
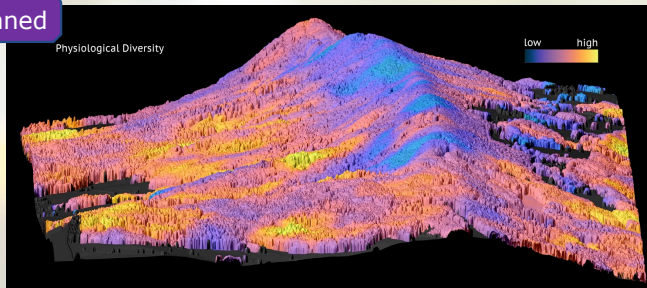


CHIME

A Swiss-knife for environmental monitoring over land and coastal waters

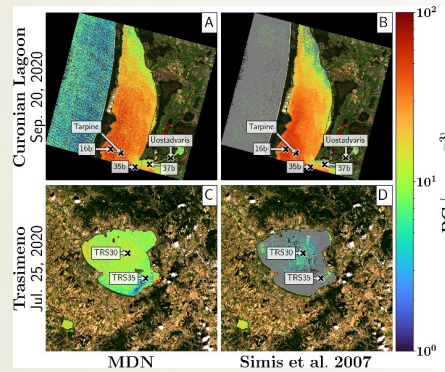
- ✓ The continuous spectral sampling in the visible, near infrared and shortwave infrared allows to monitor various parameters with high accuracy, as demonstrated by existing hyperspectral missions e.g. EnMAP and Prisma

Planned

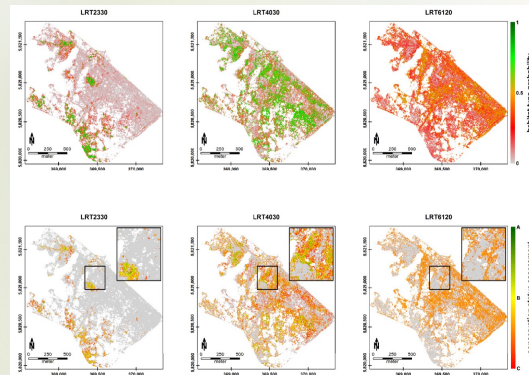


- | | | | |
|---------------------|----------------------------------|-----------------------|------------------|
| EM 1 - GT mu | EM 8 - Soils with SCH-FERR gt mu | EM 15 - CO me sch | EM 22 - RZ |
| EM 2 - GT | EM 9 - Soils with GT-FERR | EM 16 - CO pr sch | EM 23 - RZ-HA |
| EM 3 - GT-SCH mu | EM 10 - JR-SCH ferr mu | EM 17 - HA-CO | EM 24 - SZ-HA py |
| EM 4 - GT-JR mu | EM 11 - JR-GT mu | EM 18 - HA jr | EM 25 - PY SZ |
| EM 5 - SCH-JR mu | EM 12 - HE mu | EM 19 - HA sch alu gp | EM 26 - PK-HA SZ |
| EM 6 - SCH gt ch mu | EM 13 - HE | EM 20 - HA cr | |
| EM 7 - SCH-JR mu | EM 14 - HE | EM 21 - HA ch | |

O'Shea et. al (2021)



Simis et al. 2007



Zabcic et. al (2014)

Explainer

- CHIME's hyperspectral data at 30m spatial resolution and 11-day revisit enables environmental monitoring at **an actionable spatiotemporal scale.**
- CHIME allows non-intrusive mapping and monitoring of biodiversity and habitats distribution, mapping of invasive species, assessing ecosystem health and supporting conservation and management practices.
- CHIME also allows monitoring of topsoil mineralogy, degradation and erosion, detection of potential Harmful Algal Blooms (HAB), oil spills and marine litter.
- CHIME is a [Sentinel Expansion Mission](#). Two units are currently being developed and will be available for launch as from 2028 subject to budget availability.
- Know more [AT THIS LINK](#)

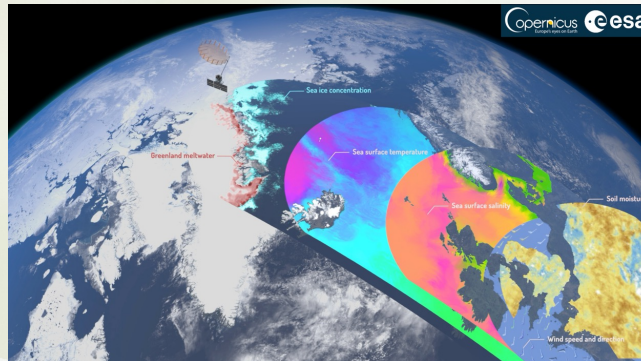
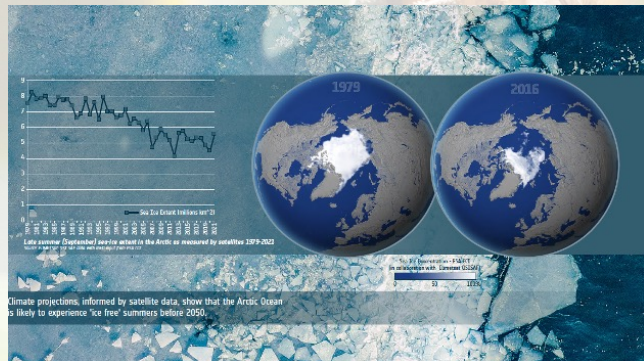
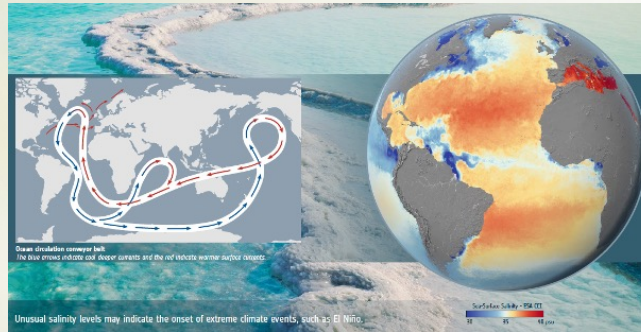
CIMR - Copernicus Imaging Microwave Radiometer



A silver bullet measurement tool for Copernicus Operational Oceanography and Cryosphere monitoring

- ✓ CIMR provides a suite of measurements that, together, provide a “silver bullet” toolkit that fuels The Copernicus Marine Service Operations Oceanography and Cryosphere monitoring

Planned



Explainer

- CIMR will provide measurements that are co-located and contemporaneous in near all weather conditions – day and night with global coverage every day. These complement measurements from optical and infrared techniques that cannot see through clouds.
- CIMR employs a suite of low-frequency but high resolution measurements requested by CMEMS and the Operational Oceanography and Cryosphere user community with global coverage each day and sub-daily revisit in the Polar regions.
- CIMR is a [Sentinel Expansion Mission](#). Two units are currently being developed and will be available for launch as from 2028 subject to budget availability.
- Know more [AT THIS LINK](#)



Copernicus4regions User Stories

Selected user testimonials from European public authorities



The implementation of the WFD was always challenging, relying only on in situ monitoring. We believe satellites will provide us with regular additional information about status of our lagoon, lakes and coastal waters."

Head of the Division Eglė Šupinienė, Environment Research Department, EPA, Lithuania [\(LINK\)](#)

The use of Copernicus Sentinels for conservation and environmental monitoring provide us with new ways of working."

Antonis Tsakirakis, Samaria National Park [\(LINK\)](#)

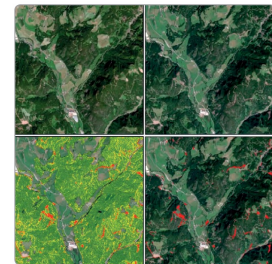
This application has transformed the way we manage the public land of Sougéal marshes for biodiversity and conservation issues."

Aurélien Bellanger, Communauté de Communes du Pays de Dol et de la Baie du Mont-Saint-Michel [\(LINK\)](#)

We hope our APP will help people plan their leisure time activities whilst raising the public awareness of air quality."

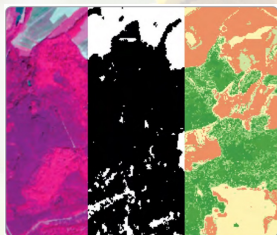
Ute Dauert, German Environment Agency [\(LINK\)](#)

Earth Observation and change products suitable for a mountain region like South Tyrol is revolutionizing our forest monitoring."



Near-real time identification of forest changes to support the management of protection forests.

Günther Unterthiner, Forest Service of Bolzano [\(LINK\)](#)



Forest mask and tree density generated for a test site in the forest district Heldburg with the use of up-to-date Sentinel data (from the left to the right): Sentinel-2 (false color composite), forest mask and tree density. Copernicus Sentinel Data 2016 / FFK Gotha

The successfully implemented afforestation monitoring system is a timesaving tool for foresters."

Sergej Chmara, ThüringenForst Institute under Public Law [\(LINK\)](#)

The use of Sentinel data has improved the control and management of high altitude grasslands providing plenty of information for remote areas."

Ramona Viterbi, Gran Paradiso National Park [\(LINK\)](#)

User quotes from [NEREUS/ESA/EC 2018](#)



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Question Time!

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POLICY AREAS](#)

[BACK TO
MEETING
AGENDA](#)



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Sustainable agriculture and food/water security

DIRECTIVE 2000/60/EC	establishing a framework for Community action in the field of water policy (Water Framework Directive)
DIRECTIVE 2008/56/EC	establishing a framework for community action in the field of marine environmental policy
REGULATION (EU) No 1380/2013	on the Common Fisheries Policy
REGULATION (EU) 2021/2116	on the financing, management and monitoring of the common agricultural policy
COM(2020) 381 final	A Farm to Fork Strategy - for a fair, healthy and environmentally-friendly food system

* Darker background indicates policy documents mentioning Copernicus

Highlights on key policy aspects supported by Copernicus

- Supporting CAP implementation
- Crop Monitoring and Forecasting
- Vegetation indices, Soil Moisture, Water Scarcity
- Monitoring of marine food chain, eutrophication and algae blooms

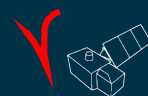
Key Copernicus supporting elements



Copernicus Marine Service



SENTINEL-1



SENTINEL-2



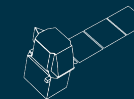
SENTINEL-3



Land Monitoring Service



LSTM



CHIME



CIMR

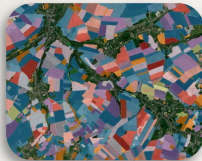
Copernicus Land Monitoring Service

To provide timely information on crop classification, agricultural practices, tree cover density and grasslands, and continuous water monitoring

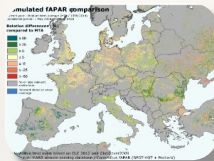
CORINE Land Cover
1990-2000-2006-12-18-24



High Resolution Crop & Agricultural patterns mapping
2015-17-18-19-20-21-22...



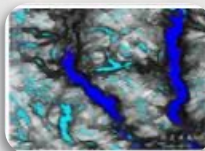
Ten daily Vegetation Indicators since 2014



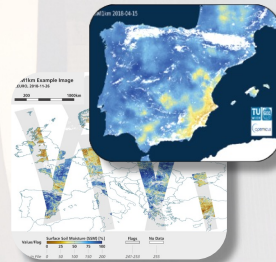
HR-Vegetation Phenology and Productivity
Near Real Time since 2017



HR-Water, Snow and Ice
Near Real Time since 2017



Soil Moisture and Soil Water Index
Since 2015



Explainer

- **Frequent monitoring of crops at EU scale**
CLMS offer - High Resolution Layer - Vegetated Land Cover Characteristics includes for the yearly crop classification and monitoring of agricultural patterns (such as harvest time and fallow land)
- **Informing about crop condition and production forecast**
CLMS offer - Mid resolution vegetation and crop indicators allow the monitoring of crop condition during the agriculture season and the forecasting of yield end of the season at regional and national scale
- **Dynamic monitoring of vegetation period and productivity**
CLMS offer - High Resolution-Vegetation Phenology and Productivity monitors plant phenology in near real time with a 10m spatial resolution back since 2017.
- **Informing about availability of water resources**
CLMS offer - High Resolution Water, Snow and Ice will monitor water in near real time. It will support drought and water scarcity analysis.
- **Informing about soil moisture**
CLMS offer - Soil moisture and soil water index inform farmers and agro-meteorological modelers about water condition, including drought alerts
- **Long term monitoring of the land use practices, extent and condition of agricultural landscapes**
CLMS offer - the CORINE Land Cover continues to map European landscapes since 1990-s, representing a consistent and coherent time series of land cover, land use and observed changes. Among 44 classes there are many cropland, pasture and agroforestry areas mapped at EU level.
- *Know more* → <https://land.copernicus.eu/en>
- *Contact point* : <https://land.copernicus.eu/en/contact-service-helpdesk>

Copernicus Marine Service

The watchful eye on Sargassum spread, aiding strategies to mitigate negative impacts on fisheries and water

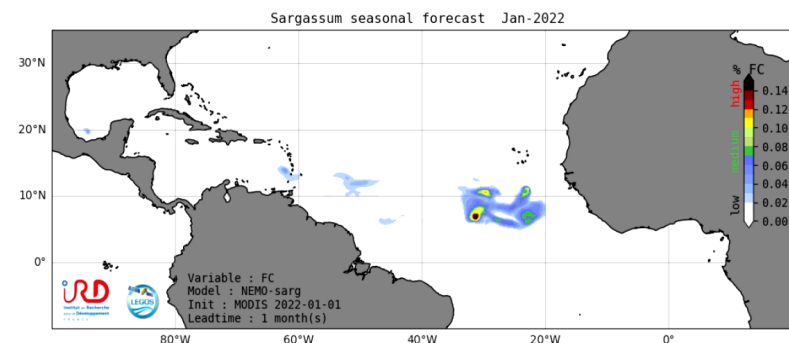
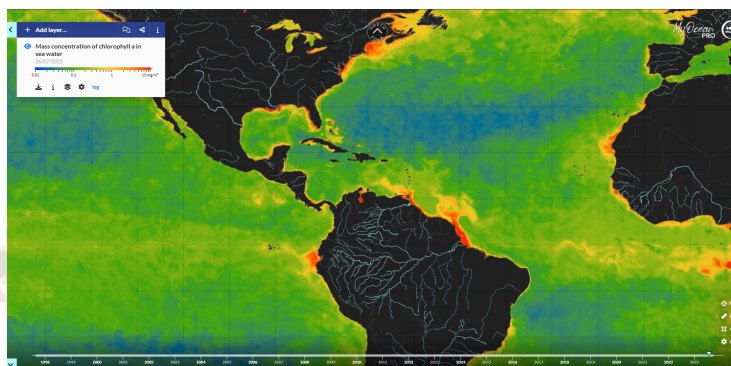


Copernicus
Marine Service



MERCATOR
OCEAN
INTERNATIONAL

- ✓ Sargassum blooms can have negative impacts on sustainable agriculture and food/water security as it contaminates all its surrounding environment once stranded.



- ✓ by reducing oxygen levels and releasing toxins in the waters, sargassum can harm fish and other marine life (affecting fisheries and aquaculture but tourism as well)
- ✓ as Sargassum washes out on beaches and coast areas and are displaced at deposition places, they can release toxins which can reach groundwater and influence drinking water supplies.

Explainer

- CMEMS provides sea surface temperature, chlorophyll a, nutrients, ocean current data to detect, track, and predict Sargassum spread, aiding in mitigation strategies.
- Customized real time maps, trends and predictions aid in understanding the factors that contribute to these outbreaks; additionally, understanding Sargassum's movement patterns, is crucial for forecasting future invasions
- **Main products:** [Global Ocean Colour \(Copernicus-GlobColour\)](#), [Bio-Geo-Chemical, L3 \(daily\) from Satellite Observations \(Near Real Time\) |](#); [Global Ocean Physics Analysis and Forecast](#)
- **Main application:** [Real time satellite detection and drift forecast of Sargassum algae in the Equatorial Atlantic](#); [SAMtool by CLS](#)
- Known more at [THIS LINK](#)



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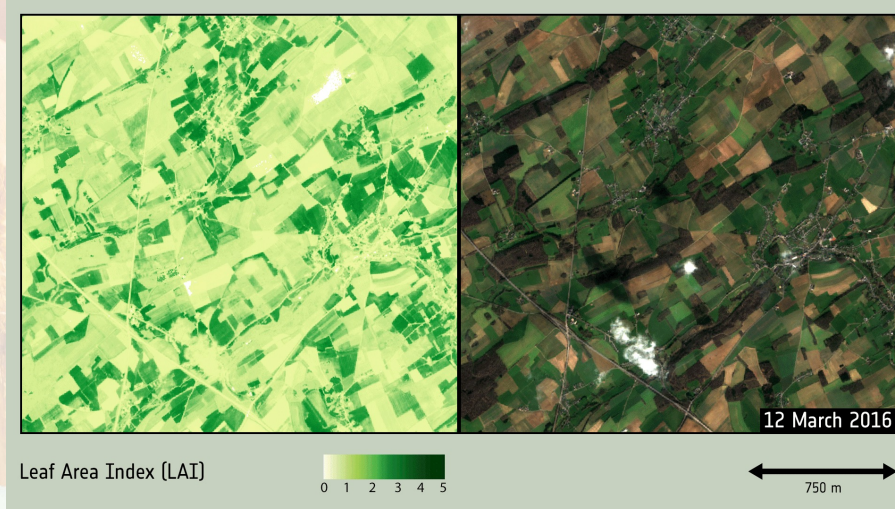
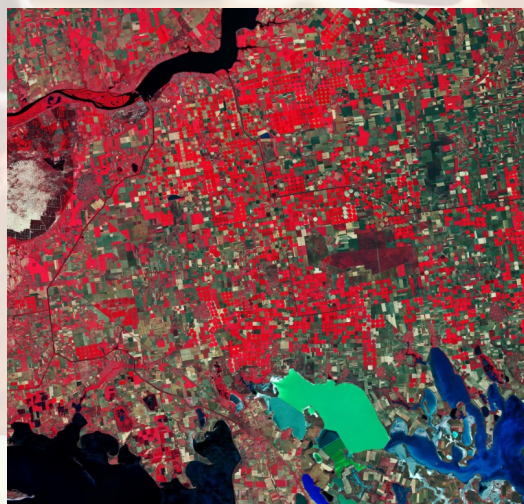


Sentinel-2

The workhorse for agricultural practices, allowing crop monitoring at field scale



- ✓ National and regional Paying Agencies make use of services based on S1/S2 as part of the new CAP Area Monitoring System, to optimize the field inspections and issue payments to farmers.



Development of crop fields in Belgium between March and October 2016.
[Source ESA [more here](#)].

Explainer

- Sentinel-2 channels in the near infrared portion of the e.m. spectrum are specifically designed to measure vegetation health
- Sentinel-2 spatial resolution of 10m is sufficient for typical sizes of European fields
- Sentinel-2 provides frequent coverage (every 3-5 days in Europe and at medium latitudes worldwide) that allows effective monitoring of agricultural fields
- Sentinel-2 observations are only available at daylight and in clear sky conditions, which limits applicability in cloud-prone countries
- Long-term continuity will be ensured through Next Generation Sentinels
- Know more [AT THIS LINK](#)



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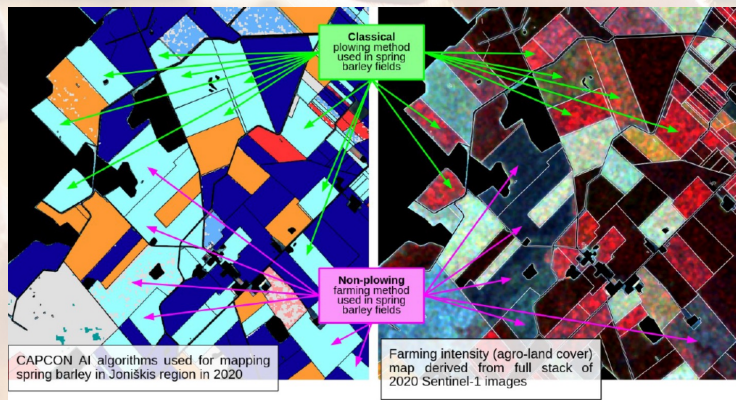


Sentinel-1

An indispensable complement for monitoring agriculture, especially over cloudy regions

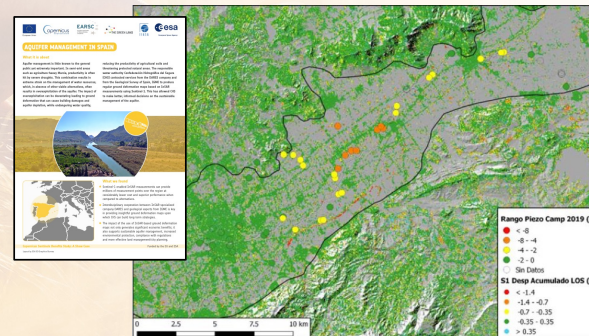


- ✓ National and regional Paying Agencies make use of services based on S1/S2 as part of the newCAP Area Monitoring System to optimize the field inspections and issue payments to farmers.



SAR farming intensity map for detection of spring barley fields in northern Lithuania, 2020. Read full article [HERE](#)

- ✓ Sentinel-1 is used to monitor underground aquifers and supports water management especially in dry regions



S1-derived deformations around the wells in the Segura river basin. Read full report <https://earsc.org/sebs/aquifer-management-in-spain/>

Explainer

- Sentinel-1 polarimetric SAR data allows detection of the main crops, farming activities and agricultural management practices at national, European and global level.
- 20m resolution, which is compatible with sizes typical of European fields.
- Sentinel-1 allows to monitor mm-scale deformations such as the ones attributable to underground water overpumping.
- All weather, day and night measurements especially important in cloudy regions.
- Sentinel-1C needs to be launched soon following Sentinel-1B unavailability
- Long-term continuity will be ensured through Next Generation Sentinels
- Know more [AT THIS LINK](#)

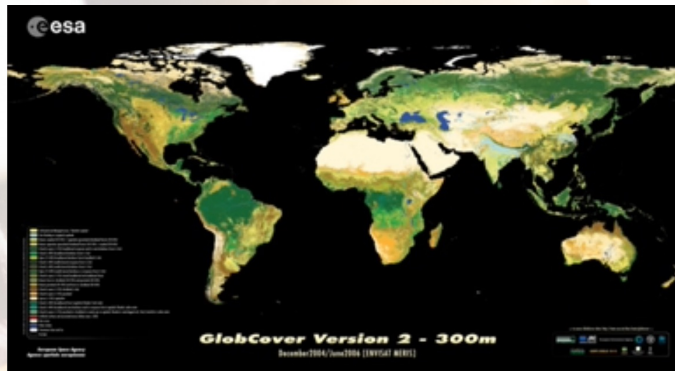


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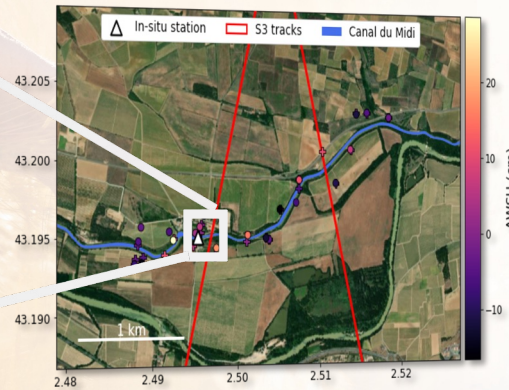
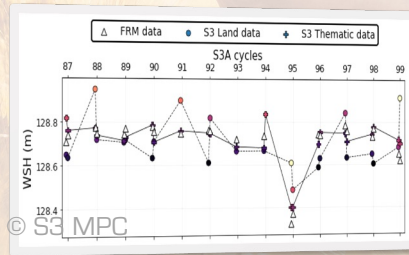
Sentinel-3 (land)

Providing early warning with a more frequent, broad-brush view of changes across the globe



- ✓ In the context of crop monitoring and food security, the most useful parameter delivered by Sentinel-3 is the NDVI product, which is used for the **early detection of deterioration in vegetation conditions and, as a consequence, of potential risk of drought and famine in any area of the world.** [Source]

- ✓ Monitoring variation of water surface height over rivers and lakes is key for the **water resource management** and forecasting of **extreme events** such as **floods** and **drought**



Sentinel-3 along-track resolution (300 m) and the on-board microwave radiometer facilitate the measurement of narrow rivers & small lakes. Water height variation from S3A altimetry and in situ over the Canal du Midi River measured during the St3TART campaign [Source]

Explainer

- Sentinel-3 is used widely in information for land and water management. With the daily and near-daily revisit time of the Sea and Land Surface Temperature instrument and the Ocean and Land Colour Instrument, users can generate maps of any area across the globe on a daily to weekly basis, enabling them to locate and track changes in the environment quickly, such as inland water algal blooms and deteriorating vegetation.
- Sentinel-3's altimeter is used to track changes in water height.
- The high revisit time is reached by having the two identical satellites in orbit, S3A and S3B.
- Long-term continuity will be ensured through the S3C and S3D units, and the Next Generation Sentinels.
- Know more [AT THIS LINK](#)



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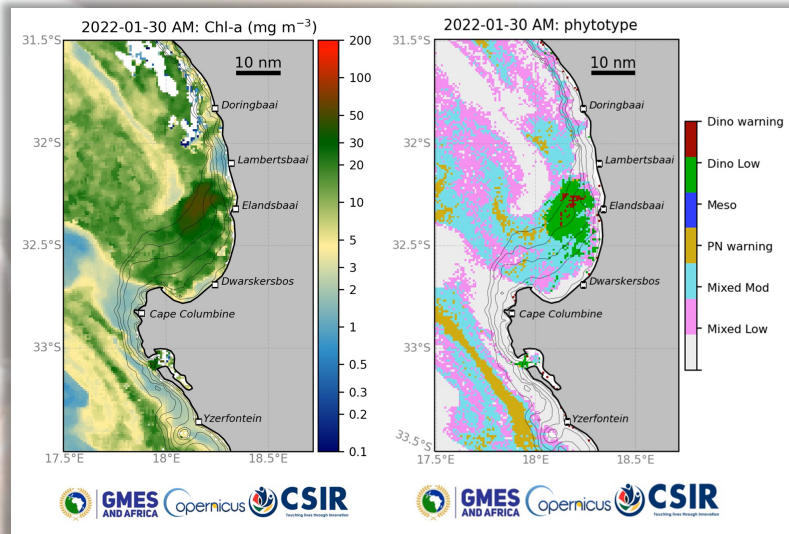


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Sentinel-3 (marine)

Satellite observations supporting aquaculture and coastal water quality management



Seaweed Solutions

USER STORY

Ana and David from Seaweed Solutions developed tools to access, process and visualise environmental data from the seafarm site in Fraya, Norway. That is relevant to seaweed cultivation during the growth season from September to June.

THE CHALLENGE

Environmental conditions influence the growth of seaweed. Data readily available from satellites, including temperature, chlorophyll-a, photosynthetically active radiation, light attenuation, and sea state, can offer a cost-effective way to monitor this.

DATA ACCESS

The EUMETSAT Data Store APIs were used to programmatically access data products for the time and region of interest.

PROCESS

Jupyter notebooks provided during the training were adapted to retrieve the data of interest, make a subset for a region near the farm, and visualise.

DISTRIBUTION

Satellite data were compared with in-situ data from the farms using the SNAP software as well as modelled nitrate data from models from the Copernicus Marine Environment Monitoring Service.

VALUE

Time series of data on environmental conditions can support an understanding of growth rates at the seafarms, informing future developments.

Explainer

- **Sentinel-3 OLCI's Ocean Colour data offers near daily, high spatial (300m) and spectral resolution data.**
- Can provide information about high biomass/deoxygenation risks, likelihood of toxic species and subsequent impacts on aquaculture.
- Can also be used as a eutrophication indicator
- Combined with other environmental conditions can provide information on risks from other biotoxins, and growth conditions.

Case study examples:

- <https://www.eumetsat.int/deoxygenation-impacts-marine-life-benguela>
- <https://www.eumetsat.int/hydrogen-sulphide-plumes-namibian-coast>
- <https://www.eumetsat.int/swirls-cyanobacteria-baltic-sea>
- Know more [AT THIS LINK](#)

CHIME - Copernicus Hyperspectral Imaging Mission for the Environment

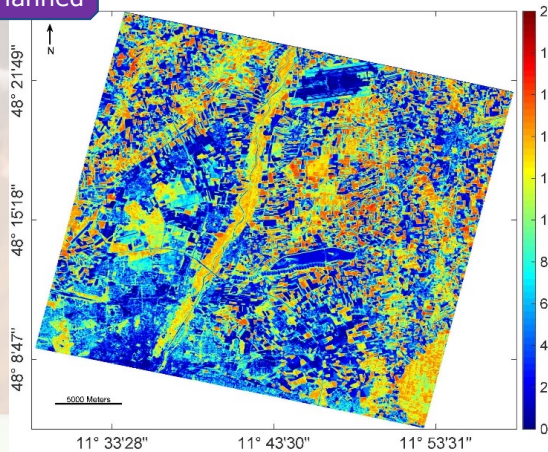


Enhancing precision agriculture practices through advanced monitoring of crops and soil properties

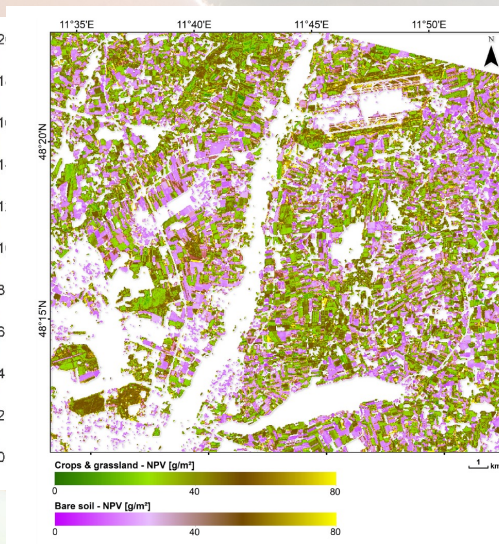
CHIME supports precision agriculture, optimisation of fertilisation practices and carbon farming by monitoring critical crops and soil properties, e.g. nitrogen and water content. Here below: maps of critical crops and soil properties at field scale e.g.:

- ✓ Canopy nitrogen content (CNC)
- ✓ Non-photosynthetic vegetation (NPV)
- ✓ Soil Organic Carbon

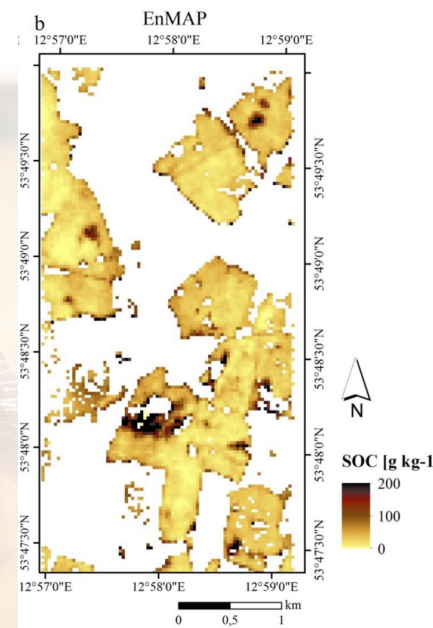
Planned



Verrelst et. al (2021)



Berger et. al (2021)



Ward et. al (2020)

Explainer

- CHIME will enable monitoring of yield quality (e.g. protein content) in crops and carbon stocks in topsoil at field scale
- Hyperspectral imagers are able to distinguish photo vs. non-photo synthetically active vegetation while also detecting nitrogen and nutrient uptake.
- The unique combination of a continuous spectral sampling in the visible, near infrared and shortwave infrared, 30 m spatial resolution and 11 days revisit (with 2 satellites) will enable effective global monitoring of agricultural practices at field scale
- CHIME a [Sentinel Expansion Mission](#). Two units are currently being developed and will be available for launch as from 2028 subject to budget availability.
- Know more [AT THIS LINK](#)



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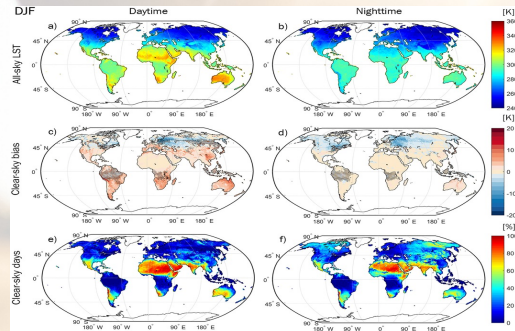
CIMR - Copernicus Imaging Microwave Radiometer

Improved measurements to support sustainable agricultural policies and practices

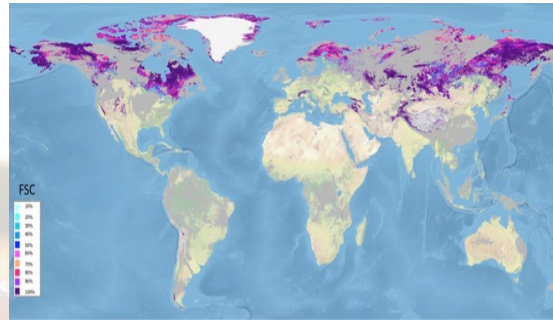


Planned

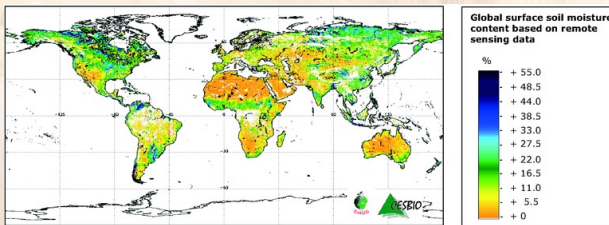
Land Surface Temperature (from AMSR)



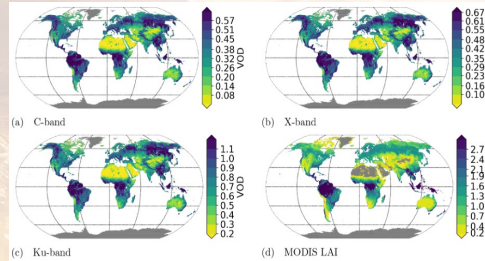
CCI Fractional Snow cover (SSM/AMSR)



EEA Global Soil Moisture (from SMOS)



Vegetation Indices (VOD+)



(Moesinger et al., 2020)

Explainer

- CIMR will provide (all weather) measurements of land surface temperature, soil moisture, vegetation state and snow parameters at improved accuracy and/or spatial resolution available from current MW sensors*.
- CIMR will combine spatial resolution of 10km gridded with sub-daily revisit in the Polar regions, allowing improved monitoring globally
- CIMR measurements will be co-located and contemporaneous in near all weather conditions – day and night with global coverage every day.
- CIMR is a [Sentinel Expansion Mission](#). Two units are currently being developed and will be available for launch as from 2028 subject to budget availability.
- Know more [AT THIS LINK](#)

*CIMR innovative deployable antenna will allow MW passive measurements at lower frequencies but higher resolutions than what is currently available



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LSTM – Land Surface Temperature Monitoring

The watchdog mission for sustainable agriculture and water productivity



Planned



- ✓ **Time series of evapotranspiration (mm/day) at field level and up to daily revisit.** Around 70% freshwater is extracted for irrigation while wide parts of Europe is and will increasingly suffer under droughts and water scarcity.
- ✓ As shown in the video, Sentinel-3 data can be combined with Sentinel-2 data to provide evapotranspiration maps synthetically sharpened to 20m resolution. **LSTM, however, will provide real measurements at 50m, with no need to sharpen from 1km to 20m.** LSTM will provide 400 times higher resolution than Sentinel-3, with a comparable revisit time.

Explainer

- LSTM will **support agriculture management services** and improve sustainable **water productivity at field scale** optimizing irrigation practices.
- LSTM will provide Thermal Infra-Red observations in **5 thermal bands with world-class radiometric accuracy (1-1.5K LST) with 2 days revisit** at the Equator (with 2 satellites).
- LSTM's unprecedented **50 metre** resolution will be much higher than what is currently available and is compatible with typical sizes of European agricultural fields.
- LSTM is a [Sentinel Expansion Mission](#). Two units are currently being developed and will be available for launch as from 2028 subject to budget availability.
- Know more [AT THIS LINK](#)



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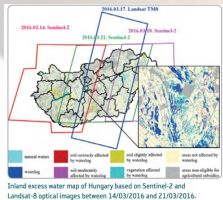


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Copernicus4regions User Stories

Selected user testimonials from European public authorities

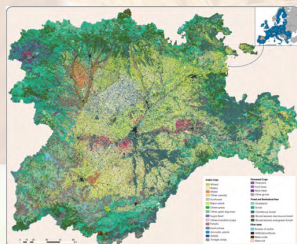


Damage maps can substitute a large number of on-the-spot checks, leading to substantial cost reductions for authorities and clients likewise."

Hungarian Paying Agency [\(LINK\)](#)

Using Sentinels to check damaged fields lets us finish compensation payments in less than two months from the first drop of rain."

Indulis Abolins, Deputy Director of Rural Support Service [\(LINK\)](#)



This crop map will allow us to monitor agricultural activities as well as improve the effectiveness of the CAP controls and reduce the farmer's paperwork."

Juan Pedro Medina Rebollo D.G. Regional Paying Agency Castilla Y leon

Space-based services enable paying agencies to improve transparency, reduce administrative burden and efficiently monitor farmers' compliance to CAP obligations."

*Alberto Lafarga,
Institute for Agrifood Technology and Infrastructures of Navarra INTIA*

This application of Copernicus Sentinels will significantly improve the way which farmers are doing online aid applications and, for the Walloon Paying Agency, will help to check the Land Parcel Identification System up-to-date and to move to new checks by monitoring."

*Alain Istasse,
General Inspector of Aids Department, General Direction of Agriculture, Natural Resources and Environment, Public Service of Wallonia*

The interpretation of satellite-based vegetation condition information especially with a higher spatial resolution will support the monitoring of the drought stress, and can facilitate decision making."

*Tatyana Ademenko,
Ukrainian Hydrometeorological Center*

With Copernicus satellite data, farmers will no longer spend time on declarations, but will receive fair payments for their hard work."

*Erikas Bernotoas,
Lithuanian Paying Agency Director [\(LINK\)](#)*

User quotes from [NEREUS/ESA/EC 2018](#)



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Question Time!

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AGENDA](#)



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Take Home messages



- Copernicus provides evidence-based, actionable information, which has become imperative today to limiting the impacts of climate change, support mitigation and adaptation and counter disinformation
- Copernicus data and products provide a robust base for the implementation of the Green Deal (*climate change monitoring, mitigation and adaptation, carbon neutrality and net zero, forestry, agriculture, food and water security, civil protection, environment and biodiversity protection*)
- Use of Copernicus on regional level is essential to provide real added value to EU citizens and companies and boost Member States economy



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Invitation to Copernicus4Regions Lunch Event

Members of Parliament are invited to attend the Lunch Event and contribute to the discussion.



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DRAFT PROGRAMME

COPERNICUS4REGIONS

Lunch debate on the Copernicus Programme and its current and future contribution to EU policies



25 October 2023 | 12:30–15:00 | European Parliament, Brussels | Members' Salon
Hosted by Adam Jarubas, Member of European Parliament

12:15 - Arrival of participants at the Salon

Copernicus – a tool for EU policies

12:30 - Welcome - MEP Adam JARUBAS

12:40 - Copernicus4regions user story: "Forest monitoring in Poland using Sentinel-2 data"
Kamil Szpakowski, General Directorate of the State Forests
Agata Hościło, Institute of Geodesy and Cartography (IGiK)

12:50 - First panel debate: "Copernicus: a tool for EU policies"
introduced by Christoph Kautz, Director for Satellite Navigation and Earth Observation, DG-DEFIS, European Commission

13:25 - Copernicus4regions user story: "New frontier for emergency response: satellite data"
Carlo Dall' Oppedio, Chief of the Italian National Fire and Rescue Service

13:30 - Second Panel Debate "Copernicus: a tool for Public Administrations"
introduced by Thierry Cotelte, NEREUS-president

14:00 - Copernicus4regions user story: "Water Management in Catalonia using Sentinel data"
Miriam Moyset, Director | Julià Talaya, Deputy Director | Oscar Mora, Remote Sensing Engineer
Institut Cartogràfic i Geològic de Catalunya

14:15 - Third Panel Debate: Future of Copernicus
introduced by Simonetta Cheli, Director of Earth Observation Programmes, ESA

14:45 - Concluding remarks

15:00 - End of Debate

Moderated by

Tanja Baerman

Head of the Representation of the Free Hanseatic City of Bremen to the European Union

The event will be live streamed

A seated light lunch will be served

Debate language: English, with interpretation from Polish

<https://www.nereus-regions.eu/copernicus4regions/>

#Copernicus4regions



Ancillary information

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