

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



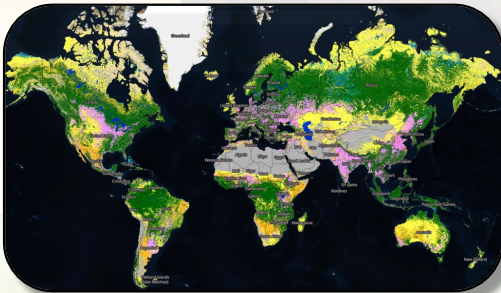
**High Resolution Layer
Vegetated Land Cover
Characteristics**
2015-17-18-19-20-21-22...



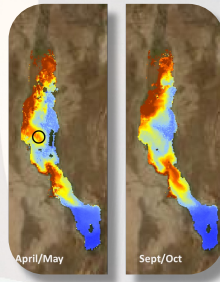
**High Resolution Layer
Small Woody Features**
2015-18-21



**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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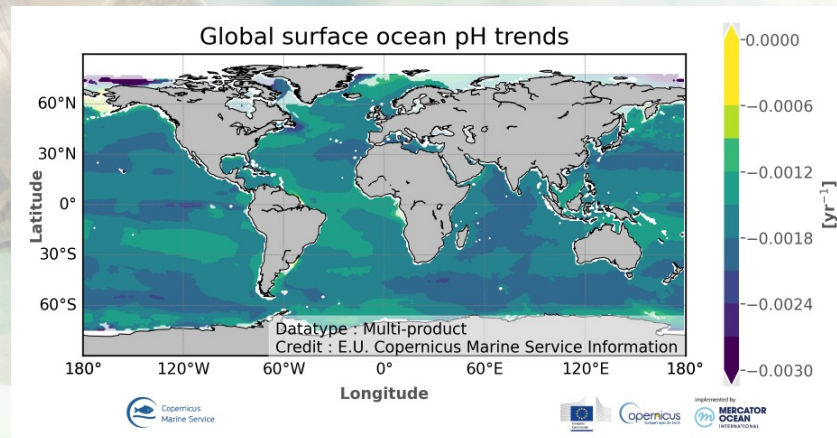
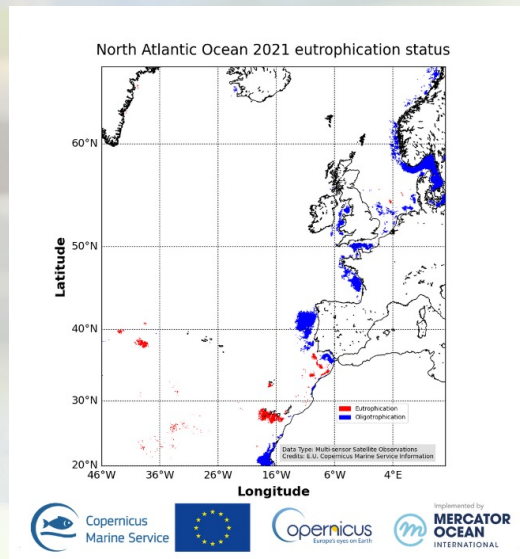
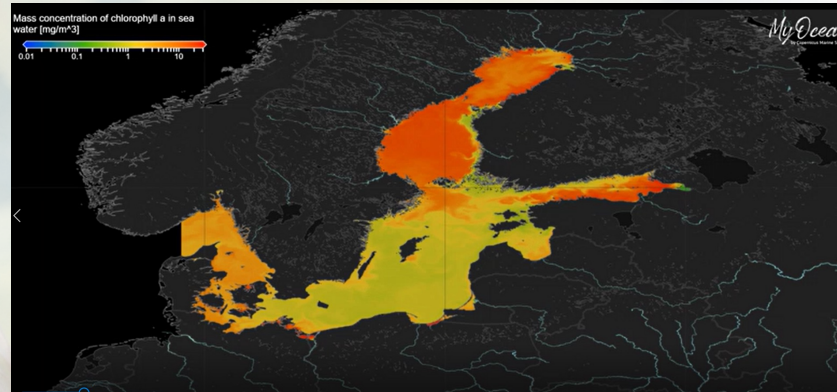


Copernicus Marine Service

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](#)



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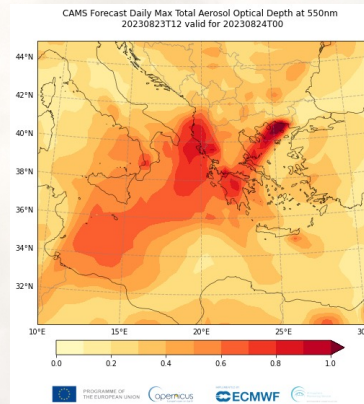


Copernicus Atmosphere Monitoring Service



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

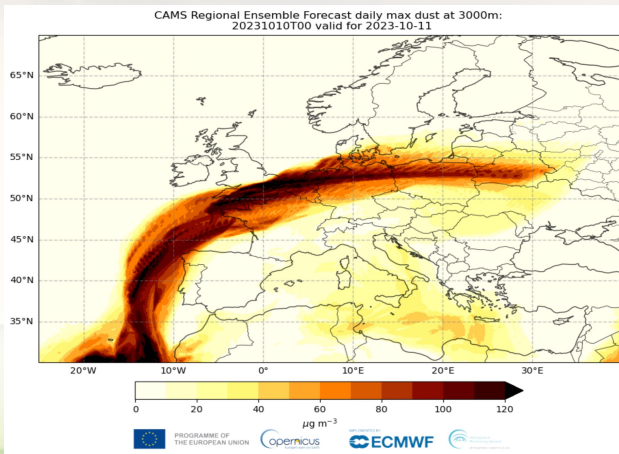
Based on models, in-situ observations and satellite observations (e.g. **S5-P**)

+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.

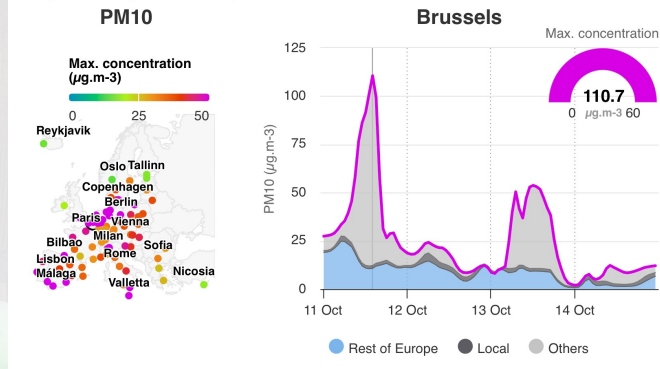
Close engagements with **EC DGs ENV, CLIMA, ENER** and **SANTE** as well as **EU Member States**. Latest policy workshop in Greece on 4.10.23

Know more → [CAMS](#)

vincent-henri.peuch@ecmwf.int



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

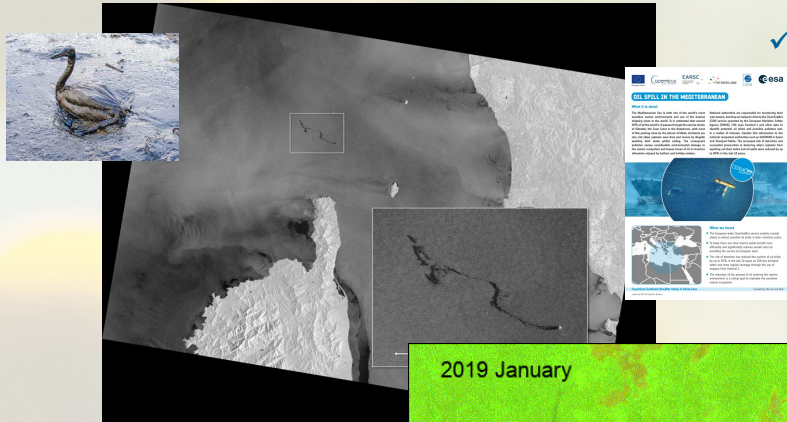


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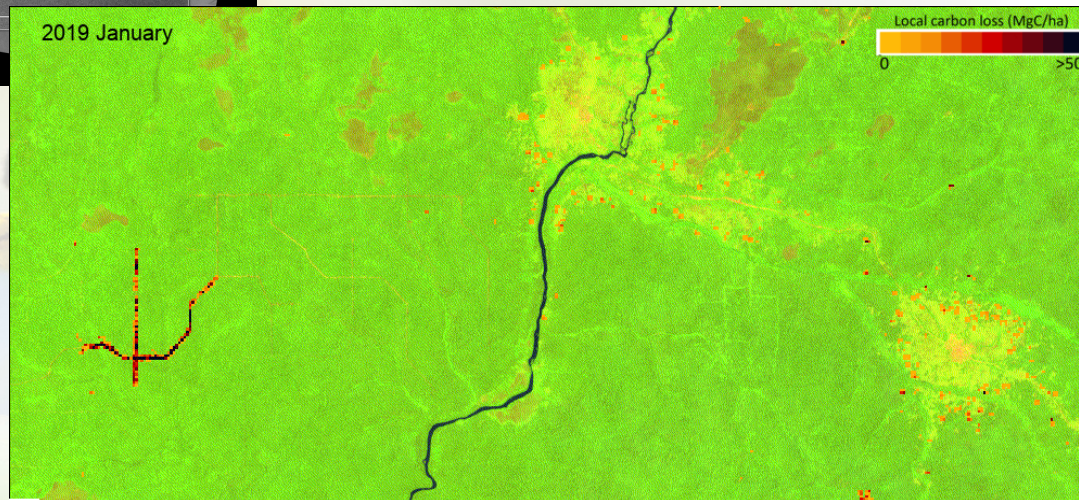
Sentinel-1

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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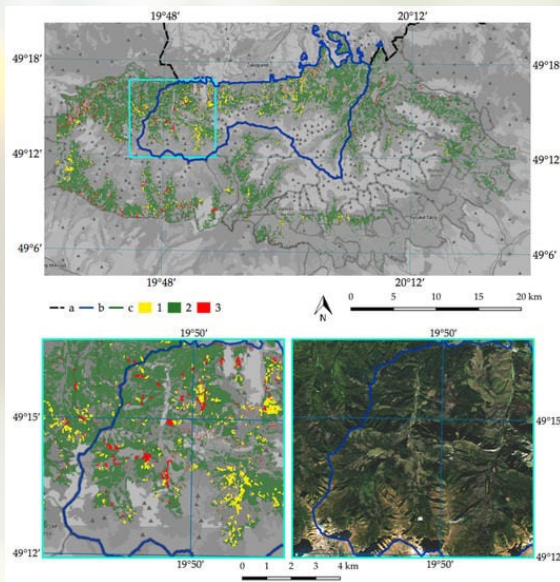


Sentinel-2



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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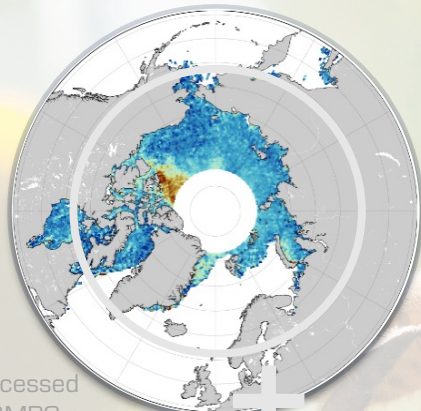


Sentinel-3 (land)

The large-scale and frequent measurements of multiple environmental parameters



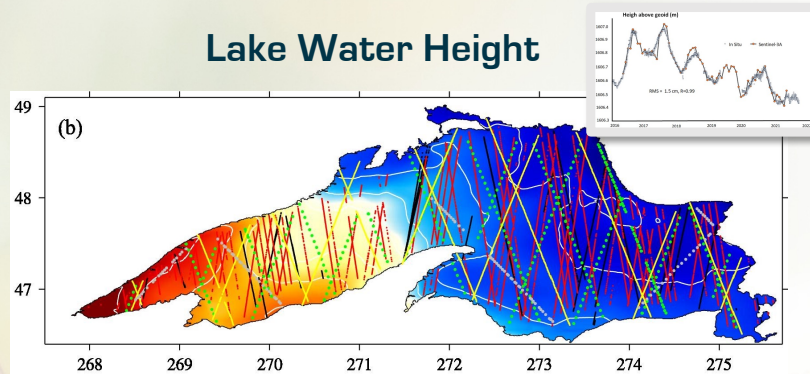
Sea ice thickness



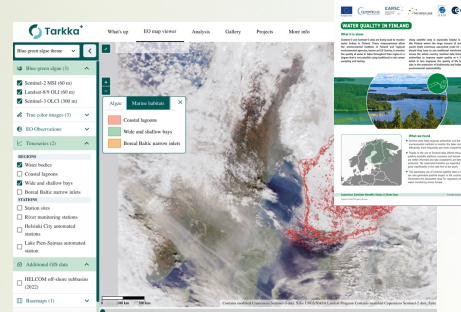
© processed by S3MPC.

- ✓ 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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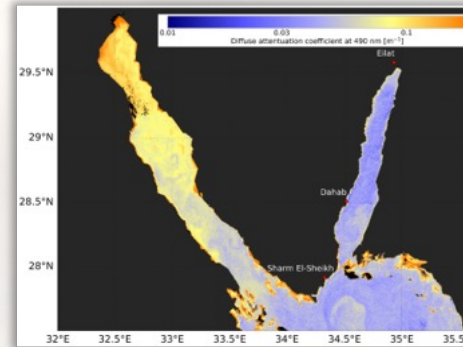
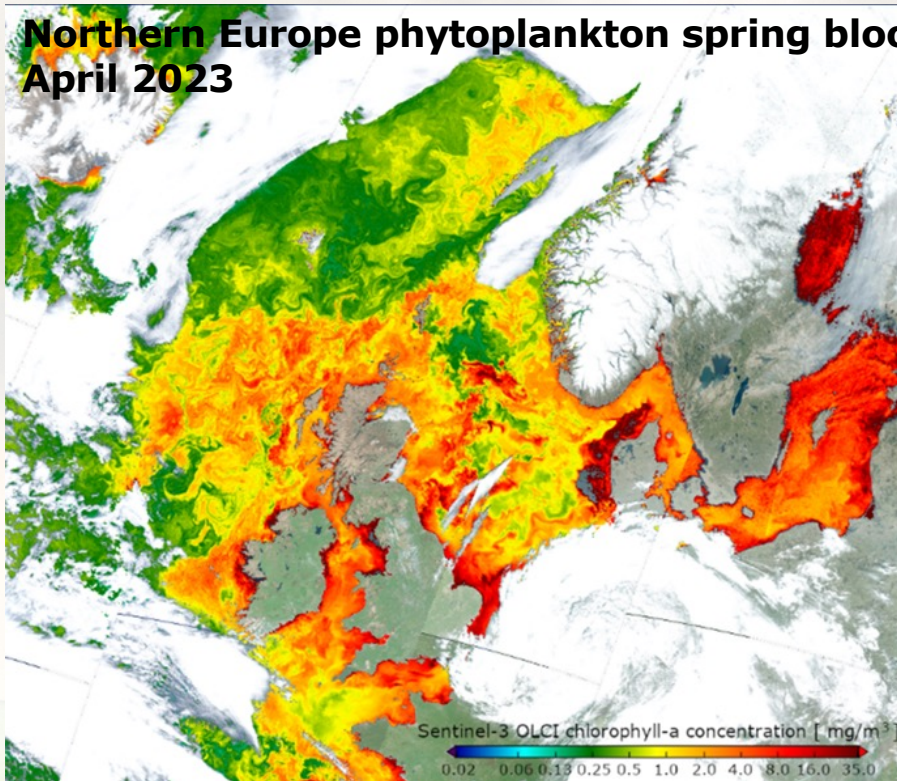


Sentinel-3 (dynamics of ocean biology)



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](#)

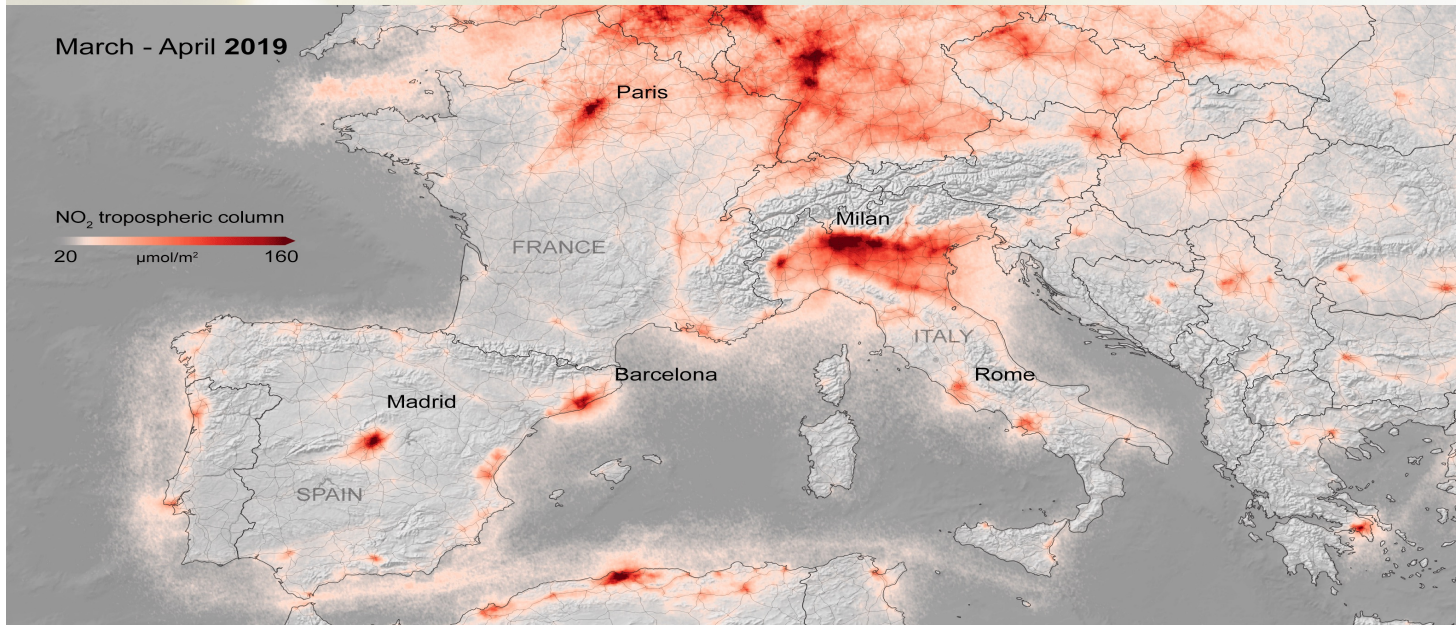


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Sentinel-5P

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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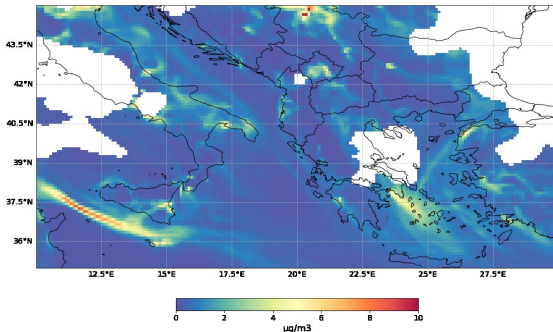
Sentinel-4

The game changer for operational satellite air quality information over Europe

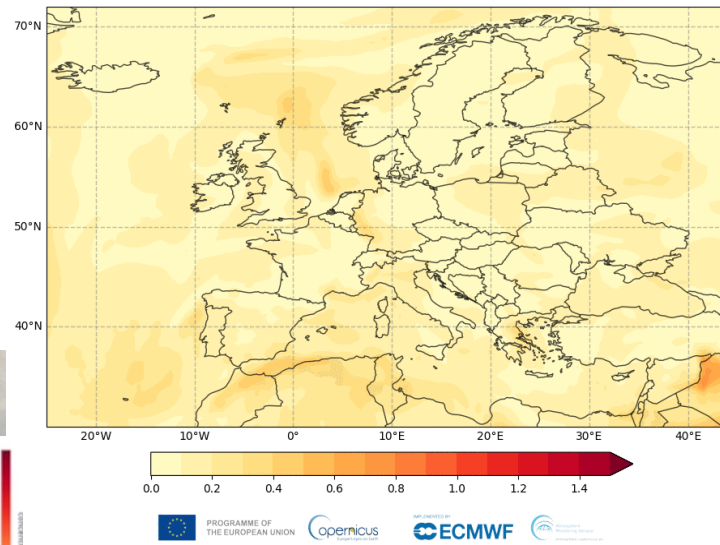


- ✓ Important input for air quality applications ('clean air') for citizens and policy development.

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

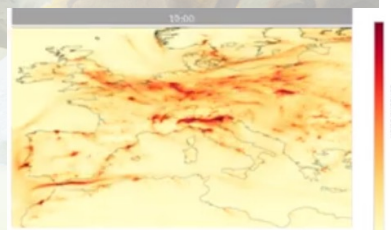
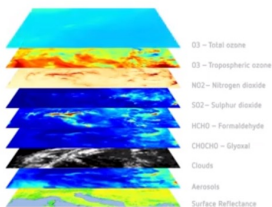


CAMS Analysis Total Aerosol Optical Depth at 550nm, 20220314T00



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](#)



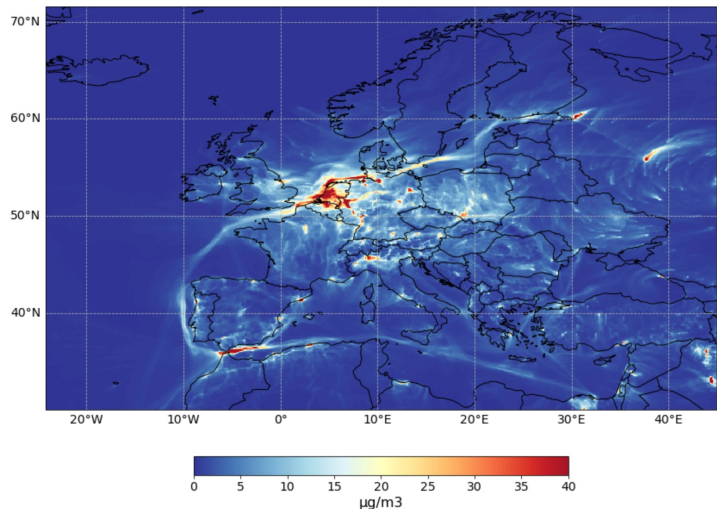
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Sentinel-5

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>



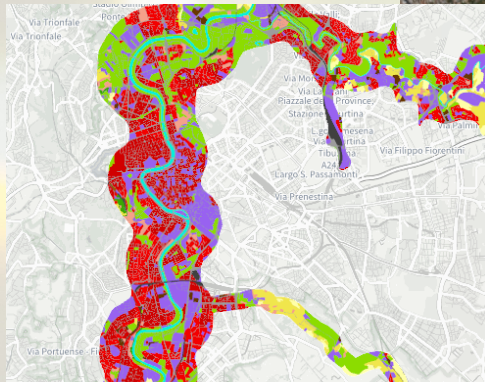
Explainer

- 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)



✓ VHR multispectral data provide an exceptional level of detail, allowing for accurate mapping and delineation of the variations in riparian zones.

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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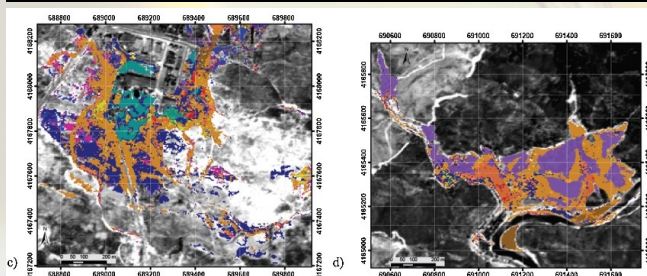
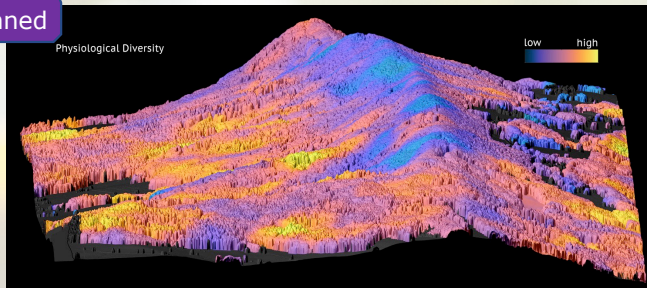
CHIME

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

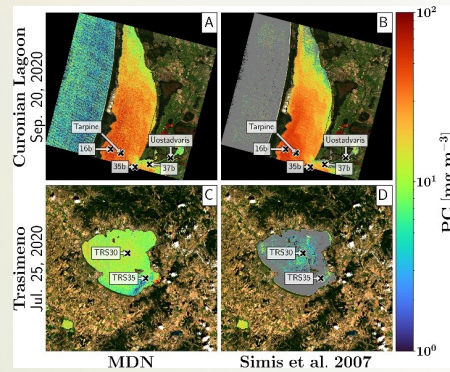


Planned

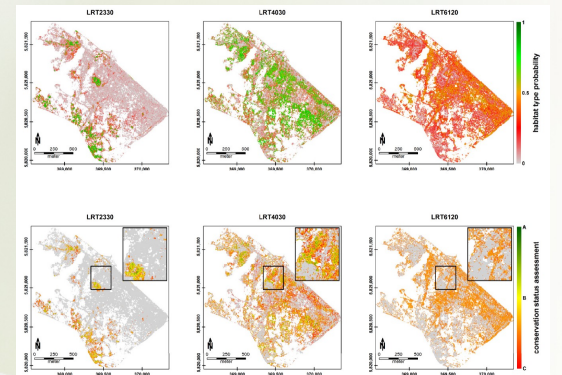


- EM 1 - GT mu
- EM 2 - GT
- EM 3 - GT-SCH mu
- EM 4 - GT-JR mu
- EM 5 - SCH-JR mu
- EM 6 - SCH-gt ch mu
- EM 7 - SCH-JR mu
- EM 8 - Soils with SCH-FERR gt mu
- EM 9 - Soils with GT-FERR
- EM 10 - JR-SCH ferr mu
- EM 11 - JR-GT mu
- EM 12 - HE mu
- EM 13 - HE
- EM 14 - HE
- EM 15 - CO me sch
- EM 16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

O'Shea et. al (2021)



MDN 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](#)



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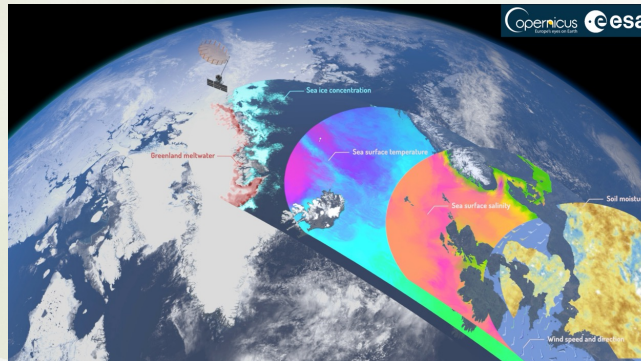
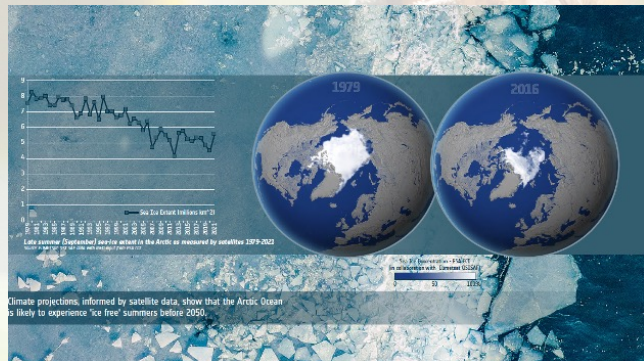
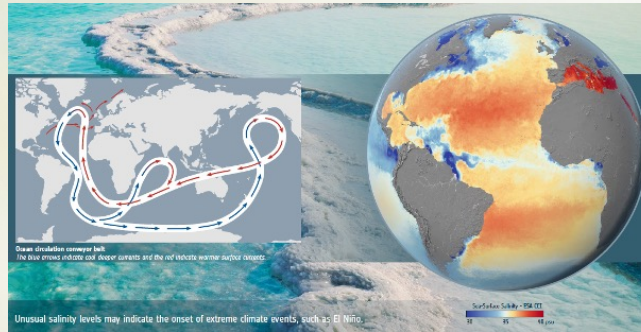
CIMR - Copernicus Imaging Microwave Radiometer



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.”

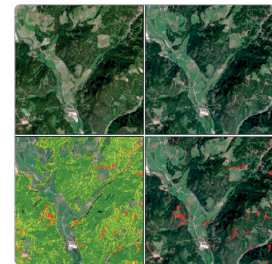
Aurélien Bellanger, Communauté de Communes du Pays de Dol et de la Baie du Mont-Saint-Michel [\(LINK\)](#)

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

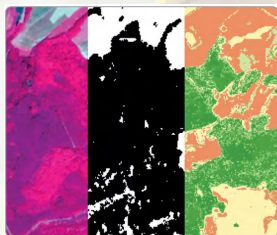
Ute Dauert, German Environment Agency [\(LINK\)](#)

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

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



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



Forest mask and tree density generated for a test site in the forest district Heildburg 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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