The EU Earth Observation Programme Copernicus

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International Cooperation

Directorate-General for Defence Industry and Space

TAT 2021 – 3. June 2021

Space

f Copernicus EU 📺 Copernicus EU

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COPERNICUS architecture

FULL, FREE AND OPEN

SENTINEL-1: 4-40m resolution, 3 day revisit at equator	2 Sats in orbit
SENTINEL-2: 10-60m resolution, 5 days revisit time	2 Sats in Orbit
SENTINEL-3: 300-1200m resolution, <2 days revisit	2 Sats in Orbit
SENTINEL-4: 8km resolution, 60 min revisit time	1st Launch in 2020
SENTINEL-5p: 7-68km resolution, 1 day revisit	1 Sat in Orbit
SENTINEL-5: 7.5-50km resolution, 1 day revisit	1st Launch in 2021
SENTINEL-6: 10 day revisit time	1st Launch in 2020

Sentinels

6 services use Earth Observation data to deliver

CLIMATE CHANGE

MARINE MONITORING.

ATMOSPHERE MONITORING

LAND MONITORING

SECURITY

EMERGENCY MANAGEMENT

added-value products

Contributing missions

In Situ

Monitoring the State of the Earth System Environment ...

... Six cross-cutting Thematic Services

Land Monitoring

Ecosystems

Biodiversity

Agriculture

Forestry

Energy

Natural Resources

Water

Urban planning

Global

VEGETATION

ENERGY

WATER

Pan-European

EU Land Cover

Specific land cover info

Hydrographic and elevation reference maps

% of built-up area
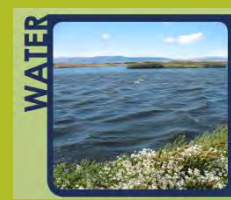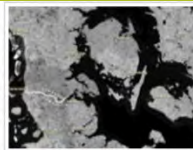
Image Mosaics
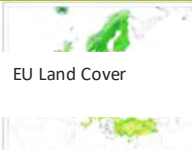
CORINE Land Cover

High Resolution Layers

Reference Data
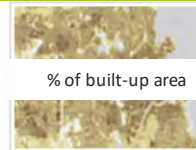
Related Pan-European products

Local

Urban Atlas
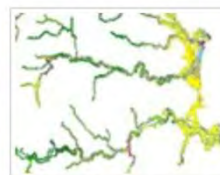
Riparian Zones

Natura 2000 (N2K)

Marine Monitoring

Marine safety

Marine resources

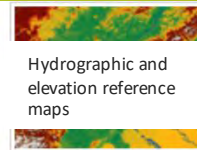**Coastal and marine environment**

Climate and meteorological forecasting

Other: Transport, Tourism, Environment, Pollution, Energy, etc.

Sea Level

Ocean Salinity

Ocean Temperature

Sea Ice

Wind

Ocean Currents

Ocean Colour / Biogeochemistry
(e.g. optics, chlorophyil, biology, chemistry)

Marine Monitoring

Ice

Sea Level

Currents

Biogeochemistry

Temperature

Salinity

A 3D and consistent estimation of the ocean state
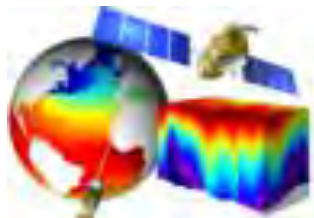
1. Global
2. Arctic
3. Baltic
4. NWS
5. IBI
6. Med Sea
7. Black Sea

- **Global** and **Regional**
- Real time and **Reanalyses**
- **Satellite** & **In Situ** obs. and **Models**

CMEMS in support of policies

Marine Monitoring

ESSENTIAL OCEAN VARIABLES
Ocean state report - Ocean monitoring indicators

POLAR ENVIRONMENT MONITORING

WATER QUALITY

SAFETY & DISASTER

NATURAL RESOURCES & ENERGY

SCIENCE & CLIMATE

COASTAL MONITORING

MARINE FOOD

MARINE NAVIGATION

SOCIETY & EDUCATION

Physics
BLUE
Winds
Waves

WHITE
Sea-ice
icebergs

Biology
Carbon
GREEN
Chemistry
Optical properties
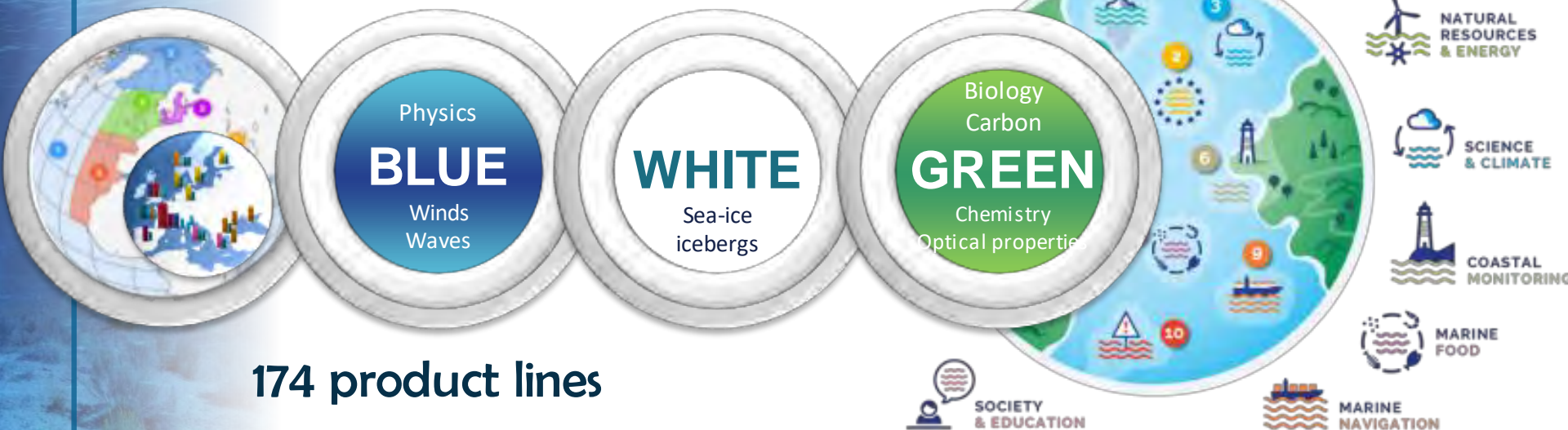
174 product lines

Past 45 years   Daily / hourly   2 to 10 days forecasted

2-7 km pan-EU   **12 km global**

MARINE CONSERVATION
Copernicus
Europe's eyes on Earth
European Commission

Implemented by
MERCATOR OCEAN
INTERNATIONAL

Atmosphere
Monitoring

Health

Environment

Pollution

Climate

Renewable Energy

Air Quality and Atmospheric Composition

Climate forcing

Ozone layer & UV
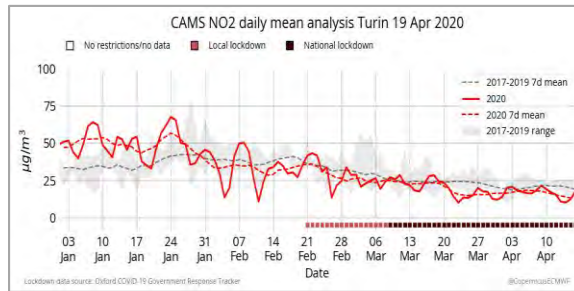
Solar radiation

Emissions and surface fluxes

Atmosphere Monitoring

https://atmosphere.copernicus.eu/european-air-quality-information-support-covid-19-crisis

Maps and animations of the latest situation in Europe.

Air pollution across Europe compared to 2017-2019 and as a function of lockdown measures.

Forecast model estimate of reduction in air pollution is expected on a daily basis accounting for weather effects.
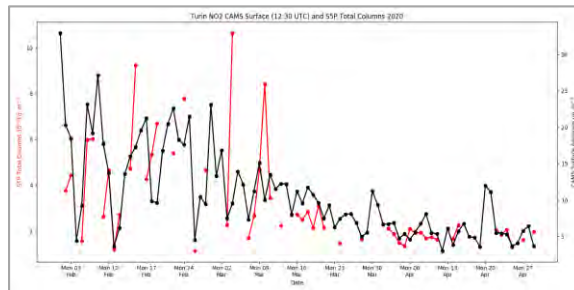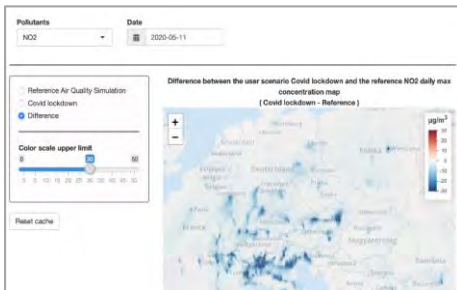
How consistent are surface and satellite measurements?

CAMS currently contributes to a number of epidemiological studies trying to evaluate the links between air pollution and COVID-19 (effects of long- and short-term exposure; fine particulate matter as a potential vector in air for the virus?...)

CAMS regional air quality forecasts: Météo-France, Ineris (FR)
CAMS COVID-19 scenario forecasts: Ineris (FR)
CAMS website: ECMWF

Climate Change

Climate change	**Consistent Estimates of the Essential Climate Variables (ECVs)**
Mitigation and adaptation	
Weather forecast	**Support to Mitigation and Adaptation Strategies**
Pollution	**Global and Regional Reanalyses**
Environment	
Health	**Seasonal Forecasts And Climate Projections**
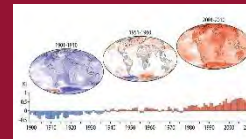
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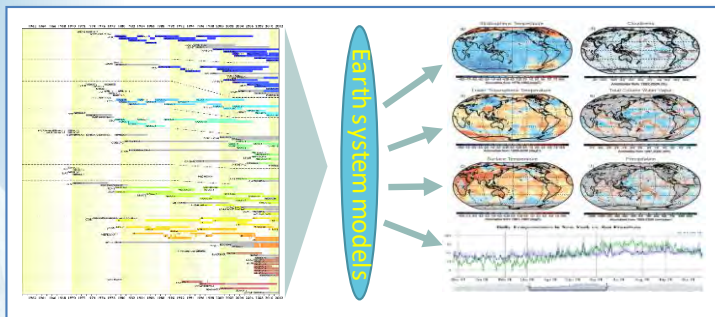
Climate Change

Observations and climate reanalyses

Seasonal forecast data and products

Climate model simulations

Sectoral climate impact indicators

One stop shop Climate Data Store

65 000 users
60 Tbytes/day
>80 datasets and 20 Apps

Climate
Change

C3S supports 22 ECV services grouped in 5 thematic areas:

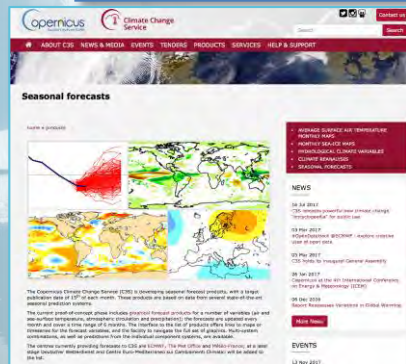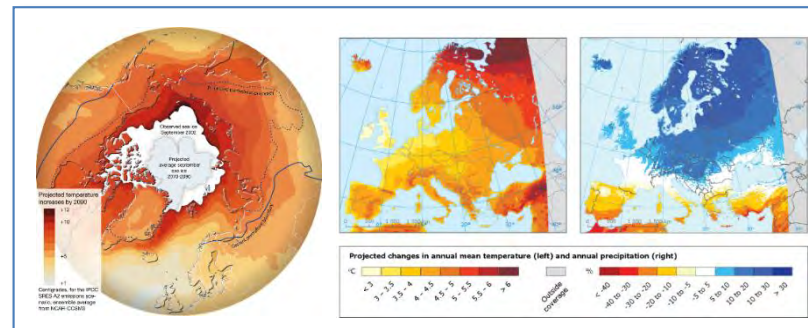| Atmospheric physics |
| --- |
| Precipitation |
| Surface Radiation Budget |
| Water Vapour |
| Cloud Properties |
| Earth Radiation Budget |

Atmospheric composition
Carbon Dioxide
Methane
Ozone
Aerosol

Ocean
Sea Surface Temperature
Sea Level
Sea ice
Ocean Colour

Land hydrology & cryosphere
Lakes
Glaciers
Ice sheets and ice shelves
Soil moisture

Land biosphere
Albedo
Land Cover
Fraction of Absorbed Photosyntheti
Leaf Area Index
Fire

New ECV products published recently
- Global GPCP precipitation dataset with monthly means since 1979 and daily means since 1996
- Tropospheric humidity profiles averaged monthly and zonally from 2006
- Sea ice products (thickness/concentration/edge/type)
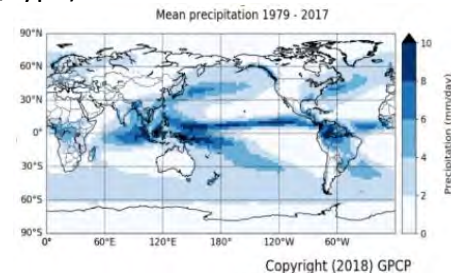
New data added constantly to the catalogue
- S3-SLSTR extends Surface Radiation Budget CDR
- New GOMOS data for Aerosols
- Recent v5 of ocean colour added

Mean precipitation 1979 - 2017

Copyright (2018) GPCP

Quality Assurance tab implemented for several ECVs (more to come)
- Transparency / traceability
- Uncertainty quantification
- Fitness for purpose

Enhancement of individual ECV services continues
- Toolbox applications submitted and will be integrated to the catalogue entries
- ECV products tutorials added
- Further evolution of catalogue entries

European Commission | Copernicus Europe's eyes on Earth

Emergency Management

Disaster Emergency Situations

Humanitarian Crises

RESILIENCE

RECOVERY

EMERGENCY RESPONSE

PREPAREDNESS

Risk & Recovery Mapping:
- **Reference Maps**
- **Pre-disaster Situation Maps**
- **Post-disaster Situation Maps**

Rapid Mapping:
- **Reference Maps**
- **Delineation Maps**
- **Grading Maps**

Early Warning:
- **Floods: EFAS**
- **Forest Fires: EFFIS**

EFAS = European Flood Awareness System;
EFFIS=European Forest Fire Information System

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User Uptake

Data to Users

- **Copernicus cooperation arrangement with Australia**
- **=> Geoscience Australia created a local data hub for all users for Australia and the region**

User to Data

- **New Copernicus Data and Information Access Systems (DIAS)**
- **=> 5 commercial consortiums provide platforms for everyone to use**
- **Copernicus data is free, the use of the computing power needs to be paid**

User Uptake

Access to Satellite data

esa

FULL, FREE AND OPEN *

sentinel data hub

Scientific and Other Access

https://scihub.copernicus.eu/

esa

CSC data access

*Copernicus Space Component Data Access Portal**
CSC-DA

https://spacedata.copernicus.eu/

EUMETSAT

FULL, FREE AND OPEN *

- Copernicus Online Data Access (CODA)

- EUMETCast: **www.eumetcast.com**
Needs to get a station and pay a yearly fee

Access to Copernicus Services Data

FULL, FREE AND OPEN

- Land-related data: http://land.copernicus.eu
- Atmosphere-related data: http://atmosphere.copernicus.eu
- Marine-related data: http://marine.copernicus.eu
- Emergency-related data: http://emergency.copernicus.eu
- Climate change-related data: http://climate.copernicus.eu (Beta version)

* Not for Security Services
And
Data purchased from third parties

(*) Includes instructions on how to access Contributing Missions data

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User Uptake

- Creotech (PL) with cloud provider CloudFerro (PL): **http://www.creodias.eu**

- Serco (IT) with cloud provider OVH (FR): **http://www.onda-dias.eu**

- Airbus (FR) with cloud provider Orange (FR): **http://www.sobloo.eu**

- ATOS (FR) with cloud provider T-Systems (DE): **www.mundiwebservices.eu**

- EUMETSAT, with Mercator Ocean and ECMWF: **http://wekeo.eu**

Copernicus

Protect people and assets

Increase general knowledge on the state of the Planet

The Union Earth Observation and monitoring programme

Improve environmental policy effectiveness

Monitor the environment

Facilitate adaptation to climate change

www.copernicus.eu

Foster downstream applications in a number of fields

Help managing emergency and security related situations