Copernicus

A success story in the global context

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European Commission

Copernicus
Europe's eyes on Earth

Space

Copernicus EU

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www.copernicus.eu

Copernicus timeline

1998
Baveno Manifesto
(first reference to Global Monitoring for Environmental Security)

2005
GMES flagship of EU Space Policy
ESA approves GMES Space Component Programme

2001
Gothenburg EU Summit
(first EC involvement in establishing European capacity for monitoring the environment from space)

2006
EC dedicated unit (GMES Bureau) in charge of Programme development and implementation

2008
EC - ESA agreement on GMES signed.
GMES services presented at Lille Forum

2011
Start of
GMES Initial Operations (GIO) phase

2012
GMES renamed "Copernicus"

2014
Start of Copernicus full operations phase

2013
EC proposed
Copernicus Regulation
Delegated act
on Copernicus
Data Policy

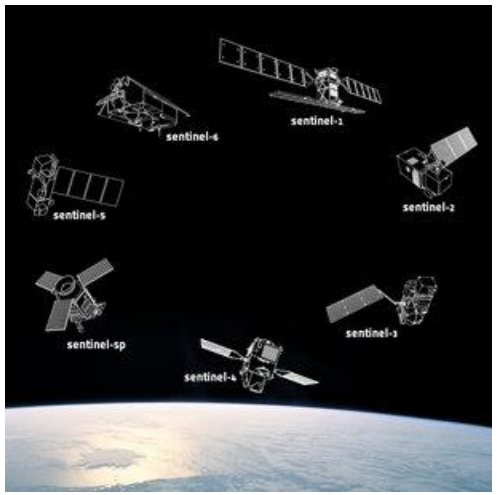
Copernicus Europe's eyes on Earth

European Commission

Copernicus
Europe's eyes on Earth

Architecture

European Commission



Sentinels

6 services use Earth Observation data to deliver …

…added-value products

Contributing missions

In Situ

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Copernicus
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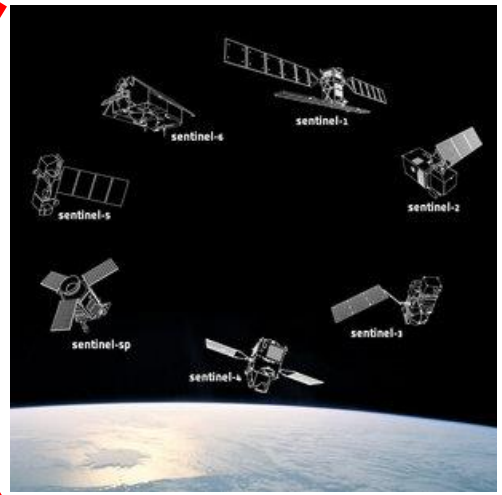
Observation infrastructure

European Commission



Sentinels

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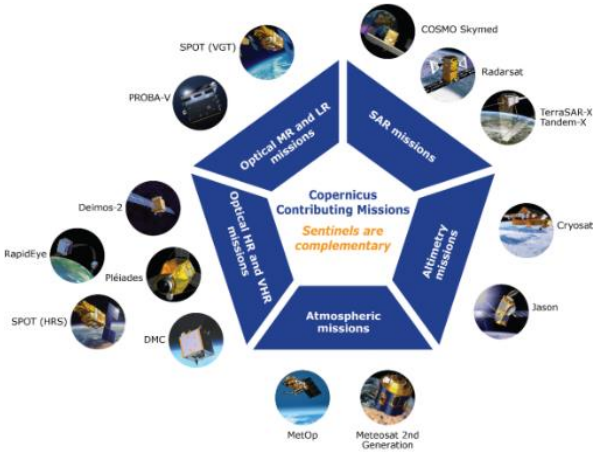

Contributing missions

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THE SENTINELS

FULL, FREE AND OPEN

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Sentinel Mission and Status		Key Features
SENTINEL-1: 4-40m resolution, 3 day revisit at equator	*2 Sats in orbit*	Polar-orbiting, all-weather, day-and-night radar imaging
SENTINEL-2: 10-60m resolution, 5 days revisit time	*2 Sats in Orbit*	Polar-orbiting, multispectral optical, high-res imaging
SENTINEL-3: 300-1200m resolution, <2 days revisit	*2 Sat in Orbit*	Optical and altimeter mission monitoring sea and land parameters
SENTINEL-4: 8km resolution, 60 min revisit time	*1st Launch in 2022*	Payload for atmosphere chemistry monitoring on MTG-S
SENTINEL-5p: 7-68km resolution, 1 day revisit	*1 Sat in Orbit*	Mission to reduce data gaps between Envisat, and S-5
SENTINEL-5: 7.5-50km resolution, 1 day revisit	*1st Launch in 2023*	Payload for atmosphere chemistry monitoring on MetOp 2nd Gen
SENTINEL-6: 10 day revisit time	*1st Launch in 2020*	Radar altimeter to measure sea-surface height globally

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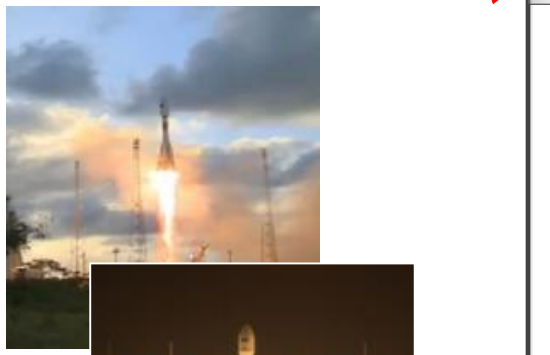
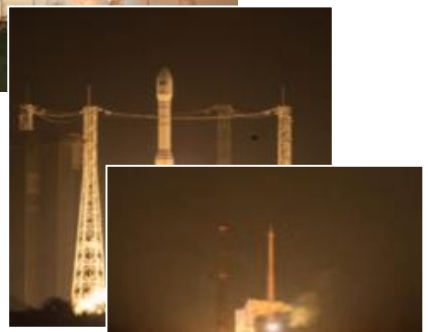
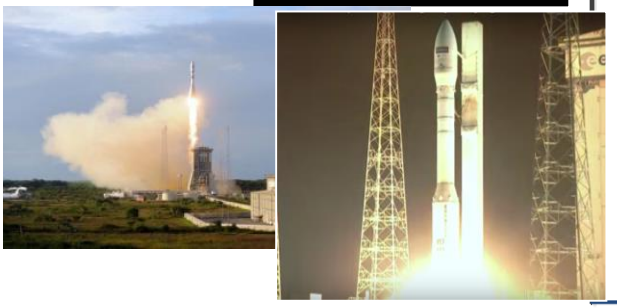
Continuity up to 2030







2014 2015 2016 2017 2018 2019 2020

FAR Sentinel 1A

FAR Sentinel 1B (recurrent)

FAR Sentinel 1C (recurrent)

PSR On-ground Storage Sentinel 1D (recurrent)

QAR Sentinel 2A

FAR Sentinel 2B (recurrent)

FAR On-ground Storage Sentinel 2C (recurrent)

PSR On-ground Storage Sentinel 2D (recurrent)

QAR Sentinel 3A

FAR Sentinel 3B (recurrent)

FAR On-ground Storage Sentinel 3C (recurrent)

PSR On-ground Storage Sentinel 3D (recurrent)

Sentinel 4A delivery to MTG-S1 Integration FAR Sentinel 4A (on MTG-S1)

Sentinel 4B delivery to MTG-S2 Integration Sentinel 4B - On-ground Storage (FAR 01/2029)

FAR On-ground Storage Sentinel 5 Precursor

Sentinel 5A delivery to MetOp-SG Integration FAR Sentinel 5A (on MetOp-SG A)

Sentinel 5B delivery to MetOp-SG On-ground Storage

Sentinel 5C delivery to MetOp-SG On-ground Storage

Sentinel 6A

On-ground Storage FAR Sentinel 6B

Operational predictability & continuity allows business plans to emerge

Legend: Qualification Acceptance Review (QAR) Flight Acceptance Review (FAR) or PreStorage Review (PSR) | On-ground Storage | Tentative launch date | In-orbit Commissioning

Status: 8 November 2016

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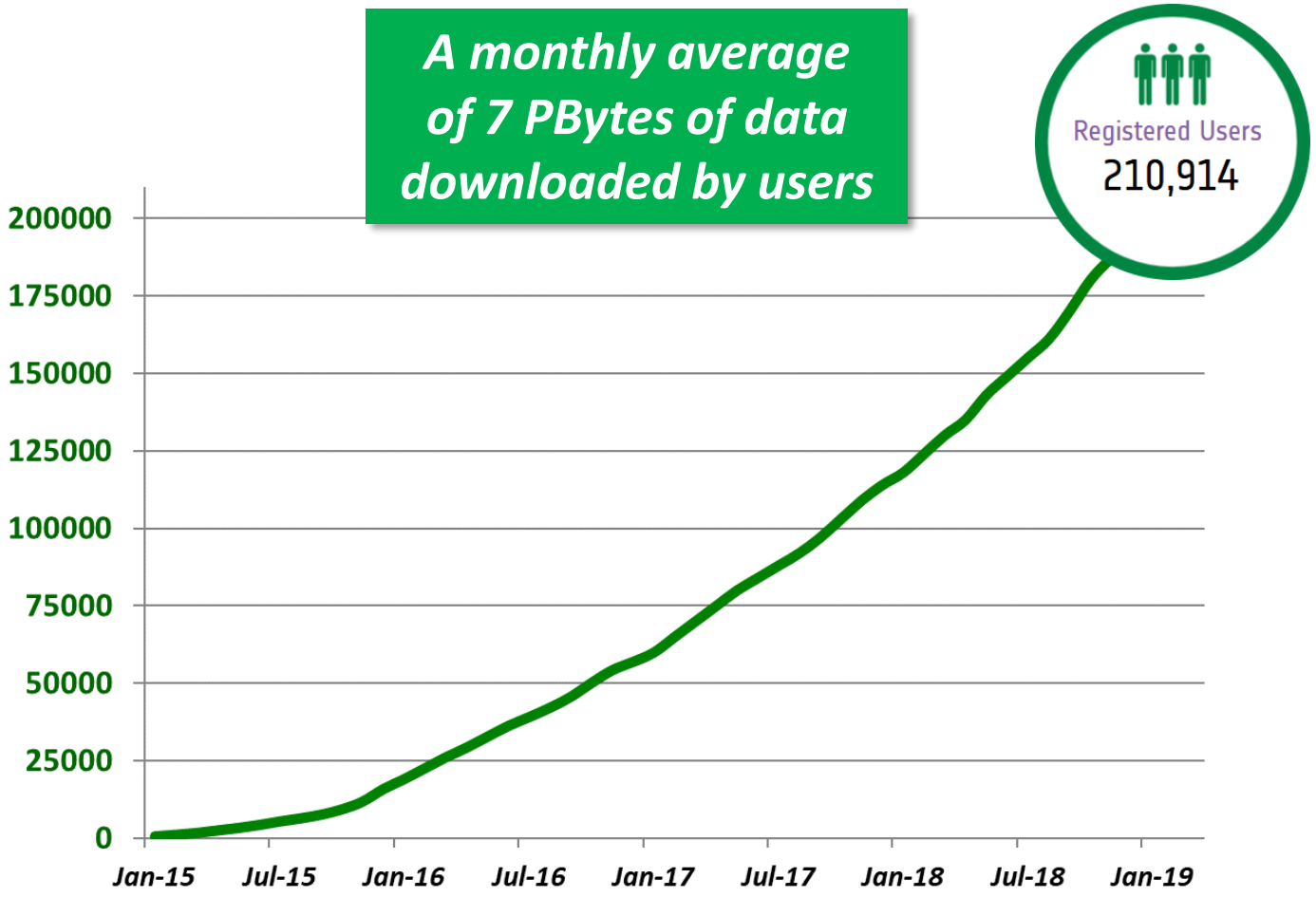
Commission

Number of registered users

A monthly average of 7 PBytes of data downloaded by users



sentinel-1a
sentinel-1b
sentinel-2a
sentinel-2b
sentinel-3a
sentinel-3b
sentinel-5p

Statistics at mid March 2019

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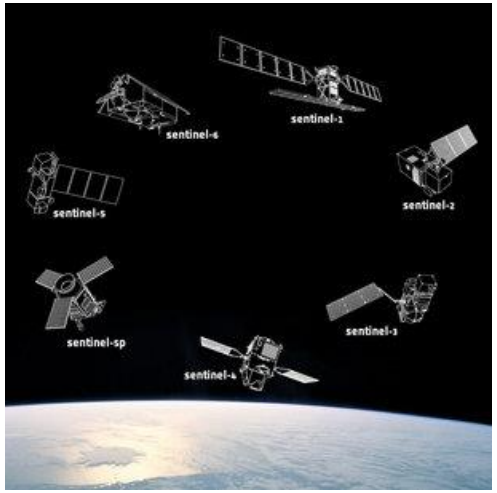
Geneva by Sentinel 2

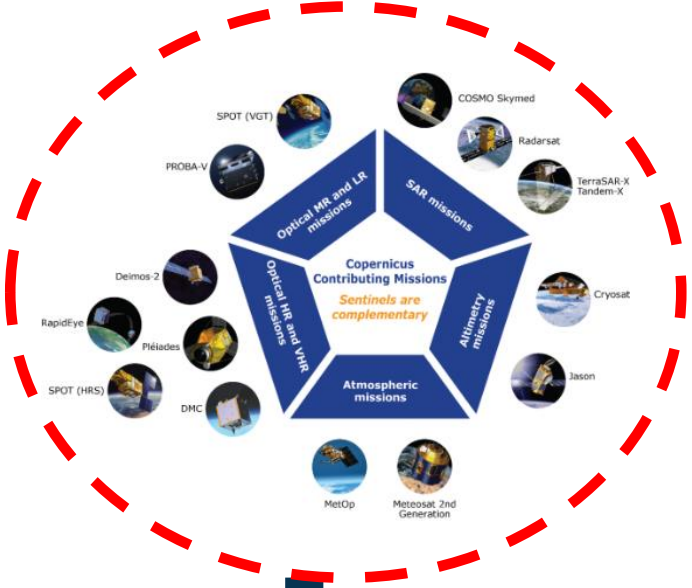
European Commission



Sentinels

6 services use Earth Observation data to deliver …

…added-value products



Contributing missions

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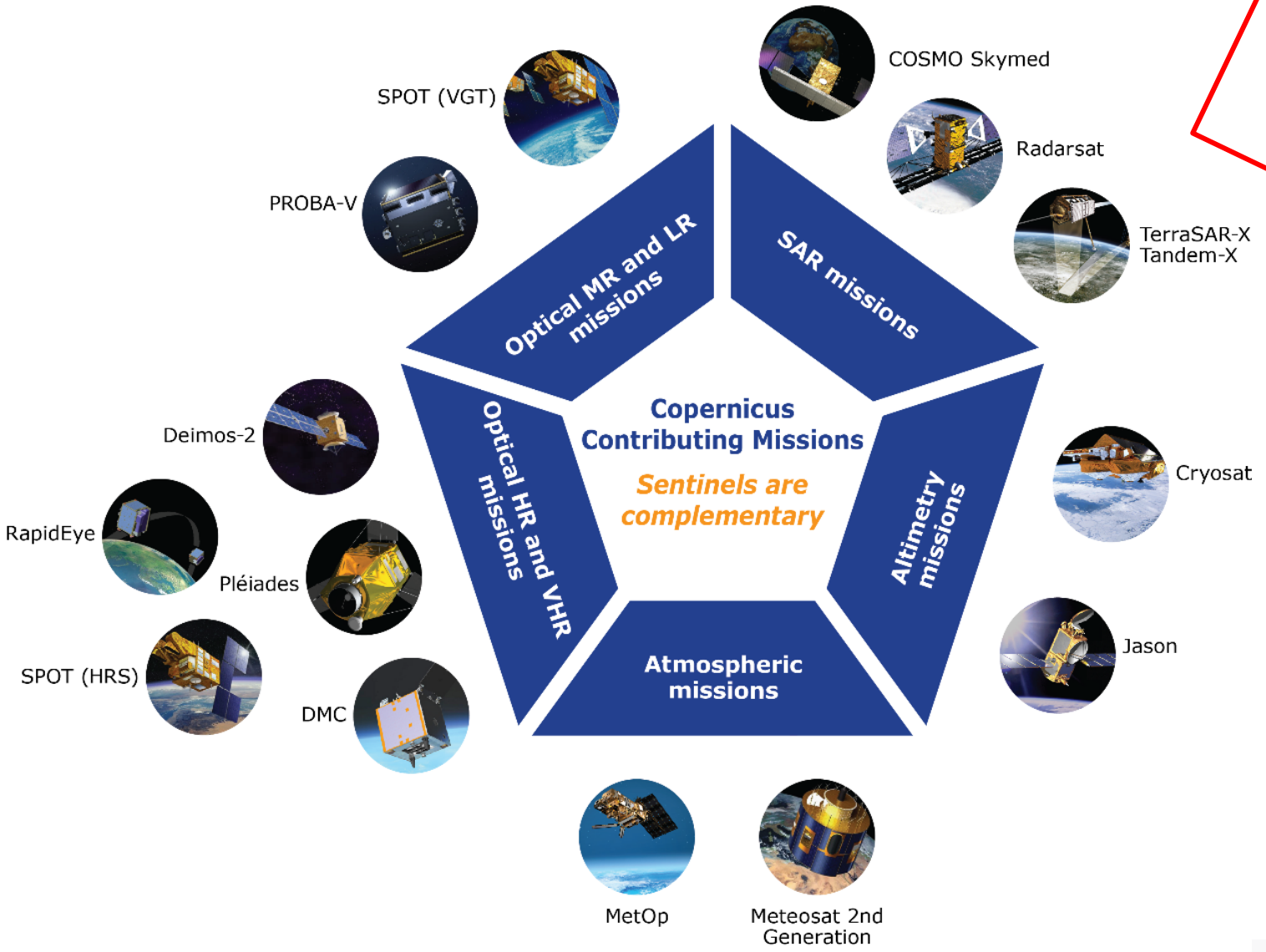
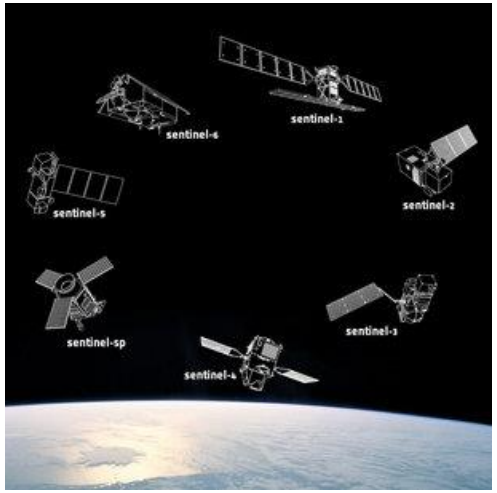
THE CONTRIBUTING MISSIONS

Subject to Data Owner's Data Policy



6 services use Earth Observation data to deliver …



Sentinels

…added-value products

Contributing missions

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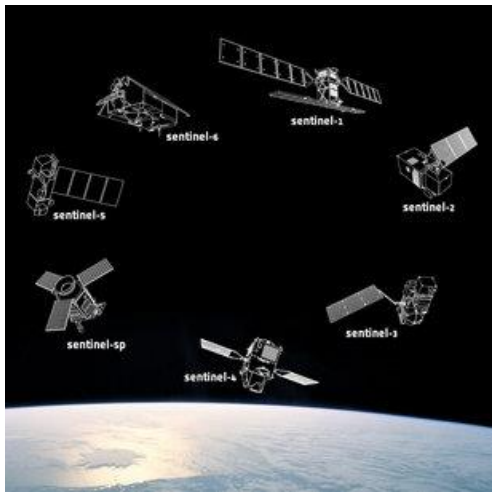
IN-SITU: OVERVIEW

- *In situ* data = observation data from ground-, sea-, or air-borne sensors, reference and ancillary data licensed for use in Copernicus
- Use of *In situ* data:
  - Validate & calibrate Copernicus products
  - Reliable information services
- Implementation in two tiers:
  - Tailored *in situ* data for each Copernicus service level
  - Cross-cutting coordination across services by the EEA

Services domains

European Commission



Sentinels

6 services use Earth Observation data to deliver …

…added-value products

Contributing missions

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COPERNICUS SERVICES

Monitoring the State of the Earth System Environment …

… Six cross-cutting Thematic Services

Copernicus Europe's eyes on Earth — European Commission

Land Monitoring

Benefit areas and products examples

- Ecosystems
- Biodiversity
- Agriculture
- Forestry
- Energy
- Natural Resources
- Water
- Urban planning

Global

Pan-European

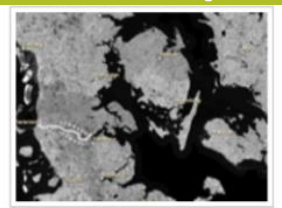


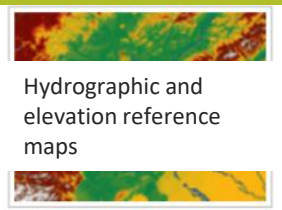
Image Mosaics

EU Land Cover

CORINE Land Cover

Specific land cover info

High Resolution Layers

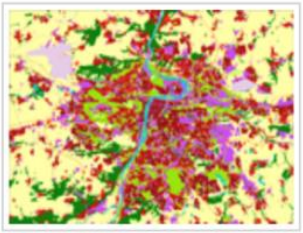

Hydrographic and elevation reference maps

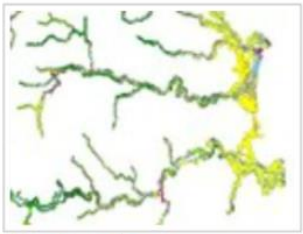
Reference Data

% of built-up area

Related Pan-European products

Local


Urban Atlas


Riparian Zones

Natura 2000 (N2K)

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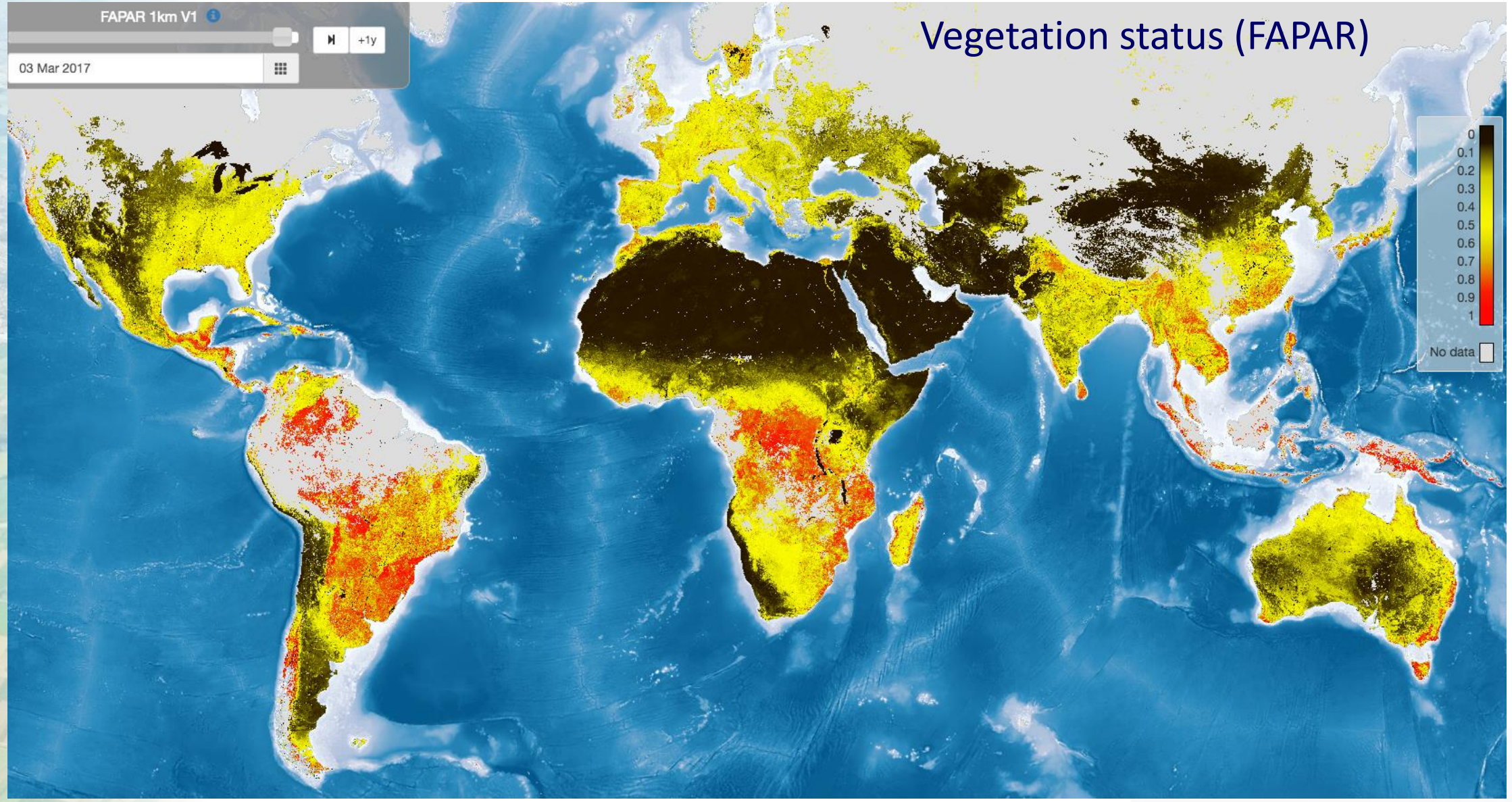
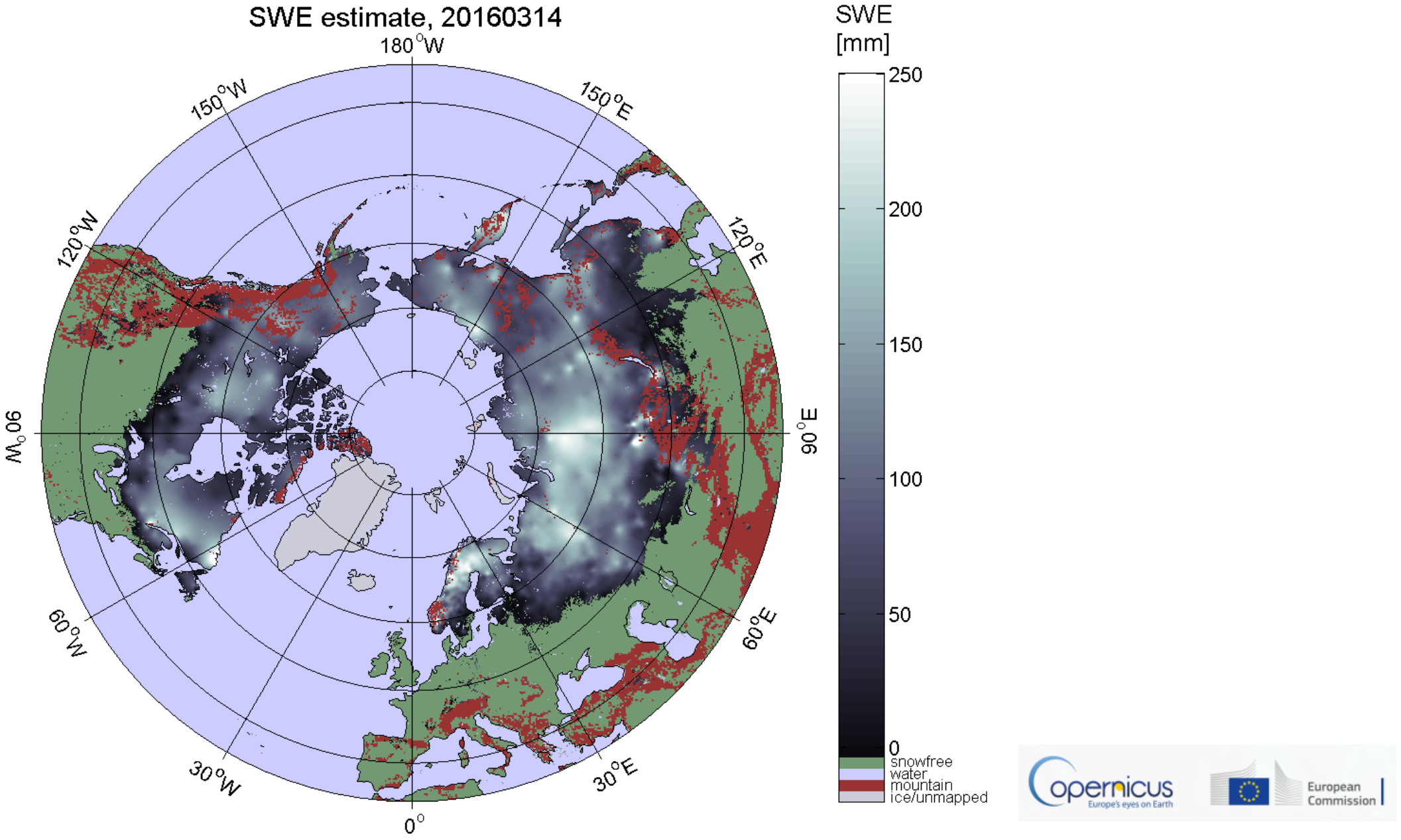
Land Monitoring

BIOPHYSICAL PRODUCTS



Land Monitoring

Snow Water Equivalent



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Marine Monitoring

Benefit areas and products examples

- 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)

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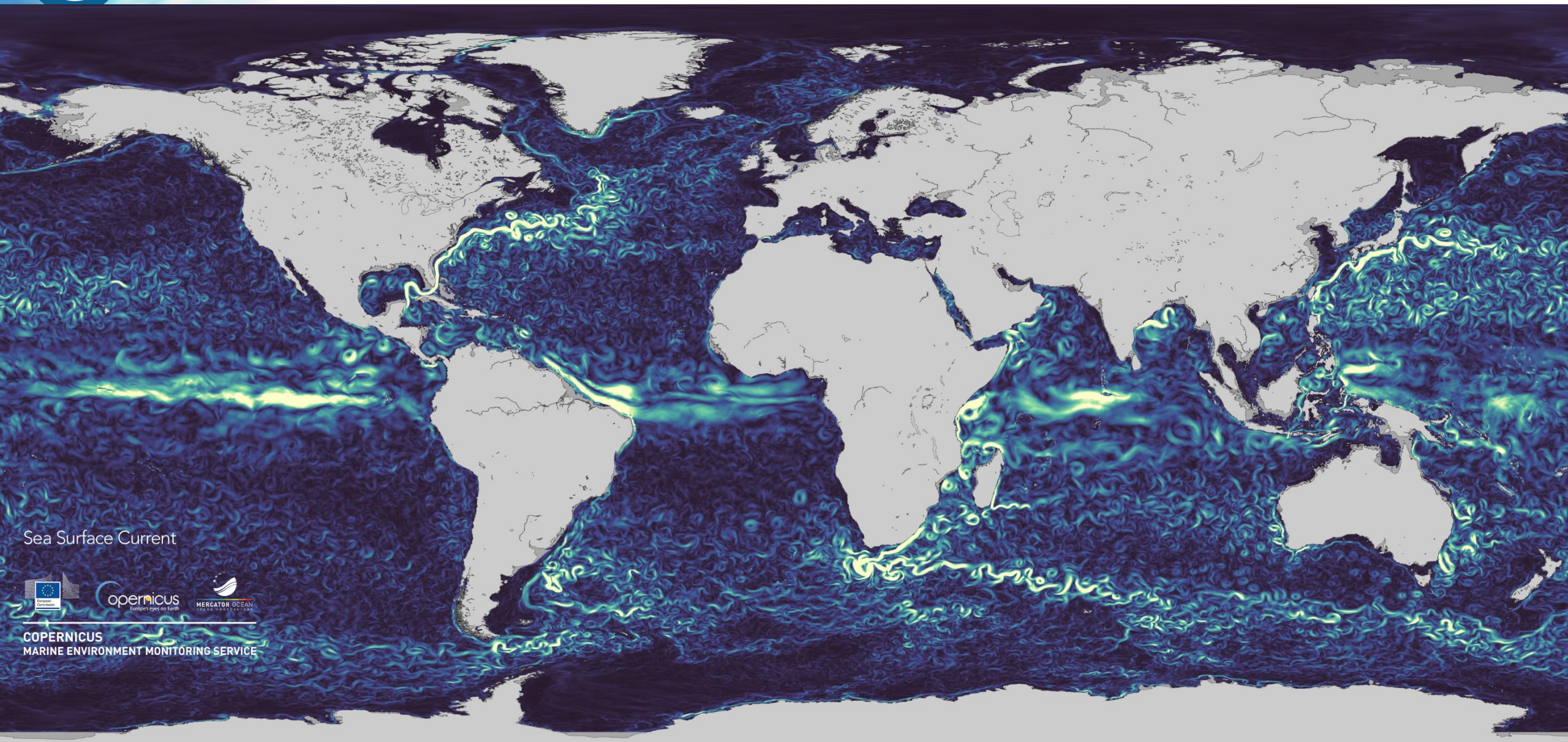
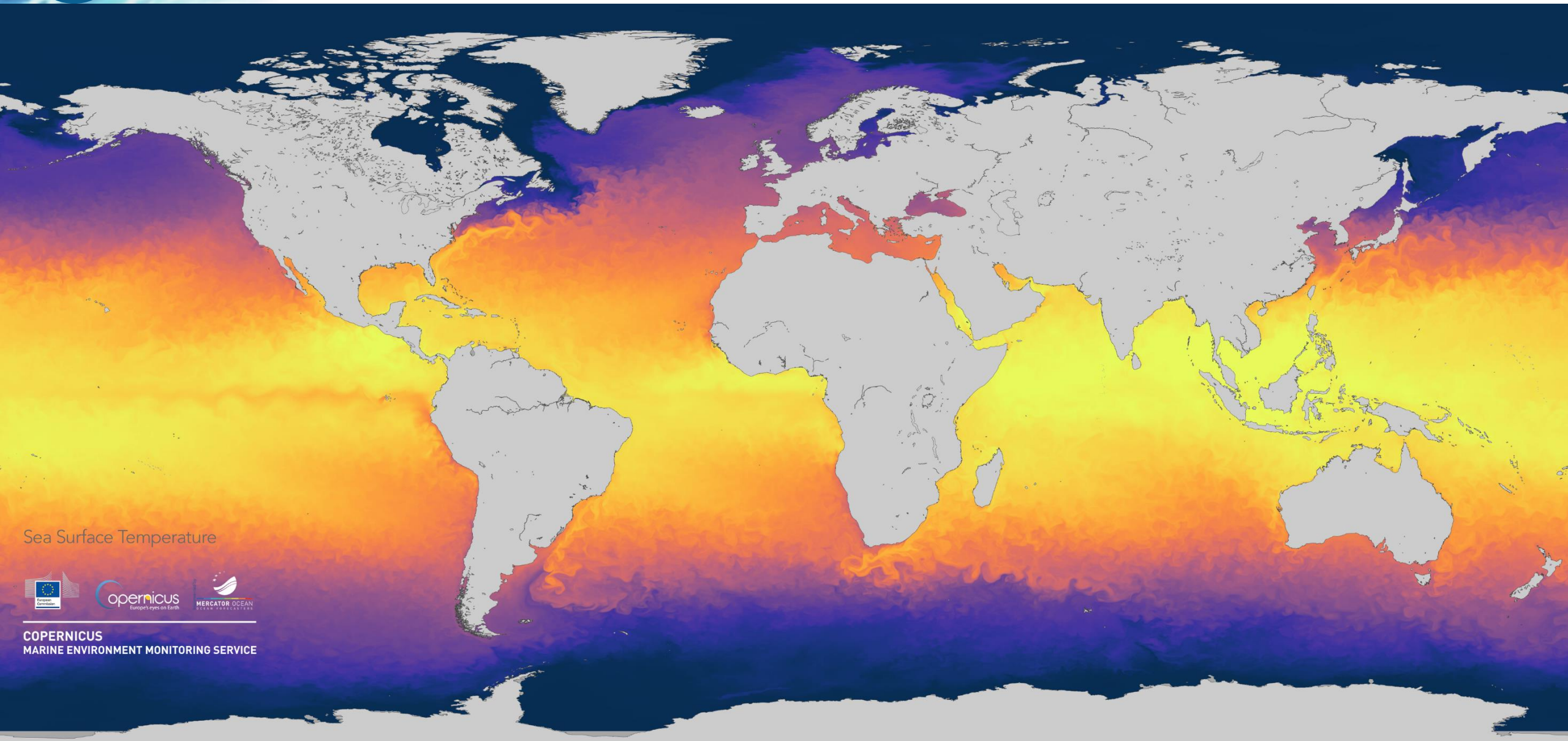
Sea surface current



Sea surface temperature



Atmosphere Monitoring

Benefit areas and products examples

- Health
- Environment
- Pollution
- Climate
- Renewable Energy

Air Quality and Atmospheric Composition

Climate forcing

Ozone layer & UV

Solar radiation

Emissions and surface fluxes

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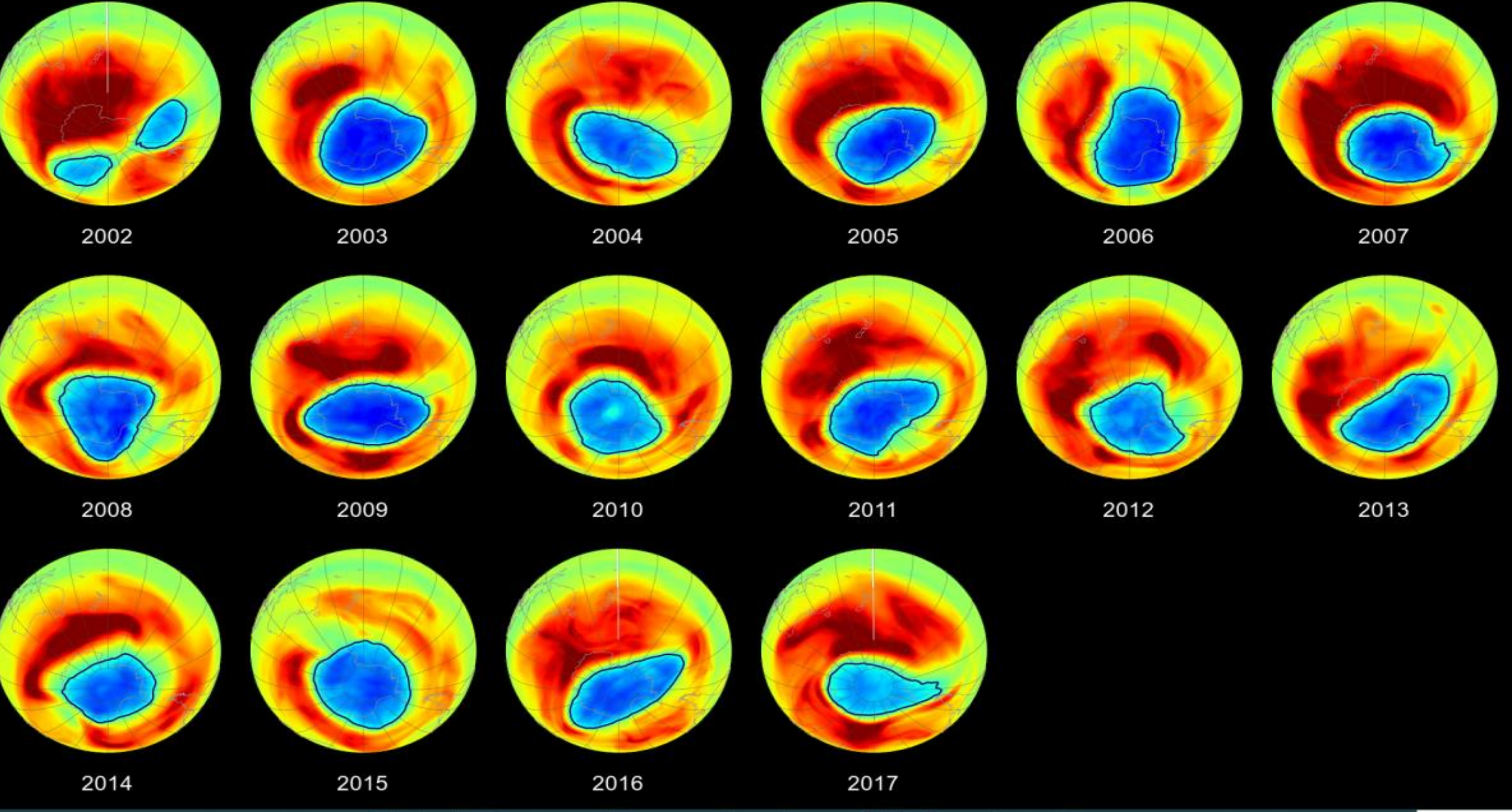


ECMWF

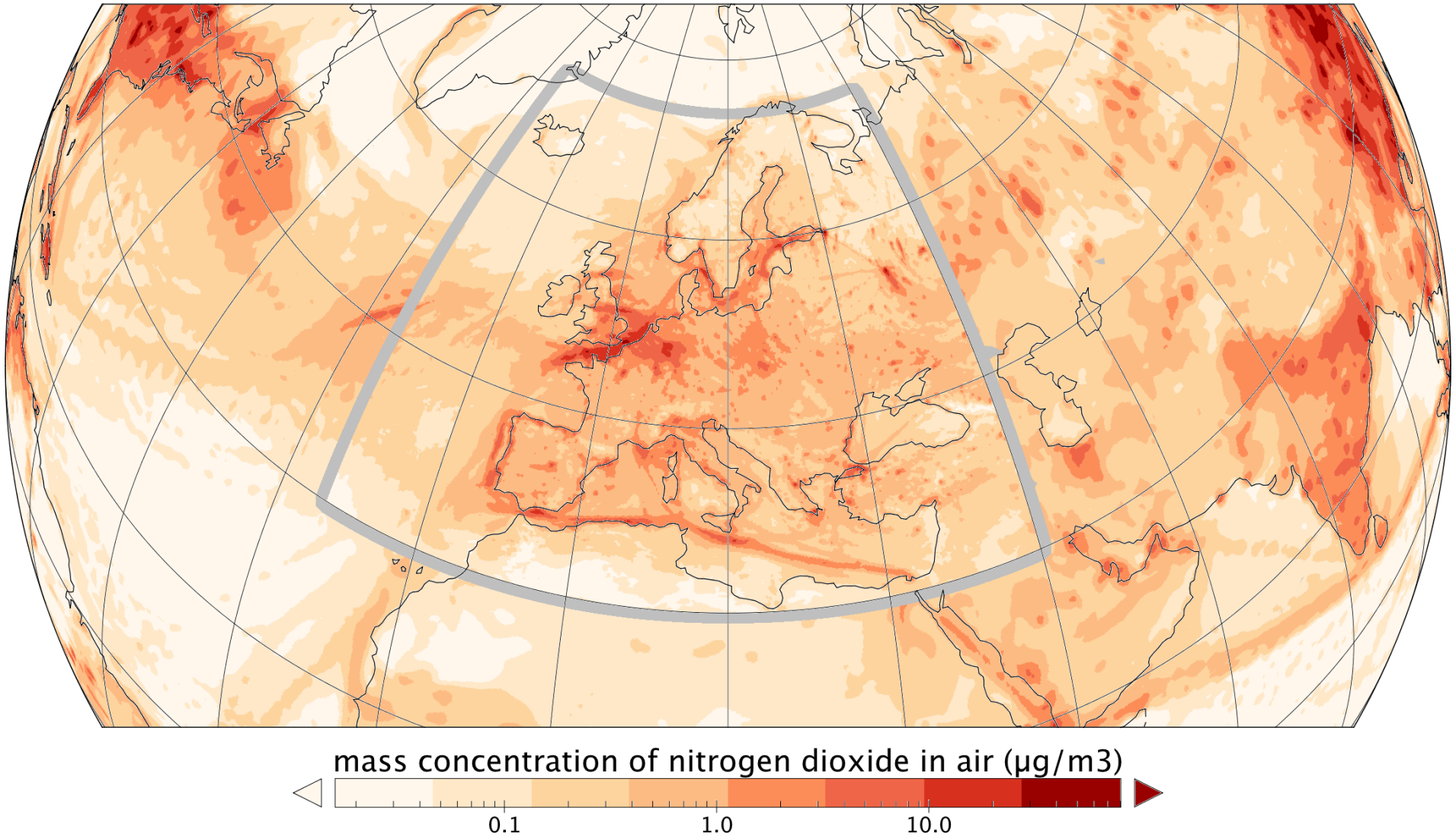
Total Ozone Reanalysis • 25 September

Copernicus

Atmosphere Monitoring

NO_2 Concentration

CAMS regional NO_2 analysis embedded in CAMS global forecast



European Commission

Benefit areas and products examples

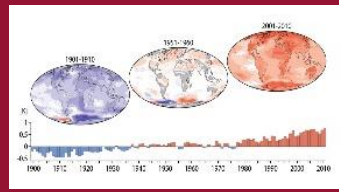
Climate Change

- Climate change
- Mitigation and adaptation
- Weather forecast
- Pollution
- Environment
- Health

Consistent Estimates of the Essential Climate Variables (ECVs)

Support to Mitigation and Adaptation Strategies

Global and Regional Reanalyses



Seasonal Forecasts And Climate Projections

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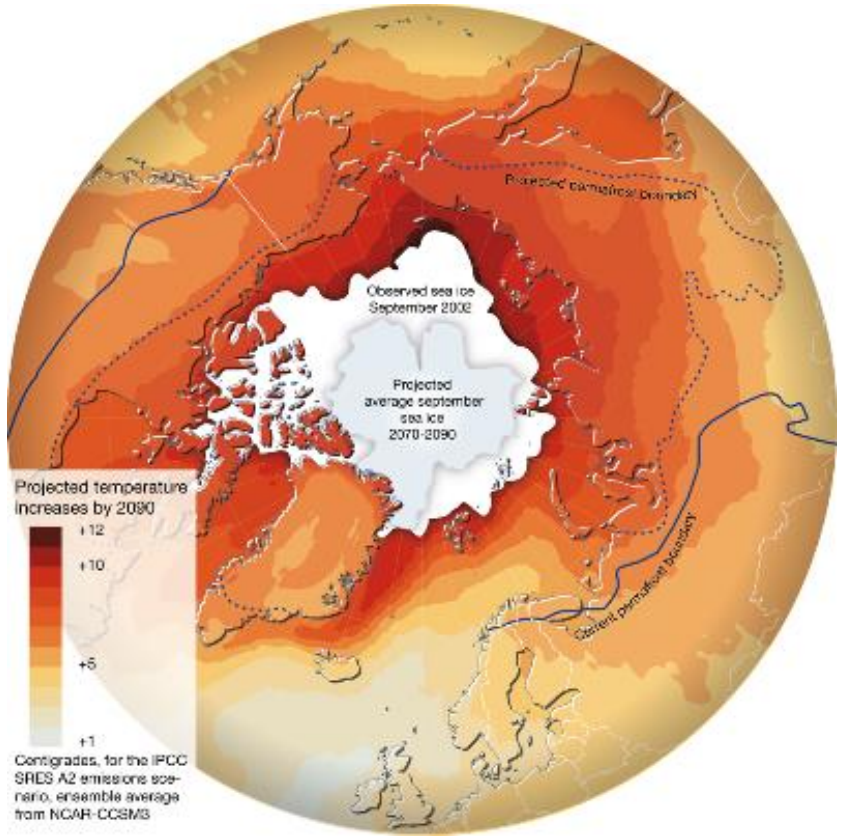
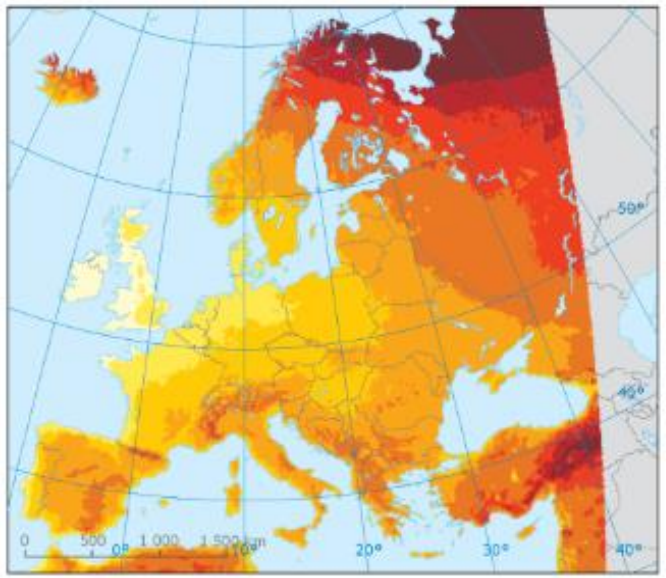
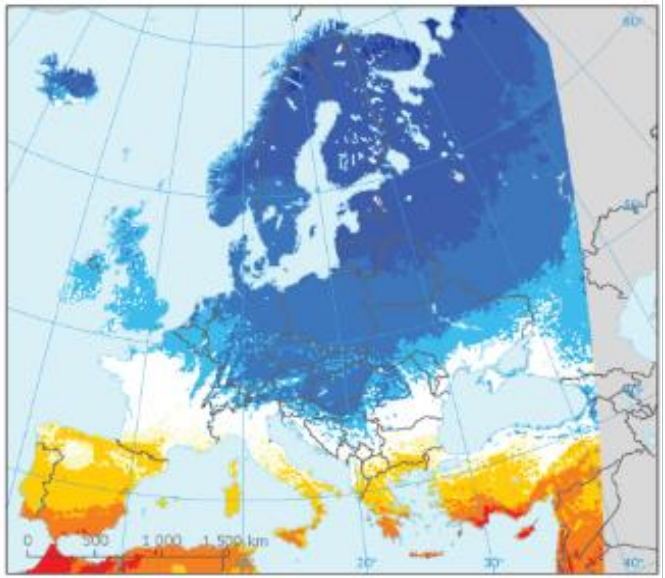
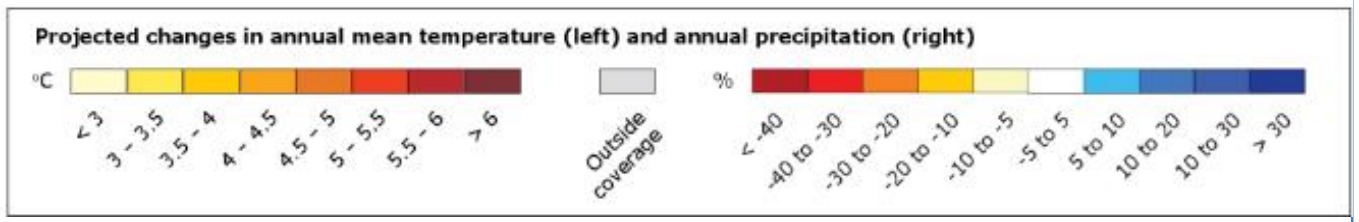
Climate Change

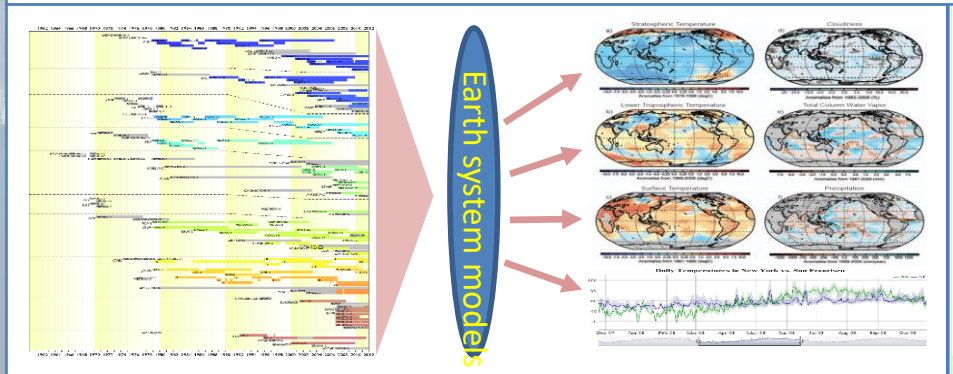
Access to past, present and future climate information

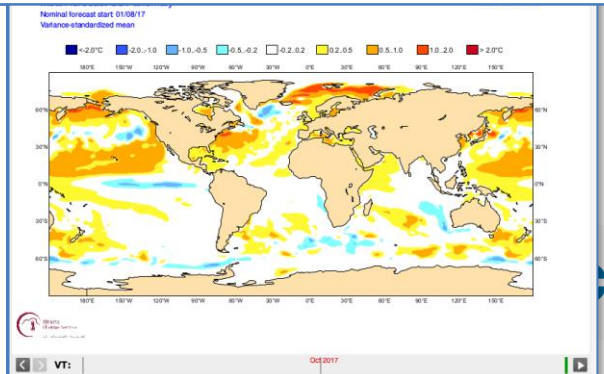












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Emergency Management

Emergency: Benefit areas and products examples

Natural & Man-made Disasters

Humanitarian Crises

Risk & Recovery Mapping:

- Reference Maps
- Pre-disaster Situation Maps
- Post-disaster Situation Maps

Rapid Mapping:

- Reference Maps
- Delineation Maps
- Grading Maps

Early Warning & Monitoring:

- Floods: EFAS/GloFAS
- Forest Fires: EFFIS/GWIS
- Drought: EDO/GDO

*EFAS = **European Flood** Awareness System; GloFAS = **Global Flood** Awareness System*
*EFFIS = **European Forest Fire** Information System; GWIS = **Global Wildfire** Information System*
*EDO = **European Drought** Observatory; GDO = **Global Drought** Observatory*

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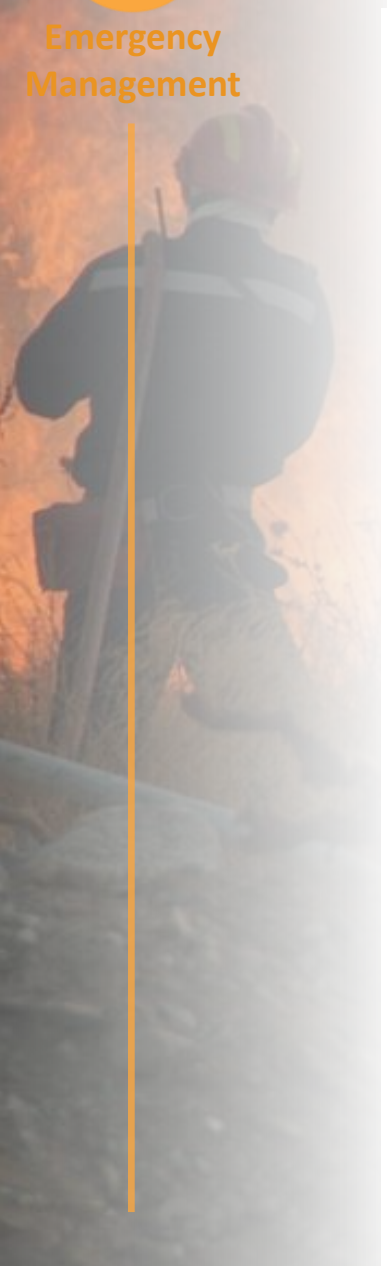
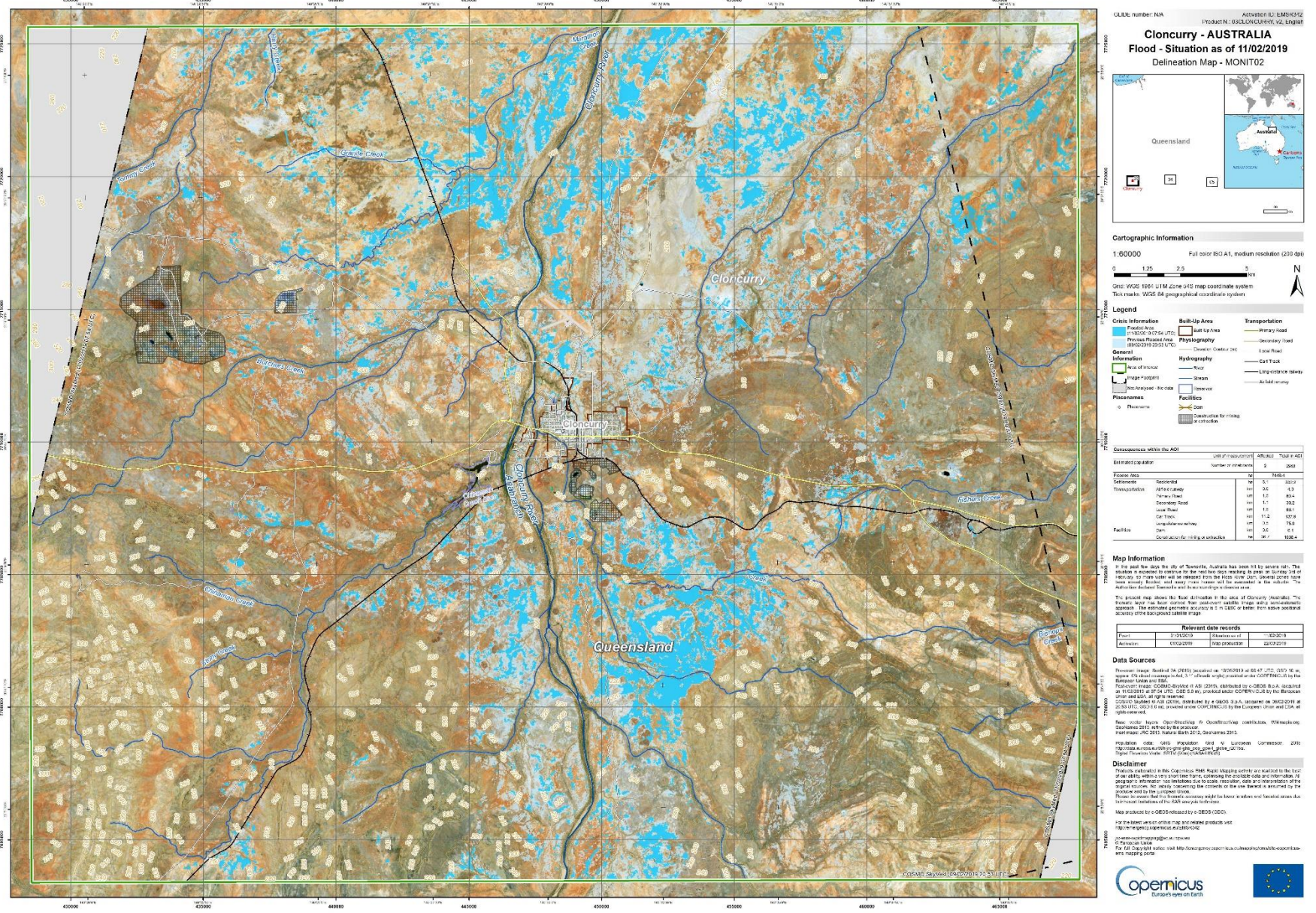
EMERGENCY ACTIVATION

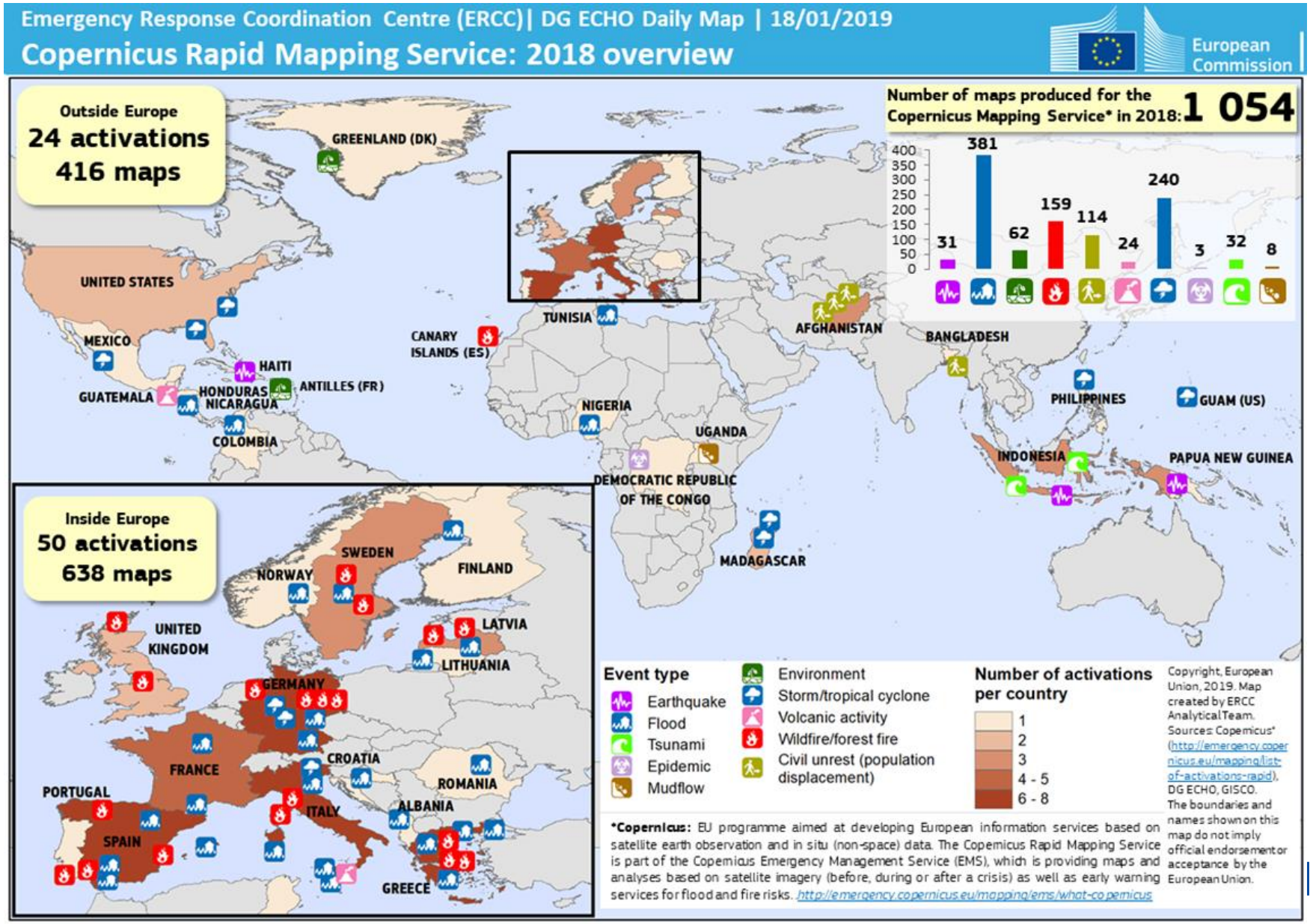
Emergency Management





Emergency Management

Emergency activations in 2018



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Security

Benefit areas and products examples

Border Surveillance

- Coastal monitoring
- Pre-frontier monitoring
- Reference mapping

Maritime Surveillance

- Maritime surveillance of an area of interest
- Vessel detection
- Vessel tracking and reporting
- Vessel anomaly detection

Support to EU External Action

- Road network status assessment
- Conflict damage assessment
- Critical infrastructure analysis
- Reference map
- Support to evacuation plans
- Crisis situation map
- Border map
- Camp analysis

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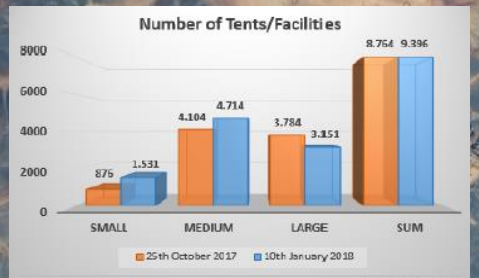
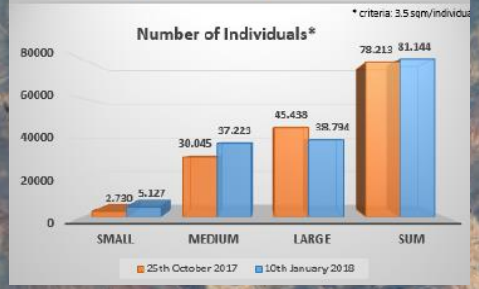
Security

Copernicus SEA Operations

- New Tent/Facility
- Old Tent/Facility
- Removed Tent/Facility





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Users and Value Chain

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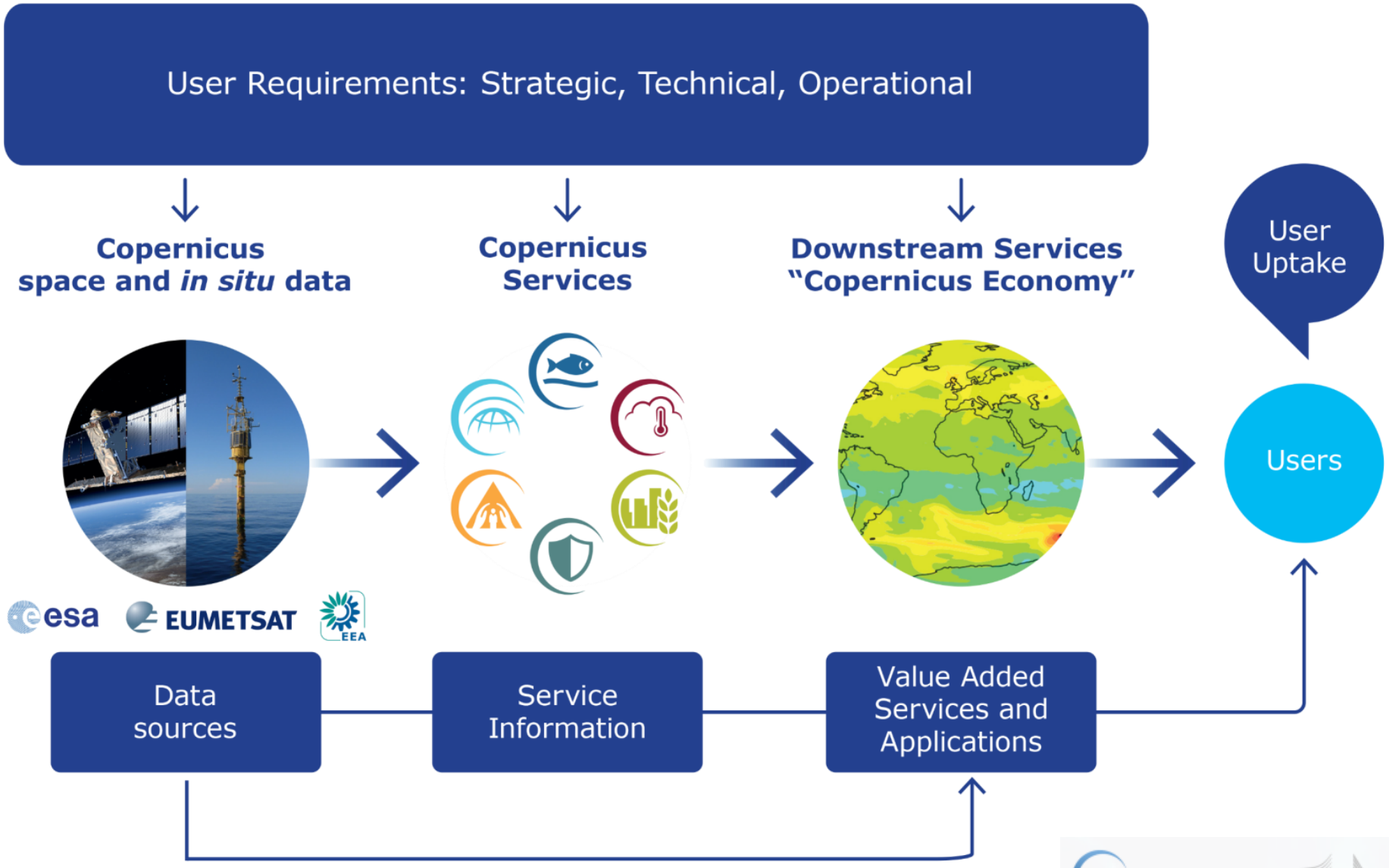
COPERNICUS IS DRIVEN BY THE USERS



COPERNICUS BROADER BENEFITS

- Climate change & Environment
- Development & Cooperation
- Security & Defence
- Tourism
- Health
- Insurance & Disaster management
- Blue economy
- Urban planning…
- Energy & Natural resources
- Forestry…

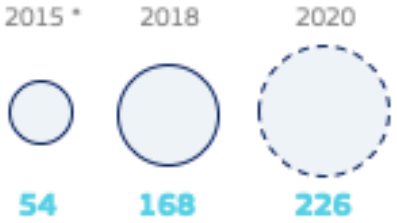
COPERNICUS ECONOMIC BENEFITS

DRIVES RESEARCH, INNOVATION AND THE CREATION OF HIGH-SKILLED JOBS

REVENUES

Copernicus impact for intermediate users of the 10 selected value chains

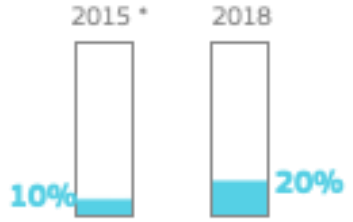
Enabled revenues for intermediate users in Europe (EUR million)



Expected average annual growth rate up to 2020

+ 15%

Average penetration of Copernicus data with regards to EO data



COPERNICUS UPTAKE (2017)

72 %
+6 pts / 2016

Proportion of EO companies exploiting **Copernicus data** in Europe

38 %
+11 pts / 2016

Proportion of EO companies exploiting **Copernicus services** in Europe

28 TB
+133 % / 2016

Volume of downloads from the Data Access Systems

300,000
(by end 2018)
+44% / Q1 2018

overall **registered users on the different hubs (ESA, EUMETSAT, ECMWF, CSA, Mercator and JRC)**

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Data and Information Access

European Commission

DATA DISSEMINATION MEANS

HUB TO HUB CONNECTIONS

EUMETCAST IN AFRICA

COOPERATION WITH DG CNECT ON SPECIFIC INSTRASTRUCTURES

PARTNERSHIP WITH DIAS

RED CLARA (SOUTH AMERICA)

DISTRIBUTION OF COPERNICUS DATA VIA GEANT NETWORK

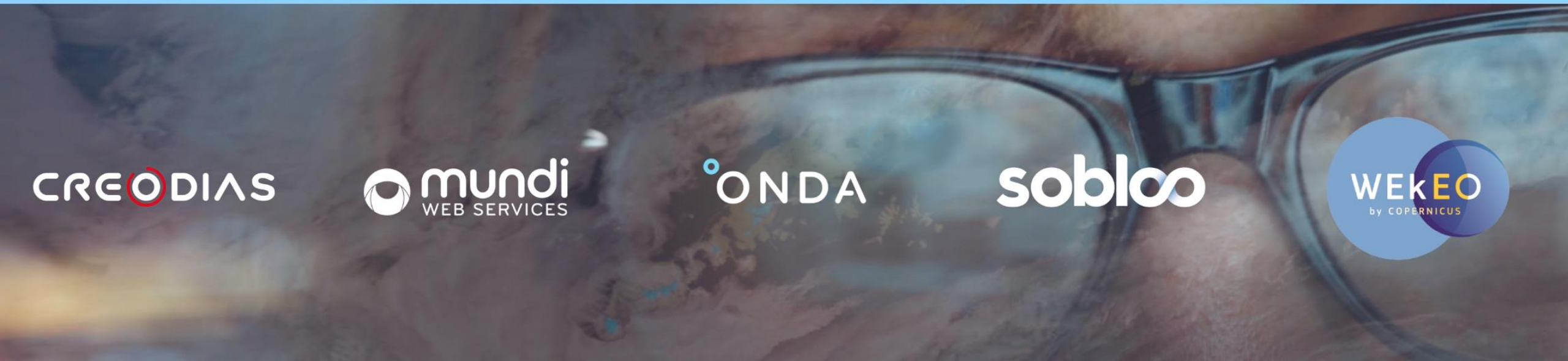
TRANSATLANTIC CABLE

COPERNICUS DATA ACCESS OVERVIEW

NO MORE LARGE FILES DOWNLOADS
NO MORE STORAGE ISSUES

THE DIAS & WHERE TO REACH THEM

WWW.CREODIAS.EU WWW.MUNDIWEBSERVICES.COM WWW.ONDA-DIAS.COM WWW.SOBLOO.EU WWW.WEKEO.EU



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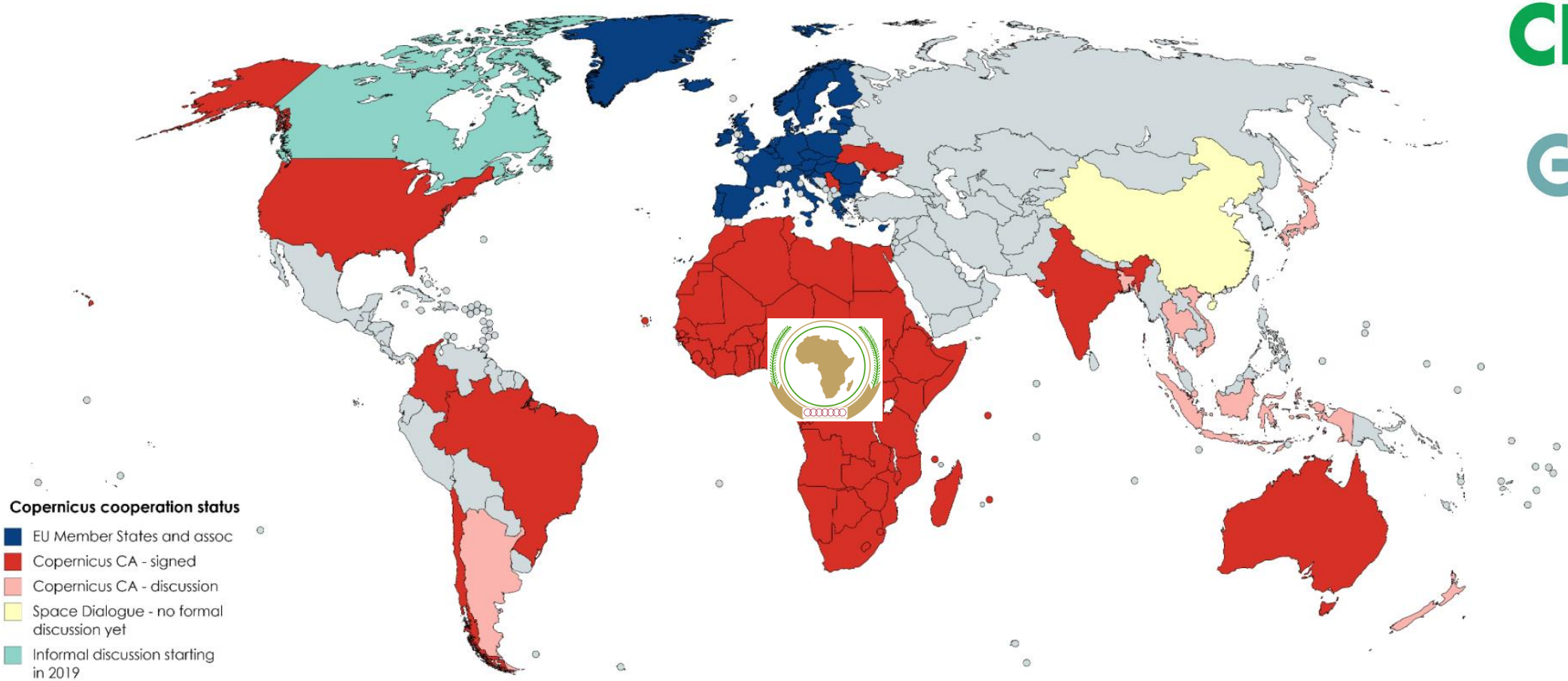
International

European Commission

COPERNICUS INTERNATIONAL STRATEGY

OBJECTIVES

- MAXIMISE THE EFFICIENCY OF EU INVESTMENTS IN ALL EU POLICIES AND **SERVING INTERNATIONAL PARTNERS AND/OR OBJECTIVES**
- PROMOTE USE OF COPERNICUS AND ACCESS TO INTERNATIONAL MARKETS (RECIPROCITY?) AND BOOST EU DATA INDUSTRY ABROAD
- AGREEMENTS SIGNED WITH **USA, AUSTRALIA, INDIA, BRAZIL, CHILE, COLOMBIA, AFRICAN UNION, SERBIA, UKRAINE**
- DISCUSSIONS ONGOING WITH **ASEAN COUNTRIES** AND **SINGAPORE, ARGENTINA, CANADA, JAPAN, FAO, UNEP, HOLY SEE**



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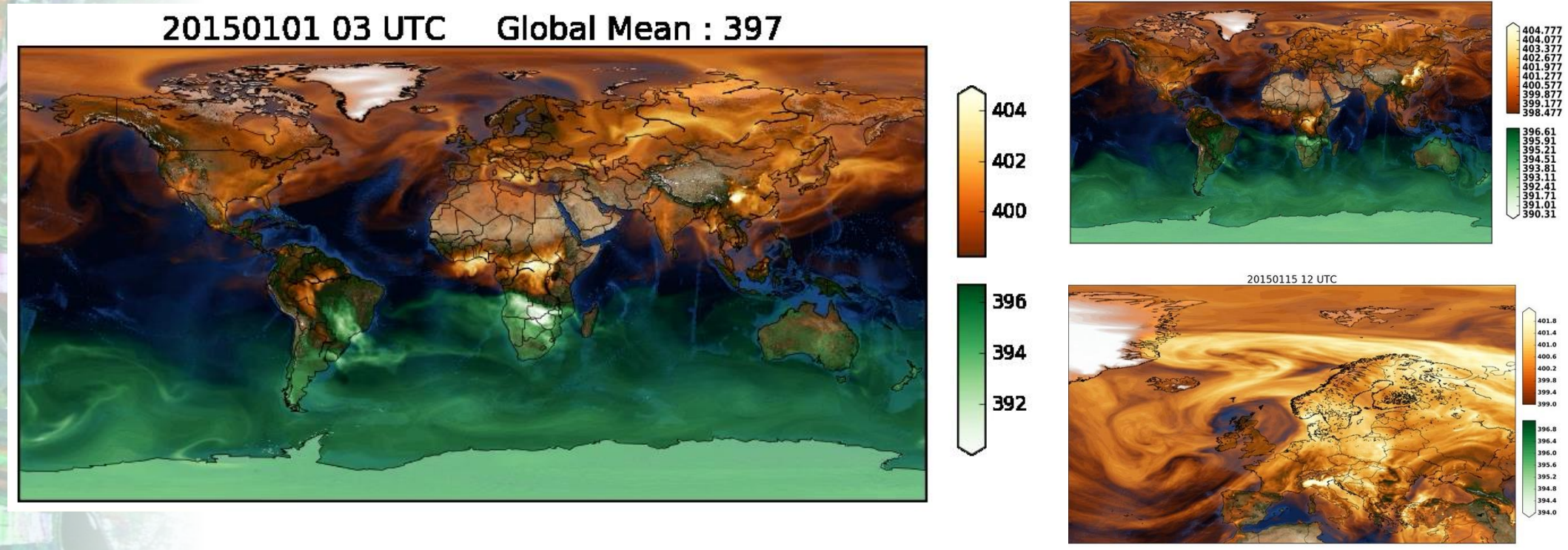
Ex.: UN Sustainable Development Goals:

http://www.stockholmresilience.org

Ex.: Preparing for a Copernicus CO2 emission Monitoring Capacity



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