



Copernicus and GCOS

GCOS SC-31, 2–5 July 2024
WMO, Geneva, Switzerland

Hugo Zunker, DG DEFIS.C.3



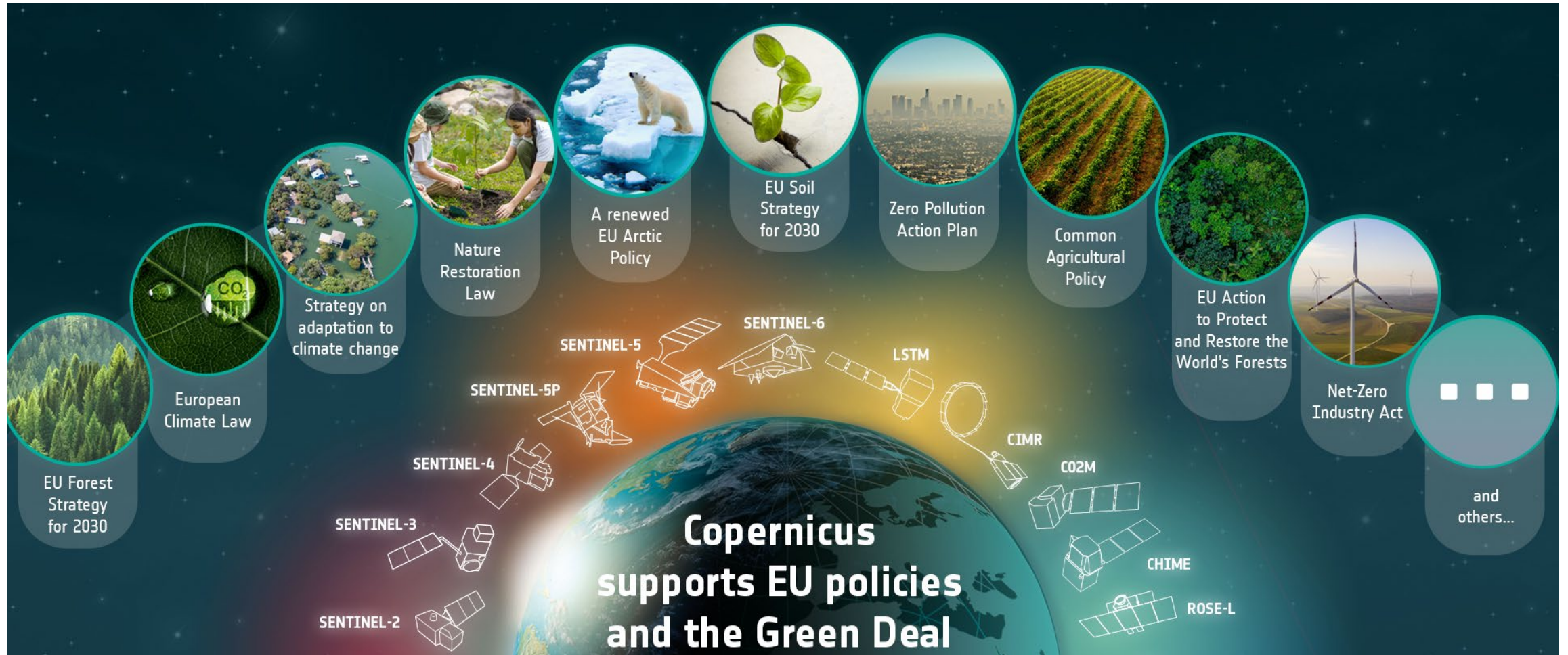
European Union

#EUSpace



EU Space Programme – Copernicus Component

Earth Observation data can support many policy areas



Copernicus structure



Sentinels



Six services using Earth Observation data to deliver timely and reliable information



LAND



MARINE



ATMOSPHERE



EMERGENCY



SECURITY



CLIMATE

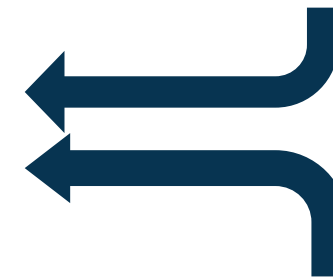
Value-added Services



Open and free data policy
User driven



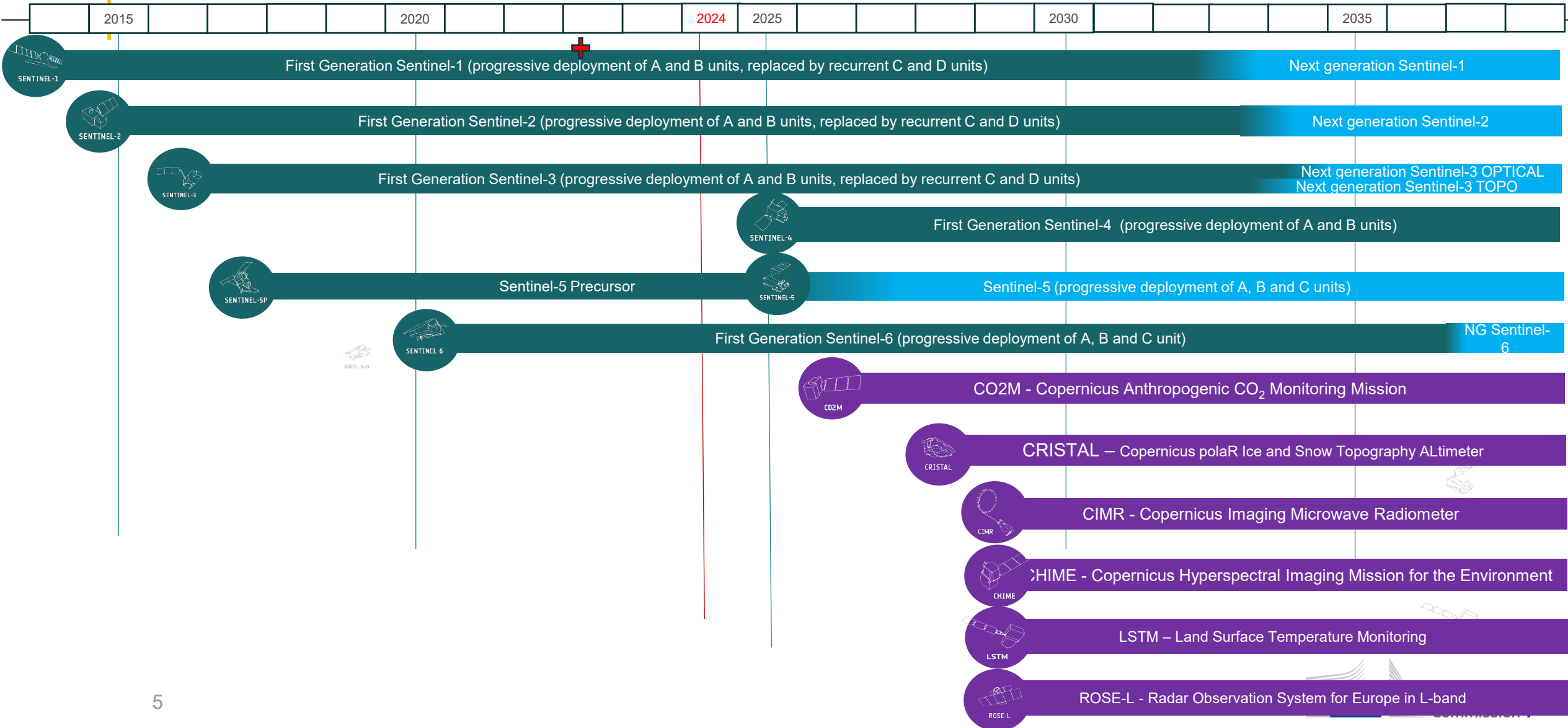
Contributing missions



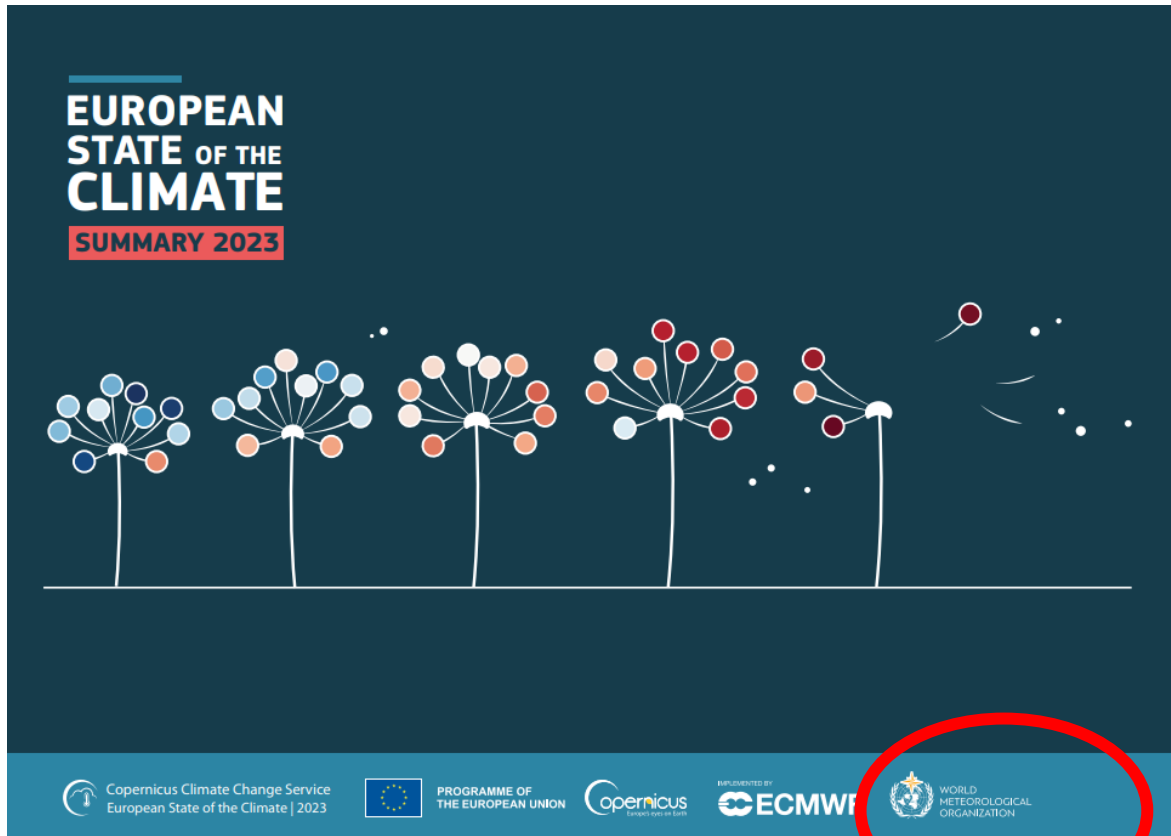
In situ data



Copernicus Sentinel Satellites Timeline



European State of the Climate



Introduction

European State of the Climate 2023

The Copernicus Climate Change Service (C3S) provides climate monitoring for the globe, Europe and the Arctic; the World Meteorological Organization (WMO) is the UN authoritative organisation that collates, monitors and predicts weather, climate and water resources, and provides related services at national, regional and global scales through its 193 Members, the National Meteorological and Hydrological Services. This year, C3S and the WMO have released a joint report on the European State of the Climate (ESOTC) in 2023. This provides descriptions and analysis of climate conditions and variations from across the Earth system, key events and their impacts, and a discussion of climate policy and action with a focus on human health. The ESOTC also includes updates on the long-term evolution of key Climate Indicators.

Since the 1980s, Europe has been warming twice as fast as the global average, becoming the fastest-warming continent on Earth. This is due to several factors, including the proportion of European land in the Arctic, which is the fastest-warming region on Earth, and to changes in atmospheric circulation that favour more frequent summer heatwaves. Glaciers are melting and there are changes in the pattern of precipitation. An increase in extreme rainfall is leading to catastrophic events, such as the widespread flooding seen in Italy, Greece, Slovenia, Norway and Sweden in 2023. Meanwhile, southern Europe is seeing widespread droughts.

The frequency and severity of extreme events are increasing.

More information on the risks that Europe is facing can be found in the European Environment Agency's [Climate Risk Assessment](#).

“

The climate crisis is the biggest challenge of our generation. The cost of climate action may seem high, but the cost of inaction is much higher. As this report shows, we need to leverage science to provide solutions for the good of society.

Celeste Saulo
Secretary-General, WMO



“

In 2023, Europe witnessed the largest wildfire ever recorded, one of the wettest years, severe marine heatwaves and widespread devastating flooding. Temperatures continue to increase, making our data ever more vital in preparing for the impacts of climate change.



Carlo Buontempo
Director, C3S

Explore the complete ESOTC

The complete report is available online at: climate.copernicus.eu/esotc/2023

Throughout the report you will find symbols that indicate the types of data and the reference period used for each section. More information on these are in [About the report](#).

● Atmosphere ● Land ● Ice ● Ocean ● Energy/Impacts



C3S is implemented by the European Centre for Medium-Range Weather Forecasts (ECMWF) with funding from the European Union.



Essential Climate Variables



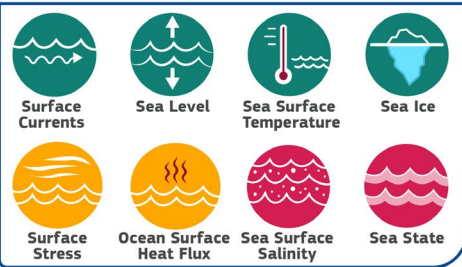
CRYOSPHERE



Legend

- Satellite ECVs
- ECVs from reanalysis
- Planned/ambition
- Unavailable

SURFACE OCEAN PHYSICS



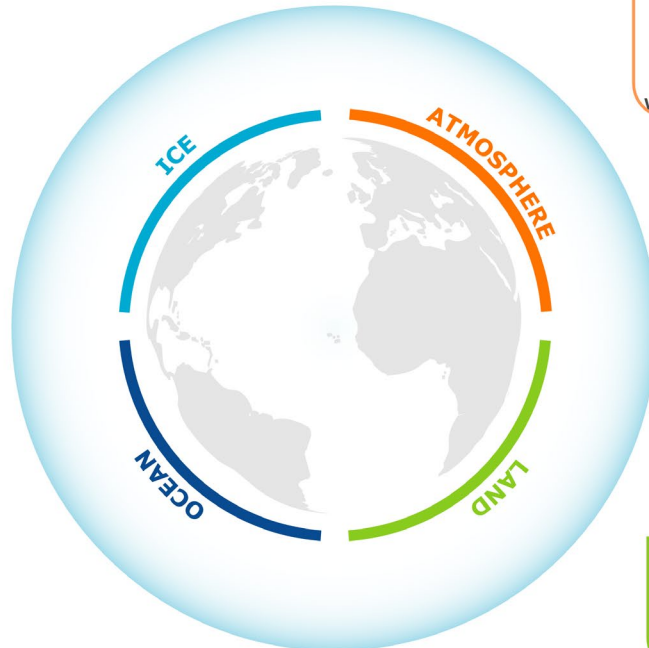
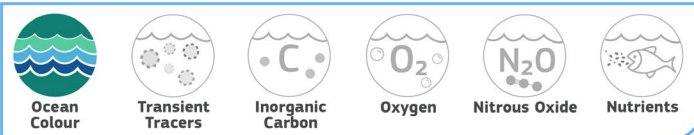
OCEAN BIOLOGY, ECOSYSTEMS



SUBSURFACE OCEAN PHYSICS



OCEAN BIOGEOCHEMISTRY



SURFACE ATMOSPHERE



UPPER-AIR ATMOSPHERE



ATMOSPHERIC COMPOSITION



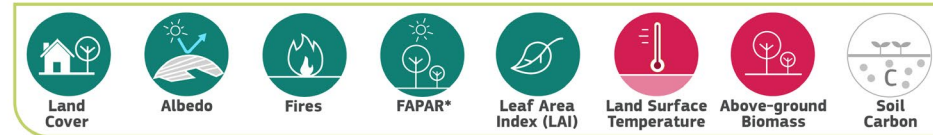
ANTHROPOSHERE



HYDROSPHERE



BIOSPHERE



*Fraction of Absorbed Photosynthetically Active Radiation

Crucial to understand changes in our climate.

C3S responds to GCOS and UNFCCC implementation needs.





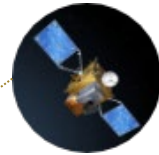
Atmosphere Monitoring

TIMELINE OF CAMS EMISSION SERVICES

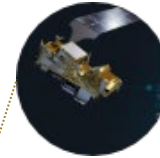
From expert groups through dedicated research funding, to operational services



Sentinel 5p



Sentinel 4



Sentinel 5



CO₂ Mission

SATELLITE MISSIONS

CO₂ TASK FORCE GUIDANCE DOCUMENTS



2015



2017



2019

2018



2017

RESEARCH AND PREPARATORY PROJECTS



2021

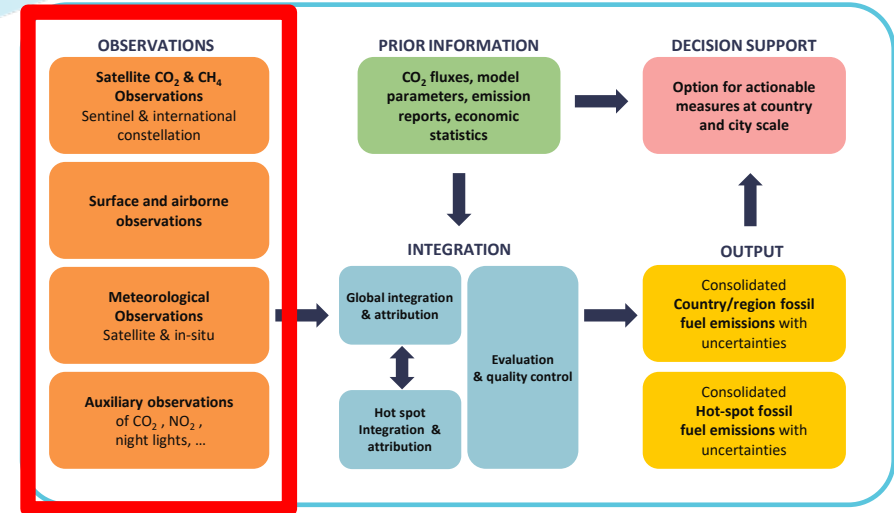


2022

Operational ramp-up in CAMS

CO₂ Monitoring & Verification Support (CO₂MVS) 2026-27

SERVICE COMPONENTS



PROGRAMME OF THE EUROPEAN UNION



IMPLEMENTED BY



Destination Earth

A Highly Accurate Digital Twin of the Earth

To monitor, simulate and predict natural phenomena and the impact of human activity on Earth



To assist in designing accurate adaptation strategies and climate change related mitigation measures



To accelerate the EU's green and digital transition



To leverage existing and new data sources and EU's advanced digital and computing infrastructure



To create and test "what if" scenarios and to integrate impact sector applications for more sustainable development



To support decision-making at various levels (e.g. EU, national, regional, local)



To make complex simulation systems more accessible to a large range of users and applications



To scale up existing models and boost the exploitation of AI-based ones



Questions

1. Where do you see the greatest benefits of Copernicus engaging with GCOS?

- International coordination, engagement, consultation and planning process
- ECVs provides focus and structure; Climate Data Records for Climate Monitoring
- Space and in-situ, maps nicely onto Copernicus
- Links to CGMS, CEOS who are actively engaged on climate
- Across Earth system (e.g. land, ocean, atmosphere) components
- Cal/val and QA/QC of Copernicus

Questions

2. Are there areas or gaps where GCOS should strengthen its focus?

- Climate monitoring from space: continuity, coordination and anticipation: upcoming gaps need to be identified as early as possible
- CO2M MVS is a key priority; multi-disciplinary problem across components (cf also WMO G3W)
- Sustained in-situ observations, in particular in observations 'deserts' for cal/val and service QA/QC
- Data rescue, timeliness, accessibility, best practices, monitoring principles, reference networks
- Research observing networks at risk (e.g. SOCAT)
- WMO Systematic Observations Financing Facility (SOFF)

Questions

3. Can you tell us more about the EU support to GCOS now and in the future?

- GCOS is essential to the C3S and other Copernicus services
- EU support to GCOS Secretariat to cover WMO cash flow issue back in 2019
- Support was implemented for 3 years (2020-2023) with the so-called 'Direct Award to identified beneficiary' instrument, EUR 250K/y
- Since 2024: subscription mechanism (as the EU does with IPCC or GEO secretariat): 250K/y
- WP25-27: tentative EUR 250K/y TBC, using a subscription mechanism
- Next MFF: to be seen

Thank you for your attention