



→ THE EUROPEAN SPACE AGENCY



# FUTURE EO

Pioneering Earth observation for a better world

## EARTH ACTION FOR A SUSTAINABLE WORLD

The FutureEO programme is a broad framework that defines and implements the long-term vision for the European Space Agency's (ESA's) ambitious Earth observation strategy.

It is Europe's bridge to sustained **leadership** and **innovation** in Earth observation, enabled through the next ambitious missions: the **Next Generation Gravity Mission** will investigate the world's oceans as a hydrology observatory from space, and **WIVERN** is set to monitor the complex interaction between winds and clouds. Both missions are a key means for FutureEO to deepen our understanding of the Earth system and climate, supporting the actionable data we need for a sustainable future. It supports data applications to serve communities – from scientists to policy makers.

Satellite mission concept and technology preparation, as well as the use of data, are all carried out as part of FutureEO. **It is the beating heart of ESA's Earth observation activities.** It adapts its focus to the rapidly evolving landscape, from scientific questions to societal challenges.

The programme delivers world-class scientific excellence, ensuring that reliable, long-term datasets are available for **climate science** and for **government policy** to address climate change, environmental challenges, biodiversity loss and sustainability.

**FutureEO prepares and enables all operational missions** that support essential services, from climate monitoring to weather forecasting and applications that improve **European resilience and autonomy.**

“*FutureEO is currently the world-leading programme in innovation for satellite remote sensing, Earth system and climate science, while playing a major role in developing the domestic space sector in Europe.*”

The Independent Scientific Panel,  
FutureEO Review Seminar, January 2025



## SCIENCE EXCELLENCE AND INNOVATION

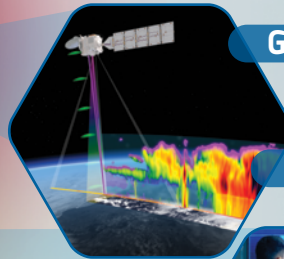
**FutureEO plays a pivotal role** in supporting European industry, building long-standing partnerships and enabling all future missions. The programme flexibly adapts to today's challenges to provide data for society: for climate and sustainability, for the economy and resilience, securing strategic autonomy for Europe.



**European leadership in Earth observation**



**Delivering missions and data for society**



**Groundbreaking science**



**Climate and sustainability**



**Crisis management**



**Preparing for tomorrow's needs**

**RESILIENCE**

**Supporting space industry**

**COMPETITIVENESS**

**OPERATIONAL MISSIONS**

**ECONOMIC GROWTH**

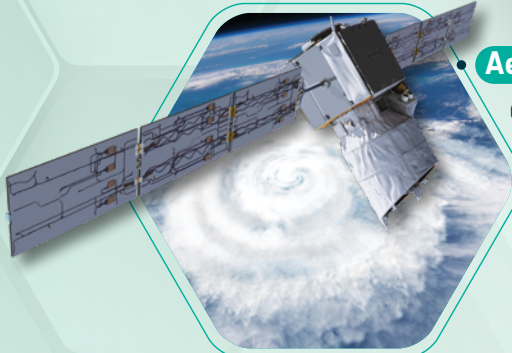
**AMBITIOUS AND AGILE**

**ENVIRONMENT**

**SOCIETAL NEEDS**

## GROUNDBREAKING MISSIONS AND SCIENCE

The FutureEO programme continues to demonstrate its value by driving new insights from scientific results and by developing the technologies we need to safeguard our future. Key recent achievements include:



### Aeolus

dramatically improved the accuracy of wind and weather forecasts, protecting against extreme climate events and used for civil protection. The mission ended with a historic first-ever controlled re-entry into Earth's atmosphere.



### HydroGNSS

ESA's first Scout mission investigates Earth's water cycle and reflects Europe's innovation and agile approach.



### Biomass

combines cutting-edge technology with scientific excellence to provide vital insights into the role of tropical forests in the global carbon cycle, into biodiversity, and monitoring and prediction of our climate.



### Φ-sat-2

further demonstrates the next step in pioneering space-based Artificial Intelligence for innovative Earth observation.



### EarthCARE

is providing unique insights into the role of clouds and aerosols, improving weather and climate forecasting.

## SURPASSING EXPECTATIONS

FutureEO missions often far outperform our expectations. They provide data that allow us to make better decisions, yielding both social and economic value. Impactful examples from recent years include:

### CryoSat

is mapping the seafloor features, providing the sharpest view of the ocean floor to date.

### Swarm

supports tools for global safety, used by **military, aviation** and **maritime operations**.

### SMOS and CryoSat

demonstrate synergies by delivering critical insights into sea ice loss and the global water and carbon cycles. Data are used in the **fishing** and **shipping industry**, by **coastal communities** and in **navigation**.

### GOCE

opened an unprecedented window onto the patterns and flows of ocean currents.

## EARTH SCIENCE STRATEGY

Beyond the missions and the science, FutureEO initiatives such as EO Africa foster collaboration for research and development, while the **ESA Earth Observation Science Strategy** defines a European vision that maintains leadership in this field. The strategy responds to the escalating threats from climate change, biodiversity loss, pollution and extreme weather and the need to take action to address these. Initiatives such as these build connections and communities, helping to prepare for the future.

## A BROAD FRAMEWORK FOR TOMORROW'S NEEDS

FutureEO is structured around three defining pillars that provide a streamlined and centralised framework for ESA's Earth Observation goals. They work together to ensure there is a smooth flow of information between projects, connecting innovative ideas with scientific objectives to inform and guide the development of missions from concept through to design and realisation.

Through its **EO Foundations pillar** FutureEO identifies and explores concepts for **future Earth observation** missions including Copernicus Sentinels and meteorological missions. Through **strategic partnerships**, it prepares industry for the future and supports competitiveness, enabling world-leading Earth observation and **technology innovation** for Europe.



The **Earth Action pillar** addresses the triple crisis of **climate change**, **biodiversity loss** and **pollution** through **actionable climate** and **environmental data**. It also fosters disruptive innovations and business ideas. Earth Action aims to integrate a wide range of data into essential climate variables addressing the challenges we face and to maximise impact to society.

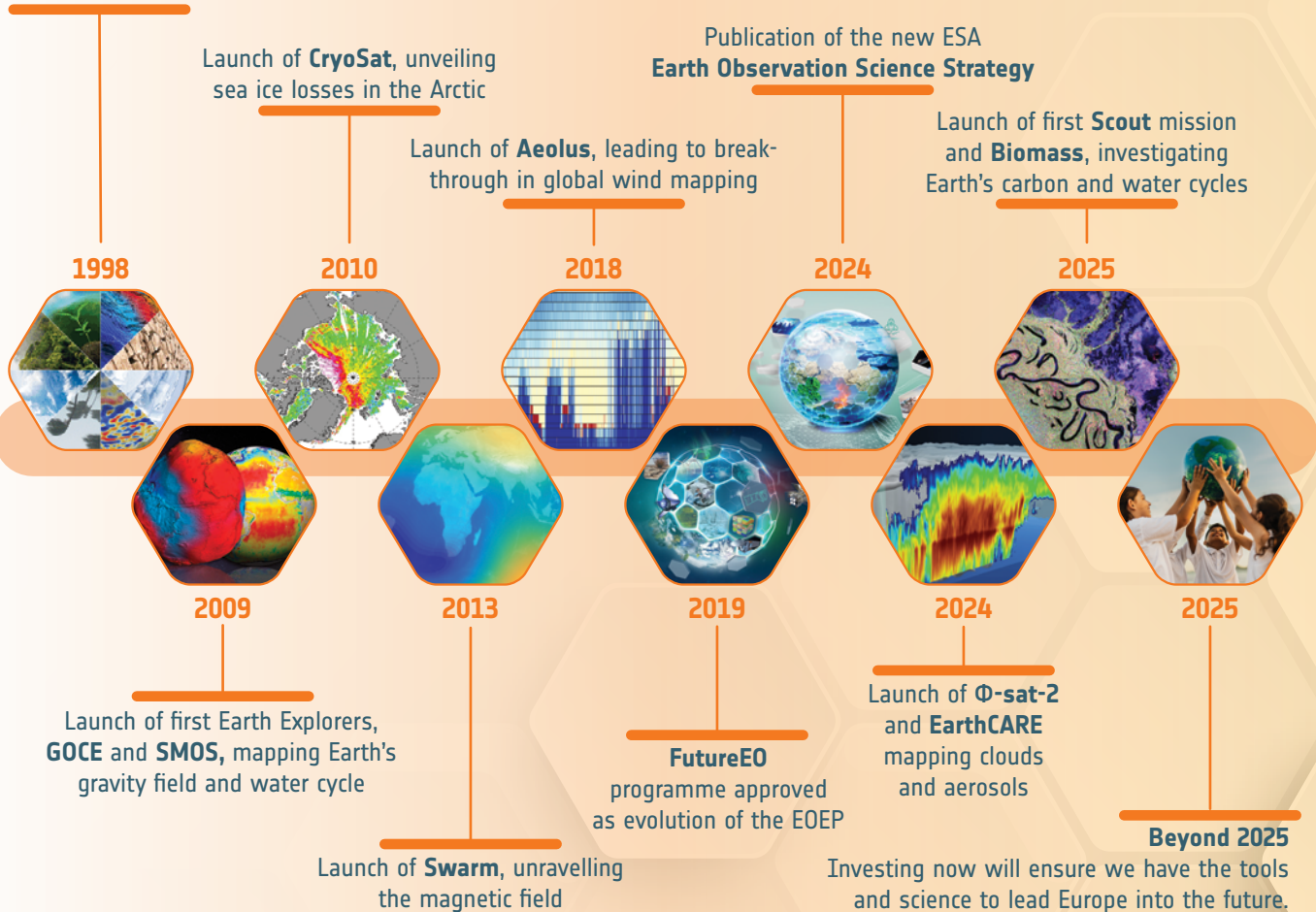


The **EO Missions and Data pillar** includes the implementation and launch of **state-of-the-art** Earth observation missions. It then manages these missions and data, developing **trusted climate reference datasets** that meet consistent standards. ESA is managing the **most diverse**, and so far, largest, **fleet of Earth observation satellites in the world**.

## DELIVERING VALUE FOR EUROPE

FutureEO continues to drive the evolution of ESA's core Earth observation activities. At ESA's Council Meeting at Ministerial Level for 2025, we aim to enable groundbreaking missions. **WIVERN** will fill a significant gap in the global satellite observing system and give new insights into severe storms. The **Next Generation Gravity Mission** will provide data at higher resolution and more rapidly than current gravity-measuring missions, enhancing our understanding of ocean movements to support climate challenges. And FutureEO's **Earth Action** will be implemented to foster Earth observation innovation and solutions for society.

ESA's Earth Observation Envelope Programme proposed by DG to Ministers  
Ongoing partnerships: Eumetsat and European Commission



## FUTUREEO AT ESA'S COUNCIL MEETING AT MINISTERIAL LEVEL 2025

Following the decisions and evaluations made during the Council Meeting in November, FutureEO will maintain its focus on delivering **value for Europe** through excellence in Earth science, innovation and support for industry competitiveness.

The following actions will be the key elements to implement:

- **Implement WIVERN (Earth Explorer 11)**
- **Implement the Next Generation Gravity Mission**
- **Operate and manage the most diverse and largest fleet of Earth observation research satellites (Earth Explorers, Scouts and  $\Phi$ -sats)**
- **Prepare the future Copernicus, Meteosat and Earth Explorer missions**
- **Implement Earth Action to deliver actionable data and monitor climate records**
- **Implement new ESA Earth Observation Science Strategy**

*“FutureEO continues to push the boundaries of Earth observation, equipping scientists, policy-makers, and society with the knowledge we need to protect our planet's future.”*

**Simonetta Cheli**  
Director of Earth Observation  
Programmes ESA



[esa.int/FutureEO](https://esa.int/FutureEO)