Expected benefits of Metop Second Generation satellites

A remarkable set of instruments on board Metop Second Generation (Metop-SG) satellites will provide more and higher-resolution measurements of temperature, humidity, precipitation, clouds, fog, sea ice, ocean currents, winds, aerosols, pollution, greenhouse gases, volcanic dust, vegetation, wildfires, and a multitude of other features.

Better numerical weather prediction

Data from first-generation Metop satellites have been the single biggest contributor to the accuracy of European weather forecasts between 12 hours and 10 days in advance. Metop-SG is expected to continue and advance these critical contributions, with datasets invaluable for global and regional numerical weather prediction models.

Enhanced nowcasting of high-impact weather

Metop-SG data will benefit nowcasting applications, very short-range forecasts that can enable specialists to spot tell-tale signs of early storm development and other high impact weather events. Datasets will be particularly beneficial at higher latitudes where coverage from geostationary spacecraft can be sparser.

Improved climate science and services

Long time-series meteorological satellite observations are an essential resource for climate monitoring. The EPS-SG programme will extend the record of Metop observations to more than four decades, enabling specialists to better understand how the Earth's climate is changing.

A multitude of other applications and services

The EPS-SG programme will support a multitude of other applications, including atmospheric composition monitoring and air quality forecasting, ocean state forecasting, hydrology, land surface analyses, and space weather monitoring.

Hazard warnings are guided by meteorological satellite data that can reveal when dangerous conditions may be developing. This includes observations of volcanic ash in the atmosphere provided by instruments on board Metop polar-orbiting satellites. Credit: Image courtesy of Icelandic Meteorological Office.

It's a fact

Metop-SG satellites are the first European satellites designed for a controlled re-entry at the end of their life in orbit, as part of an international effort to reduce space debris.

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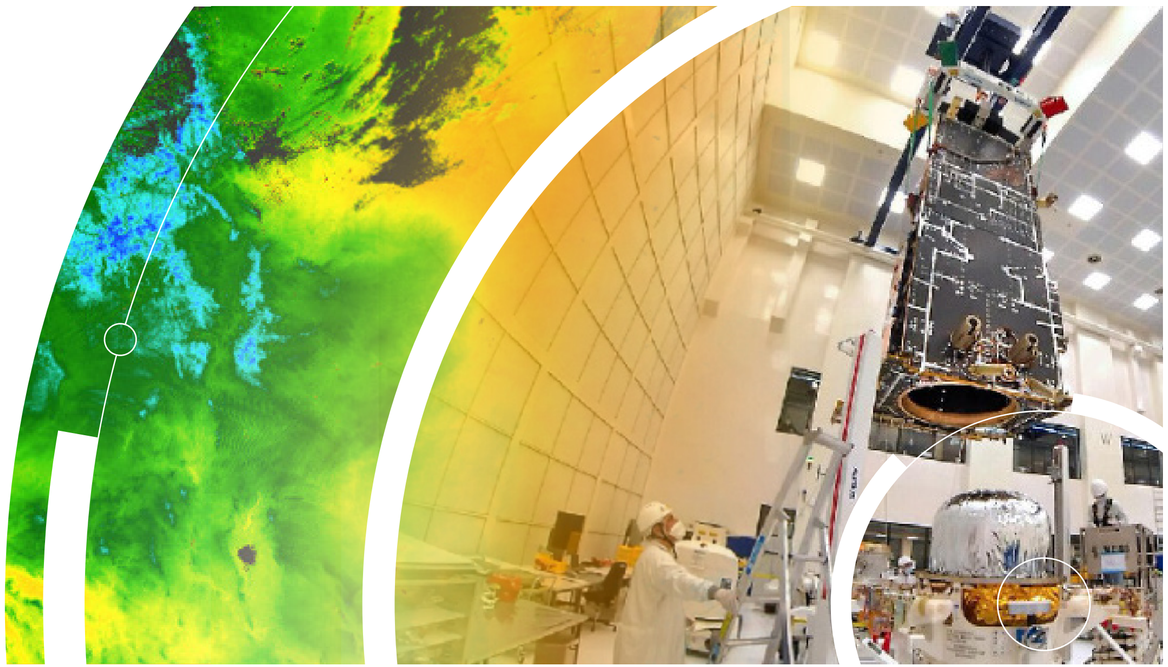
EUMETSAT

EUMETSAT Polar System – Second Generation

and its Metop Second Generation satellites

Facts & figures

Monitoring weather and climate from space



Europe's next generation of polar-orbiting meteorological satellites

Introducing the EUMETSAT Polar System – Second Generation and its Metop Second Generation spacecraft.

The EUMETSAT Polar System – Second Generation (EPS-SG) programme and its Metop Second Generation (Metop-SG) satellites will bring global observations of weather, climate, and the environment from a low-Earth polar orbit to a new standard, beginning in the mid-2020s.

By providing new and better observational inputs for numerical weather prediction, EPS-SG will further improve weather forecasts up to 10 days ahead across Europe and the world.

The programme will make crucial contributions to nowcasting, providing observations that are especially impactful at higher latitudes where data from geostationary spacecraft can be sparser.

EPS-SG will extend the record of Metop observations to at least 40 years, enabling specialists to strengthen the use of satellite data for climate science and services. The programme will also provide invaluable data for a wide range of other essential services and applications.

Two remarkable multi-instrument satellites

Three successive pairs of Metop-SGA and Metop-SGB spacecraft will be deployed, with the lifespan for individual satellites designed to exceed 7.5 years, thus enabling full operational coverage of more than two decades.

Metop-SGA satellites host six instruments covering a multitude of environmental parameters, such as atmospheric temperature and humidity profiles, fine-grain observations of the composition of the Earth's atmosphere, and land applications.

Metop-SGB satellites host microwave imaging instruments as well as a scatterometer to measure wind velocity and an Argos-4 localisation and data collection platform, providing critical information on the oceans, atmosphere and clouds.

In addition, both satellites carry radio occultation instruments for atmospheric sounding.

International expertise and cooperation

- The European Space Agency
- The French Space Agency
- The German Aerospace Centre
- Copernicus, the Earth observation component of the European Union's space programme
- A large consortium of European companies and industries.

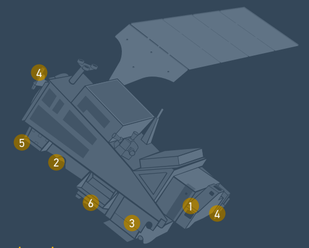
The EPS-SG programme is the European contribution to the Joint Polar System, a joint system between EUMETSAT and the United States' National Oceanographic and Atmospheric Administration.

Italy's Po River during an exceptional drought in 2022, pictured at the Ponte delle Becca, close to the city of Pavia

Satellites and instruments

The EUMETSAT Polar System - Second Generation consists of two Metop Second Generation satellites operating in tandem in a sun-synchronous polar orbit at an altitude of 823-848km.

Metop Second Generation A



Payload

1. Infrared Atmospheric Sounding Interferometer – New Generation
2. Microwave Sounder
3. Visible and Infrared Imager (METimage)
4. Radio Occultation Sounder
5. Multi-Viewing, Multi-Channel, Multi-Polarisation Imager
6. Copernicus Sentinel-5/Ultraviolet, Visible, Near-Infrared and Short Wave Infrared Sounder

Dimensions
7.0m x 14.0m x 3.4m

Orbit revolution
101 minutes

Mass in orbit
4,040kg

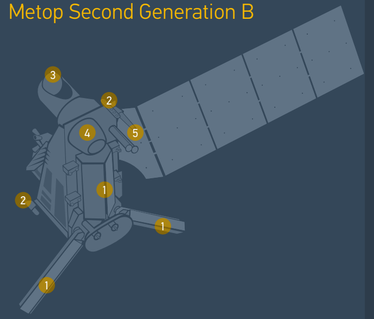
Repeat cycle
21 days

Max power
2,900W

Design lifetime
7.5 years

Orbit
Sun-synchronous, 823-848km altitude

Metop Second Generation B



Payload

1. Scatterometer
2. Radio Occultation Sounder
3. Microwave Imager
4. Ice Cloud Imager
5. Argos-4 (Advanced Data Collection System)

Dimensions
8.0m x 16.0m x 3.7m

Orbit revolution
101 minutes

Mass in orbit
3,840kg

Repeat cycle
21 days

Max power
2,100W

Design lifetime
7.5 years

Orbit
Sun-synchronous, 823-848km altitude

The EUMETSAT Polar System - Second Generation ground segment

EUMETSAT uses a comprehensive ground segment to control Metop Second Generation satellites, acquire, process and archive data and products, and deliver them to users worldwide.

EUMETSAT Mission Control

- **Darmstadt, Germany**
- **Madrid, Spain (backup)**

At the control centre, the data received from stations are consolidated to ensure that the data streams are complete with no gaps.

Measurements are processed into weather and climate data products, archived, and made available to users worldwide.

The task of extracting geophysical products from data is distributed between EUMETSAT headquarters and a European network of eight Satellite Application Facilities.

Flight control teams working 24/7 monitor the status of the satellites and the instruments using telemetry data. They also command the satellites to adjust their flight path and adjust the satellite configuration and instruments accordingly.

The teams working in the backup control centre in Madrid monitor the status and command the satellites during any contingencies which may arise in the EUMETSAT Mission Control.

User community

- **Worldwide**

Telemetry, tracking and command

- **Svalbard, Norway**

Ground segment elements are linked to the satellites via the S-band for telemetry and telecommand.

Mission data acquisition

- **Svalbard, Norway**
- **Azores, Portugal**
- **Direct broadcast stations network, Europe**
- **McMurdo Station, Antarctica** (in conjunction with the US National Oceanic and Atmospheric Administration)

Ground segment elements are linked via Ka-band, a radio frequency band that enables high-bandwidth communication, for science data acquisition. The ground segment is also linked to the satellite in X-band, to allow geographically distributed direct data acquisition.

EUMETSAT is committed to ensuring the continuous delivery of data from its satellite programmes. Specialised payload data and acquisition infrastructure located at multiple geographically distributed sites ensures the continuous delivery of data provided by Metop-SG satellites, covering global and regional missions.