

Expected benefits of MTG-S

Set to be Europe's first operational sounder in geostationary orbit, MTG-S will complement observations made by MTG-I satellites by providing a combination of improved observations and brand-new ones. These will play a key role in improving nowcasting and numerical weather prediction.

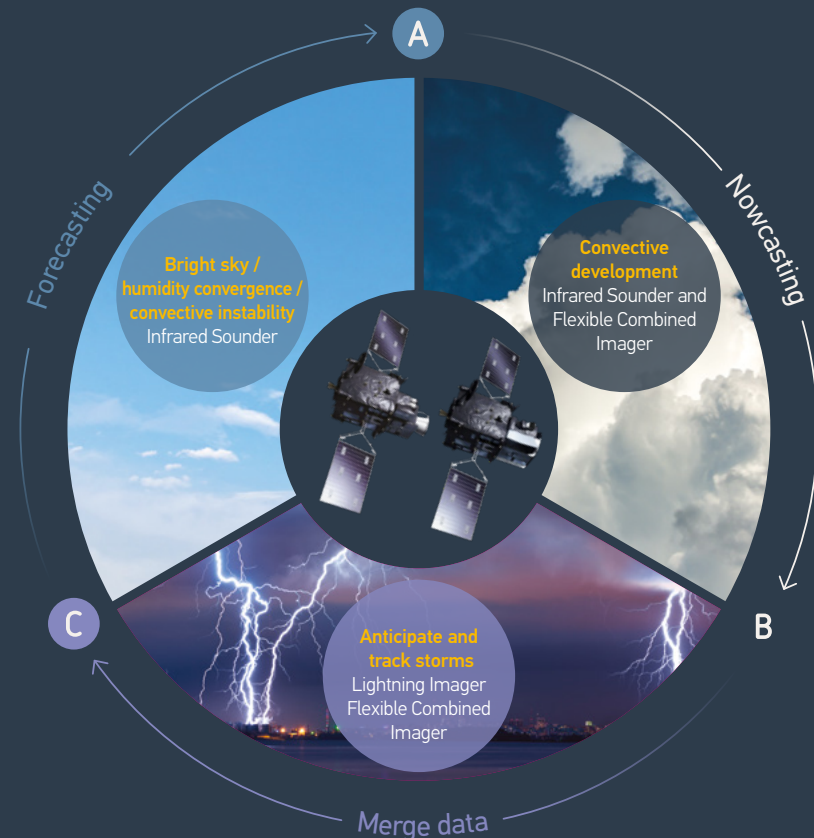
MTG-S will play an important role in the constellation of MTG satellites through its unique ability to sample the atmosphere at hyperspectral resolution. This enables the two instruments on board MTG-S, the Infrared Sounder and the Copernicus Sentinel-4 mission, to collect temperature profiles, humidity profiles, and trace gas concentrations that complement the data gathered by imaging satellites.

The Infrared Sounder – the first of its kind over Europe – will provide a dynamic three-dimensional view of the atmosphere over the full Earth disc. By scanning Europe every thirty minutes, this instrument will collect data across nearly 2000 channels, retrieving temperature and humidity profiles invisible to the naked eye. These profiles will make it possible for forecasters to better monitor

atmospheric instability and the three-dimensional movement of water vapour, likely enabling them to monitor and predict heavy rainfall, tropical cyclones, and rapidly developing winter storms with greater precision.

Meteorologists will be able to use data from the Infrared Sounder in combination with observations made by instruments on board MTG-I satellites to form a complete weather story. For example, after they have received data from the Infrared Sounder about atmospheric instability, the Flexible Combined Imager will provide forecasters with high frequency data that will allow them to track cloud formation. Then, when a storm develops further, the Lightning Imager will provide data about intra-cloud, inter-cloud, and cloud-to-ground lightning.

The Copernicus Sentinel-4 mission will monitor a number of pollutants in the atmosphere including nitrogen dioxide, sulphur dioxide, and ozone, making it possible to better understand the global distribution of these gases as well as how they fluctuate throughout the day and night. In addition to observing atmospheric composition, Sentinel-4 will support efforts to monitor air quality and emissions from natural hazards such as ash from volcanoes and smoke from wildfires.



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Meteosat Third Generation

Facts and figures

Monitoring weather and climate from space



A highly innovative geostationary satellite system for Europe and Africa

EUMETSAT’s next generation meteorological satellites are about to revolutionise weather forecasting in Europe and beyond.

The Meteosat Third Generation (MTG) system is the most complex and innovative geostationary meteorological system ever built. When fully deployed, it will include two imager satellites (MTG-I) and one sounder satellite (MTG-S). In total, the MTG programme will consist of four MTG-I and two MTG-S satellites, the first of which was launched in 2022, providing 20 years of service. This mission marks two firsts for EUMETSAT: operating the most sophisticated and complex system to date, and supporting a mission that comprises two different types of satellites.

In comparison to their forerunner satellites of the Meteosat Second Generation (MSG), the MTG-I imaging satellites will provide data more frequently, in higher resolution and with a greater number of spectral bands. The fire channel will have an extended detection scale. For the first time, this will be complemented by lightning monitoring over the full disc, encompassing Europe and Africa.

In a world premiere, the Infrared Sounders aboard the MTG-S satellites will provide vertical profiles of atmospheric temperature and moisture every 30 minutes over Europe with unprecedented accuracy from the geostationary orbit. MTG-S also carries the Copernicus Sentinel-4 Ultraviolet and Near-Infrared Sounder, which measures aerosols, ozone, nitrogen dioxide and sulphur dioxide every 60 minutes.

It’s a fact

Severe convective storms are some of the most dangerous weather-related events in Europe. From 2007 to 2017, the financial losses from convective storms in Western Europe alone amounted to about €35 billion.

Source: "NatCatService: Natural Catastrophe Statistics Online", Munich Re, accessed 2019, <https://www.munichre.com/en/reinsurance/business/non-life/natcatservice/index.html>

The MTG mission is the result of European expertise and cooperation

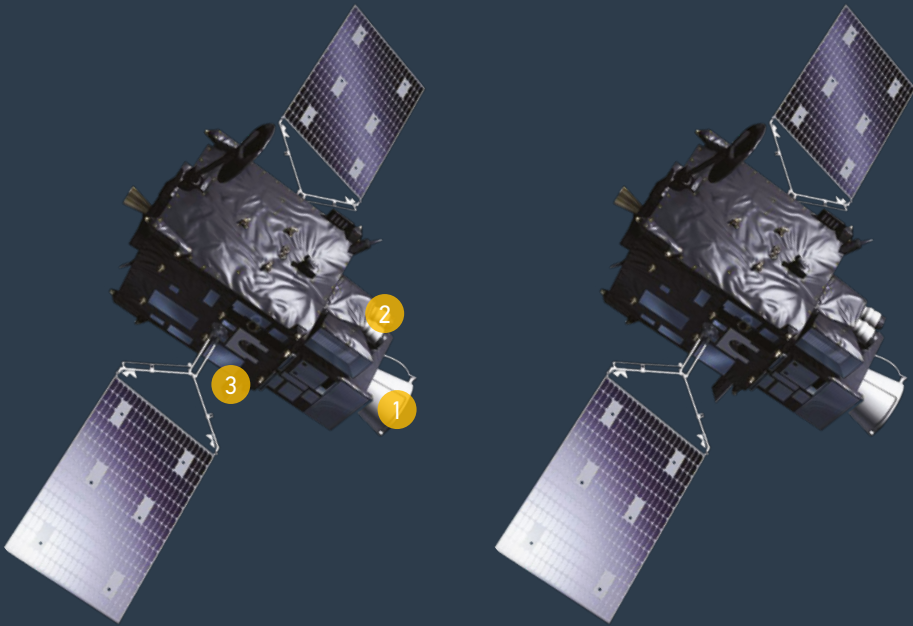
- The MTG satellites are developed and procured in cooperation with the European Space Agency (ESA) by a European industrial consortium led by Thales Alenia Space and OHB. They are developed according to the requirements defined by EUMETSAT after consultation with users of its data.
- The MTG-S satellite carries the European Union's Copernicus Sentinel-4 mission, the Ultraviolet, Visible and Near-Infrared Sounder, which is dedicated to measuring aerosols (fine particles in the atmosphere) as well as ozone, nitrogen dioxide and sulphur dioxide. These measurements, taken every 60 minutes, will be used to monitor and forecast air quality over Europe, to protect human health.
- The MTG ground segment is developed under EUMETSAT contracts with Thales Alenia Space, Telespazio, GMV and Thales Services.

Satellites and instruments

How many MTG satellites are there?

A constellation made up of three satellites: two imagers and one sounder. The programme allows for the production of six satellites in total: four imagers and two sounders.

MTG-I : two imagers



Full disc scanning service

16 spectral channels over Europe and Africa every 10 minutes

Rapid scanning service

16 spectral channels over Europe every 2.5 minutes

Payload

- 1 FCI (Flexible Combined Imager)
- 2 LI (Lightning Imager)
- 3 DCS (Data Collection and Retransmission Service) GEOSAR (Geostationary Search and Rescue Relay)

- Dimensions**
2.3m x 2.8m 5.2m (launch configuration)
- Mass in orbit**
3,800kg (including 2 tonnes of fuel)
- Payload mass**
800kg
- Power**
up to 2kW
- Design lifetime**
8.5 years

MTG-S : one sounder



Full disc sounding service

Vertical profiles of temperature and moisture over Europe every 30 minutes

Payload

- 1 IRS (Infrared Sounder)
- 2 Copernicus Sentinel-4 UVN (Ultraviolet, Visible and Near-Infrared Sounder)

- Dimensions**
2.3m x 2.8m 5.2m (launch configuration)
- Mass in orbit**
3,800kg (including 2 tonnes of fuel)
- Payload mass**
800kg
- Power**
up to 2kW
- Design lifetime**
8.5 years

Ground segment

How do we collect the data?

EUMETSAT controls the satellites, acquires and processes the data and delivers the extracted products to users worldwide. This is done by the ground segment which enables management of the spacecraft and which is made up of all the ground-based elements of the system used by operators and support personnel. For MTG these are:



Two mission data acquisition stations in Ka-band, in Lario, Italy and Leuk, Switzerland. Each station is comprised of three antennas of 6m diameter



Two ground stations in S-band to host the telemetry, tracking, and command facilities in Fucino, Italy, and Cheia, Romania. Fucino also functions as the back-up satellite monitoring and controlling system



Satellite monitoring and control system from Darmstadt, Germany



Data processing and archive at EUMETSAT in Darmstadt, Germany



Ground segment elements are linked to the satellites via the Ka-Band frequency which allows high-bandwidth communication