

Meteosat Third Generation (MTG) program

The Meteosat Third Generation (MTG) program will provide a highly innovative satellite system for Europe and Africa. MTG will support weather services and related environmental services, including improved forecasts over a timescale from minutes to hours, known as “nowcasting”.

Data from these satellites will also feed into complex computer models for numerical weather prediction, air quality monitoring and climate monitoring. It promises to revolutionize weather forecasting and enable more precise monitoring of our changing atmosphere, land surfaces and oceans.

The MTG satellites will operate in geostationary orbit, 36,000 km above the Earth. The launch of the first imager satellite in the MTG program (MTG-I 1), currently being completed at Thales Alenia Space in Cannes, France, is planned on 13 December onboard an Ariane 5 rocket.

MTG’s origins

Designed as a follow-on to the Meteosat Second Generation (MSG) series, the MTG program is a collaborative venture between the European Space Agency (ESA) and Eumetsat — the organization in charge of managing Europe’s weather satellites — to ensure the continuity of high-resolution weather monitoring beyond 2040. ESA is responsible for the definition and implementation of the MTG satellites and procurement of recurrent hardware, while Eumetsat is in charge of operating the spacecraft throughout its lifetime. Eumetsat and ESA have been successfully collaborating on meteorological missions since the first Meteosat satellite was launched in 1977.

Thales Alenia Space has been prime contractor for the Meteosat satellites on behalf of ESA for more than 30 years. The company delivered into orbit seven first-generation Meteosat satellites (the first model was launched in November 1977) and four second-generation Meteosat satellites (MSG), two of which are still in service today.

Since the start, Meteosat satellites have been the main source of meteorological data for Europe and Africa. The data from these satellites is one of ESA and Eumetsat’s key contributions to the World Meteorological Organization’s Global Observing System.

The MTG satellites and their missions

Meteosat Third Generation comprises six satellites: four imaging satellites (MTG-I) and two atmospheric sounding satellites (MTG-S). Together, they will allow continuous monitoring of the Earth at all times.

- The **four imaging satellites (MTG-I)**, such as the one currently in the clean rooms of Thales Alenia Space in Cannes (MTG-I 1), will carry three instruments:
 - A Flexible Combined Imager (FCI), which will provide a full image of the Earth every 10 minutes (2.5 minutes in fast imagery mode). The FCI gathers information about clouds and their properties as well as land and ocean surfaces. It can zoom in, to deliver images of selected regions which is key for issuing timely weather warnings and ensuring air traffic safety.
 - A Lightning Imager (LI), which comprises four cameras and will provide information about lightning events across the entire area of interest at any time of day or night. The LI instrument will continuously detect cloud-to-cloud and cloud-to-ground flashes over Europe and Africa. It serves two objectives: further our knowledge of how lightning is generated and improve emergency population warning.
 - A search & rescue data collection and support service, which will pick up distress signals and relay them to the emergency services, as well as gather data about immediate weather hazards.

The imaging satellites will operate in tandem: one will scan Europe and Africa (full disk) every 10 minutes, the other will scan Europe every 2.5 minutes. By comparison, the Meteosat Second Generation imagers scan Europe and Africa every 15 minutes and Europe every 5 minutes.

- The two **sounding satellites (MTG-S)** will provide three-dimensional atmospheric data. They will carry two instruments:
 - The Infrared Sounder (IRS) is the first of its kind in Europe. It will provide information about temperature and humidity in the atmosphere, over the Earth's entire surface. Europe will be observed every 30 minutes.
 - The Ultraviolet, Visible and Near-Infrared (UVN) Spectrometer. The UVN instrument will provide information about the composition of the atmosphere over Europe. This will be a new type of data for weather services and other applications in Europe.

The combination of MTG's increased resolution imaging data and state-of-the-art sounding products will take weather forecasting capabilities to the next level, particularly for the challenging task of nowcasting.

Nowcasting relates to the monitoring and prediction, in quasi real time, of rapidly evolving, and potentially damaging, weather phenomena such as severe thunderstorms. Earlier detection of such phenomena will increase the available reaction time for issuing severe weather warnings and implementing the necessary measures to avoid potentially catastrophic impacts.

All information from the MTG system will be made available to Eumetsat member institutions in Europe and worldwide for weather forecasting and monitoring of the composition of the atmosphere.

MTG program innovations compared to MSG

- **MTG's lightning imaging and infrared sounding missions will provide new types of data for European users.** Unprecedented information about the dynamics of atmospheric humidity and temperature over Europe will be available every 30 minutes. By adding spectral and lightning imagery data, national weather services will be able to predict severe storms and other significant weather events further in advance than before. Lightning data will offer new insights into active electrical storms.
- MTG will provide a **complete picture of the entire hemisphere every 10 minutes**, compared to 15 minutes with the MSG satellites.
- The highly accurate and detailed information provided by the Infrared Sounder and UVN instrument is new with the MTG program. For the first time, Meteosat satellites will not only provide imagery of weather systems but will also perform **layer-by-layer analysis of the atmosphere**, which will give us **new insights into the complexities of its chemical composition**. **Air quality monitoring in Europe will be further improved**, with measurement of nitrogen dioxide, ozone and fine particle matter.
- The Meteosat Third Generation satellites will have a **longer mission lifetime than the second generation**: up to 10.5 years, compared to 7 years.