Monitoring the weather from polar orbit

In 2006, the launch of MetOp-A marked a new era in operational meteorology. It was Europe’s first weather satellite to orbit Earth from pole to pole, just over 800 km high, complementing the long-standing series of Meteosat satellites that hover 36 000 km above the equator in geostationary orbit. The programme comprises a series of three identical satellites. Launched sequentially, they ensure continuous observations of a host of atmospheric variables such as temperature, humidity, trace gases, ozone and wind speed over the ocean. These data are used largely for numerical weather prediction – the basis for weather forecasting. They also contribute to climate research. MetOp-B was launched in 2012 and now it is time for MetOp-C.

Exceeding expectations

It was envisaged that each successive satellite would take over from its predecessor, but thanks to the extraordinary quality of these satellites, both MetOp-A and MetOp-B are still going strong. With MetOp-C, the mission continues as a three-satellite constellation, increasing the wealth of data for weather forecasting.

Working together

The MetOp programme is a joint undertaking between ESA and Eumetsat. The programme is also Europe’s contribution to a cooperative venture with the US NOAA agency. Not only do the MetOp and NOAA satellites fly in complementary orbits to offer maximum coverage, some of the instruments are common to both missions. The French space agency CNES also provide some sensors.

Improving forecasts

The economic and social benefits of accurate weather forecasts are huge so there is a continued effort to improve forecasts even further. Recent studies show that MetOp-A and MetOp-B have already reduced errors in one-day forecasts by 27%. MetOp-C will add to the family and guarantee the provision of these essential data well into the 2020s. In addition, it ensures the smooth transition to the next generation of MetOp satellites, which are currently being built.
Using satellite data, the maps above show sea-surface temperature, wildfires, sea-surface height and marine chlorophyll. The Sentinel-3 mission will take this legacy, and more, into the age of Copernicus.

**Launches**
- **MetOp-A**: 2006 from Kazakhstan on Soyuz
- **MetOp-B**: 2012 from Kazakhstan on Soyuz
- **MetOp-C**: 2018 from French Guiana on Soyuz

**Orbit**
Polar, Sun-synchronous at altitude of approximately 817 km

**Satellite**
- 6.2 m x 3.4 m x 3.4 m in launch configuration
- 17.6 m x 6.5 m x 5.2 m after solar array and antenna deployment
- 4083 kg at launch, including 314 kg of fuel

**Instruments**
- **Advanced Microwave Sounding Unit-A (AMSU-A)** – measures temperature of atmosphere (NOAA)
- **Advanced Scatterometer (ASCAT)** – measures surface wind speed over the ocean (Eumetsat/ESA)
- **Advanced Very High Resolution Radiometer (AVHRR/3)** – images clouds, the ocean and land surfaces (NOAA)
- **Global Ozone Monitoring Experiment-2 (GOME-2)** – profiles atmospheric ozone (Eumetsat/ESA)
- **Global Navigation Satellite System Receiver for Atmospheric Sounding (GRAS)** – measures temperature of upper troposphere and stratosphere (Eumetsat/ESA)
- **Infrared Atmospheric Sounding Interferometer (IASI)** – measures temperature and humidity (CNES)
- **Microwave Humidity Sounder (MHS)** – measures humidity (Eumetsat)
- **Space Environment Monitor (SEM)** – measures charged particles (NOAA)
- **Advanced Data Collection (ARGOS)** – for location and dissemination of measurements (CNES)

**Mission control**
Eumetsat, Darmstadt, Germany
Launch and early orbit phase via ESA's European Satellite Operations Centre in Darmstadt

**Data**
Downloaded to Eumetsat Polar System stations in Svalbard (Norway) and U.S. McMurdo in Antarctica.
Data processed at Eumetsat

**Applications**
Operational meteorology and climate research

**Prime contractor**
Airbus Defence and Space