



# EUMETSAT Systems and Plans



Presented by *Dieter Klaes*  
On behalf of all EUMETSAT Teams



## The Organisation



EUMETSAT is an intergovernmental organisation with currently 30 Member States and 1 Cooperating State

## The Mandate

EUMETSAT objective is to establish, maintain and exploit European systems of operational meteorological satellites, taking into account as far as possible the recommendations of the World Meteorological Organization. A further objective is to contribute to the operational monitoring of the climate and the detection of global climatic changes.

The EUMETSAT strategy aims at further international / intercontinental co-operation



## The Mission

- Deliver cost effective operational satellite data and products that satisfy the meteorological and climate data requirements of its Member States
- 24 hours a day, 365 days a year, over decades
- Encourage the maximum use of EUMETSAT data and products

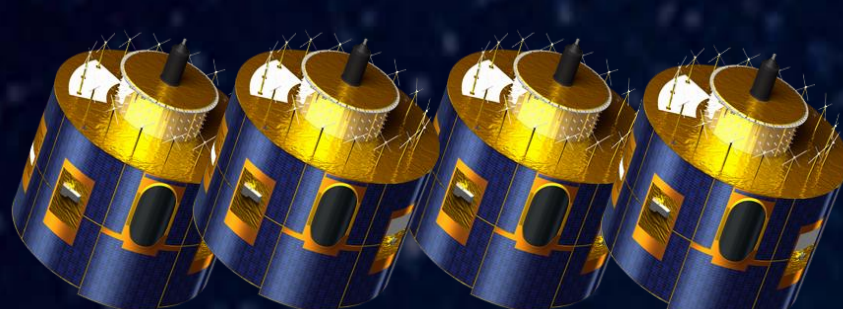


## The International Context

EUMETSAT's meteorological satellites contribute to the World Meteorological Organisation's (WMO) Global Observation System in close co-operation between European, French and German Space agencies (ESA, CNES, DLR), with the U.S. partners NOAA and NASA and with the European Commission. This ensures the provision of global satellite data, data exchange and the coordinated development of new generations of meteorological and environmental satellites.



## Meteosat Second Generation (MSG)

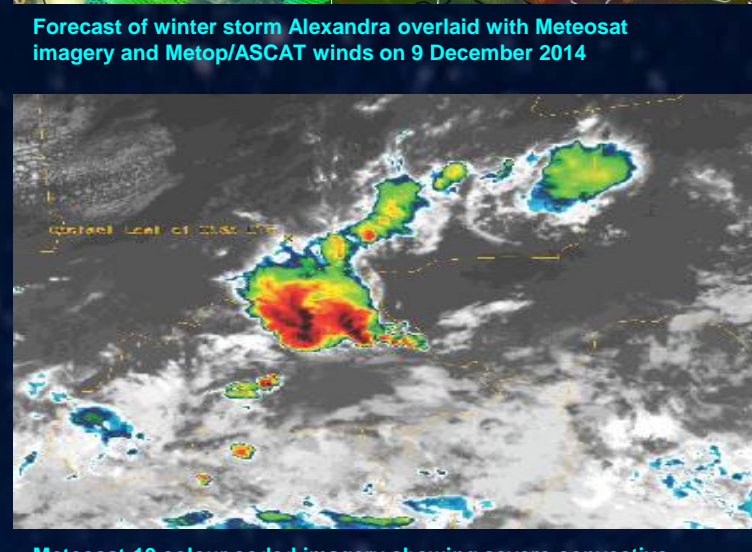
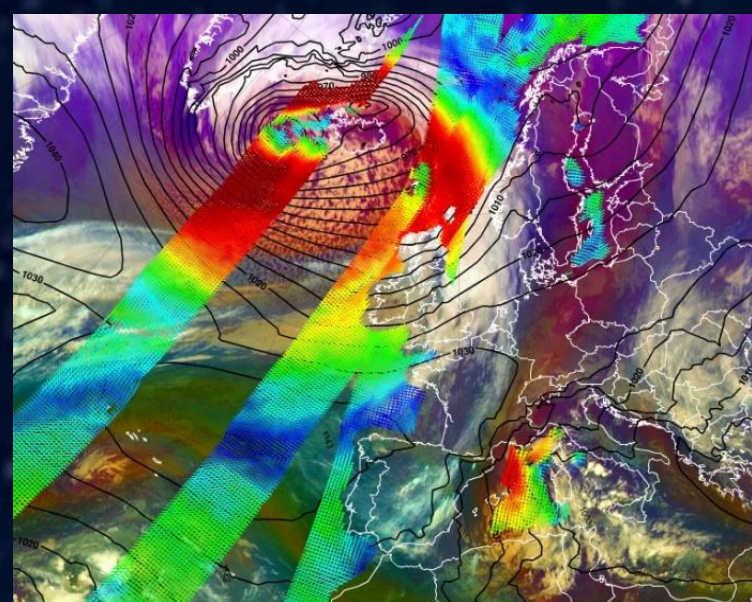


MSG: Operational, four satellites in orbit

The current prime operational satellite is Meteosat-10 (MSG-3) (at 0°), launched in July 2012. Meteosat-8 (MSG-1) provides backup at 3.5 °E Meteosat-9 (MSG-2) provides 5 min. rapid-scan service over Europe and Northern Africa (at 9.5°E). MSG-4 was launched 15 July 2015 and is currently under commissioning. After commissioning it will be stored in orbit (7 Dec. 2015) until use at 3.5° W.

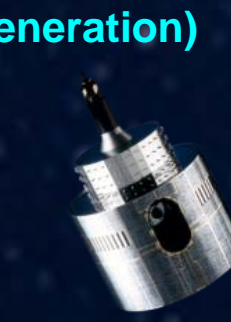
The second generation of geostationary Meteosat satellites (MSG) provides the geostationary service over Europe and Africa. MSG satellites provide since 2002 a stream of high-quality images from the 12 channel SEVIRI (Spinning Enhanced Visible and Infrared Imager) instrument every 15 minutes, to support improved forecasting and severe weather warning.

The Geostationary Earth Radiation Budget (GERB) Instrument provides information on the diurnal cycle of radiation budget components for the regions within the Meteosat field of view.



## Meteosat Transition Programme (MTP) (Meteosat First Generation)

MTP: Operational, one satellite still in orbit



The last satellite of the first generation of the Meteosat series, Meteosat-7, is still providing data services over the Indian Ocean (IODC = Indian Ocean Data Coverage) and supports a regional Tsunami warning system (Meteosat-7 at 57.5 °E). It is planned to be de-orbited in 2017. A scenario and an implementation roadmap were approved by CGMS for the future provision of IODC services. The aim is to provide more resilient IODC services based on multi-partner assets, to fulfill baseline requirements agreed at CGMS-42.

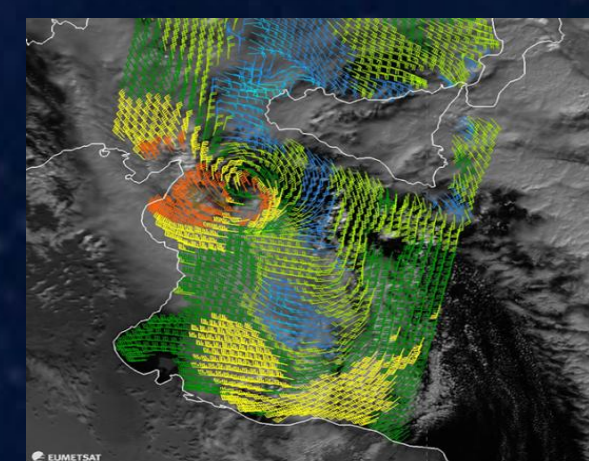
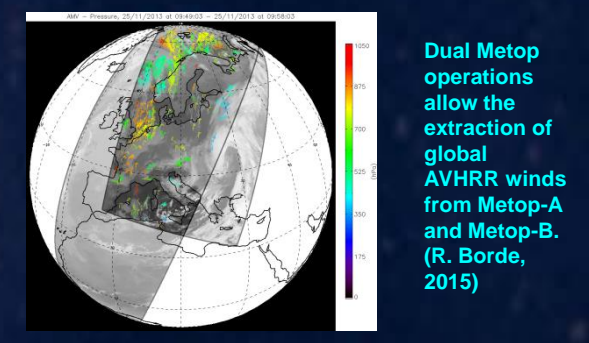
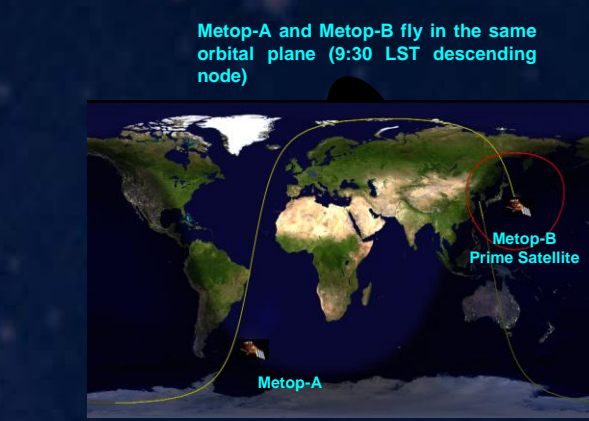
The first generation Meteosat series provides images in three spectral channels every 30 minutes. The satellite was originally developed by ESA and first launched in 1977. Operations were taken over by EUMETSAT in 1995.

## EUMETSAT Polar System (EPS)

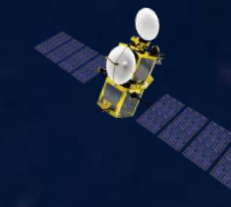


Metop: Operational, two satellites in orbit, one to be launched

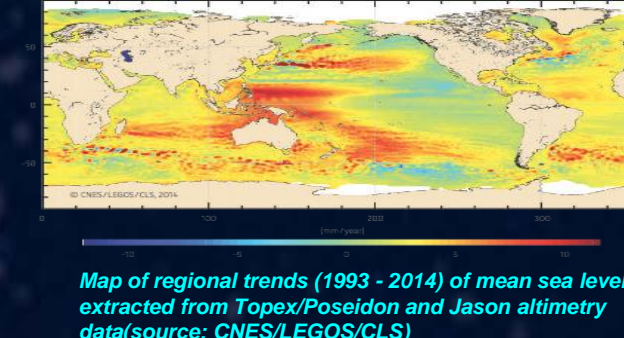
The EUMETSAT Polar System (EPS) provides detailed observations of atmospheric conditions like temperature and humidity profiles in global coverage from a polar, sun-synchronous orbit, with an equator crossing time of 9:30 Local Solar Time (desc. node). Its space component are the Metop satellites. Metop instruments provide also information on the chemical composition and ocean parameters. The Metop data are required for weather forecasting and in climate and environmental monitoring. Metop-A is in orbit since 19 October 2006 and will provide its services as long they bring benefits to the users. Metop-B was launched on the 17 September 2012 and is the prime satellite now. The orbits are phased 48.93 min. apart. Metop-C is in storage and scheduled for launch in October 2018.



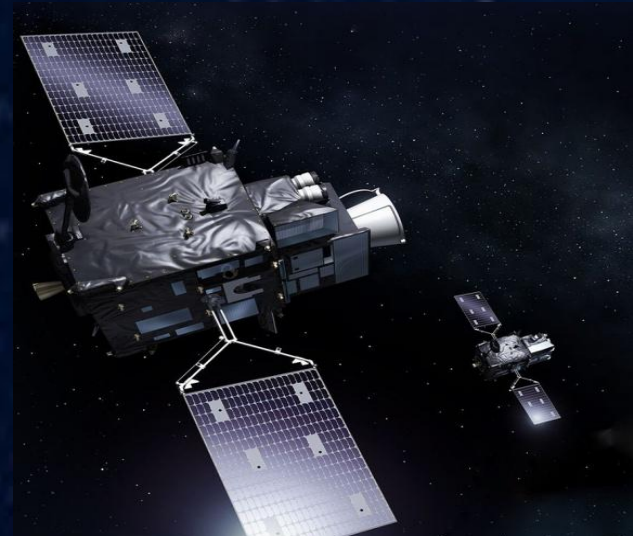
## Jason-2



EUMETSAT is contributing to operational Ocean monitoring since more than 6 years since the launch of the Jason-2 satellite on the 20 June 2008. Jason-2 is exploited jointly with NOAA, NASA and CNES. EUMETSAT provides the operational support for real-time dissemination of products and services in Europe.



## Meteosat Third Generation (MTG)



MTG: Approved, under development Sentinel-4 on board MTG-I satellites

- Imagery mission implemented by a two-satellite MTG-I system:
  - Full disk imagery every 10 minutes in 16 spectral bands
  - Fast imaging of European weather every 2.5 minutes
  - new Lightning Imager (LI)

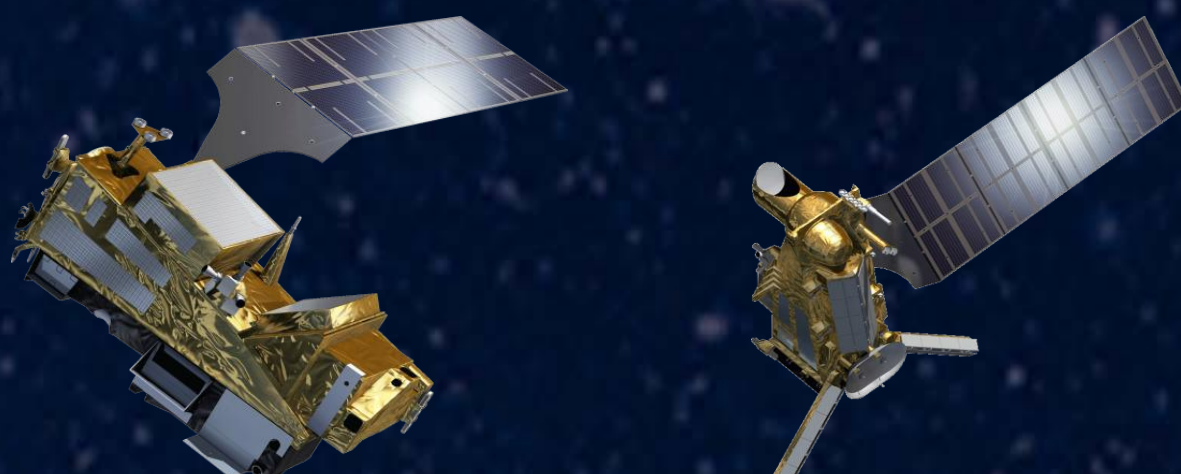
Jointly with ESA, EUMETSAT is currently developing the third generation of Meteosat satellites. The project is in Phase C/D.

This generation of Meteosat satellites are based on three-axis stabilized platforms. The operational configuration of MTG will be a system of two Imaging satellites (MTG-I) and one sounding satellite (MTG-S) with the launch of the first MTG-I satellite planned in the second half of 2020 and the launch of the first MTG-S satellite planned in 2022.

- Hyper spectral Infrared (IRS) sounding mission:
  - 3D mapping of water vapour, temperature, O3 every 1 hour
  - Air quality monitoring and atmospheric chemistry in synergy with Copernicus Sentinel-4 Ultraviolet Visible

## Long Term Continuity: Future Systems planned for the Timeframe from 2020 - 2040

### EUMETSAT Polar System Second Generation (EPS-SG)



EPS-SG: Approved in 2015, under development Metop-SG programme approved at ESA CMIN12 Sentinel-5 on board Metop-SG-A satellites

#### Sat A Payload:

- Infrared Atmospheric Sounding Instrument (IASI-NG)
- Visible-Infrared Imaging Instrument (MetImage)
- Microwave Sounding Instrument (MWS)
- Radio-occultation instrument (RO)
- Multi-viewing, multi-channel, multi-polarization imager (3MI)
- Copernicus Sentinel-5 implemented on EPS-SG

#### Sat B Payload:

- Scatterometer (SCAT)
- Radio-occultation instrument (RO)
- Microwave Imaging instrument (MWI)
- Ice Cloud Imager (ICI)
- Advanced Data Collection System (ADCS)

EUMETSAT is preparing the EPS follow on system, EPS-SG (EPS second generation), jointly with partners (ESA, NOAA, CNES, DLR). The planned launch date for the first satellite pair is June 2021/Dec. 2022. Planned missions will continue, extend and improve the current EPS services. A two satellite system is being developed. The project is currently in Phase-B. The programme was approved in summer 2015 by the EUMETSAT Council.



## Jason-3



Jason-3: approved Launch planned 2015

## Jason-CS/Sentinel-6



Jason-CS/Sentinel-6: Programme in Force since September 2015

### Continuity with Jason-3 and Jason-CS/Sentinel-6

EUMETSAT is preparing jointly with its partners the Jason-3 programme (approved in 2010) for a follow on mission of the Jason-2 with a launch envisaged in January 2016. Partners involved are EUMETSAT, CNES, NOAA, NASA.

Further in the future Jason-CS is planned to provide continuation services, in the 2021 to 2032 timeframe. The Jason-CS programme entered into force the 9 September 2015. Partners involved are EUMETSAT, ESA, EU, NOAA, NASA.

## Marine Services: Copernicus Sentinel-3 (S3)

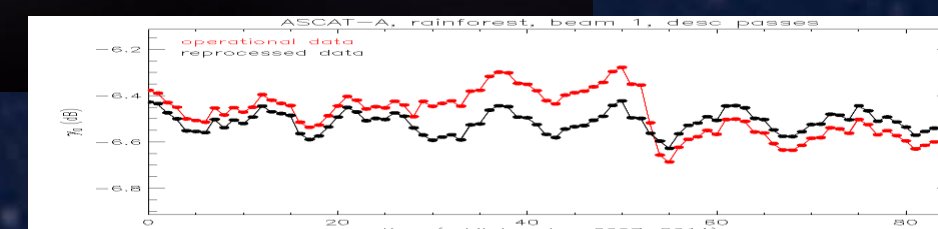


EUMETSAT has the responsibility of operations of the Copernicus Sentinel-3 marine missions (in coherence with the EUMETSAT Jason activities) under an agreement between EU and EUMETSAT in a dedicated ground segment. The Copernicus (former GMES) Sentinel-3 Programme is co-funded by ESA and EC. Sentinel-3A is scheduled for launch end of December 2015.

## Climate Services

The Climate Service Development Plan (CSDP), a rolling 4-5 year plan represents the EUMETSAT's commitment towards climate services. It benefits from product developments but also adds needed developments for climate. It comprises

- Generation of individual Climate Data Records (FCDR and TCDD), engineering and coordination activities;
- Activities committed in EU projects such as ERA-CLIM2, joint activities with the SAF network, NOAA and other international partners, e.g., for SCOPE-CM
- Participation in Horizon 2020 funded projects (FIDUCEO and GAIA-CLIM)



ASCAT real-time products (red) and recalibrated products (black).

EUMETSAT contributes with its satellite systems to monitoring changes in the climate system, like rising temperatures, melting ice and increasing sea level.

The EUMETSAT Satellite Application Facilities (SAF) are delivering products (Essential Climate Variables) for climate change monitoring, in particular the Climate Monitoring SAF.

EUMETSAT is part of the Global Satellite Inter Calibration System (GSICS) and of the SCOPE-CM project.

EUMETSAT mission data are reprocessed regularly, this includes the recalibration of historic Meteosat IR imagery and the re-calibration of ASCAT backscatter measurements.

## EUMETSAT Data Centre

- Archive dating back to 1981
- Over 1.3 Petabyte (PB) stored (end 2014)
- Established Long Term Data Preservation
- Capacity increased to 50 PB, scalable to 200 PB
- 1.4 PB retrieved annually
- Raw and reprocessed data, centrally and de-centrally produced
- Networked with Satellite Application Facilities (SAFs)
- Access online integrated into EO Portal registration



## EUMETSAT distributed Application Ground Segment



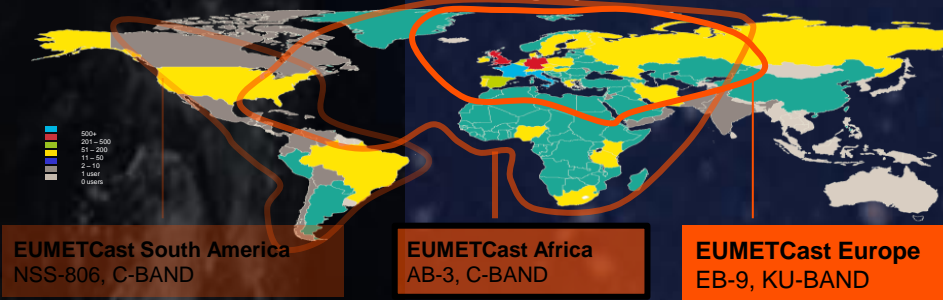
Data processing, product generation and dissemination are done centrally in Darmstadt at EUMETSAT HQ, but also decentralised by a network of Satellite Application Facilities (SAF), centres of excellence in certain fields of meteorology and applications. Typical products include detailed ocean and land surface parameters and information on atmospheric composition, but also software packages to process EUMETSAT data. There are currently eight SAFs distributed over Europe. They started the CDOP-2 (Continuous Development and Operations) phase in March 2012. Proposals for CDOP-3 are being prepared, which is planned to start in 2017.

## Distributing Data and Products

All EUMETSAT satellites transmit their measurement and telemetry data to receiving stations on the ground. From there they are relayed to the Control Centre in Darmstadt, Germany. Data are processed, archived in the EUMETSAT Data Centre, and in near real-time retransmitted to the User community, mainly via EUMETSAT's own EUMETCast dissemination system. EUMETCast is a multi-service dissemination system based on standard Digital Video Broadcast (DVB) technology. It uses commercial telecommunication geostationary satellites to multicast files (data and products) to a wide user community. EUMETCast forms the basis of EUMETSAT's contribution to the Integrated Global Data Dissemination Service (IGDDS), a component of the World Meteorological Organisation's Information Service (WIS).

It also underpins EUMETSAT's contribution to GEONETCast, a global intergovernmental network of satellite-based Earth Observation data dissemination systems, and is connected in this framework to the Chinese CMACast system, thus enabling dissemination of EUMETSAT data in the Asia-Pacific region.

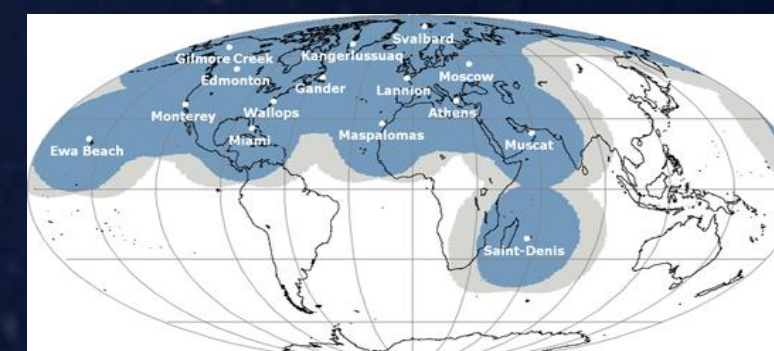
New Open WMS Pilot 'EUMETView' Released on 23 July - <http://eumetview.eumetsat.int/> Planned to supersede the current "Real time imagery service" on EUMETSAT's webpage



## EUMETSAT Advanced Retransmission Service (EARS)

The purpose of the regional service is to provide the European meteorological community with sounder, imager and scatterometer data, covering data-sparse areas, within 30 minutes of the instrument observations. The improved timeliness of regional data assists in earlier forecasting. A full list of EARS products can be found in the EUMETSAT Product Navigator.

EARS comprises of eight separate polar satellite instrument data services: EARS-ASCAT, EARS-ATOMS, EARS-AVHRR, EARS-IASI, EARS-NWC, EARS-ATMS, EARS-CHS and EARS-WIRS. Each of the EARS services retransmits observations from an instrument, or an instrument group, and aims to provide a homogeneous service across the NOAA and Metop polar orbiting satellite platforms.



## Third Party Data Services

To complement the satellite data and products generated by the EUMETSAT Application Ground Segment, EUMETSAT relays a range of third-party products from partner organisations. The majority are available via EUMETCast, some form part of the Meteosat LRIT Direct Dissemination Service. In addition to the Meteosat satellite data, EUMETSAT relays geostationary and polar satellite data from partner organisations like National Oceanic and Atmospheric Administration (NOAA), the China Meteorological Administration (CMA), the Indian Space Research Organisation (ISRO), the Japan Meteorological Agency (JMA), and the Russian ROSSHYDROMET. These data are available via EUMETCast and through direct dissemination, via the Meteosat satellites. Within the scope of the Initial Joint Polar-Orbiting Operational Satellite System (JPSS) EUMETSAT generates and disseminates polar orbiting data and products from the NOAA satellite series.