EUMETSAT Programmes and future plans

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International cooperation framework

EUROPEAN METEOROLOGICAL INFRASTRUCTURE

EUMETSAT

EUMETNET

ECMWF

CGMS
Shared systems with the United States: Joint Polar System
Relative contributions to Day 1 forecast errors (FSOI)

- Metop-A & -B
- Metop-C
- NOAA JPSS/S-NPP
- NOAA POES DMSP
- Other Satellite Observations
- In-Situ/Conventional Observations

Source: ECMWF
Shared systems with the United States: Jason series

TOPEX-POSEIDON: 1992-2006

JASON: 2001-2013

OSTM/JASON-2: 2008-2019

JASON-3: 2016 -

SENTINEL-6A MICHAEL FREILICH:
Launch: November 2020

SENTINEL-6B:
Launch planned in 2026
EUMETSAT currently exploits 10 satellites

**METOP-A, -B & -C (98.7° incl.)**
- LOW EARTH, SUN-SYNCHRONOUS ORBIT
- EUMETSAT POLAR SYSTEM (EPS)

**SENTINEL-3A & -3B (98.65° incl.)**
- LOW EARTH, SUN-SYNCHRONOUS ORBIT
- COPERNICUS DUAL SATELLITE MARINE MISSION

**METEOSAT-9, -10, -11**
- GEOSTATIONARY ORBIT
- TWO-SATELLITE SYSTEM
- METEOSAT 2ND GENERATION
  - FULL DISC IMAGERY MISSION (15 MINS) (METEOSAT-11 @0°)
  - RAPID SCAN SERVICE OVER EUROPE (5 MINS) (METEOSAT-10 @9.5° E)
  - BACKUP SATELLITE AND GAP FILLER FOR RSS (METEOSAT-9 @3.5°E)

**JASON-3 (63° incl.)**
- LOW EARTH, NON-SYNCHRONOUS ORBIT
- OCEAN SURFACE TOPOGRAPHY MISSION, SHARED WITH CNES/NOAA/NASA/EU

**METEOSAT-8 (41.5° E)**
- GEOSTATIONARY ORBIT
- METEOSAT 2ND GENERATION PROVIDING IODC FROM UNTIL MID-2022
9 satellites in 2022: Metop-A & Met-8 de-orbited, Sentinel-6 MF in orbit

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- LOW EARTH, SUN-SYNCHRONOUS ORBIT
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**SENTINEL-3A & -3B (98.65° incl.)**
- LOW EARTH, SUN-SYNCHRONOUS ORBIT
- COPERNICUS DUAL SATELLITE MARINE MISSION

**METEOSAT-10, -11**
- GEOSTATIONARY ORBIT
- TWO-SATELLITE SYSTEM
- METEOSAT 2ND GENERATION
  - FULL DISC IMAGERY MISSION (15 MINS) (METEOSAT-11 @0°)
  - RAPID SCAN SERVICE OVER EUROPE (5 MINS) (METEOSAT-10 @9.5° E)

**JASON-3 & SENTINEL-6A MICHAEL FRELICH (63° incl.)**
- LOW EARTH, NON-SYNCHRONOUS ORBIT
- OCEAN SURFACE TOPOGRAPHY MISSION, SHARED WITH CNES/NOAA/NASA/EU

**METEOSAT-9 (45.5° E)**
- GEOSTATIONARY ORBIT
- METEOSAT 2ND GENERATION PROVIDING IODC
EUMETSAT & NOAA programmes: phasing

- Meteosat SG: 2002 -
- GOES-R series: 2016 -
- MTG: 2022/2025 -
- GOES next gen: 2030
- M4G: 2040
- EPS/Metop: 2006 -
- Suomi-NPP/JPSS: 2011-
- EPS-SG/Metop-SG: 2023/2024 -
All MSG and Metop satellites are deployed and working
Launch of 1 next-generation satellite per year in 2020-2025

- **MTG-I1**
  - 2022: MTG-I1 LAUNCH
  - 2023: SYS IV&V, LC, SIOV, CAL/VAL

- **MTG-S1**
  - 2024: MTG-S1 LAUNCH
  - 2025: SYS IV&V, LC, SIOV, CAL/VAL

- **MTG-I2**
  - 2026: MTG-I2 LAUNCH
  - 2022: SYS IV&V, LC, SIOV, CAL/VAL

- **Metop-SG A1**
  - 2023: METOP-SG A1 LAUNCH
  - 2024: SYS IV&V, LC, SIOV, CAL/VAL

- **Metop-SG B1**
  - 2025: METOP-SG B1 LAUNCH
  - 2026: SYS IV&V, LC, SIOV, CAL/VAL
Meteosat Third Generation: two types of MTG satellites

- Imagery mission: MTG-I satellites
  - Full disc every 10 minutes in 16 spectral bands (MTG-I1)
  - Imagery of Europe every 2.5 minutes (MTG-I2)
  - Full disc Lightning Imager

- Sounding mission: MTG-S satellites
  - IRS hyperspectral infrared sounder
    - Temperature, moisture profiles every 30 minutes (Europe)
  - Atmospheric chemistry:
    - Synergy IRS - Copernicus Sentinel-4

- Operational exploitation: 2022-2042
Fast repeat Infrared sounding and imagery over Europe

**Current baseline**

- Every 30 min: 4
- Every 3h00 min: 3 times every 30 min

**IRS Hyperspectral sounding**

- Every 30 min

**FCI Rapid-Scan Service: 2.5 mn**
4D weather cube with MTG-I and MTG-S
Full disc coverage of Lightning imagery
EPS Second Generation: a two-satellite system

- Three successive pairs of satellites:
  - *Metop-SG A* for optical imagery and sounding
  - 6 instruments, including Sentinel-5 from Copernicus
  - *Metop-SG B* for microwave imagery
  - 5 instruments

- Contribution to the Joint Polar System (JPS) shared with NOAA

- Operational exploitation: 2023 – 2044
EPS-SG mission capabilities

- Major improvements to all EPS observation missions
  - Infrared and microwave sounding
  - Optical imagery
  - Scatterometer
  - Radio-occultation (2)

- New imagery missions
  - 3MI: first operational imaging polarimeter
  - Microwave imager (MWI): imagery of precipitation
  - Microwave Ice Cloud Imager (ICI): ice clouds
New measurements from EPS-SG

AEROSOLS

CLOUD LIQUID WATER

CLOUD DROLET RADIUS

ICE CLOUD IMAGING (664 GHz)
EPS-SG regional mission for Nowcasting

- Products disseminated within 15 to 30 minutes from sensing
Exploring further opportunities

• Scope expansions of EPS-SG programme: 2030-2040
  • Additional capability
    • Doppler Lidar for wind profiling: post-Aeolus
    • 2-year study/design roadmap with ESA
    • Review end of 2022, programme proposal in 2023
  • Additional MW sounding capacity
    • Small constellation: Arctic NWC and global NWP
    • Complement to core capacity (ATMS, MWS, etc.)
    • AWS micro-satellite developed by ESA: launch in 2023
    • 5 Bands: 54 to 325 GHz
    • Constellation study with ESA, programme proposal in 2023

• Pilot procurement of additional commercial RO data
EUMETSAT in Copernicus

• Focus:
  • Ocean monitoring
  • Monitoring of atmospheric composition including GHG
  • Data access and support to users

• Cooperation with ESA on development and operations

• Vision: *deliver integrated data streams from Copernicus and EUMETSAT missions*
Dual Sentinel-3 marine mission
Combining Sentinel-3 and Jason for operational oceanography and climate change monitoring
Copernicus Platform: a distributed, federative cloud platform
MTG-S/ Sentinel-4 in GEO ring for air Quality

TEMPO (hourly)
Tropospheric Emissions: Monitoring of Pollution

Sentinel-4 (hourly)

GEMS (hourly)
Geostationary Environmental Monitoring Spectrometer

Sentinel-5P (once per day)
Copernicus Sentinel-5 on EPS-SG/Metop-SGA

TROPOMI NO2
Apr-Sep 2018
Coming next: Copernicus CO2M GHG monitoring mission

**Satellite Overview:**
- Satellite mass: 1674 kg
- Satellite Power: < 2300W
- Payload data downlink: up to 1.8 Gbit/s (Ka-band)
- Baseline launcher: VEGA-C

**Payload overview:**
- CO2 and CH4 push-broom imaging spectrometer (CO2I)
  - with embedded NO2 visible channel (NO2I)
- Multi-Angle Polarimeter (MAP) for aerosol and light path correction
- Cloud Imager (CLIM) for cloud and cirrus detection

**Orbit:**
- Type: SSO @ 11:30 LTDN
- Altitude: 735 km
- Repeat cycle: 11 days