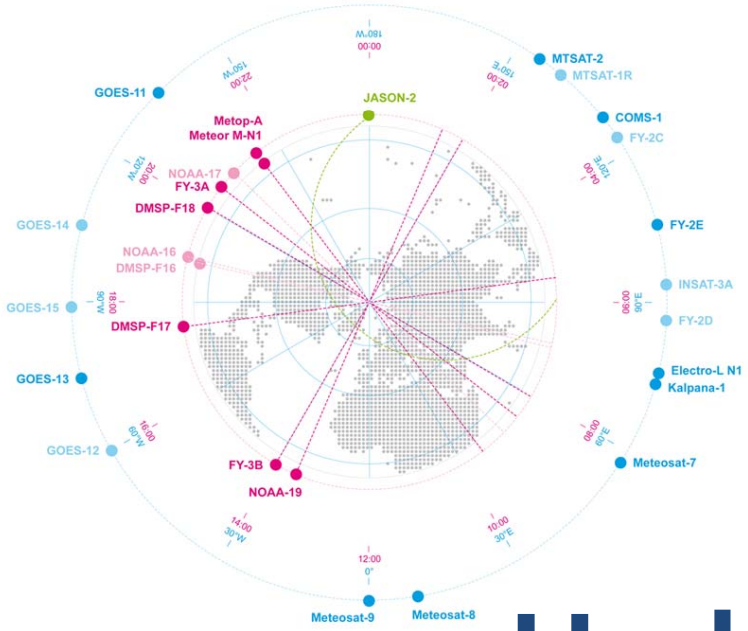


Update on EUMETSAT satellite programmes

Presented to CGMS-43 plenary session, agenda item E.1

Coordination Group for Meteorological Satellites

EUMETSAT

CGMS

EUMETSAT mission planning

YEAR... 03 04 05 06 07 08 09 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40

METEOSAT FIRST GENERATION

METEOSAT-7

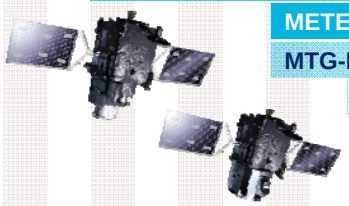
METEOSAT SECOND GENERATION

METEOSAT-8

METEOSAT-9

METEOSAT-10

MSG-4/METEOSAT-11*



METEOSAT THIRD GENERATION

MTG-I-1 : IMAGERY

MTG-S-1: SOUNDING

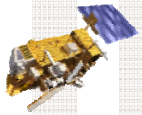
MTG-I-2: IMAGERY

MTG-I-3: IMAGERY

MTG-S-2: SOUNDING

MTG-I-4: IMAGERY

Mandatory Programmes

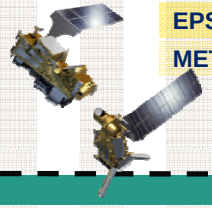


EUMETSAT POLAR SYSTEM (EPS)

METOP-A

METOP-B

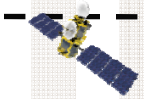
METOP-C



EPS-SECOND GENERATION (EPS-SG)

METOP-SG A: SOUNDING AND IMAGERY

METOP-SG B: MICROWAVE IMAGERY



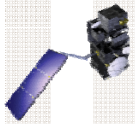
JASON

JASON-2

JASON-3

JASON-CS/SENTINEL-6

Optional Programmes



SENTINEL-3 A/B/C/D (COPERNICUS)

SENTINEL-4 ON MTG-S (COPERNICUS_

SENTINEL-5 ON EPS-SG (COPERNICUS)

Third Party Programmes

YEAR... 03 04 05 06 07 08 09 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40

EUMETSAT CGMS

Current EUMETSAT satellites

METOP A-B
(LOW-EARTH, SUN – SYNCHRONOUS ORBIT)

EUMETSAT POLAR SYSTEM/INITIAL JOINT POLAR SYSTEM

JASON-2 (with CNES, NOAA/NASA)
(LOW-EARTH, 63° INCL. NON SYNCHRONOUS ORBIT)

OCEAN SURFACE TOPOGRAPHY MISSION

METEOSAT 8-9-10 (2nd GENERATION)
(GEOSTATIONARY ORBIT)

TWO-SATELLITE SYSTEM:
- METEOSAT-10: FULL DISK IMAGERY MISSION AT 0° (15 MN)
- METEOSAT-9: RAPID SCAN SERVICE OVER EUROPE AT 9.5°E (5 MN)
- METEOSAT- 8: BACK UP AT 3.5°E (MOVE TO 40°E CONSIDERED)

METEOSAT – 7 (1st GENERATION)
(GEOSTATIONARY ORBIT)
INDIAN OCEAN DATA COVERAGE MISSION AT 57°5 E
(UNTILL SPRING 2017)

Deployment of the last MSG and Metop satellites

MSG-1 (Meteosat-8) launch 28 August 2002

MSG-2 (Meteosat-9) launch 21 December 2005

MSG-3 (Meteosat-10) launch 5 July 2012

MSG-4 to be launched On 2 July 2015

METEOSAT SECOND GENERATION

METEOSAT-8

METEOSAT-9

METEOSAT-10

MSG-4/METEOSAT-11*

YEAR... 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 2020 2021 2022 2023 2024 2025

EUMETSAT POLAR SYSTEM (EPS)

METOP-A

METOP-B

METOP-C

Metop-A launch 19 October 2006

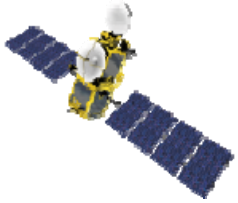
Metop-B launch 17 September 2012

Metop-C launch Planned in October 2018

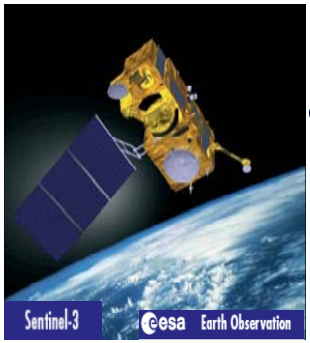
EUMETSAT CGMS

NEXT LAUNCHES

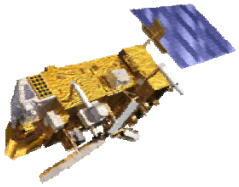
- **MSG-4** launch 2 July 2015 (for in orbit storage)



- **Jason-3** launch (with NOAA, CNES, NASA) on 22 July 2015



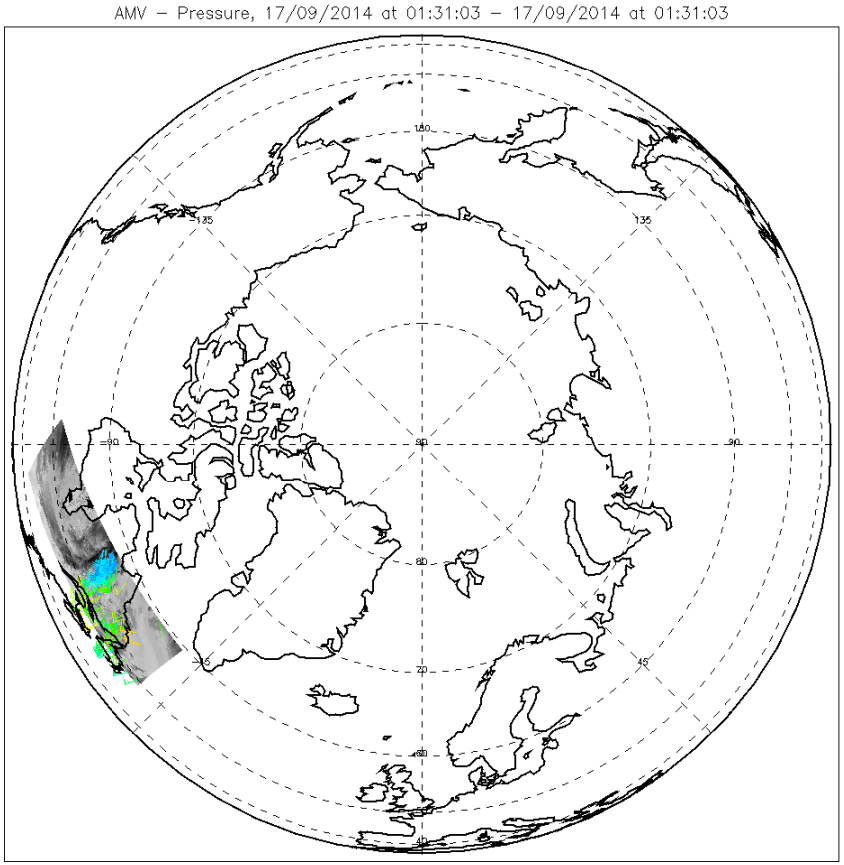
- EUMETSAT will operate **Copernicus Sentinel-3** (Marine Mission) after commissioning by ESA, in 2016



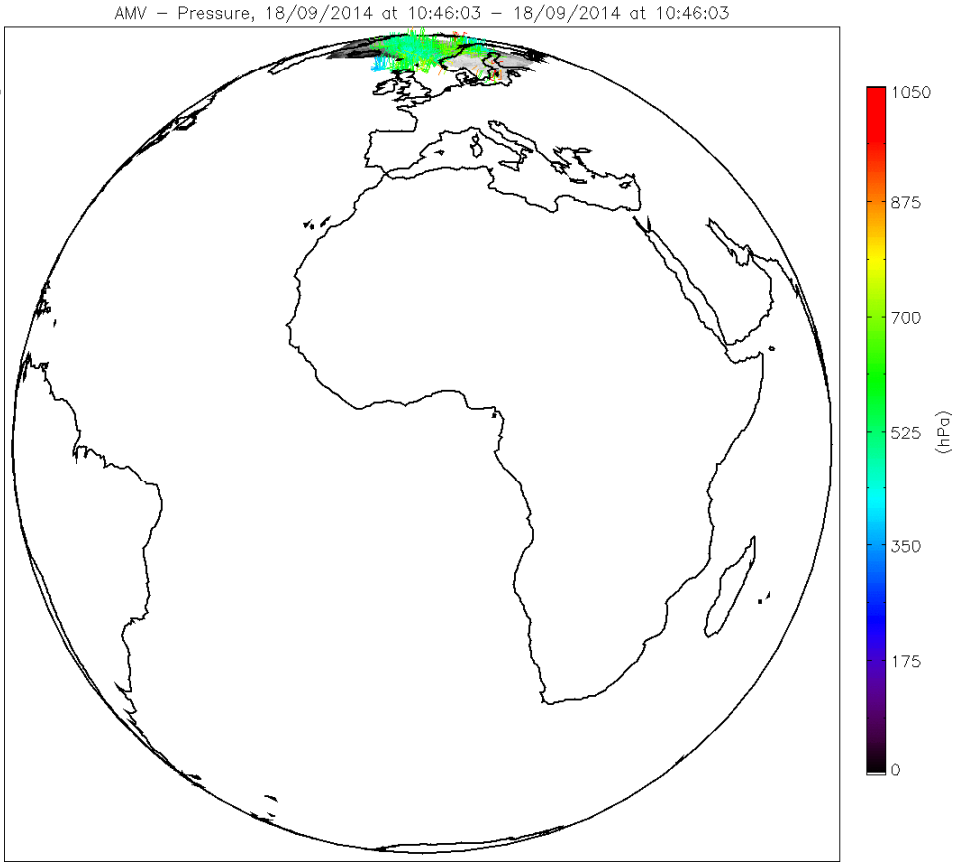
- **Metop-C** launch planned in October 2018

BENEFITS OF DUAL METOP OPERATIONS

Single Metop polar, 17/09/2014, 1:31-1:52

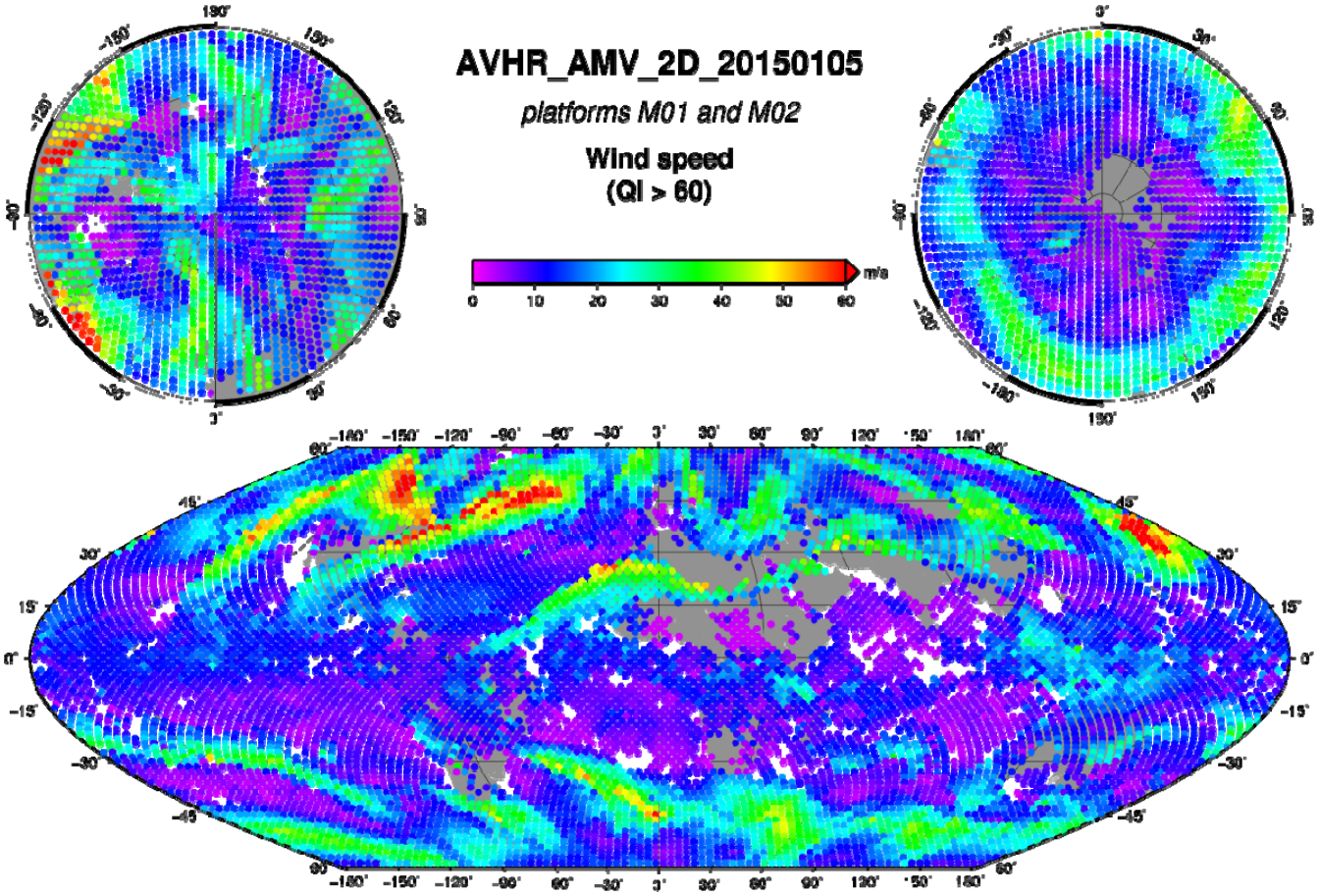


Global AVHRR, 18/09/2014, 9:04-9:46



BENEFITS OF DUAL METOP OPERATIONS

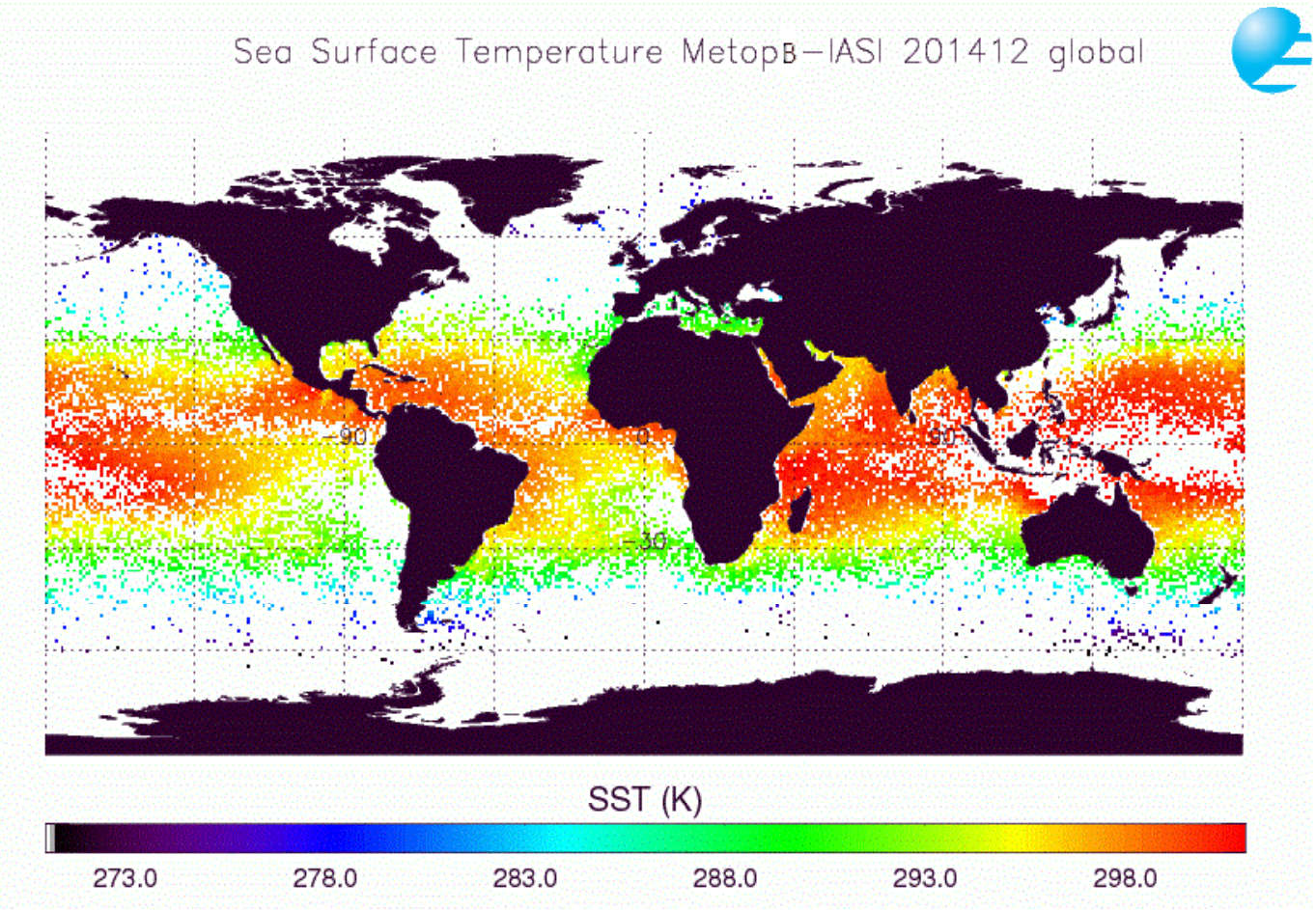
North Pole



South Pole

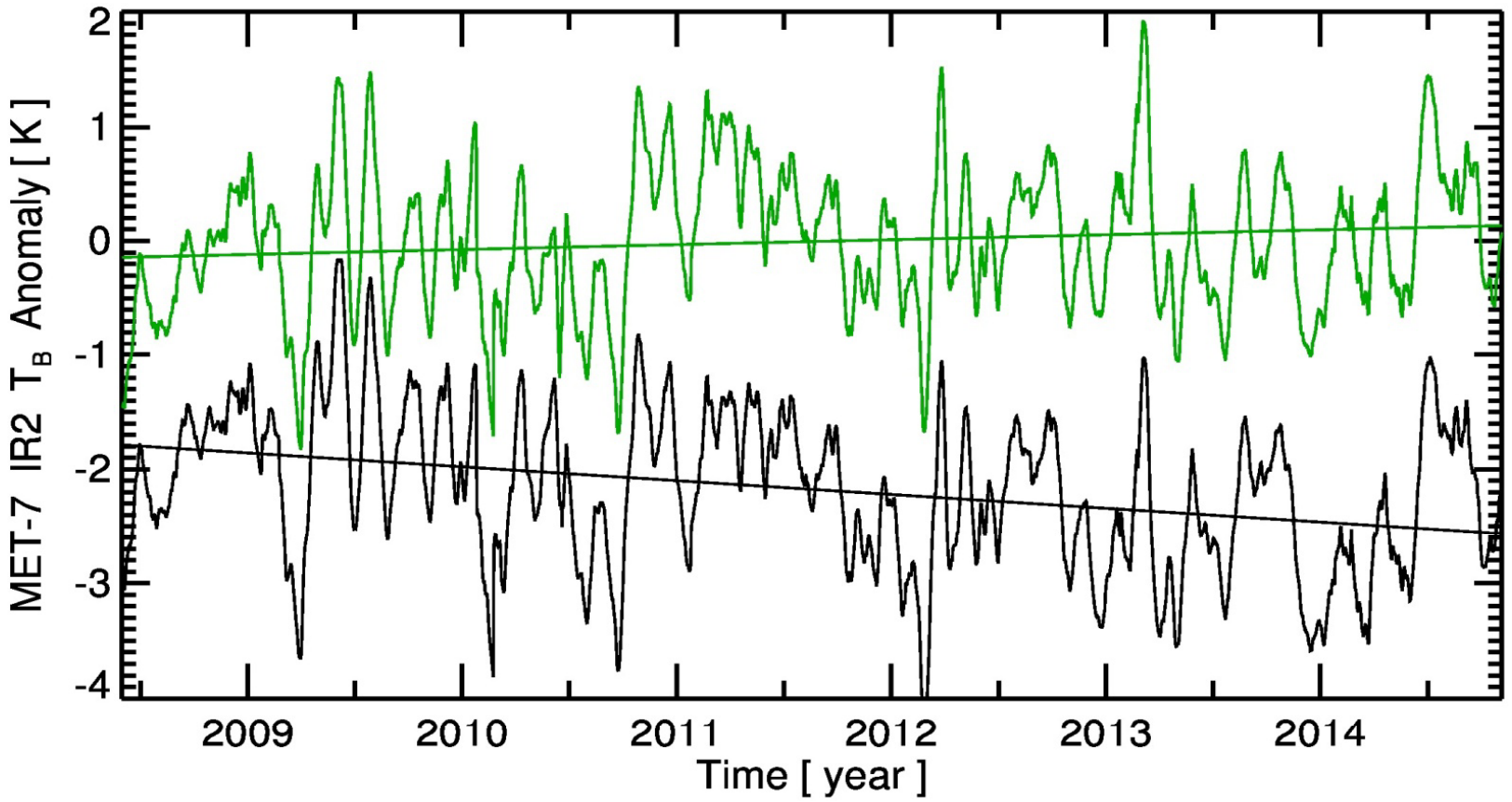
50-70 deg latitude band filled by dual Metop winds, polar jets well detected

New products: IASI Sea Surface Temperature



OSI SAF Metop-B IASI skin sea surface temperature product, where the GHRSST quality level is 3 or above for December 2014 (night and day)

Cross-calibration/re-calibration for climate

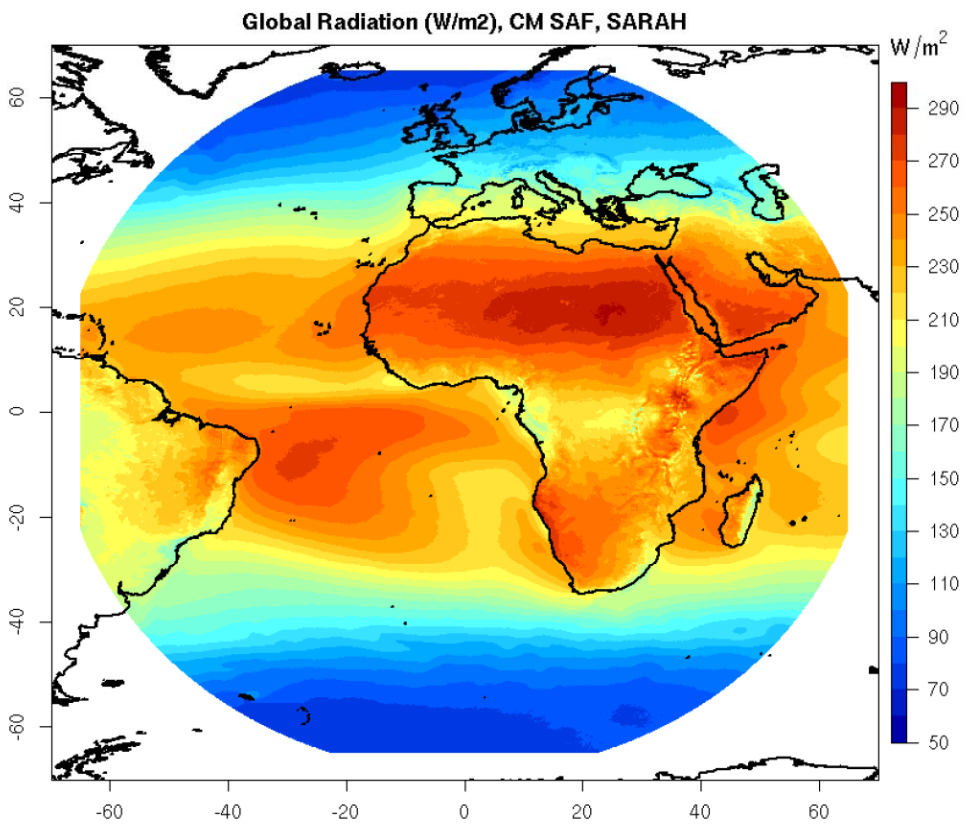


MET-7 Infrared (IR) channel brightness temperature daily anomalies:

- original time series
- corrected/re-calibrated time series using the IASI as a reference

Climate services: New Climate Data Records

f the Solar Irradiance at



CM SAF
Climate Monitoring

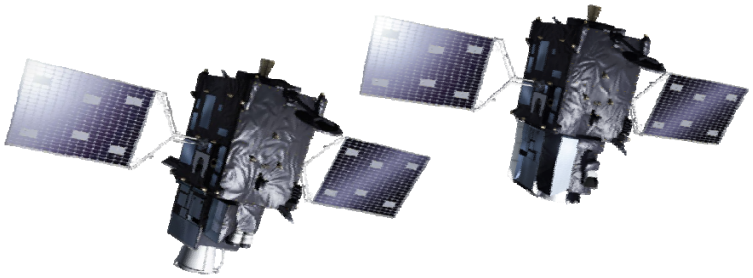
Thematic Data Record based on MVIRI and SEVIRI observations (1983 to 2013):

- surface irradiance
- the surface direct normalized irradiance
- effective cloud albedo.

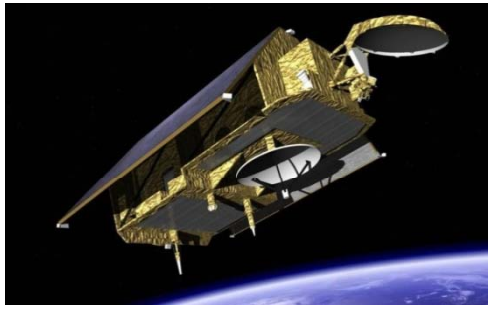
Monthly, daily, and hourly averages.

EUMETSAT CGMS

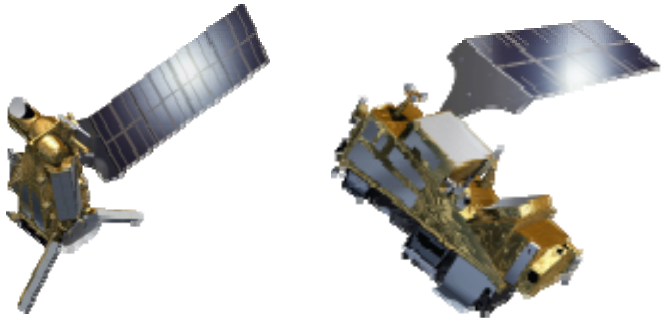
Future satellites and programmes: Observations in 2020 – 2041



MTG: Approved, under development
Sentinel-4 onboard (2) MTG-S satellites

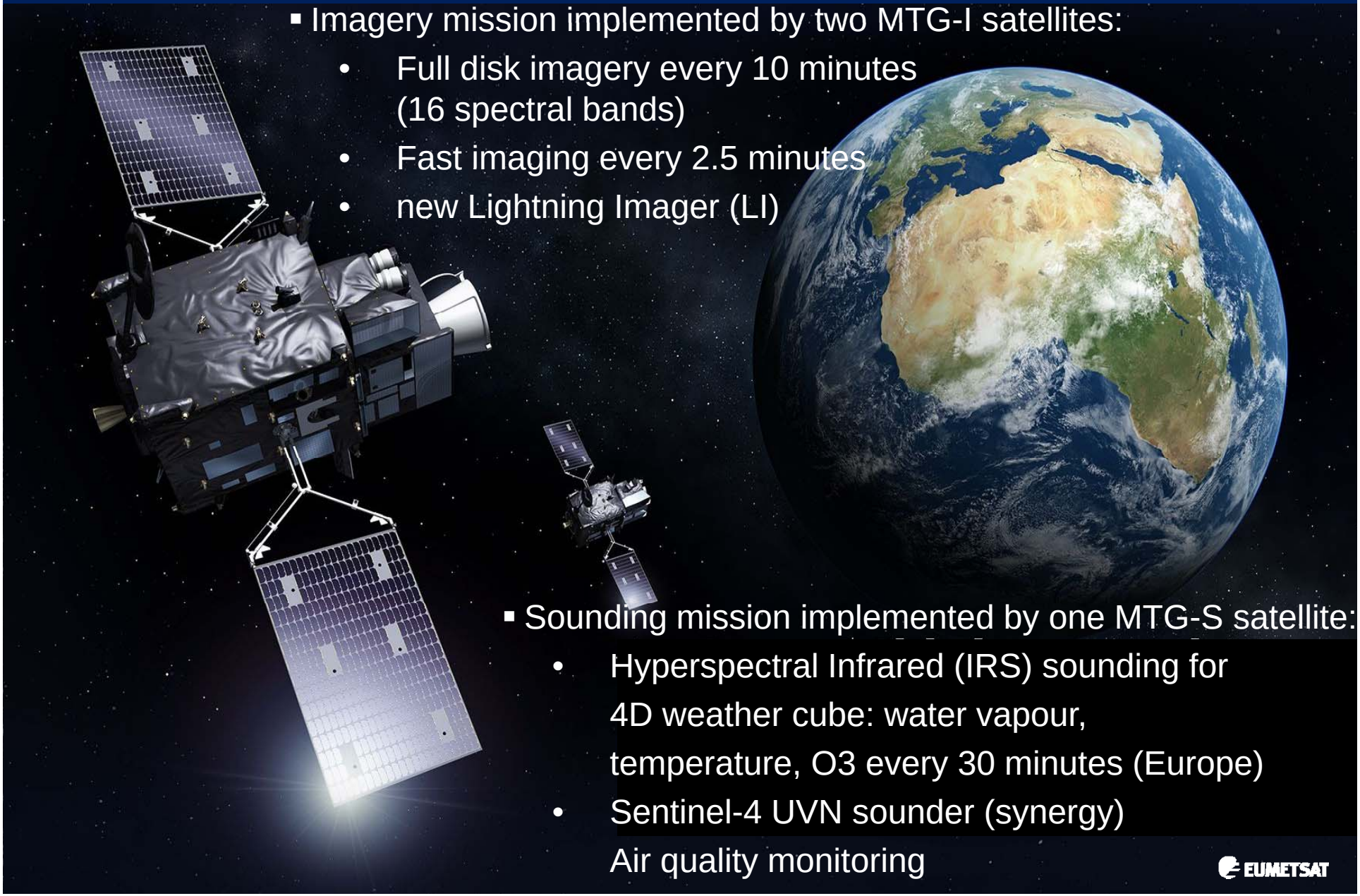


Sentinel-6
Jason-CS: *open for subscription*
Recurrent satellite co-funded by EU



EPS-SG: *Approval nearing completion*
Sentinel-5 onboard (3) Metop-SG-A satellites

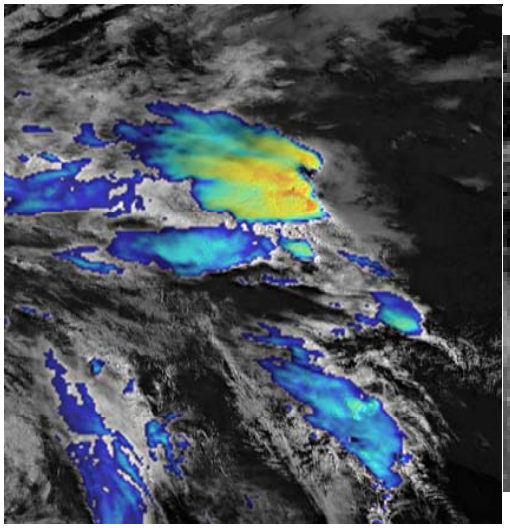
Meteosat Third Generation: Mission Overview

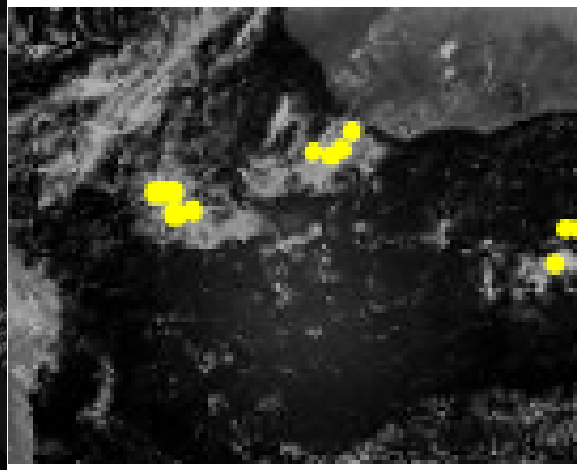


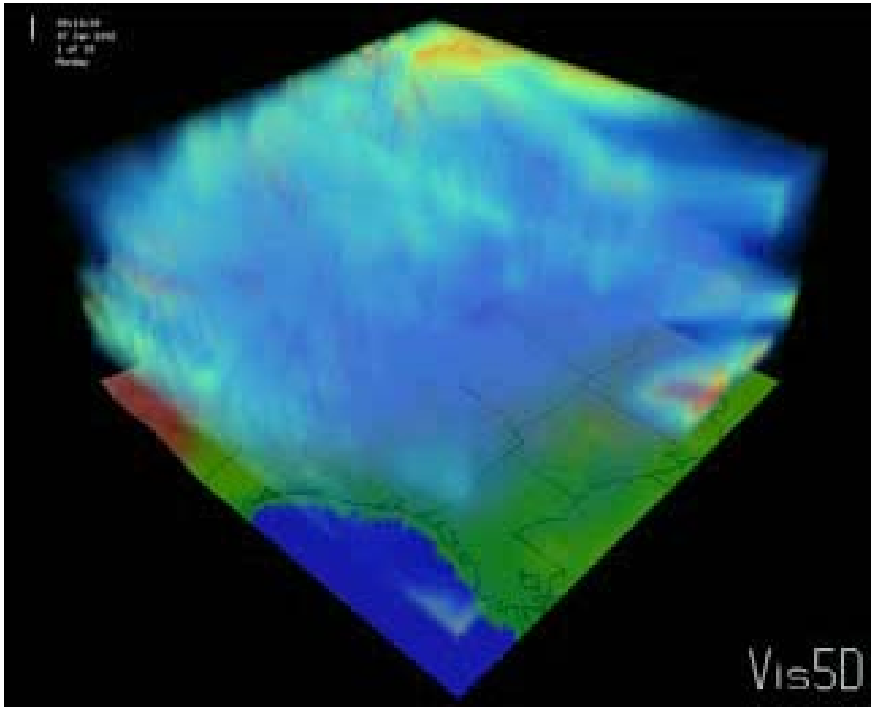
- Imagery mission implemented by two MTG-I satellites:
  - Full disk imagery every 10 minutes (16 spectral bands)
  - Fast imaging every 2.5 minutes
  - new Lightning Imager (LI)
- Sounding mission implemented by one MTG-S satellite:
  - Hyperspectral Infrared (IRS) sounding for 4D weather cube: water vapour, temperature, O3 every 30 minutes (Europe)
  - Sentinel-4 UVN sounder (synergy) Air quality monitoring

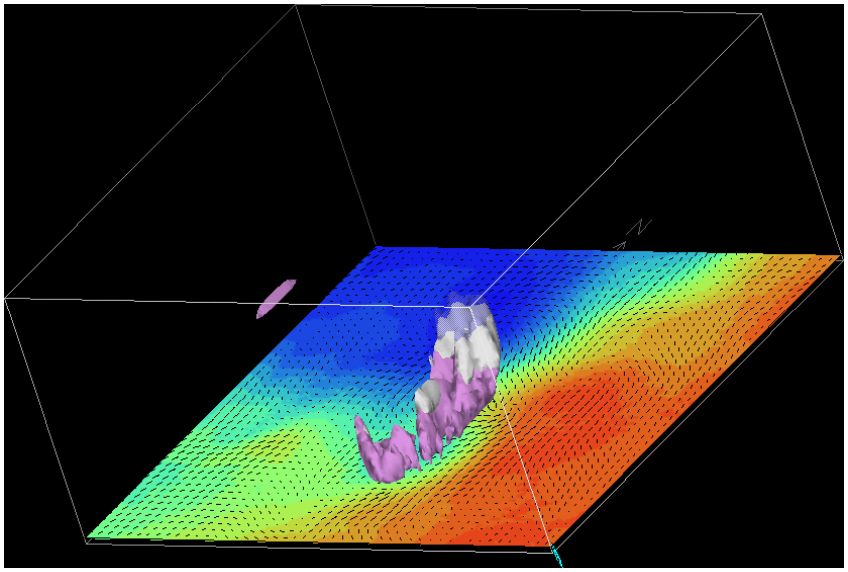
EUMETSAT

Nowcasting with NWP and MTG

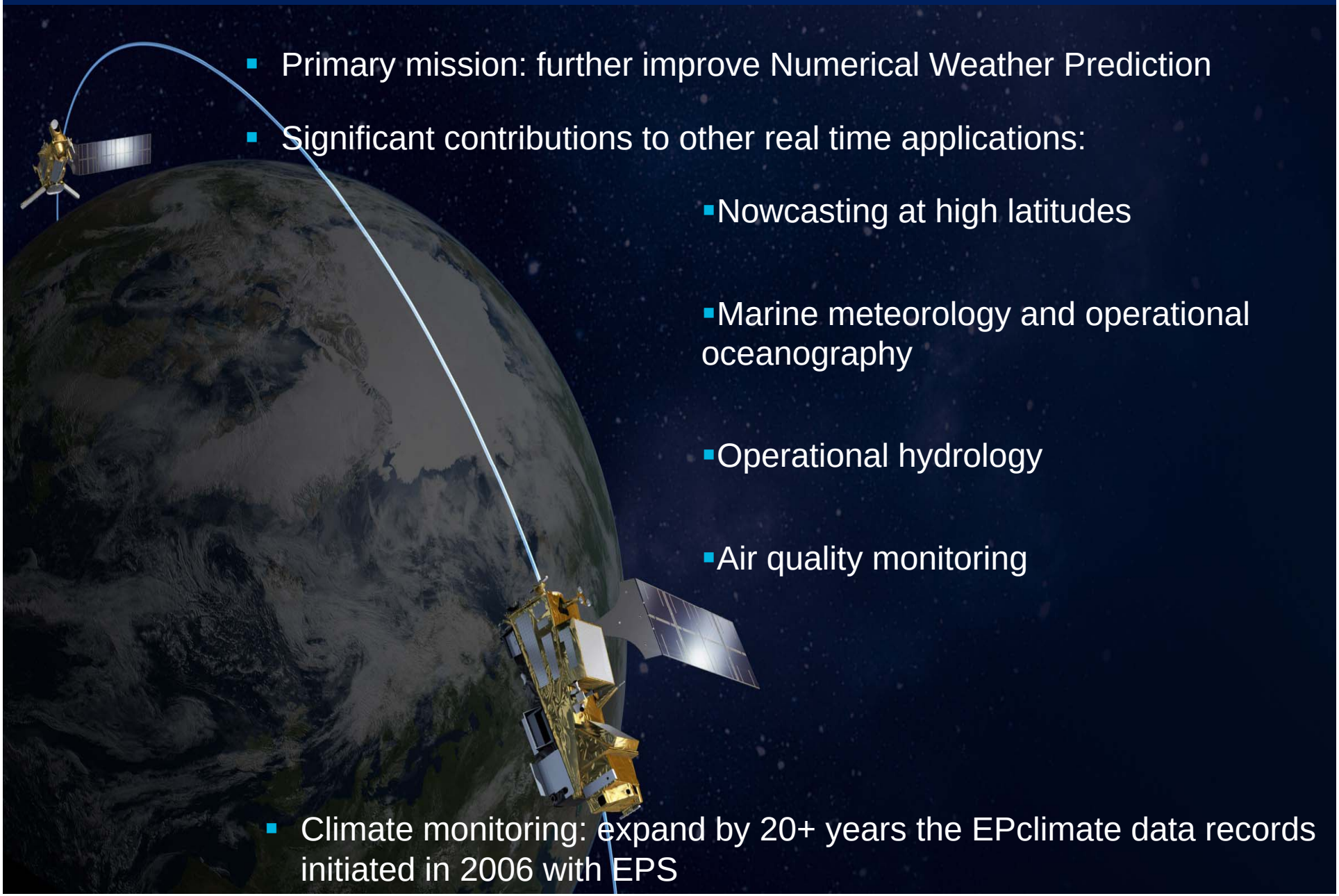






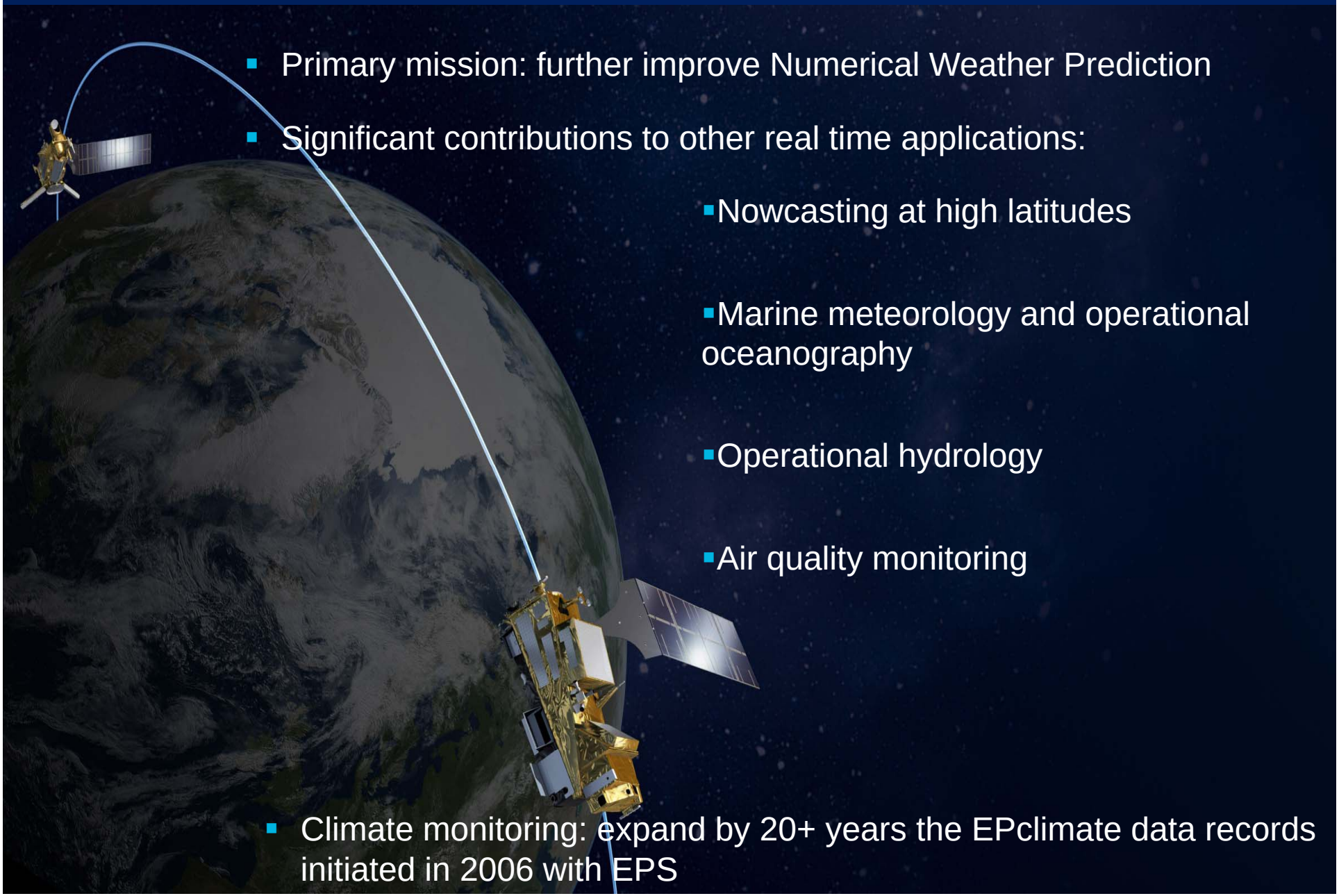


EPS Second Generation: a two-satellite system



- Primary mission: further improve Numerical Weather Prediction
- Significant contributions to other real time applications:
  - Nowcasting at high latitudes
  - Marine meteorology and operational oceanography
  - Operational hydrology
  - Air quality monitoring
- Climate monitoring: expand by 20+ years the EPclimate data records initiated in 2006 with EPS

EPS Second Generation: a two-satellite system



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  - Air quality monitoring
- Climate monitoring: expand by 20+ years the EPclimate data records initiated in 2006 with EPS

EPS Second Generation: a two-satellite system

- Two series of 3 successive satellites for 21 years of operations
  - Metop-SG A: optical imagery & sounding mission
    - Flies the Copernicus Sentinel-5 instrument

  - Metop-SG B: microwave imaging mission

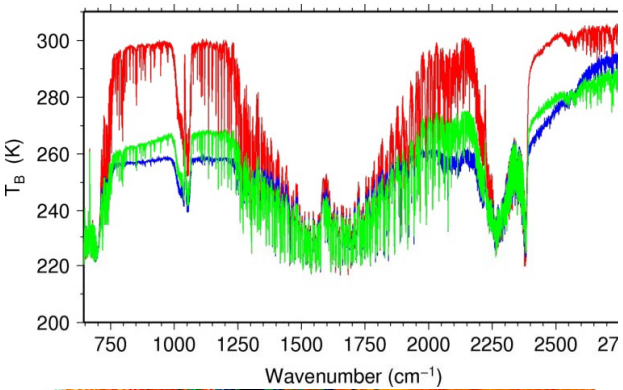
EUMETSAT

IASI-NG, MWS & Sentinel-5 on Metop-SG A: the sounding mission

IASI-NG Objectives

- T and Hu Profiles
- Trace gases (O_3, CO, CH_4, CO
- Aerosols, volcanic ash
- Reference IR instrument for climate monitoring

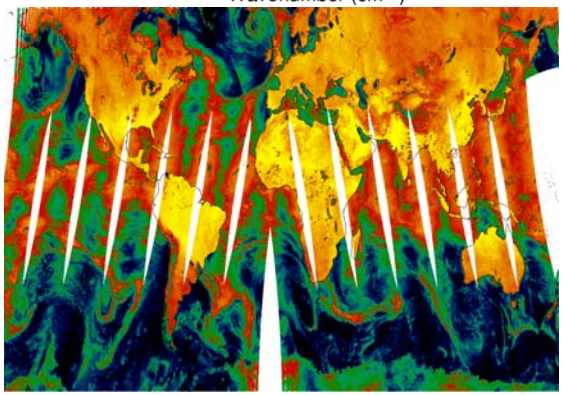
- Radiometric performance & spectral resolution doubled
- Improved Temperature and Moisture profiles (in PBL)
- Chemistry: vertical profiles and new species



MWS Objectives

- T and HU profiles (all weather)
- Cloud liquid water total column

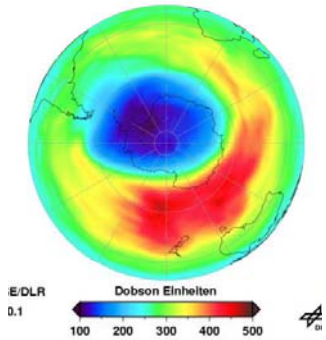
- Addition of a window channel at 229 GHz: Cirrus clouds
- Spatial oversampling to further reduce noise: more accurate soundings



Sentinel 5 Objectives

- O3 profiles
- CO_2,SO_2, NO_2, H_2O, CO, CH_4, BrO, HCHO, OCHCHO

- Horizontal resolution: 7 km
- Extension of spectral range (NIR et SWIR): aerosols, CH4 et CO in PBL



EUMETSAT CGMS

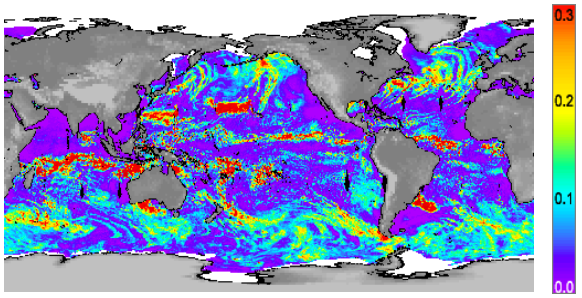
MicroWave Imager (MWI) & Ice-Cloud Imager (ICI) on Metop-SG B

MWI objectives

- Precipitation and clouds
- Imagery and H2O profiles
- Sea ice, surface snow

19 channels (18.7 - 183 GHz)

- Continuity wrt SSMI/S
- Addition of sounding channels
  - Improve estimation of precipitation
  - Water vapour and clouds



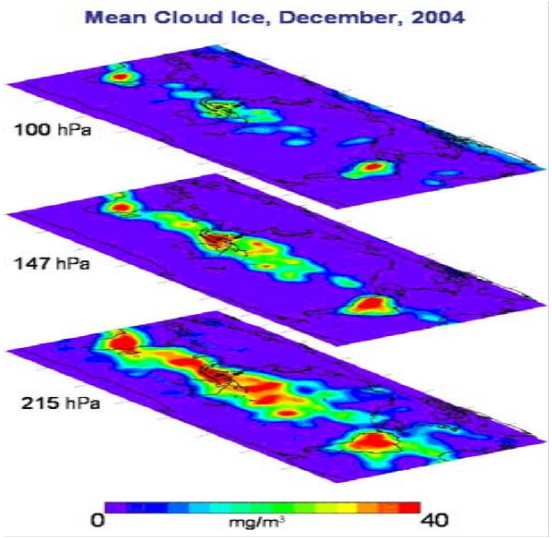
Cloud Liquid Column mm

ICI objectives

- Clouds (ice phase)
- Detection of snow

11 channels (183 – 664 GHz)

- First operational ice cloud imagery mission
- Meteorology and climate (Cirrus)

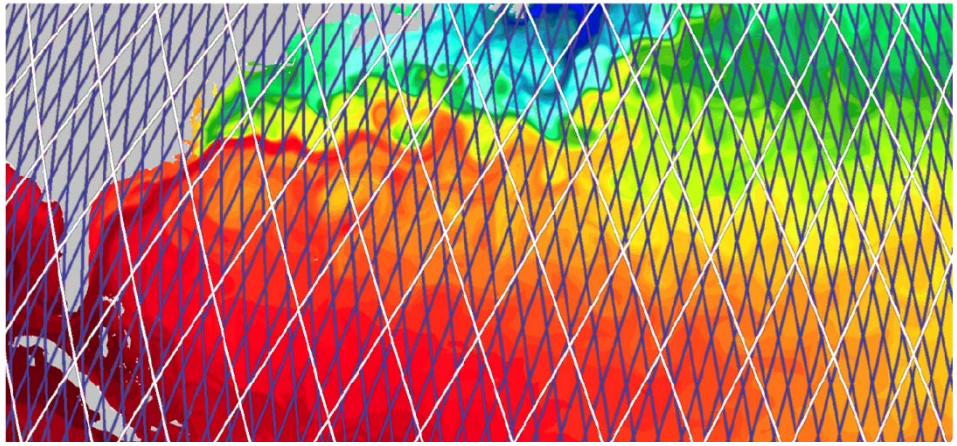


NASA: Aura/MLS

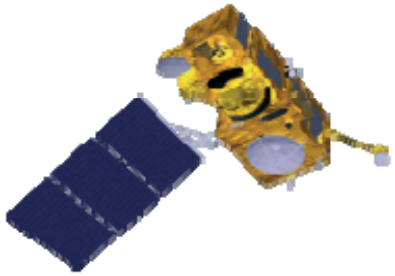
EUMETSAT CGMS

Combining Sentinel-3 and Jason/Sentinel-6 for Operational Oceanography and Climate Monitoring

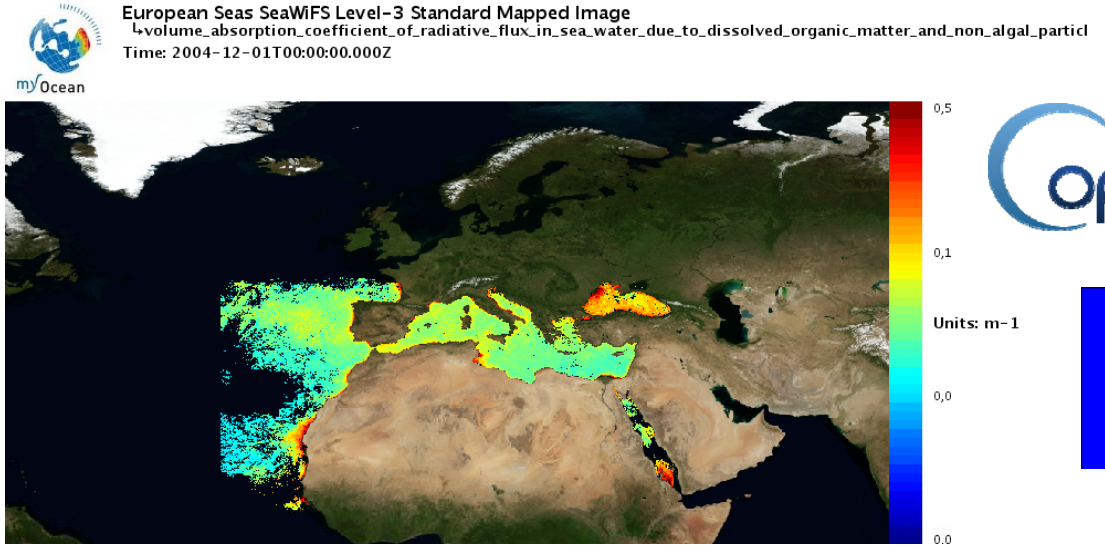
Jason-3



Sentinel 3



Jason-CS/Sentinel 6



A detailed report on EUMETSAT's activities and satellite programmes is available in **CGMS-43 EUM-WP-22**.