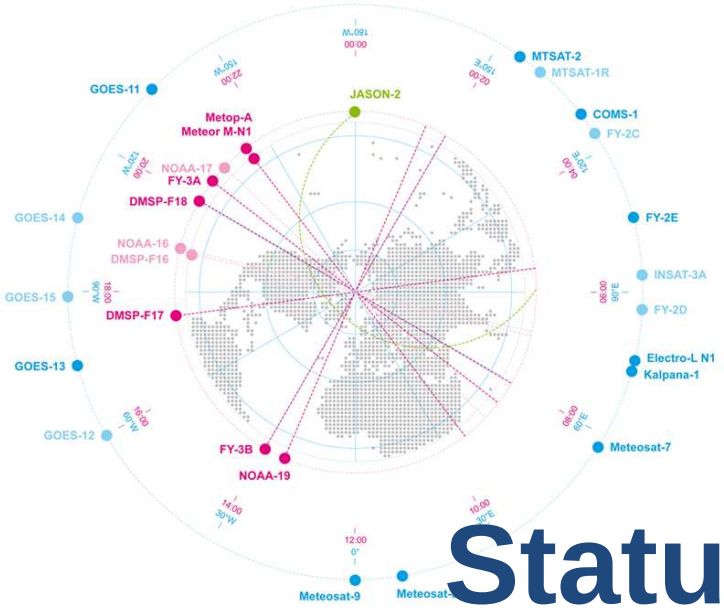


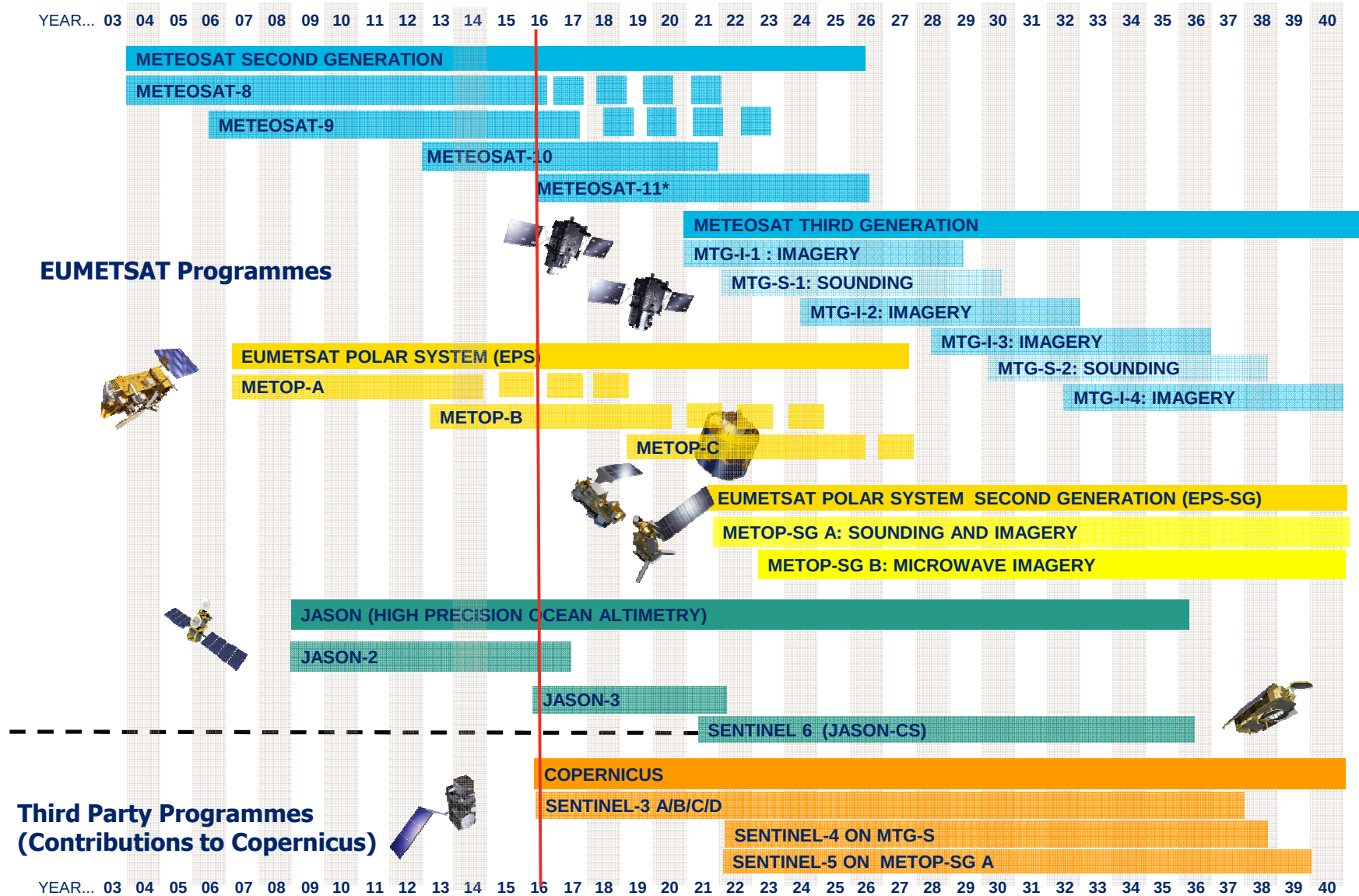
Status report on current and future satellite systems by EUMETSAT

Presented to CGMS-44, Plenary session, agenda item D.1

Coordination Group for Meteorological Satellites

EUMETSAT CGMS

MISSION PLANNING



DEPLOYMENT OF CURRENT GENERATION SATELLITES COMPLETION IN 2018 WITH THE LAUNCH OF METOP-C

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 launch 15 July 2015

METEOSAT SECOND GENERATION

METEOSAT-8

METEOSAT-9

MSG-3/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 October 2018 (TBC)

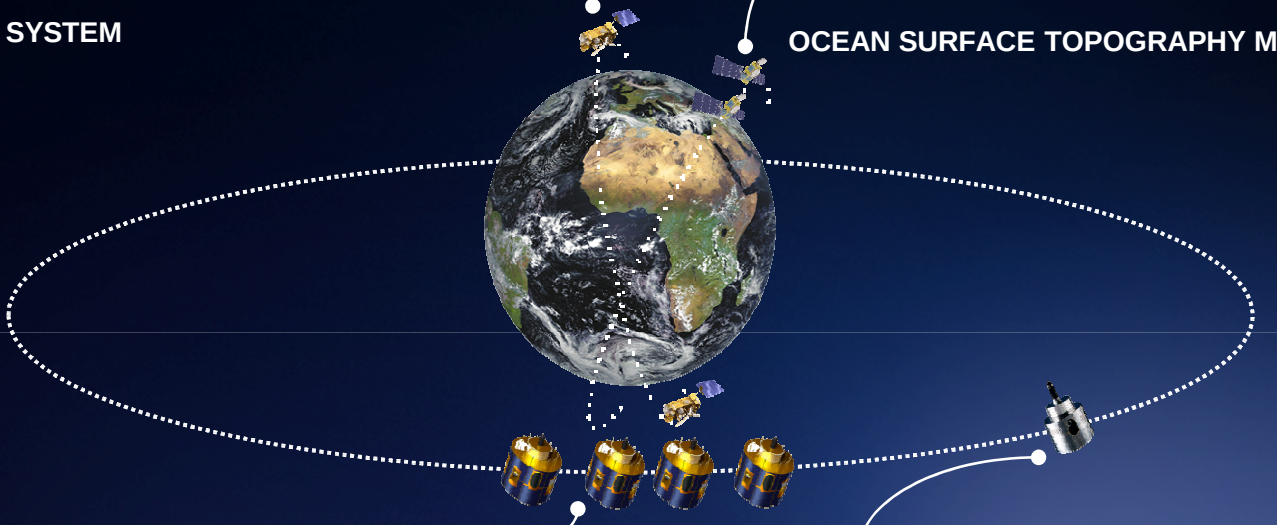
CURRENT SATELLITES IN ORBIT

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

EUMETSAT POLAR SYSTEM

JASON-2/-3 (with CNES, NOAA, NASA)
(LOW-EARTH, 63° INCL. NON SYNCHRONOUS ORBIT)

OCEAN SURFACE TOPOGRAPHY MISSION



METEOSAT (Second Generation) 0° SERVICES
(GEOSTATIONARY ORBIT)

TWO-SATELLITE SYSTEM:

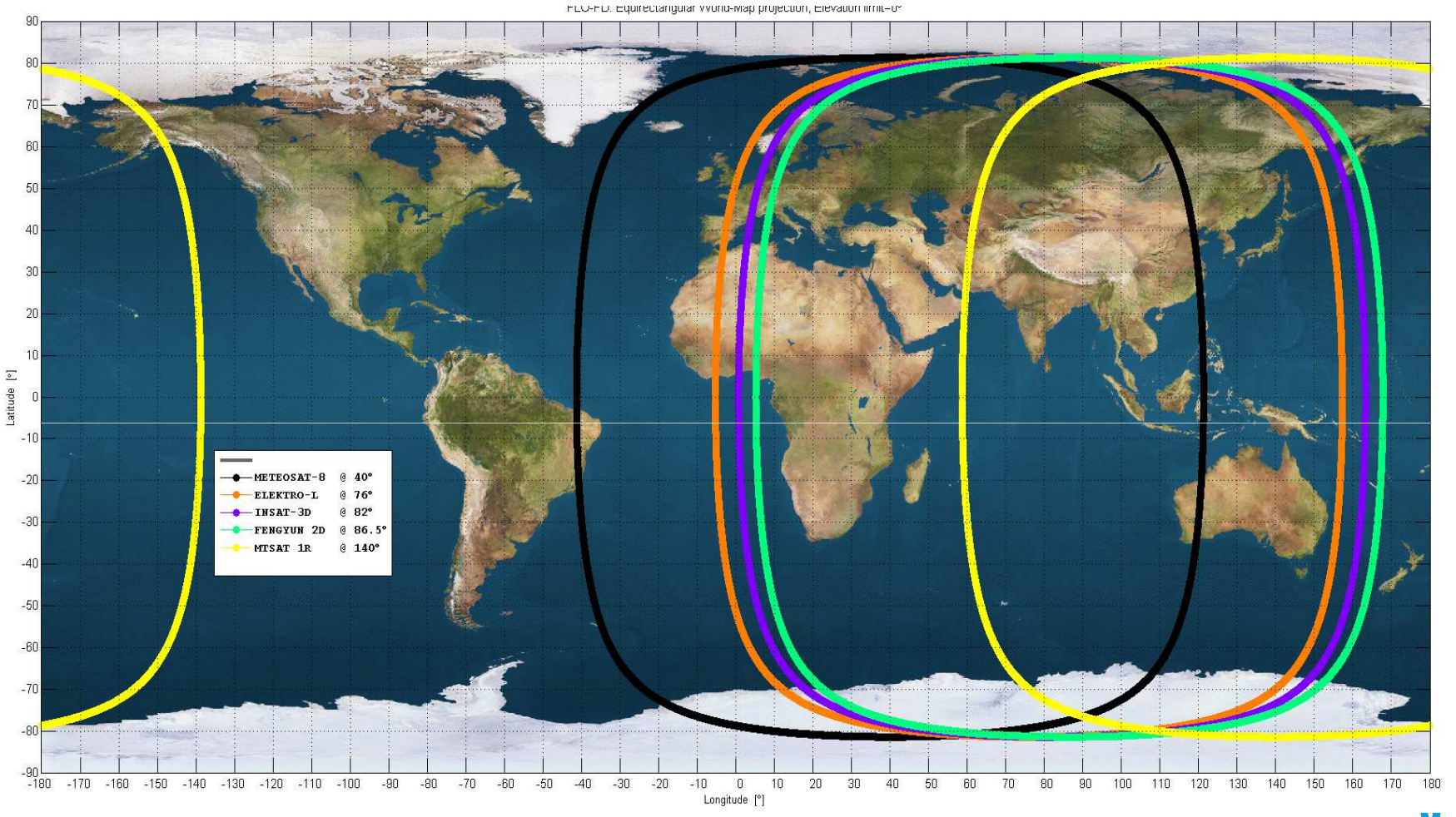
- METEOSAT-10: FULL DISK IMAGERY MISSION AT 0° (15 MN)
-METEOSAT-9: RAPID SCAN SERVICE OVER EUROPE AT 9.5°E (5 MN)

- METEOSAT- 8 HOT BACK UP AT 3.5°E (until July 2016)
- METEOSAT-11: STORED IN ORBIT (3.5°W)

BEST EFFORT CONTRIBUTION TO INDIAN OCEAN DATA COVERAGE
(GEOSTATIONARY ORBIT)

- METEOSAT-7 (1st generation) at 57°5 E (until mid 2017)

CGMS scenario for resilient multi-partner IODC services



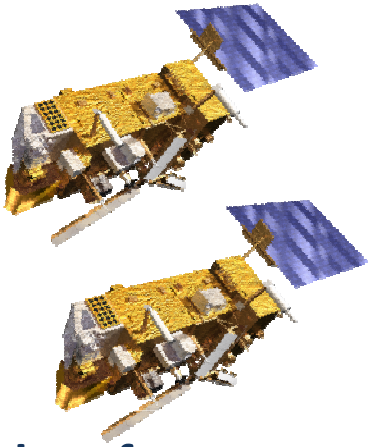
Recommendation to EUMETSAT Council to move Meteosat-8 to 41.5°E (Best Effort contribution)

Coordination Group for Meteorological Satellites

CGMS

EPS PROGRAMME: TWO METOP SATELLITES IN ORBIT

Dual Metop (-A and –B) operations: two real time data streams



- **Significant additional positive impact on NWP**
- **Expected to continue with Metop-B and –C**

Cooperation with US improves timeliness of global data from primary Metop (currently –B): dumps in Arctic and Antarctica

Successful launch of Metop-C (planned for Oct 2018) important for smooth transition with EPS-SG/Metop-SG

- **There will be 3 Metop in orbit for 1-2 years**

CURRENT PROGRAMMES: OCEAN SURFACE TOPOGRAPHY MISSION – JASON-2/-3

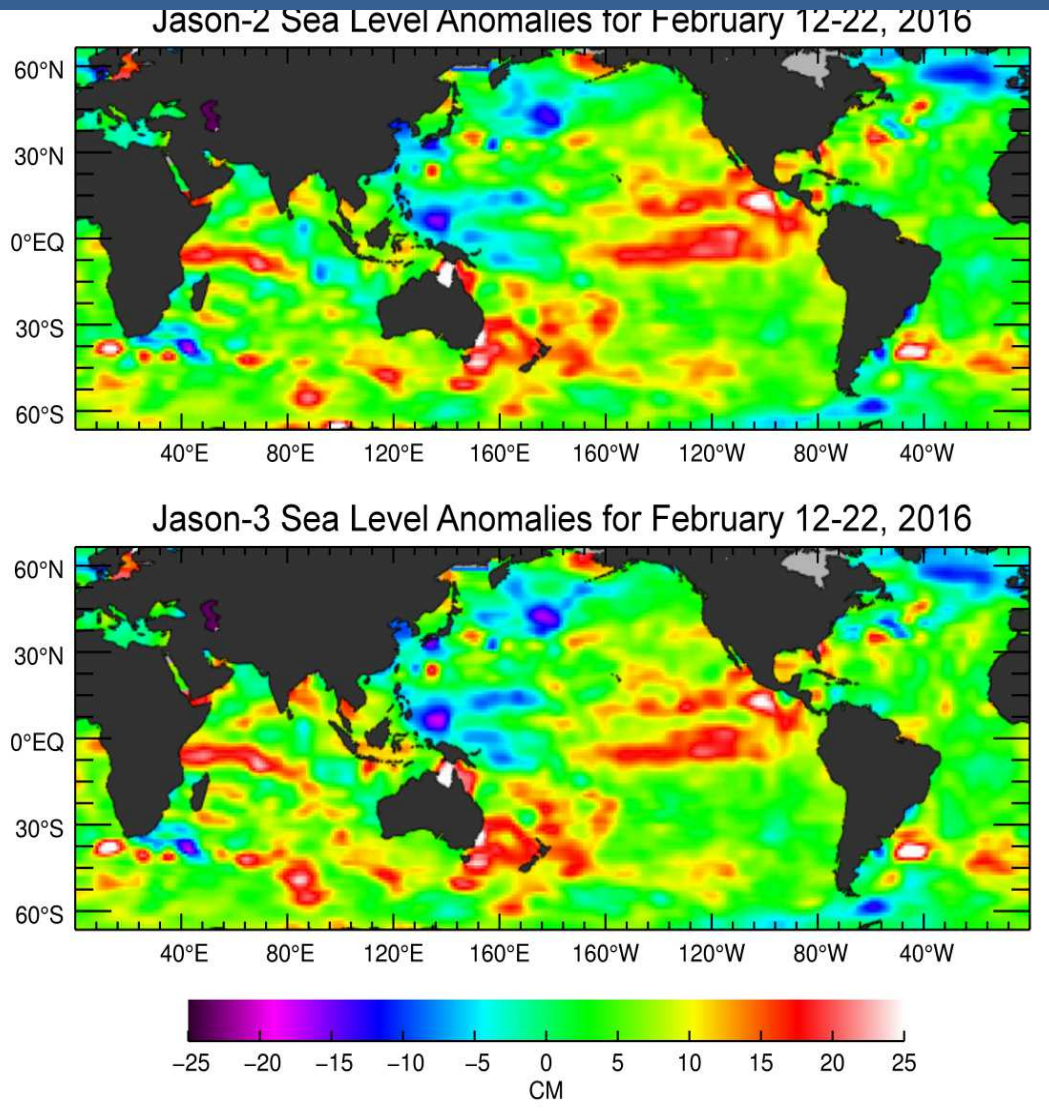
Jason-2 operational in orbit, mission extended until end 2017
Partnership with NOAA, NASA, CNES

Jason-3
Same partnership, plus contribution from ESA and operations funded by Copernicus

- **Jason-3 launched on 17 January 2016, commissioning ongoing**
- **Flies 557 km behind Jason-2 since 12 February, for tandem phase/cross-calibration**
- **Trial dissemination of OGDR started on 8 March, relesae to all users after Science Verification Workshop (21 June)**
- **Successful IFAR (12-14 April) and Handover Review (24 May) satellite operations handed over from CNES to NOAA**

CURRENT PROGRAMMES: OCEAN SURFACE TOPOGRAPHY MISSION – JASON-3

3 weeks after launch, Jason-3 monitors El Nino



CURRENT PROGRAMME: OCEAN MISSION – JASON-3 [3/3]
Next milestones

- 13 June: handover to operations within EUMETSAT
- 21 June: 1st Jason-3 verification workshop
  - Validation of OGDR products for release to all users
  - First evaluation of IGDR products
- 1 September: Start of distribution of IGDR products to all users
- 31 October 2016: Second Jason-3 verification workshop
  - Assessment of IGDR and GDR products
- 1 – 4 November : OSTST meeting in La Rochelle

JASON cooperative missions

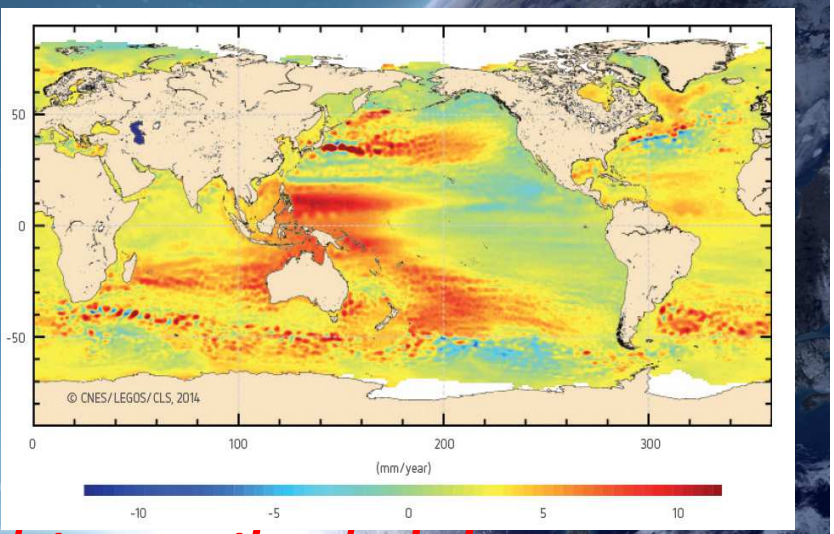
Sentinel-6/Jason-CS
2020

Jason 3
2015

OSTM/Jason 2
2008

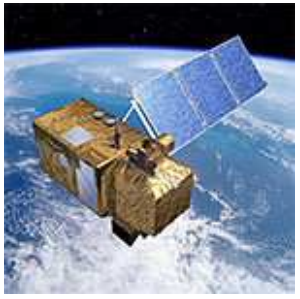
Jason 1
2001

TOPEX/Poseidon
1992–2006



Important achievement: transition from research to operational mission

CURRENT PROGRAMMES: SENTINEL-3 MARINE MISSION (3rd party programme)



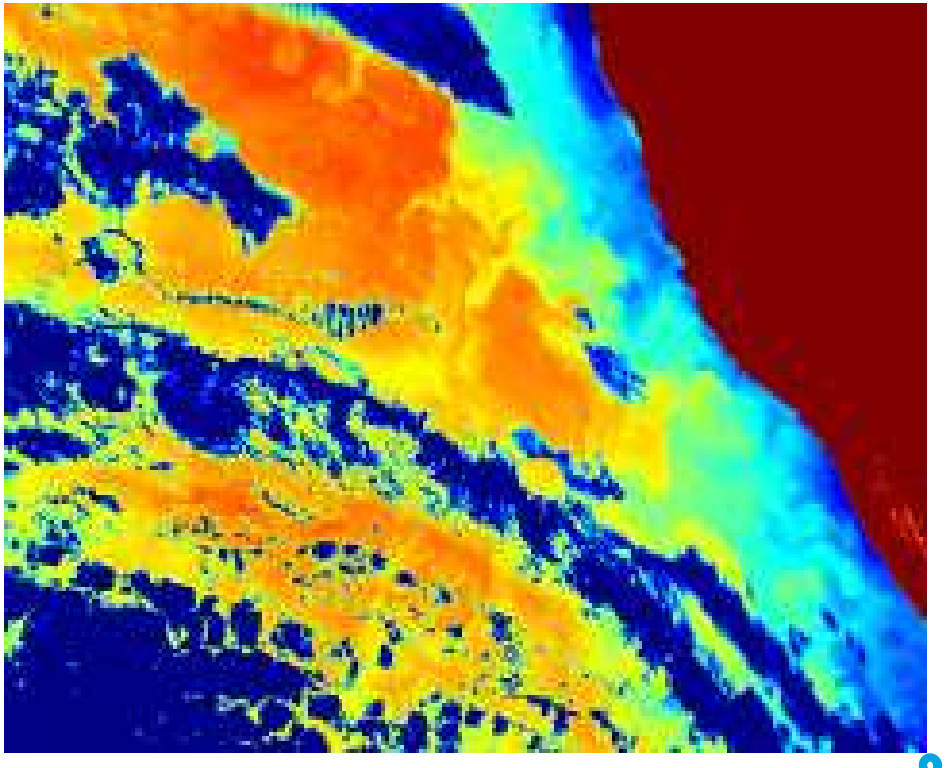
Copernicus Sentinel for global Ocean and Land observations

Cooperation with ESA on ground segment development and commissioning

EUMETSAT will operate Sentinel-3 and deliver marine mission on behalf of the European Commission

Sentinal-3A launched on 16 February 2016

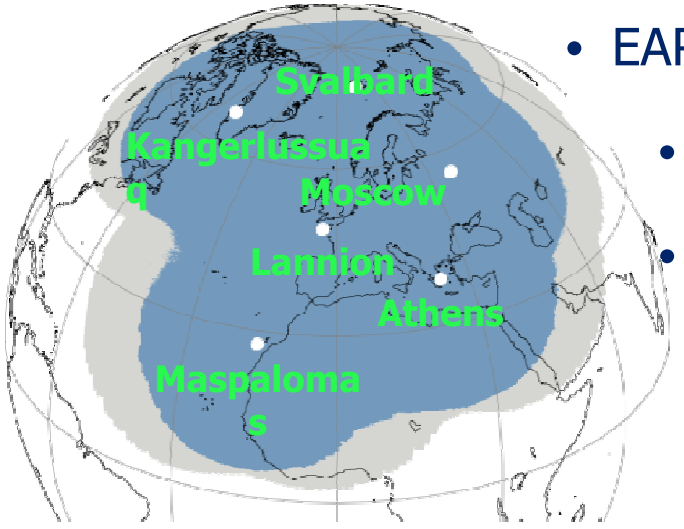
CURRENT PROGRAMMES: SENTINEL-3 MARINE MISSION
First images in March



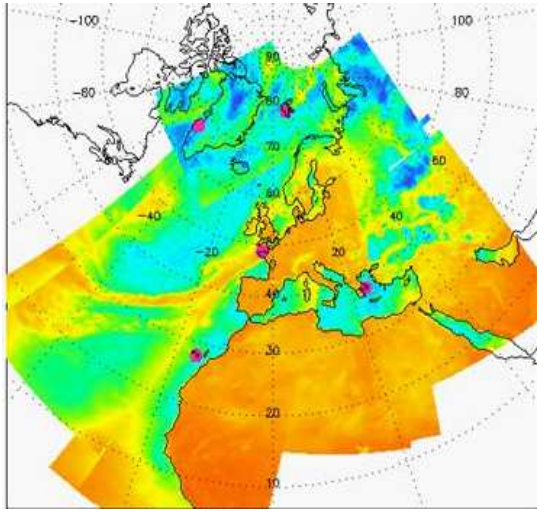
CURRENT PROGRAMMES: SENTINEL-3 MARINE MISSION
Next Milestones with ESA

- 11-12 July : In Orbit Commissioning Review (IOCR)
- 13 July : Handover of operations of satellite and Marine Centre from ESA to EUMETSAT
- Spring 2017: Start of routine operations
- December 2017: Launch of Sentinel-3B

EARS REGIONAL DATA SERVICE

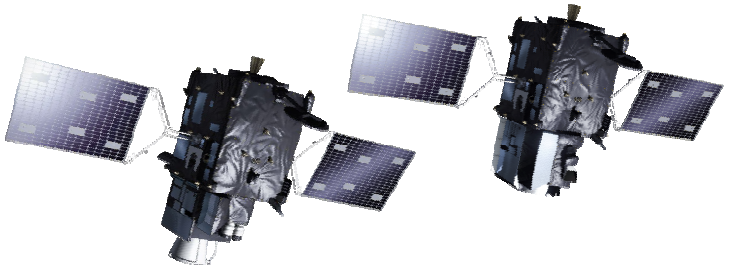


- EARS –NPP:
  - ATMS/CrIS data service nominal
  - VIIRS data service including Day/Night Band operational:
    - Timeliness now within 15 min target, except Maspalomas (up to 22 min)
  - Moscow station included in EARS-ATMS/-CrIS services

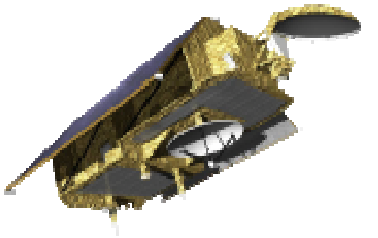


- EARS FY-3:
  - First service operational since 17 February with FY3C

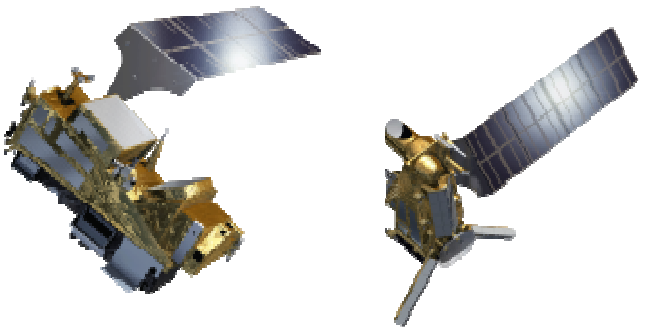
EUMETSAT PROGRAMMES APPROVED FOR NEXT GENERATION SATELLITE SYSTEMS



MTG: **Approved** in 2011, under development
Hosted mission: Sentinel-4 approved
(ESA/EU/Copernicus)



Contribution to Jason-CS/Sentinel-6
cooperative mission:
Approved in September 2015



EPS-SG : **Approved** in June 2015, under development
Hosted missions: Sentinel-5 and ARGOS-4 approved
(ESA / EU/Copernicus and CNES)

Coordination Group for Meteorological Satellites

EUMETSAT CGMS

METEOSAT THIRD GENERATION (MTG)

- *Primary mission:* Nowcasting of high impact weather
  - Continuity and enhancement of MSG imagery services
  - Infrared hyper-spectral sounding mission: world premiere
  - *Secondary mission*: Air quality monitoring
    - Synergy with Copernicus Sentinel-4
  - 6-satellite programme to cover 2020-2041

METEOSAT THIRD GENERATION : MTG-I AND MTG-S MISSIONS

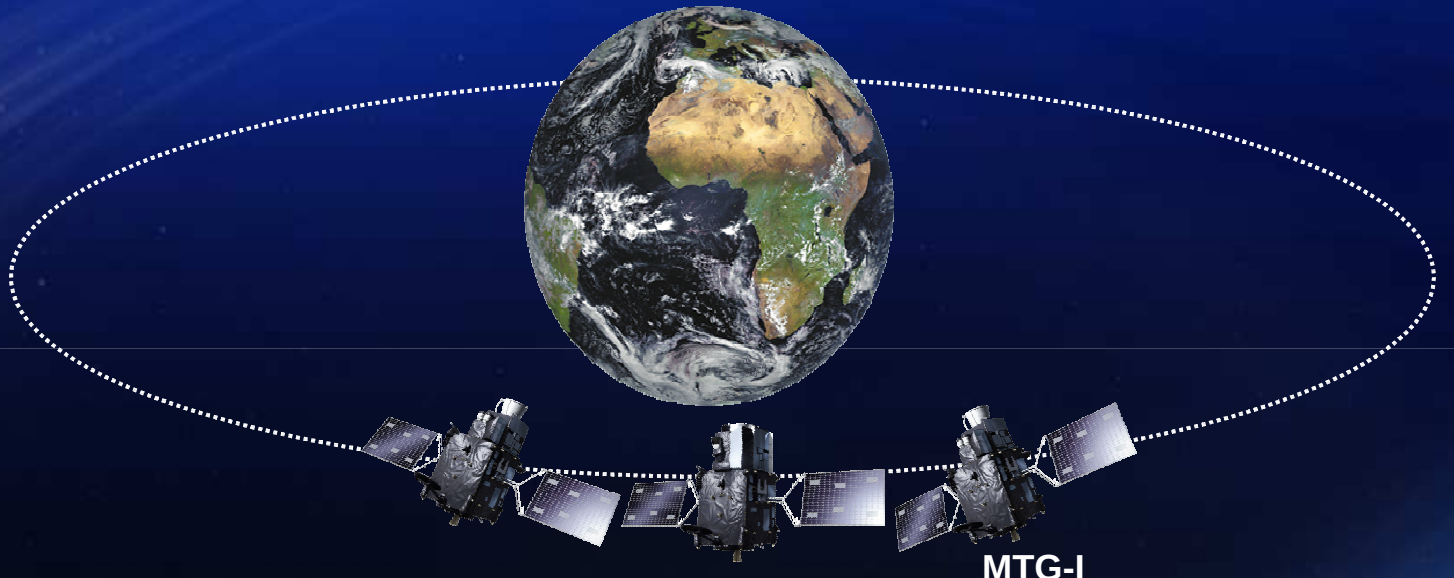
- *Imagery mission* implemented by two MTG-I satellites
  - Full disk imagery every 10 minutes in 16 bands
  - Fast imagery of Europe every 2.5 minutes
  - New Lightning Imager (LI)

- *MTG-S hyperspectral infrared sounding mission*:
  - 4D weather cube: temperature, water vapour, O3 every 30 minutes (Europe)
  - Air quality monitoring and atmospheric chemistry

    (synergy with the Sentinel-4 instrument)

- Start of operations in 2020 and 2022

MTG FULL OPERATIONAL CONFIGURATION: 2 MTG-I + 1 MTG-S



MTG-I
RAPID SCAN
SERVICE

MTG-S
SOUNDING
SERVICE

MTG-I
FULL SCAN
SERVICE

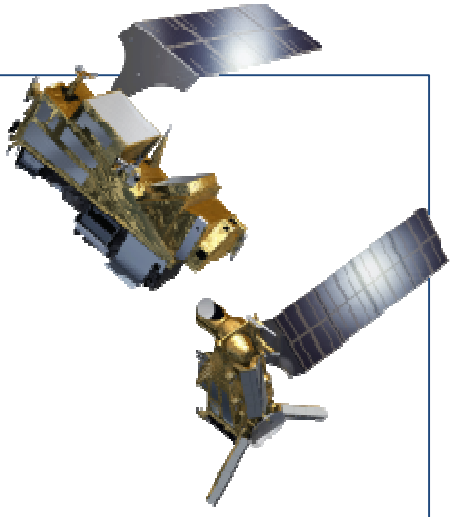
EPS SECOND GENERATION (EPS-SG): MISSIONS

- 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
- Start of operations in 2021 and 2023, exploitation 2021- 2042
- Climate monitoring: expand by 20+ years the climate data records initiated in 2006 with EPS

EPS SECOND GENERATION: A TWO-SATELLITE SYSTEM

- Continuation and enhancement of service from mid morning polar orbit in 2021 – 2042
- Twin satellite in-orbit configuration:
  - *Metop-SG A*: Optical imagery and sounding mission
    - Flies the Copernicus Sentinel-5 instrument
  - *Metop-SG B:* microwave imaging mission
- Two series of 3 successive satellites for 21 years of operations
- European contribution to the Joint Polar System (JPS) shared with the US/NOAA

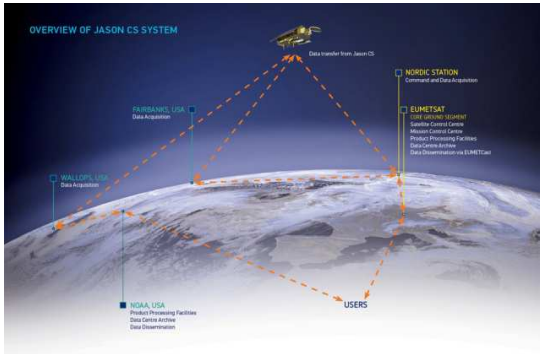
EPS-SG MISSION CAPABILITIES

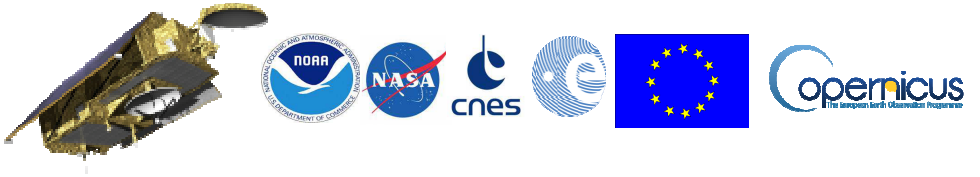


- **Major improvements to all EPS observation missions**
  - Infrared and microwave sounding
  - Optical imagery
  - Scatterometer
  - Radio-occultation (2)
- **New additional imagery missions**
  - 3MI: First operational imaging polarimeter
  - Microwave imager (MWI): imagery of precipitation
  - Ice Cloud Imager (ICI): ice clouds

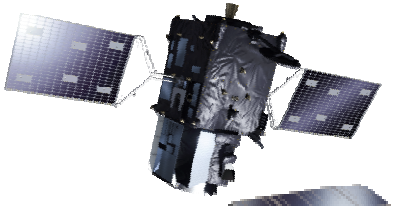
FUTURE CONTRIBUTIONS TO THE EU COPERNICUS PROGRAMME

- EUMETSAT will operate on behalf of the EU
  - Europe's contribution to **Sentinel-6/Jason-CS** operations

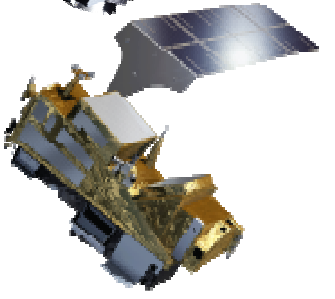




- **Sentinel-4** as a hosted mission on MTG



- **Sentinel-5** as a hosted mission on EPS-SG



Further decisions of relevance to CGMS:

- **CGMS scenario for resilient multi-partner IODC services:**

  Move of Meteosat-8 to 41.5°E unanimously recommended to EUMETSAT's Council (28-29 June) as best effort contribution to multi-partner IODC services

- **…**

More details on EUMETSAT's activities and programmes in **CGMS-44 EUM-WP-19**.