



Monitoring Weather and Climate from Space

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EUMETSAT – an intergovernmental organization with 30 Member States



EUMETSAT Mission and Vision

Primary objective:

Establish, maintain and exploit European systems of meteorological satellites.

Further objective:

Contribute to the operational monitoring of the climate and the detection of global climatic changes.

Vision:

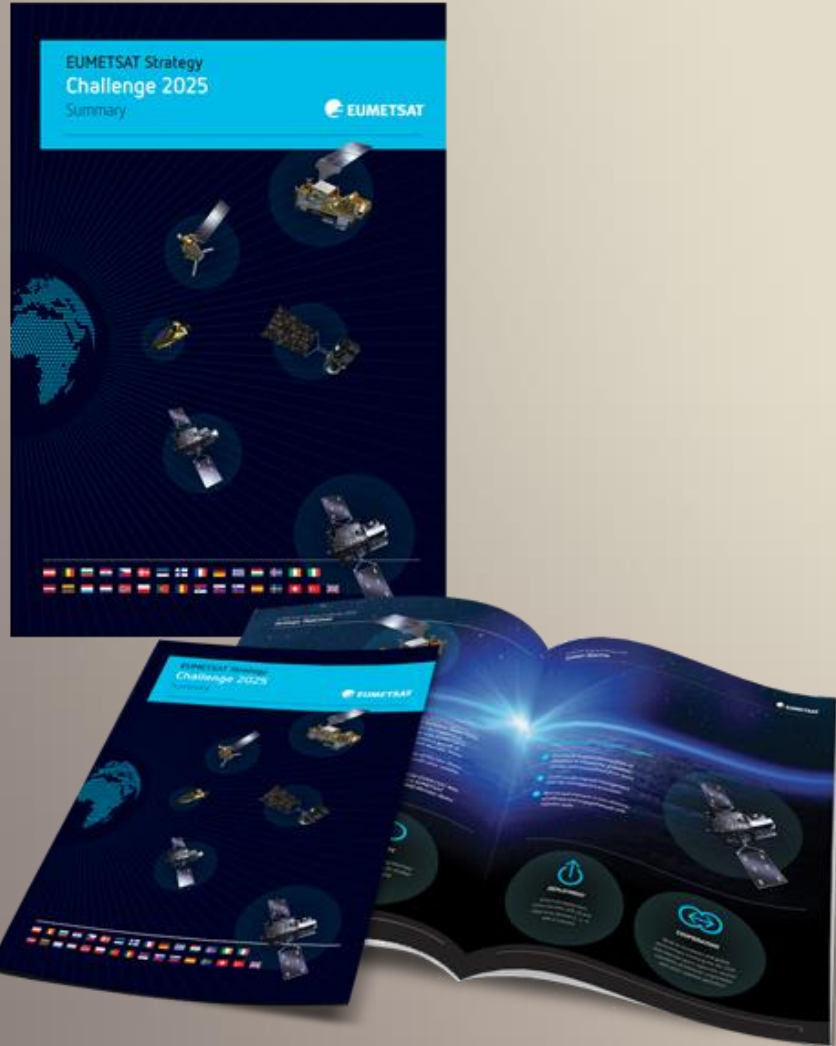
Be the leading user-driven operational agency in Europe for Earth observation satellite programmes that fulfil the objectives of its Convention, and a trusted global partner for those outside Europe who share these objectives.

EUMETSAT Priorities

In realising its vision, the first priority shall be to fulfil in the most effective manner, through its own satellite programmes, the essential requirements of its Member States for observations and data services for operational weather and Earth system monitoring and forecasting, and for climate services.

The second priority shall be to establish additional capabilities in partnership with the European Union and other satellite operators to achieve synergy with its own satellite missions for the common benefit of its Member States and partners.

EUMETSAT strategy



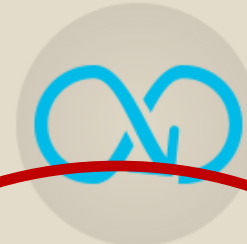
Services

Deliver services responding to evolving user requirements.



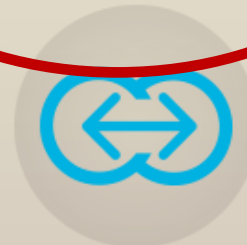
Deployment

Ensure full deployment of the new MTG, EPS-SG and Copernicus Sentinel-3, -4, -5 and -6 missions.



Continuity

Secure continuity and improvement of data services to users for another decade and beyond.



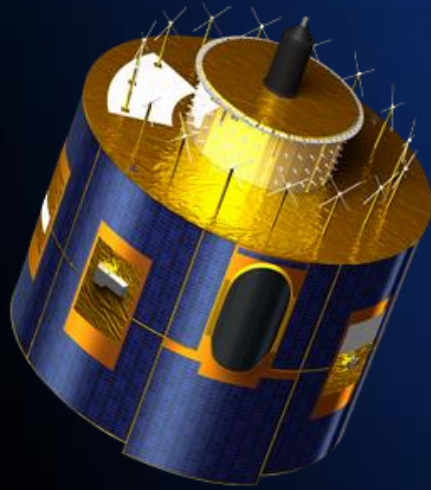
Cooperation

Build on European and global partnerships involving the EU, ESA and national space agencies, and on a portfolio of bilateral cooperation with other satellite operators.

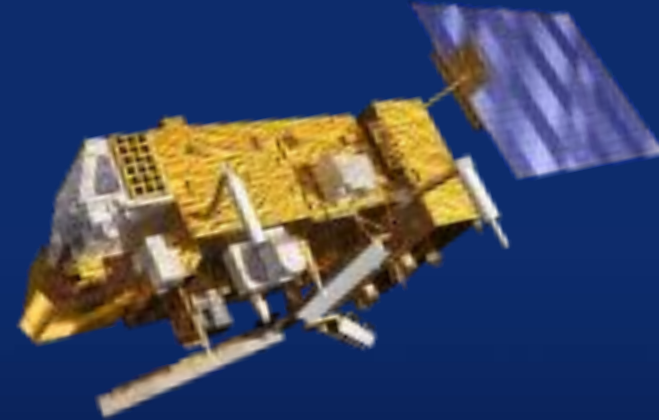


EUMETSAT satellite systems

The need for two types of meteorological satellites

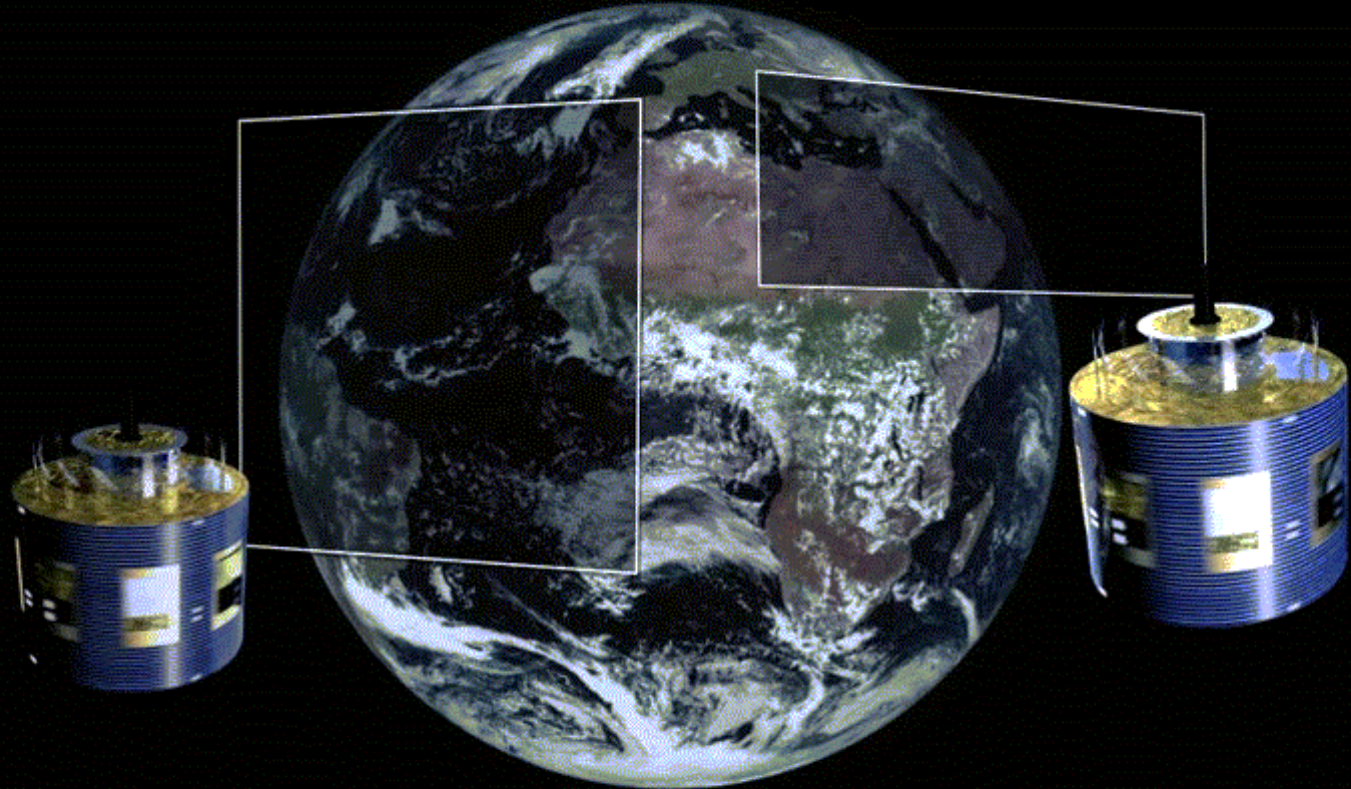


Geostationary orbit
Vital for forecasts up
to a few hours



Polar orbit
Critical for forecasts
up to 10 days

Meteosat Second Generation: a two-satellite operational system



Time-lapse
00:00

Animated representation

MTG-I imaging mission



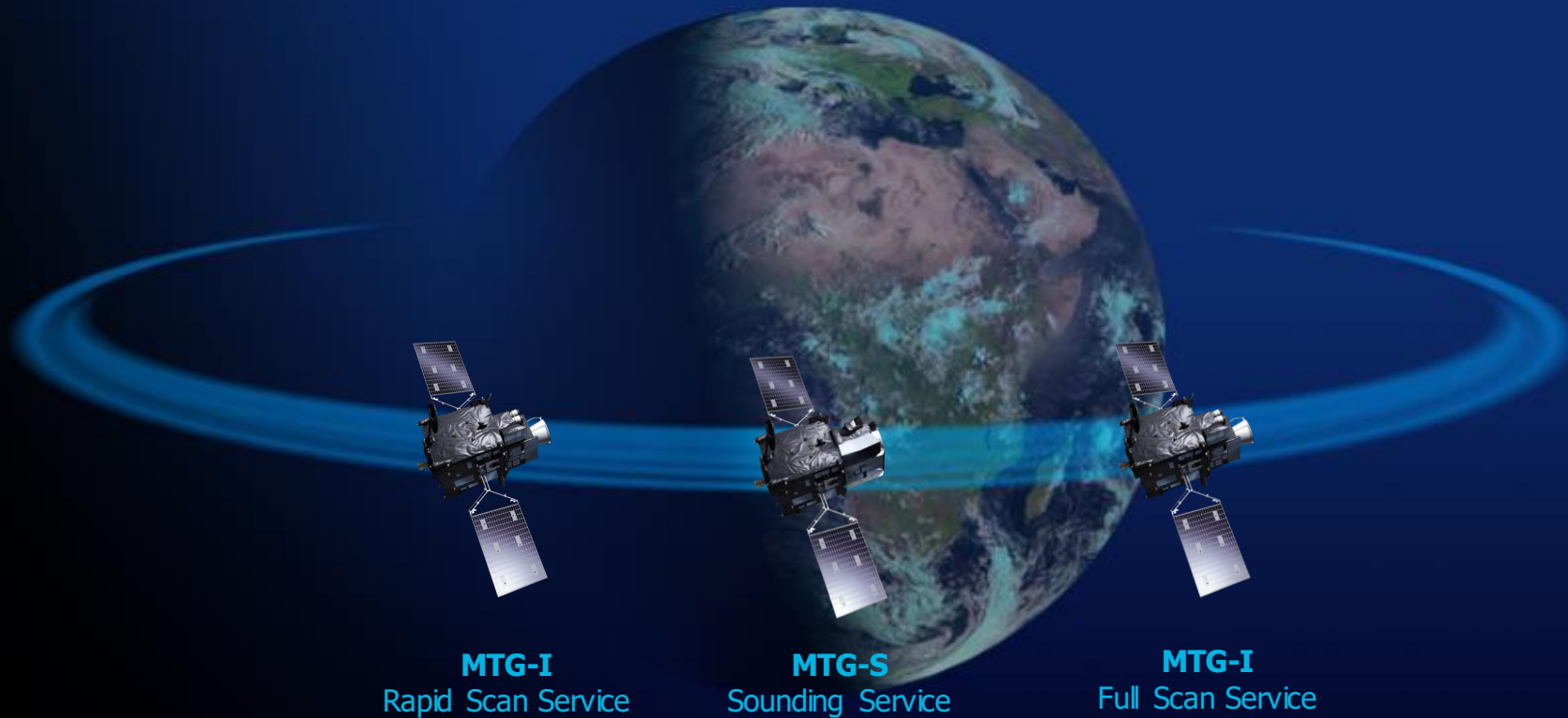
- Imagery mission implemented by two MTG-I satellites
- Full disc imagery every 10 minutes in 16 bands
- Fast imagery of Europe every 2.5 minutes
- New Lightning Imager (LI)
- Start of operations in 2021
- Operational exploitation: 2021-2042

MTG-S sounding mission

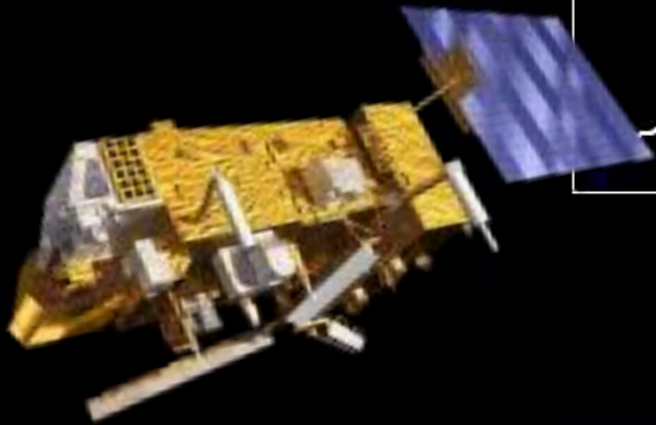
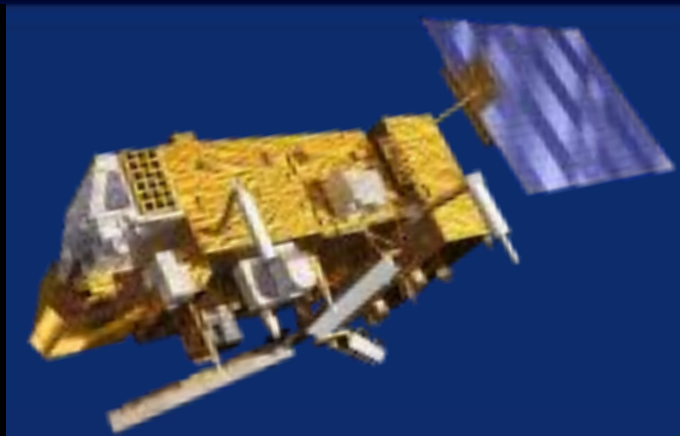
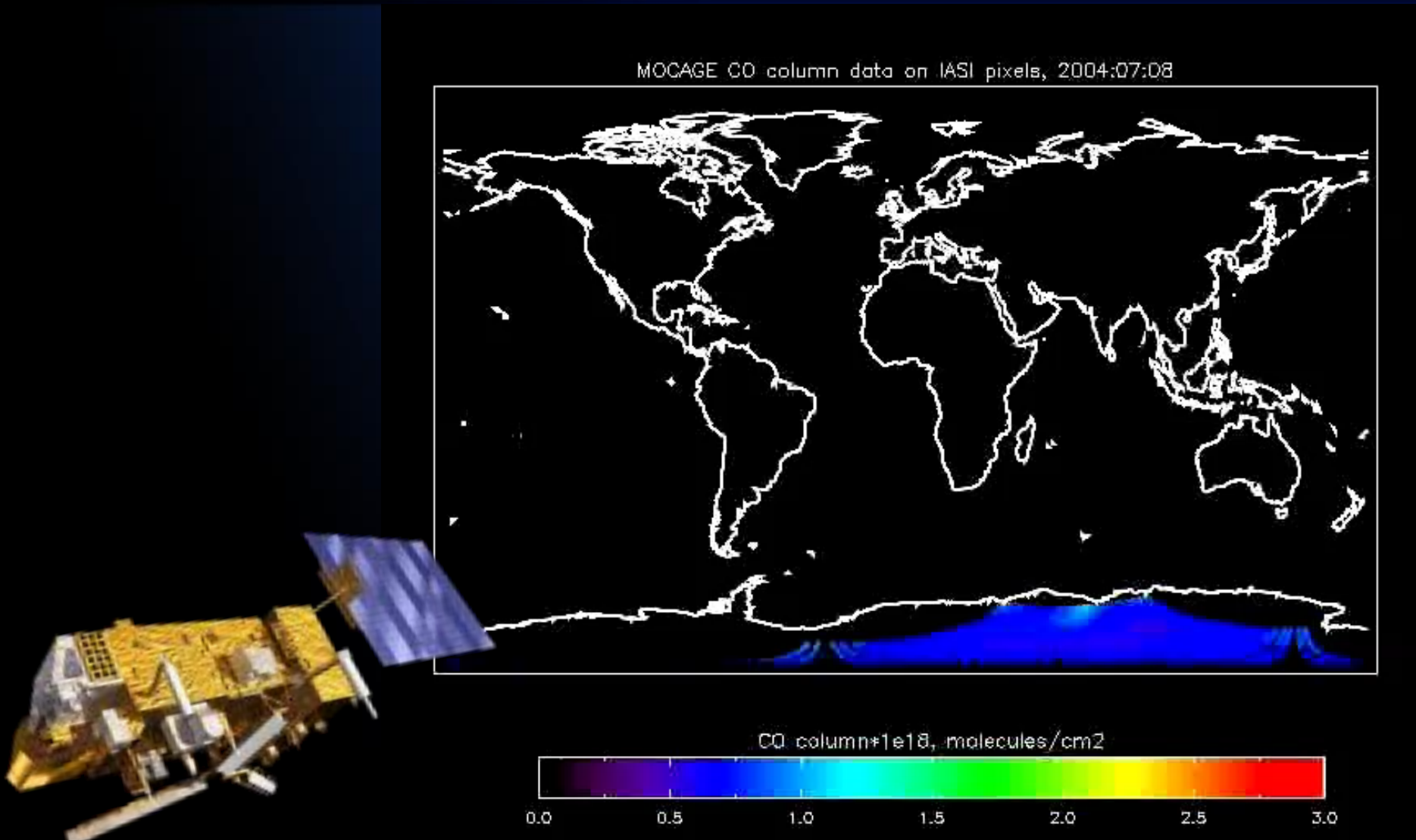


- Hyperspectral infrared sounding mission
- 3D weather cube: temperature, water vapour, O₃, every 30 minutes over Europe
- Air quality monitoring and atmospheric chemistry in synergy with Copernicus Sentinel-4 instrument
- Start of operations in 2023
- Operational exploitation: 2023-2042

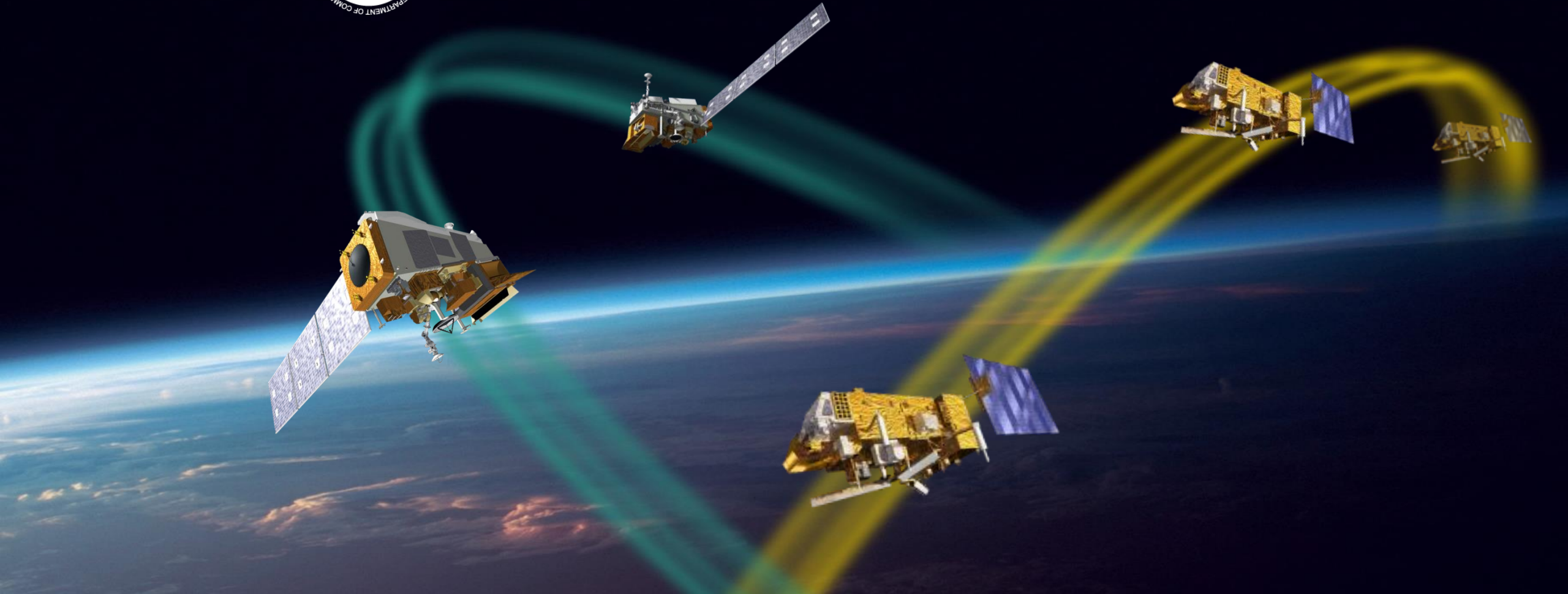
MTG full operational configuration



Polar orbit : Global observations from 800 km

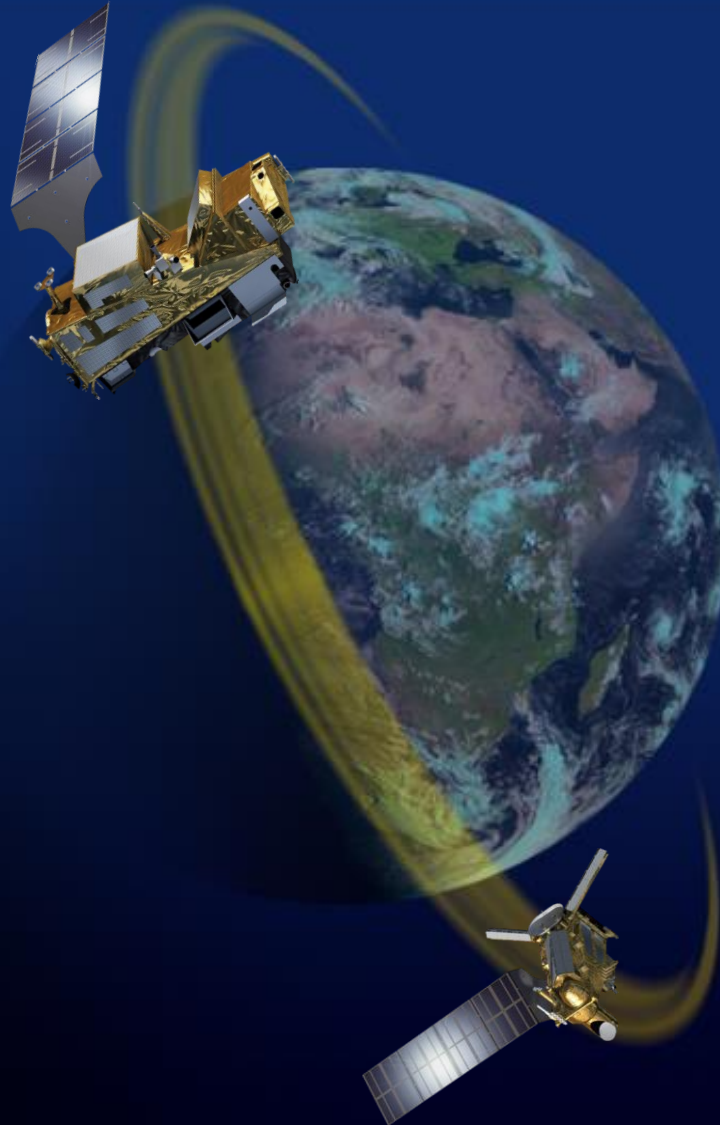


EUMETSAT Polar System: part of the Initial Joint Polar System shared with the US



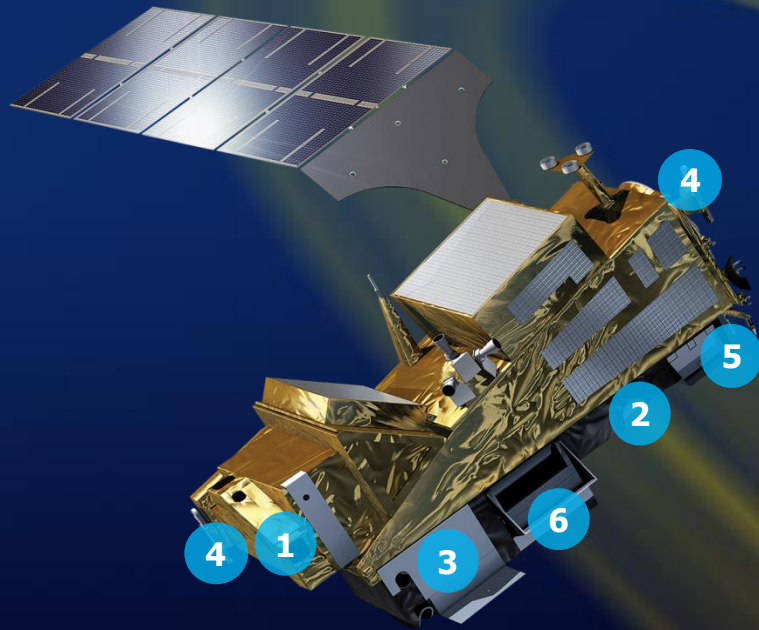
EPS-SG full operational configuration

Metop-SG A
Sounding & Imagery



Metop-SG B
Microwave Imagery

EPS-SG A sounding and imagery mission



- 1. IASI-NG**
Infrared Atmospheric Sounding
- 2. MWS**
Microwave Sounding
- 3. METImage**
Visible-Infrared Imaging
- 4. RO**
Radio Occultation
- 5. 3MI**
Multi-viewing, -channel, -polarisation
Imaging
- 6. Copernicus Sentinel-5**
UN/VIS/NIR/SWIR Sounding

EPS-SG B microwave imagery mission

1. **SCA**
Scatterometer
2. **RO**
Radio Occultation
3. **MWI**
Microwave Imaging for Precipitation
4. **ICI**
Ice Cloud Imager
5. **ARGOS-4**
Advanced Data Collection System



Current EUMETSAT satellites

METOP-A & -B (98.7° incl.)

LOW EARTH, SUN-SYNCHRONOUS ORBIT

EUMETSAT POLAR SYSTEM (EPS) /
INITIAL JOINT POLAR SYSTEM

SENTINEL-3A & -3B (98.65° incl.)

LOW EARTH, SUN-SYNCHRONOUS ORBIT

COPERNICUS SATELLITES DELIVERING
MARINE AND LAND OBSERVATIONS



JASON-2 & -3 (63° incl.)

LOW EARTH, NON-SYNCHRONOUS ORBIT

OCEAN SURFACE TOPOGRAPHY MISSION,
SHARED WITH CNES/NOAA/EU

METEOSAT-9, -10, -11

GEOSTATIONARY ORBIT

TWO-SATELLITE SYSTEM

METEOSAT 2ND GENERATION

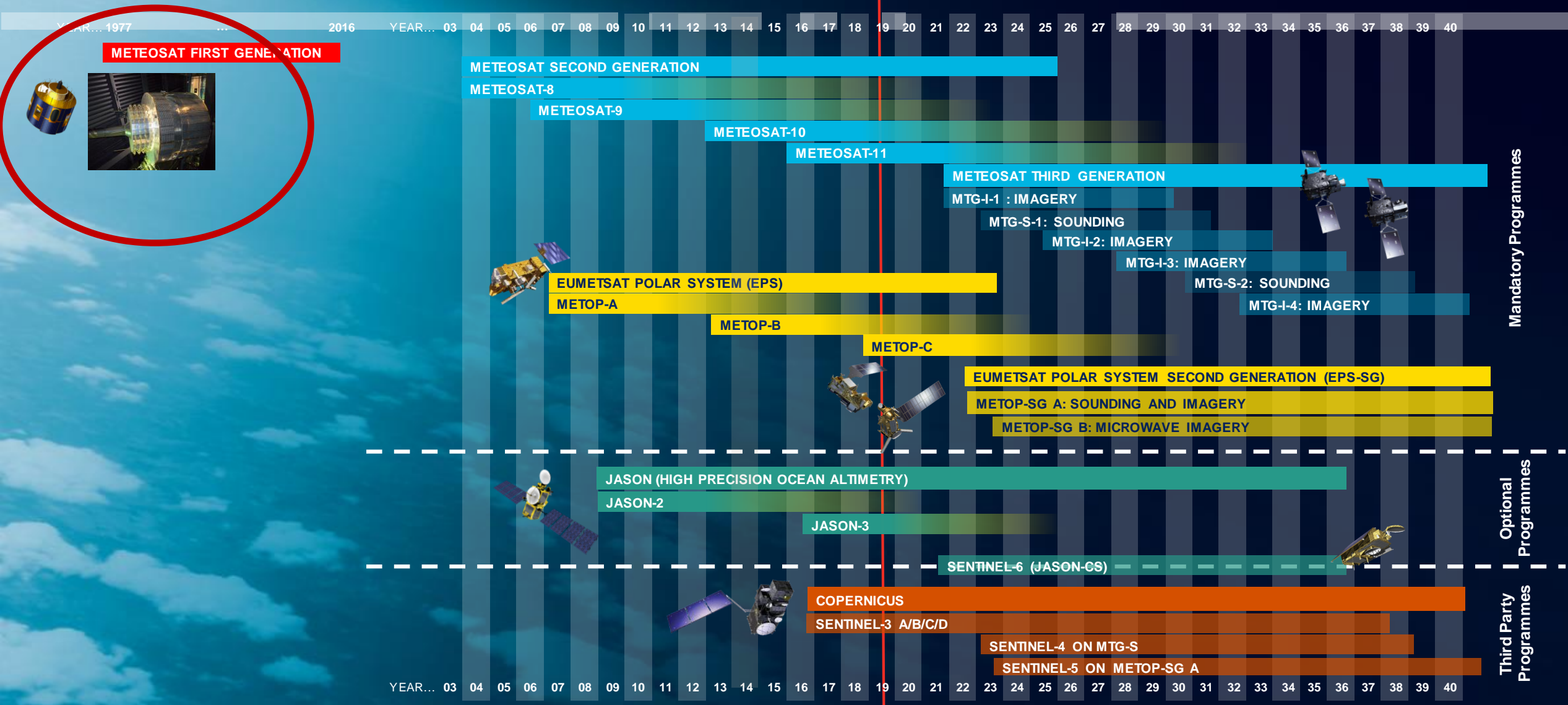
FULL DISC IMAGERY MISSION (15 MINS) (METEOSAT-11 (0°))
RAPID SCAN SERVICE OVER EUROPE (5 MINS) (METEOSAT-10 (9.5° E))
BACKUP SATELLITE AND GAP FILLER FOR RSS (METEOSAT-9 (3.5°E))

METEOSAT-8 (41.5° E)

GEOSTATIONARY ORBIT

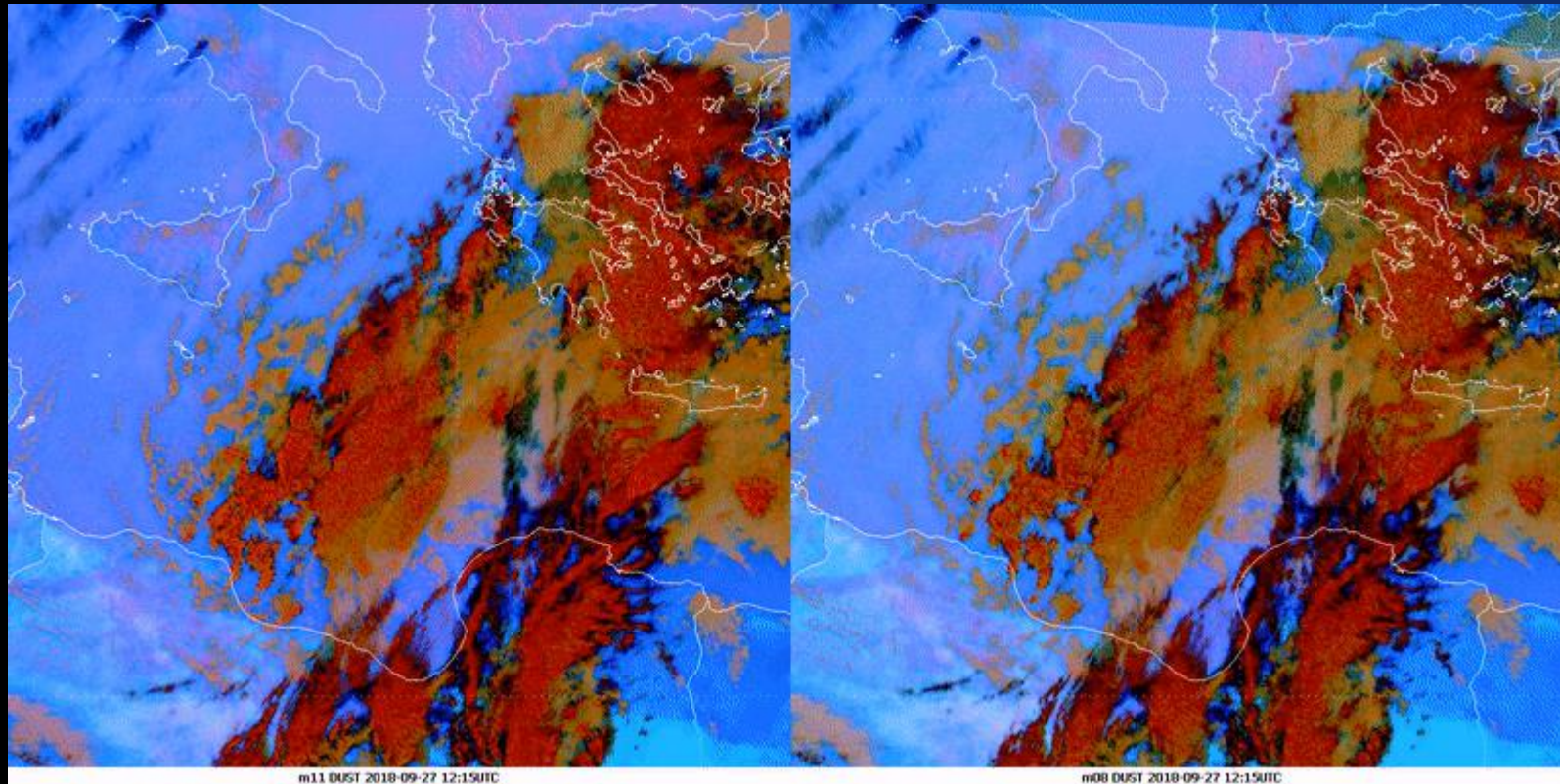
METEOSAT 2ND
GENERATION PROVIDING
IODC FROM FEBRUARY
2017 – MID-2020

Long term commitment: multi-satellite programmes



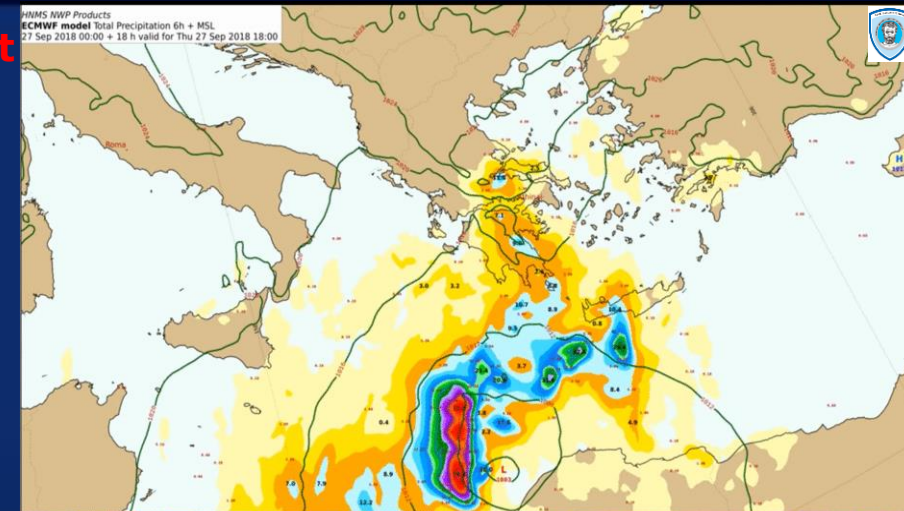
Meteosat monitors Rapid Convection Systems

Medicane Zorba: 28-30 September 2018



Observations : Meteosat -11 (0°) and Meteosat -8 (41.5°E)

Forecast

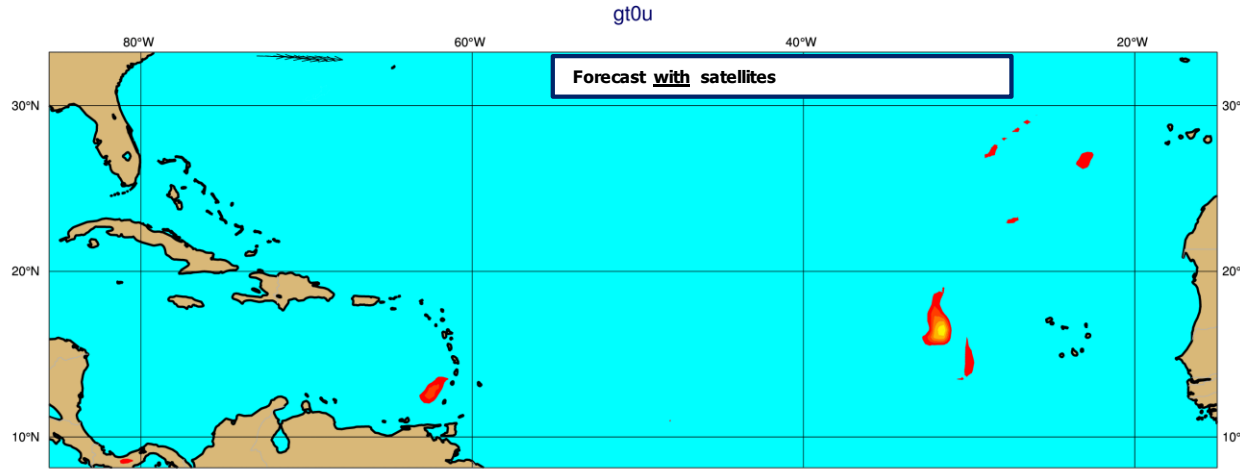


Created: 01.10.2018 03:14 CET | Valid for: 01.10.2018

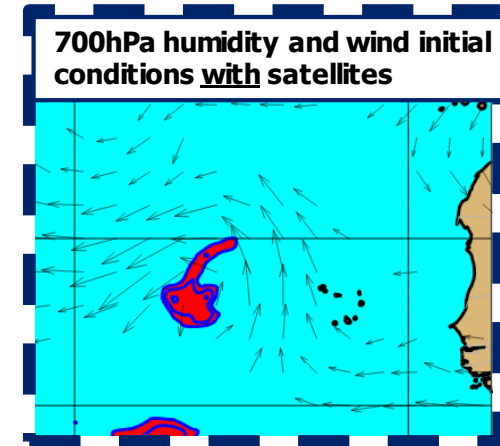
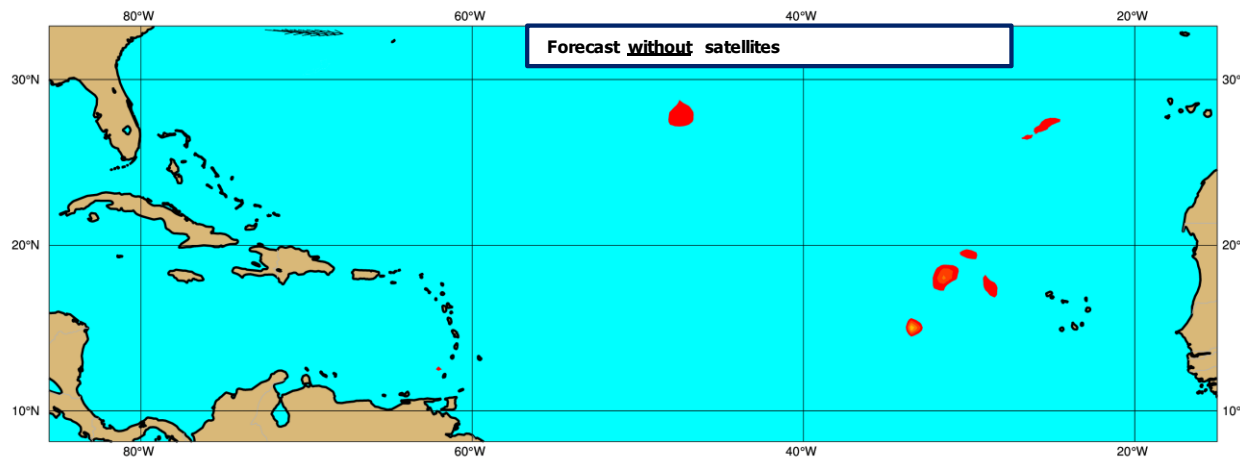


Warning

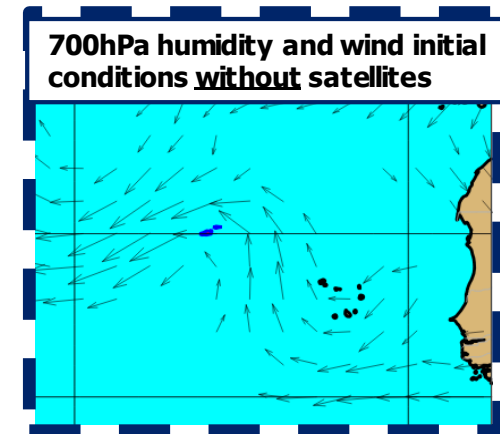
IJPS contribution to forecasting IRMA



Thursday 31 August 2017 00 UTC ecmf 500 hPa Vorticity (relative)
Thursday 31 August 2017 00 UTC ecmf 500 hPa U component of wind/V component of wind
gt0v



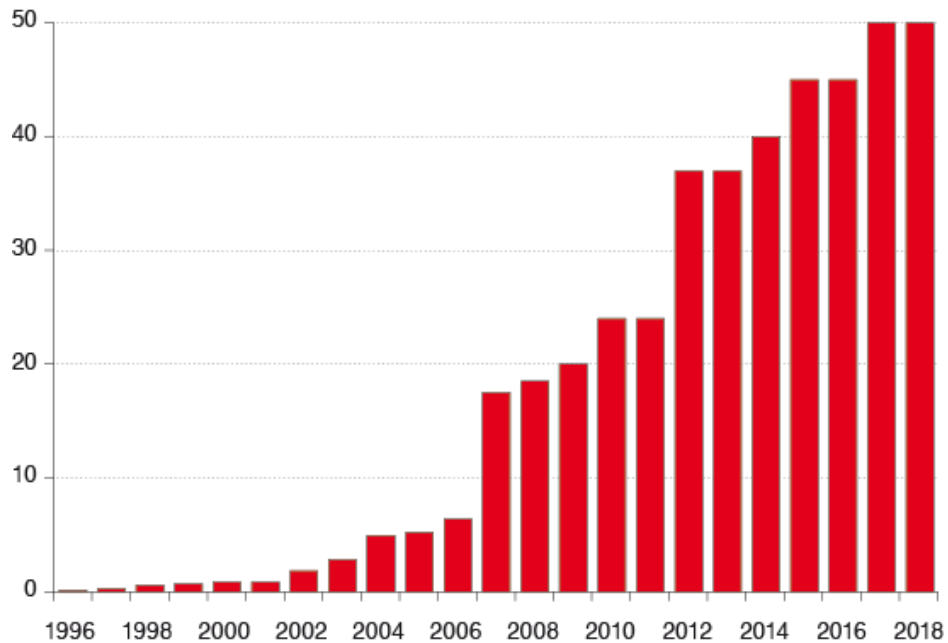
Red shading humidity > 95%



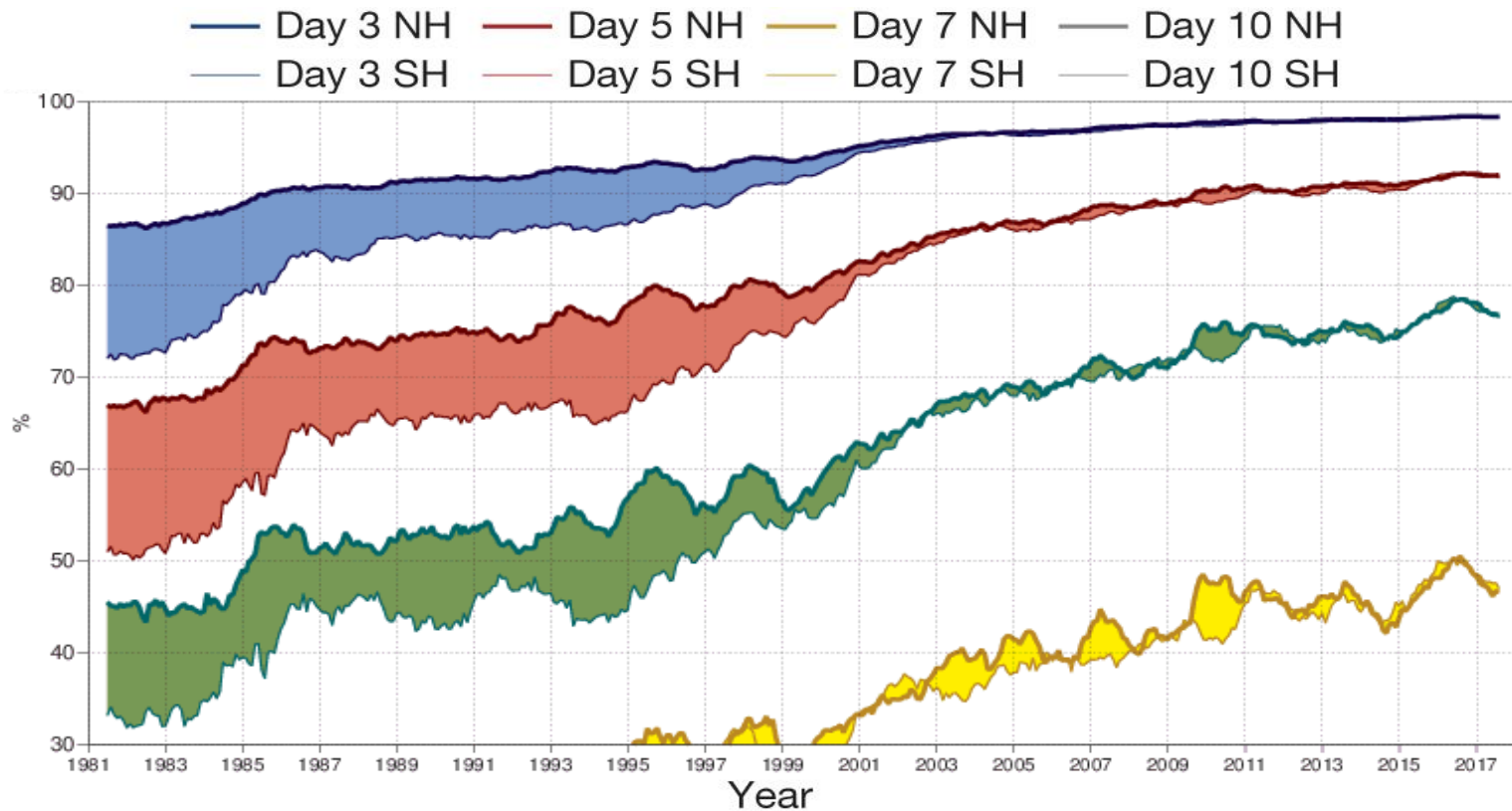
Source: ECMWF

ECMWF – Europe is a world leader of medium-range numerical weather prediction

Total number of observations monitored at ECMWF

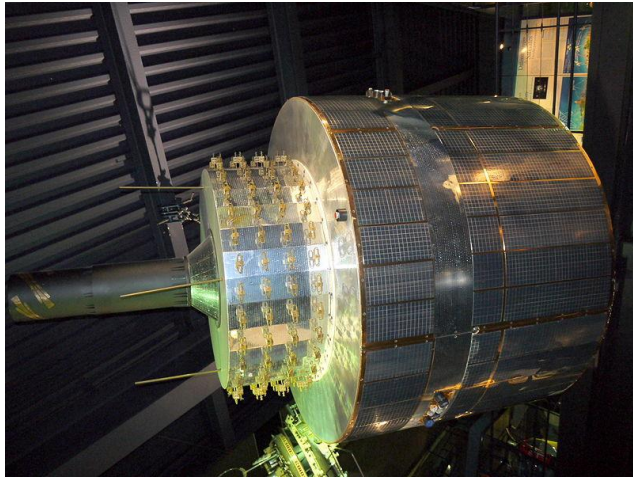


Source: ECMWF

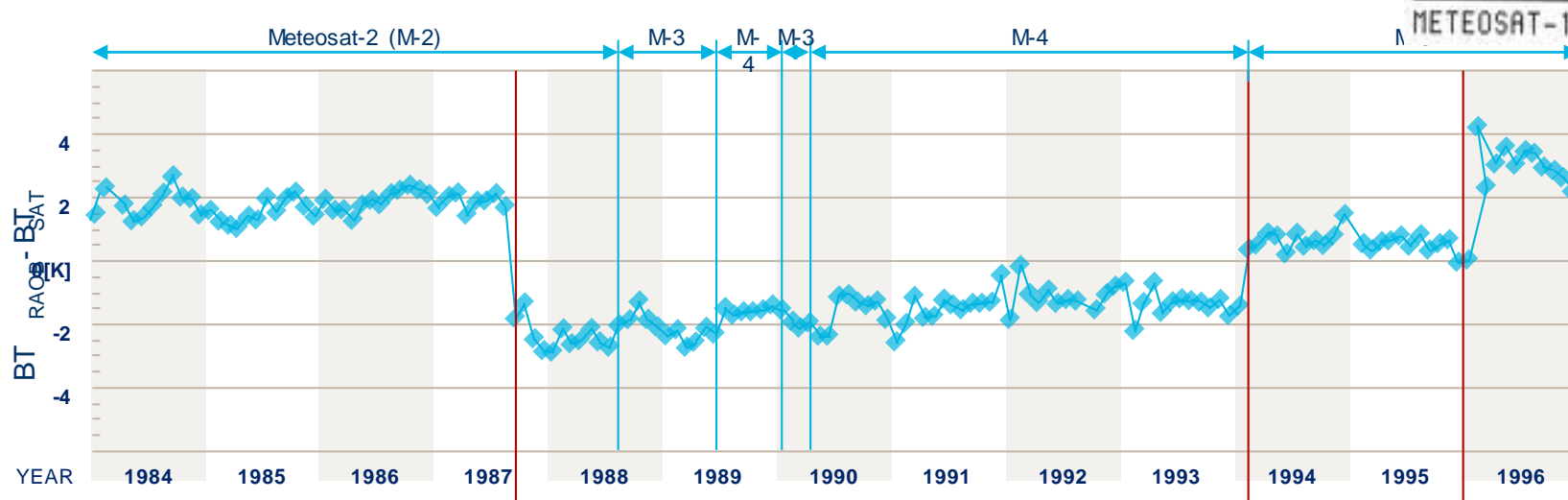


Climate @ EUMETSAT

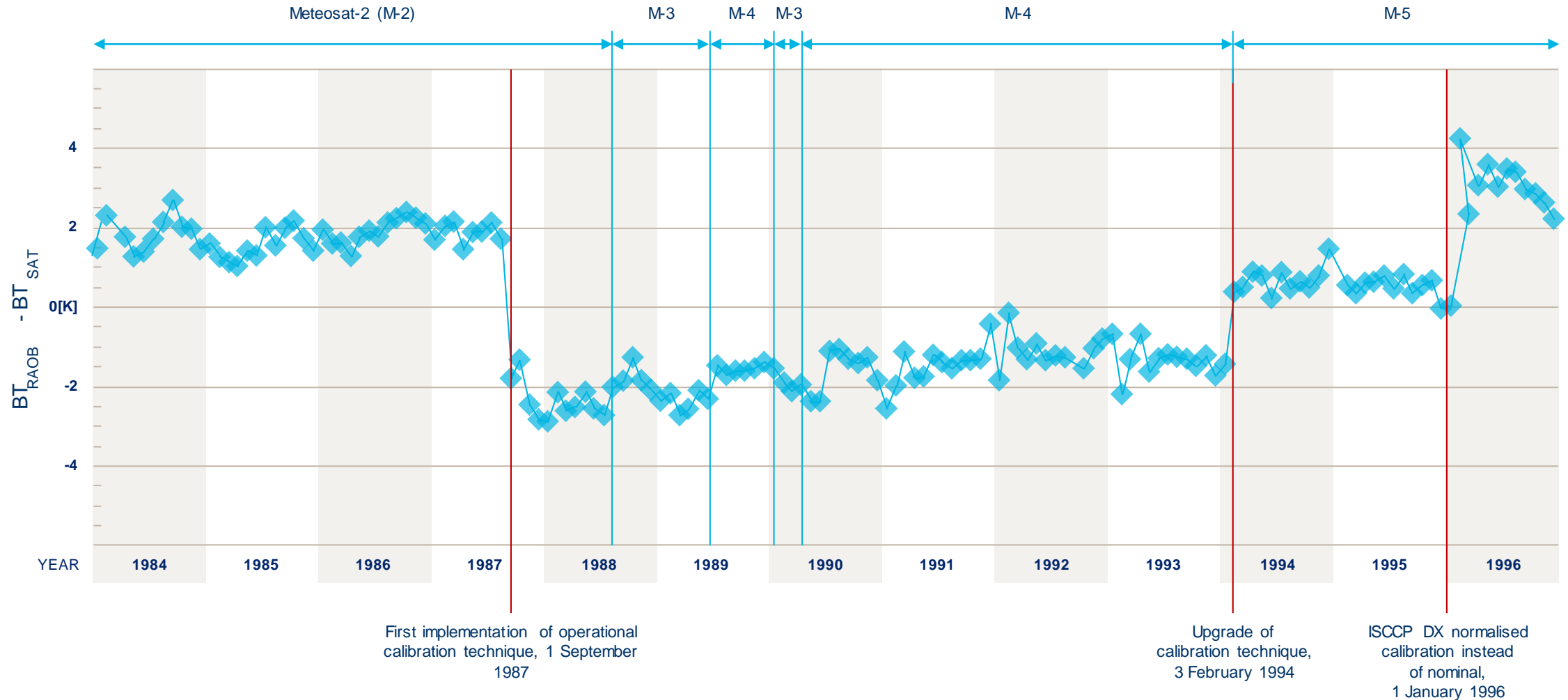
The challenge of climate monitoring from space



FIRST IMAGE: 8 DEC 1973
COPYRIGHT ESR



The challenge of climate monitoring from space

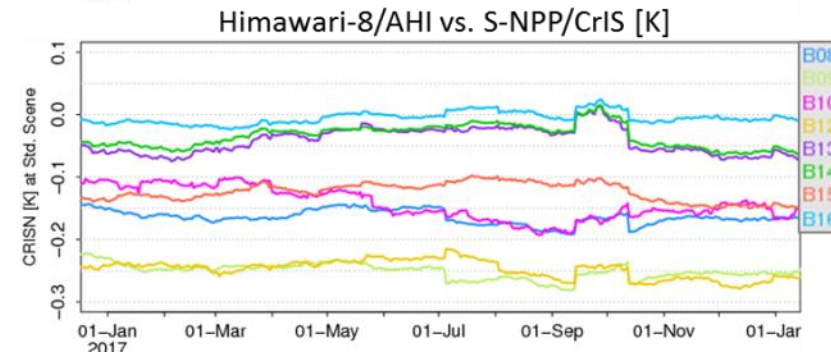
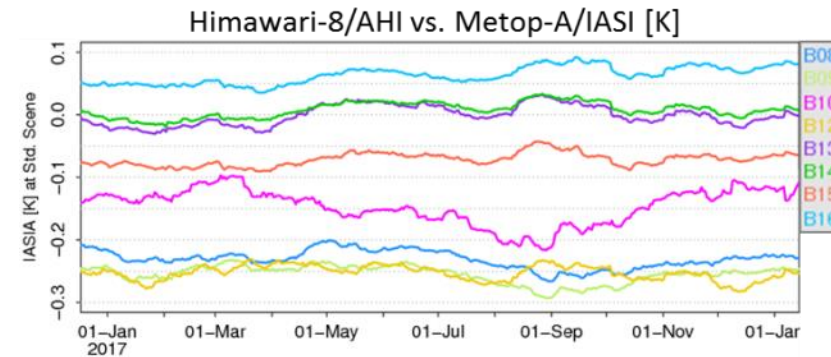
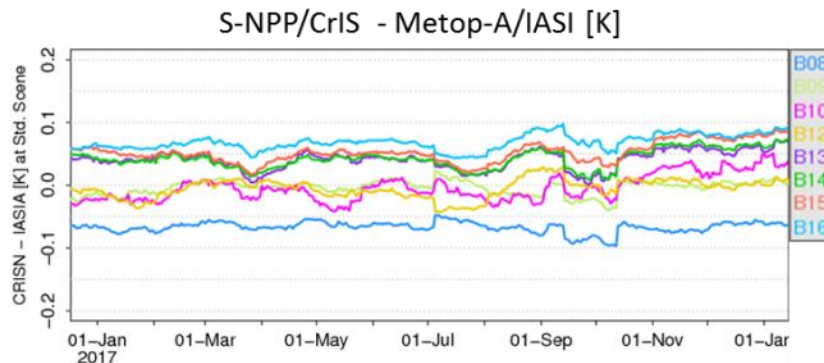


Calibration Performance: Himawari-8/AHI Infrared Bands

Summary Statistics of Himawari-8/AHI IR Calibration Performance in 2017 (All uncertainties are k=1)

	Channel Name (Central Wavelength in μm)	BAND07 (3.9)	BAND08 (6.2)	BAND09 (6.9)	BAND10 (7.3)	BAND11 (8.6)	BAND12 (9.6)	BAND13 (10.4)	BAND14 (11.2)	BAND15 (12.4)	BAND16 (13.3)
	Std. Radiance as Tb (K)	286.0	234.6	243.9	254.6	283.8	259.5	286.2	286.1	283.8	269.7
Metop-A/ IASI	Mean Bias (K)	-0.11	-0.173	-0.212	-0.129	-0.05	-0.216	0.036	0.045	-0.04	0.078
	Stdv. of Bias (K)	0.008	0.012	0.009	0.014	0.012	0.017	0.018	0.019	0.017	0.015
S-NPP/ CrIS	Mean Bias (K)	-0.07	-0.16	-0.24	-0.15	N/A	-0.23	-0.02	-0.01	-0.01	0.03
	Stdv/ of Bias (K)	0.039	0.011	0.012	0.026	N/A	0.013	0.013	0.012	0.010	0.005

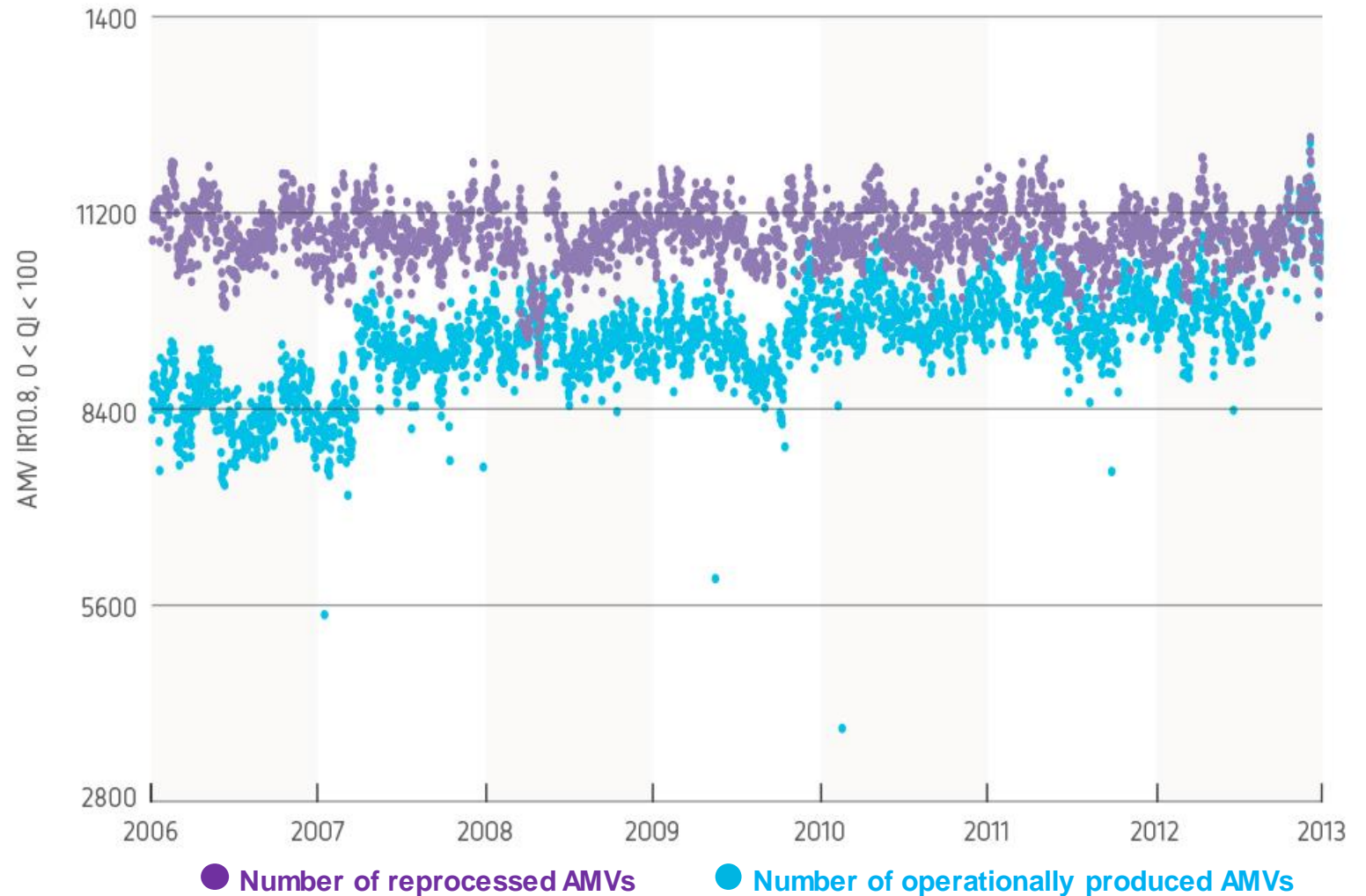
- The statistics are derived from Himawari-8/AHI GSICS Re-Analysis Correction ([ATBD](#))
- Standard Radiance: typical scene defined by GSICS for easy inter-comparison of sensors' inter-calibration biases



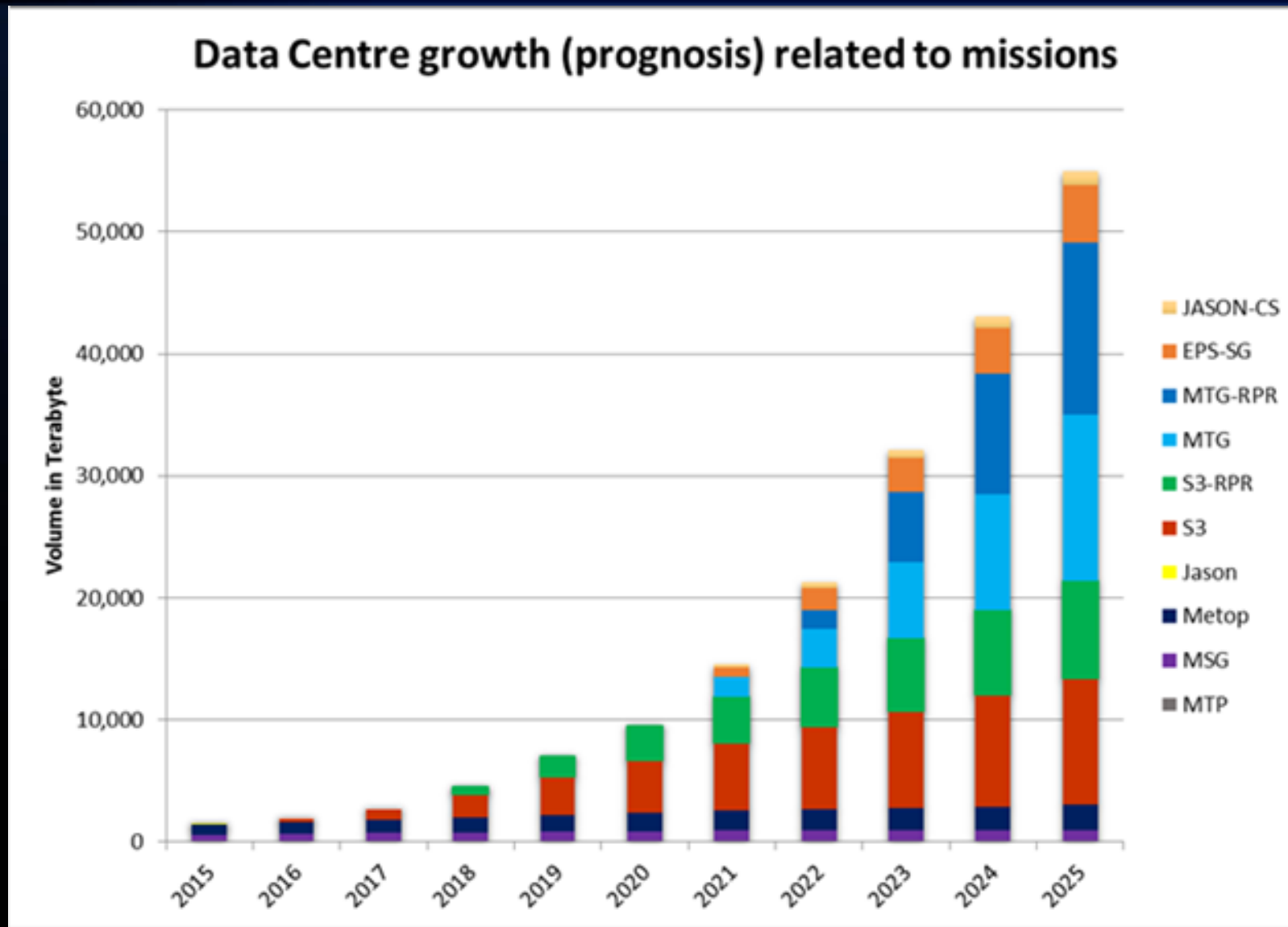
Value of reprocessing

Excellent AMVs (80 < QI < 100)

Number of reprocessed products extracted from Meteosat imaging with a quality index > 80% in the period 2005-2013



Planned growth of EUMETSAT Data Centre



EUMETSAT Network of Satellite Application Facilities



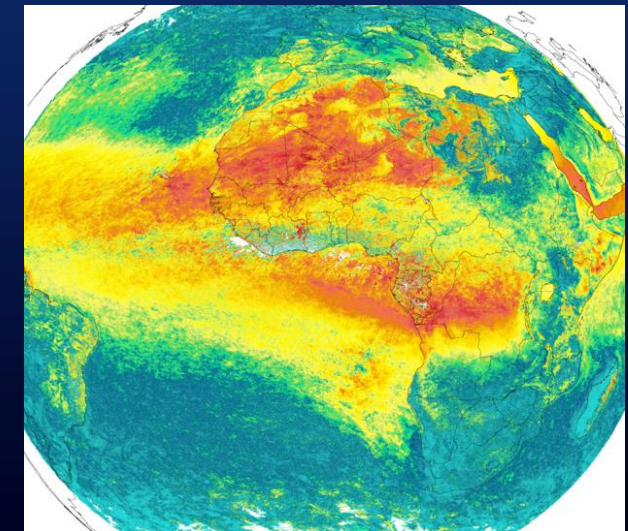
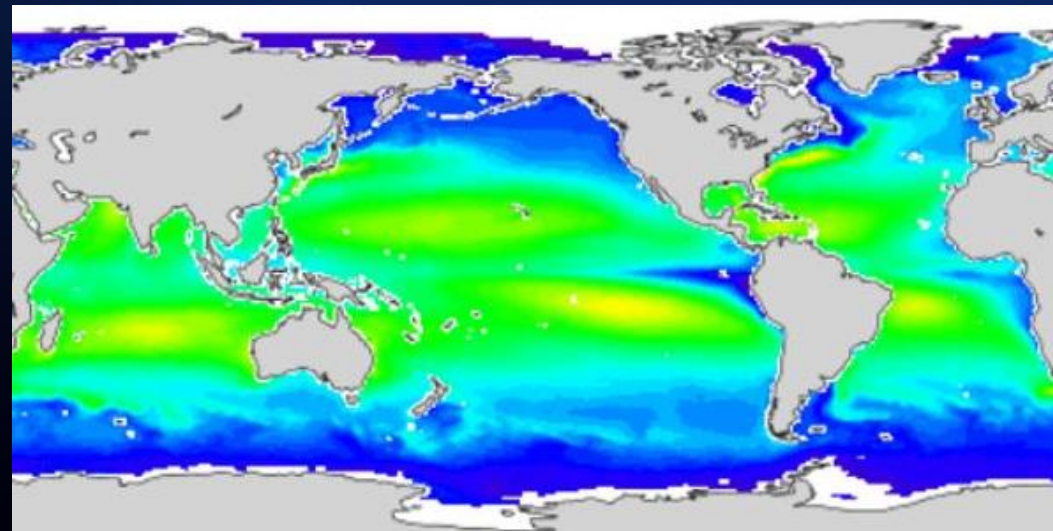
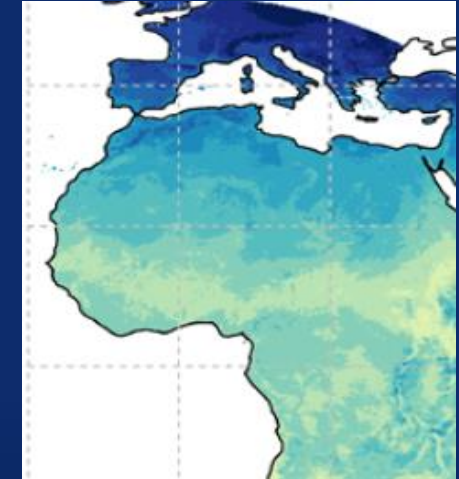
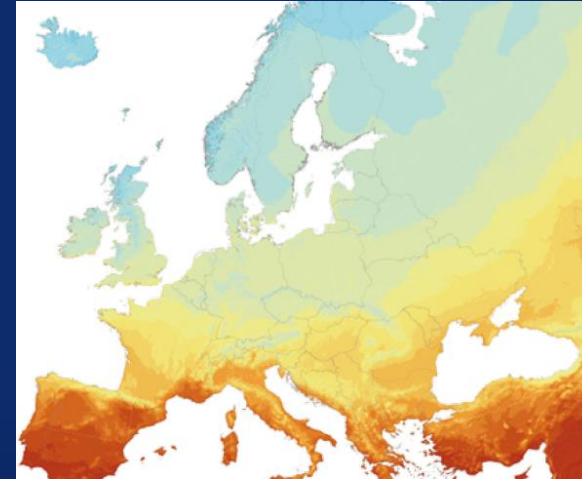
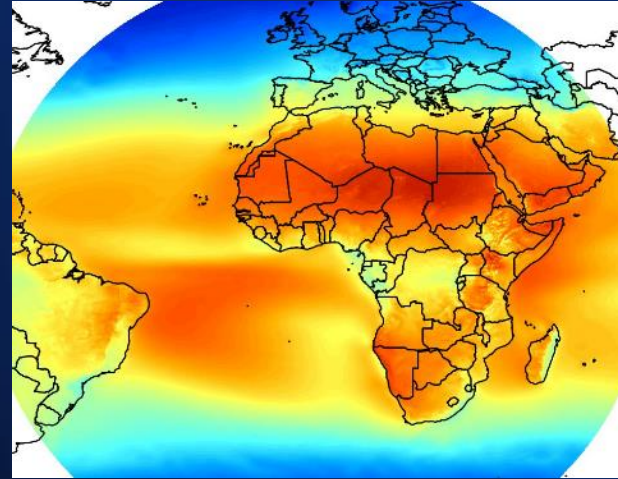
Climate Monitoring SAF



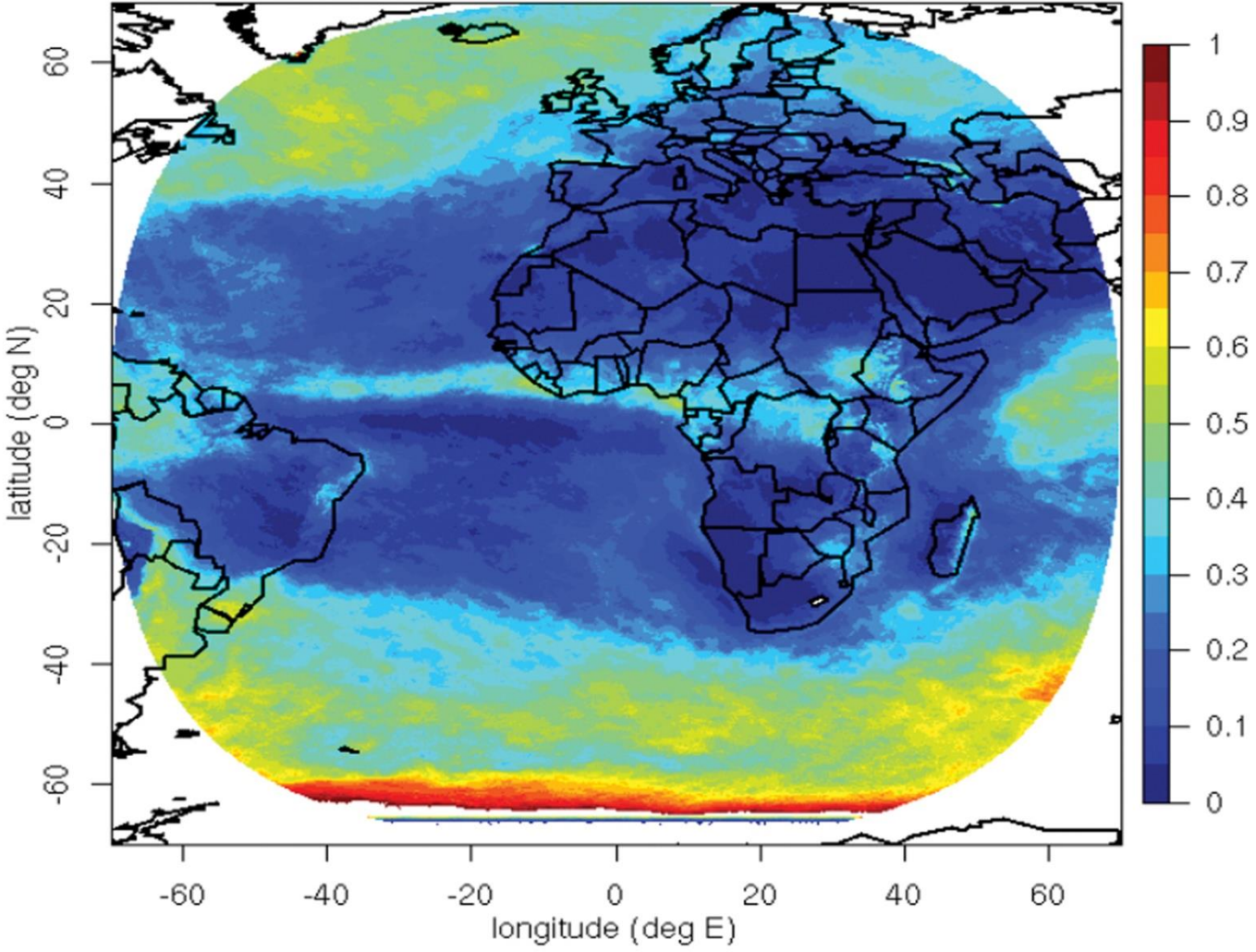
Generates and archives high-quality datasets for specific climate application areas to derive information about the climate variables of the Earth system.

It aims to provide data that can be further used to assess the current climate, e.g. for infrastructure planning; to assess the climate variability and change, including climate change detection and attribution; to support the development of climate models; by validating long-range and short-term climate forecasts; to assess the impact of changing environment, and to provide evidence for policy actions.

The applications cover the objectives of various international programs — such as Global Climate Observing System (GCOS), World Climate Programme (WCP) and World Climate Research Programme (WCRP) — and are also vital for activities within the Group on Earth Observations (GEO) and Copernicus framework.

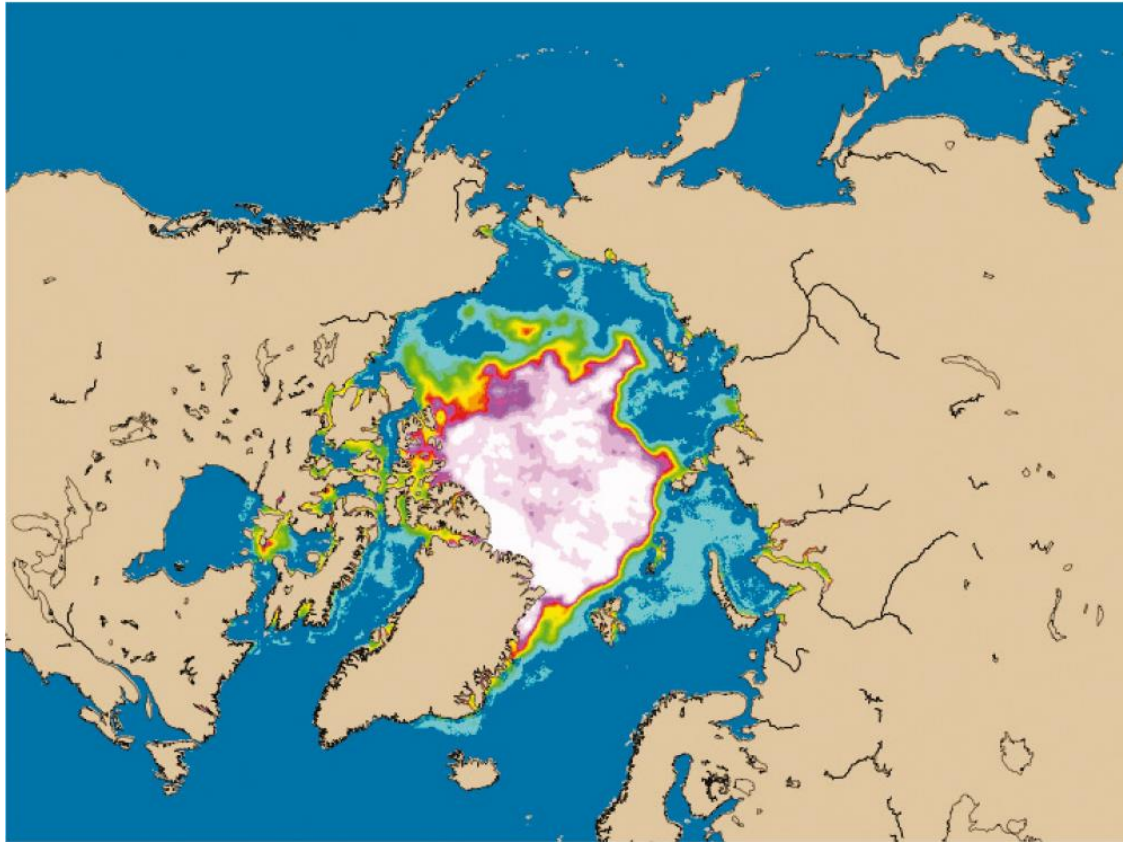


Thematic climate data records: albedo

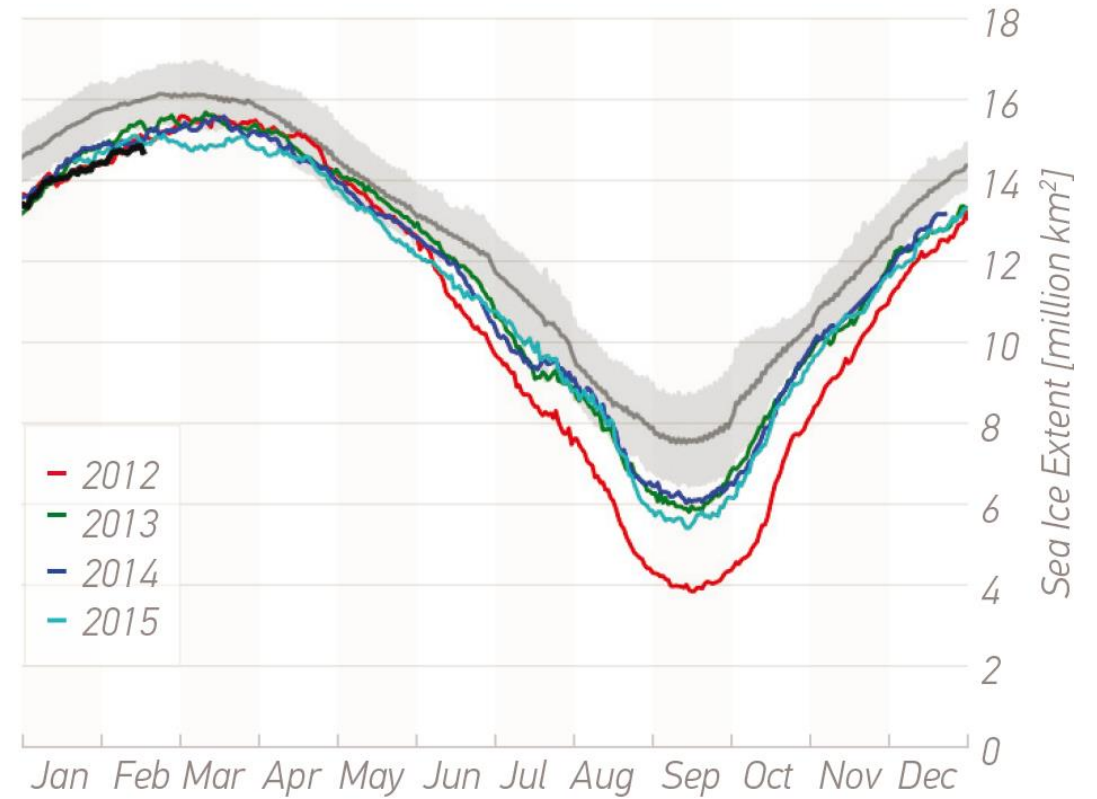


Thematic climate data records: sea ice

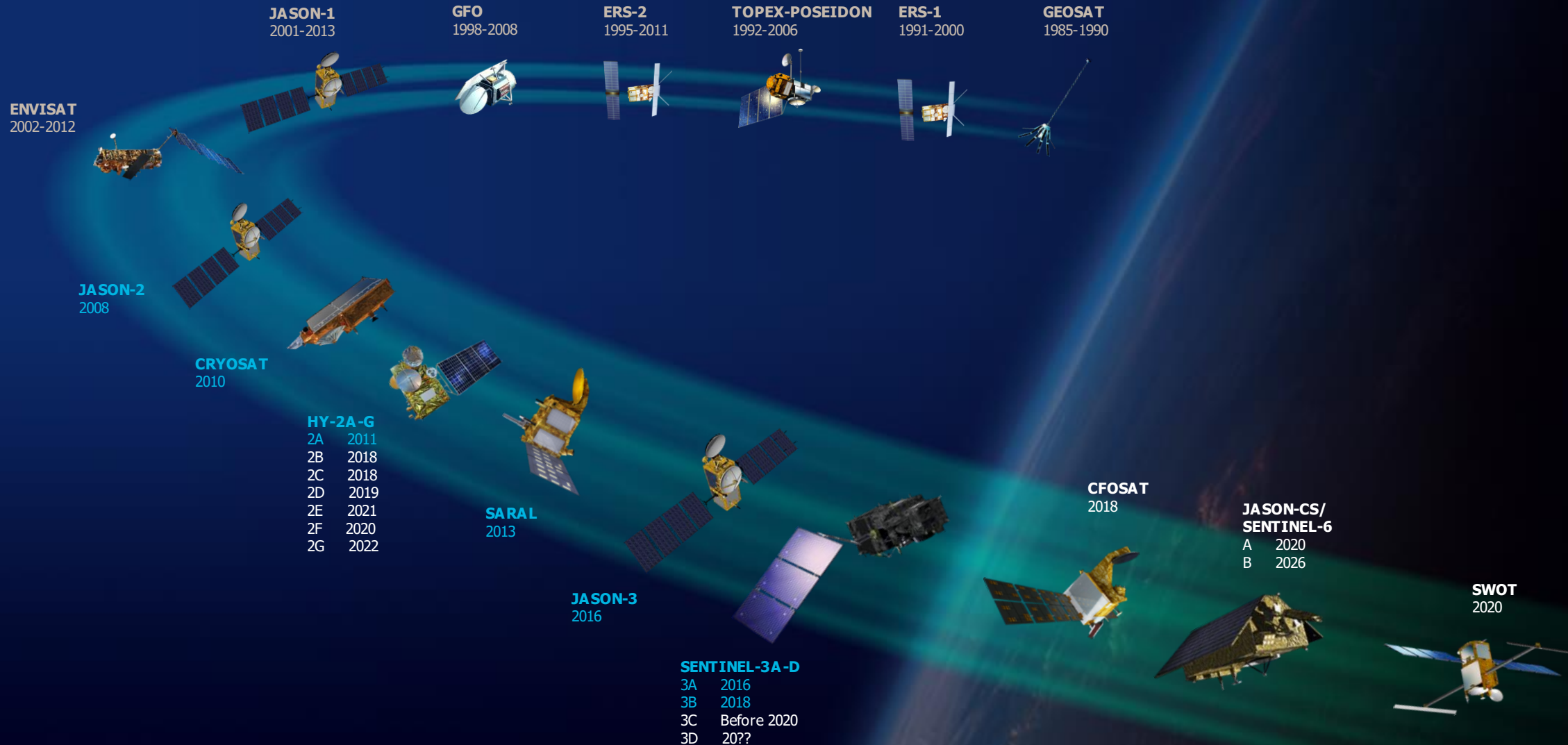
Sea Ice Concentration - Reproc NH / 2015-09-11 12:00:00



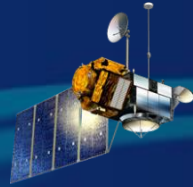
Arctic Sea Ice Extent



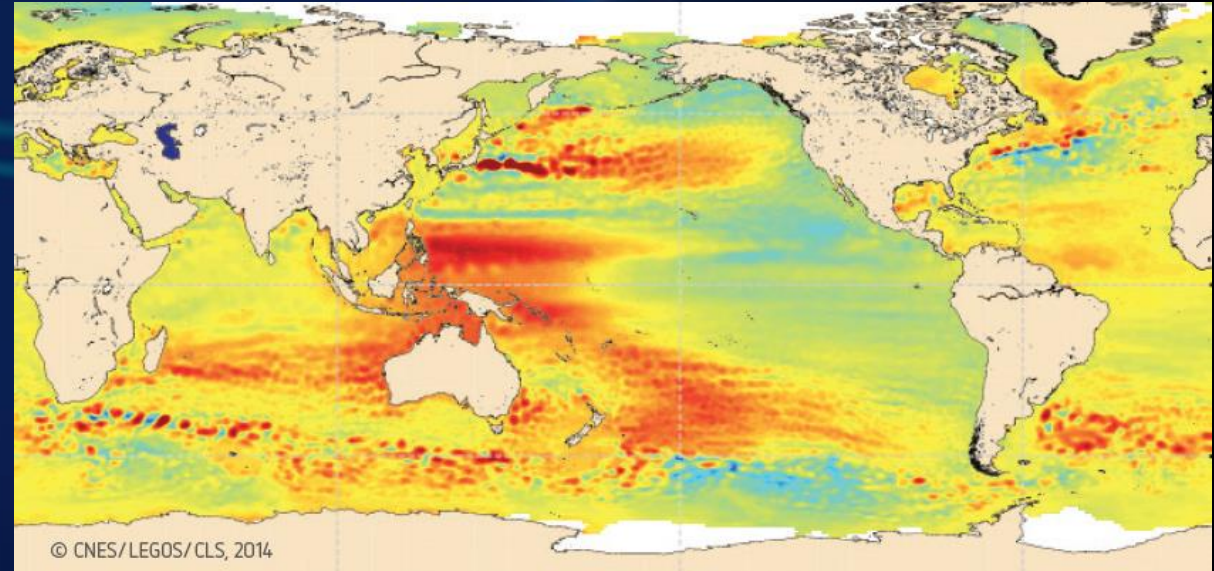
Altimetry missions – past, present and future



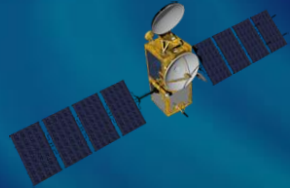
Cooperative Jason missions



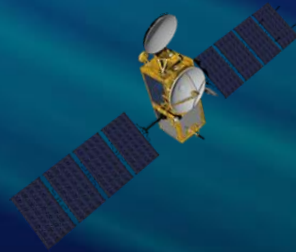
TOPEX-POSEIDON
1992-2006



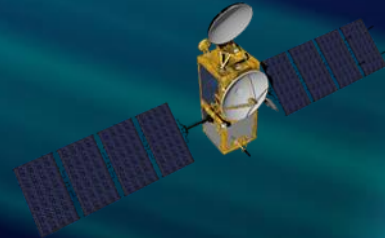
JASON-1
2001



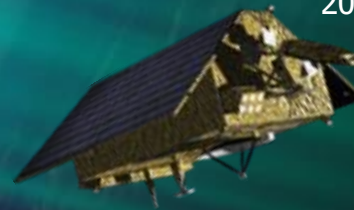
OSTM/JASON-2
2008



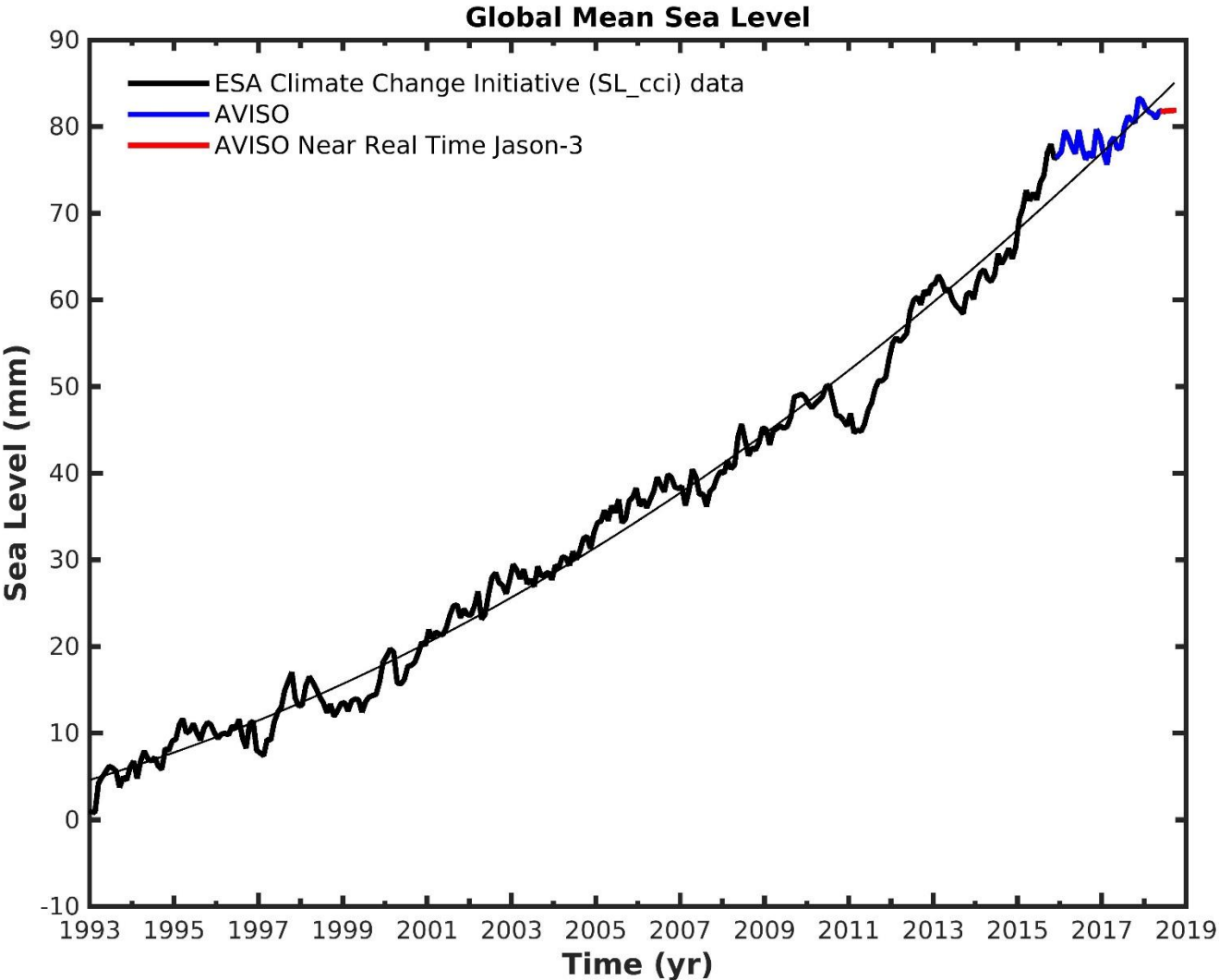
JASON-3
2016



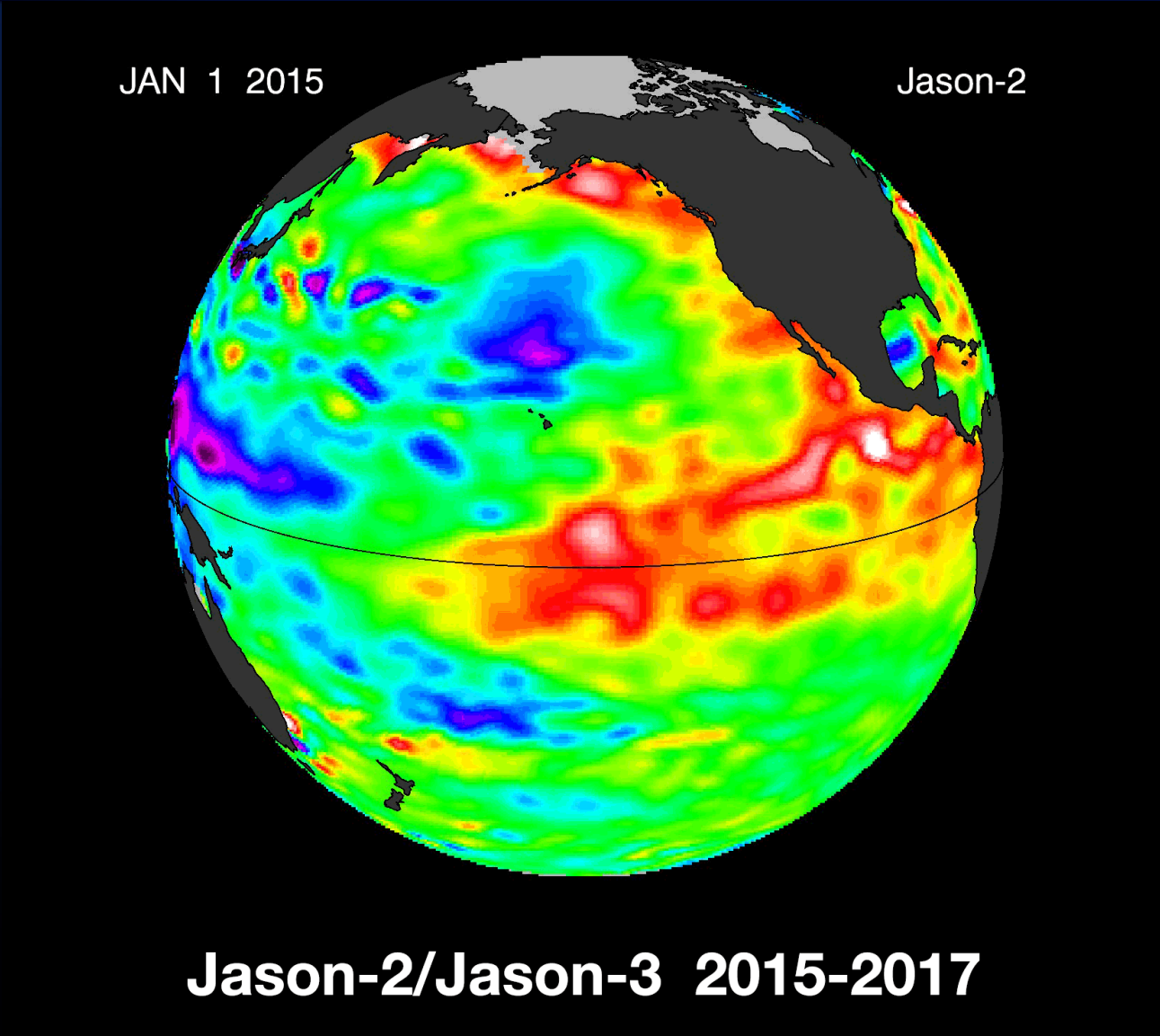
SENTINEL-6/JASON-CS
2020



Jason contributing to mean sea level observations



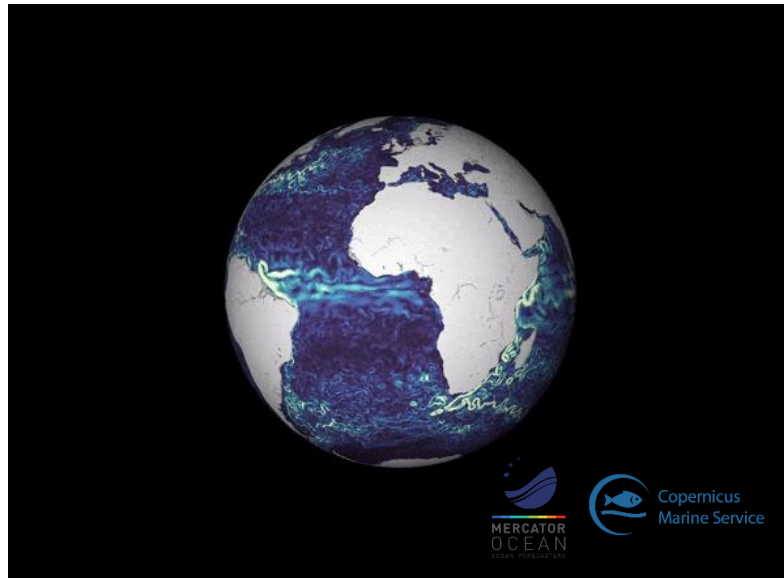
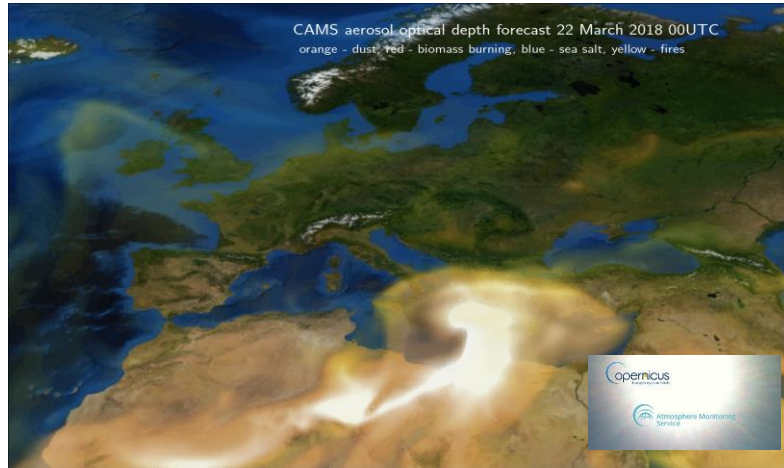
Jason-3 contributing to El Nino observations



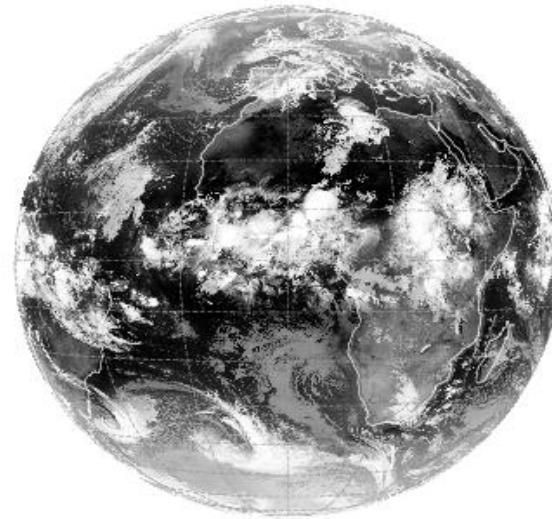


EUMETSAT and Copernicus

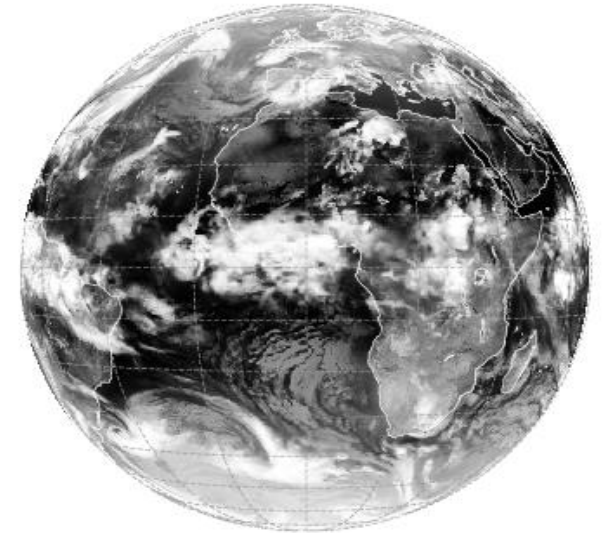
From Weather to Environmental Monitoring and Forecasting



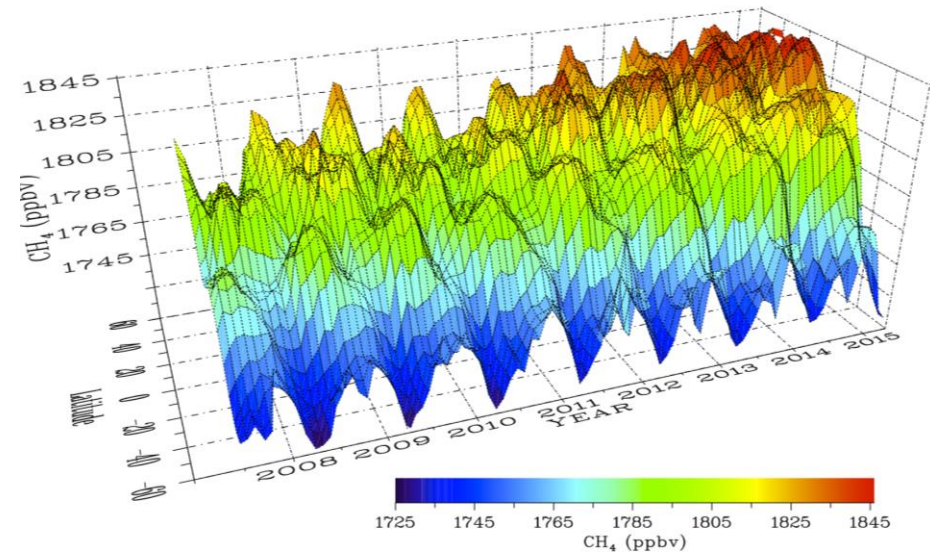
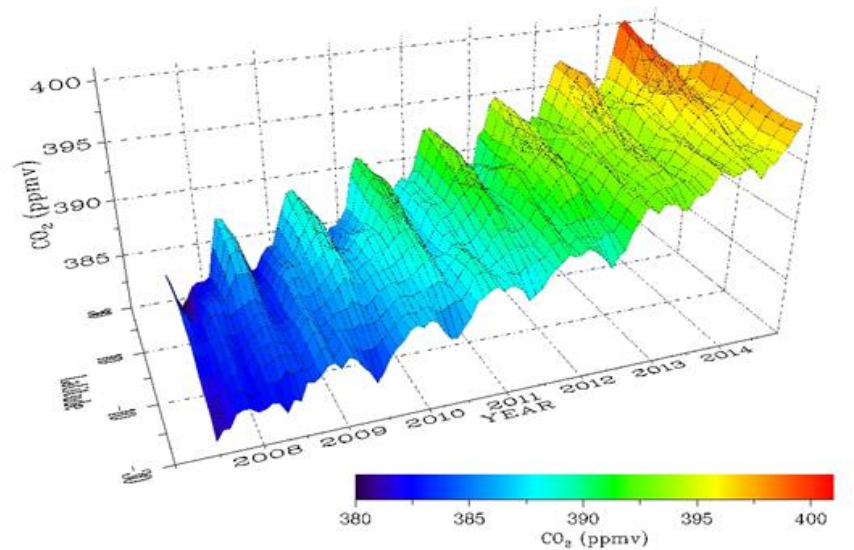
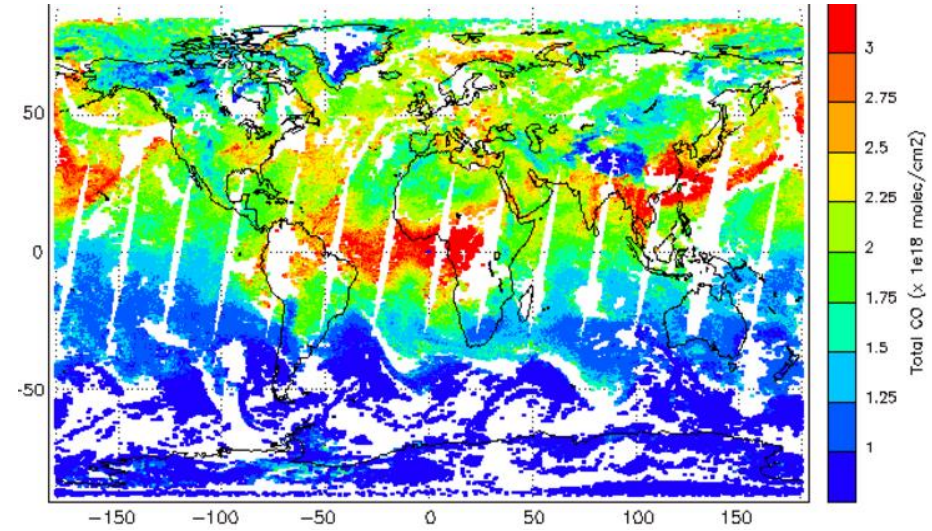
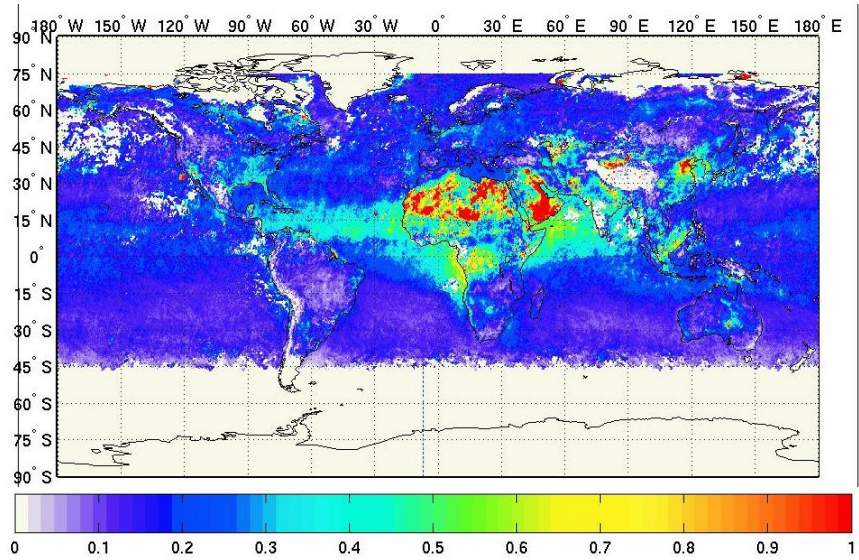
Meteosat 9 IR10.8 20080525 0 UTC



ECMWF Fc 20080525 00 UTC+0h:



Greenhouse gases – preparing for Sentinel-7



International cooperation

- Cooperation in satellite meteorology, oceanography and climate monitoring
- Focus on operational data exchange, data redistribution, production of climate-relevant datasets, scientific exchange, user training, coordination through multilateral partnerships (CGMS, CEOS, GEO)

International cooperation partners



Country	Agency
Canada:	ECCE
China:	CMA, CNSA, NSOAS
India:	ISRO, IMD
Japan:	JAXA, JMA
Russian Federation:	Roshydromet
South Korea:	KMA
United States:	NASA, NOAA



Thank you