SEVIRI vs FCI, Products and Applications (Part 1 , 2 and 3)

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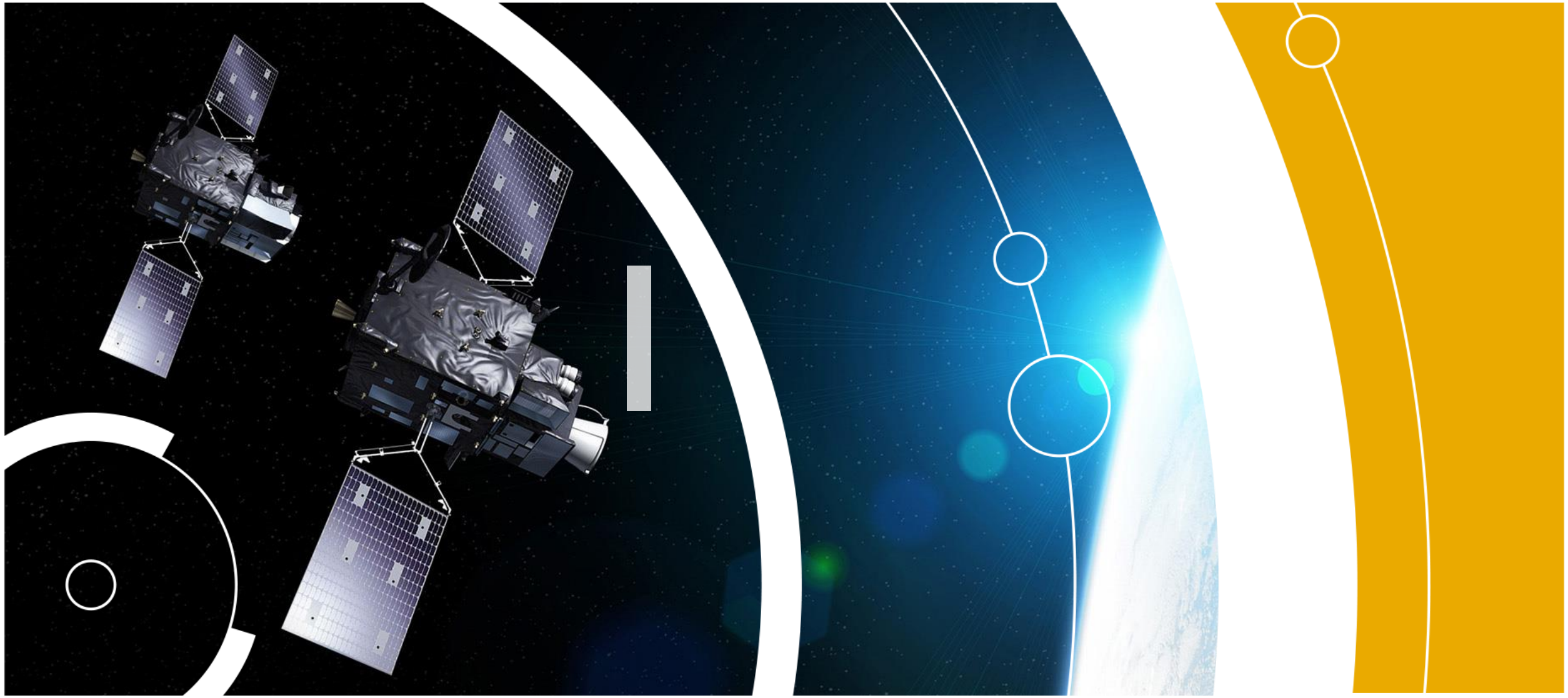
Center of Excellence – Muscat

Agenda

Part 1

- **EUMETSAT Missions Planning**
- **Generations of Meteosat Satellites**
- **MTG : Satellites and Instruments**

EUMETSAT Mission Planning



Launch of next-generation satellites 2022-2027

www.eu

Year 2022 2023 2024 2025 2026 2027

MTG-I1

MTG-I1 launch

MTG-I1 Imager
- Flexible Combined Imager FCT
- Lightening Imager

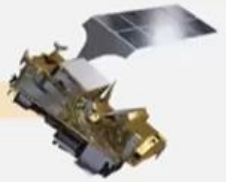
MTG-S1

MTG-S1 launch

Sounder !

Metop-SGA1

Metop-SGA1 launch



MTG-I2

MTG-I2 Imager
- Flexible Combined Imager FCT
- Lightening Imager

+ Rapid Scanning!

MTG-I2 launch

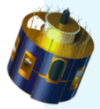
Metop-SGB1

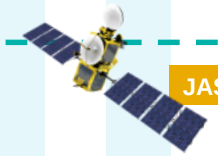
Metop-SGB1 launch

System Integration, Verification and Validation | Launch Campaign | Commis

Mission planning

www.eumetsat.int





MANDATORY PROGRAMMES

METEOSAT SECOND GENERATION
METEOSAT-8
METEOSAT-9
METEOSAT-10
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
EUMETSAT POLAR SYSTEM (EPS)
METOP-A
METOP-B
METOP-C
EUMETSAT POLAR SYSTEM SECOND GENERATION (EPS-SG)
METOP-SG A: SOUNDING AND IMAGERY
METOP-SG B: MICROWAVE IMAGERY

OPTIONAL AND THIRD PARTY PROGRAMMES

JASON (HIGH PRECISION OCEAN ALTIMETRY)
JASON-3
COPERNICUS
SENTINEL-6 MICHAEL FREILICH
SENTINEL-6B
SENTINEL-3 A/B/C/D
SENTINEL-4 ON MTG-S
SENTINEL-5 ON METOP-SG A

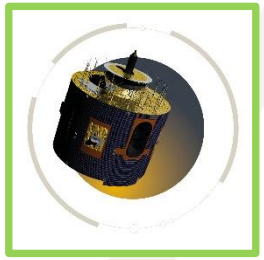
YEAR... 03 04 05 06 07 08 09 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40

Meteosat Generations

3 Channels

Meteosat First Generation (MFG)

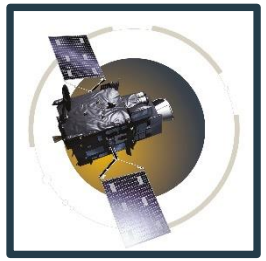
- **Meteosat-1**
  Launched on 23 November 1977, retired 25 November 1979
- **Meteosat-2**
  Launched on 19 June 1981, retired 11 August 1988
- **Meteosat-3**
  Launched on 15 June 1988, retired 31 May 1995
- **Meteosat-4**
  Launched on 6 March 1989, retired 8 November 1995
- **Meteosat-5**
  Launched on 2 March 1991, retired 16 April 2007
- **Meteosat-6**
  Launched on 19 November 1993, retired 15 April 2011
- **Meteosat-7**
  Launched on 2 September 1997, retired 31 March 2017



12 Channels

Meteosat Second Generation (MSG)

- **Meteosat-8**
  Launched on 28 August 2002, retired 1 July 2022
- **Meteosat-9**
  Launched on 22 December 2005 - provides imagery over the Indian Ocean. Operating until 2027.
- **Meteosat-10**
  Launched on 5 July 2012 - prime operational satellite at 0 degrees providing full disc imagery every 15 minutes
- **Meteosat-11**
  Launched on 15 July 2015 - provides imagery every 5 minutes over Europe and North Africa



FCI
16 Channels

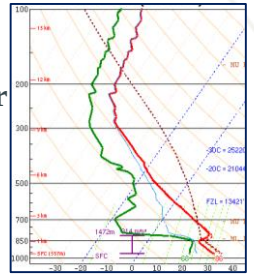
LI (lightening Imager)

Imager

- **MTG-I1**
  (to be renamed Meteosat-12 after commissioning) launched on 13 December 2022
- **MTG-I2**
  (to be renamed Meteosat-14 after commissioning) planned April – September 2026
- **MTG-I3**
  (to be renamed Meteosat-15 after commissioning) planned around 2033
- **MTG-I4**
  (to be renamed Meteosat-17 after commissioning) planned around 10 years after MTG-I3

Sounder

www.eumetsat.int



- **MTG-S1**
  (to be renamed Meteosat-13 after commissioning), planned October 2024-March 2025
- **MTG-S2**
  (to be renamed Meteosat-16 after commissioning), planned around 10 years after MTG-S1

Meteosat Third Generation (MTG)

https://www.eumetsat.int/our-satellites/meteosat-series

MTG Mission overview

IMAGERY

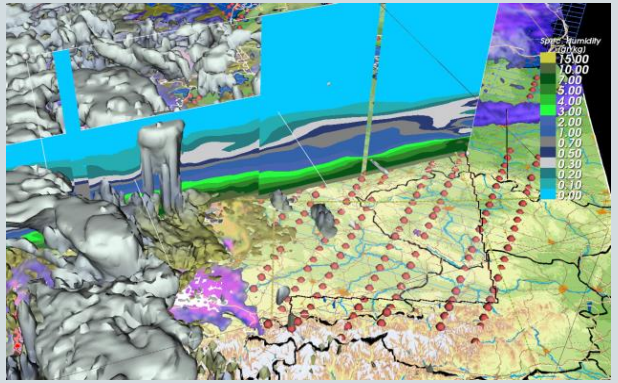
18 December 2014
(Japan snowstorm)

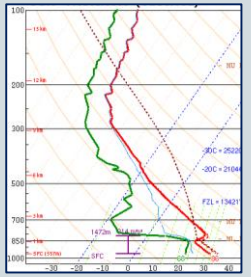
LIGHTNING

https://www.esa.int/Applications/Observing_the_Earth/Meteorological_missions/meteosat_third_generation/European_satellite_strikes_lightning?fbclid=IwAR1rMrKiBhmOD7y06OFMdaODC10P4Zu6pvjvEzMI-HFovunAA2L6Ctob8LY

SOUNDINGS

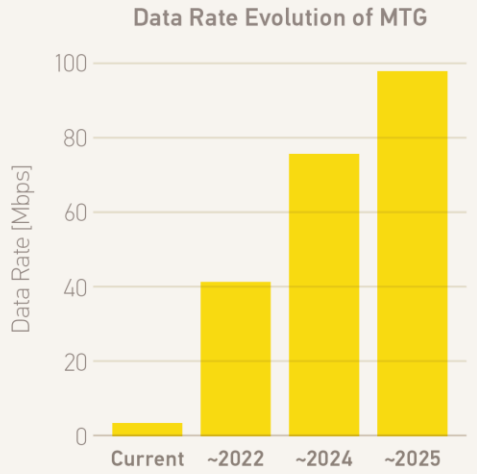
20 June 2013
(IASI vs Harmonie)

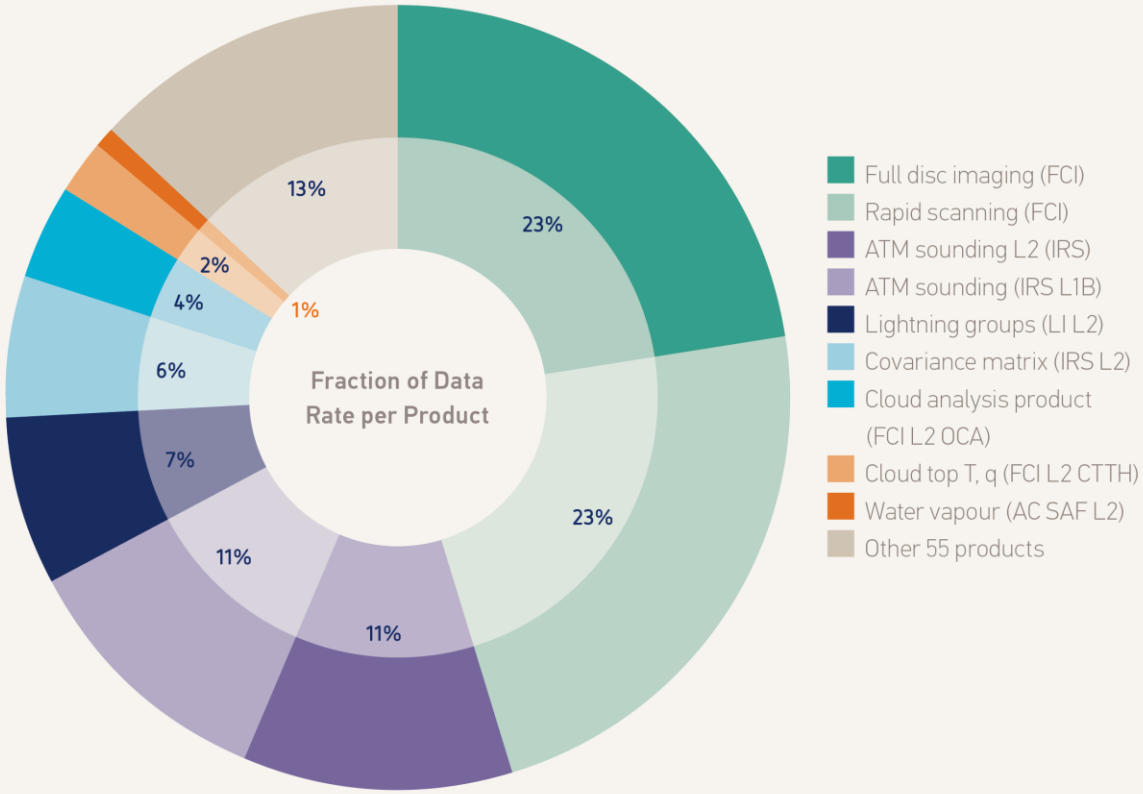




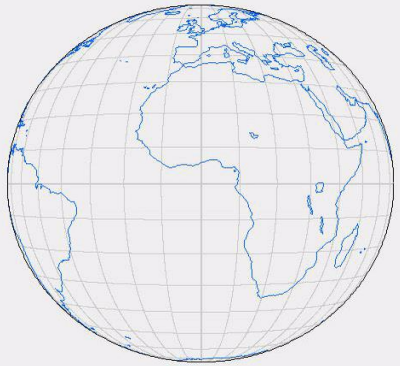
Mission planning – data volumes

Evolution of MTG data rates and fraction of data rate used per MTG product class





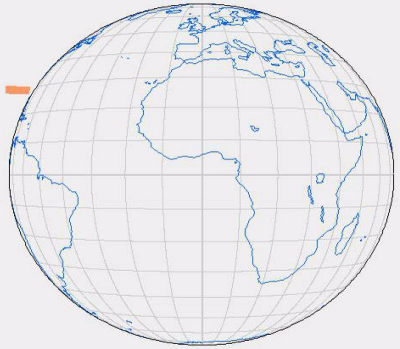
FCI



Full Disc Scanning Services FDSS

Every 10 min

16 bands

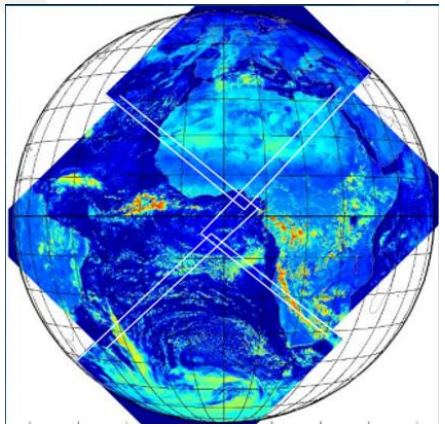


Rapid Scanning Services RSS

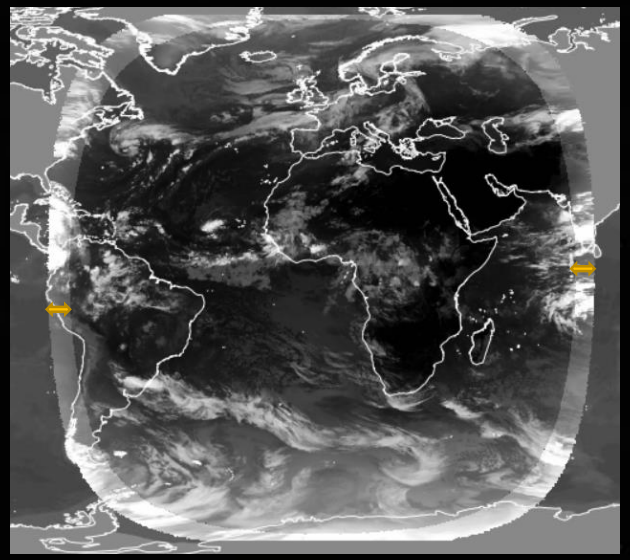
Every 2.5 min

16 bands

LI



Meteosat 12 Meteosat 10 Meteosat 11 Meteosat 9 IODC



Extra Coverage from Metaset 12

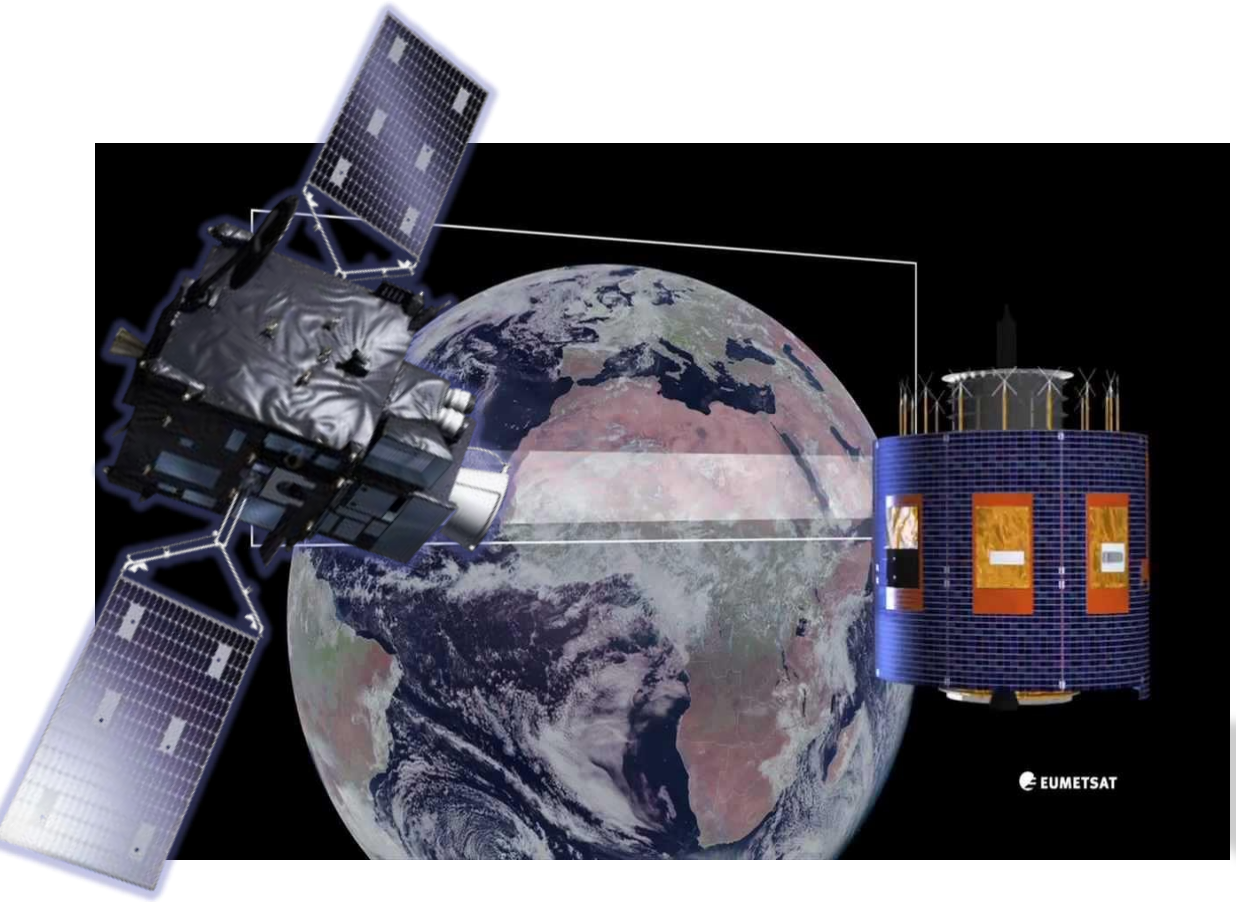
SEVITRI
Spinning Enhanced Visible Infra-Red Imager

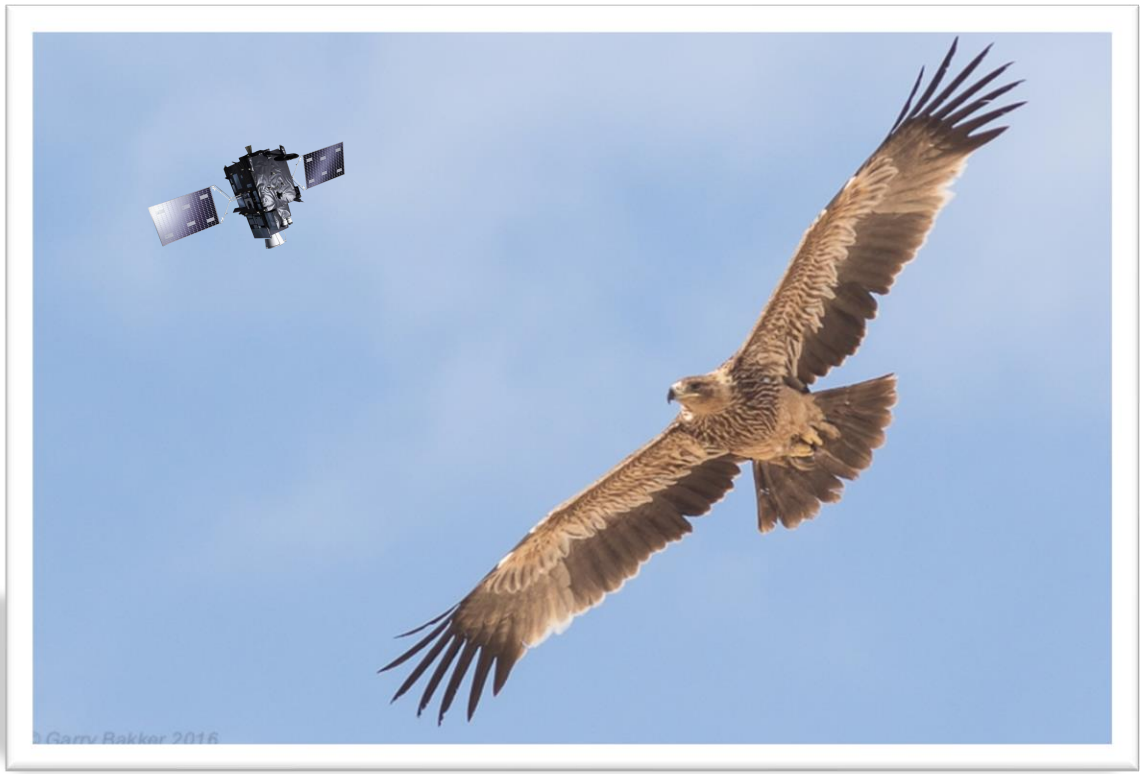
FCI
Flexible Combined Imager

LI
Lightening Imager

https://space.oscar.wmo.int/satellites/view/meteosat_11

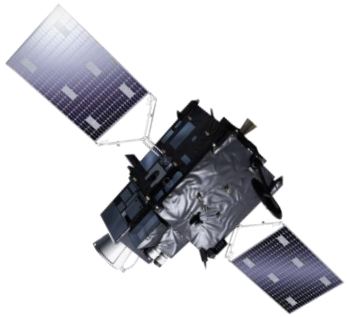
What's new?





MTG vs MSG (FCI vs SEVIRI)

- What's new? – RESOLUTION:

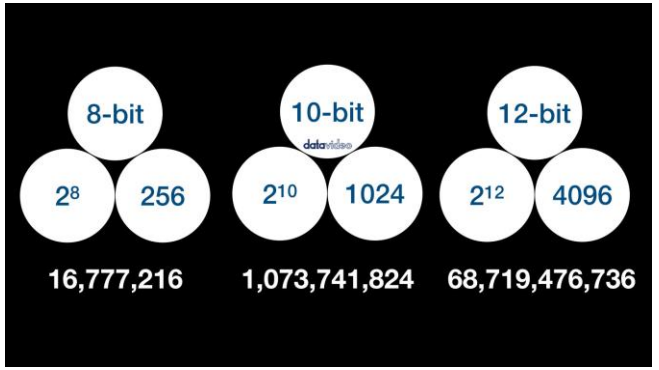


Spatial

Temporal

Spectral

Radiometric



MTG vs MSG (FCI vs SEVIRI)

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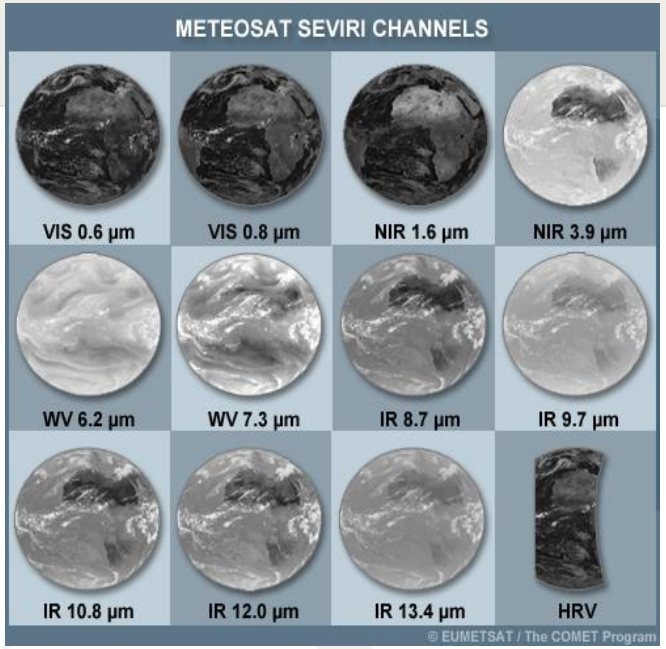
Still Very Useful

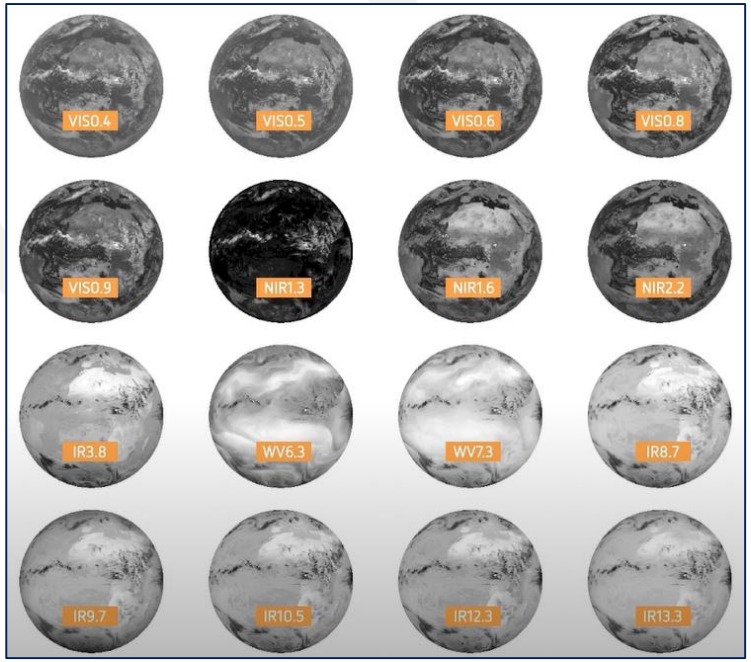
Channel	Centre wavelength (µm)	Range (µm)	Sampling distance at subsatellite point (km)
VIS0.6	0.635	0.56 – 0.71	3
VIS0.8	0.81	0.74 – 0.88	3
NIR1.6	1.60	1.50 – 1.78	3
IR3.9	3.92	3.48 – 4.36	3
WV6.2	6.25	5.35 – 7.15	3
WV7.3	7.35	6.85 – 7.85	3
IR8.7	8.70	8.30 – 9.10	3
IR9.7	9.66	9.38 – 9.94	3
IR10.8	10.80	9.80 – 11.80	3
IR12.0	12.00	11.00 – 13.00	3
IR13.4	13.40	12.40 – 14.40	3
HRV	(broadband)	0.5 – 0.9	1

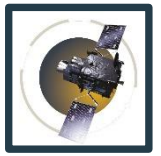


MSG

Evolution and more to come !

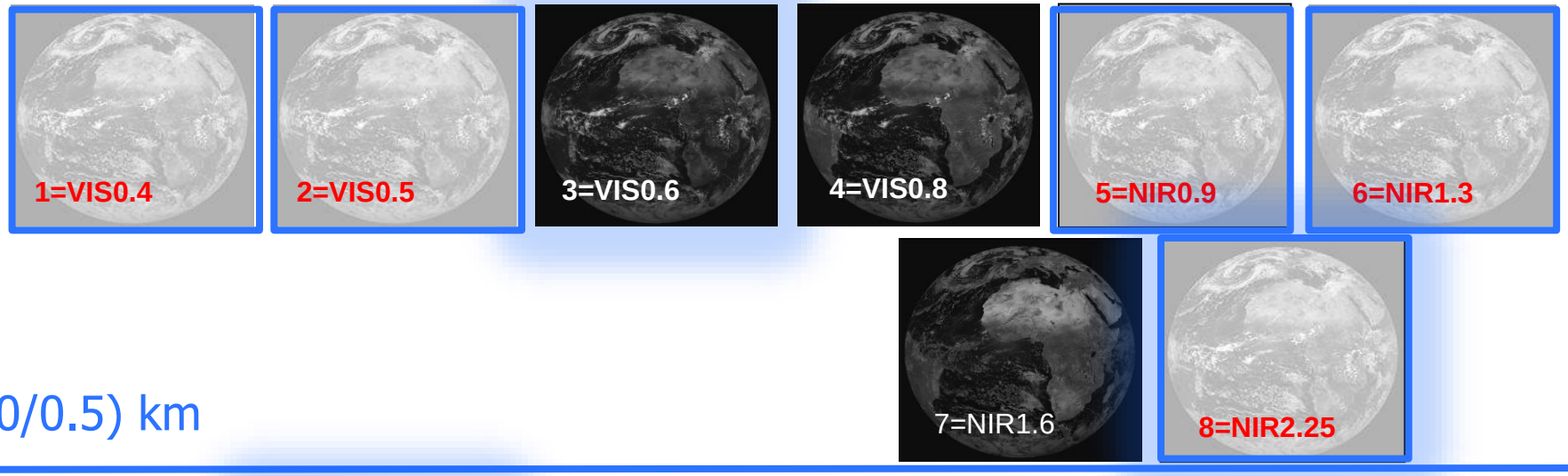
Spectral Channel	Central Wavelength, λ_0 (µm)	Spectral Width, $\Delta\lambda_0$ (µm)	On-ground spatial sampling distance (km)
VIS 0.4	0.444	0.060	1.0
VIS 0.5	0.510	0.040	1.0
VIS 0.6	0.640	0.050	1.0 / 0.5
VIS 0.8	0.865	0.050	1.0
VIS 0.9	0.914	0.020	1.0
NIR 1.3	1.380	0.030	1.0
NIR 1.6	1.610	0.050	1.0
NIR 2.2	2.250	0.050	1.0 / 0.5
IR1 3.8	3.800	0.400	2.0 / 1.0
IR1 6.3	6.300	1.000	2.0
IR1 7.3	7.350	0.500	2.0
IR2 8.7	8.700	0.400	2.0
IR2 9.7	9.660	0.300	2.0
IR3 10.5	10.500	0.700	2.0 / 1.0
IR3 12.3	12.300	0.500	2.0
IR3 13.3	13.300	0.600	2.0





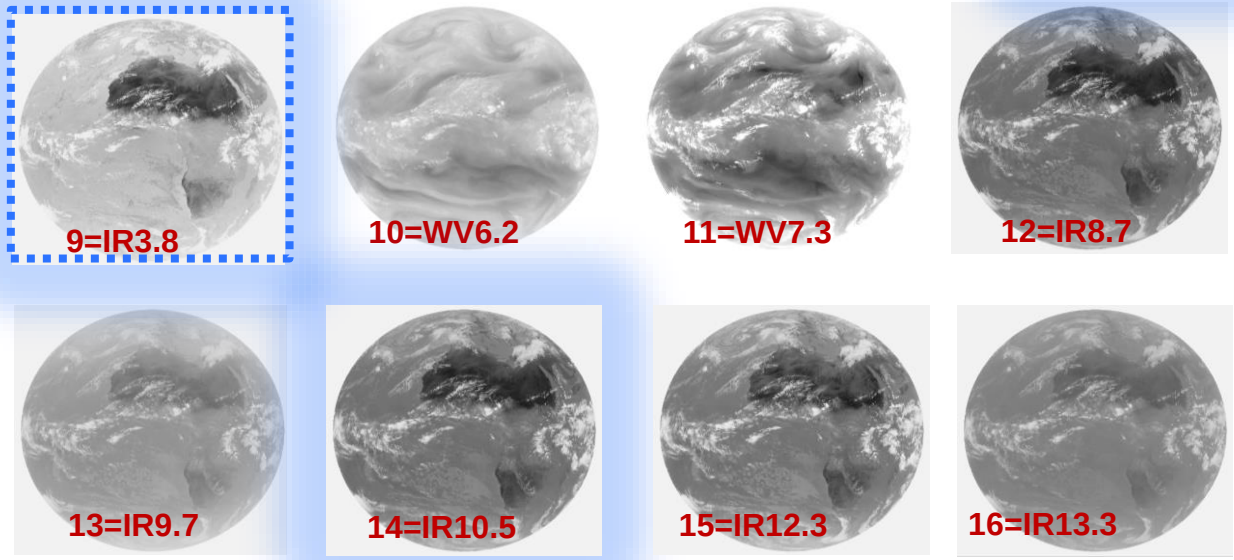
MTG

Spectral utility

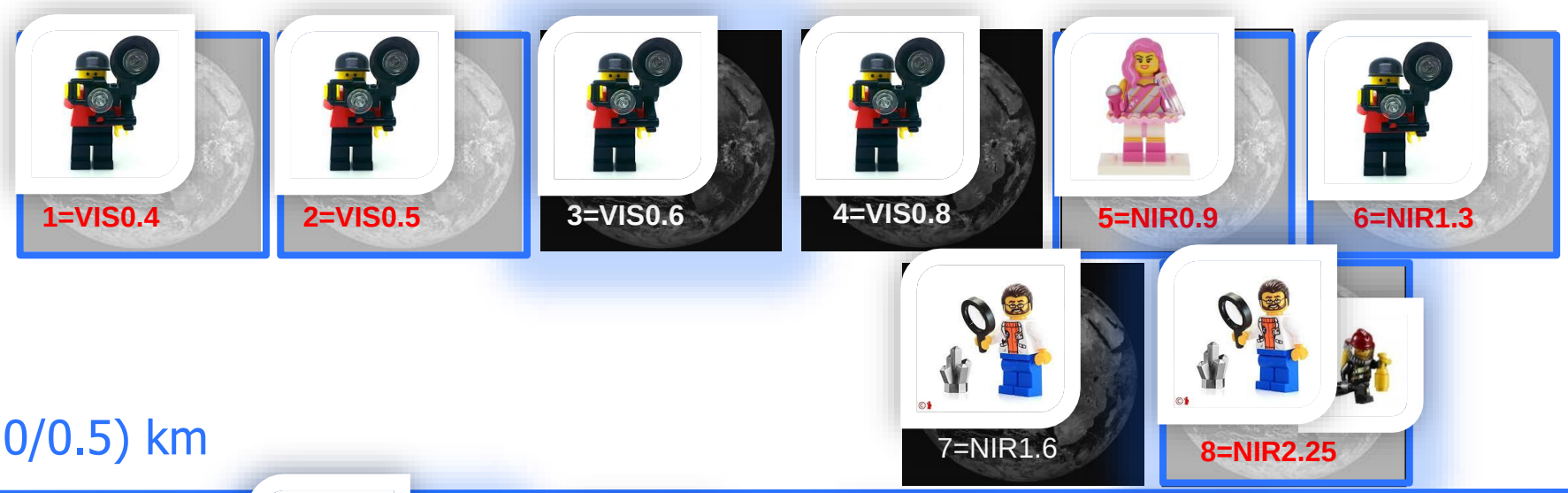


Solar
3.0 (1.0/0.5) km

Thermal
3.0 (2.0/1.0) km

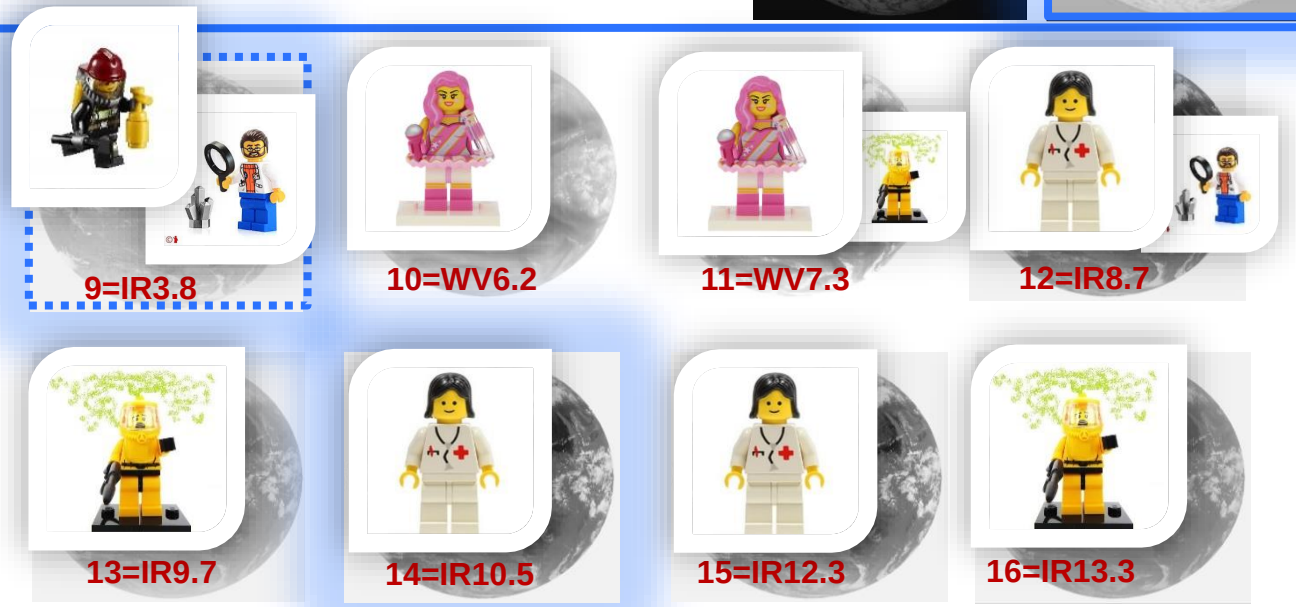


Spectral utility



Solar
3.0 (1.0/0.5) km

Thermal
3.0 (2.0/1.0) km



MTG vs MSG (FCI vs SEVIRI)

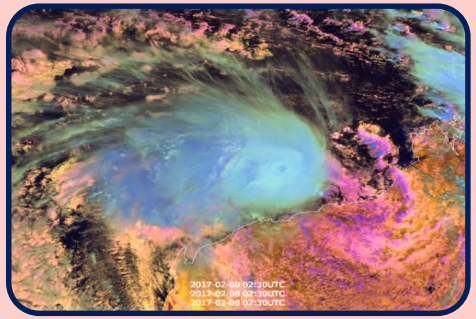
VIS0.4	VIS0.5	NIR0.9	NIR1.3	NIR2.25	IR3.8
> AEROSOL > SURFACE	> AEROSOL > VEGETATION	> LOW LEVEL WV	> CIRRUS	> MICROPHY. > FIRE TEMP.	> FIRE TEMP. > MICROPHY.

True Colour RGB

R VIS0.6
G VIS0.5
B VIS0.4

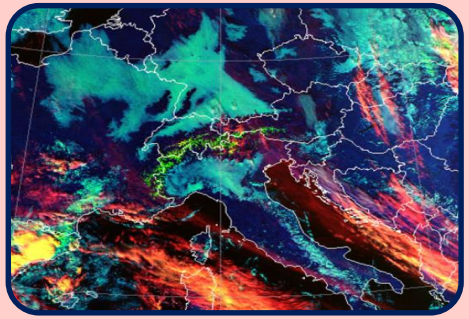
Cloud Phase RGB

R NIR1.6
G NIR2.3
B VIS0.5/VIS0.6



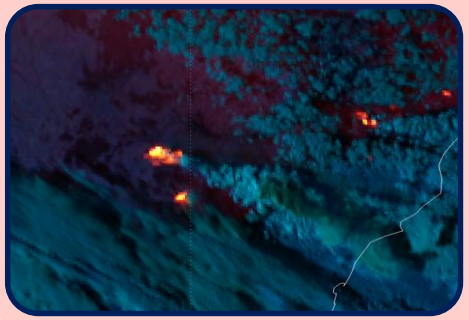
Cloud Type RGB

R NIR1.3
G VIS0.8
B VIS1.6

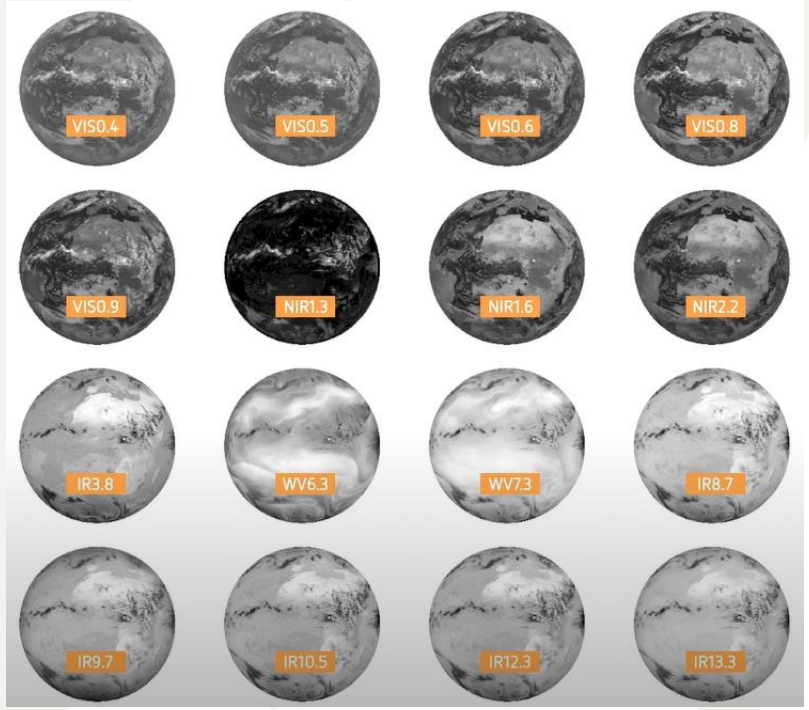


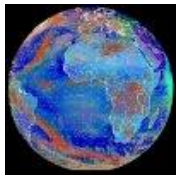
Fire Temp. RGB

R IR3.9
G NIR2.3
B NIR1.6

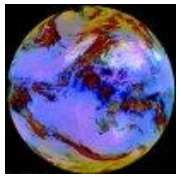


More Bands more Composite Image (RGB)

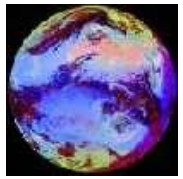




Day Microphysics RGB

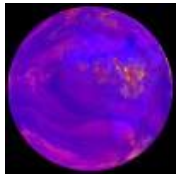


Dust RGB



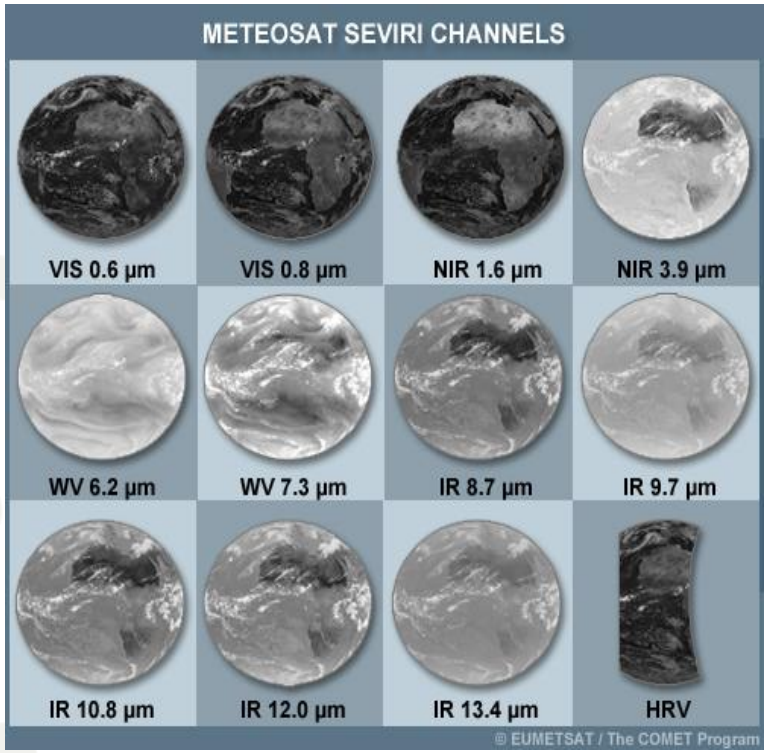
Fog / Low Clouds RGB

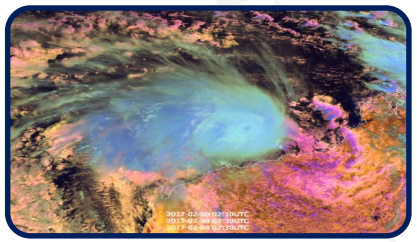
Airmass RGB

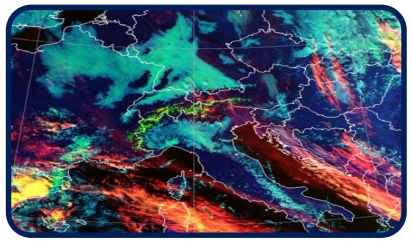


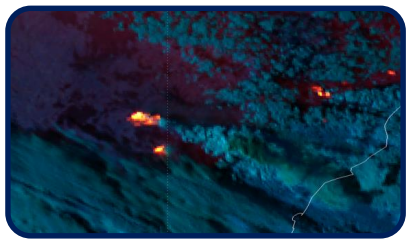
Convection RGB

Natural Color RGB









MTG vs MSG (FCI vs SEVIRI)

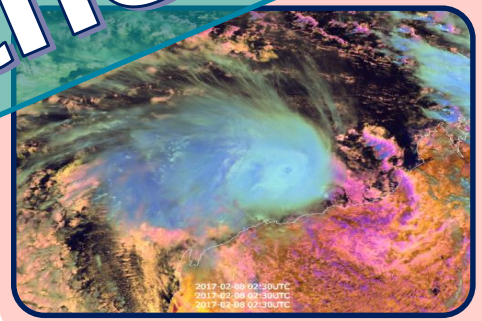
VIS0.4	VIS0.5	NIR0.9	NIR1.3	NIR2.25	IR3.8
> AEROSOL > SURFACE	> AEROSOL > VEGETATION	> LOW LEVEL WV	> CIRRUS	> MICROPHY.	> FIRE TE

True Colour RGB

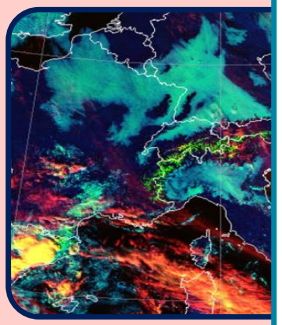
R VIS0.6
G VIS0.5
B VIS0.4

Cloud Phase RGB

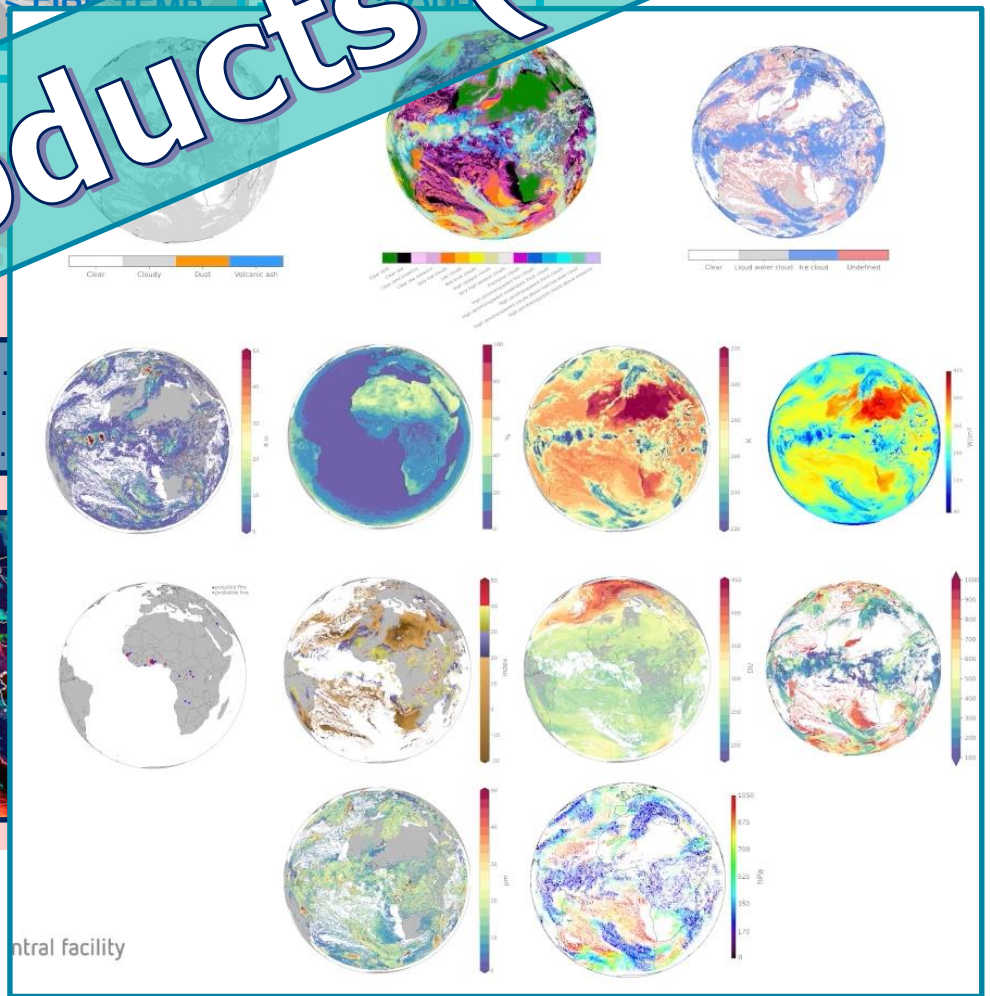
R NI
G NIR
VIS0. 0.6



R NIR1.
G VIS0.
B VIS1.



+ all the L2+ products (+)

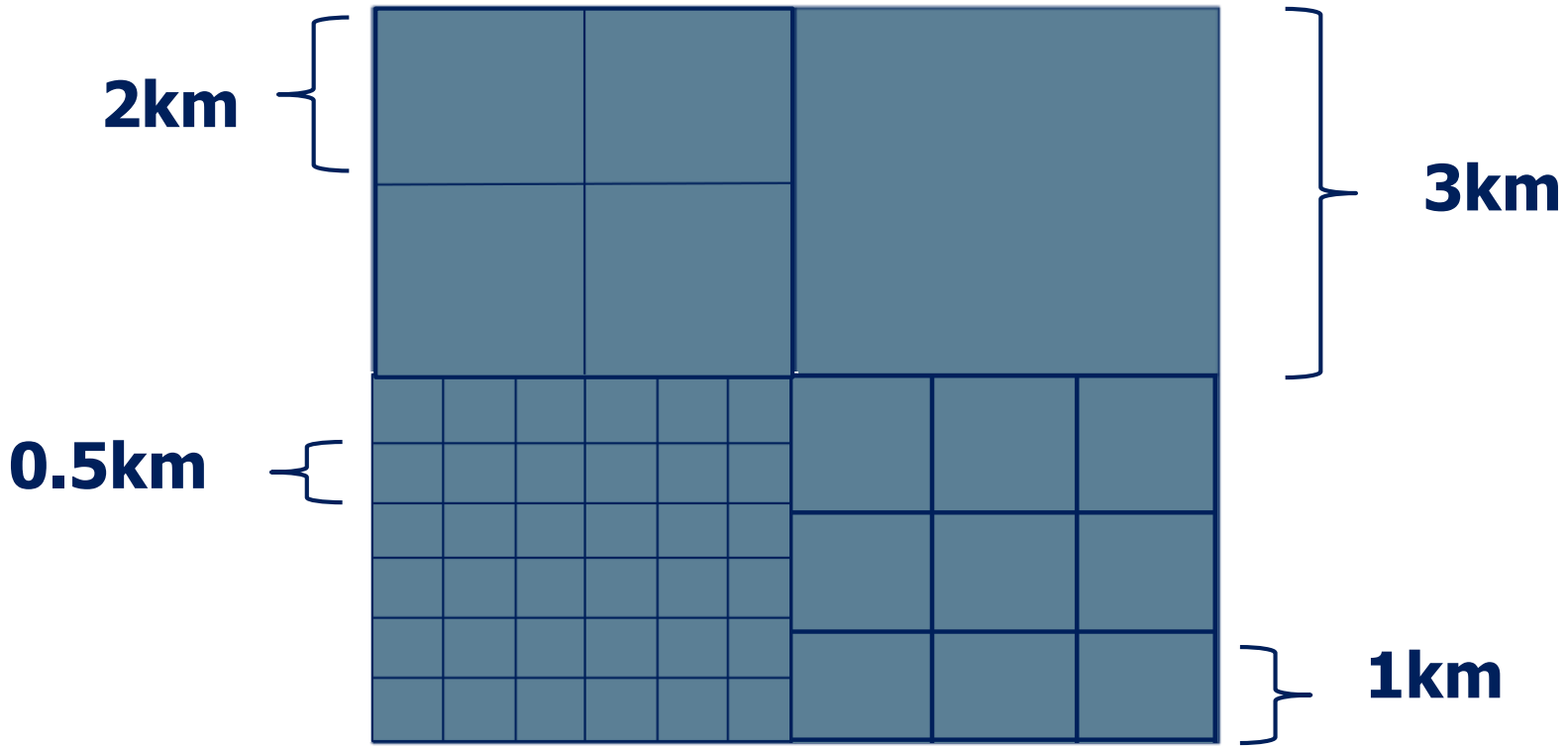


MTG vs MSG (FCI vs SEVIRI)

- **What's new? – High Resolution Mode:**

  0.6 um and 2.3 um in 1.0 km resolution (and 0.5 km in Hi-Re mode)

  3.8 um and 10.5 um in 2.0 km resolution (and 1 km in Hi-Re mode)



End of Part 1

شكرا جزيلاً