THE NEW METEOSAT SATELLITES ARE SOON HERE!

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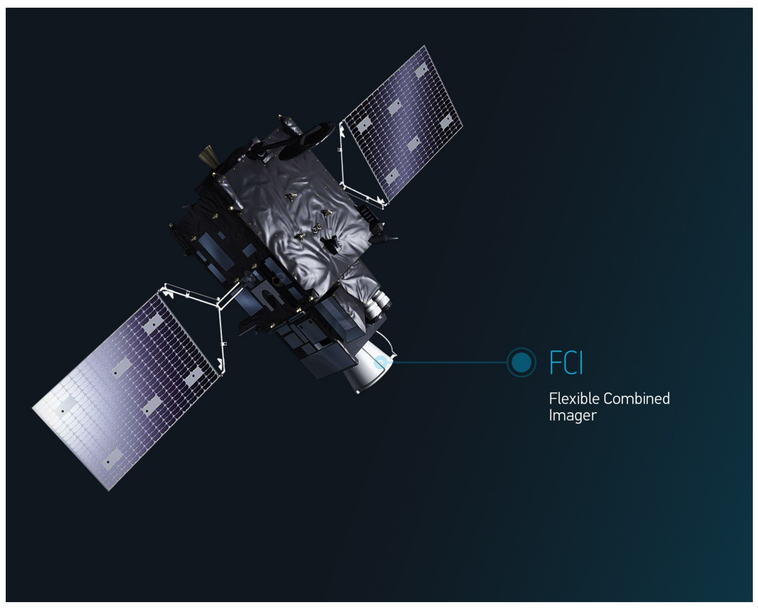


METEOSAT THIRD GENERATION - MTG

The next generation European geostationary satellites are soon here! The new series will have two platforms and 6 satellites in total covering a time span into the 2040ies:

- An Imager platform, MTG-I, with a SEVIRI follow-on instrument, called FCI (Flexible Combined Imager) and a Lightning Imager (LI);
- A Sounder platform, MTG-S, with an Infrared Sounder, IRS, and an Ultra-violet, Visible and Near-infrared sounder (UVN = Sentinel-4).

The first, MTG-I1, to become Meteosat-12, is set to launch on November 30th, 2022, with a risk of delay to summer 2023. First operational data will be available ~6 months after launch.

MTG-S1, becoming Meteosat-13, with the IRS and UVN instruments on-board will be launched 2024

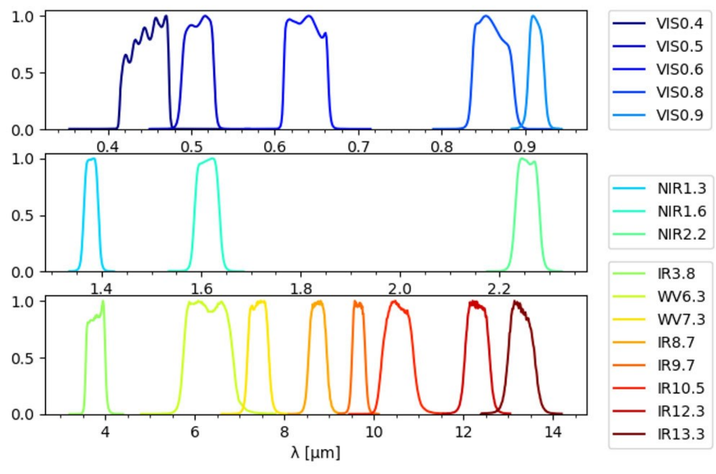
FCI - HIGHER SPATIAL, TEMPORAL AND SPECTRAL RESOLUTION

The FCI instrument will have more spectral bands (16 instead of 12), and higher spatial and temporal resolution compared to SEVIRI.

FCI will scan the full earth disk every 10 minutes (compared to every 15 for SEVIRI), and will be able to operate in a rapid scan mode, scanning a subsection covering Europe every 2.5 minutes. The First satellite, Meteosat-12, will do 10-minute scanning only. 2.5 minute scanning is planned with the launch of the next MTG-I in 2025.

All visible bands will have 1.0 km sampling at the sub-satellite point (SSP, at ~0E,0N) and all the Infrared bands have a 2.0 km sampling. In addition data from four of the bands will be available in even higher resolution: 0.6µm and 2.2µm @ 500m and 3.8µm and 10.5µm @ 1km:

Flexible Combined Imager (FCI)			SEVIRI		
Channel	Centre Wavelength	Spatial Sampling Distance (SSD)	Channel	Central Wavelength	SSD
			HRV	0.5-0.9µm	1.0km
VIS 0.4	0.444µm	1.0km			
VIS 0.5	0.510µm	1.0km			
VIS 0.6	0.640µm	1.0km; 0.5km	VIS 0.6	0.635µm	3.0km
VIS 0.8	0.865µm	1.0km	VIS 0.8	0.81µm	3.0km
VIS 0.9	0.914µm	1.0km			
NIR 1.3	1.380µm	1.0km			
NIR 1.6	1.610µm	1.0km	NIR 1.6	1.64µm	3.0km
NIR 2.2	2.250µm	1.0km; 0.5km			
IR 3.8 (TIR)	3.800µm	2.0km; 1.0km	IR 3.9	3.92µm	3.0km
WV 6.3	6.300µm	2.0km	WV 6.3	6.25µm	3.0km
WV 7.3	7.350µm	2.0km	WV 7.3	7.35µm	3.0km
IR 8.7 (TIR)	8.700µm	2.0km	IR 8.7	8.7µm	3.0km
IR 9.7 (O3)	9.660µm	2.0km	IR 9.7	9.66µm	3.0km
IR 10.5 (TIR)	10.500µm	2.0km; 1.0km	IR 10.8	10.8µm	3.0km
IR 12.3 (TIR)	12.300µm	2.0km	IR 12.0	12.0µm	3.0km
IR 13.3 (CO2)	13.300µm	2.0km	IR 13.4	13.4µm	3.0km



NEW CAPABILITIES

Besides higher temporal resolution FCI will also provide more detail compared to SEVIRI via the higher spatial resolution, and especially at daytime it will provide for new and better applications:

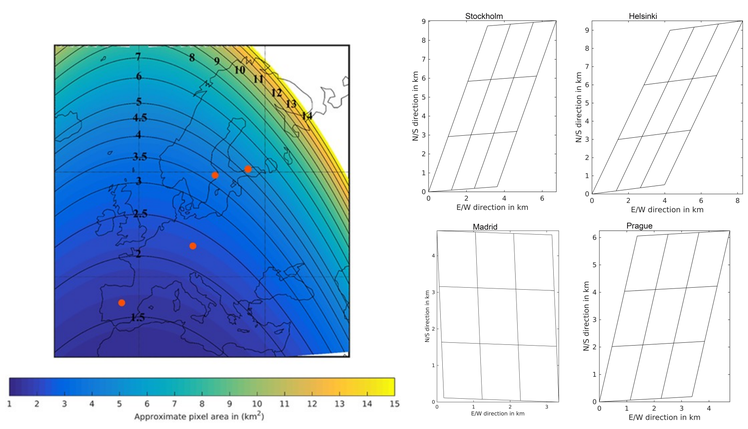
- **True color**: New bands at 0.444 µm and 0.51 µm will support true color imagery and to some extent ocean color and e.g. derivation of Chlor-A.
- **Aerosol retrievals**: The same shortwave bands and the the NIR band at 1.375 µm will permit surpassing current aerosol retrievals especially over land – also an important contribution to air quality monitoring.
- **Thin cirrus**: The 1.375 µm band will improve detection of very thin cirrus clouds (especially over snow covered areas) not seen by the current system.
- **Cloud microphysics**: The 2.26 µm channel will provide the capability for an improved retrieval of cloud microphysics.
- **Fires**: The higher spatial resolution (1 km and 2 km) of the 3.8 µm band will improve fire detection and, via its extended dynamical range (from 350 K to 450 K), the quality of products.
- **Convection**: Improved detection of convection through the shorter repeat cycle and better spatial resolution.

TWO NEW RGBS: CLOUD PHASE AND CLOUD TYPE

Two “new” RGBs to enhance the information on cloud microphysics and phuase as well as general classification of clouds will be possible with FCI. These RGBs can be derived from VIIRS (in polar orbit) today:

Cloud Phase: Red=NIR1.6; Green=NIR2.2; Blue=VIS0.6. The aim is the separation of water from ice and information on cloud top particle size. Both the 1.6 and 2.2 bands are sensitive to cloud particle phase and size, but 1.6 more to phase and 2.2 more to size. Heavy convection with larger ice particles will appear dark blue, thick ice clouds with smaller particles will appear lighter blue. Water clouds with smaller droplets appear light pink/white and darker pink when the particles are larger.

Cloud Type: Red=NIR1.3; Green=VIS0.6; Blue=NIR1.6. The aim is Cloud type differentiation (low and mid-level clouds, thin and thick high clouds, super-cooled water clouds) and thin cirrus detection.



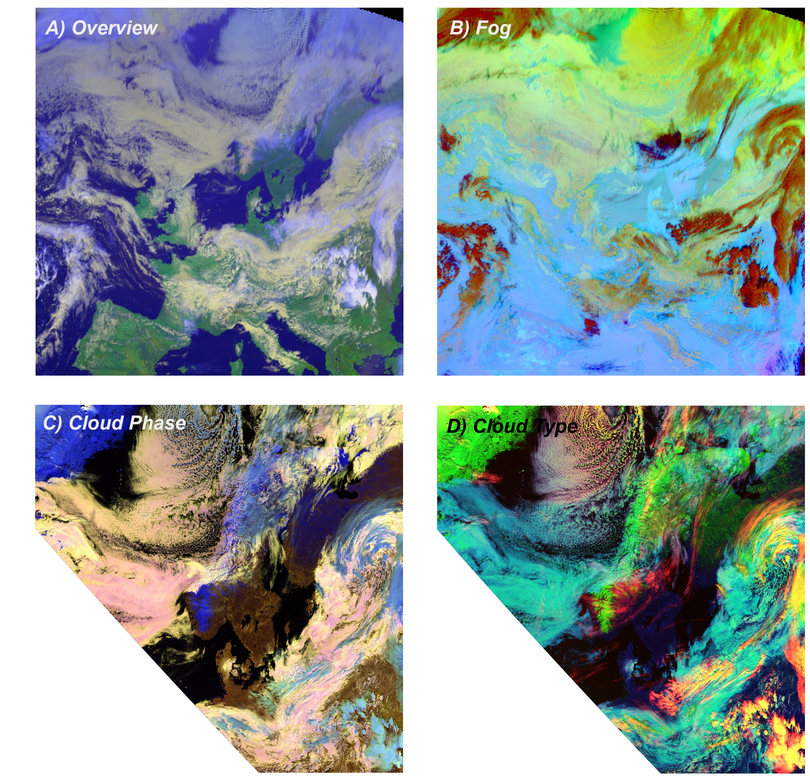
Approximate pixel area in kilometre squared of FCI imagery (left) and pixel projections (right) for four selected locations (using a transverse mercator projection) with 1km spatial resolution at nadir, over Europe

PYTROLL

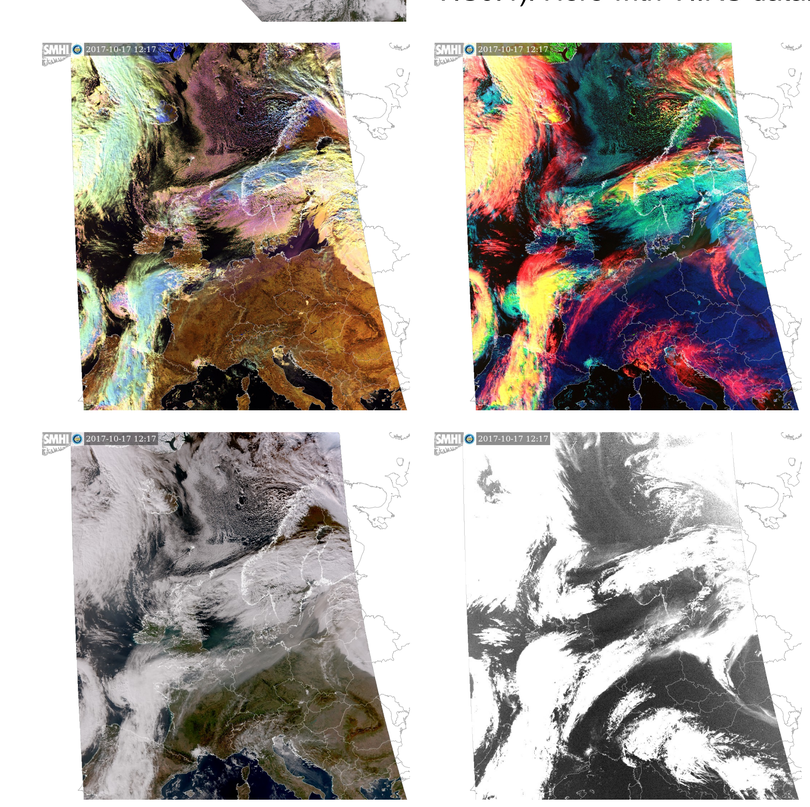
Pytroll is ready for FCI and Satpy can read the latest version of the test data provided by EUMETSAT.

DISCLAIMER

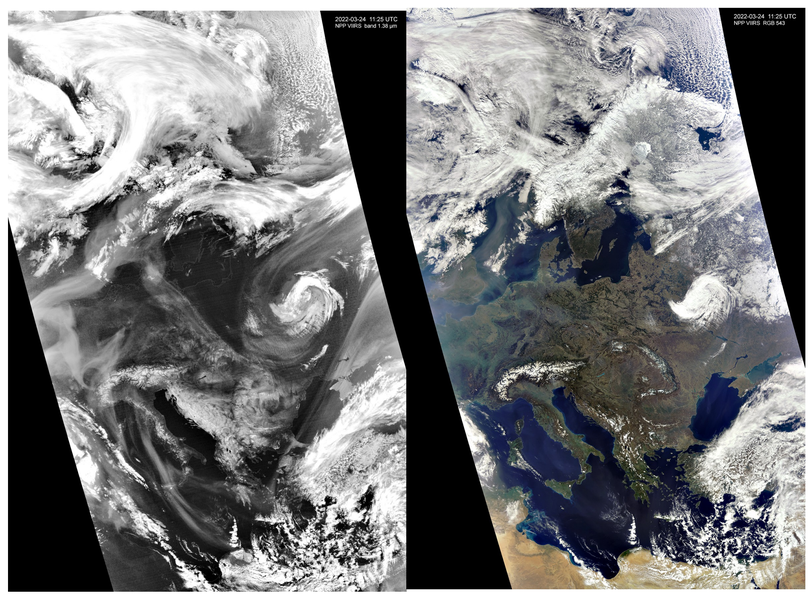
The NIR1.3 band on MTG-I1 is suffering from a number of issues that will make this band more noisy and less useful than what was expected. However, many of the issues will be mitigated for the coming satellites, so already with MTG-I2 this band is expected to perform much better and close to specification.



SEVIRI and VIIRS imagery from April 25th, 2022, 10:30 UTC. Two RGBs from todays Meteosat (top panels A and B). Panels C, D and E show three new daytime RGBs all possible on FCI: *Cloud Type* (NIR1.3, VIS0.6, NIR1.6), *Cloud Phase* (NIR1.6; NIR2.2; VIS 0.6) and *True Color* (VIS0.6; VIS0.5; VIS0.4). Here with VIIRS data.



Ophelia Storm October 17, 12:17 UTC, 2017: *Cloud Phase, Cloud Type* and *True Color* RGBs plus B/W 1.38 µm from VIIRS



Dust and other aerosols over Europe as seen by the VIIRS 1.38 µm band on 24th of March, 2022, 11:25 UTC. *Courtesy Martin Setvak.*

References
RGB Guides:
http://www.eumetrain.org/rgb_quick_guides/index.html

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