

EUMETSAT: Update on MTG-LI and Cal/Val Status

LIGHTNING IMAGER (LI)

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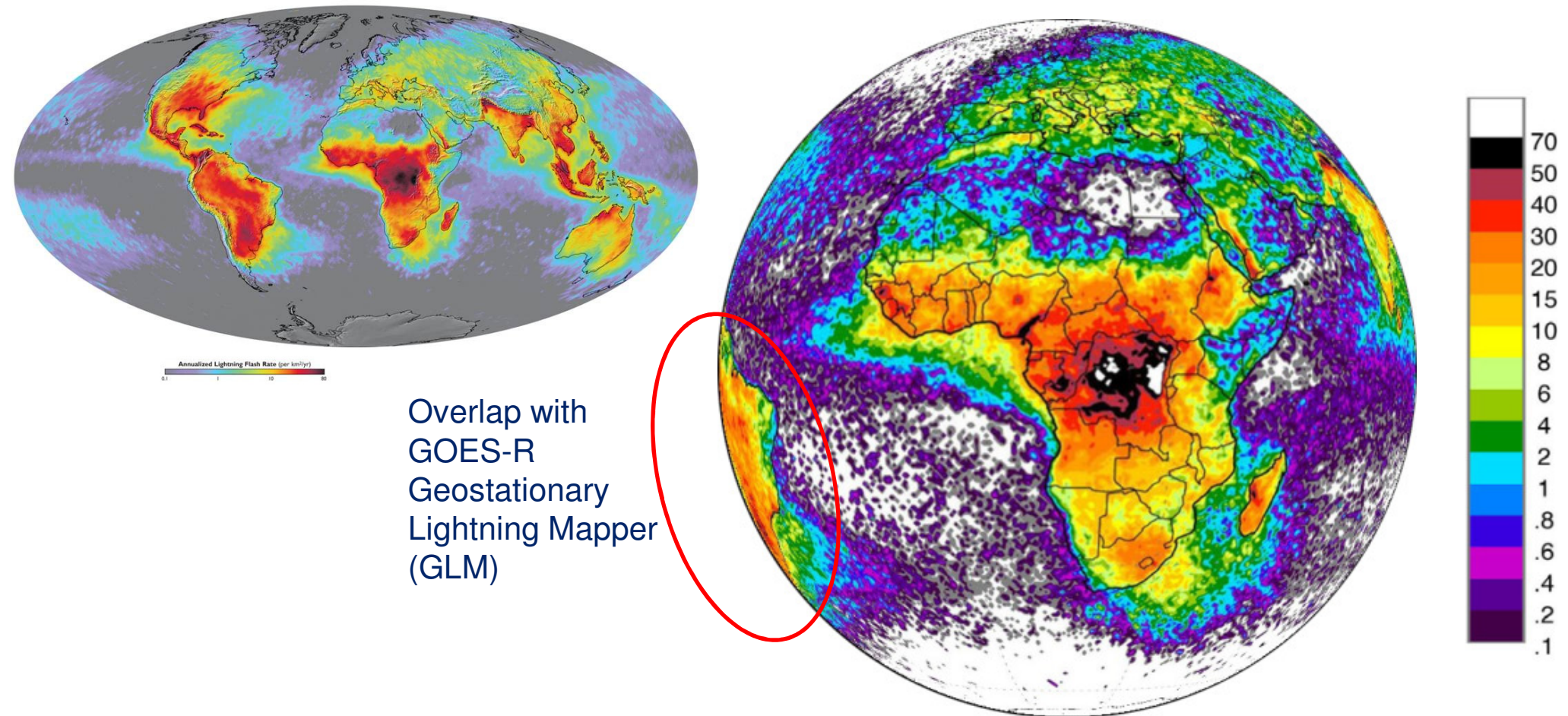
METEOSAT THIRD GENERATION (MTG)-I1 (2019), I2, I3 AND I4



The MTG-LI mission

- Earth coverage about equal to visible disc from geostationary orbit (instantaneous view) at 0 degrees longitude.
- Continuous measurements of triggered events: lightning triggered events and false events (noise, microvibrations, cosmic particles, etc.).
- Continuous measurements of background images, typically one every minute.
- Continuous measurements during day and night.
- Lightning detection at 777.6 nm (vacuum wavelength): strong lightning atomic oxygen emission line.
- Biggest challenge for this mission / instrument:
Maintain a proper balance between lightning detection efficiency and false alarm rate (= measured triggered events that are not related to lightning).

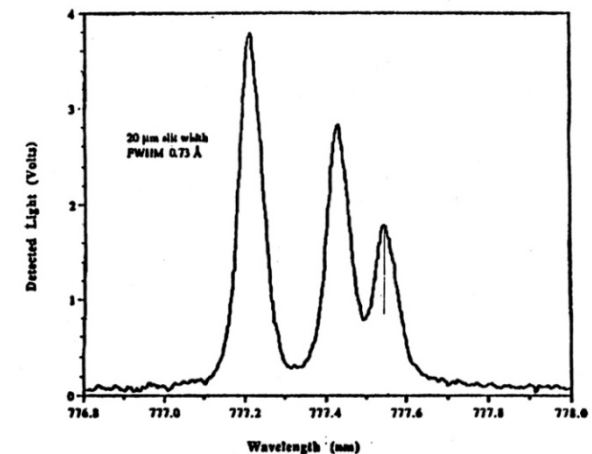
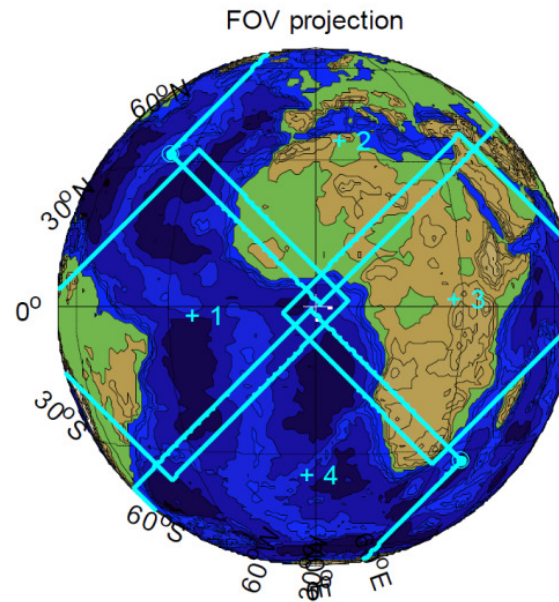
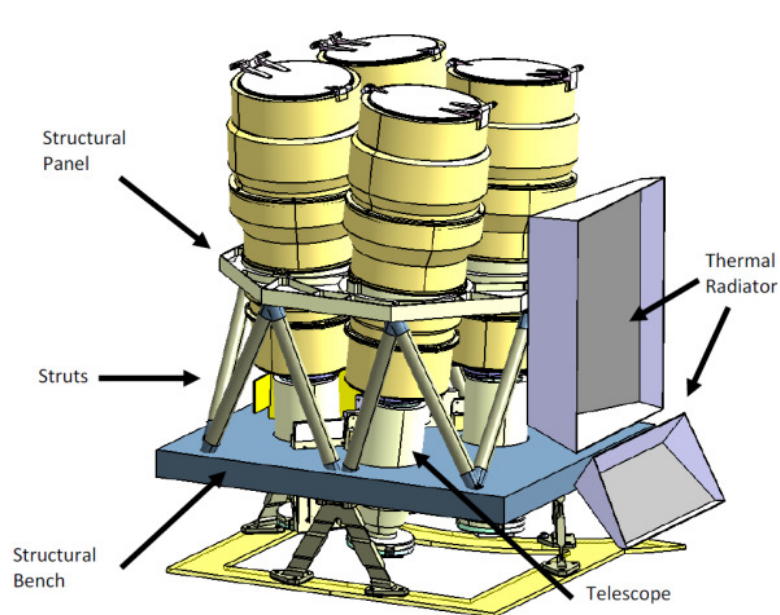
Global lightning, subsatellite longitude 0 degrees



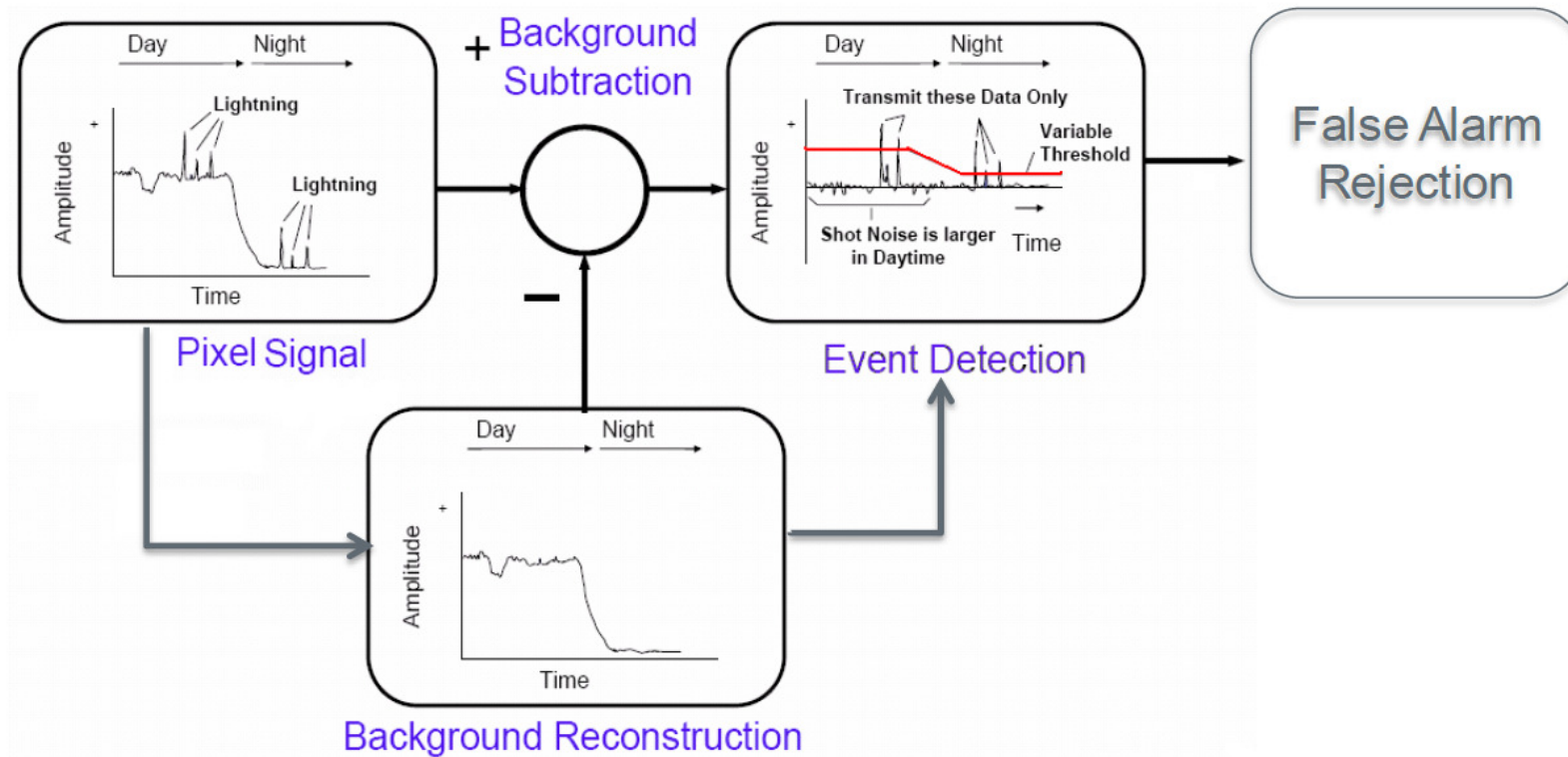
Annual flash rate (in flashes / km² / year) over the Earth (MTG view), as derived from LIS/OTD (low-earth orbit) observations at 0.5° resolution

The LI instrument

- Measurement principle to discriminate between lightning signal and background signal (e.g. bright cloud):
 - Spatial: ground pixels 4.5 km x 4.5 km at nadir (lightning typically >10 km diameter).
 - Spectral : at 777.6 nm (vacuum wavelength) with 1.5-2.0 nm spectral band pass filter.
 - Temporal : 1 ms integration time. Lightning optical pulse (from space) has a typical duration of 0.6 ms.
 - Background subtraction: before thresholding and lightning detection.
- Extensive data processing takes place on board to make the data rate fit within the allowed bandwidth to the ground.
- 4 (identical) optical cameras, each equipped with a CMOS detector having 1170 x 1000 pixels.
- Data rate < 30 Mbits/s; Mass < 110 kg; Power < 320 W.



The LI instrument



Preliminary Cal/Val plans for MTG-LI

- Ground-based networks in Europe envisaged for Cal/Val activities:
 - **ATDnet**
 - **LINET**
 - **LMA (Corsica)**
 - **GLD360 + EUCLID**
- Rigorous intercomparison of the various networks, relative sensitivity characterisation, as well as development paths (network expansions) to be an important task in the coming years (MTG-LI launch in early 2019) when preparing a solid Cal/Val plan.
- Overlap (?) between GLM and LI in 2019 providing a possibility for cross-correlation between the instruments thus mutually supporting both Cal/Val activities.
- ISS-LIS is expected to provide very interesting and useful data as well, especially for northern latitudes which currently have no LIS coverage.
- Campaigns:
 - **Nothing concrete planned yet, but campaigns will be envisaged in the European context as well as in the “hot spot” of Lake Victoria in Africa**

EUMETSAT cooperation with NOAA on GLM

- GLM participation in the MTG LI Mission Advisory group (former LI Science Team) and review of related studies on L0 => L1 => L2 processing by industry (through Doug Mach).
- Exchange of documents:
 - **GLM ATBD, Cal/Val plans (when in public domain)**
 - **MTG LI MAG related study material (filtering analysis, L2 algorithm analysis, LI simulators, etc)**
- Cal/Val workshop planned for spring 2015 in Florence, Italy, involving the LI MAG and leading GLM experts.
- EUMETSAT active participation in GLM Cal/Val sought – this could also involve e.g. contribution to measurement campaigns and data analysis.