MTG LI: Calibration and L1b validation concept

MTG LI: Calibration and L1b validation concept

L1b calibration / validation separated into:

1. Flagging of false events and real events (from real lightning optical pulses).
2. All other aspects: radiometry, geolocation, optical degradation, detector degradation, etc.

This part of the presentation is about the second point only.

At the current stage this is still very much under development.

MTG LI measures complete background images at least once per minute and triggered events.

Radiometric accuracy requirement for background images and triggered events is 10% (1-sigma).

Geolocation requirement for triggered events and background image pixels is 4 km at subsatellite point (3-sigma).

MTG LI: Calibration and L1b validation concept

Limited on-board possibilities on MTG-LI for degradation monitoring and recalibration, no dedicated sources.

Optical degradation, if any, will be monitored and corrected to comply with the radiometric accuracy requirements.

CMOS detectors radiation damage (mostly protons):

1. Exact impact remains to be assessed.
2. Non-permanent effects: transients. Real/false triggered event flagging issue.
3. Permanent effects, detector pixel-dependent:
   - Increasing pixel dark current.
   - Bad and dead pixel map / list. Used for on-board data processing and on-ground data processing.
   - Random Telegraph Signal (RTS) effects: pixel dark current jumps between multiple quasi-stable levels.

Pixel-dependent electronic offset (CMOS detectors) expected to change, need for regular recalibration.

- Used for on-board data processing and on-ground data processing.

MTG LI: Calibration and L1b validation concept

1. Very short exposure time (tens of microseconds): pixel-dependent electronic offset.

2. In-orbit (detector) flat-fielding: not possible over larger parts of the detector, only over small groups of pixels where more or less uniform illumination can be obtained.

3. Vary exposure time from short to intermediate to long (seconds): pixel-dependent electronic offset and dark current, detector pixel degradation, bad and dead pixel map

4. Background images illuminated scenes: optical degradation.
   Produce ground reflectance histograms per geolocation cell (typically 0.5 degrees x 0.5 degrees), also as function of time of day/season:
   - From low reflectances within histograms: surface albedo and optical degradation and specific ground targets (deserts, etc).
   - From high reflectances within histograms: Deep Convective Clouds (DCCs) / other clouds.
5. Background images dark scenes: detector (pixel) degradation. Also using histograms as above.
6. Moon, if within field of view (only when satellite is repositioned) for radiometric calibration, stray light and spatial response function.
7. Stars (geolocation).