FCI Commissioning Update and COM Anomaly

Ali Mousivand
on behalf of the EUMETSAT /RSP team

GSICS IR group web meeting, Oct 24

Agenda

MTG-I FCI timeline

FCI COM Anomaly

Mitigations for the loss of FCI-COM

MICMICS gain retrieval

Performance and Limitations

FCI True Color 0.5km
Fire Temperature 0.5km
(3.8 and 2.2μm)
22.09.2023 10:00-15:30 UTC

Demonstrating FCI's capabilities
Observing fires in Southern Italy
Preliminary results

Cefalù

Italia Attualità

In evidenza   Criptovalute   Spread BTP-Bund   FTSE-MIB   Petrolio

I NOSTRI VIDEO

Santini: "Collaborazione fruttuosa con Volontari e Cacciatori"

Coaching, Monica Urbani: desidero dare strumenti alle persone

Servizio | Fiamme

Sicilia, incendi a Cefalù: evacuato albergo con 700 turisti

Il Costa Verde si trova vicino a Mazzaforno dove il 22 settembre alcuni turisti ospiti di resort sono stati evacuati via mare
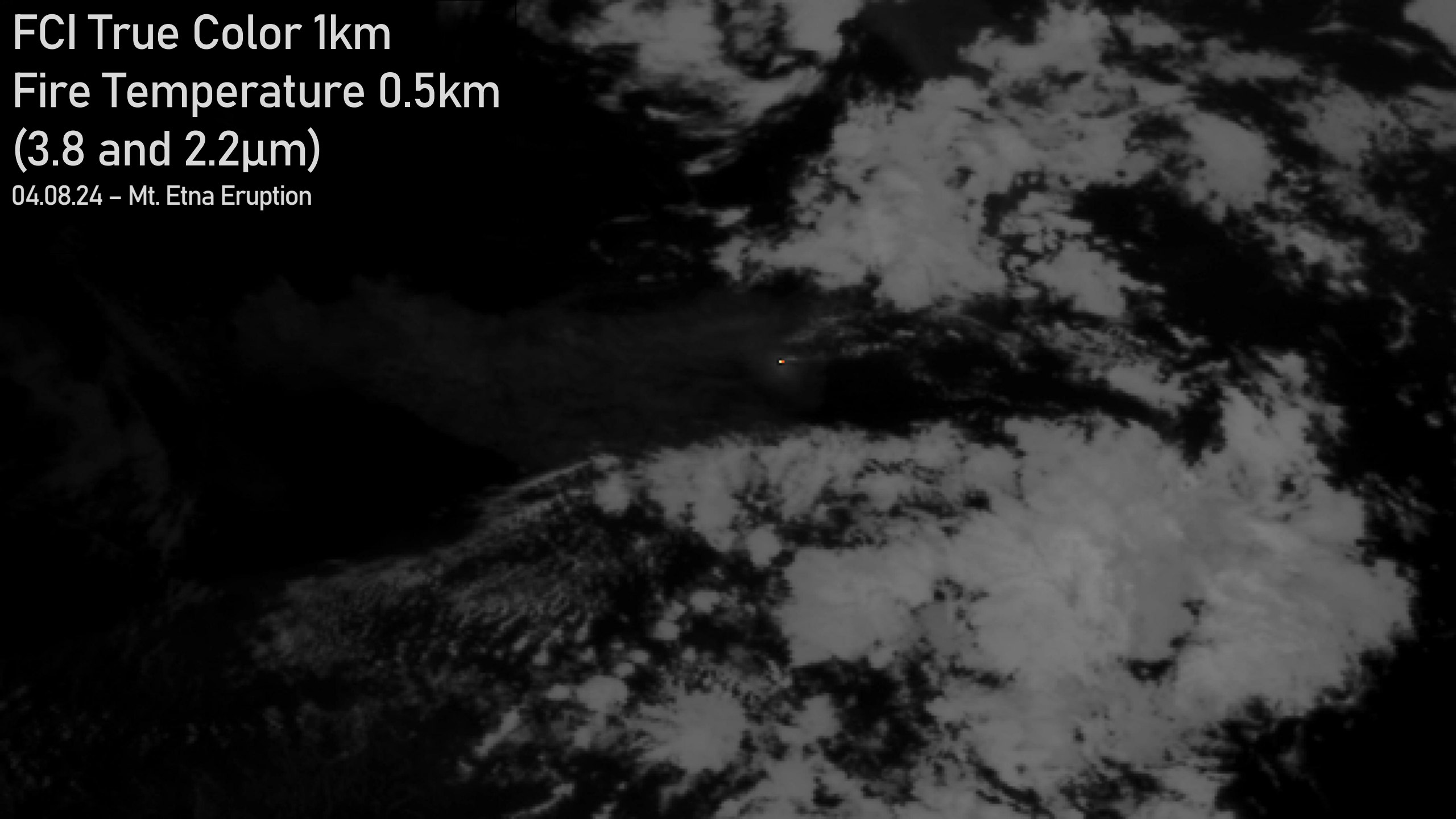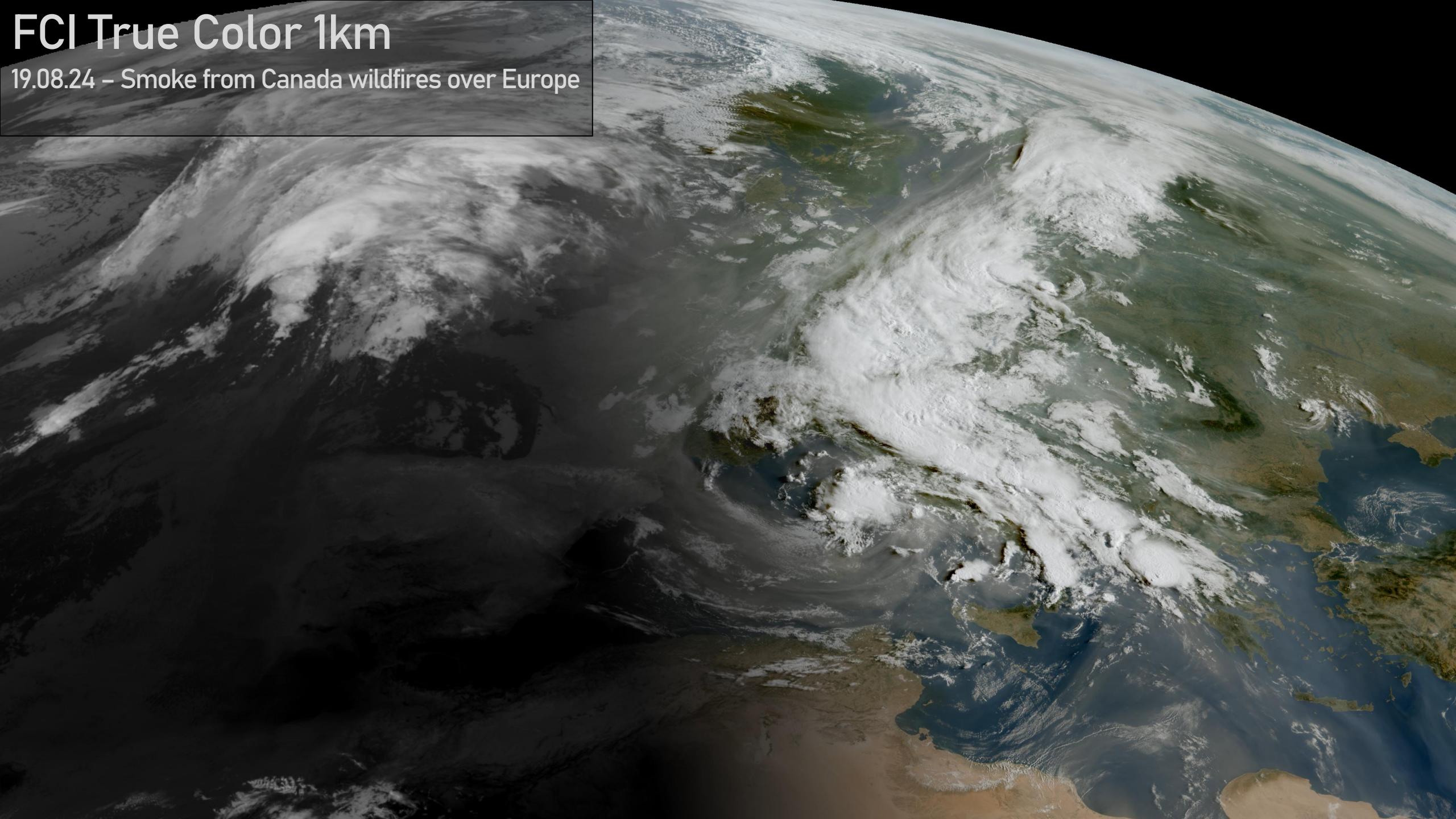
23 settembre 2023

(Ansa)

FCI True Color 1km
Fire Temperature 0.5km
(3.8 and 2.2μm)
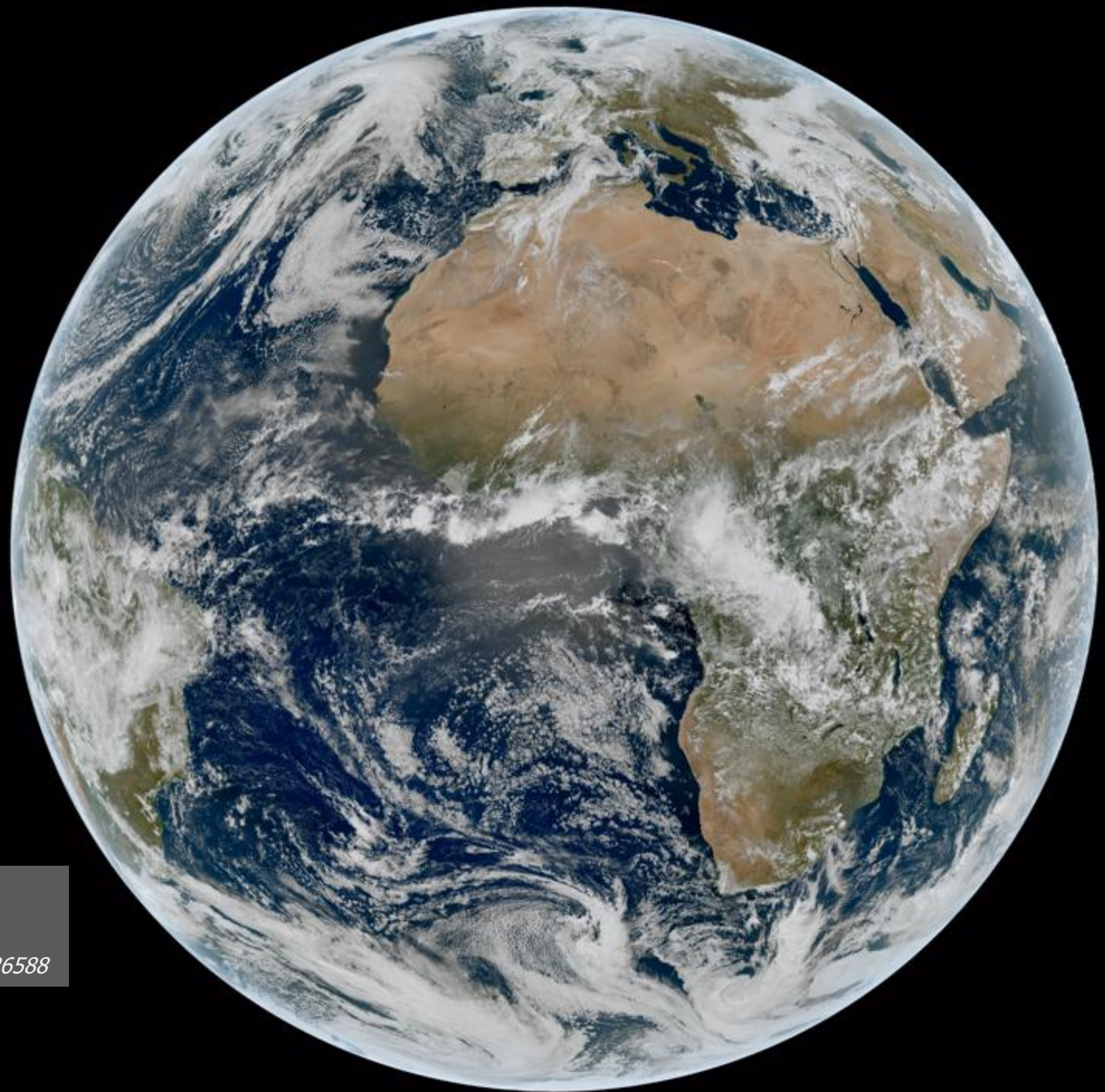04.08.24 – Mt. Etna Eruption

FCI True Color 1km

19.08.24 – Smoke from Canada wildfires over Europe

FCI GeoColor 1km
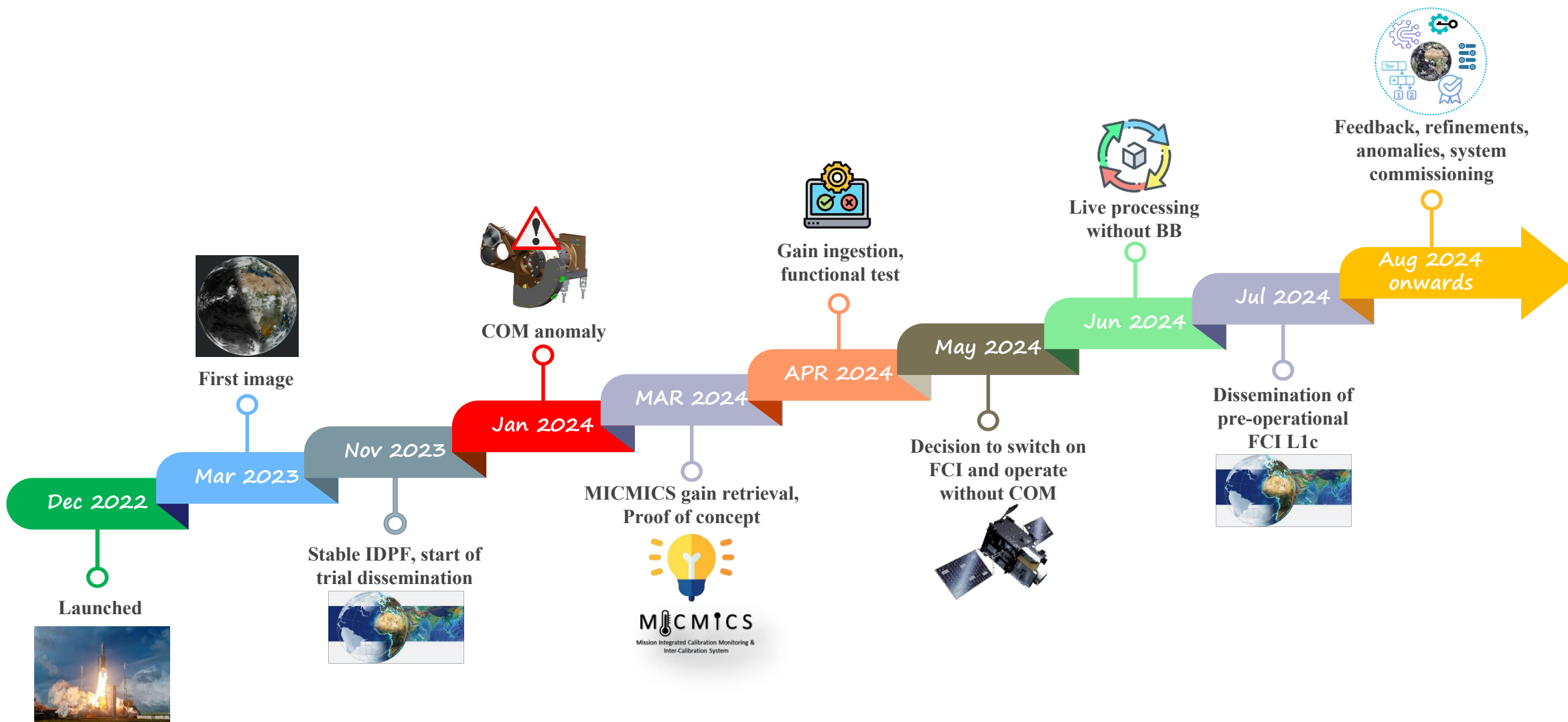18.03.2023 12:00– 19.03.2023 12:00 UTC
(Full Disk Scanning @10min)

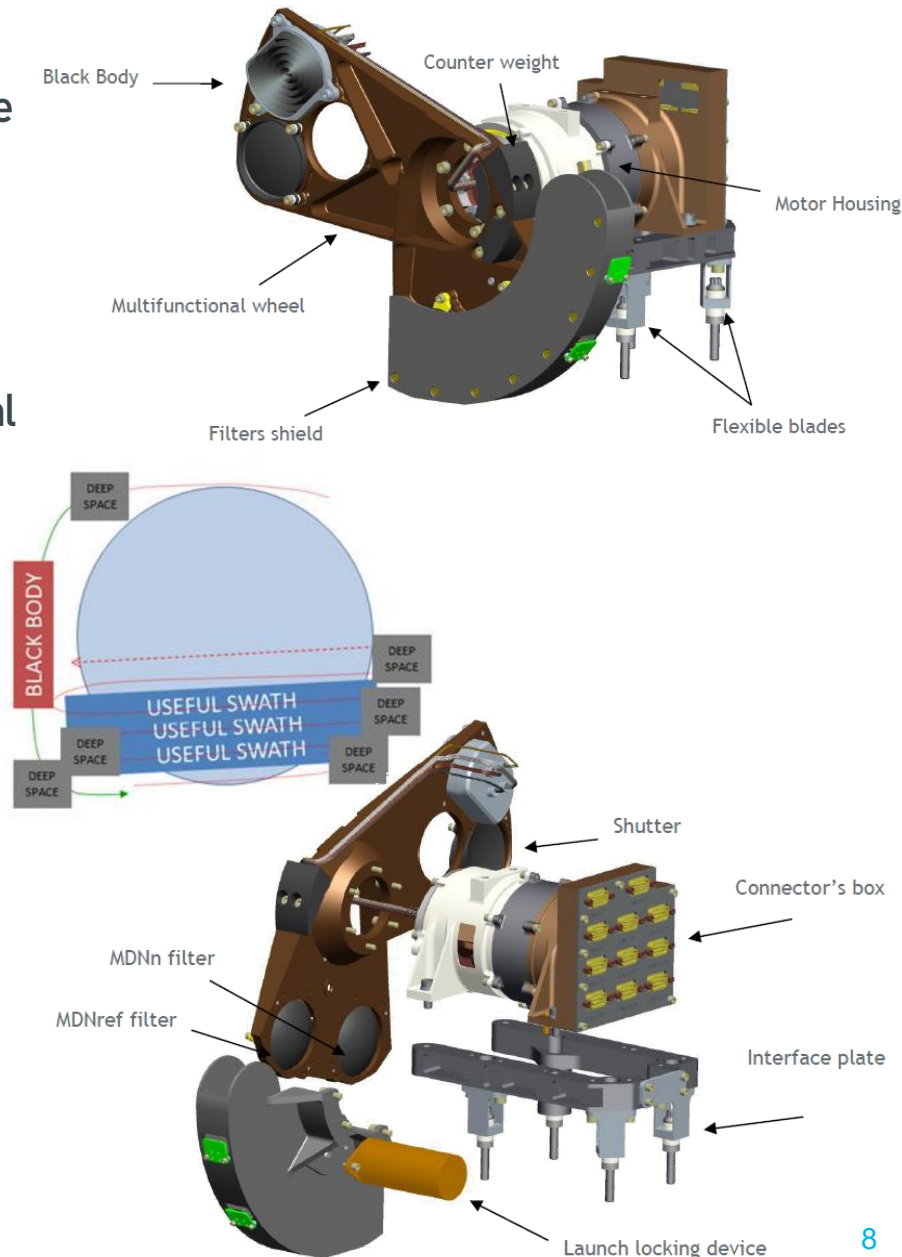

Implementation of Geocolor in now available in Satpy:

https://github.com/pytroll/satpy/pull/2557#issuecomment-1857426588

www.eumetsat.int

Feedback, refinements, anomalies, system commissioning

Live processing without BB

Gain ingestion, functional test

COM anomaly

Aug 2024 onwards

Jul 2024

Jun 2024

May 2024

APR 2024

MAR 2024

Jan 2024

Nov 2023

Mar 2023

Dec 2022

First image

Dissemination of pre-operational FCI L1c

Decision to switch on FCI and operate without COM

MICMICS gain retrieval, Proof of concept

Stable IDPF, start of trial dissemination

Launched

MICMICS
Mission Integrated Calibration Monitoring &
Inter-Calibration System

FCI COM anomaly

- On DOY 013 2024, FCI suffered a major anomaly and automatically switched to SURVIVAL mode. The initial investigations identified the root cause in an electrical failure in the COM mechanism.

- The Calibration and Obturation Mechanism for the FCI instrument (COM-I):
    - Provides optical source selection for observation, calibration (IR by a black-body and VNIR by MND filters) and obturation tasks by inserting the appropriate optical elements in the light path;
    - IR calibration uses a black-body in the light path, providing controlled radiance and precise temperature control for accurate calibration;
    - The VNIR calibration function is provided by MND filters.

- By not operating the COM anymore:
    - FCI is losing its main on-board calibration sources for the VNIR and IR channels;
    - IR Channels are more at risk of degradation (stripes in the images, loss of absolute radiometric accuracy, loss of radiometric stability) due to the sensor technology. (SHORT TERM PROBLEM);
    - VNIR on-board characterisation is still considered to be valid and thanks to the slow degradation of VIS channels, it can be considered still valid for the next short/medium term. (LONG TERM PROBLEM).

Black Body — Counter weight — Motor Housing — Multifunctional wheel — Filters shield — Flexible blades

BLACK BODY — DEEP SPACE — USEFUL SWATH — USEFUL SWATH — USEFUL SWATH — DEEP SPACE

Shutter — Connector's box — Interface plate — MDNn filter — MDNref filter — Launch locking device

# Mitigations for the loss of FCI-COM

- **Objective:**
  - Maintain control over IR & VNIR absolute calibration to ensure acceptable data quality.

- **Background:**
  - Due to optical elements and detector in the cryostat, the instrument's response varies and is no longer compensated by BB calibration;
  - This causes a drift in measured BT and errors up to ~2K/month, particularly in channels 10.5, 12.3, and 13.3, while the drift is slower in other channels;
  - This directly impacts User Requirements and the entire L2 products, RGBs, and Data Assimilation.

- **Mitigation:**
  - By using MICMICS, it is possible to retrieve the IR gains with acceptable accuracy and compensate for the IR channels' degradation.

IR12.3 Brightness Temperature Error from gain variation
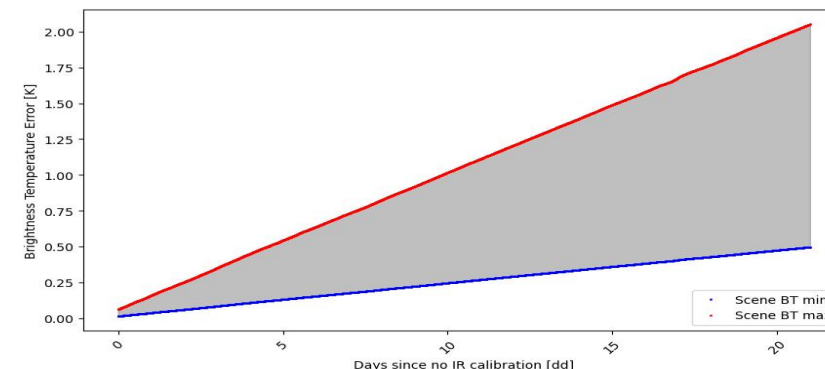
Computed evolution of 12.3 micron channel in case of no calibration at all. It is demonstrated that in the worst-case scenario Brightness Temperatures can drift up to 2 K/month.
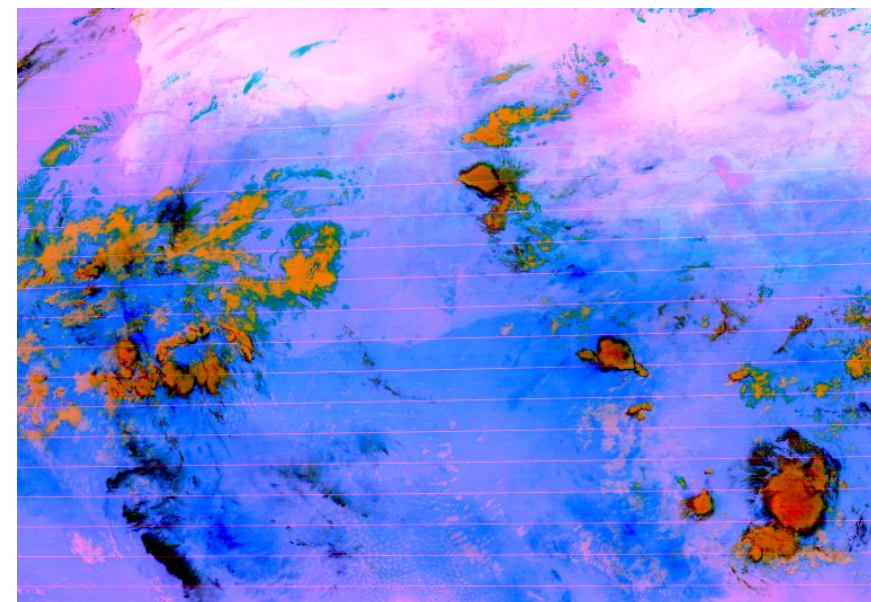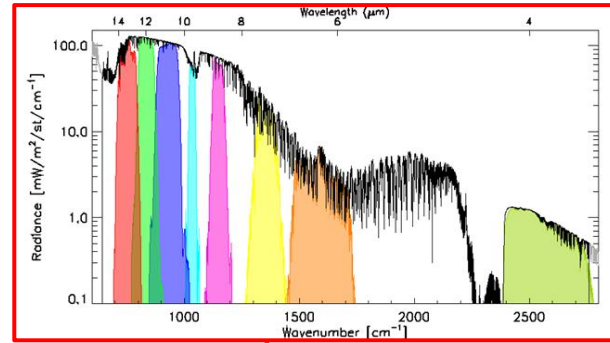
FCI Dust RGB product without onboard calibration (R: IR12.3–IR10.5; G: IR10.5–IR8.7; B:IR10.5)
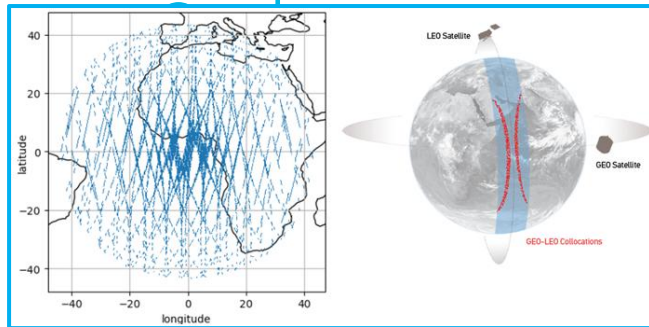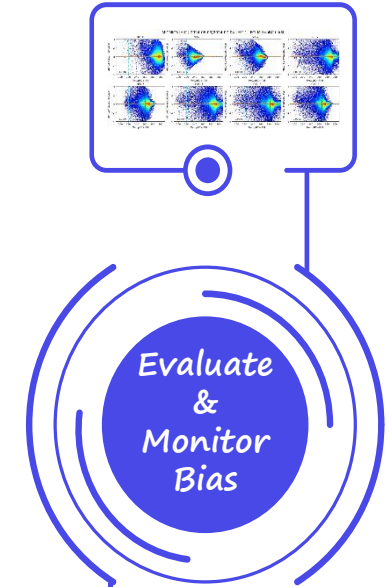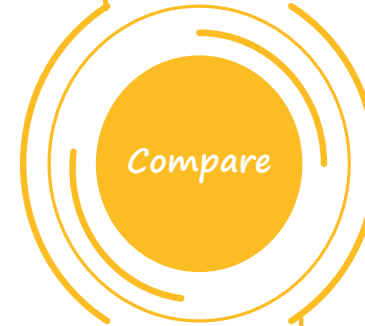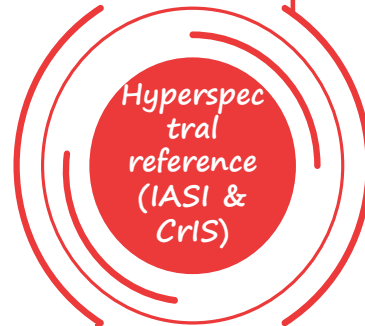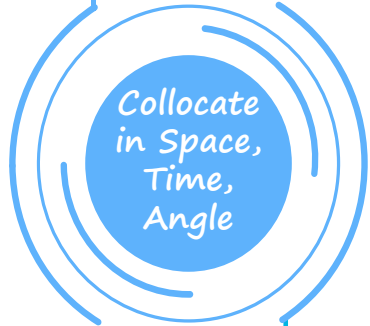
MICMICS GEO-LEO IR Calibration (IHICS)

- GSICS GEO-LEO IR algorithm
- Collect Simultaneous Nadir Overpasses (SNOs)
- Filter by angle and time
- Day- and Night-time data (IR3.8 only nighttime)

- Accumulate collocations over a 30-day period
- Apply weighted regression
- A sliding window (30 days) is utilised to generate the corrections
- Evaluate uncertainties

Collocate in Space, Time, Angle → **Hyperspectral reference (IASI & CrIS)** → **Compare** → **Evaluate & Monitor Bias**

- Convolve IASI spectrum with Spectral Response Function (SRF) of FCI
- Gap-filling to extend IASI to fully cover IR3.8
- Can diagnose SRF errors
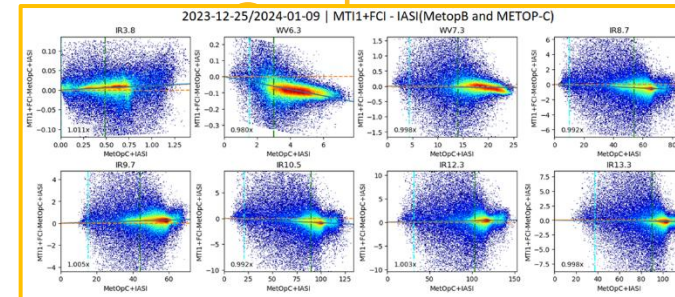
- Verify Radiometric Accuracy Requirement (<0.7 K)
- Check long-term stability (<0.3 K over lifetime)
- Including decontaminations