

# ESA EarthCARE Product Overview

*Timon Hummel  
on behalf of the joint ESA-JAXA EarthCARE Team*

*European Space Agency*



EarthCARE Science and Validation Workshop 2025

1-5 December 2025 | The University of Tokyo | Tokyo, Japan



# EarthCARE Production Model

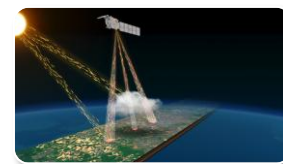
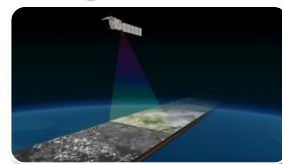
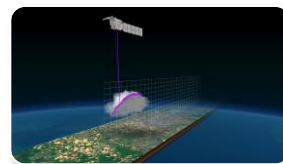
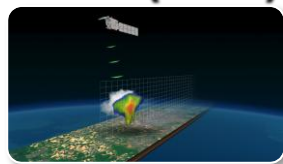


**Radar (CPR)**

**Lidar (ATLID)**

**Imager (MSI)**

**Broadband radiometer (BBR)**



EarthCARE  
X-band  
Telemetry

Legend



L0

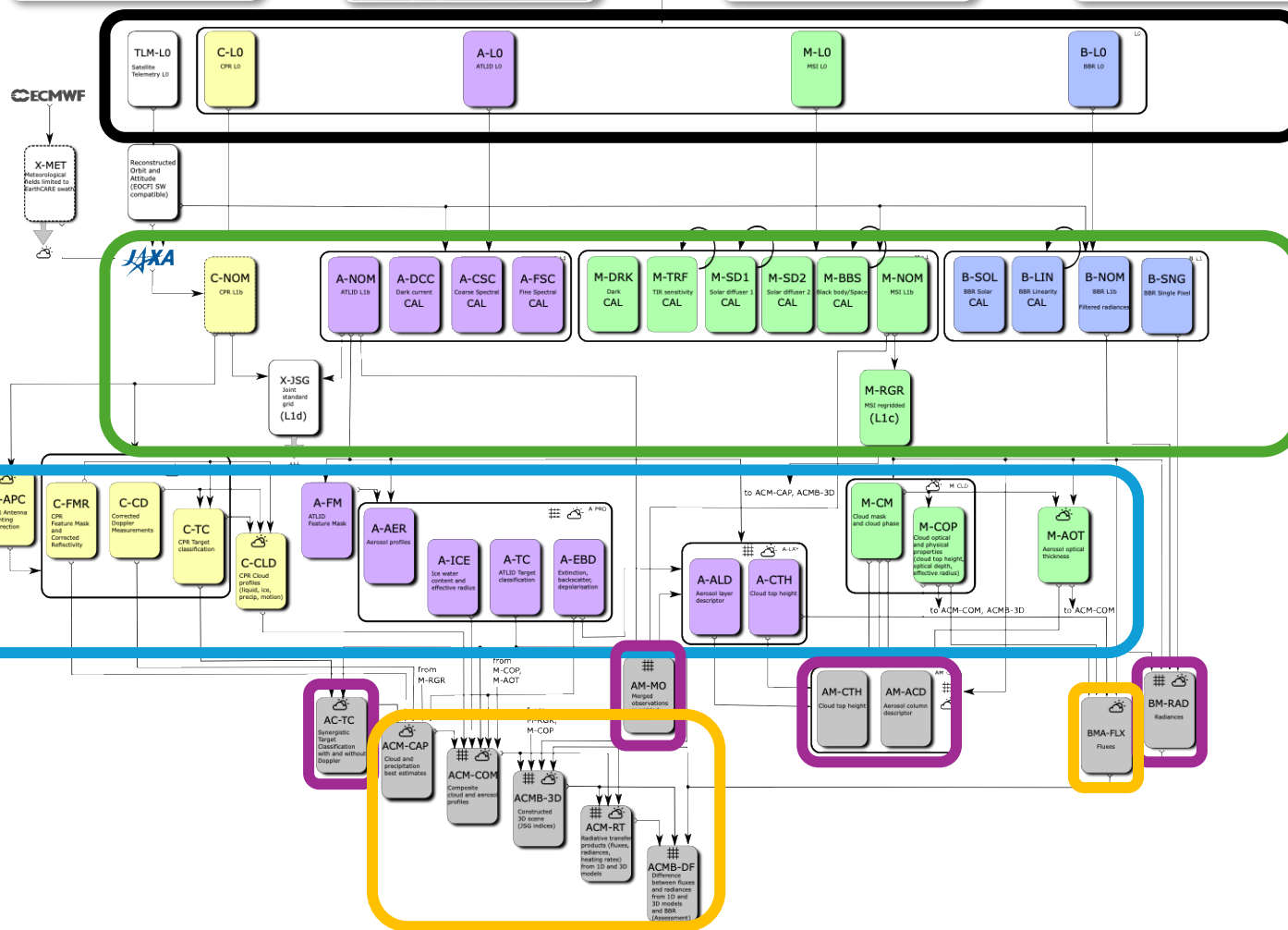
Aux

L1b

L1c/d

L2a

L2b



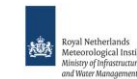
**Level 0: Raw measurements**

**Level 1: Calibrated Instrument Data**  
(Published 14/01/2025)

**Level 2a: Single sensor Products**  
(Published 17/03/2025)

**Level 2b: two-sensor synergy Products**  
(Published 17/03/2025)

**Level 2b: three- and four-sensor synergy Products**  
Published Today





**Product Overview Highlights**

**JAXA** **esa**




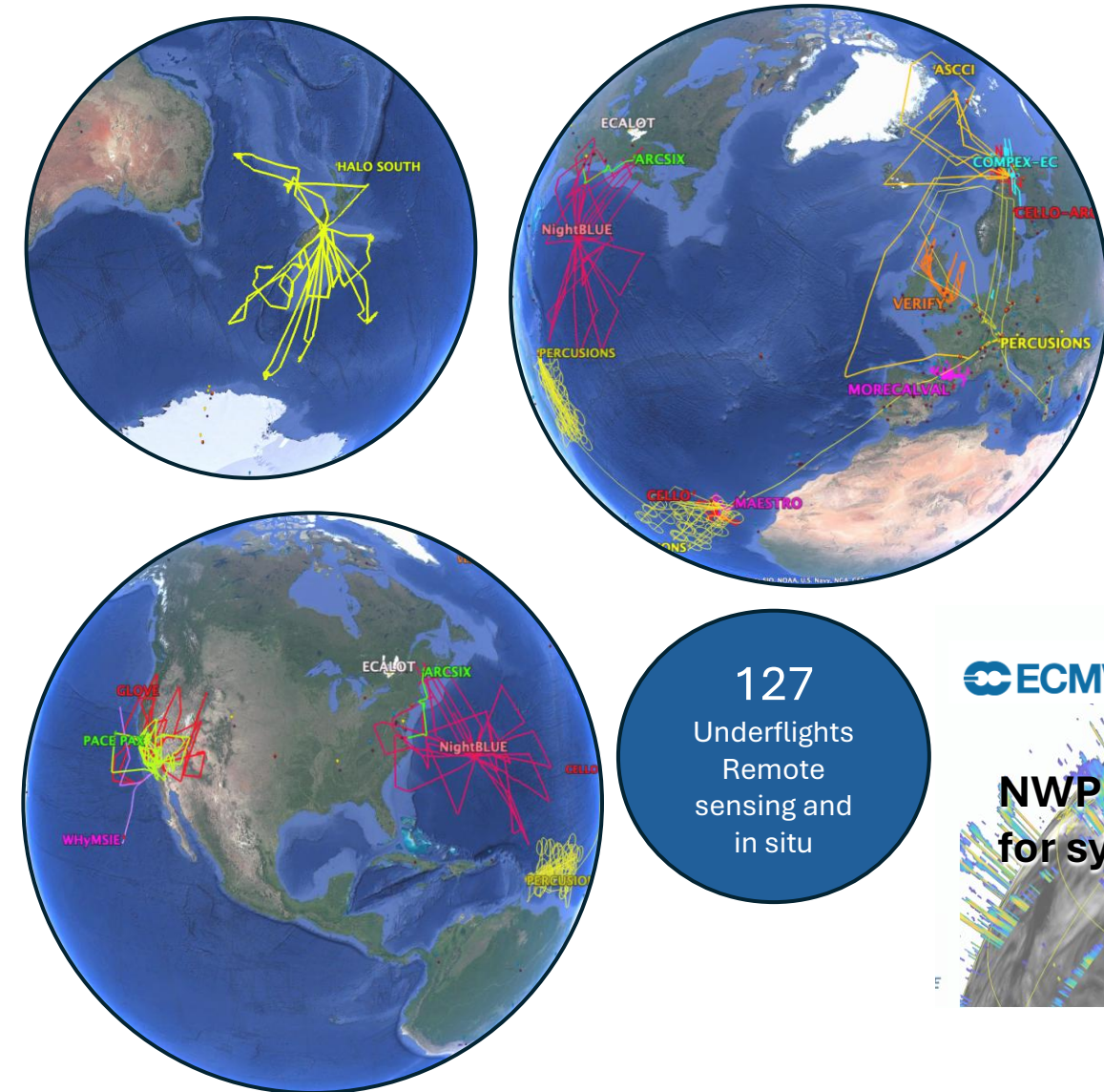
- | Product Type       | # Products [million] | Volume [TB] |
|--------------------|----------------------|-------------|
| ESA L1 and CPR L1B | 2.970                | 403         |
| ESA L2             | 6.412                | 123         |
| JAXA L2            | 0.386                | 14          |





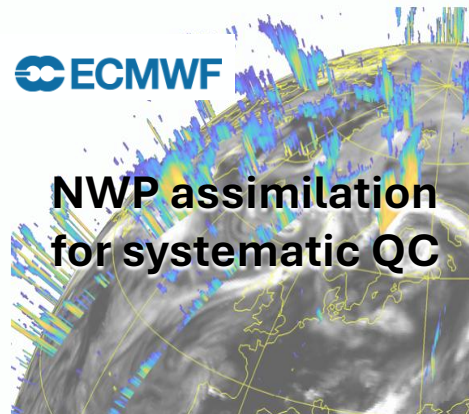
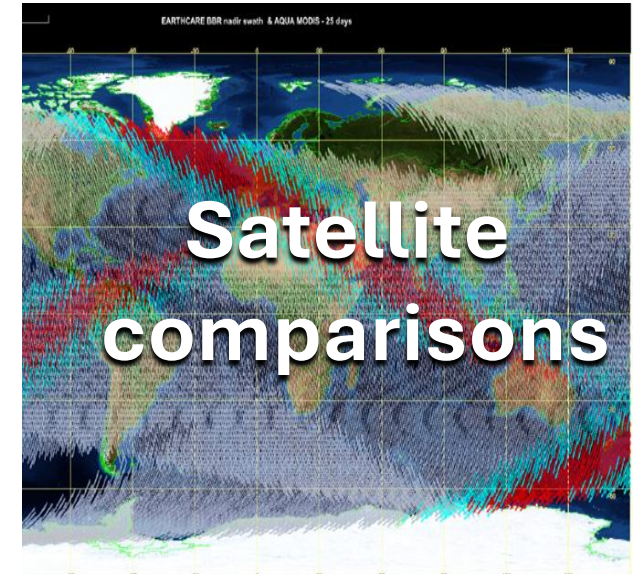
Validation approaches

JAXA ESA



127  
Underflights  
Remote  
sensing and  
in situ

Underflights  
Remote  
sensing and  
in situ



**Mobile  
Systems  
&  
Balloons  
&  
UAVS**



# Dedicated Systems

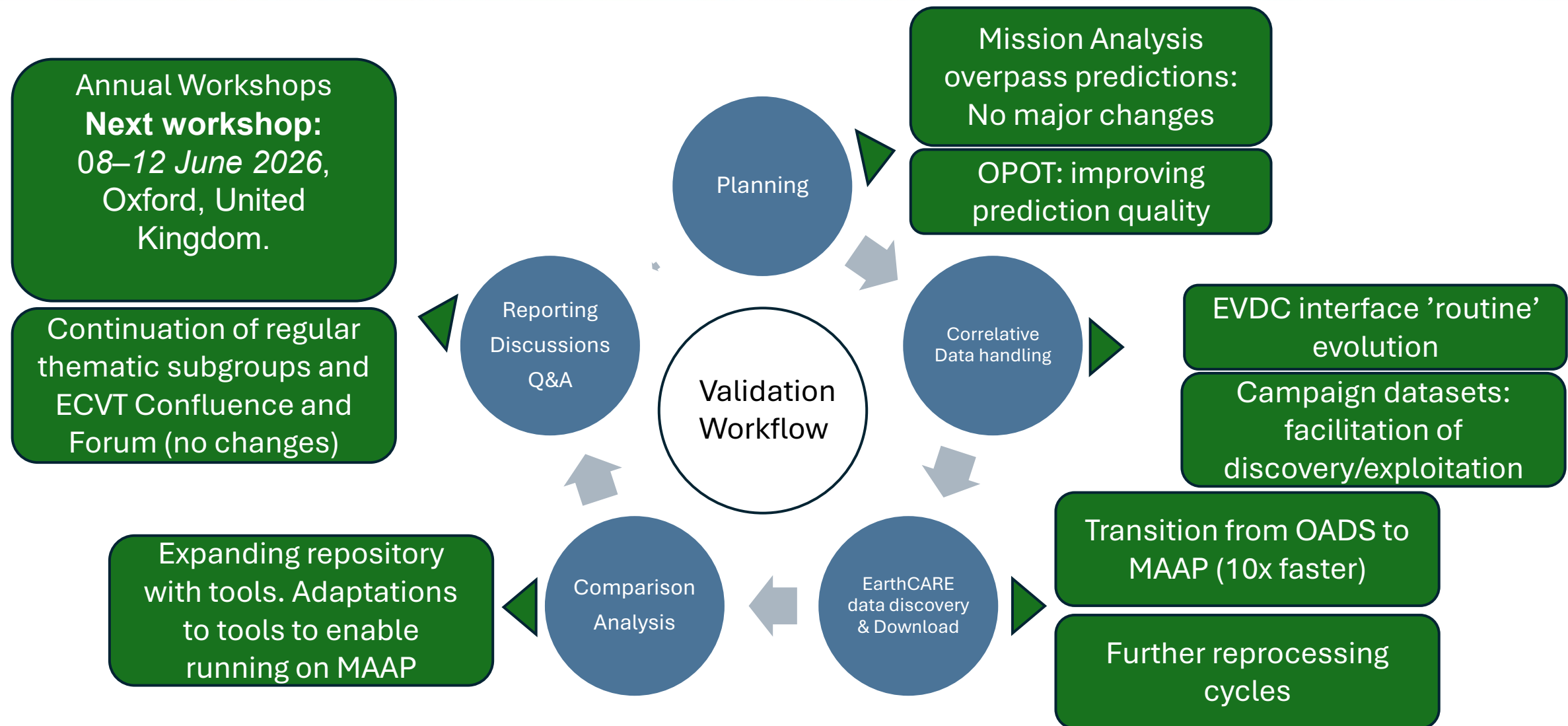
Image: Raymetrics

**Marine Cruises**

Image: TU Delft

Image: TU Delft

# Validation evolution/outlook



# 1st Full-Mission Reprocessing campaign



**First Reprocessing Campaign** completed early November (duration: 5 months)

- Processed ~1.3 million L1 and L2 products
- Involved 3 different entities:
  - CPF: 320 cores for L1 products
  - Generic reprocessing service DAMPS: 400 cores for L2 products (excluding ACM-RT & ACMB-DF)
  - ECCC Canada: 5000 cores for ACM-RT & ACMB-DF
- Additional tasks:
  - ✓ In-flight calibration data reprocessing
  - ✓ Quality control
  - ✓ Data transfers & ingestion into dissemination servers

## **2nd Reprocessing Campaign Planning: Spring 2026** 📅

- Second full-mission reprocessing campaign
- Speed up processing with fewer transfers
- Process in batches (months of sensing) with parallelization of steps
- Target: 2 weeks of data (2WDs) per month of sensing + initial reprocessing pipeline setup

# BBR intermittent Operations



## Motivation for Change

- Mission analysis indicates EarthCARE potential to exceed 10 years, but the BBR Chopper Drum Mechanism (CDM) is life-limited to ~3 years under current operations.
- Strategy shifts focus to **extending time series** coverage rather than maximizing continuous data.

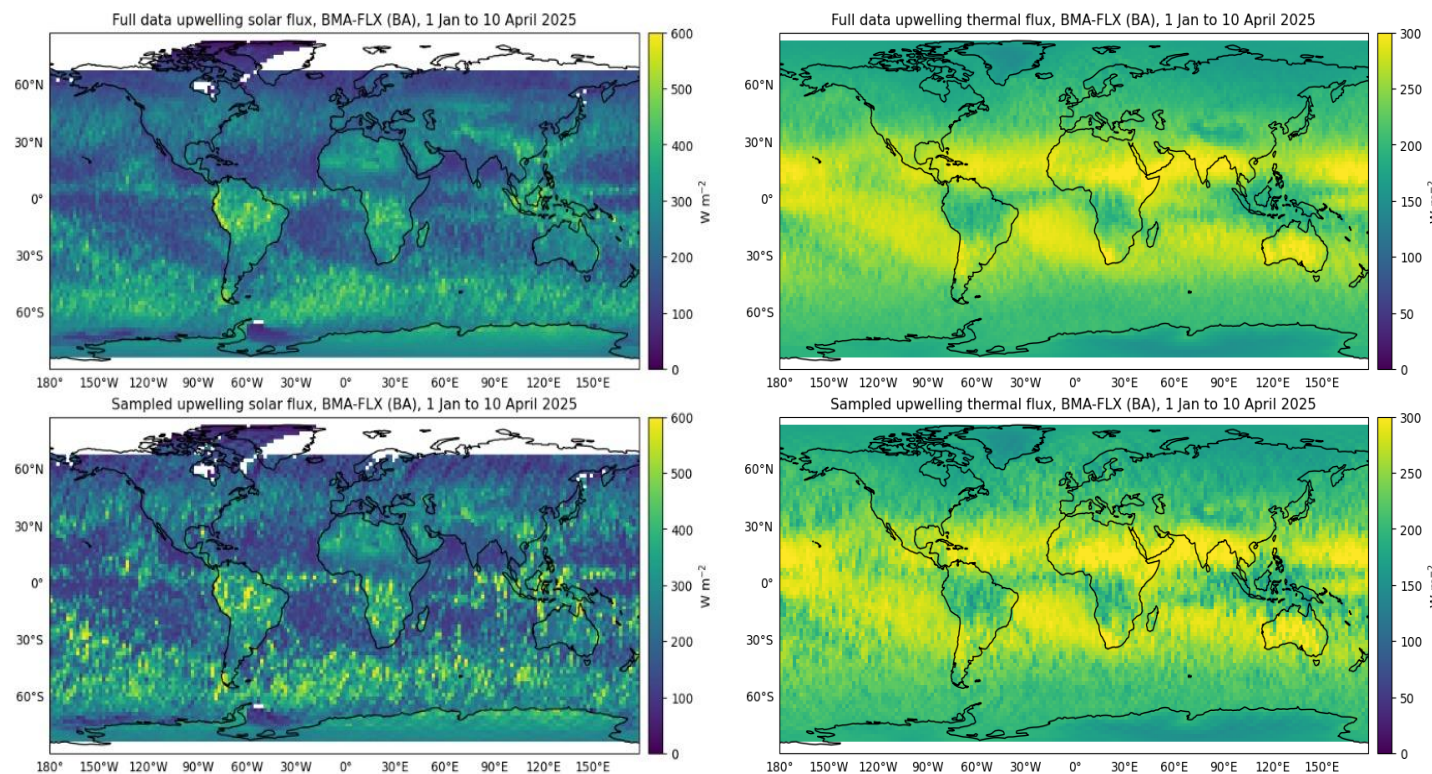
Credits: Jason Cole, Nicolas Clerbaux, Robin Hogan, et.al

## Operational Concept:

- **Intermittent Operations:** Implements a cycle of **5 days in 'Nominal' mode** followed by **15 days in 'Stand-by'**.
- **Rationale:** This 20-day cadence creates a 100-day repeat cycle, ensuring statistically accurate spatial and temporal sampling while preserving mechanism health.

## Flexibility:

- Includes **'Ad-hoc' activation** capabilities during 'Stand-by' phases to capture unforeseen events (e.g., volcanic eruptions, dust outbreaks) or support validation campaigns.



- Full EarthCARE ESA products suite have been released to the users:
  - Level-1: 14/01/2025
  - Level-2a + two-sensor Level-2b synergy: 17/03/2025
  - Three- and four-sensor L2b synergy products: **Today!**
- Very promising product quality and offering significant scientific opportunities.
- **EarthCARE Data innovation and Science Cluster (DISC)** continues to ..
  - Monitor the product quality and provide regular reports to users
  - Continuously enhance the quality of existing processors and products, building on the valuable findings and recommendations of the Validation Teams.
  - Provide User support