

Introduction





Sensor Performance, Products and Algorithms (SPPA) activities at ESRIN

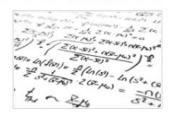
The overall functions of the *Sensor Performance, Products and Algorithms (SPPA)* section is to assure that the users are provided with best possible product quality, in line with the MRD

During the **exploitation phase** of a mission, **SPPA is therefore responsible for**:

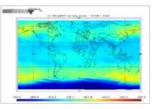
- Processor (algorithms) maintenance and evolution
- On- and Off-line performance assessment and on-demand QC
- System calibration and Product validation
- Assuring the end-to-end sensor dataset performance by:
 - Generation of ICTs (instrument control tables)
 - ✓ Harmonizing and establishing standardized Cal/Val procedures
 - Supporting data consolidation and reprocessing activities (data curation)
 - Organizing workshops and meetings

- Sensor Performance, Products and Algorithms

The Sensor Performance, Products and Algorithms (SPPA) is the element of the ESA Earth Observation ground segment responsible and performing the following activities:







Courtesy of Alfred Wegener Institute

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Developing and upgrading the data processing algorithms in order to meet mission requirements and user needs.

Algorithm Development

Cal/Val

Calibrating the sensors (through the update of on-board and on-ground configuration data) in order to meet product quality requirements.

Validating the generated products assessing, by independent means, the quality of the generated EO data products.

Routine Quality Control

Monitoring routinely the status of the spacecraft (payload and platform) and to check if the derived products meet the quality requirements along mission life-time.

The activities related to the SPPA constitute a long and continuous process involving a number of various actors with different competencies and objectives.

EarthCARE Data Innovation and Science Cluster (DISC)





Core Objective

> Assure that the users are provided with the best possible product quality, in line with the mission requirements.

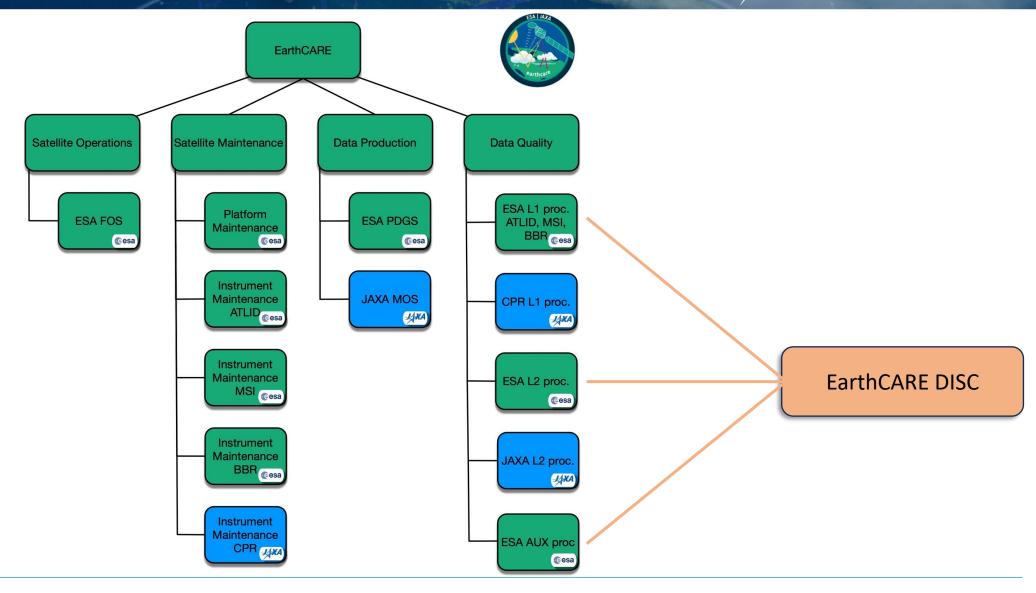
EarthCARE Data Innovation and Science Cluster (DISC)

- DISC: User data quality concept tailored to characteristics of Earth Explorer.
 - ➤ Heritage and lessons-learnt from previous DISCs: **Swarm, Aeolus**
 - > But.. Far EarthCARE more complex: # instruments, # processors, # products ...
- **Single cluster** for product, sensor and processor expert groups, picking up from the development during **Phase C/D/E1 for :**
 - L2, L1, Auxiliary- and Calibration processor development
 - Potential to include **product assimilation** in (NWP/atmospheric) models, **Cal/Val coordination**, Fiducial Reference Measurement (FRM) and outreach related activities.
- **DISC** is the **central element** in **product evolution cycle**, combines **ground processor evolution** with sensor **performance monitoring**, **internal Cal/Val** and **synthesis from external validation teams (VT)**, community **outreach and interaction**, necessary **tools**.

EarthCARE Phase E2







DISC – Tentative Overview





Communication

- Quality working group support
- User community outreach & user support
- Performance monitoring website, user support, forums, Cal/Val workshops

Tools

- Sandbox L2 Processor testbed for full processing chain
- SPPA tools/portal (data quality dashboard etc.)
- Data-visualisation, -analysis and -monitoring tools
- Data processing tools

Processor Evolution & Maintenance

- L1B, L2A, L2B, Calibration Processor, E2S, X-MET & X-JSG Processor
- Processor Validation, Acceptance and Delivery to PDGS

Coordination and Project Management

Assimilation

- NWP monitoring of EarthCARE products
- Interaction with processor developers for corrective actions
- EarthCARE product data assimilation and impact assessment

Instrument Calibration and Monitoring Facility (ICMF)

- Operation of the ICMF
- Maintenance and Evolution of ICMF processors
- Offline & interactive analysis of cal. processor output
- Determination and Provision of ICMF Config Parameters

Cal/Val

- Cal/Val coordination
- Calibration Strategy
 Refinement
- Cal/Val data synthesis
- Product validation
- Calibration processing (complement to ICMF)
- Cal/Val user support

DISC – Tentative Overview

support





Processor, E2S, X-MET & X-JSG Processor

and Delivery to PDGS

Processor Evolution & Maintenance - L1B, L2A, L2B, Calibration

- Processor Validation, Acceptance

Not in the DISC scope:

- LO processors
- Operations and maintentance related to CPR L1
- Execution of airborne validation campaigns and independent Cal/Val activities
- Ops. of X-MET and X-JSG
- Ops. and maintenance of instruments and satellite platform

- NWP monitoring of EarthCARE products
- Interaction with processor developers for corrective actions
- EarthCARE product data assimilation and impact assessment

Instrument Calibration and Monitoring Facility (ICMF)

- Operation of the ICMF
- Maintenance and Evolution

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Config Parameters

Cal/Val

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- Calibration processing (complement to ICMF)
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Communication

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Processor Evolution Cycle





PDGS

Integration of new processors,

Execution of reprocessing campaigns,

New product release



DISC

Algorithm/Processor update and verification/validation

EarthCARE Validation Teams (& DISC)

Reference & Independent
Measurements (e.g. co-located
ground-based,
model-based,
airborne, FRM)

Mission Manager

- Data Quality Manager
- PDGS Manager
- Mission Science
- Mission Planning & Op.

Quality Working Group

Discussion on major algorithm updates and reprocessing campaigns



DISC

Cal/Val data synthesis, Performance Monitoring Routine QC and NWP monitoring



DISC

EarthCARE product validation

Associated recommendations to QWG for algorithm updates

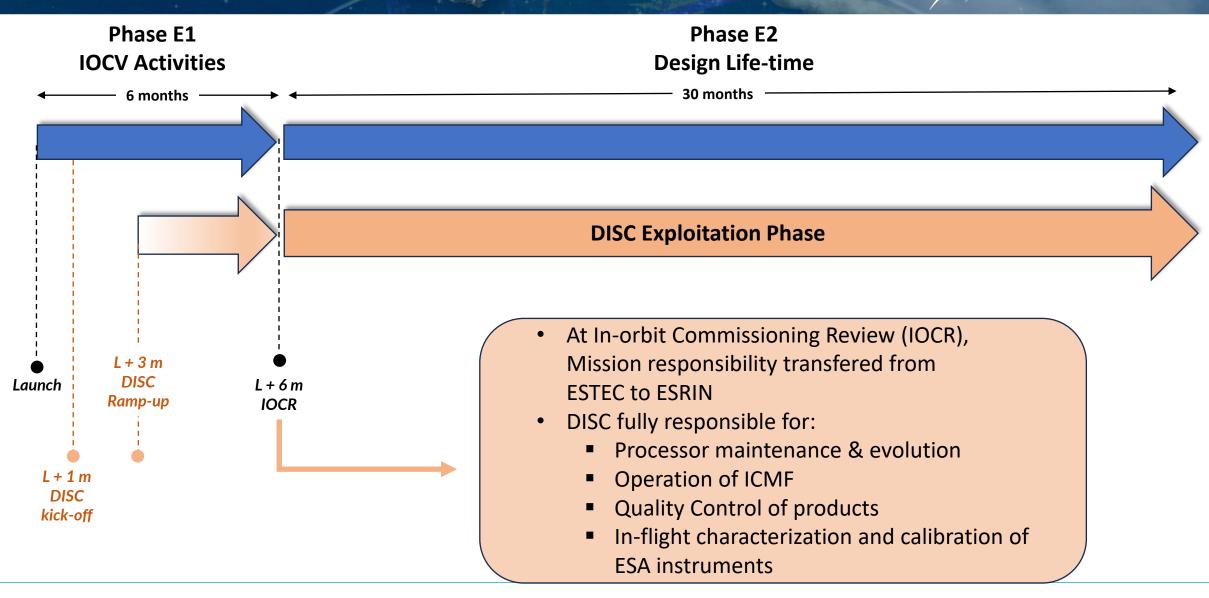
Typical Cycle Processor Evolution

- Monitoring, verification and QC activities within the DISC.
- External inputs contribute to DISC data quality work.
- Product improvements are driven by the integration of external and internal feedback in the cycle.
- EarthCARE QWG recommendation on major algorithm updates and reprocessing campaigns.
- New processor integration into PDGS.

Mission Timeline











Summary

- EarthCARE DISC groups in a single cluster product, sensor and processor experts.
- DISC is the central element in product evolution cycle, combines ground processor evolution with sensor performance monitoring, internal Cal/Val and synthesis from external Validation Teams, community outreach and interaction, necessary tools.

Outlook

- ESA procurement in preparation
- Invitation to Tender issue planned for January 2024
- Kick-Off shortly after launch with a ramp-up phase during commissioning
- Full set of activities to start at In-orbit Commissioning Review (IOCR)