



EarthCARE Data Innovation and Science Cluster (DISC)

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ATMOS2024, Bologna, 01 July 2024

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

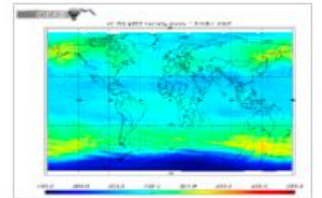
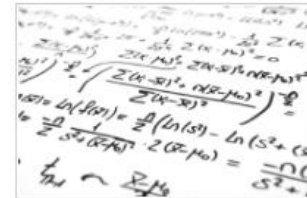
The overall functions of the **Sensor Performance, Products and Algorithms (SPPA)** section is to **assure that the users are provided with best possible product quality**, in line with the **MRD**

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

Algorithm Development

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

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.

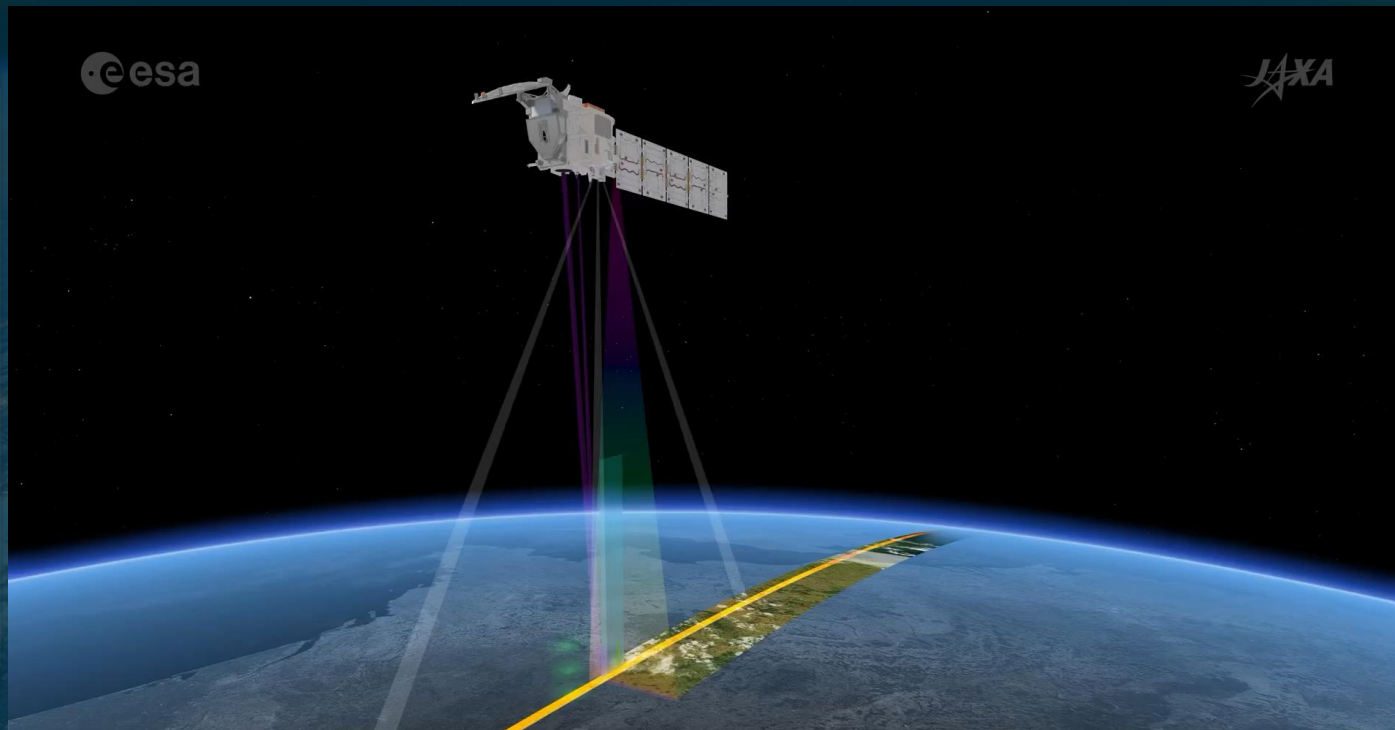
DISCs for Earth Explorers (Swarm, Aeolus, FLEX)

EarthCARE
Data Innovation and Science Cluster (DISC)

Cloud Profiling Radar CPR (JAXA)

High Power 94GHz
Doppler Radar

- *Cloud profiles, rain estimates, particle vertical velocity*



Atmospheric LIDAR ATLID (Airbus TLS)

High spectral resolution
355nm LIDAR

- *Vertical profiles of aerosol and (thin) clouds*



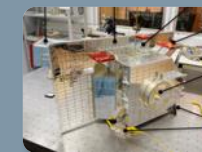
Multi Spectral Imager MSI (SSTL)

- *Context information*
- *Creating 3D cloud-aerosol scenes*
- *VIS, Near IR, SWIR Camera (VNS)*
- *Thermal IR Camera (TIR)*
- *4 solar and 3 TIR channels*

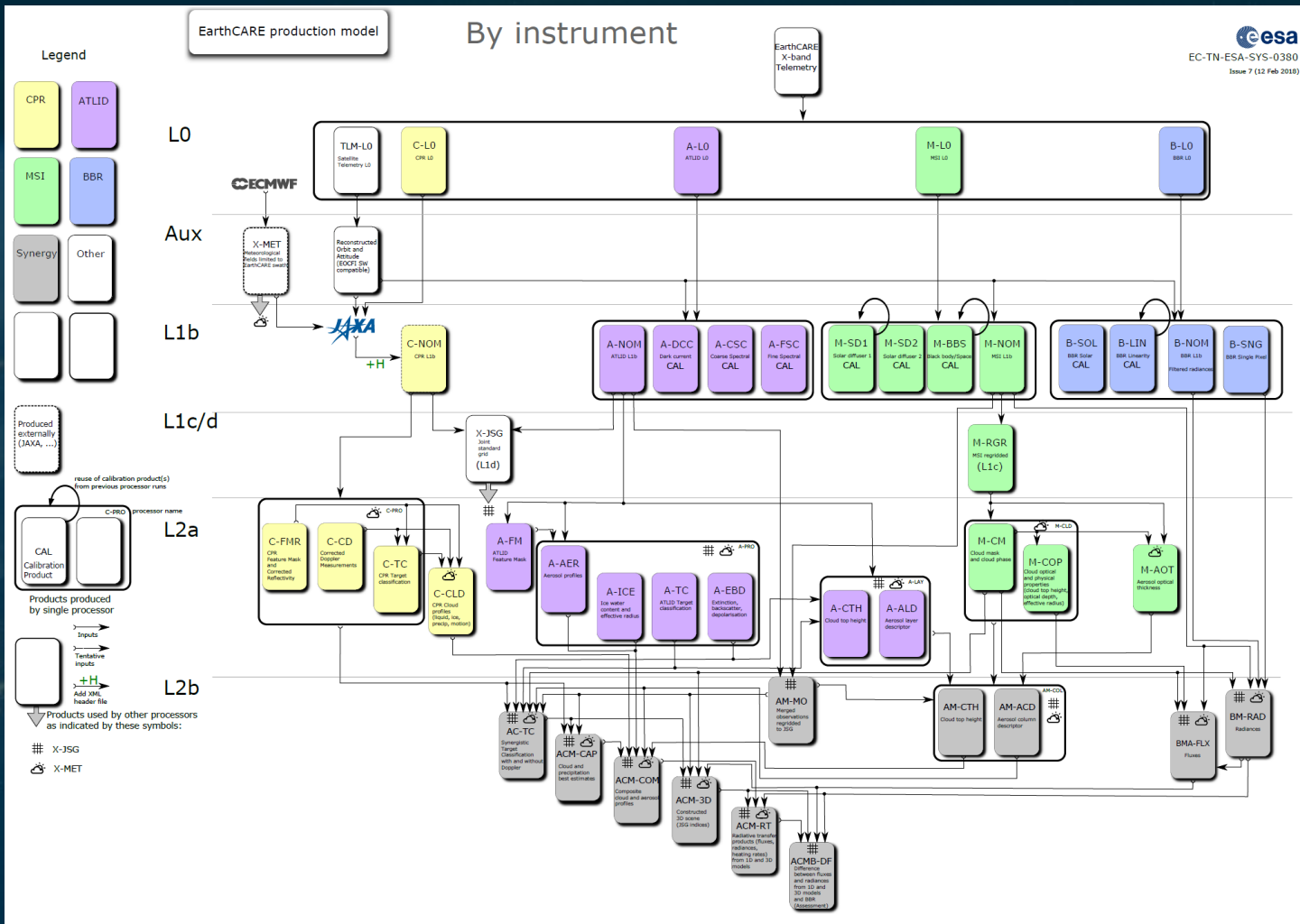


BroadBand Radiometer BBR (TAS-UK)

- *Measurements of reflected solar and emitted thermal radiation*



The ESA EarthCARE Production Model



4 instruments – 20 processors – 45 data products !

EGU European Geosciences Union

Atmospheric Measurement Techniques

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Special issue

Articles / Special issue

EarthCARE Level 2 algorithms and data products

Editor(s): Ulla Wandinger, Pavlos Kollias, Anthony Illingworth, Hajime Okamoto, and Robin Hogan

The EarthCARE (Earth Cloud, Aerosol and Radiation Explorer) satellite is a joint ESA-JAXA mission that was launched on 28 May 2024; it carries a Doppler cloud profiling radar (CPR), a high-spectral-resolution atmospheric lidar (ATLID), a multi-spectral imager (MSI), and a broadband radiometer (BBR). A large number of cloud, aerosol, precipitation, and radiation data products will be produced, some derived from individual EarthCARE instruments and some from the synergy of multiple instruments. This collection of papers describes the theoretical basis for the EarthCARE Level 2 algorithms and provides a prelaunch evaluation of their performance. An innovative aspect that links a number of the papers together is the use of realistic 3D test scenes, 6000km in length, with cloud, precipitation, and aerosol fields from a high-resolution cloud-resolving model and an aerosol transport model, with which observations by the four EarthCARE instruments have been simulated using state-of-the-art instrument simulators. This approach has enabled these algorithms to be evaluated and compared using a common dataset. The special issue is limited to papers describing official ESA or JAXA retrieval algorithms and their evaluation as well as several closely related papers.

Review process: all papers of this special issue underwent the regular interactive peer-review process of Atmospheric Measurement Techniques handled by guest editors designated by the AMT executive editors.

Download citations of all papers

- Bibtex
- EndNote

All papers Final revised papers only Preprints only

22 May 2024
Preface to the special issue "EarthCARE Level 2 algorithms and data products": Editorial in memory of Tobias Wehr
 Robin J. Hogan, Anthony J. Illingworth, Pavlos Kollias, Hajime Okamoto, and Ulla Wandinger
 Atmos. Meas. Tech., 17, 3081–3083, <https://doi.org/10.5194/amt-17-3081-2024>, 2024

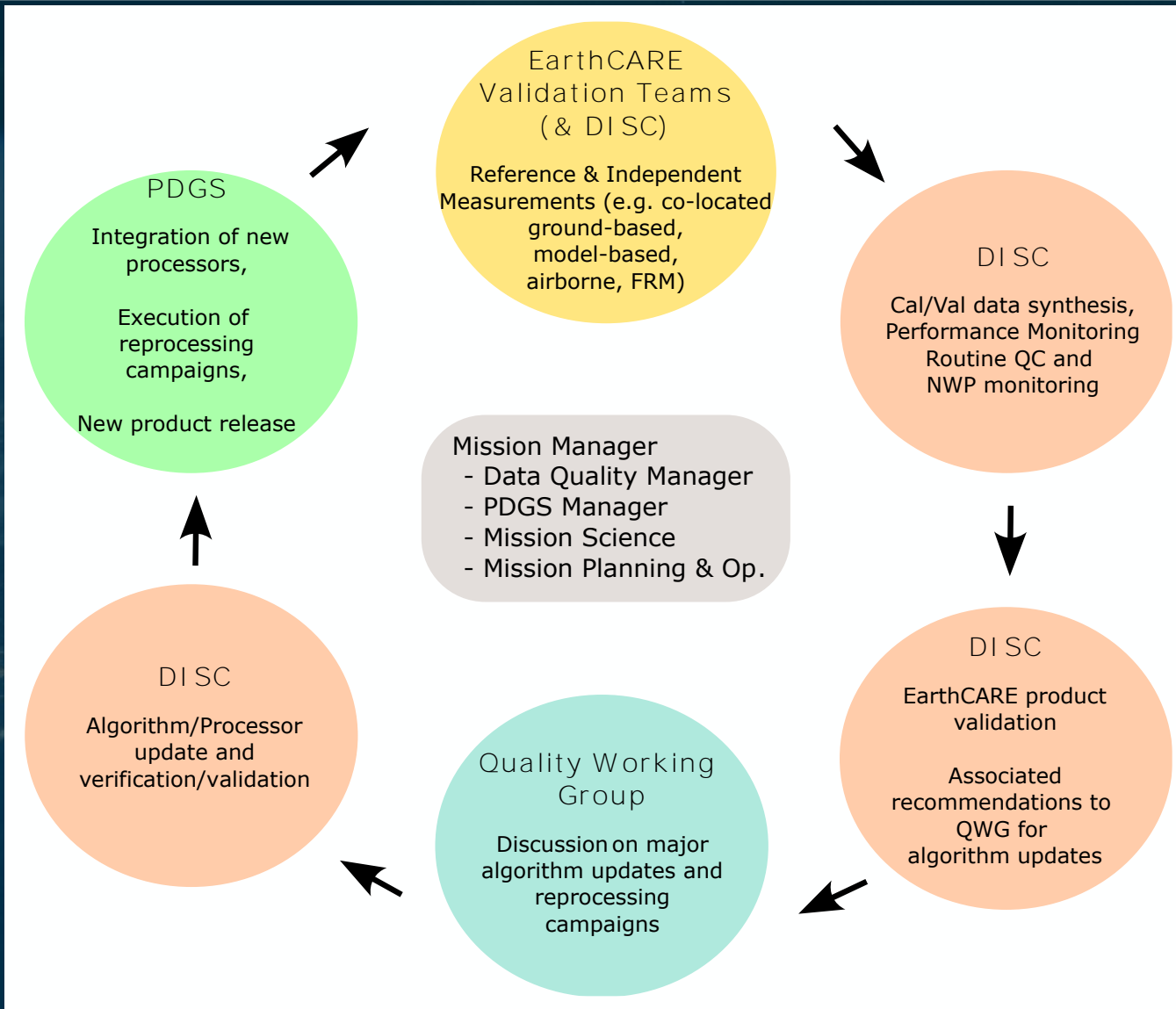
13 May 2024
Description and validation of the Japanese algorithm for radiative flux and heating rate products with all four EarthCARE Instruments: Pre-launch test with A-Train
 Akira Yamauchi, Kentaroh Suzuki, Eiji Oikawa, Miho Sekiguchi, Takashi Nagao, and Haruma Ishida
 Atmos. Meas. Tech. Discuss., <https://doi.org/10.5194/amt-2024-78>, 2024
 Preprint under review for AMT (discussion: open, 2 comments)
 Short summary

https://amt.copernicus.org/articles/special_issue1156.html

P6.10	Overview of the EarthCARE Cloud, Aerosol and Radiation science products.	Gerd-jan Van Zadelhoff KNMI
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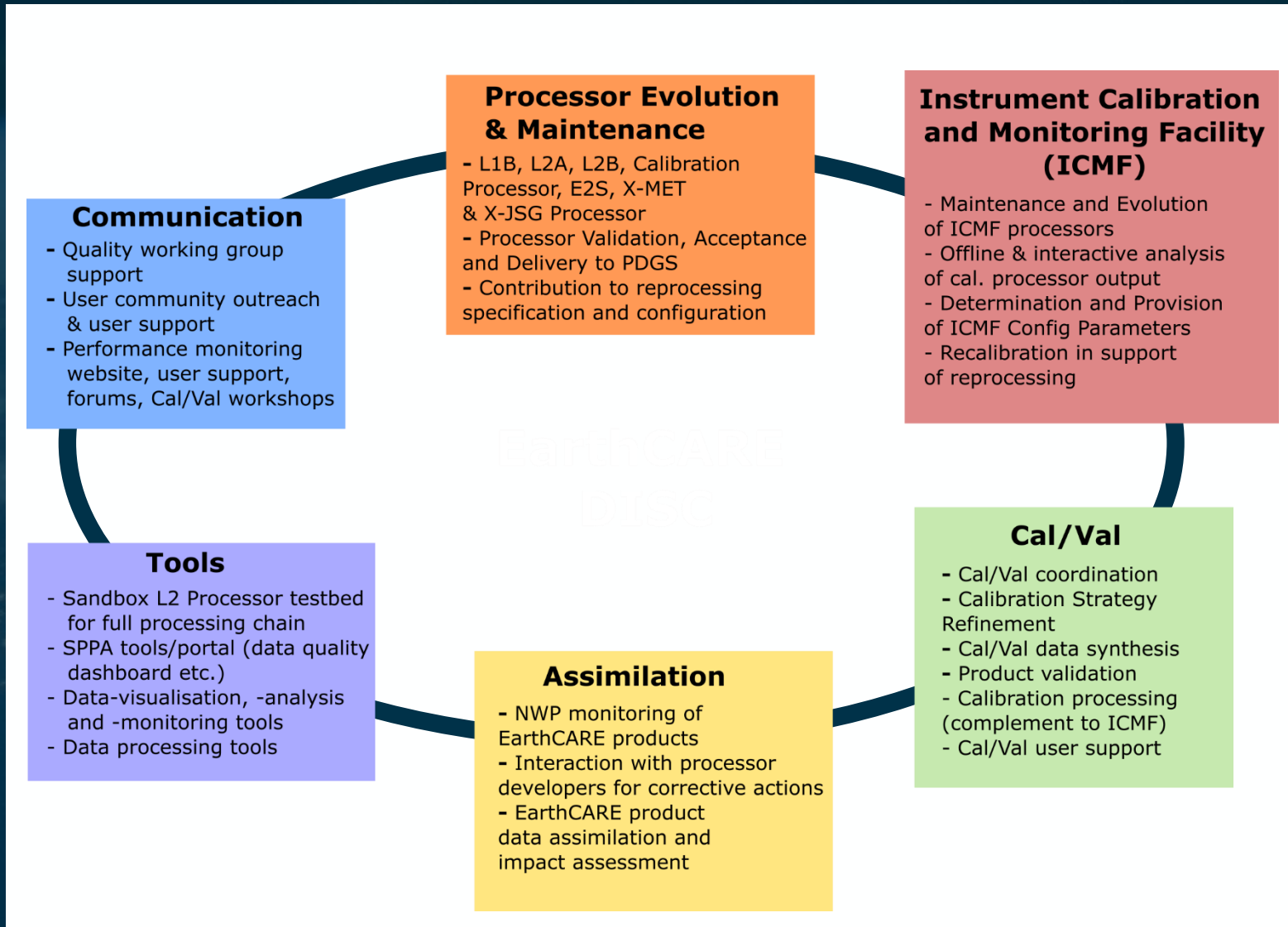


EarthCARE Processor Evolution Cycle



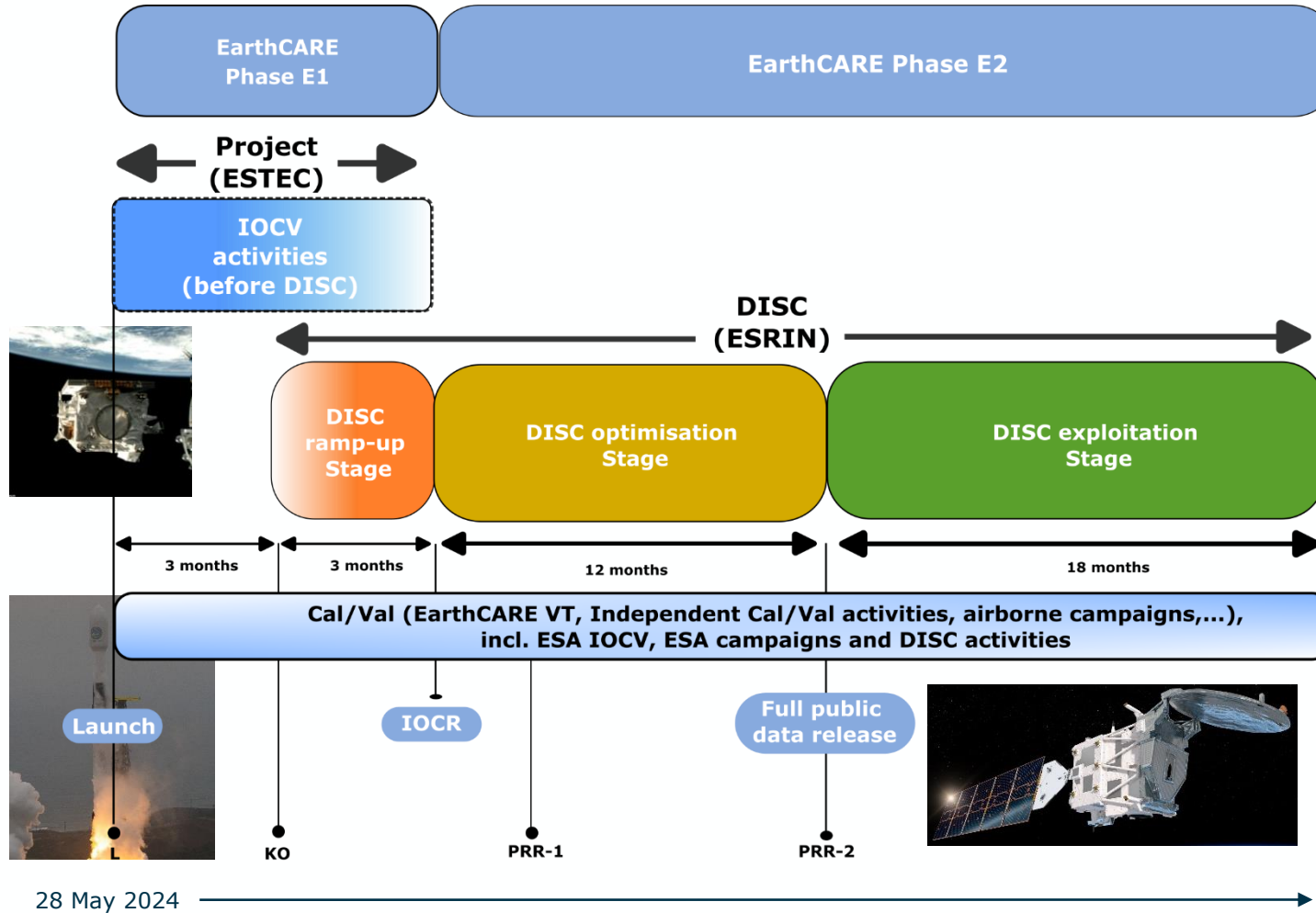
- Monitoring, verification and QC activities within the DISC
- External inputs contribute to DISC data quality work (e.g. ECVT)
- Product improvements are driven by the integration of external and internal feedback in the cycle
- The QWG provides recommendations on major algorithm updates and reprocessing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

1.4.2	15:27 15:39	Latest Developments in EarthCARE's Processors and Products Timon Hummel (ESA)
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- Continuous improvement of the EarthCARE products over the mission lifetime
- Algorithm and processor evolutions
- Data Quality Monitoring
- Cal/Val Synthesis
- EarthCARE product assimilation in NWP models
- Support and Interaction with User Community

EarthCARE DISC Timeline



1.4.3	15:39 15:51	EarthCARE Campaigns & Cal/Val Jonas von Bismarck (ESA)
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- EarthCARE DISC groups in a single cluster product, sensor and processor experts
- DISC is the central element in the product evolution cycle. It combines ground processor evolution with sensor performance monitoring, internal Cal/Val and synthesis from external Validation Teams and community outreach and interaction
- Advanced DISC procurement status – close to finalising and signing
- Kick-off at L+3 months (~ early September 2024)
- Full set of activities to start after In-Orbit Commissioning Review (IOCR) at L+6 months

