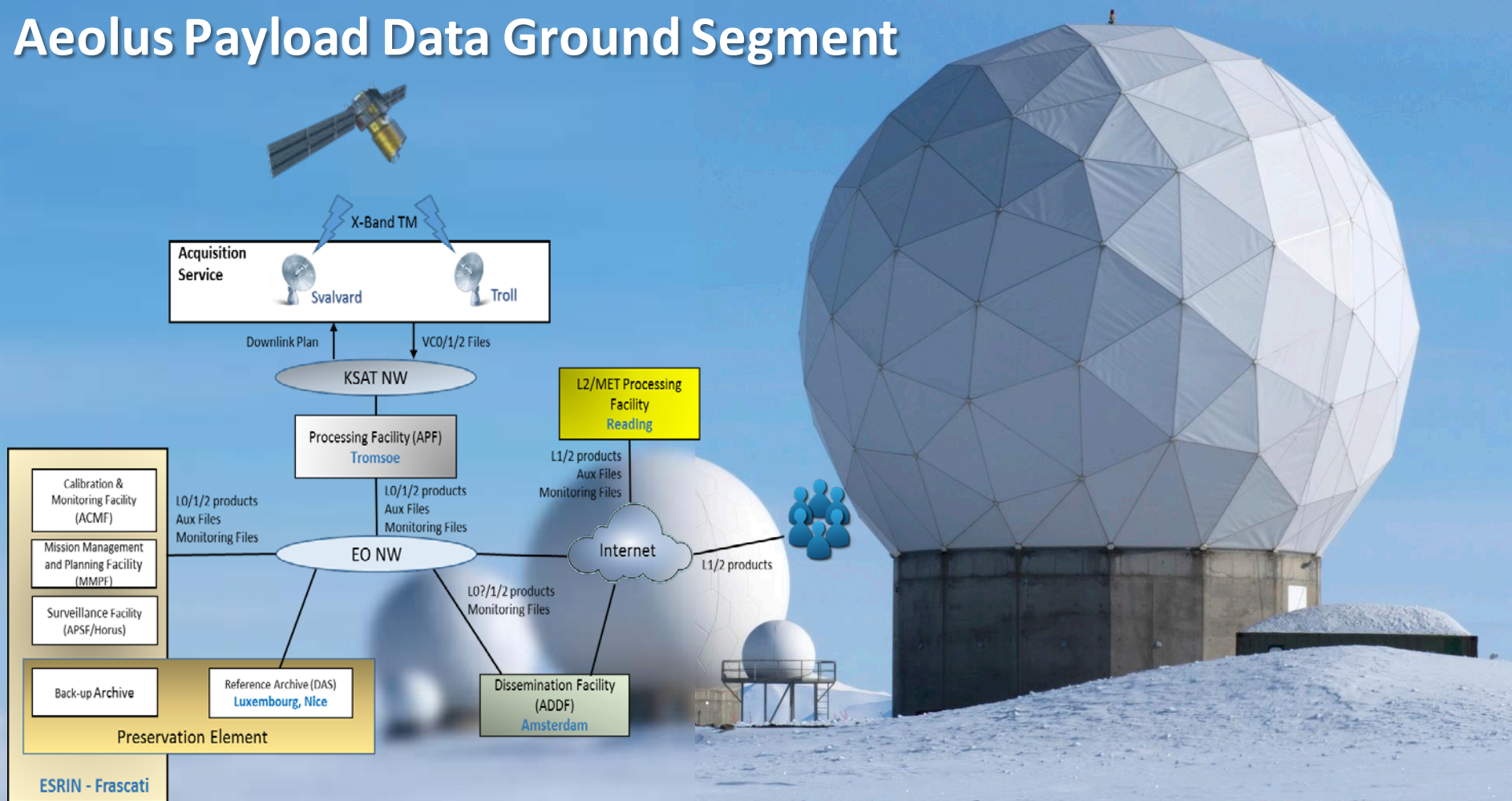# Aeolus PDGS Operations

P. Fischer (ESA-ESRIN), L. Mellano (RHEA), M. De Laurentis (RHEA), S. Aprile (RHEA), A. Biscuso (Serco)
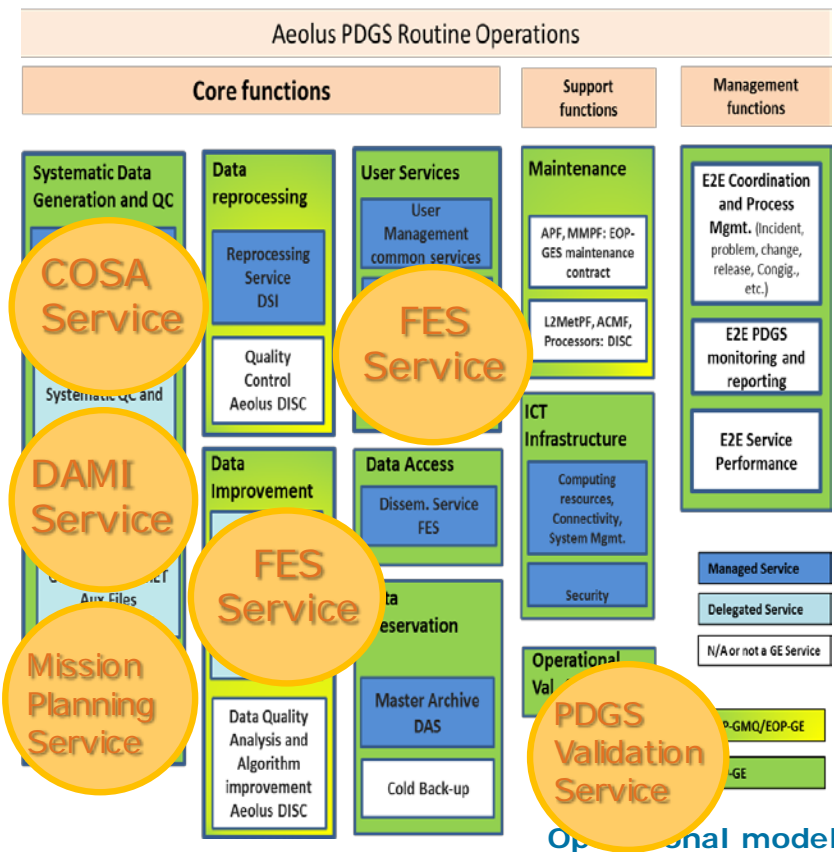
EGU General Assembly 2020

Aeolus Payload Data Ground Segment

Aeolus PDGS Operations: Overview

- Aeolus PDGS operations outsourced to **European industry**

- PDGS Operation management at ESA-Esrin

- Operations ensured through network of tailored **operational services** and collaboration of specialised teams

- Selected core tasks under direct ESA management: Mission Planning, PDGS validation and deployment management

- **ECMWF major contributor:** systematic generation of L2B + AUX Met data; Aeolus assimilation into medium range weather forecast model (L2C generation), L2B distribution to Eumetsat

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Aeolus PDGS Operations


Aeolus COSA Service/KSAT:
- Combined usage of Svalbard and Troll X-band stations ensures global NRT data coverage
- Since end of February 2019 new dedicated antenna at Troll for Aeolus mission
- Aeolus data acquired at Troll transmitted via satellite link within 2 minutes to Aeolus Processing Facility /Tromsø

- COSA Service website: https://www.ksat.no/cosa

Acquisition Performances

Science Telemetry Completeness
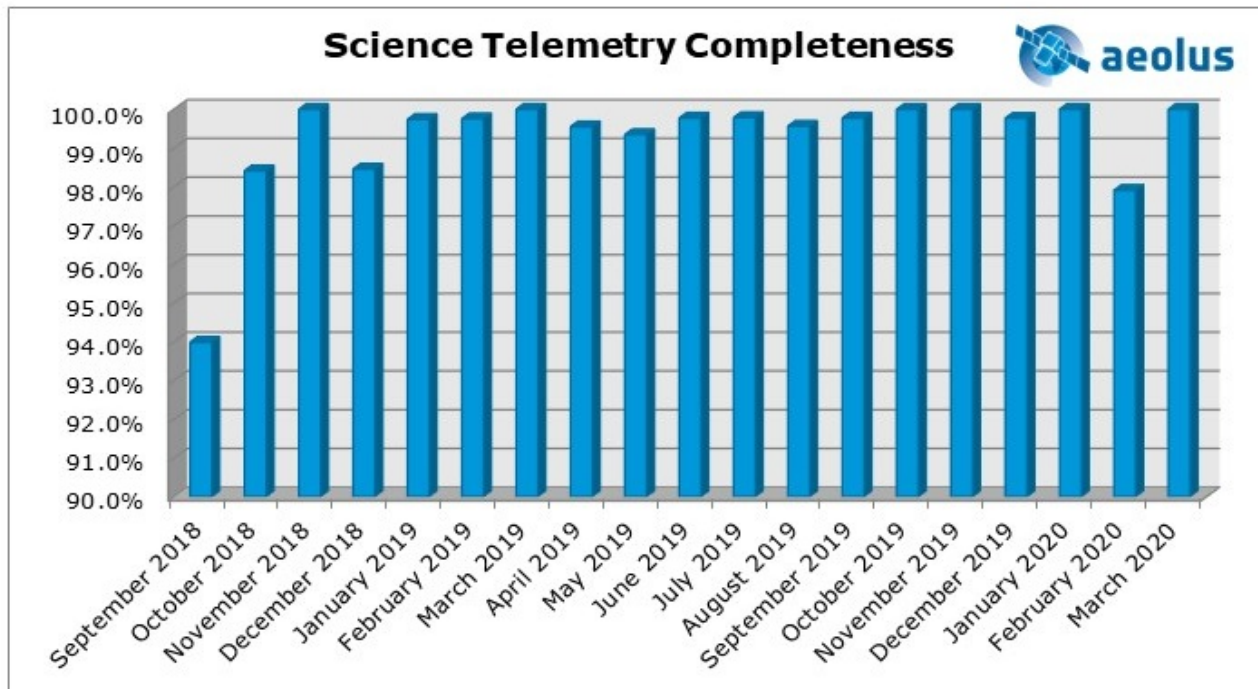
Month	Completeness
September 2018	94.0%
October 2018	98.4%
November 2018	100.0%
December 2018	98.5%
January 2019	99.7%
February 2019	99.8%
March 2019	100.0%
April 2019	99.5%
May 2019	99.3%
June 2019	99.8%
July 2019	99.8%
August 2019	99.6%
September 2019	99.8%
October 2019	100.0%
November 2019	100.0%
December 2019	99.8%
January 2020	100.0%
February 2020	97.9%
March 2020	100.0%

Phase E2 (since 02/19): 99.7%

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L1B NRT Performances

L1B data availability within 3 hours

Month	Availability
October 2018	92.29%
November 2018	99.08%
December 2018	98.88%
January 2019	96.04%
February 2019	97.41%
March 2019	97.83%
April 2019	99.32%
May 2019	99.78%
June 2019	99.26%
July 2019	98.22%
August 2019	99.78%
September 2019	98.87%
October 2019	97.61%
November 2019	98.91%
December 2019	100.00%
January 2020	99.56%
February 2020	98.83%
March 2020	99.78%

Phase E2 (since 02/19): 98.94%

L2B Performances

L2B Completness & Timeliness

Average L2B Completeness = 99.7%

Average L2B Timeliness = 98.3%

L2C Performance

L2C Completeness (Feb 2019 - 26 Apr 2020)

Legend: L2C completeness (blue bars), Average L2C completeness (orange line)

Values by month: Feb-19 95.2%, Mar-19 95.6%, Apr-19 99.8%, May-19 97.4%, Jun-19 95.5%, Jul-19 100.0%, Aug-19 100.0%, Sep-19 99.8%, Oct-19 100.0%, Nov-19 100.0%, Dec-19 100.0%, Jan-20 98.9%, Feb-20 99.8%, Mar-20 99.8%, Apr-20 100.0%

Average L2C Completeness = 98.5%

ECWMF assimilates Aeolus Data since 09/01/2020

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Data access (Cal/VAL)

Aeolus Data Downloads per Month
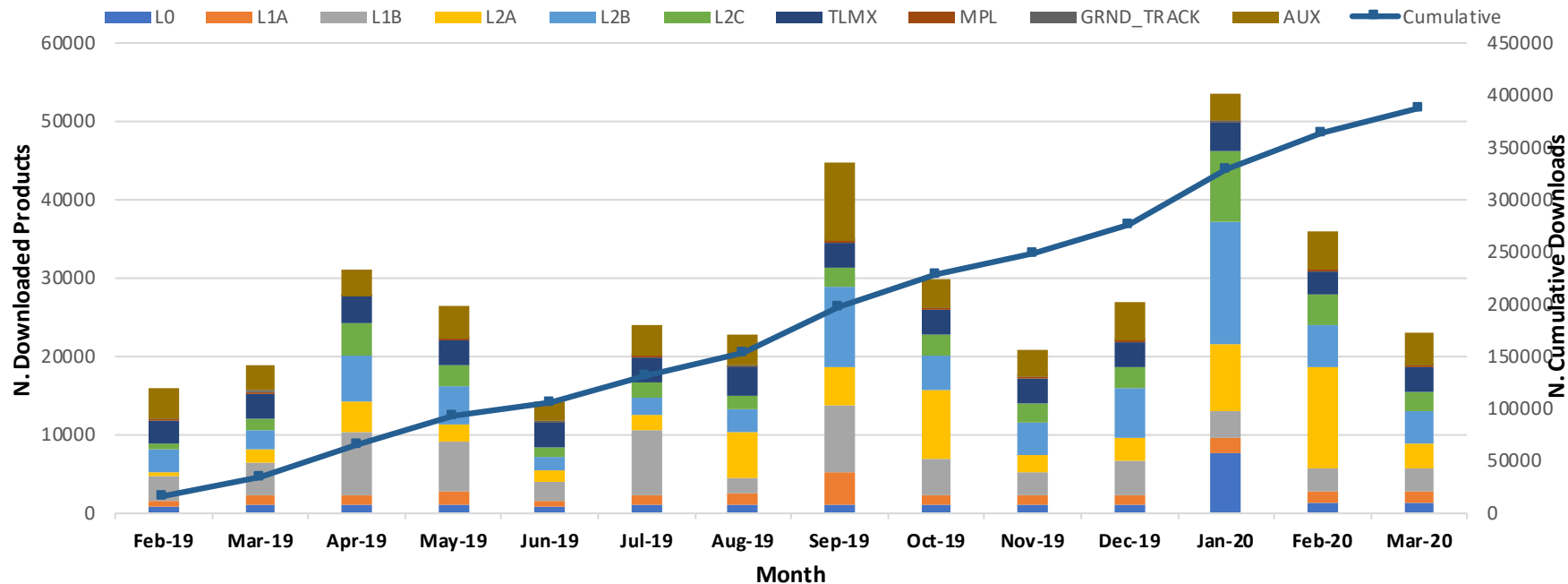
Legend: L0, L1A, L1B, L2A, L2B, L2C, TLMX, MPL, GRND_TRACK, AUX, Cumulative

X-axis (Month): Feb-19, Mar-19, Apr-19, May-19, Jun-19, Jul-19, Aug-19, Sep-19, Oct-19, Nov-19, Dec-19, Jan-20, Feb-20, Mar-20

Left Y-axis: N. Downloaded Products (0 – 60000)
Right Y-axis: N. Cumulative Downloads (0 – 450000)

ESA Aeolus Data Dissemination Portal **https://aeolus-ds.eo.esa.int/**

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Master datasets

- **Data consolidation:** All the processes and activities focused on identifying a consistent, consolidated and validated set of data records which can be declared as **Master,** i.e. usable for any future higher level re-processing campaign

- **Gap Detection:**
    - Inter-product gap: elapsed time between the end and the start of two chronologically consecutive files;
    - Intra-product gap: time between two consecutive records within the same file larger than the adopted threshold

AEOLUS Instrument timeline FMA VC1_20191025 (ref. aeolus_vc1_timeline_v1.0_20191213)
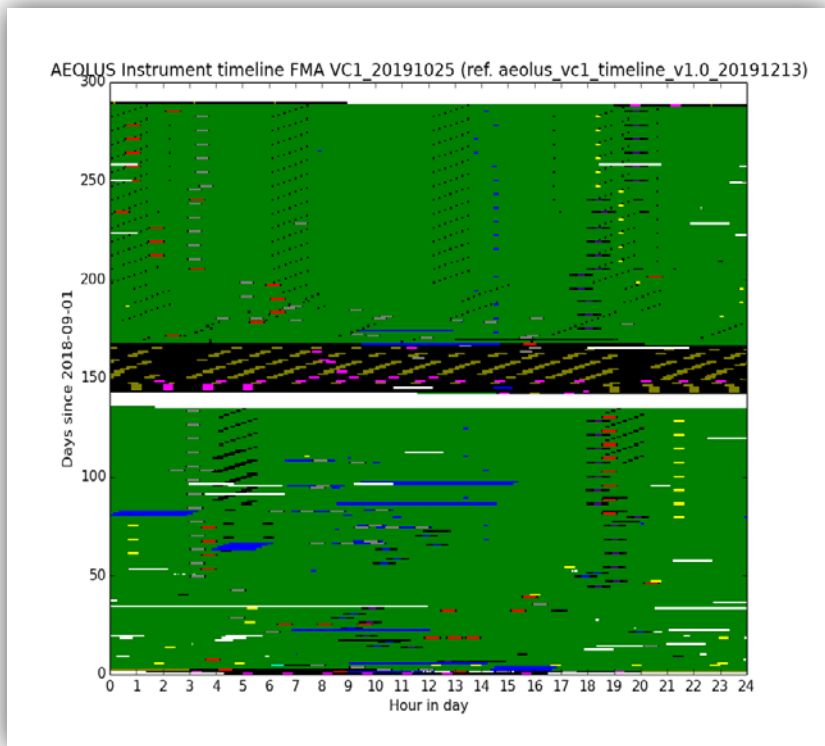
NOP: black
ISR: red
IAT: cyan
DCC: magenta
IDC: yellow
LCPA: orange
LDTA: brown
IRC: indigo
WVM: green
OWVM: blue
LBM: gray
DCMZ: olive
GAP: white

PDGS Evolution/Public Data Release

ESA Aeolus Data Dissemination Portal Evolution

https://aeolus-ds.eo.esa.int/

❑ **Access** to AEOLUS L1B + L2B FMB NRT products (B09) to public users from **12/05/2020**

    ❑ **Different level of data visualization for different user categories:** Public users will have direct access to:

        ❑ L2B Wind Products (open)

        ❑ L2B Wind Products (open)

        No change in data access functionality for CAL/VAL users

    ❑ **Access to products with a specific baseline.** public users gain access to Aeolus data processed with baseline 9.

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VirES for Aeolus
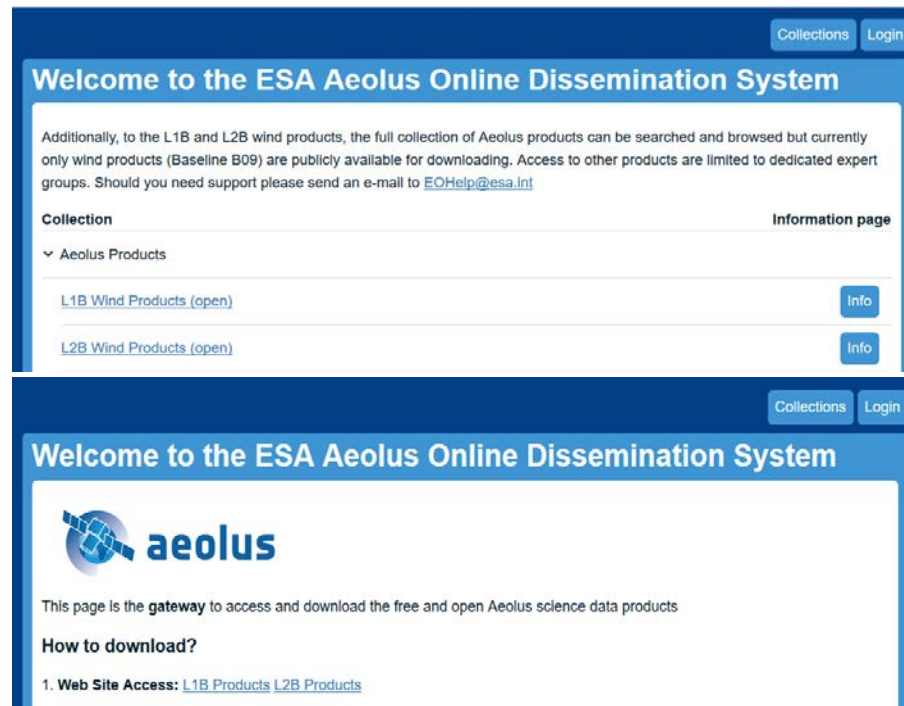
https://aeolus.services

- Interactive data manipulation and retrieval interface for Aeolus products.

- Updated Vires website will go life prior 12 May, adapted for public data access needs

- Public users will be able to self-register and manipulate/download L1B+L2B FMB NRT data products (B09)

- Existing access functionality for CAL/VAL community will remain unchanged.
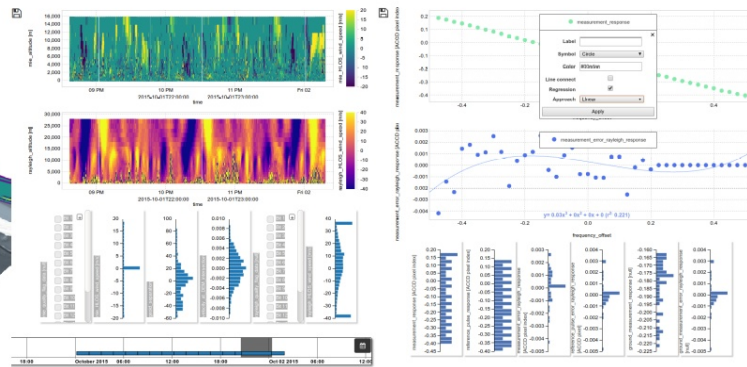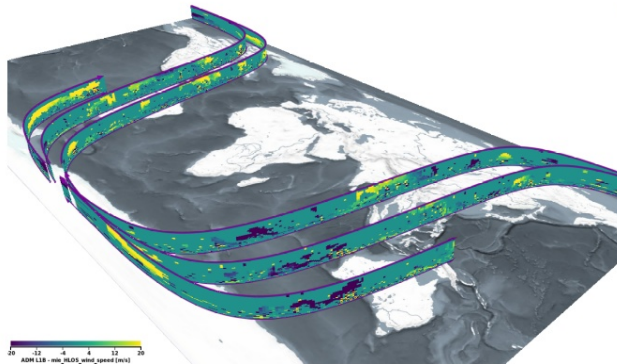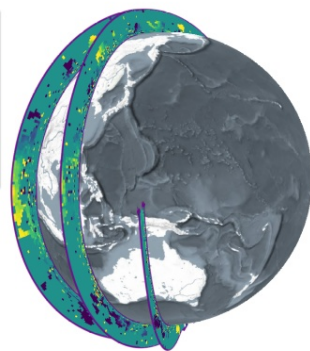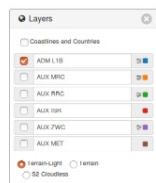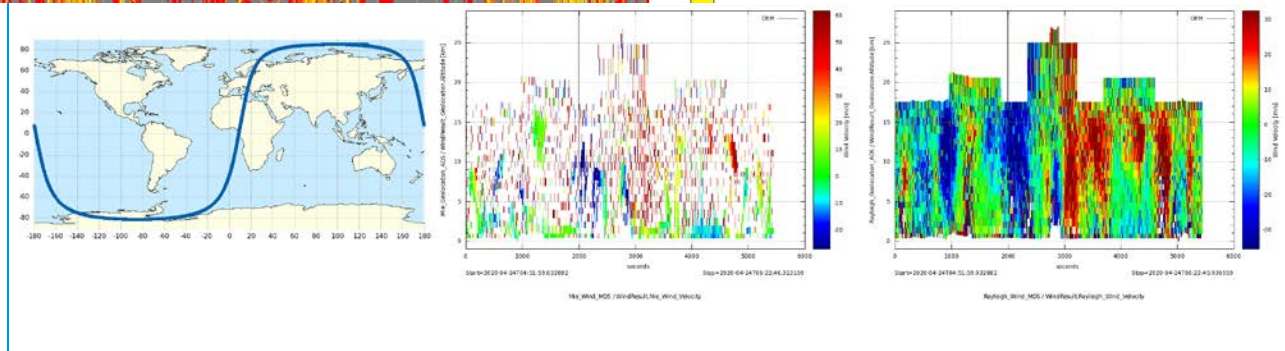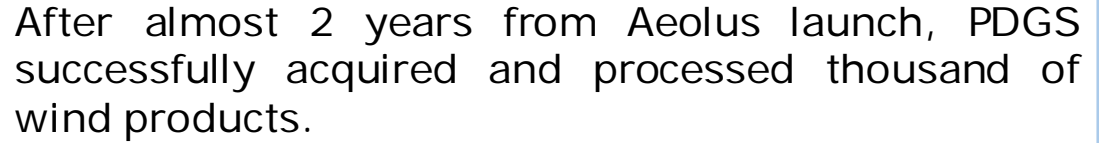
PDGS Evolution – Browse Images
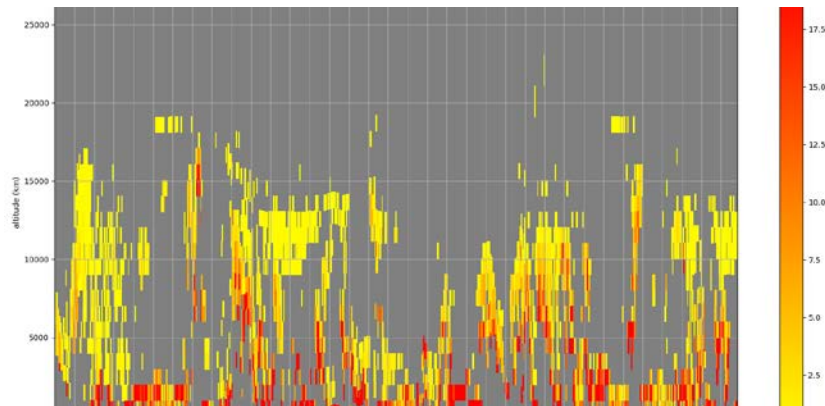
We will further enhance the (already available) ADDF Aeolus data quick-looks, to improve the plotting functionality in order to allow the main atmospheric features to be visible and hence avoid that plots are dominated by gross errors or noise.

Implementation schedule to be agreed with Exprivia (target for deployment: Q2 2020)

PDGS Evolution – Processing Infrastructure

After almost 2 years from Aeolus launch, PDGS successfully acquired and processed thousand of wind products.

Now, to ensure a better redundancy, to reach the final storage capacity and to improve the processing performance we decided to upgrade the Aeolus Wind Data Processing Facility (APF) hardware infrastructure.

Procurement is completed and installation is now started.
New virtualised infrastructure operational by June 2020.

PDGS Evolution – QRT Service

After 20 months of Operations we are confident about the possibility to generate more than 30 minutes of Wind data delivered in less than 20 minutes from the sensing time.

It would be challenging to integrate new local acquisition stations before the end of the mission to exercise this capability.

The implementation has not been planned, SAG + Mission Management to provide way forward.
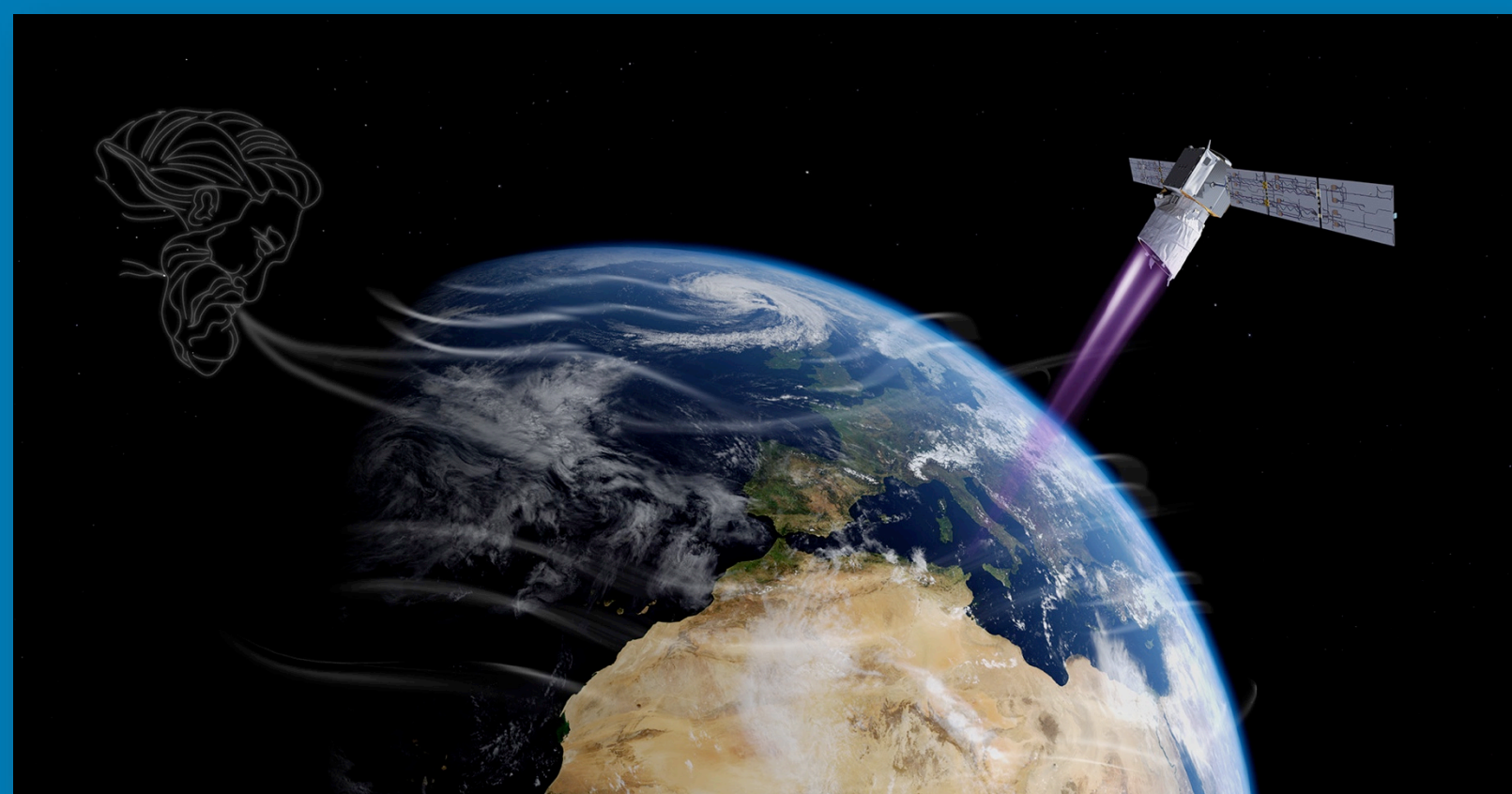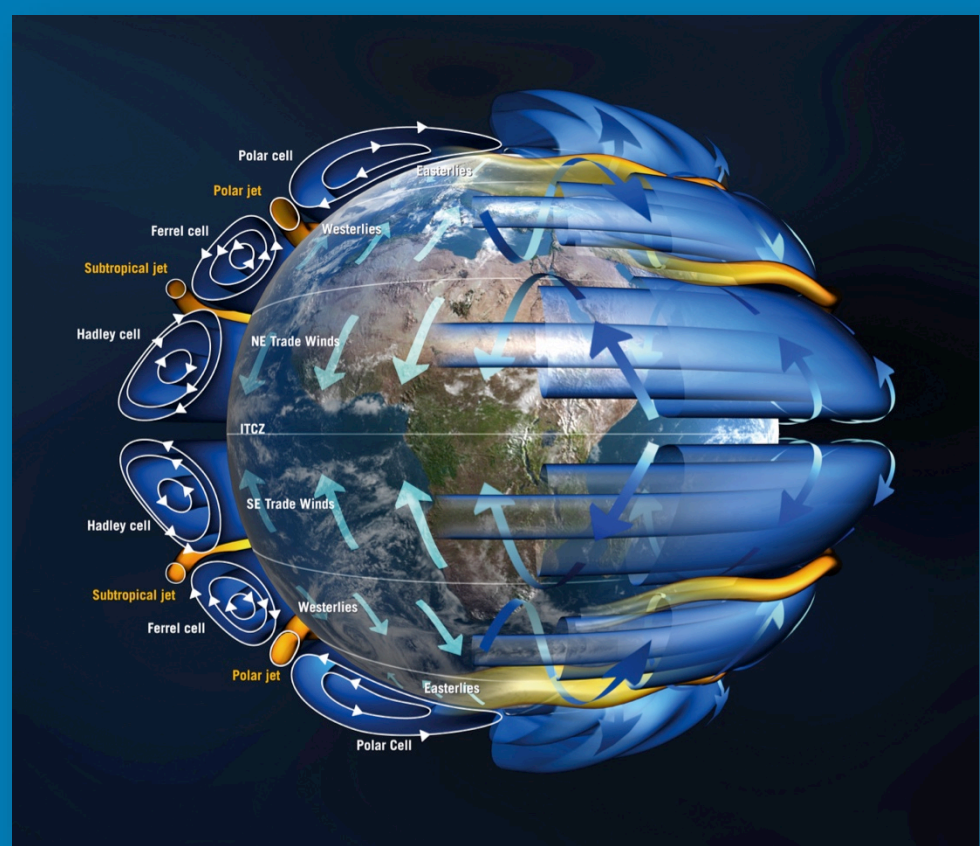
- **Aeolus Ground segment operations** ensured through network of tailored operational services and collaboration of specialised teams

- **Stable operations** are a **key facilitator** of scientific results

- Operational **mission objectives** as per MRD **fully met**:

  Science telemetry availability: 99.7%

  Data NRT production/delivery performances

  98.3 % of L2B BUFR made available within 3 hours

- **Rapid validation/deployment into operations**

- **Continuous Mission Planning operations** with routine weekly delivery of mission plans

- **Next major milestone:**

  Release of Aeolus L1B and L2B NRT data (B09) to public user community (12 May 2020)

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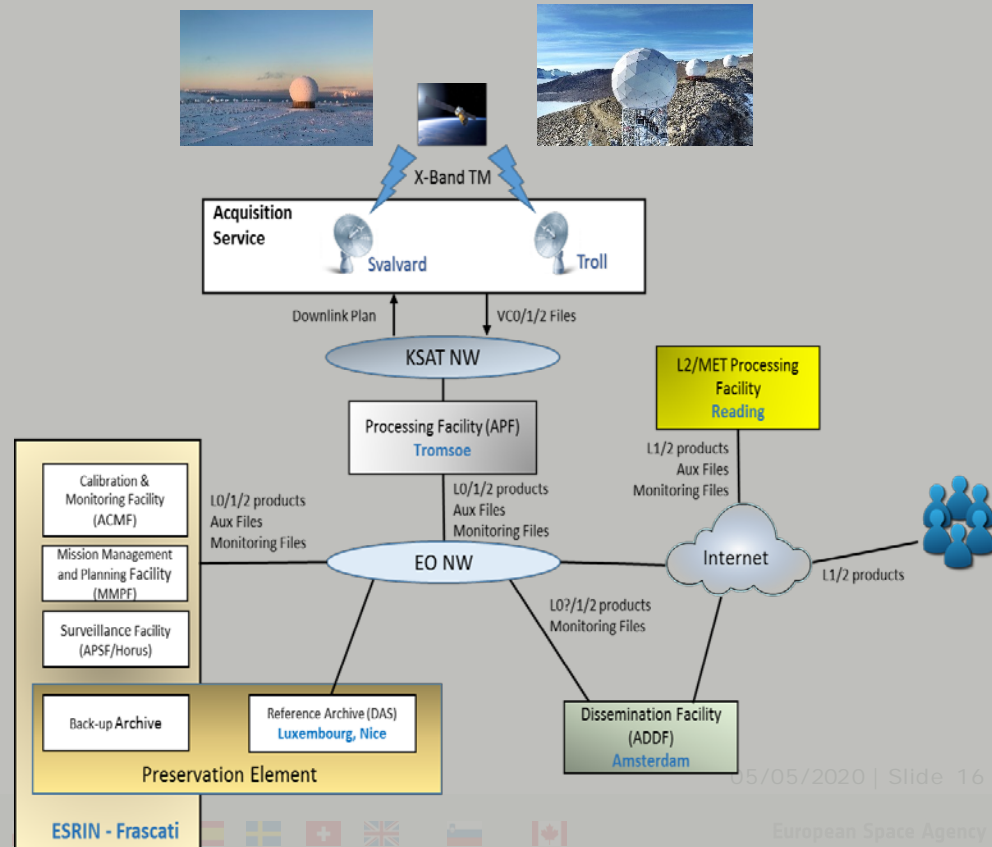
aeolus

→ESA'S WIND MISSION

Aeolus Payload Data Ground Segment operations

Peggy Fischer[1] (Peggy.Fischer@esa.int), Luca Mellano[2] , Marta De Laurentis[2] , Stefano Aprile[2], Antonio Biscuso[3]

(1) ESA-ESRIN, Italy; (2), Rhea Italia S.p.A., Italy; (3) Serco S.p.A., Italy

Payload Data Ground Segment (PDGS) – Main features

- ALADIN data acquisition, processing, re-processing and archiving. Processing of data is done within the ESA PDGS for Level-1B and Level-2A products while the generation of Level-2B/-2C products is performed in the 'L2Met Processing Facility' hosted by the European Centre for Medium-Range Weather Forecasts (ECMWF).
- ALADIN operations planning (routine wind measurements and calibration data generation).
- ALADIN calibration data processing and product data quality monitoring.
- Data dissemination to the users community ensuring Near Real Time (NRT) conditions for L1B products and Quasi-Real Time (QRT) for a sub-set of L1B products.

Functional breakdown
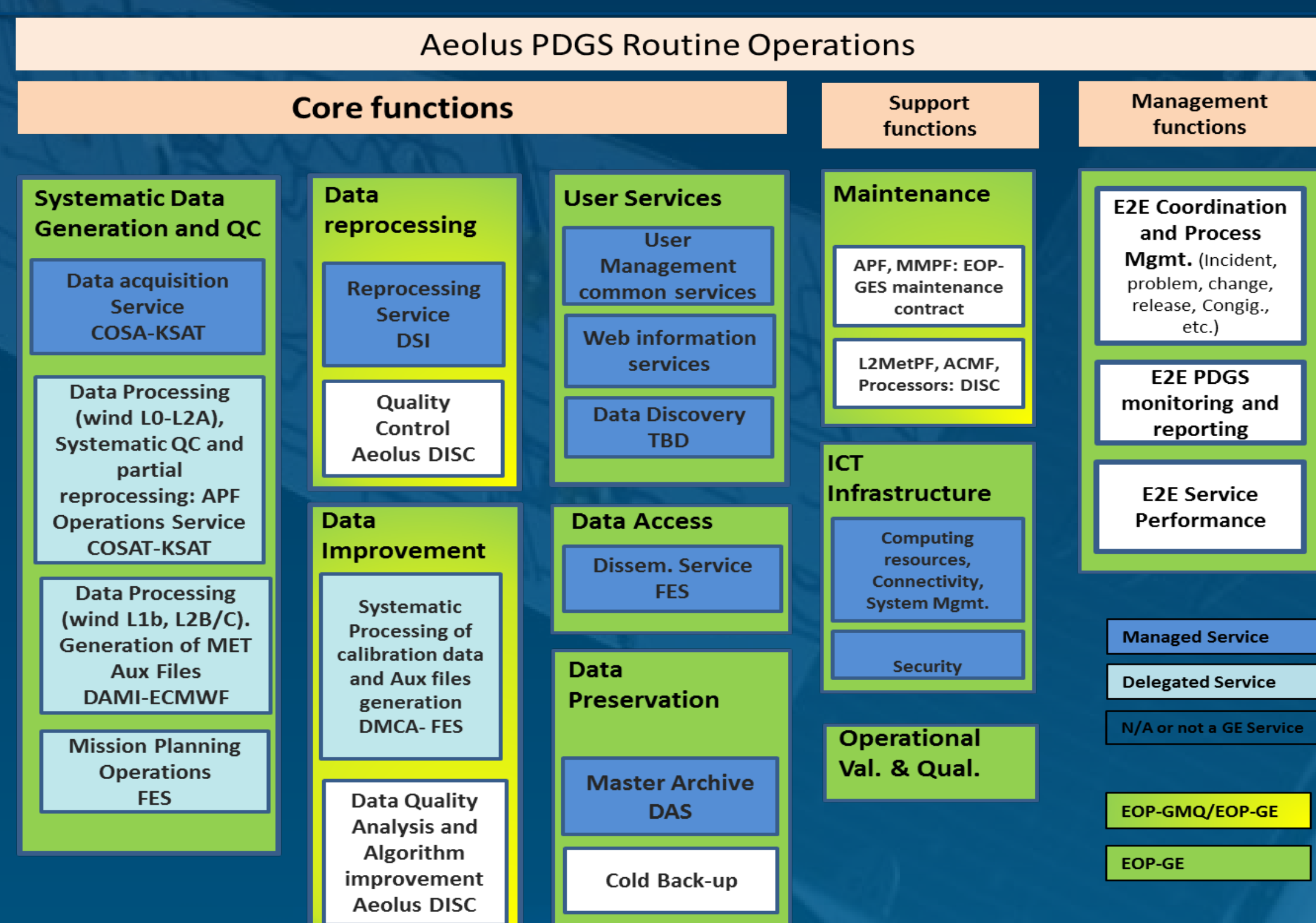
Aeolus PDGS operations outsourced to **European industry**
- PDGS Operation management at ESA-Esrin
- Operations ensured through network of tailored **operational services** and collaboration of specialised teams
- Selected core tasks under direct ESA management: Mission Planning, PDGS validation and deployment management
- **ECMWF major contributor**: systematic generation of L2B + AUX Met data; Aeolus assimilation into medium range weather forecast model (L2C generation), L2B distribution to Eumetsat

Geographical distribution
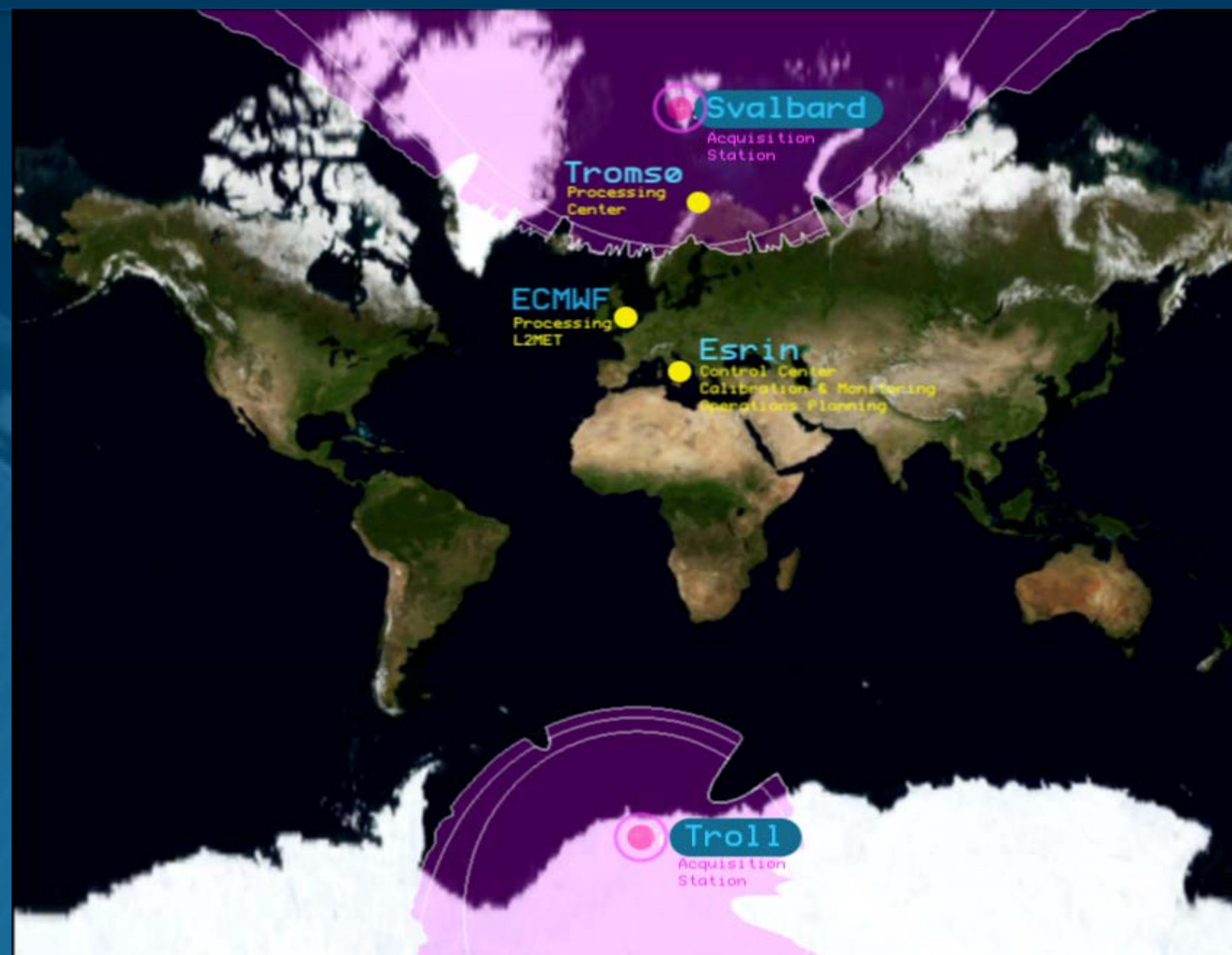
The Aeolus Payload Data Ground Segment is distributed across Europe.

Aeolus Wind production up to L2A in near-real time is performed by the Kongsberg Satellite Services (KSAT) company in Tromsø (N). The same company is also providing the X-band acquisition Service based on combined usage of Svalbard and Troll stations.

ESRIN, the ESA's center for Earth observation in Frascati, near Rome (I) oversees operations management. From this site the full PDGS is controlled/monitored and the ALADIN instrument operations are planned.

ECMWF in Reading (UK) is the center producing systematically the consolidated HLOS wind observations with full atmospheric corrections (Level-2B) from the preliminary HLOS data based on standard (default) atmospheric corrections (Level-1B). Moreover at ECMWF the Aeolus assisted wind profiles, 'u' and 'v' components result of NWP assimilation processing (Level-2C) are generated.

Data Processing concept
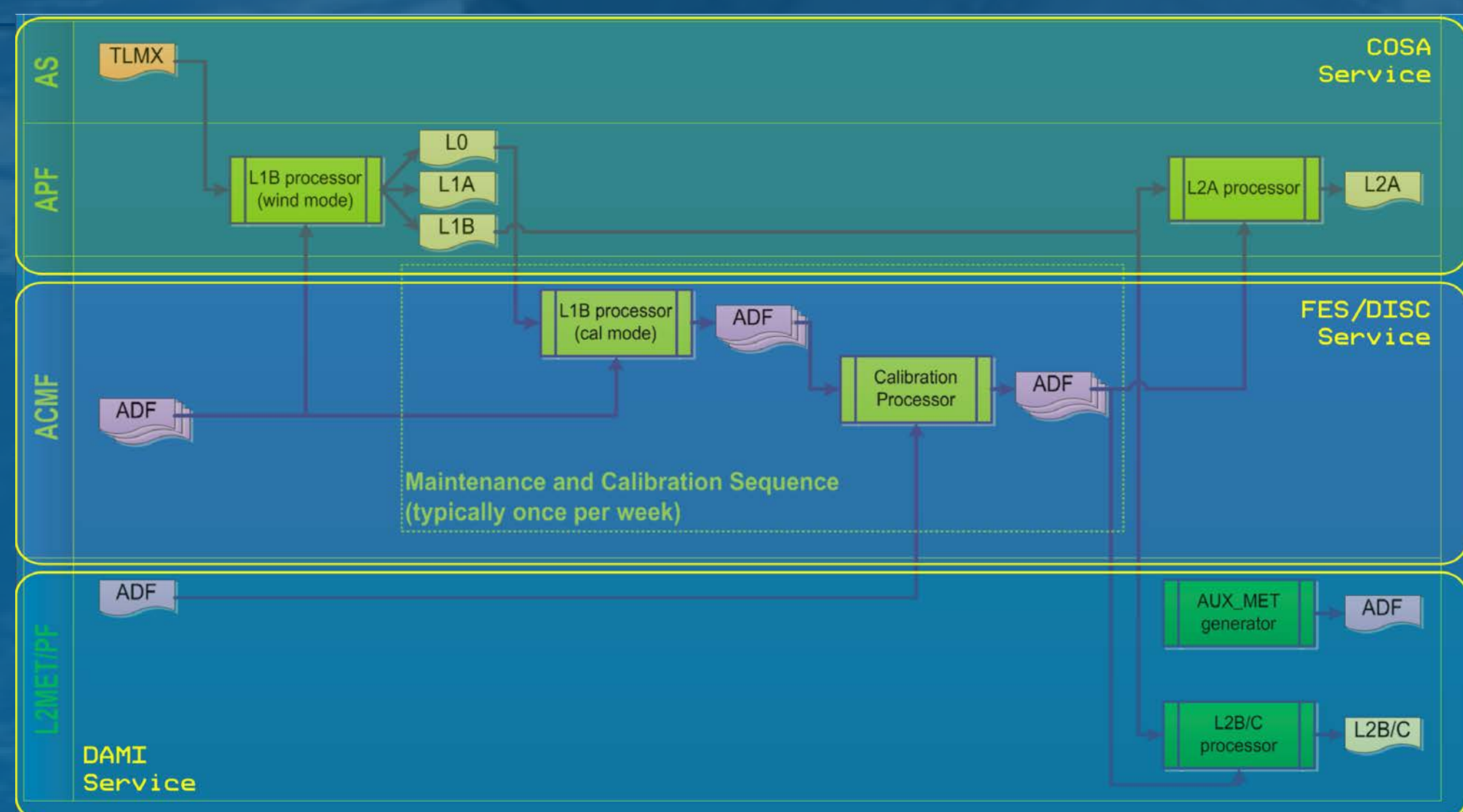
The data processing is based on three processors (in addition to the L2B processor and the AUX_MET generator running at the L2Met/PF at ECMWF).

The raw telemetry (TLMX) downloaded from the satellite is processed by the L1B processor in 'wind' mode; this is a single processor that generates at the same time the L0, L1A and L1B products.

The same processor (L1B) is used in the ACMF in 'calibration mode' to generate a first set of ADFs on the basis of the data generated on-board during the Maintenance and Calibration Sequence. A second set of ADFs is then generated/updated by the Calibration Processor. This processor needs and additional auxiliary file (AUX_MET) that contains the latest atmospheric pressure, temperature fields forecast. The AUX_MET file is generated by L2Met/PF every 12 hours.

The L2A processor is executed in the APF (once the necessary ADFs are available from ACMF) to generate the L2A products from the L1B.

In parallel the L1B products and the ADFs are sent to L2Met/PF where the L2B/C processors are executed to generate the corresponding products that are sent back to APF for further distribution to the user's community.

Users Data access
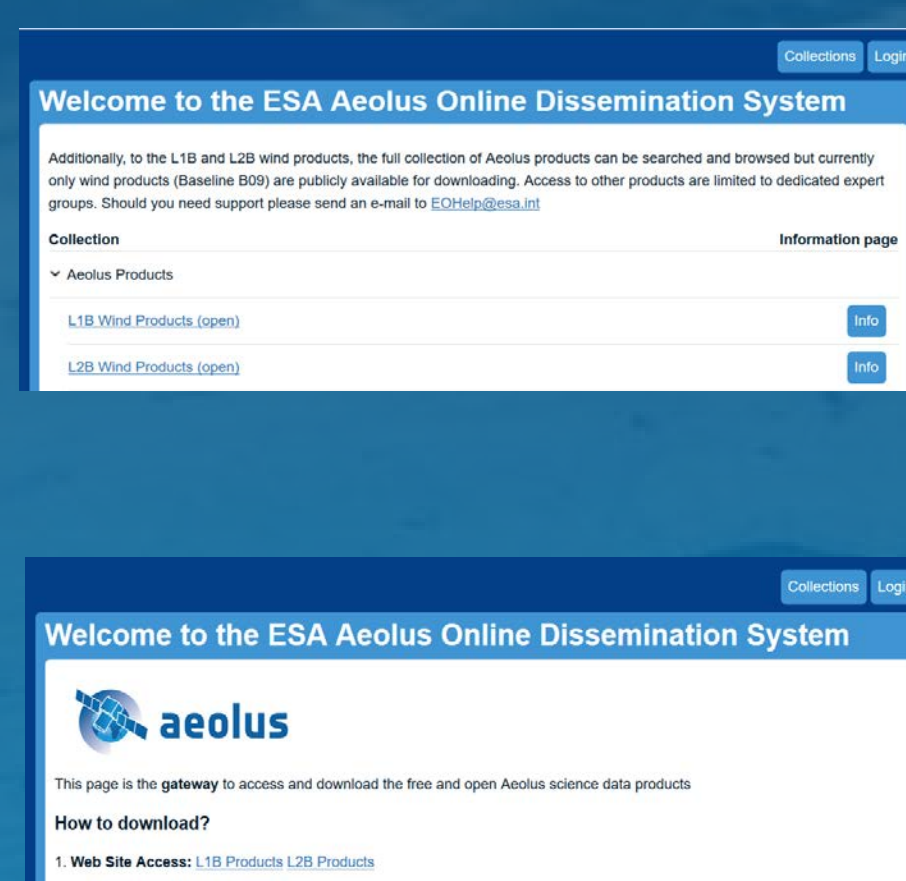
The user community (public and CAL/VAL) have access to Aeolus data via the ADDF which provides an HTTP / FTP interface.
- https://aeolus-ds.eo.esa.int/
- public users gain access to a subset of the Aeolus products (as show in the figure):
  - L1B Wind Products
  - L2B Wind Products
- Public users have access to data from baseline 09
- Aeolus data can also be manipulated interactively from the Vires system under:
  - https://Aeolus.services

Near Real Time and Quasi Real Time

One of the driving requirements for the Aeolus mission is the capability to provide data to the Numerical Weather Prediction (NWP) centers in Near Real Time (NRT) conditions. A certain data is considered to met the NRT condition if it is available to NWP within three hours from sensing.

The design of the PDGS is compliant to this requirement if the data is dumped to ground from the satellite within 100 minutes since sensing.

The PDGS is also able to support dedicated ground stations in regions where the data is required to be in Quasi Real Time condition, i.e. within 30 minutes from sensing. The PDGS is able to provide data in QRT condition for sensing time within 10 minutes from dump time.