

THE SENTINEL-3 MISSION PERFORMANCE CENTER

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ABSTRACT

As part of the Sentinel-3 mission and in order to ensure the highest quality of products, ESA in cooperation with EUMETSAT has set up the Sentinel-3 Mission Performance Centre (S-3 MPC). This facility is part of the Payload Data Ground Segment (PDGS) and aims at controlling the quality of all generated products, from L0 to L2. The S-3 MPC is composed of a Coordinating Centre (CC), where the core infrastructure is hosted, which is in charge of the main routine activities (especially the quality control of data) and the overall service management. Expert Support Laboratories (ESLs) are involved in calibration and validation activities and provide specific assessment of the products (e.g., analysis of trends, ad hoc analysis of anomalies, etc.). The S-3 MPC interacts with the Processing Archiving Centres (PACs) and the Marine centre at EUMETSAT.

1. Context

As shown in Fig. 1, the Mission Performance Centre (MPC) is one of the S-3 PDGS entities.

Its role consists in assessing the quality of products delivered by the PDGS. Many interactions will happen with other PDGS entities.

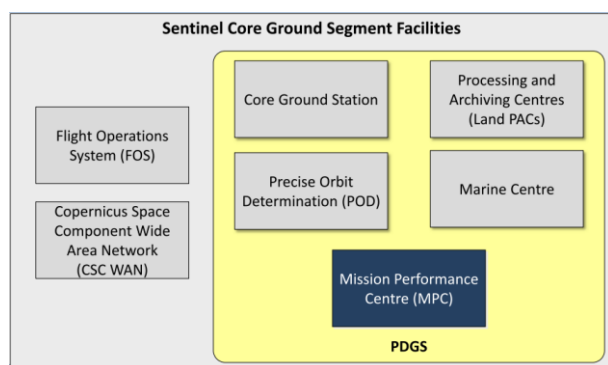


Figure 1. PDGS entities

Copernicus Context

The S3-MPC is actually part of the Copernicus programme which is a European system for monitoring the Earth. The Copernicus programme is coordinated and managed by the European Commission.

Copernicus consists of a complex set of systems which collect data from multiple sources: earth observation satellites and in situ sensors such as ground stations, airborne and sea-borne sensors. It processes these data and provides users with reliable and up-to-date information through a set of services related to environmental and security issues.

Several services are being set up and address various thematic areas and support a wide range of applications. The main users of Copernicus services are policymakers and public authorities who need the information to develop environmental legislation and policies.

Based on the Copernicus services and on the data collected through the Sentinels and the contributing missions, many value-added services can be tailored to specific public or commercial needs, resulting in new business opportunities. In fact, several economic studies have already demonstrated a huge potential for job creation, innovation and growth.

The S-3 MPC contract whose purpose is the verification, the calibration, and the validation of PDGS products has an important role to play in regards of the objectives of Copernicus. Its positioning is given in Fig. 2.

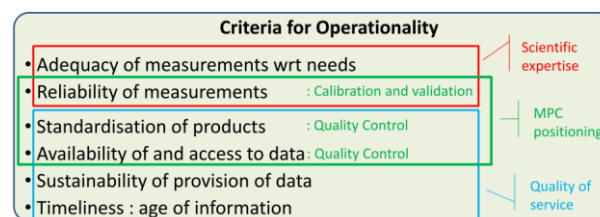


Figure 2. S3-MPC positioning

2. Rationale for building the team

The S-3 MPC service contract is currently carried out by a consortium composed of 23 partners and led by ACRI-ST, France.

The team has been built in order to cover the wide spectrum of Sentinel-3

- In terms of mission: OPT & STM
- In terms of instruments and products

and to comply with operational requirements. As an example, the Routine Operations Phase is a service contract, governed by Service Level Agreement and evaluated against a set of KPIs (Key Performance Indicators).

The team has been sized to tackle the specificities and the challenges of the optical and altimetry missions.

For the optical mission, these specificities can be briefly summarised:

- The scope of activities is wide due to the size of the mission, with 2 instruments and tens of products to calibrate and validate;
- Sentinel-3 is an innovative mission, designed to better fit with the wide spectrum of users' expectation in terms of accuracy, timeliness and reliability of measurements: if for OLCI, we rely on a strong MERIS background, the Synergy products are new and the SLSTR instrument is radically different from AATSR, leading to specific and new calibration activities;
- The high number of ESLs, necessary to cover all aspects of the optical mission, has led to an organisation facilitating cross-cutting discussions and activities between OLCI and SLSTR, as well as identifying synergies between the 2 instruments

3. Planning

The S-3 MPC contract was kick-offed in September 2014 with a first set-up phase of 12 months which consists in preparing all activities to be performed during the Commissioning & the Routine Operations phases.

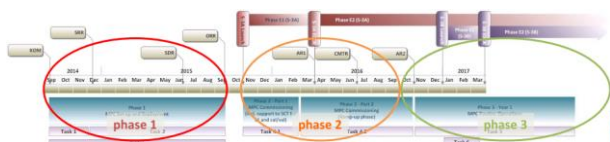


Figure 3. Planning of the S3MPC

After the launch of S3-A (planned before end of 2015), the S-3 MPC will start its second phase to support commissioning activities, during 12.5 months. Then a routine operation phase of up to 5 years will begin,

including the commissioning activities related to S3-B when this unit will be launched.

These 3 phases, as well as key milestones, are displayed in Fig. 3.

4. Activities

Though all instruments and products of the S-3 mission are in the scope of the S-3 MPC, a certain number of activities are specific to the Optical mission, which includes OLCI, SLSTR and SYN products, some other are specific to the Surface Topography Mission (STM), which addresses validation of topography products over all surfaces.

In the frame of the S-3 MPC, 2 types of activities will be done:

- **Routine Quality Control**, done by dedicated operators based at the MPC/CC; for the optical mission, there will be 3 operators who will monitor the quality of OLCI, SLSTR and SYN products; for STM, one operator will be based at CLS which host the MPC/CC secondary centre
- **Calibration and Validation activities**, as well as detailed analysis and specific expertise, done by the ESLs (Expert Support Laboratories) based in their own institutes but closely linked to the MPC/CC; 14 ESLs dedicated to the optical mission and 7 ESLs dedicated to STM are part of the S-3 MPC consortium.

The role of ESLs is essential as they are responsible for the Instrument and Level 1 processing performance and configuration and for the Level 2 processing and configuration, as well as products validation. More specifically, they are in charge of:

- Maintaining the Cal/Val and Cal/Val Implementation plans;
- Supporting the Satellite Commissioning Team during the S3-A commissioning, get ready and perform S3-B commissioning;
- Ensuring the Cal/Val Implementation Plan execution, while synthesizing results, and reporting on achieved performances;
- Proposing sensor and processing baseline evolutions (algorithms & database);
- Performing anomaly investigations.

On the STM side, a high qualified team is ready to address the different issues of Sentinel-3 STM payload:

- Quality Control activities
- The calibration, characterisation and performance of the altimeter (SRAL) and the microwave radiometer (MWR) sensors

- Validation of the products and ground processing for topography observations over all the different surfaces (ocean, sea ice, coastal, river and lakes, land ice sheet), but also for wind and wave data.
- Assessment of the mission performance, both at global and regional scales, based on comparison with other altimeters and with in-situ data
- Support for the continuous improvement of the S-3 STM performance taking into account both operational needs from the Copernicus Service and needs expressed by the scientific community.

5. Hosting the infrastructure

The MPC/CC will host the core infrastructure, composed of servers, hard disks and workstations for the operators. A LAN (local Area Network) has been set up to ensure the communication flows between all entities of the S3-MPC.

This core infrastructure is hosted in a data centre, located closed to ACRI-ST (see Fig. 4). The centre is connected itself to the Copernicus WAN from which the S3 data will be accessible.



Figure 4. Location of the core infrastructure

Fig. 5 shows the room in which the racks are installed. Please note that, in addition to the S3-MPC, the S3-PAC (SLSTR+SYN) and the S2-MPC are hosted there.



Figure 5. Data Centre

6. The ESLs

As explained above, there are many ESLs who are members of the S3-MPC consortium and their role is essential.

A brief presentation of the ESLs per instrument is provided hereafter. For all instruments, we have more or less the same scheme:

- A distinction between L1 and L2;
- For L2, a distinction between Land and Marine products.

Fig. 6 shows the ESLs for OLCI and SYN products. The ESL coordinator is Ludovic Bourg, ACRI-ST.

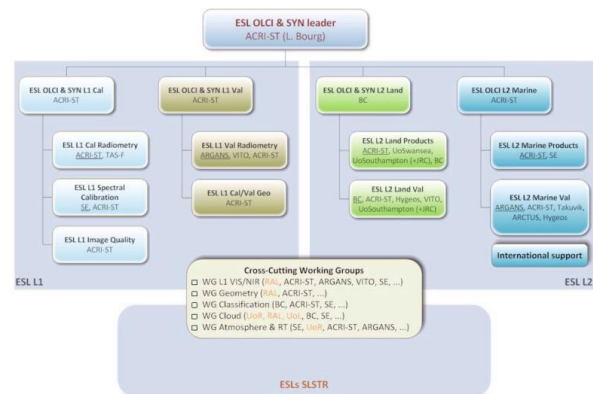


Figure 6. OLCI/SYN ESLs

Fig. 7 shows the ESLs for SLSTR products. The ESL coordinator is Dave Smith, RAL Space/STFC.

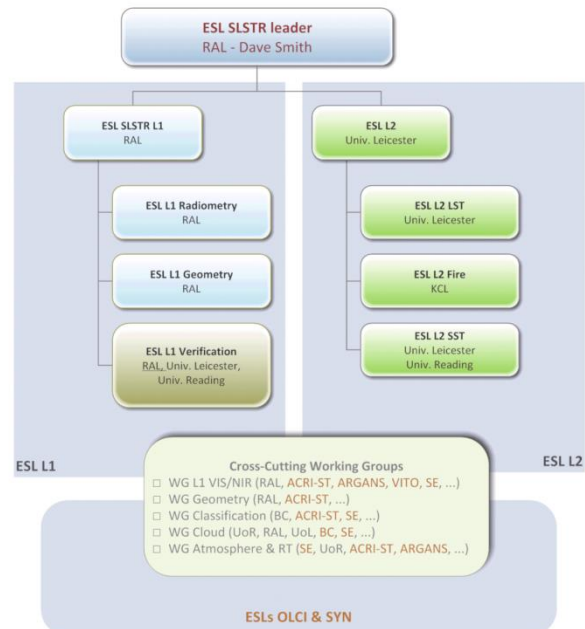


Figure 7. SLSTR ESLs

It shall be noted that different working groups are foreseen to address some topics of interest to both OLCI and SLSTR sensors (e.g., geometry, cloud,...)

Fig. 8 shows the ESLs for the altimetry mission. The ESL coordinator is Graham Quartly, PML.



Figure 8. STM ESLs

During the commissioning phase, the S-3 MPC will progressively start its activities of control and validation of PDGS products. Meanwhile, some partners are involved in phase E1 activities done by the ESTEC teams, which should ensure a seamless transition towards the routine operations phase.

The MPC/CC and the ESLs exchange products, calibration data and reports. The main tool operated at the MPC/CC is the S-3 Mission Performance Monitoring Facility (MPMF).

7. Collaborative platforms

Due to the high volume of data which must be exchanged and in order to facilitate the analysis to be performed by the expert scientists, an innovative facility is being implemented as part of the MPC/CC. We propose to all ESLs to use a collaborative platform

which is a secured IT environment mixing hardware and software elements enabling users to work remotely. The main benefit is that users do not need to download huge amount of data before processing and analysing the data. Moreover, they will benefit from processing capacities.

Specific tools will be made available through the collaborative platforms. As an example, for the optical mission, tools like the S3 toolbox, ODESA or MERMAID (adapted to OLCI) will be accessible through the environment.

8. Current status

As dated on beginning of June 2015, the status of the S3-MPC contract is as follow:

- the Site Readiness Review (see Fig. 9) was successfully passed on last January, meaning that both sites are ready to receive the H/W supplied as CFI and are connected to the Copernicus WAN.
- the Service Design Review is planned on 23-24-June
- The rehearsal activities to assess the readiness of the S3-MPC are planned after the SDR;
- Operations Readiness Review will take place in Sept./Oct. 2015.



Figure 9: Tests done during the SRR

Disclaimer

The work performed in the frame of this contract is carried out with funding by the European Union. The views expressed herein can in no way be taken to reflect the official opinion of either the European Union or the European Space Agency.

