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DOCUMENT

Call to establish a Sentinel-3 Validation Team (S3VT)

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1 REFERENCE DOCUMENTS

- [RD-1] The Sentinel-3 Calibration and Validation Plan (S3-CVP-version), first draft [July 2012]
- [RD-2] C. Donlon, B. Berruti, A Buongiorno, M-H Ferreira, P. Femenias, J. Frerick, P. Goryl, U. Klein, H. Laur, C. Mavrocordatos, J. Nieke, H. Rebhan, B. Seitz, J. Stroede, and R. Sciarra, (2012), The Global Monitoring for Environment and Security (GMES) Sentinel-3 Mission, Remote Sensing of the Environment, 120,27-57, <http://dx.doi.org/10.1016/j.rse.2011.07.024>, 2012
- [RD-3] Sentinel-3 Mission Requirements Traceability Document (MRTD), Issue 1, available from http://download.esa.int/docs/EarthObservation/GMES_Sentinel-3_MRTD_Iss-1_Rev-0-issued-signed.pdf

2 INTRODUCTION

This document sets out a joint ESA-EUMETSAT Call for a Sentinel-3 Validation Team (S3VT) to provide external validation inputs to the Sentinel-3 Mission. It defines the purpose and scope of the S3VT, provides a summary of the early mission timeline, provides a summary of expectations from S3VT members, sets out the boundaries for data provision, and presents the mechanisms and roadmap to initiate the Call.

A template for prospective members of the S3VT to submit their proposed activities and request membership of the S3VT is also provided. Finally a schedule and points of contact for this call are presented.

3 PURPOSE OF THE S3VT

ESA and EUMETSAT (the Agencies) seek the involvement of the international community with experience in conducting scientific verification and validation of Sentinel-3 type data, field experiments and campaigns.

The aim of this call is:

“To engage world-class expertise and activities, through mutual benefit collaboration, that support the implementation of the Sentinel-3 validation activities and ensure the best possible outcomes for the Sentinel-3 Mission”

The call is open to relevant and interested groups and individuals worldwide; group responses are particularly welcome.



4 BACKGROUND

The Sentinel-3 mission is an operational mission in high-inclination, low earth orbit. The complete mission objectives are achieved with two satellites (Sentinel-3A and Sentinel-3B) flying in tandem in orbit separated by 180deg. Sentinel-3 carries three core instruments, plus supporting instruments for the topography payload:

- The Ocean and Land Colour Instrument (OLCI) providing ocean colour and land reflectance measurements,
- The Sea and Land Surface Temperature Radiometer (SLSTR) providing surface temperature measurements,
- Synthetic Aperture Radar Altimeter (SRAL), supported by the Microwave radiometer (MWR) and POD package (GNSS, DORIS, LRR) together providing surface topography measurements.

Sentinel-3 also introduces new aspects (in comparison with previous missions):

- Along-track SAR Altimetry over ocean and coastal surfaces, in-land water and sea-ice,
- Active fire monitoring capability,
- Vegetation products extraction by exploitation of the synergy between the optical instruments.

The Sentinel-3 satellites have a repeating, frozen sun-synchronous orbit with local solar times close to 10:00 am. The orbit has a repeat cycle of 27 days (14+7/27 revolutions per day) with an average altitude of 815 km and an inclination of 98.6 deg.

See [RD-2] for a full description of the Sentinel-3 mission.

4.1 Overview of early Mission timeline

The Sentinel-3A Mission is expected to be launched in April 2014 and will enter a 5-month satellite commissioning phase (Phase E1) followed by a routine operations phase (Phase E2) for the remainder of its operational life.

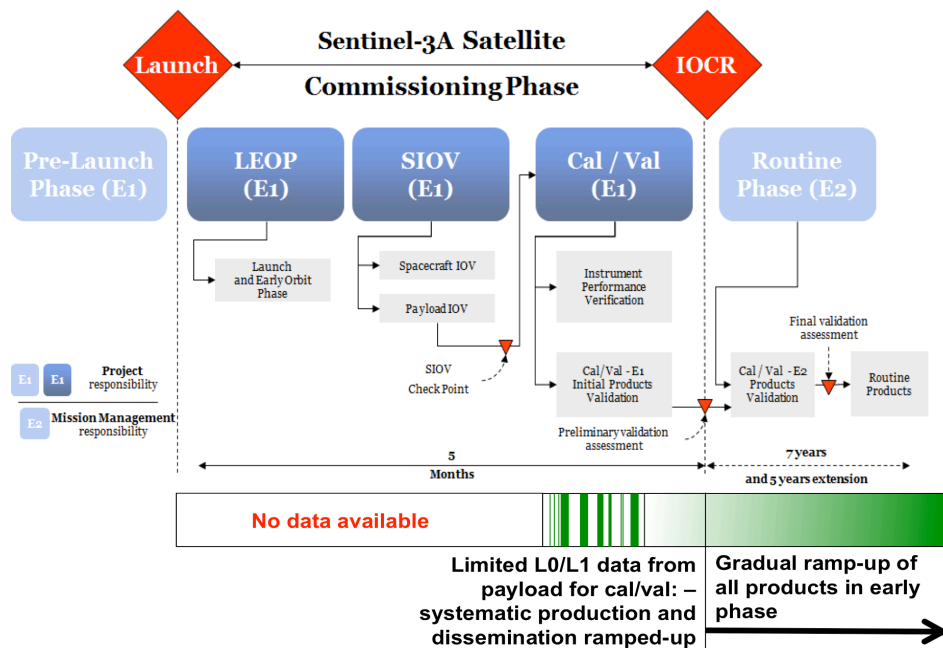


Figure 1: Sentinel-3A commissioning phase (E1) timeline overview and start of Routine Operations Phase (E2) highlighting key events and indicative data availability.



Phase E1 will conclude with an In Orbit Commissioning Review (IOCR) that marks the formal transition to the routine operational Phase E2. Figure 1 provides an overview of the Sentinel-3 Commissioning phase between Launch and IOCR (and the continuation into the routine E2 phase) that indicates all major sub-phases with their main activities.

The E1 Commissioning Phase includes three major sub-phases:

1. The Launch and Early Orbit Phase (LEOP): nominal duration 3 days. This covers launch, satellite acquisition and attitude control, normal mode health checks etc.
2. The Satellite (spacecraft and instruments) In-Orbit Verification (SIOV) phase: Nominal duration 30 days. During SIOV a systematic and incremental verification of all nominal platform and payload functionalities will take place together with a full characterization of the satellite resources (e.g. pointing, attitude, power, etc.) to support the mission objectives. Payload instruments will be switched ON and tested and limited (Lo and L1b) data flows established.
3. The instrument calibration, product verification, and initial product validation (Cal/Val-E1) phase: nominal duration 120 days. Payload instruments will be active with increasing access to Lo and L1b data flows that are essential for all validation activities. The SVT will contribute to this sub-phase as well as to the initial assessment of the products as input to the IOCR with regard to the validation aspects (see below).

Pre-launch activities include all Sentinel-3 Satellite and launch campaign activities after the Flight Acceptance Review (FAR) (at the end of phase C/D) until lift-off. During this phase of the mission preparation, rehearsals for validation activities are expected to take place (e.g., data acquisition coordination, data flow tests, test of read code, planning of campaigns etc).

The IOCR is a formal review to assess the status of the space segment performance at the end of the commissioning phase. The purpose of Phase E1 validation activities is to provide a rapid initial assessment of the products as input to the IOCR. Validation activities during the Commissioning phase will need to consider the availability of data products due to constraints across the ground segment that itself is undergoing commissioning activities at the same time. Thus products comprising limited time-scales and regions are expected in the early part of Phase E1. During Phase E1, the S3VT may also be requested to support the commissioning of the satellite-ground segment system.

The formal milestone concluding the Commissioning phase is the In Orbit commissioning Review (IOCR) with the following success criteria:

- Confirmation of the achievement of the objectives established for the Commissioning Phase,
- Confirmation that all sub-systems and, in particular, the instruments are in their operational modes and calibrated,
- Confirmation that the EUMETSAT FOS Ground Segment system is operational and capable of taking over the routine monitoring and control of the satellite,
- Confirmation that the initial product quality achieved at the end of the commissioning phase is commensurate with the MRD expectations and allows to pass the continuation of the Cal/Val activities to the operational facilities,
- Reporting of PDGS commissioning status.

Following successful IOCR and close-out of Phase-E1, the Mission then enters a routine phase E2 during which the service of Sentinel-3 will be “ramped-up” to full capacity. Validation activities during this phase of the mission will consider all products over all time-scales and all regions. It is anticipated that some validation activities, together with on-going system and data monitoring, will continue throughout the mission lifetime, nominally 7 years after IOCR.



Within this overall scenario, Scientific Cal/Val teams will be established before launch to provide support (e.g. via dedicated in situ data collection, analysis of validation data sets, reporting of results to the Management Team etc.) during Phase E1 and E2.

5 SPECIFIC OBJECTIVES OF THE CALL

The intention of this call is to create a Sentinel-3 scientific validation team, called the S3VT, to provide structured coordination of international activities that contribute to Sentinel-3 validation across the entire mission (i.e. Phase E1 and E2).

The S3VT will bring together world-leaders in relevant mission validation activities **to provide independent validation evidence, experimental data and recommendations** from such work that will be reported formally to ESA and EUMETSAT to characterise the quality and performance of the Mission. Specifically under this call, the Agencies seek the interest of institutes, research groups and scientists with expertise to address the following:

- Altimeter validation experiments and support to calibration activities;
- Microwave radiometer validation experiments and support to calibration activities;
- Visible-near infrared (400-1020nm) imaging spectrometer validation experiments over ocean and land and support to calibration activities;
- Visible-thermal infrared (0.55 – 12.0µm) scanning radiometer validation experiments over ocean and land and support to calibration activities;
- Active fire and burned area validation experiments and support to calibration activities;
- Precise Orbit Determination (POD) validation experiments and support to calibration activities;
- L2 Ocean, Land and Ice product validation experiments and support to calibration activities.
- User product development and detailed investigation of L2 retrieval algorithms.

A description of proposed validation contributions (including the technical approach and experience of the proposing team) to address these areas forms part of the response to this call.

6 FUNDING

There will be no ESA or EUMETSAT funding under this call.

7 OVERVIEW OF VALIDATION TEAM ACTIVITIES

Members of the S3VT will be expected to play an **active role** in Sentinel-3 validation or retrieval activities. Members of the S3VT may expect to participate in some, or all, of the following activities:

- Integration of their proposed work within a wider scientific and technical framework, and the establishment of collaborative linkages between specialists within and external to the S3VT sub-groups.
- Participation in the establishment of detailed validation planning for the Commissioning phase (E1) and operations/routine phase (E2) well in advance of the S3A and S3B launches.
- Support the Sentinel-3 ESA and EUMETSAT teams during the Sentinel-3 In-Orbit Commissioning Review, which will be held 5 months (TBC) after launch.
- Participation in post-launch data product and retrieval algorithm validation, and on-going monitoring of satellite performance and data quality.
- Support the planning and execution of satellite operations required for special validation activities agreed by the Agencies.



- Preparation for the validation activities of Sentinel-3B E1 and E2 activities.
- Support to the Agencies in the definition, in the light of post launch experience, of reprocessing algorithms to be applied to the level 1b and level 2 data.

8 ENGAGEMENT BEFORE, DURING AND AFTER COMMISSIONING

Prior to the satellite launch, the S3VT will play an important part in the preparation and update of the S3-CVP [RD-1]. The S3-CVP identifies the primary calibration and validation activities that will be performed, the group or groups responsible for their implementation (via a separate volume dedicated to Implementation of Cal/Val activities), their schedule, and the related schedule of satellite and/or ground segment operations. The final S3-CVT Implementation plan and the state of readiness will be reviewed shortly before launch. Support the Sentinel-3 ESA and EUMETSAT teams during the Sentinel-3 In-Orbit Commissioning Review, which will be held 5 months (TBC) after launch.

8.1 Commissioning Phase (E1)

Figure 2 illustrates the main interfaces of the S3VT with the Sentinel-3 Project during Phase E1

During Phase E1, the Commissioning Phase Management Team is led by the Sentinel-3 Project Manager and supported by the Project Mission and Operations Manager. During this Phase, specific Sentinel-3 expert-teams will be established including Space Segment Industrial and Agency partners. The industrial phase E1-expert-teams will mainly support the SIOV and the calibration aspects of the E1 Cal/Val activities, whereas the validation aspects of the E1 Cal/Val will be addressed by the S3VT.

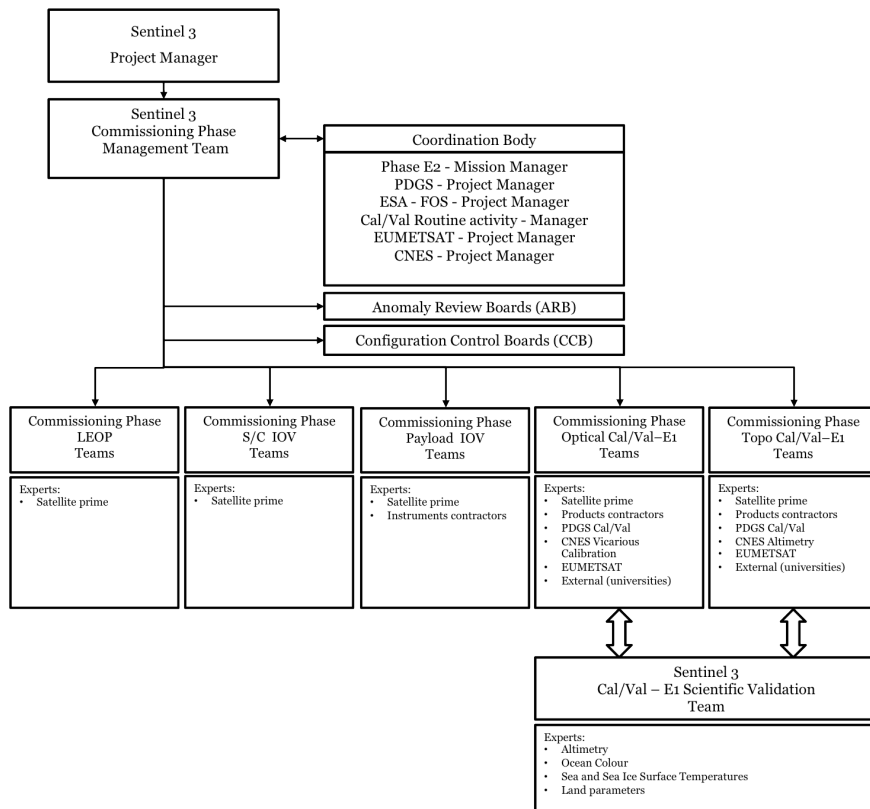


Figure 2 An overview of S3VT interfaces to Sentinel-3A activities during Phase E1.

8.2 Routine Phase (E2)

Figure 3 illustrates the main interfaces of the S3VT during Phase E2 that is part of the overall Sentinel-3 Mission Performance framework.

During Phase E2 the S3VT will interface with the Mission Performance Framework and the Quality Working Group (QWG). The QWG, amongst other tasks, manages recommendations from calibration and validation activities and reports to Mission Management. The Mission Performance Framework is the main entity responsible for routine quality control operations, L1 calibration activities and the coordination of L2 validation and development. Some overlap of S3VT activities will occur during the E1 phase as E2 activities are ramped up.

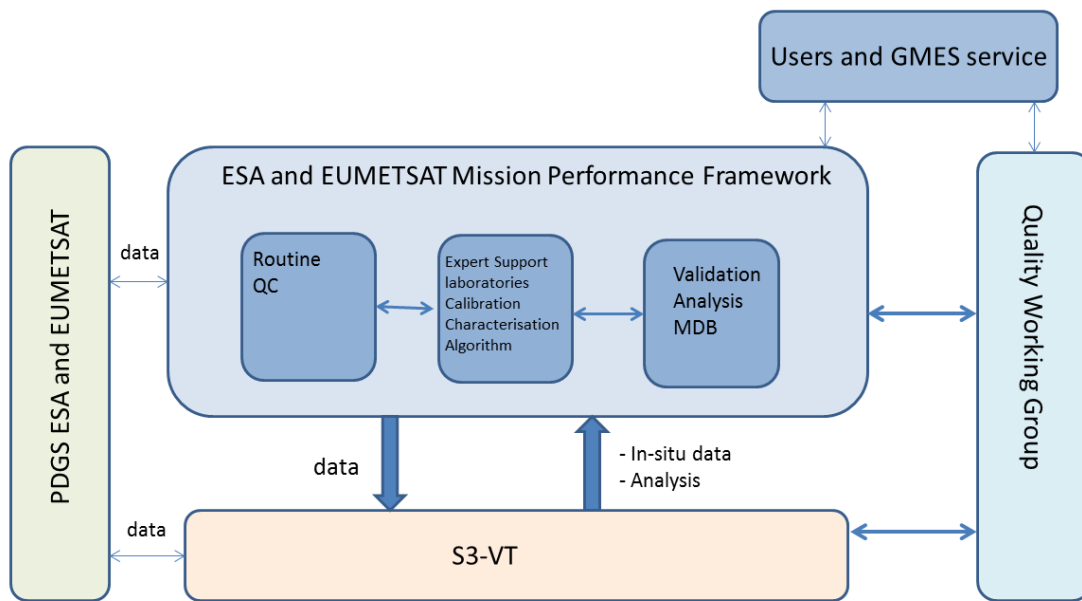


Figure 3. S3VT and Phase-E2 Mission Performance framework interfaces

9 DATA PROVISION

Members of the S3VT will have access to a range of Sentinel-3 data products, according to a ramp-up scenario following the launch and early operations phase. These will include specialist, low-level data products, to support the S3VT validation activity in order to provide the best validation of the mission. During phase E1 and phase E2 (exploitation phase), S3 data access will be guaranteed to S3VT members through agreed mechanisms. The focus of data provision will be on defined validation targets that are operationally extracted on a routine basis as a response to the requirements expressed in proposals for this call. Validation targets will include those defined by international consensus and with a long heritage (e.g. CEOS, GHRSSST, IOCCG), those covering specific validation activities as defined in the S3-CVP [RD-1] that have varied coverage requirements and those proposed and justified by successful applicants of this call.

In some cases, a proposed activity may require access to other, third party data whose supply is beyond the capability of the proposers. Provision of ESA and EUMETSAT third party mission data is foreseen within the existing constraints and data policy restrictions. While the Agencies cannot generally undertake to supply all data, proposers are requested to identify such data, so that, during the planning phase, the S3VT and Agencies may, where possible, provide support for data access.

The organisational framework for the Sentinel-3 external validation support will be provided through the Sentinels’ collaborative ground segment initiative, supporting specialised solutions to further enhance the Sentinel Missions exploitation in various areas. As part of the proposal submission, applicants are required to indicate their needs for satellite data products over specific target areas, if any. S3VT Members may be requested to refine these data requirements as part of the planning activity taking account the relevant operational constraints.



10 ORGANIZATION

The implementation of the Sentinel-3 Scientific Validation Team will be as follows:

1. Publication of the S3VT Call at the ESA EOPI web site (<https://earth.esa.int/aos/S3VT>)
2. Submission of proposals explaining the scope of proposed validation activities and associated data requirements.
3. ESA and EUMETSAT review of all proposals for this call to confirm that the proposal is of sufficient quality and relevance.
4. Confirmation that proposals have been accepted and invitation of to join a Sentinel-3 Validation Team sub-group. The following S3VT subgroups are foreseen:
 - Altimetry;
 - Ocean Colour;
 - Sea and Sea Ice Surface Temperatures;
 - Land parameters (including relevant visible, thermal and altimeter products and synergy products).

Note: All the S3VT sub-groups are also expected to interact with the Agencies for common goals (e.g. vicarious calibration, cal/val systems and tools, options for shared field campaigns, expertise, shared reporting).
5. A collaborative agreement will be established with the Validation Team members formalising the terms and conditions of the collaboration.
6. In coordination with the Agencies, the S3 VT will plan and execute validation and support the on-going monitoring of the Sentinel-3 satellite system and data products working with the Sentinel-3 Cal/Val plan [RD-1].

10.1 Rolling Call

The call will be implemented as a rolling call with distinct deadlines for proposal submissions on a regular basis. The call is designed this way to provide the widest opportunity for the S3VT to engage with the mission. Proposals will be reviewed and those accepted will be added to the register of approved validation activities for Sentinel-3 that will be maintained by the Agencies. The register will be open to all so that it can be used as a resource to foster better integration and collaboration between validation teams and the Agencies' activities.

The Call will include (TBC) at least the following documents:

1. The Call Text (based on this document)
2. Data Policies as required
3. SENTINEL-3 Description (RSE Paper)
4. SENTINEL-3 Algorithm – ATBDs
5. SENTINEL-3 Products Overview (PPT presentation)
6. MRD
7. MRDT

The call will be published on the ESA EOPI Web site (see <https://earth.esa.int/aos/S3VT>).

10.2 Proposal Submission and Guidelines

Detailed submission guidelines are available at (https://earth.esa.int/files/S3VT_guidelines). Proposals shall be submitted in electronic format using the template provided in (https://earth.esa.int/files/S3VT_Form) Section 12 of this document.



10.3 Evaluation criteria

Internal panels of ESA and EUMETSAT will review the proposals received in response to this call and recommend acceptance, with a final decision taken by the joint S3 Mission Management Team. The following criteria will be used in the evaluation of all proposals:

- a) Relevance of the proposed project to the objectives of Sentinel-3 validation and/or retrieval activity;
- b) Scientific quality and integrity of the proposed work;
- c) Collaborative benefit derived from participation as S3VT member;
- d) Feasibility and probability of success;
- e) Credibility of proposed underlying financial support and available infrastructure.

10.4 S3VT Call Schedule

Date	Activity
October 2012	Opening of the call
January 2013	Deadline for submission of first proposals
March 2013	Notification of evaluation results to the S3 VT
May/June 2013	First meeting of S3VT

11 FURTHER INFORMATION

Further information regarding this call may be found on the Web site dedicated to the Sentinel-3 Validation Team call and can also be obtained from the ESA EO Help Desk.

ESA contacts:

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12 TEMPLATE FOR S3VT VALIDATION TEAM CALL PROPOSAL SUBMISSION

<p>Validation Project Title and acronym <i>Short title and acronym if relevant</i></p>	
<p>1.0 S3VT Lead team member name and address <i>Name of organisation, institution, company</i></p>	
<p>1.1 Support team member names and addresses [0..n] <i>Name of Support team member Name of organisation, institution, company, consortium</i></p>	
<p>1.2 Description of the team <i>Summary of the team composition and its strength</i></p>	
<p>1.3 S3VT Sub-group <i>Which S3VT sub-group (cf. Section 10 above) is the proposal targeted for?</i></p>	
<p>2.0 Executive Summary of activity (500 words) <i>Include: problem to be addressed, team description, approach taken and expected outcomes</i></p>	
<p>3.0 Introduction and Background <i>Relevance of the proposed activity to the objectives of Sentinel-3 validation and/or retrieval activity</i></p>	
<p>3.1 Statement of the validation activity <i>Clear statement of the problems to be addressed by the team in relation to Sentinel-3 verification and validation. The statements shall include clear links to relevant S3 requirements as stated in [RD-3]</i></p>	
<p>3.2 Aim and Objectives <i>Single aim statement and supporting objectives to reach the aim</i></p>	
<p>3.3 Scientific Approach <i>Overview of the top-level approach taken</i></p>	
<p>3.4 Scientific Methodology <i>Describe the proposed methodology to perform the work (e.g., field experiments, availability of and interdependencies from other data sources, infrastructures, etc). Emphasis should be placed on the independent character of the validation.</i></p>	
<p>3.5 Geographic Location <i>Justification and description of the proposed</i></p>	



<i>location(s), sufficient details of target areas to be provided to support the extraction of these areas by the S3 Ground Segment</i>	
4.0 Data <i>General overview of data requirements</i>	
4.1 Sentinel-3 Data required <i>Please explain which S3 data products are required and why including a timeline and a rough order of magnitude for data volume to be provided.</i>	
4.2 Third Party Mission (TPM) Data Required <i>Access TPM data products, area of interest and timeline (rough order of magnitude for data volume to be provided)</i>	
4.3 Other EO data <i>Please list any other EO data you plan to use</i>	
4.4 Validation Data to be collected <i>Summary of in situ and other validation data that will be collected during the project</i>	
5.0 Expected Results and outcomes from the work <i>Clear statements of expected outcomes from the activity</i>	
6.0 Planning and Reporting <i>Summary overview of planning and reporting for the project</i>	
6.1 Proposed schedule <i>Please provide a schedule for the project starting before the Mission launch</i>	
6.2 Availability of (e.g. national) funding <i>Please describe funding that you plan to use for this activity</i>	
6.3 Availability of supporting infrastructure and data sources <i>Please describe supporting infrastructures/groups and data</i>	
6.4 Risk analysis <i>Please provide a top-level list of the critical risks for the activity</i>	
7.0 Tools <i>Please list any supporting tools and processing software: processors, toolboxes, on demand processing infrastructure (e.g. GPOD), network, interfaces, access</i>	



<p><i>to other than Sentinel-3 data for validation activities. Please list your expectations for potential tools support from ESA/EUMETSAT</i></p>	
<p>8.0 Collaborative benefit derived from participation as S3VT member <i>Please explain the benefits that you see to being part of the S3VT.</i></p>	
<p>9.0 Feedback to Agencies <i>Summary of expected results to be reported to ESA and EUMETSAT on regular basis in shape of reports, cal/val data, feedback to QWG and attendance to validation meetings</i></p>	