DOCUMENT

Sentinel-3 Scientific Validation Team Implementation Plan

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APPROVAL

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(TC) Include updated OC table	20/11/2014	61	
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1 Introduction

1.1 Scope and Purpose

This document sets out the Implementation Plan (IP) for Sentinel-3 Scientific Validation Team (S3VT) activities. The audience for this document includes Mission Management, Mission Performance Framework activities, EC Copernicus, National and International validation Stakeholders and the S3VT teams themselves. The S3VT Implementation Plan provides executive overview of all activities that were submitted to a Joint- ESA-EUMETSAT S3VT Announcement of Opportunity (AO) in a common format. Full details of individual projects are provided in the relevant AO proposal and are not duplicated here.

The purpose of the IP is to provide a reference for the diverse and widespread activities that are expected to occur within the Scientific Community following the launch of Sentinel-3A. The IP is in this respect a “handbook” of scientific validation activities that are distinct from those contracted by ESA and EUM Mission management directly (e.g. via the Satellite Project Commissioning Phase activities and the Mission Performance Centre in Phase E-2).

Independent validation is a critical aspect that provides credibility to a mission. It should be noted that validation of Sentinel-3 by the scientific community is a pre-requisite to the acceptance of the Mission as “fit for purpose”: the validation performed is independent and experienced scientists and engineers in specialised disciplines. Furthermore, such validation will take place, and will be reported in the scientific literature, regardless of the formal framework put in place by the Sentinel-3 mission management. As such, the S3VT-IP is a means to help ESA and EUMETSAT work effectively with the scientific validation of the mission in the interest of an operational mission success. In this latter respect, it should be recalled that Sentinel-3 joins a fleet of international operational missions that require continuous validation and monitoring to maintain operational acceptance and satisfy the quality requirements of such missions.

A schedule of all planned and potential validation activities across all S3VT Sub-groups is provided to facilitate effective communication, planning and exchange of results from S3VT scientific validation activities with other mission entities (S3 Project, MPC). As such it provides a means to coordinate external activities in a manner that empowers both validation scientists actually performing the work and the mission management.

The S3VT implementation plan also provides a status analysis, developed by the relevant Chairs of each S3VT Sub-group and their teams. The purpose of this analysis is to highlight gaps and issues that must be addressed to ensure a successful scientific validation of Sentinel-3 products according to the S3 Cal/Val plan.

The S3VT Implementation Plan is a living document that will be maintained by ESA and EUMETSAT for the duration of the S3 Mission and updated as required.

1.2 Document Structure

1. Introduction
2. Applicable and reference documents
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12. Summary and conclusions
13. Appendix-A Contact details of S3VT members
14. Appendix-B Consolidated data required for S3VT Activities
15. Appendix-C Data access arrangements for the S3VT

1.3 Acronyms and Abbreviations

AATSR	Advanced Along-Track Scanning Radiometer
ADF	Auxiliary Data File
AO	Announcement of Opportunity
ATBD	Algorithm Theoretical Basis Document
BB	Black Body
BOUSSOLE	BOUée pour l'acquiSition de Séries Optiques à Long termE
BRDF	Bidirectional Reflectance Distribution Function
BRF	Bi-directional Reflectance Function
CCD	Charge-Coupled Device
CP	Commissioning Phase
CTI	Configuration Table Interface
DIMITRI	DIagnostics of MIxing and TRansport in atmospheric Interfaces
DORIS	Doppler Orbitography and Radiopositionning Integrated by Satellite
FAR	Flight Acceptance Review
FPA	Focal Plane Assembly
FR	Full Resolution
GMES	Global Monitoring for Environment and Security
GNSS	Global Navigation Satellite System
GPP	Ground Processor Prototype
GSICS	Global Space-based Inter-Calibration System
IOCCG	International Ocean Colour Coordinating Group
IOCR	In-Orbit Commissioning Review
IPT	Instrument Parameters Table
IST	Ice Surface Temperature
LRR	Laser Retro-Reflector
LUT	Look-Up Table
MERIS	MEdium Resolution Imaging Spectrometer
MERMAID	MEris MAtchup In-situ Database
METRIC	
MOBY	Marine Optical Buoy
MOMO	Matrix Operator Model
MPC	Mission Performance Centre

MPMF	Mission Performance Monitoring Function
MRD	Mission Requirements Document
MRTD	Mission Requirements Traceability Document
MTF	Modulation Transfer Function
MUSCLE	M anuel utilisate ur de l'atelier d'étalonnage (of CNES)
MWR	Microwave Radiometer
NEDT	Noise Equivalent Differential Temperature
NIR	Near Infra Red
NRT	Near Real Time
NTC	Non Time Critical
OCD	Operational Concept Document
OLCI	Ocean and land Colour Instrument
OLTC	Off-Line Tracking Command
OME	Opto-Mechanical Enclosure
PDGS	Payload Data Ground Segment
PRF	Pulse Repetition Frequency
QC	Quality Control
QWG	Quality Working Group
RR	Reduced Resolution
SZA	Solar Zenith Angle
SISTeR	Scanning Infrared Sea Surface Temperature Radiometer

2 Applicable and Reference Documents

2.1 Applicable Documents

These documents are required to conduct any activity.

AD.1. Sentinel-3 Calibration and Validation Plan S3-PL-ESA-SY-0265 Issue 1 Revision 0 Date of Issue 31.1.2013

2.2 Reference Documents

These documents are not required to conduct activities but provide background information.

RD.1. Establishing the Sentinel-3 Validation Team, C. Donlon, P. Goryl, H. Bonekamp, S. Mecklenburg, D. Provost. ESA/EUMETSAT. Sentinel-3 Calibration and validation Planning Meeting, 20-22 March 2012.

RD.2. GMES Space Component Sentinel-3 Payload Data Ground Segment Products Definition Document, GMES-S3GS-EOPG-TN-12-0004, V1.1, 06/09/2013.

RD.3. Sentinel-3 Mission Requirements Document EOP-SM/1151/MD-md Issue 2 19/2/2007

RD.4. Sentinel-3 Mission Requirement Traceability Document EOP-SM/2184/Cd-cd Issue 1.0, 7/2/2011

RD.5. Call to establish a Sentinel-3 Validation Team (S3VT), EOP-SM/2395/CD-cd (S3-Validation-Call-v1.16-Issued.docx), 1st October 2012.

3 Background

3.1 S3 Mission Objectives

The Sentinel-3 mission is an operational mission in high-inclination, low earth orbit. Full performance is achieved with two satellites (Sentinel-3A and Sentinel-3B) in orbit separated by 180deg. Sentinel-3 implements three core missions:

- 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), Microwave radiometer (MWR), and POD package (GNSS, DORIS, LRR) providing surface topography measurements.
-

Sentinel-3 also includes new elements (in comparison to previous missions):

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

Sentinel-3 has a repeating, frozen sun-synchronous orbit with the local solar time 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.

The specific objectives for the Sentinel-3 mission are defined in the Mission Requirements Document MRD (RD.3.) and have been adopted in a traceable format in the Mission Requirements Traceability Document (MRTD) (RD.4.):

Sentinel-3 Objectives
Sentinel-3 shall provide continuity of an Envisat type ocean measurement capability for GMES Services with a consistent quality, a very high level of availability (>95%), high accuracy and reliability and in a sustained operational manner for GMES users, including: Ocean, inland sea and coastal zone colour measurements to at least at the level of quality of MERIS on Envisat; Sea surface temperature measurements to at least at the level of quality of AATSR on Envisat; Sea surface topography measurements to at least at the level of quality of the Envisat altimetry system, including an along-track SAR capability of CryoSat heritage for improved measurement quality in coastal zones and over sea ice.
Sentinel-3 shall provide continuity of medium resolution Envisat-type land measurement capability in Europe to determine land-surface temperature and land-surface colour with a consistent quality, a very high level of availability (>95%), high accuracy and reliability and in a sustained operational manner for GMES users.
Sentinel-3 shall provide, in a NRT operational and timely manner, L1b visible, shortwave and thermal infrared radiances and L2 topography products for use by GMES Services with a consistent quality, a very high level of availability (>95%), high accuracy and reliability and in a sustained operational manner for GMES users.
Sentinel-3 shall provide, in a NRT operational and timely manner, a generalised suite of high-level **primary** geophysical products with a consistent quality, a very high level of availability (>95%), high accuracy and reliability and in a sustained operational manner for GMES users. Products shall include as priority: Global coverage Sea Surface Topography (SSH) for ocean and coastal areas, Enhanced resolution SSH products in the Coastal Zones and sea ice regions,

Global coverage Sea-Surface (SST) and sea ice surface temperature (IST), Global coverage Ocean Colour and Water Quality products, Global coverage Ocean Surface Wind Speed measurements, Global coverage Significant Wave Height measurement, Global coverage atmospheric aerosol consistent over land and ocean, Global coverage Vegetation products, Global coverage Land Ice/Snow Surface Temperature products, Ice products (e.g., ice surface topography, extent, concentration)
Sentinel-3 shall provide continuity of medium resolution SPOT Vegetation P-like products by providing similar products over land and ocean with a consistent quality, a very high level of availability (>95%), high accuracy and reliability and in a sustained operational manner for GMES users.
Sentinel-3 shall provide in an operational and timely manner, a generalised suite of high-level **secondary** geophysical products with a consistent quality, a very high level of availability (>95%), high accuracy and reliability and in a sustained operational manner for GMES users. Products shall include as priority: Global coverage Fire monitoring products (FRP, burned area, risk maps etc), Inland water (lakes and rivers) surface height data.

Table 1 – Primary Mission Objectives

3.2 Sentinel-3 Product Descriptions

As result of the Ground Segment (GS) prototype development, a set of baseline products at level 1 and 2 are defined which will be produced by the Instrument Processing Facilities (IPF) for which it is mandatory to demonstrate performance via validation activities, analysis and results reporting. Note that some products in this list are considered internal and will not be part of the nominal dissemination scheme (i.e. Synergy L1c product). Also the grouping of products has been made by geophysical parameters and does not precisely correspond to the product packing defined by the Payload Data Ground Segment (PDGS). The actually PDGS product grouping can be found in RD.2. A specific Product Class ID is introduced to assign associated Cal/Val Tasks (see RD.2.). PDGS Product Nomenclature is provided where applicable.

Product class (ID) [PDGS Product Nomenclature]	**Parameter**	**Parameter Definition**
OLCI Level 1 in RR and FR (OLCI-L1B) [OL_1_EFR] [OL_1_ERR]	Top of Atmosphere radiances	Radiance in [W m s2 sr-1 µm-1] of 21 OLCI bands with time stamps, flags, geo-location, meteo annotation data set
OLCI Level 2 in RR and FR (OLCI-L2WLR) [OL_2_WRR] [OL_2_WFR]	Water leaving reflectance (R)	Surface directional reflectance, dimensionless, corrected for atmosphere and Sun specular reflection, at all OLCI channels except those dedicated to atmosphere absorption measurements, and associated error estimates.
Ocean Colour Products (OLCI-L2OC) [OL_2_WRR]	Algal pigment concentration 1 (Chl-1)	Chlorophyll-a concentration in Case 1 waters and associated error estimates, in mg.m-3
	Algal pigment concentration 2 (Chl-2)	Chlorophyll-a concentration in Case 2 waters and associated error estimates, in mg.m-3

[OL_2_WFR]	Total Suspended Matter concentration (TSM)	Total suspended matter concentration, and associated error estimates, in g.m-3
	Diffuse Attenuation coefficient (Kd)	Diffuse attenuation coefficient for downwelling irradiance, and associated error estimates, in m-1 at 490 nm.
	CDM absorption coefficient (CDOM)	Absorption of Coloured Detrital and Dissolved Material, and associated error estimates, expressed in m-1 at 443 nm.
Atmosphere Product (OLCI-ATM) [OL_2_WRR] [OL_2_WFR]	Photosynthetically Active Radiation (PAR)	Quantum energy flux from the Sun in the spectral range 400-700 nm and associated error estimates; in Einstein/m2/day.
	Aerosol optical depth over water (AOD-W)	Aerosol load, expressed in optical depth at a given wavelength (865 nm), and associated error estimates.
	Aerosol Angstrom Exponent over water (AAE-W)	Spectral dependency of the aerosol optical depth, between 779 and 865 nm, and associated error estimates.
	Integrated Water vapour column (IWV)	Total amount of water vapour integrated over an atmosphere column, and associated error estimates, kg.m-2.
Level 2 Land Products (OLCI-L2LA) [OL_2_LRR] [OL_2_LFR]	OLCI Global Vegetation Index	Fraction of Absorbed Photosynthetically Active Radiation (FAPAR) in the plant canopy. .
	red and NIR rectified reflectances	by-product of FAPAR estimate, defined as "virtual" reflectance at 681nm and 685nm largely decontaminated from atmospheric and angular effects, and good proxy to Top of Canopy reflectance
	OLCI Terrestrial Chlorophyll Index	Estimates of the Chlorophyll content in terrestrial vegetation, aims at monitoring vegetation condition and health.
	Integrated Water vapour colums	same as in OLCI_L2_WFR but estimated over land surfaces

Table 2: Baseline Product for OLCI, all products will be delivered in full- and reduced resolution

Product (ID)	**Parameter**	**Parameter Definition**	
SLSTR Level 1B (SLSTR-L1B) [SL_1_RBT]	Top of Atmosphere radiances Top of Atmosphere brightness temperatures	Radiance in [W m s2 sr-1 µm-1] of band S1-S3. Brightness Temperatures for S4-S9 in [K]. All values in dual view with time stamps, flags, geo-location and meteo annotation data set	
Level 2 SST (SLSTR-SST) [SL_2_WST]	Sea Surface skin Temperature (SST)	Stand-alone product conforming to the GHRSST L2P specification, containing a composite "best SST" field, error estimates and contextual auxiliary data fields, SST in [K] and various other units. Note: intermediate SST estimates (D2/D3/N2/N3 SSTsking products) are produced but not distributed	
Level 2 LST (SLSTR-LST) [SL_2_LST]	Land Surface Temperature (LST)	1.1.1.1.1.1.1.1.1	Single view, two channel land surface temperature in [K], associated error estimates, exception flags, and contextual information
		1.1.1.1.1.1.1.1.2	Ancillary data: NDVI, GlobCover classification, Fractional vegetation cover

Table 3 - Baseline Product for SLSTR

Product	Parameter	Parameter Description
Level 1 (SYN-L1C)	Top of Atmosphere radiances Top of Atmosphere brightness temperatures	Combined OLCI and SLSTR spectral channels in acquisition geometry with necessary co-registration data.
Level 2 (SYN-L2C) + Aerosol Parameter [SY_2_SYN]	Surface Reflectance	Fully atmosphere-corrected Surface Reflectance and associated error estimates. Synergistically retrieved from OLCI channels and SLSTR channels (both nadir and oblique views), except for gaseous absorption channels
	Aerosol Optical Depth over land (AOD-L)	Aerosol load, expressed in optical depth at a given wavelength (550 nm), and associated error estimates
	Aerosol Angström Exponent over land (AAE-L)	Spectral dependency of the Aerosol Optical Depth derived from 40 aerosol models computed with OPAC package and associated error estimates
Vegetation (SYN-VGT) [SY_2_VGP/VG1/V10]	VGT P-Product (VGT-P) VGT S1-Product (VGT-S1) VGT S10-Product (VGT-S10)	TOA Radiances and vegetation indices composites for 1 and 10 days

Table 4: Baseline Product for synergy Product

Product (ID)	Parameter	Parameter Description
Level 1b (SRAL-L1B) [SR_1_SRA] [SR_1_CAL]	Radar echoes, single waveform □$_0$ values in LRM Mode Radar echoes, single bursts □$_0$ values in SAR Mode	20Hz data in Ku- and C-band, instrument and geophys. corrections applied Note: Calibration Measurements (SR_1_CAL) are distributed as a se separate product
Level 2 Marine Ocean and Sea Ice Areas (SRAL-L2MA) [SR_2_WAT]	Elevation values (R) Backscatter coefficient Sea Surface Height anomaly (SSHA) Signification Wave Height (SWH) Wind speed (WS) LRM Mode only	all parameters except backscatter coeff and Wind Speed are provided for LRM and SAR mode in one product
	sea ice freeboard	height of sea ice floes above sea surface
	sea ice sea surface height	Height of the sea surface in sea-ice areas with respect to a reference datum
	sea ice surface height anomaly	Variations of the Sea Ice Surface Height with respect to a mean sea surface (m)
Level 2 Land (SRAL-L2LA) [SR_2_LAN]	Elevation values (R) Surface height	as baseline acquisitions over land is always in SAR-Mode No specific land algorithms are used for the land product Note: Surface Height must be computed by the user

Table 5 - Baseline Product for SRAL

Product (ID)	Parameter	Parameter Description
Level 1b MWR (MWR-BT) [MW_1_MWR] [MW_1_CAL]	Brightness temperatures calibration parameters	geo-located, radiometrically and geometrically corrected brightness temperature measurements (at each of the antenna frequencies)
GNSS Level 1 (GNSS-L1)	Navigation Solution GNSS measurements	in RINEX format C1,P1,P2,L1,L2 codes
Orbit Parameter (POD)	Orbit Solutions from GNSS/DORIS/SLR	different latencies

Table 6 - Baseline Product for MWR and POD Payload

4 S3VT General Terms of Reference

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. In order to achieve this purpose, The Agencies have convened a Joing Sentinel-3 Scientific Validation Team (S3VT).

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 – 12.0□m) 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.

Against this background, the **aim** of the S3VT 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"***

and the **objective** of the S3VT is:

> ***"To provide independent validation evidence, experimental data and recommendations to the S3 Mission"***

Further information can be found in the Joint ESA-EUMETSAT S2VT Validation team Announcement of Opportunity (A) [RD.5]. This is an open rolling call available at ESA EOPI web site (https://earth.esa.int/aos/S3VT). The following S3VT sub-groups have been convened:

- Altimetry (S3VT-ALT)
- Ocean Colour (S3VT-OC)
- Sea and Sea Ice Surface Temperatures (S3VT-T);
- Land parameters including relevant visible, thermal and altimeter products and synergy products (S3VT-L)

Sub-groups have specific Terms of Reference in relevant sections of this document. 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). The main activities foreseen by the S3VT include:

1. Gathering and federating international expertise to support ESA and EUMETSAT with Mission Performance assessments
2. Facilitating access to operational network datasets (e.g. buoys data, radiosondes) and infrastructures (e.g. tide gauges, transponder, reference in situ data such as Boussole/Moby)
3. Performing dedicated campaigns addressing specific issues
4. Facilitate access to satellite and other correlative data
5. Foster international cooperation with other Cal/Val projects, other scientific communities and Agencies
6. Improve communication on S3 mission performance

5 S3VT Sub-groups and membership contacts

Each S3VT sub-group has a chair and co-chair to represent both ESA and EUMETSAT. The role of the chairs is to coordinate the activities of each sub-group and to provide a conduit for information for the Mission and relevant coordination bodies. The Chairs are as follows:

S3VT-ALT: Pierre.Femenias@esa.int, Remko.Scharroo@eumetsat.int

S3VT-OC: Ewa.Kwiatkowska@eumetsat.int,Jean-Paul.Huot@esa.int, Marc.Bouvet@esa.int

S3VT-T: Craig.Donlon@esa.int, Anne.Ocarroll@eumetsat.int

S3VT-L: Philippe.Goryl@esa.int, Hilary.Wilson@eumetsat.int

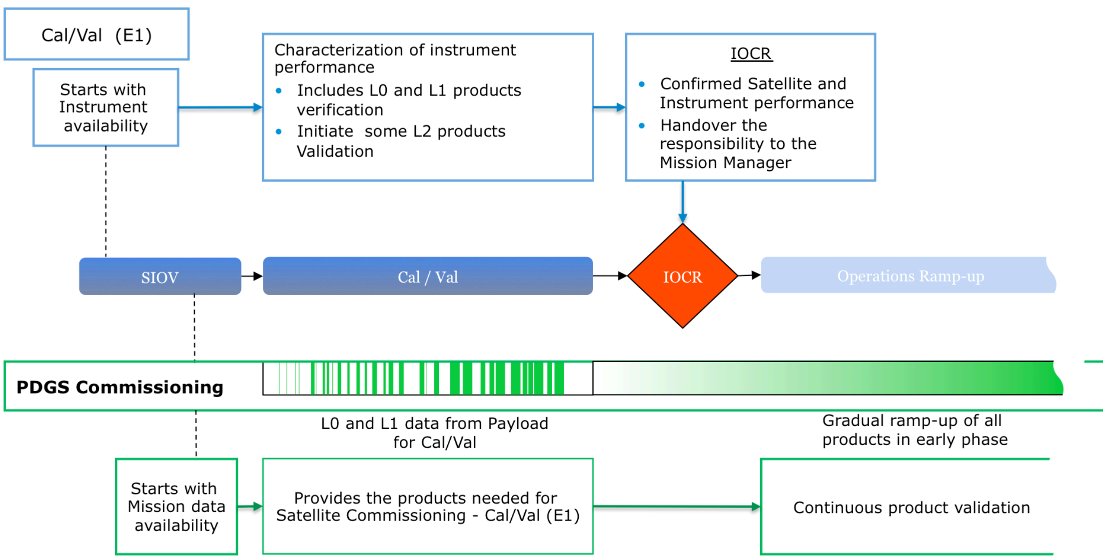
6 Sentinel-3A Cal/Val E1 and Cal/Val-E2 timelines and key activities

Mission Phase E1 covers all satellite and payload-commissioning activities up to the In Orbit Commissioning Review (IOCR) planned 5 months after launch.

After launch the Mission Launch and Early Orbit phase (LEOP) and the Satellite In-Orbit verification (SIOV) commence. Over a period of ~1 month, LEOP/SIOV activities will verify the health status and operability of the Satellite and its instruments. Commissioning of each instrument includes the instrument performance verification and initial product validation (up to L1).

An Industrial E1 Cal/Val phase starts at the end of the SIOV phase conducted by Sentinel-3 Satellite Project teams together with CNES for the topography mission (with the support of contracted Industrial teams). The PDGS will also begin commissioning the ground segment including the start of L1 and L2 validation assuming a successful SIOV. Product production will be gradually ramped up. The nominal duration is planned for four months and technical checkpoints and formal reviews are foreseen around the middle and towards the end to assess the status of the instrument's performance and the initial product validation. The IOCR will conclude Phase E1 commissioning activities and represents the formal review to assess the successful commissioning of the Satellite functionality and performance (based on the available data). The IOCR will review, among other aspects, all results of the Cal/Val-E1 activities for the satellite platform and instruments.

Phase E1 is largely led by Industrial teams although validation activities of the S3VT, if planned and coordinated well in advance, may contribute to phase E1 activities.



Following a successful IOCR, the mission then enters a routine Phase (E2) in which operations will be gradually ramped up to full capacity. Routine Cal/Val-E2 activities commence after IOCR and will continue for the mission duration coordinated by Mission Performance Framework activities. The S3VT is expected to make a significant contribution to E2 activities.

Sentinel-3 product availability during the early part of the mission is likely to be limited as it depends on the successful commissioning activities of both the space and the ground systems. Once these are both stable, it may be anticipated that products will begin to flow in a pre-operational manner.

The following are the formal timelines for checkpoints for the E1 commissioning phase Cal/Val activities:

Check Point	**ID**	**Planned Date**
Cal/Val preparation checkpoint 1	CAL/VAL CP #1	L-13 months
Cal/Val preparation checkpoint 2	CAL/VAL CP #2	GS AR – 2 months, Launch -6 months
Cal/Val preparation checkpoint 3	CAL/VAL CP #3	GS ORR Launch – 1 month
Instruments functional verification checkpoint	SIOV CP	End of SIOV (different for each instrument)
Instruments performance verification checkpoints	CAL/VAL midterm CP	Mid CAL/VAL (one CP for optical and one for topo, TBC)
In Orbit Commissioning Review	IOCR Review	Launch +5 months

7 Interfaces between S3VT and Sentinel-3 Mission activities

The S3VT is co-chaired by ESA and EUMETSAT. The S3VT is then divided in 4 sub-groups. Each sub-group is led by ESA and EUMETSAT. The points of contact are report in chapter 5.

The leaders of the subgroup will have the task to ensure relevant reporting of S3VT activities and outcomes to the Mission Quality Working Group (QWG). The QWG will be co-chaired by ESA and EUMETSAT. The QWG is composed of a group of experts providing advice and recommendations on data quality and algorithmic issues; The QWG is an advisory group typically composed by stakeholders ensuring high data quality (in its wide sense). It is composed typically of Mission Performance Centre (MPC) representatives including ESA experts, representatives from the EUMETSAT Marine Centre, experts from the Sentinel-3 Validation Tea and GMES Services representatives.

The main objective of the QWG is to ensure homogeneous and well defined product quality throughout the mission lifetime and to contribute to the continual improvement of mission data quality by detecting and characterising anomalies, instrumental degradation etc. The characterisation shall lead to recommendations for improvements to the ground-segment configuration and/or to the development of new processing, calibration or validation algorithms.

The QWG is expected to meet approximately three times per year. Discussion will be primarily based on reporting from the MPC, from the S3VT validation team and from user feedback. The QWG is an operational body in the sense that it will give recommendations on the calibration strategy, update of calibration model, algorithm update or changes in auxiliary files, validation strategy. We can anticipate the formation of QWGs for:

- OLCI and SYNERGY
- SLSTR
- Altimetry

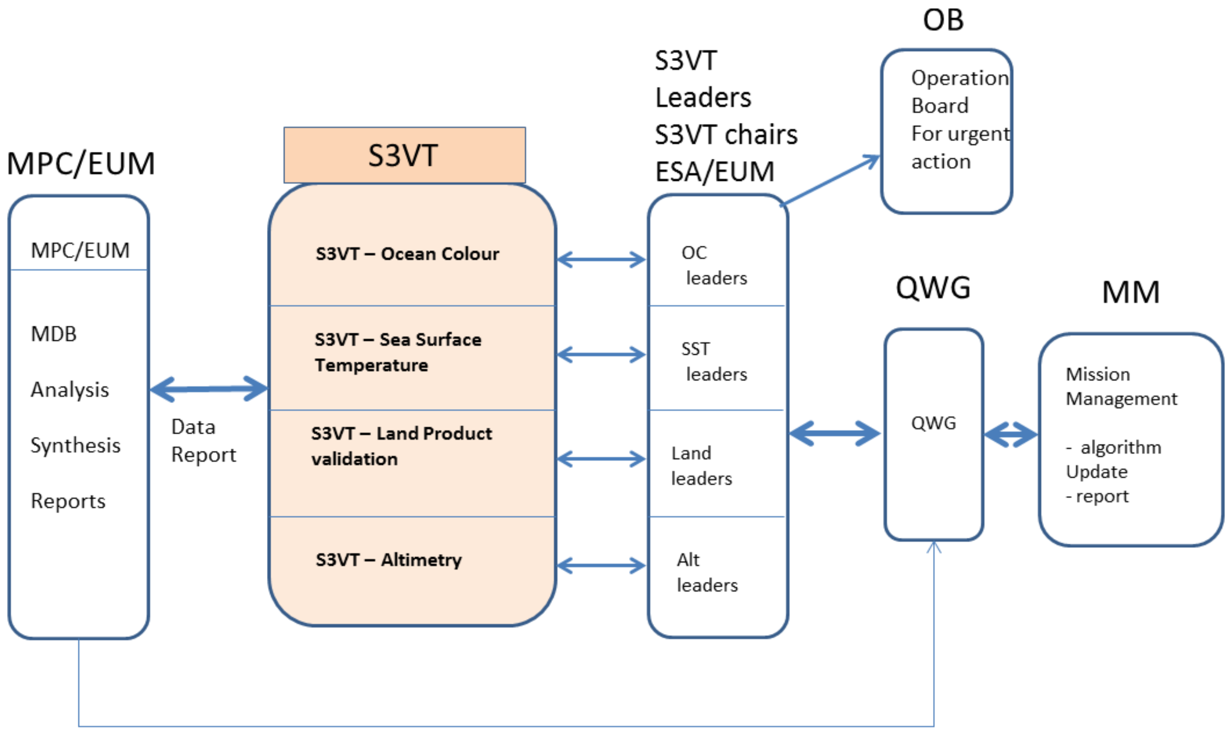
An additional POD QWG (across the Sentinel missions) will be established and managed by the GMES POD Service.

At a technical level, the results and data from the various S3VT projects will be transmitted to the Mission Performance Center (including EUMETSAT) where an overall synthesis will be performed. The synthesis will be presented and discussed in the Quality Working group (calling on S3VT experts in the field as required). Decisions on issues to address typically include: need for algorithm update, auxiliary file update, new report to users etc.) The mechanism to transfer results into the QWG and MPC will be agreed within each subgroup.

The data provided by S3VT will be stored in Match-Up Database (MDB). There will be a MDB by subgroup (OC, SST, Land, Altimetry). The data will be submitted to quality control. The approach and quality control process shall be discussed and agreed within each S3VT subgroup.

If the S3VT discovers a major issue, in the interest of mission quality, the issue will be reported immediately to the subgroup leaders who will then interface to mission management. The **Sentinel-3 Operations Board** provides a focal point for all aspects directly related to the smooth running of the mission on a day-to-day basis, it is jointly run by ESA / EUMETSAT.

The figure bellows illustrates the S3VT interfaces and the communication flow



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8 Overall summary of planned S3VT validation activities

Following the S3VT AO and subsequent coordination activities, a "top-level" summary of currently active S3VT "projects" for all the sub-groups is presented in the table below. The Project Identifier (IP) allows an easy look-up of the project proposal. A coarse timeline is provided to assist planning in the pre-launch, E1 and over the first 3 years of E2. Year 3-7.5 and beyond are also provided to indicate the expected long-term duration of each project. Green boxes define the activities that are planned ***and already funded*** (low risk to effective scientific validation) whereas yellow boxes indicate activities that are planned but have yet to confirm funding (medium to critical risk for effective scientific validation).

S3VT Activity Schedule
(Green: planned and funded; Yellow: planned and pending funding coutcome)

IP	Group	Name	Pre-Launch	Commissioning Phase E1	Year 1	Year 2	Year 3-7.5	Beyond nominal time
13765	OC	Alikas Krista						
13246	OC	Antoine David						
13653	OC	Babin Marcel						
13616	OC	Barciela Rosa						
13732	OC	Bernard Stewart						
13751	OC	Bracher Astrid						
13760	OC	Brockmann Carsten						
13739	OC	Brotas Vanda						
13743	OC	Bryere Philippe						
13583	OC	Chami Malik						
13552	OC	D'Alimonte Davide						
13772	OC	Darecki Miros□aw						
13658	OC	Thomas Schroeder						
13741	OC	DiGiacomo Paul						
13716	OC	Dorandeu Joel						
13758	OC	Fearns Peter						
13744	OC	Fischer Jürgen						
13723	OC	Hunter Peter						
13556	OC	Icely John						
13742	OC	Jamet Cédric						
14552	OC	Kahru Mati						

13597	OC	Knaeps Els						
13729	OC	Knox Nichola Maria						
13596	OC	Kratzer Susanne						
13721	OC	Kr□□el Adam						
13625	OC	Larouche Pierre						
13607	OC	Lavender Samantha						
13717	OC	Maritorena Stéphane						
13656	OC	Meister Gerhard						
13766	OC	Morris Edward						
17234	OC	Moses Wesley						
13675	OC	Oliveira Paulo						
13747	OC	Peters Steef						
13452	OC	Röttgers Rüdiger						
13702	OC	Ruddick Kevin						
13623	OC	Ruddick Kevin						
13697	OC	Santoleri Rosalia						
13750	OC	Shum C.K.						
13753	OC	Silio-Calzada Ana						
13654	OC	Sørensen Kai						
13737	OC	Tilstone Gavin						
13738	OC	Torres Jesus M.						
13768	OC	Wüest Alfred						
13652	OC	Zhu Jianhua						
13587	OC	Zibordi Giuseppe						
13423	T	Nightingale T.						
13603	T	Saunders R.						
13606	T	Minnett P.J.						
13615	T	Beggs H.						
13650	T	Høyer J.						
13713	T	Mittaz J.						
13716	T	Dorandeu J.						

13740	T	Wimmer W.						
13764	T	Dybkjær G.						
13787	T	Corlett G.						
13741	T	Ignatov A.						
13473	ALT	Dettmering D.						
13544	ALT	Leuliette E.						
13602	ALT	Andersen O.B.	Ocean	Ocean	Ocean	Ocean	Ocean	
			Land	Land	Land	Land	Land	
13652	ALT	Quartly G.						
13667	ALT	Scharroo R.						
13680	ALT	Gommenginger C.						
13696	ALT	Janssen P.						
13705	ALT	Bonnefond P.						
13752	ALT	Shum C.K.						
13773	ALT	Cipollini C.						
13774	ALT	Fenoglio-Marc L.						
17099	ALT	Shepherd A.						
13714	L	Smith D.						
13588	L	Arino O.						
13733	L	Ghent D.						
13741	L	DiGiacomo P. and Yu Y.						
13729	L	Knox N.						
13760	L	Brockmann C.						
13767	L	Gobron N. and Dash J.						
13609	L	Swinnen E.						
13764	L	Silio Calzada A.						
28372	L	Smith. D						

9 Detailed plans of the S3VT-OC

9.1 Scope of the Sub-group

The ocean colour sub-group of the Sentinel 3 Validation Team (S3VT-OC) performs validation of OLCI core products at all processing levels, including Level-1 TOA radiances, and Level-2 and Level-3 ocean colour parameters as well as S3VT-OC provides support to calibration and characterization of OLCI in-orbit and based on pre-launch measurements.

Calibration is "quantitatively defining the system response to known controlled signal inputs" (http://calvalportal.ceos.org/). Sensor calibration, prelaunch and on-orbit, is the primary driver of ocean colour data quality. It requires a continuous effort encompassing off-line instrument data reanalyses, development of improved modelling strategies as the knowledge of the instrument evolves, and calibration validations. Instrument calibration is critical and is included in S3VT-OC activities.

Validation is "the process of assessing, by independent means, the quality of the data products derived from the system outputs" (CEOS Definition). S3VT-OC validates radiometric and bio-optical core products from OLCI. This includes calibrated TOA radiances at Level-1B for all bands as well as bio-optical products and atmospheric products and by-products at Levels 2 and 3. Also, individual elements of the processing algorithms and the PDGS processing chain are validated, such as pixel flagging, parts of atmospheric correction, aerosols, bidirectional reflectance of the ocean surface, ancillary processing inputs.

The S3VT-OC sub-group includes experts in the following tasks and activities:

- calibration of ocean colour instruments,
- verification of radiometric, spectral, and geometric accuracy and stability of OLCI and assessment of OLCI characterization,
- validation of Level-2 and Level-3 ocean colour products, specifically water-leaving reflectances, reflectance-derived products including chlorophyll-a concentration as well as atmospheric products and by-products,
- algorithm validation and algorithm development across marine provinces, and coastal and estuarine waters,
- validation of the elements of the Level-2 ocean colour processing chain, such as pixel classification, flagging and masking, pixel uncertainties.

In order to accomplish its tasks, the sub-group accesses OLCI calibration and characterization data, as well as uses ocean colour satellite data from other missions (MODIS, VIIRS, HICO), model data (such as carbon cycle models) and in-situ measurements from existing and new sites and dedicated campaigns.

The subgroup provides assistance to the Sentinel-3 project before launch and in the commissioning and operational phases of the mission.

Timeliness of delivery of field measurements and validations to the Sentinel-3 project as well as satellite data to the teams is specific to all subgroup teams and itemized in the following sections.

9.2 Terms of reference of the S3VT-OC Sub-group

The S3VT-OC subgroup gathers expertise and coordinates and executes calibration and validation activities corresponding to task definitions for Sentinel-3 OLCI Level-1B products and Level-2 ocean colour products in the Sentinel-3 Cal/Val plan. The sub-group accomplishes the following tasks and activities:

- **Provision of expertise and activities** to scientifically validate OLCI products utilising both offline and NRT data streams and analyses.
- **Support to analysis of calibration and characterization** of OLCI data based on on-orbit and pre-launch calibration and characterization measurements.
- **Support to validation of OLCI calibration**, absolute and relative, including OLCI measurement time-series.
- **Provision of fiducial reference measurements** that can be regarded and employed as a standard reference and characterized by detailed instrument uncertainty budgets with SI traceability as well as detailed quantification of measurement uncertainties, including environmental observation conditions.
- **Maintenance, update and implementation of optical measurement protocols**, methodologies and guidelines for field instrument calibration and characterization, for in situ measurements, measurement processing, and validation procedures. Cooperation on protocols with organizations such as IOCCG and CEOS-OCR VC.
- **High standard of quality control across the validation process**, i.e. provision of uncertainty budgets for all in-situ measurements, proper documentation of validation data collection and reporting. Quality control across all validation measurements, radiometric and bio-optical data including AOPs, IOPs, and concentrations of constituents such as chlorophyll-a.
- **Provision of all ancillary information** needed for measurement reanalyses.
- **Characterization and calibration of field instruments**, participation in inter-calibration round robins, aiming at establishing SI traceability of instrument calibration.
- **Independent validation campaigns and data analyses**
- **Validations from existing and new fixed measurement platforms**, such like AERONET-OC, **and model data**
- **Provision of field measurements** to a common database
- **Inter-comparisons of L2 / L3 products from various ocean colour missions**
- **Facilitation of access to global field measurement datasets and networks** supported by national and inter-national organizations
- **Facilitation of access** to other satellite and correlative data
- **Sharing of information and results** through S3VT web portal, wiki, blogs, e-mails.
- **Result reporting** to the Sentinel-3 Quality Working Group
- **Collaboration with the Ground-Segment teams** to maintain adequate access to data and information, to realize processing requests and to keep apprised on mission performance.
- **Coordination of activities** to improve access to funding.

9.3 Membership of the Sub-group

Prj ID	PI	PI_Country	PI_Institution
13765	Alikas Krista	ESTONIA	Tartu Observatory
13246	Antoine David	FRANCE	Laboratoire d'Océanographie de Villefranche
13653	Babin Marcel	CANADA	Université Laval, UMI Takuvik
13616	Barciela Rosa	UK	Met Office
13732	Bernard Stewart	SOUTH AFRICA	Council for Scientific and Industrial Research
13751	Bracher Astrid	GERMANY	Alfred-Wegener-Institute for Polar and Marine Research
13760	Brockmann Carsten	GERMANY	Brockmann Consult
13739	Brotas Vanda	PORTUGAL	Centre of Oceanography, Faculty of Sciences, Univ. Lisbon
13743	Bryere Philippe	FRANCE	ACRI-ST
13583	Chami Malik	FRANCE	LOV, Université Pierre et Marie Curie
13552	D'Alimonte Davide	PORTUGAL	Faculty of Science and Technology, New Univ. of Lisbon
13772	Darecki Miros□aw	POLAND	Institute of Oceanology of the Polish Academy of Science
13658	Thomas Schroeder	AUSTRALIA	CSIRO Land & Water
13741	DiGiacomo Paul	USA	NOAA
13716	Dorandeu Joel	FRANCE	Mercator-Ocean
13758	Fearns Peter	AUSTRALIA	Curtin University
13744	Fischer Jürgen	GERMANY	Institute for Space Science, Free University Berlin
13723	Hunter Peter	UK	University of Stirling
13556	Icely John	PORTUGAL	Sagremarisco Lda
13742	Jamet Cédric	FRANCE	Laboratoire d'Oceanologie et de Geosciences
14552	Kahru Mati	USA	University of California San Diego
13597	Knaeps Els	BELGIUM	VITO
13729	Knox Nichola Maria	SOUTH AFRICA	South African National Space Agency
13596	Kratzer Susanne	SWEDEN	Department of Systems Ecology, Stockholm University
13721	Kr□□el Adam	POLAND	Depart. of Physical Oceanography (DPO), Univ. of Gda□sk
13625	Larouche Pierre	CANADA	Institut Maurice-Lamontagne
13607	Lavender Samantha	UK	Pixalytics Ltd
13717	Maritorena Stéphane	USA	Earth Research Institute - UC Santa Barbara
13656	Meister Gerhard	USA	National Aeronautics and Space Administration

13766	Morris Edward	SPAIN	Instituto de Ciencias Marinas de Andalucia, CSIC
17234	Moses Wesley J.	USA	Naval Research Laboratory
13675	Oliveira Paulo	PORTUGAL	Instituto Português do Mar e da Atmosfera
13747	Peters Steef	NETHERLANDS	Water Insight BV
13452	Röttgers Rüdiger	GERMANY	Helmholtz-Zentrum Geesthacht
13702	Ruddick Kevin	BELGIUM	Royal Belgian Institute of Natural Sciences
13623	Ruddick Kevin	BELGIUM	Royal Belgian Institute of Natural Sciences
13697	Santoleri Rosalia	ITALY	CNR -Istituto di Scienze dell'Atmosfera e del Clima
13750	Shum C.K.	USA	Ohio State University
13753	Silio-Calzada Ana	SPAIN	Environmental Hydraulics Institute of Cantabria
13654	Sørensen Kai	NORWAY	Norwegian Institute for Water Research
13737	Tilstone Gavin	UK	Plymouth Marine Laboratory, UK
13738	Torres Jesus M.	SPAIN	University of Vigo
13768	Wüest Alfred	SWITZERLAND	École Polytechnique Fédérale de Lausanne
13652	Zhu Jianhua	China	National Ocean Technology Center
13587	Zibordi Giuseppe	ITALY	Joint Research Centre

9.4 Executive Summary of planned Sub-group validation activities

Colours represent the level of the status assessment:

LOW
MED
HIGH
CRIT

Sub group	S3VT-OC
Validation Project Title	**Increasing quality of above water spectral measurements in lakes/turbid waters**
Link to full Proposal	13765
Team Leader name, address and email	Krista Alikas Tartu Observatory, Tartumaa, Estonia alikas@ut.ee

Support team-members names and emails	Anu Reinart –reinart@aai.ee Olaf Krüger – olaf.krueger@aai.ee Ilmar Ansko – esa@sputnik.aai.ee Silver Lätt – silver@aai.ee Kersti Kangro – kitty@ut.ee Reiko Randoja – a71773@ut.ee Kristi Uudeberg – kristi.uudeberg@ut.ee Martin Ligi – ligi@aai.ee Elar Asuküll – elar.asukyll@gmail.com Evelin Kangro – evelin.kangro@gmail.com Philipp Grötsch – groetsch@waterinsight.nl Riho Vendt – riho@aai.ee Joel Kuusk – joel@aai.ee
Summary of activity	1. Remote sensing instruments used to validate the satellite data need to be well calibrated and characterized. The most common parameters include: radiometric sensitivity, wavelength scale, stray light, temperature dependencies etc. This, combined with improved field measurement methods, helps to achieve the main goal: to equip all the field measured quantities with properly evaluated uncertainty estimates. 2. Measurements of the Volume Scattering Function (VSF). Despite its fundamental nature, there is little known about the range of variability in the VSF in the aquatic environment. This is mainly because the measurements of the function are difficult to perform. A new method to measure the optical VSF of seawater is under preparation in ESA PECS project and first results should be available at the end of 2013. 3. Characterizing atmospheric properties (mobile CIMEL station) over the inland and coastal waters. A mobile CIMEL instrument will be used to determine the extinction in the atmosphere. In order to determine the path radiance for atmospheric correction, we will apply different filters for the instrument. In addition we will use a radiative transfer code to quantify the path radiance. The radiative transfer calculations will allow to extrapolate the path radiance to additional wavelengths. Different aerosol models will be taken into account for the simulation of the radiative transfer. 4. The lack of bio-optical data in multi-componential waters have been a major problem for developing and improving the water quality algorithms for satellite data. We will be focusing on the broad range of field measurements - spectral (RAMSES), IOPs concentration of chl a, tsm and the absorption of CDOM (water samples). Seasonal and annual

	measurements with these instruments will help to describe and understand the variability in the spectrum in highly turbid waters, hence the region/ water type specific algorithms could be developed. Each satellite product, as well as the field measurements will be accompanied with uncertainty estimates. 5. Database for field data and satellite data. Rapidly growing satellite and in situ data sources require new approaches for data reception, processing, storage, access and combining different kinds of data. However, there is no single approved solution. Tartu Observatory water remote sensing group is working on an integrated tool for water remote sensing product development. This includes the layers for importing, storing, presenting and analyzing water remote sensing data from measurements of optical properties, water quality parameters, instrument calibration data, modelled reflectance spectra, auxiliary data, and relevant satellite imagery. The core technologies include PostgreSQL database and various web tools for the user interface. The development is divided into several phases. Database and basic user interface elements were created in the first phase. At completion, the tool should allow fluent merging of in situ and satellite data for scientific investigations. 6. Processed satellite data (including uncertainty estimates) will be made available for end-users. Processing will be done automatically in near real time (as soon as the satellite image has been received). Daily, weekly, monthly, yearly composites will be generated, continuously updated and made available through web interface, where visualization and simple/basic statistics are shown.
Expected results for S3	* the set up and continuous development of optical laboratory for calibration and characterization spectroradiometers for validation satellite products and providing service for OC community. The optical laboratory will increase the measurement capability for optical radiance and irradiances by the establishment and enhancement of a spectral irradiance scale for spectroradiometers in the optical laboratory. The scale of spectral irradiance is established for the wavelength range 350-1500 nm (the goal is to reach a 1 % uncertainty); multipurpose extended wavelength range trap detector and a miniature multi element photodetector are developed for demanding use. Estimation of angular responsivities, temperature dependence coefficients and stray light properties *Development of the the Multi-spectral Volume Scattering Meter (MVSM) and measurements in turbid lake waters *Extensive field measurements by using wide set of instruments to measure simultaneously the optical properties of water (spectra, IOPs, the concentrations of chl a, tsm and cdom) and atmosphere (scattering and extinction). * Algorithm development over turbid waters, addressing the specific

	atmospheric conditions. *The combination of optical (OLCI) and temperature (SLSTR) data will be used for validation activities and monitoring the annual trends.
Reference to S3 Cal/Val plan tasks	* simultaneous water colour and temperature measurements will be performed during the field cruises. They will be used to validate the data from OLCI and SLSTR sensors (S3-MR-870, S3-MR-620, S3-MR-350, S3-MR-360, S3-MR-380, S3-MR-390, S3-MR-400, S3-MR-440, S3-MR-1120) * due to highly dynamic conditions in the lakes and coastal areas, frequent field measurements will be performed. They should be accompanied with satellite data providing frequent overpasses and geographical coverage to allow intercomparison/validation (S3-MR-500, S3-MR-510, S3-MR-530, S3-MR-540, S3-MR-560, S3-MR-590, S3-MR-610) * Tartu Observatory has commissioned Earth Observation Data reception station in 2010 which was used for regular MERIS FR data receiving. Reception, archival and processing facilities are also planned for data from Sentinel satellites in cooperation of EUMETSAT partner in Estonia (Hydrometeorological institution) (S3-MR-10, S3-MR-20, S3-MR-30, S3-MR-40) * Processing of satellite data will be done automatically in NRT and made available for end-users with uncertainty estimates (S3-MR-830, S3-MR-840, S3-MR-1190) * field measurements will allow optimization of Sentinel-3 OLC instrument coastal shelf (case-2) waters, inland seas and lakes. (S3-MR-460) * high spatial and spectral resolution is needed due to relatively small spatial extent and rapid spatial and temporal changes in the lakes and coastal areas (S3-MR-120, S3-MR-750, S3-MR-760, S3-MR-1080, S3-MR-1090) * field measurements will coincide with the Sentinel 3 overpass (S3-MR-800) * given the similar spectral characteristics, the algorithms developed for lakes and coastal areas with the data from ENVISAT/MERIS will be tested and applied to OLCI data (S3-MR-50, S3-MR-890, S3-MR-60, S3-MR-80 * the accurate retrieval of high-priority products (i.e diffuse attenuation coefficient, chl a, tsm, cdom, SST) and the additional products (i.e. water transparency, IOPs) required by GMES will be addressed (S3-MR-1180) *New optical laboratory set up will be used for optical calibration - Sentinel-3 VIS reflectance's at TOA shall have an absolute radiometric accuracy goal of <2 % with reference to the sun for the 400-900 nm waveband and <5% with reference to the sun for wavebands > 900 nm

	traceable to international reference standards. (S3-MR-1010)		
Data requirements, data coverage and timeline	**Sentinel-3 Product Names** OL1_EFR, OL2_WFR, SL_1_RBT, SL_2_WSt	**Data Coverage** Lake Peipsi: 59.1360N, 27.0140E, 57.7640N, 28.1470E Lake Võrtsjärv: 58.4400N, 25.9350E, 58.0830N, 26.1000E Baltic Sea coastal areas Pärnu Bay: -58.332567N, 24.38324E Matsalu Bay: -58.76906 N, 23.539286E Gulf of Riga: -57.471867N, 23.743723E Gulf of Finland: -59.833775, 24.845123	**Specific Timeline of Validations** Field measurements from April - October
In situ validation data to be collected	*The list of physical quantities and instruments used for measurements in water: - spectral reflectance, radiance and irradiance (ramses, wisp) - volume scattering function (VSF3, BB3, MSVM) - absorption and beam attenuation (AC-S which is accompanied with shorter cuvette/path length (10cm) to measure in more turbid waters in comparison with standard 25 cm cuvette) - concentration of chl a, tsm - absorption of CDOM - species composition - phytoplankton pigment specific absorption - diffuse attenuation coefficient - Secchi depth - Auxiliary data: temperature, cloud and wave properties, salinity etc.		

	*Data for the atmospheric correction (CIMEL, MICROTOPS).					
Special data needs	**Need for special satellite acquisitions:** No				**Requested data timeliness:** as soon as possible	
Status assessment						
	Pre-launch	Commissioning Phase	Year 1	Year 2	Year 3 to year 7.5	Beyond nominal life
Schedule of proposed activities	LOW	LOW	LOW			
Availability of funding	MED	MED	MED	LOW		
Availability of infrastructure	MED	MED	MED	MED	LOW	LOW
Availability of people	MED	MED	MED	MED	LOW	LOW

Sub group	S3VT-OC
Validation Project Title	**BOUSSOLE**
Link to full Proposal	13246
Team Leader name, address and email	David Antoine Department of Imaging and Applied Physics, Curtin University Building 301, room 146, GPO Box U1987 Perth, WA 6845, AUSTRALIA tel +61 8 9266 3572 fax +61 8 9266 2377 david.antoine@curtin.edu.au
Support team-members names and emails	Vincenzo Vellucci, enzo@obs-vlfr.fr Melek Golbol, golbol@obs-vlfr.fr Bernard Gentili, gentili@obs-vlfr.fr
Summary of activity	The purpose of the BOUSSOLE project is to establish a time series of optical properties in oceanic waters, in support to bio-optics research, to calibration of ocean colour satellite observations, and to validation of the products derived from these observations. The bio-optics research as well as the "match-up" analyses and vicarious calibration experiments are performed based on the data set that is being built from the permanent marine optical buoy and monthly cruises. The site where the mooring is deployed and where the cruises are carried out is located in the Ligurian sea, one of the sub-basins of the Western Mediterranean sea. This project has been named “BOUSSOLE", which is a French acronym meaning "BOUée pour l'acquiSition d'une Série Optique à Long termE". It is literally translated from French as the “buoy for the acquisition of a long-term optical series." "BOUSSOLE" is the French word for "compass". BOUSSOLE is a joint effort by multiple organizations, which are pooling together the work of a lot of people, and is funded and supported by the following agencies and academic or governmental institutes: • European Space Agency (ESA), • Centre National d’Etudes Spatiales (CNES), • Centre National de la Recherche Scientifique (CNRS) • Agence Nationale de la Recherche (ANR) • National Aeronautics and Space Administration (NASA),

	• Institut National des Sciences de l'Univers (INSU), • Université Pierre et Marie Curie (UPMC), • Observatoire Océanologique de Villefranche-sur-Mer. Details at: http://www.obs-vlfr.fr/Boussole Also: Antoine, D. M. Chami, H. Claustre, F. D'Ortenzio, A. Morel, G. Bécu, B. Gentili, F. Louis, J. Ras, E. Roussier, A.J. Scott, D. Tailliez, S. B. Hooker, P. Guevel, J.-F. Desté, C. Dempsey and D. Adams. 2006, BOUSSOLE : a joint CNRS-INSU, ESA, CNES and NASA Ocean Color Calibration And Validation Activity. NASA Technical memorandum N° 2006 - 214147, 61 pp.
Expected results for S3	1- Contribute to the determination of vicarious calibration gains in the visible bands 2- Contribute to validation of all ocean products 3- Do 1 & 2 over the entire mission lifetime
Reference to S3 Cal/Val plan tasks	This refers to tasks in the S3 cal/val plan version 1.0, 31 January 2013. Providing data for task OLCI-L2-CV-220 Providing data for task OLCI-L2WLR-CV-300 Conducting task OLCI-L2WLR-CV-310, 320 & 330 (360 optional) Providing data for task OLCI-L2WLR-CV-530

Data requirements, data coverage and timeline	**Sentinel-3 Product Names** Full resolution L2 products, all ocean parameters	**Data Coverage** BOUSSOLE site, 43°22' N, 7°54' E	**Specific Timeline of Validations** All year round
In situ validation data to be collected	See Tables below: "BOUSSOLE buoy data set" "BOUSSOLE monthly cruises data set"		
Special data needs	**Need for special satellite acquisitions:** No		**Requested data timeliness:** No requirement here

Status assessment (assume launch is fall 2015)

	Pre-launch	Commissioning Phase	Year 1	Year 2	Year 3 to year 7.5	Beyond nominal life
Schedule of proposed	LOW	LOW	LOW	LOW	LOW	LOW

activities						
Availability of funding	LOW	LOW	LOW	MED	MED	MED
Availability of infrastructure	LOW	LOW	LOW	MED	MED	MED
Availability of people	LOW	LOW	LOW	MED	MED	MED

BOUSSOLE buoy data set

Type	**Instrument**	**Measurements**	**wavelengths**	**Derived products**
Above surface measurements	Satlantic 200 series radiometers	Downward irradiance above the surface	412, 443, 490, 510, 560, 665, and 683 nm	Es(□)
	Satlantic HyperOCI		350 to 800 nm, 3nm resolution	
	Satlantic PAR	PAR above the surface	Integrated flux from 400 to 700 nm	PAR(t)
Sub-surface measurements	Satlantic 200 series radiometers	Downward irradiance at 4 m	412, 443, 490, 510, 560, 665, and 683 nm	Ed(z, □), Eu(z, □), Lu(z, □), Lw(□), Rrs(□), R(□), Kd(□)
		Downward irradiance at 4 m		
		Upwelling radiance at 4 m		
		Downward irradiance at 9 m		
		Downward irradiance at 9 m		
		Upwelling radiance at 9 m		
	Satlantic HyperOCR	Upwelling radiance at 4 m	350 to 800 nm, 3nm resolution	
		Upwelling radiance at 9 m		
	Wetlabs EcoFLNTU fluorometer	Chlorophyll fluorescence at 4 m	N/A	Proxy to Chl
		Chlorophyll fluorescence at 9 m		
	Wetlabs' C-star transmissometer	Beam attenuation at 4 m	660nm	Attenuation coefficient, c(□)
		Beam attenuation at 9 m		
	Seabird' SBE 37 SI	CTD	N/A	Salinity, depth, temperature

	Hobilabs' Hydroscat-IV	Backscattering at 9m	442, 488, 550, 620 nm	Particulate backscattering coefficient, b_{bp}(□)
	EZ-compass III	Tilt sensor and compass	N/A	Tilt and orientation of the buoy (w.r.t. the sun position)

BOUSSOLE monthly cruises data set

Type	Instrument	Measurements	Wavelengths (nm)	Derived products
Free-fall vertical profiles (0-150 m)	Biospherical C-OPS	Downward irradiance	320 340 380 395 412 443 465 490 510 532 555 560 589 625 665 683 710 780 + PAR	Ed(z, □), Eu(z, □), Es(□), Rrs(□), R(□), Kd(□)
		Upward irradiance		
Above surface		Downward irradiance above surface		
Surface (0-50)	Secchi disk	Secchi depth	N/A	Secchi depth (water transparency)
Atmosphere	CIMEL CE-317	Sun beam attenuation	440, 680, 870, 936, 940, 1020 nm	Aerosol optical thickness & type
0-400 m, continuous	SeaBird 911 + SBE3 (temp), 4 (cond) & 43 (oxygen)	Classical CTD package	N/A	Conductivity, temperature, pressure, phytoplankton fluorescence, Oxygen
	Hobilabs A-sphere	Hyperspectral total absorption	350-800, 3 nm resolution	Total & particulate absorption coefficient
	Wetlabs C-star	Total attenuation	660	Particulate attenuation coefficient
	Hobilabs Hydroscat-VI	Backscattering at 140°	412, 442, 488, 510, 550, 620	Particulate backscattering coefficient, b_{bp}(□)
	Hobilabs Gamma-IV	Collimated beam attenuation	442, 488, 550 and 660	Beam attenuation coefficient, cp(□)
0-400m, discrete sampling	12 bottle rosette	HPLC analyses	N/A	Phytoplankton pigments
		Spectrophotometry (Perkin Elmer lambda 19)	350-700, 2nm resolution	Particulate absorption coefficients (phytoplankton, non-algal particles)
		Spectrophotometry (WPI ultrapath)	300-700, 2nm resolution	CDOM absorption
		Weighting	N/A	Dry weight of particles (TSM)

Sub group	S3VT-OC
Validation Project Title	**OLCI data validation in the Canadian Arctic**
Link to full Proposal	13653
Team Leader name, address and email	Prof. Marcel Babin Takuvik Joint Laboratory, CNRS- Université Laval Biology Department, Pavillon Alexandre-Vachon 1045 Avenue de la Médecine G1V 0A6 Quebec, Qc Canada email: marcel.babin@takuvik.ulaval.ca
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Summary of activity	The validation team proposes to address the validation of ocean-colour data (e.g. remote sensing reflectances) and derived products (e.g., chlorophyll-a, yellow substance absorption, diffuse attenuation coefficient) in Arctic waters. The Arctic Ocean is rapidly changing due to the loss of sea-ice cover in the spring and summer. High spatial and temporal resolution satellite sensors, in particular ocean colour sensors, present an unequalled advantage over conventional in situ measurements. However, challenges faced by ocean-colour remote sensing in Arctic waters are multiple and include: low solar zenith angles, contamination by ice cover and ice floats, highly turbid waters (particularly on the arctic shelf) and specificity of phytoplankton inherent optical properties (e.g., high packaging effect). As members of the ArcticNet network (a pan-Canadian network dedicated to the research in the Arctic), the validation team will have access to the Amundsen Ice-breaker, which visits fixed station in the Arctic Ocean on a yearly basis during the ice-free season. In addition, the team expects sporadic access to research ships cruising in the Arctic Ocean, for example Takuvik is associated with the research ship TARA that will be

	sampling Russian Arctic waters in the summer of 2013. These various cruises will provide a unique opportunity to collect data relevant to ocean-colour activities, such as spectral and angular distributions of radiative fields (including remote-sensing reflectances), chlorophyll-a concentration (an index of biomass), absorption and scattering by optically active marine components, suspended material concentration and more advanced products such as primary production. This suite of measurements will be completed with measurements carried out by gliders, profilers and automated underwater vehicle (AUV) equipped with bio-optical sensors to extend observations beyond the ship capacity. The use of gliders and AUV represents an asset when studying optical properties of the water column close to the ice edge. The instrumentation team possesses the required experience, obtained through multiple research missions in various ocean of the world including the Arctic (e.g., Malina Campaign, 2009), to apply standard protocols when collecting optical and bio-optical data. This ensemble of measurements will be primarily used to assess the performance of OLCI in Arctic waters by direct comparison of retrieved products to in situ measurements. The impact of above-mentioned issues will also be studied and possible correction proposed based on the complete set of measurements collected during research cruises, including measurement collected previously to Sentinel-3 launch. Members of the team have many years of experience in dealing with the processing of satellite data and addressing issues such as atmospheric correction and effect of ice on the radiative signal, but also with the specificity of Arctic bio-optics (e.g., highly turbid waters and strong phytoplankton packaging effect). The outcomes of the proposal are multiple. First, quantification of the performance of the standard ESA algorithms will be carried out. Modifications of current algorithms or newly-developed algorithms will be proposed to account for the specificity of the Arctic ocean. A database of relevant bio-optical measurements will be created and supplied to the ESA Mermaid archive for cal/val activities.		
Expected results for S3	The expected results for S3 are a validation of OLCI geophysical products in the Canadian arctic, including quantification of errors. Development of regional and global algorithms		
Reference to S3 Cal/Val plan tasks	OLCI-L2WLR-CV100; OLCI-L2WLR-CV200; OLCI-L2WLR-CV300; OLCI-L2WLR-CV400		
Data requirements, data coverage and timeline	**Sentinel-3 Product Names** Level 1 and Level 2 data	**Data Coverage** The arctic Ocean, above 60°N	**Specific Timeline of Validations** Continuously through the entire mission

In situ validation data to be collected	• Remote-sensing reflectances, • Downwelling and upwelling radiances over the water column • PAR at sea surface • Pigment concentrations and composition (including chlorophyll-a), • Turner chlorophyll-a concentration, • Absorption coefficients of yellow substances, detritus and phytoplankton between 350 and 750 nm. • Particle backscattering. • CDOM and Chl-a fluorescence					
Special data needs	**Need for special satellite acquisitions:** Sea-Ice concentration				**Requested data timeliness:** Same than OLCI	

Status assessment						
	Pre-launch	Commissioning Phase	Year 1	Year 2	Year 3 to year 7.5	Beyond nominal life
Schedule of proposed activities	LOW	LOW	LOW	LOW		
Availability of funding	LOW	LOW	LOW	LOW	MED	HIGH
Availability of infrastructure	LOW	LOW	LOW	LOW	MED	HIGH
Availability of people	LOW	LOW	LOW	LOW	MED	HIGH

Sub group	S3VT-OC
Validation Project Title	**Validation and Development of OLCI Products for Southern African Eutrophic Waters, the Southern Ocean and African Shelf Seas**
Link to full Proposal	13732
Team Leader name, address and email	Stewart Bernard Earth Observation, Natural Resources & the Environment Council for Scientific and Industrial Research (CSIR-NRE) 15 Lower Hope Street, Rosebank, Cape Town, South Africa sbernard@csir.co.za
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Summary of activity	Validation of standard products and development of new algorithms/products for Southern African inland and shelf sea waters (with a focus on eutrophic waters) and the Southern Ocean
Expected results for S3	Outcomes will include the following: • Characterisation of errors through per pixel error products associated with application of existing AC and in-water algorithms for eutrophic waters. • Development and validation of specialist eutrophic water products, including eutrophication indices, HAB and phytoplankton functional type algorithms. • Contribution of validation data to ESA and public-domain databases. • Contribution to updated validation protocols for eutrophic waters. • Increase in Sentinel-3 mission team understanding of eutrophic water applications.

Reference to S3 Cal/Val plan tasks	Provide a quantitative understanding of OLCI sensor and product performance, and recommendations for optimised OLCI application, in eutrophic waters, the Southern Ocean, and Southern African shelf seas. Objectives: 1. Collect radiometric and geophysical data to validate L2 (& L1 derived) products during phases E1 and E2, 2. Advise on performance and optimised application of atmospheric correction and in---water algorithms in eutrophic near---coastal and inland waters, Southern Ocean and African shelf sea waters, 3. Contribute to best practice guidelines for validation, processing and use of Sentinel 3 products in eutrophic waters.		
Data requirements, data coverage and timeline	**Sentinel-3 Product Names** OL1_EFR OL2_WFR OL1_ERR OL2_WRR OL2_LFR	**Data Coverage** Benguela: 31S to 34S, 17 to 19E; Inland: 25S to 25.5S, 29E to 29.5E; Southern Ocean: 35S to 75S, 10W to 30E.	**Specific Timeline of Validations** TBD, Launch +1M onwards
In situ validation data to be collected	Benguela and freshwater data to be collected with the deployment of radiometric bouys and coincident in-situ sampling. In addition to 2-3 annual field trips. Southern Ocean includes underway IOPS, Biogeochemistry and station radiometry occur on 3 annual cruises. Agulhas will make use of opportunistic cruises which are expected to take place annually. Data to be collected will vary on different missions but may include retrieval of some or all of the following data/tools: Autonomous platforms, AOP's & radiometry, Aerosol Optical thickness, IOPS, Biogeochemistry, Physiology and Phytoplankton assemblages.		
Special data needs	**Need for special satellite acquisitions:**		**Requested data timeliness:**

Status assessment

	Pre-launch	Commissioning Phase	Year 1	Year 2	Year 3 to year 7.5	Beyond nominal life
Schedule of proposed activities	LOW	LOW	LOW			
Availability of		HIGH	CRIT	CRIT		

funding						
Availability of infrastructure	MED	MED	MED	MED	MED	MED
Availability of people	MED	MED	MED	MED	MED	MED

Sub group	S3VT-OC
Validation Project Title	**Validation of OLCI ocean colour products focusing on high latitudes (OCVAWI)**
Link to full Proposal	13751
Team Leader name, address and email	Prof. Dr. Astrid Bracher Phytooptics Group at the Alfred-Wegener-Institute Helmholtz Centre for Polar & Marine Research, Bussestraße 24, 27570 Bremerhaven, Germany Astrid.bracher@awi.de
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Summary of activity	For the Sentinel-3 validation campaign our objective is to validate ocean color level-2 products of OLCI with in-situ measurements. We want to validate chlorophyll conc., water leaving radiances or remote sensing reflectances, Kd490, absorption coefficients (phytoplankton, CDOM), POC conc. and PAR with data from the below stated in-situ measurements obtained during various campaigns. Most of our validation campaigns within early operation of Sentinel-3 OLCI will focus on the high latitudes (at 60°N->80°N and 45° to 70°S; funding secured for three RV POLARSTERN cruises in 2015-2016), but we will also sample at a coastal site at the Costa Brava, Alfacs Bay, Spain (with a local boat and from a raft) and in the Peruvian upwelling (with RV SONNE-II Oct 2015). Specifically the following parameters will be measured either continuously throughout the campaigns or at specific stations only at surface or in the whole profile: Apparent optical properties from radiometers (TRIOS RAMSES) deployed above (for continuous measurements of E_d) and in-water (at stations profiles of Ed, Lu, kd; inherent optical properties from absorption (determined for CDOM, particulate, phytoplankton, total separately) measurements from water samples at stations and continuous attenuation and total absorption measurements during a transect at the surface and at stations in the profile or with TRIOS VIPER or ACS (WET labs); phytoplankton pigment conc. determined with HPLC and particulate organic carbon conc. with C/N Analyzer determined at water samples as mentioned above. Besides validation we are also seeking to develop further our own ocean colour algorithms.
Expected results for S3	1 – **Validation of Ocean Colour products (**CHL, FLH, a_443, aph_443, aCDOM_443, RRS(hyperspectral), PFT chl-a, other pigments) with in situ data in high latitudes and some other costal and open ocean sides 2 - **Development and implementation of bio-optical algorithms** to obtain phytoplankton fluorescence, community composition and phytoplankton abundances, CDOM on regional and global scale. 3 - **Inter-comparison of Sentinel-3 products with RS products** from

	other sources 4 – Establishment of **common protocols** for in situ parameters with the other teams.		
Reference to S3 Cal/Val plan tasks	Cal/Val activities will be conducted in several areas: high latitudes, upwelling, and estuarine (Lena and Ebro Delta) OLCI-L2WLR-CV300 OLCI-L2WLR-CV400		
Data requirements, data coverage and timeline	**Sentinel-3 Product Names** PAR,R(☐), k_d(490), CHL, a_443, adg_443, TSM If there also: FLH, aCDOM, aph_443, POC, PFT chl-a	**Data Coverage** NRT data: 4 weeks prior to 4 weeks after specific campaigns at area within 10° of campaign; Consolidated data of global coverage	**Specific Timeline of Validations** Entire life time
In situ validation data to be collected	See above		
Special data needs	**Need for special satellite acquisitions:**	FR for coastal campaigns so far not clear since launch not clear!	**Requested data timeliness:** For entire Sentinel-3 OLCI lifetime

Status assessment						
	Pre-launch	Commissioning Phase	Year 1	Year 2	Year 3 to year 7.5	Beyond nominal life
Schedule of proposed activities				MED	MED	MED
Availability of funding		LOW	LOW	MED	MED	MED
Availability of infrastructure	LOW	LOW	LOW	MED	LOW	LOW
Availability of people	LOW	MED	MED	HIGH	HIGH	HIGH

Sub group	S3VT-OC
Validation Project Title	**Ocean colour validation on subtropical North East Atlantic**
Link to full Proposal	13739 http://co.fc.ul.pt/pt/investigacao/projectos
Team Leader name, address and email	Prof. Vanda Brotas Centre of Oceanography, Faculty of Sciences of the University of Lisbon , 1749-016 Lisbon, Portugal vbrotas@fc.ul.pt
Support team-members names and emails	Prof. Ana Martins - anamartins@uac.pt Dr. Igor Bashmachnikov- igorb@fc.ul.pt Dr. Ana Brito - acbrito@fc.ul.pt Dr Carolina Sá - cgsa@fc.ul.pt Dr. Filipe Neves - fneves@fc.ul.pt Dimitri Boutov - dboutov@fc.ul.pt
Summary of activity	• Sampling and analysis of in situ data for validation purposes (in-situ data will include CTD with fluorescence measurements, phytoplankton pigments through HPLC, microscope identification of phytoplankton species, in-vivo particulate absorption coefficient, analysis of suspended matter, coloured dissolved matter absorption, diffuse attenuation coefficient and photosynthetic active radiation) • Matchup analysis with Level 2 data. • Use of Level 1 to test different atmospheric correction procedures. • Participation in workshops and round robins for methodology inter-comparisons. • Reporting on protocols, technical notes, results, and data, following data policy • Provide and share future data with S3VT according to data policy to be established. • Coordinate efforts with the other Portuguese teams, joint efforts to get national funding. Set up an Iberian network of Laboratories with expertise in Ocean Colour Remote Sensing and in situ data in order to apply for international funding.
Expected results for S3	1 – **Validation of Ocean Colour products** with in situ data in our Region of Interest (ROI) 2 - **Development and implementation of bio-optical algorithms** to obtain phytoplankton community composition and phytoplankton abundances for our ROI. 3 - **Inter-comparison of Sentinel-3 products with RS products** from other sources 4 – Establishment of **common protocols** for in situ parameters with

	the other teams. 5 - Development of tools to evaluate the **environmental quality** of case I and II waters in North East Atlantic under the Marine Strategy Framework Directive, and to help monitoring **HABs events**.		
Reference to S3 Cal/Val plan tasks	• Cal/Val activities will be conducted in several areas: upwelling, oligotrophic, mesotrophic and estuarine.		
Data requirements, data coverage and timeline	**Sentinel-3 Product Names** 1 - Water-leaving Reflectances 2 – Chlorophyll a 3 - Total Suspended Matter 4 - Diffuse Attenuation Coefficient 5 - Coloured Dissolved Matter Absorption 6 - Photosynthetically Active Radiation 7 -Additional parameters: Sea Surface Temperature (SST), Sea Level Anomalies (SLA)	**Data Coverage** 30 to 46º N; 5 to 32º W	**Specific Timeline of Validations** Since the start of the mission, including E1 phase.
In situ validation data to be collected	Data collected along the Portuguese Iberian Coast and off Azores, sampling program and effort dependent on future funding Data collected monthly inside the Tagus estuary (already funded)		
Special data needs	**Need for special satellite acquisitions:** No		**Requested data timeliness:** No special request, except during future organized campaigns

Status assessment						
	Pre-launch	Commissioning Phase	Year 1	Year 2	Year 3 to year 7.5	Beyond nominal life
Schedule of proposed activities	LOW	LOW	LOW			
Availability of funding	CRIT	CRIT	CRIT	CRIT		

Availability of infrastructure	MED	MED	MED	MED	MED	MED
Availability of people	MED	MED	MED	MED	MED	MED

Sub group	S3VT-OC
Validation Project Title	Validation of OLCI L2 products with focus on coastal waters
Link to full Proposal	13743
Team Leader name, address and email	Philippe Bryère ACRI-ST, 40 Quai de la douane 29200 Brest philippe.bryere@acri-st.fr
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Summary of activity	The team is composed of members of the MCGS (Marine Collaborative Ground Segment) in charge of developing environmental services, based on Sentinel 3 data, especially OLCI data. The MCGS team has a long-lasting experience and a deep understanding of oceanography and potential use of Earth Observation data to enhance biogeochemical monitoring systems, with an emphasis on the reliability and uncertainty assessment, of particular relevance for OLCI. Part of the validation of the Ocean Colour products will be made in partnership with Ifremer in Brest. For more than twenty years, Ifremer has been collecting a long time series of Chlorophyll-a, Suspended Particulates Matters, and turbidity data along the French shores trough the REPHY, a French national Phytoplankton network. The data collected regularly on thirty main coastal stations are made available within three weeks after acquisition through an automatic extraction which has been tested in the first year of the MCGS project. Thanks to these data, Ifremer has been able to quickly adapt the OC5 Ifremer algorithm to VIIRS, providing Chl-a, SPM and Turbidity data consistent with MODIS products. This method will be extended to OLCI, with assessment of the new OLCI algorithms and comparisons to the Ifremer OC5 products. Others IOP retrieval algorithms will be tested.
Expected results for S3	The Sentinel Marine Collaborative Ground Segment (MCGS) is currently being developed by eight French actors (private and public sector) to deliver added value products and tailored services complementing the GMES Core Ground Segment in the marine/coastal field. Targeted markets include operational monitoring and support, optimization of human and material means, respect of regulation at sea and coastal area and relies in particular on Ocean Colour products (as well as altimetry and Sentinel 1 data). In this context, MCGS will contribute to the validation of any products retrieved from OLCI, IOPs, Chl-a, SPM provided by the SV3 team and based on Mermaid data but it will also provide in near real-time an access to the Chl-a, SPM and turbidity collected within the REPHY network. An automatic access to the Ifremer Quadrige2 dataset, has been developed

	through the first years of MCGS. This access makes available the REPHY data within two of three weeks after their measurements. The performance of the new OLCI algorithms in Chl-a and SPM will also be compared to the outputs of the IFREMER OC5 algorithm for Chl-a and SPM. This algorithm has proven to be robust in the turbid waters of the European North-West Shelf and applied to MERIS, MODIS and VIIRS within MyOcean1 and 2. These results (comparisons, matchups, trend analysis...) could be shared in the S3VT-O, as well as feedback on new processing performance. Similar validation activities will be carried out on turbidity by using turbidity data collected by SHOM.					
Reference to S3 Cal/Val plan tasks	Validation of OLCI Chl-a and SPM algorithms in coastal turbid waters. Comparisons with OC5 OLCI, MODIS and VIIRS products based on a network of (mainly coastal) stations.					
Data requirements, data coverage and timeline	**Sentinel-3 Product Names** **OL2_EFR** - OLCI water-leaving reflectance (TACCS bands: 412, 443, 490, 510, 560, 620, 671) - CDM absorption coefficient ADG443) - Humic material absorption coefficient AD443 - Algal pigment concentration - Total Suspended Matter concentration TSM - Diffuse Attenuation coefficient KD490		**Data Coverage** Global		**Specific Timeline of Validations** As soon as possible as the in situ data for comparison will be available very quickly after acquisition (within 15 days for some of the coastal stations)	
In situ validation data to be collected	The IFREMER Phytoplankton network will provide a long time series of updated measurements. 28 stations of this network have been used to validate OC5 products within MyOcean1 and 2. The French Hydrographic Service of the Navy (SHOM), which is partner of MCGS, develops a database of turbidity that could be used for validation of OLCI turbidity algorithms.					
Special data needs	**Need for special satellite acquisitions:**				**Requested data timeliness:**	
Status assessment						
	Pre-launch	Commissioning Phase	Year 1	Year 2	Year 3 to year 7.5	Beyond nominal life
Schedule of	LOW	LOW	LOW			

proposed activities						
Availability of funding	MED	MED	MED	MED		
Availability of infrastructure	MED	MED	MED	MED		
Availability of people	MED	MED	MED	MED		

Sub group	S3VT-OC		
Validation Project Title	**Use of original radiometric in-situ autonomous profiling floats for OLCI vicarious calibration and validation activities (RADFLOAT)**		
Link to full Proposal	13583		
Team Leader name, address and email	Malik Chami LOV, 181 Chemin du Lazaret, 06230 Villefranche sur Mer chami@obs-vlfr.fr		
Support team-members names and emails			
Summary of activity	Vicarious calibration of OLCI using radiometric profiling float (e.g., BOSS float); validation of apparent optical properties derived from level 2 OLCI products (e.g., diffuse attenuation coefficient Kd)		
Expected results for S3	Adjustment of calibration coefficients of OLCI ; improvement of some level 2 geophysical OLCI products		
Reference to S3 Cal/Val plan tasks	OLCI-L2WLR-CV-100 OLCI-L2WLR-CV-200		
Data requirements, data coverage and timeline	**Sentinel-3 Product Names** OLCI, level 1 data and level 2 products	**Data Coverage** Commissioning phase (calibration)	**Specific Timeline of Validations** -
In situ validation data to be collected	Apparent optical properties below water (downward irradiance, upward irradiance, upward radiance below water)		
Special data needs	**Need for special satellite acquisitions**: data over given study areas (see proposal)		**Requested data timeliness:** commissioning phase for calibration

Status assessment						
	Pre-	Commissioning	Year 1	Year 2	Year 3	Beyond

	launch	Phase			to year 7.5	nominal life
Schedule of proposed activities	LOW	LOW	LOW			
Availability of funding		CRIT	CRIT	CRIT		
Availability of infrastructure	HIGH	HIGH	HIGH	HIGH	HIGH	HIGH
Availability of people		LOW	LOW	LOW	LOW	LOW

Sub group	S3VT-OC
Validation Project Title	**Va**lidation and development of optical and biological Senitinel-3 products for the **Ba**ltic optically comple**x** waters (**VABAX**)
Link to full Proposal	13772
Team Leader name, address and email	Miros☐aw Darecki Institute of Oceanology of the Polish Academy of Science, Powstancow Warszawy 55, 81-712 Sopot, Poland darecki@iopan.gda.pl
Support team-members names and emails	Slawomir Sagan, sagan@iopan.gda.pl Piotr Kowalczuk, piotr@iopan.gda.pl Miroslawa Ostrowska, ostra@iopan.gda.pl
Summary of activity	The proposed project aims to improve the quality and accuracy of ocean colour derived products from Sentinel-3 for the Baltic Sea. Various algorithms and inversion techniques (e.g. neural networks, semi-empirical algorithms) will be developed and tested within the project. Some of the advantages of the new Sentinel-3 sensor over the MERIS sensor are additional spectral bands which may be considered for improved fluorescence retrieval (e.g. 673nm). High level of eutrophication together with relatively smaller turbidity of the Baltic open waters, should provide favourable conditions for remote detection of pigment fluorescence. Fluorescence proxies for biomass in terms of chlorophyll-a as well other accessory pigments will be investigated as potentially new optical tool for phytoplankton monitoring at the group level using remote sensing techniques. The comprehensive series of in situ data, necessary for validation and development of remote sensing algorithms will be collected during several cruises on the Baltic Sea. If possible data will be collected synchronous to Sentinel-3 overpasses to ensure the best matching. Because typical for the Baltic, high percentage of partially or fully cloudy images, it is crucial to use for validation data from various sources. The most effective options seem to be platforms which provide continuously measurements of radiometric and biological water properties. Such two platforms will be also utilized in the project. The one is a bio optical buoy, recently developed at the IOPAN. The buoy will be preliminary located in middle of Gdansk Bay and is equipped with Ed and Lu radiometers at the two depths, accompanied by reference Ed sensor located above the water. Among several other bio-optical sensors, the chlorophyll and CDOM fluorometers are also mounted at the buoy. The second platform is a set of radiometers mounted at the Polish oil platform located 75 kilometers

	north of the Polish coast. The radiometers are configured for measurement of remote sensing reflectance from above the water. All the data will be transmitted for processing in the real time mode.		
Expected results for S3	Activity within this proposal should provide locally fitted and validated algorithms for ocean color products in the optically complex Baltic Peer-reviewed scientific publications; presentations at international conferences and workshops		
Reference to S3 Cal/Val plan tasks	Ocean Colour Validation with in situ measurements (OLCI-L2WLR-CV-300) Ocean Colour Validation with Level 3 products (OLCI-L2WLR-CV-400) Ocean Colour Processing Quality Validation (OLCI-L2WLR-CV-500),		
Data requirements, data coverage and timeline	**Sentinel-3 Product Names** OL1_ERR, OL2_WFR, OL2_WRR, SL_1_RBT, SL_2_WST	**Data Coverage** Baltic Sea	**Specific Timeline of Validations**
In situ validation data to be collected	• Water leaving radiance and downwelling irradiance in the spectral bands fitted to the Senitnel-3 instrument: measured above the water, retrieved from Lu profiles and measured at the float. • Photosynthetically available radiation (measured continuously at the buoy and platform locations, and during the cruises) • Phytoplankton fluorescence (chl-a fluorometers mounted on the buoy and chl-a fluorometers deployed during the cruises together with 4-bands fluorometer) • Comprehensive sets of other water bio-optical properties measured during the cruises (profiles of ctd, ac9, Lisst, cdom fluorescence, profiles of Lu and Ed e.g. to calculate kd coefficients, collected waters samples to laboratory analysis of HPLC, TSM, apl, acdom) • During the cruises, if possible, data will be collected synchronous to Sentinel-3 overpasses to ensure the best matching • Aerosol optical thickness (Microtops, measured during the cruises)		
Special data needs	**Need for special satellite acquisitions:**		**Requested data timeliness:**

Status assessment

	Pre-launch	Commissioning Phase	Year 1	Year 2	Year 3 to year 7.5	Beyond nominal life
Schedule of proposed activities		LOW	LOW	LOW	LOW	MED

Availability of funding	MED	LOW	LOW	MED	MED	MED
Availability of infrastructure	MED	LOW	LOW	LOW	LOW	MED
Availability of people	LOW	LOW	LOW	LOW	LOW	MED

Sub group	S3VT-OC
Validation Project Title	Australian Ocean, Coastal and Inland Waters Validation Exercise
Link to full Proposal	13658
Team Leader name, address and email	Thomas Schroeder, CSIRO Ocean & Atmosphere, GPO Box 2583, Brisbane, Queensland 4001, Australia Thomas.Schroeder@csiro.au
Support team-members names and emails **(in alphabetical order)**	Antoine, David – David.Antoine@curtin.edu.au Baker, Brett – Brett.Baker@csiro.au Blondeau-Patissier, David - David.Blondeau-Patissier@cdu.edu.au Boadle, David – David.Boadle@csiro.au Brando, Vittorio – Vittorio.Brando@csiro.au Cherukuru, Nagur – Nagur.Cherukuru@csiro.au Clementson, Lesley – Lesley.Clementson@csiro.au Dekker, Arnold – Arnold.Dekker@csiro.au Fearns, Peter – P.Fearns@curtin.edu.au Hardman-Mountford, Nick – Nick.Hardman-Mountford@csiro.au King, Edward – Edward.King@csiro.au Lovell, Jenny – Jenny.Lovell@csiro.au Thapar, Nandika – Nandika.Thapar@csiro.au
Summary of activity	The objective of this activity is to support validation and vicarious calibration of Sentinel-3 Level 2 and 3 products in the Australian region, by providing comprehensive ground observations of atmospheric and in-water optical measurements close to the satellite overpasses. In detail, optical and biogeochemical measurements will be performed from fixed platforms, validation floats, moorings as well as from research vessels during dedicated field campaigns. Further, the team will contribute to the development of sophisticated inversion algorithms for implementation into the Sentinel-3 toolbox led by Brockmann Consult. The team is split across CSIRO, Curtin and Charles Darwin University and has many years of experience in Cal/Val related work and round robin laboratory and algorithm inter-comparison experiments. Team members were previously involved in activities such as the MERIS Quality Working Group and Validation Team, the ESA CoastColour and BelColour-1, 2 projects, the HyspIRI Science Team as well as in the NASA SeaHARRE HPLC round robin exercises. Both organizations perform currently full in-house processing of all MODIS data for the Australian continent and surrounding oceans and prepare for a transition to VIIRS and Sentinel-3. Under this plan we propose the following five activities to support Sentinel-3 ocean colour calibration and validation in the Australian

	region. **Activity 1: IMOS ocean colour validation support** Lead: Schroeder T., CSIRO The following three tasks to support ocean colour validation will be conducted under the Integrated Marine Observing System (IMOS). (1) Collect daily high frequency atmospheric and in-water optical measurements at the Lucinda Jetty Coastal Observatory (LJCO), which is part of NASA Aeronet-OC. These measurements are complemented with surface water sampling and subsequent laboratory analysis on fortnightly basis. (2) Collect systematic ship-borne transects of above water reflectance data using the fully automated DALEC spectro-radiometer on board the RV Solander and RV Investigator. (3) Maintain and extend an overall Australian data base of bio-optical measurements and satellite match-ups for provision into SeaBASS and Mermaid to enable validation and algorithm development. **Activity 2: Vicarious calibration** Lead: Antoine D., Curtin University (1) The deployment of a MOBY-like buoy off Perth, Western Australia. This project will be soon submitted to NASA NRA "Ocean Biology and Biogeochemistry: Ocean Color Remote Sensing Vicarious (In Situ) Calibration Instruments" (Solicitation: NNH14ZDA001N-OBB) by Ken Voss (Univ. Miami, MOBY PI), in collaboration with Curtin Univ. and IMOS (Rottnest NRS). ARC support will be sought for under the form of an Australian Research Council (ARC) "Linkage Infrastructure, Equipment and Facilities (LIEF)" grant. (2) A project recently submitted to the ARC about collecting a large data set of radiometric measurements in the southern ocean, including Bio-Argo profiling floats and a large drifting platform (the "PolarPOD") equipped with instrumentation for radiometry, inherent optical properties, and water sampling. **Activity 3: Bio-Argo floats** Lead: Hardman-Mountford N., CSIRO (1) Collection of spectral radiometry data from bio-optical profiling floats that are scheduled for deployment in the Indian Ocean over the next few years. **Activity 4: Ad-hoc Cal/Val field campaigns** Lead: Jointly – CSIRO, Curtin and Charles Darwin University (1) Collection of *in situ* underway and vertical profile optical data during dedicated field campaigns. Support for this activity will come from two Western Australian Marine Science Institution

	(WAMSI) projects (PI Fearns, Curtin Univ.) studying the marine and coastal environments in the far north of Western Australia. Other scheduled projects in the Australian region are expected to support this activity. **Activity 5: Algorithm evaluation and development** Lead: Jointly – CSIRO, Curtin and Charles Darwin University (1) Use data collected under Activities 1-4 to evaluate Sentinel-3 Level 2 and 3 ocean colour products. (2) Contribute to developments of the Sentinel-3 toolbox.		
Expected results for S3	• Accuracy assessment of Sentinel-3 ocean colour products in the Australian region across inland, coastal and open ocean waters. • Provision of high quality ground observations and concurrent match-ups for validation and algorithm development. • Development of open source algorithms (Atmospheric correction and water quality algorithms as part of the Sentinel-3 toolbox) • Vicarious calibration data from the southern hemisphere, from the MOBY-like deployments off Western Australia.		
Reference to S3 Cal/Val plan tasks	Cal/Val activities will be conducted across several water types: open ocean, polar, upwelling, oligotrophic, mesotrophic, coastal, estuarine and inland waters.		
Data requirements, data coverage and timeline	**Sentinel-3 Product Names** **OL_1_EFR** (Full resolution top of atmosphere) **OL_2_WFR** (Full resolution water and atmosphere parameters) **OL_2_LFR** (Full resolution land and atmosphere parameters) **SL_2_WST** (Level 2 sea surface temperature) **SR_2_WAT** (1 Hz and 20 Hz Cu and C band parameters)	**Data Coverage** 10 - 70°S and 110 - 160°E	**Specific Timeline of Validations** **Activity 1:** IMOS related activities have commenced and are partly funded until June 2016. **Activity 2:** Proposals have been submitted, funding is still unsecure. **Activity 3:** Bio-Argo floats are funded for the next few years (June 2016). **Activity 4:** Dedicated ad-hoc field campaigns are endeavoured in year 1 and 2. Funding only confirmed in

			Western Australia through WAMSI. **Activity 5:** Algorithm evaluation will commence once Sentinel-3 data will be available. Algorithm development likely to be supported by the CSIRO Earth Observation & Informatics Transformational Capability Platform (EOI-TCP).
In situ validation data to be collected	In situ data to be collected include: • Spectral above waterradianceand irradiance • Spectral in-water radiance • Aerosol optical depth and other aerosol parameters • In-water spectral absorption, scattering, back-scattering and attenuation • Temperature, salinity, depth, dissolved oxygen, turbidity • Kd (spectral and PAR) • Spectral absorption of CDOM and particulates • DOC, POC • HPLC phytoplankton pigments • Total suspended sediments (organic, inorganic) • Secchi depth • Particle size • Nutrients (Phosphate, nitrate) • Auxiliary data such as weather and sea state measurements		
Special data needs	**Need for special satellite acquisitions:**Full resolution (300 m) during field campaigns.	Yes - FR data would be our preference	**Requested data timeliness:** Near-real time if feasible

Status assessment						
Activity 1: IMOS ocean colour validation support						
	Pre-launch	Commissioning Phase	Year 1	Year 2	Year 3 to year 7.5	Beyond nominal life

Schedule of proposed activities	LOW	LOW	LOW	LOW	LOW	
Availability of funding	LOW	LOW	LOW	HIGH	HIGH	
Availability of infrastructure	LOW	LOW	LOW	MED	HIGH	
Availability of people	LOW	LOW	LOW	MED	MED	
Activity 2: Vicarious calibration						
	Pre-launch	Commissioning Phase	Year 1	Year 2	Year 3 to year 7.5	Beyond nominal life
Schedule of proposed activities				LOW	LOW	
Availability of funding				HIGH	HIGH	
Availability of infrastructure				MED	MED	
Availability of people	LOW	LOW	LOW	MED	MED	
Activity 3: Bio-Argo floats						
	Pre-launch	Commissioning Phase	Year 1	Year 2	Year 3 to year 7.5	Beyond nominal life
Schedule of proposed activities	LOW	LOW	LOW	MED		
Availability of funding	LOW	LOW	LOW	HIGH	HIGH	
Availability of infrastructure	LOW	LOW	LOW	MED	HIGH	HIGH
Availability of people	LOW	LOW	LOW	MED	MED	MED
Activity 4: Ad-hoc Cal/Val field campaigns						

	Pre-launch	Commissioning Phase	Year 1	Year 2	Year 3 to year 7.5	Beyond nominal life
Schedule of proposed activities	LOW	LOW	LOW	MED	MED	
Availability of funding	LOW	LOW	LOW	HIGH	HIGH	
Availability of infrastructure	LOW	LOW	LOW	MED	HIGH	HIGH
Availability of people	LOW	LOW	LOW	MED	MED	MED

Activity 5: Algorithm evaluation and development

	Pre-launch	Commissioning Phase	Year 1	Year 2	Year 3 to year 7.5	Beyond nominal life
Schedule of proposed activities	LOW	LOW	LOW	LOW	MED	
Availability of funding	MED	MED	MED	HIGH	HIGH	
Availability of infrastructure	LOW	LOW	LOW	MED	MED	
Availability of people	LOW	LOW	LOW	HIGH	HIGH	

Sub group	S3VT-OC
Validation Project Title	**NOAA/NESDIS Center for Satellite Applications and Research (STAR) Validation Support for Sentinel-3: Ocean Color, Sea Surface Temperature and Land Surface Temperature**
Link to full Proposal	13741
Team Leader name, address and email	Paul M. DiGiacomo NOAA Center for Weather and Climate Prediction (NCWCP) NOAA/NESDIS/STAR, 5830 University Research Court #3201 College Park, Maryland 20740-3818USA Paul.DiGiacomo@noaa.gov
Support team-members names and emails	Menghua Wang, NOAA/NESDIS/STAR, Menghua.Wang@noaa.gov (Ocean Color Lead; S-NPP Ocean Color EDR lead) Michael Ondrusek, NOAA/NESDIS/STAR, Michael.Ondrusek@noaa.gov (Ocean Color Team) Wei Shi, NOAA/NESDIS/STAR, Wei.1.Shi@noaa.gov (Ocean Color Team) SeungHyun Son, NOAA/NESDIS/STAR, SeungHyun.Son@noaa.gov (Ocean Color Team) Lide Jiang, NOAA/NESDIS/STAR, Lide.Jiang@noaa.gov (Ocean Color Team) Xiaoming Liu, NOAA/NESDIS/STAR, Xiaoming.Liu@noaa.gov (Ocean Color Team) Liqin Tan, NOAA/NESDIS/STAR, Liqin.Tan@noaa.gov (Ocean Color Team) Kent Hughes, NOAA, kent.hughes@noaa.gov (CoastWatch Lead) Kenneth Voss, University of Miami, voss@physics.miami.edu (CoastWatch Team; MOBY Principal Investigator) Heng Gu, NOAA/NESDIS/STAR Affiliate, Heng.gu@noaa.gov (CoastWatch Team) Yong Sung Kim, NOAA/NESDIS/STAR Affiliate, yong.sung.kim@noaa.gov (CoastWatch Team)
Summary of activity	The NOAA/NESDIS Center for Satellite Applications and Research (STAR)-led validation team will address short (Phase E1) and long (Phase E2) term validation and monitoring of Sentinel-3 data for ocean color, sea-surface temperature (SST), and land surface temperature (LST), leveraging activities being undertaken in support of Suomi-NPP/JPSS. In this regard, STAR has been charged with providing the scientific leadership for the Sensor Data Records (SDRs) and Environmental Data

	Records (EDRs) generated from Suomi-NPP/JPSS, e.g., VIIRS et al. Significant progress has been made this past year with VIIRS SDR data now publicly available via NOAA's CLASS system after "beta" status was achieved last year, with the same status pending for the ocean color, SST and LST EDRs. For OLCI, we plan on leveraging ongoing activities in support of the VIIRS ocean color EDR. This includes cross-platform global consistency assessments involving standard Sentinel-3 and VIIRS IDPS products as well as potentially implementing the SWIR-based atmospheric correction algorithm using Sentinel-3/OLCI-SLSTR data in the NOAA-MSL12 ocean color data processing system for generating improved products in coastal regions. The NOAA-MSL12 ocean color data processing system for Sentinel-3 can thus be used as an independent tool for evaluation and assessment of the standard Sentinel-3 ocean color products. Additionally, extensive in situ measurements (e.g., cruises and field campaigns; AERONET-OC sites) collected as part of ongoing VIIRS and related activities by NOAA and partners will provide consistent, high quality measurements for validating OLCI data. Likewise, match-ups with MOBY measurements will provide invaluable information for monitoring and assessing OLCI data. This work will be supported by and leverage existing and planned NOAA funding, projects and activities. Overall, the expected outcome is a thorough assessment of the stability and cross-platform consistency and accuracy of the L1 and L2 data from Sentinel-3, with reports, web sites and presentations/publications on validation results and recommendations for enhancements and improvements expected to result.		
Expected results for S3	Overall, the expected outcome is a quantitative assessment and statement of the accuracy, stability and (cross-platform) consistency of the L1 and L2 data from Sentinel-3/OLCI and SLSTR, with reports, web sites, presentations and publications providing validation results and recommendations for enhancements and improvements. The team has high confidence in verification and validation of Sentinel-3 measurements and derived products, particularly the anticipated superiority of the SLSTR radiances and SSTs. Once quality of the Sentinel-3 products is demonstrated, we expect to utilize them in support of NOAA user activities, e.g., NOAA HAB Forecasts.		
Reference to S3 Cal/Val plan tasks	Ocean Colour		
Data requirements, data coverage	**Sentinel-3 Product Names**	**Data Coverage** Global	**Specific Timeline of Validations**

and timeline	OL1_EFR OL1_ERR OL2_WFR OL2_WRR SL_1_RBT SL_2_WST OL2_LFR OL2_LRR SL_2_LST	CONUS	Life of Mission
In situ validation data to be collected	In terms of ocean color, specific validation data from the MOBY site, Chesapeake Bay and other regions includes: Water leaving radiances (MOBY, Satlantic Hyperpro, and ASD Handheld 2), Aerosol Optical Depth (Microtops), Chlorophyll a (Fluorometric and HPLC; Phytoplankton Pigments (HPLC), Total Suspended Matter, CDOM absorption, Attenuation Coefficients, Backscatter and Absorption Coefficients, and AERONET-OC measurements.		
Special data needs	**Need for special satellite acquisitions:** Level 0		**Requested data timeliness:** < 6 hours

Status assessment						
	Pre-launch	Commissioning Phase	Year 1	Year 2	Year 3 to year 7.5	Beyond nominal life
Schedule of proposed activities	LOW	LOW	LOW	LOW	LOW	LOW
Availability of funding	LOW	LOW	LOW	LOW	LOW	LOW
Availability of infrastructure	LOW	LOW	LOW	LOW	LOW	LOW
Availability of people	LOW	LOW	LOW	LOW	LOW	LOW

Sub group	S3VT-OC
Validation Project Title	**Sagres Validation Ocean Colour Portugal (SagValOCPort)**
Link to full Proposal	13556
Team Leader name, address and email	Dr John Icely Sagremariscso Lda Apartado 21, 8650-999 Vila do Bispo Portugal Phone**:** + 351919110027 Email: john.icely@gmail.com
Support team-members names and emails	Davide D'Alimonte (FCT_CIMA U.Algarve, Portugal, also S3VT PI) davide.dalimonte@gmail.com Sonia Cristina (FCT_CIMA U.Algarve, Portugal) cristina.scv@gmail.com Priscila Goela (FCT_CIMA U.Algarve, Portugal) priscila.goela@gmail.com Sergei Danchenko (FCT_CIMA U.Algarve, Portugal) danchenko-sergei@tut.by Bruno Fragoso (Sagremarisco Lda ; FCT_CIMA U.Algarve, Portugal) fragoso.b@gmail.com Tamito Kajiyama (S3VT PI) t.kajiyama@fct.unl.pt Gerald Moore (Bio-Optika and consultant to SGM:geraldfmoore@gmail.com Alice Newton (FCT_CIMA U Algarve, Portugal & NILU_IMPEC Norway) anewton@ualg.pt
Summary of activity	Sagres Validation Ocean Colour Portugal (SagValOCPort) proposal for the validation of Sentinel-3 products from the Ocean Land Colour Instrument (OLCI) and Sea and Land Surface Temperature Radiometer (SLSTR) will be led by John Icely (PI) with Alice Newton (capacity building and laboratory support), Davide D'Alimonte (algorithm development), Tamito Kajiyama (remote sensing image processing), Sonia Cristina (radiometry), Priscila Goela (IOPs), Sergei Danchenko (field & laboratory support), Bruno Fragoso (field and laboratory support), Gerald Moore (consultancy and technical support). In addition, the team will work closely with the other partners in OC Portugal (http://ocportugal.org/) and also Dr Kratzer of Stockholm University, Sweden. The three Stations off the SW coast of Portugal are the same as those that were used for the validation of MERIS and thus will provide continuity from ENVISAT to Sentinel-3. Station A (37°00'34''N 8°54'07''W), Station B (36°55'53''N 8°53'40''W), Station C (36°50'32''N 8°54'54''W) are on a transect perpendicular to the coast at 2, 10 and 18 Km offshore. The aim is to collect *in situ* measurements within 0.5 and 1.5h of the overpasses by Sentinel-3 for the coastal Station A, and for the more offshore Stations B and C, respectively. The *in situ* data that will be measured to support this validation effort are: geo- located remote sensing reflectances at the centre wave lengths closest to 413, 443, 490, 510, 560, 620, 665, 681, 709, 779 , 870 and 1000 nm; Aerosol optical thickness at 413, 443, 490, 510, 560, 620, 665, 870 and 1000 nm, Angstrom exponent and water vapour; Spectral diffuse coefficient

	Kd(490)(m^{-1}); Transparency (m^{-1}); Depth (m) at surface, 0.5 Secchi depth, and Secchi depth; Algal Pigment 1 (µg.dm^{3}); Algal Pigment 2 (µg.dm^{3}) ; total suspended matter (mg. dm^{3}); absorption coefficients at 443 and nm for phytoplankton aph (m^{-1}); absorption coefficients at 443 nm for non-algal particles a_{nap} (m^{-1}); absorption coefficients at 443 nm for yellow substances a_{ys} (m^{-1}); Sea Surface Temperature. Ancillary data will include Date, Time, Latitude, Longitude, Wind Speed and Atmospheric Pressure, as well as nutrient data, analyses of the phytoplankton community and CTD profiles of the water column for temperature, salinity and photosynthetically active radiation (PAR). The *in situ* data will validate the OLCI products: OL_1_EFR - Level 1 full resolution; OL_1_ERR - Level 1 reduced resolution; OL_2_WFR - Full resolution water products including reflectances and OL_2_WRR - Reduced resolution water products including reflectances. This data will also validate the Sea and Land Surface Temperature Radiometer (SLSTR) product SL_2_WST-single product SST. Finally, data from the AERONET station will be used for the validation of merged data from OLCI and SLSTR (Synergy) for the product SY_2_SYN. The systematic and random differences between the in situ data and Sentinel-3 products will be presented in tabular and graphical form (histograms and scatter plots) with scientific interpretation of the results using the appropriate statistical analyses. Recommendations will be made to the Agency on the improvements that could be made to the quality of the data for further algorithm development as well as an assessment on the reliability and usability of the geophysical products from Sentinel-3. All accepted measurements for validation will be submitted to the ESA data repository for Sentinel-3. Independent bio-optical algorithms will be implemented for comparison with OLCI Algal Pigment 1 and 2 data products in the continental shelf zone of the western Iberian Peninsula. Specifically, regional products will be computed using Multi Layer Perceptron (MLP) neural networks specifically trained with field measurements collected in the Atlantic off Portugal. This will account for the specificity of the investigated oceanographic region. The components of this study endorse the strategic importance of using regional algorithms to timely evaluate operational space mission results as a cost-effective complement to match-up analyses. Calibration of the equipment used for the in situ measurements will be checked regularly at an appropriate marine optics laboratory. In addition, the Sagres team will participate in comparison workshops for the appropriate validation protocols for radiometric, HPLC measurements etc. This proposal is subject to adequate funding. However, most of the team is independently financed by scholarships at national and European level. Sagremarisco also has some ESA funding and as part of OCPortugal. Sagremarisco is also a partner in a 7^{th} Framework Programme for the project AQUA_USERS (AQUAculture USEr driven operational Remote Sensing information services), from 2013-2016. This means that there will be

<table>
<tr><td></td><td colspan="3">adequate funding for 2014-2016.</td></tr>
<tr><td>Expected results for S3</td><td colspan="3">The in situ data will validate the OLCI products: OL_1_EFR - Level 1 full resolution; OL_1_ERR - Level 1 reduced resolution; OL_2_WFR - Full resolution water products including reflectances and OL_2_WRR - Reduced resolution water products including reflectances. This data will also validate the Sea and Land Surface Temperature Radiometer (SLSTR) product SL_2_WST-single product SST. Finally, data from the Aeronet station will be used for the validation of merged data from OLCI and SLSTR (Synergy) for the product SY_2_SYN. The systematic and random differences between the in situ data and Sentinel-3 products will be presented in tabular and graphical form (histograms and scatter plots) with scientific interpretation of the results using the appropriate statistical analyses. Results from the analysis high-level OLCI deliverables and equivalent quantities obtained applying regional MLPs will include overall product maps comparisons, as well the specific assessments of statistical figures (e.g., coefficient of determination, percentage differences) in selected Region of Interest of the western Iberian Peninsula. Recommendations will be made to the Agency on the improvements that could be made to the quality of the data for further algorithm development as well as an assessment on the reliability and usability of the geophysical products from Sentinel-3. All accepted measurements for validation will be submitted to the ESA data repository for Sentinel-3 (such as MERMAID for MERIS).</td></tr>
<tr><td>Reference to S3 Cal/Val plan tasks</td><td colspan="3">• OL1_EFR Validation of radiance products
• OL1_ERR Validation of radiance products
• OL2_WFR Validation of water products
• OL2_WRR Validation of water products
• SL_2_WST Validation of sea surface temp.
• SY_2_SYN Validation of atmospheric products</td></tr>
<tr><td>Data requirements, data coverage and timeline</td><td>Sentinel-3 Product Names
OL1_EFR, OL1_ERR, OL2_WFR, OL2_WRR, SL2_WST and SY_2_SYN
OLCI Atmosphere by-products
- Aerosol optical depth T865
- Aerosol Angström exponent A865
Synergy product/ SST</td><td>Data Coverage
For truthing we need FR data from SW Iberian Peninsula</td><td>Specific Timeline of Validations
Pre-launch through to Commissioning Phase and Initial validation phase.</td></tr>
<tr><td>In situ validation data to be collected</td><td colspan="3">-Geo- located remote sensing reflectances at the centre - wave lengths closest to 413, 443, 490, 510, 560, 620, 665, 681, 709, 779, 870 and 1000 nm;
-Aerosol optical thickness at 413, 443, 490, 510, 560, 620, 665, 870 and 1000 nm, Angstrom exponent and water vapour;
.Spectral diffuse coefficient Kd(490)(m^{-1});
-Transparency (m^{-1});</td></tr>
</table>

	-Depth (m) at surface, 0.5 Secchi depth, and Secchi depth; -Algal Pigment 1 (µg.dm^{-3}) corresponding to the sum of all derivates of chlorophyll a (Chl*a*) present and quantifiable in the Sagres samples by High Performance Liquid Chromatography (HPLC); -Algal Pigment 2 (µg. dm^{-3}) corresponding only to Chlorophyll a, also quantifiable by HPLC; -Total Suspended Matter (mg.dm^{-3}); -Particulate Inorganic Matter (mg. dm^{-3}l); -Particulate Organic Matter (mg. dm^{-3}); -Absorption coefficients at 443 nm for phytoplankton a_{ph} (m^{-1}); -Absorption coefficients at 443 nm for non-algal particles a_{nap} (m^{-1}); -Absorption coefficients at 443 nm for yellow substances a_{ys} (m^{-1}); -Sea Surface Temperature °C. Ancillary data will include Date, Time, Latitude, Longitude, Wind Speed and Atmospheric Pressure, as well as nutrient data, analyses of the phytoplankton community and CTD profiles of the water column for Temperature, Salinity and Photosynthetically Active Radiation.		
Special data needs (Gigabytes over 3yrs) OL1_EFR 317 Gb OL1_ERR 20 Gb OL2_WFR 340 Gb OL2_WRR 2Gb SL_2_WST 25 Gb SY_2_SYN 340 Gb	**Need for special satellite acquisitions:** FR data for SW Iberia	Need to predict match-ups prior field campaigns Need quick-looks for campaigns	**Requested data timeliness:** As soon as possible to make match-up analysis; *in situ* data should be available within 1 month after campaign, reflectances will be prioritised; reporting will be based on ESA requirements.

Status assessment						
	Pre-launch	Commissioning Phase	Year 1	Year 2	Year 3 to year 7.5	Beyond nominal life
Schedule of proposed activities	LOW	LOW	LOW	LOW		
Availability of funding	LOW	LOW	LOW	LOW		
Availability of infrastructure	LOW	LOW	LOW	LOW		
Availability of people	LOW	LOW	LOW	LOW		

Sub group	S3VT-OC
Validation Project Title	**Validation and improvements of L1 and L2 OLCI products in various complex worldwide coastal waters**
Link to full Proposal	13742
Team Leader name, address and email	Cédric Jamet Laboratoire d'Océanologie et de Géosciences 32 avenue Foch, 62930, Wimereux, France Cedric.jamet@univ-littoral.fr
Support team-members names and emails	Hubert Loisel, Laboratoire d'Océanologie et de Géosciences, Université du Littoral-Côte d'Opale, UMR 8187 CNRS/ULCO, 32 avenue Foch, 62930 Wimereux, France, hubert.loisel@univ-littoral.fr Vincent Vantrepotte, Laboratoire d'Océanologie et de Géosciences, Université du Littoral-Côte d'Opale, UMR 8187 CNRS/ULCO, 32 avenue Foch, 62930 Wimereux, France, vincent.vantrepotte@univ-littoral.fr Xavier Mériaux, Laboratoire d'Océanologie et de Géosciences, Université du Littoral-Côte d'Opale, UMR 8187 CNRS/ULCO, 32 avenue Foch, 62930 Wimereux, France, xavier.mériaux@univ-littoral.fr Sylvain Ouillon, Laboratoire d'Etudes en Géophysique et Océanographie Spatiales, Université de Toulouse, UMR 5566 CNRS/CNES/IRD/Univ. Toulouse 3, 14 avenue Edouard Belin, 31400 Toulouse, France, sylvain.ouillon@legos.obs-mip.fr Bertrand Lubac, UMR 5805 EPOC - OASU, Site de Talence, Université Bordeaux 1, Avenue des Facultés, 33405 Talence Cedex, France, b.lubac@epoc.u-bordeaux1.fr Didier Ramon, HYGEOS, Euratechnologies, 165 avenue de Bretagne, 59000 LILLE, France, dr@hygeos.com François Steinmetz, HYGEOS, Euratechnologies, 165 avenue de Bretagne, 59000 LILLE, France, fs@hygeos.com Dat Dinh Ngoc Space Technology Institute (STI), Vietnam Academy of Science and Technology (VAST), Room 303, A2 Building, 18 Hoang Quoc Viet, Hanoi, dndat@sti.vast.ac.vn
Summary of activity	Validation of OLCI L1b and L2 products in various coastal waters using sea field campaigns. The L2 products of concern are the following: BAC_reflectances_Oaxx, CHL_OC4ME, CHL_NN, TSM_NN, KD490_M07, ADG_443_NN. This work is directly related to the task definitions for OLCI Level 2 products (item 6.1.4).The L1 work concerns OLCI L1b investigations of cross-track radiometric artefacts using atmospherically corrected reflectances in deep water areas (item 6.1.3.6.8).

Expected results for S3			
Reference to S3 Cal/Val plan tasks	Items 6.1.3.6.8 and 6.1.4.3		
Data requirements, data coverage and timeline	**Sentinel-3 Product Names** OL1_EFR, OL1_ERR, OL2_WFR, OL2_WRR	**Data Coverage** French Guiana [55°W-49°W; 3°N-8°N] - Eastern English Channel/Southern North Sea [1°W-4°E; 49°N-52°N] - French Atlantic Coast [4°W-0°W; 43°N-46°N] - Vietnam (Tonkin gulf [107°E-109°E; 18°N-20°N], Mekong delta) - Global waters	**Specific Timeline of Validations** Will depend of the sea-field campaigns
In situ validation data to be collected	Multi and hyperspectral Rrs, hyperspectral absorption coefficient, multispectral back-scattering coefficient, particle size distribution, aerosol optical thickness, total suspended matter, chl-a, CDOM, POC		
Special data needs	**Need for special satellite acquisitions:** Not for the moment		**Requested data timeliness:**

Status assessment						
	Pre-launch	Commissioning Phase	Year 1	Year 2	Year 3 to year 7.5	Beyond nominal life
Schedule of proposed activities	MED	LOW	LOW	LOW	MED	
Availability of funding		HIGH	LOW	LOW	MED	
Availability of infrastructure	LOW	LOW	LOW	LOW	LOW	LOW

Availability of people	LOW	LOW	LOW	LOW	LOW	LOW

<table>
<tr><td>Sub group</td><td colspan="6">S3VT-OC</td></tr>
<tr><td>Validation Project Title</td><td colspan="6">Validation of Sentinel-3 products in the Southern California Current Ecosystem</td></tr>
<tr><td>Link to full Proposal</td><td colspan="6">14552</td></tr>
<tr><td>Team Leader name, address and email</td><td colspan="6">Mati Kahru
Scripps Institution of Oceanography, UCSD, 9500 Gilman Dr., La Jolla, CA 92093-0218, USA
mkahru@ucsd.edu</td></tr>
<tr><td>Support team-members names and emails</td><td colspan="6">TBD</td></tr>
<tr><td>Summary of activity</td><td colspan="6">Validation of various OLCI products such as phytoplankton pigments, fractionated phytoplankton pigments, integrated primary production and hopefully a whole set of optical variables</td></tr>
<tr><td>Expected results for S3</td><td colspan="6">Intercomparison of OLCI products with other ocean color sensors (MODIS-Aqua, VIIRS, potentially SGLI) as well as with in situ data, intercomparison of various bio-optical algorithms applied to OLCI data</td></tr>
<tr><td>Reference to S3 Cal/Val plan tasks</td><td colspan="6"></td></tr>
<tr><td>Data requirements, data coverage and timeline</td><td colspan="2">Sentinel-3 Product Names
All OLCI Level-2 products</td><td colspan="2">Data Coverage
16-45N, 140-100W</td><td colspan="2">Specific Timeline of Validations
TBD, depends on cruises</td></tr>
<tr><td>In situ validation data to be collected</td><td colspan="6">Southern California Current area</td></tr>
<tr><td>Special data needs</td><td colspan="2">Need for special satellite acquisitions: No</td><td colspan="2"></td><td colspan="2">Requested data timeliness:
Not critical</td></tr>
<tr><td colspan="7">Status assessment</td></tr>
<tr><td></td><td>Pre-launch</td><td>Commissioning Phase</td><td>Year 1</td><td>Year 2</td><td>Year 3 to year 7.5</td><td>Beyond nominal life</td></tr>
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Schedule of proposed activities	LOW	LOW	LOW	LOW	LOW	LOW
Availability of funding	LOW	LOW	LOW	LOW	LOW	LOW
Availability of infrastructure	LOW	LOW	LOW	LOW	LOW	LOW
Availability of people	LOW	LOW	LOW	LOW	LOW	LOW

Sub group	S3VT-OC		
Validation Project Title	**Validation of OLCI water leaving reflectance (400-1020nm) in turbid and highly turbid waters**		
Link to full Proposal	13597		
Team Leader name, address and email	Els Knaeps Flemish Institute for Technological Research (VITO), Boeretang 200, 2400 Mol els.knaeps@vito.be		
Support team-members names and emails	Sindy Sterckx - VITO - sindy.sterckx@vito.be Dries Raemaekers - VITO - dries.raymaekers@vito.be Sivee Chawla - VITO- sivee.chawla@vito.be		
Summary of activity	The project addresses the problem of deriving and validating high accurate Lw (400-1020nm) in turbid and highly turbid waters. On the one hand it will address issues related to atmospheric correction in turbid waters and on the other hand by providing reliable in-situ measurements covering the full spectral range of the OLCI sensor on board Sentinel-3 it will serve the validation needs for the more turbid water bodies. The problem is approached by using an ASD spectrometer combined with a validated adjusted above-water measurement methodology to measure the water leaving reflectance from 350 to 2500nm, by linking the ASD water leaving reflectance resampled to the OLCI bands to the measured TSM concentration with specific focus to the longer wavelengths and through the organisation of airborne underflight with a state-of-the-art hyperspectral instrument APEX.		
Expected results for S3	The expected outcome includes: (1) A dataset of hyperspectral VNIR-SWIR water-leaving reflectance measurements (and the accompanying TSM concentrations) in turbid and highly turbid waters , (2) validation of OLCI Lw in the NIR/SWIR for the Belgian coastal zone, (3) recommendations on atmospheric correction for OLCI (e.g. providing limits to apply a black pixel assumption in the NIR and SWIR) and (4) assessment of within-pixel spatial variability of Lw.		
Reference to S3 Cal/Val plan tasks	OLCI-L2WLR-CV-200		
Data requirements, data coverage and timeline	**Sentinel-3 Product Names** OL1_EFR	**Data Coverage** Scheldt (51°14'04'' N, 4°23'50'' E),	**Specific Timeline of Validations** Dependent on field campaign planning.

	OL2_WFR, OL2_LFR	The Belgian Coastal zone (51° 14 ' 55''N, 2° 51' 47 '' E)	Not decided yet.
In situ validation data to be collected	Water reflectance, Total Suspended Matter, turbidity, AOT, salinity, temperature		
Special data needs	**Need for special satellite acquisitions:**		**Requested data timeliness:**

Status assessment						
	Pre-launch	Commissioning Phase	Year 1	Year 2	Year 3 to year 7.5	Beyond nominal life
Schedule of proposed activities	MED	LOW	LOW	LOW	LOW	LOW
Availability of funding	MED	MED	MED	HIGH	HIGH	HIGH
Availability of infrastructure	MED	MED	MED	MED	MED	MED
Availability of people	MED	MED	MED	MED	MED	MED

Sub group	S3VT-OC
Validation Project Title	**Sentinel-3 validation in Swedish optically complex waters (NW Baltic Sea and Lake Vänern)**
Link to full Proposal	13596
Team Leader name, address and email	Dr. Susanne Kratzer Department of Ecology Environment and Plant Sciences, Stockholm University (SU), 10691 Stockholm, Sweden Phone: + 46-8-161059 Email: Susanne.Kratzer@su.se
Support team-members names and emails	GERALD MOORE (Bio-Optika and consultant to SU:geraldfmoore@gmail.com DR. NIKLAS STRÖMBECK (Strömbeck Consulting): niklas@strombeckconsulting.se DR. PETRA PHILIPSON (Brockmann Geomatic AB): petra.philipson@brockmann-geomatics.se
Summary of activity	The maintenance and operation of the Aeronet-OC station Pålgrunden in Lake Vänern through 2014, and, if resources allow, through 2015-2016; Output: data supply to NASA Aeronet-OC (Niklas Strömbeck is subcontracted to SU as site manager of the Aeronet-OC station). Dr Kratzer shall continue the bio-optical characterisation of Swedish coastal waters through appropriate campaigns and test the validity of the application of the bio-optical model used for case 2 waters inversion in the 4th reprocessing. A one month campaign from Askö Laboratory is planned +6 months after launch during spring-summer 2015 or May 2016, dependant on timing and successful launch of Sentinel-3. There may be more campaigns planned in the following years (with focus on NW Baltic Sea, maybe one short campaign in Lake Vänern), all subject to available resources. The sea-truthing campaigns will be supported by Mr. Gerald Moore, Bio-Optika. Dr. Petra Philipson will continue with the upkeep of the Swedish operational system www.vattenkvalitet.se which is currently based on MERIS data. The system will be adapted to be operational for Sentinel-3 (if funding allows) and new local algorithms for Secchi depth and/or Kd490 and/or turbidity developed by SU and TO shall be implemented for ecological status classification. The team will apply for national funding to keep Swedish experts in post; at a later stage SU may need additional funding for direct costs of field campaigns (critical from 2016). Plan to validate Sent-3A and 3B.
Expected results for S3	Validation of latest MERIS v.4 products once available (level 2 reflectance, in-water products TSM, YS and chl-a (algal-2), expected no. of match-ups per campaign: 10-20, dependant on sky and sea conditions. Aerosol products may be validated if I manage to keep my current

	research engineer Sélima Ben Mustapha in post. Sentinel-3 validation using data from Aeronet-OC site Pålgrunden in lake Vänern (PI: S.Kratzer). MERIS data v. 4 will be delivered by ACRI. We will make match-up data available to MERMAID (if still operational, which I would like to recommend)		
Reference to S3 Cal/Val plan tasks			
Data requirements, data coverage and timeline	**Sentinel-3 Product Names** **OL2_EFR** - OLCI water-leaving reflectance (TACCS bands: 412, 443, 490, 510, 560, 620, 671) - CDM absorption coefficient ADG443) - Humic material absorption coefficient AD443 - Algal pigment concentration - Total Suspended Matter concentration TSM - Diffuse Attenuation coefficient KD490 **OLCI Atmosphere byproducts** SY_2_SYN - Aerosol optical depth T865 - Aerosol Ångström exponent A865 **SST** SL_2_WST	**Data Coverage** For truthing we need FR data from NW Baltic Sea coastal areas and for Lake Vänern. We would like to have the full Baltic Sea in FR for the operational system at Brockmann Geomatic AB.	**Specific Timeline of Validations** NW Baltic Sea: Spring-summer 2015, dependant on launch; possibly yearly campaign either in NW Baltic Sea or Vänern if funds allow. Aeronet-OC Pålgrunden in Lake Vänern will be continued through 2016 if funds allow
In situ validation data to be collected	We measure chl-a, b and c, total carotenoids (trichromatic method), SPM (organic and inorganic, gravimetric), spectral CDOM absorption and slope factor(10 cm cuvette), filter pad method (chlorophyll specific absorption and humic material absorption: CDM absorption) Secchi depth, Kd490 (TACCS), KdPAR (Licor), Aerosol products (Microtops, Aeronet-OC Pålgrunden), Spectral reflectance (TACCS and Aeronet-OC Pålgrunden); absorption and scattering (AC9, WETLabs), phase function (VSF3 (WETLabs); Gerald Moore), TriLux (Chelsea) to measure chl-a, phycoerythrin & phycocyanin fluorescence; we also measure water temperature (below surface, but not skin temperature)		

	and ancillary data (Lat/Long, water depth, air temperature, barometric pressure, wind direction and wind speed; sky and sea state (photos using fish eye and normal lens), humidity **Note that we need to adapt our measurements for each campaign to the respective budget for validation.**		
Special data needs	**Need for special satellite acquisitions:** FR data, Baltic Sea	Need to predict match-ups prior field campaigns Need quick-looks for campaigns	**Requested data timeliness:** As soon as possible to make match-up analysis. Truthing data should be available within 6 months after campaign, reflectances will be prioritised; we will provide yearly reports

Status assessment (Risk for lack of funding for truthing activities is dependent on date of launch of Sentinel-3: funding of staff in my group should be secured for 2014-2015; but is uncertain from 2016)

	Pre-launch May 2014	Commissioning Phase 2015 E1?	Year 1 2016 E1 delayed?	Year 2	Year 3 to year 7.5	Beyond nominal life
Schedule of proposed activities	LOW	MED	MED	HIGH	CRIT	CRIT
Availability of funding	LOW	MED	MED	HIGH	CRIT	CRIT
Availability of infrastructure	LOW	LOW	LOW	LOW	LOW	LOW
Availability of people	LOW	LOW	MED	HIGH	CRIT	CRIT

Sub group	S3VT-OC		
Validation Project Title	**Predicting and monitoring of cyanobacterial blooms in the Baltic Sea from space**		
Link to full Proposal	13721		
Team Leader name, address and email	Adam Kr□□el University of Gdansk, Institute of Oceanography, al. Marszalka Pilsudskiego 46, 81-378 Gdynia, Poland oceak@ug.edu.pl		
Support team-members names and emails	Katarzyna Bradtke - ocekb@ug.edu.pl, Bo□ena Wojtasiewicz – ocebwo@ug.edu.pl Monika Wo□niak – m.wozniak@ug.edu.pl, Jakub Zdroik ocejz@ug.edu.pl Hanna Mazur-Marzec - biohm@ug.edu.pl		
Summary of activity	• Field measurements of AOPs and IOPs of water • Phytoplankton species identification • Coastal water quality, harmful algal bloom (HAB) detection • Development of data assimilation techniques to assimilate satellite observations in modelling of the environment of shelf sea region • Determination of the importance of physical parameters for the bloom development		
Expected results for S3	Validation of bio-optical algorithms, in situ data.		
Reference to S3 Cal/Val plan tasks	• In situ campaigns • L2 procedures verification • Validation with in situ measurements		
Data requirements, data coverage and timeline	**Sentinel-3 Product Names** OL2_WFR, SL_2_WST, OL1_EFR, SL_1_RBT	**Data Coverage** Baltic Sea	**Specific Timeline of Validations** Operational phase (May – September)
In situ validation data to be collected	• Downwelling irradiance above the water • Upwelling radiance at surface • Chlorophyll a concentration • TSM concentration • CDOM absorption • Kd490		
Special data needs	**Need for special satellite acquisitions:** None		**Requested data timeliness:** Quick-looks available asap

Status assessment						
	Pre-launch	Commissioning Phase	Year 1	Year 2	Year 3 to year 7.5	Beyond nominal life
Schedule of proposed activities	LOW	LOW	LOW	LOW		
Availability of funding	MED	MED	HIGH	HIGH		
Availability of infrastructure	MED	MED	MED	LOW		
Availability of people	MED	MED	HIGH	HIGH		

Sub group	S3VT-OC
Validation Project Title	**Canadian Sentinel-3 validation program**
Link to full Proposal	13625
Team Leader name, address and email	Pierre Larouche Institut Maurice-Lamontagne, BP 1000, Mont-Joli, QC, Canada G5H 3Z4 Pierre.Larouche@dfo-mpo.gc.ca
Support team-members names and emails	Jim Gower: Jim.gower@dfo-mpo.gc.ca Maycira Costa: Maycira@uvic.ca Carla Caverhill: Carla.Caverhill@dfo-mpo.gc.ca Ed Horne: Ed.Horne@dfo-mpo.gc.ca
Summary of activity	Canada has one of the largest coastline. Because of their large size and remoteness, remote sensing is a key component of the Canadian capacity to monitor the coastal and offshore marine ecosystems. Phytoplankton biomass, timing of blooms, determination of functional types, etc are all important information needed to provide accurate advice to federal and provincial government officials having the mandate to manage and make informed decisions about the marine environment (fisheries, industrial development, oil production, etc.). However, remote sensing of phytoplankton biomass and higher level products is hampered by the complexity of the optical properties in coastal waters. The presence of large rivers on all three coastlines (St. Lawrence river in the Atlantic, Mackenzie river in the Arctic ocean and Fraser river in the Pacific) seriously affects the capacity to generate accurate products from actual operational remote sensing algorithms. This has been demonstrated through a series of validation exercise conducted over the years in all regions that lead to the development of regional algorithms. Yet, these development are not enough to ensure accurate products from the future Sentinel-3 mission as the characteristics of each sensor are different. This is why we would like to participate to the international effort to validate Sentinel-3 data over coastal Canadian waters. Our team is made of senior scientists having extensive experience in the field of satellite ocean color remote sensing validation. Together, we worked in each Canadian oceans gathering important measurements of inherent and apparent optical properties and we published our results in major journals. Our geographic diversity will allow us to complement each other and sample very different environments leading to a more diverse dataset than working separately. We have access to a state-of-the-art pool of equipment that will allow the gathering of accurate information on oceanic and coastal optical properties. By combining our

	expertise and data, we aim at developing more general accurate algorithms that could be applied independent of location.		
Expected results for S3	The main expected outcome of this validation program is better characterization of OLCI products over Canadian coastal waters. Ultimately, the products will be used to improved management of marine resources in a context of a changing climate that could have profound influence on the first link of the marine food chain.		
Reference to S3 Cal/Val plan tasks	OLCI-L2WLR-CV300 OLCI-L2WLR-CV400		
Data requirements, data coverage and timeline	**Sentinel-3 Product Names** OL2_WFR	**Data Coverage** Acadia region and West coast of Canada	**Specific Timeline of Validations** Phase E2
In situ validation data to be collected	The measurements would be: CDOM concentration, HPLC chlorophyll, Total suspended matter, aph and anap and above-water radiometry.		
Special data needs	**Need for special satellite acquisitions:** None		**Requested data timeliness:** No real-time necessary

Status assessment						
	Pre-launch	Commissioning Phase	Year 1	Year 2	Year 3 to year 7.5	Beyond nominal life
Schedule of proposed activities	LOW	LOW	LOW	MED	MED	MED
Availability of funding		CRIT	CRIT	CRIT	CRIT	CRIT
Availability of infrastructure	LOW	LOW	LOW	LOW	LOW	LOW
Availability of people	LOW	LOW	LOW	HIGH	HIGH	HIGH

Sub group	S3VT-OC		
Validation Project Title	**Systematic analysis of Sentinel-3 OLCI and SLSTR data uncertainties**		
Link to full Proposal	13607		
Team Leader name, address and email	Dr Samantha Lavender Pixalytics Ltd, 1 Davy Road, Plymouth Science Park, Derriford, Plymouth, PL6 8BX slavender@pixalytics.com		
Support team-members names and emails	None at present, but is expected to include postgraduate project students including those undertaking both MSc's and PhD's.		
Summary of activity	This research project focuses on the analysis, development and validation of the Sentinel-3 product uncertainties that are seen as a pixel-based measure to aid non-specialist users of remote sensing products. This will primarily be OLCI ocean colour products, but an analysis of the OLCI land products and combined OLCI/SLSTR radiometric data is also of interest.		
Expected results for S3	Peer-reviewed scientific publications; presentations at international conferences and workshops; shared tools for handling / analysing Sentinel-3 data.		
Reference to S3 Cal/Val plan tasks	Radiometry Verification at Level-1B (OLCI-L1B-CV-310); Radiometric Validation with Level 3 products (OLCI-L1B-CV-320); Image Quality Check (OLCI-L1B-CV-600); Verification of cross-track artefacts using marine products (OLCI-L1b-CV-680); Preparation for Level-2 Cal/Val (OLCI-L2-CV-100); Ocean Colour Vicarious Calibration (OLCI-L2WLR-CV-200); Development of calibration, product and science algorithms (OLCI-L2WLR-CV-380); Ocean Colour Validation with Level-3 products (OLCI-L2WLR-CV-400); Assess OLCI consistency with other missions (OLCI-L2WLR-CV-420); Algorithm performance over spatial and temporal domains (OLCI-L2WLR-CV-430); Ocean Colour Processing Quality Validation (OLCI-L2WLR-CV-500); Radiometric bias characterisation: Inter-satellite comparisons (SLSTR-L1B-CV-270); Surface Reflectance Algorithm Validation (SYN-L2C-CV100)		
Data requirements, data coverage and timeline	**Sentinel-3 Product Names** OL1_ERR, OL1_EFR, OL2_WRR, OL2_WFR, OL2_LFR, SL_1_RBT &	**Data Coverage** Global analysis for selected open ocean areas e.g. Atlantic Ocean	**Specific Timeline of Validations** None

	SY_2_SYN	Global analysis for selected coastal areas e.g. around UK, Europe and China	
In situ validation data to be collected	None planned.		
Special data needs	**Need for special satellite acquisitions:** None		**Requested data timeliness:** asap, but NRT not critical

Status assessment						
	Pre-launch	Commissioning Phase	Year 1	Year 2	Year 3 to year 7.5	Beyond nominal life
Schedule of proposed activities	MED	MED	MED	MED	MED	MED
Availability of funding	MED	MED	MED	MED	MED	MED
Availability of infrastructure	LOW	LOW	LOW	LOW	LOW	LOW
Availability of people	MED	MED	MED	MED	MED	MED

Sub group	S3VT-OC
Validation Project Title	**Ocean Color in situ experiments from 2 sites (Bermuda and Southern California) in support of the calibration and validation of the OLCI sensor**
Link to full Proposal	13717
Team Leader name, address and email	Stéphane Maritorena Earth Research Institute University of California Santa Barbara Santa Barbara, CA 93106-3060, USA Email: stephane@eri.ucsb.edu
Support team-members names and emails	David A. Siegel - Email: davey@eri.ucsb.edu Norm B. Nelson - Email: norm@eri.ucsb.edu
Summary of activity	We propose to use ship-based and autonomous platforms in situ measurements collected at 2 contrasting sites (Bermuda and Southern California) to validate the radiometric and bio-optical products from OLCI on the Sentinel-3 platform for both regions.
Expected results for S3	Independent regional validation of the radiometry (and of atmospheric corrections) and bio-optical products from OLCI.
Reference to S3 Cal/Val plan tasks	Validation of ocean colour and atmospheric products

Data requirements, data coverage and timeline	**Sentinel-3 Product Names** OL2_WFR OL2_WRR	**Data Coverage** Bermuda: 30°N-34°N 60°W-68°W Southern California: 33.5°N-35°N 119°W-120.5°W	**Specific Timeline of Validations** Daily from day 1 of the mission

In situ validation data to be collected	100-150 days of sampling per year. Lu(λ), Ed(λ), Es(λ), Rrs(λ), Kd(λ) a_{ph}(□), a_{cdom}(□), a_{nap}(□), b_{bp}(□) HPLC pigments

Special data needs	**Need for special satellite acquisitions:**		**Requested data timeliness:**

Status assessment

	Pre-launch	Commissioning Phase	Year 1	Year 2	Year 3 to year	Beyond nominal

					7.5	life
Schedule of proposed activities	LOW	LOW	LOW	LOW	MED	MED
Availability of funding	LOW	LOW	LOW	LOW	MED	MED
Availability of infrastructure	LOW	LOW	LOW	LOW	MED	MED
Availability of people	LOW	LOW	LOW	LOW	MED	MED

Sub group	S3VT-OC
Validation Project Title	**Global evaluation and analysis of OLCI ocean color products**
Link to full Proposal	13656
Team Leader name, address and email	Gerhard Meister NASA Code 616 Ocean Ecology Laboratory Goddard Space Flight Center, Maryland, USA gerhard.meister@nasa.gov
Support team-members names and emails	Bryan Franz, Ocean Ecology Laboratory (OEL), NASA Code 616, bryan.a.franz@nasa.gov Jeremy Werdell, Ocean Ecology Laboratory (OEL), NASA Code 616, jeremy.werdell@nasa.gov Sean Bailey, NASA Ocean Biology Processing Group, Futuretech Corp., sean.w.bailey@nasa.gov
Summary ofactivity	We propose to evaluate the quality of the OLCI ocean color products (GMES Sentinel 3 requirement S3-OB-1) by comparing OLCI ocean color products to ocean color products from concurrent NASA sensors, such as MODIS and VIIRS. Comparisons will be performed on global and basin-scale regions using Level-3 (spatially and temporally composited) global products. Furthermore, we propose to compare OLCI level 2 ocean color products to in-situ measurements, which will be collected under the auspices of the NASA Ocean Biology and Biogeochemistry Program. We also propose to support the OLCI calibration activities in case the above activities establish a need for improvement. We propose to develop the tools to perform global and regional timeseries comparisons of ocean color products from OLCI and VIIRS (or MODIS). This will include evaluating both the standard OLCI products produced by ESA/Eumetsat, and OLCI products produced using standard NASA algorithms and methods, relative to VIIRS. With sufficient access to the postlaunch OLCI data, results of these analyses will demonstrate the relative temporal stability of VIIRS and OLCI and likely provide insight into temporal calibration deficiencies in one or the other sensor. The integration of OLCI support into the NASA processing software will also provide an opportunity to assess the performance of the ESA/Eumetsat processing algorithms relative to the NASA algorithms, which may lead to further collaboration on refinements of those algorithms. Furthermore, we propose to

	1) modify the NASA ocean color processing software to support NASA standard atmospheric correction for OLCI 2) acquire OLCI L1 data to derive correction coefficients using the crosscalibration approach developed by our group 3) integrate support for OLCI product validation within the existing NASA in situ validation system 4) evaluate the OLCI prelaunch characterization data in order to improve the on-orbit calibration of OLCI.		
Expected results for S3	The three main results are: 1) Quantify agreement of OLCI OC data products with NASA sensors, 2) internal (i.e. OLCI data only) consistency evaluation (scan angle dependence, temporal trend), 3) suggestions how to improve the OLCI calibration		
Reference to S3 Cal/Val plan tasks	OLCI-L1B-CV-200; OLCI-L1B-CV-300; OLCI-L1B-CV-600; OLCI-L2WLR-CV-200; OLCI-L2WLR-CV-399; OLCI-L2WLR-CV-400;		
Data requirements, data coverage and timeline	**Sentinel-3 Product Names** L0 (if available with L0-to-L1 processing source code), L1 (OLI_EFR or OLI_ERR), L2 (OL_2_WFR), L3	**Data Coverage** Global for L0/L1, selected scenes for L2, global for L3	**Specific Timeline of Validations** Continuously throughout the mission
In situ validation data to be collected	None		
Special data needs	**Need for special satellite acquisitions:**	Instrument calibration assessment will be severely limited without access to the uncalibrated (L0 or L1A) data and the processing source code for generating L1B	**Requested data timeliness:** n/a

Status assessment						
	Pre-launch	Commissioning Phase	Year 1	Year 2	Year 3 to year 7.5	Beyond nominal life

Schedule of proposed activities	LOW	LOW	LOW	LOW	LOW	LOW
Availability of funding	LOW	LOW	LOW	LOW	LOW	LOW
Availability of infrastructure	LOW	LOW	LOW	LOW	MED	MED
Availability of people	LOW	LOW	LOW	LOW	LOW	LOW

Sub group	S3VT-OC
Validation Project Title	**Validation of Sentinel 3 ocean colour biophysical products in the Gulf of Cadiz and Guadalquivir estuary (South-West Spain) (GUAD-S3-VAL)**
Link to full Proposal	13766 https://dl.dropboxusercontent.com/u/5544176/GUAD-S3-VT.pdf
Team Leader name, address and email	Edward P. Morris (edward.morris@csic.es), Dept. of Ecology and Coastal Management, Instituto de Ciencias Marinas de Andalucia (ICMAN-CSIC), Campus Universitario Río San Pedro, 11519 Puerto Real, Cádiz, España, Tel: +34 956 832612 EXT:255
Support team-members names and emails	Gabriel Navarro (gabriel.navarro@icman.csic.es) Isabel Caballero de Frutos (isabel.caballero@icman.csic.es) Laura Prieto (laura.prieto@icman.csic.es) Emma Huertas (emma.huertas@icman.csic.es) Javier Ruiz (javier.ruiz@icman.csic.es)
Summary of activity	Operational long-term validation and verification of all Sentinel-3 data products, throughout the mission lifetime, is required to monitor product uncertainty estimates (S3-MR-1170, GMES_Sentinel-3_MRTD). Focusing on ocean colour data products, such as the concentration of Chlorophyll-*a* (Chl-*a*), Total Suspended Matter (TSM), Chromatic Dissolved Organic Matter (CDOM) and the optical diffuse attenuation coefficient (K), we will conduct field measurements in the coastal region of the Gulf of Cadiz, allowing the derivation of product uncertainty estimates. This region is particularly relevant as it includes the Guadalquivir estuary, one of the largest and most important estuaries in the Iberian Peninsula. This provides a perfect opportunity to assess the uncertainty of data products at the mouth of a large estuary that has very large seasonal variations in run-off (TSM values ranging from < 10 to >1000 mgL^{-1}). The research team consists of 4 senior researchers with extensive experience in oceanography and ocean colour RS, a post-doc with expertise in biophysical properties of microalgae and ground surveys, a PhD candidate who has 2 years of experience conducting RS Cal/Val campaigns (DEIMOS-1) in the Guadalquivir and reliable support staff. The approach of the project will be to conduct georeferenced field measurements of Chl-a, TSM, CDOM and K in the coastal zone of the Gulf of Cadiz influenced by the Guadalquivir estuary. Measurements will be collected in a range of river run-off conditions (i.e., in different seasons) within +- 30 minutes of satellite over passes and will characterize surface waters within an area of at least 1km2 (3*3 pixels). Care will be taken to use standard protocols for analysis of water properties and conduct evaluations of measurement uncertainty. This validation dataset will be used to statistically evaluate the uncertainty of Sentinel ocean colour data products. We expect to provide clear measures of ocean colour product uncertainty in the Gulf of Cadiz region, with particular emphasis on the reliability of S3 derived Chl-a, TSM, CDOM and K values in the vicinity of a major estuary. Fieldwork and sample analysis will be funded via joint field campaigns with the Regional project "Estudio de los eventos de turbidez en la desembocadura del Guadalquivir mediante teledetección y su conexión con procesos meteorológicos y oceanográficos" (P09-RNM-4583) and EU projects

	PERSEUS (FP7- 287600), CARBOCHANGE (FP7- 264879), MedEx (MarinERA FP6).		
Expected results for S3	Comparison of S3 ocean-colour data products against fiducial reference measurements of Chl-a, TSM, CDOM and K. Quantification of S3 ocean-colour data product uncertainty in different seasons. Indications (trends) of conditions when product uncertainty changes.		
Reference to S3 Cal/Val plan tasks	Operational long-term validation and verification of all Sentinel-3 data products, throughout the mission lifetime, is required to monitor product uncertainty estimates (S3-MR-1170, GMES_Sentinel-3_MRTD). Monitor S3 ocean-colour data product uncertainty in a coastal zone influenced by a high-sediment load estuary (OLCI-L2WLR-CV-300). Conduct field sampling campaigns to measure surface water concentrations of Chlorophyll-a (Chl-a), Total Suspended Matter (TSM), Chromatic Dissolved Organic Matter (CDOM) and the optical diffuse attenuation coefficient (K) (OLCI-L2WLR-CV-300). Evaluate uncertainties in field sampling methods (OLCI-L2WLR-CV-320). Statistically compare S3 ocean-colour data products to field measurements and derive product uncertainty measures (OLCI-L2WLR-CV-360).		
Data requirements, data coverage and timeline	**Sentinel-3 Product Names** OL_1_EFR, OL_2_WFR	**Data Coverage** Alboran sea + Gulf of Cadiz (Long: -9, -2; Lat: 37.3, 35)	**Specific Timeline of Validations** From when S3 is suitable for validation, continuing for 2 years.
In situ validation data to be collected	Concentration of Chl-*a*, TSM, CDOM and in-vivo absorption coefficient.		
Special data needs	**Need for special satellite acquisitions: none**		**Requested data timeliness:** days to weeks

Status assessment						
	Pre-launch	Commissioning Phase	Year 1	Year 2	Year 3 to year 7.5	Beyond nominal life
Schedule of proposed activities	LOW	LOW	LOW	LOW		
Availability of funding	LOW	LOW	LOW	LOW		
Availability of infrastructure						
Availability of people						

Sub group	S3VT-OC
Validation Project Title	**Validation of Coastal Aquatic Biophysical Products from OLCI**
Link to full Proposal	17234
Team Leader name, address and email	Wesley Moses U.S. Naval Research Laboratory, Washington, D.C. 20375, U.S.A. E-mail: wesley.moses@nrl.navy.mil
Support team-members names and emails	Jeffrey Bowles, U.S. Naval Research Laboratory, Washington, D.C. 20375, U.S.A. E-mail: jeffrey.bowles@nrl.navy.mil Anatoly Gitelson, University of Nebraska-Lincoln, Nebraska 68583, U.S.A. E-mail: agitelson2@unl.edu
Summary of activity	The aim is to validate L1 and L2 products from OLCI and, through research and analysis, develop algorithms suited to OLCI for retrieving biophysical parameters from water (pigment and sediment concentrations, turbidity measurements (Kd)). The aim will be achieved through field campaigns, match-up exercises, and development of semi-analytical models to estimate biophysical parameters of coastal waters using OLCI data. The demise of MERIS (MEdium Resolution Imaging Spectrometer) has created a significant gap in the availability of reliable data for remote sensing of optically complex coastal waters. This team has previously been involved in establishing algorithms based on MERIS data for determining water quality (specifically, chl-a concentration) in inland and coastal waters around the globe. Studies using multiple datasets from a number of inland and coastal water bodies showed that MERIS-based NIR-red chl-a algorithms were virtually operational and had the potential for being routinely applied to turbid productive inland and coastal waters around the globe without the need for case-specific re-parameterization of the algorithms. The upcoming launch of OLCI, which would have all the spectral channels of MERIS, opens the possibility of developing similar chl-a algorithms with the aim of eventually establishing operational OLCI-based NIR-red algorithms. This team's access to regularly collected in situ data from water bodies such as Lake Kinneret and Sea of Azov puts it in a good position to do with OLCI data the work that was done with MERIS data. NRL conducts big two-week long deployments (as part of ongoing projects) annually in coastal waters around the U.S. to collect a large suite

	of bio-optical measurements from ship and aircraft. The shipborne instruments include a towed profiler, CTD, LISST, multispectral volume scattering meter, spectrometer, polarimetric lidar, etc., while the airborne instruments include multiple hyperspectral sensors covering the visible to the SWIR region and also a filter-driven four-channel polarimetric sensor operating in the 400-800 nm region. This host of measurements would provide a comprehensive picture of the biophysical characteristics of the coastal water under study. These data would also provide a wealth of ground truth for validating L1 and L2 products from OLCI. Details of the location and time of these deployments will be communicated to the co-chairs of the S3VT-OC group in a timely manner so as to schedule coincident acquisitions of OLCI data. Results of the validation exercises will be shared with the S3VT and possibly presented at future S3VT working group meetings.
Expected results for S3	- match-up comparisons for validating L1 and L2 data from OLCI - development of OLCI-specific algorithms for retrieving bio-physical parameters from coastal waters - presentation of results at conferences (contingent on internal availability of funds and approval for travel) and future S3VT working group meetings
Reference to S3 Cal/Val plan tasks	The proposed activities will lead to the validation and subsequent improvement of L1 and L2 products from OLCI. The proposed work will help validate water quality products (pigment and sediment concentrations and turbidity estimates) from OLCI and meet the requirements outlined in section 5.9 (Ocean and Land Colour (OLC) Instrument Requirements and Performance) of the afore-linked document. The ability to acquire HICO images in addition to airborne and shipborne in situ data coincident with OLCI data will help address issues related to the synergistic use of OLCI data with data from other sensors (section 5.2.2 Synergy with External Mission Concepts - Optical Mission). The hyperspectral data from HICO, when used in conjunction with OLCI data, enhances the monitoring utility of OLCI by providing snapshots of higher spectral detail, which can be used to detect accessory pigments (and hence potentially algal species) in water. The frequent temporal coverage from OLCI can then be used to track the distribution pattern of algal species of interest. The Sea of Azov and the Taganrog Bay fall within the regions covered by MARCOAST. The proposed work of developing OLCI-based algorithms for estimating chl-a concentration in these waters will help meet the requirements given under section 3.2.12 (GSE Marine and Coastal Environmental Information Services (MARCOAST)).

	The comprehensive in situ datasets collected during NRL's deployments will help validate the ability of OLCI to characterize the bio-optical properties of coastal waters and serve to meet the requirements underlined in section 3.2.16 (Oceanographic Researchers).		
Data requirements, data coverage and timeline	**Sentinel-3 Product Names** OL1_EFR, OL1_ERR, OL2_WFR, OL2_WRR, SY_2_SYN	**Data Coverage** Lake Kinneret (Israel), Sea of Azov (Russia), Taganrog Bay (Russia) Coastal waters around the U.S. - The Gulf of Mexico, the east coast of Florida, the California coast, coastal waters northwest of Washington, Lake Erie, and the Chesapeake Bay are some of the areas where *in situ* data collection campaigns have been conducted in the recent past).	**Specific Timeline of Validations** Weekly throughout the year in Lake Kinneret; between April and October of every year in Sea of Azov and Taganrog Bay; during summer and autumn in coastal waters around the U.S.
In situ validation data to be collected	- above-surface water-leaving radiance (using a hand-held spectrometer from a ship and from airborne sensors) - just-below-surface water-leaving radiance - downwelling solar irradiance (above the water surface and possibly at various depths below the surface) - absorption coefficient - scattering coefficient - scattering phase function - chlorophyll concentration - sediment concentration - sub-surface vertical profile information - lidar measurements		
Special data needs	**Need for special satellite acquisitions:** None at the moment		**Requested data timeliness:** No special urgency

Status assessment						
	Pre-launch	Commissioning Phase	Year 1	Year 2	Year 3 to year 7.5	Beyond nominal life
Schedule of proposed activities	LOW	LOW	LOW	LOW	LOW	MED
Availability of funding	LOW	LOW	LOW	LOW	LOW	MED
Availability of infrastructure	LOW	LOW	LOW	LOW	LOW	MED
Availability of people	LOW	LOW	LOW	LOW	LOW	MED

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Sub group	S3VT-OC		
Validation Project Title	**S3OCV.PT - Sentinel-3 Ocean Colour Validation off Portugal**		
Link to full Proposal	13675 https://earth.esa.int/web/guest/pi-community/myearthnet?		
Team Leader name, address and email	Paulo B. Oliveira (pboliveira@ipma.pt) Av. Brasilia 1449-006 Lisboa, Portugal		
Support team-members names and emails	Luis Pessanha - luis.pessanha@ipma.pt; Teresa Moita - tmoita@ipma.pt Sérgio Muacho - sergio.muacho@ipma.pt; A. Miguel Santos - amsantos@ipma.pt Lourdes Bugalho - lourdes.bugalho@ipma.pt; Alexandra Silva - amsilva@ipma.pt		
Summary of activity	In situ data collection for regional validation of the ocean colour products (chlorophyll, chromophoric dissolved organic matter and transparency) for oceanic and coastal waters off Portugal		
Expected results for S3	Routine verification of the performance of satellite retrievals for the coastal and oceanic waters off Portugal		
Reference to S3 Cal/Val plan tasks	Contribution to OCV: "Ocean Colour Validation with in situ measurements (OLCI-L2WLR-CV-300)" as expressed in the S3VT Call RD-1 S3-MR-460 - Performance - "The Sentinel-3 OLC Instrument shall be optimised for measurement of water quality and ocean colour parameters including open ocean (case-1) and coastal shelf (case-2) waters, inland seas and lakes".		
Data requirements, data coverage and timeline	**Sentinel-3 Product Names** OL2_WFR, OL2_WRR SL_2_WST, SR_2_LAN, SR_2_WAT	**Data Coverage** WIberia 35N-45N 11W-5W	**Specific Timeline of Validations** Operational phase
In situ validation data to be collected	Continuous underway measurements of surface (~3m, water intake depth) fluorescence, temperature and salinity at every cruise carried with IPMA's research vessel. Same parameters from an instrumented mooring off SE Portuguese Coast.		
Special data needs	**Need for special satellite acquisitions:** NO		**Requested data timeliness:** Near-real time for dedicated campaigns

Status assessment

	Pre-launch	Commissioning Phase	Year 1	Year 2	Year 3 to year 7.5	Beyond nominal life
Schedule of proposed activities	CRIT	HIGH	MED	MED	MED	

Availability of funding		CRIT	CRIT	CRIT	CRIT	
Availability of infrastructure	LOW	LOW	LOW	LOW	LOW	
Availability of people	LOW	LOW	LOW	LOW	LOW	

Sub group	S3VT-OC
Validation Project Title	**GLaSS-S3VAL – Global Lakes Sentinel Services – Sentinel 3 VALidation**
Link to full Proposal	13747
Team Leader name, address and email	Dr. S.W.M. Peters Water Insight BV Marijkeweg 22 6709 PG Wageningen, the Netherlands peters@waterinsight.nl
Support team-members names and emails	SUOMEN YMPARISTOKESKUS (SYKE) Dr. Sampsa Koponen Finnish Environment Institute SYKE P.O. Box 140 FI - 00251 HELSINKI Finland Phone: +358 40 128 2201 email: sampsa.koponen@ymparisto.fi EOMAP GmbH & Co.KG (EOMAP) Thomas Heege Friedrichshafener Str. 1 82205 Gilching Germany Phone: +49 (0)8105 370 778 0 email: heege@eomap.de STICHTING VU-VUmc (VU/VUmc) Marieke A. Eleveld De Boelelaan 1085 (visiting address) De Boelelaan 1087 (postal address) 1081 HV Amsterdam Netherlands Phone: +31 20 59 89591 email: marieke.eleveld@ivm.vu.nl BROCKMANN CONSULT GMBH (BC) Name: Mr. Thomas Storm Address: Max-Planck-Strasse 2 21502 Geesthacht Germany Phone: +49 4152 889 319 email: thomas.storm@brockmann-consult.de

	CONSIGLIO NAZIONALE DELLE RICERCHE (CNR) Claudia Giardino via Bassini 15 Milano 20133 Milano Italy Phone: + 390223699298 email: giardino.c@irea.cnr.it TARTU OBSERVATORY - ESTONIAN MINISTRY OF EDUCATION AND RESEARCH (TO) Dr Anu Reinart address Observatooriumi 1, Tõravere Postal code town 61602, Tartu County Country ESTONIA Phone: +3727410265 email: aai@aai.ee BROCKMANN GEOMATICS SWEDEN AB (BG) Petra Philipson Torshamnsgatan 39 SE-164 40 Kista Sweden Phone: +46 70 699 6046 email: petra.philipson@brockmann-geomatics.se **Yunlin Zhang:** Taihu Lake Laboratory Ecosystem Research Station, State Key Laboratory of Lake Science and Environment, Nanjing Institute of Geography and Limnology, Chinese Academy of Sciences, **China**. **Arnold Dekker**: CSIRO aquatic earth observation research team within the Environmental Earth Observation research group which is part of the Environmental Observation and Landscape Science research program in **Australia**. **Steven Greb:** Wisconsin Department of Natural Resources who has been promoting and achieving successfully the introduction of remote sensing for the monitoring of water-quality of inland lakes across the State of Wisconsin, **USA**.
Summary of activity	The approach taken: 1) GLaSS will build tools to handle the S3 data; this process will serve to validate the data format and distribution 2) Products from Algorithms developed in the GLaSS project and standard S3 products will be validated on the bases of field data: attention will be given to the validation of L2 reflectance and L2 water quality products in at least the following lakes: 1) Netherlands: Lake IJssel (IVM & WI) 2) Estonia: Lake Peipsi (TO) 3) Italy: Lake Garda (CNR)

	4) Germany: Lake Constance (EOMAP) 5) Sweden: Lake Vanern (BG, CNR,) 6) Finland: Finnish Lakes (Syke) 7) ...additional Lakes to be determined later Partners will carry out field campaign according to the standardized field protocols and data will be combined to the preferred database. Lakes are selected to represent various classes, status, management and importance to the socio-economic development. Partners will visit field campaigns in each test lake at least once during the project to exchange experience and specifically for intercalibration purposes. All partners participate in the MVT and are actively engaged in intercomparison activities whenever possible and appropriate. Most partners are already involved in MERMAID.		
Expected results for S3	Validation of the standard S3 OLCI products for lakes of different types, development of GLaSS Lakes products for OLCI		
Reference to S3 Cal/Val plan tasks	Attention will be given to: • general precision and accuracy of S3 (also S2 but how is that organized?) • reflectances and products • accuracy under low sun elevations • the new bands at 400 and 1020 nm • extended observation angle range • improved atmospheric correction • impact of the adjacency effect • the case-2 uncertainty products		
Data requirements, data coverage and timeline	**Sentinel-3 Product Names** OLCI L1, OLCI L2, maybe SLSTR	**Data Coverage** Specific lakes, including the following and some more added in the process: Lake IJsselmeer: 53.108508 N, 4.967194 E; 52.520873 N, 5.769196 E Lake Markermeer: 52.687316 N, 5.210266 E; 52.306435 N, 5.456085 E	**Specific Timeline of Validations** 2014-2016

		Lakes in Mecklenburg-Vorpommern: 54.6°N, 10.0°E; 53.0°N, 14.7° E Lake Constance Lake Lammin Pääjärvi and other nearby lakes: 60°50□ - 61°20□ N, 24°30□ - 25°50□ E Lake Peipsi: 59.1360N, 27.0140E, 57.7640N, 28.1470E Lake Võrtsjärv: 58.4400N, 25.9350E, 58.0830N, 26.1000E Lake Garda: 45°36□N, 10°37□E Lake Maggiore: 45°56□N, 8°57□E Lake Vänern 9.450474N, 12.529907 E; 58.343716N, 14.007568E	
In situ validation data to be collected	Radiometric and optical measurements • TriOS RAMSES • WISP-3 • FieldSpec SVC, FR • CIMEL instrument • Solar spectroradiometric system (Bentham) • AIREL aerosol size and ion measurement system • Sunphotometer • AERONET station Concentrations • Chl • TSM • CDOM		

	• Phycocyanin Inherent optical properties • absorption • Scattering • AC-9 • HS-6		
Special data needs	**Need for special satellite acquisitions:** no		**Requested data timeliness:** Access to NRT data in later stages Access to full archive is preferred

Status assessment						
	Pre-launch	Commissioning Phase	Year 1	Year 2	Year 3 to year 7.5	Beyond nominal life
Schedule of proposed activities	LOW	LOW	LOW	glass project ends 2016		
Availability of funding	LOW	LOW	LOW	glass project ends 2016		
Availability of infrastructure	LOW	LOW	LOW	glass project ends 2016		
Availability of people	LOW	LOW	LOW	glass project ends 2016		

Sub group	S3VT-OC
Validation Project Title	**Validation of ocean colour data in coastal waters**
Link to full Proposal	13452
Team Leader name, address and email	Rüdiger Röttgers Max-Planck-Str. 1, D-21502 Geesthacht, Germany RRoettgers@hzg.de
Support team-members names and emails	Hajo Krasemann, Hajo.Krasemann@hzg.de Dagmar Müller, Dagmar.Mueller@hzg.de Martin Hieronymi, Martin.Hieronymi@hzg.de Wolfgang Schönfeld Wolfgang.Schoenfeld@hzg.de Kerstin Heymann Kerstin.Heymann@hzg.de Carsten Brockmann carsten.brockmann@brockmann-consult.de Roland Doerffer roland.doerffer@hzg.de Kerstin Stelzer kerstin.stelzer@brockmann-consult.de David McKee david.mckee@strath.ac.uk Cecile Dupuoy cecile.dupouy@ird.fr
Summary of activity	The proposed activities are related to the performance of this turbid coastal water retrieval algorithm for the OLCI instruments and to future improvements of this algorithm and the atmospheric correction using combined data from OLCI and SLSTR. In addition, OLCIs new bands (e.g. 400 nm) and products (e.g. uncertainties) need to be evaluated and validated, e.g. the retrieval from larger observation angles related to the off-nadir geometry of OLCI. The team consists of the remote sensing group at the HZG, Geesthacht, Germany (5 scientists, 1 technician), one scientist from the University of Strathclyde (UoS) based in Glasgow, Scotland, one scientist from the Mediterranean Institute of Oceanography, Marseille, France, who is based in New Caledonia, and three scientists of Brockmann Consult, (BC) Geesthacht, Germany. HZG was responsible for the case-2 water algorithm for MERIS and performed validation of the algorithm and its retrieval products for MERIS. A same algorithm was developed by HZG for OLCI and implemented in the OLCI processing chain. The group was participating in the MERIS Validation Team (MVT) and the MERIS Quality Working Group (QWT). The group is engaged in the development of optical remote sensing algorithms for coastal waters, its evaluation and validation, and in optical oceanographic and lab measurements, as well as in instrument development to facilitate precise measurements of optical properties. The group performed and performs comprehensive measurements of optical properties and related water constituents, mainly in the North and Baltic Sea. Other team-members from UoS and MIO are working in the field of optical measurement and remote sensing. BC is providing services and expertise to coastal remote sensing, and the BC team members are either members of the current MERIS QWG or in charge of the validation bureau of the GMES MarCoast downstream serviced network. The group in its whole will allow performing validation measurement in the North and Baltic Sea and selected close by lagoons and inland waters, in water around the UK and in the tropical lagoon around New Caledonia. This includes measurements of quite different environments that will strongly increase the evaluation of the actual case-2 water algorithm. The validation activities will focus on the exact retrieval

	and the related uncertainties of the case 2-water product from OLCI by in situ match-ups of the relevant optical and biogeochemical parameters. Problems addresses are: - general precision and accuracy of OLCI reflectances and retrievals - measurement accuracy under low sun elevations - performance of the new bands at 400 and 1020 nm - performance of the extended observation angle range - improvements of the atmospheric correction (when combining OLCI and SLSTR data) - adjacency effect - validation of the case 2-water uncertainty products Optical measurements will be performed in situ providing sets of data that combine remote sensing reflectance measurements with inherent optical properties and water constituent concentrations. Validation can be done on L2 water reflectance and retrieved parameters. Permanent sun radiation field measurements will be performed for atmospheric parameter in the German Bight. The collected data will be used to validated and improve the OLCI case 2 water retrieval algorithms, and to validate and improve the available uncertainty products. In addition the activity will be used to improve optical measurement techniques and method and improve atmospheric correction over coastal waters. Techniques will be developed to assess product performance and algorithms improvements on large datasets (time series, global datasets) using the CalValus technology. The activities will be performed on institutional funding in the framework of running projects, and will be dependent on the annual budget of each participating member.		
Expected results for S3	Validation of the case-2 water algorithm products branch		
Reference to S3 Cal/Val plan tasks	Preparation for L2 Cal/Val (OLCI-L2WLR-CV-100) Ocean Colour Validation with in-situ measurements (OLCI-L2WLR-CV-300) Ocean Colour Validation with Level 3 products (OLCI-L2WLR-CV-400) Ocean Colour Processing Quality Validation (OLCI-L2WLR-CV-500), all others relevant for Case 2 waters		
Data requirements, data coverage and timeline	**Sentinel-3 Product Names** OL2-WLR-	**Data Coverage** North-West Shelf, Baltic, Inland waters Middle Europe, New Caledonia	**Specific Timeline of Validations** Validation can start any time, first cruises in 2015, yearly cruises and ad hoc (ferry: Büsum-Helgoland)
In situ validation data to be collected	All water IOPs, Chlorophyll a, Pigments, TSM, reflectance		
Special data needs	**Need for special satellite acquisitions:**	no	**Requested data timeliness:** EO data NRT, data provided back dependent on parameter between 1 day and 2 month
Status assessment			

	Pre-launch	Commissioning Phase	Year 1	Year 2	Year 3 to year 7.5	Beyond nominal life
Schedule of proposed activities	MED	MED	MED			
Availability of funding		HIGH	HIGH	HIGH		
Availability of infrastructure	LOW	LOW	LOW	LOW	LOW	LOW
Availability of people	MED	MED	MED	MED	MED	MED

Sub group	S3VT-OC
Validation Project Title	**Belgian AERONET for Ocean Colour validation ("BEL-AERONET")**
Link to full Proposal	13702
Team Leader name, address and email	Kevin Ruddick Remote Sensing and Ecosystem Modelling (REMSEM) team, Direction Natural Environment, Royal Belgian Institute of Natural Sciences (RBINS), 100 Gulledelle, 1200 Brussels BELGIUM Tel: +32 2 7732131 Fax: +32 2 7706972 Email: K.Ruddick@mumm.ac.be http://www.mumm.ac.be/remsem/
Support team-members names and emails	Dimitry Vanderzande, D.Vanderzande@mumm.ac.be Bouchra Nechad, B.Nechad@mumm.ac.be Quinten Vanhellemont, Q.Vanhellemont@mumm.ac.be
Summary of activity	BEL-AERONET will setup, maintain and exploit two AERONET-OC sites in Belgian waters for the validation of level 2 radiometric products from ocean colour sensors (water-leaving radiance reflectance, etc.). These sites will be the focus of validation activities in Belgian waters for Sentinel-3/OLCI and the visible/near infrared bands of SLSTR and will be supported by satellite data processing activities and extra hyperspectral measurements of water-leaving radiance reflectance from occasional seaborne cruises.
Expected results for S3	The expected outcome of BEL-AERONET is a full mission validation of the OLCI water-leaving reflectance products for Belgian waters, indicating the accuracy of the product and providing indications of improvements that are needed, e.g. for aspects of the atmospheric correction algorithm, including turbid water aspects. A similar outcome is expected for all other ocean colour sensors using data from the sites.
Reference to S3 Cal/Val plan tasks	For the priority water-leaving reflectance parameter BEL-AERONET fulfils: OLCI-L2WLR-CV-310 - Acquisition of in situ measurements OLCI-L2WLR-CV-320 - Traceability of in situ measurement quality OLCI-L2WLR-CV-330 - In situ measurement archiving OLCI-L2WLR-CV-370 - Generation of side-by-side in situ and OLCI trends

<table>
<tr><td></td><td colspan="3">BEL-AERONET also supports and facilitates (but does not fulfil):
OLCI-L2WLR-CV-340 - Extractions of OLCI data over validation targets
OLCI-L2WLR-CV-350 - OLCI data from validation sites archiving
OLCI-L2WLR-CV-360 - Generation of matchups and validation results
OLCI-L2WLR-CV-380 - Development of calibration, product and science algorithms
NB. The AERONET-OC network covers only the following wavelengths of OLCI: 412, 442, 490, 665, 862.5, 1020. Coverage of the other wavelengths would require an entirely new network, as proposed in the HYPERNET-OC proposal (S3VT AO proposal 13623).</td></tr>
<tr><td>Data requirements, data coverage and timeline</td><td>Sentinel-3 Product Names
OL2_WFR, OL1_EFR, SL_2_WST</td><td>Data Coverage
Belgian waters (51-52°N, 2-3.5°E) is top priority.
If easily available we will also inspect data for the Southern North Sea and Channel, but do not promise in situ data there:
(48-53°N, 4°W-6°E)</td><td>Specific Timeline of Validations
Continuous AERONET-OC measurements from at least 1 Mar – 30 Oct each year. Possible extensions from Feb or to Nov possible, depending on calibration schedule.
Possible extra seaborne cruises in period April-July some years.</td></tr>
<tr><td>In situ validation data to be collected</td><td colspan="3">Water-leaving radiance reflectance at AERONET-OC bands
Occasional extra seaborne measurements including:
Hyperspectral water-leaving radiance reflectance, Total Suspended Matter, HPLC pigments, turbidity, etc.</td></tr>
<tr><td>Special data needs</td><td>Need for special satellite acquisitions:
No</td><td></td><td>Requested data timeliness:
Not really. If we don't get the data we won't be able to supply validation information, but there is no urgency from our side.</td></tr>
<tr><td colspan="4" align="center">Status assessment</td></tr>
</table>

	Pre-launch	Commissioning Phase	Year 1	Year 2	Year 3 to year 7.5	Beyond nominal life
Schedule of proposed activities	LOW	LOW	LOW	LOW	LOW	LOW
Availability of funding	LOW	LOW	LOW	MED	HIGH	HIGH
Availability of infrastructure	LOW	LOW	LOW	LOW	MED	MED
Availability of people	LOW	LOW	LOW	LOW	MED	MED

Sub group	S3VT-OC
Validation Project Title	**A federated network of hyperspectral visible/near infrared radiometers for multi-sensor ocean colour validation ("HYPERNET-OC")**
Link to full Proposal	13623
Team Leader name, address and email	Kevin Ruddick Remote Sensing and Ecosystem Modelling (REMSEM) team, Direction Natural Environment, Royal Belgian Institute of Natural Sciences (RBINS), 100 Gulledelle, 1200 Brussels BELGIUM Tel: +32 2 7732131 Fax: +32 2 7706972 Email: K.Ruddick@mumm.ac.be http://www.mumm.ac.be/remsem/
Support team-members names and emails	Dimitry Vanderzande, D.Vanderzande@mumm.ac.be Bouchra Nechad, B.Nechad@mumm.ac.be Quinten Vanhellemont, Q.Vanhellemont@mumm.ac.be
Summary of activity	
Expected results for S3	HYPERNET-OC will setup and run a federated international network for the validation of level 2 radiometric products from ocean colour sensors (water-leaving radiance reflectance, etc.) similar to the AERONET-OC network but based on hyperspectral visible/near infrared (VIS/NIR: 400-900nm) radiometers. These continuously-operating instruments, typically installed alongside AERONET-OC instruments on offshore platforms, will thus cover all VIS/NIR bands of all ocean colour sensors. As per AERONET-OC, the HYPERNET-OC network will consist of sites where common instrumentation is deployed under the responsibility of local site managers with central facilities (not necessarily co-located) for calibration, in situ data processing/distribution and network management. In the preparatory years (2014-15?) the international community will be consulted regarding the validation needs of the space agencies, the state of the art regarding protocols for abovewater radiometric data processing including quality control, the optimal instrument package (performance and cost), data policy, the logistics and costs of site setup and maintenance and the likely number of sites to be federated. This preparatory year will conclude with a detailed definition for the network (standard instrument package, data processing algorithms and testing of a prototype site in Belgian waters. In subsequent years (2016-2023) near real time data transmission and

<table>
<tr><td></td><td colspan="3">processing will be implemented and the network will be successively expanded and refined as new sites join, as data processing algorithms improve and as new instrumentation becomes available. Network management will include the organisation of an annual workshop, potentially co-located with AERONET-OC workshops, for discussion of science results, instrumentation and site management issues.

Although not under the responsibility of the HYPERNET-OC network, the usage of the data for global validation matchup analysis by ocean colour space agencies will be a priority application for the network.</td></tr>
<tr><td>Reference to S3 Cal/Val plan tasks</td><td colspan="3">For the priority water-leaving reflectance parameter HYPERNET-OC fulfils:

OLCI-L2WLR-CV-310 - Acquisition of in situ measurements
OLCI-L2WLR-CV-320 - Traceability of in situ measurement quality
OLCI-L2WLR-CV-330 - In situ measurement archiving
OLCI-L2WLR-CV-370 - Generation of side-by-side in situ and OLCI trends
HYPERNET-OC also supports and facilitates (but does not fulfil):

OLCI-L2WLR-CV-340 - Extractions of OLCI data over validation targets
OLCI-L2WLR-CV-350 - OLCI data from validation sites archiving
OLCI-L2WLR-CV-360 - Generation of matchups and validation results
OLCI-L2WLR-CV-380 - Development of calibration, product and science algorithms</td></tr>
<tr><td>Data requirements, data coverage and timeline</td><td>Sentinel-3 Product Names

OL2_WFR, OL1_EFR, SL_2_WST</td><td>Data Coverage

All HYPERNET-OC sites, typically similar to AERONET-OC sites.</td><td>Specific Timeline of Validations

Continuous measurements from effective network start date (not before 2016).</td></tr>
<tr><td>In situ validation data to be collected</td><td colspan="3">Water-leaving radiance reflectance at all OLCI bands, except 1020nm.</td></tr>
<tr><td>Special data needs</td><td>Need for special satellite acquisitions:

No</td><td></td><td>Requested data timeliness:

No special needs</td></tr>
</table>

Status assessment						
	Pre-launch	Commissioning Phase	Year 1	Year 2	Year 3 to year 7.5	Beyond nominal life

Schedule of proposed activities	CRIT	CRIT	CRIT	CRIT	CRIT	CRIT
Availability of funding	CRIT	CRIT	CRIT	CRIT	CRIT	CRIT
Availability of infrastructure	CRIT	CRIT	CRIT	CRIT	CRIT	CRIT
Availability of people	CRIT	CRIT	CRIT	CRIT	CRIT	CRIT

Sub group	S3VT-OC
Validation Project Title	**Validation of Sentinel-3 level 2 OLCI products in the Atlantic Ocean and coastal waters of the Western English Channel - PML-S3VT-OLCI**
Link to full Proposal	13737
Team Leader name, address and email	Gavin Tilstone Plymouth Marine Laboratory, Prospect Place, West Hoe, Plymouth, PL1 3DH, UK ghti@pml.ac.uk
Support team-members names and emails	Shubha Sathyendranath, Plymouth Marine Laboratory, ssat@pml.ac.uk Trevor Platt, Plymouth Marine Laboratory, tplatt@pml.ac.uk Steve Groom, Plymouth Marine Laboratory, sbg@pml.ac.uk Timothy Smyth, Plymouth Marine Laboratory, tjsm@pml.ac.uk Giorgio Dall'Olmo, Plymouth Marine Laboratory, gdal@pml.ac.uk Jamie Shutler, Plymouth Marine Laboratory, jams@pml.ac.uk. Robert Brewin, Plymouth Marine Laboratory, robr@pml.ac.uk Victor Martinez-Vicente, Plymouth Marine Laboratory, vmv@pml.ac.uk
Summary of activity	High quality in situ data will be collected from field campaigns, autonomous systems and mooring platforms following established satellite validation measurement protocols. The data will be uploaded to a validation database accessible to ESA and other S3VT members. Uncertainty budgets on instrument calibration, measurement platform and measurement processing will be computed to ensure measurement traceability. The approaches taken in the project will build on previous experience from NASA and ESA missions. We shall investigate the feasibility of using the Atlantic Meridional Transect as a cross S3VT validation platform (bringing in SST and altimetry requirements).
Expected results for S3	We will contribute to quantification of the errors in level 2 OLCI products in coastal (Western English Channel) and open ocean (Atlantic) environments. We will also assess the performance of standard and non-standard level 2 products using algorithms available for OLCI in both coastal and open ocean regions of the Western English Channel and Atlantic Ocean. We will quantify why and where the algorithms are failing both temporally and spatially. We will provide recommendations as part of the S3VT team to ESA on the algorithm performance over spatial domains and time-series and optimization of calibration, processor or algorithm changes. This project will therefore contribute to the high-level accuracy and reliability of Sentinel-3 level 2 products in Case 1 Atlantic Ocean and Case 2 UK coastal waters, to provide the expected continuity of Envisat ocean measurements.
Reference to S3 Cal/Val plan tasks	To provide an initial assessment of OLCI data quality of level 2 products early on during the commissioning phase of S-3; To monitor the stability and the quality of these products throughout the operational phase of the S3 mission;

	To continuously improve the quality of the products throughout the operational phase of the mission following evolving user requirements and feedback from S3VT, ESA and EUMETSAT.		
Data requirements, data coverage and timeline	**Sentinel-3 Product Names** OL_2_W_FR OL_2_W_RR OL_2_R_FR OL_2_R_RR	**Data Coverage** Atlantic Ocean, English Channel, North Sea	**Specific Timeline of Validations**
In situ validation data to be collected	Chlorophyll-a (Chla), organic (POM) and inorganic (PIM) suspended material (TSM), absorption coefficients of phytoplankton (a_{ph}), non-algal particles (a_{NAP}) and Coloured Dissolved Organic Material (a_{CDOM}), Particulate scattering coefficient (b_p), backscattering coefficient (b_{bp}), beam attenuation coefficient (c_p), Photosynthetically active radiation (PAR). If external commissioned research funding were available, particulate organic carbon (POC), attenuation coefficient (K_d) could be added to the data currently being collected. On AMT we will also get along track Rrs from a surface hyperspectral radiometer		
Special data needs	**Need for special satellite acquisitions:** OLCI FR & RR		**Requested data timeliness:** <12 hrs after acquisition

Status assessment						
	Pre-launch	Commissioning Phase	Year 1	Year 2	Year 3 to year 7.5	Beyond nominal life
Schedule of proposed activities	LOW	LOW	LOW	MED	HIGH	CRIT
Availability of funding	LOW	LOW	LOW	HIGH	HIGH	CRIT
Availability of infrastructure	LOW	LOW	LOW	HIGH	HIGH	CRIT
Availability of people	LOW	LOW	LOW	LOW	LOW	LOW

Sub group	S3VT-OC		
Validation Project Title	**Ground Truthing of Alpine Lakes**		
Link to full Proposal	13768		
Team Leader name, address and email	Alfred Johny Wüest alfred.wueest@eawag.ch		
Support team-members names and emails	Bastiaan Ibelings (Bastiaan.Ibelings@unige.ch) Devis Tuia (devis.tuia@epfl.ch) Andrew Barry (andrew.barry@epfl.ch) Damien Bouffard (damien.bouffard@epfl.ch)		
Summary of activity	Development and validation of specific algorithms for alpine lakes in order to connect the IOPs (Inherent Optical Properties) of each water body to their constituents (Chl-a, TSM, CDOM…). Ground truthing (boat + moored platform) Multiscale validation of surface reflectance (e.g. subgrid pixel analysis) Remote sensing of phytoplankton groups 3D hydro-ecological lake model		
Expected results for S3	Development of Fiducial Reference Measurements for Alpine lakes (Inland waters)		
Reference to S3 Cal/Val plan tasks			
Data requirements, data coverage and timeline	**Sentinel-3 Product Names** Level-2 (possibly Level-1) OL2_WFR; OL2_WRR; (possibly OL1_EFR; OL1_ERR)	**Data Coverage** Lake Geneva (46°27'N, 6°32'E, extent: 40 km) Bodensee (47°38'N, 9°23'E, extent: 30 km) Greifensee (47°35'N, 8°67'E, extent 5 km) Grimsel (46°34'N, 8°18'E, extent: 5 km) Alps (47°N, 9°E, extent:	**Specific Timeline of Validations** 2014 -> ?

		400 km)	
In situ validation data to be collected	Surface reflectance from boats and moored stations (ASD FieldSpec3, WISP-3, TrIOS- Ramses and Ocean Optics USB2000+) Water constituents profiles (CTD, Fluorometer, Turbidity, particle distribution, Water samples)		
Special data needs	**Need for special satellite acquisitions:**	• Satellite overpass prediction for field campaign planning • Collaborations	**Requested data timeliness:**

Status assessment

	Pre-launch	Commissioning Phase	Year 1	Year 2	Year 3 to year 7.5	Beyond nominal life
Schedule of proposed activities	LOW	LOW	LOW	MED	HIGH	CRIT
Availability of funding	LOW	LOW	LOW	HIGH	CRIT	CRIT
Availability of infrastructure	MED	MED	MED	LOW	LOW	HIGH
Availability of people	LOW	LOW	LOW	LOW	MED	CRIT

Sub group	S3VT-OC
Validation Project Title	**Pan-European Assessment of OLCI Primary Ocean Color Products**
Link to full Proposal	13587
Team Leader name, address and email	Giuseppe Zibordi European Commission Joint Research Centre Institute for Environment and Sustainability 21027, Ispra (Italy) Phone +39 0332 785902 Fax +39 0332 789034 E-mail giuseppe.zibordi@jrc.ec.europa.eu
Support team-members names and emails	Frederic Melin European Commission Joint Research Centre Institute for Environment and Sustainability 21027, Ispra (Italy) Phone +39 0332 785627 Fax +39 0332 789034 E-mail frederic.melin@jrc.ec.europa.eu Jean-Francois Berthon European Commission Joint Research Centre Institute for Environment and Sustainability 21027, Ispra (Italy) Phone +39 0332 785525 Fax +39 0332 789034 E-mail jean-francois.berthon@jrc.ec.europa.eu
Summary of activity	The activity will focus on the determination of biases and uncertainties of primary OLCI Ocean Color products: the normalized water leaving radiance and the aerosol optical thickness. The in situ data required for the execution of the activity will be collected at European Ocean Color sites operated by the JRC within the Aerosol Robotic Network (AERONET-OC). Strength of AERONET-OC is the capability to deliver in situ validation data determined from continuous standardized measurements performed at different sites with identical measuring systems and protocols, calibrated using a single reference source and method, and processed with the same code. The JRC measurement sites are located in the Adriatic, Baltic and Black Seas and include: AAOT, the Acqua Alta Oceanographic Tower in the Adriatic Sea operated since 2002; GDLT, the Gustaf Dalen Lighthouse Tower in the Baltic Proper operated since 2005; HLT, the Helsinki Lighthouse in the Gulf of Finland operated since 2006; GLR, the Gloria platform in the central Western Black Sea operated since 2010;

<table>
<tr><td></td><td colspan="3">GLT, the Galata platform in the south Western Black Sea operated form 2014.
It is underlined that the former sites offer the capability of investigating ocean color data products in both case-1 and case-2 waters. Specifically the AAOT exhibits moderately sediment dominated and occasionally pigment dominated waters. HLT and GDLT are located in case-2 yellow substance dominated waters. GLR and GLT may embrace highly sediment dominated case-2 waters affected by the Danube plume.
It is underlined that generation of the in situ data requires a major logistic effort for i. the annual deployment and calibration of the field instruments, and ii. the regular quality assurance of field data products.
It is finally recalled that the JRC acts as secondary calibration facility (NASA-GSFC is the primary) for AERONET-OC radiometers and has the responsibility for the quality assurance of the data products from all AERONET-OC sites.</td></tr>
<tr><td>Expected results for S3</td><td colspan="3">Uncertainty and bias indices for OLCI primary data products for a variety of European marine waters.</td></tr>
<tr><td>Reference to S3 Cal/Val plan tasks</td><td colspan="3">Support to validation of OLCI calibration: the AERONET - OC data generated at sites established and maintained by the Ocean Color Team of the JRC will be used for constructing OLCI match-ups to timely quantify uncertainties and biases in primary satellite ocean color products.</td></tr>
<tr><td>Data requirements, data coverage and timeline</td><td>Sentinel-3 Product Names
OL1_EFR
OL1_ERR
OL2_WFR
OL2_WRR</td><td>Data Coverage
AAOT: Lat. 45.314 and Lon. 12.508
GDLT: Lat. 58.594 and Lon. 17.467
HLT : Lat. 59.949 and Lon. 24.926
GLR : Lat. 44.599 and Lon. 129.360
GLT : Lat. 43.045 and Lon. 28.193</td><td>Specific Timeline of Validations
Six monthly</td></tr>
<tr><td>In situ validation data to be collected</td><td colspan="3">Normalized water leaving radiance and aerosol optical thickness at the 412, 443, 488, 531, 551, 667, 870, 1020 nm center-wavelengths.</td></tr>
<tr><td>Special data needs</td><td>Need for special satellite acquisitions:</td><td></td><td>Requested data timeliness:
Daily</td></tr>
<tr><td colspan="4">Status assessment</td></tr>
</table>

	Pre-launch	Commissioning Phase	Year 1	Year 2	Year 3 to year 7.5	Beyond nominal life
Schedule of proposed activities	LOW	LOW	LOW	LOW	LOW	
Availability of funding	MED	MED	MED	MED	MED	
Availability of infrastructure	LOW	LOW	LOW	LOW	LOW	
Availability of people	LOW	LOW	LOW	LOW	LOW	

9.5 Data requirements of the Sub-group

The Sentinel-3 products relevant to this group are show in the following table. The products shown in *Italics* are requested by S3VT-OC but are currently not standard or not user products in the Copernicus core PDGS configuration.

Product Type	Level	Description	Size (GB/Orbit)
OL_0_EFR or *New L1A products*	*0 or* *1A*	*Full Resolution ISPs at Level-0 or, not yet defined, Level-1A ortho-geolocated and uncalibrated top of atmosphere radiances at all bands with calibration information included*	*L0 9.5 or* *L1A unknown*
OL_1_EFR	1B	Full Resolution ortho-geolocated and calibrated top of atmosphere radiances at all bands	28.549
OL_1_ERR	1B	Reduced Resolution ortho-geolocated and calibrated top of atmosphere radiances at all bands	2.337
OL_2_WFR	2	Full Resolution Water & Atmosphere parameters	28.366
OL_2_WRR	2	Reduced Resolution Water & Atmosphere parameters	2.371
New OL_3_W products	*3*	*Not yet defined, binned parameters spatially and temporally, daily, weekly, monthly, seasonal, annual and respective climatologies*	*unknown*
SL_1_RBT	1B	Ortho-geolocated and calibrated brightness temperatures and radiances	44.543
SL_2_WST	2	Level-2P Sea Surface Temperature (GHRSST format)	2.22
SR_2_WAT	2	1Hz and 20Hz Ku and C bands parameters (LRM/SAR), waveforms. Over open ocean, coastal areas, sea-ice and part of land within a certain distance from the coastline	0.139
SR_2_LAN	2	1Hz and 20Hz Ku and C bands parameters (LRM/SAR/PLRM), waveforms. Over land, coastal areas, land ice and inland water	0.09
MWR	*2*	*Water vapour product*	*unknown*
SY_2_SYN	2	Surface Reflectances and Aerosol parameters over Land in 30 bands from OLCI and SLSTR synergy in OLCI FR geometry	31.44

OLCI Level-2 parameters at RR and FR, OL_2_W (exclusive of auxiliary data)	Algorithms, ATBD: http://earth.esa.int./aos/S3VT
Normalized water-leaving reflectances (no BRDF)	BAC_reflectances_Oaxx (Baseline atmospheric correction – BAC)
Chlorophyll-a concentration in open ocean	CHL_OC4ME (BAC)
Chlorophyll-a concentration in coastal waters	CHL_NN (Neural network alternative atmospheric correction – AAC)
Total suspended matter concentration	TSM_NN (AAC)
Diffuse attenuation coefficient	KD490_M07 (BAC)
Coloured detrital and dissolved material absorption	ADG_443_NN (AAC)
Photosynthetically active radiation	PAR (based on Frouin et al.)
Aerosol optical depth by-product	T865 (BAC)
Aerosol Angstrom exponent by-product	A865 (BAC)
Integrated water vapour over ocean and land	IWV (Neural network)

The table shows that the interest of S3VT-OC goes beyond OLCI products and includes marine, coastal and lake coverage coming from SLSTR and Topography missions as well as the Synergy products. The product list also covers additional requirements from S3VT-OC which encompass products that are not standard or not user products in the Copernicus core PDGS configuration:

- Access to Level-3 products is requested. L3 are currently not Copernicus products, they will have to be defined, developed, produced and disseminated. There is large and diverse user community requiring access to L3 OLCI products.
- Access to selected Level-0 products and to Level-0-to-Level-1B processor with source code is requested to support S3VT OLCI calibration and characterization activities.
- Sustained access to Level-0 products, or preferably Level-1A products with the corresponding Level-1A-to-Level-1B processor with source code, is requested by S3VT member agencies NASA and NOAA. OLCI L1A are ortho-geolocated and uncalibrated top of atmosphere radiances at all bands with calibration information included. OLCI L1A are currently not Copernicus products, they would have to be defined, developed, produced and disseminated.

Requirements on other mission data products:

- Sentinel-2 data are requested for inland and coastal water validation teams, Level-1 and Level-2 water products.

High level summary of S3VT-OC data requirements:

- More than ¾ of the S3VT-OC require OLCI data products at Level-1 or lower. This is in addition to Level-2 or higher level OLCI products.
- The majority of S3VT-OC teams are focused on OLCI validation in coastal waters, inland-seas, and lakes distributed globally.
- Lake/in-land water products are requested by almost half of the S3VT-OC teams.
- Complete global products are requested by 1/5th of the S3VT-OC teams.
- Auxiliary and ancillary data sets to achieve validation are also required.
- The data requirements apply to Sentinel-3 A and B.

The following table summarises ocean colour products and their coverage requested by the S3VT-OC team members:

IP	Name	Products	Coverage	Timeliness	Distribution	E1/E2
13765	Alikas Krista	OL1_EFR, _ERR, OL2_WFR, SL_1_RBT and SL_2_WST	Lake Peipsi: 59.1360N, 27.0140E, 57.7640N, 28.1470E Lake Võrtsjärv: 58.4400N, 25.9350E, 58.0830N, 26.1000E Baltic Sea coastal areas Pärnu Bay - 58.332567N, 24.38324E Matsalu Bay - 58.76906 N, 23.539286E Gulf of Riga - 57.471867N, 23.743723E Gulf of Finland - 59.833775, 24.845123	NRT quick-looks, otherwise 1 day timeliness, April to October	FTP	E1 & E2
13246	Antoine David	OL1_EFR, _ERR, and OL2_WFR & OL2_WRR	BOUSSOLE location in Ligurian Sea	NTC	FTP	E1 & E2
13653	Babin	OL1_EFR, and	> 60°N, including	1 day, NTC	FTP	E2

	Marcel	OL2_WFR	Canadian archipelago, Beaufort Sea, Baffin Bay			
13616	Barciela Rosa	OL2_WRR, L3	Global	NRT & NTC	EUMETCast & FTP	E2
13732	Bernard Stewart	OL1_EFR, _ERR, and OL2_WFR, _WRR, and OL2_LFR	E1: Benguela Current (Elands Bay) 31°S-34°S, 17°-19°E Loskop Inland: 25°S-25.5°S, 29°E -29.5°E E2: Southern Ocean: 35°S-75°S, 10°W-30°E	NRT & NTC	EUMETCast & FTP	E1 & E2
13751	Bracher Astrid	OL2_WFR, _WRR and additional parameters, which are not listed in standard products	within 10° of specific campaigns: high lats (at 60°N-80°N and 45°S-70°S) Costa Brava, Spain	NRT quick-looks, otherwise 1 day timeliness (4 weeks prior to 4 weeks after specific campaigns)	FTP	E1 & E2
13760	Brockmann Carsten	OL1_EFR, _ERR, and OL2_WFR, _WRR, OL2_LFR, LRR, SL1_RBT, SL2_WST, LST, SY2_SYN	Global (random orbits)	NTC	FTP	E1 & E2
13739	Brotas Vanda	OL2_WFR, _WRR, SL2_WST, SR2_WAT	30°N -46°N, 5°W -32°W	NRT quick-looks, otherwise 1 day timeliness, otherwise NTC	FTP	E1 & E2
13743	Bryere Philippe	OL2_EFR	Global	Marine Collaborative Ground Segment data access		

13583	Chami Malik	E1: OL1_EFR E2: OL1_EFR and OL2_WFR	PacSE 44.9°S-20.7°S, 130.2°W-89.0°W June to Sept PacNW 10.0°N-22.7°N, 139.5°E-165.6°E all year PacN 15.0°N-23.5°N, 179.4°E-200.6°E all year AtlN 17.0°N-27.0°N, 62.5°W-44.2°W Nov to April AtlS 19.9°S-9.9°S, 32.3°W-11.0°W Nov to July IndS 29.9°S-21.2°S, 89.0°E-100.1°E all year	1 day, NTC	FTP	E1 & E2
13552	D'Alimonte Davide	OL1_EFR, _ERR, and OL2_WFR, _WRR	N Adriatic Sea Baltic Sea Western Black Sea	NTC	FTP	E2 (two years after launch)
13772	Darecki Miros□aw	OL1_EFR, _ERR, OL2_WFR, _WRR, and SL_1_RBT, SL_2_WST	Baltic sea	1 day, NTC	FTP	E1 & E2
13658	Thomas Schroeder	OL1_EFR, _ERR, and OL2_WFR, _WRR, L3, SL_2_WST, SR_2_WAT	110°E-160°E, 10°S-70°S	NRT, NTC	FTP	E1 & E2
13741	DiGiacomo Paul	L0 or L1A, OL1_EFR, _ERR, and OL2_WFR, WRR, L3 (SL_1_RBT, SL_2_WST, OL2_LFR, OL2_LRR)	Global	NRT, NTC	Terrestrial multicast, FTP	E1 & E2
13716	Dorandeu	OL1_EFR,	Global	NRT, NTC	EUMETCast,	E1 & E2

	Joel	_ERR, and OL2_WFR, _WRR			FTP	
13758	Fearns Peter	OL1_EFR and OL2_WFR	N Western Australia 22ºS-15ºS; 114ºE- 124.5º E Additional locations: 1. 32ºS, 115.75ºE 2. 28.75ºS, 114.5ºE 3. 26ºS 114ºE. Also China 31ºN-37ºN, 119.5ºE-124ºE	1 day, NTC	FTP	E1 & E2
13744	Fischer Jürgen	L0, OL1_EFR, OL2_WFR, OL2_LFR, SL_1_RBT, MWR water vapour data, L3	Global (selected orbits)	1 day, NTC	FTP	E1 & E2
13723	Hunter Peter	OL1_EFR, OL2_WFR	Loch Lomond (N56°6.91', W004°37.35') Loch Leven (N56°11.89', W003°22.55') Loch Ness (N57°16.9', W004°29') Lough Neagh (N54°36.81', W006°25.07') Windermere (N54°21.27', W002°56.2') Derwent Water (N54°34.7', W003°8.8') Bassenthwaite (N54°39.21', W003°12.98') Lake Balaton (N46°49.8', E17° 44.0')	1 day, NTC	FTP	E1 & E2
13556	Icely John	OL1_EFR, _ERR, and OL2_WFR, _WRR, and	Station A (37°00'34"N, 8°54'07"W) Station B (36°55'53"N,	NRT quick-looks, otherwise 1 day	FTP	E1 & E2

		SL_2_WST, SY_2_SYN	8°53'40"W) Station C (36°50'32"N, 8°54'54"W)	timeliness, NTC		
13742	Jamet Cédric	OL1_EFR, _ERR, and OL2_WFR, _WRR, L3	French Guiana (55°W-49°W, 3°N-8°N) E English Channel / S North Sea (1°W-4°E, 49°N-52°N) French Atlantic Coast (4°W-0°W, 43°N-46°N) Vietnam (Tonkin gulf (107°E-109°E, 18°N-20°N) and Mekong delta) Global (RR)	NRT quick-looks, otherwise 1 day timeliness, NTC	FTP	E1 & E2
14552	Kahru Mati	OL2_WFR, _WRR	Southern California Current	1 day, NTC	FTP	E1 & E2
13597	Knaeps Els	OL1_EFR, OL2_WFR	Scheldt (51°14'04"N, 4°23'50"E) Gironde (45°26'20"N, 0°51'29"W) La Plata (34°45'41"S, 57°27'46"W) Belgian coast (51°14'55"N, 2°51'47"E)	1 day, NTC	FTP	E1 & E2
13729	Knox Nichola Maria	OL1_EFR	Cape Town (TL: 32°25'20.07"S, 17°39'27.79"E; BR: 34°51'41.67"S, 21°59'45.06"E) Inland area (TL: 25°38'12.83"S, 27°44'30.82"E; BR: 26°19'31.30"S, 28°45'10.11"E)	1 day, NTC	FTP	E1 & E2
13596	Kratzer Susanne	OL2_WFR, and SL_2_WST, SY_2_SYN	North-Western Baltic Sea and Lake Vänern, Sweden	NRT quick-looks, otherwise NTC	FTP	E1 & E2 (until Dec 2015)
13721	Kr□□el Adam	OL1_EFR and OL2_WFR,	Baltic Sea	NRT quick-looks,	FTP	E2

		SL_1_RBT and SL_2_WST		otherwise NTC May – September		
13625	Larouche Pierre	OL2_WFR	Bedford Basin N Scotia (44°41.0N, 63°38.0W) Rimouski (48°40.0N, 68°35.0W) Georgia Strait (49°20'24"N, 123°43'37"W) West coast of Canada	NTC	FTP	E2
13607	Lavender Samantha	L0 or L1A, OL1_EFR, _EFR, and OL2_WFR, _WRR, and OL2_LFR and SL_1_RBT and SY_2_SYN, L3	OLCI RR Global OLCI FR UK, Europe and China SLSTR global SYN UK, Europe	NTC	FTP	E1 & E2
13717	Maritorena Stéphane	OL2_WFR, OL2_WRR	Bermuda: (30°N-34°N, 60°W-68°W) Southern California: (33.5°N-35°N, 119°W-120.5°W)	NTC	FTP	E1 & E2
13656	Meister Gerhard	L0 or L1A, OL1_EFR, _EFR, and OL2_WFR, L3	L0 or L1A, L1B and L3 Global L2 selected scenes	1 day, NTC	FTP	E1 & E2
13766	Morris Edward	OL_1_EFR, OL_2_WFR	Alboran Sea + Gulf of Cadiz (37.3°N-35°N, 9°W-2°W)	NTC	FTP	E2
17234	Moses Wesley	OL1_EFR, _ERR, and OL2_WFR, _WRR, and SY_2_SYN	Lake Kinneret (weekly) Sea of Azov (April to Oct) Taganrog Bay (April to Oct) US coastal waters (summer to autumn): Gulf of Mexico, east coast of Florida, California coast, northwest Washington,	NTC	FTP	E2

			Lake Erie, and Chesapeake Bay			
13675	Oliveira Paulo	OL2_WFR, _WRR, and SL_2_WST, SR_2_LAN, SR_2_WAT	W Iberia (35°N-45°N, 11°W-5°W)	NRT quick-looks, otherwise 1 day timeliness, NTC	FTP	E2
13747	Peters Steef	OL1_EFR and OL2_WFR and SL_1_RBT	Lake IJsselmeer (53.108508°N, 4.967194°E; 52.520873°N, 5.769196°E) Lake Markermeer (52.687316°N, 5.210266°E; 52.306435°N, 5.456085°E) Lakes in Mecklenburg-Vorpommern (54.6°N, 10.0°E; 53.0°N,14.7°E) Lake Constance Lake Lammin Pääjärvi and other nearby lakes (60°50☐ - 61°20☐N; 24°30☐-25°50☐E) Lake Peipsi (59.1360°N, 27.0140°E; 57.7640°N, 28.1470°E) Lake Võrtsjärv (58.4400°N, 25.9350°E; 58.0830°N, 26.1000°E) Lake Garda (45°36☐N, 10°37☐E) Lake Maggiore (45°56☐N, 8°57☐E) Lake Vänern (9.450474°N, 12.529907°E; 58.343716°N, 14.007568°E)	NTC E1 NRT & NTC E2 (up to end 2015)	FTP	E1 & E2

13452	Röttgers Rüdiger	OL1_EFR, and OL2_WFR, SL_2_WST	North-West Shelf Baltic Sea Southern New Southern New Caledonian Lagoon and surrounding seas Lagoons and inland waters close to the Baltic and North Sea	NRT	FTP	E1 & E2 OLCI E2 SLSTR
13702	Ruddick Kevin	OL1_EFR and OL2_WFR, and SL_2_WST	BEL-AERONET stations (51°21.527'N, 3°06.960'E; 51°31.976'N, 2°57.307'E) S North Sea and Channel (48°N -53°N, 4°W-6°E)	NTC	FTP	E1 & E2
13623	Ruddick Kevin	OL1_EFR and OL2_WFR, and SL_2_WST	Zeebrugge 51°21',527 N 3°06',960 E All AERONET sites later in E2	NTC	FTP	E2
13697	Santoleri Rosalia	OL1_ERR, OL2_WRR, SL_2_WST for Mediterranean Sea OL1_EFR and OL2_WFR for Sicily Channel OL2_WFR for Gulf of Naples	Mediterranean Sea (30°N-46°N, 6°W-36°E) Lazio and Campania Tyrrhenian Sea (39.5°N-42.5°N, 11°E-16°E), LTER station in Gulf of Naples (40.5°N-41°N, 14°E-14.5°E), and mooring Sicily Channel (37°N-38°N, 12°E-13°E)	1 day, NTC	FTP	E1 & E2
13750	Shum C.K.	OL1_EFR, _ERR, and OL2_WFR, _WRR	Lake Erie (42°4'N, 81°20'W)	NRT & NTC	FTP	E1 & E2
13753	Silio-Calzada Ana	OL1_EFR, _ERR, and OL2_WFR, WRR, OL2_LFR, OL2_LRR, SL_2_WST, SL_2_LST,	Cantabria (43°45.0'N - 8°5.0' E and 42°30.0'N - 3°3.0' E)	NTC	FTP	E2

		SR_2_LAN, SR_2_WAT				
13654	Sørensen Kai	OL1_EFR, _ERR, and OL2_WFR, WRR, SL_1_RBT, SL_2_WST	54°N-78°N, 3°E-32°E	1 day, NTC	FTP	E1 & E2
13737	Tilstone Gavin	OL2_WFR, WRR	Atlantic Ocean RR English Channel FR North Sea FR	12h	FTP	E1 & E2
13738	Torres Jesus M.	OL1_EFR, OL2_WFR, SL_2_WST	Galician coast (NW Spain) Ebro Delta Catalonian coast (NE Spain)	NTC	FTP	E2
13768	Wüest Alfred	OL1_EFR, _ERR, and OL2_WFR, WRR	Lake Geneva 46°27'N, 6°32'E, extent: 40 km Bodensee 47°38'N, 9°23'E, extent: 30 km Greifensee 47°35'N, 8°67'E, extent 5 km Grimsel 46°34'N, 8°18'E, extent: 5 km Alps 47°N, 9°E, extent: 400 km	NTC	FTP	E1 & E2
13652	Zhu Jianhua	OL2_WRR, SL_2_WST, SR_2_WAT	Yellow Sea South China Sea	NTC	FTP	E2
13587	Zibordi Giuseppe	OL1_EFR, _ERR, and OL2_WFR, WRR	AAOT 45.314°N 12.508°E GDLT 58.594°N 17.467°E HLT 59.949°N 24.926°E GLR 44.599°N, 129.360°E GLT 43.045°N, 28.193°E	1 day, NTC	FTP	E1 & E2

The following table summarizes validation focus of the teams with respect to individual ocean colour core parameters:

S3VT-OC primary focus of validations of OLCI core ocean colour parameters

IP	Name	BAC_reflectances	CHL_OC4ME	CHL_NN	TSM_NN	KD490_Mo7	ADG_443_NN	PAR	T865 A865	IWV	TOA_radiances	calibration	flags
13765	Alikas Krista	■	■	■	■	■	■	■	■	■			
13246	Antoine David	■	■		■	■	■	■	■			■	
13653	Babin Marcel	■	■	■	■	■	■	■					
13616	Barciela Rosa		■			■							
13732	Bernard Stewart	■	■	■	■	■	■	■	■				■
13751	Bracher Astrid	■	■	■	■	■	■	■					
13760	Brockmann Carsten												■
13739	Brotas Vanda	■	■	■	■	■	■	■					
13743	Bryere Philippe	■	■	■	■	■	■						
13583	Chami Malik	■				■							
13552	D'Alimonte Davide		■	■	■		■						
13772	Darecki Miros□aw	■	■	■	■	■	■	■	■				
13658	Thomas Schroeder	■	■	■	■	■	■	■	■			■	
13741	DiGiacomo Paul	■	■	■	■	■	■	■	■		■	■	
13716	Dorandeu Joël	■	■	■	■	■	■	■	■	■	■	■	
13758	Fearns Peter	■	■	■	■	■	■	■					
13744	Fischer Jürgen									■			
13723	Hunter Peter	■	■	■	■	■	■	■	■				
13556	Icely John	■	■	■	■	■	■	■	■				
13742	Jamet Cédric	■	■	■	■	■	■		■		■	■	
14552	Kahru Mati	■	■	■	■	■	■	■					
13597	Knaeps Els	■			■				■				
13729	Knox Nichola Maria											■	
13596	Kratzer Susanne	■	■	■	■	■	■	■	■				
13721	Kr□□el Adam	■	■	■	■	■	■						
13625	Larouche Pierre	■	■	■	■		■						
13607	Lavender Samantha	■	■	■	■	■	■	■	■	■	■	■	
13717	Maritorena Stéphane	■	■	■	■	■	■						
13656	Meister Gerhard	■	■	■	■	■	■	■	■	■	■	■	
13766	Morris Edward		■	■	■	■	■						
17234	Moses Wesley	■	■	■	■	■	■						
13675	Oliveira Paulo		■	■	■	■							
13747	Peters Steef	■	■	■	■	■	■		■				
13452	Röttgers Rüdiger	■	■	■	■	■	■						

13702	Ruddick Kevin	■	■	■	■				■				
13623	Ruddick Kevin	■											
13697	Santoleri Rosalia	■	■	■	■	■	■						
13750	Shum C.K.	■	■	■									
13753	Silio-Calzada Ana	■	■	■	■	■	■	■					
13654	Sørensen Kai	■	■	■	■	■	■						
13737	Tilstone Gavin	■	■	■	■	■	■	■					
13738	Torres Jesus M.	■	■	■	■		■						
13768	Wüest Alfred	■	■	■	■		■						
13652	Zhu Jianhua	■	■	■	■	■	■		■				
13587	Zibordi Giuseppe	■											

9.6 Data dissemination needs

The following requirements on data dissemination are issued by S3VT-OC:

- FTP data access to the complete data archive is requested (not a limited rolling archive). FTP or HTTP access is needed that allows searching and scripting functions, e.g. search for specific geographic coverage.
- A few members of S3VT-OC want to acquire data via EUMETCast or multicast. The large majority require data distribution via simple FTP.
- Test data sets (TDS) of scientific utility are required prior to launch, both for Level-1 and Level-2 products.
- Tests of data dissemination prior to launch need to be performed.
- NRT quick-looks are requested to support validation campaigns. Otherwise NRT products, within 3 hours of the time of OLCI's sensing, are needed by a few teams. The majority expects 1 day timeliness or NTC on the data. The assumption is that 'NTC' is significantly shorter from the declared 1 month timeliness and that NTC products will be disseminated within 2-3 days of the time of OLCI's sensing.
- More than half of the team will start product validation in the Commissioning phase, E1.
- Timely delivery of data right after OLCI switch-on is requested. S3VT-OC sees no need to wait for quality control and product validation by PDGS.

9.7 Information and tools

The following recommendations for information and tools are issued by S3VT-OC:

- General-user access to Level-1-to-Level-2 source code is defined as mandatory.
- Level-0-to-Level-1B processor with source code and respective calibration tables and information needed for L1B processing are requested for S3VT OLCI calibration and characterization activities.

- If Level-0 data and Level-0-to-Level-1B processor are unavailable, development of Level-1A products is requested (ortho-geolocated and uncalibrated top of atmosphere radiances at all bands) and access to Level-1A-to-Level-1B processor with source code and calibration information to effectively process to L1B.
- Access to the OLCI characterization SCCDB data files as well as on-orbit calibration data is requested for S3VT to contribute to OLCI calibration and characterization activities. This includes access to OLCI RSR functions.
- Regional and temporal data extraction at Level-1 and Level-2 is requested from the S3 PDGS. L1 extractions are in the Sentinel-3 L1 format and processable with standard software to L2.
- Access to a collocation tool box with source code is required for users.
- Regular updates on mission planning and announcements on mission events, such as calibration campaigns, are requested via the S3VT website and potential e-mail notifications.
- Information on instrument degradation is needed to be continuously available and updated.
- Overpass prediction is requested for validation campaigns.

9.8 Recommendations on core OLCI products, in particular on inland water products

The following recommendations for OLCI products are issued by S3VT-OC:

- Dissemination of OLCI inland water, i.e. lake, products is considered of high priority. Processing of inland waters in the S3 marine chain is required by half of the teams.
- Initially, a basic modification to the atmospheric correction over lakes is recommended. In longer term, the need for algorithm development for both atmospheric correction and bio-optical component retrieval is identified.
- Provision for archiving inland water field measurements in OLCI *in situ* databases is advocated.
- Additional request to produce Sentinel-2 core water products, particularly for lakes and estuaries, at least surface reflectance data, is submitted.
- Update of the water vapour algorithm to use 940nm band is advocated.
- Additional core OLCI products are requested, e.g. FLH, aph_443, POC, PFT.

9.9 Recommendations on marine PDGS activities

The following requirements for OLCI PDGS capabilities are issued by S3VT-OC:

- Regular full mission data reprocessings are required. The primary driver of ocean colour data quality is instrument calibration. Regular reprocessings are needed to incorporate the most accurate and up-to-date models of instrument degradation and to assure consistent mission time series.

- Rapid reprocessing turnaround is recommended. The reprocessing function supports the full mission data reprocessings as well as cal/val activities concerned with testing of proposed calibration and algorithm changes.
- There is need to establish rules when to reprocess. S3VT-OC cannot wait long for improved calibration.
- For the calibration schedules in the Commissioning phase, it is recommended to perform spectral and geometric calibration early and freeze them and then to move to radiometric on-orbit calibrations.
- Further development of product uncertainties per pixel, especially at Level-1B, is strongly recommended.

9.10 Recommendations on S3VT-OC *in situ* activities

The following recommendations on *in situ* activities are issued by S3VT-OC:

- Acquisitions over the vicarious calibration sites, MOBY and BOUSSOLE, are required as early as possible in the Commissioning phase E1.
- Pre-launch update of field measurement protocols in cooperation with IOCCG is requested.
- SI-traceable and consistent field instrument calibration is required.
- Measurement inter-comparisons/round robins, training/exchange of information and expertise on measurement protocols and techniques, on exploitation of specific field systems, and on standard field instrumentation suite are needed.
- Sharing of all collected field data is requested in a centralised database with an appropriate data policy (e.g. MERMAID data policy).
- Provision of all auxiliary information associated with *in situ* measurements is required to enable full reprocessing and QC of the in situ data at any time in the future.
- Standardization of *in situ* data processing methods is advocated.
- Standardization of *in situ* measurement uncertainty assessments is advocated and provision of uncertainty breakdowns with all measurements.
- Participation in the regular Quasimeme (http://www.quasimeme.org/) chlorophyll round robin exercises is recommended for all S3VT teams providing in situ chlorophyll data.
- Inclusion of measurements supporting other marine disciplines beyond ocean colour is recommended to make optimal use of time at sea for S3 validation: temperature, SST, wind, etc.
- Definition of a standard set of *in situ* observations is desired (for different applications, including phytoplankton speciation).
- Collaboration between groups within S3VT-OC to produce standard sets of measurements on research campaigns.

- Collaboration within the wider S3VT community (including S3VT-T, -L and -A) on projects with available ship time such as the Atlantic Meridional Transect that samples over a wide range of biophysical conditions.

9.11 S3VT-OC organization

The following recommendations on S3VT-OC organization are issued:

- S3VT-OC shall coordinate to develop strong and coherent teams in position to acquire national and international funding. Regional networking and support are also recommended.
- Coordination of S3VT campaigns and information on other campaigns relevant to S3VT-OC is requested, i.e. S3VT calendar of campaigns on the S3VTweb.
- Field instruments for loan in the frame of S3VT-OC instrument pool are considered.
- S3VTweb online collaboration tools are requested, active and responsive forum and wikis, shared calendar, S3 validation portal, continues mission status updates.
- Range of support that S3VT-OC can give pre-launch and in early commissioning phase is expected from the Agencies.

9.12 Moon observation to complement the OLCI and SLSTR calibration strategies

During the first S3VT meeting, discussions took place between members of the S3VT-OC and the S3VT-L groups regarding the in-flight OLCI/SLSTR calibration strategy. In particular, the need for periodic lunar calibration was discussed.

The Moon is a target that has been used extensively by ocean colour and land missions (e.g. SeaWiFS, MODIS, VIIRS and ProbaV). Moon observations allow to:

1) Verify the MTF specification in flight.
2) Identify and quantify image quality issues, namely, electronic cross talk and straylight in flight.
3) Validate the OLCI straylight correction.
4) Confirm dark current estimates by looking at deep space data around the Moon.
5) Support the radiometric stability monitoring in conjunction with other on-board calibration methodologies of OLCI and SLSTR.

The members of S3VT-OC and the S3VT-L groups involved in this discussion recommend the following:

- The issues related to manoeuvring the S3 spacecraft to observe the Moon are investigated.
- The issues related to turning on the OLCI and SLSTR instruments for Moon observations are investigated.

- Regular (e.g. bi-monthly) observations of the Moon are included in the calibration plan of the S-3 optical mission.

9.13 Overall schedule

The overall schedule of S3VT-OC activities is shown in the table below. The schedule and respective availability of funding critically depends for many teams on the Sentinel-3 launch date.

S3VT-OC Activity Schedule (Green: planned and funded; Yellow: planned and unfunded)							
IP	**Name**	**Pre-Launch**	**Commissioning Phase E1**	**Year 1**	**Year 2**	**Year 3-7.5**	**Beyond nominal time**
13765	Alikas Krista						
13246	Antoine David						
13653	Babin Marcel						
13616	Barciela Rosa						
13732	Bernard Stewart						
13751	Bracher Astrid						
13760	Brockmann Carsten						
13739	Brotas Vanda						
13743	Bryere Philippe						
13583	Chami Malik						
13552	D'Alimonte Davide						
13772	Darecki Miros□aw						
13658	Thomas Schroeder						
13741	DiGiacomo Paul						
13716	Dorandeu Joel						
13758	Fearns Peter						
13744	Fischer Jürgen						
13723	Hunter Peter						
13556	Icely John						
13742	Jamet Cédric						
14552	Kahru Mati						
13597	Knaeps Els						
13729	Knox Nichola Maria						
13596	Kratzer Susanne						
13721	Kr□□el Adam						
13625	Larouche Pierre						
13607	Lavender						

	Samantha						
13717	Maritorena Stéphane						
13656	Meister Gerhard						
13766	Morris Edward						
17234	Moses Wesley						
13675	Oliveira Paulo						
13747	Peters Steef						
13452	Röttgers Rüdiger						
13702	Ruddick Kevin						
13623	Ruddick Kevin						
13697	Santoleri Rosalia						
13750	Shum C.K.						
13753	Silio-Calzada Ana						
13654	Sørensen Kai						
13737	Tilstone Gavin						
13738	Torres Jesus M.						
13768	Wüest Alfred						
13652	Zhu Jianhua						
13587	Zibordi Giuseppe						

10 Detailed plans of the S3VT-T

10.1 Scope of the S3VT-T Sub-group

Calibration is "quantitatively defining the system response to known controlled signal inputs" (http://calvalportal.ceos.org/). Calibration is a specific operational activity that requires dedicated activities and teams with clear reporting lines and often mission/financial implications. Instrument Calibration is the responsibility of Mission management (e.g., Instrument gains/offsets, spectral calibration etc) and is a managed process within Sentinel-3 Mission Performance framework. The sub-group operates under the assumption that the pre-launch and in-flight calibration and characterisation is the responsibility of mission management and meets specification.

Validation is "the process of assessing, by independent means, the quality of the data products derived from the system outputs" (CEOS Definition).

Against this background, the aim of the S3VT-T sub-group is:

> ***"To collaborate with world-class validation expertise and activities and provide independent validation evidence, experimental data and recommendations on the performance of Sentinel-3 products."***

10.2 Terms of reference of the S3VT-T Sub-group

The S3VT-T subgroup gathers and coordinates expertise and validation activities linked to the Sentinel-3 Cal/Val plan [Reference-1]. The following specific terms of reference are the focus of this group:

- **Engage with world-class expertise and activities** to support ESA and EUMETSAT with the S-3 SLSTR scientific validation;
- **Developing and maintaining international standards traceability** for all ground fiducial[1] measurements (e.g. validation instrument uncertainty budgets, ship-borne radiometer and reference black body inter-calibration experiments, documenting and developing better calibrated drifting buoy packages in partnership with Data Buoy Cooperation Panel (DBCP)....);
- **Maintaining, evolving and implementing agreed protocols, methodologies and guidelines for validation activities** working together with other organisations (e.g. GHRSST ST-VAL, CEOS SST-VC, CEOS IVOS etc.) including their review, revision and upgrade of applicable validation measurement protocols as required;
- **Provide independent validation evidence (match-ups)** using fiducial ground measurements during campaigns, analyses, and other data according to agreed

[1] Fiducial reference measurements are those measurements regarded or employed as a standard reference that are essential to independently verify and monitor the performance of SLSTR measurements.

measurement protocols, methodologies and guidelines. Timely access to validation results is a pre-requisite to success;

- **Conduct independent product verification and validation analysis** utilising both offline and NRT data streams (e.g. to help establish radiometric, spectral, and geometric accuracy and stability of SLSTR, verification of Level-2 marine temperature[2] products, geo-location, pixel classification, flagging and masking, uncertainties...);
- **Facilitate access to relevant datasets** (e.g. ARGO, drifting/moored buoys, radiosondes) and other infrastructures (e.g. ship-borne radiometers, oceanographic cruises, aircraft campaigns ...);
- **Facilitate access** to satellite and ancillary data;
- **Agree and follow protocols which define the validation process** (i.e. provision of uncertainty budgets for all in situ measurements, proper documentation of validation data collection and reporting....);
- **Share relevant results at the Sentinel-3 Quality Working Group** (either in person by invitation or by representation);
- **To work effectively with the Ground-Segment teams** to improve data provision in the most optimal manner for validation activities;
- **Foster international cooperation with GHRSST, other scientific communities and Agencies;**
- **Improve communication on S3 SLSTR mission performance**.

10.3 Membership of the S3VT-T Sub-group

Prj ID	PI	PI_Country	PI_Institution
13606	Minnett Peter	USA	RSMAS
13423	Nightingale Tim	UK	STFC
13603	Saunders Roger	UK	Met Office
13615	Beggs Helen	Australia	BoM
13650	Høyer Jacob	Denmark	DMI
13713	Mittaz Jonathan	USA	NOAA
13740	Wimmer Werenfrid	UK	University of Southampton
13764	Dybkjær Gorm	Denmark	DMI
13787	Corlett Gary	UK	University of Leicester
13716	Dorandeu Joel	FRANCE	Mercator-Ocean
13741	Ignatov Alexander	USA	NOAA-NESDIS

[2] Marine includes sea-ice, lakes, in-land water

In preparation	Poulter David	UK	Pelamis Scientific Software

10.4 Summary of planned S3VT-T Sub-group validation activities

Colours represent the level of the status assessment:

LOW
MED
HIGH
CRIT

Sub group	S3VT Sea Surface Temperature (S3VT-T)
Validation Project Title	Validation of SLSTR radiances using GSICS and low level calibration data
Link to full Proposal	13713.pdf
Team Leader name, address and email	Jonathan Mittaz Earth System Science Interdisciplinary Center 5825 University Research Court #4001 College Park, Mayland 20740, USA Phone +1 301 683 3351 Fax +1 301 314 1876 E-mail: jon.mittaz@noaa.gov
Support team-members names and emails	Tim Hewison: tim.hewison@eumetsat.int
Summary of activity	The activity will focus on validating and assessing the calibration of the SLSTR top of atmosphere radiances using the GSICS SLSTR collocated radiances with AIRS/IASI together with the SLSTR telemetry. The combined GSICS + telemetry data will be used to both validate the current SLSTR calibration as well as provide the ability to assess different calibration algorithms for possible improvements as well as enabling a quick assessment of possible post-launch problems.
Expected results for S3	Validation of and corrections if needed for IR top of atmosphere in-orbit radiances for SLSTR

Reference to S3 Cal/Val plan tasks	SLSTR-L1B-CV-200: TIR Calibration and Performance		
Data requirements, data coverage and timeline	**Sentinel-3 Product Names** Prelaunch data SLSTR_Level_0 SL_1_RBT_	**Data Coverage** All	**Specific Timeline of Validations** Prelaunch + Sentinel-3 launch onward
In situ validation data to be collected	IASI/AIRS collocated radiances with SLSTR pixels, collocated using the GSICS (Global Space-based Inter-Calibration System)		
Special data needs Pre-launch data IASI/AIRS collocations	**Need for special satellite acquisitions:** Calibration assessment needs collocated top of atmosphere hyperspectral references		**Requested data timeliness:** Pre-launch data is needed before launch Collocations will be obtained in near real time through the GSICS processing

Status assessment

Schedule of proposed activities	Pre-Launch	Commissioning Phase	Year 1 pos-launch	Year 2	Year 3-Year 7.5	Beyond nominal time
Availability of funding	HIGH	HIGH	HIGH			
Availability of infrastructure	HIGH	LOW	LOW			
Availability of people	LOW	LOW	LOW			

<table>
<tr><td>Sub group</td><td colspan="3">S3VT-T</td></tr>
<tr><td>Validation Project Title</td><td colspan="3">Validation by In Situ Infrared Radiometry (VISIR)</td></tr>
<tr><td>Link to full Proposal</td><td colspan="3">13423.pdf</td></tr>
<tr><td>Team Leader name, address and email</td><td colspan="3">Tim Nightingale, tim.nightingale@stfc.ac.uk
RAL Space, STFC Rutherford Appleton Laboratory, Harwell Oxford, Didcot, Oxon OX11 0QX, U.K.</td></tr>
<tr><td>Support team-members names and emails</td><td colspan="3">Caroline Cox, RAL Space, caroline.cox@stfc.ac.uk
Hugh Mortimer, RAL Space, hugh.mortimer@stfc.ac.uk
Chris Mutlow, RAL Space, chris.mutlow@stfc.ac.uk
Caroline Poulsen, RAL Space, caroline.poulsen@stfc.ac.uk
David Smith, RAL Space, dave.smith@stfc.ac.uk
Wayne Tubby, RAL Space, wayne.tubby@stfc.ac.uk</td></tr>
<tr><td>Summary of activity</td><td colspan="3">Collection of accurate and traceable measurements of skin sea surface temperature with the SISTeR in situ radiometer. An instrument is currently deployed on the Cunard Queen Mary 2 ocean liner and makes measurements over a North Atlantic transect for the majority of the year and over a global track each new year.
Development of validation tools matched to SLSTR and Felyx.
Validation of SLSTR L2 and L2P SST products where the SISTeR track intersects the SLSTR swath.
Maintenance and validation of the SISTeR calibration, including participation in radiometer “round-robins”.</td></tr>
<tr><td>Expected results for S3</td><td colspan="3">Regular (nominally quarterly) validation reports on SLSTR L2 and L2P SST products, particularly over the North Atlantic Ocean.</td></tr>
<tr><td>Reference to S3 Cal/Val plan tasks</td><td colspan="3">SLSTR-SST-CV-100: SST product validation</td></tr>
<tr><td>Data requirements, data coverage and timeline</td><td>Sentinel-3 Product Names
SL_2_WST
SL_2_WCT
SL_1_RBT</td><td>Data Coverage
Typically North Atlantic (May – December), global (January – April)</td><td>Specific Timeline of Validations
Continuous</td></tr>
</table>

In situ validation data to be collected	Traceable radiometric measurements of upwelling and downwelling radiances at 10.8µm. Derived measurements of the skin sea surface temperature.		
Special data needs	**Need for special satellite acquisitions:** **None**		**Requested data timeliness:** **None**

Status assessment						
	Pre-launch	Commissioning Phase	Year 1	Year 2	Year 3 to year 7.5	Beyond nominal life
Schedule of proposed activities	HIGH	MED	LOW	LOW	LOW	LOW
Availability of funding	HIGH	HIGH	CRIT	CRIT	CRIT	CRIT
Availability of infrastructure	LOW	LOW	LOW	LOW	MED	MED
Availability of people	MED	LOW	LOW	LOW	MED	MED

Sub group	S3VT-T		
Validation Project Title	MyOcean coordinated contribution to the Sentinel-3 Validation Team		
Link to full Proposal	13716.pdf		
Team Leader name, address and email	Joel Dorandeu Joel.dorandea@mercator-ocean.fr		
Support team-members names and emails	Hervé Roquet - Méteo-France - herve.roquet@meteo.fr		
Summary of activity	S3 SST performance assessment and inter-comparisons with other sensors and In-Situ Data		
Expected results for S3	Global assessment of data coverage, accuracy, stability and performance - Multi-mission/multi-sensor (including in-situ) comparisons for calibration, validation and combination - Long term multi-sensor monitoring - Impact on assimilation into ocean models. performance assessment for analysis, re-analysis and Numerical Ocean Prediction (NOP)		
Reference to S3 Cal/Val plan tasks	SLSTR-SST-CV-100: SST product validation SLSTR-SST-CV-130: Comparison with in situ measurements SLSTR-SST-CV-120: Inter-satellite comparisons		
Data requirements, data coverage and timeline	**Sentinel-3 Product Names** SL_2_WST SL_2_WCT SL_1_RBT	**Data Coverage** Global with focus on European Seas	**Specific Timeline of Validations**
In situ validation data to be collected			
Special data needs	**Need for special satellite acquisitions:** **None**		**Requested data timeliness:** **None**
Status assessment			

	Pre-launch	Commissioning Phase	Year 1	Year 2	Year 3 to year 7.5	Beyond nominal life
Schedule of proposed activities	LOW	MED	MED	MED	MED	MED
Availability of funding	LOW	MED	MED	MED	MED	MED
Availability of infrastructure	LOW	MED	MED	MED	MED	MED
Availability of people	LOW	MED	MED	MED	MED	MED

Sub group	S3VT-T
Validation Project Title	**Arctic SLSTR Sea and Ice Surface Temperature validation group (ASSIST)**
Link to full Proposal	13650.pdf
Team Leader name, address and email	PhD Jacob L. Høyer, Center for Ocean and Ice, Danish Meteorological Institute, Lyngbyvej 100, Copenhagen
Support team-members names and emails	• Gorm Dybkjær, PhD, Center for Ocean and Ice, Danish Meteorological Institute • Rasmus Tonboe, PhD, Center for Ocean and Ice, Danish Meteorological Institute • Leif Toudal Pedersen, PhD, Center for Ocean and Ice, Danish Meteorological Institute
Summary of activity	In this proposal, we will carry out the validation and routine monitoring of the Arctic satellite products of sea and Ice surface temperatures. This will be performed using existing observations from drifting and Argo buoys, supplemented with radiometer observations from the Infrared Sea surface temperature Autonomous Radiometer (ISAR), which provides skin observations with an accuracy of 0.1Deg C. Special attention will be dedicated to the SST retrieval performance in twilight and in the vicinity of sea ice, which has previously been shown to be problematic areas for the AATSR retrievals. The inclusion of the ISAR radiometer observations in the validation ensures traceability of the validation results to known standards as requested by GCOS. This proposal, will thus provide an unprecedented confidence in the satellite observations in the Arctic, which will facilitate the ingestion into the atmospheric and oceanographic models and ensure a robust climate data record for the Arctic. The validation and monitoring work is based on the theoretical and empirical experience of the DMI group, including high latitude SST and IST validation studies against traditional in situ observations and IR + MW radiometers.
Expected results for S3	• Validation statistics of SST products using radiometer and drifting buoy observations in the high latitudes • Assessment of the performance of the satellite SST and IST product with respect to ice edge, ice concentration, and solar elevation angle

Reference to S3 Cal/Val plan tasks	SLSTR-SST-CV-100 : SST product validation SLSTR-SST-CV-130: Comparison with in situ measurements		
Data requirements, data coverage and timeline	SL_2_WST SL_2_WCT SL_1_RBT	**Data Coverage** Arctic, North of 58°N	**Specific Timeline of Validations**
In situ validation data to be collected	ISAR Radiometer observations		
Special data needs	**Need for special satellite acquisitions:**		**Requested data timeliness:**

Status assessment

	Pre-launch	Commissioning Phase	Year 1	Year 2	Year 3 to year 7.5	Beyond nominal life
Schedule of proposed activities	MED	MED	MED	MED	MED	MED
Availability of funding	MED	HIGH	CRIT	CRIT	CRIT	CRIT
Availability of infrastructure	LOW	LOW	LOW	LOW	LOW	LOW
Availability of people	LOW	LOW	LOW	LOW	LOW	LOW

<table>
<tr><td>Sub group</td><td colspan="3">S3VT- T</td></tr>
<tr><td>Validation Project Title</td><td colspan="3">Continuity of the ARC/SST_CCI SST CDR with SLSTR (CAST)</td></tr>
<tr><td>Link to full Proposal</td><td colspan="3">13787.pdf</td></tr>
<tr><td>Team Leader name, address and email</td><td colspan="3">Gary Corlett, University of Leicester, gkc1@le.ac.uk</td></tr>
<tr><td>Support team-members names and emails</td><td colspan="3">David Berry - National Oceanography Centre - dyb@noc.ac.uk
Owen Embury - University of Edinburgh - owen.embury@ed.ac.uk
Christopher Merchant - University of Edinburgh - c.merchant@ed.ac.uk
Nick Rayner - Met Office Hadley Centre - nick.rayner@metoffice.gov.uk
John Remedios - University of Leicester - jjr8@le.ac.uk
Roger Saunders - Met Office Satellite Applications - roger.saunders@metoffice.gov.uk</td></tr>
<tr><td>Summary of activity</td><td colspan="3">The ATSR Reprocessing for Climate (ARC) project has created an SST CDR from the ATSR series that over the period 1994 to 2010 is stable, with better than 95% confidence, to within 0.005 K yr-1 (demonstrated for tropical regions), and with regional biases less than 0.1 K globally (Merchant et al., JGR, 2013). The ARC record has been extended to the end of the AATSR mission through the ESA SST_CCI project.
The minimum 6 month overlap periods between successive ATSRs was critical in harmonising the time series to account for spectral and radiometric uncertainties between instruments.
No such overlap will exist between AATSR and the first SLSTR so this project will make an initial assessment of the accuracy and stability of the combined ARC/SLSTR SST record, and highlight further areas for improvement.</td></tr>
<tr><td>Expected results for S3</td><td colspan="3">Confirmation of long-term accuracy and stability of SLSTR SST products</td></tr>
<tr><td>Reference to S3 Cal/Val plan tasks</td><td colspan="3">S3-MR-980
SLSTR-SST-CV-100: SST product validation</td></tr>
<tr><td>Data requirements, data coverage and timeline</td><td>Sentinel-3 Product Names:
SL_2_WST
SL_2_WCT</td><td>Data Coverage
Global</td><td>Specific Timeline of Validations
Full mission</td></tr>
</table>

	SL_1_RBT		
In situ validation data to be collected	None		
Special data needs	**Need for special satellite acquisitions:** None		**Requested data timeliness:** Offline reprocessed

Status assessment

	Pre-launch	Commissioning Phase	Year 1	Year 2	Year 3 to year 7.5	Beyond nominal life
Schedule of proposed activities				MED	MED	MED
Availability of funding				HIGH	HIGH	HIGH
Availability of infrastructure				LOW	LOW	LOW
Availability of people				MED	MED	MED

Sub group	S3VT- T		
Validation Project Title	Provide Australian Ship Sea Surface Temperature for SLSTR validation		
Link to full Proposal	13615.pdf		
Team Leader name, address and email	Dr Helen Beggs, GPO Box 1289, Melbourne, Vic 3001, Australia. h.beggs@bom.gov.au		
Support team-members names and emails	Dr Atiur Siddique, GPO Box 1289, Melbourne, Vic 3001, Australia. a.siddique@bom.gov.au		
Summary of activity	There is a lack of validation quality in situ (sea surface temperature) SST, particularly skin SST at ~ 10 micron depth, over the oceans surrounding Australia and Antarctica. Quality assured, real-time, sustained observations of both bulk and skin SST from research vessels and ships of opportunity (SOOP) will be provided over the Australian region to the S3VT. High quality bulk SST observations from 18 ships traversing Australian and Antarctic waters have been publicly provided through IMOS since 2008. These observations have been shown through comparison with multiple satellite SST data streams, including AATSR on EnviSat, to be of comparable or better accuracy as drifting buoy SST observations for validation of satellite SST. The advantage of using data from IMOS ships for satellite SST validation is that they cover regions not sampled by drifting buoys, such as Indonesian and Antarctic waters and coastal regions. The addition of skin SST observations from an autonomous ship-borne radiometer (ISAR) on the RV Investigator to the IMOS data set will allow validation against temperatures at the same depth as the SLSTR radiometer samples and traceable to international temperature standards, not possible using drifting buoys. If GHRSST-format SST products are provided from Sentinel-3, then BoM scientists will use the IMOS and MNF ship SST data to validate the SLSTR sea surface temperatures over the Australian region.		
Expected results for S3	Validation of SLSTR SSTskin in the Australian and Southern Ocean regions		
Reference to S3 Cal/Val plan tasks	SLSTR-SST-CV-100: SST product validation SLSTR-SST-CV-130: Comparison with in situ measurements		
Data	**Sentinel-3 Product**	**Data Coverage**	**Specific Timeline**

requirements, data coverage and timeline	**Names** SLSTR SST in GHRSST GDS2 format L2P or L3U files	60°E to 170°W, 80°S to 40°N	**of Validations** From supply of L2P/L3U products to June 2015
In situ validation data to be collected	(1) Near real-time, QA'd SSTdepth from at least 11 vessels contributing to IMOS (currently available); and (2) Near real-time, QA'd SSTskin from ISAR radiometer to be installed RV Investigator (available from October 2014).		
Special data needs	**Need for special satellite acquisitions:**	N/A	**Requested data timeliness:** Within 24 hours of observation.

Status assessment						
	Pre-launch	Commissioning Phase	Year 1	Year 2	Year 3 to year 7.5	Beyond nominal life
Schedule of proposed activities	MED	MED	MED			
Availability of funding		HIGH	CRIT	CRIT		
Availability of infrastructure	LOW	LOW	LOW	LOW	LOW	LOW
Availability of people	LOW	LOW	LOW	LOW	LOW	LOW

Sub group	S3VT- T
Validation Project Title	Validation of Sentinel-3 Sea Surface Temperature data in Met Office products
Link to full Proposal	13603.pdf
Team Leader name, address and email	Roger Saunders – Met Office – roger.saunders@metoffice.gov.uk
Support team-members names and emails	OSTIA group Alison McLaren – Met Office – alison.mclaren@metoffice.gov.uk Jonah Roberts-Jones – Met Office – jonah.roberts-jones@metoffice.gov.uk Emma Fiedler – Met Office – emma.fiedler@metoffice.gov.uk Satellite Applications Group Thomas Blackmore – Met Office – thomas.blackmore@metoffice.gov.uk Christoforos Tsamalis – Met Office – christoforos.tsamalis@metoffice.gov.uk
Summary of activity	(PLEASE NOTE that the OSTIA work contained in this proposal is also summarized in the MyOcean proposal.) The Operational Sea surface temperature and Sea Ice Analysis (OSTIA) system was developed at the Met Office, where it is run in near real time on a daily basis. OSTIA produces a global field of sea surface temperature (free of diurnal variability) every day on a 1/20 degree (~6km) grid. The system uses input data from infrared and microwave satellite measurements together with in-situ data and a sea ice concentration product. Data assimilation methods are used to combine the different input data, taking into account estimates of the observational error, to produce a gridded analysis. OSTIA is widely used, particularly in numerical weather prediction centres (including the Met Office, ECMWF, Meteo France and others) where it used as a lower boundary condition in forecast models. It is also used in operational ocean forecasting systems and by climate monitoring groups. AATSR was a key input source for the OSTIA system. In addition to using the data in the analysis, AATSR was used (together with in-situ data) as a reference data set to bias correct the data from other satellites. Tests carried out for the month March 2012 showed that the loss of AATSR caused the level of accuracy of OSTIA to decrease; the standard deviation error of OSTIA relative to independent ARGO data increasing from 0.47K

	(with AATSR) to 0.53K (without AATSR). Following the loss of AATSR, OSTIA is currently using a subset of Met-Op AVHRR data for the bias correction which has found to be an improvement on using just in-situ data but not as accurate as AATSR. Part of this proposal is to run validation experiments of the Sentinel-3 SLSTR SST data in the OSTIA system. This meets ones of the specific objectives of the Sentinel-3 Validation Team call which is 'L2 Ocean, Land and Ice product validation experiments and support to calibration activities'. Our proposal is to monitor the Near Real Time (NRT) L2P SST product in the OSTIA system and to assess the impact of SLSTR SST data on the accuracy of the OSTIA system. The focus of this work would be on using SLSTR as the reference data set for bias correction. These results would then be compared to our previous experiments assessing the impact of AATSR on OSTIA and the use of sub-sampled Met-OP as a reference dataset. The expected outcome for ESA/EUMETSAT of the OSTIA assessment is a thorough assessment of the new SST L2P product (including the uncertainty estimates) in a NRT data assimilation system. The expected outcome for the Met Office is evidence to support the inclusion of SLSTR data in OSTIA for operational purposes. The proposed work would be carried out by the OSTIA group at the Met Office. The group is very experienced in developing OSTIA and using new input data sources. The group has a proven track record of engaging with satellite providers to improve the data and the use of satellite data. Currently, the group is part of the ESA CCI (SST) project in which OSTIA is being used to create the L4 product. The satellite applications work would propose to continue the real time monitoring of SLSTR in the same way it did for AATSR where it compares the SLSTR SSTs with the OSTIA SST analysis and also buoys in near real time. It would also provide a real time correction to the data to convert it from skin SST to SST at various depths for use in products such as HadISST. Three way match ups would also be undertaken on an annual basis. This assumes continued funding of the sea surface temperature work within the Met Office Hadley Centre Climate Programme, funded jointly by the UK governmental departments DECC and Defra.
Expected results for S3	1. To monitor the Sentinel-3 SLSTR SST data in the NRT OSTIA system and to assess the impact of the data on OSTIA. 2. To compare the impact of Sentinel-3 SLSTR SST data on the OSTIA system with the past impact of AATSR SST data. 3. To monitor the Sentinel-3 SSTs using the buoys and ship in-situ data available in near real time. To make 3 way matchups with AMSR-2, buoys and SLSTR measurements to determine the observation errors of each data type.

Reference to S3 Cal/Val plan tasks	SLSTR-SST-CV-100: SST product validation SLSTR-SST-CV-130: Comparison with in situ measurements SLSTR-SST-CV-120: Inter-satellite comparisons SLSTR-L1B-CV-270: Radiometric bias characterisation		
Data requirements, data coverage and timeline	**Sentinel-3 Product Names** SL_2_WST SL_1_RBT	**Data Coverage** Global.	**Specific Timeline of Validations** At least 1.5 months for OSTIA and 1 year for three-way analysis.
In situ validation data to be collected	Satellite SST data received through the GHRSST framework and in-situ SST data from the Global Telecommunications System (GTS). Sea ice data obtained from the OSI-SAF.		
Special data needs	**Need for special satellite acquisitions:**		**Requested data timeliness:** within 3 h

Status assessment

	Pre-launch	Commissioning Phase	Year 1	Year 2	Year 3 to year 7.5	Beyond nominal life
Schedule of proposed activities	LOW	LOW	LOW	LOW	LOW	LOW
Availability of funding	HIGH	MED	MED	MED	MED	MED
Availability of infrastructure	HIGH	HIGH	HIGH	HIGH	MED	MED
Availability of people	HIGH	MED	MED	MED	MED	MED

Note: The statement assumes probability of specific item to occur.

Sub group	S3VT- T
Validation Project Title	OSI SAF / CAF Federated Activity Plan A Match-up Data Base for S3A/SLSTR SST products validation
Link to full Proposal	13764.pdf
Team Leader name, address and email	PhD Gorm Dybkjær, Center for Ocean and Ice, Danish Meteorological Institute, Lyngbyvej 100, Copenhagen O
Support team-members names and emails	Anne Ocarroll [Anne.Ocarroll@eumetsat.int] Steinar Eastwood [s.eastwood@met.no] Herve Roquet [herve.roquet@meteo.fr] Jacob L. Høyer [jlh@dmi.dk] Jean-Francois PIOLLE [Jean.Francois.Piolle@ifremer.fr]
Summary of activity	The building and delivery by IFREMER of a dedicated S3A/SLSTR MDB for SST cal/val activities. Since January 2013, IFREMER is funded by ESA to implement an open-source software based on the High-Resolution Diagnostic Dataset concept (HR-DDS) but extending it with MDB and Multi-sensor Match-up Data base (MMDB) capability, similar to the one developed by the ESA CCI SST project. It is proposed here to reuse this system and to operate it in the context of SLSTR cal/val activities. The provision by DMI of collocated ISAR and S3A/SLSTR skin SST measurements during the S3A/SLSTR cal/val phase, from DMI's ISAR radiometer operated on a Royal Arctic Lines (RAL) ship, cruising regularly between Denmark and Greenland. The ISAR radiometer is able to provide accurate skin SST measurements with an accuracy of 0.1 K, which can be referenced to traceable standards. Moreover, these reference measurements at high latitudes will be extremely useful, since other in-situ SST measurements are very scarce in these areas, where satellite SST retrievals are particularly challenging. The exploitation by met.no and M-F/CMS of the S3A/SLSTR MDB built and delivered by IFREMER, to provide detailed SST cal/val results during the S3A/SLSTR cal/val phase. Consistently with the current share of expertise in the OSI SAF consortium, the activity at met.no would focus on the High Latitudes, where satellite SST retrievals have to deal with problems related to sea ice presence, specific illumination and atmospheric conditions, and the activity at M-F/CMS would focus on the Low and Mid-Latitudes.
Expected results for S3	• Validation statistics of SLSTR SST products using radiometer and drifting buoy observations in the high latitudes • Assessment of the performance of the SLSTR SST product with respect to ice edge, ice concentration, and solar elevation angle

	• Validation statistics of SLSTR SST products using radiometer and drifting buoy observations in the low and mid- latitudes.		
Reference to S3 Cal/Val plan tasks	SLSTR-SST-CV-100: Product Validation SLSTR-SST-CV-130: Comparison with in situ measurements		
Data requirements, data coverage and timeline	**Sentinel-3 Product Names** SLSTR Level1b SLSTR Level2 SST	**Data Coverage** Global, and a dedicated HL area around Greenland and North Atlantic	**Specific Timeline of Validations** No NRT requirements
In situ validation data to be collected	IR Radiometer data, and drifter, ship and buoy observations		
Special data needs	**Need for special satellite acquisitions:**		**Requested data timeliness:**

Status assessment						
	Pre-launch	Commissioning Phase	Year 1	Year 2	Year 3 to year 7.5	Beyond nominal life
Schedule of proposed activities	MED	MED	MED	MED	MED	
Availability of funding	LOW	LOW	MED	CRIT	CRIT	CRIT
Availability of infrastructure	LOW	LOW	LOW	LOW	LOW	
Availability of people	LOW	LOW	LOW	LOW	LOW	

Sub group	S3VT- T		
Validation Project Title	Evaluation of (A)ATSR/SLSTR SST at NOAA using SQUAM and iQuam		
Link to full Proposal	13741.pdf		
Team Leader name, address and email	Alexander Ignatov 5830 University Research Court, College Park, MD 20740, USA Alex.Ignatov@noaa.gov		
Support team-members names and emails	Prasanjit.Dash@noaa.gov, Feng.Xu@noaa.gov, Yury.Kihai@noaa.gov, Xingming.Liang@noaa.gov		
Summary of activity	1) Match up ARC SST record (1991-2012) with 3 L4 fields (Reynolds, CMC02.2, and OSTIA_RAN2) and iQuam in situ data and display in SQUAM 2) Processing SLSTR SST the same way, and display in SQUAM in near-real time 3) Evaluate relative merit wrt other L2s and anchoring of wide-swath products		
Expected results for S3	1) Place (A)ATSR/SLSTR SST performance in context of all other available global polar SST products from AVHRRs, MODISs, and VIIRS 2) Evaluate potential to anchor wide-swath SST data		
Reference to S3 Cal/Val plan tasks	SLSTR-SST-CV-100: SST product validation SLSTR-SST-CV-120: Inter-satellite comparisons		
Data requirements, data coverage and timeline	**Sentinel-3 Product Names** Level2 SST product	**Data Coverage** Global	**Specific Timeline of Validations** Full life of S3 mission
In situ validation data to be collected	iQuam http://www.star.nesdis.noaa.gov/sod/sst/iquam/ L4 SST fields: Reynolds, CMC0.2, OSTIA		
Special data needs	**Need for special satellite acquisitions:** **None**		**Requested data timeliness:** **None**

Status assessment						
	Pre-launch	Commissioning Phase	Year 1	Year 2	Year 3 to year 7.5	Beyond nominal life
Schedule of proposed activities	HIGH	HIGH	HIGH	HIGH		
Availability of funding	LOW	LOW	LOW	LOW		
Availability of infrastructure	HIGH	HIGH	HIGH	HIGH		
Availability of people	HIGH	HIGH	HIGH	HIGH		

Sub group	S3VT-T		
Validation Project Title	Ship-board radiometric measurements of the ocean skin surface temperature to validate the SLSTR retrievals		
Link to full Proposal	13606.pdf		
Team Leader name, address and email	Peter J Minnett Rosenstiel School of Marine and Atmospheric Science University of Miami Miami USA pminnett@rsmas.miami.edu		
Support team-members names and emails	Miguel Angel Izaguirre, mizaguirre@rsmas.miami.edu Goshka Szczodrak, goshka@rsmas.miami.edu Kay Kilpatrick, kkilpatrick@rsmas.miami.edu		
Summary of activity	Deploy accurate ship-board radiometers (ISARs) and spectroradiometers (M-AERIs) on ships to measure skin-SSTs, with SI-traceability, to assess the uncertainty characteristics of the SLSTR skin-SST retrievals		
Expected results for S3	Uncertainty assessment of SLSTR skin-SST retrievals; SI-traceability of SLSTR skin-SST retrievals; data set compatibility with other satellite radiometers (AATSR, AVHRR, MODIS, VIIRS) that have SI traceability through M-AERI and ISAR validation.		
Reference to S3 Cal/Val plan tasks	SLSTR-SST-CV-100: SST product validation SLSTR-SST-CV-130: SST Bias characterisation: comparison with in situ measurements		
Data requirements, data coverage and timeline	**Sentinel-3 Product Names** Calibrated, geolocated, time-tagged brightness temperatures in IR channels. Derived geolocated, time-tagged skin SSTs. Ancillary data (e.g. measurement geometry, cloud mask, data quality flags, relative spectral response functions)	**Data Coverage** Global	**Specific Timeline of Validations** Continuous
In situ validation	Ship-based radiometric skin SSTs; supporting ancillary data.		

data to be collected						
Special data needs	**Need for special satellite acquisitions:** None			**Requested data timeliness:** None		
Status assessment						
	Pre-launch	Commissioning Phase	Year 1	Year 2	Year 3 to year 7.5	Beyond nominal life
Schedule of proposed activities	MED	MED	MED			
Availability of funding	CRIT	CRIT	CRIT	CRIT		
Availability of infrastructure	CRIT	CRIT	CRIT	CRIT	CRIT	CRIT
Availability of people	CRIT	CRIT	CRIT	CRIT	CRIT	CRIT

Note: Labelled critical because of dependence of funding from NASA or other sources.

Sub group	S3VT- T
Validation Project Title	ISAR-S3V - Infrared Shipborne Autonomous Radiometry for Sentinel-3 SLSTR Validation: Continuity of long-term Biscay validation data set bridging from AATSR
Link to full Proposal	13740.pdf
Team Leader name, address and email	Dr. Werenfrid Wimmer University of Southampton (UoS), National Oceanography Centre, Southampton (NOCS), European Way, Southampton, SO14 3ZH, United Kingdom.
Support team-members names and emails	Prof Ian Robinson isr@noc.soton.ac.uk
Summary of activity	Maintain continuity of the existing ship radiometer measurement programme, established since 2004 in the Biscay / English Channel, to provide independent validation for the stability of the SST climate record bridging the gap from AATSR to SLSTR. From the launch of S-3, continue the Biscay / English Channel ship radiometry programme in order to populate a growing match-up database of coincident SLSTR and ship radiometer observations throughout the lifetime of each SLSTR sensor. Regularly verify the accuracy, compared with NPL and NISST references. of the radiometers and black body calibration sources used for ship radiometry, in order to deliver traceability for the SLSTR SST validation programme. Facilitate the development of an international network of partners contributing additional ship radiometry routes for SLSTR validation, including the co-ordination of regular inter-calibration workshops between ship radiometers and traceable references.
Expected results for S3	Validate SLSTR L2 SST in a specific region. Provide continuity between AATSR and SLSTR in a specific region.
Reference to S3 Cal/Val plan tasks	SLSTR-SST-CV-100: SST product validation SLSTR-SST-CV -110: Preparations of SLSTR on orbit SST product CAL/VAL SLSTR-SST-CV-130: SST Bias characterisation: comparison with in situ measurements

Data requirements, data coverage and timeline	**Sentinel-3 Product Names** SL_2_WST SL_2_WCT SL_1_RBT	**Data Coverage** English Channel, Bay of Biscay	**Specific Timeline of Validations**
In situ validation data to be collected	SST skin measurements		
Special data needs	**Need for special satellite acquisitions:**		**Requested data timeliness:**

Status assessment						
	Pre-launch	Commissioning Phase	Year 1	Year 2	Year 3 to year 7.5	Beyond nominal life
Schedule of proposed activities	CRIT	CRIT	CRIT	CRIT	CRIT	CRIT
Availability of funding	CRIT	CRIT	CRIT	CRIT	CRIT	CRIT
Availability of infrastructure	CRIT	CRIT	CRIT	CRIT	CRIT	CRIT
Availability of people	CRIT	CRIT	CRIT	CRIT	CRIT	CRIT

10.5 Data requirements of the S3VT-T Sub-group

The Sentinel-3 core products relevant to this group are:

Product Type	Level	Description	Size (GB/Orbit)
SL_1_RBT____	1	Brightness temperatures and radiances	45.60
SL_2_WCT____	2	Single L2 Sea Surface Temperature(s) from different channel combinations (D3, D2, N3, N2, N3R)	4.0
SL_2_WST____	2	Level-2P Sea Surface Temperature (GHRSST format)	2.3

The Sentinel-3 **core variables** relevant to this group are:

- Gridded pixel Radiances: **xx_radiance_yz** (xx= solar channel, y=detector, z=view, Unit=$Wm^{-2}St^{-1}$)
- Gridded pixel Brightness Temperature: ***xx*_BT_iz** (xx=infrared channel, z=view, Unit=K)
- Sea Surface Temperature: **SST** (relates to SL_2_WST____. Best SSTskin algorithm result defined by rules in ATBD based on atmospheric aerosol load (desert dust or stratospheric), day or night conditions and location in the image swath (nadir swath is >> oblique, Unit=K). Note that in the L2P field, adjacent SST values may be derived using different algorithms (i.e. the product will include retrievals from multiple algorithms)
- Individual Sea Surface Temperature: **I_SST**, (Relates to SL_2_WCT____. SSTskin values derived from ***each*** specific SLSTR SSTskin algorithm: Dual View 3-hannel (**D3**, night), Dual view 2-channel (**D2**, day), Nadir View only 3-channel (**N3**, night), Nadir View 2-chanel (**N2**, Day), Nadir view aerosol robust 3 channel (**N3R**, Night), Units=K). S3VT-T request access to WCT data in the Felyx system for validation activities.
- Any other variable, auxiliary or ancillary data set required to achieve a successful validation of Sentinel-3 products. Metop (A+B) AVHRR and IASI are necessary to understand the gap between AATSR, and will be needed for stability and possibly calibration activities as necessary.
- Level 0 data are required by one proposal for the GSICS collocation extracts only.
- Global products are required for the duration of the mission (global reference data).
- These requirements apply to Sentinel-3 A, B, C, D, etc.
- In situ data collection primarily autonomous. There is a request for Bay of Biscay/English Channel and Caribbean Sea/North West Altlantic as priority areas during comissioning and data ramp-up, and;
- Dedicated Arctic cruises are planned and may be a consideration during the commissioning phase depending on actual dates.

- The team requested test datasets for format checking and software updates. Some teams would like to be able to test their systems with test data 6 months prior to launch.
- The teams would ideally like to obtain data from (local) collaborative ground segments (with Felyx instance), otherwise require FTP access to full archive. Some teams will access data through EUMETCast.

The following table summarises the main sources of data distribution where the S3VT-T team members plan to access SLSTR data:

	Data		Timeliness	Method
Met Office	Global L1b and L2	L1b and L2	NRT	EUMETCast; CGS
UK CGS	Global L1b and L2	L1b and L2	Climate tbc	CGS
Australia	Sub-setted over Australian region (60dE to 170dW, 80dS to 40dN)	L2	NRT	FTP, OPeNDAP
MyOcean/Copernicus services	Global	L1b and L2	NRT	Tbc
NESDIS	Global	L1b and L2	NRT	Tbc
Other S3VT-T	Global/sub-setted	L1b and L2	No requirement	FTP

10.6 Overall S3VT-T schedule

SST Activity Schedule (Green: Planned and funded; Yellow: Planned and unfunded)							
IP	**Name**	**Pre-Launch**	**Commissioning Phase**	**Year 1**	**Year 2**	**Year 3-7.5**	**Beyond nominal time**
13423	Nightingale T.						
13603(1)	Saunders R.						
13606	Minnett P.J.						
13615	Beggs H.						
13650	Høyer J.						
13713(2)	Mittaz J.						
13716	Dorandeu J.						

13740	Wimmer W.						
13764	Dybkjær G.						
13787	Corlett G.						
13741(3)	Ignatov A.						

(1): The OSTIA activity for SLSTR will be funded for the whole period. The radiance monitoring for climate purposes is funded till the pre-launch period and it is probable that the funding will continue after the launch, but it is not guaranteed yet.

(2): Following year 1 if the community thinks there is merit (or if there are ongoing problems) these activities could be extended, or transferred to standard operations.

(3): There is no funding for these tasks but the activities are hoped to fit into existing activities.

10.7 Organisation

The following organisation was requested by the sub-group:

- A dedicated web-page for the S3VT-T; my SPPA page would be sufficient. This should include a master page, and individual project pages with full wiki and blogging capability.
- Due to difficulties with funding for travel, meetings should be organised along-side other opportunities, such as GHRSST or EGU meeting. Video-conferencing should take place quarterly. The team can contribute to IOCR and other planned Sentinel-3 meetings as required or available.
- The sub-group requested that reporting should be done at meetings, via the web-site, and at the Quality Working Group as required or available. This should be a 2-way feedback.

10.8 Near-term plans

The following near-term plans were identified by the team:

- Continued development of the radiometer network. A CEOS IR radiometry inter-comparison workshop is one of the priority activities.
- Continue work and collaboration with other in situ providers. These include the GTMBA and the DBCP pilot project.
- Support the development of protocols and tools, including SI traceability and Felyx.
- The partnership with the MPMF needs to be understood by the team.
- It is important that the team members continue to seek funding.
-

10.9 Definition of fiducial measurements and datasets for temperature sub-group

The team agreed on the definition of fiducial measurements and datasets for the S3VT-T. The team referred to the Collins English dictionary definition of fiducial:

"Physics: Used as a standard of reference or measurement"

Therefore, the team defined the 'fiducial' measurements and datasets that are essential fo independent scientific validation of satellite ocean and ice observations.

Fiducial *measurements* for the S3VT-T were defined as:

- Ship-borne radiometers; traceability to SI and provide an absolute standard.
- HRSST-2 calibrated drifters; not currently funded, therefore are not yet demonstrated.
- Argo; not yet demonstrated.
- IASI measurements may be necessary, particularly if there are calibration problems.

Fiducial *datasets* for the S3VT-T were defined as:

- GTMBA; provide a long-term stability reference.
- Drifting buoys; important for analysing regional biases and the evaluation of cloud masks.
- Argo measurements are needed to supplement all of the above.
-

10.10 Other requirements and recommendations

A high degree of interaction is needed with the S3VT-L and S3VT-OC sub-group for LST and LWST. Measurements provided for LWST are also necessary for validating the L2P marine product, as inland waters are included in the marine distribution. Infra-red radiometry inter-comparison activities are important collaborative activities between the sub-groups.

Ice surface temperature over sea-ice is not yet included as a specific product, however, temperatures over sea-ice will be available in the single algorithm products, although with ocean retrievals. The sub-group recommended that IST should be included in the S3 product.

The sub-group recommended that the requested from the DBCP for the HRSST-2 project is honoured. The project is 300 k€ in total, with inter-agency cost sharing recommended. The project, when funded, will deliver individual pre-deployment calibration of approximately 150 drifters (incremental cost *circa* 10%), deployment and post-deployment impact analysis. If the impact analysis is positive then pre-launch calibration will become the norm. The need for better calibrated drifters comes from the geophysical limit of 0.1K for validation tied by the drifting buoy uncertainty.

The GTMBA has a 50% reduction since last year. There is a need for continuity. Peter Minnett is part of a panel writing a white paper for a workshop early in 2014 at Scripps.

There was a strong request to have reporting from the S3VT-T AND from the mission to the S3VT-T. The team requested strong and continual connections to the SLSTR instrument developers and engineers to understand the instrument characteristics.

The S3VT IP should describe the vision for long-term (4 satellites) validation.

More work is required on how to deal with L1 uncertainties. Random uncertainties per scan are currently there, but there is no systematic component.

Issues regarding re-gridding exist, although this affects land users more.

An approximate or greater than 90 day pre-launch calibration campaign is planned but the instrument schedule is likely to place considerable pressure on the test plan, which introduces a risk of compromise. The team expressed strongly that the pre-launch calibration campaign for SLSTR should not be reduced.

The team will begin to develop uncertainty budgets for the validation process.

It is necessary to bring together documentation for best practice for ship-board radiometers with regard to individual protocols. A radiometer inter-comparison workshop is needed before launch (expected Spring 2015), agreed by CEOS, but only part-funded. The team could play a key role as a steering group.

Most teams will use the single algorithm SST products as a priority to L2P. L1b needed by many; L0 by one team but only for GSICS collocations.

Australia is a “rising star” and has a focus on validation activities via a variety of new initiatives (New ship, ISAR radiometer, IMOS, EarthCube, etc). Future collaboration should be strengthened.

There are plans at EUMETSAT for WMO GSICS to be expanded to include SLSTR data.

The team will work together to attempt a first iteration of the overall long-term vision. A reprocessing capability is required to test new approaches.

11 Detailed plans of the S3VT-ALT sub-group

11.1 Scope of the S3VT-ALT Sub-group

The altimeter sub-group of the Sentinel 3 Validation Team concerns itself with the validation of the measurements of the SRAL altimeter (range, significant wave height, and backscatter) and MWR radiometer (brightness temperatures) and any derived physical quantities such as sea surface height, wind speed, dual-frequency ionospheric correction, and wet tropospheric correction.

The S3VT will primarily validate the most relevant physical quantities (sea surface height, inland water heights, ice sheet elevation, significant wave height, wind speed, ionospheric correction, wet tropospheric correction, sea ice freeboard, rain rates) as they are provided on the Level 1 and Level 2 data products. Where feasible, the S3VT will attempt to translate its findings back to original measurements quantities, Ku- and C-band range, backscatter, and brightness temperatures (available on Level 1 and 2 products), as well as any of additional geophysical corrections, orbital altitude, platform attitude/mispointing, and time tagging.

In order to accomplish this the sub-group will gather external satellite data (CryoSat-2, HY-2A, Jason-2, Jason-3, SARAL), model data (such as atmospheric model grids) and in-situ data (such as tide gauge and buoys), and conduct dedicated campaigns to produce additional validation data.

11.2 Terms of reference of the S3VT-ALT Sub-group

The S3VT-ALT subgroup gathers and coordinates expertise and validation/calibration activities supporting the activities described in the Sentinel-3 Cal/Val plan. The subgroup accomplishes the following tasks and activities:

- **Provide expertise and activities** to support ESA and EUMETSAT with the Sentinel-3 SRAL/MWR scientific validation.
- **Verify products,** utilising both offline and NRT data streams and analyses.
- **Provide fiducial measurements** and model data that can be regarded or employed as a standard of reference, such as tide gauge and buoy data.
- **Maintain, evolve and implement agreed protocols**, methodologies and guidelines for validation activities and to review, revise and upgrade validation measurement protocols.
- **Performing independent validation and verification campaigns and data analysis,** e.g. multi-mission crossover analyses, model comparisons, transponder measurements, and tide gauge and wave buoy collocations.
- **Facilitate access to operational network datasets** e.g. tide gauges, drifting/moored buoys, and other required data (e.g. tide models)
- **Facilitate access** to satellite and correlative data (e.g. satellite orbits)
- **Maintain a high standard of quality control across the validation process**, i.e. provision of uncertainty budgets for all in-situ measurements, proper documentation of validation data collection and reporting.
- **Share information and findings** through S3VT web portal, wiki, blogs, etc.
- **Report relevant results** at the Sentinel-3 Quality Working Group

- **Work effectively with the Ground-Segment teams** to improve communication and data provision in the most optimal manner for validation activities.
- **Coordinate activities** to improve access to funding.

11.3 Membership of the S3VT-ALT Sub-group

Prj ID	PI	PI_Country	PI_Institution
13473	Dettmering, Denise	Germany	Deutsches Geodätisches Forschungsintitut
13544	Leuliette, Eric	USA	National Oceanic and Atmospheric Administration
13551	Obligis, Estelle	France	Collecte Localisation Satellites
13602	Andersen, Ole Baltazar	Denmark	Technical University of Denmark
13622	Ollivier, Annabelle	France	Collecte Localisation Satellites
13624	Quartly, Graham	UK	Plymouth Marine Laboratory
13652	Zhu, Jianhua	China	National Ocean Technology Center
13660	Scharroo, Remko	Germany	EUMETSAT
13667	Gommenginger, Christine	UK	National Oceanography Centre, Southampton
13680	Watson, Christopher	Australia	University of Tasmania
13694	Janssen, Peter	UK	ECMWF
13696	Bonnefond, Pascal	France	Observatoire de la Côte d'Azur/Géoazur
13705	Vogel, Stefan Willi	Australia	Australian Antarctic Division
13734	Mertika, Stelios	Greece	Technical University of Crete
13750	Shum, C. K.	USA	Ohio State University
13752	Martinez, Bernat	Spain	isardSAT S.L.
13763	Thibaut, Pierre	France	Collecte Localisation Satellites
13769	Cipolini, Paolo	UK	National Oceanography Centre, Southampton
13773	Fenoglio-Marc, Luciana	Germany	Technische Universität Darmstadt
13774	Amarouche, Laiba	France	Collecte Localisation Satellites
13708	Roca, Mònica	Spain	isardSAT S.L.
13861	Shephard, Andrew	UK	University of Leeds
17099	Braun, Alexander	Canada	Queen's University
No summaries have been made available for the proposals in the yellow boxes			

11.4 Summary of planned S3VT-ALT Sub-group validation activities

Colours represent the level of the status assessment:

LOW
MED
HIGH
CRIT

Sub group	S3VT Altimetry (S3VT-ALT)		
Validation Project Title	Relative calibration of Sentinel-3 by Multi-Mission Crossover Analysis (RECAS3)		
Link to full Proposal	13473 (hyperlink later on)		
Team Leader name, address and email	Denise Dettmering Deutsches Geodätisches Forschungsinstitut (DGFI) Alfons-Goppel-Strasse 11, 80539 München (Germany) Phone +49 89 23031 1198 Fax +49 89 23031 1240 E-mail: dettmering@dgfi.badw.de		
Support team-members names and emails	Wolfgang Bosch: bosch@dgfi.badw.de Christian Schwatke: schwatke@dgfi.badw.de		
Summary of activity	The project will cross-calibrate and combine Sentinel-3 (S3) data over ocean with data of contemporaneous altimeter missions (Jason-2, Cryosat-2, HY-2, SARAL/AltiKa, ...). We will include S3 data (LRM and/or SAR) in our global Multi-Mission Crossover analysis (MMXO) in order to perform a global relative calibration of Sentinel-3 radar altimeter system.		
Expected results for S3	(1) time series of radial errors, (2) statistical characterizations in terms of auto-covariance functions, (3) relative range bias w.r.t. other missions, (4) information on time tag bias, and (5) geographically correlated error pattern.		
Reference to S3 Cal/Val plan tasks	SRAL-L2MA-CV-140; SRAL-L2LA-CV-210; POD-SV-230; POD-SV-400		
Data requirements,	**Sentinel-3 Product Names**	**Data Coverage**	**Specific Timeline of Validations**

data coverage and timeline	SR_2_WAT	global	Continuously from Sentinel-3 launch
In situ validation data to be collected	-		
Special data needs	**Need for special satellite acquisitions:**		**Requested data timeliness:** IGDR and GDR

Status assessment						
	Pre-Launch	Commissioning Phase	Year 1	Year 2	Year 3-7.5	Beyond nominal life
Schedule of proposed activities	LOW	LOW	LOW	LOW	LOW	LOW
Availability of funding	HIGH	HIGH	HIGH	HIGH	HIGH	HIGH
Availability of infrastructure	LOW	LOW	LOW	LOW	LOW	LOW
Availability of people	MED	MED	MED	MED	MED	MED

Sub group	S3VT Altimetry (S3VT-ALT)
Validation Project Title	Intersatellite calibration and tide gauge validation of Sentinel-3 altimetry
Link to full Proposal	13544.pdf (hyperlink later on)
Team Leader name, address and email	Eric Leuliette Laboratory for Satellite Altimetry National Oceanic and Atmospheric Administration NOAA Center for Weather and Climate Prediction (NCWCP) 5830 University Research Court, E/RA3 College Park MD 20740-3818 (USA) Phone +1 301 683 3380 Fax +1 301 683 3301 E-mail: Eric.Leuliette@noaa.gov
Support team-members names and emails	John Lillibridge, John.Lillibridge@noaa.gov Laury Miller, Laury.Miller@noaa.gov Walter H. F. Smith, Walter.HF.Smith@noaa.gov Gary Mitchum, mitchum@marine.usf.edu
Summary of activity	NOAA will contribute to the S3VT by performing 1) cross-comparisons of ocean altimetry level-2 datasets with other missions, 2) comparisons with tide gauges, 3) validation of delay-Doppler SAR techniques and/or coastal zone re-tracking of low resolution mode altimeter data, 4) validation of the utility of NRT Sentinel-3 data for SWH/wind speed operational monitoring, and 5) NOAA radiometer stability.
Expected results for S3	Biases, variances, and drifts from intersatellite comparisons of sea surface height, SWH, and wind-speed. Estimates of geographically-correlated errors for NRT, STC, and NTC. Drift/stability estimates of sea surface height from tide gauges of L2 NTC. Verification of wind-speed with bouys. Verification of SAR processing. Radiometer channel and wet path delay drift estimates from intersatellite comparisons and hot/cold calibrations.
Reference to S3 Cal/Val plan tasks	SRAL-L2MA-CV-100; -140; -150; -210; -220; -230; -240 SRAL-L1B-CV-110; -120 SRAL-L2LA-CV-210; -220; -240

Data requirements, data coverage and timeline	**Sentinel-3 Product Names** SR_2_WAT	**Data Coverage** global	**Specific Timeline of Validations** Post Sentinel-3 launch
In situ validation data to be collected	We won't be collecting the data ourselves, but we will be processing and applying quality controls, land-motion, and other adjustments to fast-delivery tide gauge data from the University of Hawaii Sea Level Center.		
Special data needs	**Need for special satellite acquisitions:**	None	**Requested data timeliness:** NRT (L2)

Status assessment						
	Pre-Launch	Commissioning Phase	Year 1	Year 2	Year 3-7.5	Beyond nominal life
Schedule of proposed activities	LOW	LOW	LOW	LOW	LOW	LOW
Availability of funding	LOW	LOW	LOW	LOW	LOW	LOW
Availability of infrastructure	LOW	LOW	LOW	LOW	LOW	LOW
Availability of people	LOW	LOW	LOW	LOW	LOW	LOW

Sub group	S3VT Altmetry (S3VT-ALT)		
Validation Project Title	S3 ocean, arctic and lake level validation (SEAL)		
Link to full Proposal	13602		
Team Leader name, address and email	Ole Baltazar Andersen, Senior research Scientist, DTU Space, Elektrovej 328, 2800 Lyngby, Denmark (oa@space.dtu.dk)		
Support team-members names and emails	Lars Stenseng, Associated Professor, DTU Space (stenseng@space.dtu.dk) Peter Bauer-Gottwein, Associated Professor, DTU Environment (pbg@env.dtu.dk) Jacob Tornfeldt Sørensen, DHI water and environment (jts@dhigroup.dk) Per Knudsen, DTU Space (pk@space.dtu.dk) Jain Maulik, Ph.d. Student, DTU Space (jain@space.dtu.dk) Heidi Villadsen, Ph.d. Student, DTU Space (hvil@space.dtu.dk)		
Summary of activity	The activity will focus on the determination of biases and uncertainties in primary OLCI Ocean Color products: the normalized water leaving radiance and the aerosol optical thickness.		
Expected results for S3	This validation project aims at validation of S-3 (SAR) altimetry for coastal sea level and lake level with respect to investigate the performance of the SAR altimetry as it approaches the coast. We will investigate and validate various level of the S-3 data from the S-3 waveforms on and higher. The secondary aim is to investigate the use of SAR altimetry over inland water-bodies (lakes and rivers) to investigate/validate the potential of the use of S-3 altimetry for in-land hydrology. Here the focus will be towards research aiming to investigate the resolution capabilities of the S-3 altimeter with respect to recovering and validating against lake level from increasing small water bodies. Upon securing of funding the aim to employ portable laser/radar gauges along a stretch of the Bramaputna river in Bangladesh or along the Botswana river selecting increasingly smaller water bodies		
Reference to S3 Cal/Val plan tasks			
Data requirements, data coverage and timeline	**Sentinel-3 Product Names** SR_2_WAT___ (and L1B, L1S) SR_2_LAN___ (and	**Data Coverage** Arctic Ocean. All inland regions.	**Specific Timeline of Validations** Commissioning +Y1-7 Commissioning +Y1-7

	L1B, L1S)	The North Sea	Commissioning +Y1-7
In situ validation data to be collected	Tide gauge data from Greenland (operate gauges ourselves). Lake level height using		
Special data needs	**Need for special satellite acquisitions:**		**Requested data timeliness:** NRT, All corrections

Status assessment						
	Pre-Launch	Commissioning Phase	Year 1	Year 2	Year 3-7.5	Beyond nominal life
Schedule of proposed activities	LOW	LOW	LOW	LOW	LOW	
Availability of funding	LOW (ocean)	LOW (ocean)	LOW (ocean)	LOW (ocean)	LOW (ocean)	
	HIGH (land)	HIGH (land)	HIGH (land)	HIGH (land)	HIGH (land)	
Availability of infrastructure	LOW	LOW	LOW	LOW	LOW	
Availability of people	LOW	LOW	LOW	LOW	LOW	

Sub group	S3VT ALT (S3VT-A)		
Validation Project Title	Sigma0 Monitoring and Applications (SOMA)		
Link to full Proposal	13624		
Team Leader name, address and email	Graham Quartly Plymouth Marine Laboratory (PML) Prospect Place, The Hoe, Plymouth Devon, PL1 3DH UK Phone +44-1752-633478 E-mail: gqu@pml.ac.uk		
Support team-members names and emails	Jamie Shutler (jams@pml.ac.uk)		
Summary of activity	The first part of the project (Sigma0 monitoring) will examine the sigma0 calibration, assessing its values (at Ku- and C-band) relative to that of prior Ku/C altimeters, look at long-term variations in sigma0 calibration and understand the effect of processing choices, orbital effects and any instrument interrupts. The second phase (applications) will investigate quantitative rain rate retrievals, the occurrence of sigma0 blooms, and implementation of state-of-the-art algorithms for air-sea gas flux transfer of CO_2.		
Expected results for S3	Time series of sigma0 calibrations for both Ku- and C-band. Rain rate and length scale climatologies, plus CO_2 transfer velocity for first 3 years of mission..		
Reference to S3 Cal/Val plan tasks			
Data requirements, data coverage and timeline	**Sentinel-3 Product Names** SR_2_WAT (may also want some L1B)	**Data Coverage** Global	**Specific Timeline of Validations** All time
In situ	None for the 1st phase; in 2nd phase compare with in situ campaigns e.g.		

validation data to be collected	CandyFloss, RAGNARoCC		
Special data needs	**Need for special satellite acquisitions:** **No**		**Requested data timeliness:** within a few days of collection

Status assessment

	Pre-Launch	Commissioning Phase	Year 1	Year 2	Year 3-7.5	Beyond nominal life
Schedule of proposed activities	LOW	LOW	LOW	LOW	LOW	
Availability of funding	MED	MED	MED	HIGH	HIGH	
Availability of infrastructure	LOW	LOW	LOW	LOW	LOW	
Availability of people	LOW	LOW	LOW	LOW	MED	

Sub group	S3VT-ALT
Validation Project Title	Validation of Sentinel-3 Ocean Altimeter Data through RADS
Link to full Proposal	13660
Team Leader name, address and email	Remko Scharroo EUMETSAT Eumetsat Allee 1 64295 Darmstadt Germany remko.scharroo@eumetsat.int
Support team-members names and emails	Marc Naeije, Delft University of Technology, m.c.naeije@tudelft.nl Ernst Schrama, Delft University of Technology, e.j.o.schrama@tudelft.nl John Lillibridge, NOAA Laboratory for Satellite Altimetry, john.lillibridge@noaa.gov Eric Leuliette, NOAA Laboratory for Satellite Altimetry, eric.leuliette@noaa.gov
Summary of activity	The proposing team will use the Radar Altimeter Database System (RADS) for: 1) the validation of the Sentinel-3 SRAL and MWR data products and contents; 2) the assessment of the validity and usability of the various data fields for the construction of ocean sea level informations; 3) the cross-calibration with contemporary altimeter mission data already contained in RADS; 4) "crowd-sourcing" the calibration and validation through (selected) RADS users. The Radar Altimeter Database System (RADS) is a proven platform for the dissemination and of and research involving any of the radar altimeter missions from Geosat to CryoSat-2. It has been a valuable tool for the cross-calibration and long-term monitoring of any of these missions. In addition, the in-house versions of the algorithms for many of the algorithms involved in production of altimeter data provide independent assessment of the geophysical corrections. We will use RADS to validate the data Sentinel-3 data products. When integrating Sentininel-3 into RADS incompatibilities between the ESA products and RADS in-house data will become to light very quickly. In past times this has identified very quickly minor errors in the ground-processing like scale or sign errors. Early capturing of such errors will significantly enhance the usability of Sentinel-3 data at an early stage in the mission as well as reduce reprocessing burden later on. RADS furthermore will be the main tool for the analysis of global and regional differences between Sentinel-3 and the other operating

	altimeters, Jason-1, Jason-2, CryoSat-2, and AltiKa/SARAL, for all main altimetric parameters: range (sea level), backscatter (wind speed) and significant wave height. Using multi-satellite crossovers, collinear tracks and global and regional means allow the statistical analysis of biases and variations between Sentinel-3 and the other missions. The large user base of RADS (currently about 100 users from 50 institutes in 25 countries) allows to "crowd-source" some of the validation activities to other (selected) users. Because the users already have the tools in-hand and familiar with the RADS data, they will be able to apply Sentinel-3 data for their own (validation) activity in no-time. Add to that the willingness of many RADS users to report back their findings, this effectively "crowd-sources" the validation activity, increasing the reach the activity not only to numerous users but also to validation against many (possibly proprietary) data sources used by those users.		
Expected results for S3	This proposal addresses several of the objectives of the Sentinel-3 validation activities for SRAL and MWR: • Validation of post-launch products • Validation of retrieval algorithms • On-going monitoring of satellite performance and data quality. Expected deliverables include: reporting on the suitability of the data products, and suggestions for improvements; assessment of the geophysical corrections provided on the data products; reporting of possible errors in the algorithm implementation; statistical comparisons of sea level, backscatter and wave height (in terms of global and regional biases and standard deviations) against other missions; estimates of the internal consistency of these measurements obtained through crossovers; estimate of drift and long-term variations with respect to other missions.		
Reference to S3 Cal/Val plan tasks	SRAL-L2MA-CV-100, -120, -140 SRAL-L2MA-CV-200, -210, -230, -240 MWR-BT-CV-200, -310 SRAL-L2MA-CV-600, -620		
Data requirements, data coverage and timeline	**Sentinel-3 Product Names** SR_2_WAT	**Data Coverage** Global	**Specific Timeline of Validations** Launch (L) to Launch plus 3 months (L+3m): Validate the Sentinel-3 data products. Check the

			measurements for quality against contemporary altimeter and radiometer data. Verify conformity of geophysical data corrections to algorithm descriptions and in-house software modules. L+3m to L+12m: Calibrate the measurements of sea level, backscatter and wave height to those of other altimeter missions. L+12m and later: Monitor the stability and quality of the measurements and data products.
In situ validation data to be collected			
Special data needs	**Need for special satellite acquisitions:** SAR and LRM over same region, preferably ascending/descending.		**Requested data timeliness:** NRT, STC, NTC

Status assessment						
	Pre-launch	Commissioning Phase	Year 1	Year 2	Year 3 to year 7.5	Beyond nominal life
Schedule of proposed activities	LOW	LOW	LOW	LOW	LOW	LOW

Availability of funding	LOW	LOW	LOW	LOW	MED	MED
Availability of infrastructure	LOW	LOW	LOW	LOW	MED	MED
Availability of people	LOW	LOW	LOW	LOW	MED	MED

Sub group	S3VT Altimetry (S3VT-ALT)
Validation Project Title	**Validating S3 SAR altimetry for ocean and coastal science (ValSAROC)**
Link to full Proposal	13667.pdf
Team Leader name, address and email	Christine Gommenginger National Oceanography Centre (NOC) European Way SO14 3ZH Southampton Cg1@noc.ac.uk telephone: 0044-23-80596404
Support team-members names and emails	Paolo Cipollini, National Oceanography Centre, Southampton, UK, cipo@noc.ac.uk Helen Snaith, British Oceanographic Data Centre, Southampton, UK, h.snaith@bodc.ac.uk
Summary of activity	This proposal addresses important issues linked to the validation of S3-SRAL SAR mode data over the ocean and the coastal zone. It aims to quantify the retrieval accuracy of the S3-SRAL altimeter, document improvements afforded by the use of SAR altimetry technology and determine the contribution of S3-SRAL to the long-term altimeter sea level time series. The specific activities will be: 1) Assessment of pre-L1B processing and S3-SRAL L1B SAR multi-looked products using theoretical SAR waveform simulations and comparisons with Cryosat-2 SAR waveforms. 2) Independent validation of S3-SRAL SAR retracking chain by comparing output from the operational products against SSH and SWH obtained with the SAMOSA prototype SAR retracker developed at NOC 3) Quantification of S3-SRAL SAR retrieval accuracy over ocean and coastal zone, by comparisons with in situ data, models and other satellites as appropriate, including data from Cryosat-2 SAR mode and from altimeters in the OST-Jason series if available. 4) Analysis of S3-SRAL SAR improved along-track resolution to document improvements over the ocean, in the coastal zone and in sea ice regions 5) Contribution of S3-SRAL SAR SSH to long-term high-precision sea level monitoring in anticipation of SAR altimetry on Jason-CS
Expected	As per activites proposed, i.e:

results for S3	1) Quality assessment of S3-SRAL L1B SAR multi-looked products 2) Independent validation of S3-SRAL SAR retracking chain 3) Quantification of Retrieval accuracy of S3-SRAL SAR for SSH and SWH over ocean and coastal zone 4) Verification and scientific analysis of S3-SRAL SAR along-track resolution 5) Assessment of contribution of S3-SRAL SAR SSH to long-term sea level change monitoring		
Reference to S3 Cal/Val plan tasks	Cross-Calibration with other altimetry missions (SRAL-L2MA-CV-140) Range Calibration with in-situ data (SRAL-L2MA-CV-150) Product Validation (SRAL-L2MA-CV-200) Validation vs in-situ measurements (SRAL-L2MA-CV-220) Wind, wave product validation vs models (SRAL-L2MA-CV-230)		
Data requirements, data coverage and timeline	**Sentinel-3 Product Names** S3-SRAL SAR Full-Bit Rate or equivalent (raw I&Q) S3-SRAL SAR Doppler stack (prior to incoherent summing) SRAL-L1B SRAL-L2MA	**Data Coverage** In principle global but may focus on specific areas (i.e. Around Britain) for some of the objectives	**Specific Timeline of Validations** From early availability of data to end of E2 Phase (~ 5 years)
In situ validation data to be collected	Sea Level, wave and wind measurements, and ancillary meteo observations from Network of stations, including UK Met Office buoys and PSMSL and GLOSS Tide Gauges		
Special data needs	**Need for special satellite acquisitions:** **No**		**Requested data timeliness:** NRT, STC, and NTC

Status assessment						
	Pre-Launch	Commissioning Phase	Year 1	Year 2	Year 3-7.5	Beyond nominal life
Schedule of proposed	MED	MED	MED	LOW	LOW	LOW

activities						
Availability of funding	HIGH	HIGH	HIGH	HIGH	HIGH	HIGH
Availability of infrastructure	MED	MED	MED	MED	MED	MED
Availability of people	MED	MED	MED	HIGH	HIGH	HIGH

Sub group	S3VT-ALT			
Validation Project Title	Global Monitoring and Geophysical Validation of Sentinel-3 Ocean and Sea Ice (SRAL-L2MA) SR_2_WAT Product			
Link to full Proposal	13694			
Team Leader name, address and email	Peter A.E.M. Janssen European Centre for Medium-Range Weather Forecasts (ECMWF) Shinfield Park, Reading, Berkshire RG2 9AX, UK Phone +44 118 949 2116 Fax +44 118 986 9450 E-mail:peter.janssen@ecmwf.int			
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Summary of activity	Carrying out the global monitoring and validation of the near real time (NRT) ocean wind, wave, height and, possibly, ice products of Sentinel-3; namely: Level 2 Marine Ocean and Sea Ice Areas(SRAL-L2MA) also referred to as product type SR_2_WAT.			
Expected results for S3	Validated NRT ocean wind, wave, and sea level height (and ice) products.			
Reference to S3 Cal/Val plan tasks	SRALL2MA-CV-230, -620, -210 (and possibly -250)			
Data requirements, data coverage and timeline	**Sentinel-3 Product Names** NRTL2 Marine Ocean and Sea Ice Areas (SRAL-L2MA) SR_2_WAT product	**Data Coverage** Global	**Specific Timeline of Validations** NRT data since Sentinel-3 launch	
In situ validation	None.			

data to be collected	Model fields and in-situ observation received at ECMWF in NRT will be used.		
Special data needs	**Need for special satellite acquisitions:**		**Requested data timeliness:**

Status assessment						
	Pre-Launch	Commissioning Phase	Year 1	Year 2	Year 3-7.5	Beyond nominal life
Schedule of proposed activities	LOW	LOW	LOW			
Availability of funding	MED	HIGH	CRIT	CRIT	CRIT	CRIT
Availability of infrastructure	LOW	LOW	MED		HIGH	
Availability of people	MED	HIGH	CRIT	CRIT	CRIT	CRIT

Sub group	S3VT Altimetry sub-group (S3VT-ALT)
Validation Project Title	FOAM-S3: From Ocean to inland waters Altimetry Monitoring for Sentinel 3
Link to full Proposal	13696.pdf
Team Leader name, address and email	Pascal Bonnefond Observatoire de la Côte d'Azur / Géoazur (UMR 7329) 250 rue Albert Einstein Les Lucioles 1, Sophia Antipolis 06560 Valbonne France Phone +33 4 83 61 85 63 Fax +33 4 83 61 86 10 E-mail: Pascal.Bonnefond@obs-azur.fr
Support team-members names and emails	Valerie — Ballu — ULR, France — valerie.ballu@univ-lr.fr Muriel — Berge-Nguyen — CNES/LEGOS, France — muriel.berge-nguyen@cnes.fr Xavier — Bertin — ULR, France-Xavier.bertin@univ-lr.fr Stephane — Calmant — IRD/LEGOS, France — Stephane.calmant@ird.fr Michel — Calzas — INSU/DT, France — Michel.calzas@cnrs.fr Mathilde — Cancet — Noveltis, France — Mathilde.cancet@noveltis.fr Jean-François — Cretaux — CNES/LEGOS, France — jean-francois.cretaux@cnes.fr Pierre — Exertier — OCA/GEOAZUR, France — pierre.exertier@obs-azur.fr Frederic — Frappart — OMP/GET, France — frederic.frappart@get.obs-mip.fr Mederic — Gravelle — ULR, France — mederic.gravelle@univ-lr.fr Eric — Jeansou — NOVELTIS, France — eric.jeansou@noveltis.fr Olivier — Laurain — OCA/GEOAZUR, France — olivier.laurain@obs-azur.fr Felix — Perosanz — CNES/GET, France — felix.perosanz@cnes.fr Joecila — Santos da Silva — UEA, Brazil — silva@ird.fr Frederique — Seyler — IRD/ESPACE — frederique.seyler@ird.fr CK — Shum — OSU,USA — ckshum@osu.edu Saadat — Tashbaeva — IWPH, Kyrgyz Rep. — Saadat.tashbaeva@gmail.com Laurent — Testut — OMP/ LEGOS, France — laurent.testut@legos.obs-mip.fr Pascal — Tiphaneau — ULR, France — pascal.tiphaneau@univ-lr.fr Guy — Woppelmann — ULR, France — guy.woppelmann@univ-lr.fr Yuchan — Yi — OSU, USA — Yi.3@osu.edu
Summary of activity	The activity will focus on the determination of biases and uncertainties in the SRAL products mainly from comparison with in-situ data either for ocean, coastal areas and inland waters
Expected results for S3	Determination of biases and uncertainties in Water Surface Heights products.
Reference to	SRAL-L2MA-CV-000

S3 Cal/Val plan tasks	SRAL-L2MA-CV-140 **SRAL-L2MA-CV-150** SRAL-L2MA-CV-210 ; SRAL-L2LA-CV-210 SRAL-L2MA-CV-220 ; SRAL-L2LA-CV-220 SRAL- L2MA-CV-630 POD-CV-220		
Data requirements, data coverage and timeline	**Sentinel-3 Product Names** SR_2_WAT SR_2_LAN OL_2_WFR OL_2_WRR	**Data Coverage** For each of the following locations an area of at least 200x200km is requested. CORSICA (41° 40' N, 8° 42' E): this island located south of France in the Mediterranean sea is already equipped to perform absolute calibration of past, current and future altimetric missions (T/P, Jason, ERS/Envisat, SARAL/AltiKa). Kerguelen Island (-49° 20' S, 70°13' E): this island is located in the Southern Indian Ocean and is equipped to perform absolute calibration of past, current and future altimetric missions (T/P, Jason, ERS/Envisat, SARAL/AltiKa). Perthuis (46° 10' N, 1° 9' W): this area on the French Atlantic coast is equipped with a network of tide gauges maintained in the framework of TIGA/SONEL (http://www.sonel.org/) project. Amazon basin (3° 10' S, 59° 21' W): a network of leveled rules, GPS and weather stations has been and will	**Specific Timeline of Validations** Whole mission

		be installed. This site is already involved in the Calibration/Validation of past, current and future altimetric missions (T/P, Jason, ERS/Envisat, SARAL/AltiKa). Issyk-kul Lake (42° 33' N, 77° 44' E): this lake of ~6000 km² is located in Kirgizstan at about 1600 m height and is equipped with several instruments (limnigraphs, a radar and a pressure gauge, GPS, weather stations). This site is already involved in the Calibration/Validation of past, current and future altimetric missions (T/P, Jason, ERS/Envisat, SARAL/AltiKa). Lake Erie (42° 4' N, 81° 20' W): the Great lakes are monitored by a ten of leveled tide gauges maintained by NOAA on the US shore. This site is already involved in the Calibration/Validation of past, current and future altimetric missions (T/P, Jason, ERS/Envisat, SARAL/AltiKa).	
In situ validation data to be collected	For the Corsica, Kerguelen, Perthuis, Issykul, Amazon and Great Lake sites: tide gauges and GPS-based water level measurements; GPS-based wet tropospheric correction, kinematic GPS surveys onboard boats or as a series of successive buoy moorings. See details in the "Scientific Methodology" section of the proposal.		
Special data needs	**Need for special satellite acquisitions:**		**Requested data timeliness:** NRT
Status assessment			

	Pre-Launch	Commissioning Phase	Year 1	Year 2	Year 3-7.5	Beyond nominal life
Schedule of proposed activities	LOW	LOW	LOW	LOW	LOW	LOW
Availability of funding	HIGH	MED	MED	MED	MED	MED
Availability of infrastructure	LOW	LOW	LOW	LOW	LOW	LOW
Availability of people						

Sub group	S3VT-A
Validation Project Title	Land-Ice Surface Validation Experiment Using the Sentinel-3 Constellation of Radar Altimeters (LIVE-S3)
Link to full Proposal	13750
Team Leader name, address and email	Shum— C.K.—Geodetic Science, School of Earth Sciences, Ohio State University—ckshum@osu.edu
Support team-members names and emails	Kai-chein— Cheng— NCKU, Taiwan — cheng.168@ccu.edu.tw William— Emery— UC,Boulder, USA — william.emery@colorado.edu Chung-Yen— Kuo— NCKU, Taiwan — kuo70@mail.ncku.edu.tw Stephane — Calmant — IRD/LEGOS, France — Stephane.calmant@ird.fr Jean-François — Cretaux — CNES/LEGOS, France — jean-francois.cretaux@cnes.fr Frederique — Seyler — IRD/ESPACE — frederique.seyler@ird.fr Yuchan — Yi — OSU, USA — yi.3@osu.edu Junkun— Wan— OSU,USA— wan.70@osu.edu Hyongki— Lee— UH,USA— hlee@uh.edu Alexander— Braun— Queen's University— braun@queensu.ca Kuo-Hsin— Tseng— OSU,USA— tseng.95@osu.edu Yongjun— Jia— NSOAS,China— jiayongjun@mail.nsoas.gov.cn Hailong—Peng—NSOAS,China—phl@mail.nsoas.gov.cn Lifeng— Bao— WHIGG/CAS,China—baolofeng@whigg.ac.cn Jiyoung—Lee—OSU,USA—jlee@cph.osu.edu Ke—Xu—MIRS/CAS,China—xuke@misrslab.cn Georgia—Fotopoulous—Queen's University—Georgia.Fotopoulos@queensu.ca Graham—Cogley—Trent Univ.,Canada—gcogley@trentu.ca
Summary of activity	Our Team, LIVE-S3, proposes to validate primarily non-ocean Low Resolution Mode (LRM), or the delay-Doppler or SAR Altimetry (SRAL) observations of solid Earth and ice surface, and a focused study on the validation of the Ocean and Land Colour Instrument (OLCI) observations of harmful algae bloom over an inland lake. Our international interdisciplinary team is composed of geodesists, glaciologists, geophysicists, hydrologists, sea-level scientists, and a microbiologist. Almost all team members are satellite altimetry experts and with others also experts on visible and infrared radiometry. We envision that this Project will strongly complement the FOAM-S3 (From Ocean to inland waters Altimetry Monitoring for Sentinel-3) validation proposal on the calibration/validation of Sentinel-3 radar altimeters over coastal ocean and inland waters. The scientific objectives of the project are to conduct validations of radar altimeters over ice surfaces (ice-sheets and mountain glaciers) and over solid Earth, for elevation change measurements. We have an additional cross-disciplinary objective which is to validate the OLCI multi-frequency radiometers with the objectives to fine-tune retrieval algorithms to discern water colors of harmful algae bloom over western and central part of Lake Erie for health hazard monitoring regarding safe drinking and recreational waters. The Team consists of international scientists, including hydrologists and altimetry instrument experts associated with the Chinese radar altimeter missions, Haiyang (ocean in Chinese, or HY)-2A, 2B and 2C projects. Their support to validate Sentinel-3 altimeters relative to their objectives of calibration and validation of the currently operating HY-2A pulse-limited radar altimeter is an excellent synergy.

<table>
<tr><td>Expected results for S3</td><td colspan="3">Our anticipated products include validated or calibrated constants for Sentinel-3 radar altimeters for land-ice and solid Earth measurements, and over the east coast of China absolute calibration site in the Yangtze Delta. We will have calibration constants for fresh water algae color measurements and the associated water color retrieval algorithm development. We anticipate to have a detailed error budget for the altimeter elevation measurements over land and land-ice regions, which are different from the budgets over deep or coastal ocean or hydrologic bodies. The associated possible improvement of GDR (media, geophysical, instrument) correction algorithms and the waveform retrack algorithms are anticipated to be part of the results of our project</td></tr>
<tr><td>Reference to S3 Cal/Val plan tasks</td><td colspan="3">Validate Sentinel-3 Mission Requirement (MR) IDs
S3-MR-100:
Dual frequency nadir pointing altimeter instrument (LRM)
S3-MR-110:
Passive microwave radiometer (MWR) to correct wet troposphere delay
S3-MR-120:
Visible & short-Wave infrared radiance measurements over the ocean
S3-MR-160:
Improving resolution in the coastal zone and sea ice region using SRAL
S3-MR-180:
Measurements of River and Lake Heights (RLH)</td></tr>
<tr><td>Data requirements, data coverage and timeline</td><td>Sentinel-3 Product Names

SR_2_WAT
SR_2_LAN
OL_1_EFR
OL_1_ERR
OL_2_WFR
OL_2_WRR</td><td>Data Coverage
Lake Erie (42° 4' N, 81° 20' W): western and central Lake Erie, the Great Lakes
Greenland and Antarctic ice-sheets and world's mountain glaciers
Hudson Bay (59° 50' 9.96"N, 85° 44' 25.08" W) and Fennoscandia (64°0'0" N,18°0'0" E) covered by Last Glacial Maximum ice-sheets
Sheshan Island (31° 25' 0.01"N, 122° 13' 59.99"E)</td><td>Specific Timeline of Validations
Pre-launch: Mountain glacier mass balance and elevation change from altimetry missions
Water samples Lake Erie
Tide gauge and GPS records Sheshan Island Calibration Site
HY2-A satellite data acquisition.
During commissioning phase:
Continuation of validation data acquisition.</td></tr>
</table>

In situ validation data to be collected	Glacier Mass-balance data: Ice-sheet: Over Greenland and Antarctic Mountain Glacier: Table 1 on Slide 7 (2) Water Sample data over Lake Erie to validate Sentinel-3 OLCI measurements (3) Sheshan Island Chinese Calibration Site Tide Gauge Records GPS Measurements Mapped Ocean Surface Mean Gradient		
Special data needs	**Need for special satellite acquisitions:**		**Requested data timeliness:**

Status assessment

	Pre-launch	Commissioning Phase	Year 1	Year 2	Year 3 to year 7.5	Beyond nominal life
Schedule of proposed activities	LOW	LOW	LOW	MED	MED	MED
Availability of funding	LOW	MED	HIGH	CRIT	CRIT	CRIT
Availability of infrastructure	LOW	MED	HIGH	HIGH	HIGH	HIGH
Availability of people	LOW	LOW	MED	MED	MED	MED

Sub group	S3VT Altimetry (S3VT-ALT)
Validation Project Title	**Validation Of Coastal ALtimetry from Sentinel-3 (VOCALS3)**
Link to full Proposal	13769.pdf
Team Leader name, address and email	Paolo Cipollini National Oceanography Centre (NOC) European Way SO14 3ZH Southampton cipo@noc.ac.uk Telephone: 0044-23-80596404
Support team-members names and emails	Christine Gommenginger, National Oceanography Centre, Southampton, UK, cg1@noc.ac.uk Meric Srokosz, National Oceanography Centre, Southampton, UK, mas@noc.ac.uk Helen Snaith, British Oceanographic Data Centre, Southampton, UK, h.snaith@bodc.ac.uk Philip Woodworth, National Oceanography Centre, Liverpool, UK, pwl@noc.ac.uk Judith Wolf, National Oceanography Centre, Liverpool, UK, jaw@noc.ac.uk Stefano Vignudelli, Consiglio Nazionale delle Ricerche, Pisa, Italy, vignudelli@pi.ibf.cnr.it Andrea Scozzari, Consiglio Nazionale delle Ricerche, Pisa, Italy, andrea.scozzari@isti.cnr.it M. Joana Fernandes, University of Porto, Portugal, mjfernan@fc.up.pt Susana Barbosa, University of Lisbon, Portugal, sabarbosa@fc.ul.pt Jesus Gómez-Enri, University of Cadiz, Spain, jesus.gomez@uca.es Marco Caparrini, Starlab Barcelona, Spain, marco.caparrini@starlab.es Luciana Fenoglio-Marc, Technische Universität Darmstadt (PSGTUD), Darmstadt, Germany, fenoglio@ipg.tu-darmstadt.de Jacob Høyer, Danish Meteorological Institute, Copenhagen, Denmark, jlh@dmi.dk Graham D. Quartly, Plymouth Marine Laboratory, Plymouth, UK, gqu@pml.ac.uk
Summary of activity	Validation of S3 SAR coastal altimetry data against in situ data (including tide gauges and wave buoys) in a number of European coastal regions, with

<table>
<tr><td></td><td colspan="3">the aim of assessing the improvement in both quantity of valid measurements and quality as a function of distance from coast and of a parameter accounting for the coastal morphology (coastal proximity parameter).</td></tr>
<tr><td>Expected results for S3</td><td colspan="3">Confirmation of the improvement in coastal performance due to the adoption of the SAR measurement mode in the coastal mask.

Definition of error characteristics of SRAL data in the coastal zone and assessment of the fulfilment of the relevant quantitative requirements for accuracy.

Definition of thresholds of acceptability of the SRAL data in the coastal environment (i.e. how close to the coast one can use the data) depending on the particular applications.

Peer-reviewed scientific papers.</td></tr>
<tr><td>Reference to S3 Cal/Val plan tasks</td><td colspan="3">Cross-Calibration with other altimetry missions (SRAL-L2MA/LA-CV-140)

Validation vs calibration sites (SRAL-L2MA/LA-CV-150)

Product Validation (SRAL-L2MA-CV-200)

Validation vs other altimetry missions (SRAL-L2MA-CV- 210)

Validation vs in-situ measurements (SRAL-L2MA/LA-CV-220)

Wind, wave product validation vs models (SRAL-L2MA-CV-230)

Global Mission Assessment (SRAL-L2MA/LA-CV-300)</td></tr>
<tr><td>Data requirements, data coverage and timeline</td><td>Sentinel-3 Product Names

SRAL-L1B

SRAL-L2MA</td><td>Data Coverage

6 Regions of interest:

Danish Seas: 8°E to 15°E, 53°N to 60°N

North Sea German Bight, 4°E to 10°E, 52°N to 56°N

West of Britain and NW boundary of English Channel: 10°W to 0°, 45°N to 57°N

West Iberia and Gulf of Cadiz: 11°W to 6°W, 36°N to 44°N

NW Mediterranean: 2°E to 12°E, 40°N to 45°N

Adriatic Sea: 12°E to 20°E, 40°N to 46°N</td><td>Specific Timeline of Validations

From early availability of data to end of E2 Phase (~ 5 years)</td></tr>
</table>

In situ validation data to be collected	Sea Level, wave and wind measurements, and ancillary meteo observations from several following observing systems. Detail for the single RoI: **Danish Seas:** About 15 Tide gauges, 2 moored buoys with T and S profile observations **North Sea German Bight:** Two platforms offshore (FINO1 and FINO3, http://www.fino3.de) and of tide gauge (TG) stations on lighthouses, islands and on the continent. Several stations are equipped with continuously operating Global Navigation Satellite System (GNSS) receivers. Additional instruments measure sea waves and currents. **West of Britain (including NW boundary of English Channel**): quality-controlled sea level data from the IOC tide gauges, including Newlyn and Holyhead stations already used in COASTALT, plus measurements of wind from L4 stations and waves from E1 wave buoy, both off Plymouth. **West Iberia (including Gulf of Cadiz):** Portuguese tide gauge network. If funding opportunities exist an oceanographic vessel campaign will be carried out along a Sentinel-3 ground track, as close as possible with the satellite pass, with measurements of SSH and wet tropospheric delays. Gulf of Cadiz : wave buoys (two directional, one scalar) and tide-gauges (two radar, one pressure gauge), plus wave model data **NW Mediterranean:** Sea level stations and wave buoys operated by ISPRA along the coast of the NW Mediterranean. It consists of sea level stations at Livorno, Genova, Imperia, Porto Torres and wave buoys off Alghero, Capo Comino and La Spezia. **Adriatic Sea:** ISPRA tide gauges on the Italian side (Trieste, Venezia, Ravenna, Ancona, Vieste, Otranto) plus wave and wind data from the "Acqua Alta" Platform off the Venice Lagoon are available (pending authorization). It should be noted that several of the available in situ time series and model runs listed above extend for several years in the past, and can be used to validate past and present missions, therefore helping S-3 to fit in homogenously.		
Special data needs	**Need for special satellite acquisitions:** No		**Requested data timeliness:** NRT, STC, and NTC

Status assessment						
	Pre-Launch	Commissioning Phase	Year 1	Year 2	Year 3-7.5	Beyond nominal life
Schedule of proposed activities	MED	MED	MED	LOW	LOW	LOW
Availability of funding	HIGH	HIGH	HIGH	HIGH	HIGH	HIGH
Availability of infrastructure	MED	MED	MED	MED	MED	MED
Availability of people	MED	MED	MED	HIGH	HIGH	HIGH

Sub group	S3VT Altimetry (S3VT-ALT)		
Validation Project Title	German Bight S-3 Calibration and VALidation		
Link to full Proposal	13773		
Team Leader name, address and email	Dr. Luciana Fenoglio-Marc Physical and Satellite Geodesy, Institute of Geodesy, Faculty of Civil Engineering and Geodesy Technische Universität Darmstadt (PSGTUD) 64287 Darmstadt (Germany) Phone +49 6151 163012 Fax +49 6151 164512 E-mail: fenoglio@psg.tu-darmstadt.de		
Support team-members names and emails	Matthias Becker: becker@ipg.tu-darmstadt.de Astrid Sudau: Sudau@bafg.de Rober Weiss: weiss@bafg.de Aron Roland: roland@wb.tu-darmstadt.de Salvatore Dinardo: dinardo.salvatore@gmail.com, Paolo Cipollini: cipo@noc.ac.uk		
Summary of activity	The activity will focus on a regional calibration and validation of the Sentinel-3 altimeter data using both space data and in-situ data in the German Bight. The in-situ data are available from a network of stations having a good geographical distribution, which allows considering each of the three zones : open sea, coastal zone and inland water.		
Expected results for S3	Determination of biases and uncertainties in the altimeter S-3 products. - absolute S-3 SSH measurement height (SSH) bias and relative height bias between S-3 and contemporaneous and past missions, same for sea wave height (SWH) and wind (U10) - estimated accuracy of SSH, sea wave height and wind - Assessment of the improvement of coastal performance due to SAR measurements		
Reference to S3 Cal/Val plan tasks	• SRAL-L2MA-CV-140; -150; -210, -220; -230; -630 • SRAL-L2LA-CV-210;		
Data requirements,	**Sentinel-3 Product Names**	**Data Coverage** North Sea and	**Specific Timeline of Validations**

data coverage and timeline	SR_2_LAN SR_2_WAT	Mediterranean	Since 2002 for previous missions and starting from Sentinel-3 launch
In situ validation data to be collected	• In-situ Validation of SSH at in-situ GNSS@TG stations – open sea stations (HELG, FINO-1, FINO-3, LHAW), – coastal stations :Sylt (HOE2), Borkum (TGBF), Frontlight Dwarsgat (FLDW), Wittdün (TGWD). Langeoog (TGLA) is without GNSS. – river stations: Mellumplate (TGME) at the Weser Estuary, Knock (TGKN), Dukegat (TGDU), Emden (TGEM) at the Ems Estuary • In-situ Validation of SWH and WIND at buoys – Open sea platforms (FINO-1, FINO-3), – Open sea buoys (HELG_S, HELFG_N, NSB3). – Coastal buoy (Westerland, Elbe) Space data from contemporaneous flying satellites are further used in the cross-calibration of range and of other parameters. For the validation of the SWH with model : results the regionally fully coupled SELFE-WWMII 3rd generation spectral wave and baroclinic currents will be nested in the ECMWF forecasting chain. The nesting allows a downscaling to the coast. Output from the operational circulation model of the BSH in the German Bight will be used for comparison.		
Special data needs: NO	**Need for special satellite acquisitions:** NO		**Requested data timeliness:** NO

Status assessment						
	Pre-Launch	Commissioning Phase	Year 1	Year 2	Year 3-7.5	Beyond nominal life
Schedule of proposed activities	LOW					
Availability of funding	HIGH					
Availability of infrastructure	MED					
Availability of people	CRIT					

Sub group	S3VT Altimetry sub-group (S3VT-ALT)		
Validation Project Title	Validation over the Polar Regions		
Link to full Proposal	13861		
Team Leader name, address and email	Andrew Shepherd School of Earth and Environment University of Leeds Leeds LS2 9JT UK A.Shepherd@leeds.ac.uk		
Support team-members names and emails	Malcolm McMillan M.McMillan@leeds.ac.uk		
Summary of activity	The activity will focus on the evaluation of SRAL measurements of ice sheet elevation, through internal consistency checks and comparison with external data.		
Expected results for S3	Assessment of SRAL ice sheet elevation measurements.		
Reference to S3 Cal/Val plan tasks	SRAL-L2MA-CV-210, SRAL-L2MA-CV-240		
Data requirements, data coverage and timeline	**Sentinel-3 Product Names** SR_2_LAN, SR_2_WAT	**Data Coverage** 60-90°S	**Specific Timeline of Validations** L to L+18 months
In situ validation data to be collected	None		
Special data needs	**Need for special satellite acquisitions:** None		**Requested data timeliness:** NTC

Status assessment						
	Pre-launch	Commissioning Phase	Year 1	Year 2	Year 3 to year 7.5	Beyond nominal life

Schedule of proposed activities	LOW	LOW	LOW	LOW		
Availability of funding	LOW	MED	HIGH	HIGH		
Availability of infrastructure	LOW	LOW	LOW	LOW		
Availability of people	MED	HIGH	HIGH	HIGH		

Sub group	S3VT-ALT
Validation Project Title	SAVILON: Sentinel-3 altimetry validation in Lake Ontario using GNSS buoys, lake circulation models and Citizen sensors
Link to full Proposal	17099
Team Leader name, address and email	Braun, Alexander Queen's University, Dept. of Geological Sciences and Geological Engineering 36 Union St K7L3N6 Kingston, Ontario CANADA braun@queensu.ca
Support team-members names and emails	Cheng, Kai-chien cheng.168@ccu.edu.tw Shum, C.K. ckshum@osu.edu Testut, Laurent laurent.testut@legos.obs-mip.fr Fotopoulos, Georgia gf26@queensu.ca Shore, Jennifer jennifer.shore@rmc.ca
Summary of activity	Besides observing the global oceans, altimetric records contain Earth surface elevations over lakes and lake ice. Both lake surfaces and lake ice show a lower variability in elevation compared to the sea surface and sea ice. Hence, lakes must be considered as potentially better calibration/validation sites if the absolute range measurements are concerned. We propose to establish independent in situ observations and model surfaces for Lake Ontario water levels and lake ice elevations. Three independent observables will be created, namely from, i) water level gauges, ii) lake circulation models, and iii) GNSS buoys. All observables are directly comparable with the altimetric records acquired by Sentinel-3. Research on the validation of altimetric lake levels using tide gauges is well established and has been conducted for the Great Lakes by the research team. Lake circulation models exist, but have not been fully exploited to consider existing and newly acquired altimetric records. We aim at developing lake surface models which assimilate past and Sentinel-3 observations in order to assess if lake surface models could eventually be used for permanent validation during a satellite mission. The third component is to exploit the large number of yachts available in Lake Ontario as Citizen Sensor Platforms. GNSS buoys will be developed which can be towed behind yachts. This will provide a much larger set of observations compared to research campaigns. By fusing the three independent observations sets, we expect to provide an unprecedented validation record for lake and lake ice altimetry for Sentinel-3 and its successors.
Expected results for S3	This project will deliver validation datasets to be compared with S3 altimetry products, specifically lake levels and lake ice levels. Deliverables will also include statistical information about the validation parameters, e.g. bias, trend, RMS of independent datasets. The project will also result in an improved lake circulation model to predict water levels across Lake Ontario. The GNSS buoy prototype developed will be available for for continuing validation efforts of the Sentinel-3 missions.
Reference to S3 Cal/Val plan tasks	SRAL-L2MA-CV-220- validation with in situ SRAL-L2MA-CV-310 -Product QA and Monitoring

	SRAL-L2MA-CV-300 - long-term performance assessment		
Data requirements, data coverage and timeline	**Sentinel-3 Product Names** SR2_LAN, L1B and L2, full bit rate, 20Hz	**Data Coverage** Lake Ontario 76 - 80 W, 43-44.5 N	**Specific Timeline of Validations** November to February 2013: Acquisition of required infrastructure, updates on altimetry processing software. January to March 2014: Development of GNSS buoy prototype. Static tests on land and in Lake Ontario. Lake modelling runs assimilating past satellite altimetry records and tide gauge records. April to June 2014: Deployment of GNSS buoy on Lake Ontario towed behind a boat. Analysis of the wake effect on lake level estimation. Run a series of lake circulation models to obtain time series of lake surface and variability. July to Launch 2014: Refinement of GNSS buoy prototype and campaigns along the two closest S3 ground tracks nearby Kingston. Coordination with Yacht clubs on deployment of prototype on a regular basis. till end of mission: ...... keep on fiducially validating
In situ validation data to be collected	Tide gauge records for Lake Ontario, GNSS glider lake surface heights in campaigns and by Citizen Sensors		
Special data needs	**Need for special satellite acquisitions:**		**Requested data timeliness:** NTC

Status assessment						
	Pre-launch	Commissioning Phase	Year 1	Year 2	Year 3 to year 7.5	Beyond nominal life
Schedule of proposed activities	LOW	LOW	LOW			
Availability of funding	LOW	MED	HIGH	CRIT		

Availability of infrastructure	LOW	MED	HIGH	HIGH	HIGH	HIGH
Availability of people	LOW	LOW	LOW	MED	MED	MED

11.5 Data requirements of the S3VT-ALT Sub-group

The Sentinel-3 core products relevant to this group are:

Product Type	Level	Description	Size (GB/Orbit)
SRAL L1B and L1S	1	not yet defined	unknown
SR_2_WAT__	2	1Hz and 20Hz Ku and C bands parameters (LRM/SAR), waveforms. Over open ocean, coastal areas, sea-ice and part of land within a certain distance from the coastline	0.09
SR_2_LAN__	2	1Hz and 20Hz Ku and C bands parameters (LRM/SAR), waveforms. Over land, coastal areas, land ice and inland water.	0.07
OL_1_EFR	1	Full Resolution top of atmosphere	29.90
OL_1_ERR	1	Reduced Resolution top of atmosphere	1.70
OL_2_WFR	2	Full Resolution Water & atmosphere parameters	33.40
OL_2_WRR	2	Reduced Resolution Water & atmosphere parameters	2.10

Requirements on Sentinel-3 data products:

- Level 1B and Level 1S products still need to be defined properly.
- Test data sets (TDS) to be provided prior to launch (both for Level 1 and 2 products) that are preferably based on actual CryoSat-2 measurements.
- Include the platform attitude (based on NAVATT files) in the new STM L1 and L2 products.
- Implement BUFR converter for the release of NRT data through GTS. This is an action to EUMETSAT to investigate the possibility of this service.
- Give S3VT members access to the sensor characterisation SCCDB data files.

Requirements on operations:

- Timely delivery of NRT data right after switch-on of SRAL/MWR/GNSS is required; the S3VT-ALT sees no need to wait for quality control and validation of the products by PDGS to be completed.
- Open/Closed Loop strategy: S3VT-ALT will prepare a recommendation on how to best schedule between OL and CL tracking.
- Selection of DEM for OL tracking: Use hybrid model joining the existing ACE-2 with more recent DEMs in polar regions (such as Tandem-X, GIMP) that are not decades old; this is to improve tracking of glaciers and fjords.
- Coordinate operation of Sentinel-3 and CryoSat-2 in SAR mode: for example run CryoSat for longer stretches in SAR mode, co-aligned closely with near-concurrent Sentinel-3 passes for close comparison.

- Operate Sentinel-3 SRAL in LRM mode and SAR mode on ascending and descending tracks respectively during cycle 1 and the reverse during cycle 2. This will allow crossover comparison of LRM and SAR mode as well as simultaneous full global statistics.
- Do not operate the B-sides of the instrumentation during the commissioning phase; there will not be enough time to calibrate both the A- and B-sides.

11.6 Recommendations on the Sentinel-3B operations

The S3VT-Alt recommends that the Sentinel-3B satellite with be commissioned by "in tandem" with Sentinel-3A. During the first 3 to 6 cycles (TBD) the two missions should be flying less than 1 minute apart on the same ground-track.

- This will facilitate and improve the cross-calibration of range, backscatter and SWH measurements. Because of the very should time interval the ocean conditions are expected to be the same, which means that both satellites should measure the same.
- In a similar way this will facilitate and improve the cross-calibration of the two microwave radiometers.
- This will aid validation of orbit determination as well, as both satellites should then sense the same drag.

A tandem mission of Sentinel-3A and -3B was also recommended during the Sentinel-3 Calibration/Validation Planning Meeting in March 2012 and during the Ocean Surface Topography Science Team (OSTST) Meeting in October 2013.

After the tandem mission Sentinel-3B can drift to its intended position at 180° distance from Sentinel-3A in the same orbital plane.

11.7 Other recommendations

The S3VT-Alt further requests the following to aid the calibration and validation exercise:

- Delivery of GNSS Rinex L1B files to the user community. This is an action on the PDGS and POD service to make these files available.
- Setup of a wiki to inform co-S3VT PIs and PDGS of issues discovered by other members.

11.8 Fiducial Reference Measurements

The S3VT recommends that all members have access to Fiducial Reference Measurements (FRM) through a centralised database. This requires the establishment of agreed protocls for FRM data acquisition, processing and documentation. A protocol for the absolute referencing of water level gauges is already under development.

The S3VT recognizes the need for absolute calibration and long term monitoring of the backscatter and range measurements through the use of radar transponders. This comes with the following tasks to be fulfilled:

- Define requirements for the accuracy and stability of backscatter measurements
- Consider redundancy of transponder deployment and consider the capabilities of transponders to allow calibration of both range and backscatter.
- How many of these transponders would be needed?

The outcome of the calibration and validation exercise should include a table of measurement performance in terms of levels of errors and noise as well as biases and possibly drifts to update a similar table provided in the Mission Requirements Document (MRD). The S3VT will liaise with the Mission Performance Centre (MPC) to provide consistent results.

11.9 Overall S3VT-ALT schedule

Altimetry Activity Schedule (Green: Planned and funded; Yellow: Planned and unfunded)							
IP	**Name**	**Pre-Launch**	**Commissioning Phase**	**Year 1**	**Year 2**	**Year 3-7.5**	**Beyond nominal time**
13473	Dettmering D.						
13544	Leuliette E.						
13551							
13602	Andersen O.B.	Ocean	Ocean	Ocean	Ocean	Ocean	
		Land	Land	Land	Land	Land	
13622							
13624	Quartly G.						
13652							
13660	Scharroo R.						
13667	Gommenginger C.						
13680							
13694	Janssen P.						
13696	Bonnefond P.						
13705							
13734							
13750	Shum C.K.						
13752							
13763							
13769	Cipollini C.						
13773	Fenoglio-Marc L.						
13774							
13708							
13861	Shepherd A.						
17099	Braun A.						
	No summaries have been made available for the proposals						

12 Detailed plans of the S3VT-L

12.1 Scope of the S3VT-L Sub-group

- The aim of the S3VT-L sub-group is to provide world-class validation expertise and independent validation evidence, experimental data and recommendations on the performance of Sentinel-3 products and ensure the best possible outcomes for the Sentinel-3 Mission.
- The S3VT-L sub-group will focus on the validation of the Land core products. Currently: Land Surface Temperature, Fire Radiative Power, FAPAR and Chlorophyll Index and Surface reflectance, water vapour and aerosol. Intermediate products validation is also required: Cloud masking, flagging, classification, geolocation.
- The final scope of the sub-group is to associate an error to Land each products.

12.2 Terms of reference of the S3VT-L Sub-group

This section describes S3VT-L subgroup Terms of Reference which are in addition to the general terms of reference described in chapter 4. The Land subgroup encompasses expertise and activities in Level-1B and Level-2 calibration and validation tasks described in the ESA and EUMETSAT Cal/Val plan [Reference-1]. The subgroup includes experts in the following tasks and activities:

- Radiometric and geometric calibration of optical sensors, including vicarious calibration methodologies;
- Algorithm and Validation of vegetation products and uncertainties, including FAPAR and Chlorophyll index;
- Land Surface Temperature retrieval and uncertainties;
- Fire Radiative Power Algorithm and Validation;
- Validation and verification of the pre-processing chain used for Land Product processing chain, such as pixel classification (cloud identification) and flags.

At Level-2 product validation and algorithm validation and development, the subgroup's support is:

1. The monitoring of the characterisation and calibration of all optical field instruments used in ground fiducial[3] measurements (in-situ data) acquisition
2. The revision and upgrade of optical measurement protocols
3. The quality control of in-situ radiometric measurements
4. The valorisation and documentation of radiometric matchups
5. The documentation of all matchups
6. Provision of field measurements to a common database
7. The methodologies for satellite intercomparison

[3] Fiducial reference measurements are those measurements regarded or employed as a standard reference that are essential to independently verify and monitor the performance of SLSTR measurements.

In addition, the subgroup will support the Sentinel-3 mission by:

- **Sharing relevant results at the Sentinel-3 Quality Working Group** (either in person by invitation or by representation);
- **Working effectively with the Ground-Segment teams** to improve data provision in the most optimal manner for validation activities;
- **Fostering international cooperation with CEOS WGCV (in particular LPV and IVOS), other scientific communities and Agencies;**
- **Improve communication on S3 mission performance**.

The subgroup aims to provide assistance to the Sentinel-3 project before launch and in the commissioning and operational phases of the mission.

Timeliness of delivery of field measurements and validations to the Sentinel-3 project as well as satellite data to the teams is specific to all subgroup teams and itemized in the following sections.

The modes of cooperation with the Agencies and cooperation and coordination within the Teams in the subgroup will be defined through the follow-on workshops.

12.3 Membership of the S3VT-L Sub-group

PI	Project	ID	Category	Data	Area
David Smith	Sentinel-3 Calibration Over Natural Sites (SCONS)	ID 13714	Calibration	-OLCI L1 -SLSTR L1	Extract Test Site
Bertrand Fougnie	Vicarious calibration	XX	Calibration	-OLCI L1 -SLSTR L1	Extract Test Site
O. Arino	Sentinel-3 Fire Channels Validation For ATSR World Fire Atlas Continuity	ID 13588	Fire	-SLSTR L1 -SLSTR L2 (tbc)	Global land
Johannes Kaiser	GasFlare Emission with Sentinel-3	ID - TBD	Fire	- SLSTR L1 - SLSTR L2	tbc
Dave Smith	Fire Channel calibration	28372	Fire	- SLSTR L1 - SLSTR L2	Regional – glint area
S. Pinnock	GlobTemperature	ID 13553	Temperature	- SLSTR L1 - SLSTR L2 - SYN L2	Global land

Darren Ghent	Continuity of ESA Long-term Land Surface and land Ice temperature validation from AATSR to SLSTR (CELSIAS)"	ID 13733	Temperature	- SLSTR L1 - SLSTR L2	Global land
Paul DiGiacomo	NOAA/NESDIS Center for Satellite Applications and Research (STAR) Validation Support for Sentinel-3: Ocean Color, Sea Surface Temperature and Land Surface Temperature	ID 13741	temperature	- SLSTR L1 - SLSTR L2	Regional extract: USA
Nichola Knox	South African validation of the OLCI-Geometric accuracy and SLSTR-Land Surface Temperature products	ID 13729	Temperature Geometry	-OLCI L1 -SLSTR L2 -SYN L2	Regional extract: South Africa
Carsten Brockmann	Pixel Classification Validation	ID 13760	Verification	-OLCI L1 -OLCI L2 - SLSTR L2 - SYN L2	Global Land and ocean
Nadine Gobron	OLCI Land Validation (OLCI-Land-Val)	ID 13767	Vegetation	- OLCI L1 - OLCI L2	Global Land
Else Swinnen	Consistency analysis between S3 SPOT VGT-like level2 products and Proba-V 1km resolution products	ID 13609	Vegetation	-SYN L2 - OLCI tbc	Regional Extract: Europe Africa
Ana-Silió Calzada	Monitoring the State and Evolution of Cantabria's Marine and Terrestrial	ID 13753	Vegetation	-OLCI L1 -OLCI L2 -SLSTR L2	Local extract: Spain

	Ecosystems				

12.4 Summary of planned S3VT-L Sub-group validation activities

Colours represent the level of the status assessment:

LOW
MED
HIGH
CRIT

Sub group	S3VT Land (S3VT-L)		
Validation Project Title	Sentinel-3 Calibration Over Natural Sites (SCONS)		
Link to full Proposal	13714.pdf		
Team Leader name, address and email	David Smith RAL Space (address missing) dave.smith@stfc.ac.uk		
Support team-members names and emails	Chris Mutlow, RAL Space, chris.mutlow@stfc.ac.uk Caroline Poulsen, RAL Space, caroline.poulsen@stfc.ac.uk Caroline Cox, RAL Space, Caroline.cox@stfc.ac.uk Hugh Mortimer, RAL Space, Hugh.mortimer@stfc.ac.uk Tim Nightingale, RAL Space, Tim.nightingale@stfc.ac.uk		
Summary of activity	The aim of this project is to use natural targets such as deserts, ice, dark water, sunglint and clouds to provide a verification of the level-1 calibrations of SLSTR and OLCI.		
Expected results for S3	Long term trends for all VIS-SWIR with uncertainty estimates, relative calibration biases between other sensors.		
Reference to S3 Cal/Val plan tasks	Radiometry Validation (OLCI-L1B-CV-300), SLSTR-L1B-CV-300		
Data requirements, data coverage	**Sentinel-3 Product Names** OL1_ERR, FR	**Data Coverage** Regional (Area Of interest):	**Specific Timeline of Validations**

and timeline	SL_1_RBT	Sites used for verifying the on-orbit calibrations of sensors such as AATSR and MERIS. For calibration: Aeronet sites on islands that are surrounded by dark oceans. For clouds, and sunglint regions: site selection dependent on solar/view geometry and not fixed.	Lifetime of Mission
In situ validation data to be collected	None		
Special data needs	**Need for special satellite acquisitions:** No		**Requested data timeliness:** tbc

Status assessment						
	Pre-launch	Commissioning Phase	Year 1	Year 2	Year 3 to year 7.5	Beyond nominal life
Schedule of proposed activities	MED	MED	MED	MED	MED	MED
Availability of funding	MED	MED	MED	HIGH	HIGH	HIGH
Availability of infrastructure	LOW	LOW	LOW	LOW	LOW	LOW
Availability of people	LOW	LOW	LOW	LOW	LOW	LOW

Sub group	S3VT Land (S3VT-L)
Validation Project Title	Sentinel-3 Fire Channels Validation For ATSR World Fire Atlas Continuity
Link to full Proposal	13588.pdf
Team Leader name, address and email	Olivier Arino,ESA olivier.arino@esa.int
Support team-members names and emails	Fabrizio Ramoino, SERCO (c/o ESA-ESRIN), fabrizio.ramoino@esa.int
Summary of activity	ATSR World Fire Atlas is an ESA project, the basic ALGO1 (3.7□m BT > 312K), ALGO2 (3.7□m BT > 308K) and ALGO3 (1.6□m reflectance > 0.09) approaches have been recognised to be extremely efficient and related results satisfactorily accurate. The radiometric stability of the ATSR instrument series ensured the consistency of the detection capability for long time periods. The ATSR World Fire Atlas has the big advantage to include almost 16 years (ALGO1-2) and 22 years (ALGO3) of data and to be global [Arino, Ramoino and Casadio, 2012]. Since the data has proved their reliability to compose statistic studies, it is possible to try to extract the maximum information on the fire behaviour and consequences locally or globally [Arino, Casadio and Serpe, 2012]. In the frame of S3VT activity, it will be performed intensive intercomparison and validation of the F1 (3.7□m) and F2 (11□m) channels within S7 (3.7□m) and S8 (11□m) taking into account in-situ (i.e. known wide fire, gas flaring and industrial sites) and MODIS data. This activity would help the scientific community to understand how the new fire dedicated channels (F1 and F2) onboard of Sentinel-3 improve the fire and gas flaring detection at global scale.
Expected results for S3	Characterization of the accuracy of S-3 SLSTR SL_1_RBT___ products, focussing the attention on S5 (1.6µm), S7 (3.7µm), S8 (11µm), S9 (12µm), F1 (3.7µm) and F2 (11µm) channels. The team will perform an analysis about the improvement derived from the new fire dedicated channels (F1 and F2). -1) Validation of 'Sentinel-3 fire products' -2) Intercomparison of 'S-3 fire products' with other missions and in-situ data

	-3) Overlap analysis of S-3 S7, S8, F1 and F2 aimed to demonstrate the advantages of the S-3 dedicated fire channels.		
Reference to S3 Cal/Val plan tasks	SLSTR-L1B-CV-200, SLSTR-L1B-CV-230, SLSTR-L1B-CV-250		
Data requirements, data coverage and timeline	**Sentinel-3 Product Names** SLSTR L1b TOA	**Data Coverage** Global	**Specific Timeline of Validations** Lifetime of Mission
In situ validation data to be collected	None		
Special data needs	**Need for special satellite acquisitions:** No		**Requested data timeliness:** tbc

Status assessment

	Pre-launch	Commissioning Phase	Year 1	Year 2	Year 3 to year 7.5	Beyond nominal life
Schedule of proposed activities	MED	MED	MED	MED	MED	MED
Availability of funding	LOW	LOW	LOW	LOW	MED	MED
Availability of infrastructure	LOW	LOW	LOW	LOW	LOW	LOW
Availability of people	LOW	LOW	LOW	LOW	MED	MED

Sub group	S3VT Land (S3VT-L)
Validation Project Title	Continuity of ESA Long-term Land Surface and land Ice temperature validation from AATSR to SLSTR (CELSIAS)"
Link to full Proposal	13733.pdf
Team Leader name, address and email	Darren Ghent, University of Leicester, djg20@le.ac.uk
Support team-members names and emails	John Remedios, University of Leicester, jjr8@le.ac.uk Simon Hook, NASA JPL, simon.j.hook@jpl.nasa.gov Glynn Hulley, NASA JPL, Glynn.Hulley@jpl.nasa.gov Philipp Schneider, Norwegian Institute for Air Research (NILU), Philipp.Schneider@nilu.no Pierre Guillevic, National Climatic Data Center - NOAA, pierre.guillevic@noaa.gov Isabel Trigo, IPMA LandSAF, isabel.trigo@ipma.pt Cesar Coll, University of Valencia, Cesar.Coll@uv.es Folke Olesen, Karlsruhe Institute of Technology (KIT) IMK, folke.olesen@kit.edu Frank Goettsche, Karlsruhe Institute of Technology (KIT) IMK, frank.goettsche@kit.edu Jose Sobrino, Global Change Unit, University of Valencia, sobrino@uv.es Juan-Carlos Jimenez-Munoz, Global Change Unit, University of Valencia, juancar.jimenez@uv.es Jacob Hoyer, Danish Meteorological Institute (DMI), jlh@dmi.dk
Summary of activity	Global land surface temperature validation covering each of the biomes parameterised in the SLSTR LST retrieval algorithm to assess whether SLSTR is capable of measuring LST to an accuracy of < 1 K. To achieve these objectives the approach developed as part of the ESA Long-Term LST Validation Project will be undertaken together with an established approach for validating at-sensor radiances. The team has considerable experience in applying these validation protocols to ATSR LST data, to LST synergy data within the context of the SEN4LST project, to validating ASTER, MODIS, Landsat and VIIRS top-of-atmosphere radiances, and to MODIS and VIIRS data as part of the ongoing NPP/JPSS VIIRS Land Product Validation Plan.
Expected results for S3	The project will provide an initial assessment of: 1) The absolute radiometric accuracy of the thermal infrared bands of

	SLSTR using the well calibrated sites at Lake Tahoe and Salton Sea 2) The spectral performance of SLSTR compared to IASI 3) The accuracy and precision of the LST and IST retrievals for the SL_2_LST product from SLSTR in relation to temperature-based and radiometric-based validation 4) Quantification of the differences between LST and IST retrievals from SLSTR with respect to retrievals from other satellite sensors 5) The stability of a combined AATSR/SLSTR LST record (the expected outcomes are envisaged to persist for a minimum of 2 years into SLSTR operations; further validation outcomes will depend on continuation of funding streams)		
Reference to S3 Cal/Val plan tasks	SLSTR-LST-CV-200		
Data requirements, data coverage and timeline	**Sentinel-3 Product Names** SLSTR L1b and L2 data.	**Data Coverage** Global The work will require global SLSTR data as the accuracy and stability of the LST record must be assessed across all biomes covering the entire range of geophysical conditions and geographical regimes - in particular validation must be carried out across the range of emissivity spectra.	**Specific Timeline of Validations** Lifetime of Mission
In situ validation data to be collected	Data will continue to be collected and made available to the validation team from the well calibrated and established sites at Lake Tahoe and Salton Sea managed by the team members at JPL, and from the LandSAF stations (Dahra, Evora, Gobabeb, RMZ-Kalahari)managed by team members at Karlsruhe Institute of Technology (KIT). The match-up database constructed by Leicester for the ESA Long-Term LST Validation Project will continue to be populated with radiometer data from the Atmospheric Radiation Measurement (ARM) stations, the US Climate Reference Network (USCRN), and the stations managed by the		

	team members, with individual campaign data sourced from PIs where available.		
Special data needs	**Need for special satellite acquisitions:** No		**Requested data timeliness:** tbc

Status assessment						
	Pre-launch	Commissioning Phase	Year 1	Year 2	Year 3 to year 7.5	Beyond nominal life
Schedule of proposed activities	LOW	LOW	LOW	LOW		
Availability of funding	LOW	LOW	LOW	LOW	MED	MED
Availability of infrastructure	LOW	LOW	LOW	LOW	LOW	LOW
Availability of people	LOW	LOW	LOW	LOW	LOW	LOW

Sub group	S3VT Land (S3VT-L)		
Validation Project Title	NOAA/NESDIS Center for Satellite Applications and Research (STAR) Validation Support for Sentinel-3: Ocean Color, Sea Surface Temperature and Land Surface Temperature		
Link to full Proposal	13741.pdf		
Team Leader name, address and email	Paul M. DiGiacomo, NOAA/NESDIS/STAR, Paul.DiGiacomo@noaa.gov Yunyue Yu; NOAA/NESDIS/STAR Yunyue.Yu@noaa.gov (Land Surface Temperature Lead; S-NPP LST EDR lead)		
Support team-members names and emails	Yunyue Yu; NOAA/NESDIS/STAR Yunyue.Yu@noaa.gov (Land Surface Temperature Lead; S-NPP LST EDR lead) Yuling Liu; NOAA/NESDIS/STAR Affiliate, Yuling.liu@noaa.gov (LST Team) Zhuo Wang; NOAA/NESDIS/STAR Affiliate, Zhuo.wang@noaa.gov (LST Team) Lilian Sun; George Mason University, dsun@gmu.edu (LST Team) Ivan Csiszar; NOAA/NESDIS/STAR, Ivan.Csiszar@noaa.gov (S-NPP EDR Lead)		
Summary of activity	The NPP/JPSS LST EDR team is interested in validating the Sentinel-3 LST (S3LST) data using the same data set being utilized for the NPP/JPSS LST validation. Specifically, the LST team will perform S3LST data validation using ground station data in the Continental U.S. region. The stations include the U.S. Surface Radiation Budget networks stations (SURFRAD) and the Climate Reference Network (CRN) stations. A comparison of S3LST and the VIIRS LST data will also be performed to cross-check the LST data products from these two satellites. This type of cross-check comparison will be informative to understand how the differences in the LST retrieval methods affect the resulting products, and will ultimately lead to improved products of great benefit to the user community.		
Expected results for S3	Overall, the expected outcome is a quantitative assessment and statement of the accuracy, stability and (cross-platform) consistency of the L1 and L2 data from Sentinel-3/OLCI and SLSTR, with reports, web sites, presentations and publications providing validation results and recommendations for enhancements and improvements.		
Reference to S3 Cal/Val plan tasks	SLSTR-LST-CV-200		
Data requirements,	**Sentinel-3 Product**	**Data Coverage**	**Specific Timeline**

data coverage and timeline	**Names** SLSTR L1b and L2 data.	Regional In terms of the LST effort, the SURFRAD stations and most of CRN stations are located in the Continental United States (CONUS). As such, this validation project will focus on the CONUS region.	**of Validations** Lifetime of Mission
In situ validation data to be collected	In terms of LST, the team will use 6 US SURFRAD station data and about 20 CRN station data, which are all publicly available.		
Special data needs	**Need for special satellite acquisitions:** No		**Requested data timeliness:** tbc

Status assessment						
	Pre-launch	Commissioning Phase	Year 1	Year 2	Year 3 to year 7.5	Beyond nominal life
Schedule of proposed activities	LOW	LOW	LOW	LOW	MED	MED
Availability of funding	LOW	LOW	LOW	LOW	MED	MED
Availability of infrastructure	LOW	LOW	LOW	LOW	LOW	LOW
Availability of people	LOW	LOW	LOW	LOW	LOW	LOW

Sub group	S3VT Land (S3VT-L)
Validation Project Title	South African validation of the OLCI-Geometric accuracy and SLSTR-Land Surface Temperature products
Link to full Proposal	13729.pdf
Team Leader name, address and email	PI: Geolocation Nichola Knox; Earth Observation Division; South African National Space Agency (SANSA); nknox@sansa.org.za PI: Land Surface Temperature (LST) Robert (Bob) Scholes; Natural Resource Environment; Council for Scientific and Industrial Research (CSIR-NRE); bscholes@csir.co.za Michel Verstraete; mverstraete@sansa.org.za
Support team-members names and emails	Geo-location Bruno Meyer - SANSA - bmeyer@sansa.org.za Paida Mangara - SANSA - pmangara@sansa.org.za Willard Mapurisa - SANSA - wmapurisa@sansa.org.za Hugo de Lemos - SANSA - hdelemos@sansa.org.za Linda Kleyn - SANSA - lkleyn@sansa.org.za Michelle Denner - CD:NGI (National Geospatial Information) - mdenner@ruraldevelopment.gov.za Derek Clarke - CD:NGI - dclarke@ruraldevelopment.gov.za Cameron Williams - CD:NGI - cwilliams@ruraldevelopment.gov.za Stewart Bernard - CSIR-NRE -sbernard@csir.co.za Land Surface Temperature (LST) Judith Kruger - South African National Parks - judithk@sanparks.org Sally Archibarld - CSIR-NRE - sarchibald@csir.co.za
Summary of activity	In this activity the geolocation team will provide a quantitative evaluation of the absolute and relative geolocational accuracy of the OLCI sensor within a coastal and inland area of South Africa. The outcomes of this activity will be the provision of a quantative evaluation of the geolocation accuracy of the OLCI-L1b product. The accuracy will be expressed in terms of the arithmetic along-track and across-track means and standard deviations, the root mean square errors and the Euclidean norm of the RMSE. The validation activity of the LST team will provide components of the land surface energy budget on a continuous (20 minute intervals) basis from at least one well described subtropical savanna site. This data will contribute

<table>
<tr><td></td><td colspan="3">to validating the LST measurements recovered by the Sentinel-3 products in an extensive, but challenging land cover.

The LST will make use of the Skukuza fluxnet tower, together with the accompanying supplementary data available for this site. This could be expanded to include less comprehensive data available from two other sites within the savannah region of South Africa. The data will be used to compare to the accuracy of estimates of evapotranspiration recovered through remotely-sensed surface energy balance methods with the observed evaporative fluxes.</td></tr>
<tr><td>Expected results for S3</td><td colspan="3">GCP point collection (this data is already collected and housed at CD:NGI).

The base reference imagery which will be used will the aerial-photography imagery that is already in place and is used for the SANSA annual national mosaic production. This OLCI-L1b-CV-520 validation with external imagery may be further extended to include higher resolution imagery that is downloaded and acquired at the SANSA ground segment station (e.g. SPOT5, and planned SPOT6, Landsat 8).

For the LST activity, the following data will be collected in-situ at the fluxnet tower sites:

The Skukuza site will measure downwelling and upwelling SW and LST. These measurements take place at 22m, on a lateral pole extending 5 m from a tower, to get a good integration of the patchy observation footprint.

The LST instruments will be Apogee IR thermometers, appropriately shielded from direct solar radiation and with their body temperature monitored. Four will be used: two viewing tree canopies and two viewing soil/grass patches.

A phenocam takes daily images to allow the degree of canopy greenness to be gauged (these will be compared against LAI and FAPAR obtained from RS imagery).

The down-and upwelling radiometers will be Kipp & Zonen instruments, cleaned and dried monthly, and factory-calibrated before and after the measurement campaign.</td></tr>
<tr><td>Reference to S3 Cal/Val plan tasks</td><td colspan="3">OLCI-L1B-CV-500, SLSTR-LST-CV-200</td></tr>
<tr><td>Data requirements, data coverage and timeline</td><td>Sentinel-3 Product Names

OL2_LFR , OL2_LRR

SY_2_V10

SLSTR L1b</td><td>Data Coverage

Regional

Two study areas will be targeted in the geolocational study. The two areas provide contrast by being, inland vs coastal, high vs low altitude, inland water body vs coastline and primarily</td><td>Specific Timeline of Validations

Lifetime of Mission</td></tr>
</table>

	and L2 data.	flat vs mixed terrain. The first of these sites is centred over Cape Town (TL: 32°25'20.07"S, 17°39'27.79"E; BR: 34°51'41.67"S, 21°59'45.06"E). The inland area (TL: 25°38'12.83"S, 27°44'30.82"E; BR: 26°19'31.30"S, 28°45'10.11"E) The LST study will be primarily focused on the Skukuza Fluxnet tower site (-25.0197, 31.4969), but can be extended to include 2 addition sites based at Malopeni (-23.83254, 31.21436) and Nylsvley (-24.65 28.7).	
In situ validation data to be collected	In terms of LST, the team will use 6 US SURFRAD station data and about 20 CRN station data, which are all publicly available.		
Special data needs	**Need for special satellite acquisitions:** No		**Requested data timeliness:** tbc

Status assessment						
	Pre-launch	Commissioning Phase	Year 1	Year 2	Year 3 to year 7.5	Beyond nominal life
Schedule of proposed activities	LOW	LOW	LOW	LOW	MED	MED
Availability of funding	LOW	LOW	LOW	LOW	MED	MED
Availability of infrastructure	LOW	LOW	LOW	LOW	LOW	LOW
Availability of people	LOW	LOW	LOW	LOW	LOW	LOW

Sub group	S3VT Land (S3VT-L)
Validation Project Title	Pixel Classification Validation
Link to full Proposal	13760.pdf
Team Leader name, address and email	Carsten Brockmann Brockmann Consult GmbH carsten.brockmann@brockmann-consult.de
Support team-members names and emails	Kerstin Stelzer, kerstin.stelzer@brockmann-consult.de Michael Paperin, michael.paperin@brockmann-consult.de Grit Kirches, grit.kirches@brockmann-consult.de Professor Jan-Peter Muller, Mullard Space Science Laboratory email:jpm@mssl.ucl.ac.uk
Summary of activity	The Level 2 processing of OLCI as well as SLSTR include a pixel classification, which basically consists of identifying cloud free observation and assigning these to the land or marine processing branches (OLCI) or general L2 processing (SLSTR). The SYN processing branch, unfortunately, does not have a dedicated synergistic pixel classification but relies on the OLCI one. Further attributes assigned by a pixel classification are the coastline, snow and ice coverage. Cloud screening is considered by developers of Level 2 geophysical products as well as by data users as a very critical element for building time series, up to climate data records. Although a large effort has been undertaken by the MERIS, AATSR, OLCI and SLSTR algorithm developers to improve the pixel classification, scientists and other data users still criticise the current status, e.g. at the latest S3 Preparatory and MERIS AATSR WS in October 2012. The pixel classification developed for OLCI and SLSTR is an further development of the MERIS and AATSR algorithms, and they need to be carefully validated and probably improvements or at least tuning will be required to optimise them. The validation of the OLCI and SLSTR pixel classification will be done populating the PixBox database with data from these instruments (manual selection of 10 thousands of samples) and analysing contingency tables. The validation will be complemented by comparison with analysis of cloud camera data (Chilbolton and possibly others). Alternative methods (e.g. IdePix or StereoMapper) will be developed and tested against the standard methods and the PixBox validation dataset. The performance with respect to the different OLCI, SLSTR and SYN Level 2 will be investigated by collaboration with other S3VT members.

Expected results for S3	Outcome: 1) Quantitative validation of the pixel classification of OLCI and SLSTR (clouds and other classes) 2) Recommendations for improvement with respect to the different land and ocean Level 2 algorithms Note: This proposal is submitted to the Land Parameters Subgroup. However it is equally relevant for the Ocean Colour and the Sea Surface Temperature sugbroups.					
Reference to S3 Cal/Val plan tasks	OLCI-L2LRF-CV-400, OLCI-L2WLR-CV-500, SLSTR-L1B-CV-500					
Data requirements, data coverage and timeline	**Sentinel-3 Product Names** OLCI and SLSTR L1b and L2 products, as well as SYN products (probably also need the SYN L1c)	**Data Coverage** Global			**Specific Timeline of Validations** Lifetime of Mission	
In situ validation data to be collected						
Special data needs	**Need for special satellite acquisitions:** No			**Requested data timeliness:** tbc		

Status assessment						
	Pre-launch	Commissioning Phase	Year 1	Year 2	Year 3 to year 7.5	Beyond nominal life
Schedule of proposed activities	LOW	LOW	LOW	MED	MED	MED
Availability of	MED	MED	MED	HIGH	HIGH	HIGH

funding						
Availability of infrastructure	LOW	LOW	LOW	LOW	LOW	LOW
Availability of people	LOW	LOW	LOW	LOW	LOW	LOW

Sub group	S3VT Land (S3VT-L)		
Validation Project Title	OLCI Land Validation (OLCI-Land-Val)		
Link to full Proposal	13767.pdf		
Team Leader name, address and email	Nadine Gobron - European Commission - Joint Research Center nadine.gobron@jrc.ec.europa.eu Jadunandan Dash - University of Southampton - J.DASH@soton.ac.uk		
Support team-members names and emails	Ernesto Lopez Baeza - Universitat de Valencia - Ernesto.Lopez@uv.es Alessandro Cescatti - European Commission - Joint Research Center alessandro.cescatti@jrc.ec.europa.eu Carsten Gruening - European Commission - Joint Research Center carsten.gruening@jrc.ec.europa.eu Jean-Luc Widlowski- European Commission - Joint Research Center jean-luc.widlowski@jrc.ec.europa.eu		
Summary of activity	Independent strategy for making use of ground-based measurements over a large sample of vegetation types distributed around the globe together with radiative transfer modelling for assessing theoretical accuracies from both space and in-situ retrieval algorithms. The expected outcome is a step-by-step understanding of validation processes using past and current remote sensing products, based on equivalent land retrieval algorithms to the OLCI ones, towards a preparation plan for OLCI land products in which ground-based measurements for each site and comparisons protocols will be well defined in advance. The ground sites/measurements will serve as a core validation data set for other land products and will provide one of the largest ground validation dataset for medium resolution satellite land biophysical products.		
Expected results for S3	The expected results will be to define a robust strategy for making independent validation of OLCI land products using a large sample of measurements and sites, and second use outputs from past data, ie MERIS FR, for selecting the best sites for making actual land validation campaigns.		
Reference to S3 Cal/Val plan tasks	OLCI-L2LRF-CV-300		
Data requirements, data coverage and timeline	**Sentinel-3 Product Names** OL2_LFR, OL2_LRR,	**Data Coverage** Regional 1) Agricultural sites with three management styles (United States).	**Specific Timeline of Validations** Lifetime of Mission

	OL1_EFR, OL1_ERR	2) Semi-arid Mediterranean type land cover at the Valencia (39°34'14.64"N; 1°17'17.52"W) and the Alacant (38°27'5.60"N; 1° 3'52.40"W) Anchor Stations (Eastern Spain). 3) Pinus pinea at the San Rossore (Italy) (latitude: 43.73ºN, longitude: 10.30º E, altitude 5 meters a.s.l.) is active since '99. The site has been running on the standard Fluxnet protocol. 4) Gebesee site is at Nordhausen-Lauchstaedt, located at the intersection between the German states of Thuringia and Saxonia-Anhalt. The Lauchstaedt site belongs to the new TERENO-network (Terrestrial Environmental Observatories, www.tereno.net) of the German Helmholtz Association. Both, Uni Jena and UFZ. 5) The station ABC-IS (Atmosphere, Biosphere, Climate - Integrated Station) in Ispra is operational since June 2012. 6) The New Forest site, Southern England (UK) (50° 50' 52" N, 1° 34' 40" W) . 7) Mediterranean tree crops: orange orchards in the Catania plain, vineyards and olive trees in the south-western part of Sicily. 8) European agricultural site: The site is located in the Sele river plain of the Campania Region, (Lat. 40.52 N, Long. 15.00 E).	
In situ validation data to be collected	1) Agricultural sites with three management styles (United States): Each study site is equipped with an eddy covariance tower and meteorological sensors, with which the continuous measurements of CO2 fluxes, water vapour and energy fluxes were obtained every hour. Daytime estimates of ecosystem respiration (Re) were obtained from the night CO2 exchange-temperature relationship. The GPP was then obtained by subtracting Re from NEE. Absorbed PAR (APAR) was calculated using incoming PAR, PAR reflected by the canopy, transmitted through the canopy and reflected by the soil. Incoming PAR was measured with Li-Cor (Lincoln, NE) point quantum sensors pointing to the sky, and placed at 6 m from the ground. PAR reflected by the canopy and soil was measured with Li-Cor point quantum sensors pointing down, and placed at 6 m above the ground. PAR transmitted through the canopy was measured with Li-Cor line quantum		

	sensors placed at about 2 cm above the ground, looking upward; PAR reflected by the soil was measured with Li-Cor line quantum sensors placed about 12 cm above the ground, looking downward. Within each of the three study fields, six small (20 x 20 m) plot areas were established for performing detailed measurements of green and total leaf area index, green and total aboveground biomass. These intensive measurement zones (IMZ) represent all major occurrences of soil and crop production zones within each field. 2) Semi-arid Mediterranean type land cover at the Valencia and the Alacant Anchor Stations (Eastern Spain) Accurate estimation of vegetation stage is achieved through simple measurements over well chosen areas such as vegetation height, phenologic stage (number of leaves in vineyards/plant, etc) in some fields, digital photographs giving general information on the phenology (in orchards and vineyards), LAI measurements in vineyards, shrubs and matorral areas, alometric parameter sampling in tree areas to relate plant dimensions to vegetation characteristics and vegetation water content sampling. This site is a SMOS core validation site and was also the main site for GERB/CERES ground validation. Meteorological stations are deployed in two vineyard and matorral areas (including broadband radiation measurements) and soil moisture measurements are currently carried out at 10 different sites. One of the sites (MELBEX-IV, Mediterranean Ecosystem L-Band characterization Experiment) is currently holding the ELBARA-II L-band radiometer system, on loan from ESA for SMOS validation purposes, and the site also includes an eddy-covariance station to accurately monitor surface water balance, vegetation water content electronic sensors (dendrometers) and a testbed for intercomparison of soil moisture sensors. LAI and soil roughness measurements are also carried out at the site. The team also has a primary sun-tracking radiation station (shortwave –direct, reflected, diffuse- and longwave –upwelling, downwelling) with manual photometric atmospheric measurements and incoming PAR (Li.COR). In special campaigns, the team has also count on more specific radiometric and atmospheric measurements (reflectance, NDVI, CIMEL, etc.) from other Department research groups. 3) Pinus pinea at the San Rossore (Italy) is active since '99. The site has been running on the standard Fluxnet protocol: CO_2, H_2O and sensible heat fluxes, incoming and outgoing shortwave and longwave, incoming PAR, standard meteorology. Since last month, a new tower about 1 km W from the old one (on a different pine species). 4) Gebesee site is at Nordhausen-Lauchstaedt. The Lauchstaedt site belongs to the new TERENO-network (Terrestrial Environmental Observatories, www.tereno.net) of the German Helmholtz Association. Both, Uni Jena and UFZ, possess each an ASD Field Spectrometer 3 and the relevant illumination and laboratory equipment (www.eo.uni-jena.de/6633.0.html) to take, independently of weather conditions, state-of-the-art radiance

	samples. Field sampling includes crop type, phenological description, plant height and density, LAI, structural description of plant parts, destructive biomass sampling, description of field heterogeneities and photo documentation. Soil types have already been laboratory analysed, soil moisture will be measured using gravimetric samples and Time Domain Reflectometers. 5) The station ABC-IS (Atmosphere, Biosphere, Climate - Integrated Station) in Ispra is operational since June 2012. Measurements are made for meteorology, co2, h20 and o3 fluxes, shortwave and longwave incoming and outgoing, radiometric surface temperature, broadband albedo and PAR albedo. From Spring 2013, measurement of FaPAR, chlorphyll content and probably spectral albedo (high resolution spectroradiometer to estimate of Chl fluorescence in the O2 bands). 6) The New Forest site, Southern England (UK). There has been a series of ground measurement (LAI, chorophyll, FAPAR) and airborne hyperspectal data acquisitions that can be used as scaling up ground data and in radiative transfer modelling. 7) Mediterranean tree crops: The campaign region is divided into three test sites: study sites one and two are mainly characterized by vineyards (Vitis vinifera L.) and olive trees (Olea europaea L.) and they were located in Trapani province. Study site three was characterized by orange orchards (Citrus sinensis L.) and was located in the Catania Plain. There has been a series of ground measurement (LAI, chorophyll) and airborne hyperspectal data acqusitions which can be used as scalling up ground data and in radiative transfer modelling. 8) European agricultural site: The extent of the study site is 30 x 30 km with flat topography and the average field size is about 10 hectares. Both ground measurements and high resolution remote sensing data such as RapidEye were available for this site.

Special data needs	**Need for special satellite acquisitions:** No		**Requested data timeliness:** tbc

Status assessment						
	Pre-launch	Commissioning Phase	Year 1	Year 2	Year 3 to year 7.5	Beyond nominal life
Schedule of proposed activities	LOW	LOW	LOW	MED	MED	MED
Availability of	MED	LOW	LOW	MED	MED	MED

funding						
Availability of infrastructure	LOW	LOW	LOW	LOW	LOW	LOW
Availability of people	LOW	LOW	LOW	LOW	LOW	LOW

Sub group	S3VT Land (S3VT-L)
Validation Project Title	Consistency analysis between S3 SPOT VGT-like level2 products and Proba-V 1km resolution products
Link to full Proposal	13609.pdf
Team Leader name, address and email	Dr. Else Swinnen, VITO, Boeretang 200, B-2400 Mol, Belgium, else.swinnen@vito.be
Support team-members names and emails	Dr. Pieter Kempeneers, VITO, Boeretang 200, B-2400, Mol, Belgium, pieter.kempeneers@vito.be Wouter Dierckx, VITO, Boeretang 200, B-2400 Mol, Belgium, wouter.dierckx@vito.be Sara Verbeiren, VITO, Boeretang 200, B-2400 Mol, Belgium, sara.verbeiren@vito.be Roel Van Hoolst, VITO, Boeretang 200, B-2400 Mol, Belgium, roel.vanhoolst@vito.be
Summary of activity	The project addresses the data continuity needs for GMES services currently based on SPOT VGT P, S1 and S10 products. This will be done by assessing the consistency of the S3 SPOT VGT-like level2 products with the time series of SPOT VGT and Proba-V to enable the generation of Climate Data Records. The problem is approached in three ways: (1) Intercomparison of a time series covering a substantial area of data from Proba-V and the S3 SPOT VGT-like products, the former being the gapfiller between SPOT-VGT and S3 VGT synergy products, (2) For selected sites, a comparison of data from the two sensors to Proba-V simulated data, starting from APEX measurements as independent data set, (3) Assessing the statistical distribution of the S3 SPOT VGT-like products against the historical archive of SPOT VGT, and the impact of the differences on anomaly analysis.
Expected results for S3	The expected outcome includes (1) recommendations to the SPOT VGT user community on the impact of using S3 SPOT VGT-like products in the services currently using SPOT VGT, (2) reports on the methodology and the results, (3) the full data set used for validation, and (4) feedback from the VGT user community.
Reference to S3 Cal/Val plan tasks	YN-VGT-CV100

Data requirements, data coverage and timeline	**Sentinel-3 Product Names** SY_2_VGP SY_2_VG1 SY_2_V10	**Data Coverage** Global and Regional S10: global composites covering one full year. The global extent is necessary to assess the impact of land cover type, topography etc. on the consistency. The temporal extent of 1 year allows to study the dynamic range over the seasons. S1: A subset of Europe and Africa (-10°E-40°E, -35°N-75°N). Temporal extent: one S1 per month for 12 successive months. S1 and P: For the comparison to the simulated data, the relevant APEX sites (of sufficient size) will be used. The locations of these APEX campaigns are currently not known, but will be in Europe.	**Specific Timeline of Validations** Lifetime of Mission
In situ validation data to be collected	APEX airborne hyperspectral data cubes + the necessary data to pre-process the data cubes. An established set of Belgian land target areas, within the BELAIR vicarious verification test site, will be overflown yearly with airborne sensors and complemented with in-situ measurements to aid radiometric correction and to acquire thematic information. The yearly data sets obtained in the frame of these verification campaigns, will enable the S3VT Community to perform e.g. time series analysis.		
Special data needs	**Need for special satellite acquisitions:** No		**Requested data timeliness:** tbc

Status assessment						
	Pre-launch	Commissioning Phase	Year 1	Year 2	Year 3 to year 7.5	Beyond nominal life
Schedule of proposed activities	LOW	LOW	LOW	MED	MED	MED
Availability of funding	LOW	LOW	LOW	MED	MED	MED
Availability of infrastructure	LOW	LOW	LOW	LOW	LOW	LOW

Availability of people	LOW	LOW	LOW	LOW	LOW	LOW

Sub group	S3VT Land (S3VT-L)
Validation Project Title	Monitoring the State and Evolution of Cantabria's Marine and Terrestrial Ecosystems
Link to full Proposal	13753.pdf
Team Leader name, address and email	Ana - Silió Calzada - Environmental Hydraulics Institute (IH Cantabria/University of Cantabria) - silioa@unican.es Raúl - Medina Santamaría - IH Cantabria/University of Cantabria - medinar@unican.es
Support team-members names and emails	Alicia - Lavín Montero - Spanish Oceanographic Institute (IEO) - alicia.lavin@st.ieo.es José - Barquín Ortiz - IH Cantabria/University of Cantabria - barquinj@unican.es Araceli - Puente Trueba - IH Cantabria/University of Cantabria - puentea@unican.es Fernando - Mendez Incera - IH Cantabria/University of Cantabria - mendezf@unican.es Sonia - Castanedo - IH Cantabria/University of Cantabria - castanedos@unican.es Beatriz - Echávarri Erasun - IH Cantabria/University of Cantabria - echavarrib@unican.es Carmen - Rodriguez Puente - Spanish Oceanographic Institute (IEO) - carmen@st.ieo.es
Summary of activity	In terms of terrestrial ecosystems, classifying and mapping vegetation is an important technical task for managing natural resources as vegetation provides a base for all living beings and plays an essential role in affecting global climate change, such as influencing terrestrial CO_2 (Xiao et al. 2004). Vegetation mapping also presents valuable information for understanding the natural and man-made environments through quantifying vegetation cover from local to global scales at a given time point or over a continuous period. It is critical to obtain current states of vegetation cover in order to initiate vegetation protection and restoration programs (Egbert et al. 2002; He et al. 2005). Strong preference has been given to acquire updated data on vegetation cover changes regularly or annually so as to better assess the environment and ecosystem (Knight et al. 2006).
Expected results for S3	As previously mentioned, the major outputs of the project will be the development of specific procedures for the assessment of the chemical and the ecological status on coastal water bodies affected by submarine outfall discharges, as well as the characterisation of landscape legacies, based on the creation of temporal series of landscape dynamics from airborne and

	satellite images and the identification of landscape mosaics, which they will lead to the determination and analysis of temporal dynamics and spatial arrangement of land uses within the Cantabrian region. This will lead to several maps containing information related to the main indicators used for coastal zone management.					
Reference to S3 Cal/Val plan tasks	OLCI-L2LRF-CV-400					
Data requirements, data coverage and timeline	**Sentinel-3 Product Names** OL1_EFR, OL1_ERR *OL2_WFR, OL2_WRR (marine),* OL2_LFR, OL2_LRR	**Data Coverage** Regional The area of study will comprise the inland region of Cantabria, as well as the coastal fringe located between 43º45.0'N - 8º5.0' O and 42º30.0'N - 3º3.0' O.			**Specific Timeline of Validations** Lifetime of Mission	
In situ validation data to be collected	The team will be facing the acquisition of: - At canopy land reflectances. - In situ land cover identification, classification and mapping. - Vegetation spectral libraries.					
Special data needs	**Need for special satellite acquisitions:** No			**Requested data timeliness:** tbc		

Status assessment						
	Pre-launch	Commissioning Phase	Year 1	Year 2	Year 3 to year 7.5	Beyond nominal life
Schedule of proposed activities	LOW	LOW	LOW	MED	MED	MED
Availability of funding	LOW	LOW	HIGH	HIGH	HIGH	HIGH
Availability of infrastructure	LOW	LOW	LOW	LOW	LOW	LOW

Availability of people	LOW	LOW	LOW	LOW	LOW	LOW

Sub group	S3VT Land (S3VT-L)
Validation Project Title	Sunglint Calibration for SLSTR Fire Channels
Link to full Proposal	28372
Team Leader name, address and email	David Smith, RAL Space, dave.smith@stfc.ac.uk
Support team-members names and emails	Chris Mutlow, RAL Space, chris.mutlow@stfc.ac.uk Caroline Cox, RAL Space, Caroline.cox@stfc.ac.uk Tim Nightingale, RAL Space, Tim.nightingale@stfc.ac.uk
Summary of activity	he 3.7□m (F1) and 10.8□m (F2) fire channels have been included in the SLSTR instrument design to improve our current knowledge on the global distribution and impact of active fires. The condition for the instrument design is that the fire channel implementation shall not affect the quality of the SST products. The F2 Channel uses the same detector as S8 (10.8um channel) but with a separate gain and integration to provide increased dynamic range. The calibration approach is the same as for the S8 channel, i.e. using the on-board blackbodies to provide the radiometric gain and offset. At 3.7□m the radiance range for the fire channels is over several decades as illustrated in Figure 4. To achieve the wide dynamic range, the F1 channel employs a separate detector 'strip' adjacent to the nominal S7 detectors. The 1km footprint at Nadir is achieved by integrating over 70us. The detector is separated from the integrating capacitor by means of a MOSFET that is used to maintain a constant detector bias. A feature of this technology is that the detector photo-current has to be above a certain threshold to be detected. A consequence is that the F1 channel cannot measure scenes below 285K which has implications for the calibration. The cold on-board blackbody source is predicted to operate from 230K to 260K which means that it will not be detected by the F1 channel. Hence the F1 channel will only 'see' one blackbody and the on-board calibration can only provide an offset measurement. Currently there is no planned characterisation of the radiometric gain of the F1 channel over the full dynamic range. Comparisons against the nominal S7 channel will be performed up to scene temperatures of 330K. The baseline approach is to cross calibrate with F2 using 'hot' scenes.

Expected results for S3	Input for the Fire channels calibration			
Reference to S3 Cal/Val plan tasks	[SLSTR-L1B-CV-270].			
Data requirements, data coverage and timeline	**Sentinel-3 Product Names** SKSTR L1 and L2 SST	**Data Coverage** Regional Sunglint regions over oceans.		**Specific Timeline of Validations** Lifetime of Mission
In situ validation data to be collected	N/A			
Special data needs	**Need for special satellite acquisitions:** No			**Requested data timeliness:** tbc

Status assessment						
	Pre-launch	Commissioning Phase	Year 1	Year 2	Year 3 to year 7.5	Beyond nominal life
Schedule of proposed activities	LOW	LOW	LOW	MED	MED	MED
Availability of funding	LOW	LOW	MED	HIGH	HIGH	HIGH
Availability of infrastructure	LOW	LOW	LOW	LOW	LOW	LOW
Availability of people	LOW	LOW	LOW	LOW	LOW	LOW

12.5 Data requirements of the S3VT-L Sub-group

The data requirements from the Land Subgroup is summarised below. The requirements still need consolidation and maybe optimisation:

Product Type	ROI type	Number of projects (AO) per request type	Volume / cycle
OLCI Level 1 FR Land	Global Requests	3	23.1 TB
	Regional Request	1	
	Local requests	1	
OLCI Level 1 RR land	Global Requests	2	0.9 TB
	Regional Request	1	
	Local requests	1	
OLCI Level 2 FR Land	Global Requests	3	6.9 TB
	Regional Request	5	
	Local requests	1	
OLCI Level 2 RR Land	Global Requests	2	0.3 TB
	Regional Request	1	
	Local requests	4	
SLSTR Level 1 Land	Global Requests	4	96.6 TB
	Regional Request	1	
	Local requests		
SLSTR Level 2 Land	Global Requests	4	0.57 TB
	Regional Request	1 + 1 (SST)	
	Local requests	4	
SYN/VGT L2	Global Requests	3	24 TB
	Regional Request	3	
	Local requests	6	

The Sentinel-3 data that will be required by the Land Subgroup are quite heterogeneous:

- The top of atmosphere OLCI and SLSTR radiance and brightness temperature will be used to validate the cloud masking, the flagging, the geometry and the radiometric calibration and the fires.
- The SLSTR FRP products will be used to validate the Fires.
- The SLSTR LST will be used to validate the Land Surface Temperature.
- The OLCI OCTI and OGVI will be used to validate the FAPAR and the Chlorophyll index.
- The SYN will be used to validate the surface reflectance and the aerosol.
- The VGT like product will be used to validate the vegetation product.

The areas requested are also very different. Considering all products, there are 21 request for global products, 12 for regional and 1 7 for local. These requirements will be reviewed and probably optimised.

While the global request will probably be served by the PDGS directly or by the collaborative ground segment, the regional and local can be served by the MPC. Extraction tools like Felyx or MPMF will be used for extraction. Data will then be available on FTP server.

Ideally, test datasets for format checking and software updates should be available at least 6 months prior launch.

MERIS Full Resolution archive (fully on line since 2014) will be used also for testing (specially for OLCI Land product validation group).

It is also clearly stated that Level 3 (for vegetation, for VGT product, for LST and for surface reflectance) are essential as quality control and validation tool. Such Level 3 (monthly – tbc) shall be generated from MPC.

12.6 International context

Most of the work that will be performed by the land subgroup will be done in international context. For now, the international forums that dominate the debate are the CEOS WGCV Land Product Validation (LPV) and the CEOS WGCV IVOS.

The protocols both for vegetation validation products and LST validation are discussed in the CEOS LPV subgroup. We expect a strong interaction with LPV (in both sense, i.e. S3VT toward LPV and LPV toward S3VT).

The protocols and "best practises" for vicarious calibration are discuss in the CEOS WGCV IVOS, but also in the GSICS community.

The Land subgroup activities will be "coordinated" with CEOS activities.

12.7 Group synergy and common activities

During the 1st S3VT meeting it became quite clear that despite the heterogeneity of the tasks, there are possible synergy within the group in term of methodologies, approaches, campaign, and instruments but also in term of data and expertise exchanges: indeed, calibration is key for L2 validation, geometry impact all the products validation, cloud masking has a major impact on higher level product, vegetation play an important role for Land Surface Temperature and Fire (and vice et versa)…etc…So, communication and expertise exchanges will be essential for the success of the Land subgroup.

In term of validation, the steps can be expressed in generic manner:

- Validation against precise Fiducial Reference Measurements - FRM (few points but precise). Ideally FRM provide an absolute standard traceable to SI.
- Validation against Fiducial Reference Measurements (more points less precise)
- Validation against others sources (satellite comparison)
- Validation against Models (data assimilation rejection statistics, integrated model analyses…)
- Validation using Level 3 data: Statistical comparison between various L-3 from various sensors constitutes an extremely useful tool (mean, median, sd, bias, RMS…. for selected zones, transects, latitudinal bands, seasonal trends…) for a cross-validation of the products
- Validation using monitoring tools (statistic, trend, QC… etc.)

The LST group summarise this approach as follow (extracted from D. Ghent's presentation during 1st S3VT meeting):

- **Category A: Comparison of satellite LST with in situ measurements**

  This is the traditional and most straightforward approach to validating LST. It involves a direct comparison of satellite-derived LST with collocated and simultaneously acquired LST from ground- based radiometers.

- **Category B: Radiance-based validation**

  This technique uses top-of-atmosphere (TOA) brightness temperatures (BTs) in conjunction with a radiative transfer model to simulate ground LST using data of surface emissivity and a atmospheric profiles of air temperature and water vapour content.

- **Category C: Inter-comparison with similar LST products**

  A wide variety of airborne and spaceborne instruments collects thermal infrared data and many provide operational LST products. An inter-comparison of LST products from different satellite instruments can be very valuable for determining LST.

- **Category D: Time series analysis**

  Analysing time series of satellite data over a temporally stable target site allows for the identification of potential calibration drift or other issues of the instrument that manifest themselves over time. Furthermore, problems associated with cloud contamination for example may be identified from artifacts evident in the time series. Care must be taken in distinguishing between instrument-related issues such as calibration drift and real geophysical changes of the target site or the atmosphere.

In order to fully exploit this synergy it was recognised that a common campaign shall be organised during the first month after S3 launch where surface reflectance, LST, FAPAR, LAI, Chlorophyll content and Fire will be validated together. The campaign organisation shall start about 1 year before launch.

In addition, the need for comparing, inter-calibrating and characterising the ground instrumentations (for LST, but also for vegetation) has been clearly expressed. Activities to assess the quality of the canopy radiative transfer models that are used in the retrieval algorithm for biophysical essential climate variables (ECVs) (see JL Widlowski, http://qa4eo.org/) are also identified within the international land validation community.

The CEOS WGCV, together with the CEOS virtual constellation are setting up plans to organise these campaigns and exercises which shall involve a large participation from the Space Agencies.

The S3VT team could play a key role as a steering group.

This comparison process will have the aims of

- Evaluating differences in radiometry primary calibrations and performances under a range of simulated environmental conditions (lab based)
- Establishing formal SI-traceability and uncertainty budgets for participant blackbodies and radiometers
- Evaluating differences in field and operational conditions
- Establish community best practises for LST
- Following the QA4EO principles and in particular Guidelines: QA4EO-QAEO-GEN-DQK-004, version 4.0

12.8 Communication

A dedicated web-page for the S3VT communication has been created. The address is: http://s3vt.skytek.com/.

This web service includes a master page, and individual project pages with full wiki and blogging capability. All the presentations from the 1st S3VT workshop (Nov 2013) are available in the S3VT web pages.

In addition, the Cal/Val portal - http://calvalportal.ceos.org/ provide information of Cal/Val information and also provide a platform for data exchanges. OLIVE service is available from the Cal/Val portal.

The information on Cal/Val and protocols can be found in various CEOS pages: http://www.ceos.org/ and http://lpvs.gsfc.nasa.gov/.

Given the fact that the Land Subgroup is currently quite small (less than 15 projects), direct email exchanges will be also used to communicate.

S3VT Meeting will take place regularly, but in addition subgroup meeting (or teleconf) can be organised (together with big conference or CEOS meeting). The team can contribute to IOCR and other planned Sentinel-3 meetings as required or available.

Reporting should be done at meetings, via the web-site, and at the Quality Working Group as required or available. This should be a 2-way feedback.

For all matters or questions, the subgroup leader can be contacted:

Philippe.Goryl@esa.int

Hilary.Wilson@eumetsat.int

12.9 Overall S3VT-L schedule

Land Activity Schedule (Green: Planned and funded; Yellow: Planned and unfunded)							
IP	**Name**	**Pre-Launch**	**Commissioning Phase**	**Year 1**	**Year 2**	**Year 3-7.5**	**Beyond nominal time**
13714	Smith D.	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow
13588	Arino O.	Green	Green	Green	Green	Yellow	Yellow
13733	Ghent D.	Green	Green	Green	Green	Yellow	Yellow
13741	DiGiacomo P. and Yu Y.	Green	Green	Green	Green	Yellow	Yellow
13729	Knox N.	Green	Green	Green	Green	Yellow	Yellow
13760	Brockmann C.	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow
13767	Gobron N. and Dash J.	Yellow	Green	Green	Yellow	Yellow	Yellow
13609	Swinnen E.	Green	Green	Green	Yellow	Yellow	Yellow
13764	Silio Calzada A.	Green	Green	Yellow	Yellow	Yellow	Yellow
28372	Dave Smith	Green	Green	Green	Yellow	Yellow	Yellow

13 Summary and conclusions

This document presents the Sentinel-3 Scientific Validation Team Implementation Plan. It is a reference "handbook" for all those involved in scientific validation of the mission and interfaeing to the activities that are planned within the S3VT. The IP is of course, a living document and will be updated on a regular basis as the Sentinel-3 mission progresses.

14 Appendix-A Contact details of S3VT members

ID	S3VT Sub-group	Principal Investigator	PI Country	PI Institution	PI email
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13656	OceanColour	Meister Gerhard	USA	National Aeronautics and Space Administration	gerhard.meister@nasa.gov
13658	OceanColour	Thomas Schroeder	AUSTRALIA	CSIRO Land & Water	arnold.dekker@csiro.au
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15 Appendix-B Consolidated data required for S3VT Activities

The Sentinel-3 core products relevant to the Ocean Color group are:

Product Type	Level	Description	Size (GB/Orbit)
OL_0_EFR or *New L1A products*	*0 or* *1A*	*Full Resolution ISPs at Level-0 or, not yet defined, Level-1A ortho-geolocated and uncalibrated top of atmosphere radiances at all bands*	*L0 9.5 or* *L1A unknown*
OL_1_EFR	1B	Full Resolution ortho-geolocated and calibrated top of atmosphere radiances at all bands	28.549
OL_1_ERR	1B	Reduced Resolution ortho-geolocated and calibrated top of atmosphere radiances at all bands	2.337
OL_2_WFR	2	Full Resolution Water & Atmosphere parameters	28.366
OL_2_WRR	2	Reduced Resolution Water & Atmosphere parameters	2.371
New OL_3_W products	*3*	*Not yet defined, binned parameters spatially and temporally, daily, weekly, monthly, seasonal, annual and respective climatologies*	*unknown*
SL_1_RBT	1B	Ortho-geolocated and calibrated brightness temperatures and radiances	44.543
SL_2_WST	2	Level-2P Sea Surface Temperature (GHRSST format)	2.22
SR_2_WAT	2	1Hz and 20Hz Ku and C bands parameters (LRM/SAR), waveforms. Over open ocean, coastal areas, sea-ice and part of land within a certain distance from the coastline	0.139
SR_2_LAN	2	1Hz and 20Hz Ku and C bands parameters (LRM/SAR/PLRM), waveforms. Over land, coastal areas, land ice and inland water	0.09
MWR	*2*	*Water vapour product*	*unknown*
SY_2_SYN	2	Surface Reflectances and Aerosol parameters over Land in 30 bands from OLCI and SLSTR synergy in OLCI FR geometry	31.44

OLCI Level-2 parameters at RR and FR, OL_2_W (exclusive of auxiliary data)	Algorithms, ATBD: http://earth.esa.int./aos/S3VT
Normalized water-leaving reflectances (no BRDF)	BAC_reflectances_Oaxx (Baseline atmospheric correction – BAC)
Chlorophyll-a concentration in open ocean	CHL_OC4ME (BAC)
Chlorophyll-a concentration in coastal waters	CHL_NN (Neural network alternative atmospheric correction – AAC)
Total suspended matter concentration	TSM_NN (AAC)
Diffuse attenuation coefficient	KD490_M07 (BAC)
Coloured detrital and dissolved material absorption	ADG_443_NN (AAC)
Photosynthetically active radiation	PAR (based on Frouin et al.)
Aerosol optical depth by-product	T865 (BAC)
Aerosol Angstrom exponent by-product	A865 (BAC)
Integrated water vapour over ocean and land	IWV (Neural network)

The Sentinel-3 core products relevant to the SST group are:

Product Type	Level	Description	Size (GB/Orbit)
SL_1_RBT____	1	Brightness temperatures and radiances	45.60
SL_2_WCT____	2	Single L2 Sea Surface Temperature(s) from different channel combinations (D3, D2, N3, N2, N3R)	4.0
SL_2_WST____	2	Level-2P Sea Surface Temperature (GHRSST format)	2.3

The Sentinel-3 core products relevant to the altimetry group are:

Product Type	Level	Description	Size (GB/Orbit)
SRAL L1B and L1S	1	not yet defined	unknown
SR_2_WAT___	2	1Hz and 20Hz Ku and C bands parameters (LRM/SAR), waveforms. Over open ocean, coastal areas, sea-ice and part of land within a certain distance from the coastline	0.09
SR_2_LAN___	2	1Hz and 20Hz Ku and C bands parameters (LRM/SAR), waveforms. Over land, coastal areas, land ice and inland water.	0.07
OL_1_EFR	1	Full Resolution top of atmosphere	29.90
OL_1_ERR	1	Reduced Resolution top of atmosphere	1.70
OL_2_WFR	2	Full Resolution Water & atmosphere parameters	33.40
OL_2_WRR	2	Reduced Resolution Water & atmosphere parameters	2.10

The Sentinel-3 core products relevant to the Land group are:

Product Type	**ROI type**	**Number of projects (AO) per request type**	**Volume / cycle**
OLCI Level 1 FR Land	Global Requests	3	23.1 TB
	Regional Request	1	
	Local requests	1	
OLCI Level 1 RR land	Global Requests	2	0.9 TB
	Regional Request	1	
	Local requests	1	
OLCI Level 2 FR Land	Global Requests	3	6.9 TB
	Regional Request	5	
	Local requests	1	

OLCI Level 2 RR Land	Global Requests	2	0.3 TB
	Regional Request	1	
	Local requests	4	
SLSTR Level 1 Land	Global Requests	4	96.6 TB
	Regional Request		
	Local requests		
SLSTR Level 2 Land	Global Requests	4	0.57 TB
	Regional Request	1	
	Local requests	4	
SYN/VGT L2	Global Requests	3	24 TB
	Regional Request	3	
	Local requests	6	

16 Appendix-C Data access arrangements for the S3VT