MERIS ESL

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MERIS
Commissioning Plan

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Table of contents

1. Introduction

1.1 Purpose and Scope

This document is part of the ENVISAT commissioning plan, dedicated to the commissioning of the MERIS G/S, including the full in-flight calibration and re-characterisation of MERIS.

Its purpose is to define the detailed plan of all the activities required to achieve the validation of the level 1b and verification of level 2 processing, including : algorithms, auxiliary products, in-flight calibration, and instrument performance.

In addition, this document provides the relevant inputs to the MERIS mission planning to be prepared in advance to the launch for the whole commissioning period.

At high level, the plan provides the overall organisation and planning, the general rules for the validation procedures, the interface with all the external entities.

At detailed level, the plan specifies, down to the level of each unit task, the following items :

- objective
- schedule (duration, provisional start, prerequisites)
- procedure,
- outputs,
- involved team,
- task responsible.

Detailed Procedures are integrated in a software tool allowing dynamic real-time management of resources and planning.

1.1 Context

This plan is prepared in advance to the ENVISAT launch, assumed to be end of June 2001. It covers the period July 2001 until end of March 2002.

1.2 Intended Readership

This document is intended to the actors of the ENVISAT Commissioning, especially to the MERIS Commissioning team in charge of implementing the plan during the commissioning.

It assumes familiarity of the reader with ENVISAT context, thorough expertise of the MERIS mission, and the general and detailed principles of MERIS data processing.

1.3 Authors

This document is the outcome of a joint activity performed by a scientific and engineering group involved since the beginning in the specification of the MERIS processing algorithms. The team is led by ACRI with the support of Brockmann Consult (BC). The following institutes participate to the scientific team which is referred to as "Expert Support Laboratory" (ESL):

- the Free University of Berlin (FUB), Germany;
- the GKSS, Germany;
- the Laboratoire Interdisciplinaire des Sciences de l'Environnement (LISE), France;

- the Laboratoire de Physique et Chimie Marines (LPCM), France;
- the Plymouth Marine Laboratory (PML), United Kingdom.

In addition, contributions are also provided by the other members of the MERIS Commissioning team, especially from the ESA representatives.

1.4 Guide to the document

This document is structured as follows:

- the first chapter is the introduction, providing an overview of the objectives, scope and context, the intended readership and the authors ;
- the second chapter gives an overview of the organisation, team composition, individual roles of team members, plus an overview of the external interfaces ;
- chapter 3 gives an overview of the MERIS Commissioning activity, including objectives, milestones, task breakdown, logic, and schedule ;
- chapters 4 and 5 provide the detailed description of the commissioning tasks: calibration, verification;
- chapter 6 describes the MERIS data sets required by the commissioning tasks;
- chapter 7 describes the other data sets required by the commissioning tasks;
- chapter 8 lists all the tools required to properly achieve the identified tasks of the commissioning.
- chapter 9 gives a complete description of the methods, standards, rules, definitions, environment, database, tools that are applicable to the preparation of the plan, and later to its implementation ;

2. Commissioning Organisation

2.1 Overview

The MERIS commissioning is part of the general ENVISAT CAL/VAL coordinated by Guido Levrini (ESA /ESTEC).

Within the overall ENVISAT CAL/VAL, the MERIS commissioning is organised as 2 groups:

1. the MERIS calibration group, coordinated by Steve Delwart (ESA /ESTEC), later referred to as MERIS CAL
2. the MERIS /AATSR Validation Team (MAVT) coordinated by E. Attema (ESA /ESTEC), includes 4 sub-groups:
   - the MERIS L2 algorithms verification group, coordinated by C. Brockmann (BC), and later referred to as MERIS VER
   - the water products verification group, coordinated by J-P Huot (ESA /ESTEC)
   - the clouds and water vapour products group, coordinated by P. Goryl (ESA /ESRIN)
   - the vegetation products & atmospheric corrections over land, coordinated by M. Rast (ESA /ESTEC)

MERIS CAL and MERIS VER have been set up, composed of engineers and scientists members of ESA, ESL, ACRI-ST, BC, AO CAL/VAL project PI, GMV. There is one representative of the MERIS VER in the CAL team, and one representative of the MERIS CAL in the VER team. It should be noted that the activities of the water products verification group, the clouds and water vapour products group, the vegetation products & atmospheric corrections over land group, are outside the scope of this document.

2.2 Calibration Team

The Calibration Team consists of the following people:

- S. Delwart (ESA /ESTEC) as co-ordinator

Calibration, L1B processor verification group

- L. Bourg (ACRIST) as MERIS L1B and MESCAL expert
- G. Baudin (ASPI) as MERIS instrument contractor representative
- J-L Bezy (ESA /ESTEC) as MERIS instrument specialist
- J-P Huot (ESA /ESTEC) as MAVT representative
- NNN (GMV) as MERIS Operational processor representative
- A. Buongiorno (ESA /ESRIN) as representative for routine operations
- V. Fournier-Sicre (ACRIst, partly) as image analysis specialist
- C. Ngo Van Duc (ACRIst, partly) as software and auxiliary data configuration manager

Vicarious Calibration group

- O. Hagolle (CNES) as AO 119 responsible
- Smith (RAL) as AO410 responsible

- Zoutman (TPD-TNO) as diffuser BRDF expert
- Watts () as AO510 responsible
- P-Y. Deschamps (LOA) as AO591 SIMBAD responsible
- D. Antoine (LPCM) as AO332 BOUSSOLE responsible
- K-I. Itten (IPFZ) as AO318 responsible
- X. Briottet (ONERA-CERT)
- R. Santer (LISE)
- J. Fischer (FUB)

2.3 Verification Team

The following tables lists the Level 2 Algorithm Verification Team:

Name	Organisation	Main Role	Tel. (Office)	Fax (Office)	e-Mail address
Steven Delwart	ESA-ESTEC	ESA representative	(+31) 71 565 5790	(+31) 71 565 5617	sdelwart@estec.esa.nl
Philippe Goryl	ESA-ESRIN	ESA representative			Philippe.Goryl@esrin.esa.it
Jean-Paul Huot	ESA-ESTEC	ESA representative			jhuot@estec.esa.nl
Carsten Brockmann	BC	coordinator	(+49) 4152 87 1456	(+49) 4152 87 1455	brockmann@brockmann-consult.de
Francois Montagner	ACRI	CP planning	(+33) 4 92 967 510		fm@acri.fr
Vincent Fournier-Sicre	ACRI	data processing and evaluation	(+33) 4 92 967 514		vfs@acri.fr
Uwe Krämer	BC	data processing and evaluation	(+49) 4152 871457		kraemer@brockmann-consult.de
Frank Fell	Informus	data processing and evaluation	(+49) 30 46307303		fell@informus.de
Richard Santer	LISE	ESL*)			santer@loalit.univ-littoral.fr
David Antoine	LPCM	ESL*)			david@ccrv.obs-vlfr.fr
Gerald Moore	PML	ESL*)			g.moore@ccms.ac.uk
Jürgen Fischer	FUB	ESL*)	(+49) 30 838 566 63	(+49) 30 832 86 48	fischer@zedat.fu-berlin.de
Roland Doerffer	GKSS	ESL*)	(+49) 4152 871580	(+49) 4152 87 1596	doerffer@gkss.de
NN	GMV	operational processor update			
Francis Zagolsky	BOMEM	operational table update			gaetan.p.perron@ca.abb.com
Christophe Ngo Van Duc	ACRI	Software and Auxiliary data configuration	(+33) 4 92 967 515		chr@acri.fr

The team members from ESA act as interface to ESA, participate in the planning and support the conduction of the commissioning phase.

The role of the coordinator is to manage the work of the group, to moderate the internal discussions with the aim to come to a common understanding of the objectives and activities. Also, the coordinator acts as the interface to the other teams and the ESA. The coordinator participates actively in the planning and conduction of the commissioning phase.

The group of the "data processing and evaluation" experts is participating in the planning phase, and its members are the main actors in performing the tests during the commissioning phase.

The role of the ESL partners is

- to contribute to the CP planning, e.g. by defining test cases and procedures
- during the CP (7/2001 – 03/2002) to be review the verification work and contribute to the data analysis and problem solving during 2 periods of 2 weeks, each
- to contribute to the validation round table (02/2002) and validation workshop (03/2002)

The team member from BOMEM has the task to update operational data tables for the GS software. The team member from GMV is responsible for co-ordinating the updates of auxiliary data or the code of the GS software, when this becomes necessary.

2.4 External Interfaces

The activities described in this Plan will interface with the following other components of the ENVISAT commissioning below (see also figure 2.1):

1. MERIS IECF
2. SODAP
3. Mission Planning
4. ENVISAT PDS User Services
5. ENVISAT CAL/VAL
6. NILU ENVISAT database

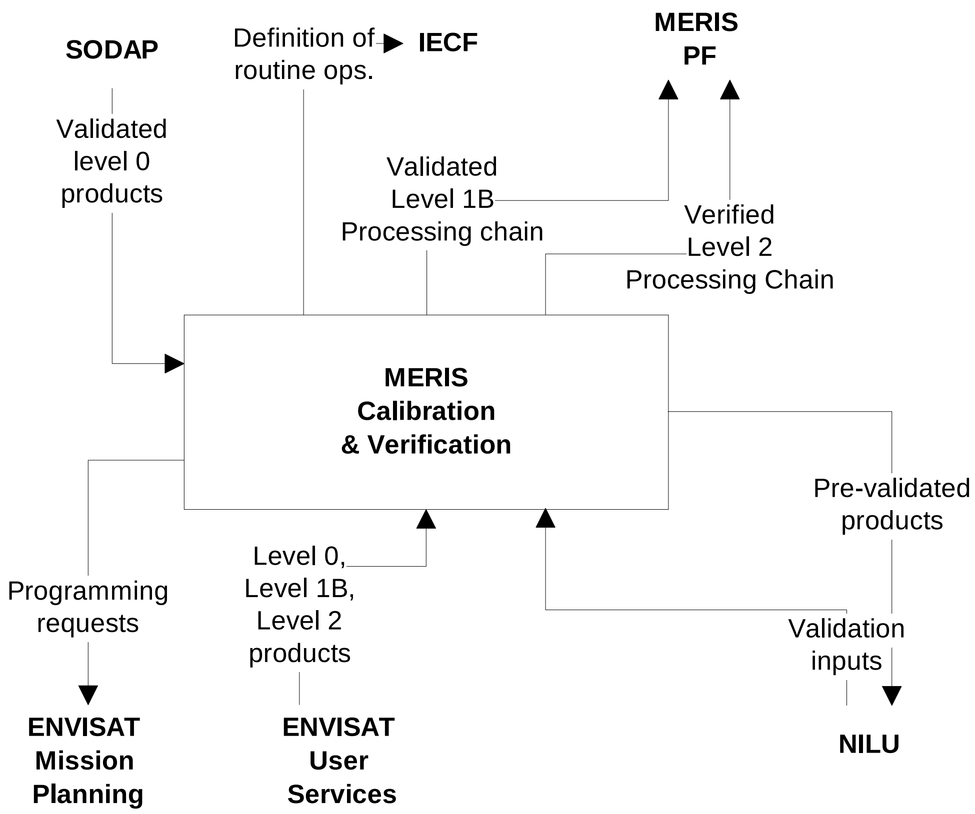


Figure 1: MERIS CalVal within the ENVISAT CalVal

This section briefly describes the contents of each interface in terms of input data (to CalVal), output data (from CalVal), events.

2.4.1 MERIS IECF

The MERIS IECF hosts software tools able to support analysis of on-ground and in-flight characterisation data, and to produce updated auxiliary data files. It also provides general interface to the ENVISAT PDS.

2.4.1.1 Inputs

Auxiliary data files from archive, MERIS calibration monitoring reports, CFI outputs.

2.4.1.2 Outputs

Auxiliary data files to be archived (pre-launch and tuned versions).

2.4.1.3 Events

TBD

2.4.2 SODAP

The Switch On and Data Acquisition Phase (SODAP) consist in the early in-orbit instrument operational check out and will include the following activities:

- Satellite and PEB switch on
- MERIS ICU switch on from LAUNCH mode to STANDBY mode

- Equipment switch on to HEATER mode
- STABILISATION mode checks
- Measurement data checks with CM in shutter position
- Functional checks
- Measurement data checks with nominal CM operation
- Handover to Calibration/Validation Phase

The SODAP activities related to MERIS are described in RD5.

2.4.2.1 Inputs

- Dark Calibration mode Measurement data sets with CM in shutter position
- Observation mode Measurement data sets with CM in shutter position
- Calibration sequence mode Measurement data sets with nominal CM operation
- Observation mode Measurement data sets with nominal CM operation

2.4.2.2 Outputs

- Recommendation for nominal OCL switch value
- Problem reports whenever MERIS data header fields show incorrect behaviour

2.4.2.3 Events

- Instrument Source Packets release
- Handover to Calibration/Validation Phase

2.4.3 Mission Planning

The ENVISAT Mission Planning is assumed to be in charge of the configuration and data acquisition macro-commands uplinked to MERIS.

2.4.3.1 Inputs

Reporting on MERIS operational and health status
TBD

2.4.3.2 Outputs

Instrument configuration and data acquisition macro-command requests, according to data set requirements (see §6 below)

2.4.3.3 Events

TBD

2.4.4 ENVISAT PDS MERIS-PF

The MERIS Processing Facility is the entity in charge of systematically processing MERIS science data.

The interface with the MERIS PF shall be supported by GMV representatives within the CAL and VER groups. The IECF supports communication with the MERIS-PF.

2.4.4.1 Inputs

Problem reports from the MERIS PF may have to be handled as a matter of emergency.

2.4.4.2 Outputs

Updated auxiliary data files
Solutions to reported problems

2.4.4.3 Events

TBD

2.4.5 ENVISAT PDS User Services

The ENVISAT PDS User Services is the entity in charge of handling MERIS data orders. The IECF supports communication with the User Services.

2.4.5.1 Inputs

Level 0 Data (TBC)
Level 1 Data
Level 2 Data

2.4.5.2 Outputs

Data orders according to data set requirements

2.4.5.3 Events

TBD

2.4.6 ENVISAT CAL/VAL

The ENVISAT CAL /VAL manages and co-ordinates the ENVISAT commissioning activities at system level.

2.4.6.1 Inputs

TBD

2.4.6.2 Outputs

Reporting

2.4.6.3 Events

TBD

2.4.7 NILU ENVISAT database

The NILU /ENVISAT Data Base is the repository for data exchange with the MERIS Cal/Val AO investigators.

2.4.7.1 Inputs

In situ data in HDF format

2.4.7.2 Outputs

Match-up and vicarious calibration results or comments (TBC)

2.4.7.3 Events

TBD

3. Commissioning Description

3.1 Objectives

The objective of the MERIS CAL is to achieve at end of the commissioning phase (6 months after launch) a complete MERIS calibration, including :

- Full in-flight calibration and re-characterisation of MERIS
- Complete verification of the level 1b processor, tuning of all parameters, regeneration of all L1b auxiliary products
- Upgrade of the level 1b processor
- Definition of routine calibration operations (to start at the end of the commissioning phase for the whole duration of the mission)

The objective of the MERIS VER is to achieve by the Validation Workshop (9 months after launch) a preliminary MERIS Level 2 algorithm verification.

Each test will be defined for a single algorithm – or a combination of them - leading to an information, which contributes substantially to one or more Level 2 products. These are the geophysical products, such as surface reflectances, algal pigment index etc, and the flags, e.g. the surface classification flags or the confidence flags. A test may include the processing and analysis of several MERIS scenes.

A test is successfully passed when it has been proven that

1. the surface classification is correct
2. the algorithm generates products which values are in the expected range *e.g.* pigment index between 0.01 and 30 mg/m^3 or water vapour between 0 and 70 g/m^2;
3. the algorithm yield values which are in accordance with common rules, *e.g.*, higher pigment index at the coasts than in the Sargasso sea or higher water vapour in the tropics than above the Sahara (plausibility);
4. the algorithm generates images which have no visual artefacts, *e.g.* tiling, stripes, which were not detected in the Level 1b product;
5. the algorithm generates meaningful product confidence flags PCDs, *i.e.* flags which are raised in normally expected cases;
6. the formatting algorithm writes all products in the right place in the product file.

3.2 Milestones

A number of key events mark the decisive progress to be made during MERIS commissioning. They are summarised in table below and described in sections 3.2.1 and following below.

Milestone name	Planned date	Abbreviation
ENVISAT Launch	15/07/01	L
Source packet release	L+2 weeks	ISPR
SODAP handover to Cal Team	L+5 weeks	SHCT
L1B release to Cal /Ver Team	L+10 weeks	CTR
L1B release to MAVT	L+20 weeks	CVTR
L1B ready for Public release	L+26 weeks	PRR
Calibration Workshop	L + 6 months	CW
Validation Workshop	L + 9 months	VW

3.2.1 Milestone: ENVISAT Launch

3.2.1.1 Description

The ENVISAT launch marks the start of the time scale for all Cal Val activities.

3.2.1.2 Planned Date

July 15-31, 2001 (TBC)

3.2.1.3 Prerequisites

N /A

3.2.1.4 Decisions

N /A

3.2.2 Milestone: Source Packet Release from SODAP

3.2.2.1 Description

The release of source packet is the event in SODAP which signals the start of Cal Ver activities in this plan.

3.2.2.2 Planned Date

See SODAP Plan

3.2.2.3 Prerequisites

N /A

3.2.2.4 Decisions

N /A

3.2.3 Milestone: SODAP Handover To Cal/Ver Team

3.2.3.1 Description

At the end of SODAP, control of the Instrument operations falls in the hand of the Cal Ver Team.

3.2.3.2 Planned Date
See SODAP Plan

3.2.3.3 Prerequisites
SODAP activities completed

3.2.3.4 Decisions
N /A

3.2.4 Milestone: Level 1B Release to Cal/Ver Team

3.2.4.1 Description
This milestone marks that sufficient initial characterisation and trouble-shooting have been achieved to allow fine characterisation by the Cal Team and initiation of the Level 2 processor troubleshooting by the Ver Team.

3.2.4.2 Planned Date
L + 10 weeks

3.2.4.3 Prerequisites
Baseline Instrument configuration defined and verified (Tasks C-1.9.1 and C-1.2.4)
Level 1b troubleshot (Task C-3.1)

3.2.4.4 Decisions
Setting of instrument “Alignment Parameters”
Setting of OCL On or Off
Selection of diffuser BRDF model
Setting of NL Correction On or Off
Setting of Stray Light Correction On or Off
Setting of instrument bands and gains for routine operations.

3.2.5 Milestone: Level 1B Release to MAVT members

3.2.5.1 Description
This milestone marks that sufficient fine characterisation and Level 1b processor tuning have been achieved to allow Level 2 algorithms verification by the Ver Team and the use of the Level 1b products by the MAVT members for validation studies.

3.2.5.2 Planned Date
L+20 weeks.

3.2.5.3 Prerequisites
Validated System Configuration (Task C-1.9.2)
Level 1b processor tuning (Task C-3.2)

3.2.5.4 Decisions

Update of CTI and Auxiliary data fields

3.2.6 Milestone: Level 1B Public Release Readiness

3.2.6.1 Description

This milestone marks that the objectives of the Commissioning phase have been reached in terms of characterisation of MERIS and of performance of the MERIS system (instrument + ground processor).

3.2.6.2 Planned Date

L + 26 weeks

3.2.6.3 Prerequisites

Synthesis (task C-4)

3.2.6.4 Decisions

Release of Level 1b products to the user community
Release of supporting information

3.2.7 Milestone: ENVISAT Calibration Workshop

3.2.7.1 Description

The ENVISAT Calibration Workshop is organised by ESA to summarise the results of the ENVISAT Commissioning phase

3.2.7.2 Planned Date

See AD3

3.2.7.3 Prerequisites

See AD3

3.2.7.4 Decisions

See AD3

3.2.8 Milestone: ENVISAT Validation Workshop

3.2.8.1 Description

The ENVISAT Validation Workshop is organise by ESA to summarise the results of ENVISAT Validation.

3.2.8.2 Planned Date

See AD3

3.2.8.3 Prerequisites

See AD3

3.2.8.4 Decisions

See AD3

3.3 Task Breakdown

3.3.1 Top Level

The MERIS commissioning covered by this Plan is split into two main activities, further detailed in sections 4 and 5 below:

1. the CAL activity
2. the VER activity

The CAL activity will start shortly after the switch-on of MERIS managed by the SODAP team, and last until L +6 months. The VER phase will start at about L + 2 months and last until L +9 months.

The Level 2 algorithm verification phase is broken down into two major tasks: V-1 for trouble shooting during the first few weeks after preliminary release of the Level 1b data, and V-2, which includes all tests to verify the proper functioning of the Level 2 algorithms according to the objectives (see §3.1 above). At the end of V-1, the Level 2 data will be released to the other CalVal teams.

The following figures present the global breakdown of the MERIS commissioning and the product data flow between these tasks.

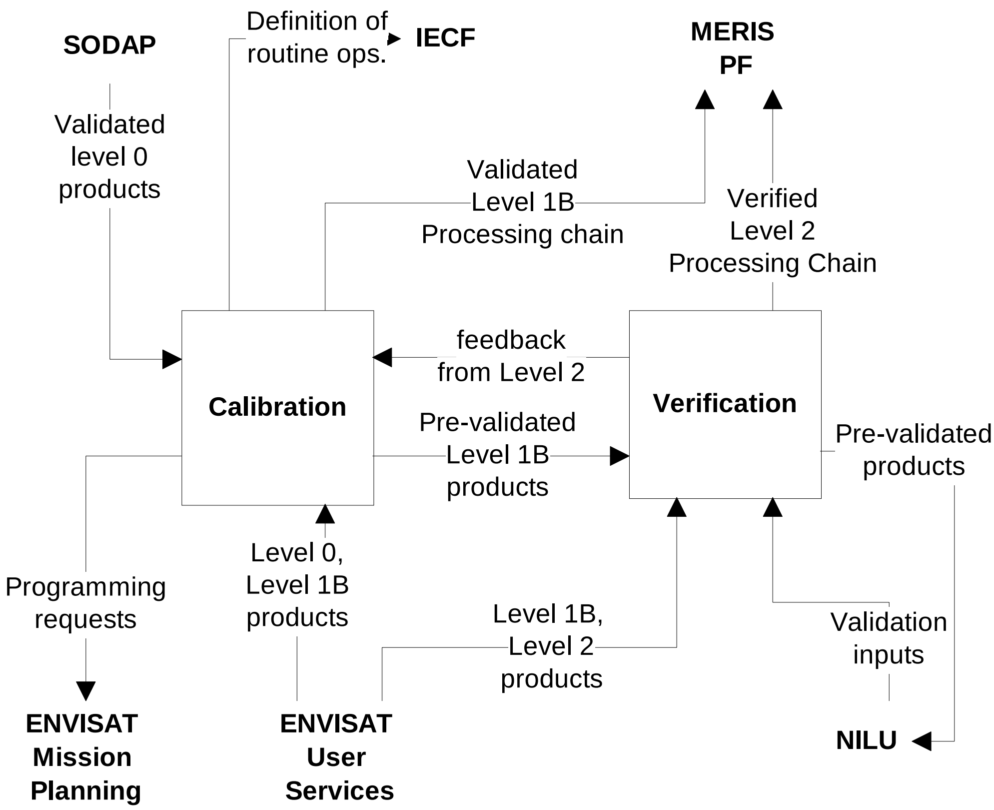


Figure 2: Top level breakdown

3.3.2 Detailed

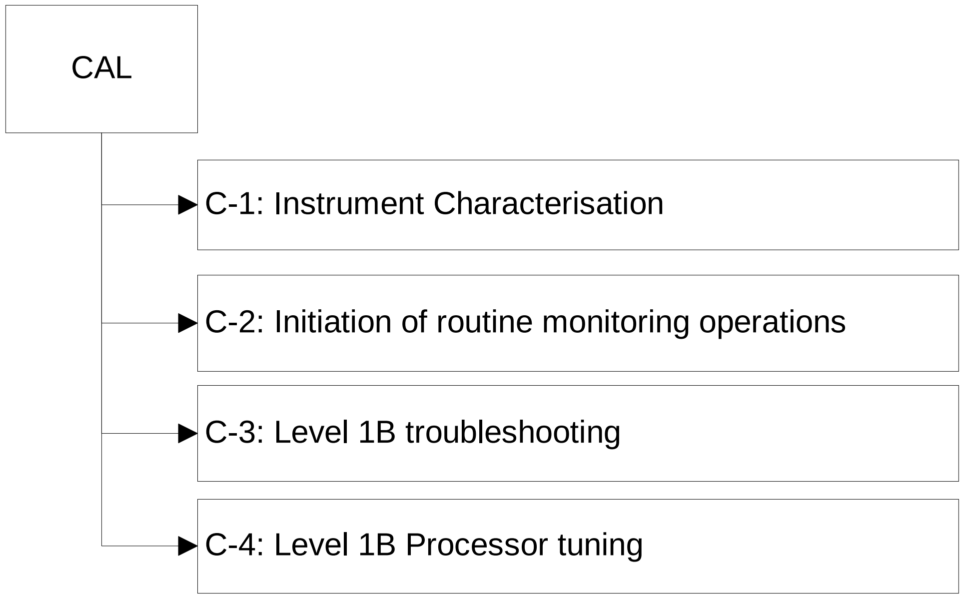


Figure 3: Breakdown of CAL activity

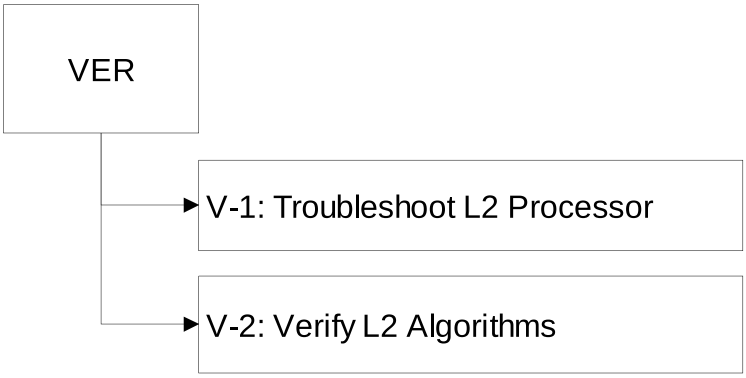


Figure 4: Breakdown of VER activity

C-1: Instrument Characterisation

- C-1.1 Dark signal characterisation
- C-1.2 Radiometric characterisation
- C-1.3 Charaterisation of the response non-linearity
- C-1.4 Characterisation of instrument straylight
- C-1.7 Spectrometric response characterisation
- C-1.8 Pointing characterisation

C-2: Initiation of routine monitoring operations

- C-2.1: Radiometric calibration monitoring
- C-2.2: Spectrometric calibration monitoring

C-3: Level 1B optimisation

- C-3.1 Level 1b troubleshooting
- C-3.2 Parameters optimisation
- C-3.3 Processor Upgrade
- C-3.4 Prototype processor managment
- C-3.5 Transfer to IPF

C-4: Calibration synthesis

- C-4.1 Radiometric characterisation synthesis
- C-4.2 L1B processor tuning synthesis
- C-4.3 Transfer to operational G/S

Figure 5: Second Level Breakdown of CAL activity

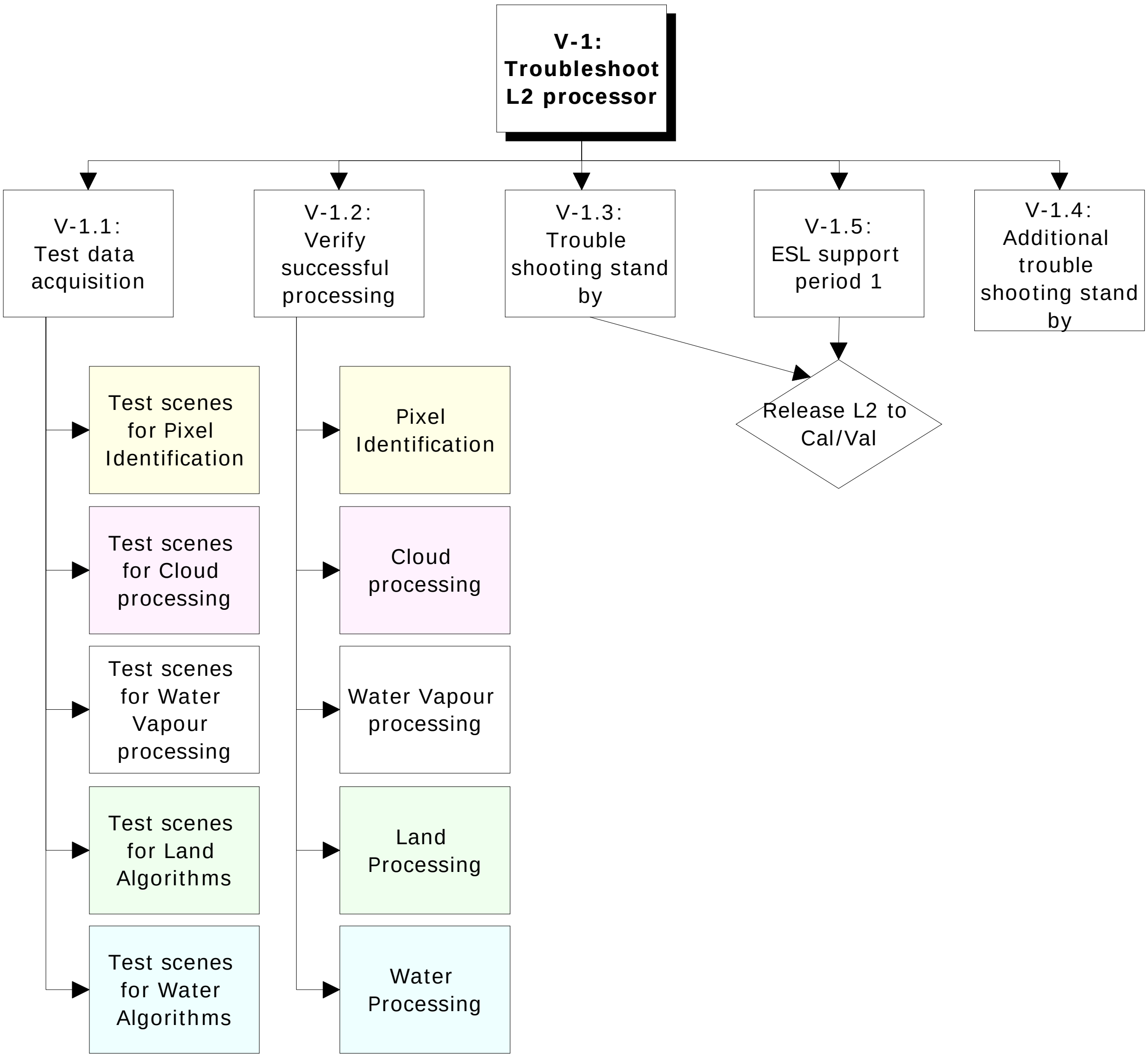


Figure 6: Breakdown of V-1 activity

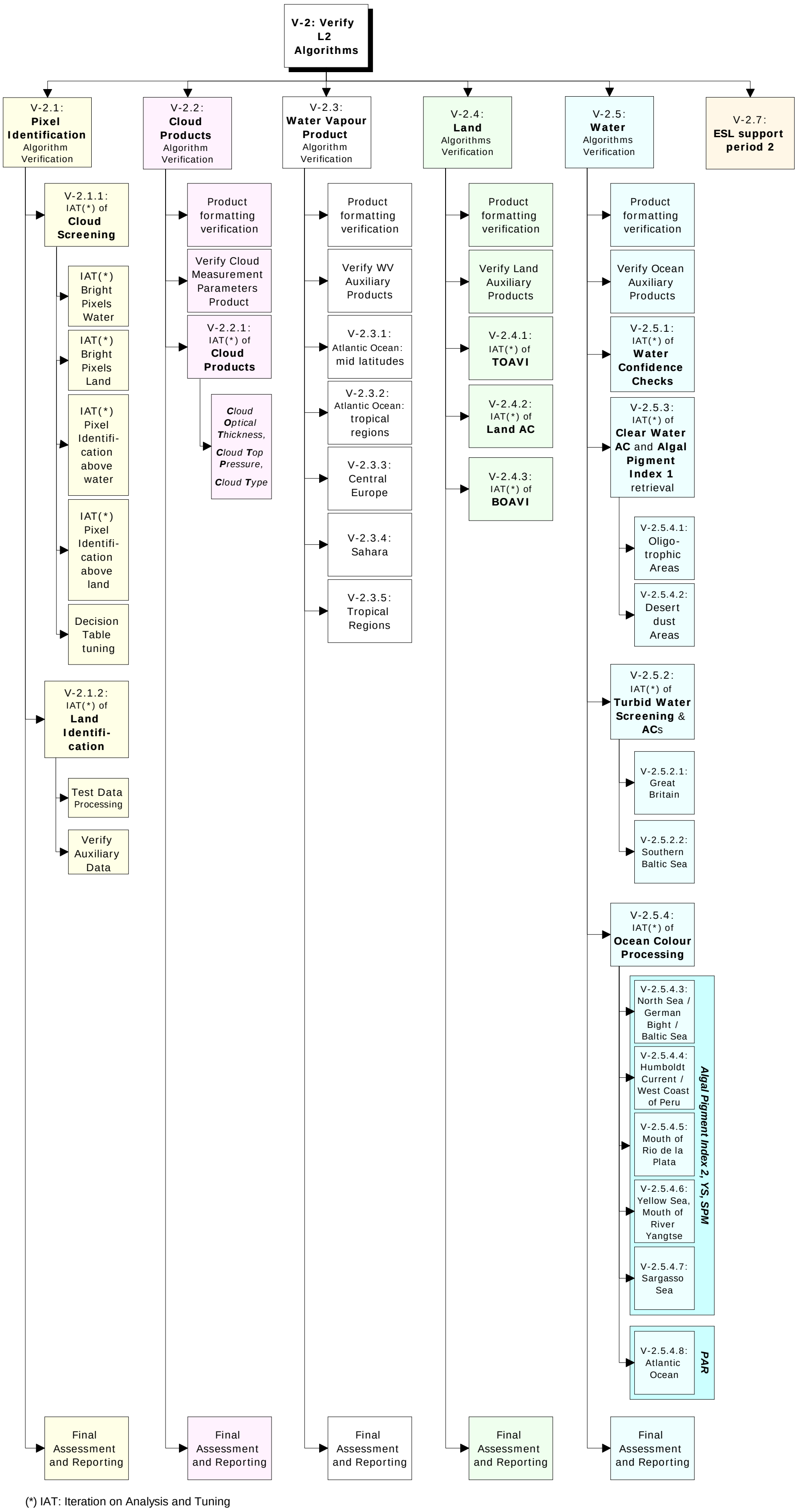


Figure 7: Breakdown of V-2 activity

3.3.3 Task Summary

Table below provides a list of the commissioning tasks with a brief comment on its objectives or content.

Task	Contents
Calibration	
C-1 Instrument characterisation	
C-1.1 Dark signal characterisation	determination of the instrument response in the absence of an illumination signal.
C-1.1.1 Acquisition: Dark Signal In-flight Characterisation	
C-1.1.2 Analysis: Dark Signal In-flight Characterisation	
C-1.1.3 Analysis: Coarse Dark Signal Orbital Behaviour	
C-1.1.4 Acquisition: Baseline Verification of Dark Signal Orbital Behaviour	
C-1.1.5 Analysis: Verification of Dark Signal Orbital Behaviour	
C-1.1.6 Acquisition: Final Dark Signal Orbital behaviour	
C-1.1.7 Analysis: Final Verification of Dark Signal Orbital Behaviour	
C-1.2 Radiometric characterisation	determination of the instrument response in the presence of an illumination signal.
C-1.2.1 Acquisition: Coarse Radiometric Characterisation	
C-1.2.2 Analysis: Coarse Radiometric Characterisation	Coarse calibration coefficients for pre-launch instrument settings
C-1.2.3 Acquisition: Baseline Verification	
C-1.2.4 Analysis: Baseline Verification	Coarse calibration coefficients for tuned instrument settings
C-1.2.5 Acquisition: Fine Radiometric Characterisation	
C-1.2.6 Analysis: Fine Radiometric Characterisation	Fine calibration coefficients for tuned instrument settings
C-1.2.7 Acquisition: Validation of Radiometric Characterisation	
C-1.2.8 Analysis: Validation of Radiometric Characterisation	Consolidated calibration coefficients for tuned instrument settings
C-1.3 Characterisation of the response non-linearity,	Determination of the instrument non-linear response in the presence of an illumination signal.
C-1.3.1 Coarse non-linearity analysis	Assessment of NL from Earth observations

Task	Contents
C-1.3.2 Acquisition: Non-linearity Characterisation	
C-1.3.3 Analysis: Non-linearity Characterisation	In-flight NL characterisation using stable target (diffuser plate)
C-1.4 Characterisation of the instrument stray light,	Determination of the instrument response to stray light from a bright source over a dark one.
C-1.4.1 Analysis: Verification of the Stray Light Correction	Assessment of SL from Earth observations
C-1.4.2 Acquisition: Stray light Characterisation	
C-1.4.3 Analysis: Stray light Characterisation	In-flight SL characterisation using image processing
C-1.7 Spectrometric Calibration	Determination of absolute wavelength at specific locations on CCDs
C-1.7.1 Acquisition: Preliminary Spectrometric Characterisation using Diffusers	
C-1.7.2 Acquisition: Coarse Spectrometric Characterisation using Diffusers	
C-1.7.3 Analysis: Coarse Spectrometric Calibration using Diffusers	Analysis of pre- to post-launch evolution of doped diffuser absorption features
C-1.7.4 Acquisition: Coarse Spectrometric Calibration Using Geophysical Targets	
C-1.7.5 Analysis: Coarse Spectrometric Calibration Using Geophysical Targets	Absolute wavelength measurements using atmospheric spectral features, first assessment
C-1.7.6 Acquisition: Consolidated Spectrometric Calibration	
C-1.7.7 Analysis: Consolidated Spectrometric Calibration	Absolute wavelength measurements using atmospheric spectral features and diffuser plates, consolidation
C-1.8 Pointing characterisation	
C-1.8.1 Coarse Pointing Verification	Determination of first level mis-pointing through coastline matching
C-1.8.2 Platform Attitude Characterisation	Fine mis-pointing determination, ENVISAT system task, based on MERIS data
C-1.9 MERIS Configurations Synthesis	Optimisation of instrument settings for the mission
C-1.9.1 Synthesis: Baseline MERIS Configuration	
C-1.9.2 Synthesis: Validated System Configuration	

Task	Contents
C-2 Initiation of the routine monitoring operations	
C-2.1 Radiometric calibration monitoring	
C-2.2 Spectral response monitoring	
C-3 Level 1B optimisation	
C-3.1 Level 1B troubleshooting	
C-3.1.1 Geo-location	
C-3.1.2 Mode transitions	
C-3.1.3 Radiometric correction	
C-3.1.4 Stray light correction	
C-3.1.5 Annotations	
C-3.1.6 Flagging	
C-3.2 Parameters Optimisation	
C-3.3 Processor Upgrade	
C-3.4 Prototype Processor Management	
C-3.5 Transfer to IPF	
C-4 Calibration Synthesis	
C-4.1 Radiometric Characterisation Synthesis	
C-4.2 L1B Processor Tuning Synthesis	
C-4.2.1 L1B Processor Parameters	
C-4.2.2 L1B Processor Algorithms	
C-4.3 Transfer to Operational G/S	
Verification	
V-1: Troubleshoot L2 Processor	inspection of all products to verify that processing has not failed
V-1.1 Test data acquisition	selection of a few RR test scenes that include water, land and clouds
V-1.2 Verify successful processing	inspect systematically all L2 products
V-1.3 Troubleshooting stand-by	correct obviously wrong tables/thresholds if necessary
V-1.4 Additional troubleshooting stdby	
V-1.5 ESL Support period 1	
V-2: Verification of L2 Algorithms	systematically verification of all L2 processing algorithms
V-2.1: Pixel Identification Algorithm Verification	
V-2.1.1: Cloud screening	
V-2.1.2: Land Identification	
V-2.2: Cloud Products Algorithm Verification	
V-2.2.1 IAT Cloud Albedo	
V-2.2.2 IAT Cloud Optical Thickness	

Task	Contents
V-2.2.4 IAT Cloud Type	
V-2.3: Water Vapour Algorithm Verification	
V-2.3.1 IAT WV above water	
V-2.3.2 IAT WV above land	
V-2.3.3 IAT WV above cloud	
V-2.4: Land Algorithms Verification	
V-2.4.1 Iteration on Analysis and Tuning of TOAVI	
V-2.4.2 Iteration on Analysis and Tuning of Land AC	
V-2.4.3 Iteration on analysis and tuning of BOAVI processing	
V-2.5: Water Algorithms Verification	
V-2.5.1 IAT Water Confidence Checks	
V-2.5.2 IAT Turbid Water Screening and AC	
V-2.5.3 IAT Clear Water AC	
V-2.5.4 IAT Ocean Colour Processing	
V-2.6: Product Formatting Verification	verification of MPH, SPH, LADS and GADS

Table 1: Task Summary

3.4 Logic

3.4.1 Calibration Logic

The logic of the Calibration activity is intended to provide, at the time of the ENVISAT Calibration workshop, a good initial in-flight characterisation of the MERIS instrument performance, implemented in reliable Level 1B products. Thus we identify two main streams of activities, running in parallel with constant interactions:

- in-flight characterisation;
- level 1B processor optimisation;

These activities are organised in three main Phases:

- Phase 1: Establishing a Baseline system configuration
- Phase 2: Completing the In-flight characterisation
- Phase 3: Validating the system configuration

A schematic calendar of the activities is shown in table below.

Phase	Planned Start date	Duration	End Milestone
1	L+ 3 wk	10 wk	Release of L1B to Cal & Ver Teams

2	L+ 13 wk	10 wk	
3	L + 23 wk	6 wk	Calibration Workshop

Note that this calendar is a summary, and the end of a phase for a given activity need not be simultaneous with the other activities.

Characterisation activities are further divided according to the model they are concerned with:

- Dark signal
- Radiometric &diffuser BRDF
- Non-linearity
- Stray light
- Spectrometric
- Geometric

The detailed tasks description is also divided into data acquisition tasks and analysis tasks.

3.4.1.1 Phase 1: Establishing a Baseline Configuration

The activities during this Phase 1 aim at establishing a baseline configuration of the "system" made of the MERIS instrument, the MERIS L1b processor, and all the models and assumptions which they use.

3.4.1.1.1 Characterisation Activities

The Characterisation activities in phase 1 (hereafter labelled "coarse") aim at:

1. confirming the choice of the main models and assumptions in the system;
2. identifying a baseline configuration of the instruments and its main parameters.

They shall be based on data acquired during SODAP to the maximum extent, with additional critical measurements.

The sequence of tasks is as follows:

1. analyse in-flight characterisation and observation data taken during SODAP;
2. perform and analyse additional characterisation measurements as needed;
3. derive baseline settings for MERIS;
4. perform initial calibration of MERIS with baseline settings;

3.4.1.1.2 Optimisation Activities

The Optimisation activities in phase 1 aim at troubleshooting the L1B processor, establishing the capability to produce stable L1B products.

3.4.1.1.3 Milestones

At the end of Phase 1, Level 1B products become available to the Cal & Ver teams.

3.4.1.1.4 Contingencies

The main contingencies in this phase are:

1. a key assumption or model is not verified. In this case, an emergency action must be taken to identify a preliminary fix or work-around, which allows to continue the planned work, and to plan the work for updating the instrument or processing model.

2. The characterisation activities are the critical path to phase 2 (phase 2 can start characterisation even if optimisation is late)

3.4.1.2 Phase 2

The activities during this Phase 2 aim at detailing in flight the characterisation of the MERIS instrument. During this phase, nominal MERIS operations with the baseline configuration (acquire observation data continuously in RR and upon request or following the background mission scenario in FR, perform radiometric calibration sequence every 2 weeks) are complemented by dedicated characterisation operations.

3.4.1.2.1 Characterisation Activities

The characterisation activities in phase 2 (hereafter labelled "fine") aim at refining the parameters of the instrument models. Characterisation is based on routine and dedicated in-flight characterisation measurements, and on acquisition and analysis of specific Earth target observations.

Routine gain characterisation and monitoring are initiated.

3.4.1.2.2 Optimisation Activities

The optimisation activities in phase 2 aim at tuning the parameters of the L1B processor.

3.4.1.2.3 Milestones

Upon TBD, Level 1B products become available to the MAVT members.

3.4.1.2.4 Contingencies

Re-definition of the models and /or algorithms shall be pursued and tested during this phase, in the event that the baseline models are insufficient.

3.4.1.3 Phase 3

The activities during this Phase 3 aim at validating the system, updated from all knowledge collected in the previous phases.

3.4.1.3.1 Characterisation Activities

The characterisation activities in Phase 3 aim at validating the baseline configuration, updated according to the results of Phase 2.
Specific characterisation data will be acquired and compared with initial values
Model parameters will be compared with outputs from MAVT Vicarious calibration activities
End to end performance: accuracy, noise will be estimated

3.4.1.3.2 Optimisation Activities

The optimisation activities aim at bringing to operational status all algorithm and parameter updates resulting from the characterisation and previous optimisation activities.

3.4.1.3.3 Milestones

Upon completion of the optimisation activities, the Level 1B products are ready to become public.

3.4.1.3.4 Contingencies

Updates may have not been fully validated at the end of phase. If not critical their implementation should be delayed until operational processor update and re-processing. Else L1B products release is delayed.

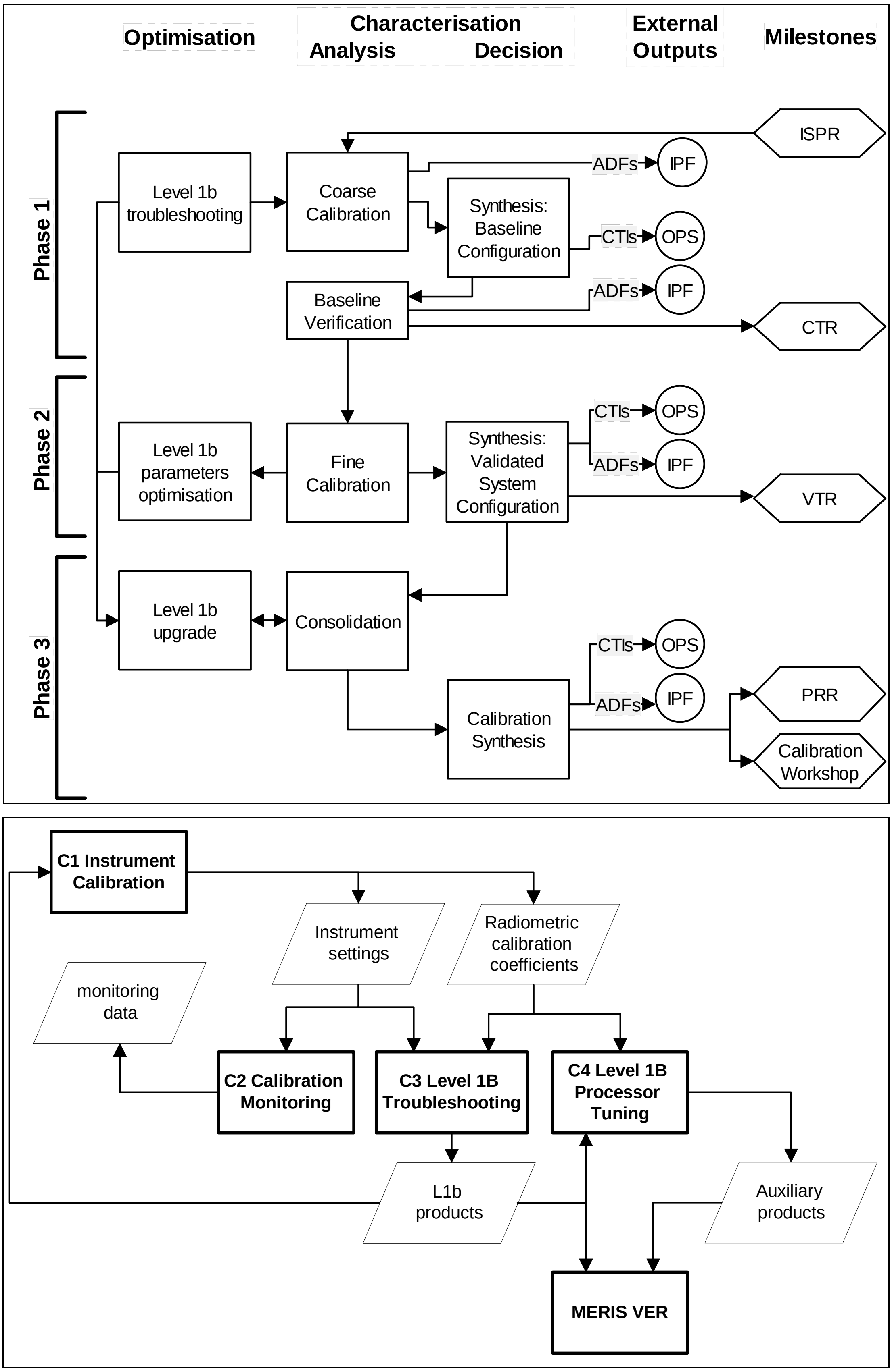


Figure 8: Calibration Logic: timeline (above) and data flow (below)

3.4.2 Verification Logic

3.5 Schedule

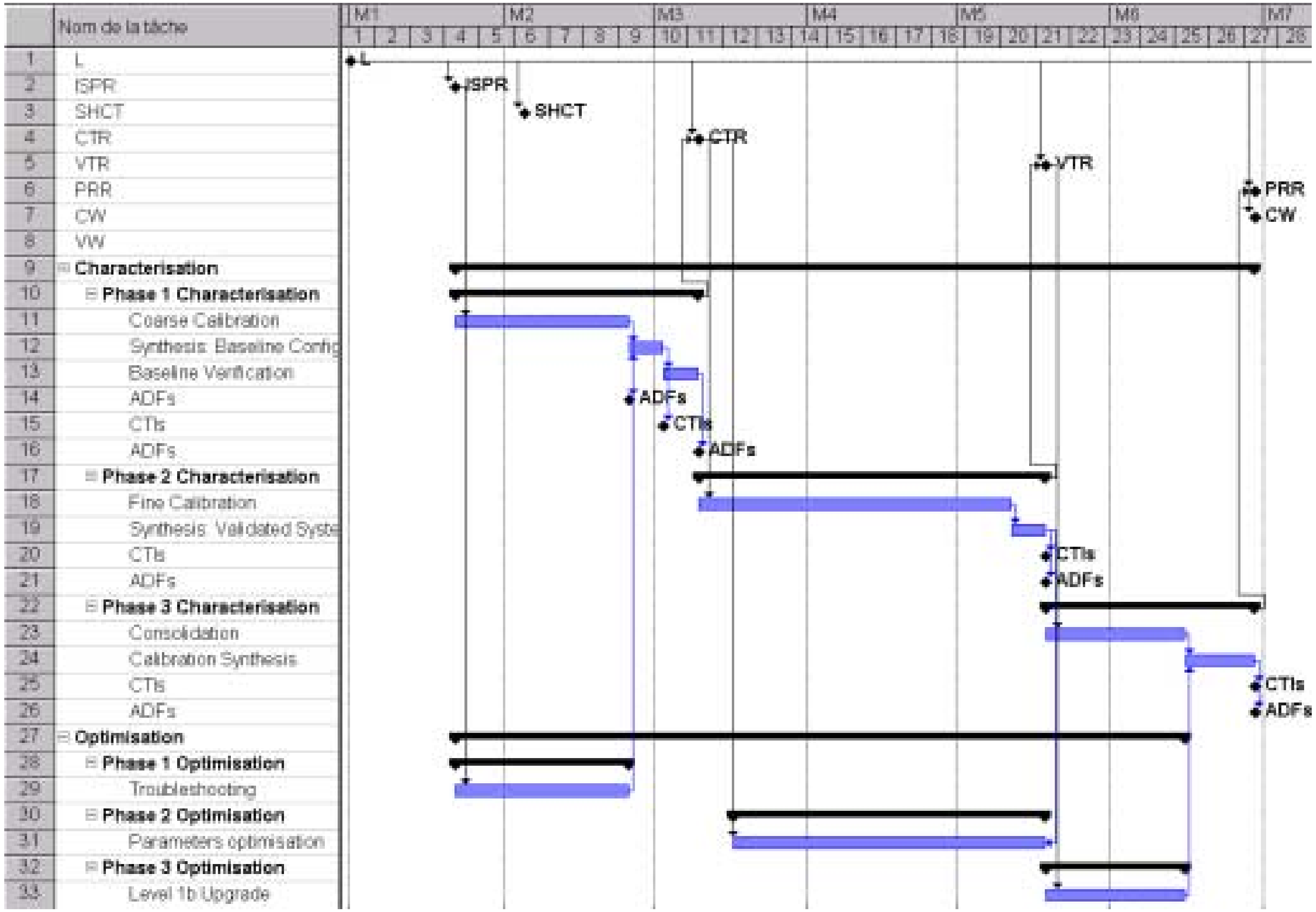


Figure 9 Gantt Chart for MERIS CAL

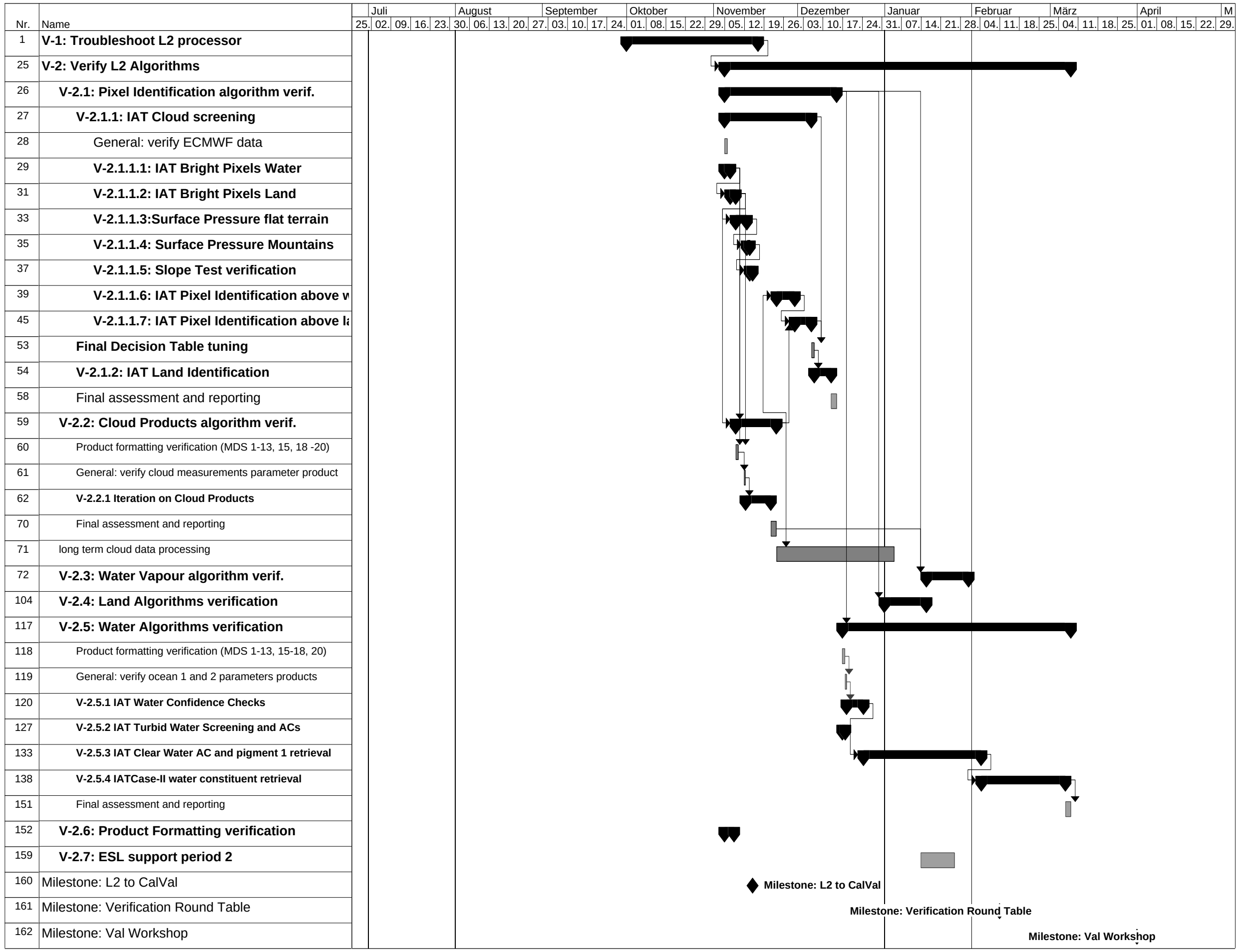


Figure 10: Gantt chart for MERIS VER (Top level)

4. Calibration Tasks Description

4.1 C-1.1: Dark signal characterisation

4.1.1 Objectives

To determine the instrument offset, the variation of this offset with time (orbit scale, long time scale), and the behaviour of related instrument ancillary data: coarse offsets, blank pixels.

4.1.2 Activities

The task responsible shall co-ordinate the activities of the sub-tasks and ensure execution of the plan.

4.1.3 Breakdown

Phase 1:

- C-1.1.1: Acquisition: Coarse Dark Signal
- C-1.1.2: Analysis: Dark Signal In-flight Characterisation
- C-1.1.3: Analysis: Dark Signal Orbital Behaviour
- C-1.1.4: Acquisition: Verification of Dark Signal Orbital Behaviour
- C-1.1.5: Analysis: Verification of Dark Signal Orbital Behaviour

Phase 3:

- C-1.1.6 Acquisition: Final Dark Signal Orbital Behaviour
- C-1.1.7 Analysis: Final Dark Signal Orbital Behaviour

4.1.4 Outputs

All outputs, data and reports, from the sub-tasks.

4.1.5 Prerequisites

ISP release by SODAP activity (see SODAP plan).

4.1.6 Pass /Fail Criteria

All sub-tasks shall pass.

4.1.7 Contingencies

N/A

4.1.8 Responsible

S. Delwart

4.2 C-1.1.1 Acquisition: Dark Signal In-flight Characterisation

4.2.1 Objectives

Acquire Dark signal in-flight characterisation data during or just after SODAP
Acquisition of dark current characterisation data during SODAP for analysis of along-orbit variation and assessment of OCL behaviour

4.2.2 Activities

Acquisition of CCD dark current map in observation,
Acquisition of Dark current in calibration with ASPI configuration
Acquisition of Dark current OCL=ON in observation with SciLo configuration,
Acquisition of Dark current OCL=OFF in observation with SciLo configuration,
Acquisition of Dark current OCL=ON in calibration with SciLo configuration,
Acquisition of Dark current OCL=OFF in calibration with SciLo configuration,

4.2.3 Prerequisites

See SODAP Plan.

4.2.4 Instrument Data

Shutter_DarkMap_Obs_i, (i=1,11): 1000 frames of Level 0 raw data times 11 band sets to map the whole CCDs with a spectral resolution of 4 CCD lines.
Shutter_ASPI_Obs: 1000 frames of Dark Current observations using ASPI AIT settings.
Shutter_SciLo_Obs_OCLON: 3 orbits, 2 of about 50 minutes (going into the eclipse), the third one of nominal duration, followed by
Shutter_SciLo_Rad_OCLON: at the end of the 3rd orbit.
Shutter_SciLo_Obs_OCLOFF: 3 orbits, 2 of about 50 minutes (going into the eclipse), the third one of nominal duration, followed by
Shutter_SciLo_Rad_OCLOFF: at the end of the 3rd orbit.

4.2.5 Auxiliary Data

N/A

4.2.6 Input reference data or document

N/A

4.2.7 Required tools and configuration

N/A

4.2.8 Archive requirement

All In-flight characterisation data

4.2.9 Processing

N/A

4.2.10 Duration

See SODAP Plan

4.2.11 Output Data

Shutter_DarkMap_Obs_(i=1,11) Level 0
Shutter_ASPI_Dark Level 0
Shutter_SciLo_Obs_OCLON: Level 0
Shutter_SciLo_Obs_OCLOFF: Level 0
Shutter_SciLo_Rad_OCLON: Level 0
Shutter_SciLo_Rad_OCLOFF: Level 0

4.2.12 Pass /Fail Criteria

Successful acquisition of Instrument data

4.2.13 Contingencies

TBD

4.2.14 Task Report Content

Date and summary of the data acquisition operations.
Description of the output data.

4.2.15 Responsible, team, location

Responsible: S. Delwart
Team: SODAP,
Location: ESTEC

4.3 C-1.1.2 Analysis: Dark Signal In-flight Characterisation

4.3.1 Objectives

Comparison of Dark in-flight characterisation with on-ground AIT data (DarkMap observations, ASPI calibration)

4.3.2 Activities

Comparison of in-flight Dark Map with CCD dark current map from EEV AIT.
Comparison of in-flight ASPI Dark Current data with Dark Current from ASPI AIT.
Checking of consistency of dark signal between ASPI and SciLo configurations

4.3.3 Prerequisites

Successful completion of C-1.1.1
Availability of AIT data.

4.3.4 Instrument Data

Shutter_DarkMap_Obs_i (i=1,11)
Shutter_ASPI_Obs
Shutter_SciLo_Obs_OCLOFF
All the above from task C-1.1.1

4.3.5 Auxiliary Data

N /A

4.3.6 Input reference data or document

DarkMap AIT reference data and documentation
ASPI Dark AIT reference data and documentation

4.3.7 Required tools

MERISVIEW Level 0 visualisation and extraction functions
IDL for DarkMap construction, ASPI data extraction, comparison between DarkMap, AIT data, SciLo data (procedures TBD)

4.3.8 Archive requirement

All AIT reference data shall be appended to In-flight characterisation data

4.3.9 Processing

Reconstruct dark map:

1. compute the mean and standard deviation, column-wise, of the 1000 frames in each Shutter_DarkMap_Obs_i, (i=1,11). Detect outliers.
2. append the mean dark signal from the 11 sequences to build a set of 5 x 740 column x 165 microbands

Extraction and comparison of in-flight *vs* on-ground characterisation data.
Any divergence from on-ground characterisation will be recorded and discussed in the test report.

4.3.10 Duration

3 Days:

1. Extraction and comparison of Shutter_DarkMap_Obs_i and Shutter_ASPI_Obs data with AIT reference data
2. Extraction and comparison of Shutter_SciLo_Obs_OCLOFF and Shutter_ASPI_Dark data
3. Report preparation

4.3.11 Output Data

In-flight dark current map
In-flight vs on-ground dark current map differences
In-flight Dark Calibration with ASPI bands
In-flight vs on-ground differences for Dark Calibration with ASPI bands
In-flight Dark Calibration with SciLo configuration
Qualitative comparison of ASPI and SciLo Dark Calibrations
Inputs for Bad Pixel Map building.

4.3.12 Pass /Fail Criteria

N /A

4.3.13 Contingencies

N /A

4.3.14 Task Report Content

1. Reference of all archive data used during analysis
2. Reference of all analysis results
3. Plots, statistics of output data
4. Discussion of differences between on-ground and in-flight characterisation.
5. Discussion on differences and similarities between Dark Calibrations in ASPI and SciLo settings

4.3.15 Responsible, team, location

Responsible: S. Delwart
Team: SODAP team, S. Delwart, L. Bourg (TBC)
Location: ESTEC

4.4 C-1.1.3 Analysis: Coarse Dark Signal Orbital Behaviour

4.4.1 Objectives

To analyse the behaviour of the instrument in shutter configuration along the orbit and determine the SQADS thresholds, and the correction parameters for Gain and Offset.

4.4.2 Activities

Assessment of the shutter efficiency (dark current level variation when satellites enters eclipse).
Analyse the instrument’s orbital behaviour with and without OCL, assess best OCL setting based on noise estimation.
Determine coarse along-orbit offset and gain correction parameters,
Determine blank pixel thresholds
Determine coarse offset thresholds

4.4.3 Prerequisites

Successful completion of C-1.1.1

4.4.4 Instrument Data

Shutter_SciLo_Obs_OCLON
Shutter_SciLo_Obs_OCLOFF
Shutter_SciLo_Rad_OCLON
Shutter_SciLo_Rad_OCLOFF
All the above from task C-1.1.1

4.4.5 Auxiliary Data

N /A

4.4.6 Input reference data or document

PO-TN-CGI-CF-0037 IECF MERIS DPM

4.4.7 Required tools and configuration

IECF_ME_DPM function “F1”
IECF_ME_DPM function “F5”
IECF_ME_DPM function “F3”
IECF_ME_DPM function “F6”
MERISVIEW and TBD IDL routines (TBC)

4.4.8 Archive requirement

All instrument data

4.4.9 Processing

1) Shutter efficiency: Display time variation of dark current along the orbit, check visually if a level drop occur when satellite enters the eclipse.
2) Comparison of Observation vs. Calibration data, comparison of Calibration acquired during the Dark part and the Radiometric part of the calibration sequence.

3) OCL setting:
   It shall be based on a) noise estimate b) fixed pattern noise c) along orbit variation range.
   Extract several sub-sets of TBD lines at TBD time interval, from the L0 data sets Shutter_SciLo_Obs_OCLON and Shutter_SciLo_obs_OCLOFF.
   Compute along-track power spectrum for each column, each band of each sub-set.
   Estimate noise power by summing up the power spectrum density at frequencies above TBD. If one of the settings has a meaningfully lower noise power than the other it shall be selected.
   Otherwise, find peaks in the frequency spectrum. for each column. If peaks are not randomly distributed from one column to another this is an evidence of some fixed pattern noise. If an OCL setting shows meaningfully less fixed pattern noise than the other it should be selected.
   Otherwise, compute mean and standard deviation of along-orbit variation range. If an OCL setting has a lower standard deviation it should be selected.
   Otherwise select OCL OFF.
4) Along-orbit variation correction coefficients: run IECF function F26
5) Blank pixels and Coarse Offsets thresholds: run IECF functions F1 & F5

4.4.10 Duration

5 days:
1. Analysis of shutter efficiency
2. Analysis of along-track power spectrum
3. Analysis using F26.
4. Analysis using IECF F1 & F5
5. Report preparation (2 days)

4.4.11 Output Data

IECF outputs for F1 & F26.
SQADS thresholds values
Dark signal harmonic variation coefficients

4.4.12 Pass /Fail Criteria

N/A

4.4.13 Contingencies

- If the instrument is NOT “dark” at Shutter_SciLo_Rad location, move the Shutter_SciLo_Rad into the eclipse.

4.4.14 Task Report Content

Discussion of instrument darkness results at Shutter_SciLo_Rad location in the orbit.
Discussion of Shutter_SciLo_Obs_OCLON versus Shutter_SciLo_Obs_OCLOFF and recommendation, with supporting evidence, for the nominal OCL setting
Discussion of Shutter_SciLo_Rad with respect to Shutter_SciLo_Obs
Discussion of orbital variations and corresponding correction parameters values
IECF reports from F5 & F26.
Discussion of SQADS threshold values.

4.4.15 Responsible, team, location

Responsible: S. Delwart
Team: SODAP
Location: ESTEC

4.5 C-1.1.4 Acquisition: Baseline Verification of Dark Signal Orbital Behaviour

4.5.1 Objectives

Acquisition of dark current harmonic variation at the end of Phase 1 to verify the stability of the dark current orbital behaviour.

4.5.2 Activities

Acquisition of Dark current OCL=ON in observation,
Acquisition of Dark current OCL=OFF in observation,
Acquisition of Dark current OCL=ON in calibration,
Acquisition of Dark current OCL=OFF in calibration,

4.5.3 Prerequisites

Successful completion of C-1.1.3
Sufficient time (as much as possible before CTR, TBC) has elapsed since previous characterisation.
Successful completion of C-1.9.1 – Synthesis: Baseline configuration

4.5.4 Instrument Data

Shutter_SciHi_Obs_OCLON: 3 orbits, 2 into the eclipse followed by
Shutter_SciHi_Rad_OCLON: at the end of the 3rd orbit.
Shutter_SciHi_Obs_OCLOFF: 3 orbits, 2 into the eclipse followed by
Shutter_SciHi_Rad_OCLOFF: at the end of the 3rd orbit.

4.5.5 Auxiliary Data

N /A

4.5.6 Input reference data or document

N /A

4.5.7 Required tools

N /A

4.5.8 Archive requirement

All instrument data

4.5.9 Processing

Acquire and transfer instrument data

4.5.10 Duration

1 day.

4.5.11 Output Data

Shutter_SciHi_Obs_OCLON: Level 0

Shutter_SciHi_Obs_OCLOFF: Level 0
Shutter_SciHi_Rad_OCLON: Level 0
Shutter_SciHi_Rad_OCLOFF: Level 0

4.5.12 Pass /Fail Criteria

Successful acquisition of Instrument data.

4.5.13 Contingencies

TBD

4.5.14 Task Report Content

Description of acquisition operations
Description of instrument data

4.5.15 Responsible, team, location

Responsible: S. Delwart
Team: Cal/Val
Location: ESTEC (TBC)

4.6 C-1.1.5 Analysis: Verification of Dark Signal Orbital Behaviour

4.6.1 Objectives

To verify the stability of dark current harmonic variation at the end of the Phase 1, verify if conclusions of task C-1.1.3 remain valid with SciHi configuration and generate the first fine Dark Offsets Coefficients LUTs for Phase 2.

4.6.2 Activities

Verification of dark signal temperature correction coefficients
Verification of coarse offset orbital behaviour (if OCL_ON chosen),
Verification of blank pixel thresholds
Verification of coarse offset thresholds
Generation of fine Dark Offsets Coefficients LUTs, with SciHi settings.

4.6.3 Prerequisites

Successful completion of C-1.1.4

4.6.4 Instrument Data

Shutter_SciHi_Obs_OCLON
Shutter_SciHi_Rad_OCLON
Shutter_SciHi_Obs_OCLOFF
Shutter_SciHi_Rad_OCLOFF

4.6.5 Auxiliary Data

Output Data from C-1.1.3

4.6.6 Input reference data or document

PO-TN-CGI-CF-0037 IECF MERIS DPM

4.6.7 Required tools

Identical to those of C-1.1.3

4.6.8 Archive requirement

IECF outputs for F1, F5, F3, F6 & F26.
First fine Offsets Coefficients LUTs for SciHi configuration
SQADS thresholds

4.6.9 Processing

See C-1.1.3.

4.6.10 Duration

3 days:

1. Verification of shutter efficiency
2. Verification of along-track variations using power spectrum
3. Analysis using IECF F1 & F5 & F3 & F6.
4. Analysis using F26.

5. Report preparation

4.6.11 Output Data

IECF outputs for F1, F5 & F26.
Confirmation of OCL setting for Mission (or Contingency)
SQADS thresholds new values or confirmation
Dark & Gain harmonic variation new values or confirmation
Consolidated Dark Offsets Coefficients LUTs

4.6.12 Pass /Fail Criteria

N/A

4.6.13 Contingencies

- If the instrument is NOT "dark" at Shutter_SciHi_Rad location, move the Shutter_SciHi_Rad into the eclipse.
- If recommendation on OCL setting differs from the Baseline Configuration then TBD

4.6.14 Task Report Content

Discussion of instrument darkness results at Shutter_SciHi_Rad location in the orbit.
Discussion of Shutter_SciHi_Obs_OCLON versus Shutter_SciHi_Obs_OCLOFF and recommendation, with supporting evidence, for the nominal OCL setting
Discussion of Shutter_SciHi_Rad with respect to Shutter_SciHi_Obs
Discussion of orbital variations and corresponding correction parameters values
IECF reports from F1, F5 & F26.
Discussion of SQADS threshold values.
Discussion on generation of the Fine Dark Offset LUTs

4.6.15 Responsible, team, location

Responsible: S. Delwart
Team: Cal /Val
Location: TBD

4.7 C-1.1.6 Acquisition: Final Dark Signal Orbital behaviour

4.7.1 Objectives

Acquisition of dark current harmonic variation at the end of commissioning to verify the stability of the dark current harmonic behaviour.

4.7.2 Activities

Acquisition of Dark current OCL=ON in observation,
Acquisition of Dark current OCL=OFF in observation,
Acquisition of Dark current OCL=ON in calibration,
Acquisition of Dark current OCL=OFF in calibration,

4.7.3 Prerequisites

C-1.1.3 and C-1.1.5 successful, and sufficient time (>= 3 months) has elapsed since previous characterisation.

4.7.4 Instrument Data

Shutter_SciHi_Obs_OCLON: 3 orbits, 2 into the eclipse followed by
Shutter_SciHi_Rad_OCLON: at the end of the 3rd orbit.
Shutter_SciHi_Obs_OCLOFF: 3 orbits, 2 into the eclipse followed by
Shutter_SciHi_Rad_OCLOFF: at the end of the 3rd orbit.

4.7.5 Auxiliary Data

N/A

4.7.6 Input reference data or document

N /A

4.7.7 Required tools

N /A

4.7.8 Archive requirement

All instrument data

4.7.9 Processing

Query and transfer instrument data

4.7.10 Duration

1 day.

4.7.11 Output Data

Shutter_SciHi_Obs_OCLON: Level 0
Shutter_SciHi_Obs_OCLOFF: Level 0
Shutter_SciHi_Rad_OCLON: Level 0
Shutter_SciHi_Rad_OCLOFF: Level 0

4.7.12 Pass /Fail Criteria

Successful acquisition of Instrument data.

4.7.13 Contingencies

See C-1.1.3

4.7.14 Task Report Content

See C-1.1.3

4.7.15 Responsible, team, location

Responsible: S. Delwart
Team: Cal /Val
Location: TBD

4.8 C-1.1.7 Analysis: Final Verification of Dark Signal Orbital Behaviour

4.8.1 Objectives

To verify the harmonic behaviour of the instrument in shutter configuration, and generate the first fine Dark Offsets Coefficients LUTs for the operations phase..

4.8.2 Activities

Verification of blank pixel harmonic correction parameters,
Verification of coarse offset harmonic behaviour (if OCL_ON chosen),
Verification of blank pixel thresholds
Verification of coarse offset thresholds
Generation of fine Dark Offsets Coefficients LUTs with SciHi settings.

4.8.3 Prerequisites

Successful completion of C-1.1.6

4.8.4 Instrument Data

Shutter_SciHi_Obs_OCLON
Shutter_SciHi_Rad_OCLON
Shutter_SciHi_Obs_OCLOFF
Shutter_SciHi_Rad_OCLOFF
All the above from C-1.1.6

4.8.5 Auxiliary Data

N/A

4.8.6 Input reference data or document

PO-TN-CGI-CF-0037 IECF MERIS DPM

4.8.7 Required tools and configuration

See C-1.1.5

4.8.8 Archive requirement

Data from C-1.1.6
IECF outputs for F1 & F5 & F3 & F6 & F26.
Coarse Dark Offsets Coefficients LUTs
SQADS thresholds
OCL status for Mission

4.8.9 Processing

See C-1.1.5

4.8.10 Duration

3 days:

1. Verification of shutter efficiency
2. Verification of along-track variations using power spectrum

3. Analysis using IECF F1 & F5 & F3 & F6.
4. Analysis using F26.
5. Report preparation

4.8.11 Output Data

IECF outputs for F1 & F26.
Confirmation of OCL setting (or Contingency)
SQADS thresholds new values or confirmation
Dark & Gain harmonic variation new values or confirmation
Consolidated Dark Offsets Coefficients LUTs

4.8.12 Pass /Fail Criteria

N /A

4.8.13 Contingencies

If verification shows discrepancies, See C-1.1.5

4.8.14 Task Report Content

Discussion of instrument darkness results at Shutter_SciHi_Rad location in the orbit.
Discussion of Shutter_SciHi_Obs_OCLON versus Shutter_SciHi_Obs_OCLOFF and recommendation, with supporting evidence, for the nominal OCL setting
Discussion of Shutter_SciHi_Rad with respect to Shutter_SciHi_Obs
Discussion of orbital variations and corresponding correction parameters values
IECF reports from F1, F5 & F26.
Discussion of SQADS threshold values.
Discussion on generation of the Fine Dark Offset LUTs

4.8.15 Responsible, team, location

Responsible: S. Delwart
Team: Cal/Val
Location: TBD

4.9 C-1.2 Radiometric characterisation

4.9.1 Objectives

To obtain a complete characterisation of all parameters of the MERIS radiometric model: instrument gain, gain and gain correction coefficients, on-board diffusers BRDF, and their variations during the commissioning phase

4.9.2 Activities

The task responsible shall co-ordinate the activities of the sub-tasks and ensure execution of the plan.

4.9.3 Breakdown

Phase 1:

- C-1.2.1: Acquisition: Coarse Radiometric Characterisation
- C-1.2.2: Analysis: Coarse Radiometric Characterisation
- C-1.2.3: Acquisition: Baseline Verification
- C-1.2.4: Analysis: Baseline Verification

Phase 2:

- C-1.2.5: Acquisition: Fine Radiometric Characterisation
- C-1.2.6: Analysis: Fine Radiometric Characterisation

Phase 3:

- C-1.2.7: Acquisition: Validation of Radiometric Characterisation
- C-1.2.8 Analysis: Validation of Radiometric Characterisation

4.9.4 Outputs

All outputs, data and reports, from the sub-tasks.

4.9.5 Prerequisites

ISPR

4.9.6 Pass /Fail Criteria

All sub-tasks shall pass

4.9.7 Contingencies

TBD

4.9.8 Responsible

S. Delwart

4.10 C-1.2.1 Acquisition: Coarse Radiometric Characterisation

4.10.1 Objectives

Acquire radiometric characterisation data for the needs of C-1.2.2 Coarse Radiometric Characterisation and C-1.9.1 Synthesis: Baseline Configuration.

4.10.2 Activities

1) Acquisition of radiometric calibration data during SODAP phase 6,
2) Acquisition of diffusers BRDF data, during SODAP phase 6:
   - Along track characterisation of diffuser 1 in observation,
   - Along track characterisation of diffuser 2 in observation,
   - Along track characterisation of diffuser λ in observation.

4.10.3 Prerequisites

Successful completion of SODAP phase 1-5 (MERIS CM operational, alignment parameters determined from on-ground characterisation, OCL setting fixed.)
MERIS CM operational (SODAP)

4.10.4 Instrument Data

1) Dif1_SciLo_Rad - radiometric calibration sequence
   Dif2_SciLo_Rad - radiometric calibration sequence
2) Dif1_SciLo_Obs - observation data over the diffuser illumination period
   Dif2_SciLo_Obs - observation data over the diffuser illumination period
   Difλ_ErbGreen_Obs- observation data over the diffuser illumination period

4.10.5 Auxiliary Data

N /A

4.10.6 Input reference data or document

N /A

4.10.7 Required tools

N /A

4.10.8 Archive requirement

All instrument data

4.10.9 Processing

Query and transfer of instrument data

4.10.10 Duration

See SODAP Plan

4.10.11 Output Data

All instrument data

4.10.12 Pass /Fail Criteria

Successful acquisition of Instrument data.

4.10.13 Contingencies

TBD

4.10.14 Task Report Content

Date and summary of the data acquisition operations.
Description of the output data.

4.10.15 Responsible, team, location

Responsible: S. Delwart
Team: SODAP,
Location: ESTEC

4.11 C-1.2.2 Analysis: Coarse Radiometric Characterisation

4.11.1 Objectives

Coarse Calibration to determine the coarse instrument gains and saturation levels with SciLo configuration.
First quality assessments of the diffusers BRDF models. Initiation of the diffuser 1 ageing survey.

4.11.2 Activities

Coarse gain determination,
Estimation of the instrument saturation levels.
First study of diffusers BRDF: calibration vs. observation mode, along-track variations, diffuser 1 vs. diffuser 2 behaviour, selection of the best representative BRDF model in MESCAL, assessment of the need for further modelling.

4.11.3 Prerequisites

MERIS CM operational
Successful completion of task C-1.2.1
Successful completion of task C-1.1.3
Datation of MERIS observation mode packets verified (SODAP)

4.11.4 Instrument Data

Dif1_SciLo_Rad, radiometric calibration sequence,.
Dif1_SciLo_Obs - observation data over the diffuser illumination period,
Dif2_SciLo_Obs - observation data over the diffuser illumination period,
All the above from C-1.2.1.
Earth_SciLo_Obs data, selected ocean scene showing Sun glint from routine observations.

4.11.5 Auxiliary Data

Not needed

4.11.6 Input reference data or document

PO-TN-CGI-CF-0037 IECF MERIS DPM

4.11.7 Required tools

IECF_ME_DPM function “F2”
IECF_ME_DPM function “F6”
IECF_ME_DPM function “F11”
IECF_ME_DPM function “F13”
IECF_ME_DPM function “F14”
IECF_ME_DPM function “F15”
IECF_ME_DPM function “F16”
IECF_ME_DPM function “F17”
IECF_ME_DPM function “F19”
MESCAL
MEGS

IDL diffuser observations analysis tool (procedure RVal)
Comparison tool for Dif 1 gains vs. Dif 2 gains (IDL procedure TBD)
Analysis and plotting tool (*e.g.* IDL, Excel)

4.11.8 Archive requirement

All output data shall be appended to instrument data

4.11.9 Processing

Process diffuser 1 data in observation mode using each available BRDF model. Select the one which the one which best fits the along-track variations of the BRDF (i.e. which minimises the gain variations). Check if resulting gain variations are acceptable, that is can be considered as noise. If not, further modelling is required during task C-1.2.6.
Compare diffuser 1 and diffuser 2 observation data to settle the basis for further ageing analysis.
Run IECF calibration functions (using the selected BRDF model), generate corresponding ADFs.
Run MEGS on Earth_SciLo_Obs data, verify radiance levels at (just below) saturation, check coherency with MESCAL outputs (from IECF function F2)

4.11.10 Duration

2 days

4.11.11 Output Data

Output of function IECF-F2

- Coarse LUT- fields:
  6.1.6-3: “bad” FR pixels,
  6.1.7-3: “bad” RR pixels,
  6.2.8-1&2 Default radiance values for saturated and out-of-range samples,
  6.2.11-7 Band saturation levels for FR samples,
  6.2.11-8 Max valid radiances,
  6.2.15-8 scaling factors – radiance,
  6.2.16-7,8,9 Stray light saturation control parameters
  6.3.4-10: OCL switch reference,
  6.3.4-20,22,23 On-board gain control parameters,
  6.3.5: FR Gain,
  6.3.6: RR Gain,
  6.3.10: FR Optics x CCD response
  6.3.11: RR Optics x CCD response

4.11.12 Pass /Fail Criteria

All ADF fields shall be derived.

4.11.13 Contingencies

- In case of failure to obtain coarse parameters, L1B processor troubleshooting shall continue with pre-flight values

- If Level 1b processor prototype not sufficiently troubleshot, standby for verification of saturation levels
- If saturation levels from MESCAL computations and from Level 1b product significantly differ, then use values from Level 1b

4.11.14 Task Report Content
Plot, statistics, discussion of all ADF fields.

4.11.15 Responsible, team, location
Responsible: S. Delwart
Team: Cal/Val
Location: ESTEC

4.12 C-1.2.3 Acquisition: Baseline Verification

4.12.1 Objectives
To obtain radiometric calibration measurements for baseline instrument configuration and earth observations for its verification

4.12.2 Activities
Perform a Calibration sequence with Diffuser 1 and baseline settings
Selection of appropriate Earth targets for verification of saturation levels (Sun glint) and verification of alignment parameters through homogeneity of level 2 pressure product (TBC, desert scenes).

4.12.3 Prerequisites
Successful completion of task C-1.9.1: Synthesis: Baseline MERIS characterisation

4.12.4 Instrument Data
Dif1_SciHi_Rad sequence
Earth_SciHi_Obs observations (one glint scene and TBC desert scenes from routine observations)

4.12.5 Auxiliary Data
N /A

4.12.6 Input reference data or document
N /A

4.12.7 Required tools
N /A

4.12.8 Archive requirement
All instrument data

4.12.9 Processing

Acquire and transfer L0 data for Cal sequence
Selection of appropriate Earth target (TBC)

4.12.10 Duration

2 days (TBC)

4.12.11 Output Data

All instrument data

4.12.12 Pass /Fail Criteria

Successful acquisition of required instrument data

4.12.13 Contingencies

TBD

4.12.14 Task Report Content

Description of acquisition operations
Description of instrument data

4.12.15 Responsible, team, location

Responsible: TBD
Team: Cal /Val
Location: ESTEC

4.13 C-1.2.4 Analysis: Baseline Verification

4.13.1 Objectives

To perform the first radiometric calibration for Baseline settings (SciHi),
To generate all ADFs needed for the IPF_L1b processing before CTR.

4.13.2 Activities

Verify consistency between Cal sequence data: SciLo (from task 1.2.1) and SciHi
Generate Gain and Dark Offsets Coefficients LUTs for "Earth_SciHi_Obs" configuration
Verify consistency of saturation levels as derived from Calibration measurements and as estimated from observations.
Verify effectiveness of alignment parameters (if applicable)

4.13.3 Prerequisites

Successful completion of C-1.2.3: Acquisition: Baseline Verification
Successful completion of C-3.1: Level 1b Troubleshooting, or at least C-3.1.3 & C-3.1.4

4.13.4 Instrument Data

Dif1_SciHi_Rad and Earth_SciHi_Obs from C-1.2.3

4.13.5 Auxiliary Data

Results from task C-1.2.2.
From C-1.9.1: MER_INS_AX and MER_CP1_AX, MER_RAC_AX template.

4.13.6 Input reference data or document

Report from task C-1.9.1, report from task C-1.1.5

4.13.7 Required tools

IECF
MEGS
MERIVIEW

4.13.8 Archive requirement

IECF outputs shall be appended to instrument data

4.13.9 Processing

Run MESCAL (RCal & RAC_ADS modes) to generate MER_RAC_AX for SciHi
Run MEGS to Level 1b for the glint scene.
Use MERISVIEW to verify saturation levels
TBC: Run MEGS to level 2 for the desert scenes (if level 2 processor sufficiently troubleshot)
Run MERISVIEW to check surface pressure homogeneity wrt ECMWF one

4.13.10 Duration

2 days

4.13.11 Output Data

Output of function IECF-F2

- Baseline ADF- fields (TBC):

6.1.6-3: Generation of gain “bad” FR pixels,
6.1.7-3: Generation of gain “bad” RR pixels,
6.2.8-1&2 Default radiance values for saturated and out-of-range samples,
6.2.11-7 Band saturation levels for FR samples,
6.2.11-8 Max valid radiance,
6.2.15-8 scaling factor – radiance,
6.2.16-7,8,9 Stray light saturation control parameters
6.3.4-10: OCL switch reference,
6.3.4-20,21,23 On-board gain control parameters,
6.3.5: FR Gain,
6.3.6: RR Gain,
6.3.10: FR Optics x CCD response
6.3.11: RR Optics x CCD response

- CTIs

Set Aij coefficients CTI

4.13.12 Pass /Fail Criteria

All ADF fields shall be derived.

4.13.13 Contingencies

If saturation levels from MESCAL computations and from glint Level 1b data significantly differ, use values from Level 1b.
Release of L1B products to Cal Team (CTR)

4.13.14 Task Report Content

Plot, statistics, discussion of all ADF fields and CTIs

4.13.15 Responsible, team, location

Responsible: S. Delwart
Team: Cal/Val
Location: ESTEC

4.14 C-1.2.5 Acquisition: Fine Radiometric Characterisation

4.14.1 Objectives

Data acquisition for characterisation of radiometric diffusers BRDF.

4.14.2 Activities

- Acquisition of radiometric diffusers BRDF data in observation mode:
- Acquisition of radiometric diffusers BRDF data in calibration mode:

4.14.3 Prerequisites

Successful completion of C-1.2.4

4.14.4 Instrument Data

Dif1_SciHi_Obs
Dif2_SciHi_Obs
Dif1_SciHi_Rad
Dif2_SciHi_Rad

4.14.5 Auxiliary Data

N /A

4.14.6 Input reference data or document

N /A

4.14.7 Required tools

N /A

4.14.8 Archive requirement

All instrument data

4.14.9 Processing

Query and transfer of instrument data

4.14.10 Duration
1 day

4.14.11 Output Data
All instrument data.

4.14.12 Pass /Fail Criteria
Successful acquisition of instrument data.

4.14.13 Contingencies
TBD

4.14.14 Task Report Content
Date and summary of the data acquisition operations.
Description of the output data.

4.14.15 Responsible, team, location
Responsible: S. Delwart
Team: Cal/Val
Location: ESTEC

4.15 C-1.2.6 Analysis: Fine Radiometric Characterisation

4.15.1 Objectives
To confirm the "mission's" instrument configuration,
To perform the fine radiometric calibration to determine the fine instrument gains and saturation levels,
To generate all ADFs needed for the IPF_L1b processing before release to Cal/Val PIs, if needed

4.15.2 Activities
Process data from observations of diffuser 1 during the whole Sun visibility window,
Process data from observation of using diffuser 2 during the whole Sun visibility window,
Process calibration data for Diffusers 1 and 2.
Analysis of Diffuser 1 versus Diffuser 2 response in both Obs and Rad modes. Comparison with previous analysis.
Analysis of the along-track variation of the diffuser BRDF from above data, comparison with available models (fitted on on-ground characterisation data): a) within the models valid angular range, b) outside the models valid angular range.
Selection of best representative model.
Assess calibration window optimal duration.
Decide whether further modelling is required.
Investigate possibility to include in-flight observations to the on-ground characterisation set.
If a simple mean is found, proceed to ingestion and run MESCAL BRDF mode ; compare new BRDF model with in-flight data.
Generation of new "radiometric" ADF fields using tuned BRDF model.

4.15.3 Prerequisites

CTR
Successful completion of C-1.2.5
Successful completion of C-1.3.3 (TBC)
Successful completion of C-1.4.3 (TBC)

4.15.4 Instrument Data

Dif1_SciHi_Obs,
Dif2_SciHi_Obs,
Dif1_SciHi_Rad,
Dif2_SciHi_Rad,
All the above from C-1.2.5.

4.15.5 Auxiliary Data

Up-to-date MER_INS_AX, MER_CP1_AX & MER_RAC_AX from C-1.9.1 and C-1.2.4

4.15.6 Input reference data or document

4.15.7 Required tools

IECF_ME_DPM function “F2”
IECF_ME_DPM function “F6”
IECF_ME_DPM function “F11”
IECF_ME_DPM function “F13”
IECF_ME_DPM function “F14”
IECF_ME_DPM function “F15”
IECF_ME_DPM function “F16”
IECF_ME_DPM function “F17”
IECF_ME_DPM function “F19”
IDL diffuser observations analysis tool (procedure RVal)
Comparison tool for Dif 1 gains vs. Dif 2 gains (IDL procedure TBD)
BRDF characterisation update tool from Diff 1 observations (this tool also includes a means for updating the BRDF characterisation using the results of Dif 1 vs. Dif 2)
Analysis and plotting tool (*e.g.* IDL, Excel)
JLB-ASPI tool for determining “Set orbital parameters”

4.15.8 Archive requirement

All output data

4.15.9 Processing

Run IECF functions.
Compare Dif1 and Dif2 measurements, crosscheck with previous comparisons.
Analyse along track diffusers BRDF variations using RVal, compare with the average from Calibration data. Check impact on radiometric gains (observations showing vignetting excluded) for all available models, select best.
If needed, try to update selected BRDF model parameters using diffuser observations, re-do analysis of along-track gain variations.

Decide if further modelling is required: if final RVal computed gains show significant variations the BRDF models have to be upgraded for better constraint on Sun Zenith angle variation.

4.15.10 Duration

5 days

4.15.11 Output Data

Analysis of Cal mode response Dif 1 vs. Dif 2
Analysis of Obs mode response Dif 1 vs. Dif 2
Analysis of BRDF model validity for along-track variations
TBC: updated BRDF model selection

- CTIs (if needed)

Set orbital parameters CTI
Set Aij coefficients CTI

4.15.12 Pass /Fail Criteria

TBD

4.15.13 Contingencies

In case of failure, continue to use CTI and ADF fields from initial calibration (C-1.2.4)
If further modelling of diffuser BRDF is required, then TBD.

4.15.14 Task Report Content

4.15.15 Responsible, team, location

Responsible: S. Delwart
Team: Cal /Val
Location: ESTEC

4.16 C-1.2.7 Acquisition: Validation of Radiometric Characterisation

4.16.1 Objectives

Acquire in-flight observation data at the end of commissioning for BRDF characterisation of all diffusers

4.16.2 Activities

- Acquisition of diffusers BRDF data,

Along track characterisation of diffuser 1 in observation,
Along track characterisation of diffuser 2 in observation,
Along track characterisation of diffuser λ in observation,

4.16.3 Prerequisites

Sufficient time (>= 3 months) elapsed after successful completion of task C-1.2.4

4.16.4 Instrument Data

Dif1_SciHi_Rad
Dif2_SciHi_Rad
Dif1_SciHi_Obs
Dif2_SciHi_Obs
Difλ_SciHi_Obs

4.16.5 Auxiliary Data

N /A

4.16.6 Input reference data or document

N /A

4.16.7 Required tools

N /A

4.16.8 Archive requirement

All instrument data

4.16.9 Processing

Acquire and transfer all instrument data

4.16.10 Duration

1 day (TBC)

4.16.11 Output Data

All instrument data

4.16.12 Pass /Fail Criteria

Successful acquisition of all instrument data

4.16.13 Contingencies

TBD

4.16.14 Task Report Content

Date and summary of the data acquisition operations.
Description of the output data.

4.16.15 Responsible, team, location

TBD

4.17 C-1.2.8 Analysis: Validation of Radiometric Characterisation

4.17.1 Objectives

Analysis of fine calibration data and determination of all “radiometric” ADF fields

4.17.2 Activities

Analysis of the diffuser (1, 2 & λ) BRDF data,
If needed, update of the associated characterisation data.
Calibration using diffuser 1,
Calibration using diffuser 2,
Analysis of calibration data.
Generation of associated ADF fields.

4.17.3 Prerequisites

Successful completion of task C-1.2.7: Acquisition

4.17.4 Instrument Data

Outputs from C-1.2.7 (observations and/or calibrations of all diffusers)
All available routine radiometric calibration sequence data since completion of C-1.2.6 (if reports from routine monitoring are not available).

4.17.5 Auxiliary Data

Up-to-date MER_INS_AX, MER_CP1_AX & MER_RAC_AX from C-1.2.6
Reports from routine calibration monitoring (if available)

4.17.6 Input reference data or document

PO-TN-CGI-CF-0037 IECF MERIS DPM

4.17.7 Required tools and configuration

See C-1.2.6

4.17.8 Archive requirement

All output data.

4.17.9 Processing

See C-1.2.6.
Analysis of seasonal variation of diffusers BRDF: comparison of RVal and RCal results variations with time (long term), analysis of diffuser 1 response evolution wrt diffuser 2 (ageing).
If needed, update BRDF characterisation (for use by MESCAL’s BRDF mode) and/or models parameters.

4.17.10 Duration

TBD

4.17.11 Output Data

Seasonal & along track variation of Diffuser 1's BRDF,
Seasonal & along track variation of Diffuser 2's BRDF,
Seasonal & along track variation of Diffuser λ's BRDF,
Analysis of BRDF Dif 1 vs. Dif 2
Analysis of calibration mode vs. observation mode diffusers response,

- CTIs (if needed)

Set orbital parameters CTI
Set Aij coefficients CTI

- LUT- fields:

6.1.6-3: "bad" FR pixels,
6.1.7-3: "bad" RR pixels,
6.2.8-1&2 Default radiance values for saturated and out-of-range samples,
6.2.11-7 Band saturation levels for FR samples,
6.2.11-8 Max valid radiance,
6.2.15-8 scaling factor – radiance,
6.3.4-13 to 15: gain Temp. Corrections,
6.3.4-19: delta_t from ascending node,
6.3.4-20,22,23 On-board gain control parameters,
6.3.4-21: Coarse offset threshold,
6.3.5: FR Gain,
6.3.6: RR Gain,
6.3.10: FR Optics x CCD response
6.3.11: RR Optics x CCD response

4.17.12 Pass /Fail Criteria

TBD

4.17.13 Contingencies

In case of failure, continue to use CTI and ADF fields from most recent successful calibration (C-1.2.4 or C-1.2.6)

4.17.14 Task Report Content

Discussion of all results

4.17.15 Responsible, team, location

Responsible: S. Delwart
Team: Cal /Val
Location: ESTEC

4.18 C-1.3 Characterisation of the response non-linearity

4.18.1 Objectives

Evaluation of the degree of non-linearity in the instrument's response.
Assessment of the need to correct for the instrument non-linearity.
If needed, assessment of the efficiency of the non-linearity correction implemented in the Level 1b processing using on-ground characterisation.
If needed, in-flight re-characterisation of the non-linearity and update of correction tables.

4.18.2 Activities

Evaluation of degree of non-linearity in the instrument's response using overlapping pixels with different detector response efficiency.
Assessment of the efficiency of the non-linearity correction implemented in the Level 1b processing using on-ground characterisation.
Acquisition of in-flight non-linearity characterisation data: known variation of the shift register charge can be achieved by observation of a stable target with widening micro-bands, namely diffuser observations over several consecutive orbits using different band settings.

4.18.3 Breakdown

Phase 1:
C-1.3.1 Coarse non-linearity analysis
Phase 2 (if not de-scoped by C-1.9.1):
C-1.3.2 Acquisition: Non-linearity Characterisation
C-1.3.3 Analysis: Non-linearity Characterisation

4.18.4 Outputs

All outputs, data and reports, from the sub-tasks.

4.18.5 Prerequisites

ISPS release by SODAP

4.18.6 Pass /Fail Criteria

All sub-tasks shall pass.

4.18.7 Contingencies

In case of unsuccessful in-flight characterisation, on-ground characterisation data shall be used.

4.18.8 Responsible

L. Bourg

4.19 C-1.3.1 Coarse non-linearity analysis

4.19.1 Objectives

To fix the nominal setting of the non-linearity correction switch.

If needed, to evaluate the quality of the instrument non-linearity correction using correction tables derived from on-ground characterisation.

4.19.2 Activities

Evaluate the instrument's non-linear response using overlapping pixels.
Decide if a non-linearity correction is necessary.
If yes, evaluate the efficiency of the implemented correction scheme using correction tables derived from on-ground characterisation.

4.19.3 Prerequisites

Successful completion of task C-1.2.2 Coarse Radiometric Calibration.

4.19.4 Instrument Data

Earth_SciLo_Obs, 3 orbits RR and 3 FR scenes (L0 raw data).

4.19.5 Auxiliary Data

MER_INS_AX with nominal non-linearity correction tables derived from on-ground characterisation data.
MER_CP1_AX versions with NL correction switch set ON and OFF respectively.

4.19.6 Input reference data or document

On-ground non-linearity characterisation data, corresponding test reports.

4.19.7 Required tools and configuration

MEGS
MERISVIEW
Tool for the evaluation of the instrument's non-linear response using overlapping pixels (IDL procedure NL_Stat).
Statistical tool for detection of stripping (IDL procedure TBD).

4.19.8 Archive requirement

4.19.9 Processing

1. Run NL_Stat without NL correction on FR data to evaluate the instrument's non-linear response using pairs of overlapping pixels with significantly different radiometric responses at the calibration radiance level.
2. Run MEGS on RR data to generate corresponding Level 1b products with NL correction OFF
3. Estimate stripping on Level 1b products using dedicated statistical tool.

If neither step 1 or step 3 give evidence of a non-linear behaviour then:

- Report to task C-1.9.1 and recommend OFF as nominal value of the non-linearity correction switch for the mission

Else

4. Run NL_Stat with NL correction enabled on FR data to evaluate the residual non-linearity after correction
5. Run MEGS on RR data to generate corresponding Level 1b products with NL correction ON

6. Estimate residual stripping on non-linearity corrected Level 1b products using dedicated statistical tool
7. If needed, analyse the cause of the residual stripping, and investigate possible solutions

- Report to task C-1.9.1 and recommend ON as nominal value of the non-linearity correction switch for the mission

End if

4.19.10 Duration

5 days

4.19.11 Output Data

Nominal value for the Non-Linearity Correction switch.

4.19.12 Pass /Fail Criteria

Criteria for the assessment of a non-linear behaviour in raw and NL corrected data = TBD or probably only good engineering judgement.
Criteria for the maximum acceptable residual stripping < 2 LSBs.

4.19.13 Contingencies

If analysis shows the existence of non acceptable non-linear behaviour and/or residual stripping, tasks C-1.3.2 and C-1.3.3 shall be initiated as soon as possible.

4.19.14 Task Report Content

Discussion on the presence of non-linearity in calibrated radiances (detectable or not) for both raw and NL-corrected data.
Estimation of the initial and residual level of stripping, discussion of the residual stripping after NL correction.

4.19.15 Responsible, team, location

Responsible: L. Bourg, S. Delwart
Team: Cal/Val
Location: ESTEC

4.20 C-1.3.2 Acquisition: Non-linearity Characterisation

4.20.1 Objectives

Acquire non-linearity characterisation data of diffuser observations using different band settings on successive orbits.

4.20.2 Activities

Acquisition of (Dif1_NL_Obs_i) data,

4.20.3 Prerequisites

C-1.3.1 successfully completed has proved the need for non-linearity re-characterisation.
Successful completion of C-1.8.1.

4.20.4 Instrument Data

Dif1_NL_Obs_i
(4 successive orbits for the 4 configurations, repeated twice to assess stability. Observations are observations of diffuser 1 during the entire full Sun visibility window.)

4.20.5 Auxiliary Data

N /A

4.20.6 Input reference data or document

N/A

4.20.7 Required tools and configuration

N/A

4.20.8 Archive requirement

N/A

4.20.9 Processing

None

4.20.10 Duration

1 Day.

4.20.11 Output Data

Dif1_NL_Obs_i: Level 0 FR (4 successive orbits for the 4 configurations, repeated twice to assess stability. Observations are observations of diffuser 1 during all the full Sun visibility window.).

4.20.12 Pass /Fail Criteria

Successful acquisition of instrument data.

4.20.13 Contingencies

N/A

4.20.14 Task Report Content

Date and summary of the data acquisition operations.
Description of the output data.

4.20.15 Responsible, team, location

Responsible: S. Delwart
Team: Cal/Val
Location: ESTEC

4.21 C-1.3.3 Analysis: Non-linearity Characterisation

4.21.1 Objectives

Characterise instrument response non-linearity using in-flight observations and compare with the on-ground characterisation data.
Update the ADF fields if the verification is not conclusive.
To identify the existence of residual stripping in the Level 1b measurement data sets, and remove it if possible.

4.21.2 Activities

Analysis of in-flight data to derive non-linearity characterisation.
Comparison of NL in-flight characterisation with on-ground characterisation,
Generate new NL LUT if needed.
Analyse the cause of the residual stripping, if any.
Modify LUT or propose modifications to Level 1b processing to remove the residual stripping (use of an offset prior to applying the NL correction, or fudge factors on the calibration coefficient (per pixel), or other TBD).

4.21.3 Prerequisites

C-1.3.1 successfully completed has proved the need for non-linearity re-characterisation.
Successful completion of C-1.8.1 and C-1.3.2.

4.21.4 Instrument Data

Data from C-1.3.2 above.
Earth_SciHi_Obs, 3 orbits RR and 3 FR scenes (L0 raw data).

4.21.5 Auxiliary Data

MER_INS_AX with nominal non-linearity correction tables derived from on-ground characterisation data.
MER_CP1_AX with and without NL switch set

4.21.6 Input reference data or document

On-ground non-linearity characterisation data, corresponding test reports.
MESCAL output files corresponding to the run used for the generation of the current Gain and Offsets LUTs.

4.21.7 Required tools and configuration

MESCAL
MEGS
Tool for the evaluation of the instrument's non-linear response using Dif1_NL_Obs_i. (IDL procedure TBD)
Statistical tool for detection of stripping (IDL procedure TBD)

4.21.8 Archive requirement

Data from C-1.3.1.

4.21.9 Processing

1. Run the tool for the characterisation of the instrument's non-linear response using Dif1_NL_Obs_i data, compare to on-ground characterisation data.

If comparison shows significant discrepancies then

AD1 Build NL correction LUTs from in-flight data

AD2 Evaluate the instrument's non-linear response NL_Stat with NL correction enabled on FR Earth data (tool using overlapping pixels with different radiometric responses).

AD3 Run MEGS with NL correction ON (using in-flight correction LUTs) on RR data.

AD4 Evaluate the residual stripping using statistical methods on the NL corrected Level 1b data.

AD5 Analysis the cause of the residual stripping, if any

AD6 Investigate solutions for residual stripping removal (if any), including modifications to the Level 1b processing

Else

AD7 Investigate solutions for residual stripping removal (if any, as stated by task C-1.31), including modifications to the Level 1b processing

End if

4.21.10 Duration

10 Days.

4.21.11 Output Data

In-flight NL characterisation data (limited number of points) using diffuser observations.
Fit of the In-flight NL characterisation data.
Differences between In-flight and on-ground NL characterisation
Non Linearity LUT (IODD 6.3.9) derived from in-flight data (if needed).
Possibly, auxiliary data corresponding to Level 1b evolutions proposed in the Task Report

4.21.12 Pass /Fail Criteria

Criteria for the maximum acceptable differences between In-flight Dif1_NL_Obs_i and on-ground NL characterisation = TBD or probably only good engineering judgement.
Criteria for the maximum acceptable residual stripping < 2 LSBs.

4.21.13 Contingencies

If verification shows a major discrepancy between In-flight and on-ground NL characterisation, use In-flight NL characterisation.
If analysis shows the existence of significant residual stripping, modification of the Level 1b will probably be required. This implies specific work to implement and test evolutions proposed in the Task Report.

4.21.14 Task Report Content

Plots of all Output Data.
Discussion of the difference between In-flight and on-ground NL characterisation
Discussion of the residual stripping after NL correction.

4.21.15 Responsible, team, location

Responsible: L. Bourg, S. Delwart

Team: Cal/Val
Location: ESTEC

4.22 C-1.4 Characterisation of the instrument stray light

4.22.1 Objectives

Evaluate stray light contribution to ocean scenes when correction is switched OFF; evaluate residual stray light after correction.
Assess nominal setting of Stray Light Correction switch.
Characterise instrument stray light response using in-flight data, derive corresponding correction parameters and repeat evaluation of residual stray light after correction.
Tune stray light correction parameters.
Confirm/update nominal setting of Stray Light Correction switch.

4.22.2 Activities

The task responsible shall co-ordinate the activities of the sub-tasks and ensure execution of the plan.

4.22.3 Prerequisites

Level 1b processing sufficiently troubleshot to generate level 1b products with reliable stray light correction and radiometric corrections.
Dif1_SciLo_Rad data available from C-1.2.2 Coarse Radiometric Calibration, even if preliminary.

4.22.4 Breakdown

Phase 1:
C-1.4.1 Analysis: Verification of the Stray Light Correction
Phase 2 (if not de-scoped by C-1.9.1):
C-1.4.2 Acquisition: Stray light Characterisation
C-1.4.3 Analysis: Stray light Characterisation

4.22.5 Pass /Fail Criteria

All sub-tasks shall pass.

4.22.6 Contingencies

N/A

4.22.7 Responsible

J.-P. Huot

4.23 C-1.4.1 Analysis: Verification of the Stray Light Correction

4.23.1 Objectives

To evaluate the quality of the instrument stray light correction.

4.23.2 Activities

Evaluate the instrument’s stray light response using overlapping pixels.

Evaluate the stray light by comparison of adjacent modules when the stray light correction is switched OFF, and evaluate the residual stray light between adjacent modules (if any) after stray light correction.
Analyse the cause of the residual stray light between adjacent modules, adjust stray light correction parameters so as to minimise it.

4.23.3 Prerequisites

Completion of C-1.2.2 Analysis: Coarse Radiometric Calibration

4.23.4 Instrument Data

Dif1_SciLo_Rad, from C-1.2.2 Coarse Radiometric Calibration.
Earth_SciLo_Obs, L0 FR and RR: selection of a cloud free scene from routine Earth observations.
Earth_SciLo_Obs, L0 FR and RR: selection of a cloudy ocean scene from routine Earth observations.
Earth_SciLo_Obs, L0 FR and RR: selection of a clear coastal zone scene from routine Earth observations.
For the last two cases, the stray light source (i.e. the cloud or the land area) shall be close to the edge of one MERIS module but outside the overlap area while the adjacent module shows clear sky over ocean.

4.23.5 Auxiliary Data

MER_INS_AX with nominal ASAP DLDF based SRDF LUTs.

4.23.6 Input reference data or document

ASAP stray light modelling reports. ASAP DLDF and DLDF based SRDF (TBC).

4.23.7 Required tools and configuration

MESCAL
ADF (MER_RAC_AX) builder from MESCAL outputs.
MEGS
StrayLight Tool (TBC)
Tool for the evaluation of the stray light correction using adjacent modules (IDL procedure TBD).

4.23.8 Archive requirement

Calibration level 0 product and all observation level 0 data listed under Instrument Data above that have been used during the analysis. Level 1b products generated and used during analysis. MESCAL outputs generated and used during analysis.

4.23.9 Processing

1. Run MESCAL in RCal mode, generate two versions of MER_RAC_AX, one with Gain LUTs corrected/uncorrected for stray light.
2. Run MEGS to Level 1b with stray light correction OFF, re-sampling OFF (through MEGS modifiers), using the uncorrected Gain LUT for the three selected areas.
3. Evaluate stray light in the module containing the potential source by comparison of the radiance levels of the overlap zone from both modules for elected bands (with particular

focus on the infrared bands). Compare inter-module discrepancies of cloud influenced and land influenced scenes with respect to the cloud free case.

4. Run MEGS to Level 1b with stray light correction ON, re-sampling OFF using the corrected Gain LUT for the same three selected areas.
5. Evaluate the residual stray light using step 3 methodology, if found acceptable then task is over, else proceed to step 6.
6. Analyse the cause of the residual stray light between adjacent modules, adjust tuning parameters using StrayLight Tool and repeat steps 1 (only the corrected Gain LUT is needed) and 4to 6.

4.23.10 Duration

5 days.

4.23.11 Output Data

If needed, all adjusted stray light related fields in ADFs (IODD ref. 6.1.5-9 & -10, -37 to -43, 6.1.8, 6.1.9, 6.2.12-2, 6.2.16)

4.23.12 Pass /Fail Criteria

Criteria for the maximum acceptable residual stray light contribution => good engineering judgement.

4.23.13 Contingencies

If analysis shows that correction does not significantly improves image quality:

- recommend OFF as nominal value of Stray Light Correction switch to task C-1.9.1,
- tasks C-1.4.2 and C-1.4.3 shall be initiated as soon as possible.

4.23.14 Task Report Content

Plots of all Output Data.
Detailed description of the Stray Light parameters tuning (final version).
Discussion on quality of the stray light correction.
Recommendation for Stray Light Correction switch setting to Task C-1.9.1

4.23.15 Responsible, team, location

Responsible: J-P. Huot, S. Delwart
Team: Cal/Val
Location: ESTEC

4.24 C-1.4.2 Acquisition: Stray light Characterisation

4.24.1 Objectives

Selection and retrieval of suitable scenes for task C-1.4.3 “Analysis: Stray light Characterisation”.

4.24.2 Activities

Browse routine Earth_SciHi_Obs L1b FR and RR observations to select, in both resolutions:

- Clear sky ocean scenes, radiance at 865 nm below TBD level.

- Clear sky ocean scenes with limited cloud(s) close to an inter-module overlap area (but outside of it), radiance at 865 nm over ocean at TBD distance from cloud below TBD level
- Clear sky coastal scenes with land area limit close to an inter-module overlap area (but outside of it), radiance at 865 nm over ocean at TBD distance from land below TBD level

In all the three cases, few frames with good conditions are sufficient (one granule).
Order and retrieve corresponding Level 0 child products.

4.24.3 Prerequisites

Completion of tasks C-1.4.1 and C-1.2.4.

4.24.4 Instrument Data

Selection from Earth_SciHi_Obs routine observations (see Activities).

4.24.5 Auxiliary Data

N/A

4.24.6 Input reference data or document

N/A

4.24.7 Required tools and configuration

USF Browse Products visualisation tool.
MERISVIEW

4.24.8 Archive requirement

Selected Level 0 Child products (3 RR and 3 FR level 0 products of minimum size).

4.24.9 Processing

7. Use USF Browse Products visualisation tool to select candidate observation sites. Order Level 1b RR scenes corresponding to candidate sites for both resolutions (selection of FR sites shall use the FR level 0 catalogue to identify available data and corresponding Browse products for visual check of the atmospheric conditions).
8. Use MERISVIEW to perform radiance level checks at 865 nm
9. repeat steps 1 and 2 until all criteria fulfilled
10. order corresponding child FR and RR level 0 products

4.24.10 Duration

1 day

4.24.11 Output Data

FR and RR child level 0 products.

4.24.12 Pass /Fail Criteria

Successful retrieval of level 0 data according to criteria listed in Activities section above.

4.24.13 Contingencies

Release radiance threshold at 865 nm if it cannot be fulfilled after TBD attempts.

4.24.14 Task Report Content

Date and summary of the data acquisition operations.
Description of the output data.

4.24.15 Responsible, team, location

Responsible: J-P. Huot, S. Delwart
Team: Cal/Val
Location: ESTEC

4.25 C-1.4.3 Analysis: Stray light Characterisation

4.25.1 Objectives

To compare the instrument stray light response measured in-flight with the on-ground characterisation data,
To complement the analysis performed in C-1.4.1 using in-flight characterisation.

4.25.2 Activities

Huot-Abrami SRDF estimation over bright clouds, (Earth_SciLo_Obs)
Analysis of Huot-Abrami SRDF data vs. ASAP DLDF based SRDF,
Generate new SRDF LUT if needed.
Continue the analysis started in C-1.4.1.

4.25.3 Prerequisites

The field 6.3.10: FR Optics x CCD response and 6.3.11: RR Optics x CCD response shall have been generated using in-flight data during C-1.2.4

4.25.4 Instrument Data

Dif1_SciHi_Rad, from C-1.2.3.
Earth_SciHi_Obs, selection of cloud free ocean, cloudy ocean and clear sky coastal zone scenes from routine Earth observations (FR and RR level 0 child products).
These data are output of Task C-1.4.2 retrieved from archive.

4.25.5 Auxiliary Data

MER_CP1_AX with stray light switch ON and OFF
MER_INS_AX with ASAP DLDF based SRDF.

4.25.6 Input reference data or document

ASAP stray light modelling reports. ASAP DLDF and DLDF based SRDDF.
Data and Task Report from C-1.4.1.

4.25.7 Required tools and configuration

MESCAL
ADF (MER_RAC_AX) builder/editor form MESCAL outputs.

MEGS
Stray light Tool (TBC)
Tool allowing to update MER_INS_AX with Huot-Abrami SRDF
Tool for the evaluation of the stray light correction using adjacent modules (IDL procedure TBD).

4.25.8 Archive requirement

4.25.9 Processing

1. Run MESCAL in RCal mode, generate two versions of MER_RAC_AX, one with Gain LUTs corrected/uncorrected for stray light.
2. Run MEGS to Level 1b with stray light correction OFF, re-sampling OFF (through MEGS modifiers), using the uncorrected Gain LUT for the three selected areas.
3. Evaluate stray light in the module containing the potential source by comparison of the radiance levels of the overlap zone from both modules for elected bands (with particular focus on the infrared bands). Compare inter-module discrepancies of cloud influenced and land influenced scenes with respect to the cloud free case.
4. Run MEGS to Level 1b with stray light correction ON, re-sampling OFF, using the corrected Gain LUT and ASAP derived SRDF, for the same three selected areas.
5. Evaluate the residual stray light using step 3 methodology.
6. Run StrayLight Tool for H-A analysis, derive H-A SRDF and build corresponding MER_RAC_AX file.
7. repeat step 1 using H-A SRDF (only the corrected Gain LUT is needed)
8. repeat step 4 using H-A SRDF
9. repeat step 5 using step 8 outputs
10. Analyse the cause of the residual stray light between adjacent modules, adjust tuning parameters using StrayLight Tool and repeat steps 7 and 8 to 10.
11. compare residual stray light from steps 5 and 10

- Confirm nominal value of Stray Light Correction switch
- Decide which SRDF and set of stray light correction parameters has to be used

4.25.10 Duration

20 days.

4.25.11 Output Data

In-flight H-A_SRDF (single region SRDF)
ASAP DLDF based H-A_SRDF (single region SRDF)
Differences between In-flight H-A_SRDF and DLDF based H-A_SRDF
All final stray light related fields in ADFs (IODD ref. 6.1.5-9 & -10, -37 to -43, 6.1.8, 6.1.9, 6.2.12-2, 6.2.16)
.

4.25.12 Pass /Fail Criteria

Criteria for the maximum acceptable residual stray light contribution => good engineering judgement.

4.25.13 Contingencies

If verification shows a major discrepancy between in-flight and on-ground stray light characterisation, and if the analysis shows an improved correction, use in-flight characterisation.
If analysis still shows a large residual stray light contribution, recommend OFF as nominal value of Stray Light Correction switch to C-1.2.6 (TBC) and C-1.9.2.

4.25.14 Task Report Content

Plots of all Output Data
Discussion of quality of the stray light correction

4.25.15 Responsible, team, location

Responsible: J-P. Huot, S. Delwart
Team: Cal/Val
Location: ESTEC

4.26 C-1.7 Spectrometric Calibration

4.26.1 Objectives

To determine if the instrument's alignment has moved during launch.
To determine values of the Instrument "alignment parameters".
To assess if the spectral shift range and sampling specified for Level 2 Auxiliary Data generation is in line with actual instrument state or shall be adapted.
To determine the "fine" across track spectral alignment, and generate the "spectral shift index" LUT.

4.26.2 Activities

The task responsible shall co-ordinate the activities of the sub-tasks and ensure execution of the plan.

4.26.3 Breakdown

Phases 1:
C-1.7.1 Acquisition: Preliminary Spectrometric Characterisation using diffusers
C-1.7.2 Acquisition: Coarse Spectrometric Characterisation using diffusers
C-1.7.3 Analysis: Coarse Spectrometric Characterisation using diffusers
C-1.7.4 Acquisition: Spectrometric Characterisation using Geophysical Targets
C-1.7.5 Analysis: Spectrometric Characterisation using Geophysical Targets
Phase 3:
C-1.7.6 Acquisition: Consolidated Spectrometric Characterisation
C-1.7.7 Analysis: Consolidated Spectrometric Characterisation

4.26.4 Outputs

All outputs, data and reports, from the sub-tasks

4.26.5 Prerequisites

Successful completion of SODAP phase 1-5 (MERIS CM operational, alignment parameters determined from on-ground characterisation, OCL setting fixed.)
ISPR milestone reached.

4.26.6 Pass /Fail Criteria

All sub-tasks shall pass.

4.26.7 Contingencies

If the spectral shift range and sampling specified for Level 2 Auxiliary Data generation appear to be obviously not in line with actual instrument state, warn L2 VER Team and deliver range and trend estimates as soon as possible.

4.26.8 Responsible

L. Bourg

4.27 C-1.7.1 Acquisition: Preliminary Spectrometric Characterisation using Diffusers

4.27.1 Objectives

Gather preliminary wavelength characterisation data in observation and calibration modes during SODAP phase 6.

4.27.2 Activities

Acquisition and retrieval of wavelength characterisation data during SODAP phase 6.

4.27.3 Prerequisites

Successful completion of SODAP phase 1-5 (MERIS CM operational, alignment parameters determined from on-ground characterisation, OCL setting fixed.)
ISPR milestone reached.

4.27.4 Instrument Data

Dif1_ErbGreen_Rad, Difλ_ErbGreen_Rad: measurements are spread over 2 successive orbits (one for each diffuser) and will be repeated at least twice to assess stability.
Dif1_ErbGreen_Obs, Difλ_ErbGreen_Obs: measurements are spread over 2 successive orbits (one for each diffuser), they cover the full Sun visibility window and will be repeated at least twice to assess stability.

4.27.5 Auxiliary Data

N/A

4.27.6 Input reference data or document

N/A

4.27.7 Required tools and configuration

N/A

4.27.8 Archive requirement

All instrument data.

4.27.9 Processing

N/A

4.27.10 Duration

See SODAP Plan

4.27.11 Output Data

All instrument data.

4.27.12 Pass /Fail Criteria

Successful acquisition of Instrument data.

4.27.13 Contingencies

If SODAP fails to deliver expected data, task shall be accomplished by Cal Team

4.27.14 Task Report Content

Date and summary of the data acquisition operations.
Description of the output data.

4.27.15 Responsible, team, location

Responsible: S. Delwart
Team: SODAP
Location: ESTEC

4.28 C-1.7.2 Acquisition: Coarse Spectrometric Characterisation using Diffusers

4.28.1 Objectives

Complete wavelength characterisation data using diffusers in observation and calibration modes.

4.28.2 Activities

Acquire diffuser 1 and doped diffuser in-flight data in calibration and observation modes with band settings corresponding to Blue and NIR Erbium absorption peaks (ErbBlue and ErbNIR band sets, ErbNIR acquisitions are TBC as no on-ground reference data exist).

4.28.3 Prerequisites

Completion of SODAP phase 6.

4.28.4 Instrument Data

Dif1_ErbBlue_Rad, Difλ _ErbBlue_Rad: measurements are spread over 2 successive orbits (one for each diffuser) and will be repeated at least twice to assess stability.
Dif1_ErbBlue_Obs, Difλ _ErbBlue_Obs: measurements are spread over 2 successive orbits (one for each diffuser), they cover the full Sun visibility window and will be repeated at least twice to assess stability.
Dif1_ErbNIR_Rad, Difλ _ErbNIR_Rad (TBC): measurements are spread over 2 successive orbits (one for each diffuser) and will be repeated at least twice to assess stability.
Dif1_ErbNIR_Obs, Difλ _ErbNIR_Obs (TBC): measurements are spread over 2 successive orbits (one for each diffuser), they cover the full Sun visibility window and will be repeated at least twice to assess stability.

4.28.5 Auxiliary Data

N/A

4.28.6 Input reference data or document

N/A

4.28.7 Required tools and configuration
N/A

4.28.8 Archive requirement
All instrument data.

4.28.9 Processing
N/A

4.28.10 Duration
2 days.

4.28.11 Output Data
All instrument data.

4.28.12 Pass /Fail Criteria
Successful acquisition of Instrument data.

4.28.13 Contingencies
N/A

4.28.14 Task Report Content
Date and summary of the data acquisition operations.
Description of the output data.

4.28.15 Responsible, team, location
Responsible: S. Delwart
Team: Cal/Val
Location: ESTEC

4.29 C-1.7.3 Analysis: Coarse Spectrometric Calibration using Diffusers

4.29.1 Objectives
To determine if the instrument’s spectral alignment has moved during launch.
To determine coarse values of the Instrument "alignment parameters"

4.29.2 Activities
Process Diffusers data to Erbium absorption peaks absolute locations on CCD.
Comparison of in-flight spectral calibration data with on-ground data to establish whether the camera alignment has changed during launch.
Determine the on-board “alignment’ parameters.

4.29.3 Prerequisites
Instrument data from C-1.7.1 and C-1.7.2 shall be available

4.29.4 Instrument Data
Outputs from C-1.7.1 and C-1.7.2

4.29.5 Auxiliary Data
N/A

4.29.6 Input reference data or document
CPSS data and description, pre-launch spectral calibration data and data analysis.

4.29.7 Required tools and configuration
MESCAL
IDL diffuser observations analysis tool (procedure SVal)
Analysis and plotting tool (*e.g.* IDL, Excel)

4.29.8 Archive requirement
MESCAL (SCal) and SVal outputs.

4.29.9 Processing
1. Run MESCAL (SCal mode) on the pairs of calibration Level 0 products.
2. Compare Blue and Green peak results with on-ground references. Evaluate changes for each module in terms of average wavelength shift, across-track slope variation. Analyse NIR peak results (TBC) to verify conclusions.
3. Process observation data using IDL (procedure SVal) to derive peak location for each frame. Analyse stability with time and noise level to assess overall measurement quality. Crosscheck with calibration mode results.
4. If all three peaks show significant average wavelength shift for any module, then consider updating the “alignment parameters”. If case of doubt, decision should be left to C-1.7.5.
5. If all three peaks, or at least the green and NIR peaks, show a significant increase on the spectral shift range, then see Contingencies.

4.29.10 Duration
2 days.

4.29.11 Output Data
Spectral blue feature,
Spectral green feature,
Spectral NIR feature location data (TBC),
Recommendation for alignment parameters
If needed, recommendations for an update of the Spectral Shift range and/or sampling (to be delivered as soon as possible to VER team).

4.29.12 Pass /Fail Criteria
Across-track behaviour of the peaks location shall be reasonably continuous.
Along-track behaviour of the peaks location shall be reasonably stable, however a significant level of noise can be expected.
Peak locations derived from averaged observations (over the calibration window) should lead to similar results than calibrations.

4.29.13 Contingencies

If the in-flight data analysis results do not show enough coherency with the on-ground characterisation then the Coarse Alignment Parameters shall be set by task C-1.7.5.
If the spectral shift range and sampling specified for Level 2 Auxiliary Data generation appear to be obviously not in line with actual instrument state, warn L2 VER Team and deliver range and trend estimates as soon as possible.

4.29.14 Task Report Content

Display of calibration results for each peak and each module. Display of reference data and of differences. Quantitative evaluation of the wavelength shift when reference data is available. Quantitative evaluation of the spectral sampling step for all possible combinations of in-flight measurements, comparison with blue-green peaks on-ground results. Discussion of coherency of observation versus calibration data. Display and discussion of along-track (temporal) variation of peak locations. Discussion and recommendation for alignment parameters and spectral shift range and sampling.

4.29.15 Responsible, team, location

Responsible: L. Bourg
Team: Cal/Val
Location ESTEC.

4.30 C-1.7.4 Acquisition: Coarse Spectrometric Calibration Using Geophysical Targets

4.30.1 Objectives

Acquire, select and retrieve all data needed by task C-1.7.5: data for the Spectrometric Characterisation of MERIS using observation of geophysical targets, data from routine observation for the verification of the Spectral Shift Index LUT.

4.30.2 Activities

Acquisition of Earth observations with band settings dedicated to spectral characterisation (O2 absorption line and TBC a TBD Fraunhoffer line).
Acquisition of radiometric calibrations for the same band settings.
Selection of RR scenes from routine observations allowing optimal pressure determination in Level 2 processing (pre-selected sites, other criteria & number of scenes: TBD). Note: if radiometric criteria have to be applied, selection can be done on Level 1b products, however the Level 0 data shall be retrieved.

4.30.3 Prerequisites

Completion of SODAP.

4.30.4 Instrument Data

Earth_O2_Obs (RR level 0 data, 3 consecutive orbits, probably over Africa), Dif1_O2_Rad (one radiometric calibration)
Earth_Fraunhoffer_Obs (TBC, RR level 0 data, number of scenes orbits TBD), Dif1_Fraunhoffer_Rad (TBC, one radiometric calibration)
Earth_SciLo_Obs (RR level 0 data, land scenes over selected sites).

4.30.5 Auxiliary Data
N/A

4.30.6 Input reference data or document
N/A

4.30.7 Required tools and configuration
N/A

4.30.8 Archive requirement
All instrument data.

4.30.9 Processing
N/A

4.30.10 Duration
2 days

4.30.11 Output Data
All instrument data.

4.30.12 Pass/Fail Criteria
All instrument data successfully acquired and retrieved.

4.30.13 Contingencies
N/A

4.30.14 Task Report Content
Date and summary of the data acquisition operations.
Description of the output data.

4.30.15 Responsible, team, location
Responsible: S. Delwart
Team: Cal/Val
Location: ESTEC

4.31 C-1.7.5 Analysis: Coarse Spectrometric Calibration Using Geophysical Targets

4.31.1 Objectives
To crosscheck results of task C-1.7.3, and update them if needed.
To derive absolute wavelength calibration of at least the CCD rows dedicated to O2 absorption line observations.
To confirm or update instrument's Alignment Parameters.
To get operational versions of spectrally sensitive Level 1b LUTs.

4.31.2 Activities

Analysis of spectral data over geophysical targets to derive absolute wavelength characterisation of the specific MERIS bands dedicated to observation of the O_2 absorption line and determine the “spectral shift index” LUT.

TBC: Analysis of spectral data over geophysical targets to derive absolute wavelength characterisation of the specific MERIS band dedicated to the observation of the TBD Fraunhoffer line. Comparisons with the O2 band results, determination of mean spectral sampling step.

Comparisons with results obtained from Diffusers observation data (see .C-1.7.3) for mean absolute spectral location and relative across-track variations.

Confirmation / new recommendations for Alignment Parameters

Recommendations for final setting of O2 absorption band in SciHi band set.

If Level 2 processor is sufficiently troubleshot: analysis of Level 2 pressure data for the verification of the “spectral shift index” LUT.

4.31.3 Prerequisites

Successful completion of task C-1.7.4.

Successful completion of task C-1.2.2 Coarse Radiometric Calibration.

4.31.4 Instrument Data

Earth_O2_Obs, Dif1_O2_Rad

TBC: Earth_Fraunhoffer_Obs, Dif1_Fraunhoffer_Rad

Earth_SciLo_Obs, land scenes over selected sites.

All the above from C-1.7.4

4.31.5 Auxiliary Data

Specific pressure determination polynomials for Earth_O2_Obs configuration.

Level 1b auxiliary data for O2, SciLo and (TBC) Fraunhoffer configurations.

Level 2 auxiliary data (pre-flight data).

4.31.6 Input reference data or document

Outputs and report from task C-1.7.3

4.31.7 Required tools and configuration

MESCAL

MEGS

O2_Obs analysis tool

TBC: Fraunhoffer_Obs analysis tool

Tool for FR and RR Spectral Shift Index LUTs from absolute wavelength characterisation of the O2 absorption band (IDL procedure TBD)

MERISVIEW

4.31.8 Archive requirement

MER_RAC_AX products generated from MESCAL processing of Dif1_O2_Rad and (TBC) Dif1_Fraunhoffer_Rad

Final Level 1b products generated during processing.

Outputs of O2_Obs analysis tool and (TBC) Frauhoffer_Obs analysis tool

4.31.9 Processing

Run MESCAL (RCal) with Dif1_O2_Rad, generate corresponding MER_RAC_AX

1. Run MEGS to process Earth_O2_Obs to Level 1b
2. Run O2_Obs analysis tool on Earth_O2_Obs Level 1b data.
3. Forward results of O2_Obs analysis tool to LISE and FUB for expertise
4. TBC: run Fraunhoffer_Obs analysis tool on Earth_Fraunhoffer_Obs data (after TBD pre-processing, possibly including MESCAL processing of Dif1_Fraunhoffer_Rad and MEGS level 1b runs)
5. TBC: forward results of Fraunhoffer_Obs analysis tool to FUB for expertise
6. Gather expertise reports from LISE and FUB. Analyse O2 data results to derive Spectral Shift index LUT for FR and RR (IODD ref. 6.1.12 and 6.1.13)
7. Update current version of SciLo MER_INS_AX with results of step 7
8. Run MEGS on Earth_SciLo_Obs level 0 data to level 2 products
9. Analyse pressure results (with support from ESLs): spatial variations, comparisons with external data (e.g. ECMWF), others TBD
10. Use expertise results to cross-check task C-1.7.3 results; discuss alignment parameters settings, confirm or recommend update; discuss band wavelengths and widths derived form on-ground characterisation, confirm or recommend update; discuss current band setting, confirm or recommend update.

4.31.10 Duration

10 days.

4.31.11 Output Data

6.1.5-25 & 26 number of used spectral shift indices, spectral shift values for each used index.
6.1.12 FR spectral shift index
6.1.13 RR spectral shift index
6.3.4-2 & 3 band wavelength and width (TBC)
6.3.4-5,6 & 7 instrument band settings
Instrument alignment parameters
Band settings CTI.

4.31.12 Pass /Fail Criteria

Successful completion of each processing step. Good quality feedback from expert laboratories. Good engineering judgment on absolute wavelength characterisation results.
Others TBD.

4.31.13 Contingencies

If the spectral shift range and sampling specified for Level 2 Auxiliary Data generation appear to be obviously not in line with actual instrument state, warn L2 VER Team and deliver range and trend estimates as soon as possible.
If significant changes occur in band wavelengths and widths, warn L2 VER Team and deliver new values.

4.31.14 Task Report Content

Reports from ESL, analysis of pressure results, comparison with Diffuser Observations results and discussion, discussion and recommendations on the use of output data.

4.31.15 Responsible, team, location

Responsible: L. Bourg
Team: Cal/Val
Location: ESTEC, LISE, FUB

4.32 C-1.7.6 Acquisition: Consolidated Spectrometric Calibration

4.32.1 Objectives

Acquire, select and retrieve all data needed by task C-1.7.7 for the consolidation of the Spectrometric Characterisation of MERIS: observation of the diffusers and geophysical targets for consolidation of the characterisation, data from routine observation for the verification of the Spectral Shift Index LUTs.

4.32.2 Activities

Acquire diffuser 1 and doped diffuser in-flight data in calibration and observation modes with band settings corresponding to Blue and NIR Erbium absorption peaks (ErbBlue and ErbNIR band sets, ErbNIR acquisitions are TBC as no on-ground reference data exist).
Acquisition of Earth observations with band settings dedicated to spectral characterisation (O2 absorption line and TBC a TBD Fraunhoffer line).
Acquisition of radiometric calibrations for the same band settings.
Selection of RR scenes from routine observations allowing optimal pressure determination in Level 2 processing (pre-selected sites, other criteria & number of scenes: TBD). Note: if radiometric criteria have to be applied, selection can be done on Level 1b products, however the Level 0 data shall be retrieved.

4.32.3 Prerequisites

Successful completion of C-1.7.2 and C-1.7.4
Successful completion of C-1.2.6 Analysis: Fine radiometric Characterisation.

4.32.4 Instrument Data

Dif1_ErbBlue_Rad, Difλ_ErbBlue_Rad: measurements are spread over 2 successive orbits (one for each diffuser).
Dif1_ErbBlue_Obs, Difλ_ErbBlue_Obs: measurements are spread over 2 successive orbits (one for each diffuser), they cover the full Sun visibility window.
Dif1_ErbNIR_Rad, Difλ_ErbNIR_Rad (TBC): measurements are spread over 2 successive orbits (one for each diffuser).
Dif1_ErbNIR_Obs, Difλ _ErbNIR_Obs (TBC): measurements are spread over 2 successive orbits (one for each diffuser), they cover the full Sun visibility window.
Earth_O2_Obs (RR level 0 data, 3 consecutive orbits, probably over Africa), Dif1_O2_Rad (one radiometric calibration)
Earth_Fraunhoffer_Obs (TBC, RR level 0 data, number of scenes orbits TBD), Dif1_Fraunhoffer_Rad (TBC, one radiometric calibration)
Earth_SciHi_Obs (RR level 0 data, land scenes over selected sites).

4.32.5 Auxiliary Data

N/A

4.32.6 Input reference data or document
N/A

4.32.7 Required tools and configuration
N/A

4.32.8 Archive requirement
All instrument data.

4.32.9 Processing
N/A

4.32.10 Duration
3 days

4.32.11 Output Data
All instrument data.

4.32.12 Pass /Fail Criteria
All instrument data successfully acquired and retrieved.

4.32.13 Contingencies
N/A

4.32.14 Task Report Content
Date and summary of the data acquisition operations.
Description of the output data.

4.32.15 Responsible, team, location
Responsible: S. Delwart
Team: Cal/Val
Location: ESTEC

4.33 C-1.7.7 Analysis: Consolidated Spectrometric Calibration

4.33.1 Objectives
To consolidate and possibly refine results of tasks C-1.7.3 & C-1.7.5. To get final fully operational versions of spectrally sensitive Level 1b LUTs.

4.33.2 Activities
Processing of Diffusers data (observation and calibration modes) to Erbium absorption peaks absolute locations on CCD, comparison of results with previous ones (on-ground, in-flight from task C-1.7.3 and routine spectral calibrations), analysis of temporal variations.
Processing of Earth observations data (O2 and TBC Fraunhoffer) to absolute wavelength characterisation of the corresponding CCD rows.
Comparison of all available data and synthesis of spectral characterisation.

Consolidate Alignment Parameters, O2 absorption band setting.
Update of all spectrally sensitive Level 1b LUTs.

4.33.3 Prerequisites

Successful completion of task C-1.7.6.
Successful completion of task C-1.2.6.

4.33.4 Instrument Data

Dif1_ErbBlue_Rad, Difλ_ErbBlue_Rad, Dif1_ErbBlue_Obs, Difλ_ErbBlue_Obs
Dif1_ErbGreen_Rad, Difλ_ErbGreen_Rad, Dif1_ErbGreen_Obs, Difλ_ErbGreen_Obs
TBC: Dif1_ErbNIR_Rad, Difλ_ErbNIR_Rad, Dif1_ErbNIR_Obs, Difλ_ErbNIR_Obs
Earth_O2_Obs, Dif1_O2_Rad
TBC: Earth_Fraunhoffer_Obs, Dif1_Fraunhoffer_Rad
Earth_SciHi_Obs.
All of the above from C-1.7.6

4.33.5 Auxiliary Data

Specific pressure determination polynomials for O2_obs_configuration.
Level 1b auxiliary data for O2, SciHi and (TBC) Fraunhoffer configurations.
Level 2 auxiliary data (pre-flight data).

4.33.6 Input reference data or document

Outputs and reports from task C-1.7.3 and C-1.7.5.
Routine spectrometric calibration monitoring reports.

4.33.7 Required tools and configuration

MESCAL
IDL diffuser observations analysis tool (procedure SVal)
Analysis and plotting tool (*e.g.* IDL, Excel)
MEGS
O2_Obs analysis tool
TBC: Frauhoffer_Obs analysis tool
Tool for FR and RR Spectral Shift Index LUTs from absolute wavelength characterisation of the O2 absorption band (IDL procedure TBD)
MERISVIEW

4.33.8 Archive requirement

MESCAL (SCal) and SVal outputs.
MER_RAC_AX products generated from MESCAL processing of Dif1_O2_Rad and (TBC) Dif1_Fraunhoffer_Rad
Final Level 1b products generated during processing.
Outputs of O2_Obs analysis tool and (TBC) Frauhoffer_Obs analysis tool.

4.33.9 Processing

1. Run MESCAL (SCal mode) on the pairs of spectral calibration Level 0 products.

2. Compare Blue and Green peak results with on-ground references. Evaluate changes for each module in terms of average wavelength shift, across-track slope variation. Analyse NIR peak results (TBC) to verify conclusions.
3. Process observation data using IDL (procedure SVal) to derive peak location for each frame. Analyse stability with time and noise level to assess overall measurement quality. Crosscheck with calibration mode results.
4. Run MESCAL (RCal) with Dif1_O2_Rad, generate corresponding MER_RAC_AX
5. Run MEGS to process Earth_O2_Obs to Level 1b
6. Run O2_Obs analysis tool on Earth_O2_Obs Level 1b data.
7. Forward results of O2_Obs analysis tool to LISE and FUB for expertise
8. TBC: run Fraunhoffer_Obs analysis tool on Earth_Fraunhoffer_Obs data (after TBD pre-processing, possibly including MESCAL processing of Dif1_Fraunhoffer_Rad and MEGS level 1b runs)
9. TBC: forward results of Fraunhoffer_Obs analysis tool to FUB for expertise
10. Gather expertise reports from LISE and FUB. Analyse O2 data results to derive Spectral Shift index LUT for FR and RR (IODD ref. 6.1.12 and 6.1.13)
11. Update current version of SciHi MER_INS_AX with results of step 7
12. Run MEGS on Earth_SciHi_Obs level 0 data to level 2 products
13. Analyse pressure results (with support from ESLs): spatial variations, comparisons with external data (e.g. ECMWF), others TBD
14. Use results of all steps to cross-check task C-1.7.5 results; discuss alignment parameters settings, confirm or recommend update; discuss band wavelengths and widths derived form on-ground characterisation, confirm or recommend update; discuss current band setting, confirm or recommend update.

4.33.10 Duration

10 days.

4.33.11 Output Data

Spectral blue feature,
Spectral green feature,
Spectral NIR feature location data (TBC),
6.1.5-25 & 26 number of used spectral shift indices, spectral shift values for each used index.
6.1.12 FR spectral shift index
6.1.13 RR spectral shift index
6.3.4-2 & 3 band wavelength and width (TBC)
6.3.4-5,6 & 7 instrument band settings
Instrument alignment parameters
Band settings CTI.

4.33.12 Pass /Fail Criteria

Successful completion of each processing step.
Good quality feedback from expert laboratories.
Good engineering judgment on absolute wavelength characterisation results.
Others TBD.

4.33.13 Contingencies

If the spectral shift range and sampling specified for Level 2 Auxiliary Data generation appear to be obviously not in line with actual instrument state, warn L2 VER Team and deliver range and trend estimates as soon as possible.
If significant changes occur in band wavelengths and widths, warn L2 VER Team and deliver new values.

4.33.14 Task Report Content

Temporal evolution of results from diffuser observation. Reports from ESL, analysis of pressure results, comparison with Diffuser Observations results and discussion, temporal evolution, discussion and recommendations on the use of output data.

4.33.15 Responsible, team, location

Responsible: L. Bourg
Team: Cal/Val
Location: ACRI, LISE, FUB

4.34 C-1.8 Pointing characterisation

4.34.1 Objectives

To perform a coarse verification of the instrument pointing characteristics (and geo-location algorithm) by comparing the Level 1b radiometry with the a priori coastline.
To characterise the ENVISAT platform attitude and generate the MERIS specific ADS of the attitude auxiliary data product.

4.34.2 Activities

The task responsible shall co-ordinate the activities of the sub-tasks and ensure execution of the plan.

4.34.3 Breakdown

Phase 1:
C-1.8.1: coarse pointing verification
Phase 2:
C-1.8.2: platform attitude characterisation

4.34.4 Outputs

All outputs, data and reports, from the subtasks.

4.34.5 Prerequisites

The instrument shall have reached the thermal equilibrium of the nominal observation scenario.
FR Calibration LUT shall be of sufficient quality (including static smear correction)
The Level 1b processing shall include an optimised smear correction. (N.B. This test could be used to determining what is an optimised smear correction (TBC))

4.34.6 Pass /Fail Criteria

All sub-tasks shall pass.

4.34.7 Contingencies

If nothing comes out of the sub-tasks, keep pre-flight data.

4.34.8 Responsible

S. Delwart

4.35 C-1.8.1 Coarse Pointing Verification

4.35.1 Objectives

To perform a coarse verification of the instrument pointing characteristics and geo-location algorithm by comparing the Level 1b radiometry with the a priori coastline.

4.35.2 Activities

Acquisition of RR observation data during SODAP. The data should include a coastline in every module (as a minimum).
Acquisition of FR observation data including a coastline at several positions in each module.
Verify that the instrument pointing (and Level 1b processing) has not moved due to launch, by analysing the Level 1b products with respect to the a-priori coastline.
Verify on scenes from different orbits that pointing is stable.

4.35.3 Prerequisites

Acquisition of sufficient RR and FR observation data.

4.35.4 Instrument Data

Earth_SciLo_Obs, scenes including coastlines at different latitudes and observation angles, about five RR scenes from one or two orbits (TBC).

4.35.5 Auxiliary Data

Level 1b radiometric data and Land /Sea /Coastline atlas.

4.35.6 Input reference data or document

Pointing characterisation data.

4.35.7 Required tools and configuration

MERISVIEW
IECF "f9" function

4.35.8 Archive requirement

N /A

4.35.9 Processing

Instrument data shall be processed to L1b
Run MERISVIEW with coastline drawn.
Visual comparison of *a priori* and observed coastline
Visual estimate of offset between *a priori* and observed coastline
Contingency: Run IECF “F9” with adjusted characterisation data and repeat the processing above.

4.35.10 Duration

3 days:
1. Selection of appropriate scenes for the 5 MERIS modules and for repeatability
2. Verification using baseline characterisation data.

3. Verification following offset adjustment

4.35.11 Output Data

Estimate of offset between *a priori* and observed coastline, for each of the 5 MERIS modules, before and after offset adjustment.

4.35.12 Pass /Fail Criteria

Offset shall be ≤ 2 RR pixels for all stable coastlines.

4.35.13 Contingencies

Level 1b processing not operative: use MEGS to process L1b
In the event of an offset or wrong pointing LUTs, adjust or correct LUTs and repeat the verification.

4.35.14 Task Report Content

Plots of all the coastline images under investigation.
Discussion of results, including the actions of the contingency procedure.

4.35.15 Responsible, team, location

Responsible: S. Delwart
Team: SODAP
Location: ESTEC

4.36 C-1.8.2 Platform Attitude Characterisation

4.36.1 Objectives

To characterise the ENVISAT platform attitude and generate the MERIS specific ADS of the attitude auxiliary data product.

4.36.2 Activities

Acquisition of FR observation data over coastlines and specific targets at well-known location (oil rigs in the ocean, others), at the edge of the MERIS swath and along the MERIS track (TBC).
Analysis of the data to determine the platform harmonic variations on the platforms attitude control law, and generate the MERIS specific ADS of the To characterise the ENVISAT platform attitude and generate the MERIS specific ADS of the attitude auxiliary data product.

4.36.3 Prerequisites

Successful completion of C-1.2.4
Successful completion of C-1.8.1

4.36.4 Instrument Data

Earth_SciLo_Obs, FR scenes including coastlines and designated targets at different latitudes and observation angles.

4.36.5 Auxiliary Data
Updated MER_INS_AX from C-1.8.1

4.36.6 Input reference data or document
PO-TN-CGI-CF-0037 IECF MERIS DPM

4.36.7 Required tools and configuration
IECF “F32”, “F33”, “F34”, “F35”,

4.36.8 Archive requirement
Data from C-1.8.1

4.36.9 Processing
See IECF MERIS DPM

4.36.10 Duration
10 Days.

4.36.11 Output Data
The details of the data output are specified in the IECF interface for “MERIS pointing”.

4.36.12 Pass /Fail Criteria
TBD

4.36.13 Contingencies
TBD

4.36.14 Task Report Content
Plots of all Output Data, See IECF MERIS DPM
Discussion TBD

4.36.15 Responsible, team, location
Responsible: M. Mc Caig
Team: Cal/Val
Location: ESTEC

4.37 C-1.9 MERIS Configurations Synthesis

4.37.1 Objectives

Establish, at the end of Calibration Phase 1, the nominal configuration of the instrument, optimised with respect to the mission objectives and processing constraints, proceed to CTR.
Verify, during Phase 2, that all settings are appropriate, confirm or update if necessary the baseline configuration before VTR. Proceed to VTR.

4.37.2 Activities

The task responsible shall co-ordinate the activities of the sub-tasks and ensure execution of the plan.

4.37.3 Breakdown

Phase 1:
C-1.9.1 Synthesis: Baseline MERIS Configuration
Phase 2:
C-1.9.2 Synthesis: Validated System Configuration

4.37.4 Outputs

4.37.5 Prerequisites

See sub-tasks.

4.37.6 Pass /Fail Criteria

All sub-tasks shall pass.

4.37.7 Contingencies

N/A

4.37.8 Responsible

S. Delwart

4.38 C-1.9.1 Synthesis: Baseline MERIS Configuration

4.38.1 Objectives

To establish the initial settings of the MERIS instrument and L1B processor, using the results of the coarse characterisation of MERIS

4.38.2 Activities

1) Check /establish timing for radiometric calibration sequence
2) Establish all on-board settings for the baseline:
   - OCL switch
   - Micro-band
   - Band
   - Gains
3) Establish L1B processor settings:
   - non-linearity correction
   - stray light correction
4) Establish diffuser BRDF model
5) Activate / de-scope fine characterisation tasks: C-1.3.2 & C-1.3.3, Non Linearity Characterisation, C-1.4.2 & C-1.4.3 Stray Light Characterisation
6) Build baseline set of Level 1b auxiliary data files, all fields filled from inputs of all Coarse Calibration Tasks, to the exception of those needing dedicated in-flight data to be filled by task C-1.2.4

4.38.3 Prerequisites

Successful completion of tasks:

- Analysis: dark signal in-flight characterisation & Analysis: dark signal orbital behaviour (C-1.1.2 & C-1.1.3)
- Analysis: coarse radiometric characterisation (C-1.2.2)
- Coarse non-linearity analysis: (C-1.3.1)
- Verification of the stray light correction (C-1.4.1)
- Analysis: coarse spectrometric calibration from diffusers & Analysis: coarse spectrometric calibration using geophysical targets (C-1.7.3 & C-1.7.5)
- Analysis: coarse pointing verification (C-1.8.1)

4.38.4 Instrument Data

Data used in C-1.1.3, C-1.2.2, C-1.3.1, C-1.4.1, C-1.7.3, C-1.7.5, C-1.8.1 (on request).

4.38.5 Auxiliary Data

Gain coefficients for SciLo configuration, from task C-1.2.2
Attitude bias, from task C-1.8.1

4.38.6 Input reference data or document

MERIS nominal band set (Level 2 DPM)
Programmable gain factors (PGICD, CPSS)

Alignment parameters and dispersion law from on-ground characterisation
Definition of radiometric calibration sequence timing (Operations manual)

4.38.7 Required tools

JLB-ASPI tool for determining "Set orbital parameters"
MESCAL
MERISVIEW, extraction of raw data from L0 product
MERSS
Plotting tool (IDL PLOT function)
Spectrum analysis tool (IDL FFT, DFT function)

4.38.8 Archive requirements

Data from C-1.1.3, C-1.2.2, C-1.3.1, C-1.4.1, C-1.7.3, C-1.7.5, C-1.8.1 (on request).

4.38.9 Processing

1) Radiometric calibration sequence timing
Plot the temporal variation of the signal at the field extreme pixels (module 1 column 740, module 5 column 1) in the Dif1_SciLo_obs sequence and check visually that no discontinuity due to vignetting occurs during the time window of the radiometric calibration sequence.

If an attitude bias has been identified in task C-1.8.1, apply that bias in a simulation of the radiometric calibration sequence and verify that the Sun zenith angle on the diffuser remains in the specified range, using the MERSS calibration mode pre-processor function.

2) OCL setting
It shall be based on a) noise estimate b) fixed pattern noise c) along orbit variation range.
Extract several sub-sets of TBD lines at TBD time interval, from the L0 data sets Shutter_SciLo_Obs_OCLON and Shutter_SciLo_obs_OCLOFF.
Compute along-track power spectrum for each column, each band of each sub-set.
Estimate noise power by summing up the power spectrum density at frequencies above TBD.
If one of the settings has a meaningfully lower noise power than the other it shall be selected.
Otherwise, find peaks in the frequency spectrum for each column. If peaks are not randomly distributed from one column to another this is an evidence of some fixed pattern noise. If an OCL setting shows meaningfully less fixed pattern noise than the other it should be selected.
Otherwise, compute mean and standard deviation of along-orbit variation range. If an OCL setting has a lower standard deviation it should be selected.
Otherwise select OCL OFF.

3) Band settings
Using the median (or average, TBC) of the absolute alignment parameters from spectral characterisation (C-1.7.2, C-1.7.4) and the dispersion law from on-ground characterisation; compute the nearest CCD line numbers corresponding to the nominal science band set of MERIS. Bands should be divided into micro-bands following the principles "use the minimum possible micro-bands per band" (to stay away from the CCD non-linearity region) and "keep micro-bands width equal within a band".

4) Gain settings

Using the theoretical programmable gains values from CPSS, the actual gain coefficients and the saturation levels determined in C-1.2.2, set the on-board gains so as to fulfil the dynamic range requirements par band established before launch in document TBD. Verify the gain settings with MERSS simulations of observation at L4 radiance and of a calibration sequence.

5) Diffuser BRDF model
Considering the results of task C-1.2.2, decide whether a BRDF model already in MESCAL is appropriate, or further modelling is required. In any case chose the best representative model as the baseline for MESCAL (IECF) operations.

5) Non-linearity correction switch
Set the NL correction switch following recommendations from task C-1.3.1.

6) Stray light correction switch
Set the Stray Light correction switch following recommendations from task C-1.4.1

4.38.10 Duration

3 days

4.38.11 Output Data

Baseline configuration of MERIS orbital parameters (Set Orbital Parameters and Set Aij Coefficients CTIs)
Baseline Level 1b ADF fields (except those directly derived from in-flight Calibration data) derived from upstream Coarse Calibration tasks and baseline instrument settings:
MER_INS_AX, MER_CP1_AX, MER_RAC_AX

4.38.12 Pass /Fail Criteria

Decision shall be made on all instrument settings.
All ADF fields shall be filled except those listed as output of task C-1.2.4

4.38.13 Contingencies

- If the dark current variation difference between OCL_ON and OCL_OFF is sufficiently large to require harmonic variation corrections for Non-Linearity => Processor update.
- If the orbital variation of the dark current with OCL_OFF cannot be modelled with the current set of parameters => Processor update.

4.38.14 Task Report Content

Decision on Radiometric Calibration sequence timing, with supporting evidence
Decision on OCL ON or OFF setting, *idem*
Decision on band and micro-band settings, *idem*
Decision on on-board gain settings, *idem*
Decision on BRDF model, *idem*
Decision on non-linearity correction switch setting, *idem*
Decision on stray light correction switch setting, *idem*
Decision on de-scoping of fine non-linearity characterisation (task C-1.3.2, C-1.3.3)
Decision on de-scoping of fine stray light characterisation (task C-1.4.2, C-1.4.3)

Decision on planning further BRDF modelling work (add "modelling" to task C-1.2.6)
Description of choices for each ADF field, with supporting evidence.

4.38.15 Responsible, team, location

Responsible: S. Delwart
Team: Cal Team
Location: Co-location of Cal team at ESTEC

4.39 C-1.9.2 Synthesis: Validated System Configuration

4.39.1 Objectives

To establish the nominal configuration of the MERIS L1B processing and its estimated performances.

4.39.2 Activities

Confirm / update the Baseline Configuration,
Select optimised auxiliary data files fields.

4.39.3 Prerequisites

Successful completion of tasks:
C-1.1.5 Analysis: Verification of Dark Signal Orbital Behaviour
C-1.2.6 Analysis: Fine Radiometric Calibration
C-1.3.3 Analysis: Non-linearity Characterisation (if applicable)
C-1.4.3 Analysis: Stray Light Characterisation (if applicable)
C-1.8.2 Platform Attitude Characterisation

4.39.4 Instrument Data

N/A

4.39.5 Auxiliary Data

Up-to-date Level 1b ADFs
All ADF fields output by tasks:
C-1.1.5 Analysis: Verification of Dark Signal Orbital Behaviour
C-1.2.6 Analysis: Fine Radiometric Calibration
C-1.3.3 Analysis: Non-linearity Characterisation (if applicable)
C-1.4.3 Analysis: Stray Light Characterisation (if applicable)
C-1.8.2 Platform Attitude Characterisation

4.39.6 Input reference data or document

Reports from tasks:
C-1.1.5 Analysis: Verification of Dark Signal Orbital Behaviour
C-1.2.6 Analysis: Fine Radiometric Calibration
C-1.3.3 Analysis: Non-linearity Characterisation (if applicable)
C-1.4.3 Analysis: Stray Light Characterisation (if applicable)
C-1.8.2 Platform Attitude Characterisation

4.39.7 Required tools

N/A

4.39.8 Archive requirement

N/A

4.39.9 Processing

N/A

4.39.10 Duration

1 week

4.39.11 Output Data

Validated baseline configuration of MERIS orbital parameters (Set Orbital Parameters and Set Aij Coefficients CTIs)
Validated baseline Level 1b ADF fields derived from upstream Fine Calibration tasks and baseline instrument settings:
MER_INS_AX, MER_CP1_AX, MER_RAC_AX, AUX_ATT_AX (MERIS ADS).

4.39.12 Pass /Fail Criteria

Decision shall be made on all instrument settings.
All ADF fields shall be filled.

4.39.13 Contingencies

Delay VTR until successful completion of task.

4.39.14 Task Report Content

Decision on VTR

4.39.15 Responsible, team, location

Responsible: S. Delwart
Team: Cal Team
Location: Co-location of Cal team at ESTEC

4.40 C-2 Initiation of the routine monitoring operations

4.40.1 Objectives

Initiate the routine monitoring operations for Dark Signal, Radiometric Response and Spectral Response.

4.40.2 Activities

4.40.3 Prerequisites

CTR

4.40.4 Breakdown

Phase 2:
Initiation of the Dark Signal Monitoring.
Initiation of the Radiometric Calibration Monitoring
Initiation of the Spectral response monitoring

4.40.5 Output Data

All outputs, data and reports, from the sub-tasks

4.40.6 Pass /Fail Criteria

NO Pass/Fail criteria

4.40.7 Contingencies

N/A

4.40.8 Task Report Content

Plots of all Output Data

4.40.9 Responsible

A. Buongiorno, ESRIN

4.41 C-2.1 Radiometric Calibration Monitoring

4.41.1 Objectives

To perform the routine radiometric calibration acquisition and monitoring.

4.41.2 Activities

To perform, every two weeks, a routine radiometric calibration sequence acquisition and monitoring using diffuser 1.
To perform, every three months, a routine radiometric calibration sequence acquisition and monitoring using diffuser 1. (Note: During Commissioning, and during the first year of operations, this activity shall be scheduled in combination with task C-1.2 Radiometric Characterisation).

4.41.3 Prerequisites
After successful completion of C-1.2.6 Analysis: Fine Radiometric Calibration.

4.41.4 Instrument Data
Dif1_SciHi_Rad
Dif2_SciHi_Rad

4.41.5 Auxiliary Data
Not Needed

4.41.6 Input reference data or document
PO-TN-CGI-CF-0037 IECF MERIS DPM

4.41.7 Required tools and configuration
IECF_ME_DPM function “F2”
IECF_ME_DPM function “F4”
IECF_ME_DPM function “F6”
IECF_ME_DPM function “F7”

4.41.8 Archive requirement
Included in IECF database (see IECF_ME_DPM)

4.41.9 Processing
If the calibration results are out of range (=> above threshold between calibration acquisitions), raise a warning to the Cal Team.

4.41.10 Duration
1 day

4.41.11 Output Data
See IECF MERIS DPM

4.41.12 Pass /Fail Criteria
Successful execution of IECF “F2” and “F6”

4.41.13 Contingencies
See IECF MERIS DPM

4.41.14 Task Report Content
See IECF MERIS DPM

4.41.15 Responsible, team, location
Responsible: P. Goryl
Team: Operations
Location: ESRIN

4.42 C-2.2 Spectral response monitoring

4.42.1 Objectives
To initiate the routine monitoring of the spectrometric calibration.

4.42.2 Activities
To initiate the routine monitoring of the spectrometric calibration using doped diffuser.
To initiate the routine monitoring of the spectrometric calibration using geophysical targets.

4.42.3 Prerequisites
After successful spectrometric response characterisation.

4.42.4 Instrument Data
Dif1_ErbGreen_Rad, Difλ_ErbGreen_Rad from routine timeline (every 90 days)
Dif1_ErbBlue_Rad, Difλ_ErbBlue_Rad from routine timeline (every 180 days)

4.42.5 Auxiliary Data
Not Needed

4.42.6 Input reference data or document
PO-TN-CGI-CF-0037 IECF MERIS DPM

4.42.7 Required tools and configuration
IECF_ME_DPM function “F2”
IECF_ME_DPM function “F4”
IECF_ME_DPM function “F6”
IECF_ME_DPM function “F7”

4.42.8 Archive requirement
Included in IECF database (see IECF_ME_DPM)

4.42.9 Processing

4.42.10 Duration

4.42.11 Output Data

4.42.12 Pass /Fail Criteria

4.42.13 Contingencies

4.42.14 Task Report Content

4.42.15 Responsible, team, location
AB, Cal/Val, ESRIN

4.43 C-3 Level 1B Optimisation

4.43.1 Objectives

4.43.2 Activities

The task responsible shall co-ordinate the activities of the sub-tasks and ensure execution of the plan.

4.43.3 Breakdown

Phase 1:
C-.3.1 Level 1b Trouble shooting
Phase 2:
C-3.2 Parameters Optimisation
Phase 3:
C-3.3 Processor Upgrade
All phases:
C-3.4 Prototype Processor Management
C-3.5 Transfer to IPF

4.43.4 Outputs

All outputs, data and reports, from the sub-tasks

4.43.5 Prerequisites

SODAP completed
MERIS PF running

4.43.6 Pass /Fail Criteria

All sub-tasks shall pass.

4.43.7 Contingencies

N/A

4.43.8 Responsible

L. Bourg

4.44 C-3 Level 1B Optimisation

4.44.1 Objectives

This activity intends to optimise the algorithms and parameters of the MERIS Level 1b processor, in particular:

- solve encountered problems;
- optimise the accuracy of product and annotations
- optimise correction algorithms

4.44.2 Activities

The task responsible shall co-ordinate the activities of the sub-tasks and ensure execution of the plan.

4.44.3 Breakdown

Phase 1:
C-.3.1 Level 1b Trouble shooting
Phase 2:
C-3.2 Parameters Optimisation
Phase 3:
C-3.3 Processor Upgrade
All phases:
C-3.4 Prototype Processor Management
C-3.5 Transfer to IPF

4.44.4 Outputs

All outputs, data and reports, from the sub-tasks

4.44.5 Prerequisites

SODAP completed
MERIS PF running

4.44.6 Pass /Fail Criteria

All sub-tasks shall pass.

4.44.7 Contingencies

N/A

4.44.8 Responsible

L. Bourg

4.45 C-3.1 Level 1B Troubleshooting

4.45.1 Objectives

To obtain stable, reliable Level 1B products.

4.45.2 Activities

Analyse L1B observation mode products and breakpoint data;
Diagnose L1B processing problems;
Test solutions;
Provide verified solutions to PF-MERIS for immediate implementation
Release L1B processing to Cal Team for internal use.

4.45.3 Prerequisites

SODAP completed
MERIS PF running
Dark signal in-flight characterisation (C-1.1.1) completed
Preliminary gain coefficients from Coarse Radiometric characterisation (C-1.2.1)

4.45.4 Breakdown

C-3.1.1 Geo-location
C-3.1.2 Mode transitions
C-3.1.3 Radiometric correction
C-3.1.4 Stray light correction
C-3.1.5 Annotations
C-3.1.6 Flagging

4.45.5 Output Data

Fields in Level 1B configuration aux data:
Problem reports

4.45.6 Pass /Fail Criteria

All sub-tasks shall pass.

4.45.7 Contingencies

A preliminary release of L1B products to Cal, Ver teams can be performed as soon as geo-location (C-3.1.1), radiometric correction (C-3.1.3), annotations (C-3.1.5) are performing correctly in RR mode.

4.45.8 Task Report Content

Reports of sub-tasks
Release of L1B products (internal to Cal /Ver) with summary description

4.45.9 Responsible

L. Bourg

4.46 C-3.1.1 Geo-location

4.46.1 Objectives

To validate the geo-location processing and annotations of the Level 1B products.

4.46.2 Activities

Analyse geo-location annotations (LADS) in L1B products and breakpoint files

4.46.3 Prerequisites

Same as top level task C-3.1

4.46.4 Instrument Data

Earth_SciLo_Obs, L1b RR data, scenes covering extreme range of latitude and longitude, dateline crossing
Earth_SciLo_Obs, L0 FR data coincident with RR data.

4.46.5 Auxiliary Data

MERIS-PF Level 1b auxiliary files as updated after C-1.1.2, C-1.2.2, C-1.8.1
Orbit files used by MERIS-PF during L1b data processing.

4.46.6 Input reference data or document

MERIS Level 1B DPM (RD 1)

4.46.7 Required tools

MEGS
MERISVIEW for LADS extraction
ESOV
Tool for computing geodetic distances (based on mission CFIs)

4.46.8 Archive requirement

All instrument and auxiliary data.

4.46.9 Processing

For the selected RR scenes:

1. Extract tie points latitude and longitude from LADS
2. Compare central tie point coordinates with SSP coordinates computed by ENVISAT orbit propagator (tolerance TBD)
3. Compute geodetic distance between tie points across-track
4. Compare AC distance with reference value
5. Verify range and behaviour of AL distance
6. Verify range and behaviour of Sun and view zenith and azimuth
7. When problems are identified, extract tie points latitude and longitude and angles from breakpoint files and repeat checks

For the selected FR scenes:

1. Extract tie points latitude and longitude from LADS

2. Compare central tie point co-ordinates with SSP co-ordinates computed by ENVISAT orbit propagator (tolerance TBD)
3. Compare scene centre co-ordinates with requested centre (tolerance TBD)

4.46.10 Duration

1 week

4.46.11 Output Data

Average value of along-track sampling step ()

4.46.12 Pass /Fail Criteria

Central tie point to SSP distance shall be within TBD tolerance.
AC Distances between tie points shall be as specified within TBD tolerance.
For all problems detected, MEGS shall be used to investigate whether problem lies in the PF-MERIS or in the DPM. In the second case, a solution should always be proposed and tested with MEGS.

4.46.13 Contingencies

This task affects:
C-3.1.5 Annotations
C-3.1.6 Flagging
without any possible workaround

4.46.14 Task Report Content

Plots of tie points on an Earth map
Histograms of distances: SSP to central tie point, AC between tie points
Plots of AL distance between tie points for one swath
Problem reports and corrections, as applicable
Document Change Proposals to DPM, as applicable

4.46.15 Responsible, team, location

Responsible: L. Bourg
Team: Cal/Val Team
Location: ACRI-ST,

4.47 C-3.1.2 Mode transitions

4.47.1 Objectives

Ensure that the Level 1B processing properly handles transitions between modes of MERIS

4.47.2 Activities

Analyse RR data acquired during the transitions between standby, averaging, direct and averaging modes
Verify DPM (RD1) assumptions about packets sequencing
Verify continuity of the RR L1B products over transitions between "averaging" and "direct and averaging" modes
Verify continuity of the RR L1B products over packet counter wraparound
Verify continuity of L1B time stamping in the case of an on-board timer reset

4.47.3 Prerequisites

Same as top level task C-3.1

4.47.4 Instrument Data

Observation mode data at start of averaging mode, L0 and L1B RR
Observation mode data at start of direct and averaging mode, L0 and L1B RR, L0 and L1B FR
Observation mode data over a sequence averaging → direct and averaging → averaging, L0 and L1B RR, L0 and L1B FR
Observation mode RR data around packet counter reset, L0 and L1B (PC wraps around about every 3 minutes in RR, reset occur at each mode transition)
Observation mode RR data around on-board timer reset, L0 and L1B (TBC)

4.47.5 Auxiliary Data

MERIS-PF auxiliary files as updated after C-1.1.2, C-1.2.2

4.47.6 Input reference data or document

MERIS Level 1B DPM (RD1)

4.47.7 Required tools

MEGS
MERISVIEW

4.47.8 Archive requirement

TBD

4.47.9 Processing

Extract packet header and secondary header from the Level 0 input data
Inspect successive values of fields TBD
Visually check L1B product MDS for dropouts

4.47.10 Duration
1 week

4.47.11 Output Data
Reference values for MER_INS_AX fields

4.47.12 Pass /Fail Criteria
Mode transitions do not affect the continuity of RR product more than 1 RR frame dropout

4.47.13 Contingencies
Reference values may have to be updated in Aux data to reflect actual on-board software status.
If a secondary header field used in L1B processing appears unstable, the L1B algorithms may have to be modified.
This task affects the completion of top-level task C-3.1

4.47.14 Task Report Content
Values of secondary header fields upon mode transition
Problem reports and correction, as applicable
Document Change Proposals to DPM, as applicable

4.47.15 Responsible, team, location
Responsible: S. Delwart
Team: G. Baudin, J-L. Bezy, L. Bourg
Location: ESTEC

4.48 C-3.1.3 Radiometric correction

4.48.1 Objectives

Ensure that the L1B processing performs radiometric corrections as specified

4.48.2 Activities

Analyse breakpoints and Level 1B data to verify the effectiveness of non-linearity correction, offset correction, smear correction, and gain correction with respect to their specifications.

4.48.3 Prerequisites

Same as top level task C-3.1

4.48.4 Instrument Data

Earth_SciLo_Obs: simultaneous RR and FR L0 data: scenes over clear sky and cloudy ocean, clear sky coastal zones. Corresponding L1b data from MERIS-PF

4.48.5 Auxiliary Data

MERIS-PF auxiliary files as updated after C-1.1.2, C-1.2.2

4.48.6 Input reference data or document

MERIS L1B DPM (RD1)
MEGS Software Acceptance Test Plan (RD9)

4.48.7 Required tools

MEGS
MERIS PF redundant chain
MERISVIEW tool for data extraction

4.48.8 Archive requirement

TBD

4.48.9 Processing

Process L0 data to L1b using MEGS.
Compare MERIS-PF and MEGS generated L1b products, analyse differences, if any.
Display all level 1b data to search for possible artefacts (stripping, discontinuities at module transitions,…). Use MERISVIEW on L1b and breakpoint files to check radiance ranges (in particular negative radiances in breakpoints, null radiances in L1b).
Compare RR and FR L1b data from breakpoints for same locations (after spatial average of FR data over RR pixels), derive statistics.

4.48.10 Duration

3 days

4.48.11 Output Data

N /A

4.48.12 Pass /Fail Criteria

RR and spatially averaged FR data should match within TBD tolerance over uniform targets. Good engineering judgment otherwise.

4.48.13 Contingencies

This task affects:
C-3.1.4 Stray light correction
without any possible workaround

4.48.14 Task Report Content

Descriptions of analyses and conclusions.
Problem reports and corrections, as applicable

4.48.15 Responsible, team, location

Responsible: L. Bourg
Team: Cal/Val team
Location: ACRI-ST, ESTEC

4.49 C-3.1.4 Stray light correction

4.49.1 Objectives
Ensure that the L1B stray light correction performs properly according to specification.

4.49.2 Activities
Analyse and compare scenes processed with and without stray light correction.

4.49.3 Prerequisites
C-3.1.3 Radiometric correction passed

4.49.4 Instrument Data
Observation mode FR scene including limited size clouds above water.

4.49.5 Auxiliary Data
MER_CP1_AX with AC stray light correction ON and OFF

4.49.6 Input reference data or document
MERIS L1B DPM (RD1)
MEGS Software Acceptance Test Plan (RD9)

4.49.7 Required tools
MEGS
MERIS PF redundant chain
MERISVIEW tool for data extraction

4.49.8 Archive requirement
TBD

4.49.9 Processing
Reprocess L0 FR data in MEGS and in redundant MERIS-PF with stray light corrections ON and OFF
Extract one frame from both versions of L1 FR scene, straddling a cloud
Plot the radiance across-track in all bands for both frames
Check that the behaviour without /with AC stray light correction matches validation results.

4.49.10 Duration
2 days

4.49.11 Output Data
N /A

4.49.12 Pass /Fail Criteria
The behaviour without /with AC stray light correction shall be consistent with the software acceptance test results.

4.49.13 Contingencies

N/A

4.49.14 Task Report Content

Test scene description and visualisation
AC radiance plots without and with stray light
Problem reports and corrections, as applicable

4.49.15 Responsible, team, location

Responsible: L. Bourg
Team: J-P Huot
Location: ACRI-ST, ESTEC

4.50 C-3.1.5 Annotations

4.50.1 Objectives

Ensure that L1B annotation data other than geo-location are correct

4.50.2 Activities

Analyse annotations (LADS) in L1B products and breakpoint files

4.50.3 Prerequisites

C-3.1.1 Geo-location passed

4.50.4 Instrument Data

Same as C-3.1.1

4.50.5 Auxiliary Data

ECMWF forecast and analysis fields as used in the processing of MERIS data

4.50.6 Input reference data or document

MERIS Level 1B DPM (RD1)

4.50.7 Required tools

MEGS
MERIS-PF auxiliary files as updated after C-1.1.2, C-1.2.2
MERISVIEW for LADS extraction
Tool for mapping geo-located data into Earth frame
Tool for visualisation of ECMWF data
Tool for visualisation of DEM, DRM

4.50.8 Archive requirement

TBD

4.50.9 Processing

Extract latitude, longitude, altitude, roughness, lat /lon altitude correction, pressure, zonal and meridional winds, and relative humidity from LADS
Display annotations on Earth grid according to lat /lon values
Extract latitude, longitude grid and data fields from ECMWF files.
Visual comparison with display of source data (extracted by alternative method) for each field.

4.50.10 Duration

0.5 week

4.50.11 Output Data

N /A

4.50.12 Pass /Fail Criteria

L1B Annotations shall be consistent with values from reference aux data extracted by alternative method.

4.50.13 Contingencies

Release of L1B products to L2 processing

4.50.14 Task Report Content

Plots of annotation parameters on Earth map
Plot of corresponding extract of reference aux data
Problem reports and corrections, as applicable
Document Change Proposals to DPM, as applicable

4.50.15 Responsible, team, location

Responsible	: V. Fournier-Sicre
Team	: Cal/Val Team
Location	: ACRI-ST, ESTEC

4.51 C-3.1.6 Flagging

4.51.1 Objectives

Ensure that L1B pixel flags fully reflect the specification

4.51.2 Activities

Analyse RR observation data and breakpoint values to ensure that flags behave according to the DPM (RD1) (FR data are avoided because the matching of product and breakpoint pixels is very complex)

4.51.3 Prerequisites

C-3.1.1 Geo-location
C-3.1.2 Mode transitions
C-3.1.3 Radiometric correction

4.51.4 Instrument Data

Observation mode L0 RR data covering saturation, blooming, Sun glint, dropouts

4.51.5 Auxiliary Data

N /A

4.51.6 Input reference data or document

MERIS Level 1B DPM (RD1)

4.51.7 Required tools

MEGS
MERISVIEW

4.51.8 Archive requirement

TBD

4.51.9 Processing

Extract flags from L1B
Within each frame, reduce pixels with "duplicate" flags, compare to breakpoint radiances “reduced” off-line using the bad pixels / re-sampling map.
Extract flags from breakpoints.
Check numerical saturation (in L0 data) with respect to “saturated flag from breakpoints.
Check that product flags match appropriate combinations of breakpoint flags
Reprocess L0 to L1B with alternative bad pixels / re-sampling map and check the variation of flags (in particular the cosmetic one).

4.51.10 Duration

1 week

4.51.11 Output Data

N /A

4.51.12 Pass /Fail Criteria

All tested L1b products shall comply to RD1.

4.51.13 Contingencies

TBD

4.51.14 Task Report Content

Descriptions of all tests and conclusions.
Problem reports and corrections, as applicable
Document Change Proposals to DPM, as applicable

4.51.15 Responsible, team, location

Responsible : V. Fournier-Sicre
Team : Cal/Val team
Location : ACRI-ST, ESTEC

4.52 C-3.2 Parameters Optimisation

4.52.1 Objectives

Set operational values for all L1B auxiliary parameters (*e.g.* flagging criteria) which are not related to in-flight characterisation of the instrument.

4.52.2 Activities

Process L0 data to breakpoint files and L1b product using MEGS.
Analyse L1B products and breakpoint files to identify situations where pixels are flagged, analyse relationship between flag and data quality, adjust flagging threshold, test processing with new threshold values. The thresholds concerned are:

1. number of following samples affected by a pixel saturation during read-out
2. number of neighbour pixels affected by saturation in one pixel
3. thresholds on zenith and azimuth difference values for glint mask
4. look-up table of threshold values

Other TBD

4.52.3 Prerequisites

C-3.1 Level 1B troubleshooting passed

4.52.4 Instrument Data

L0 RR data for scenes with:

- glint
- clouds
- snow
- ice

One full day of MERIS RR data seems appropriate to cover the needs above

L0 FR data for scenes with:

- saturation
- blooming

Cloud-free inland water body within the Sun glint spot seems appropriate to cover the needs above

4.52.5 Auxiliary Data

MERIS auxiliary parameters: as of L1B internal release

4.52.6 Input reference data or document

MERIS L1B DPM, RD1
Specification of the scientific contents of MERIS auxiliary product, RD8

4.52.7 Required tools

MEGS with same aux. parameters as MERIS-PF
MERISVIEW
RTT

4.52.8 Archive requirement

TBD

4.52.9 Processing

Saturation thresholds shall be adjusted on FR images with procedure TBD, then divided by 4 to yield the RR values.

Glint thresholds: TBD

"Bright" threshold:

for a series of RR images spanning the whole orbit with clouds, snow, ice, glint,

1. convert TOA radiance to reflectance
2. perform automated image classification on the full spectrum,
3. visually identify classes corresponding to "bright" pixels,
4. compute cross-probability for a pixel of belonging or not to a bright class *vs.* of being or not classified "bright",
5. adjust RTT parameters and compute new bright threshold to maximise correlation between bright class and bright flag
6. apply threshold to verify visually the flagging

4.52.10 Duration

2 weeks

4.52.11 Output Data

1. number of following samples affected by a pixel saturation during read-out (IODD §6.2 table 11, fields 4, 7)
2. number of neighbour pixels affected by saturation in one pixel (IODD §6.2 table 11, fields 2, 3)
3. thresholds on zenith and azimuth difference values for glint mask (IODD §6.2 table 11, fields 5, 6)
4. look-up table of threshold values (IODD §6.2 table 20)

4.52.12 Pass /Fail Criteria

The probability of having a pixel improperly flagged with reference to supervised classification shall be minimised

4.52.13 Contingencies

Use pre-launch values if this task fails.

4.52.14 Task Report Content

Recommended values for all flagging thresholds
Plots of automated classification results *vs.* bright flag, cross-probability tables
Recommended values and justification for RTT inputs

4.52.15 Responsible, team, location

Responsible: A. Buongiorno
Team: TBD

Location: ESRIN, TBC

4.53 C-3.3 Processor Upgrade

4.53.1 Objectives

When troubleshooting or validation activities show that an upgrade of the MERIS processor is needed, this activity shall implement and validate such upgrades in the processing prototype.

4.53.2 Activities

Analyse Document Change Proposals arising from any other task. In particular, ensure consistency of changes in DPM and IODD.
Design change implementation, verification and validation

4.53.3 Prerequisites

N /A

4.53.4 Instrument Data

As attached to inputs for evidence of problem.

4.53.5 Auxiliary Data

MERIS Auxiliary files modified according to upgrade requirements

4.53.6 Input Reference Data

MERIS Processor Test Data Sets used for regression testing

4.53.7 Required Tools

MEGS (the activity shall use the MEGS version prevailing at launch time as reference, a working version to implement and validate changes)
MERISVIEW

4.53.8 Archive Requirements

All validation results for upgraded prototype

4.53.9 Processing

Design of new /updated data structures, code
Unit level verification with *ad hoc* test data
System level verification & validation:

a) regression testing using TDS tests
b) validation of the changes on the input data
c) assessment of impact on run time

4.53.10 Duration

Open during whole commissioning phase

4.53.11 Output Data

New ADF fields, as applicable

4.53.12 Pass /Fail Criteria

All changes shall be validated by test on MEGS, before transfer to the IPF.

4.53.13 Contingencies

N /A

4.53.14 Task Report Contents

For each proposed change:

- description of impact on specifications
- description of design change
- validation report

4.53.15 Responsible, Team, Location

Responsible: L. Bourg
Team: Cal
Location: ACRI

4.54 C-3.4 Prototype Processor Management

4.54.1 Objectives

To ensure that all elements of MERIS Calibration remain identifiable, traceable and accessible during the Commissioning Phase

4.54.2 Activities

Configuration control of MEGS, MESCAL source code
Version control of MEGS and MESCAL
Preparation and distribution of patches
Configuration control of auxiliary data files
Configuration control of instrument data sets

4.54.3 Prerequisites

N /A

4.54.4 Instrument Data

All instrument data created by other CP tasks should be identified

4.54.5 Auxiliary Data

All auxiliary data created by other CP tasks should be identified

4.54.6 Input reference data or document

MEGS, MESCAL configuration as start of CP

4.54.7 Required tools

CVS source code and data version control
Makefiles for MEGS, MESCAL

4.54.8 Archive requirement

TBD

4.54.9 Processing

Register source code changes in a database
Prepare Makefiles, patch files for new code versions
Register code and auxiliary data versions in a database

4.54.10 Duration

Open during whole Commissioning Phase

4.54.11 Output Data

Patch installation files for MEGS, MESCAL

4.54.12 Pass /Fail Criteria

N /A

4.54.13 Contingencies

TBD

4.54.14 Task Report Content

Configuration status report for MEGS, MESCAL, auxiliary data files
Inventory of instrument data

4.54.15 Responsible, team, location

Responsible	: C. Ngo Van Duc
Team	: Cal /Val team
Location	: ACRI-ST, ESTEC

4.55 C-3.5 Transfer to IPF

4.55.1 Objectives

To implement in the MERIS operational processor, the changes and improvements identified during the MERIS commissioning

4.55.2 Activities

Validate auxiliary data updates on redundant processing chain
Design MERIS-PF code upgrades
Validate MERIS-PF code upgrades on redundant processing chain
Update MERIS-PF with code upgrade and auxiliary data updates

Phase 1: code updates limited to troubleshooting (C-3.1), aux data update after end of task C-1.9.1
Phase 2: aux data update after end of task C-1.9.2
Phase 3: code updates following outputs of task C-3.3, aux data update following outputs of task C-4

4.55.3 Prerequisites

N /A

4.55.4 Instrument Data

N /A

4.55.5 Auxiliary Data

ADF as approved by tasks C-1.9.1, C-1.9.2, C-4, and organisation changes from task C-3.3

4.55.6 Input reference data or document

Document Change Proposals validated by tasks C-3.1, C-3-3
Validation data from task C-3.3

4.55.7 Required tools

TBD

4.55.8 Archive requirement

TBD

4.55.9 Processing

Implement code or auxiliary data changes in MERIS PF redundant chain
Validate changes
Implement validated changes in MERIS PF nominal processing

4.55.10 Duration

Phase 1: TBD
Phase 2: 1 week at end of C-1.9.2
Phase 3: TBD

4.55.11 Output Data

N /A

4.55.12 Pass /Fail Criteria

Changes shall be functionally verified and shall not exceed TBD% of available processing power margin

4.55.13 Contingencies

Descoping of algorithm upgrades before L1b Products Release

4.55.14 Task Report Content

Description of changes
Verification reports

4.55.15 Responsible, team, location

Responsible: N…, GMV
Team: Cal
Location: ESTEC (TBC)

4.56 C-4 Calibration Synthesis

4.56.1 Objectives

To conclude the Commissioning Phase with a good understanding of the behaviour and main parameters of the MERIS system: instrument and Level 1 processing

4.56.2 Activities

Synthesis of the results of all characterisation and optimisation activities
Commissioning Phase reporting and participation in ENVISAT commissioning workshop
Release of MERIS L1B products to the user community

4.56.3 Prerequisites

Successful completion of tasks C-1.1, C-1.2, C-1.3, C-1.4, C-1.7, C-1.8, C-1.9, C-3.3

4.56.4 Breakdown

C-4.1 Radiometric Characterisation Synthesis
C-4.2 L1B Processor Tuning Synthesis
C-4.3 Transfer to Operational G/S

4.56.5 Pass /Fail Criteria

All sub-tasks shall succeed.

4.56.6 Contingencies

Public release of the MERIS L1b products

4.56.7 Responsible

S. Delwart

4.57 C-4.1 Radiometric Characterisation Synthesis

4.57.1 Objectives

To establish a model accounting for the radiometric performance of MERIS and its evolution during the Commissioning Phase.

4.57.2 Activities

Compare the MERIS characterisation results obtained from:

- on-ground characterisation
- in-flight characterisation (task C-1)
- routine monitoring (task C-2)
- vicarious calibration (vicarious calibration group activities)

Establish MERIS radiometric model parameter values, their evolution in the six first months of MERIS operational life, the accuracy on these parameter values.
Establish MERIS error model parameters: noise, accuracy
Present results at Calibration workshop and on ENVISAT WWW site

4.57.3 Prerequisites

Successful completion of task C-1.9
routine monitoring data available from task C-2

4.57.4 Instrument Data

Instrument data already used in characterisation tasks may be re-visited

4.57.5 Auxiliary Data

TBD

4.57.6 Input reference data or document

On-ground characterisation results (CPSS)
Reports from tasks C-1, C-2, AO experiments

4.57.7 Required tools

Data analysis and visualisation general purpose tools: EXCEL, IDL

4.57.8 Archive requirement

None

4.57.9 Processing

Establish statistics of MERIS radiometric model parameters: gains, offset, diffuser BRDF
Plot model parameters as function of time, of source
Assess influence of non-linearity, stray light, spatial registration

4.57.10 Duration

1 week

4.57.11 Output Data

MERIS radiometric model parameters, error bars.

4.57.12 Pass /Fail Criteria

Common understanding of the results across the Cal team and vicarious calibration group

4.57.13 Contingencies

Release of MERIS L1b products to the user community

4.57.14 Task Report Content

Description of the parameter sources
Time series of radiometric model parameters, plots
Discussion of the results

4.57.15 Responsible, team, location

Responsible: S. Delwart
Team: Cal Team, Vicarious calibration group
Location: ESTEC (TBC)

4.58 C-4.2 L1B Processor Tuning Synthesis

4.58.1 Objectives

To assess the performance of the MERIS L1b processor following all optimisation activities

4.58.2 Activities

Collect and consolidate software validation results

4.58.3 Prerequisites

Successful completion of tasks C-3.1 to C-3.4

4.58.4 Breakdown

C-4.2.1 L1b Processor Parameters
C-4.2.2 L1b Processor Algorithms

4.58.5 Pass /Fail Criteria

N /A

4.58.6 Contingencies

N /A

4.58.7 Responsible

L. Bourg

4.59 C-4.2.1 L1B Processor Parameters

4.59.1 Objectives

To establish, document and justify the value of all L1B processing auxiliary parameters

4.59.2 Activities

Compile evolutions of MERIS auxiliary parameter values resulting from characterisation activities, processor tuning activities

4.59.3 Prerequisites

Successful completion of tasks C-1, C-3.1, C-3.2

4.59.4 Instrument Data

N /A

4.59.5 Auxiliary Data

ADF updated by tasks C-1, C-3.1, C-3.2

4.59.6 Input reference data or document

Reports of tasks C-1, C-3

4.59.7 Required tools

N /A

4.59.8 Archive requirement

N /A

4.59.9 Processing

Compilation of values
Cross-checking for temporal consistency

4.59.10 Duration

1 week

4.59.11 Output Data

Validated ADFs

4.59.12 Pass /Fail Criteria

N /A

4.59.13 Contingencies

N /A

4.59.14 Task Report Content

For each parameter subject to tuning:

- description of the tuning operations: date, reason, activities

- impact of the tuning on output quality

4.59.15 Responsible, team, location

Responsible: L. Bourg
Team: Cal team
Location: ACRI

4.60 C-4.2.2 L1B Processor Algorithms

4.60.1 Objectives

To establish the configuration for the MERIS L1b operational processing algorithm

4.60.2 Activities

Collect all algorithm upgrades proposed for the L1 processor in tasks C-3.1 and C-3.3, their implementation and validation results from task C-3.3 (prototyping) and C-3.5 (transfer to IPF)
Assess the validity and efficiency of the algorithm upgrades

4.60.3 Prerequisites

Successful completion of tasks C-3.1, C-3.3, C-3.5

4.60.4 Instrument Data

Validation input data from predecessor tasks may be used in regression tests

4.60.5 Auxiliary Data

AFD as validated in task C-4.2.1

4.60.6 Input reference data or document

Reports from tasks C-3.1, C-3.3

4.60.7 Required tools

N /A

4.60.8 Archive requirement

N /A

4.60.9 Processing

If needed, perform regression tests of the upgraded processor on the MERIS IPF redundant chain

4.60.10 Duration

1 week

4.60.11 Output Data

Decision on algorithm upgrades for the MERIS L1b operational processor

4.60.12 Pass /Fail Criteria
TBD

4.60.13 Contingencies
Algorithm upgrades are not put in the scope of operational processing if performance is not positively improved or computation resources margin is exceeded

4.60.14 Task Report Content
Updated MERIS L1b DPM

4.60.15 Responsible, team, location
Responsible: L. Bourg
Team: Cal
Location: ACRI

4.61 C-4.3 Transfer to Operational G/S

4.61.1 Objectives
To install and initiate the MERIS processor: code, auxiliary parameters, after optimisation, in the MERIS IPF operational chain

4.61.2 Activities
Configuration control
Software and data installation procedures
Acceptance testing

4.61.3 Prerequisites
Successful completion of tasks C-4.2.1, C-4.2.2

4.61.4 Instrument Data
N /A

4.61.5 Auxiliary Data
ADF as validated in task C-4.2.1

4.61.6 Input reference data or document
Report from tasks C-4.2

4.61.7 Required tools
Version control tools
Code generation tools
Configuration management tools

4.61.8 Archive requirement
N /A

4.61.9 Processing

Configure operational MERIS processor
Install operational MERIS processor at operational facilities
Perform acceptance testing at operational facilities

4.61.10 Duration

1 week

4.61.11 Output Data

N /A

4.61.12 Pass /Fail Criteria

Successful acceptance test at operational facilities

4.61.13 Contingencies

Release of MERIS L1b products to the user community

4.61.14 Task Report Content

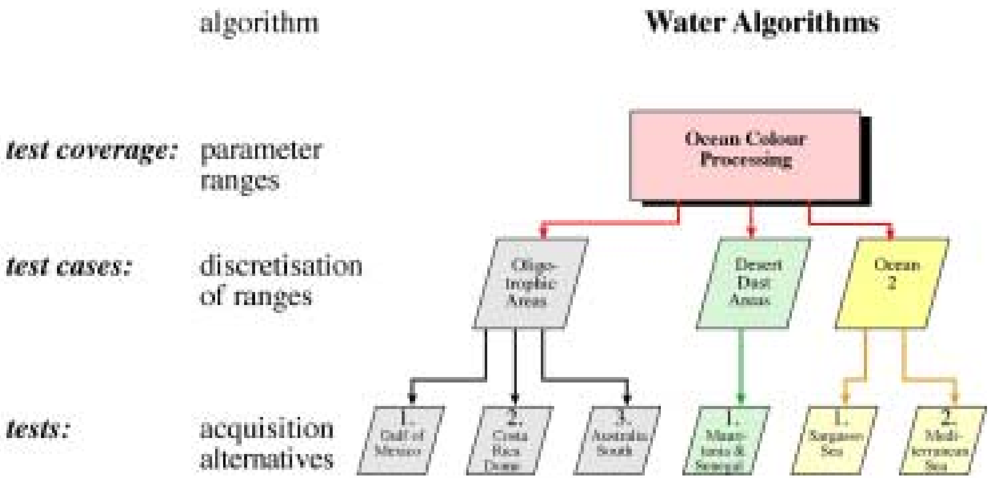
PFMERIS configuration status report
Acceptance test report

4.61.15 Responsible, team, location

Responsible: N…, GMV
Team: MERIS PF team
Location: Madrid, Kiruna or ESRIN

5. Verification Tasks Descriptions

In order to reach the objectives, for each *test* the *test coverage* is defined in terms of environmental parameters and ranges of processing / resulting parameters *e.g* sun zenith between 30° and 60°, water vapour between 1 and 7 g/cm^2). This is broken down into several *test cases*, in which these ranges are included. Finally, concrete *test* scenes in terms of MERIS FR or RR scenes will be identified, which are possible candidates for the test cases.



5.1 Task V-1: Troubleshoot L2 Processor

5.1.1 Objectives

The objective of the trouble shooting phase is to verify the overall functionality of the Level 2 processor. The processor software shall not crash, and all algorithms shall generate Level 2 products.

5.1.2 Activities

Test data acquisition, Verify successful processing, investigate products and solve problems.

5.1.3 Breakdown

V-1.1: Test data acquisition

According to a moderate number (approximately 10) of the pre-defined scenes, FR (appr. 2) and RR (appr. 8) test data have to be ordered from the PDS, including L1b and L2.

V-1.2: Verify successful processing

In case that the processing in the PDS is not successful, i.e. the software exists with an error message or crashes, the reason will be searched for by debugging the PDS software and, in parallel, processing the L1b data with the MEGS prototype.

Once the processing has been completed successfully, the products will be analysed visually and statistically.

V-1.3: Trouble shooting stand by
The processing of additional data will be monitored by visual inspection of the generated products. In case of suspect results, the error will be searched using the MEGS prototype and the L1b data, which caused the suspect results.

At the end of this activity the L2 data will be released to the other CalVal teams. However, it must be made clear that the verification is not completed and changes in the processing and products may become necessary.

V-1.4: Additional Trouble shooting stand by
After release of the L2 data, the activities which have started under V-1.3 will be continued in order to increase the number of processed data and to be sure that no major processing problems will occur.

V-1.5: ESL support period 1
Embedded in the activity V-1.3, and before the release of the L2 data to the CalVal teams, the ESL partners will be available during a 2 weeks period in order to support the trouble shooting phase.
Figure 6 shows a breakdown of the sub-tasks to be completed within Task V-1.

5.1.4 Prerequisites

Internal release of Level 1b products.

5.1.5 Task Report Content

TBD

5.1.6 Responsible

Responsible : C. Brockmann
Team : U. Krämer, V. Fournier-Sicre, F. Fell, ESL: J. Fischer (FUB), R. Santer (LISE), G. Moore (PML), D. Antoine (LPCM)
Location : BC, ACRI, FUB, LISE, PML, LPCM

5.2 Task V-2: Verification of L2 Algorithms

5.2.1 Objectives

In this phase, each algorithm individually will be tested according to the objectives defined in §3 above. This includes, for each test, several test cases represented by a single FR or RR scene and well defined criteria, which the corresponding product has to meet (see §5 above).

5.2.2 Activities

The following activities will be performed for each *test case* (see §5 above):

(1) As soon as one of the *test scenes* has been acquired successfully, *i.e.* no instrument error has occurred and all environmental conditions (*e.g.* no clouds) have been met, the other defined test scenes for that *test case* will be omitted. The test scene will be analysed according to the plan and the pass/fail criteria will be evaluated. If the test has been successfully passed, no further action is necessary.

(2) If the test failed, the identified tuning parameters will be changed according to the plan and the test will be repeated. This is iterated until the test has been passed or the final fail criteria are reached.

(3) A final evaluation and assessment of the test, including all test cases in comparison, will be done in order to close the test.

The ESLs will be involved:

- in case that the pre-defined tuning strategy does not work, the test should be submitted to the ESL before the final “fail” is given (2)
- in the final test assessment (3)

5.2.3 Prerequisites

Successful preliminary verification of the L2 data (Task V-1).

5.2.4 Breakdown

V-2.1 Pixel Identification
V-2.2 Cloud Products
V-2.3 Water Vapour Product
V-2.4 Land Algorithms
V-2.5 Water Algorithms
V-2.6 Product Formatting

5.2.5 Test procedure

Each test case consists mainly of four steps:

1. the test data processing with the PDS Level2 processor
2. the analysis of data w.r.t. product/algorithm
3. the tuning of auxiliary data / update processor software (if required)
4. the final assessment and reporting

Steps 1-3 will be repeated (if required) for each test case until the final pass or fail criteria are reached.

The following Figure 11 shows a detailed overview of the above described procedure which will be explained in the following chapter.

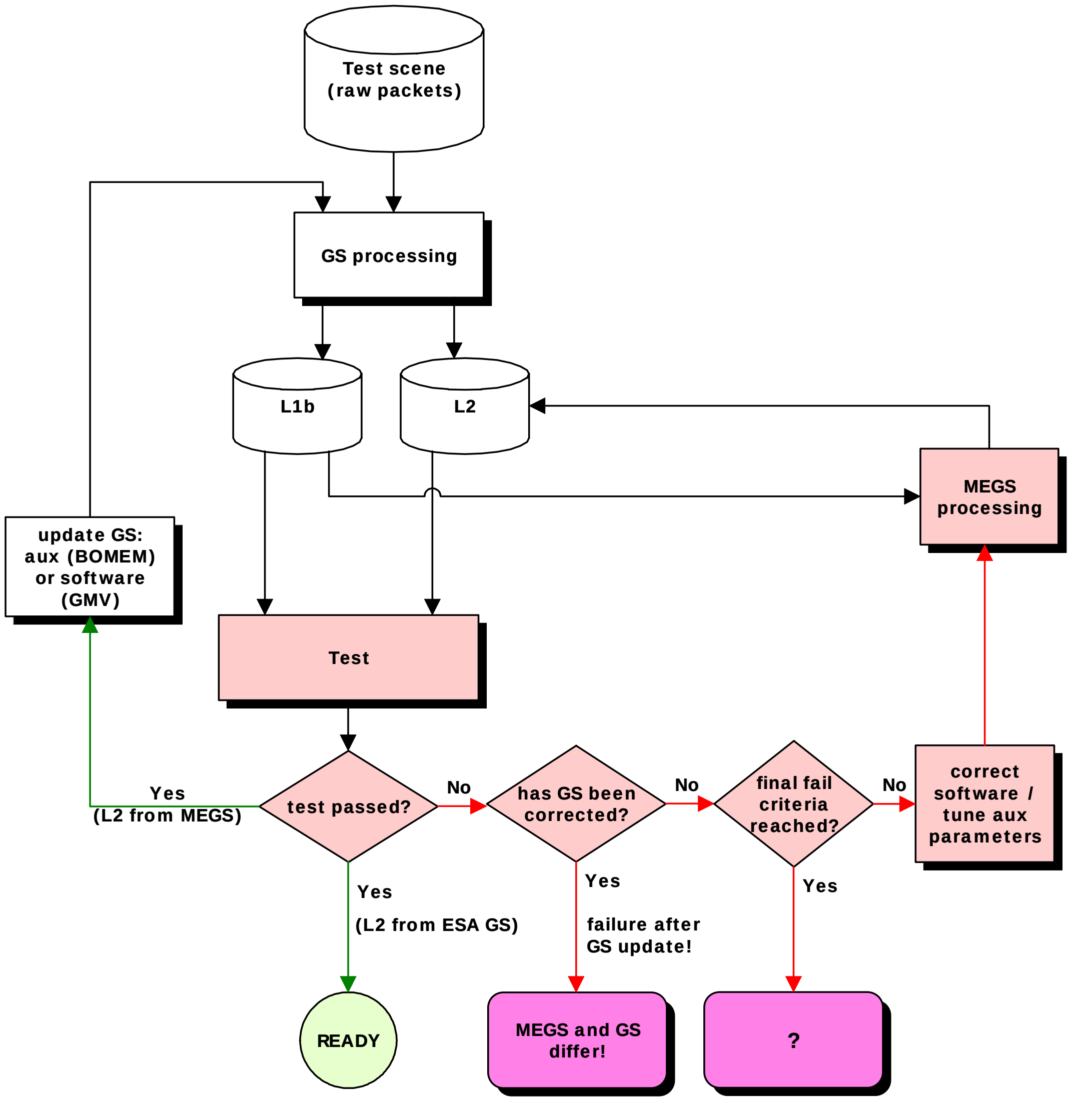


Figure 11: Scheme of test procedure

The test procedure starts with the retrieval of the MERIS raw data, which will be processed with the operational processor (GS software) to a Level1b and a Level2 product (Level2 from GS). These products will be used as input for the test conduction (first approach). Two states are possible:

1. the test will be passed at this level (Level2 from GS); the status 'READY' is reached. No additional tests on this test case will be conducted.
2. the test will not be passed. If the final fail criteria are not reached, this might imply the need of a processor modification (tuning), which can be either an update of dedicated auxiliary parameters or a software update. This tuning will be made with the MEGS

installation of the processor. After each tuning step the Level1b product will again be processed to a Level2 product with MEGS (L2 from MEGS). A new test will be conducted then. After that test, two states are again possible:

3. the test will not be passed. At this state a new tuning approach will be made (if the final fail criteria are not reached). The processing and testing will be iterated until the test will be passed. If it becomes impossible to pass the test (final fail criteria, e.g. limit number of iterations exceeded), the test is flagged as finally failed, and the processing will be switched to "exceptional" processing. The test will be further investigated off-line by the ESL partners.
4. the test will be passed at this level. As a consequence, all changes that were made to the MEGS processor/auxiliary products will be reported to be implemented in the operational GS processor. After the operational tables / GS processor has been updated, it will generate new L1b and Level2 products, that will be submitted to the test again (Level2 from GS). After that test, two states are again possible:
    a. the test will be passed at this level; the status 'READY' is reached. No additional tests on this test case will be conducted.
    b. the test will not be passed. Because the Level2 product origins from GS (which has been corrected according to the changes that were made with MEGS), an imbalance between the GS and MEGS has been detected. This has to be clarified among the experts from ACRI, BC, BOMEM and GMV.

5.2.6 Output Data

Updated auxiliary data tables, code change notes, Level 2 products and test reports.

5.2.7 Contingencies

N/A

5.2.8 Task Report Content

TBD

5.2.9 Responsible

C. Brockmann

5.3 Task V-2.1: Pixel Identification Algorithm Verification

5.3.1 Objectives

The objective of this test is to verify the correct pixel classification, including

- cloud flagging and
- land reclassification.

5.3.2 Activities

This test includes the verification of the cloud detection and the land/water reclassification.

5.3.3 Test scene requirements

The test coverage should include scenes with following characteristics:

- covered with land and water
- clear sky

- patchy clouds
- thin clouds
- mountainous areas
- Cloud type distribution according to ISCCP

5.3.4 Auxiliary Data

- Cloud Measurement Parameters Product
- Level 2 Control Parameters Data Product
- Surface Confidence Map Data Product

5.3.5 Responsible

Responsible: BC and LISE.

5.4 Task V-2.1.1: Cloud screening

5.4.1 Objectives

This test is dedicated to the cloud screening algorithms. A very important issue on these tests is to optimise the cloud screening through different sub-tests. Each of the parameters that have an impact on the cloud screening algorithm, shall be tested independently first, because they all make use of different surface properties. After successful verification of each criterion, the contents of the decision table shall be iterated in order to contain the optimal constellation of all parameters. The following figure illustrates the steps of the decision table optimisation:

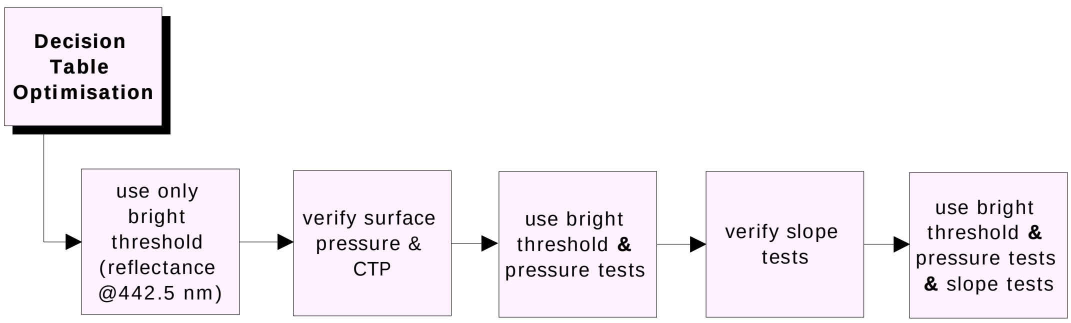


Figure 12: Sequence of Cloud Screening Decision Table Optimisation

5.4.2 Activities

As a first step, the accompanying ECMWF data need to be verified.

Then, the pressure products algorithm will be verified:

- Cloud Top Pressure determination
- Surface Pressure determination
- Pressure Confidence Tests (comparison with ECMWF)

Finally, other algorithm tests, presently not identified, will be conducted if necessary

5.4.3 Test scene requirements

The test scenes should include

- coastal scene (clouds over water & land):
- mountainous scene
- bright land surface
- various cloud types according to ISCCP
- clouds over ice
    - ice on land:
    - ice on water:

5.4.4 Auxiliary Data

- Cloud Measurement Parameters Product
- Surface Confidence Map Data Product

5.4.5 Task V-2.1.1.1: Bright Pixels Water

5.4.5.1 Objective

To verify the cloud identification above **water** using the bright pixel method.

5.4.5.2 Activities

Selection of proper test data.
Processing in MEGS with special decision matrix.
Comparison of classification results with alternative classification.
Tuning of bright threshold.

5.4.5.3 Prerequisites

L1b verification.

5.4.5.4 Instrument Data

3 ocean scenes with representative variation of clouds.

5.4.5.5 Auxiliary Data

Level2 Control Parameters Product containing a decision table for classification above water which uses only the bright threshold for cloud flagging.

- Excel table with decision table logic

5.4.5.6 Input reference data or document

N/A

5.4.5.7 Required tools and configuration

MERISView
Program for alternative classification (e.g., ENVI, eCognition)
Paramex
Flagtests
Rulex
Excel for setting the decision table logic

5.4.5.8 Archive requirement

N/A

5.4.5.9 Processing

1. Process L1b in MEGS with special Aux Data, where only bright test is turned on.
2. Extract image with cloud flag using upgraded MERISView
3. Perform alternative classification of L1b image
4. Compare two methods of classification
   a. number and percentage of agreement and disagreement (tool: flagtest)
   b. spatial distribution of disagreement (visual inspection): good are disagreements systematically at the border of clouds or some few pixels somewhere in the image. Bad are disagreements in the form of large blocks of pixels inside a cloud
5. Tuning of threshold to minimize disagreement (attention: take other tests into account to adjust threshold so that overall result is optimised)
6. In case of failure: submission to ESL (LISE)

5.4.5.10 Duration

2 days

5.4.5.11 Output Data

5.4.5.12 Pass /Fail Criteria

Not really applicable here. It is expected that a tuning of the threshold is necessary. The tuning can be stopped if an agreement of 90% of the classified clouds and non-clouds is reached.

5.4.5.13 Contingencies

N/A

5.4.5.14 Task Report Content

TBD

5.4.6 Task V-2.1.1.2: Bright Pixels Land

5.4.6.1 Objective

To verify the cloud identification above **land** using the bright pixel method.

5.4.6.2 Activities

Selection of proper test data.
Processing in MEGS with special decision matrix.
Comparison of classification results with alternative classification.
Tuning of bright threshold.

5.4.6.3 Prerequisites

L1b verification.

5.4.6.4 Instrument Data

3 land scenes with representative variation of clouds.

5.4.6.5 Auxiliary Data

Level2 Control Parameters Product containing a decision table for classification above land which uses only the bright threshold for cloud flagging.

- Excel table with decision table logic

5.4.6.6 Input reference data or document

N/A

5.4.6.7 Required tools and configuration

MERISView
Program for alternative classification (e.g., ENVI, eCognition)
Paramex
Flagtests
Rulex
Excel

5.4.6.8 Archive requirement

N/A

5.4.6.9 Processing

1. Process L1b in MEGS with special Aux Data, where only bright test is turned on.
2. Extract image with cloud flag using upgraded MERISView
3. Perform alternative classification of L1b image
4. Compare two methods of classification
   a. number and percentage of agreement and disagreement (tool: flagtest)
   b. spatial distribution of disagreement (visual inspection): good are disagreements systematically at the border of clouds or some few pixels somewhere in the image. Bad are disagreements in the form of large blocks of pixels inside a cloud
5. Tuning of threshold to minimize disagreement (attention: take other tests into account to adjust threshold so that overall result is optimised)
6. In case of failure: submission to ESL (LISE)

5.4.6.10 Duration

2 days

5.4.6.11 Output Data

5.4.6.12 Pass /Fail Criteria

Not really applicable here. It is expected that a tuning of the threshold is necessary. The tuning can be stopped if an agreement of 90% of the classified clouds and non-clouds is reached.

5.4.6.13 Contingencies

N/A

5.4.6.14 Task Report Content

TBD.

5.4.7 Task V-2.1.1.3: Surface Pressure verification: flat areas

5.4.7.1 Objective

To verify the polynomial pressure retrieval for land pixels in flat areas. This test is a prerequisite for the tasks described in §5.4.10 and §5.4.11.

5.4.7.2 Activities

Verification of

- ECMWF Pressure Product
- Surface Pressure above land

5.4.7.3 Prerequisites

L1b verification
Cloud identification using bright pixel method

5.4.7.4 Instrument Data

3 scenes covering land and water:

type	number
RR	2
FR	1

- Netherlands: location from within the following polygon: (35°N, 75°W) – () – () – ();
- time: no restrictions

5.4.7.5 Auxiliary Data

Atmosphere Parameters Product
ECMWF data

5.4.7.6 Input reference data or document

N/A

5.4.7.7 Required tools and configuration

MERISView
Paramex

5.4.7.8 Archive requirement

N/A

5.4.7.9 Processing

1. Analysis of image statistics
   a. Process L1b in MEGS with switch for intermediate / breakpoints file creation turned on
   b. Extract pressure estimates ("press" and "press_ecmwf" from intermediate #1) using upgraded MERISView
   c. Extract additional flags for pressure (F_LOW_POL_P, F_PCD_POL_P) from intermediate files #1
   d. statistics of F_LOW_POL_P: number and percentage w.r.t. land and water pixels
   e. statistics of F_PCD_POL_P: number and percentage w.r.t. land and water pixels
   f. Calculate pressure difference: $\Delta p = p - p_{ECMWF}$ for non-cloud pixels
   g. Calculate pressure difference: $\Delta p = p - p_{ECMWF}$ for cloud pixels
   h. statistics of p: mean, standard deviation and histogram
   i. statistics of p_{ECMWF}: mean, standard deviation and histogram
   j. statistics of Δp: mean ($\overline{\Delta p}$), standard deviation and histogram
2. Analysis of pass criteria
3. In case of failure:
   a. corrective actions, e.g. optimisation of polynomial coefficients

5.4.7.10 Duration

Analysis of 3 scenes including pass/fail criteria: 1 day
Corrective actions:
Pressure polynomial improvement: 1 day

5.4.7.11 Output Data

5.4.7.12 Pass /Fail Criteria

a. the PCD percentage should be less than TBD%
b. the value $|\overline{\Delta p}|$ should be less than 50 hPa for non-cloud pixels
c. the value $|\overline{\Delta p}|$ should be more than 50 hPa for cloud pixels
d. the standard deviation of Δp should be less than TBD hPa

5.4.7.13 Contingencies

N/A

5.4.7.14 Task Report Content

TBD

5.4.8 Task V-2.1.1.4: Surface Pressure verification: mountainous areas

5.4.8.1 Objective

To verify the polynomial pressure retrieval for land and water pixels in mountainous areas. This test is a prerequisite for the tasks described in §5.4.10 and §5.4.11.

5.4.8.2 Activities

Verification of

- ECMWF Pressure Product
- Surface Pressure above land surfaces

5.4.8.3 Prerequisites

L1b verification
Cloud identification using bright pixel method

5.4.8.4 Instrument Data

3 scenes covering land and water:

type	number
RR	2
FR	1

- Netherlands: location from within the following polygon: (35°N, 75°W) – () – () – ();
- time: no restrictions

5.4.8.5 Auxiliary Data

Atmosphere Parameters Product
ECMWF data

5.4.8.6 Input reference data or document

N/A

5.4.8.7 Required tools and configuration

MERISView
Paramex

5.4.8.8 Archive requirement

N/A

5.4.8.9 Processing

1. Analysis of image statistics
   a. Process L1b in MEGS with switch for intermediate / breakpoints file creation turned on
   b. Extract pressure estimates ("press" and "press_ecmwf" from intermediate #1) using upgraded MERISView
   c. Extract additional flags for pressure (F_LOW_POL_P, F_PCD_POL_P) from intermediate files #1
   d. statistics of F_LOW_POL_P: number and percentage w.r.t. land and water pixels
   e. statistics of F_PCD_POL_P: number and percentage w.r.t. land and water pixels
   f. Calculate pressure difference: $\Delta p = p - p_{ECMWF}$ for non-cloud pixels
   g. Calculate pressure difference: $\Delta p = p - p_{ECMWF}$ for cloud pixels
   h. statistics of p: mean, standard deviation and histogram
   i. statistics of p_{ECMWF}: mean, standard deviation and histogram
   j. statistics of Δp: mean ($\overline{\Delta p}$), standard deviation and histogram
2. Analysis of pass criteria
3. In case of failure:
   a. corrective actions, e.g. optimisation of polynomial coefficients

5.4.8.10 Duration

Analysis of 3 scenes including pass/fail criteria: 1 day
Corrective actions:
Pressure polynomial improvement: 1 day

5.4.8.11 Output Data

5.4.8.12 Pass /Fail Criteria

e. the PCD percentage should be less than TBD%
f. the value $\left|\overline{\Delta p}\right|$ should be less than 50 hPa for non-cloud pixels
g. the value $\left|\overline{\Delta p}\right|$ should be more than 50 hPa for cloud pixels
h. the standard deviation of Δp should be less than TBD hPa

5.4.8.13 Contingencies

N/A

5.4.8.14 Task Report Content

TBD

5.4.9 Task V-2.1.1.5: Slope Test optimisation

5.4.9.1 Objective

To optimise the discrimination between cloud and ice pixels. This test is a prerequisite for the tasks described in §5.4.10 and §5.4.11.

5.4.9.2 Activities

Verification of

- ECMWF Pressure Product
- Surface Pressure above land surfaces

5.4.9.3 Prerequisites

L1b verification
Cloud identification using bright pixel method

5.4.9.4 Instrument Data

3 scenes covering land and water:

type	number
RR	2
FR	1

- location from within the following polygon: () – () – () – (); (TBD)
- time: no restrictions

5.4.9.5 Auxiliary Data

Atmosphere Parameters Product
ECMWF data

5.4.9.6 Input reference data or document

N/A

5.4.9.7 Required tools and configuration

MERISView
Paramex

5.4.9.8 Archive requirement

N/A

5.4.9.9 Processing

1. Slope test optimisation
   a. Process L1b in MEGS with special Aux Data, where bright and slope tests are turned on. Intermediate / breakpoints should be turned on
   b. Extract image with cloud flag using upgraded MERISView
   c. Extract additional flags for slope tests (SLOPE_1, SLOPE_2) from intermediate file #1
   d. Compare two methods of classification
      i. number and percentage of agreement and disagreement
      i. analyse rules for misclassification (tool: rulex)
      ii. spatial distribution of disagreement (visual inspection): good are disagreements systematically at the border of clouds or some few pixels somewhere in the image. Bad are disagreements in the form of large blocks of pixels inside a cloud
   e. Tuning of threshold to minimize disagreement (attention: take other tests into account to adjust threshold so that overall result is optimised)

5.4.9.10 Duration

Analysis of 3 scenes including pass/fail criteria: 1 day
Corrective actions:
Pressure polynomial improvement: 1 days

5.4.9.11 Output Data

5.4.9.12 Pass /Fail Criteria

i. the PCD percentage should be less than TBD%
j. the value $\left|\overline{\Delta p}\right|$ should be less than 50 hPa for non-cloud pixels
k. the value $\left|\overline{\Delta p}\right|$ should be more than 50 hPa for cloud pixels
l. the standard deviation of Δp should be less than TBD hPa

5.4.9.13 Contingencies

N/A

5.4.9.14 Task Report Content

TBD

5.4.10 Task V-2.1.1.6: Pixel identification above water

5.4.10.1 Objective

To verify the cloud identification above **water** using the bright pixel and pressure methods. The pressure method has been tested individually, and now the decision matrix will be optimised.

5.4.10.2 Activities

5.4.10.3 Prerequisites

L1b verification
Cloud Identification using bright pixel method
Surface Pressure Verification
Cloud Products Verification

5.4.10.4 Instrument Data

5 ocean scenes with representative variation of clouds (same scenes as for bright pixels can be included).

5.4.10.5 Auxiliary Data

Level2 Control Parameters Product containing a decision table for classification above water which uses the bright threshold and the pressure tests for cloud flagging.

- Excel table with decision table logic

5.4.10.6 Input reference data or document

N/A

5.4.10.7 Required tools and configuration

MERISView
Program for alternative classification (e.g., ENVI, eCognition)
Paramex
Flagtests
Rulex
Excel

5.4.10.8 Archive requirement

N/A

5.4.10.9 Processing

1. Pressure test optimisation
    a. Process L1b in MEGS with special Aux Data, where only pressure tests are turned on. Intermediate / breakpoints should be turned on
    b. Extract image with cloud flag (from L2 product) and pressure estimates (CTP from L2, “press” and “press_ecmwf” from intermediate #1) using upgraded MERISView
    c. Extract additional flags for pressure (LOW_POL_P, LOW_NN_P, P_CONFIDENCE) from intermediate files #1
    d. Perform alternative classification of L1b image (if not available from bright pixel test)
    e. Compare two methods of classification
        i. number and percentage of agreement and disagreement
        ii. analyse rules for misclassification (tool: rulex)
        iii. spatial distribution of disagreement (visual inspection): good are disagreements systematically at the border of clouds or some few pixels somewhere in the image. Bad are disagreements in the form of large blocks of pixels inside a cloud
    f. Tuning of threshold to minimize disagreement (attention: take other tests into account to adjust threshold so that overall result is optimised)
2. Optimisation of the decision matrix
3. In case of failure: TBD

5.4.10.10 Duration

4,5 days

5.4.10.11 Output Data

5.4.10.12 Pass /Fail Criteria

Not really applicable here. It is expected that a tuning of the threshold is necessary. The tuning can be stopped if an agreement of 90% of the classified clouds and non-clouds is reached.

5.4.10.13 Contingencies

N/A

5.4.10.14 Task Report Content

TBD.

5.4.11 Task V-2.1.1.7: Pixel identification above land

5.4.11.1 Objective

To verify the cloud identification above **land** using the bright pixel, pressure and slope methods. The pressure and slope methods have been tested individually, and here the decision matrix will be optimised.

5.4.11.2 Activities

5.4.11.3 Prerequisites

L1b verification
Cloud Identification using bright pixel method
Surface Pressure Verification
Cloud Products Verification

5.4.11.4 Instrument Data

5 land scenes with representative variation of clouds (same scenes as for bright pixels can be included).

5.4.11.5 Auxiliary Data

Level2 Control Parameters Product containing a decision table for classification above land which uses the bright threshold, the pressure and the slope tests for cloud flagging.

- Excel table with decision table logic

5.4.11.6 Input reference data or document

N/A

5.4.11.7 Required tools and configuration

MERISView
Program for alternative classification (e.g., ENVI, eCognition)
Paramex
Flagtests
Rulex
Excel

5.4.11.8 Archive requirement

N/A

5.4.11.9 Processing

2. Pressure test optimisation
    a. Process L1b in MEGS with special Aux Data, where only pressure tests are turned on. Intermediate / breakpoints should be turned on
    b. Extract image with cloud flag (from L2 product) and pressure estimates (CTP from L2, "press" and "press_ecmwf" from intermediate #1) using upgraded MERISView
    c. Extract additional flags for pressure (LOW_POL_P, LOW_NN_P, P_CONFIDENCE) from intermediate files #1
    d. Perform alternative classification of L1b image (if not available from bright pixel test)
    e. Compare two methods of classification
        i. number and percentage of agreement and disagreement
        i. analyse rules for misclassification (tool: rulex)
        ii. spatial distribution of disagreement (visual inspection): good are disagreements systematically at the border of clouds or some few pixels somewhere in the image. Bad are disagreements in the form of large blocks of pixels inside a cloud
    f. Tuning of threshold to minimize disagreement (attention: take other tests into account to adjust threshold so that overall result is optimised)
3. Slope test optimisation
    a. repeat previous step with additionally the slope tests turned on
    b. Tuning of threshold to minimize disagreement (attention: take other tests into account to adjust threshold so that overall result is optimised)
4. Optimisation of the decision matrix
5. In case of failure: TBD

5.4.11.10 Duration

4 days

5.4.11.11 Output Data

5.4.11.12 Pass /Fail Criteria

Not really applicable here. It is expected that a tuning of the threshold is necessary. The tuning can be stopped if an agreement of 90% of the classified clouds and non-clouds is reached.

5.4.11.13 Contingencies

TBD

5.4.11.14 Task Report Content

TBD.

5.4.12 Responsible, team, location

Responsible: BC

5.5 Task V-2.1.2: Land Identification

5.5.1 Objectives

This test is dedicated to the land reclassification algorithms. This includes:

- the test on land-in-water and
- the test on water-in-land.

5.5.2 Specific Activities

- Test data processing with Level2 processor
- Analysis of data w.r.t land identification
- Tuning of Pixel Identification Auxiliary Data

5.5.3 Test scene requirements

The test scenes should have the following characteristics:

- coastline, as rugged as possible
- cloud free
- Wadden Sea
- islands
- inland waters

5.5.4 Auxiliary Data

- Level 2 Control Parameters Data Product
- Surface Confidence Map Data Product

5.5.5 Required tools and configuration

ENVI

Tide prediction tools. These are available online at the following sites:

URL	Comment
http://scilib.ucsd.edu/sio/tide/	Links to tide prediction sites
http://tbone.biol.sc.edu/tide/sitesel.html	Very convenient tide prediction site
http://tbone.biol.sc.edu/tide/sites_allalpha.html#alphatide	Alphabetical list of all tidal height sites (each location link leads to a page where predictions with options can be made, incl. graphic plots)

5.5.6 Pass /Fail Criteria

Maximum of 5% difference between number of cloud pixels identified by GS software and ENVI method.

5.5.7 Contingencies

TBD

5.5.8 Task Report Content

TBD

5.5.9 Responsible, team, location

Responsible: BC, LISE

5.5.10 Task V-2.1.2.1: Intertidal Areas

5.5.10.1 Objective

To verify the land reclassification in for pixels located in intertidal Areas. Because of the variable coastline due to the tidal movements, the correct reclassification for these pixels shall be verified by using a supervised classification. The land identification algorithm should reclassify the pixels:

- which are water in the a priori map (Level1b flag) and
- are located in tidal flat areas (mud pixels)

as land.

5.5.10.2 Activities

5.5.10.3 Prerequisites

L1b verification
Cloud identification using bright pixel method

5.5.10.4 Instrument Data

type	number
RR	5 (TBC)

- time: varying tide levels

Possible geolocations:

- Wadden Sea: location from within the following polygon: (53.2°N, 6.67°E) – (56.13°N, 6.67°E) – (56.13°N, 10.22°E) – (53.2°N, 10.22°E); see Figure 13.
- Gulf of Saint-Malo: location from within the following polygon: (48.5°N, 3.2°W) – (49.75°N, 3.2°W) – (49.75°N, 1.33°W) – (48.5°N, 1.33°W); see Figure 14.
- Yellow Sea: location from within the following polygon: (39.6°N, 117°W) – (41.8°N, 123.8°W) – (35.2°N, 128.33°W) – (30.75°N, 120.75°W); see Figure 15.
- Mauretania: location from within the following polygon: (14.5°N, 18.5°W) – (21.33°N, 18.5°W) – (21.33°N, 16°W) – (14.5°N, 16°W); see Figure 16.
- Gulf of Persia: location from within the following polygon: (21.75°N, 52.75°E) – (29.25°N, 47°E) – (30.9°N, 49.9°E) – (27.5°N, 57.25°E); see Figure 17.
- Chesapeake Bay: location from within the following polygon: (36.9°N, 76.9°W) – (39.45°N, 77.15°W) – (39.7°N, 75.75°W) – (37.15°N, 75.5°W); see Figure 18.
- Delaware Bay: location from within the following polygon: (38.7°N, 75.25°W) – (39.5°N, 75.65°W) – (39.6°N, 75.45°W) - (39°N, 74.65°W); see Figure 19.
- Fundy Bay: location from within the following polygon: (44.1°N, 66.1°W) – (45.2°N, 67.5°W) – (46°N, 64.4°W) – (45.4°N, 63.2°W); see Figure 20.

Figure 13: Wadden Sea: area for test scenes

Figure 14: Gulf of Saint-Malo: area for test scenes

Figure 15: Yellow Sea: area for test scenes

Figure 16: Mauretania: area for test scenes

Figure 17: Gulf of Persia: area for test scenes

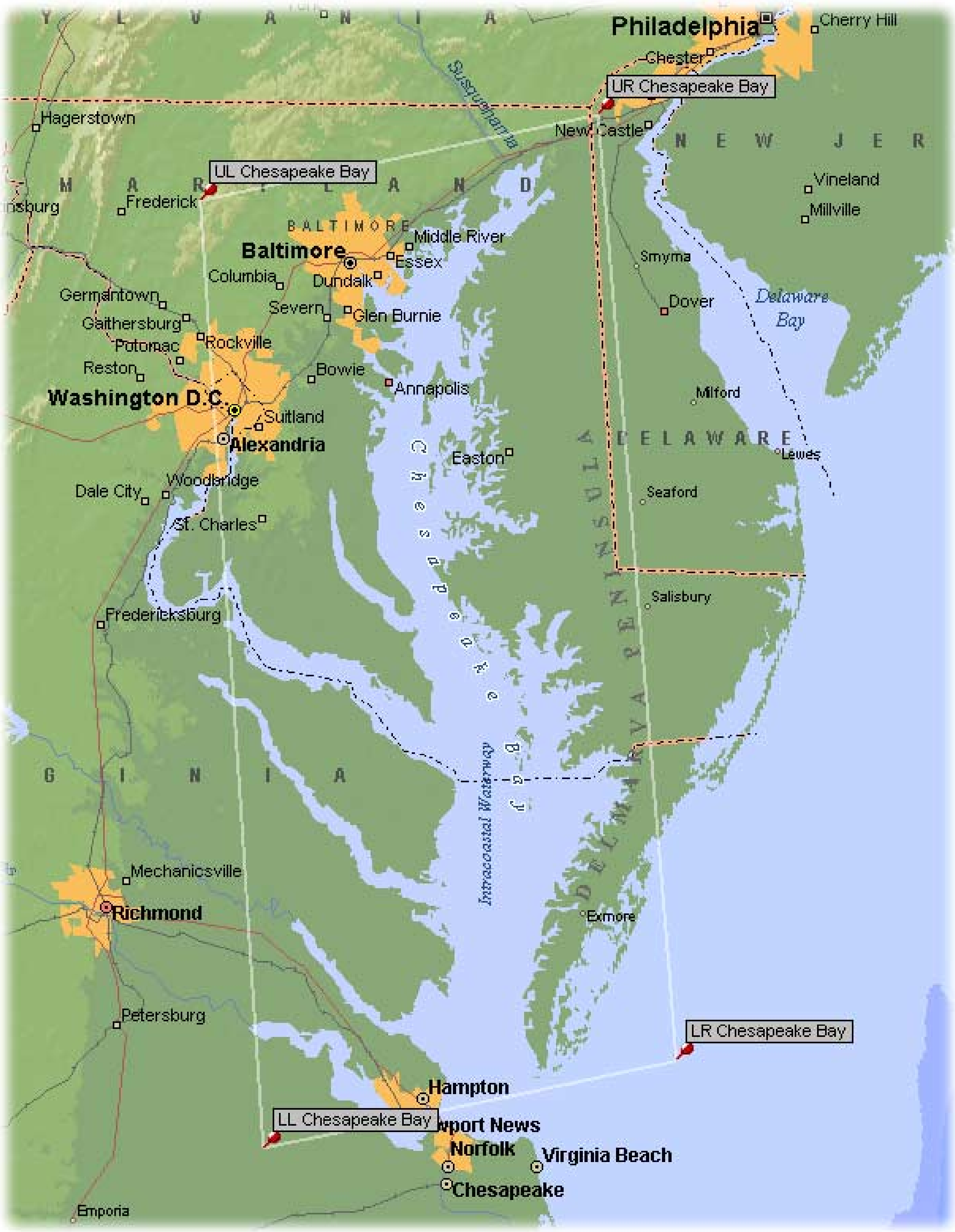


Figure 18: Chesapeake Bay: area for test scenes

Figure 19: Delaware Bay: area for test scenes

Figure 20: Fundy Bay: area for test scenes

5.5.10.5 Auxiliary Data
TBD

5.5.10.6 Input reference data or document
N/A

5.5.10.7 Required tools and configuration
MERISView
Program for alternative classification (e.g., ENVI, eCognition)
Paramex
Flagtests
Rulex

5.5.10.8 Archive requirement
N/A

5.5.10.9 Processing
1. Land identification test optimisation
    a. Process L1b in MEGS with intermediate file #1 generation turned on
    b. Extract image with LANDCONS flag from intermediate #1) using paramex
    c. Perform alternative classification of L1b image
    d. Compare two methods of classification
        i. number and percentage of agreement and disagreement (tool: flagtests)
        ii. analyse rules for misclassification (tool: rulex)
        ii. spatial distribution of disagreement (visual inspection): disagreement should only occur for pixels located in mud pixels areas; to prove the connection between the threshold set in supervised classification and the threshold used in the processor
    e. Tuning of threshold to minimize disagreement (see §5.5.11; start with $\alpha_{7thresh}$ first)
2. In case of failure: TBD

5.5.10.10 Duration
4 days

5.5.10.11 Output Data

5.5.10.12 Pass /Fail Criteria
The tuning can be stopped if an agreement of 95% of the re-classified pixels is reached.

5.5.10.13 Contingencies
TBD

5.5.10.14 Task Report Content
TBD.

5.5.11 Tuning Parameters

Variable	Descriptive Name	Comment
$\alpha_{7thresh}$	Constant applying to threshold value derived from LUT. Allows to take into account environment and bathymetric effects	Primary tuning parameter.
$\rho_{7thresh}$_LUT[θ_s, θ_v, $\Delta\phi$]	LUT containing threshold values for reflectance at 665 nm	Secondary tuning parameter.

5.5.12 Responsible, team, location

Responsible: BC

5.6 Task V-2.2: Cloud Products Algorithm Verification

5.6.1 Objectives

The objective of this test is to verify the correct cloud algorithms, including cloud top pressure (CTP), cloud optical thickness (COT) and cloud type (CT).
In respect to the highly variable nature of clouds, the tests will be founded on a longer-term statistic of MERIS cloud parameters. The evaluation will be based on the comparison of MERIS monthly averaged values with large-scale monthly mean values retrieved by ISCCP. This test remains at the level of processing verification because it simply compares mean values with expected values on the basis of a maximum permitted deviation. It does not replace an in-depth scientific evaluation.
The tests will therefore have a duration of at least two months in order to collect a sufficient amount of test scenes that can be evaluated. See §5.6.6.9 and §5.6.6.10 for details.
Due to the high inter-relation between cloud albedo (CA) and COT, which are both derived from the same MERIS band @753nm, a specific CA check will not be performed.
The CT parameter contained in the MERIS L2 product is coded with a simple indexing scheme, following the ISCCP coding conventions. This coding combines the CTP and the COT values to retrieve the CT index. The verification of the CT indexing algorithm cannot be done directly with the scheme described above, because there are no reference data available through the ISCCP. On the other hand, a verification of the CT parameter can be done by applying the simple indexing algorithm to the ISCCP reference data and comparing it to the MERIS retrieved CT mean values.

5.6.2 Activities

Verification of

- Product Formatting MDS 1-13, 18-20
- Analysis of data w.r.t. Cloud Optical Thickness
- Analysis of data w.r.t. Cloud Top Pressure
- Analysis of data w.r.t. Cloud Type

5.6.3 Test scene requirements

- land / sea surfaces
- cloudy scenes with all ISCCP cloud types
- cloud parameters with the following characteristics:
    - Cloud Top Pressure [25; 1050] hPa
    - Cloud Optical thickness [0; 255]
    - Cloud Type [128; 137]

5.6.4 Auxiliary Data

- Cloud Measurement Parameters Product

5.6.5 Responsible, team, location

Responsible: C. Brockmann
U. Krämer, V. Fournier-Sicre, F. Fell
ESL: Lothar Schüller (FUB, COT and CA), J. Fischer (FUB, all)

5.6.6 Task V-2.2.1 IAT Cloud Products

5.6.6.1 Objectives

To verify the proper range and values of Cloud Top Pressure, Cloud Optical Thickness and Cloud Type for cloud pixels on an area where long-term reference data is available through the ISCCP. The values for these parameters shall be in the definition range (see §5.6.2).

5.6.6.2 Activities

See **Figure 11**,
Verification of

- Product formatting (MDS 1-13, 18-20)
- Cloud Measurement Parameters Product
- Preparation of comparison data from ISCCP reference: extract values for each used grid cell (see Figure 21)
- Compute CT values for ISCCP grid cells using ISCCP COT and CTP

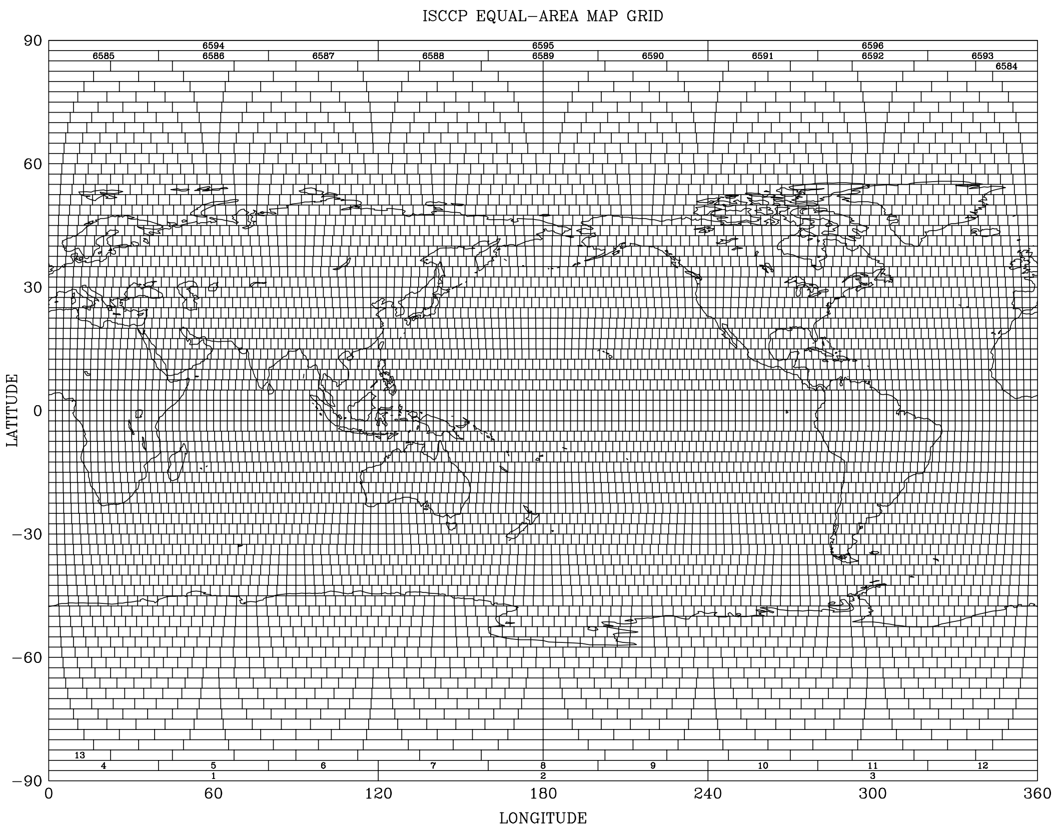


Figure 21: Equal-area map grid used for ISCCP data

5.6.6.3 Prerequisites

Successful cloud screening with bright pixel method.

5.6.6.4 Instrument Data

type	number
RR child product, full orbit (TBC)	(TBD) continuous

- time: no restrictions

Possible geolocations:

- Baltex Area: location from within the following polygon: (41.33°N, 6.54°W) – (73.5°N, 6.54°W) – (73.5°N, 53.04°E) – (41.33°N, 53.04°E); see Figure 22.

Figure 22: Northern Europe: area for test scenes

5.6.6.5 Auxiliary Data

Cloud Measurement Parameters Product with for special processing purpose (e.g., final fail)

5.6.6.6 Input reference data or document

None

5.6.6.7 Required tools and configuration

Cloud Statistics Tool
MERISView

5.6.6.8 Archive requirement

TBD

5.6.6.9 Processing

The processing will be an automated process that runs on a dedicated machine at ESRIN (TBC). Because the verification procedure uses full orbit child products containing COT and CTP, it is not necessary neither to extract sub-scenes nor to check whether the product is useful (i.e. if it contains pixels that are located in the test area). These checks will be done automatically in order to provide an independent process. It will cover the steps 1 & 2:

1. Analysis of image statistics
    a. open the product file
    b. read tie point information
    c. check whether pixels are located in the test area
    d. if yes, loop:
        - compute pixel coordinate for each pixel
        - check whether pixel is located in test area
        - if yes, compute grid cell index for comparison with ISCCP reference data
        - store MERIS retrieved COT, CTP and CT with grid cell index
    e. close the file
    f. compute MERIS mean value and std. dev. for COT, CTP and CT in each grid cell
    g. compute percentile of deviation from ISCCP mean values and acceptance value (TBD) for COT, CTP and CT in each grid cell (see Figure 23)
2. Analysis of image statistics (every 30 days)
3. In case of failure:
    a. if significant deviations from the ISCCP reference data should be encountered, available ground base observation will be consulted to check whether anomalous atmospheric conditions or extreme events may be responsible for the deviation
    b. if PCD occurrence is too high, adjust tuning parameters
    c. verify cloud screening and go back to cloud screening tuning if necessary
    d. COT coefficients tuning
    e. CTP neural net re-training

5.6.6.10 Duration

Automated process will start just after the verification of cloud screening and will last 2 to 3 months.

Corrective actions:

cloud screening improvement: 1 day
COT coefficients tuning: 1 day
CTP neural net re-training: 1 day
CT updated indexing table (if COT and CTP passed): 1 day

5.6.6.11 Output Data

N/A

5.6.6.12 Pass /Fail Criteria

1. Allowed percentile of deviation:
    a. $\Delta p_{COT} \leq$ TBD

   b. $\Delta p_{CTP} \leq$ TBD
   c. $\Delta p_{CT} \leq$ TBD
2. Final fail criteria: no success after 5 iterations of corrective actions (TBC)
3. PCD percentage should be less than 5% (TBC) in case of passing other criteria

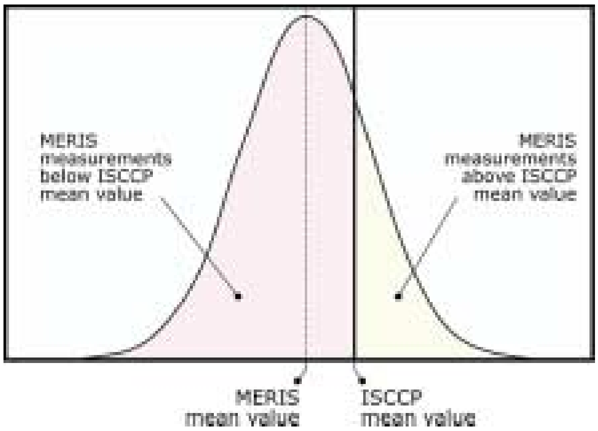


Figure 23: comparison of MERIS retrieved cloud parameter with ISCCP values (abscissa: CTP or COT, ordinate: frequency of measurements in ISCCP grid cell.

5.6.6.13 Contingencies

If the final fail criterion is reached (e.g., the CTP net crashes and the problem cannot be solved), the Cloud Parameters auxiliary product should be changed to contain a net that has default outputs in any case.
COT TBD

5.6.6.14 Task Report Content

TBD

5.7 Task V-2.3: Water Vapour Algorithm Verification

5.7.1 Objectives

The objective of this test is to verify the correct water vapour algorithms, including water vapour above all surface (water, land, clouds) and PCDs. Because water vapour is extremely variable in the atmosphere, only very relaxed criteria can be formulated. With the following tests, the order of magnitude and the global trend with increasing values towards tropical regions are verified. Also, the relative consistency among the three different procedures for water, land and cloud surfaces is verified. Especially the water vapour content above clouds should be lower than for neighbouring non-cloud pixels.
Note 1: Although the main attention will be turned to scenes with a sun zenith angle $\Theta s<60°$, tests with higher values will also be conducted.

5.7.2 Activities

Verification of

- Product formatting (MDS 14, 20)

- Water Vapour Auxiliary Product
- WV above all surfaces
- PCDs based on L1b radiometry

5.7.3 Test scene requirements

- water surfaces: varying WV content — ocean with coastal areas
- land surfaces: varying WV content — tropical areas
- cloud surfaces: varying WV content — mountainous areas with valleys

5.7.4 Auxiliary Data

- Water Vapour Parameters Product

5.7.5 Task V-2.3.1: Water / Clouds in Mid Latitudes

5.7.5.1 Objectives

To verify the proper range of water vapour values above cloud-free and cloudy ocean pixels in mid latitude regions. For cloud free pixels, the values should be between 0-6 g/cm^2. Above neighbouring cloud pixels, the water vapour should always be lower. Neighbourhood is defined as a distance of up to 30km between cloud and water pixels.

5.7.5.2 Activities

See **Figure 11**.

5.7.5.3 Prerequisites

Successful cloud screening. The algorithm for water vapour over cloud uses the cloud optical thickness (COT) as input; so the verification of COT (see §**5.6.6**) has to be completed before.

5.7.5.4 Instrument Data

type	number
RR	4
FR	1

- Atlantic Ocean - mid latitudes: location from within the following polygon: (35°N, 75°W) – (46°N, 52°W) – (60°N, 12°E) – (42°N, 11°W); see Figure 24.
- time: no restrictions (see Note 1)
- other: partly cloudy, i.e. portions of the image should be totally cloud free, others totally cloudy. The distance between the cloudy – cloud free regions should not exceed 30km. Each of the regions to be investigated should cover at least a square of 10*10 pixels.

Figure 24: Atlantic Ocean – mid latitudes: area for test scenes

5.7.5.5 Auxiliary Data

Water Vapour Parameters Product (TBC) with INV_WV=0 for special processing purpose (e.g., final fail)

5.7.5.6 Input reference data or document

None

5.7.5.7 Required tools and configuration

Statistics Analysis Tool
MERISView

5.7.5.8 Archive requirement

TBD

5.7.5.9 Processing

1. Analysis of image statistics
    a. statistics of PCD_14: number and percentage w.r.t. to all image pixels
    b. Fractions of “good” cloud and ocean pixels: A “good” cloud pixel is defined as a pixel with a cloud optical depth of more than 10. A “good” ocean pixel is one which is at least 4 pixels away from the next cloud. The scene is excluded from further processing if the number of cloud or ocean pixels is less than 30%.
    c. Mean values of water vapour and differences:
        i. mean WV, standard dev and histogram for “good” cloud pixels
        ii. mean WV, standard dev and histogram for “good” ocean pixels
        iii. set of WV differences between “good” cloud and ocean pixels, which are not more than 30km separated: histogram, mean and standard deviation
2. Analysis of pass criteria
3. In case of failure:
    a. if PCD occurrence is too high, process L1b with MEGS and generate intermediate file. Analyse float water vapour and L1b radiances with respect to thresholds. Adjust thresholds (INV_WV, OUT_MIN and OUT_MAX).
    b. verify cloud screening and go back to cloud screening tuning if necessary
    c. in case of implausible water vapour content over ocean pixels: check MERIS TOAR values against TOARs used for radiative transfer simulations
        i. if TOARs are in the same range → check algorithm implementation
        ii. if TOAR range differs → run new simulations (TBC)
    d. in case of too high water vapour content over cloud pixels:
        i. run tests with variations on COT: ΔCOT = ±30%
        ii. run tests with variations on surface albedo (SA) : ΔSA = ±10%
    e. WV coefficients aux parameters tuning (TBD with PA)

5.7.5.10 Duration

Analysis of 5 scenes including pass/fail criteria: ½ day
Corrective actions:
    cloud screening improvement: 1 day
    WV coefficients aux data tuning: ½ days

5.7.5.11 Output Data

N/A

5.7.5.12 Pass /Fail Criteria

1. Water vapour above cloud free pixels (result of processing step 1.c.iii): 0-6 g/cm2
2. Water vapour of cloud pixels should be less than the WV of neighbouring water pixel: > 95% of differences (see processing step c-iii) should be positive.
3. Final fail criteria: no success after TBD iterations of corrective actions (TBC)
4. PCD percentage should be less than 5% in case of passing other criteria

5.7.5.13 Contingencies

If the final fail criterion is reached (e.g., the WV algorithm causes crashes and the problem cannot be solved), the auxiliary product should be changed to trigger exceptional processing in any case. This will be achieved with setting INV_WV=0 (TBC).

As a result, the PCD flag is raised and WV is set to BAD_VALUE (normal exceptional processing).

5.7.5.14 Task Report Content

TBD

5.7.6 Task V-2.3.2: Water / Clouds in Tropical Regions

5.7.6.1 Objectives

To verify the proper range of water vapour values above cloud-free and cloudy ocean pixels in tropical regions. For cloud free pixels, the values should be between 2-7 g/cm^2. Above neighbouring cloud pixels, the water vapour should always be lower. Neighbourhood is defined as a distance of up to 30km between cloud and water pixels.

5.7.6.2 Activities

See **Figure 11**.

5.7.6.3 Prerequisites

Successful cloud screening. The algorithm for water vapour over cloud uses the cloud optical thickness (COT) as input; so the verification of COT (see §**5.6.6**) has to be completed before.

5.7.6.4 Instrument Data

type	number
RR	4
FR	1

- Atlantic Ocean – tropical regions: location from within the following polygon: (22°S, 41°W) – (23°N, 97°W) – (12°N, 17°W) – (13°S, 13°E); see Figure 25.
- time: no restrictions (TBC)
- other: partly cloudy, i.e. portions of the image should be totally cloud free, others totally cloudy. The distance between the cloudy – cloud free regions should not exceed 30km.

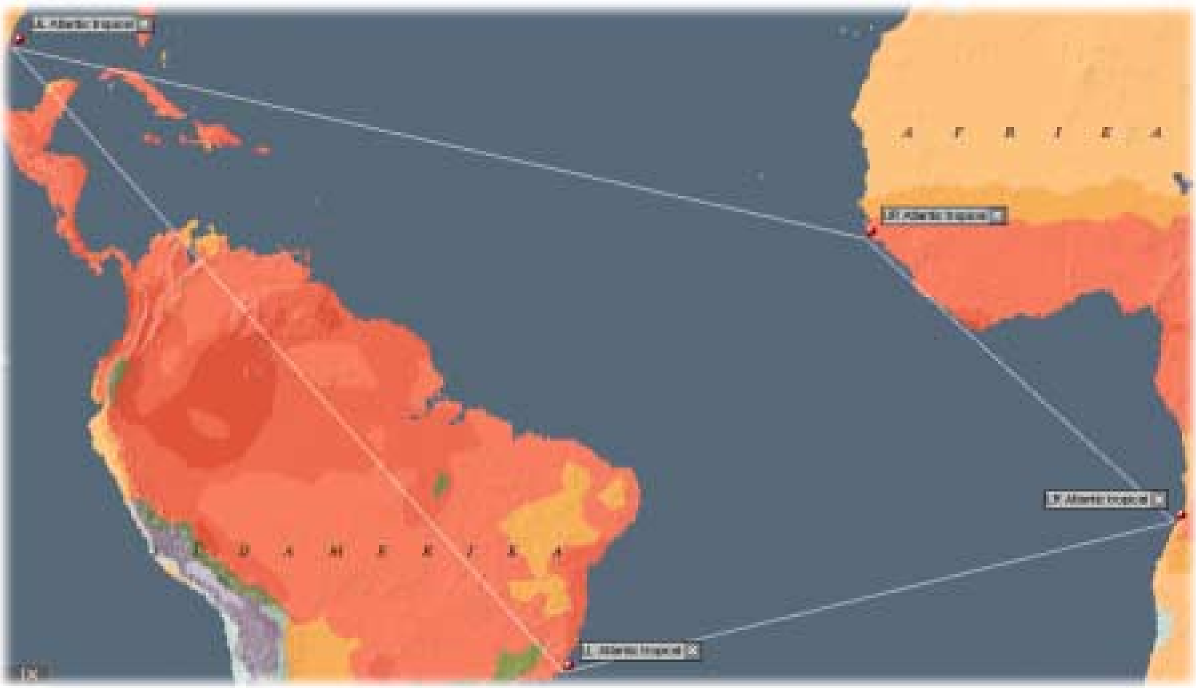


Figure 25: Atlantic Ocean – tropical regions: area for test scenes

5.7.6.5 Auxiliary Data

Water Vapour Parameters Product (TBC) with INV_WV=0 for special processing purpose (e.g., final fail)

5.7.6.6 Input reference data or document

None

5.7.6.7 Required tools and configuration

Statistics Analysis Tool
MERISView

5.7.6.8 Archive requirement

TBD

5.7.6.9 Processing

1. Analysis of image statistics
   a. statistics of PCD_14: number and percentage w.r.t. to all image pixels
   b. Fractions of "good" cloud and ocean pixels: A "good" cloud pixel is defined as a pixel with a cloud optical depth of more than 10. A "good" ocean pixel is one which is at least 4 pixels away from the next cloud. The scene is excluded from further processing if the number of cloud or ocean pixels is less than 30%.
   c. Mean values of water vapour and differences:
      i. mean WV, standard dev and histogram for "good" cloud pixels
      ii. mean WV, standard dev and histogram for "good" ocean pixels
      iii. set of WV differences between "good" cloud and ocean pixels, which are not more than 30km separated: histogram, mean and standard deviation
2. Analysis of pass criteria
3. In case of failure:
   a. if PCD occurrence is too high, process L1b with MEGS and generate intermediate file. Analyse float water vapour and L1b radiances with respect to thresholds. Adjust thresholds (INV_WV, OUT_MIN and OUT_MAX).
   b. verify cloud screening and go back to cloud screening tuning if necessary
   c. in case of implausible water vapour content over ocean pixels: check MERIS TOAR values against TOARs used for radiative transfer simulations
      i. if TOARs are in the same range → check algorithm implementation
      ii. if TOAR range differs → run new simulations (TBC)
   d. in case of too high water vapour content over cloud pixels:
      i. run tests with variations on COT: ΔCOT = ±30%
      ii. run tests with variations on surface albedo (SA) : ΔSA = ±10%
   e. WV coefficients aux parameters tuning (TBD with PA)

5.7.6.10 Duration

Analysis of 5 scenes including pass/fail criteria: ½ day

Corrective actions:

cloud screening improvement: 1 day
WV coefficients aux data tuning: 2 days

5.7.6.11 Output Data

N/A

5.7.6.12 Pass /Fail Criteria

1. Water vapour above cloud free pixels (result of processing step 1.c.iii): 2-7 g/cm2
2. Water vapour of cloud pixels should be less than the WV of neighbouring water pixel: all (TBC, maybe we permit 5% bad guys) differences (see processing step c-iii) should be positive.
3. Final fail criteria: no success after TBD iterations of corrective actions (TBC)
4. PCD percentage should be less than 5% (TBC) in case of passing other criteria

5.7.6.13 Contingencies

If the final fail criterion is reached (e.g., the WV algorithm causes crashes and the problem cannot be solved), the auxiliary product should be changed to trigger exceptional processing in any case. This will be achieved with setting INV_WV=0 (TBC).

As a result, the PCD flag is raised and WV is set to BAD_VALUE (normal exceptional processing).

5.7.6.14 Task Report Content

TBD

5.7.7 Task V-2.3.3: Land / Clouds in Mid Latitudes

5.7.7.1 Objectives

To verify the proper range of water vapour values above cloud-free and cloudy land pixels in central Europe. For cloud free pixels, the values should be between 0-6 g/cm^2. Above neighbouring cloud pixels, the water vapour should always be lower. Neighbourhood is defined as a distance of up to 30km between cloud and water pixels.

5.7.7.2 Activities

See **Figure 11**.

5.7.7.3 Prerequisites

Successful cloud screening. The algorithm for water vapour over cloud uses the cloud optical thickness (COT) as input; so the verification of COT (see §**5.6.6**) has to be completed before.

5.7.7.4 Instrument Data

type	number
RR	4
FR	1

- Central Europe: location from within the following polygon: (42.5°N, 1.5°W) – (58°N, 5°W) – (59°N, 17°W) – (43°N, 17°W); see Figure 26.
- time: no restrictions (TBC)
- other: partly cloudy, i.e. portions of the image should be totally cloud free, others totally cloudy. The distance between the cloudy – cloud free regions should not exceed 30km.

Figure 26: Central Europe:area for test scenes

5.7.7.5 Auxiliary Data

Water Vapour Parameters Product (TBC) with INV_WV=0 for special processing purpose (e.g., final fail)

5.7.7.6 Input reference data or document

None

5.7.7.7 Required tools and configuration

Statistics Analysis Tool
MERISView

5.7.7.8 Archive requirement

TBD

5.7.7.9 Processing

1. Analysis of image statistics
    a. statistics of PCD_14: number and percentage w.r.t. to all image pixels
    b. Fractions of “good” cloud and land pixels: A “good” cloud pixel is defined as a pixel with a cloud optical depth of more than 10. A “good” land pixel is one which is at least 4 pixels away from the next cloud. The scene is excluded from further processing if the number of cloud or land pixels is less than 30%.
    c. Mean values of water vapour and differences:
        i. mean WV, standard dev and histogram for “good” cloud pixels
        ii. mean WV, standard dev and histogram for “good” land pixels
        iii. set of WV differences between “good” cloud and land pixels, which are not more than 30km separated: histogram, mean and standard deviation
2. Analysis of pass criteria
3. In case of failure:
    a. if PCD occurrence is too high, process L1b with MEGS and generate intermediate file. Analyse float water vapour and L1b radiances with respect to thresholds. Adjust thresholds (INV_WV, OUT_MIN and OUT_MAX).
    b. verify cloud screening and go back to cloud screening tuning if necessary
    c. in case of implausible water vapour content over land pixels: check MERIS TOAR values against TOARs used for radiative transfer simulations
        i. if TOARs are in the same range → check algorithm implementation
        ii. if TOAR range differs → run new simulations (TBC)
    d. in case of too high water vapour content over cloud pixels:
        i. run tests with variations on COT: $\Delta COT = \pm 30\%$
        ii. run tests with variations on surface albedo (SA) : $\Delta SA = \pm 10\%$
    e. WV coefficients aux parameters tuning (TBD with PA)

5.7.7.10 Duration

Analysis of 5 scenes including pass/fail criteria: ½ day
Corrective actions:

cloud screening improvement: 1 day
WV coefficients aux data tuning: ½ day

5.7.7.11 Output Data

N/A

5.7.7.12 Pass /Fail Criteria

1. Water vapour above cloud free pixels (result of processing step 1.c.iii): 0-6 g/cm2
2. Water vapour of cloud pixels should be less than the WV of neighbouring water pixel: all (TBC, maybe we permit 5% bad guys) differences (see processing step c-iii) should be positive.
3. Final fail criteria: no success after TBD iterations of corrective actions (TBC)
4. PCD percentage should be less than 5% (TBC) in case of passing other criteria

5.7.7.13 Contingencies

If the final fail criterion is reached (e.g., the WV algorithm causes crashes and the problem cannot be solved), the auxiliary product should be changed to trigger exceptional processing in any case. This will be achieved with setting INV_WV=0 (TBC).

As a result, the PCD flag is raised and WV is set to BAD_VALUE (normal exceptional processing).

5.7.7.14 Task Report Content

TBD

5.7.8 Task V-2.3.4: Dry Air

5.7.8.1 Objectives

To verify the proper range of water vapour values above cloud-free land pixels located in the Sahara. For these pixels the values should be between 0-4 g/cm^2.

5.7.8.2 Activities

See **Figure 11**.

5.7.8.3 Prerequisites

TBD.

5.7.8.4 Instrument Data

type	number
RR	3

- Sahara: location from within the following polygon: (18°N, 16°W) – (28°N, 11°W) – (29°N, 29°E) – (19°N, 30°E); see Figure 27.
- time: no restrictions (TBC)
- other: totally cloud free

Figure 27: Sahara: area for test scenes

5.7.8.5 Auxiliary Data

Water Vapour Parameters Product (TBC) with INV_WV=0 for special processing purpose (e.g., final fail)

5.7.8.6 Input reference data or document

None

5.7.8.7 Required tools and configuration

MERISView
ENVI

5.7.8.8 Archive requirement

TBD

5.7.8.9 Processing

1. Statistics of PCD_14: number and percentage w.r.t. to all image pixels
2. Export WV image in ENVI compatible format using MERISView, mask out cloud, water and PCD_14-flagged pixels
3. Analysis of image statistics with ENVI
   a. visual identification of "pure" desert areas
   b. Mean values of water vapour for the identified areas: mean WV, standard dev and histogram
4. Analysis of pass criteria
5. In case of failure:
   a. if PCD occurrence is too high, process L1b with MEGS and generate intermediate file. Analyse float water vapour and L1b radiances with respect to thresholds. Adjust thresholds (INV_WV, OUT_MIN and OUT_MAX).
   b. in case of implausible water vapour content over land pixels: check MERIS TOAR values against TOARs used for radiative transfer simulations
      i. if TOARs are in the same range → check algorithm implementation
      ii. if TOAR range differs → run new simulations (TBC)
   c. WV coefficients aux parameters tuning (TBD with PA)

5.7.8.10 Duration

Analysis of 5 scenes including pass/fail criteria: ½ day
Corrective actions:
WV coefficients aux data tuning: ½ day

5.7.8.11 Output Data

N/A

5.7.8.12 Pass /Fail Criteria

1. Water vapour above cloud free pixels (result of processing step 3.b): 0-4 g/cm2
2. Final fail criteria: no success after TBD iterations of corrective actions (TBC)
3. PCD percentage should be less than 5% (TBC) in case of passing other criteria

5.7.8.13 Contingencies

If the final fail criterion is reached (e.g., the WV algorithm causes crashes and the problem cannot be solved), the auxiliary product should be changed to trigger exceptional processing in any case. This will be achieved with setting INV_WV=0 (TBC).

As a result, the PCD flag is raised and WV is set to BAD_VALUE (normal exceptional processing).

5.7.8.14 Task Report Content

TBD

5.7.9 Task V-2.3.5: Moisty Air

5.7.9.1 Objectives

To verify the proper range of water vapour values above cloud-free land pixels located in tropical regions of Africa and South America. For these pixels the values should be between 2-7 g/cm^2.

5.7.9.2 Activities

See **Figure 11**.

5.7.9.3 Prerequisites

TBD.

5.7.9.4 Instrument Data

type	number
RR	3

- Tropical Regions: location from within the following polygons:
  - (5°S, 12°E) – (10°N, 10°E) – (9°N, 30°E) – (5°N, 32°E) and
  - (4.5°S, 78°W) – (8°N, 76°W) – (2.5°S, 48.5°W) – (18°S, 55°W); see Figure 28 and Figure 29.
- time: no restrictions (TBC)
- other: totally cloud free

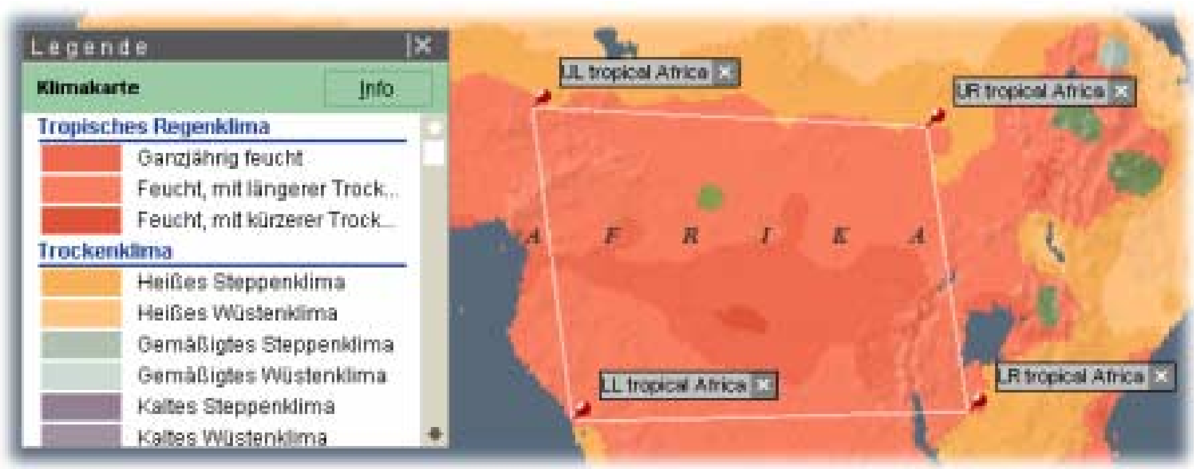


Figure 28: tropical Africa: area for test scenes

Figure 29: tropical Southamerica: area for test scenes

5.7.9.5 Auxiliary Data

Water Vapour Parameters Product (TBC) with INV_WV=0 for special processing purpose (e.g., final fail)

5.7.9.6 Input reference data or document

None

5.7.9.7 Required tools and configuration

Statistics Analysis Tool
MERISView

5.7.9.8 Archive requirement

TBD

5.7.9.9 Processing

1. Statistics of PCD_14: number and percentage w.r.t. to all image pixels
2. Export WV image in ENVI compatible format using MERISView, mask out cloud, water and PCD_14-flagged pixels
3. Analysis of image statistics with ENVI
   a. visual identification of "pure" tropical areas, far (30km) away from clouds
   b. Mean values of water vapour for the identified areas: mean WV, standard dev and histogram
4. Analysis of pass criteria
5. In case of failure:
   a. if PCD occurrence is too high, process L1b with MEGS and generate intermediate file. Analyse float water vapour and L1b radiances with respect to thresholds. Adjust thresholds (INV_WV, OUT_MIN and OUT_MAX).
   b. in case of implausible water vapour content over land pixels: check MERIS TOAR values against TOARs used for radiative transfer simulations
      i. if TOARs are in the same range → check algorithm implementation
      ii. if TOAR range differs → run new simulations (TBC)
   c. WV coefficients aux parameters tuning (TBD with PA)

5.7.9.10 Duration

Analysis of 5 scenes including pass/fail criteria: ½ day
Corrective actions:
cloud screening improvement: 1 day
WV coefficients aux data tuning: ½ day

5.7.9.11 Output Data

N/A

5.7.9.12 Pass /Fail Criteria

1. Water vapour above cloud free pixels (result of processing step 3.b): 2-7 g/cm2
2. Final fail criteria: no success after TBD iterations of corrective actions (TBC)
3. PCD percentage should be less than 5% (TBC) in case of passing other criteria

5.7.9.13 Contingencies

If the final fail criterion is reached (e.g., the WV algorithm causes crashes and the problem cannot be solved), the auxiliary product should be changed to trigger exceptional processing in any case. This will be achieved with setting INV_WV=0 (TBC).

As a result, the PCD flag is raised and WV is set to BAD_VALUE (normal exceptional processing).

5.7.9.14 Task Report Content

TBD

5.7.9.15 Tuning Parameters

Variable	Descriptive Name	Comment
INV_WV	Threshold value on radiance at 885 nm for marking a pixel as invalid for water vapour processing	Tuning during CP
OUT_MIN	Minimum acceptable output value	Tuning during CP
OUT_MAX	Maximum acceptable output value	Tuning during CP
Land_wv_LUT [μ_s, μ_v, $\Delta\phi$, Pressure, k]	LUTs of polynomial coefficients for water vapour retrieval over land and glint	fixed (TBC)
Water_noglint_wv_LUT [μ_s, μ_v, $\Delta\phi$, δ, k]	LUTs of polynomial coefficients for water vapour retrieval over water without glint	fixed (TBC)
Cloud_wv_LUT[μ_s, μ_v, $\Delta\phi$, δ, α, k]	LUTs of polynomial coefficients water vapour retrieval over cloud	fixed (TBC)
Slope_wv_LUT [μ_s, μ_v, $\Delta\phi$, k]	LUTs of coefficients for albedo slope correction over land and glint	fixed (TBC)
Aerosol_wv_LUT [μ_s, μ_v, $\Delta\phi$, k]	LUTs of polynomial coefficients for aerosol correction over water	fixed (TBC)

5.7.10 Responsible, team, location

Responsible: C. Brockmann
U. Krämer, V. Fournier-Sicre, F. Fell
ESL: P. Albert (FUB), J. Fischer (FUB)

5.8 Task V-2.4: Land Algorithms Verification

5.8.1 Objectives

The objective of this test is to verify the correct land algorithms, including atmospheric correction with the DDV screening, TOAVI and BOAVI.

5.8.2 Activities

This tasks includes the verification of

- Product formatting (MDS 1-13, 15,17, 20)
- Land products (input aux tables)
  - Land Aerosol Product
  - Land Vegetation Product
- TOAVI and BOAVI

5.8.3 Test scene requirements

The test scenes should include different vegetation types, including

- desert
- DDV (rain forest)
- agriculture (meadows, cornfields, swamp areas etc.)

5.8.4 Auxiliary Data
TBD

5.8.5 Responsible, team, location
Responsible: C. Brockmann
U. Krämer, V. Fournier-Sicre, F. Fell
ESL: R. Santer (LISE), NN (JRC, TBC)

5.8.6 Task V-2.4.2 Iteration on Analysis and Tuning of Land AC

5.8.6.1 Objectives
The land atmospheric correction includes the Rayleigh correction and the gaseous absorption correction, which are verified as part of the pixel identification, and the detection of DDV pixels and aerosol determination, which are verified here.

5.8.6.2 Activities
The activities includes the IAT on DDV identification and determination of the aerosol optical thickness.

5.8.6.3 Prerequisites
Successful cloud screening and land/water discrimination.

5.8.6.4 Instrument Data

type	number
RR	4
FR	1

- DDV forest in France (including 20% coastal water pixels)
- Barcelona area (including 20% coastal water pixels).

5.8.6.5 Auxiliary Data
TBD

5.8.6.6 Input reference data or document
None

5.8.6.7 Required tools and configuration
Statistics Analysis Tool
MERISView

5.8.6.8 Archive requirement

N/A

5.8.6.9 Processing

4. Analysis of DDV image statistics
    a. selection of DDV area, 50x50 km^2, using MERISView and statistics tool (if not part of MERISView)
    b. calculation of number of DDV pixels in that area
    c. calculation of mean and standard deviation aerosol optical depth above DDV pixels
    d. calculation of mean and standard deviation aerosol epsilon above DDV pixels
5. Analysis of aerosol optical depth above the ocean
    a. selection of cloud free water pixels in the vicinity of DDV
    b. calculation of mean aerosol optical depth water pixels
6. Analysis of pass criteria / tuning of ARVI threshold
    a. number of DDV pixels should be as large as possible
    b. standard deviation of aerosol optical depth (DDV) should be as small as possible
    c. standard deviation of aerosol epsilon (DDV) should be as small as possible
    d. difference between aerosol optical depths of DDV and water pixels should be small as possible
    e. varying ARVI threshold by steps of 0.05 (probably lowering the threshold)
7. In case of failure: TBD

5.8.6.10 Duration

Analysis of 5 scenes including pass/fail criteria: 1 day
DDV threshold tuning: 4 days

5.8.6.11 Output Data

N/A

5.8.6.12 Pass /Fail Criteria

Algorithm fails if no ARVI threshold can be defined.

5.8.6.13 Contingencies

TBD

5.8.6.14 Task Report Content

TBD

5.8.7 Task V-2.4.1 Iteration on Analysis and Tuning of TOAVI and BOAVI

5.8.7.1 Objectives

To verify the processing of the Top Of Atmosphere Vegetation Index (TOAVI) and the Bottom Of Atmosphere Vegetation Index (BOAVI). The tests will compare the vegetation indices computed above desert areas with areas covered by vegetation.

5.8.7.2 Activities

The activities include the IAT on TOAVI and BOAVI.

5.8.7.3 Prerequisites

Successful cloud screening, land/water discrimination and –for BOAVI only- successful atmospheric correction above land.

5.8.7.4 Instrument Data

type	number
RR	4

- Sahara to Congo: location from within the following polygon: (1°S; 10.5°E) – (17°N; 10.5°E) – (17°N; 26.25°E) – (1°N; 26.25°E); see Figure 30.
- Gobi to Bangla Desh: location from within the following polygon: (23.5°N; 84.5°E) – (45.5°N; 89.5°E) – (43.5°N; 110°E) – (22.25°N; 95.25°E); see Figure 31.
- Central Australia to North-West Australia: location from within the following polygon: (31.5°S; 125°E) – (15.25°S; 125°E) – (15.25°S; 136°E) – (31.5°S; 136°E); see Figure 32.
- North of Chile to East of Peru/West of Brazil: location from within the following polygon: (24.5°S; 70.25°W) – (4.5°S; 72.5°W) – (4.5°S; 59°W) – (24.5°S; 61.5°W); see Figure 33.

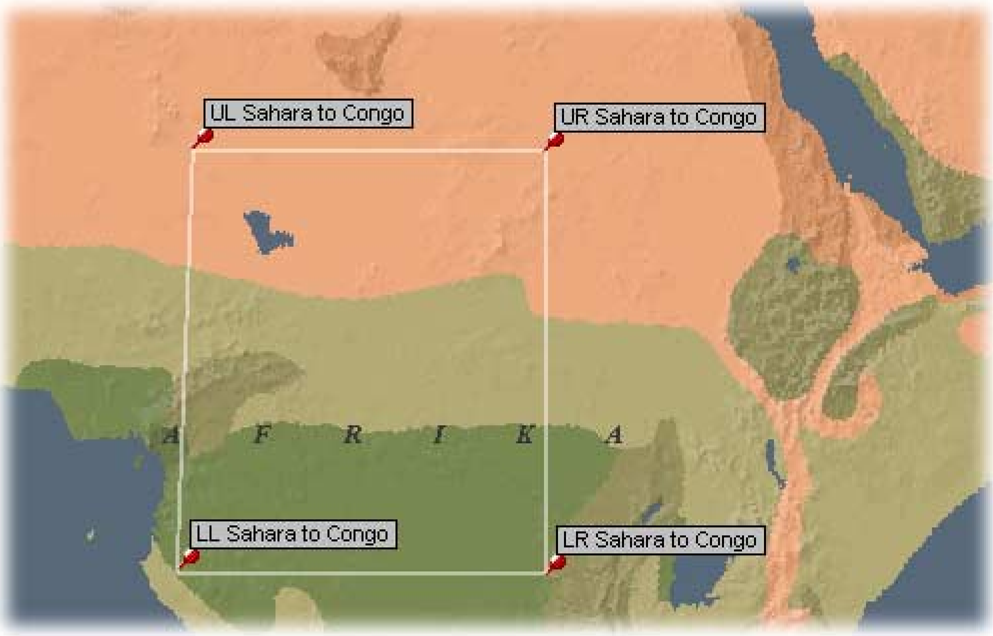


Figure 30: Sahara to Congo: area for test scenes

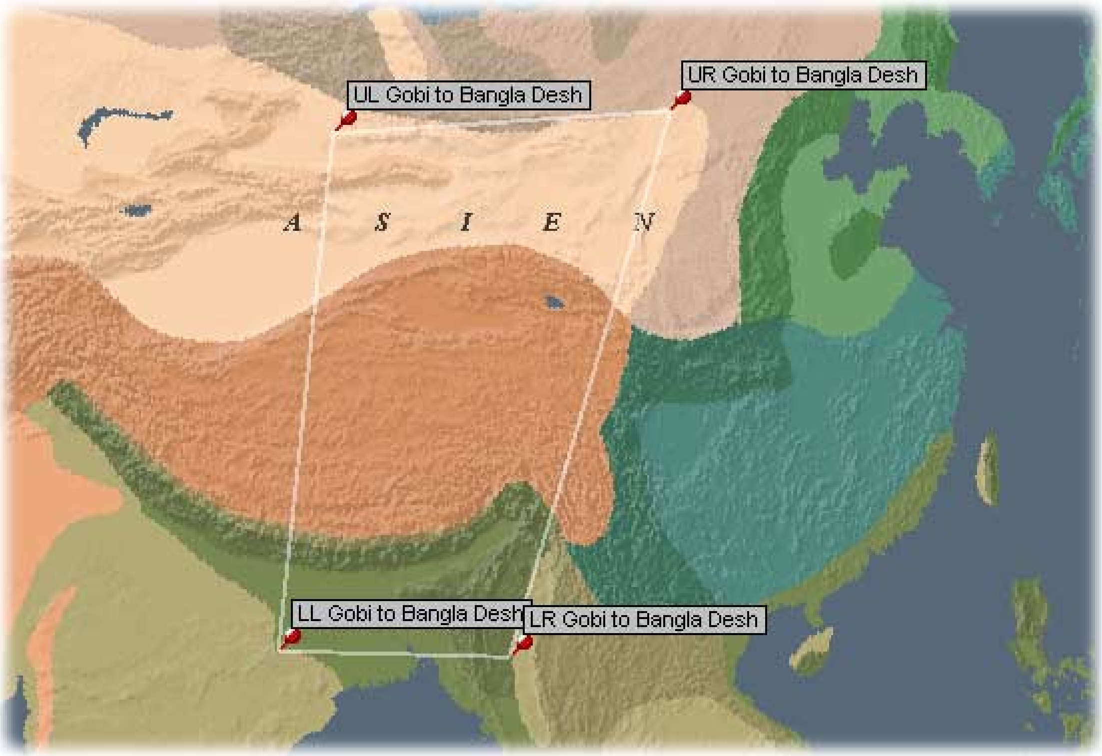


Figure 31: Gobi to Bangla Desh: area for test scenes

Figure 32: Central Australia to North-West Australia: area for test scenes

Figure 33: North of Chile to East of Peru/West of Brazil: area for test scenes

5.8.7.5 Auxiliary Data

Land Vegetation Parameters Product

5.8.7.6 Input reference data or document

None

5.8.7.7 Required tools and configuration

Statistics Analysis Tool
MERISView

5.8.7.8 Archive requirement

N/A

5.8.7.9 Processing

1. Analysis of TOAVI image statistics
    a. Select desert areas and extract TOAVI from image using MERISView
    b. Compute mean ($\overline{TOAVI_{desert}}$), standard deviation and histogram of TOAVI in desert pixels previously selected
    c. Select plant-covered areas and extract TOAVI from image using MERISView
    d. Compute mean ($\overline{TOAVI_{green}}$), standard deviation and histogram of TOAVI in green pixels previously selected
    e. Select transition areas -which are located between desert and green areas- and extract TOAVI from image using MERISView
    f. Compute mean ($\overline{TOAVI_{transition}}$), standard deviation and histogram of TOAVI in transition area pixels previously selected
2. Analysis of BOAVI image statistics
    a. Select desert areas and extract BOAVI from image using MERISView
    b. Compute mean ($\overline{BOAVI_{desert}}$), standard deviation and histogram of TOAVI in desert pixels previously selected
    c. Select plant-covered areas and extract TOAVI from image using MERISView
    d. Compute mean ($\overline{BOAVI_{green}}$), standard deviation and histogram of BOAVI in green pixels previously selected
    e. Select transition areas -which are located between desert and green areas- and extract BOAVI from image using MERISView
    f. Compute mean ($\overline{BOAVI_{transition}}$), standard deviation and histogram of BOAVI in transition area pixels previously selected
3. Analysis of pass criteria
4. Tuning of infrared to near infrared reflectance ratio threshold for TOAVI computation in order to optimise PCD flagging

5.8.7.10 Duration

Analysis of 5 scenes including pass/fail criteria: 2 days
TOAVI threshold tuning: 1 day

5.8.7.11 Output Data

N/A

5.8.7.12 Pass /Fail Criteria

1. The $\overline{TOAVI}_{desert}$ value shall be < 0.5 (TBC)
2. The $\overline{TOAVI}_{green}$ value shall be > 0.5 (TBC)
3. The $\overline{TOAVI}_{transition}$ value shall be in the interval [$\overline{TOAVI}_{desert}$; $\overline{TOAVI}_{green}$]; at least 75% (TBC) of the pixels (see histogram) shall meet the criterion
4. the same shall apply for BOAVI

5.8.7.13 Contingencies

TBD

5.8.7.14 Task Report Content

TBD

5.9 Task V-2.5: Water Algorithms Verification

5.9.1 Objectives

The objective of this test is to verify the correct ocean algorithms, including

- case-II flagging
- clear water and turbid water atmospheric corrections
- algal pigment index 1
- Case-II water constituents (algal pigment index 2, suspended particulate matter, yellow substance)
- PAR

5.9.2 Activities

This task includes the

- verification of product formatting (MDS 1-13, 15-20)
- verification of water products (input aux tables)
  - o Ocean 1 Parameters Product
  - o Ocean 2 Parameters Product
- iteration on analysis and tuning of the ocean products

5.9.3 Test scene requirements

The test scenes should include oceanic scenes, covering clear water as well as turbid water areas with the following characteristics:

- o ocean & coastal zones

- o cloud-free (max. 30% cloud pixels per scene, depending on the case a higher percentage may be accepted if the area of interest is cloud free)
- o Chl1 [0.1; 50] mg/m^3
- o Chl2 [0.1; 50] mg/m^3

5.9.4 Auxiliary Data

MERIS Ocean 1 Parameters Product
MERIS Ocean 2 Parameters Product
Validated atmospheric pressure and ozone content from ECMWF (in Level1b LADS)

5.9.5 Responsible, team, location

Responsible: C. Brockmann
U. Krämer, V. Fournier-Sicre, F. Fell
ESL: D. Antoine (LPCM), G. Moore (PML), R. Doerffer (GKSS)

5.9.6 Task V-2.5.1 IAT[1] Water Confidence Checks

5.9.6.1 Task V-2.5.1.1: Glint flags

5.9.6.1.1 Objectives

To verify the:

- Medium glint flag and processing
- High glint flag

over water pixels.

5.9.6.1.2 Activities

See **Figure 11**,
Verification of

- Product formatting (MDS 20)
- Ocean 1 Parameters Product

5.9.6.1.3 Prerequisites

Successful pixel identification

5.9.6.1.4 Instrument Data

type	number
RR	3

- time: see "Possible geolocations"
- other: the scenes shall be cloud-free (max. percentage of cloud pixels per scene: 30%)

Possible geolocations:

- In autumn: autumnal equinox: close to the equator; see Figure 24 and Figure 35.
- In winter: in the Tropic of Capricorn around winter solstice; see Figure 36 and Figure 37

[1] IAT ... Iteration on Analysis and Tuning

Figure 34: Autumnal equinox - Atlantic: area for test scenes

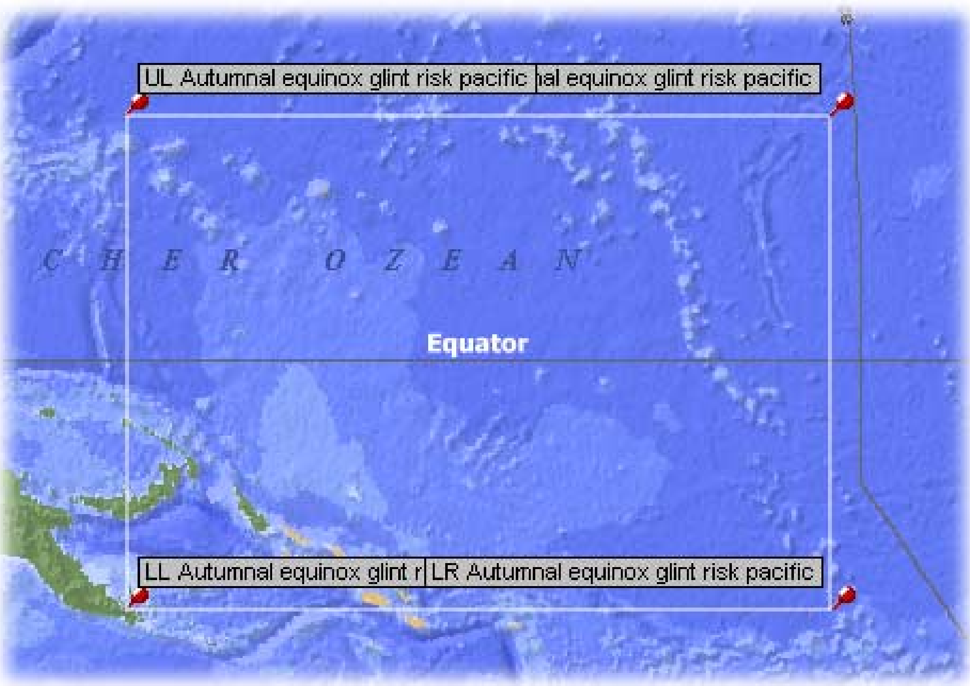


Figure 35: Autumnal equinox - Pacific: area for test scenes

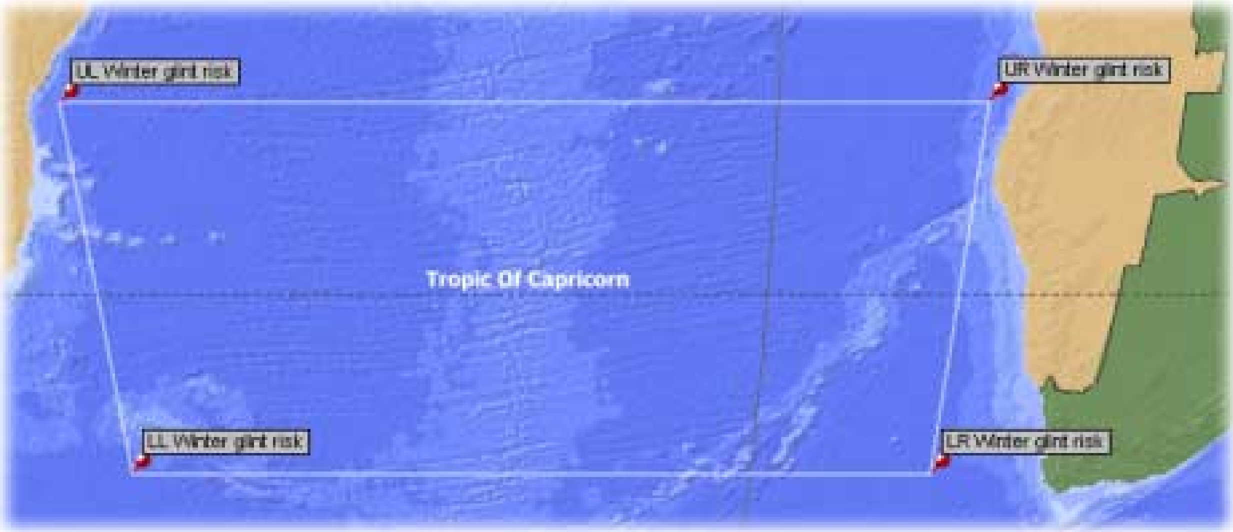


Figure 36: Winter solstice - Atlantic: area for test scenes

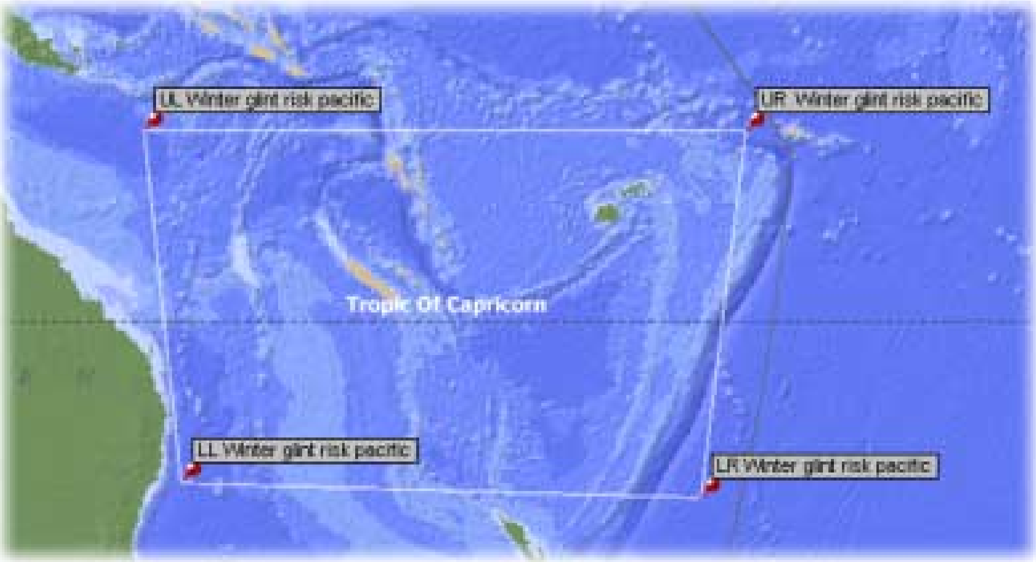


Figure 37: Winter solstice - Pacific: area for test scenes

5.9.6.1.5 Auxiliary Data
Ocean 1 Parameters Product

5.9.6.1.6 Input reference data or document
None

5.9.6.1.7 Required tools and configuration
Statistics Analysis Tool
MERISView

5.9.6.1.8 Archive requirement

N/A

5.9.6.1.9 Processing

1. Analysis of image statistics:
   a. Mark areas in the image with medium glint flag set
   b. Mark areas in the image with <u>no</u> glint flag set
   c. Compute $\overline{\rho}_{TOA-\text{meglint}}$ of TOA reflectance @ all bands in medium glint areas
   d. Compute $\overline{\rho}_{TOA}$ and σ^2_{TOA} (variance) of TOA reflectance @ all bands in non-glint areas
   e. Compute differences of $\overline{\rho}_{TOA}$ and $\overline{\rho}_{TOA-\text{meglint}}$
2. Analysis of pass criteria
3. In case of failure: corrective actions, e.g. optimisation of medium glint threshold

5.9.6.1.10 Duration

Analysis of 3 scenes including pass/fail criteria: 3 days
Corrective actions:
Glint thresholds improvement: 2 days

5.9.6.1.11 Output Data

N/A

5.9.6.1.12 Pass /Fail Criteria

1. the glint patch shall not be in the western part of the image
2. the glint patch shall be homogenous in terms of glint flags, i.e. there shall be no pixel inside the glint patch where no glint flag is raised
3. if the glint patch shows pixels with uncorrected glint, there should be a transition area between uncorrected glint and no-glint pixels, i.e. the transition area should be flagged as medium glint
4. there shall be a gradient of TOA reflectance for glint masked pixels towards no-glint pixels for all bands, i.e. all reflectances should be higher for glint masked pixels
5. the differences computed in 1.e shall be lower than three times the variance computed in 1.d:
   $(\overline{\rho}_{TOA} - \overline{\rho}_{TOA-\text{meglint}}) < 3\,\sigma^2_{TOA}$ for all bands
6. final fail criterion: TBD (e.g. TBD numbers of tuning attempts)

5.9.6.1.13 Contingencies

N/A

5.9.6.1.14 Task Report Content

TBD

5.9.6.1.15 Tuning Parameters for glint flag processing

- Medium glint threshold
- High glint threshold (both located in the Ocean 1 Parameters Product)

5.9.6.2 Task V-2.5.1.2: Yellow substance flag

5.9.6.2.1 Objectives

To verify the:

- Yellow substance flag

5.9.6.2.2 Activities

See **Figure 11**,
Verification of

- Product formatting (MDS 20)
- Ocean 1 Parameters Product

5.9.6.2.3 Prerequisites

Verification of

- pixel identification
- atmospheric correction
- yellow substance product

5.9.6.2.4 Instrument Data

type	number
FR	2
RR	8

- time: no restrictions
- other: the scenes shall be cloud-free (max. percentage of cloud pixels per scene: 30%)
- in particular the area close to the shore line and in the mouths of rivers the scenes should be cloud free

Possible geolocations:

- Southern Baltic Sea: location from within the following polygon: (54°N, 21°E) – (58°N, 21°E) – (58°N, 7°E) – (54°N, 7°E); see Figure 38.

Figure 38: Southern Baltic Sea: area for test scenes

5.9.6.2.5 Auxiliary Data

TBD

5.9.6.2.6 Input reference data or document

None

5.9.6.2.7 Required tools and configuration

Statistics Analysis Tool
MERISView

5.9.6.2.8 Archive requirement

N/A

5.9.6.2.9 Processing

4. Analysis of image statistics
    a. statistics of PCD_16: number and percentage w.r.t. to all ocean pixels
    b. statistics of CASE2_S: number and percentage w.r.t. to all ocean pixels
    c. statistics of CASE2_Y: number and percentage w.r.t. to all ocean pixels
    d. visual inspection of turbid water flag and yellow substance flag
5. Analysis of pass criteria
6. In case of failure: corrective actions, e.g. optimisations of tuning parameters

5.9.6.2.10 Duration

Analysis of 10 scenes including pass/fail criteria: 2 day

Corrective actions:

Atmospheric correction improvement: 2 days

5.9.6.2.11 Output Data

N/A

5.9.6.2.12 Pass /Fail Criteria

7. the yellow substance flag should be raised in the vicinity of the coast, the mouths of big rivers, but not in the open Baltic Sea
8. the yellow substance flag should be raised where the yellow substance product is high and vice versa
9. final fail criterion: TBD (e.g. TBD numbers of tuning attempts)

5.9.6.2.13 Contingencies

N/A

5.9.6.2.14 Task Report Content

TBD

5.9.6.2.15 Tuning Parameters for Yellow substance flag processing

TBD

5.9.7 Task V-2.5.2 IAT Turbid Water Screening and AC, PAR

5.9.7.1 Task V-2.5.2.1: Turbid Water around Great Britain

5.9.7.1.1 Objectives

To verify the:

- Turbid water flag
- Turbid water Atmospheric Correction
- Turbid water flag and turbid water Atmospheric Correction over coccolithophore blooms

For these pixels the values should be in the definition range (see §5.9.3). The verification will be based on comparison with climatological values and visual inspection.

5.9.7.1.2 Activities

See **Figure 11**,

Verification of

- Product formatting (MDS 20)
- Ocean 1 Parameters Product

5.9.7.1.3 Prerequisites

Successful verification of

- Pixel Classification (cloud screening and water reclassification)
- Clear water atmospheric correction

5.9.7.1.4 Instrument Data

type	number
FR	2
RR	8

- time: no restrictions
- other: the scenes shall be cloud-free (max. percentage of cloud pixels per scene: 30%)

Possible geolocations:

- Western English Channel / Severn Estuary / Irish Sea: location from within the following polygon: (49°N, 10°W) – (55°N, 10°W) – (55°N, 0°E) – (49°N, 0°E); see Figure 39.
- Thames / Humber / Wash: location from within the following polygon: (50°N, 2°W) – (54°N, 2°W) – (54°N, 5°E) – (50°N, 5°E); see Figure 40.

Figure 39: Western English Channel / Severn Estuary / Irish Sea: area for test scenes

Figure 40: Thames / Humber / Wash: area for test scenes

5.9.7.1.5 Auxiliary Data

TBD

5.9.7.1.6 Input reference data or document

None

5.9.7.1.7 Required tools and configuration

Statistics Analysis Tool
MERISView
ENVI

5.9.7.1.8 Archive requirement

N/A

5.9.7.1.9 Processing

1. Analysis of image statistics
    a. statistics of PCD_15: number and percentage w.r.t. to all ocean pixels
    b. visual inspection of turbid water flag
    c. statistics of level 2 parameters:
        i. aerosol optical depth: mean, standard dev and histogram
        ii. water leaving reflectance of 412.5, 490, 510, 560, 665: mean, standard dev and histogram
2. Reflectance spectra analysis
    a. export of all water leaving reflectances (using upgraded MERISView)
    b. import all bands in ENVI
    c. select ROIs: different situations (e.g. high / low SPM), within each ROI the variance of the reflectances should be minimal
        i. calculate mean reflectance spectra for ROIs manually
    d. select spectra from climatology which are representative for ROIs
3. Analysis of pass criteria
4. In case of failure: corrective actions TBD (e.g. optimisations of tuning parameters)

5.9.7.1.10 Duration

Analysis of 10 scenes including pass/fail criteria: 2 day
Corrective actions:
Atmospheric correction improvement: 1 days

5.9.7.1.11 Output Data

N/A

5.9.7.1.12 Pass /Fail Criteria

1. turbid water flag should be raised close to the coast and not raised in off-coast areas
2. spectra of water leaving reflectances should be similar to climatology
3. final fail criterion: TBD (e.g. TBD numbers of tuning attempts)

5.9.7.1.13 Contingencies

Determination of adjacency effects (both atmospheric and instrumental) on BPF and BPC: Adjacent land is bright in the infra red resulting in a possible contamination, and there are possible contamination effects for the bright pixel flagging algorithm, which uses the 709 nm channel Such effects can come from the instrument from stray light and from atmospheric scattering. Observing data in the Plymouth coastal region can test this effect, where there is ongoing monitoring work

5.9.7.1.14 Task Report Content

TBD

5.9.7.1.15 Tuning Parameters for Turbid Water Flag and AC processing

TBD

5.9.7.2 Task V-2.5.2.2: Atlantic Ocean

5.9.7.2.1 Objectives

To verify the:

- PAR
- Bright Pixel Flag and Bright Pixel Atmospheric Correction over coccolithophore blooms

For these pixels the values should be in the definition range (see §5.9.3). The PAR product will be verified using Atlantic Meridional Transect (AMT) climatology and, when possible, planned AMT cruise.

5.9.7.2.2 Activities

See **Figure 11**,

Verification of

- Product formatting (MDS 18, 20)
- Ocean 1 Parameters Product

In addition, it might be useful to compare the data with in situ data if such exist, and to examine the images by "educated eyes"

5.9.7.2.3 Prerequisites

Successful atmospheric correction.

5.9.7.2.4 Instrument Data

type	number
FR	10

- time: no restrictions
- the 10 selected scenes should be from different latitudes, possibly covering the whole latitude range
- other: the scenes shall be cloud-free (max. percentage of cloud pixels per scene: 30%)

Possible geolocations:

- AMT Atlantic Ocean; see Figure 56.

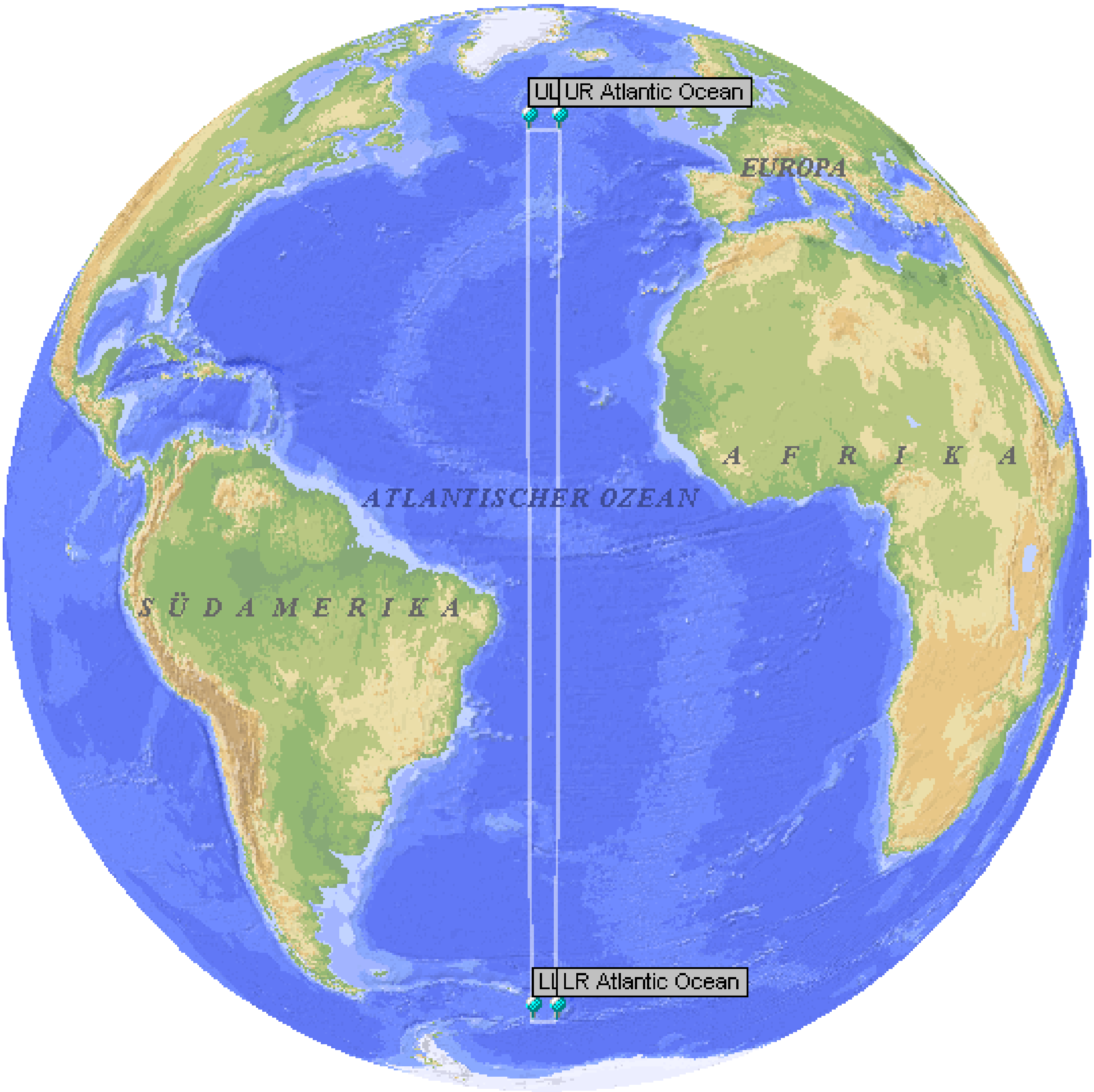


Figure 41: Atlantic Ocean: area for test scenes

5.9.7.2.5 Auxiliary Data

Ocean1 Parameters Product for special processing purposes (i.e. final fail). TBD

5.9.7.2.6 Input reference data or document

None

5.9.7.2.7 Required tools and configuration

Statistics Analysis Tool
MERISView

5.9.7.2.8 Archive requirement

TBD

5.9.7.2.9 Processing

1. Analysis of image statistics
   a. statistics of PCD_18: number and percentage w.r.t. to all ocean pixels
   b. statistics of level 2 parameters:
      i. aerosol optical depth: mean, standard dev and histogram
      ii. PAR: mean, standard dev and histogram
2. Analysis of pass criteria
3. In case of failure: corrective actions TBD (e.g. optimisations of tuning parameters)

5.9.7.2.10 Duration

Analysis of 10 scenes including pass/fail criteria: 2 days

5.9.7.2.11 Corrective actions:

Atmospheric correction improvement: 2 days

5.9.7.2.12 Output Data

N/A

5.9.7.2.13 Pass /Fail Criteria

1. PAR mean and standard deviation should be tested for common population with a proper statistical test on a TBD% confidence level
2. final fail criterion: TBD (e.g. TBD numbers of tuning attempts)

5.9.7.2.14 Contingencies

(TBD).

5.9.7.2.15 Task Report Content

TBD

5.9.7.2.16 Tuning Parameters for Case1 waters processing

TBD

5.9.8 Task V-2.5.3 Clear Water AC and pigment index 1 retrieval

5.9.8.1 Task V-2.5.3.1: Oligotrophic areas

5.9.8.1.1 Objectives

To verify the:

- proper range of Algal Pigment Index 1 (Chl1) values for ocean pixels located in oligotrophic areas (Case1 waters). For these pixels the values should be in the definition range (see §5.9.3). The tendencies and specific value ranges described in §5.9.8.1.12-1,2,3 should be met.
- atmospheric correction over clear water; investigations in water leaving reflectances and aerosol optical thickness @865nm will be made (see §5.9.8.1.12-2,3)

5.9.8.1.2 Activities

See **Figure 11**,
Verification of

- Product formatting (MDS 15, 20)
- Ocean 1 Parameters Product

In addition, it might be useful to compare the data with in situ data if such exist, and to examine the images by “educated eyes”.

5.9.8.1.3 Prerequisites

TBD

5.9.8.1.4 Instrument Data

type	number
FR	1
RR	4

- time: no restrictions
- other: the scenes shall be cloud-free

Possible geolocations:

- Pacific Ocean South-East: location from within the following polygon: (45°S, 125°W) – (20°S, 125°W) – (20°S, 90°W) – (45°S, 90°W); see Figure 42.
- Pacific Ocean North-West: location from within the following polygon: (10°N, 140°E) – (25°N, 140°E) – (25°N, 165°E) – (10°N, 165°E); see Figure 43.
- Pacific Ocean North: location from within the following polygon: (15°N, 180°W) – (25°N, 180°W) – (25°N, 160°W) – (15°N, 160°W); see Figure 44.
- Atlantic Ocean North: location from within the following polygon: (17°N, 62°W) – (30°N, 62°W) – (30°N, 45°W) – (17°N, 45°W); see Figure 45.
- Atlantic Ocean South: location from within the following polygon: (9°S, 11°W) – (20°S, 11°W) – (20°S, 32°W) – (9°S, 32°W); see Figure 46.
- Indian Ocean South: location from within the following polygon: (30°S, 90°E) – (20°S, 90°E) – (20°S, 100°E) – (30°S, 90°E); see Figure 47.

- Gulf of Mexico: location from within the following polygon: (22°N, 94°W) – (26°N, 94°W) – (26°N, 86°W) – (22°N, 86°W); see Figure 48.
- Gulf of Yucatan: location from within the following polygon: (17°N, 85°W) – (20°N, 94°W) – (20°N, 80°W) – (22°N, 86°W); see Figure 49.
- Costa Rica Dome: location from within the following polygon: (13°N, 120°W) – (20°N, 120°W) – (20°N, 108°W) – (13°N, 108°W); see Figure 50.
- Crete South: location from within the following polygon: (32.5°N, 24°E) – (34.5°N, 24°E) – (34.5°N, 27°E) – (32.5°N, 27°E); see Figure 51.
- Cyprus South-East: location from within the following polygon: (32.5°N, 32°E) – (34°N, 32°E) – (34°N, 34.5°E) – (32.5°N, 34.5°E); see Figure 52.
- Gulf of Alaska: location from within the following polygon: (44°N, 145°W) – (48°N, 145°W) – (48°N, 138°W) – (44°N, 138°W); see Figure 53.
- Australia South: location from within the following polygon: (43°S, 127.5°E) – (39°S, 127.5°E) – (39°S, 133°E) – (43°S, 133°E); see Figure 54.

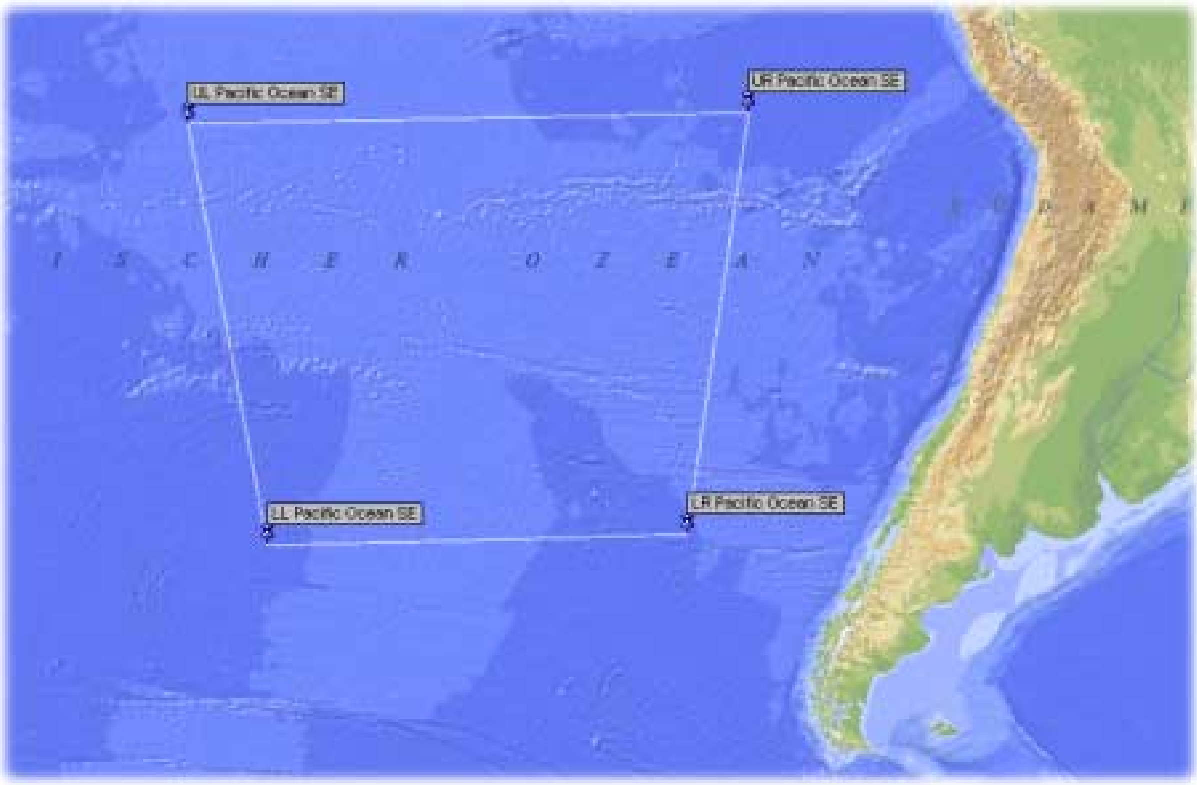


Figure 42: Pacific Ocean South-East: area for test scenes

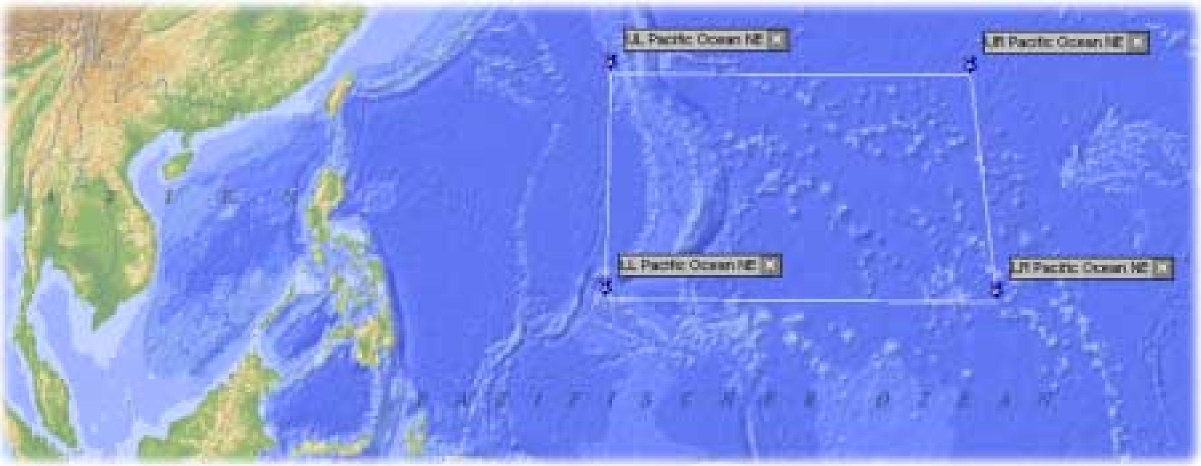


Figure 43: Pacific Ocean North-West: area for test scenes

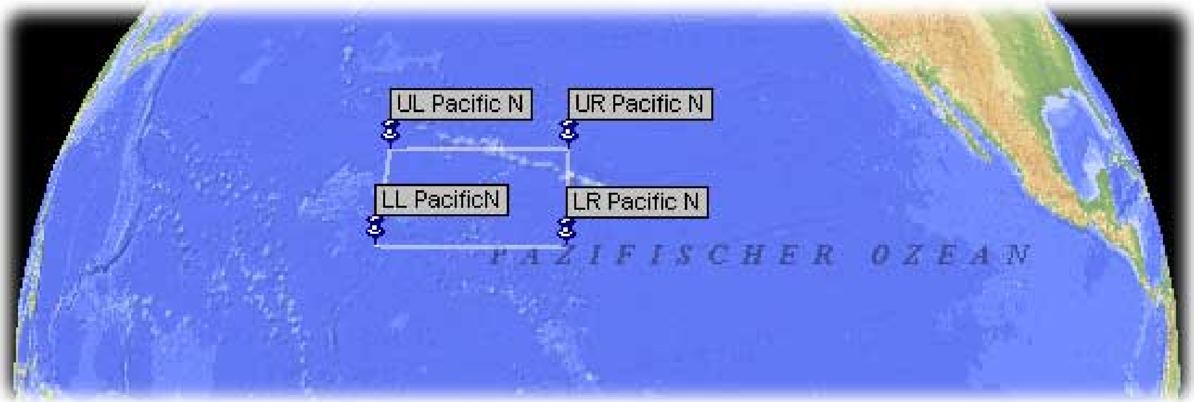


Figure 44: Pacific Ocean North: area for test scenes

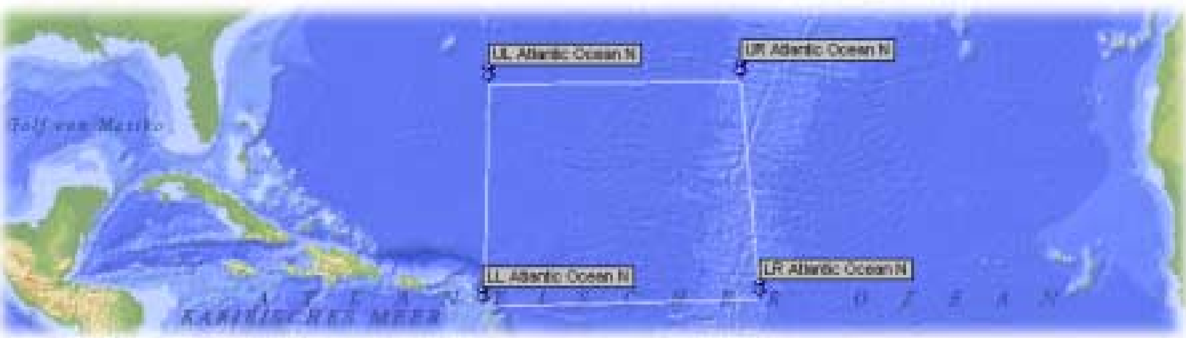


Figure 45: Atlantic Ocean North: area for test scenes

Figure 46: Atlantic Ocean South: area for test scenes

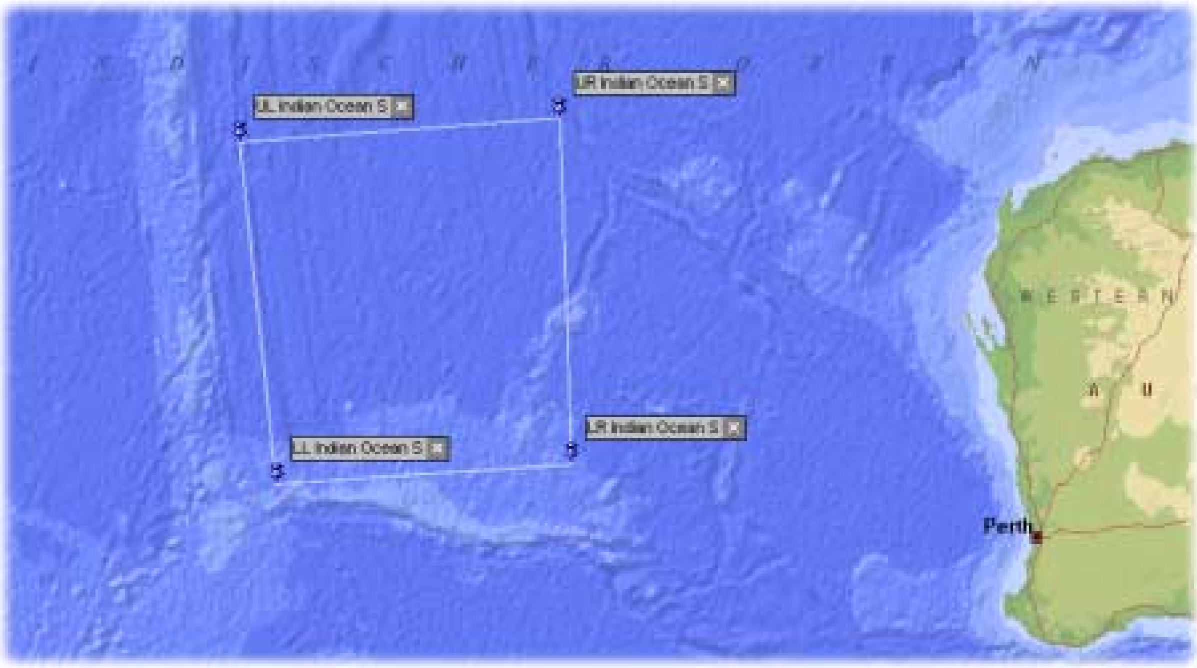


Figure 47: Indian Ocean South: area for test scenes

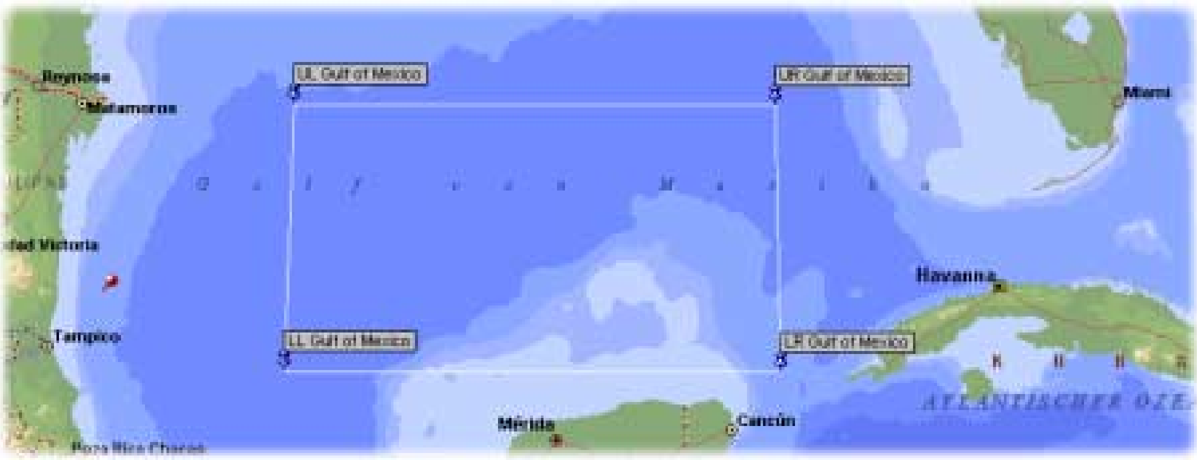


Figure 48: Gulf of Mexico: area for test scenes

Figure 49: Gulf of Yucatan: area for test scenes

Figure 50: Costa Rica Dome: area for test scenes

Figure 51: Crete South: area for test scenes

Figure 52: Cyprus South-East: area for test scenes

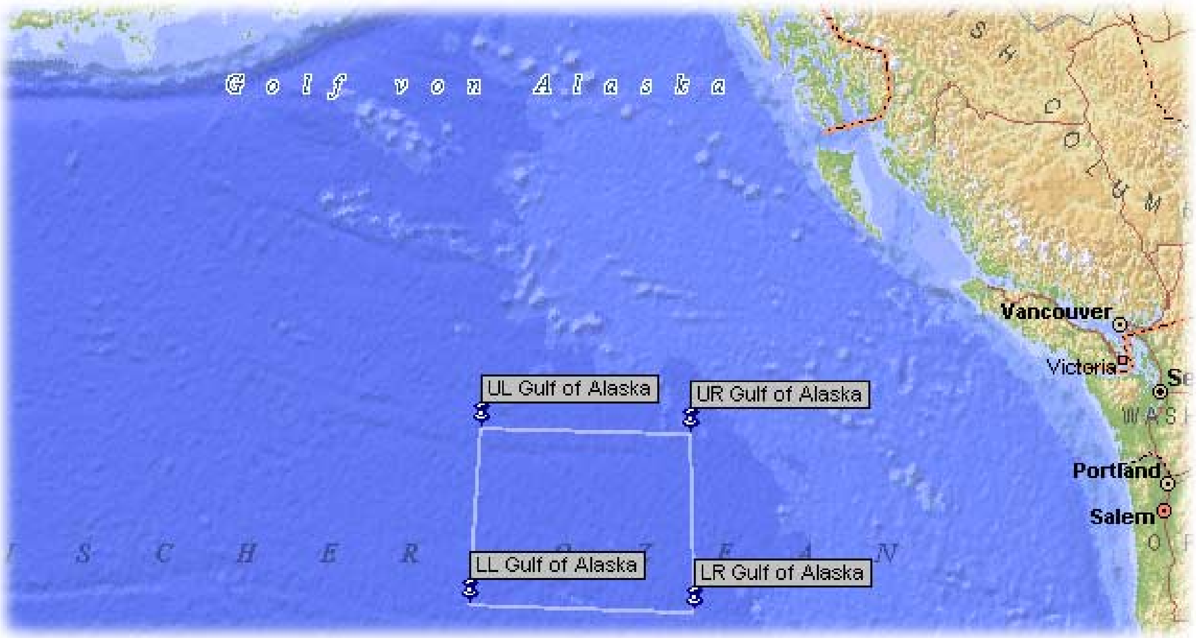


Figure 53: Gulf of Alaska: area for test scenes

Figure 54: Australia South: area for test scenes

5.9.8.1.5 Auxiliary Data

- f_over_q1LUT in ocean1 parameters product completely filled with –1.0 for special processing purpose (i.e. final fail)
- breakpoint files (for tuning, TBC)

5.9.8.1.6 Input reference data or document

None

5.9.8.1.7 Required tools and configuration

Statistics Analysis Tool
MERISView

5.9.8.1.8 Archive requirement

TBD

5.9.8.1.9 Processing

1. Analysis of image statistics
    a. statistics of PCD_15: number and percentage w.r.t. to all ocean pixels
    b. statistics of level 2 parameters:
        i. aerosol optical depth: mean, standard dev and histogram
        ii. water leaving reflectances of 412.5, 442.5, 490, 510, 560, 620, 665, 681.25: mean, standard dev and histogram
        iii. algal pigment index 1: mean, standard dev and histogram
        iv. algal pigment index 2: mean, standard dev and histogram
        v. suspended particulate matter: mean, standard dev and histogram
        vi. yellow substance: mean, standard dev and histogram
2. Analysis of pass criteria

3. In case of failure: corrective actions TBD (e.g. optimisations of tuning parameters)

5.9.8.1.10 Duration

Analysis of 5 scenes including pass/fail criteria: 5 day
Corrective actions:
Atmospheric correction improvement: 10 days

5.9.8.1.11 Output Data

N/A

5.9.8.1.12 Pass /Fail Criteria

1. The values for algal pigment index 1 should mostly be below 0.1 mg/m^3 and sometimes between 0.1 mg/m^3 and 0.2 mg/m^3.
2. The values for the aerosol optical thickness @865 nm should generally be between 0.01 and 2.0.
3. The water-leaving reflectances should be as follows (see also Figure 55):

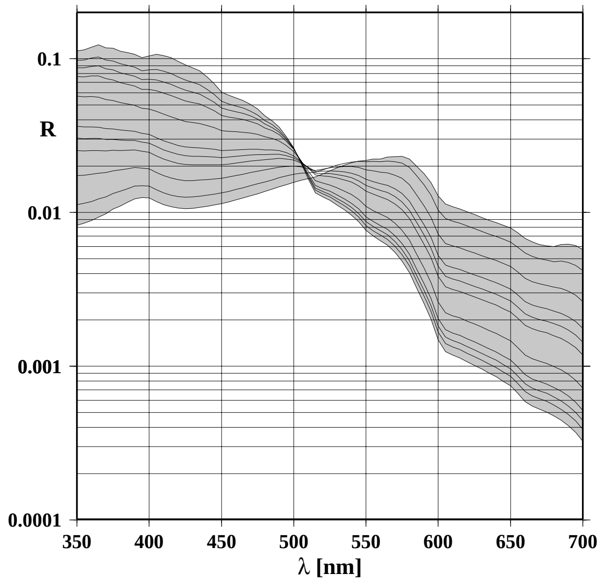


Figure 55: ***Irradiance ratio for Case 1 waters, or reflectance R, as a function of wavelength and as modelled for several chlorophyll concentrations. The reflectance product for MERIS, referred to as the directional reflectance ρ, is roughly half of R. This figure is displayed for the sole purpose of showing an approximate envelope for the marine reflectance in Case 1 waters. Because a natural noise is attached to the optical properties of natural Case 1 waters (as opposed to modelled Case 1 waters), actual values derived from MERIS ocean colour observations may however significantly fall outside this modelled envelope.***

4. final fail criterion: TBD (e.g. TBD numbers of tuning attempts)

5.9.8.1.13 Contingencies

(TBD).

5.9.8.1.14 Task Report Content

TBD

5.9.8.1.15 Responsible, team, location

Responsible: C. Brockmann
U. Krämer, V. Fournier-Sicre, F. Fell
ESL: David Antoine (LPCM)

5.9.8.2 Task V-2.5.3.2: Desert dust areas

5.9.8.2.1 Objectives

To verify the:

- proper range of Algal Pigment Index 1 (Chl1) values for ocean pixels located in oligotrophic areas (Case1 waters). For these pixels the values should be in the definition range (see §5.9.3). The tendencies and specific value ranges described in §5.9.8.2.12-1,2,3 should be met.
- atmospheric correction over clear water; investigations in water leaving reflectances and aerosol optical thickness @865nm will be made (see §5.9.8.2.12-2,3)

5.9.8.2.2 Activities

See **Figure 11**,
Verification of

- Product formatting (MDS 15, 20)
- Ocean 1 Parameters Product

In addition, it might be useful to compare the data with in situ data if such exist, and to examine the images by "educated eyes"

5.9.8.2.3 Prerequisites

Successful atmospheric correction.

5.9.8.2.4 Instrument Data

type	number
FR	5 (TBC)

- time: no restrictions
- other: the scenes shall be cloud-free (max. percentage of cloud pixels per scene: TBD%)

Possible geolocations:

- Off Mauritania & Senegal: location from within the following polygon: (10°N, 30°W) – (30°N, 30°W) – (30°N, 10°W) – (10°N, 10°W); see Figure 56.

Figure 56: Off Mauritania & Senegal: area for test scenes

5.9.8.2.5 Auxiliary Data

- f_over_q1LUT in ocean1 parameters product completely filled with –1.0 for special processing purpose (i.e. final fail)
- breakpoint files (for tuning, TBC)

5.9.8.2.6 Input reference data or document

None

5.9.8.2.7 Required tools and configuration

Statistics Analysis Tool
MERISView

5.9.8.2.8 Archive requirement

TBD

5.9.8.2.9 Processing

1. Analysis of image statistics

a. statistics of PCD_15: number and percentage w.r.t. to all ocean pixels
b. statistics of level 2 parameters:
   i. aerosol optical depth: mean, standard dev and histogram
   ii. water leaving reflectances of 442.5, 490, 510, 560, 665: mean, standard dev and histogram
   iii. algal pigment index 1: mean, standard dev and histogram

2. Analysis of pass criteria
   a. compare statistics with expected values
   b. visually inspect scenes with MERISView in order to verify assumptions according to §5.9.8.2.12-1,2,3
3. In case of failure: corrective actions TBD (e.g. optimisations of tuning parameters)

5.9.8.2.10 Duration

Analysis of 5 scenes including pass/fail criteria: 5 day
Corrective actions:
    Atmospheric correction improvement: 10 days

5.9.8.2.11 Output Data

N/A

5.9.8.2.12 Pass /Fail Criteria

1. The values for algal pigment index 1 should cover the whole definition range (see §5.9.3). Assumptions: in areas of the coastal upwelling the chlorophyll content can reach up to 30 mg/m^3 and even more; in the offshore Atlantic areas oligotrophic conditions should be encountered (see §5.9.8.1).
2. The values for the aerosol optical thickness @865 nm should generally be between 0.01 and 2.0. TBC!
3. The water-leaving reflectances should be as follows (see also Figure 57):

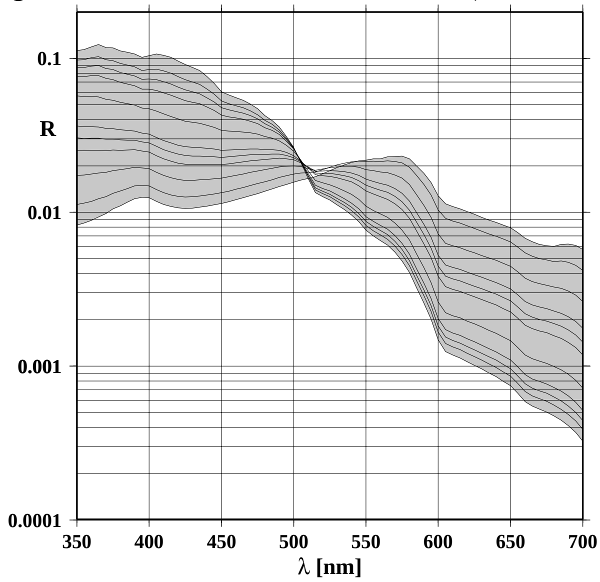


Figure 57: ***Irradiance ratio for Case 1 waters, or reflectance R, as a function of wavelength and as modelled for several chlorophyll concentrations. The reflectance product for MERIS, referred to as the directional reflectance ρ, is roughly half of R. This figure is displayed for the sole purpose of showing an approximate envelope for the marine reflectance in Case 1 waters. Because a natural noise is attached to the optical properties of natural Case 1 waters (as opposed to modelled Case 1 waters), actual values derived from MERIS ocean colour observations may however significantly fall outside this modelled envelope*.

4. final fail criterion: TBD (e.g. TBD numbers of tuning attempts)

5.9.8.2.13 Contingencies

TBD

5.9.8.2.14 Task Report Content

TBD

5.9.8.2.15 Responsible, team, location

Responsible: C. Brockmann
U. Krämer, V. Fournier-Sicre, F. Fell
ESL: David Antoine (LPCM)

5.9.8.2.16 Tuning Parameters for Case1 waters processing

Variable	Descriptive Name	IODD section	source	update method	comment
Aerclim_Ocean_LUT[lat,lon,month]	Aerosol climatology above ocean	6.7	LPCM?	fixed	
Niter	Number of iterations for Chl1 calculation	6.10	LPCM?	Tuning during CP	
DRO510_threshold	Threshold for the test of the errors in atmospheric correction at 510 nm	6.10	LPCM	Tuning during CP	
DRO705_threshold	Threshold for the test of the errors in atmospheric correction at 705 nm	6.10	LPCM	Tuning during CP	
LISTE_aer_0*i*(5), *i* in 1,8	List of aerosol models indices	6.10	LPCM?	Tuning during CP	
N_aer	Number of aerosol models in database	6.10	RMD	Tuning during CP	

N_PASSTOT	Number of passes within aerosol database	6.10	LPCM?	Tuning during CP	
N_co	Number of coefficients in XCtab	6.10	LPCM?	fixed	
MAX_TAU_AER	maximum value for aerosol optical thickness	6.10	LPCM	fixed	
DEPTH_LIM	threshold on depth to signal the "shallow water flag"	6.10	OCTF	fixed	
TROW510_MEAN	Mean value of the normalized marine reflectance at 510 nm	6.10	LPCM	Tuning during CP	
TROW705_MEAN	Mean value of the marine reflectance at 705 nm	6.10	LPCM	Tuning during CP	
TAUA865_threshold	Threshold for the aerosol optical thickness	6.10	LPCM	Tuning during CP	
TEST_AER	Switch indicating if the tests concerning the possible presence of absorbing aerosols are carried out (switch = TRUE) or not (switch = FALSE)	6.10	LPCM	fixed	
TETAS_limit	Value of the sun zenith angle above which the annotation flag is modified	6.10	LPCM	fixed	
TETAV_limit	Value of the viewing zenith angle above which the annotation flag is modified	6.10	LPCM	fixed	
PRESS_TOLERANCE	Threshold to activate a correction for pressure	6.10	LPCM	fixed	
N_wl	Number of wavelengths used in the LUTs	6.10	LPCM	fixed	
N_basic_aer	Number of aerosol models per lists	6.10	LPCM	Tuning during CP	
CLIMATO_AUX	Switch to activate the use of a climatology	6.10	LPCM	Tuning during CP	

Rho_rc_LUT[k,θ_s, θ_v, $\Delta\phi$]	LUT of thresholds on Rayleigh corrected reflectance at 442nm	6.10	RTT	Tuning during CP	
t_0,t_1,t_2	Rayleigh transmittance coefficients	6.11	RTT	Tuning during CP	
Rayscatt_coef_LUT [θ_s, θ_v, s, k]	LUT of polynomial coefficients for the 3 Fourier series terms used to compute the correction factor for Rayleigh multiple scattering	6.11	RTT	Fixed (polar ?)	
Rayalb_LUT[τ]	Rayleigh spherical albedo as a function of optical thickness	6.11	RTT	Fixed	
$\rho_R$tab_LUT [W_s,b,θ_s, θ_v, $\Delta\phi$]	LUT for the Rayleigh reflectance	6.11	RTT	Fixed (polar ?)	
	tabulated values (θ_s, θ_v, $\Delta\varphi$, wind)	6.13	LPCM	fixed	
specdep [aer,τ,b]	LUT of the spectral dependence of the aerosol optical thickness for the various aerosol assemblages	6.13	RTT	fixed	
τa_bl865 [aer,τ]	Aerosol optical thickness at 865 (boundary layer) for the N_aer aerosol assemblages and N_τ values	6.13	RTT	fixed	
$\omega_a$tab_LUT [ia, b]	LUT for the aerosol single scattering albedo for the N_aer aerosol assemblages and the N_wl bands	6.13	RTT	fixed	
$f_a$tab_LUT [ia, b]	Lookup Table for the aerosol forward scattering probability	6.13	RTT	fixed	
XCtab_LUT [k, W_s, ia, b, θ_s, θ_v, $\Delta\phi$]	LUT for polynomial coefficients linking the ratio ρ_{path}/ρ_R to the aerosol optical thickness	6.13	RTT	fixed (polar ?)	

	tabulated values (wind, λ, θ_s, θ_s, θ', θ', θ_v, θ_v, $\Delta\varphi$, $\Delta\varphi$, Chl, τ_a, wind)	6.15	LPCM	fixed	
$Chl1_0$	initial algal pigment index value	6.15	LPCM?	fixed	
c={c1,c2,c3,c6 }	constant for computation of path	6.15	LPCM?	fixed	
c7	constant for scattering detection	6.15	LPCM?	fixed	
	tabulated values (wind speed and azimuth)	6.15	LPCM	fixed	
FSURQ_0	Value of F/Q factor for nadir angle at 510 nm	6.15	from 6.15.8 at Chl=6. 15.4-21		
CMOY	Mean value of chlorophyll	6.15	LPCM?	fixed	
DRO510_LIM	Value of $\Delta\rho 510$ to set the annotation flag	6.15	RMD? LPCM?	Tuning during CP	
TETAP_ZENITH	Value of θp for nadir viewing	6.15	LPCM?	fixed	
r_{ghot}_LUT [θp, Ws]	LUT for the ocean-atmosphere reflection factor	6.15	LPCM	fixed	
$\rho_{w5thresh}$rangein	ρ_w(b5) threshold for controlling validity of input to Chl1 algorithm	6.15	LPCM	Tuning during CP	
$Chl1_{thresh}$rangeout	Chl1 threshold for controlling validity of output	6.15	LPCM	Tuning during CP	
$Chl1_{thresh1}$	algal pigment index threshold for band ratio selection	6.15	LPCM	fixed	
$Chl1_{thresh2}$	algal pigment index threshold for band ratio selection	6.15	LPCM	fixed	
thres_lowg	Threshold value for low glint	6.15	ACRI	Tuning during CP	
thres_medg	Upper threshold value for ratio between glint and TOA reflectance	6.15	ACRI	Tuning during CP	
WHITECAP_THR	wind speed threshold for whitecaps	6.15	ACRI	Tuning during CP	

ROW9_LUT [$\theta_s,\theta_v,\Delta\phi$]	LUT for threshold value on TOA ρw in channel 9	6.15	RTT (spec OCTF)	Tuning during CP	
log10coeff_LUT [p,b]	Polynomial coefficients for Algal Pigment Index retrieval in Case 1 waters	6.15	RMD?	fixed	
N_{A0}	highest order of coefficients to use in log10coeff_LUT	6.15	LPCM	fixed	
f_over_q1_LUT[b,$\theta_p,\theta_s,\Delta\phi$,Chl,$\tau_a,W_s$]	bidirectional factor f/Q	6.15	RTT (spec OCTF)	fixed	
ROG_LUT[θ_s, θ_v, $\Delta\phi$, W_s, chiw]	LUT containing glint reflectance as a function of geometry, wind speed and direction	6.15	ACRI	fixed	

5.9.9 Task V-2.5.4 Case-II water constituent retrieval

5.9.9.1 Task V-2.5.4.1: Typical Case-II Water

5.9.9.1.1 Objectives

To verify the proper range of Algal Pigment Index 2 (Chl2), Suspended Particulate Matter (SPM) and Yellow Substance (YS) values for ocean pixels in Case-II waters. Also, the verification of the turbid water atmospheric correction is included. For these pixels the values should be in the definition range (see §**5.9.3**) and the tendencies described in §5.9.9.1.12 should be met.

5.9.9.1.2 Activities

See **Figure 11**,
Verification of

- Product formatting (MDS 16, 17, 20)
- Ocean 2 Parameters Product

5.9.9.1.3 Prerequisites

Successful atmospheric correction.

5.9.9.1.4 Instrument Data

type	number
FR	1
RR	4

- North Sea / German Bight / Baltic Sea: location from within the following polygon: (50.5°N, 0.5°W) – (58.5°N, 4.25°W) – (61.5°N,14.25°E) – (53.6°N, 14.4°E); see Figure 58.
- time: no restrictions
- other: the scenes shall be cloud-free in the important areas (visual inspection)

Figure 58: North Sea, German Bight, Baltic Sea: area for test scenes

5.9.9.1.5 Auxiliary Data

MERIS Ocean Case 2 Parameters Products for special processing purposes (e.g., final fail):

- The GADS – Case-II Neural Network (6.16.10 of IODD) should contain
    1. a specifically tuned cut-value, so that the PCD is always raised (this is used if the retrieved water constituents are meaningless, but the net does not crash. Saving the “meaningless” results may be useful for error tracking)
    2. a net which disregards the input vector, writes constant values for the output vector (e.g., 100) and raises the OROUT2 always (this is used if the net crashes and the error cannot be solved)

MERIS Ocean Case 1 Parameters Products for special processing purposes (e.g., when the Atmospheric Correction did not happen due to wrong turbid waters screening):

- The GADS should contain the ‘Threshold on rw(705) values for Turbid water identification’ ROW9_LUT= 0 in order to raise the Case2 flag for all ocean pixels.

5.9.9.1.6 Input reference data or document

None

5.9.9.1.7 Required tools and configuration

GeoIdentification Tool (a tool that compares lat and lon of a pixel with a given polygon in order to decide if the pixel is inside that polygon)

Paramex
Statistics Analysis Tool
MERISView
ENVI for profile extraction (see §5.9.9.1.12-4)

5.9.9.1.8 Archive requirement

N/A

5.9.9.1.9 Processing

1. Analysis of image statistics
    a. statistics of PCD_16 and PCD_17: calculate number and percentage w.r.t. to all ocean pixels
    b. identify North Sea and Baltic Sea pixels
    c. calculate for North Sea and Baltic Sea individually:
        i. algal pigment index 2: mean, standard dev, histogram and cumulative histogram, number of pixels
        ii. YS: mean, standard dev, histogram and cumulative histogram, number of pixels
        iii. SPM: mean, standard dev, histogram and cumulative histogram, number of pixels
    d. process L1b data with MEGS with generation of intermediate and breakpoint files turned on
    e. extract rho_toa (breakpoint1 file) and rho_surf (intermediate2) into binary files (using paramex or upgraded MERISView)
    f. extract algal pigment index 2, SPM, and YS with PCD and coastline overlaid in binary format (upgraded MERISView). Also coordinates should be exported in binary file.
    g. import files in ENVI
        i. select "mouth of river Elbe" as ROI and calculate statistics
        ii. calculate rho_path = rho_toa – rho_surf
        iii. extract transect Elbe → Helgoland of
            1. rho_path
            2. algal pigment index 2
            3. SPM
            4. YS
2. Analysis of pass criteria
3. In case of failure:
    a. if more than 75% of the algal pigment index 2 values should exceed 30mg/m^3, the scene shall be inspected by the ESL
    b. in case of implausible Case2 water constituents values over ocean pixels: check atmospheric correction success: compare τ_{opt} with observations
    c. tune conversion LUTs (see §5.9.9.5.16)
    d. revise Reference Model; test alternative Neural Nets

5.9.9.1.10 Duration

Analysis of 5 scenes including pass/fail criteria: 2 day
Corrective actions:

Atmospheric correction improvement: 1 days
Conversion LUT tuning: 1 days
Case 2 IMT network re-training: 30 days

5.9.9.1.11 Output Data

N/A

5.9.9.1.12 Pass /Fail Criteria

1. 75 % of the ocean pixels shall have values for algal pigment index 2 below 10 mg/m^3; the rest should not exceed 30 mg/m^3.
2. The values for SPM should generally be higher in the North Sea than in the Baltic.
3. In the mouth of the river Elbe the SPM values should be very high (>10 g/m^3).
4. Along a transect from the mouth of the river Elbe to a little bit west of the island Helgoland (see Figure 59), the following criteria should be met:
    a. decoupling between atmospheric path radiance (difference between R_{surf} and R_{toa}) and SPM
    b. decreasing SPM values
5. PCD percentage should be less than 5% in case of passing other criteria
6. Final fail criteria: no success after 5 iterations of corrective actions

Figure 59: Profile to be investigated

5.9.9.1.13 Contingencies

If the final fail criterion is reached (e.g., the Case2 IMT algorithm causes crashes and the problem cannot be solved), the auxiliary product should be changed to a net which is independent from the input vector, writes something to the output vector and raises the OROUT2 in any case.

5.9.9.1.14 Task Report Content

TBD

5.9.9.1.15 Responsible, team, location

Responsible: C. Brockmann
U. Krämer, V. Fournier-Sicre, F. Fell
ESL: R. Doerffer (GKSS), H. Schiller (GKSS)

5.9.9.2 Task V-2.5.4.2: Upwelling

5.9.9.2.1 Objectives

To verify the proper range of Algal Pigment Index 2 (Chl2), Suspended Particulate Matter (SPM) and Yellow Substance (YS) values for ocean pixels located in the Humboldt Current or West Coast of Peru. For these pixels the values should be in the definition range (see §**5.9.3**). Additionally, the chlorophyll concentrations should generally be: Chl2 > 1 mg/m^3, in patches: Chl2 > 10 mg/m^3.

5.9.9.2.2 Activities

See **Figure 11**,
Verification of

- Product formatting (MDS 16, 17, 20)
- Ocean 2 Parameters Product

5.9.9.2.3 Prerequisites

Successful atmospheric correction.

5.9.9.2.4 Instrument Data

type	number
FR	1
RR	4

- Humboldt Current / West Coast of Peru: location from within the following polygon:
  - (37°S, 77°W) – (1.5°S, 84°W) – (1.5°S, 69°W) – (36°S, 70.25°W); (see Figure 60).
- time: no restrictions
- other: the scenes shall be cloud-free

Figure 60: Humboldt Current & West coast of Peru: area for test scenes

5.9.9.2.5 Auxiliary Data

MERIS Ocean Case 2 Parameters Products for special processing purposes (e.g., final fail):

- The GADS – Case-II Neural Network (6.16.10 of IODD) should contain
  1. a specifically tuned cut-value, so that the PCD is always raised (this is used if the retrieved water constituents are meaningless, but the net does not crash. Saving the "meaningless" results may be useful for error tracking)
  2. a net which disregards the input vector, writes constant values for the output vector (e.g., 100) and raises the OROUT2 always (this is used if the net crashes and the error cannot be solved)

MERIS Ocean Case 1 Parameters Products for special processing purposes (e.g., when the Atmospheric Correction did not happen due to wrong turbid waters screening):

- The GADS should contain the 'Threshold on rw(705) values for Turbid water identification' ROW9_LUT= 0 in order to raise the Case2 flag for all ocean pixels.

5.9.9.2.6 Input reference data or document

None

5.9.9.2.7 Required tools and configuration

Statistics Analysis Tool
MERISView

5.9.9.2.8 Archive requirement

N/A

5.9.9.2.9 Processing

1. Analysis of image statistics
   a. statistics of PCD_16 and PCD_17: calculate number and percentage w.r.t. to all ocean pixels
   b. calculate:
      i. algal pigment index 2: mean, standard dev, histogram and cumulative histogram, number of pixels
      ii. YS: mean, standard dev, histogram and cumulative histogram, number of pixels
      iii. SPM: mean, standard dev, histogram and cumulative histogram, number of pixels
2. Analysis of pass criteria
   a. compare statistics with expected values
   b. visually inspect patches with MERISView in order to verify higher values in patches
3. In case of failure:
   a. in case of implausible Case2 water constituents values over ocean pixels: check atmospheric correction success: compare τ_{opt} with observations
   b. tune conversion LUTs (see §5.9.9.5.16)
   c. revise Reference Model; test alternative Neural Nets

5.9.9.2.10 Duration

Analysis of 5 scenes including pass/fail criteria: 2 day
Corrective actions:
    Atmospheric correction improvement: 1 days
    Conversion LUT tuning: 1 days
    Case 2 IMT network re-training: 30 days

5.9.9.2.11 Output Data

N/A

5.9.9.2.12 Pass /Fail Criteria

1. 20 % of the values for algal pigment index 2 should be Chl2 > 1 mg/m^3, in patches: Chl2 > 10 mg/m^3.
2. Final fail criteria: no success after 5 iterations of corrective actions
3. PCD percentage should be less than 5% in case of passing other criteria

5.9.9.2.13 Contingencies

If the final fail criterion is reached (e.g., the Case2 IMT algorithm causes crashes and the problem cannot be solved), the auxiliary product should be changed to a net which is independent from the input vector, writes something to the output vector and raises the OROUT2 in any case.

5.9.9.2.14 Task Report Content

TBD

5.9.9.2.15 Responsible, team, location

Responsible: C. Brockmann
U. Krämer, V. Fournier-Sicre, F. Fell
ESL: R. Doerffer (GKSS), H. Schiller (GKSS)

5.9.9.3 Task V-2.5.4.3: High sediment loaded water

5.9.9.3.1 Objectives

To verify the proper range of Algal Pigment Index 2 (Chl2), Suspended Particulate Matter (SPM) and Yellow Substance (YS) values for ocean pixels located in the Mouth of the Rio de la Plata. For these pixels the values should be in the definition range (see §**5.9.3**). Additionally, the SPM concentrations should be extremely high: SPM > 10 g/m^3 and the Chl2 concentrations should be: Chl2 < 1 mg/m^3. Additionally, the values of Chl2, SPM and YS should decrease along the profile depicted in Figure 61.

5.9.9.3.2 Activities

See **Figure 11**,
Verification of

- Product formatting (MDS 16, 17, 20)
- Ocean 2 Parameters Product

5.9.9.3.3 Prerequisites

Successful atmospheric correction.

5.9.9.3.4 Instrument Data

type	number
FR	1
RR	4

- Mouth of Rio de la Plata: location from within the following polygon: (38°S, 60.5°W) – (33°S, 59.5°W) – (32.5°S, 50°W) – (38.5°S, 54°W); see Figure 61.
- time: no restrictions
- other: the scenes shall be cloud-free

Figure 61: Mouth of Rio de la Plata: area for test scenes

5.9.9.3.5 Auxiliary Data

MERIS Ocean Case 2 Parameters Products for special processing purposes (e.g., final fail). The GADS – Case-II Neural Network (6.16.10 of IODD) should contain

1. a specifically tuned cut-value, so that the PCD is always raised (this is used if the retrieved water constituents are meaningless, but the net does not crash. Saving the "meaningless" results may be useful for error tracking)
2. a net which disregards the input vector, writes constant values for the output vector (e.g., 100) and raises the OROUT2 always (this is used if the net crashes and the error cannot be solved)

MERIS Ocean Case 1 Parameters Products for special processing purposes (e.g., when the Atmospheric Correction did not happen due to wrong turbid waters screening):

- The GADS should contain the 'Threshold on rw(705) values for Turbid water identification' ROW9_LUT= 0 in order to raise the Case2 flag for all ocean pixels.

5.9.9.3.6 Input reference data or document

None

5.9.9.3.7 Required tools and configuration

Statistics Analysis Tool
MERISView

5.9.9.3.8 Archive requirement

N/A

5.9.9.3.9 Processing

1. Analysis of image statistics
   a. statistics of PCD_16 and PCD_17: calculate number and percentage w.r.t. to all ocean pixels
   b. calculate:
      i. algal pigment index 2: mean, standard dev, histogram and cumulative histogram, number of pixels
      ii. YS: mean, standard dev, histogram and cumulative histogram, number of pixels
      iii. SPM: mean, standard dev, histogram and cumulative histogram, number of pixels
   c. extract from L2 product: algal pigment index 2, SPM, and YS with PCD and coastline overlaid in binary format (upgraded MERISView). Also coordinates should be exported in binary file.
   d. import files in ENVI
      i. extract transect Mouth of Rio de La Plata → offshore (see profile in Figure 61)
         1. algal pigment index 2
         2. SPM
         3. YS
2. Analysis of pass criteria

3. In case of failure:
    a. in case of implausible Case2 water constituents values over ocean pixels: check atmospheric correction success: compare τ_{opt} with observations
    b. tune conversion LUTs (see §5.9.9.5.16)
    c. revise Reference Model; test alternative Neural Nets

5.9.9.3.10 Duration

Analysis of 5 scenes including pass/fail criteria: 2 day
Corrective actions:
Atmospheric correction improvement: 1 days
Conversion LUT tuning: 1 days
Case 2 IMT network re-training: 30 days

5.9.9.3.11 Output Data

N/A

5.9.9.3.12 Pass /Fail Criteria

1. The values for SPM should be: SPM > 10 g/m^3 and the Chl2 values should be: Chl2 < 1 mg/m^3. Additionally, the values of Chl2, SPM and YS should decrease along the profile depicted in Figure 61.
2. Final fail criteria: no success after 5 iterations of corrective actions
3. PCD percentage should be less than 5% in case of passing other criteria

5.9.9.3.13 Contingencies

If the final fail criterion is reached (e.g., the Case2 IMT algorithm causes crashes and the problem cannot be solved), the auxiliary product should be changed to a net which is independent from the input vector, writes something to the output vector and raises the OROUT2 in any case.

5.9.9.3.14 Task Report Content

TBD

5.9.9.3.15 Responsible, team, location

Responsible: C. Brockmann
U. Krämer, V. Fournier-Sicre, F. Fell
ESL: R. Doerffer (GKSS), H. Schiller (GKSS)

5.9.9.4 Task V-2.5.4.4: Yellow coloured sediment water

5.9.9.4.1 Objectives

To verify the proper range of Algal Pigment Index 2 (Chl2), Suspended Particulate Matter (SPM) and Yellow Substance (YS) values for ocean pixels located in the Mouth of the river Yangtse or in the Yellow Sea. For these pixels the values should be in the definition range (see §**5.9.3**). Additionally, in the mouth of the river Yangtse the SPM concentrations should be extremely high: SPM > 10 g/m^3. Additionally, the values for Chl2, SPM and YS should be decreasing eastwards along the profile depicted in Figure 62.

5.9.9.4.2 Activities

See **Figure 11**,
Verification of

- Product formatting (MDS 16, 17, 20)
- Ocean 2 Parameters Product

5.9.9.4.3 Prerequisites

Successful atmospheric correction.

5.9.9.4.4 Instrument Data

type	number
FR	1
RR	4

- Yellow Sea, Mouth of the river Yangtse: location from within the following polygon: (29.5°N, 118.25°E) – (39.5°N, 117°E) – (39.25°N, 126°E) – (29.5°N, 125.5°E); (see Figure 62).
- time: no restrictions
- other: the scenes shall be cloud-free

Figure 62: Yellow Sea & Mouth of the Yangtse river: area for test scenes

5.9.9.4.5 Auxiliary Data

MERIS Ocean Case 2 Parameters Products for special processing purposes (e.g., final fail):

- The GADS – Case-II Neural Network (6.16.10 of IODD) should contain
  1. a specifically tuned cut-value, so that the PCD is always raised (this is used if the retrieved water constituents are meaningless, but the net does not crash. Saving the "meaningless" results may be useful for error tracking)
  2. a net which disregards the input vector, writes constant values for the output vector (e.g., 100) and raises the OROUT2 always (this is used if the net crashes and the error cannot be solved)

MERIS Ocean Case 1 Parameters Products for special processing purposes (e.g., when the Atmospheric Correction did not happen due to wrong turbid waters screening):

- The GADS should contain the 'Threshold on rw(705) values for Turbid water identification' ROW9_LUT= 0 in order to raise the Case2 flag for all ocean pixels.

5.9.9.4.6 Input reference data or document

None

5.9.9.4.7 Required tools and configuration

Statistics Analysis Tool
MERISView

5.9.9.4.8 Archive requirement

N/A

5.9.9.4.9 Processing

1. Analysis of image statistics
    a. statistics of PCD_16 and PCD_17: calculate number and percentage w.r.t. to all ocean pixels
    b. calculate:
        i. algal pigment index 2: mean, standard dev, histogram and cumulative histogram, number of pixels
        ii. YS: mean, standard dev, histogram and cumulative histogram, number of pixels
        iii. SPM: mean, standard dev, histogram and cumulative histogram, number of pixels
    c. extract from L2 product: algal pigment index 2, SPM, and YS with PCD and coastline overlaid in binary format (upgraded MERISView). Also coordinates should be exported in binary file.
    d. import files in ENVI
        i. extract transect Mouth of the river Yangtse → eastwards (see profile in Figure 62)
            1. algal pigment index 2
            2. SPM
            3. YS
2. Analysis of pass criteria
3. In case of failure:
    a. in case of implausible Case2 water constituents values over ocean pixels: check atmospheric correction success: compare τ_{opt} with observations
    b. tune conversion LUTs (see §5.9.9.5.16)
    c. revise Reference Model; test alternative Neural Nets

5.9.9.4.10 Duration

Analysis of 5 scenes including pass/fail criteria: 2 day
Corrective actions:

Atmospheric correction improvement: 1 days
Conversion LUT tuning: 1 days
Case 2 IMT network re-training: 30 days

5.9.9.4.11 Output Data

N/A

5.9.9.4.12 Pass /Fail Criteria

1. In the mouth of the river Yangtse the values for SPM should be: SPM > 10 g/m^3. Additionally, the values for Chl2, SPM and YS should be decreasing eastwards along the profile depicted in Figure 62.
2. Final fail criteria: no success after 5 iterations of corrective actions
3. PCD percentage should be less than 5% in case of passing other criteria

5.9.9.4.13 Contingencies

If the final fail criterion is reached (e.g., the Case2 IMT algorithm causes crashes and the problem cannot be solved), the auxiliary product should be changed to a net which is independent from the input vector, writes something to the output vector and raises the OROUT2 in any case.

5.9.9.4.14 Task Report Content

TBD

5.9.9.4.15 Responsible, team, location

Responsible: C. Brockmann
U. Krämer, V. Fournier-Sicre, F. Fell
ESL: R. Doerffer (GKSS), H. Schiller (GKSS)

5.9.9.5 Task V-2.5.4.5: Ocean desert

5.9.9.5.1 Objectives

To verify the proper range of Algal Pigment Index 2 (Chl2), Suspended Particulate Matter (SPM) and Yellow Substance (YS) values for ocean pixels located in the eastern part of the Mediterranean sea or the Sargasso Sea. For these pixels the values should be at the lower limit of the definition range (see §**5.9.3**), i.e. Chl2 < 0.1 mg/m^3, SPM < 0.1 g/m^3, YS < 0.01 m^{-1}. In particular, the chlorophyll values in winter should be very low. To detect these low values, the wind speed has to be below 5m/s.

5.9.9.5.2 Activities

See **Figure 11**,
Verification of

- Product formatting (MDS 16, 17, 20)
- Ocean 2 Parameters Product

5.9.9.5.3 Prerequisites

Successful atmospheric correction.

5.9.9.5.4 Instrument Data

type	number
FR	1
RR	4

- Sargasso Sea: location from within the following polygon: (27°N, 61°W) – (34°N, 61°W) – (34°N, 35°W) – (25°N, 40°W); see Figure 63.
- Mediterranean Sea: location from within the following polygon: (30°N, 0°E) – (45°N, 0°E) – (45°N, 30°E) – (30°N, 30°E); see Figure 64.
- time: no restrictions
- other: the scenes shall be cloud-free

Figure 63: Sargasso Sea: area for test scenes

Figure 64: Mediterranean Sea: area for test scenes

5.9.9.5.5 Auxiliary Data

MERIS Ocean Case 2 Parameters Products for special processing purposes (e.g., final fail):

- The GADS – Case-II Neural Network (6.16.10 of IODD) should contain
  1. a specifically tuned cut-value, so that the PCD is always raised (this is used if the retrieved water constituents are meaningless, but the net does not crash. Saving the “meaningless” results may be useful for error tracking)
  2. a net which disregards the input vector, writes constant values for the output vector (e.g., 100) and raises the OROUT2 always (this is used if the net crashes and the error cannot be solved)

MERIS Ocean Case 1 Parameters Products for special processing purposes (e.g., when the Atmospheric Correction did not happen due to wrong turbid waters screening):

- The GADS should contain the ‘Threshold on rw(705) values for Turbid water identification’ ROW9_LUT= 0 in order to raise the Case2 flag for all ocean pixels.

5.9.9.5.6 Input reference data or document

None

5.9.9.5.7 Required tools and configuration

Statistics Analysis Tool
MERISView

5.9.9.5.8 Archive requirement

N/A

5.9.9.5.9 Processing

1. Analysis of image statistics
   a. statistics of PCD_16 and PCD_17: number and percentage w.r.t. to all image pixels
   b. Mean values of Case2 water constituents:
      i. mean Chl2, standard dev and histogram
      ii. mean YS, standard dev and histogram
      iii. mean SPM, standard dev and histogram
2. Analysis of pass criteria
3. In case of failure:
   a. Verify the wind speed: if not below 5 m/s, the scene has to be dismissed and re-rerecorded.
   b. in case of implausible Case2 water constituents values over ocean pixels: check atmospheric correction success: compare τ_{opt} with observations
   c. tune conversion LUTs (see §5.9.9.5.16)
   d. revise Reference Model; test alternative Neural Nets

5.9.9.5.10 Duration

Analysis of 5 scenes including pass/fail criteria: 2 day
Corrective actions:
    Atmospheric correction improvement: 1 days
    Conversion LUT tuning: 1 days
    Case 2 IMT network re-training: 30 days

5.9.9.5.11 Output Data

N/A

5.9.9.5.12 Pass /Fail Criteria

1. The values for all parameters should be close to zero (Chl2 < 0.1 mg/m^3, SPM < 0.1 g/m^3, YS < 0.01 m^{-1}).
2. Final fail criteria: no success after 5 iterations of corrective actions
3. PCD percentage should be less than 5% in case of passing other criteria

5.9.9.5.13 Contingencies

If the final fail criterion is reached (e.g., the Case2 IMT algorithm causes crashes and the problem cannot be solved), the auxiliary product should be changed to a net which is independent from the input vector, writes something to the output vector and raises the OROUT2 in any case.

5.9.9.5.14 Task Report Content

TBD

5.9.9.5.15 Responsible, team, location

Responsible: C. Brockmann
U. Krämer, V. Fournier-Sicre, F. Fell
ESL: R. Doerffer (GKSS), H. Schiller (GKSS)

5.9.9.5.16 Tuning Parameters for Case2 waters processing

Variable	Descriptive Name
a'_{chl}_LUT[b,Chl]	LUT giving estimated chlorophyll absorption coefficient
b'_{chl}_LUT [b,Chl]	LUT giving b' coefficient
a'_LUT [b, SPM]	Table giving a', absorption coefficient, as a function of the sediment load
b'_LUT [b, SPM]	Table giving b', diffusion coefficient, as a function of the sediment load

5.10 Task V-2.6: Product Formatting Verification

5.10.1 Objectives

In this task, the correct writing of the products shall be verified. While the contents of the MDS is already verified in the scope of the corresponding algorithm tests, the general data sets will be verified in this task.

5.10.2 Activities

The data sets to be verified are

- MPH
- SPH
- GADS
- SQADS
- LADS

5.10.3 Prerequisites

N/A

5.10.4 Test scene requirements and Identified scenes

- any scene

5.10.5 Required tools and configuration

TBD

5.10.6 Processing

Inspection of data sets in MEGS.

5.10.7 Pass /Fail Criteria

Values should exactly compare with expected values.

5.10.8 Contingencies

N/A

5.10.9 Task Report Content

TBD

5.10.10 Responsible, team, location

Responsible: BC

6. MERIS Data Description

6.1 MERIS Configurations

A MERIS configuration identifier is built as the concatenation of <CMSetting>_<BandSetting>_<InstMode>_<SubMode>_<ConfigurationNumber>
Where:

- CMSetting (calibration mechanism setting) belongs to {Earth, Dif1, Dif2, Difλ, Shutter}. When applied to a Radiometric Calibration sequence, it corresponds to the physical CM setting of the diffuser observations part of the sequence (the physical CM setting can be forced to a different position than the Logical setting, e.g. Shutter instead of Diffuser 1)
- BandSetting is a mnemonic designating without ambiguity a given configuration of the programmable bands and gains settings.
- InstMode (instrument mode) belongs to {Obs, Dark, Rad} corresponding respectively to Observation, Dark Current Calibration Sequence and Radiometric Calibration Sequence (see AD2 or AD4 for further details on instrument modes)
- SubMode, **optional**, allows to specify specific settings within a given CM, band and instrument mode configuration (e.g. OCL switch on or off)
- ConfigurationNumber, **optional**, allows to use the same MERIS configuration radix with a varying version number when more than one band set is needed for a given data set (e.g. mapping the CCD using *n* contiguous sets of bands).

The following instrument configurations are identified to date:

1. Earth_SciLo_Obs
2. Earth_SciHi_Obs
3. Shutter_ASPI_Obs
4. Shutter_DarkMap_Obs_i
5. Shutter_SciLo_Rad_OCLON
6. Shutter_SciLo_Rad_OCLOFF
7. Shutter_SciLo_Obs_OCLON
8. Shutter_SciLo_Obs_OCLOFF
9. Shutter_SciHi_Rad_OCLON
10. Shutter_SciHi_Rad_OCLOFF
11. Shutter_SciHi_Obs_OCLON
12. Shutter_SciHi_Obs_OCLOFF
13. Dif1_SciLo_Rad
14. Dif1_SciLo_Obs
15. Dif2_SciLo_Rad
16. Dif2_SciLo_Obs
17. Dif1_SciHi_Rad
18. Dif1_SciHi_Obs
19. Dif2_SciHi_Rad
20. Dif2_SciHi_Obs
21. Dif1_NL_Obs_i

22. Difλ_ErbBlue_Rad
23. Difλ_ErbBlue_Obs
24. Difλ_ErbGreen_Rad
25. Difλ_ErbGreen_Obs
26. Difλ_ErbNIR_Rad
27. Difλ_ErbNIR_Obs
28. Dif1_ErbBlue_Rad
29. Dif1_ErbBlue_Obs
30. Dif1_ErbGreen_Rad
31. Dif1_ErbGreen_Obs
32. Dif1_ErbNIR_Rad
33. Dif1_ErbNIR_Obs
34. Earth_O2_Obs
35. Dif1_O2_Rad
36. Earth_Fraunhoffer_Obs
37. Dif1_Fraunhoffer_Rad
38. Difλ_SciHi_Obs

6.2 MERIS Operations

6.2.1 Routine Operations, Low gains

6.2.1.1 Description

Nominal operation of MERIS from L to task C-1.9.1 Synthesis: Baseline Configuration, using the SciLo band/gain setting. At initiation during SODAP, the OCL switch will be determined following results of task C-1.1.3.
Observation scenario will follow mission baseline except when interrupted by any of the specific campaigns listed hereafter.

6.2.1.2 Date and Duration

From L+TBD (decision pertains to SODAP team) to completion of task C-1.9.1.

6.2.1.3 Configurations Used

Earth_SciLo_Obs, Dif1_SciLo_Rad.

6.2.1.4 Remarks

SODAP may take the decision to initiate SciLo observation with a default OCL setting before getting a recommendation from task C-1.1.3 if the latter is delayed.

6.2.2 Routine Operations, High gains

6.2.2.1 Description

Routine operation of MERIS after optimisation of the gain settings with respect to the mission objectives during task C-1.9.1.

Observation scenario will follow mission baseline except when interrupted by any of the specific campaigns listed hereafter.

6.2.2.2 Date and Duration

From completion of task C-1.9.1 to end of mission.

6.2.2.3 Configurations Used

Earth_SciHi_Obs, Dif1_SciHi_Rad.

6.2.2.4 Remarks

Definition of SciHi configuration may slightly evolve between tasks C-1.9.1 and PRR.

6.2.3 Dark Characterisation Campaigns

6.2.3.1 Description

MERIS Dark Signal characterisation includes specific measurement campaigns to:

- repeat on-ground characterisation measurements for comparisons,
- assess shutter efficiency and characterise along-track behaviour.
- assess orbital variations of dark current and OCL setting.

These measurements are performed either in Observation or in Radiometric Calibration modes and need the re-definition of the corresponding CM logical settings (Earth or Diffuser 1) to the physical position Shutter.

6.2.3.2 Date and Duration

Dates:
TBD during SODAP phase 4 (on-ground characterisation configurations, along-track behaviour).
1 week before CTR (along-track behaviour).
2 weeks (TBC) after VTR (along-track behaviour).
Durations:
Shutter_DarkMap_Obs_i: 11 orbits (one for each of the 11 band sets)
Shutter_ASPI_Obs: 1 orbit
Shutter_SciLo_Rad_OCLxx and Shutter_SciLo_Obs_OCLxx: 3 orbits for each OCL setting (6 orbits for the whole Shutter_SciLo_XXX_OCLxx measurements)
Shutter_SciHi_XXX_OCLxx: nominally 6 orbits for the whole set of measurements (times 2 for the 2 campaigns), could be reduced to 2 orbits per campaign if SODAP (SciLo) measurements have shown sufficient evidence of orbit to orbit stability.

6.2.3.3 Configurations Used

Shutter_DarkMap_Obs_i (i=1,11), Shutter_ASPI_Obs, Shutter_SciLo_Rad_OCLON, Shutter_SciLo_Rad_OCLOFF, Shutter_SciLo_Obs_OCLON, Shutter_SciLo_Obs_OCLOFF (during SODAP)
Shutter_SciHi_Rad_OCLON, Shutter_SciHi_Rad_OCLOFF, Shutter_SciHi_Obs_OCLON, Shutter_SciHi_Obs_OCLOFF (after SHTC).

6.2.3.4 Remarks
Due to the CM forced in Shutter position, both the Dark and Diffuser measurement packets of the Radiometric Calibration sequences can be used for Dark Current analysis.

6.2.4 Radiometric Diffuser Characterisation Campaigns

6.2.4.1 Description
Specific measurements of the diffuser radiance in Observation mode are necessary to assess the along-track behaviour of the diffuser BRDF i.e. its variations with respect to Sun zenith angle. Measurements are FR raw data continuously acquired during the entire Sun visibility window, including the window edges where vignetting occurs. It concerns the two radiometric diffusers and the doped diffuser. Measurements in observation mode shall immediately precede or follow measurements in Calibration mode using the same instrument settings (bands, gains, OCL, alignment parameters).

6.2.4.2 Date and Duration
TBD during SODAP (phase 6) for all diffusers, duration 2 orbits for each diffuser (one for Observation mode and one for Calibration mode measurements).
Asap after CTR, duration *idem*.
Asap after VTR, duration *idem*.

6.2.4.3 Configurations Used
Dif1_SciLo_Rad, Dif1_SciLo_Obs, Dif2_SciLo_Rad, Dif2_SciLo_Obs, Difλ_ErbGreen_Obs (SODAP)
Dif1_SciHi_Rad, Dif1_SciHi_Obs, Dif2_SciHi_Rad, Dif2_SciHi_Obs, Difλ_SciHi_Obs (after CTR).

6.2.4.4 Remarks

6.2.5 Doped Diffuser Characterisation Campaigns

6.2.5.1 Description
Measurements of the location on the CCD grid of absorption features of the Erbium doped diffuser with respect to (non-doped) diffuser 1. These measurements are part of the nominal operation profile every 3 months for one absorption feature and every 6 months for a second one, however more frequent and more complete measurements are required during the commissioning phase. Measurements are foreseen in both Calibration and Observation modes for 3 absorption features (one in the blue region of the spectrum, one in the green and one in the near infrared regions). Calibration and Observation modes measurements shall be as close as possible to each other, doped diffuser and white diffuser measurements for the same band setting and observation mode shall be on 2 consecutive orbits.
Three measurement campaigns are foreseen, corresponding respectively to Phases 1 to 3 of the MERIS Calibration.

6.2.5.2 Date and Duration
TBD during SODAP (phase 6) for ErbGreen band setting.

Asap after SHCT for ErbBlue and ErbNIR band settings.
Asap after CTR for all band settings.
L + ~16 weeks.
All: duration one orbit for each configuration.

6.2.5.3 Configurations Used

Dif1_ErbBlue_Rad, Difλ_ErbBlue_Rad, Dif1_ErbBlue_Obs, Difλ_ErbBlue_Obs, Dif1_ErbGreen_Rad, Difλ_ErbGreen_Rad, Dif1_ErbGreen_Obs, Difλ_ErbGreen_Obs, Dif1_ErbNIR_Rad, Difλ_ErbNIR_Rad, Dif1_ErbNIR_Obs, Difλ_ErbNIR_Obs.

6.2.5.4 Remarks

NIR measurements are TBC as no on-ground reference is available.

6.2.6 O2 absorption band observations campaigns

6.2.6.1 Description

Earth observations using a dedicated band setting allowing to derive absolute wavelength for the used band setting.

6.2.6.2 Date and Duration

O2 absorption band observations are limited to two campaigns in Calibration Phase 1 and Phase 3, with a duration of three orbits each. The first orbit of each campaign includes a Radiometric Calibration Sequence using the observation band setting.
Foreseen dates are asap after SHCT and L + ~16 weeks (TBC)

6.2.6.3 Configurations Used

Earth_O2_Obs, Dif1_O2_Rad.

6.2.6.4 Remarks

N/A

6.2.7 Fraunhoffer lines observation campaigns

6.2.7.1 Description

Earth observations using a dedicated band setting allowing to derive absolute wavelength for the used band setting.

6.2.7.2 Date and Duration

Fraunhoffer lines observations are limited to two campaigns in Calibration Phase 1 and Phase 3, with a duration of three orbits each. The first orbit of each campaign includes a Radiometric Calibration Sequence using the observation band setting. Foreseen dates are End of SHCT + 2 weeks and L+16 weeks (TBC)

6.2.7.3 Configurations Used

Earth_Fraunhoffer_Obs, Dif1_Fraunhoffer_Rad.

6.2.7.4 Remarks

Fraunhoffer lines observation campaigns are still TBC due to sensitivity analysis in progress at ESL.

6.2.8 Non-linearity Characterisation Campaign

6.2.8.1 Description

Diffuser observations spread over 4 successive orbits using 4 specific band sets with widening bands over the same spectral range, simulating signal increase as diffuser radiance is assumed stable.

6.2.8.2 Date and Duration

CTR + TBD weeks, duration 4 orbits.

6.2.8.3 Configurations Used

Dif1_NL_Obs_i, i=1,4

6.2.8.4 Remarks

This campaign may be cancelled if task C-1.3.1 does not show the need for it.

6.3 Band and Gain Settings

This section describes the programmable band and gain settings used in commissioning activities. In all that follows, we assume that MERIS has its nominal wavelength range (390-1040nm), not taking registration into account. The band settings specs consist of the lowest wavelength of the band λ (nm), followed by its width $\Delta\lambda$ (nm).

6.3.1 SciLo

These are the nominal science band settings for achieving MERIS Level 1 and Level 2 processing, with programmable gains set such as no saturation occur above L4 radiance.

6.3.1.1 Band setting

Nominal operational science band set, as per **Error! Reference source not found.**, recalled here:

No	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
λ	407.5	437.5	485	505	555	615	660	677.5	703.75	750	758.75	767.5	855	880	895
$\Delta\lambda$	10	10	10	10	10	10	10	7.5	10	7.5	3.75	15	20	10	10

6.3.1.2 Gain setting

Gains shall be such as to avoid saturation above L4 level for any band.

6.3.2 SciHi

These are the nominal science band settings for achieving MERIS Level 1 and Level 2 processing, with gain settings optimised for each band with respect to the Level 1b processing constraints and its use within the MERIS level 2 algorithms.

6.3.2.1 Band setting

Nominal operational science band set, as per **Error! Reference source not found.**, recalled here:

No	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
λ	407.5	437.5	485	505	555	615	660	677.5	703.75	750	758.75	767.5	855	880	895
Δλ	10	10	10	10	10	10	10	7.5	10	7.5	3.75	15	20	10	10

6.3.2.2 Gain setting

Gains shall be such as TBD.

6.3.3 ASPI

Band and gain settings as used during instrument characterisation at ASPI (ME120 configuration)

6.3.3.1 Band setting

No	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
λ	405	440	485	515	555	615	660	676.25	700	745	755	770	850	860	895
Δλ	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10

6.3.3.2 Gain setting

All gain shall be set to 3.75

6.3.4 Dark_map_i

Settings dedicated to complete characterisation of offset signal

6.3.4.1 Band setting

Set 1:

N	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
λ	390	395	400	405	410	415	420	425	430	435	440	445	450	455	460
Δλ	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5

Set 2:

N	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
λ	465	470	475	480	485	490	495	500	505	510	515	520	525	530	535
Δλ	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5

Set 3:

N	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
λ	540	545	550	555	560	565	570	575	580	585	590	595	600	605	610
Δλ	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5

Set 4:

N	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
λ	615	620	625	630	635	640	645	650	655	660	665	670	675	680	685
Δλ	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5

Set 5:

N	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
λ	690	695	700	705	710	715	720	725	730	735	740	745	750	755	760
Δλ	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5

Set 6:

N	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
λ	635	770	775	780	785	790	795	800	805	810	815	820	825	830	835
Δλ	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5

Set 7:

N	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
λ	635	845	850	855	860	865	870	875	880	885	890	895	900	905	910
Δλ	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5

Set 8:

N	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
λ	635	920	925	930	935	940	945	950	955	960	965	970	975	980	985
Δλ	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5

Set 9:

N	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
λ	391.25	392.5	393.75	395	396.25	990	995	1000	1005	1010	1015	1020	1025	1030	1035
Δλ	1.25	1.25	1.25	1.25	1.25	5	5	5	5	5	5	5	5	5	5

Set 10:

N	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
λ	407.5	420	437.5	495	570	645	677.5	720	750	758.75	767.5	795	870	945	995
Δλ	10	5	10	5	5	5	7.5	5	7.5	2.5	15	5	5	5	5

Set 11:

N	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
λ	390	395	400	405	410	415	420	425	430	435	440	445	765	840	915
Δλ	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5

6.3.4.2 Gain setting

All gains shall be set to 3.75 (TBC) for all band settings.

6.3.5 ErbBlue

Settings dedicated to observation of the absorption peak of the doped diffuser in the green

6.3.5.1 Band setting

No	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
λ	400	401.25	402.5	403.75	405	406.25	407.5	408.75	410	411.25	412.5	413.75	415	416.25	417.5
Δλ	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25

6.3.5.2 Gain setting

All gains shall be set to their maximum value (3.75).

6.3.6 ErbGreen

Settings dedicated to observation of the absorption peak of the doped diffuser in the green

6.3.6.1 Band setting

No	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
λ	513.75	515	516.25	517.5	518.75	520	521.25	522.5	523.75	525	526.25	527.5	528.75	530	531.25
Δλ	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25

6.3.6.2 Gain setting

All gains shall be set to their maximum value (3.75).

6.3.7 ErbNir

Settings dedicated to observation of the absorption peak of the doped diffuser in the NIR

6.3.7.1 Band setting

No	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
λ	646.25	647.5	648.75	650	651.25	652.5	653.75	655	656.25	657.5	658.75	660	661.25	662.5	663.75
Δλ	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25

6.3.7.2 Gain setting

All gains shall be set to their maximum value (3.75).

6.3.8 NL_i

Settings dedicated to Non-Linearity characterisation (see task C-1.3). There are 4 such settings with i= 1..4

6.3.8.1 Band setting

Table below shows the band settings (lower wavelength, width) for the 4 NL_i settings. Bands shown in grey background are not used by the non-linearity characterisation procedure.

N	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
λ_1	700	701.25	702.5	703.75	705	706.25	707.5	708.75	710	711.25	712.5	713.75	715	716.3	717.5
Δλ_1	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25
λ_2	700	702.5	705	707.5	710	712.5	715	717.5	718.75	720	721.25	722.5	723.75	725	726.25
Δλ_2	2.5	2.5	2.5	2.5	2.5	2.5	2.5	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25
λ_3	700	705	710	715	718.75	720	721.25	722.5	723.75	725	726.25	727.5	728.75	730	731.25
Δλ_3	5	5	5	3.75	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25
λ_4	700	710	718.75	720	721.25	722.5	723.75	725	726.25	727.5	728.75	730	731.25	732.5	733.75
Δλ_4	10	8.75	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25

6.3.8.2 Gain setting

Programmable gains shall be set to 1 (TBC) for all bands, all settings.

6.3.9 O2

Settings dedicated to observation of the absorption peak of atmospheric oxygen in the 760nm region.

6.3.9.1 Band setting

No	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
λ	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
Δλ	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25

6.3.9.2 Gain setting

All gains shall be set to their maximum value (3.75), TBC.

6.3.10 Fraunhoffer

Settings dedicated to observation of a TBD Fraunhoffer line

6.3.10.1 Band setting

No	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
λ	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
Δλ	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD

6.3.10.2 Gain setting

TBD

6.4 MERIS Data Sets

An overview of the already identified data sets, with a summary description and references to the tasks using them is given in table 6.4-1 below:

Data Set #	Instrument Data Description	Task
1	Shutter_DarkMap_Obs_i, i=1,11, 1000 FR frames for each 9 band setting, L0 raw data (SODAP)	C-1.1.1
2	Shutter_ASPI_Obs, 1000 FR frames, L0 raw data. (SODAP)	C-1.1.1
3	Shutter_SciLo_Obs_OCLON, RR L0 raw data, 2 orbits of 50 minutes (going into eclipse), 1 orbit of 43 minutes. (SODAP)	C-1.1.1
4	Shutter_SciLo_Obs_OCLOFF, RR L0 raw data, 2 orbits of 50 minutes (going into eclipse), 1 orbit of 43 minutes. (SODAP)	C-1.1.1
5	Shutter_SciLo_Rad_OCLON, Rad Current on-ground calibration STG. (SODAP)	C-1.1.1
6	Shutter_SciLo_Rad_OCLOFF, Rad Current on-ground calibration STG. (SODAP)	C-1.1.1
7	Shutter_SciHi_Obs_OCLON, RR L0 raw data, 2 orbits of 50 minutes (going into eclipse), 1 orbit of 43 minutes.	C-1.1.4
8	Shutter_SciHi_Obs_OCLOFF, RR L0 raw data, 2 orbits of 50 minutes (going into eclipse), 1 orbit of 43 minutes.	C-1.1.4
9	Shutter_SciHi_Rad_OCLON, Rad Current on-ground calibration STG.	C-1.1.4
10	Shutter_SciHi_Rad_OCLOFF, Rad Current on-ground calibration STG.	C-1.1.4
11	Shutter_SciHi_Obs_OCLON, RR L0 raw data, 2 orbits of 50 minutes (going into eclipse), 1 orbit of 43 minutes.	C-1.1.4
12	Shutter_SciHi_Obs_OCLOFF, RR L0 raw data, 2 orbits of 50 minutes (going into eclipse), 1 orbit of 43 minutes.	C-1.1.4
13	Shutter_SciHi_Rad_OCLON, Rad Current on-ground calibration STG.	C-1.1.4
14	Shutter_SciHi_Rad_OCLOFF, Rad Current on-ground calibration STG.	C-1.1.4
15	Dif1_SciLo_Rad, radiometric calibration sequence STG (SODAP)	C-1.2.1
15	Dif1_SciLo_Rad, radiometric calibration sequence STG (from SODAP via C-1.2.1)	C-1.4.1
16	Dif2_SciLo_Rad, radiometric calibration sequence STG (SODAP)	C-1.2.1
17	Dif1_SciLo_Obs, L0 FR observation data over the diffuser illumination period (SODAP)	C-1.2.1
18	Dif2_SciLo_Obs, L0 FR observation data over the diffuser illumination period (SODAP)	C-1.2.1
19	Difl_ErbGreen_Obs, L0 FR observation data over the diffuser illumination period (SODAP)	C-1.2.1
20	Earth_SciLo_Obs, L0 RR data, scene showing Sun Glint selected from routine observations	C-1.2.2
21	Dif1_SciHi_Rad, radiometric calibration sequence STG	C-1.2.3
21	Dif1_SciHi_Rad, radiometric calibration sequence STG, from C-1.2.3	C-1.4.3
22	Earth_SciHi_Obs, L0 RR data, scene showing Sun Glint selected from routine observations	C-1.2.3
23	Dif1_SciHi_Rad, radiometric calibration sequence STG	C-1.2.5
24	Dif2_SciHi_Rad, radiometric calibration sequence STG	C-1.2.5
25	Dif1_SciHi_Obs, L0 FR observation data over the diffuser illumination period	C-1.2.5
26	Dif2_SciHi_Obs, L0 FR observation data over the diffuser illumination period	C-1.2.5
27	Dif1_SciHi_Rad, radiometric calibration sequence STG	C-1.2.7
28	Dif2_SciHi_Rad, radiometric calibration sequence STG	C-1.2.7
29	Dif1_SciHi_Obs, L0 FR observation data over the diffuser illumination period	C-1.2.7

Data Set #	Instrument Data Description	Task
30	Dif2_SciHi_Obs, L0 FR observation data over the diffuser illumination period	C-1.2.7
31	Difl_SciHi_Obs, L0 FR observation data over the diffuser illumination period	C-1.2.7
32	Earth_SciLo_Obs, - L0 RR data, 3 orbits from routine observations with all types of surface - L0 FR data, 3 scenes from the above orbits with all types of surface	C-1.3.1
33	Dif1_NL_Obs_i, i=1,4, L0 FR data, acquisition of the diffuser radiance in observation mode during the entire Sun visibility window using the 4 dedicated band settings on 4 successive orbits.	C-1.3.2
34	Earth_SciHi_Obs, L0 raw data, 3 orbits RR, 3 scenes FR	C-1.3.3
35	Earth_SciLo_Obs, L0 RR data, 3 scenes from routine observations showing:-cloud free ocean,-bright cloud over otherwise clear sky ocean-clear sky coastal zoneIn the last two cases, the stray light source shall be close to a module edge but outside the overlap area while the adjacent module shows clear sky ocean.	C-1.4.1
36	Eart_SciHi_Obs, L0 RR and FR data, limited to one granule if the following conditions are met (each condition correspond to a different L0): -clear sky ocean, radiance at 865 nm below TBD -clear sky ocean with limited cloud, radiance at 865 nm below TBD at TBD distance from cloud -clear sky coastal zone, radiance at 865 nm below TBD at TBD distance from coast In the last two cases, the stray light source shall be close to a module edge but outside the overlap area while the adjacent module shows clear sky ocean.	C-1.4.2
37	Dif1_ErbGreen_Rad, Difl_ErbGreen_Rad: wavelength type 1 calibration STGs, spread over 2 consecutive orbits and repeated twice to assess stability (SODAP)	C-1.7.1
38	Dif1_ErbGreen_Obs, Difl_ErbGreen_Obs: L0 FR raw data, measurements of diffuser radiance in observation mode during the entire Sun visibility window, spread over 2 consecutive orbits and repeated twice to assess stability (SODAP)	C-1.7.1
39	Dif1_ErbBlue_Rad, Difl_ErbBlue_Rad: wavelength type 1 calibration STGs, spread over 2 consecutive orbits and repeated twice to assess stability	C-1.7.2
40	Dif1_ErbBlue_Obs, Difl_ErbBlue_Obs: L0 FR raw data, measurements of diffuser radiance in observation mode during the entire Sun visibility window, spread over 2 consecutive orbits and repeated twice to assess stability	C-1.7.2
41	Dif1_ErbNIR_Rad, Difl_ErbNIR_Rad (TBC): wavelength type 1 calibration STGs, spread over 2 consecutive orbits and repeated twice to assess stability	C-1.7.2
42	Dif1_ErbNIR_Obs, Difl_ErbNIR_Obs (TBC): L0 FR raw data, measurements of diffuser radiance in observation mode during the entire Sun visibility window, spread over 2 consecutive orbits and repeated twice to assess stability	C-1.7.2
43	Earth_O2_Obs, RR L0 data, 3 consecutive orbits, probably over Africa	C-1.7.4
44	Dif1_O2_Rad, radiometric calibration sequence STG	C-1.7.4

Data Set #	Instrument Data Description	Task
45	Earth_Fraunhoffer_Obs (TBC), RR L0 data, 3 consecutive orbits, geographic constraints TBD	C-1.7.4
46	Dif1_Fraunhoffer_Rad (TBC), radiometric calibration sequence STG	C-1.7.4
47	Earth_SciLo_Obs, RR L0 data, land scenes over selected sites, number of scenes TBD, most probably less than 10, from routine observations.	C-1.7.4
48	Dif1_ErbGreen_Rad, Difl_ErbGreen_Rad: wavelength type 1 calibration STGs, spread over 2 consecutive orbits and repeated twice to assess stability	C-1.7.6
49	Dif1_ErbGreen_Obs, Difl_ErbGreen_Obs: L0 FR raw data, measurements of diffuser radiance in observation mode during the entire Sun visibility window, spread over 2 consecutive orbits and repeated twice to assess stability	C-1.7.6
50	Dif1_ErbBlue_Rad, Difl_ErbBlue_Rad: wavelength type 1 calibration STGs, spread over 2 consecutive orbits and repeated twice to assess stability	C-1.7.6
51	Dif1_ErbBlue_Obs, Difl_ErbBlue_Obs: L0 FR raw data, measurements of diffuser radiance in observation mode during the entire Sun visibility window, spread over 2 consecutive orbits and repeated twice to assess stability	C-1.7.6
52	Dif1_ErbNIR_Rad, Difl_ErbNIR_Rad (TBC): wavelength type 1 calibration STGs, spread over 2 consecutive orbits and repeated twice to assess stability	C-1.7.6
53	Dif1_ErbNIR_Obs, Difl_ErbNIR_Obs (TBC): L0 FR raw data, measurements of diffuser radiance in observation mode during the entire Sun visibility window, spread over 2 consecutive orbits and repeated twice to assess stability	C-1.7.6
54	Earth_O2_Obs, RR L0 data, 3 consecutive orbits, probably over Africa	C-1.7.6
55	Dif1_O2_Rad, radiometric calibration sequence STG	C-1.7.6
56	Earth_Fraunhoffer_Obs (TBC), RR L0 data, 3 consecutive orbits, geographic constraints TBD	C-1.7.6
57	Dif1_Fraunhoffer_Rad (TBC), radiometric calibration sequence STG	C-1.7.6
58	Earth_SciHi_Obs, RR L0 data, land scenes over selected sites, number of scenes TBD, most probably less than 10, from routine observations.	C-1.7.6
59	Earth_SciLo_Obs, RR L0 scenes including coastlines at different latitudes and observation angles, about five scenes from one or two orbits (TBC), from routine observations.	C-1.8.1
60	Earth_SciHi_Obs, FR L0 data, scenes including coastlines and designated targets at different latitudes and observation angles, from routine observations.	C-1.8.2
61	Dif1_SciHi_Rad, radiometric calibrations STGs from routine timeline (only first STG used, once every 15 days)	C-2.1
61	Dif1_SciHi_Rad, routine timeline (both STG, once every 15 days)	C-2.2
62	Dif2_SciHi_Rad, radiometric calibrations STGs from routine timeline (only first STG used, once every 90 days)	C-2.1
62	Dif2_SciHi_Rad, routine timeline (both STG, once every 90 days)	C-2.2
63	Dif1_ErbGreen_Rad, Difl_ErbGreen_Rad, routine timeline (both STG for each, once every 90 days)	C-2.3
64	Dif1_ErbBlue_Rad, Difl_ErbBlue_Rad, routine timeline (both STG for each, once every 180 days)	C-2.3

Data Set #	Instrument Data Description	Task
65	Earth_SciLo_Obs: RR L1b data, scenes from routine observations covering extreme ranges of latitude and longitude, date line crossing, …	C-3.1.1
66	Earth_SciLo_Obs: FR L1b data, scenes from routine observations covering extreme ranges of latitude and longitude, date line crossing, …	C-3.1.1
67	Earth_SciLo_Obs: - L0 and L1b RR data over an observation mode transition Averaging --> Direct And Averaging --> Averaging with at least one PC reset during the Direct And Averaging observations period. - FR L0 & L1b data corresponding to the Direct And Averaging Mode observations	C-3.1.2
68	Earth_SciLo_Obs: (TBC) RR L0 and L1b data around on-board timer reset. Few frames before and after (e.g. one granule) should be sufficient.	C-3.1.2
69	Earth_SciLo_Obs: simulataneous RR and FR L0 data: scenes over clear sky and cloudy ocean, clear sky coastal zones. Corresponding L1b data from MERIS-PF	C-3.1.3
70	Earth_SciLo_Obs: FR L0 data, scene including limited size clouds above water.	C-3.1.4
71	Earth_SciLo_Obs: RR L0 data, scenes covering saturation, bloming, Sun Glint, dropouts.	C-3.1.6
72	Earth_SciHi_Obs: RR L0 data, scenes including snow, ice, Sun glint, bright clouds.	C-3.2.1
73	Earth_SciHi_Obs: FR L0 data, scene showing saturation and blooming (Sun glint over a large inland water body should meet requirements).	C-3.2.1
74	Earth_SciHi_Obs: TBD	C-3.2.2

Detailed description of each of the above MERIS data sets are given in the following sections: (these sections will be filled in the Procedure issue of the document, through automatic processing, most of the information being already in the summary table above.).

6.4.1 Data Set 1

6.4.1.1 Contents

Brief description of data set including cross-ref to task(s) using this data set

6.4.1.2 MERIS Mode

6.4.1.3 Constraints

Orbit side, Sun zenith, lat /lon, season…

6.4.1.4 Size Estimate

Duration, FR or RR

7. Other Data Description

7.1 Auxiliary Data

Brief description of the auxiliary data supporting tests, inside the processor (specific versions of the processor auxiliary data) and outside (e.g. additional ECMWF fields, climatologies, etc.)
NOTE: this section will be automatically generated using the Commissioning Procedure Database.

7.2 Output data

The following section describes the output data of the various tests, with cross-references to the origin task. In sections 7.2.1 to 7.2.12 below, we describe the MERIS processing auxiliary products to be updated by the Calibration and Verification tasks.

NOTE: sections 7.2.x below will be automatically generated using the Commissioning Procedure Database.

7.2.1 Instrument Data Product

RD3 Ref	Description	Modified by task
TBD	TBD	TBD

7.2.2 Level 1B Control Parameters Data Product

RD3 Ref	Description	Modified by task
TBD	TBD	TBD

7.2.3 Radiometric Calibration Data Product

RD3 Ref	Description	Modified by task
TBD	TBD	TBD

7.2.4 ENVISAT-1 Platform Attitude Data Product

RD3 Ref	Description	Modified by task
TBD	TBD	TBD

7.2.5 Level 2 Control Parameters Data Product

RD3 Ref	Description	Modified by task
TBD	TBD	TBD

7.2.6 Atmosphere Parameters Product

RD3 Ref	Description	Modified by task

TBD	TBD	TBD

7.2.7 Water Vapour Parameters Product

RD3 Ref	Description	Modified by task
TBD	TBD	TBD

7.2.8 Ocean Aerosols Parameters Product

RD3 Ref	Description	Modified by task
TBD	TBD	TBD

7.2.9 Land Aerosols Parameters Product

RD3 Ref	Description	Modified by task
TBD	TBD	TBD

7.2.10 Ocean I Parameters Product

RD3 Ref	Description	Modified by task
TBD	TBD	TBD

7.2.11 Ocean II Parameters Product

RD3 Ref	Description	Modified by task
TBD	TBD	TBD

7.2.12 Cloud Measurement Parameters Product

RD3 Ref	Description	Modified by task
TBD	TBD	TBD

7.2.13 Land Vegetation Index Parameters Product

RD3 Ref	Description	Modified by task
TBD	TBD	TBD

8. Tools Description

8.1 IECF MERIS

8.1.1 Function

This set of tools integrated in IECF provides a wide range of radiometric calibration functions, as specified in RD4 and RD7

8.1.2 Inputs

MER_L0_CAL or MER_L0__FR
On-ground characterisation data (in IECF database)

8.1.3 Outputs

In-flight characterisation data (in IECF database)
MERIS Processing auxiliary parameter files
Plots and maps

8.1.4 Resources

IECF processor

8.1.5 References

C-1.1: Dark signal characterisation
C-1.2 Radiometric characterisation
C-1.7 Spectrometric Calibration

8.2 MEGS

8.2.1 Function

Reference prototype implementation of MERIS L1 and L2 processing as specified in RD1, RD2, RD3.

8.2.2 Inputs

Level 0 or Level 1B products
Auxiliary parameters
Modifiers

8.2.3 Outputs

Level 1B, Level 2 products
Breakpoint files

8.2.4 Resources

MEGS runs on a SUN SPARCStation 20 with 192 Mbytes and 10 Gbyte disk, under Solaris 2.6

8.2.5 References

C-1.2 Radiometric characterisation
C-1.3 Characterisation of the response non-linearity
C-1.4 Characterisation of the instrument stray light
C-1.8 Pointing characterisation
C-3.1 Level 1B Troubleshooting
C-3.2 Parameters Optimisation
C-3.3 Processor Upgrade
C-3.4 Prototype Processor Management

8.3 MERISVIEW

8.3.1 Function

Interactive visualisation and analysis of MERIS data

8.3.2 Inputs

L0, L1B, L2 products
Breakpoints files

8.3.3 Outputs

Maps of parameters, flags, statistics.

8.3.4 Resources

MERISVIEW runs on a SUN SPARCstation 20 workstation with Solaris 2.6 and IDL 5. 4 and on a PC with Windows NT, at least 256 Mbytes of RAM and IDL 5.4.

8.3.5 References

C-1 Instrument Calibration
C-3 Level 1B Optimisation
C-4 Calibration Synthesis
V-1 Troubleshoot L2 Processor
V-2 Verify L2 Algorithms

8.4 ESOV

8.4.1 Function

Computation of ENVISAT orbit and MERIS swath

8.4.2 Inputs

Orbit and swath characteristics
Ground station characteristics for match-up with in situ data

8.4.3 Outputs

Orbit and timeline of required observations

8.4.4 Resources

TBD

8.4.5 References

C-3.1.1 Geo-location
In addition ESOV will be used in planning observations for all tasks

8.5 Tool for determining MERIS orbital parameters

8.5.1 Function

To compute micro-band, band, on-board gain (TBC) programming of MERIS

8.5.2 Inputs

TBD

8.5.3 Outputs

Set orbital parameters of MERIS

8.5.4 Resources

TBD

8.5.5 References

C-1.1 Dark Signal Characterisation
C-1.2 Radiometric Calibration
C-1.9 MERIS Configuration Synthesis

8.6 Radiative Transfer Tool (RTT)

8.6.1 Function

Compute radiative transfer and ancillary computations needed by MERIS auxiliary parameters, as specified in RD8

8.6.2 Inputs

See RD8

8.6.3 Outputs

MERIS Auxiliary parameters files

8.6.4 Resources

RTT runs on a SUN SPARCStation 20 under Solaris 2.6 (TBC)

8.6.5 References

C-4.1 Tuning of thresholds for flagging
V-2 Verify L2 Algorithms

8.7 Dark_map data extraction tool

8.7.1 Function

Extracts dark signal map from calibration or observation data

8.7.2 Inputs

MER_L0_CAL or MER_L0__FR
[Previous dark signal map]

8.7.3 Outputs

Dark signal map, updated at the bands in the input L0 product

8.7.4 Resources

TBD

8.7.5 References

C-1.1.1 Dark signal characterisation

8.8 BRDF & Gains Tool

8.8.1 Function

To compare matrices, representing either diffuser BRDFs or MERIS gains: compute difference or ratio or average or moments; display and printing of plot or map

8.8.2 Inputs

Reference matrix of 15 x 3700 or 15 x 925 elements
One or more matrix of same size for comparison

8.8.3 Outputs

Difference matrices
Ratio matrices
Graphical displays

8.8.4 Resources

TBD

8.8.5 References

C-1.2.2 In-flight BRDF characterisation
C-1.2.3 Fine Radiometric Calibration
C-1.2.4 Vicarious Calibration
C-1.7.1 Spectral characterisation using the doped diffuser

8.9 Non-linearity characterisation tools

8.9.1 Function

Function NL_Stat: evaluate the instrument's non-linear response using overlapping pixels: given two pixels pointing at the same location but showing different radiometric responses allows to estimate the non-linearity of the response wrt to the calibration line through the statistical behaviour of their count levels - x1 and x2 - as a function of the input radiance. As the latter is not available, the mean count level (x1+x2)/2 can be used in place. Plot of x1/x2 as a function of (x1+x2)/2 will be produced for the requested overlapping pixels with and without non-linearity correction applied, as well as their deviation with respect to the best fit line.

8.9.2 Inputs

8.9.3 Outputs

8.9.4 Resources

SUN SPARCstation 20 workstation with Solaris 2.6 and IDL 5.3, uses the MERIS dedicated IDL functions library.

8.9.5 References

8.10 paramex

8.10.1 Function

paramex is a parameter extraction tool that reads parameters from intermediate or breakpoint files and writes binary images for each parameter

8.10.2 Inputs

Intermediate files or breakpoint files that can be generated on request by the L2 processor. These files are stored in the BAF (Binary ASCII File) format.

8.10.3 Outputs

- `*.img` (parameter image files)
- `paramex.log` (logfile)

8.10.4 Resources

RTT runs on a SUN SPARCStation 20 under Solaris 2.6 (TBC)

8.10.5 References

TBD

8.11 flagtests

8.11.1 Function

- compares the cloud flags from a supervised classification image with the appropriate flags that were extracted by paramex
- reconstructs the paths that have been taken within the decision table on a per pixel basis

8.11.2 Inputs

- `l2_flags1.img` or `l2_flags2.img` (output from paramex)
- `class.img` (ENVI supervised classification file)

8.11.3 Outputs

- `flagtests_mis_ num.txt` (flags per pixel table)
- `flagtests_mis_sym.txt` (symbolic table)
- `flagtests_l_histo.txt` (decision matrix booking)

8.11.4 Resources

a SUN SPARCStation 20 under Solaris 2.6 (TBC)

8.11.5 References

TBD

8.12 rulex

8.12.1 Function

'rulex' is a tool that finds the rules for misclassifications in dependence of the flags used. It is invoked with SQL-like statements

8.12.2 Inputs

- `flagtests_mis_ num.txt` (output from flagtests)

8.12.3 Outputs

- `sceneXX_rules.txt` (rules table)

8.12.4 Resources

SUN SPARCStation 20 under Solaris 2.6 (TBC)

8.12.5 References

TBD

8.13 patcher

8.13.1 Function

‘patcher is a binary "patch" tool. It allows to change any range of data in a file; either by replacing with a constant value or with data from a given ASCII file

8.13.2 Inputs

Any file can be used as input. The file contents will be changed according to the specifications that are made by invoking the tool.

8.13.3 Outputs

The output is the changed file itself; the tool can be forced to save the original file with a different name before changing it.

8.13.4 Resources

SUN SPARCStation 20 under Solaris 2.6 (TBC)

8.13.5 Reference

TBD

8.14 CONTEST

8.14.1 Function

CONTEST is a tool, which supports the distributed testing of the software processor for the imaging spectrometer MERIS. CONTEST has the main objective to control the testing, which is performed to verify the functions of the processor.

8.14.2 Inputs

All input data to CONTEST are entered through a Web interface by the tester performing the test.

8.14.3 Outputs

All output information is provided to the tester through the Web interface of CONTEST.

8.14.4 Resources

CONTEST consists of a set of html pages including Java script. It requires TOMCAT application server and MySQL database, and any WebServer, preferably the Apache.
A dedicated data server, provided by BC, stores and provides via ftp all test data. The access to the data server is part of CONTEST.

8.14.5 Reference

Technote CONTEST Iss1, 19.12.2000

8.15 CloudProductsVerificationTool

8.15.1 Function

The CloudProductsVerificationTool derives from MERIS L2 data re-binned mean values of the cloud products, namely and CTP, COT. These values are compared with climatological values.

8.15.2 Inputs

MERIS L2 RR products.

8.15.3 Outputs

Re-binned maps of CTP and COT, CT from MERIS and CT from ISCCP
Statistical evaluation of the differences between MERIS and ISCCP

8.15.4 Resources

SUN SPARCStation 20 under Solaris 2.6 (or higher)

8.15.5 Reference

Cloud Statistics Tool User Requirements, Iss. 1, 10.1.2001

9. Methods

9.1 References

9.1.1 Applicable Documents

AD1 MERIS Assumptions on the Ground Segment, PO-RS-DOR-SY-0029, Issue 1b
AD2 Measurement data definition and format description for MERIS, PO-ID-DOR-SY-0032
AD3 ENVISAT Cal /Val Plan, PO-PL-ACR-GS-1092
AD4 MERIS Instrument Operation Manual, PO-MA-AER-ME-0005

9.1.2 Reference Documents

RD1 MERIS L1B DPM, PO-TN-MEL-GS-0002, Iss. 4.2
RD2 MERIS L2 DPM, PO-TN-MEL-GS-0006, Iss. 4.4.
RD3 MERIS I/O DD, PO-TN-MEL-GS-0003, Iss. 4.3
RD4 MERIS IECF / CFI Algorithm Document, PO-AD-ACR-GS-0001, Iss. 2.0
RD5 MERIS Inputs to SODAP Plan, PO-PL-DOR-ME-0211, Iss. 1, 19/10/2000
RD6 Commissioning Plan Data Base and Procedures, ACRI tech note, draft of 13/07/00
RD7 IECF MERIS DPM, PO-TN-CGI-CF-0037
RD8 Specification of the scientific contents of MERIS auxiliary products, PO-RS-BOM-GS-0002
RD9 MERIS SVVP-AT, PO-TP-ACR-GS-0006, Iss. 4.1

9.2 Standards

9.2.1 Nomenclature

9.2.1.1 Task identifiers

Each task in this plan receives a unique identifier corresponding to its location in the hierarchical breakdown described in section 3 above. The identifier syntax is :
<group initial>-<top level breakdown no>[.<2nd level breakdown no>[.<3rd level breakdown no>]]

9.2.2 Abbreviations and acronyms

BC Brockmann Consult
CM Calibration Mechanism
IECF Instrument Engineering Calibration Facility
TBC To Be Confirmed
TBD To Be Defined

9.2.3 Definitions

9.2.4 File Naming Conventions

The following conventions shall apply to archive files:

TBD

9.3 General Rules

9.3.1 Rules for execution

Each MERIS commissioning task will be performed under the responsibility of a member of the corresponding group.

This responsibility covers:

- the management and monitoring of the activities performed during the task,
- the management of the human resources, of the computer resources and of the data availability,
- the organisation of the technical and scientific support required by the tasks,
- the interface with the CAL or VAL group coordinator,
- the generation of the planned output data and task report.

Each task procedure is defined according to the following items :

- task activities,
- input instrument data,
- input auxiliary data,
- input reference data or document,
- needed tools and associated configuration,
- processing description,
- output data,
- archive
- passed/failed criteria,
- anomaly action,
- task report content,

9.4 Environment

TBD

9.5 Project Database

The design of the project database is described in RD6.

9.6 Configuration Management

Configuration management is an important element for secure conduction of all verification test as well as the transfer of the tuned parameters from the test environment into the operational system.

The management of the test data and conduction of the tests is supported by the CONTEST database, described in 8.14. This tool provides the following support:

- documentation of all test coverages, test cases and tests

- providing all test data from a central data storage
- relating all repetitions of each test to a well defined status of the test environment
- securing the consistency of each test, test case and test coverage with respect to the test environment

The configuration management of the tools, including MEGS and the auxiliary data products, is ensured by a dedicated configuration manager at ACRI.