MERIS ATBD 2.0

Introduction to MERIS Level 2 ATBDs

Ref.: PO-TN-MEL-GS-0005

Issue: 5. 0

Date: 30/07/2011

Preparation and signature list

	Name and role	Company	Signature
Prepared by	MERIS team	ACRI-ST	

Distribution List

Company	To
	Public distribution

Change log

Version	Date	Changes
5.0	30/07/2011	Changes following the 3rd MERIS data reprocessing and update/creation of the ATBDs
4.1	18/02/2000	Revised sections: 2.1, 2.3, 2.7, 2.8, 2.9 New sections: 2.10, 2.11, 2.19 to 2.21
4.0	05/12/1997	Re-issue following: ▪ peer review in 1997 (NWP/4057/GL) ▪ advances in design, sensitivity testing
3.2	21/03/1997	Revised sections: 2.1&2.2, 2.3, 2.4
3.1	23/01/1997	Revised sections:2.12, 2.15, 2.18 (new section)
3.0	29/11/1996	Prototyping phase final report
2.2	16/09/1996	Revision of sections: 2.5 (pp 78-82), 2.6 (pp83-90), 2.8 (pp159-165), 2.10 (pp.201-207), 2.11(pp208-214), 2.15(pp266-311), 2.17(pp321-349)
2.0	26/07/1996	Complete rework according to study progress
1.0	17/10/1995	Initial version

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1 Introduction

1.1 Scope of the document

This document corresponds to the **MERIS ATBD 2.0**: It introduces the MERIS Level 2 ATBD documentation providing the theoretical justification and the detailed description of the algorithms developed and implemented in the Level 2 MERIS processing facility.

This version of the document and all MERIS ATBD have been updated in order to reflect all implemented algorithm changes of the 3rd data reprocessing performed with IPF6 and MEGS8.

1.2 Acronyms

The definitions of the acronyms used in this document are listed in the Table below.

ATBD	Algorithm Theoretical Basis Document
ESA	European Space Agency
ESL	Expert Support Laboratories
FUB	Freie Universität Berlin
HZG	Helmholtz-Zentrum Geesthacht
IPF	Instrument Processing Facility
JRC-EC	Joint Research Centre of the European Union
LOV	Laboratoire d'Océanographie de Villefranche
MEGS	MERIS Ground Segment
MERIS	MEdium Resolution Imaging Spectrometer
PCD	Product Confidence Data
PML	Plymouth Marine Laboratory
TOA	Top Of Atmosphere
ULCO	Université du Littoral et de la Côte d'Opale

2 Context

2.1 MERIS L2 products content

The MERIS Level 2 products processing is part of the ENVISAT-1 mission Payload Data Segment. The purpose of the L2 processing is to derive bio-geophysical parameters, depending on the nature of the observed surface, from the MERIS Level 1B products. The Level 1B products contain radiance measurements at Top Of Atmosphere (TOA) for the 15 MERIS bands, re-ordered, calibrated, geo-located, annotated with Product Confidence Data (PCD), calibration data, classification flags, and environment parameters. The Level 2 products contain different types of mixed geophysical information and flags according to the type of each pixel:

- WATER pixels:
  - Water-leaving reflectance
  - Algal pigment index I
  - Algal pigment index II
  - Yellow substance
  - Suspended sediment
  - Photosynthetically active radiation
  - Aerosol Angström exponent
  - Aerosol optical thickness
  - Total water vapour column
- LAND pixels:
  - Rayleigh-corrected reflectance
  - MERIS Terrestrial Chlorophyll Index
  - MERIS Global Vegetation Index
  - Aerosol Angström exponent
  - Aerosols optical thickness
  - Total water vapour column
  - Surface pressure
- CLOUD pixels:
  - TOA reflectance
  - Cloud top pressure
  - Cloud optical thickness
  - Cloud albedo

- Cloud type
- Total water vapour column.

2.2 MERIS L2 ATBD

2.2.1 ATBD purpose

All Level 2 algorithms which require geo-physical modelling and justification are described in an independent document named Algorithm Theoretical Basis Document (ATBD). These are intended to support understanding of the MERIS processing and of the contents of the Level 2 products. They are the basis for the software specifications which are implemented in the operational MERIS processors of the ENVISAT-1 Ground Segment.

2.2.2 ATBD content

Each ATBD is a self-standing document and deals at least with the following items:

- Algorithm Overview and Algorithm Description with both a theoretical description (physics of the problem, mathematical description of the algorithm, etc.) and practical considerations for implementation (exceptions, output description, etc.);
- Assumptions and limitations;
- References.

2.2.3 ATBD responsibilities

Under ESA assignment and directives, the ATBDs have been prepared by MERIS Expert Support Laboratories (ESL):

- ACRI-ST, Sophia-Antipolis, France (coordinator)
- ARGANS, Plymouth, UK
- BioOptika, Plymouth, United Kingdom
- Brockmann-Consult, Geetshacht, Germany
- Freie Universität Berlin (FUB), Berlin, Germany
- Helmholtz-Zentrum Geesthacht (HZG) previously GKSS, Geesthacht, Germany
- HYGEOS, Lille, France
- Joint Research Centre of the European Union (JRC-EC)
- Laboratoire d'Océanographie de Villefranche (LOV), Villefranche-sur-Mer, France
- Plymouth Marine Laboratory (PML), Plymouth, United Kingdom
- Université du Littoral et de la Côte d'Opale (ULCO), Wimereux, France
- University of Southampton, Southampton, UK

3 List of the MERIS ATBDs

The list of the current MERIS ATBDs corresponding to algorithms implemented in IPF6 and MEGS8 is summarised in the Table below.

Table 1: List of the MERIS ATBDs

No	Title	Version	Date	Author
2.0	Introduction to MERIS Level 2 ATBDs	5.0	30/07/2011	ACRI-ST
2.1 & 2.2	Cloud Albedo and Cloud Optical Thickness		Coming soon	FUB
2.3	Cloud Top Pressure	4.2	30/06/2011	FUB
2.4	Retrieval of Total Water Vapour Content from MERIS measurements	4.2	30/06/2010	FUB
2.6	Case 2 (Sediment) Bright Pixel Atmospheric Correction	5.0	30/06/2011	ARGANS & BioOptika
2.7	Atmospheric Correction over the Ocean (Case 1 Waters)	5.1	01/07/2011	LOV
2.9	Pigment Index Retrieval in Case 1 Waters	4.3	22/07/2011	LOV
2.10	MERIS Global Vegetation Index	3.0	12/05/2011	JRC-EC
2.12	Pigment Index, Sediment and Gelbstoff Retrieval from directional Water-leaving Reflectances using Inverse Modeling Technique	4.0	05/12/1997	GKSS
2.13	Sun glint Flag Algorithm	4.3	18/07/2011	ACRI-ST
2.15	Land Aerosol Remote Sensing	5.0	12/07/2011	ULCO/HYGEOS
2.17	Pixel Identification	5.0	30/05/2011	BC
2.18	Photosynthetically Available Radiation (PAR)	4.0	05/12/1997	PML
2.22	MERIS Terrestrial Chlorophyll Index	1.2	16/09/2005	University of Southampton
2.23	Surface Pressure	2.1	30/06/2011	FUB
2.24	Vicarious calibration	1.0	Coming soon	ACRI-ST
2.25	Alternative Atmospheric Correction Procedure for Case 2 Water Remote Sensing using MERIS	1.0	Coming soon	HZG

4 Relationship between MERIS L2 processing and ATBD

The architecture of the MERIS Level 2 processing is schematically represented in the block diagram of the figure below.

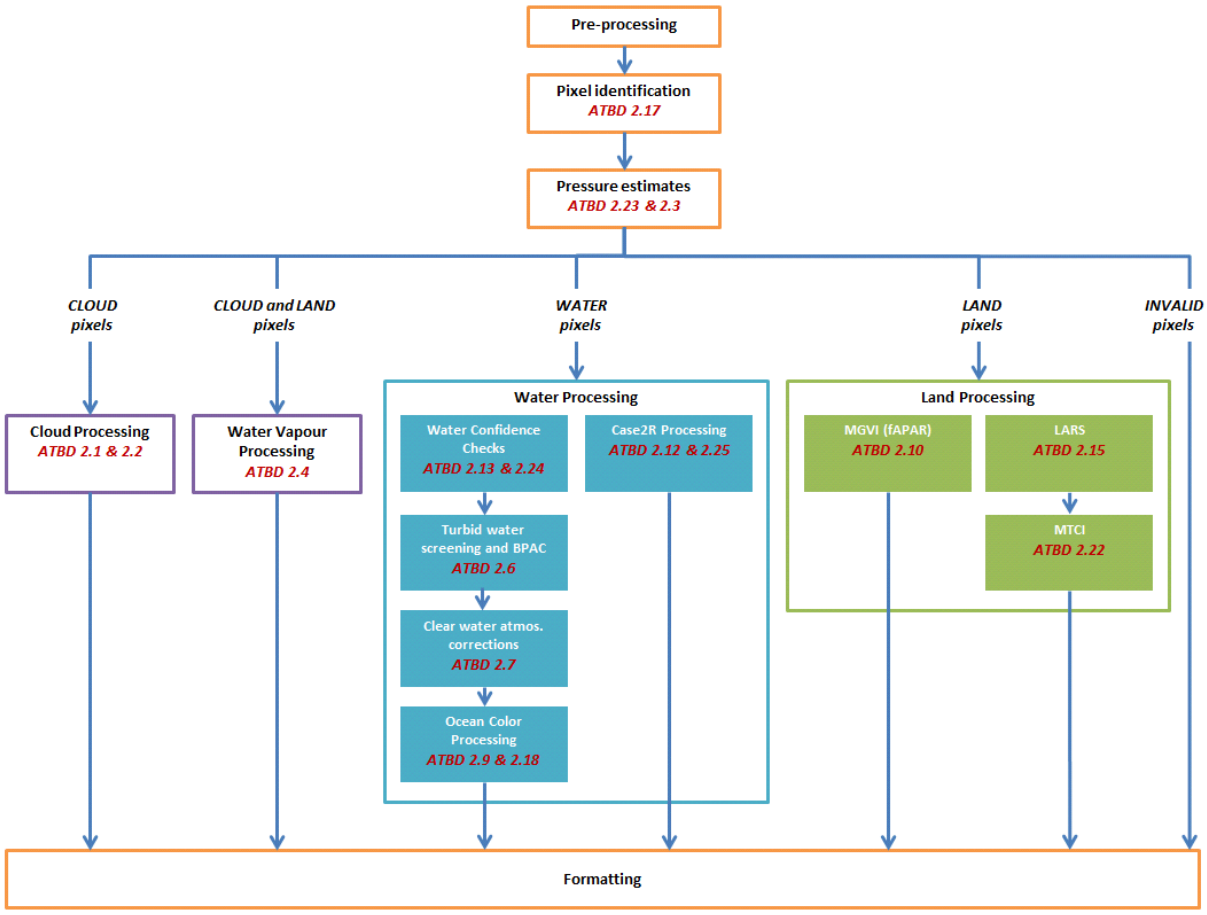

Figure 1: MERIS Level 2 processing overview

Each processing step corresponds to one or more ATBDs identified by red numbers.

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