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TITLE: ENVISAT-1 PRODUCTS SPECIFICATIONS
VOLUME 11: MERIS PRODUCTS SPECIFICATIONS

Abstract : This document contains the MERIS Product Specifications.

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AMENDMENT POLICY

This document shall be amended by releasing a new edition of the document in its entirety. The Amendment Record Sheet below records the history and issue status of this document.

AMENDMENT RECORD SHEET

ISSUE	REVISION	DATE	CHANGE STATUS	ORIGIN
1	A	12/01/96	Issue 1	
1	B	16/02/96	SCR #16, CR #16 Issue 1, Revision B Reason for Change: Updated to reflect information in PO-TN-ESA-GS-0381 and to address RIDs of Feb. 2/96 pertaining to the Level 0 structure. MPH, SPH, DSD, and DSR structures modified. Table added showing generalized Level 0 product structure. RIDs Addressed: ESA/0001: FEP header defined ESA/0002: PF-Host time stamp clarified ESA/0004: Processing PCD added ESA/0006: AF PCD ADS and DSD added ESA/0007: page A-3 updated ESA/0008: page B-3 updated ESA/0009: Table 8.1.1 modified ESA/0011: TBD changed to Range/ Doppler ESA/0013: FEP header defined ESA/0014: Table 8.4.7.4-2 corrected CSF/1: filename in MPH corrected CSF/2: page A-3 updated CSF/3: MPH PCD information updated CSF/5: DSD added to Level 0 SPH CSF/6: Section on AATSR updated and re-issued CSF/8: AATSR_O Summary Sheet updated	
1	C	04/04/96	SCR #38, CR #38 Issue 1, Revision C Reason for Change: Updated Sections 1-6, 17 and Annex A to reflect changes discussed at the Products Review Meeting #1, March 5-8, 1996, as per action item "AI MDA 6 April 96" from PO-MN-ESA-00416, Pg. 35.	Products Review Meeting #1
2	A	20/05/96	SCR #71, CR #71 Issue 2 Reason for Change:	

ISSUE	REVISION	DATE	CHANGE STATUS	ORIGIN
			Separate volume created. Updated with new product information from Document A-3.	
2	B	10/02/97	SCR #102, CR #102 Issue 2, Revision B Reason for Change: Defined data sets based upon available information in MERIS IODD document (Issue 3.1) and fax DPD/ JMJ/ENV, 0280/97.	Products Review Meeting #2
3	A	14/04/97	SCR #145, CR #145 Issue 3 Reason for Change: Updated in response to ESA RIDs of Facility Panel RIDs Folder PO-RD-CSF-GS-1421 and DDR decisions PO-MN-CSF-GS-1416. Differences between Prod, Specs and MERIS IODD Issue 3.1: • SPH structures converted to ASCII format. • Threshold information for quality flags added to SPH. • Threshold values added to the Level 1B Control Parameters Flagging GADS. • Stripline continuity counters added to SPH. • Auxiliary data SPH structures changed to ENVISAT standard format (see Vol.16). Information not accommodated by ENVISAT standard format was placed in a “General” GADS. • Large SPH structures, not needed for user evaluation of products, was moved to the “Scaling Factors GADS” to conserve space. Scaling Factors GADS” renamed to “Scaling Factors and General Information GADS”. • Line and sample #’s added to Tie Point ADSRs. • Size estimates updated. • Lat/long information converted to ENVISAT standard (see Vol. A). • Line/pixel number added to “Tie points ADS” to allow traceability between image and tie points. • All ADS structures in auxiliary data files were changed to GADS structures. This is because the ADS time stamp and attachment flag is useless for auxiliary. • Spare fields added to structures to accommodate future changes. • “CFI software data product” renamed “ENVISAT-1 Attitude data file”. • DSD in Level 2 SPH referencing Level 0 product changed to reference Level 1B product. DSD references to files not used in Level 2 processing removed. • ECMWF files consolidated into 1 file as per fax minutes of DDR meeting PO-MN-CSF-GS-1416.	
3	B	19/06/97	SCR #169, CR #169 Issue 3, Revision B Reason for Change: Updated to address RIDs from Products Review	Products Review Meeting #3

ISSUE	REVISION	DATE	CHANGE STATUS	ORIGIN
			Meeting #3 PO-MN-CSF-GS-1523. Latitude and longitude values in Aerosol Climatology GADS (p. 11-122). Updated to follow ENVISAT standard (it was agreed at the review that all lat/ long coordinates should follow ENVISAT standards).	
3	C	20/03/98	SCR #169, CR #169 Issue 3, Revision C Reason for Change: Updated for SPRs: SPR-42000-0047-CSF to SPR-42000-0080-CSF, SPR-42000-0092-CSF, SPR-42000-0105-CSF to SPR-42000-0117-CSF, and SPR-42000-0156-CSF	
3	D	05/11/98	SCR #218, CR #218 Issue 3, Revision D Reason for Change: Updated for SPRs: SPR-42000-0159-CSF, SPR-42000-0215-CSF to SPR-42000-0218-CSF.	
3	E	30/4/2000	Issue 3, Revision E Reason for change : MERIS IODD issue 4.3	PDS V3
3	F	20/11/00	Issue 3, Revision F Reason for change : Fax MERIS Errata (14/07/00) : NWP/ SD/13637. • "stored combinations" in the field 8 of the table 11.7.8.1.1-1 changed by "stored index combinations" • "polynomial order" and "each Fourier series" in the note of the chapter 11.7.8.1-4 changed by "polynomial coefficient order" and "each term of the Fourier series". Updated for SPR : • SPR-100L0-0685-ESA : The size of the Browse Configuration Parameters GADS in table 11.7.2.1.13-1 has been changed (804 instead of 816). The size of the MER_CP1_AX has been changed. (19257 bytes instead of 19 269). • SPR - 3L00-0845-GMV : Fields of the table 11.5.1.6-1 "MERIS Level2- RR SPR" and the table 11.5.1.6-2 "DS_NAME STRING" have been changed.	
		20/03/2001	table 11.7.10.1.7-2, 3*15*10*15 changed to 3*15*10*25	
3	G	18/02/2002	Issue 3, revision G Reason for change: IODD V.5.0 and 5.0A (DSD names) Updated table 11.5.1.7.2-1 Updated table 11.5.2.7.4-1	

ISSUE	REVISION	DATE	CHANGE STATUS	ORIGIN
		18/02/2002	Updated table 11.5.2.7.4-2 Page 11-54: Added in mds (1-20) of MER_RR_2P "Rectfied reflectances in red and near infrared bands dimensionless" Added "rectified reflectances in red and near infrared bands" in paragraph 11.5.1.7.4.4 Updated table 11.5.1.7.4.4-1 and following note Changed name of paragraph 11.5.2 Added "Top cloud pressure" to table 11.5.2.4-1 Changed from "UNUSED" to "SPARE" paragraph 11.5.2.6 Added DSD names table 11.5.2.6-1 in paragraph 11.5.2.6 Updated table 11.5.2.7.2-1 Added paragraph 11.5.2.7.5 Changed description in paragraph 11.5.2.7.6 Updated size estimate in paragraph 11.5.2.8 Changed name in paragraph 11.5.3 Updated table 11.5.3.4-1 Changed description in paragraph 11.5.3.6 changing from "UNUSED" to "SPARE" Updated table 11.5.3.6-1 Added paragraph 11.5.3.7.5 Updated size estimate in paragraph 11.5.3.8 Updated table 11.7.1.1-1 Updated paragraph 11.7.1.1.5 Updated size in paragraph 11.7.2 Updated Table 11.7.2.1-1 Updated Table 11.7.2.1.11-1 Updated Table 11.7.7.1.1-1 Updated Table 11.7.8.1.1-1 Corrected foot note of Table 11.7.8.1.1-1 Corrected paragraph 11.7.8.1.5 Updated Table 11.7.10.1.7-2 Updated table 11.7.13.1.1-1	
3	H	01/2/2002	Removed Ambiguous phrase in definition of MER_RRV_2P, MER_RRC_2P, MER_LRC_2P format. Added DSD spare missing from table 11.7.7.1-1	
3	I	20/1/2003	Updated Paragraph 11.4.1.4 "Product structure", changed MDS(16) description. Updated Table 11.4.1.6-1 field #46 description. Updated Table 11.4.1.6-2 changed MDS(16) description. Updated Table 11.4.1.7.4.2-1 description and sizes. Updated Table 11.4.1.7.4.2-2 description and sizes. Updated paragraph 11.4.1.8, Total product size. Updated Table 11.4.2.4-1 changed MDS(16) description. Updated Table 11.4.2.7.4.2-1 description and sizes. Updated paragraph 11.4.2.7.4.2 foot note for table 11.4.2.7.4.2-1. Updated Table 11.4.2.7.4.2-2 description and sizes. Updated paragraph 11.4.2.8, Total	IODD 6.0 (PO-TN-MEL-GS-003 Is. 6 Rev. 0)

ISSUE	REVISION	DATE	CHANGE STATUS	ORIGIN
			product size. Updated paragraphs 11.5.2.6, 11.5.3.6, 11.5.4.6 removed ambiguous phrase. Changed units (typo) in Table 11.7.2.1.11-1 Updated paragraph 11.7.7 MER_CP2_AX file size. Updated Table 11.7.7.1-1 descriptions, new DSD-G "Smile Effect Corrections" substitution of Spare DSD. Updated Table 11.7.7.1-2 DS names strings. Inserted new paragraph 11.7.7.1.2 "Smile Effect Corrections" Updated Table 11.7.8.1.1-1 field #26 description updated, field 27# changed to Spare. Updated Table 11.7.8.1.3-1 field #1 description and foot note. Updated Table 11.7.8.1.7-1 field #1 description and foot note	
3	J	12/5/2003	Updated Table 11.5.1.7.4.8-2 New Flags values and meanings. Chapter 11.7.3 New product size Updated Table 11.7.3.1-1 New DSD's added. Added Chapter 11.7.3.1.9 For new DSD Added Chapter 11.7.3.1.10 For new DSD Updated Table 11.7.11.1-1 Fields 5,6,7,18 New values in place of spare, new spare size. Chapter 11.7.12 New product size Updated Table 11.7.12.1.3-1 Changed fields 9,10 and size. Chapter 11.7.14 New product size. Updated Table 11.7.14.1-1 New footnote Updated Table 11.7.14.1.1-1 Fields 1,2 and size Updated Table 11.7.14.1.2-1 Changed sizes in table. Correction of Typos for DS Names in tables: 11.5.2.6-1, 11.5.3.6-1 Chapter 11.7.3 Incorrectly defined GADS corrected in to ADS. Refer to change bars.	New Baseline: PO-TN-MEL-GS-0003 Issue 6 Rev. I of 28-03-2003
3	K		This version is identical to version 5A.	
3	L		This version is identical to version 5A	
4	A	4/11/2004	Table 11.2-1 Updated with Full Swath products Figure 11.2-1 Updated with Full Swath products branch Full Paragraph 11.4.3 added for Level 1b Full Swath description. Full Paragraph 11.5.6 added for Level 2 Full Swath description. Updated DSD names of RR Browse product in table 11.6.1.6-2 (correction on document, real product already correct) Full Paragraph 11.6.2 added for Full Swath Browse product description. Clarification written in paragraph 11.7.8 on MER_ATP_AX file spare GADS description. Chapter 11.8 - Product summary sheets updated. Note that this chapter used to be the output of a tool that is not anymore maintained. The products description and sizes are anyway updated to reflect the actual formats.	Meris FR Full Swath products addition: PO-TN-ESR-GS-0233/AB
5	A	09/03/2006	See Register of Changes	IODD 7.0draft, IODD 7.2., IODD 7.3

ISSUE	REVISION	DATE	CHANGE STATUS	ORIGIN
5	B	19/01/2007	Table 11.7.7.1.2-1 (GADS Smile Effect Correction). Dimention of fields 8 and 9 corrected; no impacts on byte length.	OAR-2598
6	A	22/06/2011	MERIS Level 2 Specific Product Header renumbered and. Reference DSD for AUX_SCM_AX, previously missing, replaces the Spare DSD. ➔ C1	IODD 8.0
			MERIS Instrument data product - High-Level breakdown Size of GADS FR Pointing and GADS RR Pointing modified GADS Spare #1 and Spare #2 deleted, as well as GADS FR Spectral Shift and RR Spectral Shift. Product size modified. ➔ C2a, C2b	IODD 8.0
			GADS FR Pointing update Field 1 and 2 modified (description, unit, type). Field. Field 3 and 4 modified (offset). Field 5 added. ➔ C3	IODD 8.0
			GADS RR Pointing update Field 1 and 2 modified (description, unit, type). Field. Field 3 and 4 modified (offset). Field 5 added. ➔ C4	IODD 8.0
			MERIS Instrument data product Four GADS deleted (Spare number 1, Spare number 2, FR Spectral Shift, RR Spectral Shift). ➔ C5	IODD 8.0
			Level 1 Control Parameters Unit corrected ➔ C6	IODD 8.0
			Level 2 Control Parameters -Organisation Size of GADS Classification Parameters and Atmospheric Corrections for Case I waters updated, as well as size of product ➔ C7	IODD 8.0
			Level 2 Control Parameters Units corrected, text clarifications ➔ C8, C9	IODD 8.0
			Level 2 Control Parameters – GADS Atmospheric Corrections for Case I waters Field modified, GADS size changed ➔ C10	IODD 8.0
			Level 2 Control Parameters – GADS Classification Fields updated or added. GADS size changed ➔ C11	IODD 8.0
			Atmosphere parameters product – Organisation Size of GADS General changed ➔ C12	IODD 8.0
			Atmosphere parameters product –GADS General Several fields (4 to end) updated and added ➔ C13	IODD 8.0
			Atmosphere parameters product – H_2O transmission GADS renamed ; field 1 set to spare ➔ C14, C15	IODD 8.0
			Atmosphere parameters product – O_2 transmission New ADS (replaces an obsolete one) ➔ C16	IODD 8.0
			Atmosphere parameters product – Apparent Pressure Obsolete GA DS renamed, transformed into ADS with	IODD 8.0

ISSUE	REVISION	DATE	CHANGE STATUS	ORIGIN
			fully revised content. ➔ C17	
			Atmosphere parameters product – Rayleigh reflectance. Field 3 added ➔ C18, C19, C20	IODD 8.0
			Water vapour parameters product – Organisation Structure and size of the product updated: 1 data set added, several modified and renamed ➔ C21, C22, C23	IODD 8.0
			Water vapour parameters product – General Fields modified and added ➔ C24	IODD 8.0
			Water vapour parameters product – Neural Network for Water Vapour Retrieval over Land Whole data set changed: change from ADS to GADS, new content. ➔ C25	IODD 8.0
			Water vapour parameters product – Surface Albedo slope. ADS now includes albedo slope maps instead of polynomial coefficients to estimate it ➔ C26 ,C27, C28	IODD 8.0
			Water vapour parameters product – Surface Albedo at 885 nm ➔ C29	IODD 8.0
			Ocean aerosol parameters product – Organisation Two data sets added, SPH size updated, several GADS updated, product size changed ➔ C30 ,C31	IODD 8.0
			Water vapour parameters product – General Fields changed ➔ C32	IODD 8.0
			Ocean aerosol parameters product – Spectral Optical Thickness. Size updated ➔ C33	IODD 8.0
			Ocean aerosol parameters product – Optical Thickness at 865 nm Size updated ➔ C34	IODD 8.0
			Ocean aerosol parameters product – Blue Rogc threshold Size updated ➔ C35	IODD 8.0
			Ocean aerosol parameters product - Coeff of (rT/rR) to ta Relation Size updated ➔ C36, C37, C38	IODD 8.0
			Ocean aerosol parameters product – Downward transmittance New data set ➔ C39	IODD 8.0
			Ocean aerosol parameters product – Upward transmittance New data set ➔ C40	IODD 8.0
			Land aerosols parameters product – Organisation Size update ➔ C41	IODD 8.0
			Land aerosols parameters product – General	IODD 8.0

ISSUE	REVISION	DATE	CHANGE STATUS	ORIGIN
			Fields update and addition , product size update ➔ C42	
			Land aerosols parameters product – rT Thresholds… Size change ➔ C43	IODD 8.0
			Land aerosols parameters product - Standard Surface Reflectance ranges for DDV models Spare fields removed, a 4th band has been added. DS size changed ➔ C44,C45, C46	IODD 8.0
			Land aerosols parameters product - DDV parameters for bidirectionality correction. Number of bands increased from 3 to 4 in all fields ➔ C47, C48, C49	IODD 8.0
			Land aerosols parameters product - DDV reflectance correction. Number of bands increased from 3 to 4 in fields 1 and 2. ➔ C50, C51, C52	IODD 8.0
			Ocean I parameters - product – Organisation Size of 2 data sets modified, one data set added, size of product modified. ➔ C53, C54	IODD 8.0
			Ocean I parameters product – General. One field added ➔ C55	IODD 8.0
			Ocean I parameters product - log10 polynomial coefficients Field 3 updated, DS size changed ➔ C56	IODD 8.0
			Ocean I parameters - product – f0 factor New data set ➔ C57	IODD 8.0
			Ocean II parameters product – Organisation Product organisation revis ed: one GADS removed, another one renamed (and fully changed) Sizes of SPH and GADS General changed, size of product changed ➔ C58, C59, C60	IODD 8.0
			Ocean II parameters - product – General Several fields updated, GADS size changed ➔ C61	IODD 8.0
			Ocean II parameters product – Anomalous Scattering Detection LUT sampling description added ➔ C62	IODD 8.0
			Ocean II parameters product – Coefficients of F' to IOPs relation New data set, replacing obsolete "Reflectance vs IOP" ➔ C63	IODD 8.0
			Cloud measurement product – Orginisation SPH and several data sets updated, new data set, product size updated ➔ C64, C65	IODD 8.0
			Cloud measurement product – General Size of fields 1,2 updated, fields 8 and 14 to 24 modified, fields 25 to 29 added. ➔ C66	IODD 8.0
			Cloud measurement product – Surface Albedo at 761. Name, structure of ADS and ADSR modified	IODD 8.0

ISSUE	REVISION	DATE	CHANGE STATUS	ORIGIN
			➔ C67, C68, C69	
			Cloud measurement product – Cloud Top Pressure Neural Network for not null surface albedo Name modified (clarified), ADS changed to GADS (no more need for several records) ➔ C70	IODD 8.0
			Cloud measurement product – Cloud Top Pressure Neural Network for null surface albedo Name modified (clarified), ADS changed to GADS (no more need for several records) ➔ C71	IODD 8.0
			Cloud measurement product – Surface Pressure Neural Network for null surface albedo New GADS ➔ C72	IODD 8.0
			Land Vegetation Index Parameters product – Organisation Size of GADS General and of product changed ➔ C73	IODD 8.0
			Land Vegetation Index Parameters product – General Size of several fields updated ➔ C74	IODD 8.0
			MERIS Instrument – GADS Instrumental parameters Content removed and let to spare ➔ C75	IODD 8.0A
			MERIS Level 1 Control Parameters – GADS General Re-wording ➔ C76	IODD 8.0A
			MERIS Level 1 Control Parameters – GADS Classification Re-wording ➔ C77	IODD 8.0A
			MERIS Level 2 control parameters data product High-Level breakdown Size of GADS Classification Parameters updated; size of product updated accordingly ➔ C78	IODD 8.0A
			MERIS Level 2 control parameters data product - GADS General Epsilon renamed as Alpha (in scaling factor and offset referring to the product of same name). ➔ C79	IODD 8.0A
			MERIS Level 2 control parameters data product – GADS Atmospheric Correction for Case I waters Re-wording ➔ C80	IODD 8.0A
			MERIS Level 2 control parameters data product GADS – Classification Parameters Size of fields changed to 2 elements, GADS size updated ➔ C81	IODD 8.0A
			MERIS Level 2 control parameters data product GADS – Classification Parameters New field added, GADS size updated ➔ C82	IODD 8.0A
			MERIS Level 2 control parameters data product GADS – Classification Parameters Obsolete comment deleted ➔ C83	IODD 8.0A
			Atmosphere parameters product – General Annotation Data Set – General	IODD 8.0A

ISSUE	REVISION	DATE	CHANGE STATUS	ORIGIN
			Description corrected ➔ C84	
			Water vapour parameters product – General Byte# corrected, GADS size corrected ➔ C85	IODD 8.0A
			Ocean aerosol parameters product – Organisation GADS General updated, product size updated accordingly ➔ C86	IODD 8.0A
			Ocean aerosol parameters product – General Spare field re-added, GADS size changed. Comment about number of aerosol models corrected ➔ C87	IODD 8.0A
			Land aerosol parameters product – Organisation Size of GADS rho_T threshold corrected, product size updated accordingly ➔ C88	IODD 8.0A
			Ocean I parameters product - High-Level breakdown SPH size corrected, product size updated accordingly ➔ C89	IODD 8.0A
			Ocean I parameters product – GADS General Unit correction and re-wording ➔ C90	IODD 8.0A
			Ocean I parameters product – GADS Thresholds Unit correction ➔ C91	IODD 8.0A
			Ocean II parameters product - GADS General New field inserted in available "spare" room, unit correction. No size change. ➔ C92	IODD 8.0A
			Ocean II parameters product – ADS Coefficients of F' to IOPs relation Typo correction ➔ C93	IODD 8.0A
			Cloud measurement parameters data products - High-Level breakdown Size of GADS General increased, size of product updated accordingly ➔ C94	IODD 8.0A
			Cloud measurement parameters data products - GADS – General Unit correction and new field added ➔ C95	IODD 8.0A
			Land vegetation index parameters data products – GADS General #Bytes corrected ➔ Not applicable	IODD 8.0A
			MERIS Data Set Descriptor Names Update of some Data Set Descriptor Names in Auxiliary data products ➔ C96, C97, C98, C99, C100, C101, C102	IODD 8.0A

REGISTER OF CHANGES

Section	Change	ID
Table 11.4.1.1-1	Renumbered IDs, and reference to DSD for AUX_SCM_AX	C1
Table 11.4.1.1-2	3 GADS DSD removed. Duplicated table removed	C2a
Section 11.7.1	Product size updated	C2b
Table 11.7.1.1.3-1	Field 1 and 2 modified (description, unit, type). Field 5 added. Total size modified	C3
Table 11.7.1.1.4-1	Field 1 and 2 modified (description, unit, type). Field 5 added. Total size modified	C4
Section 11.7.1.1.7 **Section 11.7.1.1.8** **Section 11.7.1.1.9** **Section 11.7.1.1.10**	Deleted	C5
Table 11.4.1.7.1-1	Fields 3 unit corrected Fields 4,5,6,8,9: unit specified	C6
Section 11.7.7	DSs and Product sizes corrected	C7
Table 11.4.1.7.1-2	Fields 3,4 modified (Units corrected Clarification note added	C8
Table 11.4.1.7.1-3	Fields 1,7,9,11 modified (Units corrected	C9
Table 11.4.1.7.1-4	Field 1 modified (units, type, dim.) GADS size changed	C10
Table 11.4.1.7.1-5	Fields 1, 10, 11, modified (field, units, type, dim.) Field 15 updated description Fields 16 to 20 added GADS size changed Notes changed	C11
Section 11.7.8	DSs size and product size changed	C12
Table 11.4.1.7.1-6	Fields updated 4, 5, 7, 8 to 15, 21, 26, 27 Fields added: 29 to 32 Total size changed Note 2 added	C13
Section 11.7.8.1.3	GADS renamed	C14
Table 11.4.1.7.1-7	GADS remaned Field 1 set to spare FIleds 2, 3 unit specified	C15
Section 11.7.8.1.6	Completely renamed and replaced with new ADS	C16
Section 11.7.8.1.7	Obsolete GA DS renamed, transformed into ADS with fully revised content	C17
Section 0	Changed from GADS to ADS	C18
Table 11.4.1.7.1-8	Changed from GADS to ADS Changed Num ADSR fro m16 to 22 Changed ADSR size Changed total size	C19
Table 11.4.1.7.1-9	Changed from GADS to ADS Updated fields 1,2 (byte, dim, unit) Added field 3 Changed total size Updated notes	C20
Section 11.7.9	Updated SPH, GADS and product size	C21
Table 11.4.1.1-3	Updated GADS / ADS names Added new ADS	C22
Table 11.4.1.1-4	Updated GADS / ADS names Added new ADS	C23
Table 11.4.1.7.1-10	Field 7 modified (description, unit, bytes, dim)	C24

Section	Change	ID
	Fields 12 to 20 added Total size updated	
Section 11.7.9.1.2	Completely rewritten	C25
Section 11.7.9.1.5	Renamed Changed from GADS to ADS	C26
Table 11.4.1.7.1-11	Renamed Changed from GADS to ADS ADSR description and number changed Total size changed Change explanation notes	C27
Table 11.4.1.7.1-12	Renamed Changed from GADS to ADS ADSR description and number changed FIleds changed: all to 1 Total size changed Change explanation notes	C28
Section 11.7.9.1.7	New section	C29
Section 11.7.10	Updated SPH, DSs and total product sizes	C30
Table 11.4.1.1-5	Added ADS	C31
Table 11.4.1.7.1-13	Field modified: 3, 4, 6, 7	C32
Table 11.4.1.7.1-14	Field 1 updated (size) Total size updated	C33
Table 11.4.1.7.1-15	Field 1 updated (size) Total size updated	C34
Table 11.4.1.7.1-16	Field 1 updated (size) Total size updated	C35
Section 11.7.10.1.7	Changed from GADS to ADS	C36
Table 11.4.1.7.1-17	Changed from GADS to ADS All fields updated (size) Total size updated	C37
Table 11.4.1.7.1-18	Changed from GADS to ADS All fields updated (unit, size, dim) Total size updated	C38
Section 11.7.10.1.8	New section	C39
Section 11.7.10.1.9	New section	C40
Section 11.7.11	DSs and total size updated	C41
Table 11.4.1.7.1-19	Fields updated: 5 (descriotion, unit); Fields updated: 4 to 12 and 15 to 18 (unit) Fields added: 19, 20 Total size updated Explanation note added	C42
Table 11.4.1.7.1-20	Fields 1-4: units updated Filed 5 added Total size updated	C43
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Table 11.4.1.7.1-21	Changed From GADS to ADS Size changed	C45
Table 11.4.1.7.1-22	Filds spare removed: 2,4,6 Field 3 added Total Size changed	C46
Section 11.7.11.1.13	Changed from GADS to ADS	C47
Table 11.4.1.7.1-23	Changed from GADS to ADS Size fields changed Total size changed	C48

Section	Change	ID
Table 11.4.1.7.1-24	Changed from GADS to ADS All fields changed (bytes, unit and dim) Total size changed	C49
Section 11.7.11.1.15	Changed from GADS to ADS	C50
Table 11.4.1.7.1-25	Changed from GADS to ADS Size fields changed Total size changed	C51
Table 11.4.1.7.1-26	Changed from GADS to ADS fields changed (bytes, unit and dim): 1, 2 fields changed (unit): 3 Total size changed	C52
Section 11.7.12	SPH, DSs and total product sizes changed	C53
Table 11.7.12.1 1	One DS added	C54
Table 11.4.1.7.1-27	Fields updated (units): 11, 13 to16. 19 to 23, 25 to 28 Field added: 31 Overall product size changed	C55
Table 11.4.1.7.1-28	All fileds: updaed unit Field 3 changed all Overall product size changed	C56
Section 11.7.12.1.8	New section	C57
Section 11.7.13	SPH, DSs and total size of product changed	C58
Table 11.4.1.1-6	1 GADS removed 1 GADS renamed	C59
Table 11.4.1.1-7	1 GADS removed 1 GADS renamed	C60
Table 11.4.1.7.1-29	Fields changed: 1 to 6, 10, 12 to 16, 18 to 28 Total size changed	C61
Section 11.7.13.1.3	Added explanation text	C62
Section 11.7.13.1.4	Section replaced with new one	C63
Section 11.7.14	Updated SPH, DSs and total product sizes	C64
Table 11.4.1.1-8	Added GADS	C65
Table 11.4.1.7.1-30	Fields changed: 1, 2, 8, 13 to 24 Fields added: 25 to 30	C66
Section 11.7.14.1.2	Renamed Changed from GADS to ADS	C67
Table 11.4.1.7.1-31	Changed from GADS to ADS Changed all ADS Changed total size Replaced explanatory text	C68
Table 11.4.1.7.1-32	Changed from GADS to ADS Changed fields: 1 Changed total size	C69
Section 11.7.14.1.5	Renamed GADS Clarified text	C70
Section 11.7.14.1.6	Renamed GADS Clarified text	C71
Section 11.7.14.1.8	New section	C72
Section 11.7.15	Changed GADs size and total product size	C73
Table 11.4.1.1-9	Fields updated unit: all Fields updated Length/Dim: 4, 5, 6, 8 Total size changed	C74
Table 11.7.1.1.2-1	Fields 25 and 25 renamed to spare	C75
Table 11.4.1.7.1-33	Rewording field 1, added unit	C76
Table 11.4.1.7.1-34	Rewording fields 1, 2, 3	C77

Section	Change	ID
Section 11.7.7	Updated DSs size and overall product size	C78
Table 11.4.1.7.1-35	Updated fields: 9, 23 Added units to fields: 4 to 19, 23 to 25, 33 to 36	C79
Table 11.4.1.7.1-36	Changed field: 11 (rewording, added unit)	C80
Table 11.4.1.7.1-37	Fields changed to 2 elements: 11, 16 (size) GADS size updated	C81
Table 11.4.1.7.1-38	Fields added: GADS size updated	C82
Table 11.4.1.7.1-39	Comment removed	C83
Table 11.4.1.7.1-40	Field description replaced: 8	C84
Table 11.4.1.7.1-41	Total size changed	C85
Section 11.7.10	DS size changed and total product size changed	C86
Table 11.4.1.7.1-42	Spare field re-added: 8 GADS size changed Comment added	C87
Section 11.7.11	DSs size changed Total product size changed	C88
Section 11.7.12	DSs size changed Total product size changed	C89
Table 11.4.1.7.1-43	Fields changed: 10. 13. 22 (unit correction and/or re-wording)	C90
Table 11.4.1.7.1-44	Fields changed: 2 (unit correction) Fields changed: 1, 3 to 6, 8,9 (unit specified)	C91
Table 11.4.1.7.1-45	Fields changed: 2, 10	C92
Table 11.4.1.7.1-46	Fields changed: 2, 3, 4 (typo correction)	C93
Section 11.7.14	DS size updated Product size updated	C94
Table 11.4.1.7.1-47	Fields changed: 14, 15, 24 Field added: 30	C95
Table 11.4.1.1-10	Updated AUX Data Set Descriptor Names	C96
Table 11.4.1.1-11	Updated AUX Data Set Descriptor Names	C97
Table 11.4.1.1-12	Updated AUX Data Set Descriptor Names	C98
Table 11.4.1.1-13	Updated AUX Data Set Descriptor Names	C99
Table 11.4.1.1-14	Updated AUX Data Set Descriptor Names	C100
Table 11.4.1.1-15	Updated AUX Data Set Descriptor Names	C101
Table 11.4.1.1-16	Updated AUX Data Set Descriptor Names	C102

11. MERIS PRODUCTS SPECIFICATIONS

11.1 INSTRUMENT OVERVIEW

The Medium Resolution Imaging Spectrometer (MERIS) instrument produces multi-spectral images (in 15 selected spectral bands between 390 nm and 1040 nm) obtained in a downward viewing pushbroom imaging manner. The 15 bands acquire radiance in the visible and near infra-red bands. MERIS measurement data are used to derive information including:

- ocean color parameters in open waters such as chlorophyll and coastal waters parameters such as chlorophyll, dissolved organic matter, and suspended solid matter concentrations,
- characteristics of clouds, such as top pressure and optical thickness,
- the presence of vegetation and derived indices to characterize vegetation vigor, and
- atmosphere parameters such as aerosol optical thickness, aerosol type, and water vapor column contents.

The MERIS instrument may operate at Full Resolution (FR) of approximately 0.3 km pixels at nadir, or at Reduced Resolution (RR) of approximately 1.2 km pixels at nadir, with detailed characteristics which are summarized in Table 11.1-1. RR data is acquired on a global basis whereas FR data is acquired regionally by direct reception. In both the FR and the RR modes, the radiometric corrections are normally done on-board, although radiometrically uncorrected data may be acquired for correction on-ground. A Reduced Field of View (RV) mode is available primarily for performance verification purposes with data from 231 pixels selected within +/- 40 degrees from the subsatellite point and transmitted in FR for four lines. In RV mode, no radiometric corrections are done on-board.

Table 11.1-1 MERIS Instrument Characteristics	
GEOMETRIC:	The instrument cross-track FOV of 68^0 produces an image swath width of approx. 1150 km. The swath is comprised of 5 imaging spectrometer modules. **Full Resolution (FR)** a) for FR each pixel has an IFOV of 0.019^0, with a nadir spatial sampling of 0.26 km across track by 0.29 km along track. **Reduced Resolution (RR)** a) maximum length of 43.5 minutes (all of full sunlight orbit), producing approximately 17400 km of coverage. Each RR pixel is approximately 1040 m across track by 1160 m along track at nadir. **Reduced Field Of View (RV)** a) Level 0 product contains 231 spatial pixels from a single spectral band, in Full Resolution from a selectable spectrometer module and spatial region. Only a Level 0 product is created from RV data.
RADIOMETRIC:	16 bits of digitization, with selectable gain settings. MERIS has on-board shutters and reflectance panels for on-orbit radiance and wavelength calibration, and collects a 16th "smear" band of data for compensation of radiance spectral smearing during CCD charge transfer during readout. Four calibration sequences of MERIS include: a) Dark Current Offset (2^N, where N =0....15 frame average with shutters closed) once per orbit. Coefficients stored on-board. b) Absolute Gain (nominally 512 dark and smear corrected diffuser frames) once per orbit. Coefficients stored on-board. c) Diffuser Aging (two subsequent orbit Gain, first from diffuser 1 and during the second orbit from diffuser 2. This is done on-ground once per month). d) Wavelength Calibration (two subsequent orbit Gain sets, first with diffuser 1 and on the subsequent orbit with a filter/diffuser. The latter may be extended over 2 more subsequent orbits. This calibration is done on-ground once per month).

Table 11.1-1 MERIS Instrument Characteristics

SPECTRAL	Each CCD module readout may "bin" the spectral detectors (each detector with 2.5 nm resolution and at 1.25 nm detector spacing) into selectable bandwidth bands at selectable wavelength positions. The "nominal" 15 spectral bands ("standard set") will be selected later from the 16 bands below (note that bands are TBC):

Centre (nm)	Bandwidth (nm)	Use
412.5	10	Yellow substance and detrital pigments
442.5	10	Chlorophyll absorption maximum
490	10	Chlorophyll and other pigments
510	10	Suspended sediment, red tides
560	10	Chlorophyll absorption minimum
620	10	Suspended sediment
665	10	Chlorophyll absorption and fluo. reference
681.25	7.5	Chlorophyll fluorescence peak
705	10	Fluo. reference, atmospheric corrections
753.75	7.5	Vegetation, cloud
760.625	3.75	O_2 R-branch absorption band
775	15	Atmosphere corrections
865	20	Vegetation, water vapour reference
885	10	Atmosphere corrections
900	10	Water vapour, land

A Static Smear band is the 16th downlink MERIS band.

Processing for MERIS global (RR) data is done systematically through Level 0 to Level 1B, Browse, and Level 2 for complete and full swath width orbital segments up to 43.5 minutes duration per orbit.

MERIS FR data are processed On Request from the acquired Level 0 segments, on a floating scene basis.

MERIS FR Full Swath (FRS) data over Europe. North America and Africa are systematically processed; all FRS data is available for processing offline

11.2 PRODUCTS OVERVIEW

The MERIS Product Tree is shown in Figure 11.2-1. An overview of the MERIS products is presented in Table 11.2-1.

Table 11.2-1 MERIS Products

Instrument / mode	Product ID	Description
MERIS	MER_RV__0P	MERIS Level 0 Reduced Field of View
	MER_CA__0P	MERIS Level 0 Calibration (all calibration modes)
RR	MER_RR__0P	MERIS Level 0 Reduced Resolution
	MER_RR__1P	Reduced Resolution Geolocated and Calibrated TOA Radiance (stripline)
	MER_RR__2P	Reduced Resolution Geophysical Product for Ocean, Land and Atmosphere (stripline)
	MER_LRC_2P	Extracted Cloud Thickness and Water Vapour for Meteo Users Level 2 Product generated from MER_RR__2P (Cloud thickness and water vapour content for the Meteo at reduced resolution > 5 km) (stripline)
	MER_RRC_2P	Extracted Cloud Thickness and Water Vapour (non-Meteo Users) Level 2 product extracted from MER_RR__2P (Cloud thickness and water vapour content at nominal RR resolution) for NRT distribution (stripline)
	MER_RRV_2P	Extracted Vegetation Indices Level 2 product extracted from MER_RR__2P (Vegetation indices including atmospheric corrections for selected land regions) for NRT distribution (stripline)
	MER_RR__BP	Browse (covers FR and RR requirements) (stripline)
FR	MER_FR__0P	MERIS Level 0 Full Resolution
	MER_FR__1P	Full Resolution Geolocated and Calibrated TOA Radiance
	MER_FR__2P	Full Resolution Geophysical Product for Ocean, Land and Atmosphere
FRS	MER_FRS_1P	Full Resolution Full Swath Geolocated and Calibrated TOA Radiance
	MER_FRS_BP	Full Resolution Full Swath Browse product

Table 11.2-1 MERIS Products		
Instrument / mode	**Product ID**	**Description**
	MER_FRS_2P	Full Resolution Full Swath Geophysical Product for Ocean, Land and Atmosphere

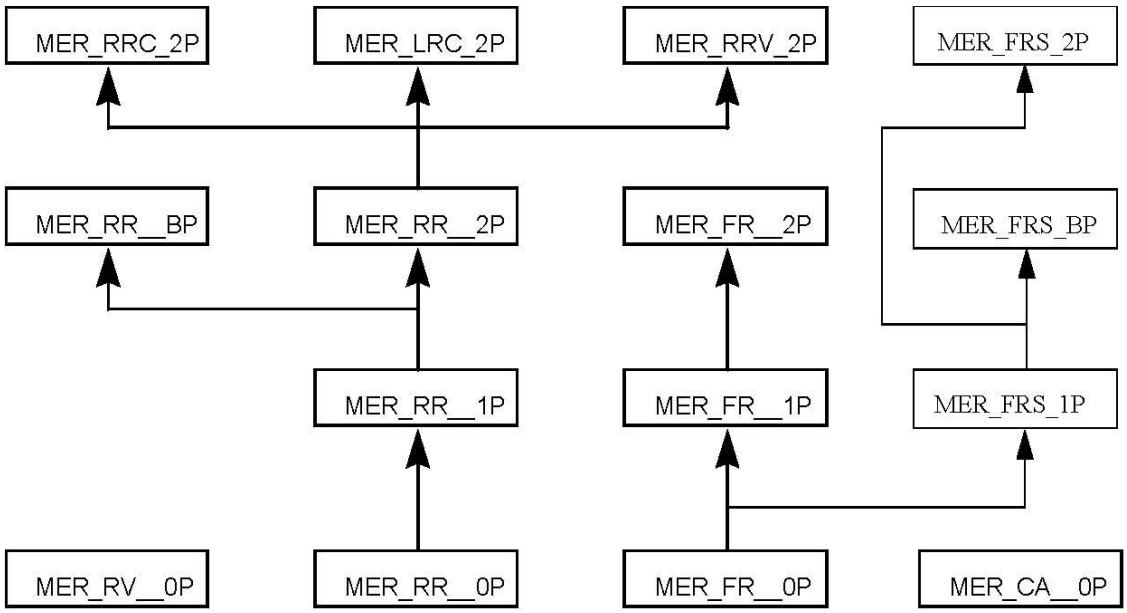

Figure 11.2-1 MERIS Product Tree

11.2.1 Product Specific Notation

The following table lists units and notations specific to the MERIS Product Specifications.

Table 11.2.1-1 Notation and Units		
Quantity	**Units**	**Notation**
Irradiance	10^{-3} W.m^{-2}.nm^{-1}	IU
Radiance	10^{-3} W.m^{-2}.sr^{-1}.nm^{-1}	LU
Pressure	hPa	hPa
Wind speed	ms^{-1}	ms-1

Table 11.2.1-1 Notation and Units		
Ozone	10^{-3} atm.cm (or Dobson Units)	DU
Algal pigment index	$mg.m^{-3}$	mg.m-3
Suspended matter	$g.m^{-3}$	g.m-3
Yellow Substance absorption coefficient	m^{-1}	m-1
Photosynthetic Available Radiation (PAR)	10^{-6} Einstein.$m^{-2}.s^{-1}$ (10^{-6} mol.photons.$s^{-1}.m^{-2}$)	µ Einstein.m^{-2}
Dimensionless Quantities	dl	-
Digital Counts	nc	nc
Percentage	percentage	%
Modified Julian Day 2000	As per Volume A	mjd
Data Set Descriptor	As per Volume 5	dsd
Degrees	degrees	deg
Spare Data Set Descriptor	As per Volume 5	dsd_sp

The following terminology is specific to MERIS:

- **Tie Frame:** Set of tie points corresponding to a given satellite position.
- **Tie Point:** The set of product pixels where location (with other auxiliary data) is provided.
- **Frame:** The set of product lines containing all data acquired at the same time.
- **Granule:** The set of 16 x 16 product pixels in RR (or 64 x 64 product pixels in FR) children of the same tie point.

11.2.2 Product Grid

MERIS is an imaging instrument and produces three-dimensional data sets. Lines in the image correspond to the along-track chronological order. Lines in the Level 0 image correspond to across-track instrument pixel numbers, lines in the Level 1b & 2 image correspond to across-track product pixel numbers.

The MERIS Product grid is intended to:

- be related to the satellite track (assuming nominal pitch and yaw attitude control of the satellite);
- provide quasi even distance sampling of the parameters on Earth;
- provide geo-location and other geo-physical annotations at a regular subset of the pixels in order to improve storage efficiency.

Resampling will be defined on a line basis, with an even spacing grid on Earth in the across-track direction, and it will be centered at the ideal (assuming perfect pitch and yaw steering of the spacecraft) sub-satellite point. The along track sampling will be evenly spaced in time and will thus provide a quasi even distance on Earth.

The grid may be summarized as follows:

- the RR product grid has 1121 RR pixels across track;
- the FR product grid has 4x4 more points than the RR product grid, in the across track direction it has 4481 points;
- the RR Browse product and the LRC product grid each have 4x4 less points than the RR product grid, in the across track direction it has 281 pixels;
- the Tie Points grid is identical for all products, it has 71 Tie points across track covering the full swath width of 1150 km; it is a 16x16 sub-grid of the RR product grid, a 64 x 64 sub-grid of the FR product grid, and a 4x4 sub-grid of the Browse and LRC product grids; the sub grid of browse can be configured.
- in the along track direction, the number of points is product dependent.

The Product image locations and geometrical annotations will only be provided at tie points in the Tie Points ADS. The information given at the tie point correspond only to the pixel at the tie point itself.

A Tie Frame is defined as a complete row of across track tie points. For example, there are 71 tie points in a tie frame of the full across track swath width. Tie Frames are used for indexing Product Quality information.

The browse product will be generated by subsampling the Level 1b data.

The grids are shown on the following figure.

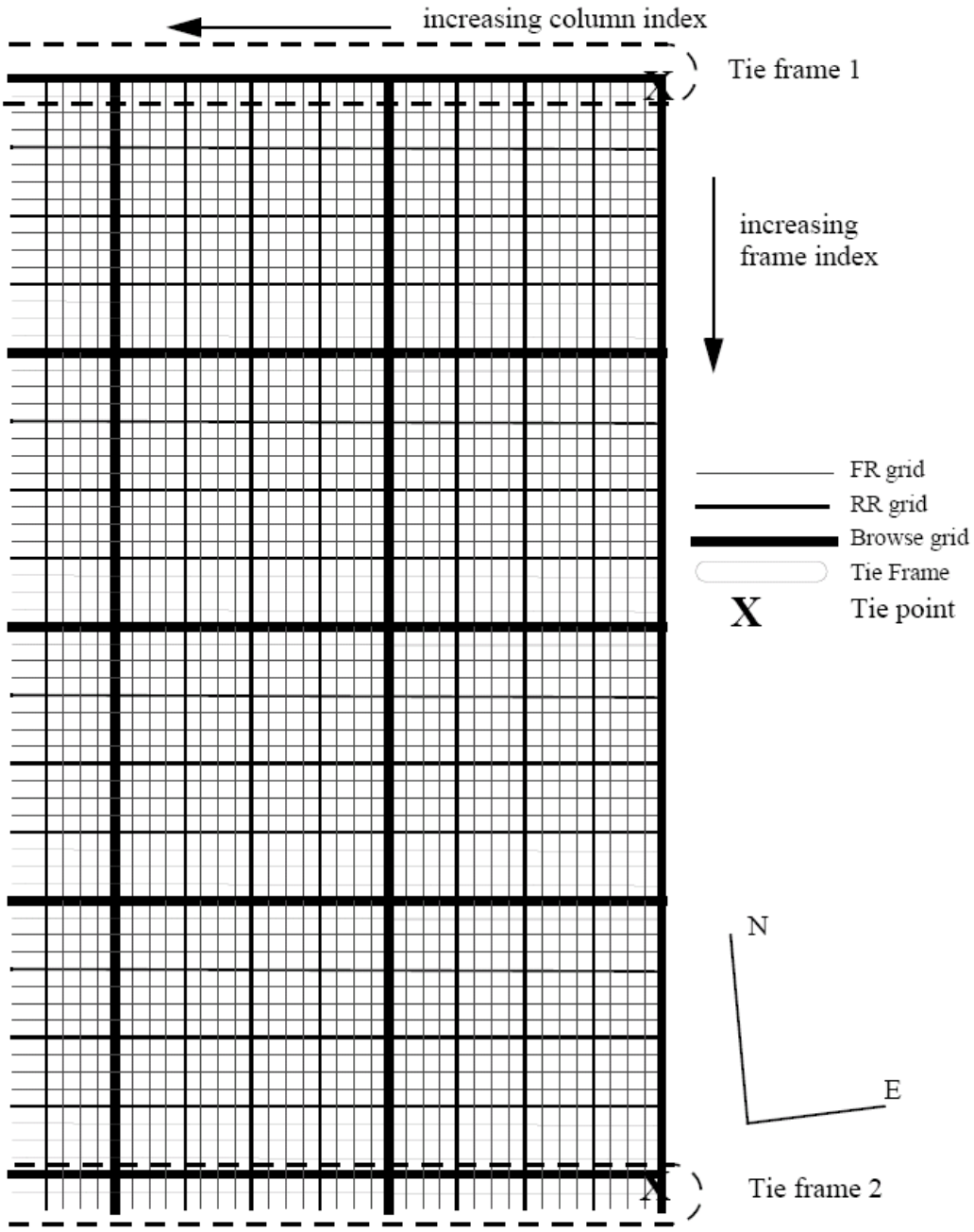

Figure 11.2-2 MERIS Product Grid

11.3 LEVEL 0 PRODUCTS

There are four MERIS Level 0 products: the Full Resolution Level 0, the Reduced Resolution Level 0, the Reduced Field of View Level 0, and the Calibration Level 0.

11.3.1 MERIS Reduced Resolution Level 0

The Reduced Resolution Level 0 product consists of time ordered AISPs collected while the instrument is operating in Reduced Resolution mode. The product is produced systematically and the NRT version of the product is available within 3 hours of data acquisition from the PDHS. The OFL (fully consolidated) version of the product is available from the LRAC 2 weeks after acquisition. This product is archived and is the basis of further processing to produce higher level RR products.

11.3.2 MERIS Full Resolution Level 0

The Full Resolution Level 0 product consists of time ordered AISPs collected while the instrument is operating in Full Resolution mode. The product is produced systematically and the NRT version of the product is available within 1 day of data acquisition from the PDHS. This product is archived and is the basis of further processing to produce higher level FR products.

11.3.3 MERIS Reduced Field of View Level 0

The Reduced Field of View Level 0 product consists of time ordered AISPs collected while the instrument is operating in Reduced Field of View mode. The product is produced systematically and the NRT version of the product is available within 3 hours of data acquisition from the PDHS. The OFL (fully consolidated) version of the product is available from the LRAC 2 weeks after acquisition. This product is used for calibration and validation purposes. Further PDS products are not produced from this data.

11.3.4 MERIS Calibration Level 0

The Calibration Level 0 product consists of time ordered AISPs collected while the instrument is operating in Calibration mode. The product is produced systematically and the NRT version of the product is available within 3 hours of data acquisition from the PDHS. The OFL (fully consolidated) version of the product is available from the LRAC 2 weeks after acquisition. This product is used for calibration and validation purposes. Further PDS products are not produced from this data.

11.3.5 Input Data

Annotated ISPs received from the Front End Processor (FEP) plus auxiliary data.

11.3.6 Auxiliary Data Used

The Level 0 product requires the following auxiliary information (refer to Volume 6):

- Phase, cycle and orbit number data,
- ID of the systems and subsystem that collect and process the data,

- ENVISAT orbital state vectors,
- Processor Configuration file, which includes PCD error codes and threshold values, and
- SBT to UTC conversion data.

11.3.7 Processing Performed

The determination of the satellite position and conversion of Satellite Binary Time (SBT) to Universal Time Co-ordinates (UTC) is accomplished using ESA software. These are the only algorithms applied when forming the Level 0 product.

11.3.8 Product Structure

As defined in Volume 6. The detailed description of the Instrument Source Packets is contained in Document A-1.

11.4 LEVEL 1B PRODUCTS

There are two MERIS Level 1B products corresponding to the Reduced Resolution and Full Resolution operating modes.

11.4.1 MERIS Reduced Resolution Geolocated and Calibrated TOA Radiance

This RR Level 1B product consists of the Top of Atmosphere (TOA) radiances of the 15 bands. The reference for the absolute calibration will be based on the assumed solar irradiance at the time of calibration. The product will be resampled to a fixed grid aligned to the subsatellite track, and localization information (lat. long.) will be provided along with the viewing geometry. Surface identification will be performed for each pixel in the image and an identification flag attached to each pixel. The product serves as the basis for Level 2 RR processing and has applications in atmospheric modelling, land use monitoring, ocean colour monitoring, vegetation indices, and others. It is produced systematically from the Level 0 RR product and the NRT version is available from the PDHS 3 hours after data acquisition. The OFL (fully consolidated) version is available 2 weeks after acquisition form the LRAC. The product is archived in stripline format, and disseminated to users in multiples of the 1165 km by 1300 km minimum scene size.

11.4.1.1 Input Data

Level 0 RR product and auxiliary data.

11.4.1.2 Auxiliary Data Used

Auxiliary data used to produce the product includes:

Table 11.4.1.2-1 Auxiliary Data Files for MERIS Level 1B Processing

Description	Auxiliary File ID
Instrument data file	MER_INS_AX
Radiometric calibration data	MER_RAC_AX
Digital elevation data	AUX_DEM_AX
Digital Roughness Model	MER_DRM_AX
Processing Level-1B control parameters data	MER_CP1_AX
ECMWF Forecast data or	AUX_ECF_AX
ECMWF Analysis data	AUX_ECA_AX
Land-ocean-coastline data	AUX_LSM_AX
Attitude Data File	AUX_ATT_AX

Table 11.4.1.2-1 Auxiliary Data Files for MERIS Level 1B Processing	
Description	**Auxiliary File ID**
Orbit state vectors	AUX_FPO_AX AUX_FRO_AX DOR_NAV_0P DOR_POR_AX DOR_VOR_AX

11.4.1.3 Processing Performed

This document is not the applicable document for algorithm description. The following is intended only as a high level overview of the processing steps. Several algorithms will be applied during Level 1B processing. They include (details TBC):

- Spatial:
  - geolocation,
  - image resampling to fixed grid,
- Spectral:
  - spectral calibration,
  - spectral band position and width by module,
- Radiometric:
  - dark current and response calibration by band and by module gain,
  - Pixel Classification algorithms for a minimum of water type (coastal and open ocean), cloud, vegetation, and mixed pixels,
- Data validation.

11.4.1.4 Product Struture

The high level structure of the product is shown below.

MPH
Level 1b - SPH (includes DSDs)
Level 1b Summary Quality ADS (SQ ADS)
Level 1b GADS Scaling Factors and General Info
Level 1b ADS Tie Points Location & Aux. Data (L ADS)
Level 1b MDS (1) TOA Radiance
Level 1b MDS (2) TOA Radiance
Level 1b MDS (3) TOA Radiance
Level 1b MDS (4) TOA Radiance
Level 1b MDS (5) TOA Radiance
Level 1b MDS (6) TOA Radiance
Level 1b MDS (7) TOA Radiance
Level 1b MDS (8) TOA Radiance
Level 1b MDS (9) TOA Radiance
Level 1b MDS (10) TOA Radiance
Level 1b MDS (11) TOA Radiance
Level 1b MDS (12) TOA Radiance
Level 1b MDS (13) TOA Radiance
Level 1b MDS (14) TOA Radiance
Level 1b MDS (15) TOA Radiance
Level 1b MDS (16) Flags and Detector Index

11.4.1.5 Main Product Header

The MPH will be the same as described in Volume 5.

11.4.1.6 Specific Product Header

The content of the MER_RR__1P Specific Product Header shall be as follows. The SPH is an ASCII header. Refer to Volume 5 for an explanation of ASCII header conventions.

Table 11.4.1.6-1 MER_RR__1P - SPH

N	Description	Units	Byte Length	Data Type	Dim.

Table 11.4.1.6-1 MER_RR__1P - SPH					
1	**SPH_DESCRIPTOR=**	keyword	15	uc	15
	quotation mark (“)	-	1	uc	1
	SPH Descriptor ASCII string describing the product.	-	28	uc	28
	quotation mark (“)	-	1	uc	1
	newline character	terminator	1	uc	1
2	**STRIPLINE_CONTINUITY_INDICATOR=**	keyword	31	uc	31
	Value: 0= No stripline continuity, the product is a complete segment Other: Stripline Counter	-	4	Ac	1
	newline character	terminator	1	uc	1
3	**SLICE_POSITION=**	keyword	15	uc	15
	Value: +001 to NUM_SLICES Default value if no stripline continuity = +001	-	4	Ac	1
	newline character	terminator	1	uc	1
4	**NUM_SLICES=**	keyword	11	uc	11
	Number of slices in this stripline Default value if no continuity = +001	-	4	Ac	1
	newline character	terminator	1	uc	1
	Product Time Information				
5	**FIRST_LINE_TIME=**	keyword	16	uc	16
	quotation mark (“)	-	1	uc	1
	Azimuth time first line of product UTC Time of first range line in the MDS of this product. UTC time format contained within quotation marks.	UTC	27	uc	27
	quotation mark (“)	-	1	uc	1
	newline character	terminator	1	uc	1
6	**LAST_LINE_TIME=**	keyword	15	uc	15
	quotation mark (“)	-	1	uc	1
	Azimuth time last line of product Time of last range line in the MDS of this product. UTC time format contained within quotation marks.	UTC	27	uc	27
	quotation mark (“)	-	1	uc	1
	newline character	terminator	1	uc	1
	Product Positioning Information				

Table 11.4.1.6-1 MER_RR__1P - SPH					
7	**FIRST_FIRST_LAT=**	keyword	16	uc	16
	Geodetic Latitude of the first sample of the first line A negative value denotes south latitude, a positive value denotes North latitude	10 -6 degrees	11	Al	1
	<10-6degN>	units	10	uc	10
	newline character	terminator	1	uc	1
8	**FIRST_FIRST_LONG=**	keyword	17	uc	17
	East geodetic longitude of the first sample of the first line.	10-6 degrees	11	Al	1
	Positive values East of Greenwich, negative values west of Greenwich.				
	<10-6degE>	units	10	uc	10
	newline character	terminator	1	uc	1
9	**FIRST_MID_LAT=**	keyword	14	uc	14
	Geodetic Latitude of the middle sample of the first line A negative value denotes south latitude, a positive value denotes North latitude	10-6 degrees	11	Al	1
	<10-6degN>	units	10	uc	10
	newline character	terminator	1	uc	1
10	**FIRST_MID_LONG=**	keyword	15	uc	15
	East geodetic longitude of the middle sample of the first line. Positive values East of Greenwich, negative values west of Greenwich.	10-6 degrees	11	Al	1
	<10-6degE>	units	10	uc	10
	newline character	terminator	1	uc	1
11	**FIRST_LAST_LAT=**	keyword	15	uc	15
	Geodetic Latitude of the last sample of the first line A negative value denotes south latitude, a positive value denotes North latitude	10-6 degrees	11	Al	1
	<10-6degN>	units	10	uc	10
	newline character	terminator	1	uc	1
12	**FIRST_LAST_LONG=**	keyword	16	uc	16
	East geodetic longitude of the last sample of the first line. Positive values East of Greenwich, negative values west of Greenwich.	10-6 degrees	11	Al	1
	<10-6degE>	units	10	uc	10

Table 11.4.1.6-1 MER_RR__1P - SPH					
	newline character	terminator	1	uc	1
13	**LAST_FIRST_LAT=**	keyword	15	uc	15
	Geodetic Latitude of the first sample of the last line A negative value denotes south latitude, a positive value denotes North latitude	10-6 degrees	11	Al	1
	<10-6degN>	units	10	uc	10
	newline character	terminator	1	uc	1
14	**LAST_FIRST_LONG=**	keyword	16	uc	16
	East geodetic longitude of the first sample of the last line. Positive values East of Greenwich, negative values west of Greenwich.	10-6 degrees	11	Al	1
	<10-6degE>	units	10	uc	10
	newline character	terminator	1	uc	1
15	**LAST_MID_LAT=**	keyword	13	uc	13
	Geodetic Latitude of the middle sample of the last line A negative value denotes south latitude, a positive value denotes North latitude	10-6 degrees	11	Al	1
	<10-6degN>	units	10	uc	10
	newline character	terminator	1	uc	1
16	**LAST_MID_LONG=**	keyword	14	uc	14
	East geodetic longitude of the middle sample of the last line. Positive values East of Greenwich, negative values west of Greenwich.	10-6 degrees	11	Al	1
	<10-6degE>	units	10	uc	10
	newline character	terminator	1	uc	1
17	**LAST_LAST_LAT=**	keyword	14	uc	14
	Geodetic Latitude of the last sample of the last line A negative value denotes south latitude, a positive value denotes North latitude	10-6 degrees	11	Al	1
	<10-6degN>	units	10	uc	10
	newline character	terminator	1	uc	1
18	**LAST_LAST_LONG=**	keyword	15	uc	15
	East geodetic longitude of the last sample of the last line. Positive values East of Greenwich, negative values west of Greenwich.	10-6 degrees	11	Al	1
	<10-6degE>	units	10	uc	10

Table 11.4.1.6-1 MER_RR__1P - SPH					
	newline character	terminator	1	uc	1
19	**Spare (blank characters)**	-	47	uc	47
	newline character	terminator	1	uc	1
	Product Quality Information				
20	**TRANS_ERR_FLAG=**	keyword	15	uc	15
	Set to 1 if number of transmission errors exceeds threshold. Set to 0 otherwise.	-	1	uc	1
	newline character	terminator	1	uc	1
21	**FORMAT_ERR_FLAG=**	keyword	16	uc	16
	Set to 1 if number of format errors exceeds threshold. Set to 0 otherwise.	-	1	uc	1
	newline character	terminator	1	uc	1
22	**DATABASE_FLAG=**	keyword	14	uc	14
	Flag set to 1 if the processing parameters data base contents does not match the packet header contents.	-	1	uc	1
	newline character	terminator	1	uc	1
23	**COARSE_ERR_FLAG=**	keyword	16	uc	16
	Flag indicating coarse offsets are above threshold	-	1	uc	1
	newline character	terminator	1	uc	1
24	**ECMWF_TYPE=**	keyword	11	uc	11
	0 = forecast ECMWF data was used 1 = analysis ECMWF data was used	-	1	uc	1
	newline character	terminator	1	uc	1
25	**NUM_TRANS_ERR=**	keyword	14	uc	14
	Number of transmission errors in the product	-	11	A1	1
	newline character	terminator	1	uc	1
26	**NUM_FORMAT_ERR=**	keyword	15	uc	15
	Number of format errors in the product	-	11	A1	1
	newline character	terminator	1	uc	1
27	**TRANS_ERR_THRESH=**	keyword	17	uc	17
	Threshold for setting TRANS_ERR_FLAG	%	15	Afl	1
	<%>	units	3	uc	3
	newline character	terminator	1	uc	1

Table 11.4.1.6-1 MER_RR__1P - SPH					
28	**FORMAT_ERR_THRESH=**	keyword	18	uc	18
	Threshold for setting FORMAT_ERR_FLAG	%	15	Afl	1
	<%>	units	3	uc	3
	newline character	terminator	1	uc	1
29	**DELETED. NO FIELD.**				
30	**Spare (blank characters)**	-	77	uc	77
	newline character	terminator	1	uc	1
	Additional Product Information				
31	**NUM_BANDS=**	keyword	10	uc	10
	Number of bands in the product	-	4	Ac	1
	newline character	terminator	1	uc	1
32	**BAND_WAVELEN=**	keyword	13	uc	13
	List of up to 15 band central wavelengths of the bands contained in this product. Unused values are set to zero. Each entry is of the form Al. e.g., if only 13 bands were included in the product: +0000412500+0000442500+0000490000+0000510000+0000560000+0000620000+0000665000+0000681250+0000705000+0000753750+0000760625+0000775000+0000865000+0000000000+0000000000	10-3 nm	165	Al	15
	<10-3nm>	units	8	uc	8
	newline character	terminator	1	uc	1
33	**BANDWIDTH=**	keyword	10	uc	10
	List of up to 15 bandwidths for the bands in the product. The order of the list must match the order of the central wavelengths entries in the previous field. Unused values are set to zero. Each entry is of the form Al. e.g., if only 13 bands were included in the product: +10000+10000+10000+10000+10000+10000+10000+07500+10000+07500+03750+15000+20000+00000+00000	10-3 nm	90	As	15
	<10-3nm>	units	8	uc	8
	newline character	terminator	1	uc	1
34	**INST_FOV=**	keyword	9	uc	9
	Instantaneous Field of View	10-6 deg	11	Al	1
	<10-6deg>	units	9	uc	9
	newline character	terminator	1	uc	1

Table 11.4.1.6-1 MER_RR__1P - SPH					
35	**PROC_MODE=**	keyword	10	uc	10
	Processor mode of operation 1 = Raw (no radiometric corrections on-board) 0 = Full Processing (on-board radiometric corrections applied)	flag	1	uc	1
	newline character	terminator	1	uc	1
35.5	**OFFSET_COMP=**	keyword	12	uc	12
	Offset compensation flag 1 = compensation applied 0 = no compensation	flag	1	uc	1
	newline character	terminator	1	uc	1
36	**LINE_TIME_INTERVAL=**	keyword	19	uc	19
	Line spacing in time	(10-6) sec	11	Al	1
	<10-6s>	units	7	uc	7
	newline character	terminator	1	uc	1
37	**LINE_LENGTH=**	keyword	12	uc	12
	Number of samples per output line	samples	6	As	1
	<samples>	units	9	uc	9
	newline character	terminator	1	uc	1
38	**LINES_PER_TIE_PT=**	keyword	17	uc	17
	Number of lines between along track tie points	lines	4	Ac	1
	newline character	terminator	1	uc	1
39	**SAMPLES_PER_TIE_PT=**	keyword	19	uc	19
	Number of samples between across track tie points	samples	4	Ac	1
	newline character	terminator	1	uc	1
40	**COLUMN_SPACING=**	keyword	15	uc	15
	On ground spacing between columns	m	15	Afl	1
	<m>	units	3	uc	3
	newline character	terminator	1	uc	1
40.5	Offset Compensation field moved to position 35.5 above.				
41	**Spare (blank characters)**	-	41	uc	41
	newline character	terminator	1	uc	1
	DSDs for included Data Sets				

Table 11.4.1.6-1 MER_RR__1P - SPH					
42	**DSD-A of Level 1b Summary Quality ADS (SQADS)**	-	280	dsd	1
43	**DSD-G of Level 1b Scaling Factors and General info GADS**	-	280	dsd	1
44	**DSD-A of Level 1b Tie Points Loc. & Aux. Data ADS**	-	280	dsd	1
45	**DSD-M(1-15) of Level 1b TOA Radiances MDSs**	-	4200	dsd	15
46	**DSD-M(16) of Level 1b Flags & Detector Index**	-	280	dsd	1
	DSDs for referenced files				
47	**DSD-R Level 0 data file**	-	280	dsd	1
48	**DSD-R Instrument auxiliary data file**	-	280	dsd	1
49	**DSD-R Proc. Level 1b control parameters data file**	-	280	dsd	1
50	**DSD-R Radiometric calibration data file**	-	280	dsd	1
51	**DSD-R Digital Elevation Model data file**	-	280	dsd	1
52	**DSD-R Digital Roughness Model data file**	-	280	dsd	1
53	**DSD-R Coast-line/Land/Ocean file**	-	280	dsd	1
54	**DSD-R for ECMWF file used**	-	280	dsd	1
55	**DSD-R for Orbit State Vectors used**	-	280	dsd	1
56	**DSD-R Platform Attitude data file (CFI software)**	-	280	dsd	1
57	**DSD spare (279 blank space characters followed by 1 newline character)**		280	dsd_sp	1
	size (in bytes)		**9942**		

NOTE: The time difference between the ECMWF data and MERIS acquisition time can be found by comparing the MERIS acquisition time in the MPH, and the ECMWF file applicability date found in the filename for the ECMWF DSD in the SPH.

The following strings will be used in the field DS_NAME for the DSDs listed in the SPH above.

Table 11.4.1.6-2 DS_NAME Strings	
DSD	**DS_NAME String**
DSDs for included Data Sets	
DSD-A of Level 1b Summary Quality ADS (SQADS)	Quality ADS
DSD-G of Level 1b Scaling Factors and General info GADS	Scaling Factor GADS

Table 11.4.1.6-2 DS_NAME Strings	
DSD	**DS_NAME String**
DSD-A of Level 1b Tie Points Loc. & Aux. Data ADS	Tie points ADS
DSD-M of Level 1b TOA Radiances MDSs (1)	Radiance MDS(1)
DSD-M of Level 1b TOA Radiances MDSs (2)	Radiance MDS(2)
DSD-M of Level 1b TOA Radiances MDSs (3)	Radiance MDS(3)
DSD-M of Level 1b TOA Radiances MDSs (4)	Radiance MDS(4)
DSD-M of Level 1b TOA Radiances MDSs (5)	Radiance MDS(5)
DSD-M of Level 1b TOA Radiances MDSs (6)	Radiance MDS(6)
DSD-M of Level 1b TOA Radiances MDSs (7)	Radiance MDS(7)
DSD-M of Level 1b TOA Radiances MDSs (8)	Radiance MDS(8)
DSD-M of Level 1b TOA Radiances MDSs (9)	Radiance MDS(9)
DSD-M of Level 1b TOA Radiances MDSs (10)	Radiance MDS(10)
DSD-M of Level 1b TOA Radiances MDSs (11)	Radiance MDS(11)
DSD-M of Level 1b TOA Radiances MDSs (12)	Radiance MDS(12)
DSD-M of Level 1b TOA Radiances MDSs (13)	Radiance MDS(13)
DSD-M of Level 1b TOA Radiances MDSs (14)	Radiance MDS(14)
DSD-M of Level 1b TOA Radiances MDSs (15)	Radiance MDS(15)
DSD-M(16) of Level 1b Flags & Detector Index	Flags MDS(16)
DSDs for referenced files	
DSD-R Level 0 data file	MERIS_SOURCE_PACKETS
DSD-R Instrument auxiliary data file	INSTRUMENT_DATA_FILE
DSD-R Proc. Level 1b control parameters data file	PROCESSING_PARAMS_L1B_FILE
DSD-R Radiometric calibration data file	RADIOMETRIC_CALIBRATION_FILE
DSD-R Digital Elevation Model data file	DIGITAL_ELEVATION_MODEL_FILE
DSD-R Digital Roughness Model data file	DIGITAL_ROUGHNESS_MODEL_FILE
DSD-R Coast-line/Land/Ocean file	LAND_SEA_MASK_DATA_FILE
DSD -R for ECMWF file used	ECMWF_DATA_FILE
DSD- R for Orbit State Vectors Used	ORBIT_STATE_VECTOR_FILE
DSD-R Platform Attitude data file (CFI software)	ATTITUDE_DATA_FILE

11.4.1.7 Data Sets

The contents of the Data Sets are described in the following sections. Data Sets are

in mixed binary format. They may contain ACSII strings, but the ASCII strings are not contained within quotation marks as for the MPH/SPH.

11.4.1.7.1 Annotation Data Set - Summary Quality ADS

This data set contains only data useful for the evaluation of the quality of the product. It will have ADS records every 8th tie frame, therefore, if the Tie points ADS holds a maximum of 925 ADSRs, this ADS will hold a maximum of 116 records. The size of the ADS has been summarized below:

Table 11.4.1.7.1-1 MER_RR__1P - Summary Quality ADS

ADSR No.	Description	Size (bytes)
1	**ADSR associated with tie frame # 1 -- #8**	33
2	**ADSR associated with frame #9 to #16**	33
...	**...**	...
115	**ADSR associated with frame #913 to #920**	33
116	**ADSR associated with frame #921 to #925**	33
	Total (in bytes)	**3828**

The content of the SQ ADS shall be as follows:

Table 11.4.1.7.1-2 MER_RR__1P ADS - SQ ADS

N	Description	Units	Byte Length	Data Type	Dim.
1	**Time of the first line in the MDS corresponding to this record.**	-	12	mjd	1
2	**Attachment Flag:** Set to 1 if all the records in all the bands are blank for the period corresponding to this record, set to zero otherwise	-	1	uc	1
3	**Out of Range flag** For every band, when the number of out of range samples is above a given threshold then it is set to TRUE, otherwise it is left to FALSE. The 15 flags for all the bands of a module are stored in an unsigned integer. To have this information for every MERIS module, five unsigned integers are needed.	-	10	us	5
4	**Out of Range blank flag** flags set to TRUE when the number of out of range blank spectral samples per module is above a given threshold. Flag ordering same as described in field 3.	-	10	us	5

Table 11.4.1.7.1-2 MER_RR__1P ADS - SQ ADS					
	size (in bytes)		**33**		

11.4.1.7.2 Global Annotation Data Set - Scaling Factors and General Info

The content of the GADS -Scaling Factors and General Info of the MER_RR__1P shall be as follows:

Table 11.4.1.7.2-1 MER_RR__1P Scaling Factors and General Info GADS

N	Description	Units	Byte Length	Data Type	Dim.
1	**scaling factor - altitude**	-	4	fl	1
2	**scaling factor - roughness**	-	4	fl	1
3	**scaling factor - zonal wind**	-	4	fl	1
4	**scaling factor - meridional wind**	-	4	fl	1
5	**scaling factor - atmospheric pressure**	-	4	fl	1
6	**scaling factor - ozone**	-	4	fl	1
7	**scaling factor - relative humidity**	-	4	fl	1
8	**scaling factor - radiances**	-	60	fl	15
9	**Gain setting**	-	80	uc	5*16
10	**sampling rate**	(10-6) s	4	ul	1
11	**Sun Spectral Flux (for bands 1-15)**	LU	60	fl	15
12	**Spare**	-	60	uc	60
	size (in bytes)	**-**	**292**	**-**	**-**

All the scaling factors do not carry any unit, the units are carried by the corresponding parameters.

11.4.1.7.3 Annotation Data Set - Tie Points Location & Corresp. Aux. Data (LADS)

With the tie point grid being a 16 x 16 sub grid of the RR product grid consisting of 14785 (maximum AL) x 1121 (AC) pixels, there are a maximum of 925*71 (AL*AC) tie points. There is therefore a maximum of 925 tie points Annotation Data Set Records for the MER_RR__1P Product.

Each ADS is made of ADS Records, the maximum size of the ADS has been summarized below:

Table 11.4.1.7.3-1 MER_RR__1P - Tie Points ADS		
ADSR No.	**Description**	**Size (bytes)**
1	**ADSR associated with line # 1**	3563
2	**ADSR associated with line # 17**	3563
...	**...**	...
925	**ADSR associated with line # 14785 RR pixels**	3563
	Total (in bytes)	**3295775**

The format and content of the tie point ADSR is described below.

Table 11.4.1.7.3-2 MER_RR__1P - Tie Point Annotation					
N	**Description**	**Units**	**Byte Length**	**Data Type**	**Dim.**
1	**Start time of the measurement**	-	12	mjd	1
2	**Attachment Flag** (set to 1 if there are no MDSRs corresponding to this ADSR, set to zero otherwise)	-	1	uc	1
3	**latitude of the tie points** WGS084, positive N	(10-6) deg	284	sl	71
4	**longitude of the tie points** WGS084, Greenwich origin, positive E	(10-6) deg	284	sl	71
5	**DEM altitude of the tie points** Tie point altitude shall be provided using the data provided in the Digital Elevation data file.	m	284	sl	71
6	**DRM roughness** Tie point roughness shall be provided using the data provided in the Digital Roughness data file.	m	284	ul	71
7	**DEM latitude corrections**[1]	(10-6) deg	284	sl	71
8	**DEM longitude corrections**	(10-6) deg	284	sl	71
9	**sun zenith angles**	(10-6) deg	284	ul	71
10	**sun azimuth angles**	(10-6) deg	284	sl	71
11	**viewing zenith angles**	(10-6) deg	284	ul	71

[1] *Note: DEM longitude (resp. latitude) correction shall be added to the corresponding Tie Point longitude (resp. latitude) to obtain the longitude (resp. latitude) of the intersection between the Tie Point Line Of Sight (from the Satellite) and the Earth surface, i.e. accounting for the DEM latitude at the Tie Point.*

Table 11.4.1.7.3-2 MER_RR__1P - Tie Point Annotation					
12	**viewing azimuth angles**	(10-6) deg	284	sl	71
13	**zonal winds** Wind vector fields from ECMWF shall be resampled to the tie point grid by interpolation	m*s-1	142	ss	71
14	**meridional winds** Wind vector fields from ECMWF shall be resampled to the tie point grid by interpolation	m*s-1	142	ss	71
15	**mean sea level pressures** Mean sea level pressures fields from ECMWF shall be resampled to the tie point grid by interpolation	hPa	142	us	71
16	**total ozone** Total ozone fields from ECMWF shall be resampled to the tie point grid by interpolation	DU	142	us	71
17	**relative humidity** Relative humidity fields from ECMWF shall be resampled to the tie point grid by interpolation	%	142	us	71
	size (in bytes)	-	**3563**	-	-

11.4.1.7.4 Measurement Data Sets MDS(1-16)

There are 16 measurement data sets, the first 15 consist of Top of Atmosphere radiances, the 16th consists of flags associated to each pixel.

A product corresponds to a maximum footprint of 14785 (AL) x 1121 (AC) RR pixels.

There is therefore a maximum of 14785 Records for each MDS. The data of the 1121 RR product pixels are stored in a single Measurement Data Set Record.

11.4.1.7.4.1 Measurement Data Set Records for MDS(1-15)

The MER_RR__1P MDS(1-15) has been summarized below:

Table 11.4.1.7.4.1-1 MER_RR__1P - MDS(1-15)		
MDSR No.	**Description (for band b)**	**Size (bytes)**
1	**MDSR associated with line # 1**	2255
2	**MDSR associated with line # 2**	2255

Table 11.4.1.7.4.1-1 MER_RR__1P - MDS(1-15)		
MDSR No.	**Description (for band b)**	**Size (bytes)**
...	**...**	...
14785	**MDSR associated with line # 14785 RR pixels**	2255
	Total (in bytes)	**33340175**

Each MDSR(1-15) consists of 1121 lines of pixels as shown below:

Table 11.4.1.7.4.1-2 MER_RR__1P - MDSR(1-15)					
N	**Description**	**Units**	**Byte Length**	**Data Type**	**Dim.**
1	**Start time of the Data Set Record**	mjd	12	mjd	1
2	**Quality Indicator** -1 = all values are zero, 0 otherwise.	-	1	sc	1
3	**TOA radiance pixel #1 band b**	LU	2	us	1
4	**TOA radiance pixel #2 band b**	LU	2	us	1
...	**...**	...	...	...	...
1123	**TOA radiance pixel #1121 band b**	LU	2	us	1
	MDSR size (in bytes)	**-**	**2255**	**-**	**-**

11.4.1.7.4.2 Measurement Data Set MDS(16) Flags

A different MDS Record is associated to each frame.
The MER_RR__1P MDS(16) has been summarized below:

Table 11.4.1.7.4.2-1 MER_RR__1P - MDS(16)		
MDSR No.	**Description (for band b)**	**Size (bytes)**
1	**MDSR associated with line # 1**	3376
2	**MDSR associated with line # 2**	3376
...	**...**	...
14785	**MDSR associated with line # 14785 RR pixels**	3376

Table 11.4.1.7.4.2-1 MER_RR__1P - MDS(16)		
MDSR No.	**Description (for band b)**	**Size (bytes)**
	Total (in bytes)	**49914160**

A MDSR contains the flags and detector index for each pixel of the corresponding line, therefore it contains two arrays of 1121 elements.
Each MDSR(16) shall be of the following format:

Table 11.4.1.7.4.2-2 MER_RR__1P - MDSR(16)					
N	**Description**	**Units**	**Byte Length**	**Data Type**	**Dim.**
1	**Start time of the Data Set Record**	mjd	12	mjd	1
2	**Quality Indicator** -1 = all values are zero, 0 otherwise.	-	1	sc	1
3	**Flags for pixel #1-1121**	-	1121	uc	1
4	**Detector index of pixel #1 - #1121**	-	2242	ss	1
	size (in bytes)	**-**	**3376**	**-**	**-**

The quality flag element shall be coded on a single byte, with each flag being coded on a single bit according to the following sequence[2]:

Table 11.4.1.7.4.2-3 MER_RR__1P - Quality Flag Coding	
Flag Type	**Bit Number**
cosmetic	0
duplicated	1
glint risk	2
suspect	3
land/ocean	4
bright	5

[2] Refer to Annex A for bit numbering convention.

Table 11.4.1.7.4.2-3 MER_RR__1P - Quality Flag Coding	
Flag Type	**Bit Number**
coastline	6
invalid	7

The bit numbering complies with the requirements defined in Annex A.

11.4.1.8 Size Estimate

The estimated size of the maximum Level 1B RR Product is calculated as follows:

MPH: 1247 bytes

SPH: 9942 bytes

SQ ADS: 3828 bytes

Scaling Factors and General Info GADS: 292 bytes

Tie Points ADS: 3295775 bytes

MDSs (1-15) + MDS 16: 15 * 33340175 + 49914160 bytes = 550 MB

TOTAL: approx. 553 MB

11.4.2 MERIS Full Resolution Geolocated and Calibrated TOA Radiance

This Level 1B FR product is similar to the Level 1B RR product except that the image data is full resolution. The Level 1B FR product is produced by request only. It is produced from the Level 0 FR product. The NRT version of the product is available 1 day after data acquisition. The product is disseminated to users in floating scene size of 582 km by 650 km or 300 km by 334 km. The smaller of the two floating scenes is referred to as an “imagette” in the following documentation.

11.4.2.1 Input Data

Level 0 FR product and auxiliary data.

11.4.2.2 Auxiliary Data Used

Same as for the Reduced Resolution Level 1B product. Some data may need to be at higher resolution than those for the RR product.

11.4.2.3 Processing Performed

Same as for the Reduced Resolution product (TBC). Some data may need to be at

higher resolution than those for the RR product.

11.4.2.4 Product Structure

The high-level breakdown of the Level 1-FR product is described below:

Table 11.4.2.4-1 High-level Breakdown of MER_FR__1P

MPH
Level 1b - SPH (includes DSDs)
Level 1b Summary Quality ADS (SQ ADS)
Level 1b GADS Scaling Factors and General Info
Level 1b ADS Tie Points Location & Aux. Data
Level 1b MDS (1) TOA Radiance
Level 1b MDS (2) TOA Radiance
Level 1b MDS (3) TOA Radiance
Level 1b MDS (4) TOA Radiance
Level 1b MDS (5) TOA Radiance
Level 1b MDS (6) TOA Radiance
Level 1b MDS (7) TOA Radiance
Level 1b MDS (8) TOA Radiance
Level 1b MDS (9) TOA Radiance
Level 1b MDS (10) TOA Radiance
Level 1b MDS (11) TOA Radiance
Level 1b MDS (12) TOA Radiance
Level 1b MDS (13) TOA Radiance
Level 1b MDS (14) TOA Radiance
Level 1b MDS (15) TOA Radiance
Level 1b MDS (16) Flags & Detector Index

The Imagette product is a FR product containing 1153 x 1153 pixels (and 19 x 19 tie points), as opposed to the usual 2241 by 2241 pixels with 36 by 36 tie points.

11.4.2.5 Main Product Header

The MPH will be the same as described in Volume 5.

11.4.2.6 Specific Product Header

The structure SPH of the Level 1B FR is identical to the Level 1B RR SPH described in Section 11.4.1.6.

11.4.2.7 Data Sets

The contents of the Data Sets are described in the following sections. Data Sets are in mixed binary format. They may contain ACSII strings, but the ASCII strings are not contained within quotation marks as for the MPH/SPH.

11.4.2.7.1 Annotation Data Set - Summary Quality ADS

This ADS contains only data useful for the evaluation of the quality of the product. It will have one ADS Record for every new group of 8 tie frames (a new record has to be generated when starting the 9th tie frame, the last SQ ADSR of the product may be relevant for less than 8 tie frames), therefore, it will hold 5 ADSRs in the reference product, and 3 for the reference imagette product.

The size of the ADS has been summarized below:

Table 11.4.2.7.1-1 MER_FR__1P - Summary Quality ADS

ADSR No.	Description	Size (bytes)
1	**ADSR associated with line # 1 - 512 FR pixels**	33
2	**ADSR associated with line # 513 - 1024 FR Pixels**	33
...	**...**	...
5	**ADSR associated with line # 2049 -2241 FR pixels**	33
	Total (in bytes)	**165**

For the imagette product there are only 3 ADSRs in the ADS:

Table 11.4.2.7.1-2 Summary Quality ADS for the imagette

ADSR No.	Description	Size (bytes)
1	**ADSR associated with line # 1 - 512 FR pixels**	33
2	**ADSR associated with line # 513 - 1024 FR Pixels**	33
3	**ADSR associated with line # 1025 - 1153 FR Pixels**	33
	Total (in bytes)	**99**

The format and content of the Summary Quality ADSR is identical to that described in Table 11.4.1.7.1-2.

11.4.2.7.2 Global Annotation Data Set - Scaling Factors and General Info

The content of the GADS - Scaling Factors of the MER_FR__1P shall be as described in Section 11.4.1.7.2.

11.4.2.7.3 Annotation Data Set - Tie Points Location & Corresp. Aux. Data

With the tie point grid being a 64 x 64 sub grid of the FR product grid consisting of 2241 (AL) x 2241 (AC) pixels (1153 by 1153 for the imagette), there are 36*36 (AL*AC) tie points [19 by 19 for the imagette]. There is therefore 36 tie points Annotation Data Set Records for the MER_FR__1P Product [19 for the imagette].

Each ADS is made of ADS Records (one ADSR for each frame product), the size of the ADS has been summarized below:

Table 11.4.2.7.3-1 MER_FR__1P - Tie Points ADS

ADSR No.	Description	Size (bytes)
1	**ADSR associated with line # 1**	1813
2	**ADSR associated with line # 65**	1813
...	**...**	...
36	**ADSR associated with line # 2241 FR pixels**	1813
	Total (in bytes)	**65268**

For the imagette product, there are only 1153 lines by 1153 samples, meaning 19 by 19 tie points. Therefore the sizing estimate is as shown:

Table 11.4.2.7.3-2 MER_FR__1P - Tie Points ADS for the Imagette Product

ADSR No.	Description	Size (bytes)
1	**ADSR associated with line # 1**	963
2	**ADSR associated with line # 65**	963
...	**...**	...
19	**ADSR associated with line # 1153 FR pixels**	963
	Total (in bytes)	**18297**

The format and content of the tie point ADSR is described below. The square braces

([]) indicate values for the imagette product:

Table 11.4.2.7.3-3 MER_FR__1P - Tie Points ADSR

N	Description	Units	Byte Length	Data Type	Dim.
1	**Start time of the measurement**	-	12	mjd	1
2	**Attachment Flag** (set to 1 if there are no MDSRs corresponding to this ADSR, set to zero otherwise)	-	1	uc	1
3	**latitude of the tie points** WGS84, positive N	(10-6) deg	144 [76]	sl	36 [19]
4	**longitude of the tie points** WGS84, Greenwich origin, positive E	(10-6) deg	144 [76]	sl	36 [19]
5	**DEM altitude of the tie points** Tie point altitude shall be provided using the data provided in the Digital Elevation data file.	m	144 [76]	sl	36 [19]
6	**DRM roughness** Tie point roughness shall be provided using the data provided in the Digital Roughness data file.	m	144 [76]	ul	36 [19]
7	**DEM latitude corrections**	(10-6) deg	144 [76]	sl	36 [19]
8	**DEM longitude corrections**	(10-6) deg	144 [76]	sl	36 [19]
ç	**sun zenith angles**	(10-6) deg	144 [76]	ul	36 [19]
10	**sun azimuth angles**	(10-6) deg	144 [76]	sl	36 [19]
11	**viewing zenith angles**	(10-6) deg	144 [76]	ul	36 [19]
12	**viewing azimuth angles**	(10-6) deg	144 [76]	sl	36 [19]
13	**zonal winds** Wind vector fields from ECMWF shall be resampled to the tie point grid by interpolation	m*s-1	72 [38]	ss	36 [19]
14	**meridional winds** Wind vector fields from ECMWF shall be resampled to the tie point grid by interpolation	m*s-1	72 [38]	ss	36 [19]
15	**sea level pressures** Sea level pressure fields from ECMWF shall be resampled to the tie point grid by interpolation	hPa	72 [38]	us	36 [19]

Table 11.4.2.7.3-3 MER_FR__1P - Tie Points ADSR					
N	**Description**	**Units**	**Byte Length**	**Data Type**	**Dim.**
16	**total ozone** Total ozone fields from ECMWF shall be resampled to the tie point grid by interpolation	DU	72 [38]	us	36 [19]
17	**relative humidity** Relative humidity fields from ECMWF shall be resampled to the tie point grid by interpolation	%	72 [38]	us	36 [19]
	size (in bytes)	**-**	**1813 [963]**	**-**	**-**

11.4.2.7.4 Measurement Data Sets MDS(1-16)

There are 16 measurement data sets, the first 15 consist of Top of Atmosphere radiances, the 16th consists of flags associated to each pixel.

The reference product corresponds to a footprint of 2241 (AL) x 2241 (AC) FR pixels. The imagette product corresponds to a footprint of 1153 (AL) x 1153 (AC) FR pixels.

There is therefore 2241 Records for each MDS for the reference product [1153 for the imagette product]. The data of the 2241 [or 1153] FR product pixels are stored in a single Measurement Data Set Record.In the information below, [] refers to the imagette product.

11.4.2.7.4.1 Measurement Data Set Records MDS(1-15)

The MER_FR__1P MDS(1-15) has been summarized below:

Table 11.4.2.7.4.1-1 MER_FR__1P -MDS(1-15)		
MDSR No.	**Description (for band b)**	**Size (bytes)**
1	**MDSR associated with line # 1**	4495 [2319]
2	**MDSR associated with line # 2**	4495 [2319]
...	**...**	...
2241 [1153]	**MDSR associated with line # 2241 [1153] FR pixels**	4495 [2319]
	Total (in bytes)	**10073295 [2673807]**

Each MDSR(1-15) consists of 2241 [1153] elements as shown below:

Table 11.4.2.7.4.1-2 MER_FR__1P - MDSR(1-15)

N	Description	Units	Byte Length	Data Type	Dim.
1	**Start time of the Data Set Record**	mjd	12	mjd	1
2	**Quality Indicator** -1 = all values are zero, 0 otherwise.	-	1	sc	1
3	**TOA radiance pixel #1 band b**	LU	2	us	1
4	**TOA radiance pixel #2 band b**	LU	2	us	1
...	**...**	...	...	...	...
2243 [1155]	**TOA radiance pixel #2241 [#1155] band b**	LU	2	us	1
	MDSR size (in bytes)	**-**	**4495 [2319]**	**-**	**-**

11.4.2.7.4.2 Measurement Data Set Records MDS(16) Flags

The MER_FR__1P MDS(16) has been summarized below, values in [] braces refer to the imagette product:

Table 11.4.2.7.4.2-1 MER_FR__1P - MDS(16)

MDSR No.	Description (for band b)	Size (bytes)
1	**MDSR associated with line # 1**	6736 [3472]
2	**MDSR associated with line # 2**	6736 [3472]
...	**...**	...
2241 [1153]	**MDSR associated with line # 2241 [#1153] FR pixels**	6736 [3472]
	Total (in bytes)	**15095376 [4003216]**

Each MDSR contains the flags and detector index for each pixel of the corresponding image data. The detector index allows to link each product pixel to the instrument detector.

Each MDSR(16) shall be of the following format:

Table 11.4.2.7.4.2-2 MER_FR__1P - MDSR(16)

N	Description	Units	Byte Length	Data Type	Dim.
1	**Start time of the Data Set Record**	mjd	12	mjd	1
2	**Quality Indicator** -1 = all values are zero, 0 otherwise.	-	1	sc	1
3	**Flags of pixel #1 - #2241 [#1 - #1153]**	-	2241 [1153]	uc	1
2254 [1165]	**Detector Index of pixel #1 - #2241 [#1 - #1153]**	-	4482 [2306]	ss	1
	size (in bytes)	**-**	**6736 [3472]**	**-**	**-**

A flag element shall be coded on a single byte, with each flag being coded on a single bit according to the sequence described in Table 11.4.1.7.4.2-3.

11.4.2.8 Size Estimate

The estimated size of the Level 1B FR Product is calculated as follows (the [] notation gives the sizes for the imagette product):

MPH: 1247 bytes

SPH: 9942 bytes

SQ ADS: 165 [99] bytes

Scaling Factors and General Info GADS: 292 bytes

Tie Points ADS (LADS): 65268 [18297] bytes

MDSs (1-15): 15 * 10073295 [2673807] bytes

MDS (16): 15095376 [4003216] bytes

TOTAL: approx. 166 [44] MB

11.4.3 MERIS Full Resolution Full Swath Geolocated and Calibrated TOA Radiance

The Level 1b FRS product is similar to the Level 1B FR product except that the image record covers the complete instrument swath. The level 1B FRS product is generated offline, from MERIS FR Level 0 product. The product duration is not fixed as for the MERIS FR scene and it can span up to the time interval of the input Level 0.

11.4.3.1 Input Data

Level 0 FR product and auxiliary data.

11.4.3.2 Auxiliary Data Used

Same as for the Full Resolution Level 1B product. Some data may need to be at higher resolution than those for the RR product.

11.4.3.3 Processing Performed

Same as for the Full Resolution product.

11.4.3.4 Product Structure

The high-level breakdown of the Level 1-FRS product is described below:

Table 11.4.3.4-1 High-level Breakdown of MER_FRS__1P

MPH
Level 1b - SPH (includes DSDs)
Level 1b Summary Quality ADS (SQ ADS)
Level 1b GADS Scaling Factors and General Info
Level 1b ADS Tie Points Location & Aux. Data
Level 1b MDS (1) TOA Radiance
Level 1b MDS (2) TOA Radiance
Level 1b MDS (3) TOA Radiance
Level 1b MDS (4) TOA Radiance
Level 1b MDS (5) TOA Radiance
Level 1b MDS (6) TOA Radiance
Level 1b MDS (7) TOA Radiance
Level 1b MDS (8) TOA Radiance
Level 1b MDS (9) TOA Radiance
Level 1b MDS (10) TOA Radiance
Level 1b MDS (11) TOA Radiance
Level 1b MDS (12) TOA Radiance
Level 1b MDS (13) TOA Radiance
Level 1b MDS (14) TOA Radiance
Level 1b MDS (15) TOA Radiance
Level 1b MDS (16) Flags & Detector Index

11.4.3.5 Main Product Header

The MPH will be the same as described in Volume 5.

11.4.3.6 Specific Product Header

The structure SPH of the Level 1B FRS is identical to the Level 1B FR SPH described in Section 11.4.2.6.

11.4.3.7 Data Sets

The contents of the Data Sets are described in the following sections. Data Sets are in mixed binary format. They may contain ASCII strings, but the ASCII strings are not contained within quotation marks as for the MPH/SPH.

11.4.3.7.1 Annotation Data Set - Summary Quality ADS

This ADS contains only data useful for the evaluation of the quality of the product. It will have one ADS Record for every new group of 8 tie frames (a new record has to be generated when starting the 9th tie frame, the last SQ ADSR of the product may be relevant for less than 8 tie frames), it will hold a variable number of ADSRs depending on the chosen product duration. The size of the ADS has been summarized below:

Table 11.4.3.7.1-1 MER_FRS_1P - Summary Quality ADS

ADSR No.	Description	Size (bytes)
1	**ADSR associated with line # 1 - 512 FR pixels**	33
2	**ADSR associated with line # 513 - 1024 FR Pixels**	33
...	**...**	...
n	**ADSR associated with line # [(n-1)+512] -[n*512] FR pixels**	33
	Total (in bytes)	**n*33**

The format and content of the Summary Quality ADSR is identical to that described in Table 11.4.1.7.1-2.

11.4.3.7.2 Global Annotation Data Set - Scaling Factors and General Info

The content of the GADS - Scaling Factors of the MER_FR__1P shall be as described in Section 11.4.1.7.2.

11.4.3.7.3 Annotation Data Set - Tie Points Location & Corresp. Aux. Data

With the tie point grid being a 64 x 64 sub grid of the FR product grid consisting of n (AL) x 4481 (AC) pixels, there are n/64*71 (AL*AC) tie points. There are therefore n/64 tie points Annotation Data Set Records for the MER_FRS_1P Product.

Each ADS is made of ADS Records (one ADSR for each frame product), the size of the ADS has been summarized below:

Table 11.4.3.7.3-1 MER_FRS_1P - Tie Points ADS

ADSR No.	Description	Size (bytes)
1	**ADSR associated with line # 1**	3563
2	**ADSR associated with line # 65**	3563

Table 11.4.3.7.3-1 MER_FRS_1P - Tie Points ADS		
ADSR No.	**Description**	**Size (bytes)**
...	**...**	...
na	**ADSR associated with line # [64+n-1] FR pixels**	3563
	Total (in bytes)	**n***3563

a. n = number lines/64

The format and content of the tie point ADSR is described below.

Table 11.4.3.7.3-2 MER_FRS_1P - Tie Points ADSR					
N	**Description**	**Units**	**Byte Length**	**Data Type**	**Dim.**
1	**Start time of the measurement**	-	12	mjd	1
2	**Attachment Flag** (set to 1 if there are no MDSRs corresponding to this ADSR, set to zero otherwise)	-	1	uc	1
3	**latitude of the tie points** WGS84, positive N	(10^{-6}) deg	284	sl	71
4	**longitude of the tie points** WGS84, Greenwich origin, positive E	(10^{-6}) deg	284	sl	71
5	**DEM altitude of the tie points** Tie point altitude shall be provided using the data provided in the Digital Elevation data file.	m	284	sl	71
6	**DRM roughness** Tie point roughness shall be provided using the data provided in the Digital Roughness data file.	m	284	ul	71
7	**DEM latitude corrections**	(10^{-6}) deg	284	sl	71
8	**DEM longitude corrections**	(10^{-6}) deg	284	sl	71
ç	**sun zenith angles**	(10^{-6}) deg	284	ul	71
10	**sun azimuth angles**	(10^{-6}) deg	284	sl	71
11	**viewing zenith angles**	(10^{-6}) deg	284	ul	71
12	**viewing azimuth angles**	(10^{-6}) deg	284	sl	71
13	**zonal winds** Wind vector fields from ECMWF shall be resampled to the tie point grid by interpolation	$m*s^{-1}$	142	ss	71

Table 11.4.3.7.3-2 MER_FRS_1P - Tie Points ADSR					
N	**Description**	**Units**	**Byte Length**	**Data Type**	**Dim.**
14	**meridional winds** Wind vector fields from ECMWF shall be resampled to the tie point grid by interpolation	$m*s^{-1}$	142	ss	71
15	**sea level pressures** Sea level pressure fields from ECMWF shall be resampled to the tie point grid by interpolation	hPa	142	us	71
16	**total ozone** Total ozone fields from ECMWF shall be resampled to the tie point grid by interpolation	DU	142	us	71
17	**relative humidity** Relative humidity fields from ECMWF shall be resampled to the tie point grid by interpolation	%	142	us	71
	size (in bytes)	-	3563	-	-

11.4.3.7.4 Measurement Data Sets MDS(1-16)

There are 16 measurement data sets, the first 15 consist of Top of Atmosphere radiances, the 16th consists of flags associated to each pixel.
The product corresponds to a footprint of n*(AL) x 4481 (AC) FR pixels.
There is therefore 4481 Records for each MDS for the product. The data of the 4481 FRS product pixels are stored in a single Measurement Data Set Record.

11.4.3.7.4.1 Measurement Data Set Records MDS(1-15)

The MER_FRS_1P MDS(1-15) has been summarized below:

Table 11.4.3.7.4.1-1 MER_FRS_1P - MDS(1-15)		
MDSR No.	**Description (for band b)**	**Size (bytes)**
1	**MDSR associated with line # 1**	8975
2	**MDSR associated with line # 2**	8975
...	**...**	...
n	**MDSR associated with line # n FR pixels**	8975
	Total (in bytes)	**n*8975**

Each MDSR(1-15) consists of 4485 elements as shown below:

Table 11.4.3.7.4.1-2 MER_FRS_1P - MDSR(1-15)

N	Description	Units	Byte Length	Data Type	Dim.
1	**Start time of the Data Set Record**	mjd	12	mjd	1
2	**Quality Indicator** -1 = all values are zero, 0 otherwise.	-	1	sc	1
3	**TOA radiance pixel #1 band b**	LU	2	us	1
4	**TOA radiance pixel #2 band b**	LU	2	us	1
...	**...**	...	...	...	...
4485	**TOA radiance pixel #4481 band b**	LU	2	us	1
	MDSR size (in bytes)	**-**	**8975**	**-**	**-**

11.4.3.7.4.2 Measurement Data Set Records MDS(16) Flags

The MER_FRS_1P MDS(16) has been summarized below:

Table 11.4.3.7.4.2-1 MER_FRS_1P - MDS(16)

MDSR No.	Description (for band b)	Size (bytes)
1	**MDSR associated with line # 1**	13456
2	**MDSR associated with line # 2**	13456
...	**...**	...
n	**MDSR associated with line # n FR pixels**	13456
	Total (in bytes)	**n*13456**

Each MDSR contains the flags and detector index for each pixel of the corresponding image data. The detector index allows to link each product pixel to the instrument detector.

Each MDSR(16) shall be of the following format:

Table 11.4.3.7.4.2-2 MER_FRS_1P - MDSR(16)

N	Description	Units	Byte Length	Data Type	Dim.
1	**Start time of the Data Set Record**	mjd	12	mjd	1
2	**Quality Indicator** -1 = all values are zero, 0 otherwise.	-	1	sc	1
3-4483	**Flags of pixel #1 - #4481**	-	4481	uc	1
4484	**Detector Index of pixel #1 - #4481**	-	8962	ss	1
	size (in bytes)	-	**13456**	-	-

A flag element shall be coded on a single byte, with each flag being coded on a single bit according to the sequence described in Table 11.4.1.7.4.2-3.

11.4.3.8 Size Estimate

The estimated size of the Level 1B FRS is dependant to the start/stop time of the requested product.

Estimated size for 5 minutes of level 0 data in input ~1 Gb

11.5 LEVEL 2 PRODUCTS

There are five MERIS Level 2 products. Four are associated with the Reduced Resolution mode: the Reduced Resolution Geophysical product, the Extracted Cloud Thickness and Water Vapour for Meteo Users, the Extracted Cloud Thickness and Water Vapour (non-Meteo users), and the Extracted Vegetation Indices. There is one Full Resolution product: the Full Resolution Geophysical product.

11.5.1 MERIS Reduced Resolution Geophysical Product

This RR Level 2 product is a mixture of geolocated geophysical data (dependent on pixel classification) along with surface radiance/ reflectance and TOA radiance in the case of unclassified pixels. Localization information (lat. long.) will be provided along with the viewing geometry. The surface classification information from the Level 1B processing (accessed via the pixel identification flags) will allow the processor to calculate the appropriate geophysical parameters for each pixel. The primary applications of this product include coastal zones, land, ocean and atmospheric monitoring.The NRT version of the product is available from the PDHS 3 hours after data acquisition. The OFL (fully consolidated) version is available from the PAC 2 weeks after data acquisition. The product is produced in stripline format and disseminated to users in multiples of the minimum scene size of 1165 km by 1300 km.

11.5.1.1 Input Data

Level 1B RR product plus auxiliary data.

11.5.1.2 Auxiliary Data Used

Auxiliary data used to create this product will include:

Table 11.5.1.2-1 Auxiliary Data Files for MERIS Level 2 Processing

Description	Auxiliary File ID
Cloud measurement parameters data	MER_CMP_AX
Land aerosols parameters data	MER_LAP_AX
Ocean aerosols parameters data	MER_OAP_AX
Ocean I parameters data file	MER_OC1_AX
Ocean II parameters data	MER_OC2_AX
Atmospheric parameters data	MER_ATP_AX

Table 11.5.1.2-1 Auxiliary Data Files for MERIS Level 2 Processing	
Description	**Auxiliary File ID**
Processing Level-2 control parameters data	MER_CP2_AX
Land vegetation index parameters data	MER_LVI_AX
Aerosol Climatology Data file	MER_AER_AX
Water Vapour Parameters	MER_WVP_AX
Surface Confidence Map data	MER_SCM_AX

11.5.1.3 Processing Performed

This document is not the applicable document for algorithm description. The following is intended only as a high level overview of the processing steps. Algorithm steps applied include :

- further Pixel Classification algorithms (water type, cloud, snow, vegetation, soil),
- Surface pressure at non-cloud global DEM elevations,
- Aerosol type, size, and spatial distribution,
- Ozone optical thickness and spatial distribution,
- Water vapour amount and spatial distribution,
- Wind speed glint and white cap threat flagging,
- Atmospheric aerosol and Rayleigh scattering,
- Water parameter algorithms,
- Land indices, and quality assessment.

11.5.1.4 Product Structure

Each MERIS Level 2-RR geophysical product corresponds to one complete segment. The top level breakdown of the product is shown in the table below.

Table 11.5.1.4-1 High-level Breakdown of MER_RR__2P

MPH
Level 2 - SPH (includes DSDs)
Level 2 ADS Summary Quality ADS (SQ ADS)
Level 2 GADS Scaling Factors and General Info
Level 2 ADS Tie Points Location & Aux. Data (L ADS)
Level 2 MDS (1)
...
Level 2 MDS (13)
Level 2 MDS (14)
Level 2 MDS (15)
Level 2 MDS (16)
Level 2 MDS (17)
Level 2 MDS (18)
Level 2 MDS (19)
Level 2 MDS (20) Flags

11.5.1.5 Main Product Header

The MPH will be the same as described in Volume 5.

11.5.1.6 Specific Product Header

The only difference between the SPH of the Level 1B RR product and that of the Level 2 RR product is the list of DSDs which follow the main body of the SPH. The contents of the MER_RR__2P Specific Product Header shall be as shown in the table below. The SPH is an ASCII header. Refer to Volume 5 for an explanation of ASCII header conventions.

Table 11.5.1.6-1 MERIS Level 2 - RR SPH Description

N	Description	Units	Byte Length	Data Type	Dim.
1-41	**Fields 1-41 of the Level 1B SPH described in Table 11.4.1.6-1.**	-	1542	-	-
	DSDs for included Data Sets				
42	**DSD (A) - Summary Quality ADS (SQ ADS)**	-	280	dsd	1
43	**DSD (G) -GADS - Scaling factors and Offsets**	-	280	dsd	1

Table 11.5.1.6-1 MERIS Level 2 - RR SPH Description					
N	**Description**	**Units**	**Byte Length**	**Data Type**	**Dim.**
44	**DSD (A) - Tie points annotation loc. & Aux. Data ADS**	-	280	dsd	1
45 - 64	**DSD (M) -Measurement Data Set Descriptors MDS (1-20)**	-	5600	dsd	20
65	**DSD - Spare (279 blank space characters followed by a newline character)**	-	280	dsd_sp	1
	DSDs for referenced files				
66	**DSD (R) Parent Level 1B Product**	-	280	dsd	1
67	**DSD (R) - Aerosol Climatology Data File**	-	280	dsd	1
68	**DSD (R) - Level 2 control parameters data file**	-	280	dsd	1
69	**DSDs (R) -Atmospheric parameters data file**	-	280	dsd	1
70	**DSDs (R) -Water vapour parameters data file**	-	280	dsd	1
71	**DSDs (R) -Ocean aerosols parameters data file**	-	280	dsd	1
72	**DSDs (R) -Land aerosols parameters data file**	-	280	dsd	1
73	**DSDs (R) -Ocean I parameters data file**	-	280	dsd	1
74	**DSDs (R) -Ocean II parameters data file**	-	280	dsd	1
75	**DSDs (R) -Cloud measurement parameters data file**	-	280	dsd	1
76	**DSDs (R) -Land vegetation index parameters data file**	-	280	dsd	1
77	**DSDs (R) -Spare (279 blank space characters followed by a newline character)**	-	280	dsd	1
TOTAL			**11622**		

The following strings will be used in the field DS_NAME for the DSDs listed in the SPH above.

Table 11.5.1.6-2 DS_NAME Strings	
DSD	**DS_NAME String**
DSDs for included Data Sets	
DSD-A of Level 2 Summary Quality ADS (SQADS)	Quality ADS
DSD-G of Level 2 Scaling Factors and Offsets GADS	Scaling Factor GADS
DSD-A of Level 2 Tie Points Loc. & Aux. Data ADS	Tie points ADS
DSD (M) -Measurement Data Set Descriptors MDS (1)	Norm. rho_surf - MDS(1)
DSD (M) -Measurement Data Set Descriptors MDS (2)	Norm. rho_surf - MDS(2)

Table 11.5.1.6-2 DS_NAME Strings	
DSD	**DS_NAME String**
DSD (M) -Measurement Data Set Descriptors MDS (3)	Norm. rho_surf - MDS(3)
DSD (M) -Measurement Data Set Descriptors MDS (4)	Norm. rho_surf - MDS(4)
DSD (M) -Measurement Data Set Descriptors MDS (5)	Norm. rho_surf - MDS(5)
DSD (M) -Measurement Data Set Descriptors MDS (6)	Norm. rho_surf - MDS(6)
DSD (M) -Measurement Data Set Descriptors MDS (7)	Norm. rho_surf - MDS(7)
DSD (M) -Measurement Data Set Descriptors MDS (8)	Norm. rho_surf - MDS(8)
DSD (M) -Measurement Data Set Descriptors MDS (9)	Norm. rho_surf - MDS(9)
DSD (M) -Measurement Data Set Descriptors MDS (10)	Norm. rho_surf - MDS(10)
DSD (M) -Measurement Data Set Descriptors MDS (11)	Norm. rho_surf - MDS(11)
DSD (M) -Measurement Data Set Descriptors MDS (12)	Norm. rho_surf - MDS(12)
DSD (M) -Measurement Data Set Descriptors MDS (13)	Norm. rho_surf - MDS(13)
DSD (M) -Measurement Data Set Descriptors MDS (14)	Vapour Content - MDS(14)
DSD (M) -Measurement Data Set Descriptors MDS (15)	Chl_1, TOAVI - MDS(15)
DSD (M) -Measurement Data Set Descriptors MDS (16)	YS, SPM, Rect. Rho- MDS(16)
DSD (M) -Measurement Data Set Descriptors MDS (17)	Chl_2, BOAVI - MDS(17)
DSD (M) -Measurement Data Set Descriptors MDS (18)	Press PAR Alb - MDS(18)
DSD (M) -Measurement Data Set Descriptors MDS (19)	Alpha, OPT - MDS(19)
DSD (M) -Measurement Data Set Descriptors MDS (20)	Flags - MDS(20)
DSDs for referenced files	
DSD (R) Parent Level 1B Product	LEVEL_1B_PRODUCT
DSD (R) - Aerosol Climatology Data File	AEROSOL_CLIMATOLOGY_FILE
DSD (R) - Level 2 control parameters data file	PROCESSING_PARAMS_L2_FILE
DSDs (R) -Atmospheric parameters data file	ATMOSPHERIC_PARAMETERS_FILE
DSDs (R) -Water vapour parameters data file	WATER_VAPOUR_PARAMETERS_FILE
DSDs (R) -Ocean aerosols parameters data file	OCEAN_AEROSOLS_PARAMS_FILE
DSDs (R) -Land aerosols parameters data file	LAND_AEROSOLS_PARAMS_FILE
DSDs (R) -Ocean I parameters data file	OCEAN_I_PARAMETERS_FILE
DSDs (R) -Ocean II parameters data file	OCEAN_II_PARAMETERS_FILE
DSDs (R) -Cloud measurement parameters data file	CLOUD_MEASUREMENT_FILE
DSDs (R) -Land vegetation index parameters data file	LAND_VEGETATION_INDEX_FILE

Note : additional blank space characters "Ø" are defined in several DS_Names for string alignment only.

11.5.1.7 Data Sets

The contents of the Data Sets are described in the following sections. Data Sets are in mixed binary format. They may contain ACSII strings, but the ASCII strings are not contained within quotation marks as for the MPH/SPH.

11.5.1.7.1 Annotation Data Set - Summary Quality

This ADS contains only data useful for the evaluation of the quality of the product. It will have one ADS Record for every 8th along track tie frame, therefore it will hold a maximum of 116 records.

The size of the ADS has been summarized below:

Table 11.5.1.7.1-1 MER_RR__2P - Summary Quality ADS

ADSR No.	Description	Byte Size
1	**ADSR associated with Tie Frame 1 .. 8**	32
2	**ADSR associated with Tie Frame 9 .. 16**	32
...	**...**	...
115	**ADSR associated with Tie Frame 913 .. 920**	32
116	**ADSR associated with Tie Frame 921 .. 925**	32
	Total (in bytes)	**3712**

Table 11.5.1.7.1-2 MER_RR__2P - Summary Quality ADSR

N	Description	Units	Byte Length	Data Type	Dim.
1	**Start time of the measurement**	-	12	mjd	1
2	**Attachment Flag** (set to 1 if there are no MDSRs corresponding to this ADSR, set to zero otherwise)	-	1	uc	1
3	**% of water pixels having absorbing aerosols**	%	1	uc	1
4	**% of water pixels**	%	1	uc	1

Table 11.5.1.7.1-2 MER_RR__2P - Summary Quality ADSR					
N	**Description**	**Units**	**Byte Length**	**Data Type**	**Dim.**
5	**% of DDV land pixels**	%	1	uc	1
6	**% of land pixels**	%	1	uc	1
7	**% of cloud pixels**	%	1	uc	1
8	**% of pixels with low polynomial pressure**	%	1	uc	1
9	**% of pixels with low Neural Network pressure**	%	1	uc	1
10	**% of pixels with out of range inputs for water vapour proc.**	%	1	uc	1
11	**% of pixels with out of range outputs for water vapour proc.**	%	1	uc	1
12	**% of pixels with out of range inputs for Cloud proc.**	%	1	uc	1
13	**% of pixels with out of range outputs for Cloud proc.**	%	1	uc	1
14	**% of pixels with out of range inputs for Land proc.**	%	1	uc	1
15	**% of pixels with out of range outputs for Land proc.**	%	1	uc	1
16	**% of pixels with out of range inputs for Water proc.**	%	1	uc	1
17	**% of pixels with out of range outputs for Water proc.**	%	1	uc	1
18	**% of pixels with out of range inputs for Case 1 proc.**	%	1	uc	1
19	**% of pixels with out of range outputs for Case 1 proc.**	%	1	uc	1
20	**% of pixels with. out of range inputs for Case 2 proc.**	%	1	uc	1
21	**% of pixels with. out of range outputs for Case 2 proc.**	%	1	uc	1
	ADSR size (in bytes)		**32**		

11.5.1.7.2 Global Annotation Data Set - Scaling Factors and General Info

The contents of the GADS - Scaling Factors and General Info is shown in the table below:

Table 11.5.1.7.2-1 MER_RR__2P - Scaling Factors and General Info GADS					
N	**Description**	**Units**	**Byte Length**	**Data Type**	**Dim.**
1	**scaling factor - altitude**	-	4	fl	1
2	**scaling factor - roughness**	-	4	fl	1
3	**scaling factor - zonal wind**	-	4	fl	1
4	**scaling factor - meridional wind**	-	4	fl	1
5	**scaling factor - atmospheric pressure**	-	4	fl	1
6	**scaling factor - ozone**	-	4	fl	1
7	**scaling factor - relative humidity**	-	4	fl	1
8	**scaling factor - reflectances**	-	52	fl	13
9	**scaling factor - Algal pigment index**	-	4	fl	1
10	**scaling factor - Yellow substance**	-	4	fl	1
11	**scaling factor - Suspended sediment**	-	4	fl	1
12	**scaling factor - Aerosol epsilon**	-	4	fl	1
13	**scaling factor - Aerosol optical thickness**	-	4	fl	1
14	**scaling factor - Cloud optical thickness**	-	4	fl	1
15	**scaling factor - Surface pressure**	-	4	fl	1
16	**scaling factor - Water vapour**	-	4	fl	1
17	**scaling factor - Photosynthetically active radiation**	-	4	fl	1
18	**scaling factor - TOA Vegetation index**	-	4	fl	1
19	**scaling factor - BOA Vegetation index**	-	4	fl	1
20	**scaling factor - Cloud Albedo**	-	4	fl	1
21	**scaling factor - Cloud Top Pressure**	-	4	fl	1
22	**offset - reflectances**	-	52	fl	13
23	**offset - Algal pigment index**	$Log_{10}(mg.m^{-3})$	4	fl	1
24	**offset - Yellow substance**	$Log_{10}(m^{-1})$	4	fl	1
25	**offset - Total Suspended sediment**	$Log10(g.m^{-3})$	4	fl	1
26	**offset - Aerosol epsilon**	-	4	fl	1
27	**offset - Aerosol optical thickness**	-	4	fl	1
28	**offset - Cloud optical thickness**	-	4	fl	1
29	**offset - Surface pressure**	hPa	4	fl	1

Table 11.5.1.7.2-1 MER_RR__2P - Scaling Factors and General Info GADS					
N	**Description**	**Units**	**Byte Length**	**Data Type**	**Dim.**
30	**offset - Water vapour**	$g.cm^{-2}$	4	fl	1
31	**offset - Photosynthetically active radiation**	$\mu Einstein.m^{-2}$	4	fl	1
32	**offset - TOA Vegetation index**	-	4	fl	1
33	**offset - BOA Vegetation index**	-	4	fl	1
34	**offset - Cloud Albedo**	-	4	fl	1
35	**offset - Cloud Top Pressure**	hPa	4	fl	1
36	**Gain setting**	-	80	uc	5*16
37	**sampling rate**	(10^{-6}) s	4	ul	1
38	**Sun Spectral Flux (for bands 1-15)**	LU	60	fl	15
39	**scaling factor -rectified near infrared reflectance**	-	4	fl	1
40	**offset -rectified near infrared reflectance**	-	4	fl	1
41	**scaling factor -rectified near red reflectance**	-	4	fl	1
42	**offset -rectified near red reflectance**	-	4	fl	1
43	**Spare**	-	44	uc	44
	GADS size (in bytes)		**440**		

All scaling coefficients are dimensionless, the field unit is specified in the ADSR / MDSR description section.

11.5.1.7.3 Annotation Data Set - Tie Points Location and Auxiliary Data

The Tie Points location annotation data set of the MERIS RR Level 2 product shall have the same format and contents as the Level 1 RR product Tie Points location annotation data set, described in Section 11.4.1.7.3.

11.5.1.7.4 Measurement Data Sets (1-20)

There are 20 measurement data sets, the first 19 consist of geophysical parameters, the 20th MDS consists of flags associated to each pixel.
Each measurement data set consists of a maximum of 14785 image lines. Each image line constitutes one MDSR including 1121 samples.

Table 11.5.1.7.4-1 below summarises the contents of the MDSs.

Table 11.5.1.7.4-1 MERIS Level 2 - RR MDS Summary		
MDS No.	**Description**	**Size (10⁶ bytes)**
1	**MDS-1 normalised surface reflectance 1**	33.3
...	**....**	
13	**MDS-13 normalised surface reflectance 13**	33.3
14	**MDS-14 Water vapour content**	16.7
15	**MDS-15 Algal index I, TOAVI, Cloud Top Pressure**	16.7
16	**MDS-16 Yellow Substance, Total Suspended Matter, Rect. Rho**	33.3
17	**MDS-17 Algal index II, BOAVI**	16.7
18	**MDS-18 PAR, surface pressure, cloud albedo**	16.7
19	**MDS-19 Aerosols type and Angstrom exponent, optical thickness, Cloud type**	33.3
20	**MDS-20 Flags**	49.9
	Total	**617**

Note: the values above are subject of ongoing work and are likely to evolve meaningfully in the future.

The measurement data set shall consist of geophysical parameters provided in counts with the appropriate band geophysical scaling factor provided in the GADS - Scaling Factors (see Global Annotation Data Set - Scaling Factors above).
Geophysical parameters for each pixel shall be provided which depend on their classification: ocean, land, cloud and which include:

Table 11.5.1.7.4-2 MERIS Level 2 - RR-pixel MDS Contents Summary			
MDS No.	**Ocean**	**Land**	**Cloud**
1	rs(b1)	rs(b1)	rs(b1)
2	rs(b2)	rs(b2)	rs(b2)
3	rs(b3)	rs(b3)	rs(b3)
4	rs(b4)	rs(b4)	rs(b4)
5	rs(b5)	rs(b5)	rs(b5)
6	rs(b6)	rs(b6)	rs(b6)
7	rs(b7)	rs(b7)	rs(b7)

Table 11.5.1.7.4-2 MERIS Level 2 - RR-pixel MDS Contents Summary			
MDS No.	**Ocean**	**Land**	**Cloud**
8	rs(b8)	rs(b8)	rs(b8)
9	rs(b9)	rs(b9)	rs(b9)
10	rs(b10)	rs(b10)	rs(b10)
11	rs(b12)	rs(b12)	rs(b12)
12	rs(b13)	rs(b13)	rs(b13)
13	rs(b14)	rs(b14)	rs(b14)
14	Water vapour	Water vapour	Water vapour
15	Algal I	TOAVI	Cloud top pressure
16	TSM - YS	Rectified reflectances in red and near infrared bands	Spare
17	Algal II	BOAVI	Spare
18	PAR	Surface pressure	Cloud albedo
19	Aerosol δ at 865nm, Angstrom exponent between 779 and 865 nm	Aerosol δ at 442nm, Angstrom exponent over the visibile range	Cloud δ, type
20	Flags	Flags	Flags

Notes:

- rs: normalised surface reflectance, dimensionless, indexed by MERIS band index. Reflectance are obtained above waters, above lands, above cloud;
- Water vapour total column contents is in $g.m^{-2}$;
- Surface pressure in hPa;
- Algal pigment index I and II expressed in equivalent Log_{10} ($mg.m^{-3}$) of chlorophyll;
- TOAVI Top of atmosphere vegetation index, dimensionless; The MGVI algorithm is used for TOAVI computation.
- Cloud top pressure in hPa;
- YS, yellow substance absorption expressed in $Log_{10}(m^{-1})$;
- TSM (or SPM), total suspended matter concentration expressed in equivalent in Log_{10} ($g.m^{-3}$);
- Cloud albedo, dimensionless;
- BOAVI: Bottom Of Atmosphere Vegetation Index, based on Rayleigh corrected TOAR; The MTCI algorithm is used for BOAVI computation.
- PAR Photosynthetically Available Radiation expressed in $\mu Einstein.m^{-2}\ s^{-1}$;
- δ, cloud or aerosol optical thickness (AOT), dimensionless; AOT is retrieved at

443nm over land and at 865nm over sea.

- aerosol Angstrom exponent, dimensionless;
- Cloud type index used to describe the cloud, as described in Measurement Data Set Records MDS (19) below;
- Rectfied reflectances in red and near infrared bands dimensionless
- Flag annotation as described in Measurement Data Set Records MDS (20) below.

11.5.1.7.4.1 Measurement Data Set Records MDS (1-13)

The MDSRs for the first 13 MDSs shall be normalised surface reflectance provided in counts - with the appropriate band radiometric scaling factor provided in the GADS-Scaling factors.

Table 11.5.1.7.4.1-1 MERIS Level 2 - RR-MDSR 1 to 13

N	Description	Units	Byte Size	Data Type	Dim.
1	**Start Time of the measurement**	-	12	mjd	1
2	**Quality Indicator** -1 = all values are zero, 0 otherwise.	-	1	sc	1
3	**normalised surface reflectance pixel #1 - 1121**	-	2242	us	1121
	Total		**2255**		

There is one MDSR per line of data, therefore there are a maximum of 14785 MDSRs of the above format in the MDS.

11.5.1.7.4.2 Measurement Data Set Records MDS (14)

The MDSRs for MDS-14 shall be water vapour column content provided in $g.cm^{-2}$ - with the appropriate scaling factor provided in the GADS - Scaling factors.

Table 11.5.1.7.4.2-1 MERIS Level 2 - RR-MDSR for MDS 14

N	Description	Units	Byte Size	Data Type	Dim.
1	**Start Time of DSR**	-	12	mjd	1
2	**Quality Indicator** -1 = all values are zero, 0 otherwise.	-	1	sc	1
3	**Water vapour content pixel #1 - 1121**	$g.cm^{-2}$	1121	uc	1121

Table 11.5.1.7.4.2-1 MERIS Level 2 - RR-MDSR for MDS 14					
N	**Description**	**Units**	**Byte Size**	**Data Type**	**Dim.**
	Total		**1134**		

There is one MDSR per line of data, therefore there are a maximum of 14785 MDSRs of the above format in the MDS.

11.5.1.7.4.3 Measurement Data Set Records MDS (15)

The MDSRs for MDS-15 shall contain algal pigment index I ($Log_{10}(mg.m^{-3})$), top of the atmosphere vegetation index (dimensionless) or cloud top pressure (hPa), depending on the surface type; all are provided with the appropriate scaling factors provided in the GADS - Scaling factors.

TOAVI is computed through the MGVI (MERIS Global Vegetation Index) Algorithm.

Table 11.5.1.7.4.3-1 MERIS Level 2 - RR-MDSR for MDS 15					
N	**Description**	**Units**	**Byte Size**	**Data Type**	**Dim.**
1	**Start Time of DSR**	-	12	mjd	1
2	**Quality Indicator** -1 = all values are zero, 0 otherwise.	-	1	sc	1
3	**Algal I or TOAVI or cloud top pressure pixel #1 - #1121**	$Log_{10}(mg.m^{-3})$ or dl or hPa	1121	uc	1121
	Total		**1134**		

There is one MDSR per line of data, therefore there are a maximum of 14785 MDSRs of the above format in the MDS.

11.5.1.7.4.4 Measurement Data Set Records MDS (16)

The MDSRs for MDS-16 shall be yellow substance absorption (m-1 in Log10 scale) and total suspended matter concentration (g.m-3) above water and rectified reflectances in red and near infrared bands (dimensionless) above land interleaved by pixel and scaled with the appropriate scaling factor and offsets provided in the GADS - Scaling factors and offsets. The samples shall be void above cloudy pixels.

Table 11.5.1.7.4.4-1 MERIS Level 2 - RR-MDSR for MDS 16

N	Description	Units	Byte Size	Data Type	Dim.
1	**Start Time of DSR**	-	12	mjd	1
2	**Quality Indicator** -1 = all values are zero, 0 otherwise.	-	1	sc	1
3	**YS and TSM for pixel or rectified reflectances in red and near infrared bands#1 - #1121**	$\log_{10}(m^{-1})$, $\log_{10}(g.m^{-3})$	2242	uc	1121 *2
	Total		**2255**		

Note for water pixels that YS and TSM are interleaved by pixel: in 2 consecutive bytes, YS is stored in byte 0 and TSM is stored in byte 1.For land pixels rectified reflectances are interleaved by pixel: each pixel uses two consecutive bytes of the MDSR, red band is stored in byte 0 and near infrared band is stored in byte. There is one MDSR per line of data, therefore there are a maximum of 14785 MDSRs of the above format in the MDS.

11.5.1.7.4.5 Measurement Data Set Records MDS (17)

The MDSRs for MDS-17 shall be algal pigment index II ($Log_{10}(mg.m^{-3})$) above water and bright pixels, bottom of atmosphere vegetation index (dimensionless) above land, scaled with the appropriate scaling factor provided in the GADS - Scaling factors. The samples will be void above cloudy pixels. Void samples are set to zero.

Table 11.5.1.7.4.5-1 MERIS Level 2 - RR-MDSR for MDS 17

N	Description	Units	Byte Size	Data Type	Dim.
1	**Start Time of DSR**	-	12	mjd	1
2	**Quality Indicator** -1 = all values are zero, 0 otherwise.	-	1	sc	1
3	**Algal II or BOAVI pixel #1 - #1121**	$\log_{10}(mg.m^{-3})$ or	1121	uc	1121
	Total		**1134**		

There is one MDSR per line of data, therefore there are a maximum of 14785 MDSRs of the above format in the MDS.
BOAVI is computed through the MTCI (MERIS Terrestrial Chlorophil Index) Algorithm.

11.5.1.7.4.6 Measurement Data Set Records MDS (18)

The MDSRs for MDS-18 shall be Photosynthetically Available Radiation (Einstein.m^{-2}) above water and bright pixels, cloud albedo (dimensionless) above clouds pixels, or surface pressure (hPa) above land pixels, scaled with the appropriate scaling factor provided in the GADS - Scaling factors. The samples will be void for land pixels. Void samples are set to zero.

Table 11.5.1.7.4.6-1 MERIS Level 2 - RR-MDSR for MDS 18

N	Description	Units	Byte Size	Data Type	Dim.
1	**Start Time of DSR**	-	12	mjd	1
2	**Quality Indicator** -1 = all values are zero, 0 otherwise.	-	1	sc	1
3	**PAR, surface pressure or cloud albedo pixel #1- #1121**	µEinstein.m^{-2} m^{-1}, hPa or dl	1121	uc	1121
	Total		**1134**		

There is one MDSR per line of data, therefore there are a maximum of 14785 MDSRs of the above format in the MDS.

11.5.1.7.4.7 Measurement Data Set Records MDS (19)

The MDSRs for MDS-19 shall be aerosol Angstrom exponent (dimensionless) and aerosol optical thickness respectively at 865 nm (dimensionless) above water and at 433 nm above land pixels, and cloud optical thickness (dimensionless) and type index above cloud pixels, scaled with the appropriate scaling factor provided in the GADS - Scaling factors.

Table 11.5.1.7.4.7-1 MERIS Level 2 - RR-MDSR for MDS 19

N	Description	Units	Byte Size	Data Type	Dim.
1	**Start Time of DSR**	-	12	mjd	1
2	**Quality Indicator** -1 = all values are zero, 0 otherwise.	-	1	sc	1
3	**Aerosol Angstrom exponent or Cloud type & optical thickness pixel #1- #1121**	-	2242	uc	1121* 2
	Total		**2255**		

Note that Aerosol Angstrom exponent or Cloud type and Cloud optical thickness are interleaved by pixel. In 2 consecutive bytes, cloud type is stored in byte 0 and cloud optical thickness is stored in byte 1. There is one MDSR per line of data, therefore there are a maximum of 14785 MDSRs of the above format in the MDS.

Table 11.5.1.7.4.7-2 Cloud type index coding			
Optical thickness Pressure (hPa)	**0 - 3.6**	**3.6 - 23**	**23 - 379**
50 - 440	135 (Cirrus)	136 (Cirrostratus)	137 (deep convection)
440 - 680	132 (Altocumulus)	133 (Altostratus)	134 (Nimbostratus)
680 - 1000	129 (Cumulus)	130 (Stratocumulus)	131 (Stratus)

Note : Clouds outside the ranges in table above have a cloud type index of 128. The cloud type index is devised so that by masking bit 7, one gets an index in the range 0-9.

11.5.1.7.4.8 Measurement Data Set Records MDS (20)

The MDSR for MDS-20 shall be binary annotation flags associated to each pixel, each flag coded on 3 bytes (24 bits). The format of each MDSR is shown below:

Table 11.5.1.7.4.8-1 MERIS Level 2 - RR-MDSR for MDS 20					
N	**Description**	**Units**	**Byte Size**	**Data Type**	**Dim.**
1	**Start Time of DSR**	-	12	mjd	1
2	**Quality Indicator** -1 = all values are zero, 0 otherwise.	-	1	sc	1
3	**Flags associated with pixel #1**	-	3	uc	3
...	**...**	...	...	...	...
1123	**Flags associated with pixel #1121**	counts	3	uc	3
	Total		**3376**		

There is one MDSR per line of data, therefore there are a maximum of 14785 MDSRs of the above format in the MDS.
The flags shall be coded on 24 bits or 3 bytes, with each flag being coded on a single bit according to the following sequence[3]:

Table 11.5.1.7.4.8-2 Description of the Flag Coding					
Bit num.	**Symbol & Description**	**Type**	**Relevant to surface type**		
			Water	**Land**	**Cloud**
23	LAND : Land product available	class	Yes	Yes	Yes
22	CLOUD : Cloud product available	class	Yes	Yes	Yes

[3] *Refer to Annex A for bit numbering convention.*

Table 11.5.1.7.4.8-2 Description of the Flag Coding

Bit num.	Symbol & Description	Type	Relevant to surface type		
			Water	Land	Cloud
21	WATER : Water product available	class	Yes	Yes	Yes
20	PCD_1_13 : Confidence flag for MDS 1 to 13	confidence	Yes	Yes	Yes
19	PCD_14 : Confidence flag for MDS 14	confidence	Yes	Yes	Yes
18	PCD_15 : Confidence flag for MDS 15	confidence	Yes	Yes	Yes
17	PCD_16 : Confidence flag for MDS 16	confidence	Yes	Yes	No
16	PCD_17 : Confidence flag for MDS 17	confidence	Yes	Yes	No
15	PCD_18 : Confidence flag for MDS 18	confidence	Yes	Yes	Yes
14	PCD_19 : Confidence flag for MDS 19	confidence	Yes	Yes	Yes
13	COASTLINE : Coastline flag	science	Yes	Yes	Yes
12	COSMETIC : Cosmetic flag (from level-1B)	science	Yes	Yes	Yes
11	SUSPECT : Suspect flag (from level-1B)	science	Yes	Yes	Yes
10	OADB : Out of Aerosol Data Base (no available aerosol model could fit measurements)	science	Yes	No	No
9	ABSOA_DUST : Dust-like absorbing aerosol	science	Yes	No	No
8	CASE2_S or SNOW_ICE: Turbid (sediment dominated Case 2) water or Snow/Ice covered land	science	Yes	Yes	No
7	CASE2_ANOM or TOAVI_BRIGHT: Anomalous scattering water or bright land pixel according to MGVI processing	science	Yes	Yes	No
6	CASE2_Y or TOAVI_BAD: Yellow substance loaded water or bad land pixel according to MGVI processing	science	Yes	Yes	No
5	ICE_HAZE or TOAVI_CSI: Ice ot high aerosol load pixel or cloud, snow or ice over land pixel according to MGVI processing	science	Yes	Yes	No
4	MEDIUM_GLINT or TOAVI_WS: Corrected for glint or Water/Shadow land pixel according to MGVI processing	science	Yes	Yes	No
3	BPAC_ON or DDV : Bright Pixels Atm. Correction activated (water) or Dense Dark Vegetation (land)	science	Yes	Yes	No
2	HIGH_GLINT or TOAVI_INVAL_REC: High (uncorrected) glint or invalid rectification for land pixels	science	Yes	Yes	No
1	LOW_SUN: Sun low above horizon (or conversely high Sun zenith angle)	science	Yes	Yes	Yes
0	WHITE_SCATTERER : presence of a white scatterer in water (water)	science	Yes	No	No

Note 1: LAND, CLOUD and WATER flags are mutually exclusive.

Note 2 : The type of the above flags correspond to the following cases :
- Class flags : to support the decoding of other MDS by providing the surface type information;
- Science flags : to provide additional scientific information, relevant to product interpretation;
- Confidence flags : to provide confidence information for each product.

11.5.1.8 Size Estimate

The maximum estimated size of the Level 2 RR Product is calculated as follows:

MPH: 1247 bytes
SPH: 11662 bytes
SQ ADS: 3712 bytes
Scaling Factors and General Info GADS: 440 bytes
Tie Points ADS:3295775 bytes
MDSs: 617 MB
TOTAL: approx. 621 MB

11.5.2 MERIS Extracted Cloud and Water Vapour

This RR Level 2 product contains selected information extracted from the MERIS Reduced Resolution Geophysical product. The primary geophysical parameters are cloud thickness and water vapour content. This product is available in NRT form only, from the PDHS, 3 hours after data acquisition. It is primarily intended for meteorological applications.

11.5.2.1 Input Data

Level 2 RR Geophysical product.

11.5.2.2 Auxiliary Data Used

This is an extracted product thus no further auxiliary data is used.

11.5.2.3 Processing Performed

This is an extracted product thus only an extraction algorithm is needed.

11.5.2.4 Product Structure

The format of the product is shown below:

Table 11.5.2.4-1 High-level Breakdown of MER_RRC_2P

MPH
Level 2 - SPH (includes DSDs)
Level 2 Summary Quality ADS (SQ ADS)
Level 2 GADS Scaling Factors and General Info
Level 2 ADS Tie Points Location & Aux. Data (L ADS)
Level 2 MDS Cloud Optical Thickness
Level 2 MDS Cloud Top Pressure
Level 2 MDS Total Water Vapour
Level 2 MDS Flags

11.5.2.5 Main Product Header

The MPH will be the same as described in Volume 5.

11.5.2.6 Specific Product Header

The SPH will have the same format and contents as the Level 2 reduced resolution Product SPH described in Section 11.5.1.6. Unused DSDs will be set to SPARE, as per

Volume 5.
The following strings will be used in the field DS_NAME for the DSDs listed in the SPH above.

Table 11.5.2.6-1 DS_NAME Strings	
DSD	**DS_NAME String**
DSDs for included Data Sets	
DSD-A of Level 2 Summary Quality ADS (SQADS)	Quality ADS
DSD-G of Level 2 Scaling Factors and Offsets GADS	Scaling Factor GADS
DSD-A of Level 2 Tie Points Loc. & Aux. Data ADS	Tie points ADS
DSD (M) -Measurement Data Set Descriptors MDS (1)	MDS Cloud Type, OT
DSD (M) -Measurement Data Set Descriptors MDS (2)	MDS Cloud Top Pressure
DSD (M) -Measurement Data Set Descriptors MDS (3)	MDS Vapour Content
DSD (M) -Measurement Data Set Descriptors MDS (4)	MDS Flags

11.5.2.7 Data Sets

The Data Sets contained in the MER_RRC_2P product are described in the following sub-sections.

11.5.2.7.1 Annotation Data Set - Summary Quality ADS (SQ ADS)

This data set is of the same format and content as the Level 2 Reduced Resolution Product SQ ADS described in Section 11.5.1.7.1.

11.5.2.7.2 Global Annotation Data Set - Scaling Factors and General Info

The format and content of this GADS is shown in the table below:

Table 11.5.2.7.2-1 MERIS Level 2 -Scaling Factors and General Info GADS					
N	**Description**	**Units**	**Byte Size**	**Data Type**	**Dim.**
1	**scaling factor - Cloud optical thickness**	-	4	fl	1
2	**scaling factor - Cloud Top Pressure**	-	4	fl	1
3	**scaling factor - Water vapour**	-	4	fl	1
4	**offset - Cloud optical thickness**	-	4	fl	1
5	**offset - Cloud Top Pressure**	hPa	4	fl	1
6	**offset - Water vapour**	$g.cm^{-2}$	4	fl	1
7	**Spare**	-	52	uc	52

Table 11.5.2.7.2-1 MERIS Level 2 -Scaling Factors and General Info GADS					
N	**Description**	**Units**	**Byte Size**	**Data Type**	**Dim.**
	Total		**76**		

11.5.2.7.3 Annotation Data Set - Tie Points location and Auxiliary Data

The Tie Points location and Auxiliary Data ADS of the Level 2 Reduced Resolution Cloud Optical Thickness and Water Vapour Product shall have the same format and contents as the Level 1 Reduced Resolution Tie Points location and Auxiliary Data ADS, described in Section 11.4.1.7.3.

11.5.2.7.4 Measurement Data Set - Cloud Optical Thickness

The format and contents of this MDS shall be as the Level 2 Reduced Resolution Cloud Optical Thickness MDS described in Section 11.5.1.7.4.7.
Water, land and bright pixels shall have a value set to 0.

11.5.2.7.5 Measurement Data Set - Cloud Top Pressure

The format of this MDS shall be as the Level 2 Reduced Resolution Cloud Top Pressure MDS described in Section 11.5.1.7.4.3.
Water, land and bright pixels shall have a value set to 0.

11.5.2.7.6 Measurement Data Set - Total Water Vapour

The format and contents of this MDS shall be as the Level 2 Reduced Resolution Cloud and Total Water Vapour MDS described in Section 11.5.1.7.4.2.

11.5.2.7.7 Measurement Data Set - Flags

The format and contents of this MDS shall be as the Level 2 Reduced Resolution Flags MDS described in Section 11.5.1.7.4.8.

11.5.2.8 Size Estimate

The maximum size is estimated at:

MPH: 1247 bytes
SPH: 11662 bytes
SQ ADS: 3712 bytes
Scaling Factors and General Info GADS: 76 bytes
Tie Points ADS:3295775 bytes
MDS Optical thickness = 2255 bytes/MDSR * 14785 MDSR = 33.3 MB
MDS Cloud Top Pressure = 1134 bytes/MDSR * 14785 MDSR = 16.76 MB
MDS Water Vapour = 1134 bytes/MDSR * 14785 MDSR = 16.76 MB
MDS Flags = 3376 bytes/MDSR * 14785 MDSR = 49.9 MB
TOTAL: approx. 120 MB

11.5.3 MERIS Extracted Cloud and Water Vapour for Meteo Users

This RR Level 2 product (MER_LRC_2P) contains selected information extracted from the MERIS Reduced Resolution Geophysical product. The primary geophysical parameters are cloud thickness and water vapour content. The resolution of the product is reduced to 4160 m across track at nadir by 4640 m along track through an averaging process. This product is available in NRT form only, from the PDHS, 3 hours after data acquisition. It is intended only for meteorological applications, and may be converted to BUFR format outside the PDS for GTS communications.

11.5.3.1 Input Data

Level 2 RR Geophysical product.

11.5.3.2 Auxiliary Data Used

This is an extracted product thus no further auxiliary data is used.

11.5.3.3 Processing Performed

Operations will include:

- data extraction;
- reduction of resolution. The product shall be resampled with reference to a 4 x 4 sub-sampled MERIS RR product grid.

11.5.3.4 Product Structure

The format of the product is shown below:

Table 11.5.3.4-1 High-level Breakdown of MER_LRC_2P
MPH
Level 2 - SPH (includes DSDs)
Level 2 Summary Quality ADS (SQ ADS)
Level 2 GADS Scaling Factors and General Info
Level 2 ADS Tie Points Location & Aux. Data (L ADS)
Level 2 MDS Cloud Optical Thickness
Level 2 MDS Cloud Top Pressure
Level 2 MDS Total Water Vapour
Level 2 MDS Flags

11.5.3.5 Main Product Header

The MPH will be the same as described in Volume 5.

11.5.3.6 Specific Product Header

The SPH will have the same format and contents as the Level 2 reduced resolution Product SPH described in Section 11.5.1.6. Unused DSDs will be set to SPARE, as per Volume 5.

The following strings will be used in the field DS_NAME for the DSDs listed in the SPH above.

Table 11.5.3.6-1 DS_NAME Strings

DSD	DS_NAME String
DSDs for included Data Sets	
DSD-A of Level 2 Summary Quality ADS (SQADS)	Quality ADS
DSD-G of Level 2 Scaling Factors and Offsets GADS	Scaling Factor GADS
DSD-A of Level 2 Tie Points Loc. & Aux. Data ADS	Tie points ADS
DSD (M) -Measurement Data Set Descriptors MDS (1)	MDS Cloud Type, OT
DSD (M) -Measurement Data Set Descriptors MDS (2)	MDS Cloud Top Pressure
DSD (M) -Measurement Data Set Descriptors MDS (3)	MDS Vapour Content
DSD (M) -Measurement Data Set Descriptors MDS (4)	MDS Flags

11.5.3.7 Data Sets

The Data Sets contained in the MER_LRC_2P product are described in the following sub-sections.

11.5.3.7.1 Annotation Data Set - Summary Quality ADS (SQ ADS)

This data set is of the same format and content as the Level 2 Reduced Resolution Product SQ ADS described in Section 11.5.1.7.1.

11.5.3.7.2 Global Annotation Data Set - Scaling Factors and General Info

The format and content of this GADS is identical to that of the MER_RRC_2P product, and is described in Section 11.5.2.7.2.

11.5.3.7.3 Annotation Data Set - Tie Points location and Auxiliary Data

The Tie Points location and Auxiliary Data ADS of the Level 2 Reduced Resolution Cloud Optical Thickness and Water Vapour Product shall have the same format and contents as the Level 1 Reduced Resolution Tie Points location and Auxiliary Data ADS, described in Section 11.4.1.7.3.

11.5.3.7.4 Measurement Data Set - Cloud Optical Thickness

Through the reduction in resolution, each MDSR contains only 281 samples, and there are only 3697 MDSRs maximum in an MDS. The format of each MDSR is shown in the table below:

Table 11.5.3.7.4-1 MERIS Level 2 - MER_LRC_2P MDSR

N	Description	Units	Byte Size	Data Type	Dim.
1	**Start Time of DSR**	-	12	mjd	1
2	**Quality Indicator** -1 = all values are zero, 0 otherwise.	-	1	sc	1
3	**cloud optical thickness pixel #1- #281**	-	281	uc	281
	Total		**294**		

11.5.3.7.5 Measurement Data Set - Cloud Top Pressure

Through the reduction in resolution, each MDSR contains only 281 samples, and there are only 3697 MDSRs maximum in an MDS. The format of each MDSR is shown in the table below:

Table 11.5.3.7.5-1 MERIS Level 2 - MER_LRC_2P MDSR

N	Description	Units	Byte Size	Data Type	Dim.
1	**Start Time of DSR**	-	12	mjd	1
2	**Quality Indicator** -1 = all values are zero, 0 otherwise.	-	1	sc	1
3	**cloud top pressure pixel #1- #281**	hPa	281	uc	281
	Total		**294**		

11.5.3.7.6 Measurement Data Set - Total Water Vapour

Through the reduction in resolution, each MDSR contains only 281 samples, and there are only 3697 MDSRs maximum in an MDS. The format of each MDSR is shown in the table below:

Table 11.5.3.7.6-1 MERIS Level 2 - MER_LRC_2P MDSR

N	Description	Units	Byte Size	Data Type	Dim.
1	**Start Time of DSR**	-	12	mjd	1

Table 11.5.3.7.6-1 MERIS Level 2 - MER_LRC_2P MDSR					
N	**Description**	**Units**	**Byte Size**	**Data Type**	**Dim.**
2	**Quality Indicator** -1 = all values are zero, 0 otherwise.	-	1	sc	1
3	**Water Vapour Content pixel #1-#281**	$g.cm^{-2}$	281	uc	281
	Total		**294**		

11.5.3.7.7 Measurement Data Set - Flags

Through the reduction in resolution, each MDSR contains only 281 samples, and there are only 3697 MDSRs maximum in an MDS. The format of each MDSR is shown in the table below:

Table 11.5.3.7.7-1 MERIS Level 2 - MER_LRC_2P MDSR					
N	**Description**	**Units**	**Byte Size**	**Data Type**	**Dim.**
1	**Start Time of DSR**	-	12	mjd	1
2	**Quality Indicator** -1 = all values are zero, 0 otherwise.	-	1	sc	1
3	**Flags associated with pixel #1**	-	3	uc	3
...	**...**	...	...	...	...
1123	**Flags associated with pixel #281**	-	3	uc	3
	Total		**856**		

The format and contents of the above flags are described in table 11.5.1.7.4.8-2.

11.5.3.8 Size Estimate

The maximum size is estimated at:

MPH: 1247 bytes
SPH: 11662 bytes
SQ ADS: 3712 bytes Scaling Factors and General Info GADS: 76 bytes
Tie Points ADS:3295775 bytes
MDS Optical thickness = 294 bytes/MDSR * 3697 MDSR = 1086918 bytes
MDS Cloud Top Pressure=294 bytes/MDSR * 3697 MDSR = 1086918 bytes
MDS Water Vapour = 294 bytes/MDSR * 3697 MDSR = 1086918 bytes
MDS Flags = 856 bytes/MDSR * 3697 MDSR = 3164632 bytes
TOTAL: approx. 9.7 MB

11.5.4 MERIS Extracted Vegetation Indices

This RR Level 2 product contains selected information extracted from the MERIS Reduced Resolution Geophysical product. The primary geophysical parameters is Vegetation indices. This product is available in NRT form only, from the PDHS, 3 hours after data acquisition.

11.5.4.1 Input Data

Level 2 RR Geophysical product.

11.5.4.2 Auxiliary Data Used

This is an extracted product thus no further auxiliary data is used.

11.5.4.3 Processing Performed

This is an extracted product thus only an extraction algorithm is needed.

11.5.4.4 Product Structure

The format of the product is shown below:

Table 11.5.4.4-1 High-level Breakdown of MER_RRV_2P

MPH
Level 2 - SPH (includes DSDs)
Level 2 ADS Summary Quality ADS (SQ ADS)
Level 2 GADS Scaling Factors and General Info
Level 2 ADS Tie Points Location & Aux. Data (L ADS)
Level 2 MDS TOA Vegetation Index
Level 2 MDS BOA Vegetation Index
Level 2 MDS Flags

11.5.4.5 Main Product Header

The MPH will be the same as described in Volume 5.

11.5.4.6 Specific Product Header

The SPH will have the same format and contents as the Level 2 reduced resolution Product SPH described in Section 11.5.1.6. Unused DSDs will be set to SPARE, as per Volume 5.

11.5.4.7 Data Sets

The Data Sets contained in the MER_RRV_2P product are described in the following sub-sections.

11.5.4.7.1 Annotation Data Set - Summary Quality ADS (SQ ADS)

This data set is of the same format and content as the Level 2 Reduced Resolution Product SQ ADS described in Section 11.5.1.7.1.

11.5.4.7.2 Global Annotation Data Set - Scaling Factors and General Info

The format and content of this GADS is shown in the table below:

Table 11.5.4.7.2-1 MERIS Level 2 - Scaling Factors and General Info GADS

N	Description	Units	Byte Size	Data Type	Dim.
1	**scaling factor - TOA Vegetation Index**	-	4	fl	1
2	**scaling factor - BOA Vegetation Index**	-	4	fl	1
3	**offset - TOA Vegetation Index**	-	4	fl	1
4	**offset - BOA Vegetation Index**	-	4	fl	1
5	**Spare**	-	60	uc	60
	Total		**76**		

11.5.4.7.3 Annotation Data Set - Tie Points location and Auxiliary Data

The Tie Points location and Auxiliary Data ADS of the Level 2 Reduced Resolution Extracted Vegetation Indices product shall have the same format and contents as the Level 1 Reduced Resolution Tie Points location and Auxiliary Data ADS, described in Section 11.4.1.7.3.

11.5.4.7.4 Measurement Data Set - Top of Atmosphere Vegetation Index

The format and contents of this MDS shall be as the Level 2 Reduced Resolution TOA Vegetation Index MDS described in Section 11.5.1.7.4.3.

Water, land and bright pixels shall have a value set to 0.

11.5.4.7.5 Measurement Data Set - Bottom of Atmosphere Vegetation Index

The format and contents of this MDS shall be as the Level 2 Reduced Resolution BOA Vegetation Index MDS described in Section 11.5.1.7.4.5.

Water, land and bright pixels shall have a value set to 0.

11.5.4.7.6 Measurement Data Set - Flags

The format and contents of this MDS shall be as the Level 2 Reduced Resolution Flags MDS described in Section 11.5.1.7.4.8.

11.5.4.8 Size Estimate

The maximum size is estimated at:

MPH: 1247 bytes SPH: 11662 bytes
SQ ADS: 3712 bytes Scaling Factors and General Info GADS: 76 bytes
Tie Points ADS:3295775 bytes
MDS TOAVI = 1134 bytes/MDSR * 14785 MDSR = 16.76 MB
MDS BOAVI = 1134 bytes/MDSR * 14785 MDSR = 16.76 MB

TOTAL: approx. 87 MB

11.5.5 MERIS Full Resolution Geophysical Product

This FR Level 2 product shares essentially the same format as the RR Geophysical product except that the data contained in the product is at full resolution.The Level 2 FR product is produced by request only. The NRT version of the product is available 1 day after data acquisition, and an OFL fully consolidated version is available 2 weeks after acquisition. The product is disseminated to users in floating scene size of 582 km by 650 km or 300 km by 334 km. The smaller floating scene is referred to as an "imagette" in the following documentation.

11.5.5.1 Input Data

Level 1B FR product plus auxiliary data.

11.5.5.2 Auxiliary Data Used

As described in Section 11.5.1.2.

11.5.5.3 Processing Performed

The processing steps applied to the FR data are identical to this applied to the RR data although some operation is performed at higher resolution.

11.5.5.4 Product Structure

Each MERIS Level 2-FR scene product includes 2241 x 2241 pixels, 36 x 36 tie points. Each Level 2-FR imagette product includes 1153 x 1153 pixels, 19 x 19 tie points. The top level breakdown of the product is shown in the table below.

Table 11.5.5.4-1 High-level Breakdown of MER_FR__2P

MPH
Level 2 - SPH (includes DSDs)
Level 2 ADS Summary Quality ADS (SQ ADS)
Level 2 GADS Scaling Factors and General Info
Level 2 ADS Tie Points Location & Aux. Data (L ADS)
Level 2 MDS (1)
…
Level 2 MDS (13)
Level 2 MDS (14)
Level 2 MDS (15)
Level 2 MDS (16)

Level 2 MDS (17)
Level 2 MDS (18)
Level 2 MDS (19)
Level 2 MDS (20) Flags

In the following sections, values between [] brackets refer to the imagette product. Sizes in the tables are specified for the scene product only, unless otherwise specified.

11.5.5.5 Main Product Header

The MPH will be the same as described in Volume 5.

11.5.5.6 Specific Product Header Specific Product Header

The SPH is the same as that of the Level 2 RR product described in Section 11.5.1.6.

11.5.5.7 Data Sets

The contents of the Data Sets are described in the following sections. Data Sets are in mixed binary format. They may contain ACSII strings, but the ASCII strings are not contained within quotation marks as for the MPH/SPH.

11.5.5.7.1 Annotation Data Set - Summary Quality ADS

This ADS contains only data useful for the evaluation of the quality of the product. It will have ADS records for every new group of 8 tie frames (a new record has to be generated when starting the 9th tie frame, the last SQ ADSR of the product may be relevant for less than 8 tie frames), therefore it will hold 5 ADSRs in the reference product.
The size of the ADS has been summarized below:

Table 11.5.5.7.1-1 MER_FR__2P - Summary Quality ADS

ADSR No.	Description	Byte Size
1	**ADSR associated with line # 1 - 512 FR pixels**	32
2	**ADSR associated with line # 513- 1024 FR pixels**	32
...	**...**	...
5	**ADSR associated with line # 2049- 2241 FR pixels**	32
	Total (in bytes)	**160**

For the imagette product, only 3 ADSRs are required in the ADS as shown in the table below.

Table 11.5.5.7.1-2 MER_FR__2P - Summary Quality ADS for Imagettes

ADS No.	Description	Byte Size
1	**ADSR associated with line # 1 - 512 FR pixels**	32
2	**ADSR associated with line # 513 - 1024 FR pixels**	32
3	**ADSR associated with line # 1025 - 1153 FR pixels**	32
	Total (in bytes)	**96**

The format and content of the Summary Quality ADSR is identical to that of the RR Level 2 product and is described in Table 11.5.1.7.1-2.

11.5.5.7.2 Global Annotation Data Set - Scaling Factors and General Info

The format of the Global Annotation Data Set shall be the same as for the Level 2 RR product as described in Section 11.5.1.7.2.

11.5.5.7.3 Annotation Data Set - Tie Points Location and Auxiliary Data

The Tie Points location annotation data set of the MERIS FR Level 2 product shall have the same format and contents as the Level 1 FR product Tie Points location annotation data set, described in Section 11.4.2.7.3.

11.5.5.7.4 Measurement Data Sets (1-20)

There are 20 measurement data sets. The parameters stored in each MDS shall be the same as those in the Level 2 RR products MDSs, described in Section 11.5.1.7.4. Only the number of pixels per MDSR differs.
Each measurement data set consists of 2241 [1153] image lines. Each image line constitutes one MDSR including 2241 [1153] samples ([] refers to the imagette product).

11.5.5.7.4.1 Measurement Data Set Records MDS (1-20)

The MDSR content for all Level 2-FR MDSs shall be identical to those of the Level 2-RR MDSs, described previously. Only the MDSR sizes differ, as detailed in Table 11.5.6.7.4.1-1 below which shows the format for each MDSR in the scene product:

Table 11.5.5.7.4.1-1 MERIS Level 2 - FR MDSR					
N	**Description**	**Units**	**Byte Size**	**Data Type**	**Dim.**
1	**Start Time of DSR**	-	12	mjd	1
2	**Quality Indicator** -1 = all values are zero, 0 otherwise.	-	1	sc	1
3	**Parameter value* for pixel #1**	*	*	*	*
...	**...**	...	...	...	...
2243 [1155]	**Parameter value* for pixel #2241 [#1153]**	*	*	*	1
	Total		**		

* values, types, sizes and units depend on MDSR number, refer to Measurement Data Sets (1-20) for the Level 2 RR product described previously

** MDSR size depends on MDSR number, see Table 11.5.6.7.4.1-2 below.

Table 11.5.5.7.4.1-2 MERIS Level 2 - FR MDSR Sizes (in bytes)			
MDS No.	**Description**	**Size /sam-ple (bytes)**	**Size (scene)**
1	**MDSR-1 normalised surface reflectance 1**	2	4495 [2319]
...	**....**	...	...
13	**MDSR-13 normalised surface reflectance 13**	2	4495 [2319]
14	**MDSR-14 Water vapour content**	1	2254 [1166]
15	**MDSR-15 Algal index I, TOAVI, Cloud Top Pressure**	1	2254 [1166]
16	**MDSR-16 Yellow Substance and Total Suspended Mat-ter or rectified reflectances**	2	4495 [2319]
17	**MDSR-17 Algal pigment II & BOAVI**	1	2254 [1166]
18	**MDSR-18 PAR, surface pressure, cloud albedo**	1	2254 [1166]
19	**MDSR-19 Aerosol Angstrom exponent, optical thickness, Cloud type**	2	4495 [2319]

Table 11.5.5.7.4.1-2 MERIS Level 2 - FR MDSR Sizes (in bytes)			
MDS No.	**Description**	**Size /sample (bytes)**	**Size (scene)**
20	**MDSR-20 Flags**	3	6736 [3472]

11.5.5.8 Size Estimate

The estimated size of the Level 1B FR Product is calculated as follows (the [] notation gives the sizes for the imagette product):

MPH: 1247 bytes

SPH: 11622 bytes

SQ ADS: 160 [96] bytes

Scaling Factors and General Info GADS: 440 bytes

Tie Points ADS (LADS): 65268 [18297] bytes

MDSs: 191.4 [50.8] MB

TOTAL: approx. 186 [50] MB

11.5.6 MERIS Full Resolution Full Swath Geophysical Product

This FRS Level 2 product shares essentially the same format as the FR Geophysical product except that the data contained in the product cover the complete instrument swath. The Level 2 FRS product is generated offline, from MERIS FRS Level 1B product.
The product duration is not fixed as for the MERIS FRS Level 1B product.

11.5.6.1 Input Data

Level 1B FRS product plus auxiliary data.

11.5.6.2 Auxiliary Data Used

As described in Section 11.5.1.2.

11.5.6.3 Processing Performed

The processing steps applied to the FRS data are identical to this applied to the FR data although some operation is performed at higher resolution.

11.5.6.4 Product Structure

Each MERIS Level 2-FRS product includes n[4] x 4481 pixels, n/64 x 71 tie points.
The top level breakdown of the product is shown in the table below.

[4] *n is the number of lines, dependant on the chosen sensing time interval for the requested production*

Table 11.5.6.4-1 High-level Breakdown of MER_FRS_2P

MPH
Level 2 - SPH (includes DSDs)
Level 2 ADS Summary Quality ADS (SQ ADS)
Level 2 GADS Scaling Factors and General Info
Level 2 ADS Tie Points Location & Aux. Data (L ADS)
Level 2 MDS (1)
...
Level 2 MDS (13)
Level 2 MDS (14)
Level 2 MDS (15)
Level 2 MDS (16)
Level 2 MDS (17)
Level 2 MDS (18)
Level 2 MDS (19)
Level 2 MDS (20) Flags

In the following sections, values between [] brackets refer to the imagette product. Sizes in the tables are specified for the scene product only, unless otherwise specified.

11.5.6.5 Main Product Header

The MPH will be the same as described in Volume 5.

11.5.6.6 Specific Product Header Specific Product Header

The SPH is the same as that of the Level 2 RR product described in Section 11.5.1.6.

11.5.6.7 Data Sets

The contents of the Data Sets are described in the following sections. Data Sets are in mixed binary format. They may contain ACSII strings, but the ASCII strings are not contained within quotation marks as for the MPH/SPH.

11.5.6.7.1 Annotation Data Set - Summary Quality ADS

This ADS contains only data useful for the evaluation of the quality of the product. It will have ADS records for every new group of 8 tie frames (a new record has to be generated when starting the 9th tie frame, the last SQ ADSR of the product may be relevant for less than 8 tie frames), therefore it shall hold (up to) 26 Records in the Full Swath product. The information stored in this ADSR is relevant to 512 consecutive frames.

.The size of the ADS has been summarized below:

Table 11.5.6.7.1-1 MER_FRS_2P - Summary Quality ADS

ADSR No.	Description	Byte Size
1	**ADSR associated with line # 1 - 512 FR pixels**	32
2	**ADSR associated with line # 513- 1024 FR pixels**	32
...	**...**	...
n	**ADSR associated with line # [(n-1)*512 +1]- n*512 FR pixels**	32
	Total (in bytes)	**n*32**

The format and content of the Summary Quality ADSR is identical to that of the RR Level 2 product and is described in Table 11.5.1.7.1-2.

11.5.6.7.2 Global Annotation Data Set - Scaling Factors and General Info

The format of the Global Annotation Data Set shall be the same as for the Level 2 RR product as described in Section 11.5.1.7.2.

11.5.6.7.3 Annotation Data Set - Tie Points Location and Auxiliary Data

The Tie Points location annotation data set of the MERIS FRS Level 2 product shall have the same format and contents as the Level 1 FR product Tie Points location annotation data set, described in Section 11.4.2.7.3.

11.5.6.7.4 Measurement Data Sets (1-20)

There are 20 measurement data sets. The parameters stored in each MDS shall be the same as those in the Level 2 RR products MDSs, described in Section 11.5.1.7.4. Only the number of pixels per MDSR differs.

Each measurement data set consists of a variable number of image lines. Each image line constitutes one MDSR including 4481 samples.

11.5.6.7.4.1 Measurement Data Set Records MDS (1-20)

The MDSR content for all Level 2-FRS MDSs shall be identical to those of the Level 2-RR MDSs, described previously. Only the MDSR sizes differ, as detailed in Table 11.5.6.7.4.1-1 below which shows the format for each MDSR:

Table 11.5.6.7.4.1-1 MERIS Level 2 - FRS MDSR

N	Description	Units	Byte Size	Data Type	Dim.

Table 11.5.6.7.4.1-1 MERIS Level 2 - FRS MDSR					
N	**Description**	**Units**	**Byte Size**	**Data Type**	**Dim.**
1	**Start Time of DSR**	-	12	mjd	1
2	**Quality Indicator** -1 = all values are zero, 0 otherwise.	-	1	sc	1
3	**Parameter value* for pixel #1**	*	*	*	*
...	**...**	...	...	...	...
4483	**Parameter value* for pixel #4481**	*	*	*	1
	Total		**		

* values, types, sizes and units depend on MDSR number, refer to Measurement Data Sets (1-20) for the Level 2 RR product described previously

** MDSR size depends on MDSR number, see Table 11.5.6.7.4.1-2 below.

Table 11.5.6.7.4.1-2 MERIS Level 2 - FRS MDSR Sizes (in bytes)			
MDS No.	**Description**	**Size / sample (bytes)**	**Size (scene)**
1	**MDSR-1 normalised surface reflectance 1**	2	8975
...	**....**	...	...
13	**MDSR-13 normalised surface reflectance 13**	2	8975
14	**MDSR-14 Water vapour content**	1	4494
15	**MDSR-15 Algal index I, TOAVI, Cloud Top Pressure**	1	4494
16	**MDSR-16 Yellow Substance and Total Suspended Matter or rectified reflectances**	2	8975
17	**MDSR-17 Algal pigment II & BOAVI**	1	4494
18	**MDSR-18 PAR, surface pressure, cloud albedo**	1	4494
19	**MDSR-19 Aerosol Angstrom exponent, optical thickness, Cloud type**	2	8975
20	**MDSR-20 Flags**	3	13456

11.5.6.8 Size Estimate

The estimated size of the Level 2 FRS Product is calculated as follows 2:

MPH: 1247 bytes
SPH: 11622 bytes
SQ ADS: variable
Scaling Factors and General Info GADS: Variable
Tie Points ADS (LADS): Variable
MDSs: Variable MB

11.6 BROWSE PRODUCTS

There are two browse products for the MERIS instrument:

- MERIS Reduced Resolution Browse Product,
- MERIS Full Swath Browse Product.

11.6.1 MERIS Reduced Resolution Browse Product

MERIS Browse products contain a sub-sampled set of selected RR radiometrically calibrated Level 1B products. The Browse product contains 3 selected spectral bands (red, blue and green) of 0 to 255 intensity levels for each band. This product is systematically produced and archived and is available from the PDHS 3 hours after data acquisition.
The Browse product is intended to supply prospective users with a visual indication of the quality of the full image products and is intended to support queries made to the MERIS archive server.
In order to provide the user a MERIS browse product with the left side corresponding to the west and the right side corresponding to the east, the browse image is turned over to exchange the left and right sides, while the RR radiometrically calibrated Level 1B product is unchanged.

11.6.1.1 Input Data

The NRT version of the RR Level 1B product is used to create the Browse product.

11.6.1.2 Auxiliary Data Used

No new auxiliary data is required over that already available from the Level 1B product.

11.6.1.3 Processing Performed

Processing includes:

- selection and extraction of bands,
- sub-sampling of data,
- re-orientation of image (turning over of data).

11.6.1.4 Product Structure

The high-level breakdown of the browse product is shown in Table 11.6.1.4-1 below.

Table 11.6.1.4-1 High-level Breakdown of MER_RR__BP
MPH
Browse - SPH (includes DSDs)
Browse - Summary Quality ADS (SQ ADS)
Browse - Tie Points ADS
Browse - MDS

11.6.1.5 Main Product Header

The MPH will be the same as described in Volume 5.

11.6.1.6 Specific Product Header

The SPH for the Browse product is described below. The SPH is an ASCII header. Refer to Volume 5 for a description of ASCII header conventions.
The SPH for the browse product is identical in format and content to the Level 1B RR SPH described in Section 11.4.1.6 except for the number of DSDs it contains.
The format of the browse SPH is shown below:

Table 11.6.1.6-1 MER_RR__BP - SPH					
N	**Description**	**Units**	**Byte Length**	**Data Type**	**Dim.**
1-41	First 41 fields of the Level 1B RR SPH as described in section 11.4.1.6.	-	1542	-	-
	DSDs for included Data Sets				
42	**DSD-A of Level 1b Summary Quality ADS (SQADS)**	-	280	dsd	1
43	**DSD-A of Level 1b Tie Points Loc. & Aux. Data ADS**	-	280	dsd	1
44	**DSD-M Browse MDS**	-	280	dsd	1
	DSDs referencing files				
45	**DSD (R) referencing the Level 1B product from which this browse product was created**	-	280	dsd	1
	size (in bytes)		**2662**		

The following strings will be used in the field DS_NAME for the DSDs listed in the SPH above.

Table 11.6.1.6-2 DS_NAME Strings	
DSD	**DS_NAME String**
DSDs for included Data Sets	
DSD-A of Level 1b Summary Quality ADS (SQADS)	SUMMARY_QUALITY_ADS

Table 11.6.1.6-2 DS_NAME Strings	
DSD	**DS_NAME String**
DSD-A of Level 1b Tie Points Loc. & Aux. Data ADS	GEOLOCATION_ADS
DSD-M Browse MDS	BROWSE_MDS
DSDs referencing files	
DSD (R) referencing the Level 1B product from which this browse product was created	LEVEL_1B_PRODUCT

11.6.1.7 Data Sets

The contents of the Data Sets are described in the following sections. Data Sets are in mixed binary format. They may contain ASCII strings, but the ASCII strings are not contained within quotation marks as for the MPH/SPH.

11.6.1.7.1 Annotation Data Set - Summary Quality

This data set is identical to the SQ ADS of the Level 1B RR parent product from which the browse product was created. The format and content are described in Section 11.4.1.7.1.

11.6.1.7.2 Tie Points ADS[5]

The tie points ADS for the Browse product contains a subset of the Tie Points ADS used for the Level 1B RR product. There is one ADSR per tie frame (maximum of 925 ADSRs), and each ADSR contains information pertaining to 71 tie points. The format of the ADS is described in Section 11.6.1.7.2. Each ADS is made of ADS Records, the maximum size of the ADS has been summarized below:

Table 11.6.1.7.2-1 MER_RR__BP - Tie Points ADS		
ADSR No.	**Description**	**Size (bytes)**
1	**ADSR associated with line # 1**	581
2	**ADSR associated with line # 17**	581
...	**...**	...

[5] This ADS has been added to the Browse product due to the need for geolocation information when viewing the Browse.

Table 11.6.1.7.2-1 MER_RR__BP - Tie Points ADS		
ADSR No.	**Description**	**Size (bytes)**
925	**ADSR associated with line # 14785 RR pixels**	581
	Total (in bytes)	**537425**

A tie point annotation contains location and auxiliary data of the corresponding tie point as follows:

Table 11.6.1.7.2-2 MER_RR__BP - Tie Point Annotation					
N	**Description**	**Units**	**Byte Length**	**Data Type**	**Dim.**
1	**Start time of the measurement**	-	12	mjd	1
2	**Attachment Flag** (set to 1 if there are no MDSRs corresponding to this ADSR, set to zero otherwise)	-	1	uc	1
3	**latitude of the tie points** WGS84, positive N	(10-6) deg	284	sl	71
4	**longitude of the tie points** WGS84, Greenwich origin, positive E	(10-6) deg	284	sl	71
	size (in bytes)	**-**	**581**	**-**	**-**

11.6.1.7.3 Browse MDS

A browse data set consists of a maximum of 3696 browse data set records, each containing 280 pixels. Following the widespread RBG convention in computer representation of images, the Browse data set records represent RGB-coded colour image lines. Each pixel includes:

- a red channel intensity (0 to 255);
- a green channel intensity (0 to 255);
- a blue channel intensity (0 to 255);

Table 11.6.1.7.3-1 MERIS Browse MDS Summary		
N	**Description of MDS**	**Size (bytes)**
1	**Browse MDSR**	**853**
…		**853**
3696	**Browse MDSR**	**853**

Table 11.6.1.7.3-1 MERIS Browse MDS Summary		
N	**Description of MDS**	**Size (bytes)**
	Total	**$3.15*10^6$**

11.6.1.7.4 Browse Data Set Record

Each image line constitutes one MDSR consisting of 280 pixels. Each browse pixels contains one Red, one Green, one Blue value. Interleaving is by pixel.
Red, Green, Blue values are derived from the Level 1B TOA Radiances.

Table 11.6.1.7.4-1 MERIS Browse MDSR					
N	**Description**	**Units**	**Byte Size**	**Data Type**	**Dim.**
1	**Start Time of DSR**	-	12	mjd	1
2	**Quality Indicator** -1 = all values are zero, 0 otherwise.	-	1	sc	1
3	**R, G, B colour pixel #1 - #280**	-	840	uc	3*280
	Total		**853**		

Interleaving by pixel means that image line values are ordered as follows :
Pixel_#1_Red, Pixel_#1_Green, Pixel_#1_Blue, ..., Pixel_#280_Red, Pixel_#280_Green, Pixel_#280_Blue.

11.6.1.8 Size Estimate

The estimated maximum size of the Browse Product is calculated as follows:

MPH: 1247 bytes
SPH: 2662 bytes
SQ ADS: 3795 bytes
Tie Points ADS: 672475bytes
MDS: 3152688 bytes
TOTAL: 3.9 MB

11.6.2 MERIS Full Swath Browse Product

MERIS Full Swath Browse products contain a sub-sampled set of selected FR Full Swath radiometrically calibrated Level 1B products. The Browse product contains 3 selected spectral bands (red, blue and green) of 0 to 255 intensity levels for each band.

The MERIS FRS browse product is intended to supply users with a visual indication of the MERIS FRS image quality.

In order to provide the user a MERIS browse product with the left side corresponding to the west and the right side corresponding to the east, the browse image is turned over to exchange the left and right sides, while the FRS radiometrically calibrated Level 1B product is unchanged.

11.6.2.1 Input Data

The FRS Level 1B product is used to create the Browse product.

11.6.2.2 Auxiliary Data Used

No new auxiliary data is required over that already available from the Level 1B product.

11.6.2.3 Processing Performed

Processing includes:

- selection and extraction of bands;
- sub-sampling of data (the scale factor may be chosen by configuring it into the IPF configuration parameters as 4X4 (default), 8x8, 16x16 averaging factors.
- re-orientation of image (turning over of data).

11.6.2.4 Product Structure

The high-level breakdown of the browse product is shown in Table 11.6.2.4-1 below.

Table 11.6.2.4-1 High-level Breakdown of MER_FRS Browse product

MPH
Browse - SPH (includes DSDs)
Browse - Summary Quality ADS (SQ ADS)
Browse - Tie Points ADS
Browse - MDS

11.6.2.5 Main Product Header

The MPH will be the same as described in Volume 5.

11.6.2.6 Product Structure

The SPH for the Browse product is described below. The SPH is an ASCII header. Refer to Volume 5 for a description of ASCII header conventions.
The SPH for the browse product is identical in format and content to the Level 1B FR SPH described in Section 11.4.1.6 except for the number of DSDs it contains.
The format of the browse SPH is shown below:

Table 11.6.2.6-1 - MER_FRS Browse product - SPH

N	Description	Units	Byte Length	Data Type	Dim.
1-41	First 41 fields of the Level 1B FR SPH as described in section 11.4.1.6.	-	1542	-	-
	DSDs for included Data Sets				
42	**DSD-A of Level 1b Summary Quality ADS (SQADS)**	-	280	dsd	1
43	**DSD-A of Level 1b Tie Points Loc. & Aux. Data ADS**	-	280	dsd	1
44	**DSD-M Browse MDS**	-	280	dsd	1
	DSDs referencing files				
45	**DSD (R) referencing the Level 1B product from which this browse product was created**	-	280	dsd	1
	size (in bytes)		**2662**		

The following strings will be used in the field DS_NAME for the DSDs listed in the SPH above.

Table 11.6.2.6-2 MER_FRS Browse product - DS_NAME Strings

DSD	DS_NAME String
DSDs for included Data Sets	
DSD-A of Level 1b Summary Quality ADS (SQADS)	SUMMARY_QUALITY_ADS
DSD-A of Level 1b Tie Points Loc. & Aux. Data ADS	GEOLOCATION_ADS
DSD-M Browse MDS	BROWSE_MDS
DSDs referencing files	
DSD (R) referencing the Level 1B product from which this browse product was created	LEVEL_1B_PRODUCT

11.6.2.7 Data Sets

The contents of the Data Sets are described in the following sections. Data Sets are in mixed binary format. They may contain ASCII strings, but the ASCII strings are not contained within quotation marks as for the MPH/SPH.

11.6.2.7.1 Annotation Data Set - Summary Quality

This data set is identical to the SQ ADS of the Level 1B FRS parent product from which the browse product was created. The format and content are described in Section 11.4.3.7.1.

11.6.2.7.2 Tie Points ADS[6]

The tie points ADS for the Browse product contains a subset of the Tie Points ADS used for the Level 1B FRS product. There is one ADSR per tie frame and each ADSR contains information pertaining to 71 tie points. The format of the ADS is described in Section 11.4.1.7.3.
Each ADS is made of ADS Records, the maximum size of the ADS has been summarized below:

Table 11.6.2.7.2-1 MER_FRS Browse product - Tie Points ADS

ADSR No.	Description	Size (bytes)
1	**ADSR associated with line # 1**	581
2	**ADSR associated with line # 17**	581
...	**...**	...
	Total (in bytes)	**Variable**

A tie point annotation contains location and auxiliary data of the corresponding tie point as follows:

Table 11.6.2.7.2-2 MER_FRS Browse product - Tie Point Annotation

N	Description	Units	Byte Length	Data Type	Dim.
1	**Start time of the measurement**	-	12	mjd	1
2	**Attachment Flag** (set to 1 if there are no MDSRs corresponding to this ADSR, set to zero otherwise)	-	1	uc	1
3	**latitude of the tie points** WGS84, positive N	(10-6) deg	284	sl	71
4	**longitude of the tie points** WGS84, Greenwich origin, positive E	(10-6) deg	284	sl	71
	size (in bytes)	**-**	**581**	**-**	**-**

[6] This ADS has been added to the Browse product due to the need for geolocation information when viewing the Browse.

11.6.2.7.3 Browse MDS

A browse data set consists of a maximum of 3696 browse data set records, each containing 280, 560, 1120 pixels, according to the scale factor configured [4(default) - 8 - 6] (if the default is chosen, then the number of pixels is 1120).
Following the widespread RBG convention in computer representation of images, the Browse data set records represent RGB-coded colour image lines. Each pixel includes:

- a red channel intensity (0 to 255);
- a green channel intensity (0 to 255);
- a blue channel intensity (0 to 255);

Table 11.6.2.7.3-1 MERIS FRS Browse MDS Summary

N	Description of MDS	Size (bytes)
1	**Browse MDSR**	**3373**
…		**3373**
	Total	**Variable**

11.6.2.7.4 Browse Data Set Record

Each image line constitutes one MDSR consisting of 280 pixels. Each browse pixels contains one Red, one Green, one Blue value. Interleaving is by pixel. Red, Green, Blue values are derived from the Level 1B TOA Radiances.

Table 11.6.2.7.4-1 MERIS Browse MDSR

N	Description	Units	Byte Size	Data Type	Dim.
1	**Start Time of DSR**	-	12	mjd	1
2	**Quality Indicator** -1 = all values are zero, 0 otherwise.	-	1	sc	1
3	**R, G, B colour pixel #1 - #1120**[a]	-	3360	uc	3*112 0
	Total				

a. 1120 is the number of pixel for the default sampling factor (4), if 8 is chosen then the pixels are 560, if 16 is chosen, the pixels are 280.

Interleaving by pixel means that image line values are ordered as follows :
Pixel_**#1_Red**, Pixel_**#1_Green**, Pixel_**#1_Blue**, ..., Pixel_**#1120_Red**, Pixel_**#1120_Green**, Pixel_**#1120_Blue...**

11.6.2.8 Size Estimate

The estimated maximum size of the Browse Product is calculated as follows:

MPH: 1247 bytes
SPH: 2662 bytes
SQ ADS: Variable
Tie Points ADS: Variable
MDS: Variable

TOTAL: Variable MB

11.7 AUXILIARY DATA FILES

11.7.1 MERIS Instrument Data File

This data file contains all the parameters needed for processing MERIS data in any band configurations. Therefore, it will also contain the data needed for geolocation and resampling.

FILE ID: MER_INS_AX

TYPE: Auxiliary

USE: Level 1B processing

UPDATED: infrequently

SIZE: MPH(1247 bytes) + SPH(1778 bytes) + DSs(approx. 2914257 bytes) = 2917282 Bytes

11.7.1.1 Format

The high-level breakdown of the data file is described below:

Table 11.7.1.1-1 MERIS Instrument Data File - High-Level Breakdown
MPH
Auxiliary Data SPH (refer to Volume 16) with 10 DSDs
DSD (G) - GADS Config. reference values
DSD (G) - GADS Instrumental param.
DSD (G) - GADS FR Pointing
DSD (G) - GADS RR Pointing
DSD (G) - ADS FR SRDF
DSD (G) - ADS RR SRDF
MERIS Instrument - GADS Config. reference values
MERIS Instrument - GADS Instrumental param.
MERIS Instrument - GADS FR Pointing
MERIS Instrument - GADS RR Pointing
MERIS Instrument - GADS FR SRDF
DSD (G) - GADS RR SRDF

The following strings will be used in the field DS_NAME for the DSDs listed in the SPH above.

Table 11.7.1.1-2 DS_NAME Strings

DSD	DS_NAME String
DSDs for included Data Sets	
DSD (G) - GADS Config. reference values	GADS Config. references
DSD (G) - Instrumental parameters GADS	GADS Instrumental params
DSD (G) - FR Pointing GADS	GADS FR Pixel Pointing
DSD (G) - RR Pointing GADS	GADS RR Pixel Pointing
DSD (A) - FR SRDF GADS	ADS FR SRDF
DSD (A) - RR SRDF GADS	ADS RR SRDF

11.7.1.1.1 GADS - Configuration Reference Values

The content of the GADS shall be as follows:

Table 11.7.1.1.1-1 MERIS Instrument - GADS Configuration Reference Values

N	Description	Units	Byte Length	Data Type	Dim.
1	**number of APID valid values for FR**	-	1	uc	1
2	**number of APID valid values for RR**		1	uc	1
3	**ref. value for FR packet length**	-	2	us	1
4	**ref. value for RR packet length**	-	2	us	1
5	**Data Field Header length**	-	2	us	1
6	**mode/format APID dependant bits mask**	-	2	us	1
7	**FR APID possible values**	-	8	us	4
8	**FR reference values for APID dependant bits**	-	8	us	4
9	**RR APID possible values**	-	16	us	8
10	**RR reference values for APID dependant bits**	-	16	us	8
11	**reference values for other bits**	-	2	us	1
12	**packet counter wraparound value**	-	2	us	1
13	**Binary mask for the OCL dependent bits in the instrument mode field**	-	2	us	1

Table 11.7.1.1.1-1 MERIS Instrument - GADS Configuration Reference Values					
N	**Description**	**Units**	**Byte Length**	**Data Type**	**Dim.**
14	**Binary mask for the on-board correction switch dependent bits in the instrument mode field**	-	2	us	1
15	**Binary mask for the other bits in the instrument mode field**		2	us	1
	size (in bytes)	**-**	**68**	**-**	**-**

11.7.1.1.2 GADS - Instrumental Parameters

The content of the GADS shall be as follows:

Table 11.7.1.1.2-1 GADS Instrumental Parameters					
N	**Description**	**Units**	**Byte Length**	**Data Type**	**Dim.**
1	**number of modules**	-	1	uc	1
2	**number of FR columns per modules**	-	2	us	1
3	**number of RR columns per modules**	-	2	us	1
4	**FR frame sampling time**	(1.e-6) s	4	ul	1
5	**RR frame sampling time**	(1.e-6) s	4	ul	1
6	**Offset time between acquisition and packet time tag FR**	(1.e-6) s	4	sl	1
7	**Offset time between acquisition and packet time tag RR**	(1.e-6) s	4	sl	1
8	**MERIS modules central column index**	-	4	fl	1
9	**number of SP regions for FR SRDF**	-	2	us	1
10	**number of SP regions for RR SRDF**	-	2	us	1
11	**number of AC regions for FR PSF AL**	-	2	us	1
12	**number of SP regions for FR PSF AL**	-	2	us	1
13	**number of AC regions for RR PSF AL**	-	2	us	1
14	**number of SP regions for RR PSF AL**	-	2	us	1
15	**AC FR SRDF extent**	-	2	us	1
16	**AC FR SRDF origin**	-	2	us	1
17	**AC RR SRDF extent**	-	2	us	1
18	**AC RR SRDF origin**	-	2	us	1
19	**AL FR PSF extent**	-	2	us	1

Table 11.7.1.1.2-1 GADS Instrumental Parameters					
N	**Description**	**Units**	**Byte Length**	**Data Type**	**Dim.**
20	**AL FR PSF origin**	-	2	us	1
21	**AL RR PSF extent**	-	2	us	1
22	**AL RR PSF origin**	-	2	us	1
23	**Number of blank pixels in one module**	-	2	us	1
24	**Number of rows (spectral samples) of a CCD**	-	2	us	1
25	**spare**	-	2	us	1
26	**spare**	nm	164	fl	41
	size (in bytes)	**-**	**223**	**-**	**-**

11.7.1.1.3 GADS FR Pointing

The content of the GADS shall be as follows:

Table 11.7.1.1.3-1 GADS FR Pointing					
N	**Description**	**Units**	**Byte Length**	**Data Type**	**Dim.**
1	**Pointing FR AC direction cosine Ux**	nd	14800	fl	3700
2	**Pointing FR AL direction cosine Uy**	nd	14800	fl	3700
3	**FR pixel ID (true on bit #i, i in 0-14, means bad sample for band i+1, true on bit 15 allows the use of current pixel in resampling).**	-	7400	us	3700
4	**Instantaneous FR Field of View (FOV) of one pixel**	10^{-6} deg	4	ul	1
5	**FR along-track angular sampling step**	10^{-6} deg	4	ul	1
	size (in bytes)	**-**	**37008**	**-**	**-**

The AC pointing corresponds to the true pointing angle for each pixel (from approx. -34 to +34 degrees), and the AL frame offset corresponds to the frame on which the pixel is pointing (to get the actual frame number, the offset value is subtracted from the nominal frame number).

11.7.1.1.4 GADS RR Pointing

The content of the GADS shall be as follows:

Table 11.7.1.1.4-1 GADS RR Pointing					
N	**Description**	**Units**	**Byte Length**	**Data Type**	**Dim.**
1	**Pointing RR AC direction cosine Ux**	nd	3700	fl	925
2	**Pointing RR AL direction cosine Uy**	nd	3700	fl	925
3	**RR pixel ID (true on bit #i, i in 0-14, means bad sample for band i+1, true on bit 15 allows the use of current pixel in resampling).**	-	1850	us	925
4	**Instantaneous RR Field of View of one pixel**	10^{-6} deg	4	ul	1
5	RR along-track angular sampling step	10^{-6} deg	4	ul	1
	size (in bytes)	-	9258	-	-

The AC pointing corresponds to the true pointing angle for each pixel (from approx. -34 to +34 degrees), and the AL frame offset corresponds to the frame on which the pixel is pointing (to get the actual frame number, the offset value is subtracted from the nominal frame number).

11.7.1.1.5 FR Spectral Region Distribution Function ADS

During its path through the instrument, the input light flux is attenuated by scattering and absorption. Part of the scattered energy is re-distributed over the whole surface of the sensor and is identified as "stray light". This stray light contribution can be modeled as a weighted sum of the input field, resampled to a low spectral resolution regular grid. These low resolution samples are referred to as "spectral region flux". The Spectral Region Distribution Functions are arrays of weighting factors allowing to compute the contribution of each across-track pixel within a spectral region to each across-track pixel of each MERIS band. In order to account for variation of the importance of the stray light relative to the direct flux in the across track direction, an array of weights to be applied to the spectral region flux prior to the stray light computation.

A ADSR contains all the SRDF for a given spectral region and the across-track weights array.

The number of spectral regions has been intentionally left variable but its nominal value is 5. The number of ADSR will then be the number of spectral regions.

The algorithm for the stray light correction using the SRDF will be as defined in R-32.

The number of bands has been assumed fixed to 15 in the ADS size computations below.

Table 11.7.1.1.5-1 FR Spectral Region Distribution Function ADS

Table 11.7.1.1.5-1 FR Spectral Region Distribution Function ADS		
ADSR No.	**Description**	**Size**
1	ADSR associated with FR SRDF for spectral region # 1, module # 1	91764
...	...	...
5	ADSR associated with FR SRDF for spectral region # 5, module # 1	91764
6	ADSR associated with FR SRDF for spectral region # 1, module # 2	91764
...	...	...
25	ADSR associated with FR SRDF for spectral region # 5, module # 5	91764
	Total size	**2294100**

The format and content of the ADS Record shall be as follows:

Table 11.7.1.1.5-2 FR Spectral Region Distribution Function ADSR					
N	**Description**	**Units**	**Byte Length**	**Data Type**	**Dim.**
1	**module index for FR SRDF**	-	2	us	1
2	**spectral region index for FR SRDF**	-	2	us	1
3	**SRDF FR for band 1**	-	5920	fl	1480
4	**SRDF FR for band 2**	-	5920	fl	1480
5	**SRDF FR for band 3**	-	5920	fl	1480
6	**SRDF FR for band 4**	-	5920	fl	1480
7	**SRDF FR for band 5**	-	5920	fl	1480
8	**SRDF FR for band 6**	-	5920	fl	1480
9	**SRDF FR for band 7**	-	5920	fl	1480
10	**SRDF FR for band 8**	-	5920	fl	1480
11	**SRDF FR for band 9**	-	5920	fl	1480
12	**SRDF FR for band 10**	-	5920	fl	1480
13	**SRDF FR for band 11**	-	5920	fl	1480
14	**SRDF FR for band 12**	-	5920	fl	1480

Table 11.7.1.1.5-2 FR Spectral Region Distribution Function ADSR					
N	**Description**	**Units**	**Byte Length**	**Data Type**	**Dim.**
15	**SRDF FR for band 13**	-	5920	fl	1480
16	**SRDF FR for band 14**	-	5920	fl	1480
17	**SRDF FR for band 15**	-	5920	fl	1480
18	**FR across-track weighting for equivalent flux of current spectral region**	-	2960	fl	740
	size (in bytes)	**-**	**91764**	**-**	**-**

11.7.1.1.6 RR Spectral Region Distribution Function ADS

This ADS contains specific SRDF for RR processing. The number of spectral regions has been intentionally left variable but its nominal value is 5. The number of ADSR will then be the number of spectral regions.

The algorithm for the stray light correction using the SRDF will be as defined in R-32.

The number of bands has been assumed fixed to 15 in the ADS size computations below.

Table 11.7.1.1.6-1 RR Spectral Region Distribution Function ADS		
GADSR No.	**Description**	**Size**
1	GADSR associated with RR SRDF for spectral region # 1, module # 1	22944
...	...	...
5	GADSR associated with RR SRDF for spectral region # 5, module # 1	22944
6	GADSR associated with RR SRDF for spectral region # 1, module # 2	22944
...	...	...
25	GADSR associated with RR SRDF for spectral region # 5, module # 5	22944
	Total size	**573600**

The format and content of the GADS Record shall be as follows:

Table 11.7.1.1.6-2 RR Spectral Region Distribution Function GADSR					
N	**Description**	**Units**	**Byte Length**	**Data Type**	**Dim.**
1	**module index for RR SRDF**	-	2	us	1
2	**spectral region index for RR SRDF**	-	2	us	1

Table 11.7.1.1.6-2 RR Spectral Region Distribution Function GADSR					
N	**Description**	**Units**	**Byte Length**	**Data Type**	**Dim.**
3	**SRDF RR for band 1**	-	1480	fl	370
4	**SRDF RR for band 2**	-	1480	fl	370
5	**SRDF RR for band 3**	-	1480	fl	370
6	**SRDF RR for band 4**	-	1480	fl	370
7	**SRDF RR for band 5**	-	1480	fl	370
8	**SRDF RR for band 6**	-	1480	fl	370
9	**SRDF RR for band 7**	-	1480	fl	370
10	**SRDF RR for band 8**	-	1480	fl	370
11	**SRDF RR for band 9**	-	1480	fl	370
12	**SRDF RR for band 10**	-	1480	fl	370
13	**SRDF RR for band 11**	-	1480	fl	370
14	**SRDF RR for band 12**	-	1480	fl	370
15	**SRDF RR for band 13**	-	1480	fl	370
16	**SRDF RR for band 14**	-	1480	fl	370
17	**SRDF RR for band 15**	-	1480	fl	370
18	**RR across-track weighting for equivalent flux of current spectral region**	-	740	fl	185
	size (in bytes)	**-**	**22944**	**-**	**-**

11.7.2 MERIS Level 1b Control Parameters Data File

This file contains processing parameters used during the generation of the Level 1B products.

FILE ID: MER_CP1_AX

TYPE: Auxiliary

USE: Level 1B processing

UPDATED: infrequently

SIZE: MPH(1247 bytes) + SPH(5138 bytes) + DSs(12884 bytes) = 19269 bytes

11.7.2.1 Format

The high-level breakdown of the data file is as follows:

Table 11.7.2.1-1 MERIS Level 1b Control Parameters Data File - High-Level Breakdown

MPH
Auxiliary Data SPH (refer to Volume 16) with 18 DSDs:
DSD for GADS General
Spare DSD
DSD for GADS Solar Parameters
Spare DSD
DSD for GADS Exception handling
DSD for GADS Level 0 extraction
DSD for GADS Geolocation
DSD for GADS Flagging
DSD for GADS Radiometric
DSD for GADS Classification
DSD for GADS Resampling
DSD for GADS Scaling Factors

Table 11.7.2.1-1 MERIS Level 1b Control Parameters Data File - High-Level Breakdown

DSD for GADS Straylight Evaluation parameters
Spare DSD
Spare DSD
Spare DSD
DSD for GADS Rad. Thresholds LUT
DSD for GADS Browse Configuration Parameters
Control Parameters - GADS General
Control Parameters - GADS Solar Parameters
Control Parameters - GADS Exception handling
Control Parameters - GADS Level 0 Extraction
Control Parameters - GADS Geolocation
Control Parameters - GADS Flagging
Control Parameters - GADS Radiometric
Control Parameters - GADS Classification
Control Parameters - GADS Resampling
Control Parameters - GADS Scaling Factors
Control Parameters - GADS Straylight Evaluation Parameters
Control Parameters - GADS Radiometric Thresholds LUT
Control Parameters - GADS Browse Configuration Parameters

The following strings will be used in the field DS_NAME for the DSDs listed in the SPH above.

Table 11.7.2.1-2 DS_NAME Strings

DSD	DS_NAME String
DSDs for included Data Sets	
DSD (G) - General GADS	GADS General
DSD (G) - Solar Parameters GADS	GADS Solar Parameters
DSD (G) - Exception handling GADS	GADS Exception Handling
DSD (G) - Level 0 extraction GADS	GADS Level 0 Extraction
DSD (G) - Geolocation GADS	GADS Geolocation
DSD (G) - Flagging GADS	GADS Flagging

DSD (G) - Radiometric GADS	GADS Radiometric
DSD (G) - Classification GADS	GADS Classification
DSD (G) - Resampling GADS	GADS Resampling
DSD (G) - Scaling Factors GADS	GADS Scaling Factors
DSD (G) - Straylight Evaluation Parameters GADS	GADS Straylight Parameters
DSD (G) - Rad. Thresholds LUT GADS	GADS Radiometric Threshold
DSD (G) - Browse Configuration Parameters GADS	GADS Browse configuration

11.7.2.1.1 GADS - General

The content of the GADS General of the Processing Level 1b Control Parameters Data File shall be as follows:

Table 11.7.2.1.1-1 MERIS Level 1b Control Parameters Data File - GADS General

N	Description	Units	Byte Length	Data Type	Dim.
1	**Julian days to Millisecondconversion factor**	$ms.days^{-1}$	4	sl	1
2	**Max number of missing packets allowed**	-nd	1	uc	1
	size (in bytes)		**5**		

11.7.2.1.2 GADS - Solar Parameters

The content of the GADS shall be as follows:

Table 11.7.2.1.2-1 GADS Solar Parameters

N	Description	Units	Byte Length	Data Type	Dim.
1	**solar flux reference values** The solar reference values contain the solar spectral fluxes ($mW.m^{-2}.nm^{-1}$) averaged over each of the 15 MERIS bands, for a reference date	IU	60	fl	15
2	**square of Sun-Earth distance at reference date**	m^2	4	fl	1
	size (in bytes)		**64**		

11.7.2.1.3 GADS - Exception Handling

The content of the GADS shall be as follows:

Table 11.7.2.1.3-1 GADS Exception Handling

N	Description	Units	Byte Length	Data Type	Dim.
1	**Default radiance value for saturated samples**	LU	60	fl	15
2	**Default radiance value for above range samples**	LU	60	fl	15
	size (in bytes)	**-**	**120**	**-**	**-**

11.7.2.1.4 GADS - Level 0 Extraction

The content of the GADS shall be as follows:

Table 11.7.2.1.4-1 GADS Level 0 Extraction

N	Description	Units	Byte Length	Data Type	Dim.
1	**blank sample threshold**	-	32	us	16
2	**blank sample difference threshold**	-	32	us	16
3	**Scaling factor for floating values coding**	-	2	us	1
	size (in bytes)	**-**	**66**	**-**	**-**

11.7.2.1.5 GADS - Geolocation

The content of the GADS shall be as follows:

Table 11.7.2.1.5-1 GADS Geolocation

N	Description	Units	Byte Length	Data Type	Dim.
1	**Mean Earth Radius**	m	4	ul	1
2	**Number of tie points per frame for full swath**	-	2	us	1
3	**AC distance between tie points**	m	2	us	1
4	**FR product AC pixel size**	m	4	fl	1
5	**RR product AC pixel size**	m	4	fl	1
	size (in bytes)	**-**	**16**	**-**	**-**

11.7.2.1.6 GADS - Flagging

The content of the GADS shall be as follows:

Table 11.7.2.1.6-1 GADS Flagging

N	Description	Units	Byte Length	Data Type	Dim.
1	**width of blooming contamination for FR**	-	2	us	1
2	**width of blooming contamination for RR**	-	2	us	1
3	**saturation recovery width for FR**	-	2	us	1
4	**saturation recovery width for RR**	-	2	us	1
5	**azimuth angle range for sun glint risk**	(10-6) deg	4	ul	1
6	**zenithal angle range for sun glint risk**	(10-6) deg	4	ul	1
7	**band saturation levels (15 bands plus smear)**	-nc	32	us	16
8	**max valid radiance**	LU	60	fl	15
9	**threshold value for percentage of out of range image samples**	%	2	us	1
10	**threshold value for percentage of out of range blank samples**	%	2	us	1
11	**Land processing bands** (1=Yes)	nd	15	uc	15
12	**Threshold for setting TRANS_ERR_FLAG in SPH (mean number of errors per packet)**	nd	4	fl	1
13	**Threshold for setting FORMAT_ERR_FLAG in SPH (mean number of errors per packet)**	nd	4	fl	1
	size (in bytes)	**-**	**135**	**-**	**-**

11.7.2.1.7 11.7.2.1.7 GADS - Radiometric

The content of the GADS shall be as follows:

Table 11.7.2.1.7-1 GADS Radiometric

N	Description	Units	Byte Length	Data Type	Dim.
1	**Switch enabling FR non-linearity corrections**	-	1	uc	1
2	**Switch enabling RR non-linearity corrections**	-	1	uc	1
3	**Switch enabling AC straylight correction**	-	1	uc	1
4	**Switch enabling AL straylight correction**	-	1	uc	1
	size (in bytes)	**-**	**4**	**-**	**-**

11.7.2.1.8 GADS - Classification

The content of the GADS shall be as follows:

Table 11.7.2.1.8-1 GADS Classification

N	Description	Units	Byte Length	Data Type	Dim.
1	**θ_v vector - view zenithal angle**	($1e^{-6}$) deg	48	ul	12
2	**θ_s vector - sun zenith angle**	($1e^{-6}$) deg	48	ul	12
3	**$\Delta\varphi$ vector – relative azimuth angle**	($1e^{-6}$) deg	76	ul	19
4	**Spare**	-	40	fl	10
5	**Spare**	-	3	uc	3
6	**Spare**	-	4	fl	1
7	**Spare**	-	4	fl	1
8	**index of band for radiometric threshold**	-	1	uc	1
9	**Spare**	-	4	uc	4
	size (in bytes)	**-**	**228**	**-**	**-**

11.7.2.1.9 GADS - Resampling

The content of the GADS shall be as follows:

Table 11.7.2.1.9-1 GADS Resampling

N	Description	Units	Byte Length	Data Type	Dim.
1	**resampling switch**	-	1	uc	1
2	**number of AC samples used in product FR Imagette**	-	2	us	1
3	**number of AC samples used in product FR Scene**	-	2	us	1
4	**number of AC samples used in product RR**	-	2	us	1
5	**FR pixel to tie point sub-sampling factor (number of samples)**	-	1	uc	1
6	**RR pixel to tie point sub-sampling factor (number of samples)**	-	1	uc	1
7	**FR frame to tie frame sub-sampling factor (number of samples)**	-	1	uc	1
8	**RR frame to tie frame sub-sampling factor (number of samples)**	-	1	uc	1
9	**Tie Frame to Summary Quality ADS frame sub-sampling factor**	-	1	uc	1
10	**Maximum across track angular distance allowing pixel selection in FR**	(1.e-6) deg	4	ul	1

Table 11.7.2.1.9-1 GADS Resampling					
N	**Description**	**Units**	**Byte Length**	**Data Type**	**Dim.**
11	**Maximum across track angular distance allowing pixel selection in RR**	(1.e-6) deg	4	ul	1
	size (in bytes)	**-**	**20**	**-**	**-**

11.7.2.1.10 Scaling Factors GADS

The content of the GADS shall be as follows:

Table 11.7.2.1.10-1 Scaling Factors GADS					
N	**Description**	**Units**	**Byte Length**	**Data Type**	**Dim.**
1	**scaling factor - altitude**	-	4	fl	1
2	**scaling factor - roughness**	-	4	fl	1
3	**scaling factor - zonal wind**	-	4	fl	1
4	**scaling factor - meridional wind**	-	4	fl	1
5	**scaling factor - atmospheric pressure**	-	4	fl	1
6	**scaling factor - ozone**	-	4	fl	1
7	**scaling factor - relative humidity**	-	4	fl	1
8	**scaling factor - radiances**	-	60	fl	15
	size (in bytes)		**88**		

11.7.2.1.11 Straylight Evaluation Parameters GADS

The content of the GADS shall be as follows:

Table 11.7.2.1.11-1 Straylight Evaluation Parameters GADS					
N	**Description**	**Units**	**Byte Length**	**Data Type**	**Dim.**
1	**Number of spectral regions**	-	2	us	1
2	**Band index of default radiance for pixels wiht all bands saturated (1- based)**	-	2	us	1
3	**default radiance for pixels with all bands saturated**	LU	4	fl	1
4	**spare**	dl	44	fl	11
5	**spare**	dl	20	fl	5

Table 11.7.2.1.11-1 Straylight Evaluation Parameters GADS					
N	**Description**	**Units**	**Byte Length**	**Data Type**	**Dim.**
6	**interpolation coeff for spectral region flux estimation**	dl	300	fl	15*5
7	**Flag register showing the bands that can be used for radiance estimation of saturated samples.** (bits 0-14 used for bands 1-15, bit 15 is spare)	-	2	us	1
8	**FR Threshold on saturated samples counts to flag for stray light risk**	nd	2	us	1
9	**RR Threshold on saturated samples counts to flag for stray light risk**	nd	2	us	1
	size (in bytes)	**-**	**378**	-	-

11.7.2.1.12 GADS - Radiometric Thresholds LUT

The format and content of the GADS shall be as follows:

Table 11.7.2.1.12-1 GADS Rad. Thresh. LUT					
N	**Description**	**Units**	**Byte Length**	**Data Type**	**Dim.**
1	**Rad. thresholds LUT (θs , θv , φ)**	-	10944	fl	12*12*19
	size (in bytes)	**-**	**10944**	**-**	**-**

The LUT indices correspond to the discrete values of the following parameters: θ_s, θ_v and φ. The discretized values of those parameters are stored in the GADS Classification of the Level 1b Control Parameters Data File.

11.7.2.1.13 GADS - Browse Configuration Parameters

The format and content of the GADS shall be as follows:

Table 11.7.2.1.13-1 Browse Configuration Parameters GADS					
N	**Description**	**Units**	**Byte Length**	**Data Type**	**Dim.**
1	**Red band composition 1 parameter for Land**	-	64	fl	16
2	**Green band composition 1 parameter for Land**	-	64	fl	16
3	**Blue band composition 1 parameter for Land**	-	64	fl	16
4	**Red band composition 1 parameter for Ocean**	-	64	fl	16
5	**Green band composition 1 parameter for Ocean**	-	64	fl	16

Table 11.7.2.1.13-1 Browse Configuration Parameters GADS					
N	**Description**	**Units**	**Byte Length**	**Data Type**	**Dim.**
6	**Blue band composition 1 parameter for Ocean**	-	64	fl	16
7	**Red band composition 2 parameter for Land**	-	64	fl	16
8	**Green band composition 2 parameter for Land**	-	64	fl	16
9	**Blue band composition 2 parameter for Land**	-	64	fl	16
10	**Red band composition 2 parameter for Ocean**	-	64	fl	16
11	**Green band composition 2 parameter for Ocean**	-	64	fl	16
12	**Blue band composition 2 parameter for Ocean**	-	64	fl	16
13	**Histogram Equalization Input Red Boundaries**	-	6	us	3
14	**Histogram Equalization Input Green Boundaries**	-	6	us	3
15	**Histogram Equalization Input Blue Boundaries**	-	6	us	3
16	**Histogram Equalization Output Red Boundaries**	-	6	us	3
17	**Histogram Equalization Output Green Boundaries**	-	6	us	3
18	**Histogram Equalization Output Blue Boundaries**	-	6	us	3
	size (in bytes)	**-**	**804**	**-**	**-**

11.7.3 Radiometric Calibration Data File

FILE ID: MER_RAC_AX

TYPE: Auxiliary

USE: Level 1B processing

UPDATED: nominally every 2 weeks

SIZE: MPH(1247 bytes) + SPH(2898 bytes) + DSs(2998957 bytes) = 3003102 bytes

11.7.3.1 Format

The high-level breakdown of the data file is as follows:

Table 11.7.3.1-1 Radiometric Calibration Data File - High-level Breakdown
MPH
Auxiliary Data SPH (refer to Volume 16) with 10 DSDs: *DSD for GADS of the Radiometric correction control parameters* *DSD for ADS of the Gain FR* *DSD for ADS of the Gain RR* *DSD for ADS of the Offset FR* *DSD for ADS of the Offset RR* *DSD for ADS of the non-linearity LUT* *DSD for ADS of the optics x CCD response FR* *DSD for ADS of the optics x CCD response RR* *DSD for ADS of the Degradation FR* *DSD for ADS of the Degradation RR*
Radiometric Calibration - GADS of the Radiometric correction control parameters
Radiometric Calibration - ADS of the Gain FR
Radiometric Calibration - ADS of the Gain RR
Radiometric Calibration - ADS of the Offset FR
Radiometric Calibration - ADS of the Offset RR
Radiometric Calibration - ADS of the non-linearity LUT
Radiometric Calibration - ADS of the optics x CCD response FR
Radiometric Calibration - ADS of the optics x CCD response RR
Radiometric Calibration - ADS Degradation FR
Radiometric Calibration - ADS Degradation RR

The following strings will be used in the field DS_NAME for the DSDs listed in the SPH above.

Table 11.7.3.1-2 DS_NAME Strings	
DSD	**DS_NAME String**
DSDs for included Data Sets	
DSD (G) - Radiometric correction control parameters GADS	GADS Corr. Control Params
DSD (G) - Gain FR GADS	ADS Gain FR
DSD (G) - Gain RR GADS	ADS Gain RR
DSD (G) - Offset FR GADS	ADS Offset FR
DSD (G) - Offset RR GADS	ADS Offset RR
DSD (G) - Non-linearity LUT GADS	ADS Non Linearity LUT
DSD (G) - Optics x CCD response FR GADS	ADS OpticsxCCD response FR
DSD (G) - Optics x CCD response RR GADS	ADS OpticsxCCD response RR
DSD (G) - Degradation FR	ADS Degradation FR
DSD (G) - Degradation RR	ADS Degradation RR

11.7.3.1.1 GADS - Radiometric Correction Processing Control Parameters

The content of the GADS shall be as follows:

Table 11.7.3.1.1-1 Radiometric Calibration - GADS of Processing Control Parameters					
N	**Description**	**Units**	**Byte Length**	**Data Type**	**Dim.**
1	**value for redundancy vector**	-	2	us	1
2	**number of bands**	-	1	uc	1
3	**band wavelengths**	(10-3) nm	60	ul	15
4	**band width references**	(10-3) nm	30	us	15
5	**First CCD row of each band (in [0,520])**	-	32	us	16
6	**Number of microbands for each band**	-	32	us	16
7	**width of each band in CCD rows**	-	32	us	16
8	**smear weighting factor for RR ($K_{sm}(b)$)**	-	60	fl	15
9	**smear weighting factor for FR ($K_{sm}(b,j)$)**	-	120	fl	15*2
10	**OCL (Offset Control Loop) switch reference**	-	1	uc	1
11	**on board correction switch reference**	-	1	uc	1

Table 11.7.3.1.1-1 Radiometric Calibration - GADS of Processing Control Parameters					
N	**Description**	**Units**	**Byte Length**	**Data Type**	**Dim.**
12	**Weights for on-board spatial and temporal relaxation**	-	64	fl	16
13	**0 - order coeff. of gain Temp. correction g0**	-	4	fl	1
14	**1st order coeff. of gain Temp. correction g1**	JD-1	4	fl	1
15	**2nd order coeff. of gain Temp. correction g2**	JD-2	4	fl	1
16	**0-order coeff. off dark temp. correction gc0**	-	4	fl	1
17	**1-order coeff. off dark temp. correction gc1**	JD-1	4	fl	1
18	**2-order coeff. off dark temp. correction gc2**	JD-2	4	fl	1
19	**Delay between ascending node and time corresponding to instrument reference temperature (related to sun zenith angle)**	JD	2928	do	366
20	**On board gain settings (per band & per module with 12 values in [0,1,..,11])**	-	80	uc	5*16
21	**thresholds for coarse offset**	-	450	us	5*45
22	**Reference for on board absolute gain coefficients**	-	160	us	5*16
23	**Inverse Mean Absolute Gain**	LU/nc	300	fl	5*15
	size (in bytes)	**-**	**4377**	**-**	**-**

11.7.3.1.2 ADS - FR Gain

The ADS will contain 15 Records, 1 for each observation band. The size of the ADS has been summarized below:

Table 11.7.3.1.2-1 ADS FR Gain		
GADSR no	**Description**	**Size**
1	**GADSR associated with band 1**	14800
…	**…**	…
15	**GADSR associated with band 15**	14800
	Total (in bytes)	**222000**

The content of the ADS Record shall be as follows:

Table 11.7.3.1.2-2 ADSR FR Gain					
N	**Description**	**Units**	**Byte Length**	**Data Type**	**Dim.**
1	**Inverse Absolute radiometric Gain FR**	LU/nc	14800	fl	5*740
	ADSR size (in bytes)	**-**	**14800**	**-**	**-**

11.7.3.1.3 ADS - RR Gain

The ADS will contain 15 Records, 1 for each observation band. The size of the ADS has been summarized below:

Table 11.7.3.1.3-1 ADS RR Gain		
GADSR no	**Description**	**Size**
1	**ADSR associated with band 1**	3700
…	**…**	…
15	**ADSR associated with band 15**	3700
	Total (in bytes)	**55500**

The content of theGADS Record shall be as follows:

Table 11.7.3.1.3-2 ADSR RR Gain					
N	**Description**	**Units**	**Byte Length**	**Data Type**	**Dim.**
1	**Inverse Absolute radiometric Gain RR**	LU/nc	3700	fl	5*185
	ADSR size (in bytes)	**-**	**3700**	**-**	**-**

11.7.3.1.4 ADS - FR Offset

The ADS will contain 16 Records, 1 for each band plus the smear band. The size of the ADS has been summarized below:

Table 11.7.3.1.4-1 ADS FR Offset		
GADSR no	**Description**	**Size**
1	**ADSR associated with band 1**	14800
…	**…**	…
15	**ADSR associated with band 15**	14800
16	**ADSR associated with smear band**	14800

Table 11.7.3.1.4-1 ADS FR Offset		
GADSR no	**Description**	**Size**
	Total (in bytes)	**236800**

The content of the ADS Record shall be as follows:

Table 11.7.3.1.4-2 ADSR FR Offset					
N	**Description**	**Units**	**Byte Length**	**Data Type**	**Dim.**
1	**FR Dark signal char. data (C0 b,k,m)**	nc	14800	fl	5*740
	size (in bytes)	**-**	**14800**	**-**	**-**

11.7.3.1.5 ADS - RR Offset

The GADS will contain 16 Records, 1 for each band plus the smear band. The size of the GADS has been summarized below:

Table 11.7.3.1.5-1 ADS RR Offset		
GADSR no	**Description**	**Size**
1	**ADSR associated with band 1**	3700
…	**…**	…
15	**ADSR associated with band 15**	3700
16	**ADSR associated with band 16**	3700
	Total (in bytes)	**59200**

The content of the ADSR shall be as follows:

Table 11.7.3.1.5-2 ADSR RR Offset					
N	**Description**	**Units**	**Byte Length**	**Data Type**	**Dim.**
1	**RR Dark signal char. data (C0 b,k,m)**	nc	3700	fl	5*185
	size (in bytes)	**-**	**3700**	**-**	**-**

11.7.3.1.6 Non-Linearity LUT ADS

For each module there is one different ADSR.The size of the ADS has been summarized below:

Table 11.7.3.1.6-1 ADS Non-Linearity LUT		
GADSR no	**Description**	**Size**
1	**ADSR associated with module 1**	262144
…	**...**	...
5	**ADSR associated with module 5**	262144
	Total (in bytes)	**1310720**

The content of the ADSR shall be as follows:

Table 11.7.3.1.6-2 ADSR Non-Linearity LUT					
N	**Description**	**Units**	**Byte Length**	**Data Type**	**Dim.**
1	**inverse non-linearity LUT for band 1**	-	16384	fl	4096
2	**inverse non-linearity LUT for band 2**	-	16384	fl	4096
3	**inverse non-linearity LUT for band 3**	-	16384	fl	4096
4	**inverse non-linearity LUT for band 4**	-	16384	fl	4096
5	**inverse non-linearity LUT for band 5**	-	16384	fl	4096
6	**inverse non-linearity LUT for band 6**	-	16384	fl	4096
7	**inverse non-linearity LUT for band 7**	-	16384	fl	4096
8	**inverse non-linearity LUT for band 8**	-	16384	fl	4096
9	**inverse non-linearity LUT for band 9**	-	16384	fl	4096
10	**inverse non-linearity LUT for band 10**	-	16384	fl	4096
11	**inverse non-linearity LUT for band 11**	-	16384	fl	4096
12	**inverse non-linearity LUT for band 12**	-	16384	fl	4096
13	**inverse non-linearity LUT for band 13**	-	16384	fl	4096
14	**inverse non-linearity LUT for band 14**	-	16384	fl	4096
15	**inverse non-linearity LUT for band 15**	-	16384	fl	4096
16	**inverse non-linearity LUT for smear band**	-	16384	fl	4096
	size (in bytes)	**-**	**262144**	**-**	**-**

11.7.3.1.7 FR Optics x CCD Response ADS

This ADS will contain 15 Records, 1 for each observation band. The size of the ADS has been summarized below:

Table 11.7.3.1.7-1 FR Optics x CCD Response ADS		
GADSR no	**Description**	**Size**
1	**ADSR associated with band 1**	14800
…	**...**	...
15	**ADSR associated with band 15**	14800
	Total (in bytes)	**222000**

The content of the ADSR shall be as follows:

Table 11.7.3.1.7-2 Optics x CCD Response ADSR					
N	**Description**	**Units**	**Byte Length**	**Data Type**	**Dim.**
1	**Product of optics transmission by CCD response FR**	e/W	14800	fl	5*740
	size (in bytes)	**-**	**14800**	**-**	**-**

11.7.3.1.8 RR Optics x CCD Response ADS

This ADS will contain 15 Records, 1 for each observation band. The size of the ADS has been summarized below:

Table 11.7.3.1.8-1 FR Optics x CCD Response ADS		
GADSR no	**Description**	**Size**
1	**ADSR associated with band 1**	3700
…	**...**	...
15	**ADSR associated with band 15**	3700
	Total (in bytes)	**55500**

The content of the ADSR shall be as follows:

Table 11.7.3.1.8-2 Optics x CCD Response ADSR					
N	**Description**	**Units**	**Byte Length**	**Data Type**	**Dim.**
1	**Product of optics transmission by CCD response RR**	e/W	3700	fl	5*185
	size (in bytes)	**-**	**3700**	**-**	**-**

11.7.3.1.9 ADS FR Degradation

This ADS will contain 15 Records, one for each observation band. The size of the ADS has been summarized below:

Table 11.7.3.1.9-1 FR Degradation ADS		
ADSR no	**Description**	**Size**
1	**ADSR associated with band 1**	44412
…	**...**	...
15	**ADSR associated with band 15**	44412
	Total (in bytes)	**666180**

The content of the ADSR shall be as follows:

Table 11.7.3.1.9-2 FR Degradation ADSR					
N	**Description**	**Units**	**Byte Length**	**Data Type**	**Dim.**
1	**Reference Time**	mjd	12	sl	3
	beta	**-**	**14800**	**fl**	**5*740**
	gamma	**-**	**14800**	**fl**	**5*740**
	delta	**-**	**14800**	**fl**	**5*740**
	ASDR Size (Total)		**44412**		

11.7.3.1.10 ADS RR Degradation

This ADS will contain 15 Records, one for each observation band.

The size of the ADS has been summarized below:

Table 11.7.3.1.10-1 RR Degradation ADS		
ADSR no	**Description**	**Size**
1	**ADSR associated with band 1**	11112
…	**...**	...
15	**ADSR associated with band 15**	11112
	Total (in bytes)	**166680**

The content of the ADSR shall be as follows:

Table 11.7.3.1.10-2 RR Degradation ADSR					
N	**Description**	**Units**	**Byte Length**	**Data Type**	**Dim.**
1	**Reference Time**	mjd	12	sl	3
	beta	**-**	**3700**	**fl**	**5*185**
	gamma	**-**	**3700**	**fl**	**5*185**
	delta	**-**	**3700**	**fl**	**5*185**
	ASDR Size (Total)		**11112**		

11.7.4 Digital Roughness Model Data File

FILE ID: MER_DRM_AX

TYPE: Auxiliary

USE: Level 1B processing

UPDATED: infrequently

SIZE: MPH(1247 bytes) + SPH(658 bytes) + DSs(approx 37 MB) = approx. 37.3 MB

The purpose of the Digital Roughness Model (DRM) is to provide for any latitude and longitude on Earth a roughness value (meaningful only for land), which is the standard deviation of the elevation.

The format of the Digital Roughness Model file is identical to the format of the Digital Elevation Model (DEM) file described in Volume 16. Roughness is defined as the standard deviation of land elevation over a grid cell centered at the grid point. Roughness is set to 0 when the cell contains only water. It is expressed in mm and coded in floating point format.

The field DS_NAME for the DSD of the General GADS of the file has to be set to “GADS General”.

The field DS_NAME for the DSD of the Digital Roughness Model GADS of the file has to be set to “GADS DRM”.

11.7.5 Coastline/Land/Ocean Data File

The MERIS processor will use the common Land/Sea Mask file described in Volume 16.

11.7.6 Aerosol Climatology Data File

FILE ID: MER_AER_AX

TYPE: Auxiliary

USE: Level 2 processing

UPDATED: infrequently

SIZE: MPH(1247 bytes) + SPH(1498 bytes) + GADSs(1233444 bytes) = 1236189 bytes

11.7.6.1 Format

The high-level breakdown of the data file is as follows:

Table 11.7.6.1-1 Aerosol Climatology Data File- High-level Breakdown

MPH
Auxiliary Data SPH (refer to Volume 16) with 5 DSDs: *DSD for GADS General* *DSD for GADS Aerosol Climatology* *DSD for GADS Volcanic Aerosol Climatology* *DSD for GADS Aerosol Climatology over Ocean* *DSD referencing Land Aerosols Parameters Data file*
Aerosol Climatology - GADS General
Aerosol Climatology - GADS Aerosol Climatology
Aerosol Climatology - GADS Volcanic Aerosol Climatology
Aerosol Climatology - GADS Aerosol Climatology over Ocean

The following strings will be used in the field DS_NAME for the DSDs listed in the SPH above.

Table 11.7.6.1-2 DS_NAME Strings

DSD	DS_NAME String
DSDs for included Data Sets	
DSD (G) - General GADS	GADS General
DSD (G) - Aerosol Climatology GADS	ADS Aer. Clim.
DSD (G) - Volcanic Aerosol Climatology GADS	ADS Volcanic Aer. Clim.

Table 11.7.6.1-2 DS_NAME Strings	
DSD	**DS_NAME String**
DSD (G) - Aerosol Climatology over Ocean GADS	ADS Aer. Clim. Over Ocean
DSD (R) - referencing Land Aerosols Parameters Data file	Land Aer. Param. data file

11.7.6.1.1 General GADS

The format and contents of the General GADS is shown below:

Table 11.7.6.1.1-1 Aerosol Climatology - GADS General					
N	**Description**	**Units**	**Byte Length**	**Data Type**	**Dim.**
1	**τ_A tabulated values**	-	48	fl	12
2	**Latitude tabulated values (format as defined in Volume A)**	10^{-6} deg	720	sl	180
3	**Longitude tabulated values (format as defined in Volume A)**	10^{-6} deg	1140	sl	360
4	**Tabulated values of the volcanic aerosol optical thickness**	-	24	fl	6
5	**Tabulated values of the volcanic aerosol effective radius**	10^{-6} m	12	fl	3
	size (in bytes)	**-**	**2244**	**-**	**-**

11.7.6.1.2 Aerosol Climatology GADS

There is one different GADS record for every two-months period, record 1 pertains to any day of January or February, record 2 pertains to any day of March or April, ... , record 6 pertains to any day of November or December.

The size of the GADS has been summarized below:

Table 11.7.6.1.2-1 Aerosol Climatology GADS		
GADSR no	**Description**	**Size**
1	GADSR associated with season # 1	129600
...	...	...
6	GADSR associated with season # 6	129600

Table 11.7.6.1.2-1 Aerosol Climatology GADS		
GADS R no	**Description**	**Size**
-	**Total (in bytes)**	**777600**

The content of each GADSR shall be as follows:

Table 11.7.6.1.2-2 Aerosol Climatology GADSR					
N	**Description**	**Units**	**Byte Length**	**Data Type**	**Dim.**
1	**τa&model (Lat, Long)**	-	129600	uc	180*360* 2
	size (in bytes)	-	**129600**	-	-

The "τ_a&model" table stored in this file is indexed by the Latitude and the Longitude in this order. The coefficient which is stored in this table is coded as shown in the table below. There are 12 different acceptable classes of optical thickness τ_a that are given by the values given in the "tabulated values of τa for aerosol climatology" stored in the "GADS General" of this file. The aerosol model number is used for indexing tables of optical properties in the "Land aerosol parameters" data file (see Section 11.7.11).

Table 11.7.6.1.2-3 Aerosol Climatology Coding	
τa&model	**Bytes**
Aerosol optical thickness index	0
Aerosol model number	1

11.7.6.1.3 Volcanic Aerosol Climatology GADS

The content of the GADS shall be as follows:

Table 11.7.6.1.3-1 Volcanic Aerosol Climatology GADS					
N	**Description**	**Units**	**Byte Length**	**Data Type**	**Dim.**
1	**Model Index (Lat, Long)**	-	64800	uc	180*360
	size (in bytes)	-	**64800**	-	-

The model index (0..18) stored in this data is indexed by latitude and longitude (in

this order). The latitude and longitude tabulated values are stored in the GADS "General" of this auxiliary data.

11.7.6.1.4 Aerosol Climatology over Ocean GADS

There is one different GADS record for every two-months period, record 1 pertains to any day of January or February, record 2 pertains to any day of March or April, ... , record 6 pertains to any day of November or December.

The size of the GADS has been summarized below:

Table 11.7.6.1.4-1 Aerosol Climatology over Ocean GADS

GADS R no	Description	Size
1	GADSR associated with season # 1	64800
...	...	...
6	GADSR associated with season # 6	64800
-	**Total (in bytes)**	**388800**

The content of each GADSR shall be as follows:

Table 11.7.6.1.4-2 Aerosol Climatology over Ocean GADSR

N	Description	Units	Byte Length	Data Type	Dim.
1	**Aerosol switches (Lat, Long)**	-	64800	uc	180*360
	size (in bytes)	-	**129600**	-	-

The aerosol switches stored in this data is indexed by latitude and longitude (in this order). The latitude and longitude tabulated values are stored in the GADS "General" of this auxiliary data.

Switches are stored on 1 byte per location according to the following table :.

Table 11.7.6.1.4-3 Aerosol Climatology over Ocean Coding

Switch	Bit position
switch to enable/disable the use of maritime aerosols	0
switch to enable/disable the use of urban aerosols in the AC algorithm	1
switch to enable/disable the use of continental aerosols	2
switch to enable/disable the use of desert dust aerosols	3

Table 11.7.6.1.4-3 Aerosol Climatology over Ocean Coding	
Switch	**Bit position**
switch to flag maritime aerosols as “out of range”	4
switch to flag urban aerosol as “out of range”	5
switch to flag continental aerosols as “out of range”	6
switch to flag desert dust aerosols as “out of range”	7

Note : Bit position (least and most significant bits positions) follows Annex A.

11.7.7 Level 2 Control Parameters Data File

FILE ID: MER_CP2_AX

TYPE: Auxiliary

USE: Level 2 processing

UPDATED: infrequently

SIZE: MPH(1247 bytes) + SPH(1498 bytes) + DSs(568072 bytes) = 570817 bytes

11.7.7.1 11.7.7.1 Format

The high-level breakdown of the data file is as follows:

Table 11.7.7.1-1 Level 2 Control Parameters File -High-level Breakdown

MPH
Auxiliary Data SPH (refer to Volume 16) with 5 DSDs: *DSD for GADS General* *DSD for GADS Smile Effect Correction* *DSD for GADS Atmospheric Corrections for Case I waters* *DSD for GADS Classification Parameters* *DSD for GADS Reflectance thresholds*
Level 2 Controls - GADS General
Level2 Controls- GADS Smile Effect Correction
Level 2 Controls - GADS Atmospheric Corrections for Case I waters
Level 2 Controls - GADS Classification Parameters
Level 2 Controls - GADS Reflectance thresholds

The following strings will be used in the field DS_NAME for the DSDs listed in the SPH above.

Table 11.7.7.1-2 DS_NAME Strings

DSD	DS_NAME String
DSDs for included Data Sets	
DSD (G) - General GADS	GADS General
DSD (G)- Smile Effect Correction	GADS Smile Correction
DSD (G) - Atmospheric Corrections for Case I waters	GADS Atm. Corr. - Case 1

Table 11.7.7.1-2 DS_NAME Strings	
DSD	**DS_NAME String**
GADS	
DSD (G) - Classification Parameters GADS	GADS Classification Param.
DSD (G) - Reflectance thresholds GADS	ADS Reflect. Thresholds

11.7.7.1.1 General GADS

The content of the GADS shall be as follows:

Table 11.7.7.1.1-1 MERIS Level 2 Control Parameters Data File - GADS General					
N	**Description**	**Units**	**Byte Length**	**Data Type**	**Dim.**
1	**Number of iterations for chl1 calculation**	-	2	us	1
2	**Flag indicating the presence of stratospheric aerosols**	-	1	uc	1
3	**Default radiance for saturated pixels**	LU	60	fl	15
4	**Maximum Optical Thickness for Land Aerosol**	dl	4	fl	1
5	**scaling factor - reflectances**	dl	60	fl	15
6	**scaling factor - Algal pigment index**	dl	4	fl	1
7	**scaling factor - Yellow substance**	dl	4	fl	1
8	**scaling factor - Suspended sediment**	dl	4	fl	1
9	**scaling factor - Aerosol alpha**	dl	4	fl	1
10	**scaling factor - Aerosol optical thickness**	dl	4	fl	1
11	**scaling factor - Cloud optical thickness**	dl	4	fl	1
12	**scaling factor - Surface pressure**	-dl	4	fl	1
13	**scaling factor - Water vapour**	dl	4	fl	1
14	**scaling factor - Photosynthetically active radiation**	dl	4	fl	1
15	**scaling factor - TOA Vegetation index**	dl	4	fl	1
16	**scaling factor - BOA Vegetation index**	dl	4	fl	1
17	**scaling factor - Cloud Albedo**	dl	4	fl	1
18	**scaling factor - Cloud Top Pressure**	dl	4	fl	1
19	**offset - reflectances**	dl	60	fl	15
20	**offset - Algal pigment index**	$Log_{10}(mg.m^{-3})$	4	fl	1

Table 11.7.7.1.1-1 MERIS Level 2 Control Parameters Data File - GADS General					
N	**Description**	**Units**	**Byte Length**	**Data Type**	**Dim.**
21	**offset - Yellow substance**	$Log_{10}(m^{-1})$	4	fl	1
22	**offset - Suspended sediment**	Log10(g.m-3)	4	fl	1
23	**offset - Aerosol alpha**	dl	4	fl	1
24	**offset - Aerosol optical thickness**	dl	4	fl	1
25	**offset - Cloud optical thickness**	dl	4	fl	1
26	**offset - Surface pressure**	hPa	4	fl	1
27	**offset - Water vapour**	g.cm-2	4	fl	1
28	**offset - Photosynthetically active radiation**	Einstein.m-2	4	fl	1
29	**offset - TOA Vegetation index**	dl	4	fl	1
30	**offset - BOA Vegetation index**	dl	4	fl	1
31	**offset - Cloud Albedo**	dl	4	fl	1
32	**offset - Cloud Top Pressure**	hPa	4	fl	1
33	**scaling factor - rectified near infrared reflectance**	dl	4	fl	1
34	**offset -rectified near infrared reflectance**	dl	4	fl	1
35	**scaling factor -rectified red reflectance**	dl	4	fl	1
36	**offset -rectified red reflectance**	dl	4	fl	1
	size (in bytes)	-	**307**	-	-

Note: reflectance scaling factors and offsets are provided for the 15 MERIS bands (fields 5 and 19).

11.7.7.1.2 Smile Effect Correction GADS

The content of the GADS shall be as follows

Table 11.7.7.1.2-1 Meris Level 2 control parameters data product - GADS Smile Effect Correction					
N	**Description**	**Units**	**Byte Length**	**Data Type**	**Dim.**
1	**Square of Sun-Earth distance at reference date**	m^3	4	fl	1
2	**Array of per band switches enabling Smile Effect Correction for land pixels reflectance**	dl	15	uc	15
3	**Array of per band switches enabling Smile Effect Correction for Water pixels reflectance**	dl	15	uc	15

Table 11.7.7.1.2-1 Meris Level 2 control parameters data product - GADS Smile Effect Correction					
N	**Description**	**Units**	**Byte Length**	**Data Type**	**Dim.**
4	**Array of pairs of band indices for estimation of reflectance spectral derivative (Land pixels)**	dl	15*2	uc	15
5	**Array of pairs of band indices for estimation of reflectance spectral derivative (Water pixels)**	dl	15*2	uc	15
6	**MERIS bands theoretical central wavelengths**	nm	60	fl	15
7	**Reference Solar flux used in Look-up-tables generation**	IU	60	fl	15
8	**MERIS RR pixels characterised wavelengths**	nm	55500	fl	15*925
9	**Reference Solar flux for MERIS RR pixels**	IU	55500	fl	15*925
10	**MERIS FR pixels characterised wavelengths**	nm	222000	fl	15*3700
11	**Reference Solar flux for MERIS FR pixels**	IU	222000	fl	15*3700
	size (in bytes)	-	**555214**	-	-

11.7.7.1.3 Atmospheric Corrections for Case I Waters GADS

The content of the GADS shall be as follows:

Table 11.7.7.1.3-1 Atmospheric Corrections for Case I Waters GADS					
N	**Description**	**Units**	**Byte Length**	**Data Type**	**Dim.**
1	**Reflectance thresholds to set the negative eflectance flag**	dl	60	fl	15
2	**Threshold for absorbing aerosol test at 510 nm**	dl	4	fl	1
3	**Threshold for blue absorbing aerosol test at 510 nm**	dl	4	fl	1
4	**Lists of Aerosol Models indices**	nd	200	uc	10*20
5	**Total number of aerosol models used**	-	1	uc	1
6	**Number of passes within the algorithm**	-	1	uc	1
7	**Number of polynomial coefficients relating ρ_{path}/ρ_R to the aerosol optical thickness**	-	1	uc	1
8	**Indices of models that shall trigger the AERO_BLUE flag**	nd	50	uc	50
9	**Spare**	-	1	uc	1
10	**Spare**	-	1	uc	1
11	**Maximum allowed value for optical thickness at 865 nm**	dl	4	fl	1

Table 11.7.7.1.3-1 Atmospheric Corrections for Case I Waters GADS					
N	**Description**	**Units**	**Byte Length**	**Data Type**	**Dim.**
12	**Threshold on depth for flagging shallow water**	m	4	fl	1
13	**spare**	-	4	fl	1
14	**spare**	-	4	fl	1
15	**Threshold for flagging aerosol optical thickness**	dl	4	fl	1
16	**Switch to test for absorbing aerosols**	-	1	uc	1
17	**θ_s ceiling value for modifying annotation flag**	$(1.e^{-6})$deg	4	ul	1
18	spare	-	4	ul	1
19	**Threshold for pressure correction**	hPa	4	fl	1
20	**Number of wavelengths used in the LUTs**	-	1	uc	1
21	**Number of aerosol models used at each pass**	-	1	uc	1
22	**Switch to use an aerosol climatology**	-	1	uc	1
	size (in bytes)	-	**359**	-	-

The list of aerosol model indices (field 4) is organised as a 10*20 array of model indices. Model indices, between 1 and 34, refer to those models described in the "Ocean aerosols" file. Each 20-elements sub-array corresponds to one pass of the atmosphere correction algorithm. The total number of passes is specified in field 6, which does not mean that the remaining sub-arrays of the list are void. Within each sub-array, the algorithm uses a fixed number of models, specified in field 21.

11.7.7.1.4 Classification Parameters GADS

The content of the GADS shall be as follows:

Table 11.7.7.1.4-1 Classification Parameters GADS					
N	**Description**	**Units**	**Byte Length**	**Data Type**	**Dim.**
1	**Threshold on MERIS Differential Snow Index**	dl	4	fl	1
2	**Numerator band index for spectral ratio #1**	nd	1	uc	1
3	**Denominator band index for spectral ratio #1**	nd	1	uc	1
4	**Lower Threshold for spectral ratio #1**	dl	4	fl	1
5	**Upper Threshold for spectral ratio #1**	dl	4	fl	1
6	**Numerator band index for spectral ratio #2**	nd	1	uc	1

Table 11.7.7.1.4-1 Classification Parameters GADS					
N	**Description**	**Units**	**Byte Length**	**Data Type**	**Dim.**
7	**Denominator band index for spectral ratio #2**	nd	1	uc	1
8	**Lower Threshold for spectral ratio #2**	dl	4	fl	1
9	**Upper Threshold for spectral ratio #2**	dl	4	fl	1
10	**Index of band for test on TOA reflectance (with band numbering starting at 1)**	nd	1	uc	1
11	**Thresholds on TOA reflectance at band b_bright2**	dl	8	fl	2
12	**Index of band for reflectance threshold test**	dl	1	uc	1
13	**θ tabulated values for GADS reflectance threshold**	10^{-6} deg	48	ul	12
14	**Stored combinations of (θ_s , θ_v) for GADS reflectance threshold**	dl	156	uc	78*2
15	**$\Delta\varphi$ tabulated values for GADS reflectance threshold**	10^{-6} deg	76	ul	19
16	**Apparent pressure thresholds over Land**	hPa	**8**	fl	2
17	**Apparent pressure threshold over Water**	hPa	**4**	fl	1
18	**Minimum b10 reflectance value to consider apparent pressure over land**	dl	**4**	fl	1
19	**Minimum b10-b12 spectral slope value to consider apparent pressure over water**	dl	**4**	fl	1
20	**Band indices for MDSI computation**	dl	**2**	uc	2
	size (in bytes)	-	**336**	-	-

Note: For each field in this GADS referring to the MERIS bands : fields 2, 3, 6, 7, 12, 20, band numbering starts at 1. See section 3 above for definition of the MERIS bands. Field 16 "Apparent pressure thresholds over Land" contains two elements: the first one is to be used far from coast while the second is dedicated to Land pixels close to the coastline.

11.7.7.1.5 Reflectance Thresholds GADS

The size of the GADS has been summarized below:

Table 11.7.7.1.5-1 Reflectance Thresholds GADS		
GADS R no	**Description**	**Size**

1	GADSR associated with land pixels	5928
2	GADSR associated with ocean pixels	5928
-	**Total (in bytes)**	**11856**

The content of each GADSR shall be as follows:

Table 11.7.7.1.5-2 Reflectance Thresholds GADSR

N	Description	Units	Byte Length	Data Type	Dim.
1	**Thresholds on Rayleigh-corrected reflectance (θ_s x θ_v , φ)**	dl	5928	fl	78*19
	size (in bytes)	-	**5928**	-	-

The "thresholds on Rayleigh corrected reflectance" are indexed by stored combinations of θ_s and θ_v angles which are tabulated in the "GADS Classification parameters" of this file (fields #13, #14), then by the azimuth difference φ, tabulated in field #15 of that GADS.

11.7.8 Atmosphere Parameters Data File

FILE ID: MER_ATP_AX

TYPE: Auxiliary

USE: Level 2 processing

UPDATED: once a year

SIZE: MPH(1247 bytes) + SPH(2898 bytes) + DSs(9142632) = 9146777 bytes

11.7.8.1 Format

The high-level breakdown of the file is described below:

Table 11.7.8.1-1 Atmosphere Parameters File - High-level Breakdown
MPH
Auxiliary Data SPH (refer to Volume 16) with 10 DSDs: *DSD (G) - GADS General* *DSD (G) - GADS Optical Thicknesses* *DSD (G) -GADS H_20 Transmission* *DSD (G) -GADS Rayleigh Scattering Function* *DSD (G) - GADS Rayleigh Spherical Albedo* *DSD (A) - ADS O_2 Transmission around 779nm* *DSD (A) - ADS Apparent Pressure Parameters* *DSD (G) - GADS Spare (This DSD is not a "real" spare, it is not empty and is defined and referenced in the SPH, the contents are anyway blank)* *DSD (A) - ADS Rayleigh Reflectance over Ocean* *DSD (G) -GADS Photosynthetically Available Radiation*
Atmosphere - GADS General
Atmosphere - GADS Optical Thicknesses
Atmosphere - GADS H20 Transmission
Atmosphere – GADS Rayleigh Scattering Function
Atmosphere – GADS Rayleigh Spherical Albedo
Atmosphere – ADS O_2 Transmission around 779nm
Atmosphere – ADS Apparent Pressure Parameters
Atmosphere – GADS GADS Spare (Pay attention that this is the GADS name that is reported in the SPH as a "real" GADS and not defined as an empty one)

Table 11.7.8.1-1 Atmosphere Parameters File - High-level Breakdown
Atmosphere – ADS Rayleigh Reflectance over Ocean
Atmosphere – GADS Photosynthetically Available Radiation

The following strings will be used in the field DS_NAME for the DSDs listed in the SPH above.

Table 11.7.8.1-2 DS_NAME Strings	
DSD	**DS_NAME String**
DSDs for included Data Sets	
DSD (G) - General GADS	GADS General
DSD (G) - Optical Thicknesses GADS	GADS Optical Thickness
DSD (G) - H20 Transmission GADS	GADS H20 Transmission
DSD (G) - Rayleigh Scattering Function GADS	GADS Rayl. Scatter. Function
DSD (G) - Rayleigh Spherical Albedo GADS	GADS Rayl. Spher. Albedo
DSD (A) - O2 Transmission around 779nm	ADS O2 Transmission
DSD (A) - Pressure Retrieval Parameters GADS	Apparent Press. Param.
DSD (G) - Spare GADS	GADS spare **(Pay attention that this is the GADS name that is reported in the SPH as a "real" GADS and not defined as an empty one)**
DSD (A) - Rayleigh Reflectance over Ocean GADS	ADS Rayl. R efl. over Ocean
DSD (G) -Photosynthetically Available Radiation GADS	GADS PAR

11.7.8.1.1 General GADS

The content of the GADS shall be as follows:

Table 11.7.8.1.1-1 Atmosphere Parameters File - General GADS					
N	**Description**	**Units**	**Byte Length**	**Data Type**	**Dim.**
1	**T_R Transmittance Coefficients**	dl	12	fl	3
2	**τ_R (Rayleigh optical thickness) tabulated values**	dl	68	fl	17
3	**λ tabulated values**	nm	60	fl	15

Table 11.7.8.1.1-1 Atmosphere Parameters File - General GADS					
N	**Description**	**Units**	**Byte Length**	**Data Type**	**Dim.**
4	**θ_s tabulated values for GADS Rayleigh reflectances**	$(1.e^{-6})$deg	92	ul	23
5	**θ_v tabulated values for GADS Rayleigh reflectances**	$(1.e^{-6})$deg	52	ul	13
6	**φtabulated values for GADS Rayleigh reflectances**	$(1.e^{-6})$deg	100	ul	25
7	**θ, zenithal angles tabulated values used for GADS Rayleigh Scattering Pressure thresholds** (see note 1 below)	$(1.e^{-6})$deg	48	ul	12
8	**θ_s x θ_v stored index combinations for GADS Rayleigh Scattering**	dl	156	uc	78*2
9	**Constants used for Rayleigh phase function (A,B)**	dl	8	fl	2
10	**M=(cos θ_s)$^{-1}$+(cos θ_v)$^{-1}$ air mass tabulated values**	dl	24	fl	6
11	**Reference wavelengths for GADS "O_2 transmission"**	nm	84	fl	21
12	**Normalised radiance values at 779 nm**	$-sr^{-1}$	100	fl	25
13	**θ_s tabulated values for GADS "O2 transmission"**	(1.e-6)deg	60	ul	15
14	**θ_v tabulated values for GADS "O2 transmission"**	(1.e-6)deg	40	ul	10
15	**$\Delta\varphi$ tabulated values for GADS "O2 transmission"**	(1.e-6)deg	76	ul	19
16	**Threshold for flagging low pressure water**	hPa	4	fl	1
17	**Standard water vapour content**	$g.cm^{-2}$	4	fl	1
18	**Standard ozone content**	cm.atm	4	fl	1
19	**Standard surface pressure**	hPa	4	fl	1
20	**Wind values for GADS Rayleigh reflectance**	$m.s^{-1}$	12	fl	3
21	**Maximum valid pressure**	hPa	4	fl	1
22	**Angström exponent tabulated values for PAR**	dl	80	fl	20
23	**Ozone concentration tabulated values for PAR**	DU	80	fl	20
24	**Aerosol optical thickness at 865 mn tabulated values for PAR**	dl	80	fl	20
25	**Water vapour tabulated values for PAR**	$g.cm^{-2}$	80	fl	20
26	**Reference wavelengths for GADS "Apparent Pressure Parameters".**	nm	84	fl	21
27	**Reference wavelengths for fields "H2O Transmittance Polyn. Coeffs. for correction of b709"**	nm	84	fl	21

Table 11.7.8.1.1-1 Atmosphere Parameters File - General GADS					
N	**Description**	**Units**	**Byte Length**	**Data Type**	**Dim.**
28	**Pressure scale height to account for altitude**	m	4	fl	1
29	**θ, zenithal angles tabulated values used for GADS "Apparent Pressure Parameters".**	(1.e-6)deg	96	ul	24
30	**Reference pressure levels for GADS "Apparent Pressure Parameters" (field 4).**	hPa	84	fl	21
31	**Aerosol Scattering Phase function (scattering angle)**	dl	724	fl	181
32	**LUT of parameters to compute Fresnel reflection coefficients (zenith angle)**	dl	364	fl	91
	size (in bytes)	-	**2772**	-	-

Note:

1) The index combinations in field #8 apply only to the storage of the LUTs in auxiliary data files. As the matrices are symmetrical in the (θ_s,θ_v) directions, only the upper-half triangular matrix is stored : N*(N+1)/2 instead of N^2 elements stored (78 instead of 144). When reading the LUT from file (with θ_s running slower than θ_v), the rectangular LUT shall be built by duplication of the symmetrical elements.

2) Fields 31 & 32 provide values for every degree of angle – from 0 to 180 for the former, from 0 to 90 for the latter. Corresponding grid vectors are thus straightforward and have been omitted.

11.7.8.1.2 Optical Thicknesses GADS

The content of the GADS shall be as follows :

Table 11.7.8.1.2-1 Optical Thicknesses GADS					
N	**Description**	**Units**	**Byte Length**	**Data Type**	**Dim.**
1	**Spare**	-	60	uc	60
2	**Spare**	-	60	uc	60
3	**Spare**	-	60	uc	60
4	**Rayleigh Optical Thicknesses(λ) for standard pressure**	dl	60	fl	15
5	**O_3 Optical Thicknesses(λ) for 1 cm.atm**	dl	60	fl	15
	size (in bytes)	-	**300**	-	-

All of the optical thicknesses vectors stored in this table are indexed by the MERIS band numbers. A complete description of the data stored in this table may

be found in R-34.

11.7.8.1.3 H2O TransmissionGADS

The content of the GADS shall be as follows:

Table 11.7.8.1.3-1 H2O Transmission GADS

N	Description	Units	Byte Length	Data Type	Dim.
1	Spare	dl	336	fl	84
2	H2O Transmittance Polynomial Coefficients (λb709, order) for correction of b709	dl	336	fl	21*4
3	H_2O Transmittance Polynomial Coefficients (λ ,order) for correction at all bands (values for b709 should not be used but taken from previous field)	dl	240	fl	15*4
	size (in bytes)	-	**912**	-	-

The O2 transmittance polynomial coefficients apply to band at 775 nm and depend on the actual wavelength of band 11 of the pixel on which it will be applied. Reference band 11 wavelengths for each of the 21 polynomials are listed in field 26 of the GADS general.
The H2O transmittance polynomial coefficients given in field #2 apply to band at 709 nm only and depend on the actual wavelength of that band of the pixel on which it will be applied. Reference band b709 wavelengths for each of the 21 polynomials are listed in field 27 of the GADS general.
The H2O coefficients given in field #3 are indexed by MERIS band λ (field #3 of General GADS) and polynomial order. The 0th order coefficient is the first value stored in each "Transmission Polynomial Coefficients" vector, the 1st order coefficient is the second value, ... Values for band b709 have been kept to keep for historical reason but the proper use of field #2 as described above give more accurate results.

11.7.8.1.4 Rayleigh Scattering Function GADS

The content of the GADS shall be as follows:

Table 11.7.8.1.4-1 Rayleigh Scattering Function GADS

N	Description	Units	Byte Length	Data Type	Dim.
1	**Rayleigh Scattering Fourier series1 ($\theta_s x \theta_v$, order)**	dl	1248	fl	78*4

2	**Rayleigh Scattering Fourier series2 ($\theta_s x \theta_v$, order)**	dl	1248	fl	78*4
3	**Rayleigh Scattering Fourier series3 ($\theta_s x \theta_v$, order)**	dl	1248	fl	78*4
	size (in bytes)	-	**3744**	-	-

Each term of the Fourier series is first indexed by the stored combinations of θ_s and θ_v angles which are tabulated in fields #7, #8 of the General GADS, then by polynomial coefficient order (from 0 to 3).

11.7.8.1.5 Rayleigh Spherical Albedo GADS

The content of the GADS shall be as follows:

Table 11.7.8.1.5-1 Rayleigh Spherical Albedo GADS

N	Description	Units	Byte Length	Data Type	Dim.
1	**s_R Rayleigh Spherical Albedo LUT (τ_R)**	-	68	fl	17
	size (in bytes)		**68**		

The s_R Rayleigh Spherical Albedo is indexed by τ_R, the Rayleigh optical thickness which is tabulated in fields #2 of the General GADS of this file.

11.7.8.1.6 O_2 transmission around 779 nm ADS

The format of the Annotation Data Set shall be as specified in [A-4].

For each one of the wavelength tabulated values listed in the "GADS General" (field 26) of this product there is one different record.

The size of the ADS has been summarized below:

Table 11.7.8.1.6-1 Atmosphere parameters product - Oxygen transmission at 779 nm ADS

ADSR no	Description	Size
0	ADSR associated with λ value # 1 and LN(779) value #1	11400
…	…	…
24	ADSR associated with λ value # 1 and LN(779) value #25	11400
25	ADSR associated with λ value # 2 and LN(779) value #1	11400
…	…	…

Table 11.7.8.1.6-1 Atmosphere parameters product - Oxygen transmission at 779 nm ADS		
ADSR no	**Description**	**Size**
524	ADSR associated with λ value # 21 and LN(779) value #25	11400
	Total (bytes)	**5985000**

There is one Record for each one of the 21 wavelengths times the 25 tabulated values of normalised radiance listed in the "GADS General" of this product (fields 11 and 12 respectively). Therefore the ADS holds 525 records.

Table 11.7.8.1.6-2 Atmosphere parameters product - ADSR - Oxygen transmission at 779 nm					
N	**Description**	**Units**	**Byte Length**	**Data Type**	**Dim.**
1	**Oxygen transmission (θs,θv,Δφ)**	dl	11400	fl	15*10*19
	size (in bytes)	-	**11400**	-	-

Each record contains a three-dimensional table giving the transmission of molecular oxygen as a function of Sun zenith angle, view zenith angle and relative azimuth angle. The tabulated values of these three angles are stored in the "GADS General" of this product, fields 13, 14 & 15.

11.7.8.1.7 Apparent Pressure Parameters ADS

The format of the Annotation Data Set shall be as specified in [A-4].
For each one of the wavelength tabulated values listed in the "GADS General" (field 26) of this product there is one different record.

Table 11.7.8.1.7-1 Apparent Pressure Parameters ADS		
ADSR no	**Description**	**Size**
0	ADSR associated with λ value # 1	55296
…	…	…
21	ADSR associated with λ value # 21	55296
	Total (bytes)	**1161216**

The content of the ADSR shall be as follows:

Table 11.7.8.1.7-2 Apparent Pressure Parameters ADSR					
N	**Description**	**Units**	**Byte Length**	**Data Type**	**Dim.**
1	**O2 Rayleigh transmittance (θs,θv)**	dl	2304	fl	24*24
2	**O2 aerosol transmittance for Ha=2km (θs,θv)**	dl	2304	fl	24*24
3	**O2 Aerosol Fresnel transmittance (θs,θv)**	dl	2304	fl	24*24
4	**O2 atmo spheric transmittance LUT (layer, θs,θv)**	dl	48384	fl	21*24*24
	size (in bytes)	-	**55296**	-	-

The tables of the first three fields are two-dimensional and indexed by the Sun and View zenith angles, both tabulated in field 29 of the "GADS General" (see §6.11.6 above). The table in the fourth and last field is three-dimensional and indexed by the pressure layer, tabulated in field 30 of the "GADS General" and the Sun and View zenith angles, both tabulated in field 29.

11.7.8.1.8 Spare GADS

The content of the GADS shall be as follows:

Table 11.7.8.1.8-1 Spare GADS					
N	**Description**	**Units**	**Byte Length**	**Data Type**	**Dim.**
1	**Spare**	-	1560	fl	78*5
2	**Spare**	-	1560	fl	78*5
	size (in bytes)	-	**3120**	-	-

11.7.8.1.9 Rayleigh Reflectance over Ocean ADS

For each one of the θ_s tabulated values listed in the field #4 of the General GADS of this file there is one different record.
The size of the ADS has been summarized below:

Table 11.7.8.1.9-1 Rayleigh Reflectance over Ocean ADS		
ADSR no	**Description**	**Size**
1	ADSR associated with θ_s value # 1	58500
...	...	...

Table 11.7.8.1.9-1 Rayleigh Reflectance over Ocean ADS		
ADSR no	**Description**	**Size**
22	ADSR associated with θ_s value # 23	58500
-	**Total (in bytes)**	**1345500**

The content of the GADSR shall be as follows:

Table 11.7.8.1.9-2 Rayleigh Reflectance over Ocean ADSR					
N	**Description**	**Units**	**Byte Length**	**Data Type**	**Dim.**
1	**Rayleigh reflectance over Ocean (λ,θ_v,φ)case 1 wind**	dl	19500	fl	15*13*25
2	**Rayleigh reflectance over Ocean (λ,θ_v,φ)case 2 wind**	dl	19500	fl	15*13*25
3	**Rayleigh reflectance over Ocean (λ,θv,φ)case 3 wind**	dl	19500	fl	15*13*25
	size (in bytes)	-	**58500**	-	-

Each coefficient stored in this table is first indexed by the MERIS band λ (field #3 of the General GADS), then by the viewing zenithal angle θ_v, and finally by the azimuth angle φ.All of those parameters are tabulated in the "GADS General" of this file. The wind specifying the three cases may also be found in the "GADS General" of this product (respectively fields 5, 6, 20).

11.7.8.1.10 Photosynthetically Available Radiation GADS

The content of the GADS shall be as follows:

Table 11.7.8.1.10-1 Photosynthetically Available Radiation GADS					
N	**Description**	**Units**	**Byte Length**	**Data Type**	**Dim.**
1	**PAR (Angström exponent, ozone, tau_a865, vapour)**	µEinstein. m^{-2} s^{-1}	640000	fl	20*20*20 *20
	size (in bytes)	-	**640000**	-	-

The photosynthetically available radiation values stored in this table are indexed by the Angström exponent, by ozone values, by aerosol optical thickness at 865 nm, and finally by water vapour. Angström exponent value giving the slowest growing index.

All the parameters used for indexing the data of this table are stored in the fields #22,

#23, #24, #25 of the General GADS of this file.

11.7.9 Water Vapour Parameters Data File

FILE ID: MER_WVP_AX

TYPE: Auxiliary

USE: Level 2 processing

UPDATED: once a year SIZE: MPH(1247 bytes) + SPH(2058bytes) + GADSs(666271773Bytes) = 666275078Bytes

11.7.9.1 Format

The high-level breakdown of the file is described below:

Table 11.7.9.1-1 Water Vapour Parameters File - High-level Breakdown
MPH
Auxiliary Data SPH (refer to Volume 16) with 6 DSDs *DSD (G) - GADS General* *DSD (G) - ADS Neural Network for Water Vapour retrieval over Land* *DSD (A) - ADS Polynomial Coefficients for Water Vapour retrieval over Ocean when there is no glint* *DSD (A) - ADS Polynomial Coefficients over Clouds* *DSD (A) - ADS Polynomial Coefficients for Albedo Slope Correction 900/885* *DSD (A) - ADS Polynomial Coefficients for Aerosol Correction* *DSD (A) – ADS Albedo at 885nm*
Water Vapour - GADS General
Water Vapour - GADS Neural Network for Water Vapour retrieval over Land
Water Vapour - ADS Polyn. Coeffs. over Ocean when there is no glint
Water Vapour - ADS Polyn. Coeffs. over Clouds
Water Vapour - ADS Albedo Slope LUT between 990 and 885 nm
Water Vapour - ADS Polynomial Coefficients for Aerosols Correction
Water Vapour - ADS Surface Albedo at 885 nm

The following strings will be used in the field DS_NAME for the DSDs listed in the SPH above.

Table 11.7.9.1-2 DS_NAME Strings	
DSD	**DS_NAME String**
DSDs for included Data Sets	
DSD (G) - General GADS	GADS General
Water Vapour - GADS Neural Network for Water Vapour retrieval over Land	ADS Land Coeff.
Water Vapour - ADS Polyn. Coeffs. over Ocean when there is no glint	ADS Ocean (no glint) Coeff.
Water Vapour - ADS Polyn. Coeffs. over Clouds	ADS Cloud Coeff.
Water Vapour - ADS Albedo Slope LUT between 990 and 885 nm	ADS Albedo Slope 900/885
Water Vapour - ADS Polynomial Coefficients for Aerosols Correction	ADS Aerosol Corr. Coeff.
Water Vapour - ADS Surface Albedo at 885 nm	ADS Albedo at 885nm

11.7.9.1.1 General GADS

The content of the GADS shall be as follows:

Table 11.7.9.1.1-1 Water Vapour Parameters File - General GADS					
N	**Description**	**Units**	**Byte Length**	**Data Type**	**Dim.**
1	**θ_s tabulated values**	$(1.e^{-6})$deg	108	ul	27
2	**θ_v tabulated values**	$(1.e^{-6})$deg	72	ul	18
3	**φ tabulated values**	$(1.e^{-6})$deg	100	ul	25
4	**Threshold value on radiance at 885 nm for marking pixel as invalid for water vapour processing**	LU	4	fl	1
5	**Minimum threshold for out of range output value of water vapour content**	$g.cm^{-2}$	4	fl	1
6	**Maximum threshold for out of range output value of water vapour content**	$g.cm^{-2}$	4	fl	1
7	**Sun irradiance values at 775, 865, 885, 900nm, consistent with Cloud LUTs**	EU	16	fl	4
8	**Aerosol optical depth tabulated values**	dl	80	fl	20
9	**Surface albedo tabulated values**	dl	40	fl	10
10	**Cloud optical depth tabulated values**	dl	80	fl	20

Table 11.7.9.1.1-1 Water Vapour Parameters File - General GADS					
N	**Description**	**Units**	**Byte Length**	**Data Type**	**Dim.**
11	**Wind modulus tabulated values**	$m.s^{-1}$	20	fl	5
12	**Latitude tabulated values**	$(1.e^{-6})$ deg	**14400**	sl	3600
13	**Longitude tabulated values**	$(1.e^{-6})$ deg	**28800**	sl	7200
14	**Offset & scaling factor for surface albedo ratio b15/b14**	dl	**8**	fl	2
15	**scaling factor for surface albedo at b14**	dl	**4**	fl	1
16	**Bad data value for surface albedo ratio b15/b14**	dl	**1**	uc	1
17	**Minimum valid values for Neural Net inputs**	misc	**40**	fl	10
18	**Maximum valid values for Neural Net inputs**	misc	**40**	fl	10
19	**Minimum valid value for Neural Net output**	$g.cm^{-2}$	**4**	fl	1
20	**Maximum valid value for Neural Net output**	$g.cm^{-2}$	**4**	fl	1
	size (in bytes)	-	**43829**	-	-

11.7.9.1.2 Neural Network for Water Vapour retrieval over Land GADS

The format of each ADSR of this ADS will be the NNff format specified in section 11.7.13.1.4. There is only one record in this GADS.

11.7.9.1.3 Polynomial Coefficients for Water Vapour Retrieval over Ocean when there is no glint ADS

For each one of the θ_s tabulated values listed in the "GADS General" of this file there is one different record.

The size of the ADS has been summarized below:

Table 11.7.9.1.3-1 Polynomial Coefficients for Ocean Water Vapour Retrieval - No Glint ADS		
ADSR no	**Description**	**Size**
1	ADSR associated with θ_s value # 1	540000
...	...	...
27	ADSR associated with θ_s value # 27	540000
-	**Total (in bytes)**	**1458000**

The content of the ADSR shall be as follows:

Table 11.7.9.1.3-2 Polynomial Coefficients for Ocean Water Vapour Retrieval - No Glint ADSR					
N	**Description**	**Units**	**Byte Length**	**Data Type**	**Dim.**
1	**k_0 Polynomial Coefficients (θv, φ, δ, w)**	-	180000	fl	18*25*20*5
2	**k_1 Polynomial Coefficients (θv, φ, δ, w)**	-	180000	fl	18*25*20*5
3	**k_2 Polynomial Coefficients (θv, φ, δ, w)**	-	180000	fl	18*25*20*5
	size (in bytes)	-	**540000**	-	-

Each coefficient stored in this table is first indexed by the viewing zenithal angle θ_v, then by the azimuth angle φ, then by the aerosol optical thickness δ. The parameters θ_v, $\varphi$and $\delta$are tabulated in the "GADS General" (fields #2, #3, #8) of this file.

11.7.9.1.4 Polynomial Coefficients for Water Vapour Retrieval over Clouds ADS

For each one of the θ_s tabulated values listed in the "GADS General" (field #1) of this file there is one different record.

The size of the ADS has been summarized below:

Table 11.7.9.1.4-1 Polynomial Coefficients for Water Vapour Retrieval over Clouds ADS		
ADSR no	**Description**	**Size**
1	GADSR associated with θ_s value # 1	1080000
...	...	...
27	GADSR associated with θ_s value # 27	1080000
-	**Total (in bytes)**	**29160000**

The content of the ADSR shall be as follows:

Table 11.7.9.1.4-2 Polynomial Coefficients for Water Vapour Retrieval over Clouds ADSR					
N	**Description**	**Units**	**Byte Length**	**Data Type**	**Dim.**
1	**k_0 Polynomial Coefficients (θ_v, φ, α, δ)**	-	360000	fl	18*25*10*20
2	**k_1 Polynomial Coefficients (θ_v, φ, α, δ)**	-	360000	fl	18*25*10*20

3	**k_2 Polynomial Coefficients (θ_v, φ, α, δ)**	-	360000	fl	18*25*10*20
	size (in bytes)	-	**1080000**	-	-

Each coefficient stored in this table is first indexed by the viewing zenithal angle θ_v, then by the azimuth angle φ, then by the surface albedo α, and finally by the cloud optical thickness δ. The parameters θ_v, φ,α,and $\delta$are tabulated in the "GADS General" (fields #2, #3, #9, #10) of this file.

11.7.9.1.5 Surface Albedo Slope between 900 and 885 nm ADS

For each one of the 12 months times the 3600 latitudes tabulated values listed in the "GADS General" of this product (field 12) there is one different record.The size of the ADS has been summarized below:

Table 11.7.9.1.5-1 Surface Albedo Slope between 900 and 885 nm ADS

ADSR no	Description	Size
0	ADSR associated with # month 1, latitude #1	7200
...	...	...
3599	ADSR associated with # month 1, latitude #3600	7200
3600	ADSR associated with # month 2, latitude #1	7200
...	...	...
43199	ADSR associated with # month 12, latitude #3600	7200
-	**Total (in bytes)**	**311040000**

Each record contains a one-dimensional table giving the surface albedo slope as a function of Longitude. The tabulated values of the longitude are stored in the "GADS General" of this product, field 13. The Albedo Slope values are stored as unsigned 1-byte integers. They shall be converted to geophysically meaningful values using the offset and scaling factors provided in field 14 of the "GADS General" of this product. The conversion formula is as follows:
SurfaceAlbedo = byte_count * Scale + Offset.
In addition, a specific value of the byte count is reserved to the “missing data” value. This byte count value is stored in field 16 of the “GADS General”. It is the responsibility of the user to identify (longitude, latitude) cells affected by these values in the unscaled Surface Albedo Slope maps before scaling and use them appropriately.

The content of the ADSR shall be as follows:

Table 11.7.9.1.5-2 Surface Albedo Slope between 900 and 885 nm ADSR

N	Description	Units	Byte Length	Data Type	Dim.
1	**Surface albedo slope (Longitude)**	dl	7200	uc	7200
	size (in bytes)	-	**7200**	-	-

11.7.9.1.6 Aerosol Correction ADS

For each one of the θ_s tabulated values listed in the "GADS General" (field #1) of this file there is one different record.

The size of the ADS has been summarized below:

Table 11.7.9.1.6-1 Aerosol Correction ADS

ADSR no	Description	Size
1	ADSR associated with θ_s value # 1	5400
...	...	...
27	ADSR associated with θ_s value # 27	5400
-	**Total (in bytes)**	**145800**

The content of the GADSR shall be as follows:

Table 11.7.9.1.6-2 Aerosol Correction ADSR

N	Description	Units	Byte Length	Data Type	Dim.
1	**A_{aer} Coefficients for aerosol correction (θ_v , φ)**	dl	1800	fl	18*25
2	**B_{aer} Coefficients for aerosol correction (θ_v , φ)**	dl	1800	fl	18*25
3	**C_{aer} Coefficients for aerosol correction (θ_v , φ)**	dl	1800	fl	18*25
	size (in bytes)	-	**5400**	-	-

Each coefficient stored in this table is first indexed by the viewing zenithal angle θ_v, and then by the azimuth difference angle φ. The parameters θ_v and $\varphi$are tabulated in the "GADS General" (fields #2, #3) of this file.

11.7.9.1.7 Surface Albedo Surface Albedo at 885 nm ADS

For each one of the 12 months times the 3600 latitudes tabulated values listed in the "GADS General" of this product (field 12) there is one different record.

The size of the ADS has been summarized below

Table 11.7.9.1.7-1 Surface Albedo at 885 nm ADS		
ADSR no	**Description**	**Size**
0	ADSR associated with # month 1, latitude #1	7200
...	...	...
3599	ADSR associated with # month 1, latitude #3600	7200
3600	ADSR associated with # month 2, latitude #1	7200
...	...	...
43199	ADSR associated with # month 12, latitude #3600	7200
-	**Total (in bytes)**	**311040000**

Each record contains a one-dimensional table giving the surface albedo as a function of Longitude. The tabulated values of the longitude are stored in the "GADS General" of this product, field 13. The Surface Albedo values are stored as unsigned 1-byte integers. They shall be converted to geophysically meaningful values using the scaling factor provided in field 15 of the "GADS General" of this product. The conversion formula is as follows: SurfaceAlbedo = byte_count * Scale..

The content of each ADSR shall be as follows

Table 11.7.9.1.7-2 Surface Albedo at 885 nm ADSR					
N	**Description**	**Units**	**Byte Length**	**Data Type**	**Dim.**
1	**Band 14 Surface Albedo (Longitude)**	dl	7200	uc	7200
	size (in bytes)	-	**7200**	-	-

11.7.10 Ocean Aerosols Parameters Data File

FILE ID: MER_OAP_AX

TYPE: Auxiliary

USE: Level 2 processing

UPDATED: once a year

SIZE: MPH(1247 bytes) + SPH(2618bytes) + DSs(138462574bytes) = 138466439bytes

11.7.10.1 Format

The high-level breakdown of the file is described below:

Table 11.7.10.1-1 Ocean Aerosol Parameters File - High-level Breakdown
MPH
Auxiliary Data SPH (refer to Volume 16) with 8 DSDs *DSD (G) - GADS General* *DSD (G) - GADS Spectral Optical Thickness* *DSD (G) - GADS Aerosol Optical Thickness at 865 nm* *DSD (G) - GADS Aerosol Single Scattering Albedo* *DSD (G) - GADS Aerosol Scattering Probability* *DSD (G) - GADS Blue ROGC Threshold* *DSD(A) - ADS Coeff of* (ρ_T/ρ_R) *to* τ_a *relation* *DSD(A) - ADSDownward transmittance* *DSD(A) - ADS Upward transmittance*
Ocean Aerosols - GADS General
Ocean Aerosols - GADS Spectral Optical Thickness
Ocean Aerosols - GADS Aerosol Optical Thickness at 865 nm
Ocean Aerosols - GADS Aerosol Single Scattering Albedo
Ocean Aerosols - GADS Aerosol Scattering Probability
Ocean Aerosols - GADS Blue ROGC Threshold
Ocean Aerosols - ADS Coeff of (ρT/ρR) to τa relation
Ocean Aerosols - ADS Transmittance down
Ocean Aerosols - ADS Transmittance up

The following strings will be used in the field DS_NAME for the DSDs listed in the SPH above.

Table 11.7.10.1-2 DS_NAME Strings

DSD	DS_NAME String
DSDs for included Data Sets	
DSD (G) - General GADS	GADS General
DSD (G) - Spectral Optical Thickness GADS	GADS Spectral OT
DSD (G) - Aerosol Optical Thickness at 865 nm GADS	GADS Aer. OT at 865 nm
DSD (G) - Aerosol Single Scattering Albedo GADS	GADS Aer. Single Scatt. Alb.
DSD (G) - Aerosol Scattering Probability GADS	GADS Aer. Scatt. Probability
DSD (G) - *Blue ROGC Threshold* GADS	GADS Blue ROGC Threshold
DSD (G) - Coeff of (ρ_T/ρ_R) to τ_a relation GADS	ADS (rT/rR) to Aer. OT rel.
DSD (A) - Transmittance down	ADS Downward transmittance
DSD (A) - Transmittance up	ADS Upward transmittance

11.7.10.1.1 General GADS

The content of the GADS shall be as follows:

Table 11.7.10.1.1-1 Ocean Aerosol Parameters File - General GADS

N	Description	Units	Byte Length	Data Type	Dim.
1	**λ tabulated values for 10 bands**	nm	60	fl	15
2	**Spare**	-	20	fl	5
3	**θ_s tabulated values**	(1.e-6)deg	92	ul	23
4	**θ_v tabulated values**	(1.e-6)deg	52	ul	13
5	**φ tabulated values**	(1.e-6)deg	100	ul	25
6	**wind tabulated values**	$m.s^{-1}$	12	fl	3
7	**Vicarious adjustment gains (λ)**	dl	60	fl	15
8	**Spare**	-	1006	uc	1006
	size (in bytes)		**1402**		

There are 34 aerosol models, numbered from 1 to 34 whenever listed in a table.

11.7.10.1.2 Spectral Optical Thickness GADS

The content of the GADS shall be as follows:

Table 11.7.10.1.2-1 Spectral Optical Thickness GADS					
N	**Description**	**Units**	**Byte Length**	**Data Type**	**Dim.**
1	**Spectral Optical Thickness (iaer, λ,τ_a)**	dl	14280	fl	34*15*7
	size (in bytes)	-	**14280**	-	-

This table gives the “normalized” (wrt 865 nm) spectral optical thickness. The data stored in the table is first indexed by the aerosol model number, then by the wavelength, and finally by the optical thickness at 865nm. The wavelength is tabulated in the "GADS General" of this file.The optical thickness at 865 nm is tabulated in the “Aerosol Optical Thickness” below.

11.7.10.1.3 Aerosol Optical Thickness at 865 nm

The content of the GADS shall be as follows:

Table 11.7.10.1.3-1 Aerosol Optical Thickness at 865 nm GADS					
N	**Description**	**Units**	**Byte Length**	**Data Type**	**Dim.**
1	**Aerosol Optical Thickness at 865 nm (iaer, τ_a)**	dl	952	fl	34*7
	size (in bytes)	-	**952**	-	-

This table stores optical thickness at 865 nm and is used as follows : given an aerosol model, 5 different optical thickness at 865 nm are available in the table. Then, given an aerosol optical thickness at 865 nm, its index in that range of 5 values is used to address the GADS “Spectral optical thickness” given above.

11.7.10.1.4 Aerosol Single Scattering Albedo GADS

The content of the GADS shall be as follows:

Table 11.7.10.1.4-1 Aerosol Single Scattering Albedo GADS					
N	**Description**	**Units**	**Byte Length**	**Data Type**	**Dim.**
1	**Aerosol Forward Single Scattering Albedo (iaer,λ)**	dl	2040	fl	34*15
	size (in bytes)	-	**2040**	-	-

The data stored in this table is indexed by the aerosol model number, then by the wavelength tabulated in field #1 of the General GADS in this file.

11.7.10.1.5 Aerosol Scattering Probability GADS

The content of the GADS shall be as follows:

Table 11.7.10.1.5-1 Aerosol Scattering Probability GADS

N	Description	Units	Byte Length	Data Type	Dim.
1	**Aerosol Scattering Probability (iaer, λ)**	-	2040	fl	34*15
	size (in bytes)	**-**	**2040**	**-**	**-**

The data stored in this table is first indexed by the aerosol model number, then by the wavelength. The wavelength is tabulated in the field #1 of the "GADS General" of this file.

11.7.10.1.6 Blue ROGC Threshold GADS

The content of the GADS shall be as follows:

Table 11.7.10.1.6-1 Blue ROGC Threshold GADS

N	Description	Units	Byte Length	Data Type	Dim.
1	Blue ROGC Threshold (θ_s, θ_v, φ)	dl	29900	fl	23*13*25
	size (in bytes)	**-**	29900	**-**	**-**

11.7.10.1.7 Coefficients of (ρT/ρR) to τa Relation ADS

For each of the different θ_s tabulated values in the "GADS General" (field #3) of this file and for each of the different models there is one different record. The size of the ADS has been summarized below:

Table 11.7.10.1.7-1 Coeff of (ρT/ρR) to τa Relation ADS

ADSR no	Description	Size
0	ADSR associated with θ_s value # 1, aerosol 1	175500
1	ADSR associated with θ_s value # 1, aerosol 2	175500
...	...	
782	ADSR associated with θ_s value # 23, aerosol 34	175500
-	**Total (in bytes)**	**137241000**

The content of the ADSR shall be as follows:

Table 11.7.10.1.7-2 Coeff of (ρT/ρR) to τa Relation ADSR					
N	**Description**	**Units**	**Byte Length**	**Data Type**	**Dim.**
1	**Coeffs of (ρ_T/ρ_R) to τ_a relation for case 1 wind (order λ, θ_v, φ)**	dl	58500	fl	3*15*13*25
2	**Coeffs of (ρ_T/ρ_R) to τ_a relation for case 2 wind (order λ, θ_v, φ)**	dl	58500	fl	3*15*13*25
	size (in bytes)	**-**	**175500**	**-**	**-**

Each coefficient stored in this table is first indexed by the polynomial order of the coefficients, then by the wavelength, then by the viewing angle θ_v, and finally by the azimuth difference angle φ. The index φ is the fastest. All the indexing parameters (λ, θ_v,φ, and wind) are tabulated in fields #1, #4, #5 and #6 of the "GADS General" of this file.

11.7.10.1.8 Downward Total Transmittance ADS

For each of the different aerosol models there is one different record.

The size of the ADS has been summarized below

Table 11.7.10.1.8-1 Transmittance down ADS		
ADSR no	**Description**	**Size**
0	ADSR associated with aerosol 1	28980
1	ADSR associated with aerosol 2	28980
...	...	
33	ADSR associated with aerosol 34	28980
-	**Total (in bytes)**	**985320**

The content of the ADSR shall be as follows:

Table 11.7.10.1.8-2 Downward transmittance ADSR					
N	**Description**	**Units**	**Byte Length**	**Data Type**	**Dim.**

Table 11.7.10.1.8-2 Downward transmittance ADSR					
N	**Description**	**Units**	**Byte Length**	**Data Type**	**Dim.**
1	Downward total transmittance for wind 1 (λ, θ_s, τ_{aer}_865)	dl	9660	fl	15*23*7
2	Downward total transmittance for wind 2 (λ, θ_s, τ_{aer}_865)	dl	9660	fl	15*23*7
3	Downward total transmittance for wind 3 (λ, θ_s, τ_{aer}_865)	dl	9660	fl	15*23*7
	size (in bytes)	**-**	**28980**	**-**	**-**

This table stores the total (Rayleigh+aerosol) downward transmittance. Each coefficient stored in this table if first indexed by the wavelength, then by the zenith angle qs, and finally by the aerosol optical thickness at 865 nm. Indexing parameters l and qs are tabulated in the "GADS General" of this product, fields 1 and 3, while taer_865 is tabulated in GADS “Aerosol Optical Thickness at 865”, for a given aerosol model.

11.7.10.1.9 Upward Total Transmittance ADS

For each of the different aerosol models there is one different record.

The size of the ADS has been summarized below

Table 11.7.10.1.9-1 Transmittance up ADS		
ADSR no	**Description**	**Size**
0	ADSR associated with aerosol 1	5460
1	ADSR associated with aerosol 2	5460
...	...	
33	ADSR associated with aerosol 34	5460
-	**Total (in bytes)**	**185640**

The content of the ADSR shall be as follows:

Table 11.7.10.1.9-2 Upward transmittance ADSR					
N	**Description**	**Units**	**Byte Length**	**Data Type**	**Dim.**

Table 11.7.10.1.9-2 Upward transmittance ADSR					
N	**Description**	**Units**	**Byte Length**	**Data Type**	**Dim.**
1	Upward total transmittance (λ, θv, τaer_865)	dl	5460	fl	15*13*7
	size (in bytes)	**-**	**5460**	**-**	**-**

This table stores the total (Rayleigh+aerosol) upward transmittance. Each coefficient stored in this table if first indexed by the wavelength, then by the view zenith angle qv, and finally by the aerosol optical thickness at 865 nm. Indexing parameters l and qv are tabulated in the "GADS General" of this product, fields 1 and 4, while taer_865 is tabulated in GADS “Aerosol Optical Thickness at 865”, for a given aerosol model.

11.7.11 Land Aerosols Parameters Data File

FILE ID: MER_LAP_AX

TYPE: Auxiliary

USE: Level 2 processing

UPDATED: once a year

SIZE: MPH(1247 bytes) + SPH(4298 bytes) + DSs(42258466 bytes) = 42264011 bytes (see Note 1)

11.7.11.1 Format

The high-level breakdown of the file is described below:

Table 11.7.11.1-1 Land Aerosols Parameters File - High-level Breakdown
MPH
Auxiliary Data SPH (refer to Volume 16) with 15 DSDs *DSD (G) - GADS General* *DSD (G) - GADS ρT(665) Thresholds for Inland waters processing and Islands screening* *DSD (G) - GADS ARVI Thresholds for DDV models (see Note 1) DSD (G) - GADS Standard Surface Reflectance ranges for DDV Models (see Note 1)* *DSD (G) - GADS Aerosol Spherical Albedo* *DSD (G) - GADS Aerosol Transmittance* *DSD (G) - GADS Multiplicative Function to account for Aerosol Multiple Scattering Effects* *DSD (G) - GADS Aerosol Phase Function times Single Scattering Albedo* *DSD (G) - GADS Volcanic aerosols spherical albedo* *DSD (G) - GADS Volcanic aerosols transmittance* *DSD (G) - GADS Volcanic aerosols reflectance* *DSD (G) - GADS Dense dark vegetation climatology* *DSD (G) - GADS DDV parameters for bi-directionality correction* (see Note 1) *DSD (G) - GADS Aerosol parameters for bi-directionality* *DSD (G) – GADS DDV Reflectance Correction parameters*
Land Aerosols - GADS General
Land Aerosols - GADS ρT(665) Thresholds for Inland waters Processing and Islands screening
Land Aerosols - GADS ARVI Thresholds for DDV models (seeNote 1)
Land Aerosols - GADS Standard Surface Reflectance ranges for DDV Models (see Note 1)
Land Aerosols - GADS Aerosol Spherical Albedo
Land Aerosols - GADS Aerosol Transmittance
Land Aerosols - GADS Multiplicative Function to account for Aerosol Multiple Scattering Effects

Table 11.7.11.1-1 Land Aerosols Parameters File - High-level Breakdown
Land Aerosols - GADS Aerosol Phase Function times Single Scattering Albedo
Land Aerosols - GADS Volcanic aerosols spherical albedo
Land Aerosols - GADS Volcanic aerosols transmittance
Land Aerosols - GADS Volcanic aerosols reflectance
Land Aerosols - GADS Dense dark vegetation climatology
Land Aerosols - GADS DDV parameters for bi-directionnality **correction (see note1)**
Land Aerosols - GADS Aerosol parameters for bidirectionnality correction
Land Aerosols – GADS DDV Reflectance Correction parameters

Note 1: For the purpose of the file size estimation, the number of DDV models is set to 20 but may vary. The number of DDV models is reported into the DSD field “NUM_DSR” for each of the GADSs having one GADS-DSR per DDV model.

The following strings will be used in the field DS_NAME for the DSDs listed in the SPH above.

Table 11.7.11.1-2 DS_NAME Strings	
DSD	**DS_NAME String**
DSDs for included Data Sets	
DSD (G) - General GADS	GADS General
DSD (G) - ρ_T(665) Thresholds for Inland waters processing and Islands screening	GADS Inland Water rho_665
DSD (G) - ARVI Thresholds for DDV models (see Note 1)	ADS ARVI DDV Thresholds
DSD (G) - Standard Surface Reflectance ranges for DDV Models (see Note 1)	ADS DDV rho_surf ranges
DSD (G) - Aerosol Spherical Albedo	ADS Aer. Spherical Albedo
DSD (G) - Aerosol Transmittance	ADS Aer. Transmittance
DSD (G) - Multiplicative Function to account for Aerosol Multiple Scattering Effects	ADS Aer. Mult. Scatt. Func.
DSD (G) - Aerosol Phase Function times Single Scattering Albedo	ADS Aer. Phase Func. x SA
DSD (G) - Volcanic aerosols spherical albedo	ADS Volc. Aer. Spherical Alb
DSD (G) - Volcanic aerosols transmittance	ADS Volc. Aer. Transm.
DSD (G) - Volcanic aerosols reflectance	ADS Volc. Aer. Reflect.

Table 11.7.11.1-2 DS_NAME Strings	
DSD	**DS_NAME String**
DSD (G) - Dense dark vegetation climatology	GADS DDV climatology
DSD (G) - DDV parameters for bi-directionnality correction (see note1)	ADS DDV bi-dir Param.
DSD (G) - Aerosol parameters for bi-directionnality correction	ADS Aer. bi-dir Param.
DSD (G) - DDV Reflectance Correction parameters	ADS DDV refl. Corr. Param.

11.7.11.1.1 General GADS

The content of the GADS shall be as follows:

Table 11.7.11.1.1-1 General GADS					
N	**Description**	**Units**	**Byte Length**	**Data Type**	**Dim.**
1	**θ tabulated values**	$(1.e^{-6})$deg	48	ul	12
2	**stored combinations of (θ_s x θ_v) values (see note after table 11.7.8.1.1-1)**	dl	156	uc	78*2
3	**$\Delta\varphi$ tabulated values**	$(1.e^{-6})$deg	76	ul	19
4	**scattering cosines tabulated values**	dl	332	fl	83
5	**Index of band (starting from 1) numbers for in-land water and islands screening (respectively)**	dl	4	us	2
6	**Threshold for in-land waters screening spectral slope test**	dl	4	fl	1
7	**Threshold for island screening spectral slope test**	dl	4	fl	1
8	**Aerosol properties (Aerosol model)**	dl	624	fl	78*2
9	**τ_a tabulated values at 550 nm**	dl	64	fl	16
10	**Gamma coefficient for ARVI computation**	dl	4	fl	1
11	**$\Delta\tau_a$ for iterative procedure**	dl	4	fl	1
12	**Dense Dark Vegetation (biome, month) table**	dl	132	uc	11*12
13	**Latitude tabulated values for DDV climatology**	$(1.e^{-6})$deg	720	sl	180
14	**Longitude tabulated values for DDV climatology**	$(1.e^{-6})$deg	1440	sl	360
15	**Effective radius tabulated values**	dl	18	uc	18

Table 11.7.11.1.1-1 General GADS					
N	**Description**	**Units**	**Byte Length**	**Data Type**	**Dim.**
16	**record number of the *"Multiplicative function to account for aerosol multiple scattering effects"* GADS associated to each volcanic aerosol model**	dl	18	uc	18
17	**Optical thickness tabulated values for volcanic aerosols**	dl	72	fl	18
18	865nm reflectance threshold for DDV screening	dl	4	fl	1
19	**665nm ground reflectance threshold for iterative aerosol identification**	dl	4	fl	1
20	**List of band indices (starting from 1) to be used for Land Aerosols Remote Sensing**	dl	6	us	3
	size (in bytes)	**-**	**3734**	**-**	**-**

There are 78 aerosol models, numbered from 1 to 78 whenever read from a table (but may correspond to 0..77 when indexing other tables, GADSs, etc).
Field #8 provides for each aerosol model the refractive index (k=1), and the Angström exponent (k=2).

Volcanic aerosol model is read from climatology (table 11.7.6.1.3-1. With this model number, records of tables 11.7.11.1.9-1 and 11.7.11.1.10-1 may be retrieved. The records of table 11.7.11.1.11-1 may be retrieved using field #15. The records of table 11.7.11.1.7-1 may be retrieved using field #16.

For information, the volcanic aerosol model index (between 1 and 18 ; 0 being reserved for when no volcanic aerosols have to be considered) is built with the optical thickness index (between 0 and 5) and the effective radius index (between 0 and 2) as follow:

model index = 1 + 3*(optical thickness index) + (effective radius index).

The biome (or type of ecosystem) number is given by the DDV climatology (table 11.7.11.1.12-1), and with this number associated to a month a DDV model is provided with field #12. This DDV model number is then used to address tables 11.7.11.1.3-1, 11.7.11.1.4-1, and 11.7.11.1.13-1 as well as fields 18 to 20 of General GADS (together with the month index).

Field 20 allows to define which bands, among 412, 443, 490 and 665nm, shall be used for the Land Aerosol Remote Sensing algorithm. Two or three bands shall be selected. Indices shall be given with respect to the whole MERIS band set and counted from 1 (hence indices shall pertain to {1,2,3,7}). If only two bands are used, the last index shall be set to -1.

11.7.11.1.2 ρT(665) Thresholds for Inland Waters Processing and Islands screening GADS

The content of the GADS shall be as follows:

Table 11.7.11.1.2-1 ρT(665) Thresholds for Inland Waters Processing and Islands screening GADS

N	Description	Units	Byte Length	Data Type	Dim.
1	**α -constant applied to threshold for inland water screening**	dl	4	fl	1
2	**ρT(665) Thresholds for inland water screening**	dl	5928	fl	78*19
3	**α - constant applied to threshold for islands screening**	dl	4	fl	1
4	**ρT Thresholds for islands screening**	dl	5928	fl	78*19
5	**Altitude threshold above which inland water screening is disabled**	m	4	fl	1
	size (in bytes)	**-**	**11868**	**-**	**-**

The $\rho_T(665)$ Thresholds tables are indexed by the (θ_s , θ_v) combinations, then by the azimuth difference angle $\Delta\varphi$, respectively in fields #2 and #3 of the "GADS General" of this file.

11.7.11.1.3 ARVI Thresholds for DDV Models ADS

For each of the DDV models there is one ADS record.

The size of the ADS has been summarized below:

Table 11.7.11.1.3-1 ARVI Thresholds for DDV Models ADS

ADSR no	Description	Size
1	ADSR associated with DDV model # 1	5928
...	...	...
20	ADSR associated with DDV model #20	5928
-	**Total (in bytes)**	**118560**

The content of each ADSR shall be as follows:

Table 11.7.11.1.3-2 ARVI Thresholds for DDV Models ADSR					
N	**Description**	**Units**	**Byte Length**	**Data Type**	**Dim.**
1	**ARVI Thresholds**	-	5928	fl	78*19
	size (in bytes)	**-**	**5928**	**-**	**-**

The ARVI Thresholds tables are all indexed by the (θs , θv) combinations, then by the azimuth difference angle Δφ in fields #2 and #3 of the "GADS General" of this file.

11.7.11.1.4 Standard Surface Reflectance for DDV models ADS

For each of the 20 DDV models there is one ADS record.

The size of the ADS has been summarized below:

Table 11.7.11.1.4-1 Standard Surface Reflectance Ranges for DDV Models ADS		
ADSR no	**Description**	**Size**
0	ADSR associated with DDV model # 1	23712
...	...	...
19	ADSR associated with DDV model #20	23712
-	**Total (in bytes)**	**474240**

The content of each ADSR shall be as follows:

Table 11.7.11.1.4-2 Standard Surface Reflectance Ranges for DDV Models ADSR					
N	**Description**	**Units**	**Byte Length**	**Data Type**	**Dim.**
1	**mean reflectance of DDV for λ = 412 nm**	-	5928	fl	78*19
2	**mean reflectance of DDV for λ = 443 nm**	-	5928	fl	78*19
3	**mean reflectance of DDV for λ = 490 nm**	-	5928	fl	78*19
4	**mean reflectance of DDV for λ = 665 nm**	-	5928	fl	78*19

	size (in bytes)	**-**	**23712**	**-**	**-**

The reflectance ranges tables are all indexed by the (θ_s , θ_v) combinations, then by the azimuth difference angle $\Delta\varphi$ in fields #2 and #3 of the "GADS General" of this file.

11.7.11.1.5 Aerosol Spherical Albedo ADS

For each aerosol models there is one ADS record. The size of the ADS has been summarized below:

Table 11.7.11.1.5-1 Aerosol Spherical Albedo ADS

ADSR no	Description	Size
1	ADSR associated with aerosol model # 1	64
...	...	...
78	ADSR associated with aerosol model # 78	64
-	**Total (in bytes)**	**4992**

The content of each ADSR shall be as follows:

Table 11.7.11.1.5-2 Aerosol Spherical Albedo ADS

N	Description	Units	Byte Length	Data Type	Dim.
1	Aerosol Spherical Albedo(τ_A)	-	64	fl	16
	size (in bytes)	**-**	**64**	**-**	**-**

The Aerosol Spherical Albedo table stored in this record is indexed by the aerosol optical thickness τ_A tabulated in field #9 of the "GADS General" of this file.

11.7.11.1.6 Aerosol Transmittance ADS

For each of the aerosol models there is one ADS record. The size of the ADS has been summarized below:

Table 11.7.11.1.6-1 Aerosol Transmittance ADS

ADSR no	Description	Size
1	ADSR associated with aerosol model # 1	768
...	...	...

78	ADSR associated with aerosol model # 78	768
-	**Total (in bytes)**	**59904**

The content of each ADSR shall be as follows:

Table 11.7.11.1.6-2 Aerosol Transmittance ADS

N	Description	Units	Byte Length	Data Type	Dim.
1	**T_A - Aerosol Transmittance (θ_s,τ_A)**	-	768	fl	12*16
	size (in bytes)	**-**	**768**	**-**	**-**

The Aerosol Transmittance table stored in this table is first indexed by the zenithal angle, then by the aerosol optical thickness τ_A. The tabulated values for both parameters are stored in the "GADS General" of this file.

11.7.11.1.7 Multiplicative Function for Aerosol Multiple Scattering Effects ADS

There is one ADS record for each one of the aerosol

models and for each of the 3 Volcanic Aerosol Radius.

The size of the ADS has been summarized below:

Table 11.7.11.1.7-1 Multiplicative Function for Aerosol Multiple Scattering Effects ADS

ADSR no	Description	Size
1	ADSR associated with aerosol model # 1	7488
...	...	...
78	ADSR associated with aerosol model # 78	7488
79	ADSR associated with Volcanic Aerosol Radius # 1	7488
80	ADSR associated with Volcanic Aerosol Radius # 2	7488
81	ADSR associated with Volcanic Aerosol Radius # 3	7488
-	**Total (in bytes)**	**606528**

The content of each ADSR shall be as follows:

Table 11.7.11.1.7-2 Multiplicative Function for Aerosol Multiple Scattering Effects ADSR					
N	**Description**	**Units**	**Byte Length**	**Data Type**	**Dim.**
1	**Fourier series term (a^0_0, ..., a^0_3) (a^1_0, ..., a^1_3) ... (a^5_0, ..., a^5_3)**	-	7488	fl	78*6*4
	size (in bytes)	**-**	**7488**	**-**	**-**

The "Fourier series term" table is first indexed by the (θ_s , θ_v) combinations in field #2 of the "GADS General" of this file, then by the order of the series (0^{th}, 1^{st}, ..., 5^{th}), and finally by the polynomial order of the coefficient (a_0, a_1, a_2, a_3).

11.7.11.1.8 Aerosol Phase Function Times Single Scattering Albedo ADS

For each of the aerosol models there is one ADS record. The

size of the ADS has been summarized below:

Table 11.7.11.1.8-1 Aerosol Phase Function Times Single Scattering Albedo ADS		
ADSR no	**Description**	**Size**
1	ADSR associated with aerosol model # 1	332
...	...	...
78	ADSR associated with aerosol model # 78	332
-	**Total (in bytes)**	**25896**

This table contains the Aerosol phase function Pa(Θ) times the single scattering albedo ω0. The content of each ADSR shall be as follows:

Table 11.7.11.1.8-2 Aerosol Phase Function Times Single Scattering Albedo ADSR					
N	**Description**	**Units**	**Byte Length**	**Data Type**	**Dim.**
1	**Aerosol Phase Function (scattering angle cosine)**	-	332	fl	83
	size (in bytes)	**-**	**332**	**-**	**-**

The "Aerosol Phase function" table is indexed by the scattering angle cosine The tabulated values of the scattering angles cosine are read in field #4 of the “GADS

General" of this file.

11.7.11.1.9 Volcanic aerosols spherical albedo ADS

For each of the 18 aerosol models there is one ADS record. The size of the ADS has been summarized below:

Table 11.7.11.1.9-1 Volcanic aerosols spherical albedo ADS

ADSR no	Description	Size
1	ADSR associated with volcanic aerosol model # 1	60
...	...	...
18	ADSR associated with volcanic aerosol model # 18	60
-	**Total (in bytes)**	**1080**

Beware: The volcanic aerosol climatology (see chapter 11.7.6.1.3) provides a number between 0 and 18 where 0 is reserved when volcanic aerosols are not considered at all, otherwise the model is given with a number between 1 and 18, corresponding to the ADSR number in the above table.

The content of each ADSR shall be as follows:

Table 11.7.11.1.9-2 Volcanic aerosols spherical albedo ADSR

N	Description	Units	Byte Length	Data Type	Dim.
1	**Volcanic aerosol spherical albedo (band)**	-	60	fl	15
	size (in bytes)	**-**	**60**	**-**	**-**

The band index corresponds to the 15 MERIS bands.

11.7.11.1.10 Volcanic aerosols transmittance ADS

For each of the 18 aerosol models there is one ADS record. The size of the ADS has been summarized below:

Table 11.7.11.1.10-1 Volcanic aerosols transmittance ADS

ADSR no	Description	Size
1	ADSR associated with volcanic aerosol model # 1	720
...	...	...

18	ADSR associated with volcanic aerosol model # 18	720
-	**Total (in bytes)**	**12960**

Beware: The volcanic aerosol climatology (see chapter 11.7.6.1.3) provides a number between 0 and 18 where 0 is reserved when volcanic aerosols are not considered at all, otherwise the model is given with a number between 1 and 18, corresponding to the ADSR number in the above table.

The content of each ADSR shall be as follows:

Table 11.7.11.1.10-2 Volcanic aerosols transmittance ADSR

N	Description	Units	Byte Length	Data Type	Dim.
1	**Volcanic aerosol transmittance (band, θ)**	-	720	fl	15*12
	size (in bytes)	**-**	**720**	**-**	**-**

The band index corresponds to the 15 MERIS bands. The zenith angle index corresponds to the tabulated values in field #1 of the General GADS.

11.7.11.1.11 Volcanic aerosols reflectance ADS

For each of the 3 effective volcanic aerosol radius there is one ADS record. The size of the ADS has been summarized below:

Table 11.7.11.1.11-1 Volcanic aerosols reflectance ADS

ADSR no	Description	Size
1	ADSR associated with volcanic aerosol model # 1	5040
...	...	...
3	ADSR associated with volcanic aerosol model # 3	5040
-	**Total (in bytes)**	**15120**

The content of each ADSR shall be as follows:

Table 11.7.11.1.11-2 Volcanic aerosols reflectance ADSR

N	Description	Units	Byte Length	Data Type	Dim.
1	**Phase function (band, θ)**	-	4980	fl	15*83
2	**Spectral dependency of Optical Thickness (band)**	-	60	fl	15
	size (in bytes)	**-**	**5040**	**-**	**-**

The band index corresponds to the 15 MERIS bands. The θ scattering cosine tabulated values may be found in field #4 of the General GADS.

11.7.11.1.12 Dense Dark Vegetation Climatology GADS

The content of the GADS shall be as follows:

Table 11.7.11.1.12-1 Dense Dark Vegetation Climatology GADS

N	Description	Units	Byte Length	Data Type	Dim.
1	**Biome index (lat, long)**	-	64800	uc	180*360
	size (in bytes)	**-**	**64800**	**-**	**-**

The latitude and longitude indices correspond respectively to the tabulated values in fields #13 and #14 of the General GADS. Each element of the table is a “biome” index (0..10) representative of the type of DDV to be found at any given place.

11.7.11.1.13 DDV Parameters for bi-directionality correction ADS

For each of the DDV model there is one ADS record. The size of the ADS has been summarized below:

Table 11.7.11.1.13-1 DDV Parameters for bi-directionality correction ADS

ADSR no	Description	Size
0	ADSR associated with DDV model # 1	486928
...	...	...
19	ADSR associated with DDV model # 20	486928
-	**Total (in bytes)**	**9738560**

The content of each GADSR shall be as follows:

Table 11.7.11.1.13-2 DDV Parameters for bi-directionality correction ADSR					
N	**Description**	**Units**	**Byte Length**	**Data Type**	**Dim.**
1	**Ground bi-directional term ρ_g (band, θ)**	dl	192	fl	4*12
2	**Ground-aerosol coupling bi-directionality term $\rho^a{}_g$ (s, band, iaer, θ_s x θ_v)**	dl	486720	fl	5*4*78 *78
3	**Ground Albedo (band)**	dl	16	fl	4
	size (in bytes)	dl	**486928**	-	-

The band index corresponds to bands 1 (421.5 nm), 2 (443.5 nm), 7 (665 nm) of MERIS. The zenith angle index θ corresponds to the tabulated in field #1 of the General GADS. The aerosol model index "iaer" corresponds to the 12 model index values. The θ_s x θ_v index correspond to the combinations of θ_s ,θ_v in field #2 of the General GADS. The s index corresponds to the order of a Fourier serie (from 0 to 4).

11.7.11.1.14 Aerosol parameters for bi-directionality correction ADS

For each of the aerosol model there is one ADS record. The size of the ADS has been summarized below:

Table 11.7.11.1.14-1 Aerosol parameters for bi-directionality correction ADS		
ADSR no	**Description**	**Size**
1	ADSR associated with aerosol model # 1	208
...	...	...
78	ADSR associated with aerosol model # 78	208
-	**Total (in bytes)**	**16224**

The content of each ADSR shall be as follows:

Table 11.7.11.1.14-2 Aerosol parameters for bi-directionality correction ADSR					
N	**Description**	**Units**	**Byte Length**	**Data Type**	**Dim.**
1	**Aerosol bi-directional term ρ_g (θ , k)**	-	192	fl	12*4
2	**Spare**	-	16	fl	4

	size (in bytes)	**-**	**208**	**-**	**-**

The zenith angle index θ corresponds to the tabulated in field #1 of the General GADS. The index k corresponds to the polynomial order.

11.7.11.1.15 DDV Reflectance Correction Parameters ADS

Correction parameters are given as a function of time and location on Earth surface. Time. Resolution is monthly, there is one ADS record for each month.

The size of the ADS has been summarized below:

Table 11.7.11.1.15-1 DDV Reflectance Correction Parameters ADS

ADSR no	Description	Size
0	**ADSR associated with month # 1**	2592000
...	...	...
11	**ADSR associated with month # 12**	2592000
-	**Total (in bytes)**	**31104000**

The content of each ADSR shall be as follows:

Table 11.7.11.1.15-2 DDV Reflectance Correction Parameters ADSR

N	Description	Units	Byte Length	Data Type	Dim.
1	**Monthly adjustment for bands 412, 443, and 670nm (lat,lon, b)**	dl	1036800	fl	180*360*4
2	**Linear corrections for bands 412, 443, and 670nm (lat, lon, b)**	dl	1036800	fl	180*360*4
3	**[ΔARVImin, ΔARVImax] (lat, lon)**	dl	518400	fl	180*360*2
	size (in bytes)	**-**	**2592000**	**-**	**-**

11.7.12 Ocean I Parameters Data File

FILE ID: MER_OC1_AX

TYPE: Auxiliary

USE: Level 2 processing

UPDATED: once a year

SIZE: MPH(1247 bytes) + SPH(2338 bytes) + DSs(52978169 bytes) = 52981754 bytes.

11.7.12.1 Format

The high-level breakdown of the file is described below:

Table 11.7.12.1-1 Ocean I Parameters File - High-level Breakdown

MPH
Auxiliary Data SPH (refer to Volume 16) with 6 DSDs: DSD (G) - GADS General DSD (G) - GADS Geometrical factor $\Re$ DSD (G) - GADS Thresholds DSD (G) - GADS $\log_{10}$ Polynomial Coefficients DSD (A) - ADS f1/Q factor DSD (A) - ADS Glint reflectance DSD (A) - ADS Mean ρw at 510nm DSD (G) - GADS f_0 factor
Ocean I - GADS General
Ocean I - GADS Geometrical factor $\Re$
Ocean I - GADS Thresholds
Ocean I - GADS $\log_{10}$ Polynomial Coefficients
Ocean I - ADS f_1/Q factor
Ocean I - ADS Glint reflectance

Ocean I - ADS Mean ρ_w at 510nm
Ocean I - GADS f_0 factor

The following strings will be used in the field DS_NAME for the DSDs listed in the SPH above.

Table 11.7.11.1.15-1 DS_NAME Strings

DSD	DS_NAME String
DSDs for included Data Sets	
DSD (G) - General GADS	GADS General
DSD (G) - Geometrical factor R	GADS Geometrical Factor
DSD (G) - Thresholds	GADS Thresholds
DSD (G) -$\log_{10}$ Polynomial Coefficients	GADS Log10 Polynomial Coeff.
DSD (G) - f1/Q factor	ADS F1/Q Factor
DSD (G) -Glint reflectance	ADS Glint Reflectance
DSD (G) - Mean ρ_w at 510nm	ADS Mean ρ_w at 510nm
DSD (G) - GADS f_0 factor	GADS f_0 factor R(l,Chl)

11.7.12.1.1 General GADS

The content of the GADS shall be as follows:

Table 11.7.12.1.1-1 GADS General

N	Description	Units	Byte Length	Data Type	Dim.
1	**wind speed tabulated values for "GADS - Geometrical factor R"**	$m.s^{-1}$	4	uc	4
2	**λ tabulated values for GADS f1/Q**	nm	36	fl	9
3	**θ_s tabulated values for GADS f1/Q**	$(1.e^{-6})$deg	24	ul	6
4	**θ_s tabulated values for GADS Thresholds and GADS glint reflectance**	$(1.e^{-6})$deg	108	ul	27
5	**θ' tabulated values for GADS f1/Q**	$(1.e^{-6})$deg	56	ul	14
6	**θ' tabulated values for GADS Geometrical factor R_{goth}**	$(1.e^{-6})$deg	76	ul	19
7	**θ_v tabulated values for GADS Thresholds and GADS glint reflectance**	$(1.e^{-6})$deg	76	ul	19

Table 11.7.12.1.1-1 GADS General

N	Description	Units	Byte Length	Data Type	Dim.
8	**$\Delta\varphi$ tabulated values for ADS f_1/Q**	$(1.e^{-6})$deg	52	ul	13
9	**$\Delta\varphi$ tabulated values for GADS Thresholds and GADS glint reflectance**	$(1.e^{-6})$deg	100	ul	25
10	**Chl tabulated values for ADS f_1/Q**	$(1.e^{-3})g.m^{-3}$	20	fl	5
11	**τa tabulated values for ADS f_1/Q**	dl	8	fl	2
12	**wind speed tabulated values for the GADS - f1/Q factor**	$m.s^{-1}$	8	fl	2
13	**Initial algal pigment index value used for f_over_q1**	$mg.m^{-3}$	4	fl	1
14	**C_i constants for downward atmospheric transmittance**	dl	24	fl	6
15	**C_7 constant for scattering detection**	dl	4	fl	1
16	**Factor relating b_b/a to R (for $\theta_s = 0$)**	dl	4	fl	1
17	**Wind speed tabulated values for GADS glint reflectance**	$m.s^{-1}$	20	fl	5
18	**Wind azimuth χ tabulated values for GADS glint reflectance**	$(1.e^{-6})$deg	28	fl	7
19	**Spare**	nd	1	uc	1
20	**Value of f/Q factor for nadir angle at 510 nm**	dl	4	fl	1
21	**Mean value of Chlorophyll**	$mg.m^{-3}$	4	fl	1
22	**Water refraction index**	dl	4	fl	1
23	**Value of $\Delta\rho$ 510 to set the annotation flag**	dl	4	fl	1
24	**Value of $\theta\rho$ for Nadir viewing**	$(1.e^{-6})$deg	4	ul	1
25	**Scaling Factor for decoding ρ_w _510 mean value ADSR**	dl	4	fl	1
26	**Offset for decoding ρ_w510 mean value ADSR**	dl	4	fl	1
27	**Scaling Factor for decoding ρ_w510 variability value ADSR**	dl	4	fl	1
28	**Offset for decoding ρ_w510 variability value ADSR**	dl	4	fl	1
29	**Latitude tabulated values for ρ_w510 mean values ADS**	$(1.e^{-6})$deg	4096	sl	1024
30	**Longitude tabulated values for _ρ_w510 mean values ADS**	$(1.e^{-6})$deg	8192	sl	2048
31	**Chl tabulated values for the GADS – f0 factor**	**$(1.e^{-3})mg.m^{-3}$**	**24**	**fl**	**6**
	size (in bytes)	**-**	**13001**	**-**	**-**

The tabulated values for θ'_v and the wind speed (for "GADS - Geometrical factor R_{goth}") are used for indexing the data stored in the "GADS - Geometrical factor R_{goth}".

The tabulated values for λ , θ_s , θ_v , $\Delta\varphi$, Chl, τ_a, and wind speed (for the "GADS - f_1/ Q factor") are used for indexing the "GADS - f1/Q factor".

11.7.12.1.2 Geometrical Factor R_{goth} GADS

The content of the GADS shall be as follows:

Table 11.7.12.1.2-1 Geometrical Factor R GADS

N	Description	Units	Byte Length	Data Type	Dim.
1	**Geometrical factor R(θ', wind speed)**	-	304	fl	19*4
	size (in bytes)	**-**	**304**	**-**	**-**

The table is indexed by θ' and the wind speed in this order; the tabulated values of those two parameters are stored in the fields #6 and #1 the "GADS General" of this file.

11.7.12.1.3 Thresholds GADS

The content of the GADS shall be as follows:

Table 11.7.12.1.3-1 Thresholds GADS

N	Description	Units	Byte Length	Data Type	Dim.
1	**ρ_w(560) threshold for input validity**	dl	4	fl	1
2	**Chl1 range thresholds for output validity**	$(1.e^{-3})mg.m^{-3}$	8	fl	2
3	**spare**	dl	4	fl	1
4	**spare**	dl	4	fl	1
5	**Low Glint threshold**	dl	4	fl	1
6	**Medium Glint threshold**	dl	4	fl	1
7	**Wind speed threshold for whitecaps flagging**	$m.s^{-1}$	4	fl	1
8	**Threshold on ρ_w(708.75) values for Turbid water identification - (θ_s , θ_v , $\Delta\varphi$)**	dl	51300	fl	27*19*25
9	**Water Vapour high glint threshold**	dl	4	fl	1
10	**Shallow water depth threshold**	m	4	fl	1
	size (in bytes)	**-**	**51340**	**-**	**-**

In the table above field 8 is indexed by λ , θ_s (tabulated values in field #4 of the General GADS), θ_v (tabulated values in field #7 of the General GADS), $\Delta\varphi$ (tabulated values in field #9 of the General GADS).

11.7.12.1.4 Log_{10} Polynomial Coefficients GADS

The content of the GADS shall be as follows:

Table 11.7.12.1.4-1 Log_{10} Polynomial Coefficients GADS

N	Description	Units	Byte Length	Data Type	Dim.
1	**log10 polynomial coefficients**	dl	24	fl	6
2	**Convergence critrerium for iterative Chlorphyll retrieval**	dl	4	fl	1
3	**Irradiance reflectance ratio validity range for Algal_1 computation using log_{10} polynomial**	dl	8	fl	2
4	**Highest order of log_{10} coefficients used in case 1 waters algorithm**	dl	1	uc	1
5	**Bands selected for computation of Chl_1 (band number starting at 1)**	dl	3	uc	3
	size (in bytes)	**-**	**40**	**-**	**-**

The Polynomial coefficients are stored by their order, 0^{th} order coefficient is first, ... , 5^{th} order coefficient is the 6^{th} value of the corresponding table. Band indices refer to the MERIS bands, with numbering starting at 1.

11.7.12.1.5 f_l/Q Factor ADS

The ADS is indexed by θ_s which is tabulated and stored in field #3 of the "GADS General" of this file. The size of the ADS has been summarized below:

Table 11.7.12.1.5-1 f_l/Q Factor ADS

ADSR no	Description	Size
1	ADSR associated with θ_s value # 1	131040
...	...	...
6	ADSR associated with θ_s value # 6	131040
	Total (in bytes)	**786240**

The content of each ADSR shall be as follows:

Table 11.7.12.1.5-2 fl/Q Factor ADSR

N	Description	Units	Byte Length	Data Type	Dim.
1	**fl/Q factor (λ, θ', Δφ, Chl) for τA 1 & wind 1**	-	32760	fl	9*14*13*5
2	**fl/Q factor (λ, θ', Δφ, Chl) for τA 2 & wind 1**	-	32760	fl	9*14*13*5
3	**fl/Q factor (λ, θ', Δφ, Chl) for τA 1 & wind 2**	-	32760	fl	9*14*13*5
4	**fl/Q factor (λ, θ', Δφ, Chl) for τA 2 & wind 2**	-	32760	fl	9*14*13*5
	size (in bytes)	**-**	**131040**	**-**	**-**

The table is indexed by λ , θ', Δφ, and Chl in this order; the tabulated values of those parameters are stored in fields #2, #5, #8, #10 of the "GADS General" of this file. The tabulated values of τ_a and wind are stored in fields #11, #12 of the "GADS General" of this file.

11.7.12.1.6 Glint Reflectance ADS

The ADS is indexed by θ_s which is tabulated and stored in field #4 of the "GADS General" of this file. The size of the ADS has been summarized below:

Table 11.7.12.1.6-1 Glint Reflectance ADS

ADSR no	Description	Size
1	ADSR associated with θ_s value # 1	66500
...	...	...
27	ADSR associated with θ_s value # 27	66500
-	**Total (in bytes)**	**1795500**

The content of each ADSR shall be as follows:

Table 11.7.12.1.6-2 Glint Reflectance ADSR

N	Description	Units	Byte Length	Data Type	Dim.
1	**Glint reflectance for wind 1**	-	13300	fl	7*19*25
2	**Glint reflectance for wind 2**	-	13300	fl	7*19*25
3	**Glint reflectance for wind 3**	-	13300	fl	7*19*25

4	**Glint reflectance for wind 4**	-	13300	fl	7*19*25
5	**Glint reflectance for wind 5**	-	13300	fl	7*19*25
	size (in bytes)	**-**	**66500**	**-**	**-**

The table is indexed by χ, θv, Δφ in this order; the tabulated values of those parameters are stored in fields #18, #7, #9 of the "GADS General" of this file. The wind speed is tabulated in field #17 of the "GADS General" of this file.

11.7.12.1.7 Mean ρ_w at 510nm ADS

The GADS is indexed by the twelve months.

The size of the ADS has been summarized below:

Table 11.7.12.1.7-1 Mean ρw at 510nm ADS

ADSR no	Description	Size
1	ADSR associated with January	4194304
...	...	...
12	ADSR associated with December	4194304
-	**Total (in bytes)**	**50331648**

The content of each ADSR shall be as follows:

Table 11.7.12.1.7-2 Mean ρw at 510nm ADSR

N	Description	Units	Byte Length	Data Type	Dim.
1	Mean water leaving reflectance at 510nm (lat, lon)	-	2097152	uc	1024*2048
2	Variability of Mean water leaving reflectance at 510nm (lat, lon)	-	2097152	uc	1024*2048
	size (in bytes)	**-**	**4194304**	**-**	**-**

The table is indexed by the latitude and the longitude in this order; the tabulated values of those two parameters are stored in fields #29, #30 of the "GADS General" of this file.

11.7.12.1.8 f_0 factor GADS

The content of each GADSR shall be as follows:

Table 11.7.12.1.8-1 f0 factor GADSR

N	Description	Units	Byte Length	Data Type	Dim.
1	f_0 factor (l, Chl)	dl	96	fl	4*6
	size (in bytes)	**-**	**96**	**-**	**-**

The f0 factor relates the ratio of two water inherent properties, bb/a, to the irradiance reflectance just beneath the surface when the Sun is at the zenith. bb and a are respectively the backscattering and absorbtion coefficients of the water body.
The table is indexed by the wavelength l, for the four bands involved in the Chl1 computation, namely 443, 490, 510 and 560, and the chlorophyll concentration, in this order ; the tabulated values of the latter are stored in the "GADS General" of this product, fields 6, 1 respectively. The former can be addressed as a band index and does not require tabulated values.

11.7.13 Ocean II Parameters Data File

FILE ID: MER_OC2_AX

TYPE: Auxiliary

USE: Level 2 processing

UPDATED: once a year

SIZE: MPH(1247 bytes) + SPH(1498bytes) + DSs(1084675) = 1087420 .

11.7.13.1 Format

The high-level breakdown of the file is described below:

Table 11.7.13.1-1 Ocean II Parameters File - High-level Breakdown

MPH
Auxiliary Data SPH (refer to Volume 16) with 6 DSDs: DSD (G) - GADS General DSD (G) - GADS Case II Yellow Substance Detection Coefficients DSD (G) - GADS Anomalous Scattering Detection DSD (A) - ADS Coeff of F' to IOPs relation DSD (G) - GADS Case II Neural Network
Ocean II - GADS General
Ocean II - GADS Case II Yellow Substance Detection Coefficients
Ocean II - GADS Anomalous Scattering Detection
Ocean II - GADS Coefficients of F' to IOPs relation
Ocean II - GADS Case II Neural Network

The following strings will be used in the field DS_NAME for the DSDs listed in the SPH above.

Table 11.7.13.1-2 DS_NAME Strings

DSD	DS_NAME String
DSDs for included Data Sets	
DSD (G) - General GADS	GADS General
DSD (G) - Case II Yellow Substance Detection Coefficients GADS	GADS Case 2 YS Det. Coeff.
DSD (G) - Anomalous Scattering Detection GADS	GADS Anomalous Scattering Detection
DSD (G) - Coefficients of F' to IOPs relation	ADS Coeff of Fp to IOP relation
DSD (G) - Case II Neural Network GADS	GADS Neural Network

11.7.13.1.1 General GADS

The content of the GADS shall be as follows:

Table 11.7.13.1.1-1 General GADS

N	Description	Units	Byte Length	Data Type	Dim.
1	**λ tabulated values**	nm	60	fl	15
2	**number of polynomial coefficient in Fp computation**	-	4	ul	1
3	**wind tabulated values for ADS F' factor**	ms^{-1}	16	fl	4
4	**θv tabulated values for ADS F' factor**	(1.e-6) deg	20	ul	5
5	**θs tabulated values for ADS F' factor**	(1.e-6) deg	20	ul	5
6	**Δφ tabulated values for ADS F' factor**	(1.e-6) deg	52	ul	13
7	**θv tabulated values for GADS Anomalous Scattering Detection and GADS Reflectance versus IOP**	(1.e-6) deg	40	ul	10
8	**θs tabulated values for GADS Anomalous Scattering Detection and GADS Reflectance versus IOP**	($1.e^{-6}$) deg	40	ul	10
9	**Δφ tabulated values for GADS Anomalous Scattering Detection and GADS Reflectance versus IOP**	($1.e^{-6}$) deg	76	ul	19
10	**Conversion factors for Chl2**	$mg.m^{-3}$/dl / dl /dl	16	fl	4

Table 11.7.13.1.1-1 General GADS

N	Description	Units	Byte Length	Data Type	Dim.
11	**Conversion factor for SPM**	$g.m^{-3}$	4	uc	1
12	**absorption of pure water**	m^{-1}	60	fl	15
13	**back scattering of pure water**	m^{-1}	60	fl	10
14	**specific back scattering of coccoliths**	$m^2.g^{-1}$	60	fl	15
15	**specific back scattering of particulates**	$m^2.g^{-1}$	60	fl	15
16	**Number of iterations in BPAC for band set LOW and band set HIGH**	-	4	us	2
17	**Threshold on TSM value to raise CASE2_S flag**	$g.m^{-3}$	4	fl	1
18	**Convergence criteria on bbp in the BPAC iterations**	dl	4	fl	1
19	**Convergence criteria on bb in the rhow_to_bb routine**	dl	4	fl	1
20	**Number of iterations in the rhow_to_bb routine**	-	2	us	1
21	**specific absorption, case of coccoliths**	$m^2.g^{-1}$	60	fl	15
22	**specific absorption, case of particulate**	$m^2.g^{-1}$	60	fl	15
23	**Initial estimate of backscatter at 775 for LOW and HIGH band estimate**	m^{-1}	8	fl	2
24	**Initial estimate of the Angström exponent**	dl	4	fl	1
25	**Threshold on rhow at 775 to activate the HIGH bandset**	dl	4	fl	1
26	**Threshold on rhow at 775 to desactivate the LOW bandset**	**dl**	4	fl	1
27	**Minimum normalised radiance measurable by MERIS at b709**	sr^{-1}	4	fl	1
28	**Initial value of bbp to initialise rhow_to_bb routine**	m^{-1} -	4	fl	1
29	**Threshold for flagging Yellow substance dominated waters**	-	4	fl	1
30	**Chl tabulated values for GADS Anomalous Scattering Detection**	$mg.m^{-3}$	104	fl	26
31	**Floor values for NN inputs [reflectance threshold, floor NN input]**	-	8	fl	2
32	**Threshold for White Scatterer detection**	-	4	fl	1
	size (in bytes)	-	**874**	-	-

The field #1 (λ tabulated values) are used for indexing the tables of a' and b' stored in the GADS "IOP versus Geochemical variables",the GADS "Reflectance versus IOP" and fields 12, 13 and 14 of GADS General[7].

The fields #2 (YS), #3 (Chl), #4 (SPM) are used for indexing the tables of a' and b' stored in the GADS "IOP versus Geochemical variables".

The tabulated values of a', b', $\Delta\varphi$, θ_s , θ_v are used for indexing the tables of reflectance stored in the GADS "Reflectance versus IOP".

The tabulated values of the geochemical variables:

- Yellow substance absorption at 440nm Y (in m^{-1}),
- Chlorophyll concentration Chl (in $mg.m^{-3}$)
- Suspended Particulate Matter concentration SPM (in $g.m^{-3}$)

are used for indexing the tables of a' and b' stored in the GADS "IOP versus Geochemical variables". The tabulated values of a', b', Df , qs, qv, are used for indexing the tables of reflectances stored in the ADS "Reflectance versus IOP".

11.7.13.1.2 Case II Yellow Substance Detection Coefficients GADS

The content of the GADS shall be as follows:

Table 11.7.13.1.2-1 Case II Yellow Substance Detection Coefficients GADS

N	Description	Units	Byte Length	Data Type	Dim.
1	**B_i constants**	-	8	fl	2
2	**A_i constants for H (443 nm, 560 nm) estimation**	-	12	fl	3
3	**A_i constants for H (490 nm, 560 nm) estimation**	-	12	fl	3
4	**A_i constants for H (510 nm, 560 nm) estimation**	-	12	fl	3
5	**N_i exponants**	-	12	fl	3
	size (in bytes)	**-**	**56**	**-**	**-**

11.7.13.1.3 Anomalous Scattering Detection GADS

The content of the GADS shall be as follows:

Table 11.7.13.1.3-1 Anomalous Scattering Detection GADS

N		Description	Units	Byte	Data	Dim.
				Length	Type	

[7] *Sentence rectified by L.Bourg with e-mail 17/10/2005.*

N		Description	Units	Byte	Data	Dim.
1	**Threshold on reflectance at 560 nm (θs, θv, Δφ, Chl)**		-	197600	fl	10*10*19*26
	size (in bytes)		**-**	**197600**	**-**	**-**

Each coefficient stored in this table is first indexed by the sun zenith angle, then the view zenith angle, the azimuth difference angle and finally the chlorophyll concentration (the fastest index). All indexing parameter (θs, θv, Δϕ, Chl) are tabulated in the "GADS General" of this Product, fields 8, 7, 9 and 30.

11.7.13.1.4 Coefficients of F' to IOPs relation ADS

The ADS are indexed by Sun zenith angle θs . The tabulated values of θs may be found in the "GADS General" of this product, field5.

The size of the ADS has been summarized below (5 Sun zenith angles):

Table 11.7.13.1.4-1 Coefficients of F' to IOPs relation ADS

ADSR no	Description	Size
0	ADSR associated with θ_{s1}	124800
1	ADSR associated with θ_{s2}	124800
...	...	...
4	ADSR associated with θ_{s5}	124800
-	**Total (in bytes)**	624000

The content of each ADSR shall be as follows:

Table 11.7.13.1.4-2 Coefficients of F' to IOPs relation ADSR

N	Description	Units	Byte Length	Data Type	Dim.
1	Coeffs of F' to IOPs relation for wind 1 (order, λ, θ_v, Δϕ)	dl	31200	fl	8*15*5*13
2	Coeffs of F' to IOPs relation for wind 2 (order, λ, θ_v, Δϕ)	dl	31200	fl	8*15*5*13
3	Coeffs of F' to IOPs relation for wind 3 (order, λ, θ_v, Δϕ)	dl	31200	fl	8*15*5*13
4	Coeffs of F' to IOPs relation for wind 4 (order, λ, θ_v, Δϕ)	dl	31200	fl	8*15*5*13
	size (in bytes)	**-**	**124800**	**-**	**-**

Each coefficient stored in this table is first indexed by the fitting (1) order of the coefficients, then by the wavelength, the zenith viewing angle and finally by the azimuth difference angle (the fastest index). All indexing parameter (λ, θ_v, $\Delta\phi$, wind) are tabulated in the "GADS General" of this Product, fields 1, 4, 6 and 3.
Note:
(1) The F' to IOPs relation is not directly a polynomial, it is the sum of two polynomials in two different IOPs combinations

11.7.13.1.5 Case II Neural Network GADS

The GADS stores the fixed parameters of a neural network. The GADS holds a one dimensional vector as follows:

Table 11.7.13.1.5-1 Case II Neural Network GADS

N	Description	Units	Byte Length	Data Type	Dim.
1	**Neural Network Parameters**	-	262144	uc	262144
2	**Switch for reflectance log-scaling**	-	1	uc	1
	size (in bytes)	**-**	**262145**	**-**	**-**

The fixed size of 262144 bytes is reserved to hold the vector holding the Neural Network structure. This vector may vary in size.

Table 11.7.13.1.5-2 Case II Neural Network GADS

Section Type	Content
Net Section	Specifies the network (and the number of layers NL in the network)
Layer Section	Specifies layer 1 (and the number of units NU_1 in this layer)
Layer Section	.....
Layer Section	Specifies layer NL (and the number of units NU_{NL} in this layer)
Unit Section	Specifies Unit 1 of layer 1
Unit Section	.....
Unit Section	Specifies unit NU_1 of layer 1
Unit Section	.....
Unit Section	Specifies unit 1 of layer NL
Unit Section	.....
Unit Section	Specifies unit NU_{NL} of layer NL

The order of entries within each section is fixed and the number of consecutive sections is specified in the current and previous sections. The 5 types of neural

network GADS are:

1. One Net Section, which lays down the number of layers as well as general net properties such as the computational precision.
2. Successive Layer Sections which lay down the number of units as well as general properties such as the input, activation, and output functions used by all units of the layer
3. Successive Unit Sections which lay down the number of incoming connections from other units of the net as well as general properties such as parameters for the input, activation, and output functions.
4. If a unit has incoming connections, the Unit section is directly followed by the Connection Section, where each connection is defined by its source unit and its connection weight or (if the unit belongs to a radial base function layer) its center point co-ordinate of a radial base function.
5. If a unit belongs to a layer with a radial base function defined, the connection section can immediately be followed by the definition of the inverse covariance matrix for the radial base function.

The Net Section and Layer Section sizes are fixed.

The Unit Section may contain a connection block and/or an RBF co-variance block. It is known from the unit specifications whether these blocks are added in the Unit Section. Thus, the size of a Unit Section may vary from unit to unit.

The Net Section has to be the first section in the GADS and has the following format.

Table 11.7.13.1.5-3 Format of Net Section

N	Description	Units	Byte Length	Data Type	Dim.
1	**Net Section identifier string ("NET\0")**	-	4	sl	1
2	**Number of bytes for the following entry structure**	-	4	sl	1
3	**Major and minor version number for the format defined here**	-	4	ss	2
4	**Number of layers within the net, and hence defines the number of following layer sections**	-	2	ss	1
5	**Index of the input layer, and hence defines the input units of the net**	-	2	ss	1
6	**Index of the output layer, and hence defines the output units of the net**	-	2	ss	1
7	**Numerical precision which is internally used to calculate the new net state.** The value corresponds to the number of bytes used for the representation of the IEEE floating point formats (4 or 8)	-	2	ss	1
8	**Reserved bytes for structure alignment and format updates** Set to zeros	-	52	ss	26
	size (in bytes)	**-**	**72**	**-**	-

The Layer Sections follow immediately after the Net Section. The number of following Layer Sections is specified in the Net Section.

Table 11.7.13.1.5-4 Format of Layer Sections

N	Description	Units	Byte Length	Data Type	Dim.
1	**Layer Section identifier string ("LAY\0")**	-	4	sl	1
2	**Number of bytes for the following entry structure**	-	4	sl	1
3	**Specifies the index of the layer which is defined within this section**	-	2	ss	1
4	**Number of units within the layer**	-	2	ss	1
5	**Input function identifier:** -1: Undefined 0: Zero 40: Sum 1 41: Sum 2	-	2	ss	1
6	**Activation function identifier** 0: Identity 10: Threshold 11: Linear 12: Semilinear 20: Sigmoid 1 30: RBF 1 31: RBF 2	-	2	ss	1
7	**Output function identifier** 0: Identity 11: Linear 13: Exponential 14: Logarithmic 15: Quadratic	-	2	ss	1

Table 11.7.13.1.5-4 Format of Layer Sections

N	Description	Units	Byte Length	Data Type	Dim.
8	**Reserved bytes for structure alignment** Set to zero	-	6	ss	3
9	**Slope (β) for the activation functions** Linear, Semi-Linear and Sigmoid 1	-	8	do	1
10	**Threshold (x0) for the activation functions** Threshold, Linear, Semi-Linear and Sigmoid 1	-	8	do	1
11	**Reserved for additional function parameters for later versions of this format** Set to zeros	-	32	do	4
	size (in bytes)	**-**	**72**	**-**	-

The Unit Sections follow immediately after the Layer Sections. The number of consecutive Unit Sections is specified in the corresponding Net section.

Every unit section describing a unit with a non-zero number of incoming connections is immediately followed by a connection section.

If a unit belongs to a layer with a RBF activation function (RBF1 or RBF2), the RBF center point co-ordinates are specified in the following connection section. In this case they replace the connection weights. If the activation is RBF 2, the connection section is followed by a matrix section, which defines the RBF inverse co-variance matrix.

The format of a Unit Section block is as follows.

Table 11.7.13.1.5-5 Format of a Unit Section

N	Description	Units	Byte Length	Data Type	Dim.
1	**Unit Section identifier string ("UNI\0")**	-	4	sl	1
2	**Number of bytes for the following entry structure**	-	4	sl	1
3	**Specifies the index of the layer to which this unit belongs. The *number of layers* is found in the corresponding layer section for this unit**	-	2	ss	1
4	**Specifies the index of the unit which is defined within this section. The *number of units* is given in the layer section identified by the *layer index*.**	-	2	ss	1
5	**number of incoming connections with other units of the net. If not zero, a connection section is directly following this unit section.**	-	2	ss	1
6	**If not zero, a matrix section is directly following the connection section.**	-	2	ss	1
7	**Reserved bytes for structure alignment Set to**	-	8	ss	4

Table 11.7.13.1.5-5 Format of a Unit Section					
N	**Description**	**Units**	**Byte Length**	**Data Type**	**Dim.**
	zero				
8	**Input bias (θ_i) for the input functions *Sum 1* and *Sum 2***	-	8	do	1
9	**Input scaling factor (α_i) for the input functions *Sum 1* and *Sum 2* If the activation function is RBF1 then this parameter is interpreted as the variance σ^2 of the unit.**	-	8	do	1
10	**Output bias (θ_o) for the output function *Linear and Exponential***	-	8	do	1
11	**Output scaling factor (α_o) for the output function *Linear and Exponential***	-	8	do	1
12	**Reserved for additional function parameters for later versions of this format Set to zeros**	-	16	do	2
	size (in bytes)	**-**	**72**	**-**	**-**

The connection section follows immediately after the unit section. Since one entry in the connection section has the size of 16 bytes, the size SC of the complete connection section is SC(n) = 8 + 16n, where n is the total number of incoming connections which was specified in the corresponding Unit Section. The connection section is introduced by the connection section header, as described in the table below.

Table 11.7.13.1.5-6 Format of Unit Connection Block Header

N	**Description**	**Units**	**Byte Length**	**Data Type**	**Dim.**
1	**Unit Section identifier string (“CON\0”)**	-	4	sl	1
2	**Number of bytes for the following entry structure**	-	4	sl	1
	size (in bytes)	**-**	**8**	**-**	**-**

The connection section consists of consecutive definitions of incoming connections from other units. The number of connections is specified in the previous unit section. A single connection definition has the following form.

Table 11.7.13.1.5-7 Format of Unit Connection Block

N	**Description**	**Units**	**Byte Length**	**Data Type**	**Dim.**
1	**Specifies the index of the layer to which the following source unit for connection 1 belongs.** The *number of layers* is found in the corresponding layer section.	-	2	ss	1
2	**Specifies the index of the source unit that serves a weighted input amount for connection 1.** The *number of units* is given by the layer identified by source layer index.	-	2	ss	1

3	**Reserved bytes for structure alignment** Set to zeros	-	4	ss	2
4	**Weight for the connection or, in the case of a previous RBF unit, the RBF centre point coordinate**	-	8	do	1
	size (in bytes)	**-**	**16**	**-**	**-**

The co-variance block follows immediately the connection section, if the unit is a RBF unit and the RBF function is RBF 2. Since one entry in the co-variance matrix has the size of 8 bytes (size of double precision float) the size of SM of the complete matrix section is $SM(n) = 8 + 8n^2$ where n is the total number of incoming connections which was specified in the previous unit section. The section for the inverse co-variance matrix is introduced by the matrix section header.

Table 11.7.13.1.5-8 Format of Co-variance Block Header

N	Description	Units	Byte Length	Data Type	Dim.
1	**Matrix section identifier string "MAT\0".**	-	4	sl	1
2	**Size of single matrix entry**	-	4	sl	1
	size (in bytes)	**-**	**8**	**-**	**-**

The matrix section consists of consecutive definitions of the matrix entries (row by row).

Table 11.7.13.1.5-9 Format of Co-variance Block

N	Description	Units	Byte Length	Data Type	Dim.
1	**Specifies the (1,1) element of the incerse co-variance matrix**	-	8	do	1
2	**Specifies the (1,2) element of the incerse co-variance matrix**	-	8	do	1
3	**Specifies the (1,3) element of the incerse co-variance matrix**	-	8	do	1
4	**....**	...	..	...	..
n^2	**Specifies the (n,n) element of the incerse co-variance matrix**	-	8	do	1
	size (in bytes)	**-**	**8*n2**	**-**	**-**

11.7.14 Cloud Measurement Parameters Data File

FILE ID: MER_CMP_AX

TYPE: Auxiliary

USE: Level 2 processing

UPDATED: once a year

SIZE: MPH(1247 bytes) + SPH(2338 bytes) + DSs(314969050 bytes) = 314972635 bytes (see Note 1)

11.7.14.1 Format

The high-level breakdown of the file is described below:

Table 11.7.14.1-1 Cloud Measurement Parameters Data File - High-level Breakdown

MPH
Auxiliary Data SPH (Refer to Volume 16) with 7DSDs: *DSD (G) - GADS General DSD (G) - GADS Surface albedo* *DSD (A) - ADS Polynomial Coefficients for Cloud Albedo Retrieval* *DSD (A) - ADS Polynomial Coefficients for Cloud Optical Thickness Retrieval* *DSD (G) - GADS Cloud TP Neural Network when Surface Albedo is not null (see Note 1)* *DSD (G) - GADS Cloud TP Neural Network when Surface Albedo is null (see Note 1)* *DSD (G) - GADS Cloud Type Index* *DSD (A) - ADS Surface Pressure Neural Network*
Cloud Meas - GADS General
Cloud Meas - ADS Surface albedo
Cloud Meas - ADS Polynomial Coefficients for Cloud Albedo Retrieval
Cloud Meas - ADS Polynomial Coefficients for Cloud Optical Thickness Retrieval
Cloud Meas - GADS Cloud TP Neural Network when Surface Albedo is not null (see Note 1)
Cloud Meas - GADS Cloud TP Neural Network when Surface Albedo is null (see Note 1)
Cloud Meas - GADS Cloud Type Index
Cloud Meas - ADS Surface Pressure Neural Network

Note 1: Both GADSs for Cloud Neural Network have a variable number of records reported in field 'NUM_DSR' of the corresponding DSDs. For the file size estimation, only 1 record has been considered in each of these GADSs.

The following strings will be used in the field DS_NAME for the DSDs listed in the SPH above.

Table 11.7.14.1-2 DS_NAME Strings

DSD	DS_NAME String
DSDs for included Data Sets	
DSD (G) - General GADS	GADS General
DSD (A) - Surface albedo	ADS Surface Albedo
DSD (A) -Polynomial Coefficients for Cloud Albedo Retrieval	ADS Cloud Albedo Coeff.
DSD (A) - Polynomial Coefficients for Cloud Optical Thickness Retrieval	ADS Cloud Opt. Thick. Coeff.
DSD (G) - Cloud Neural Network when Surface Albedo is not null (see Note 1)	GADS CTP NN when SA not null
DSD (G) - Cloud Neural Network when Surface Albedo is null (see Note 1)	GADS CTP NN when SA null
DSD (G) -Cloud Type Index	GADS Cloud type index
DSD (G) - Surface Pressure Neural Network	GADS Surface Pressure NN

11.7.14.1.1 General GADS

The content of the GADS shall be as follows:

Table 11.7.14.1.1-1 General GADS

N	Description	Units	Byte Length	Data Type	Dim.
1	**Latitude tabulated values**	($1.e^{-6}$) deg	14400	sl	3600
2	**Longitude tabulated values**	($1.e^{-6}$) deg	28800	sl	7200
3	**θ_s tabulated values**	($1.e^{-6}$) deg	108	ul	27
4	**θ_v tabulated values**	($1.e^{-6}$) deg	72	ul	18
5	**$\Delta\varphi$ tabulated values**	($1.e^{-6}$) deg	100	ul	25
6	**Surface Albedo α_{surf} tabulated values**	-	36	fl	9
7	**Surface Albedo scaling factor**	-	8	do	1
8	**CTP NN Solar flux at 754nm and 761/754 ratio**	EU / dl	8	fl	2
9	**Minimum acceptable value for TOAR at 753.75 nm**	LU	4	fl	1
10	**Maximum acceptable value for TOAR at 753.75 nm**	LU	4	fl	1
11	**Minimum acceptable value for TOAR at 760.625 nm**	LU	4	fl	1
12	**Maximum acceptable value for TOAR at 760.625 nm**	LU	4	fl	1
13	**Switch to use Spectral Shift index**	dl	4	ul	1
14	**FR b11 wavelength for pressure NN**	nm	14800	fl	3700
15	**RR b11 wavelength for pressure NN**	nm	3700	fl	925
16	**FR residual stray-light correction factor**	dl	14800	fl	3700

Table 11.7.14.1.1-1 General GADS

N	Description	Units	Byte Length	Data Type	Dim.
17	**RR residual stray-light correction factor**	dl	3700	fl	925
18	**Minimum acceptable value for Surface albedo**	dl	4	fl	1
19	**Maximum acceptable value for Surface albedo**	dl	4	fl	1
20	**Cloud top pressure tabulated values**	hPa	40	fl	10
21	**Cloud optical thickness tabulated values**	dl	40	fl	10
22	**Number of Cloud top pressure tabulated values**	dl	1	uc	1
23	**Number of Cloud optical thickness tabulated values**	dl	1	uc	1
24	**Solar flux at 753.75nm for cloud LUTs**	LU	4	fl	1
25	**Minimum valid values for SP NN inputs**	misc	28	fl	7
26	**Maximum valid values for SP NN inputs**	misc	28	fl	7
27	**Minimum valid value for SP NN output**	hPa	4	fl	1
28	**Maximum valid value for SP NN output**	hPa	4	fl	1
29	**Default AOT value for SP NN**	dl	4	fl	1
30	**Maximum allowed surface pressure difference**	hPa	4	fl	1
	size (in bytes)	**-**	**80718**	**-**	**-**

11.7.14.1.2 Surface Albedo at 761 nm ADS

The size of the ADS has been summarized below:

Table 11.7.14.1.2-1 Surface Albedo ADS

ADSR no	Description	Size
0	ADSR associated with month # 1, latitude #1	7200
...	...	...
3599	ADSR associated with # month 1, latitude #3600	7200
3600	ADSR associated with # month 2, latitude #31	7200
…	…	…
43199	ADSR associated with # month 12, latitude #3600	7200
-	**Total (in bytes)**	**311040000**

There is one Record for each one of the 12 months times the 3600 latitudes tabulated values listed in the "GADS General" of this product (field 1). Months are ordered the usual way, from January (#0) to Decmber (#11). Therefore the ADS holds 43200 records.

Each record contains a one-dimensional table giving the surface albedo as a function of Longitude. The tabulated values of the longitude are stored in the "GADS General" of this product, field 2.

The content of each ADSR shall be as follows:

Table 11.7.14.1.2-2 Surface Albedo ADSR

N	Description	Units	Byte Length	Data Type	Dim.
1	**Band 11 Surface Albedo (Longitude)**	dl	7200	uc	7200

	size (in bytes)	**-**	**7200**	**-**	**-**

11.7.14.1.3 Polynomial Coefficients for Cloud Albedo Retrieval ADS

Each record of the ADS is indexed by the Sun zenithal angle θ_s. Its tabulated values are given in the field #3 of the "GADS General" of this file. The size of the ADS has been summarized below:

Table 11.7.14.1.3-1 Polynomial Coefficients for Cloud Albedo Retrieval ADS

ADSR no	Description	Size
1	ADSR associated with # 1	**48600**
...	...	**...**
27	ADSR associated with # *27*	**48600**
-	**Total (in bytes)**	**1312200**

The content of each ADSR shall be as follows:

Table 11.7.14.1.3-2 Polynomial Coefficients for Cloud Albedo Retrieval ADSR

N	Description	Units	Byte Length	Data Type	Dim.
1	**a_{al} , 0 order coefficient (θ_v, $\Delta\varphi$, α_{surf}) LUT**	-	16200	fl	18*25*9
2	**b_{al} , 1 order coefficient (θ_v, $\Delta\varphi$, α_{surf}) LUT**	LU-1	16200	fl	18*25*9
3	**c_{al} , 2 order coefficient (θ_v, $\Delta\varphi$, α_{surf}) LUT**	LU-2	16200	fl	18*25*9
	size (in bytes)	**-**	**48600**	**-**	**-**

The table stored in each record is first indexed by θv, than by Δφ, and lastly by αsurf. Tabulated values of thee parameters are found in fields #4, #5, #6 of the General GADS.

11.7.14.1.4 Polynomial Coefficients for Cloud Optical Thickness Retrieval ADS

Each record of the ADS is indexed by the Sun zenithal angle θ_s. The size of the ADS has been summarized below:

Table 11.7.14.1.4-1 Polynomial Coefficients for Cloud Optical Thickness Retrieval ADS

ADSR no	Description	Size
1	ADSR associated with # 1	**64800**
...	...	...

27	ADSR associated with # 27	**64800**
-	**Total (in bytes)**	**1749600**

The content of each ADSR shall be as follows:

Table 11.7.14.1.4-2 Polynomial Coefficients for Cloud Optical Thickness Retrieval ADSR

N	Description	Units	Byte Length	Data Type	Dim.
1	**ath 0 order coefficient (θ_v, $\Delta\varphi$, α_{surf})**	dl	16200	fl	18*25*9
2	**bth 1 order coefficient (θ_v, $\Delta\varphi$, α_{surf})**	LU^{-1}	16200	fl	18*25*9
3	**cth 2 order coefficient (θ_v, $\Delta\varphi$, α_{surf})**	LU^{-2}	16200	fl	18*25*9
4	**dth 3 order coefficient (θ_v, $\Delta\varphi$, α_{surf})**	LU^{-3}	16200	fl	18*25*9
	size (in bytes)	**-**	**64800**	**-**	**-**

The table stored in each record is first indexed by θv, than by Δφ, and lastly by αsurf. Tabulated values of thee parameters are found in fields #4, #5, #6 of the General GADS.

11.7.14.1.5 Cloud Top Pressure Neural Network when Surface Albedo is not null GADS

The format of this GADS is identical to that described in Section 11.7.13.1.6. There is only one record in this GADS.

11.7.14.1.6 Cloud Top Pressure Neural Network when Surface Albedo is null GADS

The format of this GADS is identical to that described in Section 11.7.13.1.6. There is only one record in this GADS.

11.7.14.1.7 Cloud Type Index GADS

The content of the GADS shall be as follows:

Table 11.7.14.1.7-1 Cloud Type Index GADS

N	Description	Units	Byte Length	Data Type	Dim.
1	**Cloud type index (cloud top pressure, optical thickness)**	-	100	uc	10*10
	size (in bytes)	**-**	**100**	**-**	**-**

The cloud type is indexed first by the cloud top pressure (tabulated values in field #20 of the General GADS), then by the optical thickness (tabulated values in field

#21 of the General GADS). A subset only of the indices may be used, its size is specified in fields #22, #23 of the General GADS.

11.7.14.1.8 Surface Pressure Neural Network GADS

The format of this GADS is identical to that described in Section 11.7.13.1.6. There is only one record in this GADS.

11.7.15 Land Vegetation Index Parameters Data File

FILE ID: MER_LVI_AX

TYPE: Auxiliary

USE: Level 2 processing

UPDATED: once a year

SIZE: MPH(1247 bytes) + SPH(378 bytes) + GADS(359 bytes) = 1984 bytes

11.7.15.1 Format

The field DS_NAME for the DSD of the General GADS shall be set to "GADS General".

The GADS contains the following fields:

Table 11.7.15.1-1 Land Vegetation Index Parameters Data File - General GADS

N	Description	Units	Byte Length	Data Type	Dim.
1	**Blue wavelength band number (with bands starting at 1) for TOAVI computation**	dl	1	uc	1
2	**Red wavelength band number (with bands starting at 1) for TOAVI computation**	dl	1	uc	1
3	**Near Infrared wavelength band number (with bands starting at 1) for TOAVI computation**	dl	1	uc	1
4	**K_i normalisation parameters for blue, red and NIR channels and for Vegetated and Bright soils**	dl	24	fl	2*3
5	**theta_i normalisation parameters for blue, red and NIR channels and for Vegetated and Bright soils**	dl	24	fl	2*3
6	**rho_i normalisation parameters for blue, red and NIR channels and for Vegetated and Bright soils**	dl	24	fl	2*3
7	**maximum reflectances for blue, red and near infrared channels for TOAVI computation**	dl	12	fl	3
8	**polynomial coefficients for blue, red and near infrared channels for TOAVI computation**	dl	240	fl	5*12
9	**infrared to near infrared reflectance ratio threshold for TOAVI computation**	dl	4	fl	1
10	**red wavelength band number (with bands starting at 1) for BOAVI computation**	dl	1	uc	1
11	**near infrared wavelength band #1 (with bands starting at 1) for BOAVI computation**	dl	1	uc	1
12	**near infrared wavelength band #2 (with bands starting at 1) for BOAVI computation**	dl	1	uc	1
13	**near infrared wavelength band #3 (with bands starting at 1) for BOAVI computation**	dl	1	uc	1

Table 11.7.15.1-1 Land Vegetation Index Parameters Data File - General GADS

N	Description	Units	Byte Length	Data Type	Dim.
14	**BOAVI acceptable range [min, max]**	dl	8	fl	2
15	**Maximum value of top of aerosol reflectance in red band to allow MTCI computation**	dl	**4**	fl	1
16	**Minimum value of top of aerosol reflectance in near infrared band #2 to allow MTCI computation**	dl	**4**	fl	1
17	**Minimum value of the top of aerosol reflectance difference between near infrared #1 and red bands to allow MTCI computation**	dl	**4**	fl	1
18	**Minimum (NIR3 - Red) top of aero refl. diff to allow MTCI computation**	dl	**4**	fl	1
Size			**359**		

11.7.16 Surface Confidence Map File

The Surface Confidence Map file provides a boolean flag which indicates for any location on Earth, whether the Land/Water classification provided by the Land/Sea Mask file is fully asserted or not.

FILE ID: MER_SCM_AX

TYPE: Auxiliary

USE: Level 2 processing

UPDATED: Infrequently.

SIZE: MPH(1247 bytes) + SPH(938 bytes) + GADS(7608256 bytes) = 7610441 bytes

11.7.16.1 Format

The high level breakdown of the file is shown below.

Table 11.7.16.1-1 Schematic Structure of the Surface Confidence Map File

MPH
SPH - standard Auxiliary Data SPH with 3 DSDs: *DSD for the 1 Degree Resolution Surface Confidence GADS* *DSD for the 0.1 Degree Resolution Surface Confidence GADS* *DSD for the 0.01 Degree Resolution Surface Confidence GADS*
1 Degree Resolution Surface Confidence GADS
0.1 Degree Resolution Surface Confidence GADS
0.01 Degree Resolution Surface Confidence GADS

The following strings will be used in the field DS_NAME for the DSDs listed in the SPH above.

Table 11.7.16.1-2 DS_NAME Strings

DSD	DS_NAME String
DSDs for included Data Sets	

DSD (G) - 1 Degree Resolution Surface Confidence GADS	ADS Surf. Confidence 1 deg
DSD (G) - 0.1 Degree Resolution Surface Confidence GADS	ADS Surf. Confidence .1 deg
DSD (G) - 0.01 Degree Resolution Surface Confidence GADS	ADS Surf. Confidence .01 deg

11.7.16.1.1 1 Degree Resolution Surface Confidence GADS

The size of the GADS is summarized in the table below:

Table 11.7.16.1.1-1 1 Degree Resolution Surface Confidence GADS

GADSR no	Description	Byte Length
0	**GADSR associated with latitude 1 (90 deg. S to 89 deg. S)**	720
....	**.....**	.....
179	**GADSR associated with latitude 180 (89 deg. N to 90 deg. N)**	720
Size		**129600**

There are 180 records in this GADS, each record being associated with a 1 degree latitude line. Each record contains 360 values.

The format of each GADS record is defined in the table below.

Table 11.7.16.1.1-2 1 Degree Resolution Surface Confidence GADS Record

N	Description	Units	Byte Length	Data Type	Dim.
1	**Surface Confidence flag, 1 degree resolution** Values: -2 = uncertain surface cell -1 = asserted surface cell N > 0 = surface of the cell is not fully asserted or uncertain: a description of higher resolution of this cell may be found in the record number N (equal to 1+GADSR number) of the 0.1 Degree Surface Confidence GADS.	-	720	ss	360
Size			**720**		

In each record (i.e. each latitude line) cells are ordered with longitude going from 180 deg. W to 179 deg. E: the first cell corresponds to a region within 180 deg. W - 179 deg. W, the last cell corresponds to a region within 179 deg. E - 180 deg. E.

11.7.16.1.2 0.1 Degree Surface Confidence GADS

The size of the GADS is summarized in the table below:

Table 11.7.16.1.2-1 0.1 Degree Resolution Surface Confidence GADS

GADSR no	Description	Byte Length
0	**GADSR associated with 1 degree cell 1**	400
....	**.....**	.....
12196	**GADSR associated with 1 degree cell 12197**	400
Size		**4878800**

There are 12197 records in this GADS, each record being associated with a 1 degree cell to be further detailed. Each record contains 100 values ordered with longitude (going Eastward) varying more rapidly than latitude (going northward).
The format of each GADSR is shown in the table below.

Table 11.7.16.1.2-2 0.1 Degree Resolution Surface Confidence GADS Record

N	Description	Units	Byte Length	Data Type	Dim.

N	Description	Units	Byte Length	Data Type	Dim.
1	**Surface Confidence flag , 0.1 degree resolution** Values: -2 = uncertain surface cell -1 = asserted surface cell N > 0 = surface of the cell is not fully asserted or uncertain: a description of higher resolution of this cell may be found in the record number N (equal to 1+GADSR number) of the 0.01 Degree Surface Confidence GADS	-	400	sl	100
Size			**400**		

11.7.16.1.3 0.01 Degree Surface Confidence GADS

The size of the GADS is summarized in the table below:

Table 11.7.16.1.3-1 0.01 Degree Resolution Surface Confidence GADS

GADSR no	Description	Byte Length
0	**GADSR associated with 0.1 degree cell 1**	14
....	**.....**	.....
185703	**GADSR associated with 0.1 degree cell 185704**	14
Size		**2599856**

There are 185704 records in this GADS, each record being associated with a 0.1 degree cell to be further detailed. Each record contains 100 values ordered with longitude (going Eastward) varying more rapidly than latitude (going northward). The format of each GADSR is shown in the table below.

Table 11.7.16.1.3-2 0.01 Degree Resolution Surface Confidence GADS Record

N	Description	Units	Byte Length	Data Type	Dim.
1	**Surface Confidence Flag , 0.01 Degree resolution** 14 bytes holding 112 bits. Each one of the first 100 bits is related to a 0.01 by 0.01 degree cell. The bit value has the following meaning: 1 = TRUE = uncertain surface type 0 = FALSE = asserted surface type	flags	14	uc	14

N	Description	Units	Byte Length	Data Type	Dim.
Size			**14**		

11.7.17 ENVISAT-1 Orbit Data Files

Orbit Data files are described in Volume 16 (FOS files) and Volume 9 (DORIS products).

11.7.18 ECMWF Data Files

The MERIS processor will use an ECMWF data file during the processing. The ECMWF data file is described in Volume 16.

11.7.19 Digital Elevation Model

The MERIS processor will use the ENVISAT Digital Elevation Model defined in Volume 16.

11.8 MERIS PRODUCT SUMMARY SHEETS

The information presented on the following pages is a record of the data stored in the Data Dictionary Tool (DDT) Product Summary Sheets. The DDT contains data formats and descriptions for all products produced by the ENVISAT PDS.

MERIS Reduced Resolution Level 0

PRODUCT ID	MER_RR__0P
PRODUCT NAME	MERIS Reduced Resolution Level 0
DESCRIPTION	The Reduced Resolution Level 0 product consists of time ordered AISPs collected while the instrument is operating in Reduced Resolution mode.
APPLICATIONS	Product is archived, and is the basis for all further MERIS RR data processing
DELIVERY TIME	The product is produced systematically and the NRT version of the product is available within 3 hours of data acquisition from the PDHS. The OFL (fully consolidated) version of the product is available from the LRAC 2 weeks after acquisition.
COVERAGE	1165 km by 17500 km (43.5 minutes of data on daylight side of orbit)
THROUGHPUT	1 product per orbit. Satellite data generation at 1.6 Mbps
PRODUCT SIZE	max. 522 Mb/product (43.5 min. x 1.6 Mbps).
GEOMETRICAL SAMPLING	1040 m across track by 1160 meters along track at nadir
GEOMETRIC RESOLUTION	N/A
GEOMETRIC ACCURACY	Absolute localization accuracy better than 2000 m.
RADIOMETRIC RESOLUTION	From noise level to albedo 1.0 (approx. 40 dB); dependent on gain and channel; Coded in 16 bits/sample; spectral resolution < 2.5 nm; spectral sampling < 1.25 nm.
RADIOMETRIC ACCURACY	from 400 to 900 nm < 2% relative to the sun from 900 to 1050 nm < 5% relative to the sun
AUXILIARY DATA	Orbit state vectors; Time correlation parameters.
ALGORITHMS USED	Satellite positioning, time correlation
NOTES	Produced systematically for all RR data acquired

MERIS Full Resolution Level 0

PRODUCT ID	MER_FR__0P
PRODUCT NAME	MERIS Full Resolution Level 0
DESCRIPTION	The Full Resolution Level 0 product consists of time ordered AISPs collected while the instrument is operating in Full Resolution mode.
APPLICATIONS	Product is archived and is the basis for all further MERIS FR data processing
DELIVERY TIME	NRT version of the product is available within 1 day of data acquisition from the PDHS. The OFL (fully consolidated) version of the product is available from the PAC 2 weeks after acquisition.
COVERAGE	1165 km by 8000 km maximum. this is a regional product is based on direct reception and depends on orbit-station geometry
THROUGHPUT	Variable as data is acquired upon request. Satellite data generation at 24 Mbps. Up to 12.5 minutes/orbit to PDHS-K, 20, minutes / orbit to PDHS-E, and 12.5 minutes /orbit to PDAS.
PRODUCT SIZE	max. 3600 Mb/orbit [24 Mbps for 20 minutes] to PDHS-E, or max. 2250 Mb for 12.5 minutes per orbit at PDHS-K. Max file size is 2 GB, thus when larger, product divided across several files, each with own MPH and SPH
GEOMETRICAL SAMPLING	260 m across track x 290 m along track at nadir
GEOMETRIC RESOLUTION	N/A
GEOMETRIC ACCURACY	Absolute localization accuracy better than 2000 m.
RADIOMETRIC RESOLUTION	From noise level to albedo 1.0 (approx. 40 dB); dependent on gain and channel; Coded in 16 bits/sample; spectral resolution < 2.5 nm; spectral sampling < 1.25 nm.
RADIOMETRIC ACCURACY	from 400 to 900 nm < 2% relative to the sun from 900 to 1050 nm < 5% relative to the sun
AUXILIARY DATA	Orbit state vectors, time correlation parameters
ALGORITHMS USED	Satellite positioning, time correlation
NOTES	Produced systematically for all FR data acquired.

MERIS Calibration Level 0

PRODUCT ID	MER_CA__0P
PRODUCT NAME	MERIS Calibration Level 0
DESCRIPTION	The Calibration Level 0 product consists of time ordered AISPs collected while the instrument is operating in Calibration mode.
APPLICATIONS	This product is used for calibration and validation purposes. Further PDS products are not produced from this data.
DELIVERY TIME	NRT version of the product is available within 3 hours of data acquisition from the PDHS. The OFL (fully consolidated) version of the product is available from the LRAC 2 weeks after acquisition
COVERAGE	N/A
THROUGHPUT	performed on demand at a weekly to monthly rate. Calibration sequence takes approximately 160 seconds. Satellite data generation at 1.6 Mbps.
PRODUCT SIZE	approx. 160 s * 1.6 MBps/8 = 32 Mb / product.
GEOMETRICAL SAMPLING	N/A
GEOMETRIC RESOLUTION	N/A
GEOMETRIC ACCURACY	N/A
RADIOMETRIC RESOLUTION	N/A
RADIOMETRIC ACCURACY	N/A
AUXILIARY DATA	Orbit state vectors; Time correlation parameters.
ALGORITHMS USED	satellite positioning; Time correlation.
NOTES	product is produced systematically when calibration mode data is received.

MERIS Reduced Field of View Level 0

PRODUCT ID	MER_RV__0P
PRODUCT NAME	MERIS Reduced Field of View Level 0
DESCRIPTION	The Reduced Field of View Level 0 product consists of time ordered AISPs collected while the instrument is operating in Reduced Field of View mode.
APPLICATIONS	This product is used for calibration and validation purposes. Further PDS products are not produced from this data.
DELIVERY TIME	NRT version of the product is available within 3 hours of data acquisition from the PDHS. The OFL (fully consolidated) version of the product is available from the LRAC 2 weeks after acquisition
COVERAGE	variable. Up to 43.5 minutes per orbit. Mode choosen by request only.
THROUGHPUT	variable. Mode choosen by request only. Satellite data generation at 1.6 Mbps.
PRODUCT SIZE	up to 43.5 minute at 1.6 Mbps = 522 Mb/ product.
GEOMETRICAL SAMPLING	231 pixels are acquired at full resolution
GEOMETRIC RESOLUTION	260 m across track x 290 m along track at nadir
GEOMETRIC ACCURACY	Absolute localization accuracy better than 2000 m.
RADIOMETRIC RESOLUTION	From noise level to albedo 1.0 (approx. 40 dB); dependent on gain and channel; Coded in 16 bits/sample; spectral resolution < 2.5 nm; spectral sampling < 1.25 nm.
RADIOMETRIC ACCURACY	from 400 to 900 nm < 2% relative to the sun from 900 to 1050 nm < 5% relative to the sun
AUXILIARY DATA	Orbit state vectors, time correlation parameters
ALGORITHMS USED	Satellite positioning, time correlation
NOTES	Produced systematically for all RFOV data acquired.

MERIS Reduced Resolution Geolocated and Calibrated TOA Radiance

PRODUCT ID	MER_RR__1P
PRODUCT NAME	MERIS Reduced Resolution Geolocated and Calibrated TOA Radiance
DESCRIPTION	This RR Level 1B product consists of the Top of Atmosphere (TOA) radiances of the 15 bands. The reference for the absolute calibration will be based on the assumed solar irradiance at the time of calibration. The product will be resampled to a fixed grid aligned to the subsatellite track, and localization information (lat. long.) will be provided along with the viewing geometry. Surface identification will be performed for each pixel in the image and an identification flag attached to each pixel. The product is archived in stripline format, and disseminated to users in multiples of the 1165 km by 1300 km minimum scene size.
APPLICATIONS	**The product serves as the basis for Level 2 RR processing and has applications in atmospheric modelling, land use monitoring, ocean colour monitoring, vegetation indices, and others.**
DELIVERY TIME	**NRT version is available from the PDHS 3 hours after data acquisition. The OFL (fully consolidated) version is available 2 weeks after acquisition form the LRAC.**
COVERAGE	**up to 1165 km by 17500 km coverage; archived in stripline (43.5 minutes of coverage on daylight side of orbit); disseminated in multiples of 1165 by 1300 km scenes**
THROUGHPUT	1 per orbit
PRODUCT SIZE	approx 40 MB per 1165 by 1300 km scene (1121 pixels * 1121 lines * 32 bytes/pixel) up to 553 Mb/orbit (1165 km x 17400 km x 15 bands + 1 annotation band + auxiliary information appended)
GEOMETRICAL SAMPLING	1040 m across track at nadir by 1160 m along track
GEOMETRIC RESOLUTION	MTF > 0.3 at Nyquist freq.
GEOMETRIC ACCURACY	**Absolute localization accuracy better than 2000 m.**
RADIOMETRIC RESOLUTION	From noise level to albedo 1.0 (approx. 40 dB); dependent on gain and channel; Coded in 16 bits/sample; spectral resolution < 2.5 nm; spectral sampling < 1.25 nm.
RADIOMETRIC ACCURACY	from 400 to 900 nm < 2% relative to the sun from 900 to 1050 nm < 5% relative to the sun
AUXILIARY DATA	Orbit state vectors; Time correlation parameters; ADS Summary Quality GADS Scaling Factors and General Info ADS Tie Points Location & Aux. Data
ALGORITHMS USED	Spatial: geolocation, image resampling to fixed grid, Spectral: spectral calibration, spectral band position and width by module, Radiometric:dark and response calibration by band and by module gain, Pixel Classification Data validation

NOTES Produced systematically in stripline from RR Level 0 product.

MERIS Full Resolution Geolocated and Calibrated TOA Radiance

PRODUCT ID	MER_FR__1P
PRODUCT NAME	MERIS Full Resolution Geolocated and Calibrated TOA Radiance
DESCRIPTION	This FR Level 1B product consists of the Top of Atmosphere (TOA) radiances of the 15 bands. The reference for the absolute calibration will be based on the assumed solar irradiance at the time of calibration. The product will be resampled to a fixed grid aligned to the subsatellite track, and localization information (lat. long.) will be provided along with the viewing geometry. Surface identification will be performed for each pixel in the image and an identification flag attached to each pixel.
APPLICATIONS	The product serves as the basis for Level 2 FR processing and has applications in atmospheric modelling, land use monitoring, ocean colour monitoring, vegetation indices, and others.
DELIVERY TIME	NRT version available 1 day after data acquisition, OFL (fully consolidated version) available 2 weeks after acquisition.
COVERAGE	regional, depends on orbit-station geometry. 582 km by 650 km scene or 300 km by 334 km imagette (floating scene distribution).
THROUGHPUT	Variable as data is acquired upon request. Up to 12.5 minutes/orbit to PDHS-K, 20, minutes / orbit to PDHS-E, and 12.5 minutes /orbit to PDAS.
PRODUCT SIZE	166 Mb scene; 44 Mb /imagette.
GEOMETRICAL SAMPLING	260 m across track at nadir by 290 m along track
GEOMETRIC RESOLUTION	MTF > 0.3 at Nyquist freq.
GEOMETRIC ACCURACY	Absolute localization accuracy better than 2000 m.
RADIOMETRIC RESOLUTION	From noise level to albedo 1.0 (approx. 40 dB); dependent on gain and channel; Coded in 16 bits/sample; spectral resolution < 2.5 nm; spectral sampling < 1.25 nm.
RADIOMETRIC ACCURACY	from 400 to 900 nm < 2% relative to the sun from 900 to 1050 nm < 5% relative to the sun
AUXILIARY DATA	Orbit state vectors, time correlation parameters, ADS Summary Quality GADS Scaling Factors and General Info ADS Tie Points Location & Aux. Data
ALGORITHMS USED	Spatial: geolocation, image resampling to fixed grid, Spectral: spectral calibration, spectral band position and width by module, Radiometric:dark current and response calibration by band and by module gain, Pixel Classification, Data validation
NOTES	Produced on request.

MERIS Full Resolution Full Swath Geolocated and Calibrated TOA Radiance

PRODUCT ID	MER_FRS_1P
PRODUCT NAME	MERIS Full Resolution Full Swath Geolocated and Calibrated TOA Radiance
DESCRIPTION	This FR Level 1B product consists of the Top of Atmosphere (TOA) radiances of the 15 bands. The reference for the absolute calibration will be based on the assumed solar irradiance at the time of calibration. The product will be resampled to a fixed grid aligned to the subsatellite track, and localization information (lat. long.) will be provided along with the viewing geometry. Surface identification will be performed for each pixel in the image and an identification flag attached to each pixel.
APPLICATIONS	The product serves as the basis for Level 2 FRS processing and has applications in atmospheric modelling, land use monitoring, ocean colour monitoring, vegetation indices, and others.
DELIVERY TIME	Produced off - line.
	regional, depends on orbit-station geometry.
COVERAGE	variable
THROUGHPUT	Variable as data is acquired upon request. Up to 12.5 minutes/orbit to PDHS-K, 20, minutes / orbit to PDHS-E, and 12.5 minutes /orbit to PDAS.
PRODUCT SIZE	variable
GEOMETRICAL SAMPLING	260 m across track at nadir by 290 m along track
GEOMETRIC RESOLUTION	MTF > 0.3 at Nyquist freq.
GEOMETRIC ACCURACY	Absolute localization accuracy better than 2000 m.
RADIOMETRIC RESOLUTION	From noise level to albedo 1.0 (approx. 40 dB); dependent on gain and channel; Coded in 16 bits/sample; spectral resolution < 2.5 nm; spectral sampling < 1.25 nm.
RADIOMETRIC ACCURACY	from 400 to 900 nm < 2% relative to the sun from 900 to 1050 nm < 5% relative to the sun
AUXILIARY DATA	Orbit state vectors, time correlation parameters, ADS Summary Quality GADS Scaling Factors and General Info ADS Tie Points Location & Aux. Data
ALGORITHMS USED	Spatial: geolocation, image resampling to fixed grid, Spectral: spectral calibration, spectral band position and width by module, Radiometric:dark current and response calibration by band and by module gain, Pixel Classification, Data validation
NOTES	Produced on request.

MERIS Reduced Resolution Geophysical Product

PRODUCT ID	MER_RR__2P
PRODUCT NAME	MERIS Reduced Resolution Geophysical Product
DESCRIPTION	This RR Level 2 product is a mixture of geolocated geophysical data (dependent on pixel classification) along with surface radiance/ reflectance and TOA radiance in the case of unclassified pixels. Localization information (lat. long.) will be provided along with the viewing geometry. The surface classification information from the Level 1B processing (accessed via the pixel identification flags) will allow the processor to calculate the appropriate geophysical parameters for each pixel.
APPLICATIONS	Ocean, land or atmosphere characterization at 1040 by 1160 m pixel spatial resolution
DELIVERY TIME	NRT version of the product is available from the PDHS 3 hours after data acquisition. The OFL (fully consolidated) version is available from the LRAC 2 weeks after data acquisition
COVERAGE	up to 1165 km by 17400 km (43.5 minutes) coverage
THROUGHPUT	1 product per orbit
PRODUCT SIZE	max. 621 MB/ 43.5' product, approx. 46 MB per 1165 km by 1300 km floating scene
GEOMETRICAL SAMPLING	1040 m across track at nadir by 1160 m along track
GEOMETRIC RESOLUTION	MTF > 0.3 at Nyquist freq.
GEOMETRIC ACCURACY	Absolute localization accuracy better than 2000 m.
RADIOMETRIC RESOLUTION	From noise level to albedo 1.0 (approx. 40 dB); dependent on gain and channel; Coded in 16 bits/sample; spectral resolution < 2.5 nm; spectral sampling < 1.25 nm.
RADIOMETRIC ACCURACY	from 400 to 900 nm < 2% relative to the sun from 900 to 1050 nm < 5% relative to the sun
AUXILIARY DATA	Orbit stated vectors; Time correlation parameters; SQ ADS GADS Scaling Factors and General Info ADS Tie Points Location & Aux. Data
ALGORITHMS USED	Further pixel classification algorithms (water type, cloud, snow, vegetation, soil); Estimation of atmospheric, ocean, cloud and land geophysical parameters; Validation of data
NOTES	Produced systematically from RR Level 1B product. On demand dissemination of multiple of scene sized 1165 km by 1300 km

MERIS Full Resolution Geophysical Product

PRODUCT ID	MER_FR__2P
PRODUCT NAME	MERIS Full Resolution Geophysical Product
DESCRIPTION	This FR Level 2 product is a mixture of geolocated geophysical data (dependent on pixel classification) along with surface radiance/ reflectance and TOA radiance in the case of unclassified pixels. Localization information (lat. long.) will be provided along with the viewing geometry. The surface classification information from the Level 1B processing (accessed via the pixel identification flags) will allow the processor to calculate the appropriate geophysical parameters for each pixel
APPLICATIONS	Climatology, meteorology, environmental monitoring etc.
DELIVERY TIME	NRT version available 1 day after data acquisition, OFL (fully consolidated version) available 2 weeks after acquisition.
COVERAGE	regional, depends on orbit-station geometry. 582 km by 650 km scne or 300 by 334 km imagette (floating scene distribution)
THROUGHPUT	Variable as data is acquired upon request. Up to 12.5 minutes/orbit to PDHS-K, 20, minutes / orbit to PDHS-E, and 12.5 minutes /orbit to PDAS.
PRODUCT SIZE	186 MB / scene typically. 50 MB per imagette
GEOMETRICAL SAMPLING	260 m across track at nadir by 290 m along track
GEOMETRIC RESOLUTION	265 x 292 meters at nadir
GEOMETRIC ACCURACY	Absolute localization accuracy better than 2000 m.
RADIOMETRIC RESOLUTION	From noise level to albedo 1.0 (approx. 40 dB); dependent on gain and channel; Coded in 16 bits/sample; spectral resolution < 2.5 nm; spectral sampling < 1.25 nm.
RADIOMETRIC ACCURACY	from 400 to 900 nm < 2% relative to the sun from 900 to 1050 nm < 5% relative to the sun
AUXILIARY DATA	Orbit state vectors; Time correlation parameters; SQ ADS GADS Scaling Factors and General Info ADS Tie Points Location & Aux. Data
ALGORITHMS USED	Further pixel classification algorithms (water type, cloud, snow, vegetation, soil); Estimation of atmospheric, ocean, cloud and land geophysical parameters;
NOTES	Validation of data Produced from FR Level 1B product. Distributed on demand using the floating scene concept

MERIS Extracted Cloud Thickness and Water Vapour for Meteo Users

PRODUCT ID	MER_LRC_2P
PRODUCT NAME	MERIS Extracted Cloud Thickness and Water Vapour for Meteo Users
DESCRIPTION	This RR Level 2 product contains selected information extracted from the MERIS Reduced Resolution Geophysical product. The primary geophysical parameters are cloud thickness and water vapour content. The resolution of the product is reduced to > 5km through an averaging process (TBC).
APPLICATIONS	Intended only for meteorological applications
DELIVERY TIME	This product is available in NRT form only, from the PDHS, 3 hours after data acquisition
COVERAGE	up to 1165 km by 17400 km (43.5 minutes) coverage
THROUGHPUT	1 product per orbit.
PRODUCT SIZE	max. 9 MB/product
GEOMETRICAL SAMPLING	approx. 4160 m across track at nadir by 4640 km along track
GEOMETRIC RESOLUTION	MTF > 0.3 at Nyquist freq.
GEOMETRIC ACCURACY	Information not available
RADIOMETRIC RESOLUTION	Information not available
RADIOMETRIC ACCURACY	Information not available
AUXILIARY DATA	Orbit state vectors, time correlation parameters, ADS Summary Quality GADS Scaling Factors and General Info ADS Tie Points Location & Aux. Data
ALGORITHMS USED	data extraction; reduction of resolution.
NOTES	Extracted systematically from the Level 2 RR geophysical product. Product may be converted to BUFR format outside the PDS for distribution to Meteo users.

MERIS Extracted Cloud Thickness and Water Vapour

PRODUCT ID	MER_RRC_2P
PRODUCT NAME	MERIS Extracted Cloud Thickness and Water Vapour
DESCRIPTION	This RR Level 2 product contains selected information extracted from the MERIS Reduced Resolution Geophysical product. The primary geophysical parameters are cloud thickness and water vapour content.
APPLICATIONS	Intended for meteorological applications
DELIVERY TIME	This product is available in NRT form only, from the PDHS, 3 hours after data acquisition
COVERAGE	up to 1165 km by 17400 km (43.5 minutes) coverage
THROUGHPUT	1 product per orbit.
PRODUCT SIZE	max. 104 MB/product
GEOMETRICAL SAMPLING	1040 m across track at nadir by 1160 m along track
GEOMETRIC RESOLUTION	MTF > 0.3 at Nyquist freq.
GEOMETRIC ACCURACY	Absolute localization accuracy better than 2000 m.
RADIOMETRIC RESOLUTION	From noise level to albedo 1.0 (approx. 40 dB); dependent on gain and channel; Coded in 16 bits/sample; spectral resolution < 2.5 nm; spectral sampling < 1.25 nm.
RADIOMETRIC ACCURACY	from 400 to 900 nm < 2% relative to the sun from 900 to 1050 nm < 5% relative to the sun
AUXILIARY DATA	Orbit state vectors, time correlation parameters, ADS Summary Quality GADS Scaling Factors and General Info ADS Tie Points Location & Aux. Data
ALGORITHMS USED	data extraction
NOTES	Extracted systematically from the Level 2 RR geophysical product.

MERIS Extracted Vegetation Indices

PRODUCT ID **MER_RRV_2P**

PRODUCT NAME	MERIS Extracted Vegetation Indices
DESCRIPTION	This RR Level 2 product contains selected information extracted from the MERIS Reduced Resolution Geophysical product. The primary geophysical parameters is Vegetation indices.
APPLICATIONS	Intended for NRT land monitoring.
DELIVERY TIME	This product is available in NRT form only, from the PDHS, 3 hours after data acquisition
COVERAGE	up to 1165 km by 17400 km (43.5 minutes) coverage
THROUGHPUT	1 product per orbit.
PRODUCT SIZE	max. 87 Mb/product
GEOMETRICAL SAMPLING	1040 m across track at nadir by 1160 m along track
GEOMETRIC RESOLUTION	MTF > 0.3 at Nyquist freq.
GEOMETRIC ACCURACY	Absolute localization accuracy better than 2000 m.
RADIOMETRIC RESOLUTION	From noise level to albedo 1.0 (approx. 40 dB); dependent on gain and channel; Coded in 16 bits/sample; spectral resolution < 2.5 nm; spectral sampling < 1.25 nm.
RADIOMETRIC ACCURACY	from 400 to 900 nm < 2% relative to the sun from 900 to 1050 nm < 5% relative to the sun
AUXILIARY DATA	Orbit state vectors, time correlation parameters, ADS Summary Quality GADS Scaling Factors and General Info ADS Tie Points Location & Aux. Data
ALGORITHMS USED	data extraction
NOTES	Extracted systematically from the Level 2 RR geophysical product.

MERIS Full Resolution Geophysical Product

PRODUCT ID	MER_FRS_2P
PRODUCT NAME	MERIS Full Resolution Full Swath Geophysical Product
DESCRIPTION	This FR Level 2 product is a mixture of geolocated geophysical data (dependent on pixel classification) along with surface radiance/ reflectance and TOA radiance in the case of unclassified pixels. Localization information (lat. long.) will be provided along with the viewing geometry. The surface classification information from the Level 1B processing (accessed via the pixel identification flags) will allow the processor to calculate the appropriate geophysical parameters for each pixel
APPLICATIONS	Climatology, meteorology, environmental monitoring etc.
DELIVERY TIME	TBD
COVERAGE	regional, depends on orbit-station geometry.
THROUGHPUT	Variable as data is acquired upon request. Up to 12.5 minutes/orbit to PDHS-K, 20, minutes / orbit to PDHS-E, and 12.5 minutes /orbit to PDAS.
PRODUCT SIZE	Depends on chosen size (max 8.30 min. of sensing=~ 2Gbytes)
GEOMETRICAL SAMPLING	260 m across track at nadir by 290 m along track
GEOMETRIC RESOLUTION	265 x 292 meters at nadir
GEOMETRIC ACCURACY	Absolute localization accuracy better than 2000 m.
RADIOMETRIC RESOLUTION	From noise level to albedo 1.0 (approx. 40 dB); dependent on gain and channel; Coded in 16 bits/sample; spectral resolution < 2.5 nm; spectral sampling < 1.25 nm.
RADIOMETRIC ACCURACY	from 400 to 900 nm < 2% relative to the sun from 900 to 1050 nm < 5% relative to the sun
AUXILIARY DATA	Orbit state vectors; Time correlation parameters; SQ ADS GADS Scaling Factors and General Info ADS Tie Points Location & Aux. Data
ALGORITHMS USED	Further pixel classification algorithms (water type, cloud, snow, vegetation, soil); Estimation of atmospheric, ocean, cloud and land geophysical parameters;
NOTES	Validation of data Produced from FRS Level 1B product. Distributed on demand

MERIS browse image (for both FR and RR products)

PRODUCT ID	MER_RR__BP
PRODUCT NAME	MERIS browse image (for both FR and RR products)
DESCRIPTION	MERIS Browse products contain a sub-sampled set of selected RR radiometrically calibrated Level 1B products. The Browse product contains 3 selected spectral bands (red, blue and green) of 0 to 255 intensity levels for each band.
APPLICATIONS	Browse is created to support queries to a MERIS archive for land, sea, ice or cloud features, to be viewed from a remote user terminal.
DELIVERY TIME	NRT product available from PDHS within 3 hours from data acquisition
COVERAGE	up to 1165 km by 17500 km (43.5 minutes) stripline product.
THROUGHPUT	One product per orbit
PRODUCT SIZE	max 4 MB (full orbit)
GEOMETRICAL SAMPLING	4.8 km by 4.8 km
GEOMETRIC RESOLUTION	Information not available
GEOMETRIC ACCURACY	Information not available
RADIOMETRIC RESOLUTION	Information not available, variable depending upon contrast and enhancement
RADIOMETRIC ACCURACY	Information not available
AUXILIARY DATA	Orbit state vectors; Time correlation parameters; SQ ADS GADS Scaling Factors and General Info ADS Tie Points Location
ALGORITHMS USED	selection, extraction and weighting of bands; sub-sampling of data;
NOTES	Produced systematically in stripline from the RR Level 1B product.

MERIS Full Swath browse image

PRODUCT ID	MER_FRS_BP
PRODUCT NAME	MERIS Full resolution, full swath browse image
DESCRIPTION	MERIS Browse products contain a sub-sampled set of selected FRS radiometrically calibrated Level 1B products. The Browse product contains 3 selected spectral bands (red, blue and green) of 0 to 255 intensity levels for each band.
APPLICATIONS	Browse is created to support queries to a MERIS archive for land, sea, ice or cloud features, to be viewed from a remote user terminal.
DELIVERY TIME	On request
COVERAGE	up to X km by 17500 km (43.5 minutes) stripline product.
THROUGHPUT	One product per orbit
PRODUCT SIZE	Variable
GEOMETRICAL SAMPLING	Configurable, sampling factor may be set to 4x4 (default), 8x8, 16x16
GEOMETRIC RESOLUTION	Information not available
GEOMETRIC ACCURACY	Information not available
RADIOMETRIC RESOLUTION	Information not available, variable depending upon contrast and enhancement
RADIOMETRIC ACCURACY	Information not available
AUXILIARY DATA	Orbit state vectors; Time correlation parameters; SQ ADS GADS Scaling Factors and General Info ADS Tie Points Location
ALGORITHMS USED	selection, extraction and weighting of bands; sub-sampling of data;
NOTES	

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