CRYOSAT-2 ESL IPF Maintenance

IOP & GOP Product Format Specification

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Document Change Record

Issue/Revision	Date	Reason for Change	Changed Pages/Sections
1 / 0	01/03/2013	First Version	
1 / 1	03/04/2012	In L1b MDSR: - In the 20-Hz MCD, the "Type of processing" field is stored on 2 bytes	p29

		In L2 MDSR unit update for the following fields: - 1-Hz Peakiness - 20-Hz Peakiness In L2 MSDR, type update for the following fields: – Instantaneous altitude rate derived from orbit and removing of the following spare, and renumbering of the following fields	p45-47
1 / 2	06/05/2013	Issue for Delta QR	Section 3.3 : Size of MDS added in Table 8 Section 4.3 : Size of MDS added in Table 19 Section 1.1.3: the acronyms for DFCB and IPS have been added. The following sections have been updated according to the comments by the Agency: Section 1.1.3 Section 1.2 Section 2.1 Section 2.2.2 Section 2.3.1 Section 2.3.3 Section 3.1 Section 3.2 Section 3.3 Section 4.1 Section 4.2 Section 4.3
1 / 3	13/05/2013	Issue to close the delta QR	All changes as in version 1.2 The following tables have been modified to add or correct the "TOTAL" field (i.e. size in bytes of the data block described in each table): table 4, table 5, table

			8, table 15 e table 16 and table 19
1/4	31/05/2013	Issue for AR	p26&27 Table 8: Update of some fields to provide a more precise description. p43 Table 18: Adding of a DSD-R for the MSS Solution 2 and renaming of the DSD-R for MSS Solution 1. p46&47 Table 19: Adding of Mean Quadratic Error field and update of the MDS size accordingly. Update of some fields to provide a more precise description. Appendix A added to assess product size

TABLE OF CONTENTS

1 INTRODUCTION

This document contains the description of the format of the Level 1b and Level-2 Intermediate (IOP) and Geophysical (GOP) Ocean Products generated inside the PDS for the Cryosat-2 mission, performed under ESA contract IPF Cryosat Ocean Products Contract Change Notice # 5 [AD 1].

1.1 APPLICABLE AND REFERENCE DOCUMENTS

1.1.1 Applicable documents

Document Title	Identifier	Internal Reference
IPF Cryosat Ocean Products Contract Change Notice # 5	C2-CN-ACS-GS-5309	[AD 1]
Earth Explorer Ground Segment File Format Standard	PE-TN-ESA-GS-0001	[AD 2]
Cryosat Ground Segment Master ICD	CS-ID-ESA-GS-0147	[AD 3]

1.1.2 Reference documents

Document Title	Identifier	Internal Reference
Level 0 Products Specification Format	CS-ID-ACS-GS-0119 3rev3	[RD 1]
IPF1 Product Formats Specification	CS-RS-ACS-GS-5106 4rev9	[RD 2]
L2 Products Format Specification	CS-RS-ACS-GS-5123 2rev8	[RD 3]

1.1.3 Terms, definitions and abbreviated terms

ACS	Advanced Computer Systems A.C.S. S.p.A.
CLS	Collect Localisation Satellites
DFCB	Data Format Control Block
ESA	European Space Agency
IPF	Instrument Processing Facility
ISP	Instrument Source Packet
MDS	Measurement Data Set
MPH	Main Product Header
PDS	Payload Data Segment
SIRAL	Synthetic Interferometric Radar Altimeter
SPH	Specific Product Header
XML	eXtensible Markup Language

1.2 DEFINITIONS

Two instrument data levels are considered for Cryosat-2 Ocean Products:

- Level 1b products correspond to geo-located engineering-calibrated products
- Level 2 products correspond to geo-located geophysical products

Two delivery delays are considered for Cryosat-2 Ocean Products:

- Intermediate (IOP): delivered within 48 hours after data sensing acquisition, due mainly to the consolidation of some auxiliary or ancillary data (e.g. preliminary restituted orbit data)
- Geophysical (GOP): delivered within typically 1 month after data acquisition, due mainly to the consolidation of some auxiliary or ancillary data (e.g. precise orbit data).

1.3 ORGANISATION OF THE DOCUMENT

The document is organized as follows:

- Chapter 1 : Introduction (current section)
- Chapter 2 : Specification of Cryosat-2 Ocean Level 1b and Level 2 general structure
- Chapter 3 : Specification of Cryosat-2 Ocean Level 1b Products
- Chapter 4 : Specification of Cryosat-2 Ocean Level 2 Products
- Chapter 5 : Definition of Cryosat-2 Ocean Products nomenclature

2 LEVEL 1B AND LEVEL 2 GENERAL STRUCTURE

2.1 FILE STRUCTURE

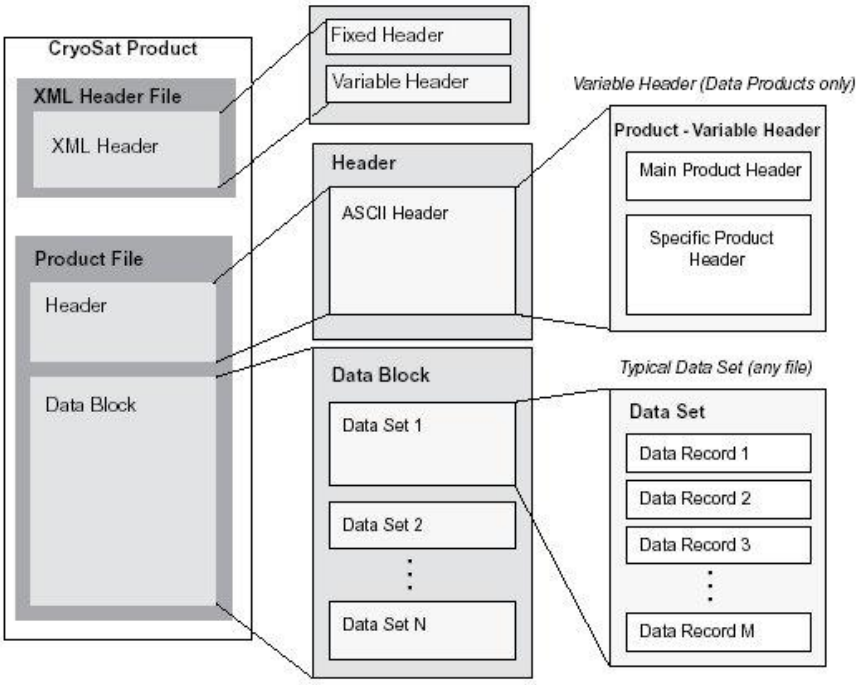
The file structure of any file produced by the Cryosat Ocean IPF system follows the requirements of the Earth Explorer Ground Segment File Format Standard [AD 2].

Each Level 1b or Level 2 product is composed by two files:

- XML Header File
- Binary Product File

The XML Header file is an auxiliary ASCII file that users can easily access for identifying the product without needs to look inside the Product File.

The Product File is the real product containing meaningful instrument data and ASCII header used by ad-hoc developed standard tools for inspecting the product content. In order to use tools already developed for the ENVISAT mission, the product structure for Cryosat will follow the structure of the ENVISAT products as far as possible.



2.2 XML HEADER FILE

The XML Header file contains information identifying the product and easy to read as based on a standard syntax accessed by common tools available for visualising its content. The XML syntax has been chosen for the scope of the PDS.

The XML Header file is composed by:

- a Fixed Header
- a Variable Header

The Fixed Header (hereafter called Standard Cryosat Header) is the common header for all files managed into the PDS. That means it is applied to all files flowing amongst the sub-systems composing the PDS.

The Variable Header (hereafter called Product Header) is the header with format and content depending on the file type and kind of product.

2.2.1 Fixed Header (Cryosat Header)

The Fixed Header is based on XML syntax. Its format and content are under ESA responsibility and are specified in Earth Explorer Ground Segment File Format Standard [AD 2].

2.2.2 Variable Header (Product Header)

The Variable Header (hereafter called XML Product Header) for the Level 1b and Level 2 Ocean Products is composed of:

- a XML Main Product Header (XML MPH)
- a XML Specific Product Header (XML SPH) which includes Reference Data Set Descriptors for external input files and one or more XML Specific Measurement Data Headers (XML MDH) for the Data Sets of the Product

The XML MPH and XML SPH are derived from the correspondent headers (MPH and SPH) of the Product File, removing the unused fields and fields already reported in the Standard Cryosat Header.

Each header is completely ASCII and based on XML syntax and conventions proposed in the Earth Explorer Ground Segment File Format Standard document (AD 2).

Section 2.2.2.1 describes the format and content of the XML MPH without overload of the XML format description.

Section 2.2.2.2 describes the format and content of the XML SPH.

2.2.2.1 XML Main Product Header (XML MPH)

Field #	Description	Units	Bytes	Format
	MPH	Tag		
	Product Identification Info			
#01	**Product**	Tag		
	Product File Name Note: the file name is without extension		62	See Section 3
#02	**Proc_Stage_Code**	Tag		
	Processing stage code identifier: RPRO = Reprocessing OFFL = Routine Operations NRT_ = Near Real Time TEST = Test LTA_ = Long Term Archive		4	4*uc
#03	**Ref_Doc**	Tag		
	Reference Document describing the product		23	CLS-DOS-NT-12-295
	Data Processing Information			
#04	**Proc_Time**	Tag		
	Processing Time (Product Generation Time)		30	UTC=yyyy-mm-ddThh:mm:ss.uuuuuu
#05	**Software_Version**	Tag		
	Processor Name and software version number		14	ProcessorName/VV.rr
	Orbit Information			
#06	**Phase**	Tag		
	Phase Code If not used set to X		1	uc
#07	**Cycle**	Tag		
	Cycle Number If not used set to +000		4	%+04d
#08	**Rel_Orbit**	Tag		
	Relative Orbit Number at sensing start time. If not used set to +00000		6	%+06d
#09	**Abs_Orbit**	Tag		
	Absolute Orbit Number at sensing start time. If not used set to +00000		6	%+06d
#10	**State_Vector_Time**	Tag		
	UTC state vector time		30	UTC=yyyy-mm-ddThh:mm:ss.uuuuuu
#11	**Delta_UT1**	Tag		
	Universal Time Correction: DUT1 = UT1 – UTC If not used set to +.000000	s	8	%+08.6f
#12	**X_Position**	Tag		
	X position in Earth Fixed Reference If not used set to +0000000.000	m	12	%+012.3f
#13	**Y_Position**	Tag		
	Y position in Earth Fixed Reference If not used set to +0000000.000	m	12	%+012.3f
#14	**Z_Position**	Tag		
	Z position in Earth Fixed Reference	m	12	%+012.3f

Field #	Description	Units	Bytes	Format
	If not used set to +0000000.000			
#15	**X_Velocity**	Tag		
	X velocity in Earth Fixed Reference If not used set to +0000.000000	m/s	12	%+012.6f
#16	**Y_Velocity**	Tag		
	Y velocity in Earth Fixed Reference If not used set to +0000.000000	m/s	12	%+012.6f
#17	**Z_Velocity**	Tag		
	Z velocity in Earth Fixed Reference If not used set to +0000.000000	m/s	12	%+012.6f
#18	**State_Vector_Source**	Tag		
	Source of Orbit State Vector Record FP = FOS predicted DN = DORIS Level 0 navigator DP = DORIS precise orbit FR= FOS Restituted DI = DORIS Preliminary		2	2*uc
	Product Confidence Data Information			
#19	**Product_Err**	Tag		
	Product Error Flag 1 errors have been reported in the Product 0 no errors		1	uc
	Product Size Information			
#20	**Tot_Size**	Tag		
	Total Size of the Data Product	bytes	21	%021d

Table 1 XML Main Product Header Description

2.2.2.2 XML Specific Product Header (XML SPH)

The format and content of the XML SPH for Cryosat Ocean Products depend on the product level (Level 1b or Level 2). They are thus described in section 3.1 for Level 1b products and section 4.1 for Level 2 products.

2.3 PRODUCT FILES

As shown in Figure 2-1, each product file is composed of:

- A Main Product Header (MPH)
- A Specific Product Header (SPH)
- Data Sets

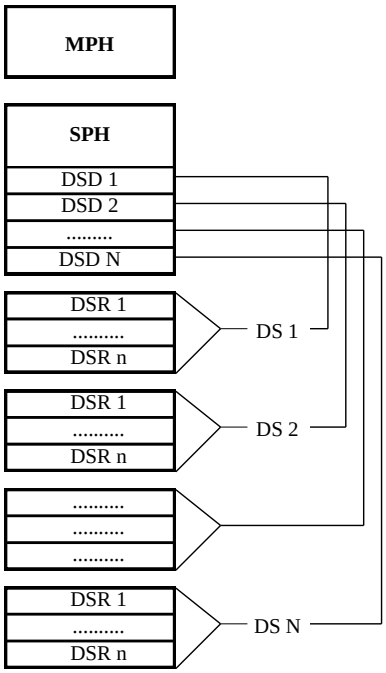


Figure 2-1: Generalised Product Structure

The MPH and SPH blocks are ASCII, whereas the Data Sets are completely binary and contain one or more Data Set Records each.

Level 1b and Level 2 Ocean Products contain one Data Set, which leads to the product structure shown in the Figure 2-2 below:

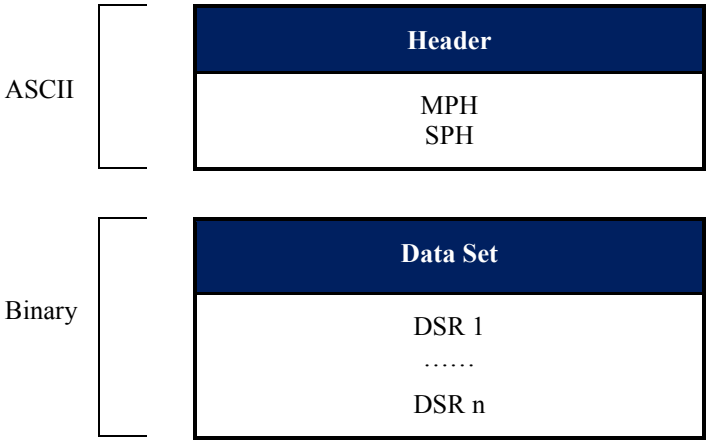


Figure 2-2: Ocean Products Structure

2.3.1 Main Product Header

The Main Product Header is an ASCII header that has the same structure as the MPH in the SIRAL IPFproducts. It is therefore common to all Level 1b and Level 2 Ocean Products.

Field #	Description	Units	Bytes	Format
Product Identification Info				
#01	**PRODUCT**=	keyword	8	
	quotation mark (")		1	Uc
	Product File Name It is left justified with trailer blanks		62	See 3.1
	quotation mark (")		1	Uc
	newline character	terminator	1	
#02	**PROC_STAGE**=	keyword	11	11*uc
	Processing stage code: N = Near-Real Time T = Test O = Off Line (Systematic) R = Reprocessing L = Long Term Archive		1	
	newline character	terminator	1	
#03	**REF_DOC**=	keyword	8	8*uc
	quotation mark (")		1	Uc
	Reference DFCB Document describing the product		23	23*uc
	quotation mark (")		1	Uc
	newline character	terminator	1	
#04	**Spare** (blank characters)		40	40*uc
	newline character	terminator	1	Uc
Data Processing Information				
#05	**ACQUISITION_STATION**=	keyword	20	20*uc
	quotation mark (")		1	Uc
	Acquisition Station Filled by blanks		20	Kiruna
	quotation mark (")		1	Uc
	newline character	terminator	1	
#06	**PROC_CENTER**=	keyword	12	12*uc
	quotation mark (")		1	Uc
	Processing Centre code		6	PDS
	quotation mark (")		1	Uc
	newline character	terminator	1	
#07	**PROC_TIME**=	keyword	10	10*uc
	quotation mark (")		1	Uc
	Processing Time (Product Generation Time)	UTC	27	dd-MMM-yyyy hh:mm:ss.uuuuuu
	quotation mark (")		1	Uc
	newline character	terminator	1	
#08	**SOFTWARE_VER**=	keyword	13	13*uc
	quotation mark (")		1	Uc
	Processor name, up to 8 characters, and		14	14*uc

Field #	Description	Units	Bytes	Format
	software version number followed by trailer blanks if any. If not used set to blanks			ProcessorName/VV.rr
	quotation mark (")		1	Uc
	newline character	terminator	1	
#09	**Spare** (blank characters)		40	40*uc
	newline character	terminator	1	Uc
Information on Time of Data				
#10	**SENSING_START**=	keyword	14	14*uc
	quotation mark (")		1	Uc
	UTC start time of data sensing. This is the UTC start time of the Input Level 0 Product. If not used set to 27 blanks	UTC	27	dd-MMM-yyyy hh:mm:ss.uuuuuu
	quotation mark (")		1	Uc
	newline character	terminator	1	
#11	**SENSING_STOP**=	keyword	13	13*uc
	quotation mark (")		1	Uc
	UTC stop time of data sensing. This is the UTC stop time of the Input Level 0 Product. If not used set to 27 blanks	UTC	27	dd-MMM-yyyy hh:mm:ss.uuuuuu
	quotation mark (")		1	Uc
	newline character	terminator	1	
#12	**Spare** (blank characters)		40	40*uc
	newline character	terminator	1	Uc
Orbit Information				
#13	**PHASE**=	keyword	6	6*uc
	Phase Code: phase letter (A, B, …) If not used set to X		1	
	newline character	terminator	1	Uc
#14	**CYCLE**=	keyword	6	6*uc
	Cycle number. If not used set to +000		4	%+04d
	newline character	terminator	1	Uc
#15	**REL_ORBIT**=	keyword	10	10*uc
	Relative Orbit Number at sensing start time. If not used set to +00000		6	%+06d
	newline character	terminator	1	Uc
#16	**ABS_ORBIT**=	keyword	10	10*uc
	Absolute Orbit Number at sensing start time. If not used set to +00000		6	%+06d
	newline character	terminator	1	Uc
#17	**STATE_VECTOR_TIME**=	keyword	18	18*uc
	quotation mark (")		1	Uc
	UTC state vector time It is filled properly in case of usage of FOS Predicted Orbit information otherwise it shall be set to 27 blanks	UTC	27	dd-MMM-yyyy hh:mm:ss.uuuuuu
	quotation mark (")		1	Uc
	newline character	terminator	1	
#18	**DELTA_UT1**=	keyword	10	10*uc

Field #	Description	Units	Bytes	Format
	Universal Time Correction: DUT1 = UT1 – UTC	s	8	%+08.6f
	<s>	units	3	3*uc
	newline character	terminator	1	
#19	**X_POSITION**=	keyword	11	11*uc
	X position in Earth Fixed Reference. If not used set to +0000000.000	m	12	%+012.3f
	<m>	units	3	3*uc
	newline character	terminator	1	
#20	**Y_POSITION**=	keyword	11	11*uc
	Y position in Earth Fixed Reference. If not used set to +0000000.000	m	12	%+012.3f
	<m>	units	3	3*uc
	newline character	terminator	1	
#21	**Z_POSITION**=	keyword	11	11*uc
	Z position in Earth Fixed Reference. If not used set to +0000000.000	m	12	%+012.3f
	<m>	units	3	3*uc
	newline character	terminator	1	
#22	**X_VELOCITY**=	keyword	11	11*uc
	X velocity in Earth Fixed Reference. If not used set to +0000.000000	m/s	12	%+012.6f
	<m/s>	units	5	5*uc
	newline character	terminator	1	
#23	**Y_VELOCITY**=	keyword	11	11*uc
	Y velocity in Earth Fixed Reference. If not used set to +0000.000000	m/s	12	%+012.6f
	<m/s>	units	5	5*uc
	newline character	terminator	1	
#24	**Z_VELOCITY**=	keyword	11	11*uc
	Z velocity in Earth Fixed Reference. If not used set to +0000.000000	m/s	12	%+012.6f
	<m/s>	units	5	5*uc
	newline character	terminator	1	
#25	**VECTOR_SOURCE**=	keyword	14	14*uc
	quotation mark (")		1	Uc
	Source of Orbit State Vector Record FP = FOS predicted DN = DORIS Level 0 navigator DP = DORIS precise orbit FR = FOS Restituted DI = DORIS Preliminary		2	2*uc
	quotation mark (")		1	Uc
	newline character	terminator	1	
#26	**Spare** (blank characters)		40	40*uc
	newline character	terminator	1	Uc
SBT to UTC conversion Information				
#27	**UTC_SBT_TIME**=	keyword	13	13*uc
	quotation mark (")		1	Uc

Field #	Description	Units	Bytes	Format
	Not used and set to 27 blanks		27	$$$$$$$$$$$$$$$$$$$$$$$$$$$
	quotation mark (")		1	Uc
	newline character	terminator	1	Uc
#28	**SAT_BINARY_TIME**=	keyword	16	16*uc
	Satellite Binary Time Not used for Cryosat and it shall be set to zeros		11	+0000000000
	newline character	terminator	1	Uc
#29	**CLOCK_STEP** =	keyword	11	11*uc
	Clock Step Not used for Cryosat and it shall be set to zeros		11	+0000000000
	<ps>	units	4	4*uc
	newline character	terminator	1	Uc
#30	**Spare** (blank characters)		32	32*uc
	newline character	terminator	1	Uc
Leap Second Information				
#31	**LEAP_UTC**=	keyword	9	9*uc
	quotation mark (")		1	Uc
	UTC Time of the occurrence of the leap second. If a leap second occurred in the product window the field is set by a devoted function in the CFI EXPLORER_ORBIT library (see [EXPL_ORB-SUM] for details), otherwise it is set to 27 blanks. It corresponds to the time after the Leap Second occurrence (i.e. midnight of the day after the leap second)		27	dd-MMM-yyyy hh:mm:ss.uuuuuu
	quotation mark (")		1	Uc
	newline character	terminator	1	Uc
#32	**LEAP_SIGN**=	keyword	10	10*uc
	Leap second sign If a leap second occurred in the product window the field is set to the expected value by a devoted function in the CFI EXPLORER_ORBIT library (see [EXPL_ORB-SUM] for details), otherwise it is set to +000.	s	4	%+04d
	newline character	terminator	1	Uc
#33	**LEAP_ERR**=	keyword	9	9*uc
	Leap second error flag. This field is always set to 0 considering that CRYOSAT products have true UTC times		1	Uc
	newline character	terminator	1	Uc
#34	**Spare** (blank characters)		40	40*uc
	newline character	terminator	1	Uc
Product Confidence Data Information				
#35	**PRODUCT_ERR**=	keyword	12	12*uc
	Product Error Flag set to 1 if errors have been reported in the product		1	Uc
	newline character	terminator	1	Uc
Product Size Information				

Field #	Description	Units	Bytes	Format
#36	**TOT_SIZE**=	keyword	9	9*uc
	Total size of the product	bytes	21	%+021d
	<bytes>	units	7	7*uc
	newline character	terminator	1	Uc
#37	**SPH_SIZE**=	keyword	9	9*uc
	Length of the SPH	bytes	11	%+011d
	<bytes>	units	7	7*uc
	newline character	terminator	1	Uc
#38	**NUM_DSD**=	keyword	8	8*uc
	Number of Data Set Descriptors, including spares and all other types of DSDs		11	%+011d
	newline character	terminator	1	Uc
#39	**DSD_SIZE**=	keyword	9	9*uc
	Length of each DSD	bytes	11	%+011d
	<bytes>	units	7	7*uc
	newline character	terminator	1	Uc
#40	**NUM_DATA_SETS**=	keyword	14	14*uc
	Number of attached Data Sets (note that not all the DSDs have a DS attached)		11	%+011d
	newline character	terminator	1	Uc
#41	**CRC**=	keyword	4	4*uc
	Cyclic Redundancy Code computed as overall value of all records of the Measurement Data Set. If not computed it shall be set to -00001		6	%+06d
	newline character	terminator	1	Uc
#42	**Spare** (blank characters)		29	29*uc
	newline character	terminator	1	Uc
	TOTAL		**1247**	

Table 2: MPH Description

2.3.2 Specific Product Header

The format and content of the SPH for Cryosat Ocean Products depend on the product level (Level 1b or Level 2). They are thus described in section 3.2 for Level 1b products and section 4.2 for Level 2 products.

2.3.3 Measurement Data Set Record

The format and content of the MDS for Cryosat Ocean Products depend on the product level (Level 1b or Level 2). They are thus described in sections 3.3 and 3.4 for IOP&GOP Level-1b products and sections 4.3 and 4.4 for IOP&GOP Level-2 products.

3 LEVEL 1B IOP & GOP PRODUCTS

The following sections describe the part of the format specific to Level 1b IOP & GOP products.

The general structure of the product and the description of the XML and ASCII MPH are described in section 2.

3.1 XML SPECIFIC PRODUCT HEADER (XML SPH)

Field #	Description	Units	Bytes	FORMAT
	SPH	tag		
Product description and identification				
#1	**SPH_Descriptor**	tag		
	Name describing the Specific Product Header		28	*Filetype SPECIFIC HEADER* *See* Table 20
Product Time information				
	Time_Information	tag		
#2	**Start_Record_Time**	tag		
	TAI of the first record in the Main MDS of this product		30	TAI=yyyy-mm-ddThh:mm:ss.uuuuuu
#3	**Stop_Record_Time**	tag		
	TAI of the last record in in the Main MDS of this product		30	TAI=yyyy-mm-ddThh:mm:ss.uuuuuu
Product Orbit information				
	Orbit_Information	Tag		
#4	**ABS_Orbit_Start**	Tag		
	Absolute Orbit Number at sensing start time.		6	%06d
#5	**Rel_Time_ASC_Node_Start**	Tag		
	Relative time since crossing ascending node time relative to start time of data sensing.	s	11	%011.6f
#6	**ABS_Orbit_Stop**	Tag		
	Absolute Orbit Number at sensing stop time.		6	%06d
#7	**Rel_Time_ASC_Node_Stop**	Tag		
	Relative time since crossing ascending node time relative to stop time of data sensing.	s	11	%011.6f
#8	**Equator_Cross_Time**	Tag		
	Time of equator crossing at the ascending node relative to the sensing start time.		30	UTC=yyyy-mm-ddThh:mm:ss.uuuuuu
#9	**Equator_Cross_Long**	Tag		
	Longitude of equator crossing at the ascending node relative to the sensing start time (positive East, 0 = Greenwich) referred to WGS84.	10-6 deg	11	%+011d

Field #	Description	Units	Bytes	FORMAT
#10	**Ascending_Flag**	Tag		
	Orbit Orientation at the sensing start time A=Ascending D=Descending		1	Uc
Product Location Information				
	Product_Location	tag		
#11	**Start_Lat**	tag		
	WGS84 latitude of the first record in the Main MDS (positive north)	10-6 deg	11	%+011d
#12	**Start_Long**	tag		
	WGS84 longitude of the first record in the Main MDS (positive East, 0 = Greenwich)	10-6 deg	11	%+011d
#13	**Stop_Lat**	tag		
	WGS84 latitude of the last record in the Main MDS (positive north)	10-6 deg	11	%+011d
#14	**Stop_Long**	tag		
	WGS84 longitude of the last record in the Main MDS (positive East, 0 = Greenwich)	10-6 deg	11	%+011d
SIRAL Level 0 Quality information				
	Level_0_Confidence_Data	tag		
#15	**L0_Proc_Flag**	tag		
	Processing errors significance flag 1 errors (percentage of errors greater than threshold) 0 no errors		1	Uc
#16	**L0_Processing_Quality**	tag		
	Percentage of quality checks successfully passed during ISP processing (max allowed +10000)	10-2 %	6	%+06d
#17	**L0_Proc_Thresh**	tag		
	Minimum acceptable percentage of quality threshold that must be passed during ISP processing (max allowed +10000)	10-2 %	6	%+06d
#18	**L0_Gaps_Flag**	tag		
	Flag to indicate gaps in input data • 1 gaps • 0 no gaps		1	uc
#19	**L0_Gaps_Num**	tag		
	Number of gaps detected during ISP processing		7	%07d
SIRAL Instrument Configuration				
	SIR_Instrument_Configuration	tag		
#20	**Instrument_Identifier**	tag	1	1*uc A (SIRAL Nominal) B (SIRAL Redundant)
#21	**SIR_Op_Mode**	tag		

Field #	Description	Units	Bytes	FORMAT
	SIRAL Operative Mode		10	10*uc LRM_____ SAR_____ SARIN____ CAL1_LRM__ CAL1_SAR__ CAL1_SARIN CAL2_SAR__ CAL2_SARIN ACQ_____ TRK_SARIN_ TRK_SAR___ CAL4_____
#22	**SIR_Configuration**	tag		
	SIRAL Rx Configuration		7	7*uc RX_1___ RX_2___ BOTH___ UNKNOWN
Level 1 Surface Statistics				
	Surface_Statistics	tag		
#23	**Open_Ocean_Percent**	tag		
	Percentage of output L1B records detected on open ocean or semi-enclosed seas	10-2 %	6	%+06d
#24	**Close_Sea_Percent**	tag		
	Percentage of output L1B records detected on close seas or lakes	10-2 %	6	%+06d
#25	**Continent_Ice_Percent**	tag		
	Percentage of output L1B records detected on continental ice	10-2 %	6	%+06d
#26	**Land_Percent**	tag		
	Percentage of output L1B records detected on land	10-2 %	6	%+06d
SIRAL Level 1 Processing information				
	Level_1_Confidence_Data	tag		
#27	**L1B_Prod_Status**	tag		
	Complete/Incomplete Product Completion Flag (0 or 1). 1 if the Product as a duration shorter than the input Level 0		1	uc
#28	**L1B_Proc_Flag**	tag		
	Processing errors significance flag 1 errors (percentage of errors greater than threshold) 0 no errors		1	uc
#29	**L1B_Processing_Quality**	tag		
	Percentage of quality checks successfully passed during Level 1B processing (max allowed +10000)	10-2 %	6	%+06d
#30	**L1B_Proc_Thresh**	tag		

Field #	Description	Units	Bytes	FORMAT
	Minimum acceptable percentage of quality threshold that must be passed during Level 1B processing (max allowed +10000)	10-2 %	6	%+06d
Data Set Descriptors				
	DSDs	tag		
	List_of_DSDs	tag		
	Data_Set_Descriptor	tag		
#31	**Data_Set_Name**	tag		
	Name of the Data Set		28	Uc
#32	**Data_Set_Type**	tag		
	M for Measurement – R for Reference		1	Uc
#33	**File_Name**	tag		
	Name of the reference file. Field is left empty for Measurement DSD		62	Uc
#34	**Data_Set_Offset**	tag		
	Offset in bytes from the beginning of the DBL file. For reference DSDs the field is set to 0.	bytes	21	%+021d
#35	**Data_Set_Size**	tag		
	Size in bytes of the Measurement Data Set Record. For reference DSDs the field is set to 0.	bytes	21	%+021d
#36	**Num_of_Records**	tag		
	Number of Data Set Records. For reference DSDs the field is set to 0.		11	%+011d
#37	**Record_Size**	tag		
	Record size in bytes. For reference DSDs the field is set to 0.	bytes	11	%+011d
#38	**Byte_Order**	tag		
	It describes the endianess of the data set 3210 → Big-endian 0123 → Little-endian For Reference DSDs the field is left empty		4	%4c 3210 for Cryosat

Table 3: XML Specific Product Header description

3.2 SPECIFIC PRODUCT HEADER

The Product file Specific Product Header is an ASCII header that has the same structure as in the SIRAL IPF1 product.

Field #	Description	Units	Bytes	Data Type
Product description and identification				
#1	**SPH_DESCRIPTOR=**	keyword	15	15*uc
	quotation mark (")		1	uc
	ASCII string describing the product		28	28*uc *Product Type* SPECIFIC HEADER See Table 20
	quotation mark (")		1	uc
	newline character	terminator	1	uc
Product Time information				
#2	**START_RECORD_TAI_TIME=**	keyword	22	22*uc
	quotation mark (")		1	uc
	TAI of the first record in the Main MDS of this product	TAI	27	dd-MMM-yyyy hh:mm:ss.uuuuuu
	quotation mark (")		1	uc
	newline character	terminator	1	uc
#3	**STOP_RECORD_TAI_TIME=**	keyword	21	21*uc
	quotation mark (")		1	uc
	TAI of the last record in in the Main MDS of this product	TAI	27	dd-MMM-yyyy hh:mm:ss.uuuuuu
	quotation mark (")		1	uc
	newline character	terminator	1	uc
Product Orbit Information				
#4	**ABS_ORBIT_START**=	Keyword	16	16*uc
	Absolute Orbit Number at Product Start Time		6	%06d
	Newline character	terminator	1	uc
#5	**REL_TIME_ASC_NODE_START**=	Keyword	24	24*uc
	Relative time since crossing ascending node time relative to start time of data sensing	s	11	%011.6f
	<s>	units	3	3*uc
	Newline character	terminator	1	Uc
#6	**ABS_ORBIT_STOP**=	Keyword	15	15*uc
	Absolute Orbit Number at Product Stop Time		6	%06d
	Newline character	terminator	1	uc
#7	**REL_TIME_ASC_NODE_STOP**=	Keyword	23	23*uc
	Relative time since crossing ascending node time relative to stop time of data sensing	s	11	%011.6f
	<s>	units	3	3*uc
	Newline character	terminator	1	uc
#8	**EQUATOR_CROSS_TIME_UTC**=	Keyword	23	23*uc
	Quotation mark(")		1	uc
	Time of Equator crossing at the ascending node of the sensing start time	UTC	27	dd-MMM-yyyy hh:mm:ss.uuuuuu

Field #	Description	Units	Bytes	Data Type
	Quotation mark (")		1	uc
	Newline character	terminator	1	uc
#9	**EQUATOR_CROSS_LONG**=	Keyword	19	19*uc
	Longitude of Equator Crossing at the ascending node of the sensing start time (positive East, 0 = Greenwich) referred to WGS84	s	11	%+011d
	<10-6degE>	units	10	10*uc
	Newline character	terminator	1	uc
#10	**ASCENDING_FLAG**=	Keyword	15	15*uc
	Orbit Orientation at the sensing start time A= Ascending D= Descending		1	uc
	Newline character	terminator	1	uc
Product Location Information				
#11	**START_LAT=**	keyword	10	10*uc
	WGS84 latitude of the first record in the Main MDS (positive north)	[10-6 deg]	11	%+011d
	<10-6degN>	units	10	10*uc
	newline character	terminator	1	uc
#12	**START_LONG=**	keyword	11	11*uc
	WGS84 longitude of the first record in the Main MDS (positive East, 0 = Greenwich)	[10-6 deg]	11	%+011d
	<10-6degE>	units	10	10*uc
	newline character	terminator	1	uc
#13	**STOP_LAT=**	keyword	9	9*uc
	WGS84 latitude of the last record in the Main MDS (positive north)	[10-6 deg]	11	%+011d
	<10-6degN>	units	10	10*uc
	newline character	terminator	1	uc
#14	**STOP_LONG=**	keyword	10	10*uc
	WGS84 longitude of the last record in the Main MDS (positive East, 0 = Greenwich)	[10-6 deg]	11	%+011d
	<10-6degE>	units	10	10*uc
	newline character	terminator	1	uc
#15	**Spare (blank characters)**	ascii	50	50*uc
	newline character	terminator	1	uc
Level 0 Quality information				
#16	**L0_PROC_FLAG=**	keyword	13	13*uc
	Processing errors significance flag (1 or 0). 1 if the percentage of SIRAL packets- free of processing errors is less than the acceptable threshold		1	uc
	newline character	terminator	1	uc
#17	**L0_PROCESSING_QUALITY=**	keyword	22	22*uc
	Percentage of quality checks successfully passed during the SP processing (max allowed +10000)	[10-2 %]	6	%+06d
	<10-2%>	units	7	7*uc
	newline character	terminator	1	uc
#18	**L0_PROC_THRESH=**	keyword	15	15*uc

Field #	Description	Units	Bytes	Data Type
	Minimum acceptable percentage of quality threshold that must be passed during SP processing (max allowed +10000)	[10-2 %]	6	%+06d
	<10-2%>	units	7	7*uc
	newline character	terminator	1	uc
#19	**L0_GAPS_FLAG=**	keyword	13	13*uc
	Gaps significance flag (1 or 0). 1 if gaps (either caused by extraction or alignment failures) were detected during the SP processing		1	uc
	newline character	terminator	1	uc
#20	**L0_GAPS_NUM=**	keyword	12	12*uc
	Number of gaps detected during the SP processing (no gaps indicated as +0000000)		8	%+08d
	newline character	terminator	1	uc
#21	**Spare (blank characters)**	ascii	37	37*uc
	newline character	terminator	1	uc
SIRAL Instrument Configuration				
#22	**INSTR_ID=**	keyword	9	9*uc
	quotation mark (")		1	uc
	Instrument identifier		1	1*uc A = SIRAL Nominal B = SIRAL Redundant
	quotation mark (")		1	uc
	newline character	terminator	1	uc
#23	**SIR_OP_MODE=**	keyword	12	12*uc
	quotation mark (")		1	uc
	SIRAL Operative Mode: LRM$$$$$$ SAR$$$$$$ SARIN$$$$$ CAL1_LRM$$ CAL1_SAR$$ CAL1_SARIN CAL2_SAR$$ CAL2_SARIN ACQ$$$$$$$ TRK_SAR$$$ TRK_SARIN$ CAL4$$$$$$ (strings shorter than 10 are filled in with blanks $)		10	10*uc
	quotation mark (")		1	uc
	Newline character	terminator	1	uc
#24	**SIR_CONFIGURATION=**	keyword	18	17*uc
	quotation mark (")		1	uc

Field #	Description	Units	Bytes	Data Type
	SIRAL Configuration: RX_1$$$ RX_2$$$ BOTH$$$ UNKNOWN (strings shorter than 7 are filled in with blanks)		7	7*uc
	quotation mark (")		1	uc
	Newline character	terminator	1	uc
Surface ID Statistics				
#25	**OPEN_OCEAN_PERCENT=**	keyword	19	19*uc
	Percentage of records detected on open ocean or semi-enclosed seas	[10-2 %]	6	%+06d
	<10-2%>	units	7	7*uc
	Newline character	terminator	1	uc
#26	**CLOSE_SEA_PERCENT=**	keyword	18	18*uc
	Percentage of records detected on close seas or lakes	[10-2 %]	6	%+06d
	<10-2%>	units	7	7*uc
	Newline character	terminator	1	Uc
#27	**CONTINENT_ICE_PERCENT=**	keyword	22	22*uc
	Percentage of records detected on continental ice	[10-2 %]	6	%+06d
	<10-2%>	units	7	7*uc
	Newline character	terminator	1	Uc
#28	**LAND_PERCENT=**	keyword	13	13*uc
	Percentage of records detected on land	[10-2 %]	6	%+06d
	<10-2%>	units	7	7*uc
	Newline character	terminator	1	Uc
#29	**Spare (blank characters)**	ascii	50	50*uc
	newline character	terminator	1	uc
Level 1 Processing information				
#30	**L1B_PROD_STATUS=**	keyword	16	16*uc
	Complete/Incomplete Product Completion Flag (0 or 1). 1 if the Product as a duration shorter than the input Level 0		1	uc
	newline character	terminator	1	uc
#31	**L1B_PROC_FLAG=**	keyword	14	14*uc
	Processing errors significance flag (1 or 0). 1 if the percentage of DSR free of processing errors is less than the acceptable threshold		1	uc
	newline character	terminator	1	uc
#32	**L1B_PROCESSING_QUALITY=**	keyword	23	23*uc
	Percentage of quality checks successfully passed during Level 1B processing (max allowed +10000)	[10-2 %]	6	%+06d
	<10-2%>	units	7	7*uc
	newline character	terminator	1	uc
#33	**L1B_PROC_THRESH=**	keyword	16	16*uc

Field #	Description	Units	Bytes	Data Type
	Minimum acceptable percentage of quality threshold that must be passed during Level 1B processing (max allowed +10000)	[10-2 %]	6	%+06d
	<10-2%>	units	7	7*uc
	newline character	terminator	1	uc
#34	**Spare (blank characters)**	ascii	50	50*uc
	newline character	terminator	1	uc
TOTAL			**1112**	
DSD Section				
See Table 5				

Table 4: Level 1b Ocean Product SPH Description

The DSD Section is divided in two principal sections : Measurement DSD, indicated as DSD (M) and Reference DSD, indicated as DSD (R). The general structure of a DSD is shown in Table 5. The number of DSD (M) is fixed (only one), whereas the number of DSD (R) depends on the number of auxiliary files and input Level 0 files effectively used to generate the product.

#N	DSD			
#N.1	**DS_NAME=**	Keyword	8	8*uc
	quotation mark		1	uc
	Name describing the Data Set		28	28*uc
	quotation mark		1	uc
	newline character	Terminator	1	uc
#N.2	**DS_TYPE=**	Keyword	8	8*uc
	Type of Data Set. It can be: M = Measurement R = Reference		1	uc
	newline character	Terminator	1	uc
External product reference				
#N.3	**FILENAME=**	Keyword	9	9*uc
	quotation mark		1	uc
	Name of the Reference File. Used if DS_TYPE is set to R. It is left justified with trailer blanks. The file name includes the extension. If not used it is set to 62 blanks.		62	62*uc
	quotation mark		1	uc
	newline character	terminator	1	uc
Position and size of DS				
#N.4	**DS_OFFSET=**	keyword	10	10*uc
	Length in bytes of MPH + SPH (including DSDs) + DS size of previous Data Set (if any).	byte	21	%+021d
	<bytes>	units	7	7*uc
	newline character	terminator	1	uc
#N.5	**DS_SIZE=**	keyword	8	8*uc
	Length in bytes of the attached Data Set Used if DS_TYPE is set to M If not used set to 0	byte	21	%+021d
	<bytes>	units	7	7*uc
	newline character	terminator	1	uc

#N	DSD			
Number and length of DSRs				
#N.6	**NUM_DSR=**	keyword	8	8*uc
	Number of Data Set Records		11	%+011d
	newline character	terminator	1	uc
#N.7	**DSR_SIZE=**	keyword	9	9*uc
	Length in bytes of the Data Set Record If not used set to +0 If variable set to -1	byte	11	%+011d
	<bytes>	units	7	7*uc
	newline character	terminator	1	uc
#N.8	**Spare**	ascii	32	32*uc
	newline character	terminator	1	Uc
TOTAL			**280**	

Table 5: Generic DSD Description

The allowed values for the name of the DSD (M) are given in Table 6

DS_NAME for DSD (M)
SIR_L1B_IOP
SIR_L1B_GOP

Table 6: DS Names for Measurement Data Sets of Level 1b

The allowed values for the name of the DSD (R) are given in Table 7, together with the allowed number of occurrences of the DSD (R) in the Specific Product Header.

DS_NAME for DSD (R)		
ID	**Description**	**Cardinality (See Note 1)**
CONSTANTS_FILE	Constants File	{1}
PROC_CONFIG_PARAMS_FILE	Processor Configuration Parameters File	{1}
SIRAL_LEVEL_0_FILE	SIRAL level 0 File from which the product was created	{1,2} (See Note 2)
SCENARIO_FILE	Orbit Scenario File	{1}
ORBIT_FILE	Orbit Data File	{1,2}
DORIS_USO_DRIFT_FILE	DORIS USO Drift File	{1}
IPF_RA_DATABASE_FILE	Instrument Characterisation Data File	{1}
CALIBRATION_TYPE_1_FILE	File Product containing CAL_1 corrections	{1}
CALIBRATION_TYPE_2_FILE	File Product containing CAL_2 corrections	{1}
OCEAN_TIDE_SOL1_FILE	File for Ocean Tide Solution 1 (See Note 3)	{1}
TIDAL_LOADING_SOL1_FILE	File for Tidal Loading Solution 1 (See Note 3)	{1}
OCEAN_TIDE_SOL2_FILE	File for Ocean Tide Solution 2 (See Note 3)	{1}
TIDAL_LOADING_SOL2_FILE	File for Tidal Loading Solution 2 (See Note 3)	{1}
LONG_PERIOD_TIDE_FILE	File for Long Period Ocean Tide (See Note 3)	{1}
EARTH_TIDE_FILE	CartWright File (See Note 3)	{1}
POLE_TIDE_FILE	Pole Location Data File	{1}
SURFACE_TYPE_FILE	Surface Type Map File	{1}
GPS_IONO_MAP	GPS Ionospheric Map Data	{1,2}
SURFACE_PRESSURE_FILE	Surface Pressure File for Meteo Correction	{2,3}
MEAN_PRESSURE_FILE	Mean Pressure File for Meteo Correction	{2,3}
WET_TROPOSPHERE_FILE	Wet Troposphere File for Meteo Correction	{2,3}
MOG_2D_FILE	2D Gravity Wave model for Dynamic Atmospheric Correction	{2,3}
U_WIND_FILE	U Wind component File for Meteo Correction	{2,3}
V_WIND_FILE	V Wind component File for Meteo Correction	{2,3}
METEO_GRID_DEF_FILE	Meteo Grid Definition File	{2,3}

Table 7: DS Names for Reference DSDs

Note 1: {i,j} means i or j occurrences

Note 2: One file for L0 data in LRM mode

Two files for L0 data in SAR mode: one TRK file and one SAR file

Note 3: For static auxiliary files, the file name is meaningless as it is an internal name. It is thus replaced by the reference of the used model

3.3 L1B IOP MDS PRODUCT STRUCTURE

The MDS record structure of the L1B IOP products is summarized in Figure 3-1 and detailed in Table 8. When "(20 x Record)" is used, this means that the group's sub-structure is repeated 20 times in each MDS record.

Figure 3-1 L1b Ocean Product MDS

Note that instrument mode switching and data partitioning can occur at the highest rate. Sometimes a record will contain less than 20 measurements. In this case, the remaining unused blocks in the measurement group are flagged and filled with zeros.

Field	Description	Units	Bytes	Format
Time and Orbit Group (20 Hz)				
1	**20-Hz Data Record Time (MDSR Time Stamp)**	UTC	12	sl+2*ul
2	**20-Hz TAI - UTC Difference**	s	2	ss
3	**Spares** (See Note 1)	/	2*1	uc
4	**20-Hz Mode ID** (See Note 2)	/	2	us
5	**20-Hz Source Sequence Counter**	/	2	us
6	**20-Hz Instrument Configuration** (See Note 3) Derived from flags in the L0 packets	/	4	ul
7	**20-Hz Burst counter (surface sample counter)** Increment from 1 for each data block. Hence the first full MDS record will contain the numbers 1-20, the second 21-40, etc.	/	4	ul

Field	Description	Units	Bytes	Format
8	**20-Hz Latitude of measurement**	10^{-1} µdeg	4	sl
9	**20-Hz Longitude of measurement** (positive E, 0 at Greenwich)	10^{-1} µdeg	4	sl
10	**20-Hz Altitude of COG above reference ellipsoid**	mm	4	sl
11	**20-Hz Instantaneous altitude rate derived from orbit**	mm/s	4	sl
12	**20-Hz Level 1b Measurement Confidence Data** (see Note 4)	/	4	ul
Measurements Group (20 Hz)				
13	**20-Hz Tracker range** (corrected) Corrected for : USO drift, antenna COG distance and internal calibration correction (CAL1)	mm	4	ul
14	**20-Hz H0 Initial Height Word**	48.8 ps	4	sl
15	**20-Hz COR2 Height Rate**	3.05 ps/rc	4	sl
16	**20-Hz Coarse Range word LAI**	12.5 ns	4	sl
17	**20-Hz Fine Range word FAI**	12.5/256 ns	4	sl
18	**Spares** (see Note 1)	/	2*1	uc
19	**20-Hz USO drift correction**	mm	2	ss
20	**20-Hz Doppler correction**	mm	4	sl
21	**20-Hz AGC (corrected)**	dB/100	2	ss
22	**Spares** (see Note 1)	/	2*1	uc
23	**20-Hz Scaling factor for backscatter coefficient evaluation** (corrected) Corrected for: AGC errors and internal calibration (CAL1)	dB/100	4	sl
24	**20-Hz Noise power measurement**	/	4	sl
25	**Spares** (see Note 1)	/	4*1	uc
Time and orbit group (1 Hz)				
26	**Data Record Time (MDSR Time Stamp)**	UTC	12	sl+2*ul
27	**TAI - UTC Difference**	s	2	ss
28	**Spares** (see Note 1)	/	2*1	uc
29	**Latitude of measurement**	10^{-1} µdeg	4	sl
30	**Longitude of measurement** Positive E, 0 at Greenwich	10^{-1} µdeg	4	sl
31	**Altitude of COG above reference ellipsoid**	mm	4	sl
32	**Instantaneous altitude rate derived from orbit**	mm/s	4	sl
Instrumental and environmental / geophysical corrections group (1 Hz)				
33	**Distance antenna – COG**	mm	2	ss
34	**USO drift correction**	mm	2	ss
35	**Doppler correction**	mm	2	ss
36	**Range internal calibration correction (CAL1)**	mm	2	ss
37	**Spares** (see Note 1)	/	8*1	uc
38	**AGC** (corrected)	dB/100	2	ss
39	**AGC correction**	dB/100	2	ss
40	**Backscatter coefficient internal calibration correction (CAL1)**	dB/100	2	ss
41	**Spares** (see Note 1)	/	8*1	uc

Field	Description	Units	Bytes	Format
42	**Dry Tropospheric Correction**	mm	2	ss
43	**Wet Tropospheric Correction**	mm	2	ss
44	**Inverse Barometric Correction**	mm	2	ss
45	**Dynamic Atmospheric Correction**	mm	2	ss
46	**GIM Ionospheric Correction**	mm	2	ss
47	**Ocean Tide (Solution 1 : GOT)**	mm	2	ss
48	**Ocean Tide (Solution 2 : FES)**	mm	2	ss
49	**Long Period Tide Height**	mm	2	ss
50	**Non equilibrium long period ocean tide height**	mm	2	ss
51	**Ocean Loading Tide (Solution 1 : GOT)**	mm	2	ss
52	**Ocean Loading Tide (Solution 2 : FES)**	mm	2	ss
53	**Solid Earth Tide**	mm	2	ss
54	**Geocentric Polar Tide**	mm	2	ss
55	**U-component of the wind vector**	mm/s	2	ss
56	**V-component of the wind vector**	mm/s	2	ss
57	**Surface type flag** 0 = Open Ocean, 1 = Enclosed Sea or lakes, 2 = Continental Ice, 3 = Land	/	2	us
58	**Spares** (see Note 1)	/	2*1	uc
59	**Correction status flags** (see Note 5)	/	4	ul
60	**Correction error flags** (see Note 6)	/	4	ul
61	**Spares** (see Note 1)	/	20*1	uc
Waveform group: LRM (20 Hz)				
62	**20-Hz Scaled Power Echo Waveform[128]** (corrected) Corrected for: on-board FFT filtering effected, accounting for the Gain Profile Range Window (CAL2) Scaled Power Echo Waveform = Echo * Echo Scale Factor with Echo being the real Power Echo Waveform and Echo Scale Factor being the Echo Scale Factor provided in field 63	scaled	128*2	us
63	**20-Hz Echo Scale Factor** If Max_Corrected_Waveform<>0: Scale_factor=round(65535/Max_Corrected_Waveform) If Max_Corrected_Waveform=0: Scale_factor=1	/	2	us
64	**20-Hz Number of echoes averaged**	/	2	us
65	**20-Hz Flags** 0=no errors, 1=Loss of Echo, 2=Run Time Error, 3=Echo Saturation Error, 7=Unknown Error	/	2*1	us
66	**Spares** (see Note 1)	/	2	uc
TOTAL			**7244**	

Table 8: L1b MDS definition

Note 1: The spare fields are always set to zero

Note 2: The definition of the Mode ID is given below in Table 9

Field	Definition	Bit (*)	Bit (**)	Setting
1	Instrument Operative Mode	15-10	0-5	1 = LRM 2 = SAR 3 = SARIN
2	Reserved	9-0	6-15	Set to zero

Table 9: Mode ID definition

(*) Ground Segment bit numbering standard
(**) Space Segment bit numbering standard

Note 3: The definition of the Instrument Configuration is given below in Table 10

Field	Definition	Bit (*)	Bit (**)	Setting
1	Rx chain in use	31-30	0-1	1 = Rx1 2 = Rx2 3 = Both 0 = Unknown
2	SIRAL_Identifier	29	2	0 = Nominal 1 = Redundant
3	Reserved	28	3	Set to zero
4	Bandwidth	27-26	4-5	1 = 320 Mhz 2 = 40 Mhz 0 = Unknown Always set to 1 in IOP/GOP products
5	Reserved	25-24	6-7	Set to zero
6	Tracking Mode	23-22	8-9	1 = LRM 2 = SAR 3 = SARIN 0 = Unknown
7	Reserved	21	10-11	Set to zero
8	Loop Status	19	12	0 = closed loop 1 = open loop
9	Loss of Echo (from Cycle Report)	18	13	0 = OK 1 = Loss of Echo
10	Real Time Error (from Cycle Report)	17	14	0 = OK 1 = Real Time Computation Error
11	Echo Saturation Error (from Cycle Report)	16	15	0 = OK 1 = Echo Saturation Error
12	Rx Band Attenuation	15	16	0 = not applied 1 = applied
13	Cycle Report General Error	14	17	0 = Cycle Report is 0 1 = Cycle Report is not 0
14	Reserved	13-0	18-31	Set to zero

Table 10: Instrument Configuration

(*) Ground Segment bit numbering standard
(**) Space Segment bit numbering standard

Note 4: The definition of the MCD is given below in Table 11.

Field	Definition	Bit (*)	Bit (**)	Setting
1	**Block Degraded**	31	0	0 = OK 1 = Degraded (set if the block should not be processed – indicated by **bold** typeface)
2	**Blank Block**	30	1	0 = OK 1 = Blank Block inserted for record padding
3	Reserved	29	2	Set to zero
4	**Orbit Propagation Error**	28	3	0 = OK 1 = Error (returned by CFI or independent check)
5	Orbit File Change	27	4	0 = OK 1 = Orbit file has changed wrt previous record
6	Orbit Discontinuity	26	5	0 = OK 1 = discontinuity (e.g. gap)
7	Echo Saturation (from Cycle Report)	25	6	0 = OK 1 = Saturated
8	Other Echo Error	24	7	0 = OK 1 = Echo Error (bit fields Tracking Echo Error or Echo Rx1 Error or Echo Rx2 Error set to 1)
9	Reserved	23-20	8-11	Set to zero
10	Cal1 Correction Missing	19	12	0 = correction applied 1 = correction not applied
11	Cal1 Correction from IPF DB	18	13	0 = correction from CAL1 Product used 1 = correction from IPF DB used
12	DORIS USO Correction	17	14	0 = USO Correction Factor is available 1 = USO Correction Factor is not available
13	Reserved	16	15	Set to zero
14	TRK Echo Error	15	16	0 = OK 1 = empty (or null) tracking echo
15	Echo Rx 1 Error	14	17	0 = OK 1 = empty (or null) raw echo
16	Echo Rx2 Error	13	18	0 = OK 1 = empty (or null) raw echo
17	Reserved	12-7	19-24	Set to zero
18	Cal 2 Correction Missing	6	25	0 = correction applied 1 = correction not applied
19	Cal 2 Correction from IPF DB	5	26	0 = correction from CAL2 Product used 1 = correction from IPF DB used
20	**Power Scaling Error**	4	27	0 = Ok (echo has been power scaled) 1 = Error in scaling (L1B waveform is null)
21	Type of processing	3-2	28-29	0 = LRM 1 = SAR / tracking echoes 2 = SAR / bursts (pseudo-LRM)
22	Reserved	1-0	30-31	Set to zero

Table 11: MCD definition

(*) Ground Segment bit numbering standard
(**) Space Segment bit numbering standard

Note 5: The definition of the **Correction Status Flags** is given below in Table 12.

Field	Definition	Bit (*)	Bit (**)	Setting
1	Dry Tropospheric Correction Called	31	0	0 = no, 1 = yes
2	Wet Tropospheric Correction Called	30	1	0 = no, 1 = yes
3	Inverse Barometric Correction Called	29	2	0 = no, 1 = yes
4	DAC correction Called	28	3	0 = no, 1 = yes
5	GIM Ionospheric Correction Called	27	4	0 = no, 1 = yes
6	Model Ionospheric Correction Called	26	5	0 = no, 1 = yes
7	Ocean Equilibrium Tide Called	25	6	0 = no, 1 = yes
8	Ocean Long Period Tide Called	24	7	0 = no, 1 = yes
9	Ocean Loading Tide Called	23	8	0 = no, 1 = yes
10	Solid Earth Tide Called	22	9	0 = no, 1 = yes
11	Geocentric Polar Tide Called	21	10	0 = no, 1 = yes
12	Surface type flag Called	20	11	0 = no, 1 = yes
13	Reserved	19-0	12-31	Set to zero

Table 12: Correction Status Flags definition

(*) Ground Segment bit numbering standard
(**) Space Segment bit numbering standard

Note 6: The definition of the **Correction Error flags** is given below in Table 13

Field	Definition	Bit (*)	Bit (**)	Setting
1	Dry Tropospheric Correction Error	31	0	0 = ok, 1 = error
2	Wet Tropospheric Correction Error	30	1	0 = ok, 1 = error
3	Inverse Barometric Correction Error	29	2	0 = ok, 1 = error
4	Dynamic Atmospheric Correction Error	28	3	0 = ok, 1 = error
5	GIM Ionospheric Correction Error	27	4	0 = ok, 1 = error
6	Model Ionospheric Correction Error	26	5	0 = ok, 1 = error
7	Ocean Equilibrium Tide Error	25	6	0 = ok, 1 = error
8	Ocean Long Period Tide Error	24	7	0 = ok, 1 = error
9	Ocean Loading Tide Error	23	8	0 = ok, 1 = error
10	Solid Earth Tide Error	22	9	0 = ok, 1 = error
11	Geocentric Polar Tide Error	21	10	0 = ok, 1 = error
12	Surface type flag Error	20	11	0 = ok, 1 = error
13	Reserved	19-0	12-31	Set to zero

Table 13: Correction Error Flags definition

(*) Ground Segment bit numbering standard

(**) Space Segment bit numbering standard

3.4 L1B GOP MDS PRODUCT STRUCTURE

The L1B GOP MDS Record Structure is the same as the L1B IOP MDS Record Structure described in section 3.3.

4 LEVEL 2 IOP & GOP PRODUCTS

The following sections described the part of the format specific to Level 2 IOP & GOP products.
For the general structure of the product and for the description of the XML and ASCII MPH, see section 2.

4.1 XML SPECIFIC PRODUCT HEADER (XML SPH)

Field #	Description	Units	Bytes	FORMAT
	SPH	tag		
Product description and identification				
#1	**SPH_Descriptor**	tag		
	Name describing the Specific Product Header		28	*ProductID SPECIFIC HEADER See Table 20*
Product Time information				
	Time_Information	tag		
#2	**Start_Record_Time**	tag		
	TAI of the first record in the main MDS of this product		30	TAI=yyyy-mm-ddThh:mm:ss.uuuuuu
#3	**Stop_Record_Time**	tag		
	TAI of the last record in the main MDS of this product		30	TAI=yyyy-mm-ddThh:mm:ss.uuuuuu
Product Orbit information				
	Orbit_Information	Tag		
#4	**ABS_Orbit_Start**	Tag		
	Absolute Orbit Number at sensing start time.		6	%06d
#5	**Rel_Time_ASC_Node_Start**	Tag		
	Relative time since crossing ascending node time relative to start time of data sensing.	s	11	%011.6f
#6	**ABS_Orbit_Stop**	Tag		
	Absolute Orbit Number at sensing stop time.		6	%06d
#7	**Rel_Time_ASC_Node_Stop**	Tag		
	Relative time since crossing ascending node time relative to stop time of data sensing.	s	11	%011.6f
#8	**Equator_Cross_Time**	Tag		
	Time of equator crossing at the ascending node relative to the sensing start time.		30	UTC=yyyy-mm-ddThh:mm:ss.uuuuuu
#9	**Equator_Cross_Long**	Tag		
	Longitude of equator crossing at the ascending node relative to the sensing start time (positive East, 0 = Greenwich) referred to WGS84.	10-6 deg	11	%+011d
#10	**Ascending_Flag**	Tag		

Field #	Description	Units	Bytes	FORMAT
	Orbit Orientation at the sensing start time A=Ascending D=Descending		1	uc
Product Location Information				
	Product_Location	tag		
#11	**Start_Lat**	tag		
	WGS84 latitude of the first record in the Main MDS (positive north)	10-6 deg	11	%+011d
#12	**Start_Long**	tag		
	WGS84 longitude of the first record in the Main MDS (positive East, 0 = Greenwich)	10-6 deg	11	%+011d
#13	**Stop_Lat**	tag		
	WGS84 latitude of the last record in the Main MDS (positive north)	10-6 deg	11	%+011d
#14	**Stop_Long**	tag		
	WGS84 longitude of the last record in the Main MDS (positive East, 0 = Greenwich)	10-6 deg	11	%+011d
SIRAL Level 1B Quality information				
	Level_1_Confidence_Data	tag		
#15	**L1_Proc_Flag**	tag		
	Processing errors significance flag 1 errors (percentage of errors greater than threshold) 0 no errors		1	uc
#16	**L1_Processing_Quality**	tag		
	Percentage of quality checks successfully passed during the ISP processing (max allowed +10000)	10-2 %	6	%+06d
#17	**L1_Proc_Thresh**	tag		
	Minimum acceptable percentage of quality threshold that must be passed during ISP processing (max allowed +10000)	10-2 %	6	%+06d
#18	**Num_L1_DSR_Processed**	tag		
	Number of L1 Data Set Records analysed		11	%+011d
SIRAL Instrument Configuration				
	SIR_Instrument_Configuration	tag		
#19	**Instrument_Identifier**	tag	1	1*uc A (SIRAL Nominal) B (SIRAL Redundant)
SIRAL Mode Statistics				
	SIR_Mode_Statistics	tag		
#20	**LRM_Mode_Percent**	tag		
	Percentage of input Level-1B records detected in LRM mode	10-2 %	6	%+06d
#21	**SAR_Mode_Percent**	tag		
	Percentage of input Level-1B records detected in SAR mode	10-2 %	6	%+06d
#22	**SARIN_Mode_Percent**	tag		
	Percentage of input Level-1B records detected in SIN mode	10-2 %	6	%+06d
#23	**Other_Modes_Percent**	tag		

Field #	Description	Units	Bytes	FORMAT
	Percentage of input Level-1B records detected in other modes	10-2 %	6	%+06d
SIRAL L1B Surface Statistics				
	Surface_Statistics	tag		
#24	**Open_Ocean_Percent**	tag		
	Percentage of records detected on open ocean or semi-enclosed seas	10-2 %	6	%+06d
#25	**Close_Sea_Percent**	tag		
	Percentage of records detected on close seas or lakes	10-2 %	6	%+06d
#26	**Continent_Ice_Percent**	tag		
	Percentage of records detected on continental ice	10-2 %	6	%+06d
#27	**Land_Percent**	tag		
	Percentage of records detected on land	10-2 %	6	%+06d
SIRAL Level 2 Processing information				
	Level_2_Confidence_Data	tag		
#28	**L2_Prod_Status**	tag		
	Complete/Incomplete Product Completion Flag (0 or 1). 1 if the Product has a duration shorter than the input Level-0 input		1	uc
#29	**L2_Proc_Flag**	tag		
	Processing errors significance flag 1 errors (percentage of errors greater than threshold) 0 no errors		1	uc
#30	**L2_Processing_Quality**	tag		
	Percentage of quality checks successfully passed during Level-2 processing (max allowed +10000)	10-2 %	6	%+06d
#31	**L2_Proc_Thresh**	tag		
	Minimum acceptable percentage of quality threshold that must be passed during Level-2 processing (max allowed +10000)	10-2 %	6	%+06d
Data Set Descriptors				
	DSDs	tag		
	List_of_DSDs	tag		
	Data_Set_Descriptor	tag		
#32	**Data_Set_Name**	tag		
	Name of the Data Set		28	uc
#33	**Data_Set_Type**	tag		
	M for Measurement – R for Reference		1	uc
#34	**File_Name**	tag		
	Name of the reference file. Field is left empty for Measurement DSD		62	uc
#35	**Data_Set_Offset**	tag		
	Offset in bytes from the beginning of the DBL file. For reference DSDs the field is set to 0.	bytes	21	%+021d
#36	**Data_Set_Size**	tag		

Field #	Description	Units	Bytes	FORMAT
	Size in bytes of the Measurement Data Set Record. For reference DSDs the field is set to 0.	bytes	21	%+021d
#37	**Num_of_Records**	tag		
	Number of Data Set Records. For reference DSDs the field is set to 0.		11	%+011d
#38	**Record_Size**	tag		
	Record size in bytes. For reference DSDs the field is set to 0.	bytes	11	%+011d
#39	**Byte_Order**	tag		
	It describes the endianess of the data set 3210 → Big-endian 0123 → Little-endian For Reference DSDs the field is left empty		4	%4c 3210 for Cryosat

Table 14: Level 2 XML Specific Product Header description

4.2 SPECIFIC PRODUCT HEADER

The Specific Product Header is an ASCII header common to all Level-2 products.

Field #	Description	Units	Bytes	Data Type
Product description and identification				
#1	**SPH_DESCRIPTOR=**	keyword	15	15*uc
	quotation mark (")		1	uc
	ASCII string describing the product		28	28*uc Product ID SPECIFIC HEADER See Product ID in table 20
	quotation mark (")		1	uc
	newline character	terminator	1	uc
Product Time information				
#2	**START_RECORD_TAI_TIME=**	keyword	22	22*uc
	quotation mark (")		1	uc
	TAI of the first record in the Main MDS of this product	TAI	27	dd-MMM-yyyy hh:mm:ss.uuuuuu
	quotation mark (")		1	uc
	newline character	terminator	1	uc
#3	**STOP_RECORD_TAI_TIME=**	keyword	21	21*uc
	quotation mark (")		1	uc
	TAI of the last record in in the Main MDS of this product	TAI	27	dd-MMM-yyyy hh:mm:ss.uuuuuu
	quotation mark (")		1	uc
	newline character	terminator	1	uc
Product Orbit Information				
#4	**ABS_ORBIT_START**=	Keyword	16	16*uc
	Absolute Orbit Number at Product Start Time		6	%06d
	Newline character	terminator	1	uc
#5	**REL_TIME_ASC_NODE_START**=	Keyword	24	24*uc
	Relative time since crossing ascending node time relative to start time of data sensing	s	11	%011.6f
	<s>	units	3	3*uc
	Newline character	terminator	1	Uc
#6	**ABS_ORBIT_STOP**=	Keyword	15	15*uc
	Absolute Orbit Number at Product Stop Time		6	%06d
	Newline character	terminator	1	uc
#7	**REL_TIME_ASC_NODE_STOP**=	Keyword	23	23*uc
	Relative time since crossing ascending node time relative to stop time of data sensing	s	11	%011.6f
	<s>	units	3	3*uc
	Newline character	terminator	1	uc
#8	**EQUATOR_CROSS_TIME_UTC**=	Keyword	23	23*uc
	Quotation mark(")		1	uc
	Time of Equator crossing at the ascending node of the sensing start time	UTC	27	dd-MMM-yyyy hh:mm:ss.uuuuuu

Field #	Description	Units	Bytes	Data Type
	Quotation mark (")		1	uc
	Newline character	terminator	1	uc
#9	**EQUATOR_CROSS_LONG**=	Keyword	19	19*uc
	Longitude of Equator Crossing at the ascending node of the sensing start time (positive East, 0 = Greenwich) referred to WGS84	s	11	%+011d
	<10-6degE>	units	10	10*uc
	Newline character	terminator	1	uc
#10	**ASCENDING_FLAG**=	Keyword	15	15*uc
	Orbit Orientation at the sensing start time A= Ascending D= Descending		1	uc
	Newline character	terminator	1	uc
Product Location Information				
#11	**START_LAT=**	keyword	10	10*uc
	WGS84 latitude of the first record in the Main MDS (positive north)	[10-6 deg]	11	%+011d
	<10-6degN>	units	10	10*uc
	newline character	terminator	1	uc
#12	**START_LONG=**	keyword	11	11*uc
	WGS84 longitude of the first record in the Main MDS (positive East, 0 = Greenwich)	[10-6 deg]	11	%+011d
	<10-6degE>	units	10	10*uc
	newline character	terminator	1	uc
#13	**STOP_LAT=**	keyword	9	9*uc
	WGS84 latitude of the last record in the Main MDS (positive north)	[10-6 deg]	11	%+011d
	<10-6degN>	units	10	10*uc
	newline character	terminator	1	uc
#14	**STOP_LONG=**	keyword	10	10*uc
	WGS84 longitude of the last record in the Main MDS (positive East, 0 = Greenwich)	[10-6 deg]	11	%+011d
	<10-6degE>	units	10	10*uc
	newline character	terminator	1	uc
#15	**Spare (blank characters)**	ascii	50	50*uc
	newline character	terminator	1	uc
Level 1B Quality information				
#16	**L1_PROC_FLAG=**	keyword	13	13*uc
	Processing errors significance flag (1 or 0). 1 if the percentage of L1B records- free of processing errors is less than the acceptable threshold		1	uc
	newline character	terminator	1	uc
#17	**L1_PROCESSING_QUALITY=**	keyword	22	22*uc
	Percentage of quality checks successfully passed during the L1B processing (max allowed +10000)	[10-2 %]	6	%+06d
	<10-2%>	units	7	7*uc
	newline character	terminator	1	uc
#18	**L1_PROC_THRESH=**	keyword	15	15*uc

Field #	Description	Units	Bytes	Data Type
	Minimum acceptable percentage of quality threshold that must be passed during L1B processing (max allowed +10000)	[10-2 %]	6	%+06d
	<10-2%>	units	7	7*uc
	newline character	terminator	1	uc
#19	**NUM_L1_DSR_PROC=**		16	16*uc
	Number of L1B Data Set Records analysed		11	%+011d
	newline character	terminator	1	uc
#20	**Spare (blank characters)**	ascii	37	37*uc
	newline character	terminator	1	uc
SIRAL Instrument Configuration				
#21	**INSTR_ID=**	keyword	9	9*uc
	quotation mark (")		1	uc
	Instrument identifier		1	1*uc A = SIRAL Nominal B = SIRAL Redundant
	quotation mark (")		1	uc
	newline character	terminator	1	uc
SIRAL Mode Statistics				
#22	**LRM_MODE_PERCENT=**	keyword	17	17*uc
	Percentage of input L1B records detected in LRM mode	[10-2 %]	6	%+06d
	<10-2%>	units	7	7*uc
	Newline character	terminator	1	uc
#23	**SAR_MODE_PERCENT=**	keyword	17	17*uc
	Percentage of input L1B records detected in SAR mode	[10-2 %]	6	%+06d
	<10-2%>	units	7	7*uc
	Newline character	terminator	1	uc
#24	**SARIN_MODE_PERCENT=**	keyword	19	19*uc
	Percentage of input L1B records detected in SIN mode	[10-2 %]	6	%+06d
	<10-2%>	units	7	7*uc
	Newline character	terminator	1	uc
#25	**OTHER_MODES_PERCENT=**	keyword	20	20*uc
	Percentage of input L1B records detected in any other mode	[10-2 %]	6	%+06d
	<10-2%>	units	7	7*uc
	Newline character	terminator	1	uc
#26	**Spare (blank characters)**	ascii	50	50*uc
	newline character	terminator	1	uc
SIRAL Surface Statistics				
#27	**OPEN_OCEAN_PERCENT=**	keyword	19	19*uc
	Percentage of records detected on open ocean or semi-enclosed seas	[10-2 %]	6	%+06d
	<10-2%>	units	7	7*uc
	Newline character	terminator	1	uc
#28	**CLOSE_SEA_PERCENT=**	keyword	18	18*uc
	Percentage of records detected on close seas or lakes	[10-2 %]	6	%+06d

Field #	Description	Units	Bytes	Data Type
	<10-2%>	units	7	7*uc
	Newline character	terminator	1	Uc
#29	**CONTINENT_ICE_PERCENT=**	keyword	22	22*uc
	Percentage of records detected on continental ice	[10-2 %]	6	%+06d
	<10-2%>	units	7	7*uc
	Newline character	terminator	1	Uc
#30	**LAND_PERCENT=**	keyword	13	13*uc
	Percentage of records detected on land	[10-2 %]	6	%+06d
	<10-2%>	units	7	7*uc
	Newline character	terminator	1	Uc
#31	**Spare (blank characters)**	ascii	50	50*uc
	newline character	terminator	1	uc
Level 2 Processing information				
#32	**L2_PROD_STATUS=**	keyword	15	15*uc
	Complete/Incomplete Product Completion Flag (0 or 1). 1 if the Product as a duration shorter than the input product.		1	uc
	newline character	terminator	1	uc
#33	**L2_PROC_FLAG=**	keyword	13	13*uc
	Processing errors significance flag (1 or 0). 1 if the percentage of DSR free of processing errors is less than the acceptable threshold		1	uc
	newline character	terminator	1	uc
#34	**L2_PROCESSING_QUALITY=**	keyword	22	22*uc
	Percentage of quality checks successfully passed during Level-2 processing (max allowed +10000)	[10-2 %]	6	%+06d
	<10-2%>	units	7	7*uc
	newline character	terminator	1	uc
#35	**L2_PROC_THRESH=**	keyword	15	15*uc
	Minimum acceptable percentage of quality threshold that must be passed during Level-2 processing (max allowed +10000)	[10-2 %]	6	%+06d
	<10-2%>	units	7	7*uc
	newline character	terminator	1	Uc
#36	**Spare (blank characters)**	ascii	50	50*uc
	newline character	terminator	1	Uc
	TOTAL		**1227**	
DSD Section				

Table 15: Level 2 ASCII Specific Product Header Description

The DSD Section is divided in two principal sections: Measurement DSD, indicated as DSD (M) and Reference DSD, indicated as DSD (R). The general structure of a DSD is shown in Table 16. The number of DSD (M) is fixed (only one), whereas the number of DSD (R) depends on the number of auxiliary files and input Level 0 and Level 1B files effectively used to generate the product.

#N	DSD			
#N.1	**DS_NAME=**	keyword	8	8*uc
	quotation mark		1	uc
	Name describing the Data Set		28	28*uc
	quotation mark		1	uc
	newline character	terminator	1	uc
#N.2	**DS_TYPE=**	keyword	8	8*uc
	Type of Data Set. It can be: M = Measurement R = Reference		1	uc
	newline character	terminator	1	uc
External product reference				
#N.3	**FILENAME=**	keyword	9	9*uc
	quotation mark		1	uc
	Name of the Reference File. Used if DS_TYPE is set to R. It is left justified with trailer blanks. The file name includes the extension. If not used it is set to 62 blanks.		62	62*uc
	quotation mark		1	uc
	newline character	terminator	1	uc
Position and size of DS				
#N.4	**DS_OFFSET=**	keyword	10	10*uc
	Length in bytes of MPH + SPH (including DSDs) + DS size of previous Data Set (if any).	byte	21	%+021d
	<bytes>	units	7	7*uc
	newline character	terminator	1	uc
#N.5	**DS_SIZE=**	keyword	8	8*uc
	Length in bytes of the attached Data Set Used if DS_TYPE is set to M If not used set to 0	byte	21	%+021d
	<bytes>	units	7	7*uc
	newline character	terminator	1	uc
Number and length of DSRs				
#N.6	**NUM_DSR=**	keyword	8	8*uc
	Number of Data Set Records		11	%+011d
	newline character	terminator	1	uc
#N.7	**DSR_SIZE=**	keyword	9	9*uc
	Length in bytes of the Data Set Record If not used set to +0 If variable set to -1	byte	11	%+011d
	<bytes>	units	7	7*uc
	newline character	terminator	1	uc
#N.8	**Spare**	ascii	32	32*uc
	newline character	terminator	1	Uc
TOTAL			**280**	

Table 16: Generic Level 2 DSD Description

The allowed values for the name of the DSD (M) are given in Table 17

DS_NAME for DSD (M)
SIR_L2_IOP
SIR_L2_GOP

Table 17: DS Names for the Level 2 Measurement Data Set Descriptors

As it is done in all other Level-2 Cryosat-2 products, all the reference DSDs of the source L1B file are included into the L2 products, thus providing a Level-2 product which contains all the references to the files that were used along the Ocean processing chain to generate the product. In addition, some new DSDs have to be introduced.

The allowed values for the name of the DSD (R) are given inTable 18, together with the allowed number of occurrences of the DSD (R) in the Specific Product Header.

DS_NAME for DSD (R)		
ID	**Description**	**Cardinality (See Note 1)**
CONSTANTS_FILE	Constants File	{1}
PROC_CONFIG_PARAMS_FILE	Processor Configuration Parameters File	{1}
SIRAL_LEVEL_0_FILE	SIRAL Level 0 File from which the product was created	{1,2} (See Note 2)
SIRAL_LEVEL_1B_FILE	SIRAL Level 1B File from which the product was created	{1}
SCENARIO_FILE	Orbit Scenario File	{1}
ORBIT_FILE	Orbit Data File	{1,2}
DORIS_USO_DRIFT_FILE	DORIS USO Drift File	{1}
IPF_RA_DATABASE_FILE	Instrument Characterisation Data File	{1}
CALIBRATION_TYPE_1_FILE	File Product containing CAL_1 corrections	{1}
CALIBRATION_TYPE_2_FILE	File Product containing CAL_2 corrections	{1}
OCEAN_TIDE_SOL1_FILE	File for Ocean Tide Solution 1 (See Note 3)	{1}
TIDAL_LOADING_SOL1_FILE	File for Tidal Loading Solution 1 (See Note 3)	{1}
OCEAN_TIDE_SOL2_FILE	File for Ocean Tide Solution 2 (See Note 3)	{1}
TIDAL_LOADING_SOL2_FILE	File for Tidal Loading Solution 2 (See Note 3)	{1}
LONG_PERIOD_TIDE_FILE	File for Long Period Ocean Tide (See Note 3)	{1}
EARTH_TIDE_FILE	CartWright File (See Note 3)	{1}
POLE_TIDE_FILE	Pole Location Data File	{1}
SURFACE_TYPE_FILE	Surface Type Map File (See Note 3)	{1}
GPS_IONO_MAP	GPS Ionospheric Map Data	{1,2}
SURFACE_PRESSURE_FILE	Surface Pressure File for Meteo Correction	{2,3}
MEAN_PRESSURE_FILE	Mean Pressure File for Meteo Correction	{2,3}
WET_TROPOSPHERE_FILE	Wet Troposphere File for Meteo Correction	{2,3}
MOG_2D_FILE	2D Gravity Wave model for Dynamic Atmospheric Correction	{2,3}

DS_NAME for DSD (R)		
U_WIND_FILE	U Wind component File for Meteo Correction	{2,3}
V_WIND_FILE	V Wind component File for Meteo Correction	{2,3}
METEO_GRID_DEF_FILE	Meteo Grid Definition File	{2,3}
MEAN_SEA_SURFACE_SOL1_FILE	Mean Sea Surface File Solution 1 (See Note 3)	{1}
MEAN_SEA_SURFACE_SOL2_FILE	Mean Sea Surface File Solution 2 (See Note 3)	{1}
MEAN_SEA_SURFACE_FILE	Mean Sea Surface File (See Note 3)	{1}
GEOID_FILE	Geoid File (See Note 3)	{1}
ODLE_FILE	Ocean Depth/Land Elevation File (See Note 3)	{1}
SEA_STATE_BIAS_FILE	Sea State Bias File (See Note 3)	{1}
WIND_MODEL_FILE	Windspeed table (See Note 3)	{1}

Table 18: Level 2 Reference DSDs

Note 1: {i,j} means i or j occurrences

Note 2: One file for L0 data in LRM mode

Two files for L0 data in SAR mode: one TRK file and one SAR file

Note 3: For static auxiliary files, the file name is meaningless as it is an internal name. It is thus replaced by the reference of the used model

4.3 L2 IOP MDS PRODUCT STRUCTURE

The MDS record structure of the L2 IOP products is summarized in Figure 4-1 and detailed in Table 19.

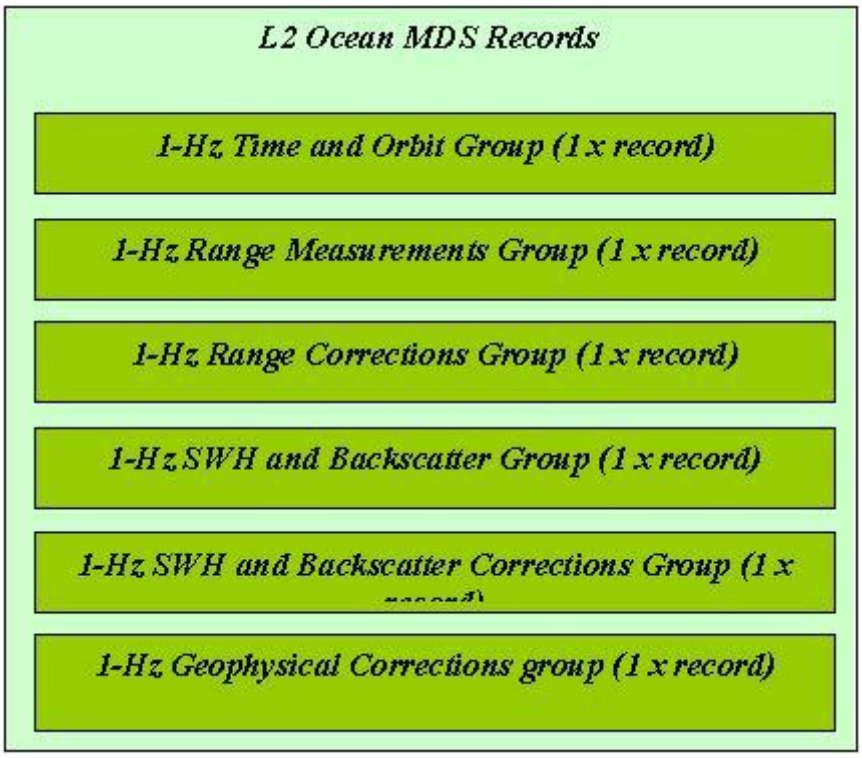


Figure 4-1 Level 2 Ocean Product MDS

Field	Description	Units	Bytes	Format
Time and Orbit Group (1-Hz)				
1	**Data Record Time** (MDSR Time Stamp)	UTC	12	sl+2*ul
2	**TAI - UTC Difference**	s	2	ss
3	**Spares** (See Note 1)	/	2*1	uc
4	**20-Hz Time differences** [0..19]	µs	20*4	sl
5	**TAI - UTC Differences** [0..19]	s	20*2	ss
6	**Record Counter**	/	4	ul
7	**Latitude of measurement**	10-1 µdeg	4	sl
8	**20-Hz Latitude of measurement** [0..19]	10-1 µdeg	20*4	sl
9	**Longitude of measurement** Positive E, 0 at Greenwich	10-1 µdeg	4	sl
10	**20-Hz Longitude of measurement** [0..19] Positive E, 0 at Greenwich	10-1 µdeg	20*4	sl
11	**Altitude of COG above reference ellipsoid**	mm	4	sl
12	**20-Hz Altitude of COG above reference ellipsoid** [0..19]	mm	20*4	sl

Field	Description	Units	Bytes	Format
13	**Instantaneous altitude rate derived from orbit**	mm/s	4	sl
14	**20-Hz Level 2 Measurement Confidence Data** [0..19] (see Note 2)	/	20*4	ul
15	**Spares** (See Note 1)	/	2	uc
16	**Peakiness**	10-2	2	ss
17	**20-Hz peakiness** [0..19]	10-2	20*2	ss
18	**20-Hz Mean Quadratic Error from ocean retracking** [0..19]	10-4	20*2	ss
19	**Ocean retracking quality** [20bits]	/	4	ul
20	**Spares** (See Note 1)	/	4*1	uc
Range Measurement Group (1-Hz)				
21	**Ocean range to ocean surface** (corrected) Corrected for: USO drift, antenna-COG distance, internal calibration (CAL1), doppler correction, modeled instrumental correction, system bias	mm	4	ul
22	**20-Hz ocean range** [0..19] (corrected) Corrected for: USO drift, antenna-COG distance, internal calibration (CAL1), doppler correction, modeled instrumental correction, system bias	mm	20*4	ul
23	**Standard deviation of 20-Hz ocean range**	mm	2	us
24	**Number of 20-Hz valid points for ocean range**	/	2	us
25	**Ocean range averaging status flags** First 20 least significant bits (0-19) correspond to the 20 values (one per data block) containing : 0=valid measurement, 1=invalid. Bit 0 applies to the first data block. Unused bits are set to 0.	/	4	ul
26	**Ice range to ocean surface** (corrected) Corrected for: USO drift, antenna-COG distance, internal calibration (CAL1), doppler correction, system bias	mm	4	ul
27	**20-Hz Ice range** [0..19] (corrected) Corrected for: USO drift, antenna-COG distance, internal calibration (CAL1), doppler correction, system bias	mm	20*4	ul
28	**Standard deviation of 20-Hz Ice range**	mm	2	us
29	**Number of 20-Hz valid points for Ice range**	/	2	us
30	**Ice range averaging status flags** First 20 least significant bits (0-19) correspond to the 20 values (one per data block) containing : 0=valid measurement, 1=invalid. Bit 0 applies to the first data block. Unused bits are set to 0.	/	4	ul
Range Corrections Group (1-Hz)				
31	**Doppler correction**	mm	2	ss
32	**USO drift correction**	mm	2	ss
33	**Distance antenna – COG**	mm	2	ss
34	**Range internal calibration correction** (CAL1)	mm	2	ss
35	**Range modeled instrumental correction** (ocean table)	mm	2	ss
36	**Dry Tropospheric Correction**	mm	2	ss
37	**Wet Tropospheric Correction**	mm	2	ss
38	**Inverse Barometric Correction**	mm	2	ss
39	**Dynamic Atmospheric Correction**	mm	2	ss
40	**GIM Ionospheric Correction**	mm	2	ss
41	**Sea State Bias correction**	mm	2	ss

Field	Description	Units	Bytes	Format
42	**Spares** (See Note 1)	/	6*1	uc
SWH and Backscatter Group (1-Hz)				
43	**Square of Significant Wave Height**	mm^2	4	sl
44	**Significant Wave Height** (corrected) Corrected for: modeled instrumental correction, system bias	mm	2	ss
45	**Spares** (See Note 1)	/	2*1	uc
46	**20-Hz SWH [0..19]** (corrected) Corrected for: modeled instrumental correction, system bias	mm	20*2	ss
47	**Standard deviation of 20-Hz SWH**	mm	2	us
48	**Number of 20-Hz valid points for SWH**	/	2	us
49	**SWH averaging status flags** First 20 least significant bits (0-19) correspond to the 20 values (one per data block) containing : 0=valid measurement, 1=invalid. Bit 0 applies to the first data block. Unused bits are set to 0.	/	4	ul
50	**Spares** (See Note 1)	/	2*1	uc
51	**Ocean backscatter coefficient** (corrected) Corrected for : AGC correction, internal calibration (CAL1), modeled instrumental correction, system bias. Not corrected for atmospheric attenuation	dB/100	2	ss
52	**20-Hz ocean backscatter coefficient** [0..19] (corrected) Corrected for: AGC correction, internal calibration (CAL1), modeled instrumental correction, system bias. Not corrected for atmospheric attenuation	dB/100	20*2	ss
53	**Standard deviation of 20-Hz ocean backscatter coefficient**	dB/100	2	us
54	**Number of 20-Hz valid points for ocean backscatter coefficient**	/	2	us
55	**Ocean backscatter averaging status flags** First 20 least significant bits (0-19) correspond to the 20 values (one per data block) containing : 0=valid measurement, 1=invalid. Bit 0 applies to the first data block. Unused bits are set to 0.	/	4	ul
56	**Spares** (See Note 1)	/	2*1	uc
57	**Ice backscatter coefficient** (corrected) Corrected for : AGC correction, internal calibration (CAL1), system bias. Not corrected for atmospheric attenuation	dB/100	2	ss
58	**20-Hz Ice backscatter coefficient** [0..19] (corrected) Corrected for : AGC correction, internal calibration (CAL1), system bias. Not corrected for atmospheric attenuation	dB/100	20*2	ss
59	**Standard deviation of 20-Hz Ice backscatter coefficient**	dB/100	2	us
60	**Number of 20-Hz valid points for Ice backscatter coefficient**	/	2	us
61	**Ice backscatter coefficient averaging status flags** First 20 least significant bits (0-19) correspond to the 20 values (one per data block) containing : 0=valid measurement, 1=invalid. Bit 0 applies to the first data block. Unused bits are set to 0.	/	4	ul
62	**Square of the off nadir angle of the satellite from waveforms**	$Deg^2/10^4$	4	sl
63	**Spares** (See Note 1)	/	6*1	uc
64	**AGC** (corrected)	dB/100	2	ss
65	**20-Hz Scaling factors for backscatter coefficient evaluation** [0..19]	dB/100	20*4	sl
SWH and Backscatter Correction Group (1-Hz)				

Field	Description	Units	Bytes	Format
66	**SWH modeled instrumental correction** (Ocean table)	mm	2	ss
67	**AGC correction**	dB/100	2	ss
68	**Sigma0 internal calibration correction** (CAL1)	dB/100	2	ss
69	**Backscatter coefficient modeled instrumental correction** (Ocean table)	dB/100	2	ss
70	**Atmospheric attenuation**	dB/100	2	ss
71	**Spares** (See Note 1)	/	6*1	uc
Geophysical Group (1 Hz)				
72	**Mean Sea Surface height (Solution 1)**	mm	4	sl
73	**Mean Sea Surface height (Solution 2)**	mm	4	sl
74	**Geoid height**	mm	4	sl
75	**Ocean Depth / Land Elevation**	mm	4	sl
76	**Mean Dynamic Topography height**	mm	4	sl
77	**Spares** (See Note 1)	/	8*1	uc
78	**Total geocentric ocean tide height (Solution 1 : GOT)**	mm	2	ss
79	**Total geocentric ocean tide height (Solution 2 : FES)**	mm	2	ss
80	**Long Period Tide Height**	mm	2	ss
81	**Non eq. long period ocean tide height**	mm	2	ss
82	**Ocean Loading Tide (Solution 1 : GOT)**	mm	2	ss
83	**Ocean Loading Tide (Solution 2 : FES)**	mm	2	ss
84	**Solid Earth Tide**	mm	2	ss
85	**Geocentric Polar Tide**	mm	2	ss
86	**Spares** (See Note 1)	/	6*1	uc
87	**Altimeter wind speed**	mm/s	2	ss
88	**U-component of the model wind vector**	mm/s	2	ss
89	**V-component of the model wind vector**	mm/s	2	ss
90	**Surface type flag**	/	2	us
91	**Spares** (See Note 1)	/	2*1	uc
TOTAL			**1108**	

Table 19: L2 MDS definition

Note 1: The spare fields are always set to zero

Note 2: The definition of the MCD is the same than for Level 1b products. It is given in Table 11

4.4 L2 GOP MDS PRODUCT STRUCTURE

The L2 GOP MDS Record Structure is the same as the L2 IOP MDS Record Structure described in section 4.3.

5 CRYOSAT OCEAN PRODUCTS NAMING RULES

The file names follow the official conventions as for [MASTER-ICD].

MM_CCCC_XXXXXXXXXX_yyyymmdd_hhmmss_YYYYMMDD_HHMMSS__bvvv.ttt

MM = CS (Mission Identifier)

CCCC = file class which can be: OFFL (Off Line Processing/Systematic)
RPRO (ReProcessing)
TEST (Testing)
LTA_ (Long Term Archive)

yyyymmdd_hhmmss = validity start time corresponds to the input Level 1 UTC start time

YYYYMMDD_HHMMSS = validity stop time corresponds to the input Level 1 UTC stop time

b = baseline identifier as read-in from the PCONF

vvv = version number of the file

ttt = extension: HDR for Header and DBL for binary data

XXXXXXXXXX is the file type.

For the Ocean products, the file type is given in the Table 20 below.

File Type	Description
SIR_IOP_1B	Interim L1B Ocean Product
SIR_GOP_1B	Geophysical L1B Ocean Product
SIR_IOP_2_	Interim L2 Ocean Product
SIR_GOP_2_	Geophysical L2 Ocean Product

Table 20: L1B and L2 Products File types

APPENDIX A : PRODUCT SIZE

In order to gain some insight into how much space will the new COP production take up in the PDS storage system, a comparison with the FDM production is proposed in this appendix.

The comparison is based on the MDS size of each product as we assume that the size of the header part can be neglected for sensible products (i.e. not too short products).
The XML header size is negligible in terms of overall storage requirements.

The size (in bytes) of the MDS of each product is provided in the next table.

	FDM MDS	IOP MDS	GOP MDS
L1b	9084	7244	7244
L2	844	1108	1108

According to this scenario we expect the L1b COP products to be roughly 20% smaller than the L1b FDM products.
Similarly, the L2 COP products are expected to be about 30% larger than the L2 FDM products

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