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SSALTO

SSALTO PRODUCTS SPECIFICATIONS - VOLUME 1 : JASON-1 USER PRODUCTS

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0	0	30th July, 1998	Document creation	
0	1	21st Dec., 1998	Document modifications accounting for the SWT's remarks	
1	0	23 Jul. 1999	First complete version including headers	
1	1	23 June 2000	Correction of IGDR header and squre of the « off nadir angle »	

ABBREVIATIONS

Sigle	Definition
AD	Applicable Document
CNES	Centre National d'Etudes Spatiales
CCSDS	Consultative Committee for Space Data Systems
ECMWF	European Centre for Meteorological Weather Forecast
GDR	Geophysical Data Record
IGDR	Interim Geophysical Data Record
JMR	JASON Microwave Radiometer
LSB	Least Significant Bit
MSB	Most Significant Bit
NASA	National Aeronautics and Space Administration
NRT	Near Real Time

Sigle	Definition
OFL	Off-Line
OSDR	Operational Sensor Data Record
PCD	Product Confidence Data
RD	Reference Document
SFDU	Standard Formatted Data Unit
SGDR	Sensor Geophysical Data Record
SWH	Significant WaveHeight
TAI	International Atomic Time
TBC	To Be Confirmed
TBD	To Be Defined
UTC	Universal Time Coordinated

APPLICABLE AND REFERENCE DOCUMENTS

Reference	Document title
TP2-SB-J0-459-CNES	AD1 JASON-1 Products Description
SMM-ST-M2-EA-11002-CN	RD1 Algorithm Definition Accuracy and Specifications – Volume 1: JASON Real Time Processing
SMM-ST-M2-EA-11003-CN	RD2 Algorithm Definition Accuracy and Specifications – Volume 2: CMA Altimeter Level 1B Processing
SMM-ST-M2-EA-11005-CN	RD3 Algorithm Definition Accuracy and Specifications – Volume 4: CMA Altimeter Level 2 Processing
ALT-SP-1000-003-ATS	RD4 Définition de l'Interface de l'Altimètre POSEIDON-2 (Commande/Télémesure)
AVI-NT-02-101-CN	RD5 AVISO User Handbook – Merged TOPEX/POSEIDON products
PO-ST-RA-0005-CLS	RD6 RA-2/MWR Level 2 Input/Output Data Definition
CCSDS 620.0-B-2	RD7 Standard Formatted Data Units – Structures and construction rules
CCSDS 641.0-B-1	RD8 Parameter Value Language specification (CCSD0006)

TBC AND TBD LIST

TBC/TBD	Paragraph	Brief description
TBD	4.4	Radiometer state flag
TBD	4.4	Orbit state flag
TBD	5.5	Radiometer state flag
TBD	5.5	Orbit state flag
TBD	7.3	Common min. and max. values of Instrumental corrections

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1. INTRODUCTION

The aim of this document is to define the Jason-1 products that will be produced in Near Real Time (NRT) and Off-Line (OFL). These products will be distributed to users on a systematic basis or on a request basis.

In the current version of this document, the following products will be described :

- the Operational Sensor Data Record (OSDR), produced on a NRT basis
- the Interim Geophysical Data Record (IGDR), produced on an OFL basis
- the Geophysical Data Record (GDR), produced on an OFL basis
- the Sensor Geophysical Data Record (SGDR), produced on an OFL basis

The algorithms detailing the calculation of the parameters contained in the products are to be found in RD1 to RD3. The definition of the POSEIDON-2 altimeter telemetry has been taken into account through RD4. The TOPEX/POSEIDON and ENVISAT feedback experience have also been used (RD5 and RD6) to support the definition of these products.

An overview of the products is given in section 2. It is followed by the description of the conventions used in the products. Then the products themselves are described from section 4 to section 7. For each product, the following information will be found :

- general description
- header description
- data description
- flag description whenever needed

In the current version of this document a set of flags is proposed for each product. This list is not exhaustive and can still be updated.

2. JASON-1 PRODUCTS OVERVIEW

A general overview of the Jason-1 telemetry processing is given on the diagram below.

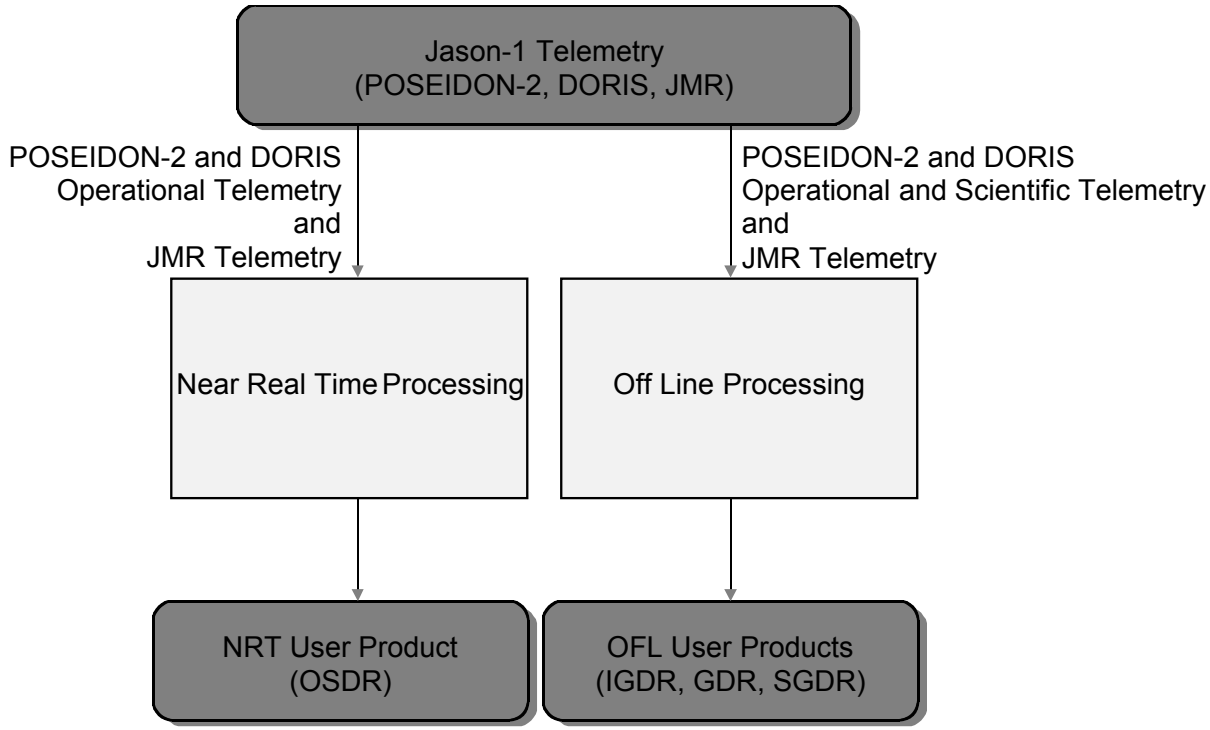

Figure 1 : Jason-1 Telemetry processing

From the telemetry, the following User Products are generated :

- the NRT product, namely the OSDR, through the NRT processing (NRT product)
- the OFL products, namely the IGDR, GDR and SGDR through the OFL processing

These products are the geophysical Level 2 products which will be distributed to the users. The major differences between these products are related to latency and structure (see AD1)

3. JASON-1 USER PRODUCT CONVENTIONS AND FLAGS

The conventions defined for the Jason-1 user products are the following :

- each product begins with an header in SFDU format (see RD7 and RD8)
- for readability purposes, the information provided in the header are separated by a "newline character" (ASCII decimal code 10)
- the datation is expressed in UTC (both in header and in measurement records)
- inside the header, the datation is expressed in CCSDS format
  (ie: YYYY-MM-DDThh:mm:ss.ms where ms are microseconds represented on 6 digits)
- the reference date is January 1st 1958, 00h 00mn 00s
- all the parameters that are part of the data section are stored as integers in binary format
- the default value for a parameter is the maximum possible value for that parameter
  For an unsigned short integer (2 bytes), the default value is 65 535
  For a signed short integer (2 bytes), the default value is 32 767
  For an unsigned long integer (4 bytes), the default value is 4 294 967 295
  For a signed long integer (4 bytes), the default value is 2 147 483 647
- the longitude is expressed between 0 (included) and 360 degrees (excluded) and corresponds to the East longitude relative to Greenwich meridian
- the altimetric ranges are included in the product (not the Sea Surface Height)
- the altimetric ranges are corrected for instrumental effects
- the 1 Hz altitudes and altimetric ranges are expressed relative to a reference altitude and range (this offset is provided in the product header), except for the OSDR product which provides raw altitudes and ranges
- the environmental and geophysical corrections are to be added to the altimetric parameters
- the parameters are recorded as integers

Two types of flags have been defined :

- bitfield flags, in which several flags are gathered, each one being defined as a two state parameter (0 = Good, 1 = Bad)
- byte flags, associated with flags whose values may be higher than 1

The maps of valid points are coded as bitfields where each bit corresponds to a single 20 Hz data point (requiring at least 20 bits).

Regarding the bitfield notation, the convention is to number the bits from right to left :

- the least significant bit (LSB) at location 0 and the most significant bit (MSB) at location 7, for a one byte bitfield
- the least significant bit (LSB) at location 0 and the most significant bit (MSB) at location 15, for a two byte bitfield
- the least significant bit (LSB) at location 0 and the most significant bit (MSB) at location 31, for a four byte bitfield

This convention is represented below for one and two bytes bitfield.

One Byte

7	6	5	4	3	2	1	0
MSB							LSB

Two bytes

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
MSB															LSB

4. OSDR

4.1. GENERAL DESCRIPTION

The OSDR is a NRT wind/wave oriented product, dedicated to meteorological users. It is generated using the operational telemetry from POSEIDON-2 and DORIS, as well as the telemetry from the Jason-1 Microwave Radiometer (JMR), with a limited amount of processing on ground. In particular, ground retracking is not applied on the waveforms and no environmental or geophysical parameters are computed apart from the ones which can be derived from the instrument measurements themselves (ionospheric correction, wet tropospheric correction, sea state bias). OSDR data are corrected for instrumental effects.

The OSDR is a non validated product which contains 1 Hz data for both bands (Ku and C). It is structured in segments that correspond to telemetry dumps over the ground stations.

The definition of the OSDR has also been driven by concerns over data volume since these data will have to be distributed in near real time. The result is a product which is much smaller than the IGDR, GDR or SGDR products.

4.2. HEADER DESCRIPTION

The information included in the header are encoded in ASCII and follow the SFDU CCSDS rules (see RD7 and RD8). They cover the followings areas :

- generation of the product
- sensors
- processing information
- data flow of the product
- product confidence data
- reference of the auxiliary data used to generate the product

Field	Contents	Dim.	Unit	Type	Bytes Length
CCSDS EDU Label	CCSD3ZF0000100000001	1	Keyword	Char	**20**
Volume Production Data					
CCSDS Volume Label	CCSD3VS00006PRODUCER	1	Keyword	Char	**20**
	newline character	1	Terminator	Char	**1**
Product file name	Product_File_Name =	1	Keyword	Char	**20**
	Name of the product (ie JA1_OSD_2PvSyyyymmdd_hhmmss_nnnnn.CNES or JA1_OSD_2PvSyyyymmdd_hhmmss_nnnnn.NASA)	1	-	Char	**40**
	semicolon mark (;)	1	-	Char	**1**
	newline character	1	Terminator	Char	**1**
Agency Name	Producer_Agency_Name =	1	Keyword	Char	**23**
	Name (CNES or NASA)	1	-	Char	**4**
	semicolon mark (;)	1	-	Char	**1**
	newline character	1	Terminator	Char	**1**
Center	Processing_Center =	1	Keyword	Char	**20**
	Center (SSALTO or JSDS)	1	-	Char	**6**
	semicolon mark (;)	1	-	Char	**1**
	newline character	1	Terminator	Char	**1**
Data type	File_Data_Type =	1	Keyword	Char	**17**
	Type of data (OSDR)	1	-	Char	**4**
	semicolon mark (;)	1	-	Char	**1**
	newline character	1	Terminator	Char	**1**
Document	Reference_Document =	1	Keyword	Char	**21**
	ID of the document describing the product (ie SMM-ST-M-EA-10879-CN)	1	-	Char	**50**
	semicolon mark (;)	1	-	Char	**1**
	newline character	1	Terminator	Char	**1**
Software	Reference_Software =	1	Keyword	Char	**21**
	ID of the software used to create the product (ie CMA CNES Vx.x)	1	-	Char	**20**
	semicolon mark (;)	1	-	Char	**1**
	newline character	1	Terminator	Char	**1**
Operating System	Operating_System =	1	Keyword	Char	**19**
	ID of the operating system (ie SUN/Solaris 7)	1		Char	**20**
	semicolon mark (;)	1	-	Char	**1**
	newline character	1	Terminator	Char	**1**
Creation time	Product_Creation_Time =	1	Keyword	Char	**24**
	UTC date & time of product generation (CCSDS format) ie 2000-06-21T04:20:00.000000	1	CCSDS date	Char	**26**
	Semicolon mark (;)	1	-	Char	**1**
	Newline character	1	Terminator	Char	**1**
CCSDS marker	CCSD$$MARKERPRODUCER	1	Keyword	Char	**20**
Catalogue Attribute Data					
CCSDS Catalog label	CCSD3KS00006SEGMFILE	1	Keyword	Char	**20**
	Newline character	1	Terminator	Char	**1**
	Mission_Name =	1	Keyword	Char	**15**
	Jason-1	1	-		**7**
	Semicolon mark (;)	1	-	Char	**1**
	Newline character	1	Terminator	Char	**1**
	Altimeter_Sensor_Name =	1	Keyword	Char	**24**
	POSEIDON-2	1	-		**10**
	Semicolon mark (;)	1	-	Char	**1**
	Newline character	1	Terminator	Char	**1**
	Radiometer_Sensor_Name =	1	Keyword	Char	**25**
	JMR	1	-		**3**
	Semicolon mark (;)	1	-	Char	**1**
	Newline character	1	Terminator	Char	**1**
		Subtotal			**523**

	DORIS_Sensor_Name =	1	Keyword	Char	**20**
	DORIS-2 GM	1	-		**10**
	Semicolon mark (;)	1	-	Char	**1**
	Newline character	1	Terminator	Char	**1**
	Acquisition_Station_Name =	1	Keyword	Char	**27**
	Name of the station where the raw data have been acquired (directly derived from Level1.0 product)	1	-	Char	**20**
	Semicolon mark (;)	1	-	Char	**1**
	Newline character	1	Terminator	Char	**1**
	Cycle_Number =	1	Keyword	Char	**15**
	Cycle	1	-	Char	**5**
	Semicolon mark (;)	1	-	Char	**1**
	Newline character	1	Terminator	Char	**1**
	Absolute_Revolution_Number =	1	Keyword	Char	**29**
	Start absolute orbit number	1	-	Char	**5**
	Semicolon mark (;)	1	-	Char	**1**
	Newline character	1	Terminator	Char	**1**
	Equator_Time =	1	Keyword	Char	**15**
	UTC date & time of equator crossing (CCSDS format) for the half revolution containing the first point of the file	1	CCSDS date	Char	**26**
	Semicolon mark (;)	1	-	Char	**1**
	Newline character	1	Terminator	Char	**1**
	Equator_Longitude =	1	Keyword	Char	**20**
	Longitude in degrees of equator crossing (format xxx.xx)	1	-	Char	**7**
	<deg>	1	Units	Char	**5**
	Semicolon mark (;)	1	-	Char	**1**
	Newline character	1	Terminator	Char	**1**
	First_Measurement_Time =	1	Keyword	Char	**25**
	UTC date & time of first measurement in the product (CCSDS format)	1	CCSDS date	Char	**26**
	Semicolon mark (;)	1	-	Char	**1**
	Newline character	1	Terminator	Char	**1**
	Last_Measurement_Time =	1	Keyword	Char	**24**
	UTC date & time of last measurement in the product (CCSDS format)	1	CCSDS date	Char	**26**
	Semicolon mark (;)	1	-	Char	**1**
	Newline character	1	Terminator	Char	**1**
	First_Measurement_Latitude =	1	Keyword	Char	**29**
	Latitude in degrees of first measurement in the product (format +xx.xx or -xx.xx)	1	-	Char	**6**
	<deg>	1	Units	Char	**5**
	semicolon mark (;)	1	-	Char	**1**
	newline character	1	Terminator	Char	**1**
	Last_Measurement_Latitude =	1	Keyword	Char	**28**
	Latitude in degrees of last measurement in the product (format +xx.xx or -xx.xx)	1	-	Char	**6**
	<deg>	1	Units	Char	**5**
	semicolon mark (;)	1	-	Char	**1**
	newline character	1	Terminator	Char	**1**
	First_Measurement_Longitude =	1	Keyword	Char	**30**
	Longitude in degrees of first measurement in the product (format xxx.xx)	1	-	Char	**7**
	<deg>	1	Units	Char	**5**
	semicolon mark (;)	1	-	Char	**1**
	newline character	1	Terminator	Char	**1**
		Subtotal			**971**

	Last_Measurement_Longitude =	1	Keyword	Char	**29**
	Longitude in degrees of last measurement in the product (format xxx.xx)	1	-	Char	**7**
	<deg>	1	Units	Char	**5**
	semicolon mark (;)	1	-	Char	**1**
	newline character	1	Terminator	Char	**1**
	1Hz_Measurement_Number =	1	Keyword	Char	**25**
	Number of 1 Hz measurements in the product	1	-	Char	**5**
	semicolon mark (;)	1	-	Char	**1**
	newline character	1	Terminator	Char	**1**
	1Hz_Ocean_Measurement_Number =	1	Keyword	Char	**31**
	Number of 1 Hz measurements over ocean in the product	1	-	Char	**5**
	semicolon mark (;)	1	-	Char	**1**
	newline character	1	Terminator	Char	**1**
	Ocean_PCD =	1	Keyword	Char	**12**
	Product confidence data in percentage (ratio of the altimeter data declared OK to the total number of ocean measurements where data integrity is determined using the quality flag for the 1 Hz altimeter data (altimeter + radiometer + environmental parameters)	1	-	Char	**3**
	<%>	1	Units	Char	**3**
	semicolon mark (;)	1	-	Char	**1**
	newline character	1	Terminator	Char	**1**
	Time_Epoch =	1	Keyword	Char	**13**
	Reference used for measurement datation in the product (UTC value=1958-01-01T00:00:00.000000)	1	CCSDS date	Char	**26**
	semicolon mark (;)	1	-	Char	**1**
	newline character	1	Terminator	Char	**1**
	TAI_UTC_Difference =	1	Keyword	Char	**21**
	Increment to be applied to UTC to give TAI (dt=TAI-UTC).	1	s	Char	**4**
	Semicolon mark (;)	1	-	Char	**1**
	Newline character	1	Terminator	Char	**1**
	Time_Of_Leap_Second =	1	Keyword	Char	**22**
	UTC Time at which a leap second occured in the product Set to 0000-00-00T00:00:00.000000 if not useful.	1	CCSDS date	Char	**26**
	semicolon mark (;)	1	-	Char	**1**
	newline character	1	Terminator	Char	**1**
	CCSD$$MARKERSEGMFILE	1	Keyword	Char	**20**
Supplementary Data	***(Input measurements)***				
CCSDS Supplementary data Label	CCSD3SS00006MEASFILE	1	Keyword	Char	**20**
	newline character	1	Terminator	Char	**1**
	Altimeter_Level1 =	1	Keyword	Char	**19**
	Name of the altimeter Level 1.0 file in input	1	-	Char	**40**
	semicolon mark (;)	1	-	Char	**1**
	newline character	1	Terminator	Char	**1**
		Subtotal			**1324**

	Radiometer_Level1 =	1	Keyword	Char	**20**
	Name of the radiometer Level 1.0 file in input	1	-	Char	**40**
	semicolon mark (;)	1	-	Char	**1**
	newline character	1	Terminator	Char	**1**
	CCSD$$MARKERMEASFILE	1	Keyword	Char	**20**
Supplementary Data	***(auxiliary data)***				
CCSDS Supplementary data Label	CCSD3SS00006AUXFILES	1	Keyword	Char	**20**
	Newline character	1	Terminator	Char	**1**
	POSEIDON-2_Characterization =	1	Keyword	Char	**30**
	Name of the file containing the characterization data for the POSEIDON-2 altimeter	1	-	Char	**61**
	Semicolon mark (;)	1	-	Char	**1**
	Newline character	1	Terminator	Char	**1**
	POSEIDON-2_LTM =	1	Keyword	Char	**17**
	Name of the file containing the Long Term Monitoring values for the POSEIDON-2 altimeter	1	-	Char	**61**
	Semicolon mark (;)	1	-	Char	**1**
	Newline character	1	Terminator	Char	**1**
	JMR_Main_Beam =	1	Keyword	Char	**16**
	Name of the file containing the main beam brightness temperature coefficients for the antenna pattern correction	1	-	Char	**61**
	Semicolon mark (;)	1	-	Char	**1**
	Newline character	1	Terminator	Char	**1**
	JMR_BT_Averaging =	1	Keyword	Char	**19**
	Name of the file containing the main beam brightness temperature averaging coefficients	1	-	Char	**61**
	Semicolon mark (;)	1	-	Char	**1**
	Newline character	1	Terminator	Char	**1**
	DORIS_USO =	1	Keyword	Char	**12**
	Name of the file containing the on-board Doris frequency shift	1	-	Char	**61**
	Semicolon mark (;)	1	-	Char	**1**
	Newline character	1	Terminator	Char	**1**
	POSEIDON-2_OB_RET_Correction_Tables =	1	Keyword	Char	**38**
	Name of the file containing the on-board retracking coefficient corrections	1	-	Char	**61**
	semicolon mark (;)	1	-	Char	**1**
	newline character	1	Terminator	Char	**1**
	POSEIDON-2_SSB =	1	Keyword	Char	**17**
	Name of the file containing the Sea state bias coefficient for Poseidon-2	1	-	Char	**61**
	semicolon mark (;)	1	-	Char	**1**
	newline character	1	Terminator	Char	**1**
	JMR_Retrieval_Coefficients =	1	Keyword	Char	**29**
	Name of the file containing the geophysical coefficients for the JMR	1	-	Char	**61**
	semicolon mark (;)	1	-	Char	**1**
	newline character	1	Terminator	Char	**1**
	LAND_SEA_Mask_Map =	1	Keyword	Char	**20**
	Name of the file containing the Land/Sea mask map	1	-	Char	**61**
	semicolon mark (;)	1	-	Char	**1**
	newline character	1	Terminator	Char	**1**
	CCSD$$MARKERAUXFILES	1	Keyword	Char	**20**
Data					
CCSDS data label	FCST3IF0011300000001	1	Keyword	Char	**20**
		Total			**2232**

4.3. DATA DESCRIPTION

The information included in the data record cover the followings areas :

- time tag
- location and surface type
- quality information and sensors status
- orbit
- altimeter range
- altimeter range corrections
- significant waveheight
- significant waveheight corrections
- backscatter coefficient
- backscatter coefficient corrections
- off nadir angle
- brightness temperatures
- geophysical parameters

These information are recorded at a 1 Hz rate.

Parameter Number	Parameter	Dim.	Unit	Common min. value	Common max. value	Byte length	Type	Total Bytes
Time Tag								
1	time stamp 1 (number of days from reference date)	1	day			4	u	4
2	time stamp 2 (seconds within the day)	1	s	0	86 400	4	u	4
3	time stamp 3 (microseconds)	1	µs	0	999 999	4	u	4
Location and surface type								
4	latitude	1	µdeg	-70 000 000	70 000 000	4	s	4
5	longitude	1	µdeg	0	359 999 999	4	u	4
6	surface type (1)	1	-	-	-	1	u	1
7	altimeter echo type (0 = ocean-like , 1 = non ocean-like)	1	-	-	-	1	u	1
8	radiometer surface type (0 = ocean , 1 = land)	1	-	-	-	1	u	1
Quality information and sensors status								
9	quality flag for 1 Hz altimeter data	1	-	-	-	1	u	1
10	quality flag for 1 Hz radiometer data	1	-	-	-	1	u	1
11	altimeter state flag	1	-	-	-	1	u	1
12	radiometer state flag	1	-	-	-	1	u	1
13	orbit state flag	1	-	-	-	1	u	1
On board retracked significant waveheight								
14	Ku band significant waveheight (2)	1	mm	0	25 000	2	u	2
15	RMS of the Ku band significant waveheight	1	mm	0	2 500	2	u	2
16	number of valid points SWH and backscatter coefficient (3)	1	-	0	20	1	u	1
17	spare (to be aligned)	3	-	-	-	1	u	3
On board retracked backscatter coefficient								
18	Ku band backscatter coefficient (4)	1	10-2 dB	0	5 000	2	u	2
19	C band backscatter coefficient (4)	1	10-2 dB	0	5 500	2	u	2
20	RMS of the Ku band backscatter coefficient	1	10-2 dB	0	250	2	u	2
21	RMS of the C band backscatter coefficient	1	10-2 dB	0	250	2	u	2
Orbit								
22	altitude of satellite	1	mm	1 300 000 000	1 400 000 000	4	u	4
On board retracked altimeter range								
23	Ku band range	1	mm	1 300 000 000	1 400 000 000	4	u	4
24	C band range	1	mm	1 300 000 000	1 400 000 000	4	u	4
25	RMS of the Ku band range	1	mm	0	200	2	u	2
26	RMS of the C band range	1	mm	0	300	2	u	2
27	number of valid points for Ku band range	1	-	0	20	1	u	1
28	number of valid points for C band range	1	-	0	20	1	u	1
Off nadir angle								
29	square of the off nadir angle computed from Ku waveform derived parameters	1	10-4 deg2	0	900	2	u	2
					Subtotal			**64**

(1) the values of this flag are : 0 = open oceans or semi-enclosed seas; 1 = enclosed seas or lakes; 2 = continental ice; 3 = land

(2) only Ku band SWH is estimated by the on board retracking (no on board C band SWH)

(3) it is issued from average performed on board the altimeter

(4) backscatter coefficients are corrected for atmospheric attenuations

Parameter Number	Parameter	Dim.	Unit	Common min. value	Common max. value	Byte length	Type	Total Bytes
Brightness temperatures								
30	18,7 GHz brightness temperature (6)	1	10-2 K	11 000	23 000	2	u	2
31	23,8 GHz brightness temperature (6)	1	10-2 K	13 000	25 000	2	u	2
32	34 GHz brightness temperature (6)	1	10-2 K	15 000	26 000	2	u	2
Environmental parameters								
33	altimeter wind speed	1	cm/s	0	2 500	2	u	2
34	altimeter total electronic content	1	10^{15} e/m2	0	2 500	2	u	2
35	radiometer wind speed	1	cm/s	0	2 500	2	u	2
36	radiometer water vapour content	1	10-2g/cm2	0	700	2	s	2
37	radiometer liquid water	1	10-2kg/m2	0	200	2	s	2
					Total			**80**

(6) along track averaging has not been performed on the brightness temperature

4.4. ESTIMATED PRODUCT SIZE

The estimated product size of the Operational Sensor Data Record product is determined as follows :

Header : 2 232 bytes

Data : 80 bytes * 6745 = 539 600 bytes

Total : 541 832 bytes

These values are based on the following assumptions :

- Jason-1 orbit duration is 6745 seconds,
- One OSDR product per acquisition segment (~ one orbit)
- One data record per second

4.5. FLAG DESCRIPTION

Here below is given the definition regarding the following flags :

- quality flag for the 1 Hz altimeter data
- quality flag for the 1 Hz radiometer data
- altimeter state flag
- radiometer state flag
- orbit state flag

The first two flags are issued from the "Control Processing" which is run after the "NRT production processing". The controls basically consist of a comparison of the altimeter parameters to threshold values. The values of the thresholds will be tuned for ocean-like surfaces.

Quality flag for the 1 Hz altimeter data

This flag is defined on one byte and given in the table below :

Bits	**Indicator** (0 = Good and 1 = Bad)
0	Ku band range
1	C band range
2	Ku band SWH
3	Ku band backscatter coefficient
4	C band backscatter coefficient
5	off nadir angle from Ku band waveform parameters
6	spare
7	spare

Quality flag for the 1 Hz radiometer data

This flag is defined on one byte and is given in the table below :

Bits	**Indicator** (0 = Good and 1 = Bad)
0	18,7 GHz brightness temperature
1	23,8 GHz brightness temperature
2	34 GHz brightness temperature
3	spare
4	spare
5	spare
6	spare
7	spare

Altimeter state flag

This flag is defined on one byte and is given in the table below :

Bits	Indicator
0	Spare
1	Altimeter operating (0 = side A (nominal POSEIDON-2 altimeter), 1 = side B (redondancy))
2	Reception bandwidth inversion (0 = No reversed, 1 = reversed)
3	Spectrum coding (0 = I and Q, 1 = $I^2 + Q^2$)
4	C bandwidth (0 = 320 Mhz; 1 = 100 MHz)
5	Ku/C band sequencing (0 = 3Ku-1C-3Ku , 1 = 2Ku-1C-2Ku)
6	Ku band status (0 = on , 1 = off)
7	C band status (0 = on , 1 = off)

Radiometer state flag

This flag is defined on one byte and is TBD. It contains at least the radiometer operating (nominal or redondancy).

Orbit state flag

This flag is defined on one byte and is TBD. It contains at least the Doris sensor operating (nominal or redondancy) and a quality orbit indicator.

5. IGDR

5.1. GENERAL DESCRIPTION

The IGDR is an OFL geophysical product generated from operational and science telemetry from Poseidon-2, processed DORIS data for the orbit, and telemetry from the Jason-1 Microwave Radiometer (JMR). Unlike the OSDR, the IGDR is fully processed and contains all environmental and geophysical corrections. Instrumental corrections have been applied to IGDR data. Furthermore a dedicated ground retracking is applied on the waveforms to improve the accuracy of the product.

The IGDR is a non fully validated product which contains data for both bands (Ku and C) at a rate of 1 Hz and 20 Hz. It is structured in pass files (pole to pole structure).

5.2. HEADER DESCRIPTION

The information included in the header are encoded in ASCII and follow the SFDU CCSDS rules (see RD7 and RD8). They cover the followings areas :

- generation of the product
- sensors
- processing information
- data flow of the product
- product confidence data
- reference of the auxiliary data used to generate the product

Field	Contents	Dim.	Unit	Type	Bytes Length
CCSDS EDU Label	CCSD3ZF0000100000001	1	Keyword	Char	**20**
Volume Production Data					
CCSDS Volume Label	CCSD3VS00006PRODUCER	1	Keyword	Char	**20**
	newline character	1	Terminator	Char	**1**
Product file name	Product_File_Name =	1	Keyword	Char	**20**
	Name of the product (ie JA1_IGD_2PvPccc_ppp.CNES or JA1_IGD_2PvPccc_ppp.NASA)	1	-	Char	**40**
	semicolon mark (;)	1	-	Char	**1**
	newline character	1	Terminator	Char	**1**
Agency Name	Producer_Agency_Name =	1	Keyword	Char	**23**
	Name (CNES or NASA)	1	-	Char	**4**
	semicolon mark (;)	1	-	Char	**1**
	newline character	1	Terminator	Char	**1**
Center	Processing_Center =	1	Keyword	Char	**20**
	Center (SSALTO or JSDS)	1	-	Char	**6**
	semicolon mark (;)	1	-	Char	**1**
	newline character	1	Terminator	Char	**1**
Data type	File_Data_Type =	1	Keyword	Char	**17**
	Type of data (IGDR or GDR)	1	-	Char	**4**
	semicolon mark (;)	1	-	Char	**1**
	newline character	1	Terminator	Char	**1**
Document	Reference_Document =	1	Keyword	Char	**21**
	ID of the document describing the product (ie SMM-ST-M-EA-10879-CN)	1	-	Char	**50**
	semicolon mark (;)	1	-	Char	**1**
	newline character	1	Terminator	Char	**1**
Software	Reference_Software =	1	Keyword	Char	**21**
	ID of the software used to create the product (ie CMA CNES Vx.x)	1	-	Char	**20**
	semicolon mark (;)	1	-	Char	**1**
	newline character	1	Terminator	Char	**1**
Operating System	Operating_System =	1	Keyword	Char	**19**
	ID of the operating system (ie SUN/Solaris 7)	1		Char	**20**
	semicolon mark (;)	1	-	Char	**1**
	newline character	1	Terminator	Char	**1**
Creation time	Product_Creation_Time =	1	Keyword	Char	**24**
	UTC date & time of product generation (CCSDS format) ie 2000-06-21T04:20:00.000000	1	CCSDS date	Char	**26**
	semicolon mark (;)	1	-	Char	**1**
	newline character	1	Terminator	Char	**1**
CCSDS marker	CCSD$$MARKERPRODUCER	1	Keyword	Char	**20**
Catalogue Attribute Data					
CCSDS Catalog label	CCSD3KS00006PASSFILE	1	Keyword	Char	**20**
	newline character	1	Terminator	Char	**1**
	Mission_Name =	1	Keyword	Char	**15**
	Jason-1	1	-		**7**
	semicolon mark (;)	1	-	Char	**1**
	newline character	1	Terminator	Char	**1**
	Altimeter_Sensor_Name =	1	Keyword	Char	**24**
	POSEIDON-2	1	-		**10**
	semicolon mark (;)	1	-	Char	**1**
	newline character	1	Terminator	Char	**1**
	Radiometer_Sensor_Name =	1	Keyword	Char	**25**
	JMR	1	-		**3**
	semicolon mark (;)	1	-	Char	**1**
	newline character	1	Terminator	Char	**1**
		Subtotal			**523**

	DORIS_Sensor_Name =	1	Keyword	Char	**20**
	DORIS-2 GM	1	-		**10**
	semicolon mark (;)	1	-	Char	**1**
	newline character	1	Terminator	Char	**1**
	Acquisition_Station_Name =	1	Keyword	Char	**27**
	Name of the station where the raw data have been acquired (directly derived from Level1.0 product)	1	-	Char	**20**
	semicolon mark (;)	1	-	Char	**1**
	newline character	1	Terminator	Char	**1**
	Cycle_Number =	1	Keyword	Char	**15**
	Cycle	1	-	Char	**5**
	semicolon mark (;)	1	-	Char	**1**
	newline character	1	Terminator	Char	**1**
	Absolute_Revolution_Number =	1	Keyword	Char	**29**
	Start absolute orbit number	1	-	Char	**5**
	semicolon mark (;)	1	-	Char	**1**
	newline character	1	Terminator	Char	**1**
	Pass_Number =	1	Keyword	Char	**14**
	Pass number within the cycle	1	-	Char	**3**
	semicolon mark (;)	1	-	Char	**1**
	newline character	1	Terminator	Char	**1**
	Pass_Data_Count =	1	Keyword	Char	**18**
	Start absolute pass number	1	-	Char	**5**
	semicolon mark (;)	1	-	Char	**1**
	newline character	1	Terminator	Char	**1**
	Equator_Time =	1	Keyword	Char	**15**
	UTC date & time of equator crossing (CCSDS format)	1	CCSDS date	Char	**26**
	semicolon mark (;)	1	-	Char	**1**
	newline character	1	Terminator	Char	**1**
	Equator_Longitude =	1	Keyword	Char	**20**
	Longitude in degrees of equator crossing (format xxx.xx)	1	-	Char	**7**
	<deg>	1	Units	Char	**5**
	semicolon mark (;)	1	-	Char	**1**
	newline character	1	Terminator	Char	**1**
	First_Measurement_Time =	1	Keyword	Char	**25**
	UTC date & time of first measurement in the product (CCSDS format)	1	CCSDS date	Char	**26**
	semicolon mark (;)	1	-	Char	**1**
	newline character	1	Terminator	Char	**1**
	Last_Measurement_Time =	1	Keyword	Char	**24**
	UTC date & time of last measurement in the product (CCSDS format)	1	CCSDS date	Char	**26**
	semicolon mark (;)	1	-	Char	**1**
	newline character	1	Terminator	Char	**1**
	First_Measurement_Latitude =	1	Keyword	Char	**29**
	Latitude in degrees of first measurement in the product (format +xx.xx or -xx.xx)	1	-	Char	**6**
	<deg>	1	Units	Char	**5**
	semicolon mark (;)	1	-	Char	**1**
	newline character	1	Terminator	Char	**1**
	Last_Measurement_Latitude =	1	Keyword	Char	**28**
	Latitude in degrees of last measurement in the product (format +xx.xx or -xx.xx)	1	-	Char	**6**
	<deg>	1	Units	Char	**5**
	semicolon mark (;)	1	-	Char	**1**
	newline character	1	Terminator	Char	**1**
		Subtotal			**971**

	First_Measurement_Longitude =	1	Keyword	Char	**30**
	Longitude in degrees of first measurement in the product (format xxx.xx)	1	-	Char	**7**
	<deg>	1	Units	Char	**5**
	semicolon mark (;)	1	-	Char	**1**
	newline character	1	Terminator	Char	**1**
	Last_Measurement_Longitude =	1	Keyword	Char	**29**
	Longitude in degrees of last measurement in the product (format xxx.xx)	1	-	Char	**7**
	<deg>	1	Units	Char	**5**
	semicolon mark (;)	1	-	Char	**1**
	newline character	1	Terminator	Char	**1**
	1Hz_Measurement_Number =	1	Keyword	Char	**25**
	Number of 1 Hz measurements in the product	1	-	Char	**5**
	semicolon mark (;)	1	-	Char	**1**
	newline character	1	Terminator	Char	**1**
	1Hz_Ocean_Measurement_Number =	1	Keyword	Char	**31**
	Number of 1 Hz measurements over ocean in the product	1	-	Char	**5**
	semicolon mark (;)	1	-	Char	**1**
	newline character	1	Terminator	Char	**1**
	Ocean_PCD =	1	Keyword	Char	**12**
	Product confidence data in percentage (ratio of the altimeter data declared OK to the total number of ocean measurements where data integrity is determined using the quality flag for the 1 Hz altimeter data (altimeter + radiometer + environmental parameters)	1	-	Char	**3**
	<%>	1	Units	Char	**3**
	semicolon mark (;)	1	-	Char	**1**
	newline character	1	Terminator	Char	**1**
	Time_Epoch =	1	Keyword	Char	**13**
	Reference used for measurement datation in the product (value=1958-01-01T00:00:00.00000)	1	CCSDS date	Char	**26**
	semicolon mark (;)	1	-	Char	**1**
	newline character	1	Terminator	Char	**1**
	TAI_UTC_Difference =	1	Keyword	Char	**21**
	Increment to be applied to UTC to give TAI (dt=TAI-UTC)	1	s	Char	**4**
	semicolon mark (;)	1	-	Char	**1**
	newline character	1	Terminator	Char	**1**
	Time of Leap_Second =	1	Keyword	Char	**22**
	UTC Time at which a leap second occured in the product Set to 0000-00-00T00:00:00.000000 if not useful	1	CCSDS date	Char	**26**
	semicolon mark (;)	1	-	Char	**1**
	newline character	1	Terminator	Char	**1**
	Subtotal				**1266**

	Time_Shift_Mid_Frame =	1	Keyword	Char	**23**
	Offset to apply to time to derive the time tag of the first 20 Hz waveform (unit:microsecond)	1	-	Char	**10**
	<us>	1	Units	Char	**4**
	semicolon mark (;)	1	-	Char	**1**
	newline character	1	Terminator	Char	**1**
	Time_Shift_Interval =	1	Keyword	Char	**22**
	Time interval (microseconds) between two 20 Hz waveforms	1	-	Char	**10**
	<us>	1	Units	Char	**4**
	semicolon mark (;)	1	-	Char	**1**
	newline character	1	Terminator	Char	**1**
	Range_Offset =	1	Keyword	Char	**15**
	Offset to be added to the altitude and to the range to retrieve the absolute values of these parameters (ie 1300 km)	1	-	Char	**4**
	<km>	1	Units	Char	**4**
	semicolon mark (;)	1	-	Char	**1**
	newline character	1	Terminator	Char	**1**
	Average_Pressure =	1	Keyword	Char	**19**
	Average global pressure from meteo fields (unit : 10 Pa) The nearest meteorological field to the first measurement of the pass is used to compute this average pressure	1	-	Char	**5**
	<daPa>	1	Units	Char	**6**
	semicolon mark (;)	1	-	Char	**1**
	newline character	1	Terminator	Char	**1**
	CCSD$$MARKERPASSFILE	1	Keyword	Char	**20**
Supplementary Data	***(Input measurements)***				
CCSDS Supplementary data Label	CCSD3SS00006MEASFILE	1	Keyword	Char	**20**
	newline character	1	Terminator	Char	**1**
	Altimeter_Level1 =	1	Keyword	Char	**19**
	Name of the altimeter Level 1.0 file in input	1	-	Char	**40**
	semicolon mark (;)	1	-	Char	**1**
	newline character	1	Terminator	Char	**1**
	Radiometer_Level1 =	1	Keyword	Char	**20**
	Name of the radiometer Level 1.0 file in input	1	-	Char	**40**
	semicolon mark (;)	1	-	Char	**1**
	newline character	1	Terminator	Char	**1**
	CCSD$$MARKERMEASFILE	1	Keyword	Char	**20**
Supplementary Data	***(auxiliary data)***				
CCSDS Supplementary data Label	CCSD3SS00006AUXFILES	1	Keyword	Char	**20**
	newline character	1	Terminator	Char	**1**
	POSEIDON-2_Characterization =	1	Keyword	Char	**30**
	Name of the file containing the caracterization data for the POSEIDON-2 altimeter	1	-	Char	**61**
	semicolon mark (;)	1	-	Char	**1**
	newline character	1	Terminator	Char	**1**
	POSEIDON-2_LTM =	1	Keyword	Char	**17**
	Name of the file containing the Long Term Monitoring values for the POSEIDON-2 altimeter	1	-	Char	**61**
	semicolon mark (;)	1	-	Char	**1**
	newline character	1	Terminator	Char	**1**
		Subtotal			**1778**

	JMR_Main_Beam =	1	Keyword	Char	**16**
	Name of the file containing the characterization data for the JMR radiometer	1	-	Char	**61**
	semicolon mark (;)	1	-	Char	**1**
	newline character	1	Terminator	Char	**1**
	JMR_BT_Averaging =	1	Keyword	Char	**19**
	Name of the file containing the characterization data for the JMR radiometer	1	-	Char	**61**
	semicolon mark (;)	1	-	Char	**1**
	newline character	1	Terminator	Char	**1**
	DORIS_TEC_Map =	1	Keyword	Char	**16**
	Name of the file containing the Total Electronic Contents calculated from DORIS measurements. (Set to 61 blank characters if the file was not available for the processing)	1	-	Char	**61**
	semicolon mark (;)	1	-	Char	**1**
	newline character	1	Terminator	Char	**1**
	DORIS_USO =	1	Keyword	Char	**12**
	Name of the file containing the on-board Doris frequency shift	1	-	Char	**61**
	semicolon mark (;)	1	-	Char	**1**
	newline character	1	Terminator	Char	**1**
	Orbit_Data =	1	Keyword	Char	**13**
	Name of the file containing the orbit ephemeris (MOE for IGDR, POE for GDR)	1	-	Char	**61**
	Semicolon mark (;)	1	-	Char	**1**
	Newline character	1	Terminator	Char	**1**
	PF_Corrections =	1	Keyword	Char	**17**
	Name of the file containing the platform corrections (depointing relative to the subsatellite point distance between antenna center of phase and center of gravity	1	-	Char	**61**
	semicolon mark (;)	1	-	Char	**1**
	newline character	1	Terminator	Char	**1**
	Pole_Location =	1	Keyword	Char	**16**
	Name of the file containing the precise pole location data	1	-	Char	**61**
	semicolon mark (;)	1	-	Char	**1**
	newline character	1	Terminator	Char	**1**
	MTO_Surface_Pressure =	1	Keyword	Char	**23**
	Name of the file containing the meteorological fileds (Set to 61 blank characters if the file was not available for the processing)	1	-	Char	**61**
	semicolon mark (;)	1	-	Char	**1**
	newline character	1	Terminator	Char	**1**
	MTO_Wet_Tropo_Correction =	1	Keyword	Char	**27**
	Name of the file containing the meteorological fileds (Set to 61 blank characters if the file was not available for the processing)	1	-	Char	**61**
	semicolon mark (;)	1	-	Char	**1**
	newline character	1	Terminator	Char	**1**
	MTO_Wind =	1	Keyword	Char	**11**
	Name of the file containing the meteorological fileds (Set to 61 blank characters if the file was not available for the processing)	1	-	Char	**61**
	semicolon mark (;)	1	-	Char	**1**
	newline character	1	Terminator	Char	**1**
		Subtotal			**2578**

	ORF_Data =	1	Keyword	Char	**11**
	Orbit Revolution File used to create the pass file	1	-	Char	**61**
	semicolon mark (;)	1	-	Char	**1**
	newline character	1	Terminator	Char	**1**
	POSEIDON-2_OB_RET_Correction_Tables =	1	Keyword	Char	**38**
	Name of the file containing the on-board retracking coefficient corrections (for level1B and level2 processing)	1	-	Char	**61**
	semicolon mark (;)	1	-	Char	**1**
	newline character	1	Terminator	Char	**1**
	POSEIDON-2_SSB =	1	Keyword	Char	**17**
	Name of the file containing the Sea state bias coefficients for Poseidon-2	1	-	Char	**61**
	semicolon mark (;)	1	-	Char	**1**
	newline character	1	Terminator	Char	**1**
	POSEIDON-2_Composite_SSB =	1	Keyword	Char	**27**
	Name of the file containing the composite Sea state bias coefficients for Poseidon-2	1	-	Char	**61**
	semicolon mark (;)	1	-	Char	**1**
	newline character	1	Terminator	Char	**1**
	JMR_Retrieval_Coefficients =	1	Keyword	Char	**29**
	Name of the file containing the geophysical coefficient for the JMR	1	-	Char	**61**
	semicolon mark (;)	1	-	Char	**1**
	newline character	1	Terminator	Char	**1**
	LAND_SEA_Mask_Map =	1	Keyword	Char	**20**
	Name of the file containing the Land/Sea mask map	1	-	Char	**61**
	semicolon mark (;)	1	-	Char	**1**
	newline character	1	Terminator	Char	**1**
	Ocean_Tide_Sol_1 =	1	Keyword	Char	**19**
	Name of the file containing the coefficients for the diurnal and semi-diurnal elastic ocean tide calculation (solution 1 : orthotide algorithm)	1	-	Char	**61**
	semicolon mark (;)	1	-	Char	**1**
	newline character	1	Terminator	Char	**1**
	Ocean_Tide_Sol_2 =	1	Keyword	Char	**19**
	Name of the file containing the coefficients for the diurnal and semi-diurnal elastic ocean tide calculation (solution 2 : harmonic components algorithm)	1	-	Char	**61**
	semicolon mark (;)	1	-	Char	**1**
	newline character	1	Terminator	Char	**1**
	Tidal_loading_Sol_1 =	1	Keyword	Char	**22**
	Name of the file containing the coefficients for the tidal loading effect calculation (solution 1 = orthotide algorithm)	1	-	Char	**61**
	semicolon mark (;)	1	-	Char	**1**
	newline character	1	Terminator	Char	**1**
	Tidal_loading_Sol_2 =	1	Keyword	Char	**22**
	Name of the file containing the coefficients for the tidal loading effect calculation (solution 2 = harmonic algorithm)	1	-	Char	**61**
	semicolon mark (;)	1	-	Char	**1**
	newline character	1	Terminator	Char	**1**
		Subtotal			**3432**

	Solid_Earth_Tide =	1	Keyword	Char	**19**
	Name of the file containing the Cartwright and Edden tide potential amplitudes for the solid earth tide and the Equilibrium long period ocean tide height calculation	1	-	Char	**61**
	semicolon mark (;)	1	-	Char	**1**
	newline character	1	Terminator	Char	**1**
	NEQ_Tide =	1	Keyword	Char	**11**
	Name of the file containing the coefficients for the long period non equilibrium tide height calculation (harmonic components algorithm)	1	-	Char	**61**
	semicolon mark (;)	1	-	Char	**1**
	newline character	1	Terminator	Char	**1**
	Geoid_Map =	1	Keyword	Char	**12**
	Name of the file containing the geoid values for Jason-1 mission	1	-	Char	**61**
	semicolon mark (;)	1	-	Char	**1**
	newline character	1	Terminator	Char	**1**
	MSS_Map =	1	Keyword	Char	**10**
	Name of the file containing the Mean Sea Surface values for Jason-1 mission	1	-	Char	**61**
	semicolon mark (;)	1	-	Char	**1**
	newline character	1	Terminator	Char	**1**
	Bathymetry_Map =	1	Keyword	Char	**17**
	Name of the file containing the bathymetry/topography values used for Jason-1 mission	1	-	Char	**61**
	semicolon mark (;)	1	-	Char	**1**
	newline character	1	Terminator	Char	**1**
	CCSD$$MARKERAUXFILES	1	Keyword	Char	**20**
Data					
CCSDS data label	FCST3IF0011400000001	1	Keyword	char	**20**
		Total			**3856**

5.3. DATA DESCRIPTION

The information included in the data record cover the following areas :

- time tag
- location and surface type
- quality information and sensors status
- orbit
- altimeter range
- altimeter range corrections
- significant waveheight
- significant waveheight corrections
- backscatter coefficient
- backscatter coefficient corrections
- off nadir angle
- brightness temperatures
- geophysical parameters
- environmental parameters
- flags

These information are recorded at 1 and 20 Hz rates. The 20 Hz data are indicated by the number 20 in the "Dim." column of the table below.

Parameter Number	Parameter	Dim.	Unit	Common min. value	Common max. value	Byte length	Type	Total bytes
Time Tag								
1	time stamp 1 (number of days from reference date)	1	day			4	u	4
2	time stamp 2 (seconds within the day)	1	s	0	86 400	4	u	4
3	time stamp 3 (microseconds)	1	µs	0	999 999	4	u	4
Location and surface type								
4	latitude	1	µdeg	-70 000 000	70 000 000	4	s	4
5	longitude	1	µdeg	0	359 999 999	4	u	4
6	surface type (1)	1	-	-	-	1	u	1
7	altimeter echo type (0 = ocean-like , 1 = non ocean-like)	1	-	-	-	1	u	1
8	radiometer surface type (0 = ocean , 1 = land)	1	-	-	-	1	u	1
Quality information and sensors status								
9	quality flag for 1 Hz altimeter data	1	-	-	-	1	u	1
10	quality flag for 1 Hz altimeter instrumental corrections	1	-	-	-	1	u	1
11	quality flag for 1 Hz radiometer data	1	-	-	-	1	u	1
12	altimeter state flag	1	-	-	-	1	u	1
13	radiometer state flag	1	-	-	-	1	u	1
14	orbit state flag	1	-	-	-	1	u	1
15	spare (to be aligned)	3	-	-	-	1	u	3
Orbit								
16	1 Hz altitude of satellite (2)	1	10-4 m	300 000 000	700 000 000	4	u	4
17	differences between altitudes corresponding to the elementary measurements to that of the averaged measurements	20	10-4 m	-80 000	80 000	4	s	80
18	orbital altitude rate	1	cm/s	-1 500	1 500	2	s	2
19	spare (to be aligned)	2	-	-	-	1	u	2
Altimeter range								
20	1 Hz Ku band range (2)	1	10-4 m	300 000 000	700 000 000	4	u	4
21	differences between elementary Ku range and averaged Ku band range	20	10-4 m	-150 000	150 000	4	s	80
22	1 Hz C band range (2)	1	10-4 m	300 000 000	700 000 000	4	u	4
23	differences between elementary C range and averaged C band range	20	10-4 m	-150 000	150 000	4	s	80
24	RMS of the Ku band range	1	10-4 m	0	2 000	2	u	2
25	RMS of the C band range	1	10-4 m	0	3 000	2	u	2
26	number of valid points for Ku band range	1	-	0	20	1	u	1
27	number of valid points for C band range	1	-	0	20	1	u	1
28	spare (to be aligned)	2	-	-	-	1	u	2
29	map of valid points used to compute Ku band range	1	-	-	-	4	u	4
30	map of valid points used to compute C band range	1	-	-	-	4	u	4
Altimeter range corrections								
31	net instrumental correction on Ku band range	1	10-4 m	-120 000	120 000	4	s	4
32	net instrumental correction on C band range	1	10-4 m	-120 000	120 000	4	s	4
33	model dry tropospheric correction	1	10-4 m	-25 000	-22 000	2	s	2
34	model wet tropospheric correction	1	10-4 m	-5 000	0	2	s	2
35	radiometer wet tropospheric correction	1	10-4 m	-5 000	0	2	s	2
36	altimeter ionospheric correction on Ku band	1	10-4 m	-5 000	0	2	s	2
37	Doris iono correction on Ku band	1	10-4 m	-5 000	0	2	s	2
					Sub-total			**322**

(1) the values of this flag are : 0 = open oceans or semi-enclosed seas; 1 = enclosed seas or lakes; 2 = continental ice; 3 = land
(2) a reference offset is subtracted from the 1Hz altitudes and ranges.The reference offset can be found in header

Parameter Number	Parameter	Dim.	Unit	Common min. value	Common max. value	Byte length	Type	Total bytes
38	sea state bias correction in Ku-band	1	10-4 m	-6 000	0	2	s	2
39	sea state bias correction in C-band	1	10-4 m	-6 000	0	2	s	2
40	composite sea state bias correction	1	10-4 m	-6 000	0	2	s	2
Significant waveheight								
41	Ku band significant waveheight	1	10-3 m	0	25 000	2	u	2
42	C band significant waveheight	1	10-3 m	0	25 000	2	u	2
43	RMS of the Ku band significant waveheight	1	10-3 m	0	2 500	2	u	2
44	RMS of the C band significant waveheight	1	10-3 m	0	2 500	2	u	2
45	number of valid points used to compute Ku significant waveheight	1	-	0	20	1	u	1
46	number of valid points used to compute C significant waveheight	1	-	0	20	1	u	1
Significant waveheight corrections								
47	net instrumental correction on Ku band significant waveheight	1	10-3 m	-1 000	1 000	2	s	2
48	net instrumental correction on C band significant waveheight	1	10-3 m	-1 000	1 000	2	s	2
Backscatter coefficient								
49	Ku band backscatter coefficient (1)	1	10-2 dB	0	5 000	2	u	2
50	C band backscatter coefficient (1)	1	10-2 dB	0	5 500	2	u	2
51	RMS of the Ku band backscatter coefficient	1	10-2 dB	0	250	2	u	2
52	RMS of the C band backscatter coefficient	1	10-2 dB	0	250	2	u	2
53	number of valid points used to compute Ku backscatter coefficient	1	-	0	20	1	u	1
54	number of valid points used to compute C backscatter coefficient	1	-	0	20	1	u	1
55	Ku band AGC	1	10-2 dB	0	5 000	2	u	2
56	C band AGC	1	10-2 dB	0	5 500	2	u	2
57	RMS of the Ku band AGC	1	10-2 dB	0	250	2	u	2
58	RMS of the C band AGC	1	10-2 dB	0	250	2	u	2
59	number of valid points used to compute Ku band AGC	1	-	0	20	1	u	1
60	number of valid points used to compute C band AGC	1	-	0	20	1	u	1
Backscatter coefficient corrections								
61	net instrumental correction on Ku band backscatter coefficient	1	10-2 dB	-1 000	1 000	2	s	2
62	net instrumental correction on C band backscatter coefficient	1	10-2 dB	-1 000	1 000	2	s	2
63	atmospheric attenuation correction on Ku band backscatter coefficient	1	10-2 dB	0	50	2	s	2
64	atmospheric attenuation correction on C band backscatter coefficient	1	10-2 dB	0	50	2	s	2
Off nadir angle								
65	square of the off nadir angle computed from Ku waveforms	1	10-4 deg2	0	900	2	u	2
66	square of the off nadir angle computed from platform data	1	10-4 deg2	0	900	2	u	2
Brightness temperatures								
67	18,7 GHz brightness temperature (2)	1	10-2 K	11 000	23 000	2	u	2
68	23,8 Ghz brightness temperature (2)	1	10-2 K	13 000	25 000	2	u	2
69	34 GHz brightness temperature (2)	1	10-2 K	15 000	26 000	2	u	2
					Sub-total			**380**

(1) backscatter coefficients are corrected for atmospheric attenuations
(2) these brightness temperatures are unsmoothed

Parameter Number	Parameter	Dim.	Unit	Common min. value	Common max. value	Byte length	Type	Total bytes
Geophysical parameters								
70	mean sea surface height	1	10-4 m	-1 500 000	1 500 000	4	s	4
71	TP along-track mean sea surface	1	10-4 m	-1 500 000	1 500 000	4	s	4
72	geoid height	1	10-4 m	-1 500 000	1 500 000	4	s	4
73	ocean depth/land elevation	1	m	-10 000	10 000	2	s	2
74	inverted barometer height correction	1	10-4 m	-3 000	3 000	2	s	2
75	High frequency fluctuations of the sea surface topography	1	10-4 m	-3 000	3 000	2	s	2
76	spare (to be aligned)	2	-	-	-	1	u	2
77	geocentric ocean tide height (solution 1) (1)	1	10-4 m	-50 000	50 000	4	s	4
78	geocentric ocean tide height (solution 2) (1)	1	10-4 m	-50 000	50 000	4	s	4
79	equilibrium long-period ocean tide height	1	10-4 m	-2 000	2 000	2	s	2
80	non-equilibrium long-period ocean tide height	1	10-4 m	-2 000	2 000	2	s	2
81	loading tide height for geocentric ocean tide solution 1	1	10-4 m	-2 000	2 000	2	s	2
82	loading tide height for geocentric ocean tide solution 2	1	10-4 m	-2 000	2 000	2	s	2
83	solid earth tide height	1	10-4 m	-3 000	3 000	2	s	2
84	geocentric pole tide height	1	10-4 m	-200	200	2	s	2
Environmental parameters								
85	U component of the model wind vector	1	cm/s	-2 500	2 500	2	s	2
86	V component of the model wind vector	1	cm/s	-2 500	2 500	2	s	2
87	altimeter wind speed	1	cm/s	0	2 500	2	u	2
88	radiometer wind speed	1	cm/s	0	2 500	2	u	2
89	radiometer water vapour content	1	10-2g/cm2	0	700	2	s	2
90	radiometer liquid water	1	10-2kg/m2	0	200	2	s	2
Flags								
91	ECMWF meteorological map availability	1	-	-	-	1	u	1
92	radiometer brightness temperatures interpolation flag	1	-	-	-	1	u	1
93	rain flag (0 : OK, 1 : rain)	1	-	-	-	1	u	1
94	ice flag (0 : OK, 1 : ice)	1	-	-	-	1	u	1
95	interpolation flag	1	-	-	-	1	u	1
96	spare (to be aligned)	3	-	-	-	1	u	3
					Total			**440**

5.4. ESTIMATED PRODUCT SIZE

The estimated product size of the Interim Geophysical Data Record product is determined as follows :

Header : 3 856 bytes

Data : 440 bytes * 3373 = 1 484 120 bytes

Total : 1 487 976 bytes

These values are based on the following assumptions :

- Jason-1 orbit duration is 6745 seconds,
- One IGDR product per half orbit (~ 3373 seconds)
- One data record per second

(1) includes the loading tide height

5.5. FLAG DESCRIPTION

Here below is given the definition regarding the following flags :

- quality flag for the 1 Hz altimeter data
- quality flag for the 1 Hz instrumental correction on altimeter data
- quality flag for the 1 Hz radiometer data
- altimeter state flag
- radiometer state flag
- orbit state flag
- ECMWF meteorological map availability
- radiometer brightness temperatures interpolation flag
- interpolation flag

The first three flags are issued from the "Control Processing" which is run after the "OFL IGDR production processing". The controls basically consist of a comparison of the altimeter parameters to thresholds. The values of the thresholds will be tuned for ocean surface.

Quality flag for the 1 Hz altimeter data

This flag is defined on one byte and given in the table below :

Bits	**Indicator** (0 = Good and 1 = Bad)
0	Ku band range
1	C band range
2	Ku band SWH
3	C band SWH
4	Ku band backscatter coefficient
5	C band backscatter coefficient
6	off nadir angle from Ku band waveform parameters
7	off nadir angle from platform

Quality flag for the 1 Hz instrumental correction on altimeter data

This flag is defined on one byte. Content is given in the table below :

Bits	**Indicator** (0 = Good and 1 = Bad)
0	Ku band range instrumental correction
1	C band range instrumental correction
2	Ku band SWH instrumental correction
3	C band SWH instrumental correction
4	Ku band backscatter coefficient instrumental correction
5	C band backscatter coefficient instrumental correction
6	spare
7	spare

Quality flag for the 1 Hz radiometer data

This flag is defined on one byte. Content is given in the table below :

Bits	**Indicator** (0 = Good and 1 = Bad)
0	18,7 Ghz brightness temperature
1	23,8 Ghz brightness temperature
2	34 Ghz brightness temperature
3	spare
4	spare
5	spare
6	spare
7	spare

Altimeter state flag

This flag is defined on one byte. Content is given in the table below :

Bits	Indicator
0	Spare
1	Altimeter operating (0 = side A (nominal POSEIDON-2 altimeter), 1 = side B (redondancy))
2	Reception bandwidth inversion (0 = No reversed, 1 = reversed)
3	Spectrum coding (0 = I and Q, 1 = $I^2 + Q^2$)
4	C bandwidth (0 = 320 Mhz; 1 = 100 MHz)
5	Ku/C band sequencing (0 = 3Ku-1C-3Ku , 1 = 2Ku-1C-2Ku)
6	Ku band status (0 = on , 1 = off)
7	C band status (0 = on , 1 = off)

Radiometer state flag

This flag is defined on one byte and is TBD. It contains at least the radiometer operating (nominal or redondancy).

Orbit state flag

This flag is defined on one byte and is TBD. It contains at least the Doris sensor operating (nominal or redondancy) and a quality orbit indicator.

ECMWF Meteorological map availablity

This flag is defined on one byte. Possible values are:

0 meaning "2 maps, nominal" (six hours apart)

1 meaning "2 maps, degraded" (more than six hours apart)

2 meaning "1 map" (extrapolation used)

3 meaning "no map"

Radiometer brightness temperatures interpolation flag

This flag is defined on one byte. Possible values are:

0 meaning "good" (no gap between JMR data)

1 meaning "interp" (gap between JMR data)

2 meaning "extrap" (extrapolation used)

3 meaning "fail" (extrapolation and interpolation failed)

Interpolation flag

This flag is defined on one byte. Content is given in the table below :

Bits	**Indicator** (0 = Good and 1 = Bad)
0	MSS interpolation flag
1	ocean tide solution 1 interpolation flag
2	ocean tide solution 2 interpolation flag
3	meteorological data interpolation flag
4	spare
5	spare
6	spare
7	spare

6. GDR

6.1. GENERAL DESCRIPTION

The GDR product is an OFL Level 2 product which is identical to the IGDR except for the following points :

- a more precise orbit is used
- improved pole location data are used
- it is a fully validated product

The reader is invited to read the description of the IGDR product.

6.2. HEADER DESCRIPTION

Same content as the one given in IGDR section except for fields :

- “Product Name” where value is set to JA1_GDR_2PvPccc_ppp.CNES or JA1_GDR_2PvPccc_ppp.NASA,
- “Data_Type” where value is set to **GDR**

6.3. DATA DESCRIPTION

See description given in IGDR section

6.4. ESTIMATED PRODUCT SIZE

See estimated product given in IGDR section

6.5. FLAG DESCRIPTION

See description given in IGDR section

7. SGDR

7.1. GENERAL DESCRIPTION

The SGDR product is an OFL Level 2 product which is the GDR to which tracker data, instrumental corrections and waveform data have been added to allow expert users to retrack the waveforms.

As for the GDR the reader is invited to read the description of the IGDR product for the description of the GDR part of this product.

7.2. HEADER DESCRIPTION

Same content as the one given in IGDR section except for fields :

- "Product Name" where value is set to JA1_SDR_2PvPccc_ppp.CNES or JA1_SDR_2PvPccc_ppp.NASA,
- "Data_Type" where value is set to **SGDR**,
- "CCSDS data label" where value is set to **FCST3IF0011500000001**

7.3. DATA DESCRIPTION

For the GDR part, see description given in IGDR section. Below are given the tracker data, the instrumental corrections and the waveform data that are added to the GDR product. These data are provided at 1 Hz and 20 Hz rate.

Parameter Number	Parameter	Dim.	Unit	Common min. value	Common max. value	Byte length	Type	Total bytes
Tracker Data								
97	Relative tracker Ku band range (1)	20	10-4 m	300 000 000	700 000 000	4	u	80
98	Relative tracker C band range (1)	20	10-4 m	300 000 000	700 000 000	4	u	80
99	K_Cal_Ku factor for Ku band backscatter coefficient (2)	20	10-2 dB	TBD	TBD	4	s	80
100	K_Cal_Ku factor for C band backscatter coefficient (2)	20	10-2 dB	TBD	TBD	4	s	80
Instrumental Corrections								
101	USO frequency correction on altimeter range	1	10-4 m	TBD	TBD	2	u	2
102	Ku internal path delay correction on altimeter range	1	10-4 m	TBD	TBD	2	u	2
103	C internal path delay correction on altimeter range	1	10-4 m	TBD	TBD	2	u	2
104	Ku-band modeled instrumental correction on altimeter range	1	10-4 m	TBD	TBD	2	u	2
105	C-band modeled instrumental correction on altimeter range	1	10-4 m	TBD	TBD	2	u	2
106	Ku Doppler correction on altimeter range	1	10-4 m	TBD	TBD	2	u	2
107	C Doppler correction on altimeter range	1	10-4 m	TBD	TBD	2	u	2
108	Centre of gravity correction on altimeter range	1	10-4 m	TBD	TBD	2	u	2
109	Ku-band modeled instrumental correction on significant waveheight	1	10-4 m	TBD	TBD	2	u	2
110	C-band modeled instrumental correction on significant waveheight	1	10-4 m	TBD	TBD	2	u	2
111	Ku AGC correction on AGC	1	10-2 dB	TBD	TBD	2	u	2
112	C AGC correction on AGC	1	10-2 dB	TBD	TBD	2	u	2
113	Ku internal calibration correction on backscatter coefficient	1	10-2 dB	TBD	TBD	2	u	2
114	C internal calibration correction on backscatter coefficient	1	10-2 dB	TBD	TBD	2	u	2
115	Ku-band modeled instrumental correction on backscatter coefficient	1	10-2 dB	TBD	TBD	2	u	2
116	C-band modeled instrumental correction on backscatter coefficient	1	10-2 dB	TBD	TBD	2	u	2
Waveforms								
117	Ku band samples (2)	20*104	10-2 u	0	20 000	4	u	8320
118	C band samples (320 MHz) (2) (3)	20*104	10-2 u	0	20 000	4	u	8320
					Sub-total			**16992**
					SGDR record size			**17432**

The gate at half point of the leading edge is located at :

- gate 31 for a waveform with 320 MHz bandwidth (104 samples from 0 to 103)
- gate 13 for a waveform with 100 MHz bandwidth (40 samples from 0 to 39)

(1) instrumental corrections are applied to the altimeter parameters but not the Doppler effect

(2) instrumental corrections are applied to the altimeter parameters (waveforms are corrected for the low pass filter effects)

(3) 40 samples instead of 104 samples when the 100 MHz bandwidth is used for the C frequency (from samples 0 to 39 followed with 64 default values)

7.4. ESTIMATED PRODUCT SIZE

The estimated product size of the Sensor Geophysical Data Record product is determined as follows :

Header : 3 856 bytes

Data : (440+16992) bytes * 3373 = 58 798 136 bytes

Total : 58 801 992 bytes

These values are based on the following assumptions :

- Jason-1 orbit duration is 6745 seconds,
- One SGDR product per half orbit (~ 3373 seconds)
- One data record per second

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