CRYOSAT Ground Segment

Cryosat Ocean Processor

CryoSat Ocean NetCDF Product Format Specification (L1b&L2)

[PFS-OCE]

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2.0draft		22/07/2016	Accounting for 2nd collocation meeting	All
1.0	R	29/07/2016	First Official Issue	All
1.1	R	19/09/2016	Implementation of ESA's comments	
1.2	R	22/03/2017	Implementation of ESA's comments, before COP CONFORM final AR	All
2.0	R	03/04/2017	Introduction of the L1b SAR and SARin products merging SAR (or SARin) figures with PLRM figures	Sections 2.1, 2.3, 3.1 and 3.3 Appendix A
2.1	R	11/05/2017	Update of L1b SAR and SARin merge products: use of "hr" suffix for HR, instead of use of "plrm" suffix" for PLRM	
3.0	R	06/06/2017	Generic improvement of the text Description of the P2P products Conventions used for the variable names explained Explanation of the use of the indices between 1Hz and 20 Hz measurements L1b variable names and long_names have been reviewed COG has been replaced with CoM in the "long_name" and "comment" attributes "long_name" of L2 HR variables reviewed L2 20 Hz Variables flag_instr_op_mode_20_plrm_ku and	Section 2.1 Section 2.1 and section 5 added. Section 2.4 added Section 2.5 Section 3.1, 3.3.22, 3.3.40 and Appendix A Section 3.1.1, 3.1.3, 3.1.4, 3.3.8, 3.3.10, 4.1.1, 4.1.5, 4.3.7, 4.3.69 -> 4.3.72, 4.3.79 -> 4.3.82 Section 3.3 Section 4.1.1, 4.1.2, 4.3.10 and 4.3.11

			flag_instr_op_mode_20_ku have been added L2 20 Hz Variables time_1hz_20_ku and time_1hz_20_plrm_ku have been added	 Section 4.1.1, 4.1.2, 4.3.135 and 4.3.136
3.1	R	21/09/2017	General improvement for V3.10 CLS COP delivery	Section 3: - off_nadir_pitch_angle_str_20_ku, off_nadir_roll_angle_str_20_ku, off_nadir_yaw_angle_str_20_ku, flag_instr_conf_rx_str_in_use_20_ku, flag_instr_mode_att_ctrl_20_ku variables suppressed in L1B product Section 3.3 added Section 4: - Fix for plrm variables. Comment modified to have "Not provided in LRM" in place of "Set to FillValue in LRM" Section 4.3 added

TABLE OF CONTENTS

1 INTRODUCTION

This document specifies the NetCDF format of the Level-1b and Level-2 Near-Real Time (NOP), Intermediate (IOP) and Geophysical (GOP) Ocean Products generated by the CryoSat ocean processing chains.

1.1 PURPOSE AND SCOPE

The purpose of the document is to specify the NetCDF product structure and content of the Level-1b and Level 2 products generated by the CryoSat ocean processing.

Since the beginning of the mission (2010), all CryoSat products had been generated in EE (Earth Explorer) a bespoke format devised for the CryoSat products at the time of the CryoSat-1 mission and derived from the ENVISAT products format with the purpose to maximise the reuse of decoding/analysis tools developed for this mission.

In 2015 the Agency decided to migrate from this Earth Explorer format to the more flexible and up-to-date NetCDF model for those products that are intended to be distributed to the users.

This new format is called CONFORM (CryOsat Netcdf FORMat) and is applicable to the whole CryoSat ocean production.

1.2 DOCUMENT STRUCTURE

The document includes the following sections:

Section 1 – Introduction	Introduction to the whole document
Section 2 - General Overview	This section gives an overview of the CryoSat ocean production as well as a short introduction to the NetCDF.
Section 3 - Level-1b Format Description	This section contains the specification of the L1b ocean CONFORM products. In particular: • section 3.1 lists the variables of the L1b products and links each of them to the relevant CDL dump • section 3.2 lists the variables of the products and links each of them to the relevant CDL dump • section 3.3 contains the CDL dump of each variable • section 3.4 specifies the global attributes of each product
Section 4 - Level 2 Format Description	This section contains the specification of the L2 ocean CONFORM products. In particular: • section 4.1 lists the variables of the L2 products and links each of them to the relevant CDL dump • section 4.2 lists the variables of the products and links each of them to the relevant CDL dump • section 4.3 contains the CDL dump of each variable • section 4.4 specifies the global attributes of each product
Section 5- CryoSat Ocean CONFORM Products	Here is the list of CONFORM ocean products
Appendix A – Variables to Products Mapping	In this section there is the variable name list alphabetically ordered and for each variable it is shows in which product types it can be used
Appendix B : Default Setting of the Attribute: _FillValue	In this section the list of _FillValues for each variable type is listed

Appendix C: Timestamps Data Type	In this section it is demonstrated that the timestamps used in the CONFORM products are reliable till January 2034
Appendix D - EE to NetCDF Migration	This section contains a short description of the general rules followed to migrate from the EE format to CONFORM

1.3 APPLICABLE & REFERENCE DOCUMENTS

1.3.1 Applicable Documents

Document Title	Identifier	Reference
CCN #3: CONFORM [IPF1-CCN3] Issue 1.0	C2-CN-ACS-GS-5343	[CCN3-TN]
Minute of CCN#3 and CCN#4 KO meeting	C2-MN-ACS-GS-5248	[CCN3-KO]

1.3.2 Reference Documents

Document Title	Identifier	Reference
IEEE Standard for Binary Floating-Point Arithmetic. ANSI/IEEE Std 754-1985 Institute of Electrical and Electronics Engineers Issued 1985	IEEE-754	[IEEE]
CCSDS Recommendation Time Code Formats Blue Book Issue 2.0, April 1990	CCSDS 301.0-B-2	[CCSDS-TIMEGUIDE]
IOP & GOP Product Format Specification	C2-RS-ACS-ESL-5213	[COP-FMT]

1.4 ACRONYMS AND ABBREVIATIONS

AGC	Automatic Gain Control
CAL	Calibration
CCSDS	Consultative Committee for Space Data Systems
CONFORM	CryOsat Necdf FORMat
DSR	Data Set Record
EE	Earth Explorer
EO	Earth Observation
ESA	European Space Agency
FBR	Full Bit Rate
GOP	Geophysical Ocean Product
ID	IDentifier
I/O	Input/Output
IOP	Intermediate Ocean Product
IPF	Instrument Processing Facility
ISP	Instrument Source Packet
L1B	Level 1B
LRM	Low Rate Mode
MDS	Measurement Data Set
MJD	Modified Julian Day
MPH	Main Product Header
NetCDF	Network Common Data Form
NOP	Near-real-time Ocean Product
NPM	Noise Power Measurement
PDS	Payload Data System
PLRM	Pseudo LRM
PTR	Point Target Response
SIRAL	Synthetic Interferometric Radar ALtimeter
SOW	Statement Of Work
SPH	Specific Product Header
TAI	International Atomic Time Reference
TBC	To Be Clarified
TBD	To Be Defined
TRK	TRaKing
UTC	Universal Time Co-ordinates
XML	eXtensible Markup Language
WGS84	World Geodetic System 1984

2 GENERAL OVERVIEW

2.1 OVERVIEW OF THE CRYOSAT OCEAN PRODUCTION

The CryoSat ocean chains process SIRAL instrument Level 0 LRM, SAR and SARin products to generate L1b and L2 ocean products by applying the processing algorithms specified for the ocean.

The ocean processing chains provide three classes of products sorted according to their delivering latency:

- **Near-Real Time Ocean Products (NOP)** – delivered three hours after acquisition
- **Intermediate Ocean Products (IOP)** – delivered 48 hours after acquisition
- **Geophysical Ocean Products (GOP)** – delivered one month after acquisition

The processing applied to generate these products is the same and the only difference lies in the different types of auxiliary files (i.e. corrections and orbit) used for the generation: the shorter the latency, the poorer the accuracy of the orbit used for the generation.

All these products are further classified according to processing level (L1b and L2) and the acquisition mode (LRM, SAR and SARin) and therefore the total ocean production consists of the following products:

- **L1b Ocean Products – nine products:**
  - **L1b LRM (NOP, IOP and GOP)** containing LRM measurements and data
  - **L1b SAR (NOP, IOP and GOP)** containing PLRM (data acquired in SAR mode and reduced to a sequence of LRM-like echoes) and SAR measurements and data
  - **L1b SARin (NOP, IOP and GOP)** containing PLRM (data acquired in SARin mode and reduced to a sequence of LRM-like echoes) and SARin measurements and data

- **L2 Ocean Products – nine products:**
  - **L2 LRM (NOP, IOP and GOP)** containing LRM measurements and data
  - **L2 SAR (NOP, IOP and GOP)** containing PLRM and SAR measurements and data
  - **L2 SARin (NOP, IOP and GOP)** containing PLRM and PSAR (i.e. the two SARin channels data averaged in the L1b processing and retracked as SAR data in the L2 processing) measurements and data

Beside the products listed above, one more set of L2 products is generated by the CryoSat Ocean Chains and they are the pole to pole products, i.e. multi-mode L2 products with a half-orbit coverage (from one pole to the other): LRM, SAR and SARin L2 products are concatenated into a single P2P product.

Accordingly, the list of products has to be completed with:

❒ **Pole to Pole Ocean Products – two products:**

- **IOP P2P** containing LRM, SAR and SARin L2 IOP data and covering half an orbit.
- **GOP P2P** containing LRM, SAR and SARin L2 GOP data and covering half an orbit.

NOP P2P products do not exist because of the three hours latency constraint.

The complete set of the L1b and L2 CryoSat Ocean Product and their dependencies is depicted in figure 2.1-1 where each product is identified by the following file types:.

The following table provides the Product Identification for each CONFORM product generated by the IPF1.

Product Identification	Description
SIR_NOPM1B	NRT L1B LRM Ocean Product
SIR_NOPR1B	NRT L1B SAR Ocean Product
SIR_NOPN1B	NRT L1B SARin Ocean Product
SIR_IOPM1B	Intermediate L1B LRM Ocean Product
SIR_IOPR1B	Intermediate L1B SAR Ocean Product
SIR_IOPN1B	Intermediate L1B SARin Ocean Product
SIR_GOPM1B	Geophysical L1B LRM Ocean Product
SIR_GOPR1B	Geophysical L1B SAR Ocean Product
SIR_GOPN1B	Geophysical L1B SARin Ocean Product
SIR_NOPM_2	NRT L2 LRM Ocean Product
SIR_NOPR_2	NRT L2 SAR Ocean Product
SIR_NOPN_2	NRT L2 SARin Ocean Product
SIR_IOPM_2	Intermediate L2 LRM Ocean Product
SIR_IOPR_2	Intermediate L2 SAR Ocean Product
SIR_IOPN_2	Intermediate L2 SARin Ocean Product
SIR_GOPM_2	Geophysical L2 LRM Ocean Product
SIR_GOPR_2	Geophysical L2 SAR Ocean Product
SIR_GOPN_2	Geophysical L2 SARin Ocean Product
SIR_IOP_2_	Intermediate L2 Pole-to-Pole Ocean Product
SIR_GOP_2_	Geophysical L2 Pole-to-Pole Ocean Product

Table 3-1: CryoSat Ocean CONFORM products list

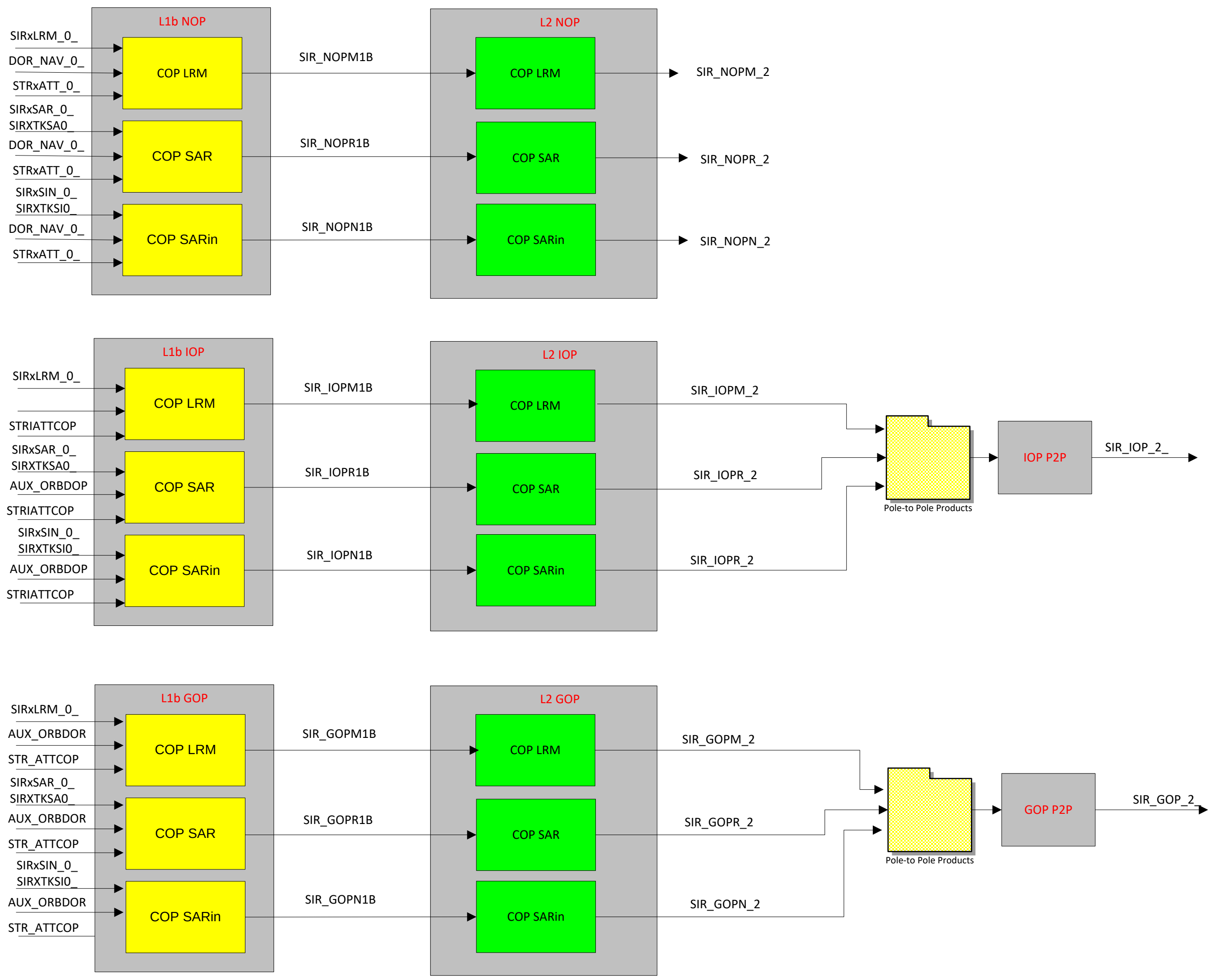

Figure 2.1-1 The CryoSat Ocean Products

2.2 CRYOSAT OCEAN PRODUCTS FILE NAMES

The file name of each CryoSat Ocean Product is built up as follows:

MM_CCCC_TTTTTTTTTT_yyyymmddThhmmss_YYYYMMDDTHHMMSS_bvvv.nc

where

MM is the mission identifier **CS** for CryoSat

CCCC is the file class (i.e.: OPER for routine operation, NRT_ for Near Real Time, RPRO for Reprocessing, TEST for Testing or TIxx for stand alone IPF1 testing associated to Test Data Sets tagged as Tixx, LTA_ for products generated in the Long Term Archive).

TTTTTTTTTT is the file type and corresponds to the Product ID of the Table 3-1

yyyymmddThhmmss is the validity start time and corresponds to the time of the first valid record stored in the Interim FBR.

YYYYMMDDTHHMMSS is the validity stop time and correspond to time of the last valid record stored in the Interim FBR.

b is the baseline identifier as read-in from the PCONF

vvv is the version number

For example, in case of an operational Intermediate L1B Ocean product of the SIRAL instrument in baseline C and version 1 the name could be:

CS_OPER_ SIR_IOP1B_20170624T075728_20170624T080231_C001.nc

2.3 OVERVIEW OF THE NETCDF

NetCDF (Network Common Data Form) is a set of software libraries and self-describing, machine-independent data formats that support the creation, access, and sharing of array-oriented scientific data.

The version of the NetCDF libraries used for the CryoSat ice production is **NetCDF-4 CF compliant** and consists of the following elements:

- DIMENSIONS:
  A dimension is used to represent a real physical dimension (for example, time, latitude, longitude, and height) or to index other quantities (for example number of records or waveforms or samples). A dimension can also be used to index other quantities (waveforms index for example).
  A NetCDF dimension has both a name and a length and can be limited or unlimited (i.e. a dimension that can be appended to).

- VARIABLES:
  Variables are used to store the bulk of the data in a NetCDF dataset. A variable represents an array of values of the same type. A scalar value is treated as a 0-dimensional array. A variable has a name, a data type, and a shape described by its list of dimensions specified when the variable is created. A variable may also have associated attributes, which may be added, deleted or changed after the variable is created.

- COORDINATE VARIABLES:
  A variable can have the same name as a dimension and in this case the variable is called a coordinate variable. It typically defines a physical coordinate corresponding to that dimension. If a dimension has a corresponding coordinate variable, then this provides an alternative, and often more convenient, means of specifying position along it. Current application packages that make use of coordinate variables commonly assume they are numeric vectors and strictly monotonic (all values are different and either increasing or decreasing).

- ATTRIBUTES:
  Attributes are used to store information about the data (ancillary data or metadata). Most attributes provide information about a specific variable. These are identified by the name (or ID) of that variable, together with the name of the attribute.

- GLOBAL ATTRIBUTES:
  Some attributes provide information about the dataset as a whole and are called global attributes. In particular, the global attributes used in the CryoSat products contains the information that were present in the EE header (see [PROD-FMT])

2.4 CRYOSAT NETCDF VARIABLE NAME CONVENTIONS

The names of the CryoSat NetCDF variables are as much as possible self-explaining and a specific effort has been done to align them to the same kind of variables used in other current and future altimetric missions (e.g. Sentinel 3 and Sentinel 6/Jason-CS).

Moreover, the following template has been used for the ***L1b variables*** names:

variable_name_F1_F2_F3

where:

- Variable_name is a self-explaining name for the variable. This lowercase name can contain underscores and numbers (e.g. *cor2_applied*) and it is mandatory
- F1: this field can be **01** or **20** to state whether the variable is a 1-Hz or a 20-Hz variable (e.g. *cor2_applied_20*) and it is mandatory
- F2: this field can only hold **hr** (i.e. high resolution) and it is used for the variables computed by processing native SAR or SARin waveforms. This suffix is not used for variable computed with PLRM waveforms and it is therefore optional. Example: *cor2_applied_20* or *cor2_applied_20_hr*
- F3: this field can only hold **ku** and it is used flag variable computed with data coming from the satellite (Ku-band) and therefore it is optional. Example: *cor2_applied_20_ku* or *cor2_applied_20_hr_ku* but *wind_speed_mod_v_01*

The conventions used for ***L2 variables*** names are alike but not exactly the same. In this case the convention is:

variable_name_F1_F4_F3

where:

- Variable_name is a self-explaining name for the variable. This lowercase name can contain underscores and numbers (e.g. *lon*) and it is mandatory
- F1: this field can be **01** or **20** to state whether the variable is a 1-Hz or a 20-Hz variable (e.g. *lon_20*) and it is mandatory
- F4: this field can only hold **plrm** and it is used for the variables computed by processing PLRM L1 data. This suffix is not used for variable computed with high resolution (SAR/SARin) L1b variables and it is therefore optional. Example: *lon_20* or *lon_20_plrm*
- F3: this field can only hold **ku** and it is used flag variable computed with data coming from the satellite (Ku-band) and therefore it is optional. Example: *lon_20 _ku* or *lon_20_plrm_ku* but *wind_speed_mod_v_01*

2.5 NETCDF PRIMITIVES

2.5.1 Dimensions and Indices

The following **dimensions** are used in the CryoSat ocean CONFORM L1b products:

Dimensions					
Name	Description	Size	Units	Type	Limited/ Unlimited
time_01	Timestamp of the 1Hz power waveforms	Number of 1 Hz measurements in the product file	UTC seconds since 2000-01-01 00:00:00.0	double	Limited
time_20_hr_ku	Timestamp of the 20Hz high resolution power waveforms	Number of 20 Hz HR measurements in the product file	TAI seconds since 2000-01-01 00:00:00.0	double	Limited
time_20_ku	Timestamp of the 20Hz power waveforms	Number of 20 Hz measurements in the product file	UTC seconds since 2000-01-01 00:00:00.0	double	Limited
ns_20_hr_ku	Number of samples in one high resolution waveform	Number of samples in one HR waveform	count	short	Limited
ns_20_ku	Number of samples in one low resolution waveform	Number of samples in one LR waveform	count	short	Limited
space_3d	3 dimensions of space (x,y,z)	3	count	short	Limited

The following **dimensions** are used in the CryoSat ocean CONFORM L2 products:

Dimensions					
Name	Description	Size	Units	Type	Limited/ Unlimited
time_01	Timestamp of the 1Hz measurements	Number of 1 Hz measurements in the product file	UTC seconds since 2000-01-01 00:00:00.0	double	Limited
time_20_ku	Timestamp of the 20Hz measurements	Number of 20 Hz measurements in the product file	UTC seconds since 2000-01-01 00:00:00.0	double	Limited
time_20_plrm_ku	Timestamp of the 20Hz low resolution measurements	Number of 20 Hz low resolution measurements in the product file	TAI seconds since 2000-01-01 00:00:00.0	double	Limited

The following **indices** are used in the CryoSat ocean products:

Indices			
Name	Description	L1b	L2
ind_first_meas_20hz_01	Index of the first 20Hz measurement of the 1Hz packet	x	x
ind_first_meas_20hz_01_plrm_ku	Index of the first 20Hz PLRM measurement of the 1Hz packet		x
ind_meas_1hz_20_ku	Index of the 1Hz measurement to which belongs the 20Hz measurement	x	x
ind_meas_1hz_20_plrm_ku	Index of the 1Hz measurement to which belongs the 20Hz PLRM measurement		x

2.5.2 **Types**

The following **types** are used in the CryoSat ocean CONFORM products:

Types	
Name	Description
byte	8-bit data signed
short	16-bit signed integer
int	32-bit signed integer
double	IEEE double precision floating point (64 bits)

2.5.3 **Attributes**

The following **attributes** are used in the CryoSat ocean CONFORM products:

Attributes	
Name	Description
add_offset	If present, this number is to be added to the date after it is read by an application. If both *scale_factor* and *add_offset* attributes are present, the date are first scaled before the offset is added.
calendar	Reference time calendar
comment	Miscellaneous information about the data or the methods used to produce it
coordinates	Identified auxiliary coordinates variables
_FillValue	A value used to represent missing or undefined data
flag_meanings	Use in conjunction with flag_values to provide descriptive words or phrase for each flag value.
flag_values	Provide a list of the flag values. Use in conjunction with *flag_meanings*.
flag_mask	Provide a list of number of independent Boolean conditions using bit field notation. Use in conjunction with *flag_meanings*.
institution	Institution which provides the data
long_name	A descriptive name that indicates a variable's content. This name is not standardized.
quality_flag	Name of the variable(s) (quality flag) representing the quality of the current variable
scale_factor	If present, the date is to be multiplied by this factor after the data are read by an application. See also *add_offset* attribute
source	Data source (model features, or observation)
standard_name	A standard name that references a description of a variables' content in the standard name table.
tai_utc_difference	Difference between TAI and UTC reference time
units	Unit of a variable's content. The value of this attribute must be a string that can be recognized by the UNIDATA's Udunits package.

3 L1B PRODUCT FORMAT SPECIFICATION

3.1 L1B PRODUCT FORMAT SPECIFICATION – LIST OF VARIABLES

The contents of the CryoSat science ocean products can be logically grouped in:

1. 20-Hz Time and Orbit
2. 20-Hz Measurements
3. 1-Hz Time and Orbit
4. 1-Hz Corrections
5. 20-Hz-Waveforms

This logical classification could be implemented in the NetCDF 4.0 model by means of a specific structure called **group**, however this feature is not used in the CryoSat products because users could be forced to update their existing analysis/visualisation tools in order to keep up with these new NetCDF features.

Nevertheless the logic behind this grouping is kept in the definition of the products and the remaining of this section will follow this hierarchy for the format specification.

3.1.1 **20-Hz Time and Orbit**

20-Hz Time and Orbit				
Variable Name	**Dimension**	**long_name**	**units**	**EE Field**
time_20_ku	time_20_ku	UTC: 20 Hz	s	20-Hz Data Record Time (MDSR Time Stamp)
time_20_hr_ku	time_20_hr_ku	TAI: 20 Hz	s	/
ind_meas_1hz_20_ku	time_20_ku	index of the 1Hz measurement: 20 Hz	count	/
flag_instr_op_mode_20_ku	time_20_ku	mode id - operative mode : 20 Hz	FLAG	/
flag_instr_ op_mode_20_hr_ku	time_20_hr_ku	mode id - operative mode : 20 Hz from HR data	FLAG	20-Hz Mode ID
flag_instr_mode_att_ctrl_20_hr_ku	time_20_hr_ku	mode id -platform attitude control: 20 Hz from HR data	FLAG	/
flag_instr_mode_flags_20_hr_ku	time_20_hr_ku	mode id - identifies the siral instrument measurement mode from HR data	FLAG	/
seq_count_20_ku	time_20_ku	sequence counter: 20 Hz	count	20-Hz Source Sequence Counter

20-Hz Time and Orbit				
Variable Name	**Dimension**	**long_name**	**units**	**EE Field**
seq_count_20_hr_ku	time_20_hr_ku	sequence counter: 20 Hz from HR data	count	/
flag_instr_conf_rx_in_use_20_ku	time_20_ku	instrument configuration flag - rx chain in use : 20 Hz	FLAG	20-Hz Instrument Configuration
flag_instr_conf_rx_in_use_hr_20_ku	time_20_hr_ku	instrument configuration flag - rx chain in use : 20 Hz from HR data	FLAG	/
flag_instr_conf_rx_bwdt_20_ku	time_20_ku	instrument configuration flag -bandwidth: 20 Hz	FLAG	20-Hz Instrument Configuration
flag_instr_conf_rx_bwdt_20_hr_ku	time_20_hr_ku	instrument configuration flag-bandwidth: 20 Hz from HR data	FLAG	/
flag_instr_conf_rx_trk_mode_20_ku	time_20_ku	instrument configuration flag -tracking mode: 20 Hz	FLAG	20-Hz Instrument Configuration
flag_instr_conf_rx_trk_mode_20_hr_ku	time_20_hr_ku	instrument configuration flag -tracking mode: 20 Hz from HR data	FLAG	/
flag_instr_conf_rx_flags_20_ku	time_20_ku	instrument configuration flag -flags: 20 Hz	FLAG	20-Hz Instrument Configuration

20-Hz Time and Orbit				
Variable Name	**Dimension**	**long_name**	**units**	**EE Field**
flag_instr_conf_rx_flags_20_hr_ku	time_20_hr_ku	instrument configuration flag -flags: 20 Hz from HR data	FLAG	/
rec_count_20_ku	time_20_ku	record counter: 20 Hz	count	20-Hz Burst counter
rec_count_20_hr_ku	time_20_hr_ku	record counter: 20 Hz from HR data	count	/
lat_20_ku	time_20_ku	latitude: 20 Hz	degrees_north	20-Hz Latitude of measurement
lat_20_hr_ku	time_20_hr_ku	latitude: 20 Hz from HR data	degrees_north	/
lon_20_ku	time_20_ku	longitude: 20 Hz	degrees_east	20-Hz Longitude of measurement
lon_20_hr_ku	time_20_hr_ku	longitude: 20 Hz from HR data	degrees_east	/
alt_20_ku	time_20_ku	altitude of CoM above reference ellipsoid[WGS84]: 20 Hz	m	20-Hz Altitude of CoM above reference ellipsoid
alt_20_hr_ku	time_20_hr_ku	altitude of CoM above reference ellipsoid [WGS84] : 20 Hz from HR data	m	/

20-Hz Time and Orbit				
Variable Name	**Dimension**	**long_name**	**units**	**EE Field**
orb_alt_rate_20_ku	time_20_ku	centre of mass altitude rate with respect to the reference ellipsoid [WGS84]: 20 Hz	m/s	20-Hz Instantaneous altitude rate derived from orbit Satellite velocity vector
orb_alt_rate_20_hr_ku	time_20_hr_ku	centre of mass altitude rate with respect to the reference ellipsoid: 20 Hz from HR data	m/s	/
flag_mcd_20_ku	time_20_ku	measurement confidence data: 20 Hz	FLAG	20-Hz Level 1b Measurement Confidence Data (flag word)
flag_mcd_20_hr_ku	time_20_hr_ku	measurement confidence data: 20 Hz from HR data	FLAG	/
flag_instr_conf_rx_str_in_use_20_hr_ku	time_20_hr_ku	instrument configuration flags - star tracker used: 20 Hz form HR data	FLAG	/
inter_base_vec_20_hr_ku	time_20_hr_ku,space_3d	interferometric baseline direction vector in crf from HR data	m	/

20-Hz Time and Orbit				
Variable Name	**Dimension**	**long_name**	**units**	**EE Field**
off_nadir_roll_angle_str_20_hr_ku	time_20_hr_ku	off nadir roll angle derived from star tracker data: 20 Hz from HR data	degrees	/
off_nadir_pitch_angle_str_20_hr_ku	time_20_hr_ku	off nadir pitch angle derived from star tracker data: 20 Hz from HR data	degrees	/
off_nadir_yaw_angle_str_20_hr_ku	time_20_hr_ku	off nadir yaw angle derived from star tracker data: 20 Hz from HR data	degrees	/
ph_diff_waveform_20_hr_ku	time_20_hr_ku,ns_20_hr_ku	l1b Phase Difference waveform	rad	/
sat_vel_vec_20_hr_ku	time_20_hr_ku, space_3d	velocity vector in itrf	m/s	/
beam_dir_vec_20_hr_ku	time_20_hr_ku, space_3d	real beam direction vector in crf	m	/

Table 3.1.1-1 – 20-Hz Time and Orbit Variables

3.1.2 **20-Hz Measurements**

20-Hz Measurements				
Variable Name	**Dimension**	**long_name**	**units**	**EE Field**
window_del_20_hr_ku	time_20_hr_ku	calibrated window delay (2way)	s	/
tracker_range_20_ku	time_20_ku	corrected tracker range: 20 Hz	m	20-Hz Tracker Range
h0_applied_20_ku	time_20_ku	range height initial word (12.5/256 ns): 20 Hz	count	20-Hz H0 Initial Height Word
h0_applied_20_hr_ku	time_20_hr_ku	range height initial word: 20 Hz from HR data	s	/
agc_ch1_20_hr_ku	time_20_hr_ku	agc gain applied on rx channel 1 HR. Gain calibration corrections are applied	dB	/
agc_ch2_20_hr_ku	time_20_hr_ku	agc gain applied on rx channel 2 HR. Gain calibration corrections are applied	dB	/
cor2_applied_20_ku	time_20_ku	range height rate initial word (3.05 ps): 20 Hz	count	20-Hz COR2 Height Rate
cor2_applied_20_hr_ku	time_20_hr_ku	range height rate initial word: 20 Hz from HR data	seconds/rc	/

20-Hz Measurements				
Variable Name	**Dimension**	**long_name**	**units**	**EE Field**
h0_lai_word_20_ku	time_20_ku	coarse range word (12.5 ns): 20 Hz	count	20-Hz Coarse Range word LAI
h0_lai_word_20_hr_ku	time_20_hr_ku	coarse range word (12.5 ns): 20 Hz from HR data	s	/
h0_fai_word_20_ku	time_20_ku	fine range word (12.5/256 ns): 20 Hz	count	20-Hz Fine Range word FAI
h0_fai_word_20_hr_ku	time_20_hr_ku	fine range word (12.5/256 ns): 20 Hz from HR data	s	/
uso_cor_20_ku	time_20_ku	uso correction on the altimeter range (2-way) : 20 Hz	m	20-Hz USO drift correction
uso_cor_20_hr_ku	time_20_hr_ku	uso correction on the altimeter range (2-way) : 20 Hz from HR data	/	/
dop_cor_20_ku	time_20_ku	doppler correction on the altimeter range: 20 Hz	m	20-Hz Doppler correction
dop_cor_20_hr_ku	time_20_hr_ku	doppler correction on the altimeter range: 20 Hz from HR data	m	/

20-Hz Measurements				
Variable Name	**Dimension**	**long_name**	**units**	**EE Field**
instr_cor_range_tx_rx_20_hr_ku	time_20_hr_ku	2-way instrument range correction (tx-rx chain) from HR data	m	/
instr_cor_range_rx_20_hr_ku	time_20_hr_ku	instrument gain correction (rx only chain) from HR data	m	/
instr_cor_gain_tx_rx_20_hr_ku	time_20_hr_ku	instrument gain correction (tx-rx chain) from HR data	dB	/
instr_cor_gain_rx_20_hr_ku	time_20_hr_ku	2-way instrument range correction (rx only chain) from HR data	dB	/
instr_int_ph_cor_20_hr_ku	time_20_hr_ku	internal phase correction computed from the cal-4 from HR data	rad	/
instr_ext_ph_cor_20_hr_ku	time_20_hr_ku	external phase correction taken from the ipfdb file from HR data	rad	/
agc_20_ku	time_20_ku	corrected AGC: 20 Hz	dB	20-Hz AGC
tot_gain_ch1_20_hr_ku	time_20_hr_ku	total fixed gain on channel 1 HR	dB	/
tot_gain_ch2_20_hr_ku	time_20_hr_ku	total fixed gain on channel 2 HR	dB	/
transmit_pwr_20_hr_ku	time_20_hr_ku	transmitted power from HR data	Watt	/

20-Hz Measurements				
Variable Name	**Dimension**	**long_name**	**units**	**EE Field**
scale_factor_20_ku	time_20_ku	scaling factor for backscatter coefficient evaluation: 20 Hz	dB	20-Hz Scaling Factor for Backscatter Coefficient Evaluation
noise_power_20_ku	time_20_ku	noise power measurement: 20 Hz	dB	20-Hz Noise power measurement
noise_power_20_hr_ku	time_20_hr_ku	noise power measurement: 20 Hz from HR data	dB	/
ph_slope_cor_20_hr_ku	time_20_hr_ku	phase slope correction from HR data	rad	/

Table 3.1.2-1 – 20-Hz Measurements Variables

3.1.3 **1-Hz Time and Orbit**

20-Hz Time and Orbit Group				
Variable Name	**Dimension**	**long_name**	**units**	**EE Field**
time_01	time_01	UTC: 1 Hz	seconds since 2000-01-01 00:00:00.0	Data Record Time (MDSR Time Stamp)
ind_first_meas_20hz_01	time_01	index of the first 20Hz measurement: 1 Hz	count	/
num_meas_20hz_01	time_01	number of 20Hz measurements: 1 Hz	count	/
lat_01	time_01	latitude: 1 Hz	degrees_north	Latitude of measurement
lon_01	time_01	longitude: 1 Hz	degrees_east	Longitude of measurement
alt_01	time_01	center of mass altitude of the satellite: 1 Hz	m	Altitude of CoM above reference ellipsoid

20-Hz Time and Orbit Group				
Variable Name	**Dimension**	**long_name**	**units**	**EE Field**
orb_alt_rate_01	time_01	centre of mass altitude rate: 1 Hz	m/s	Instantaneous altitude rate derived from orbit Satellite velocity vector

Table 3.1.3-1 – 1-Hz Time and Orbit Variables

3.1.4 **1-Hz Corrections Group**

1-Hz Corrections				
Variable Name	**Dimension**	**long_name**	**units**	**EE Field**
cog_cor_01	time_01	distance antenna-CoM correction on altimeter range: 1 Hz	m	Distance antenna- CoM
uso_cor_01_ku	time_01	uso correction on the altimeter range (2-way): 1 Hz	m	USO drift correction
dop_cor_01_ku	time_01	doppler correction on the altimeter range: 1 Hz	m	Doppler correction
int_path_cor_01	time_01	internal path correction on the altimeter range: 1 Hz	m	Range internal calibration correction (CAL1)
agc_01_ku	time_01	corrected AGC: 1 Hz	dB	AGC (Corrected)
agc_cor_01	time_01	correction for instrumental errors on AGC: 1 Hz	dB	AGC Correction
internal_cor_sig0_01	time_01	internal calibration correction on the backscatter coefficient: 1 Hz	dB	Backscatter coefficient internal calibration correction (CAL1)

1-Hz Corrections				
Variable Name	**Dimension**	**long_name**	**units**	**EE Field**
mod_dry_tropo_cor_01	time_01	model dry tropospheric correction: 1 Hz	m	Dry Tropospheric Correction
mod_wet_tropo_cor_01	time_01	model wet tropospheric correction: 1 Hz	m	Wet Tropospheric Correction
inv_bar_cor_01	time_01	inverse barometric correction: 1 Hz	m	Inverse Barometric Correction
hf_fluct_cor_01	time_01	inverted barometer height correction: 1 Hz	m	Dynamic Atmospheric Correction
iono_cor_gim_01	time_01	GIM ionospheric correction: 1 Hz	m	GIM Ionospheric Correction
ocean_tide_sol1_01	time_01	geocentric ocean tide height (solution 1): 1 Hz	m	Elastic Ocean Tide
ocean_tide_sol2_01	time_01	geocentric ocean tide height (solution 2): 1 Hz	m	Elastic Ocean Tide
ocean_tide_eq_01	time_01	equilibrium long-period ocean tide height	m	Long Period Ocean Tide
ocean_tide_non_eq_01	time_01	non-equilibrium long-period ocean tide height	m	/

1-Hz Corrections				
Variable Name	**Dimension**	**long_name**	**units**	**EE Field**
load_tide_sol1_01	time_01	load tide height for geocentric ocean tide (solution 1): 1 Hz	m	Ocean Loading Tide
load_tide_sol2_01	time_01	load tide height for geocentric ocean tide (solution 2): 1 Hz	m	Ocean Loading Tide
solid_earth_tide_01	time_01	solid earth tide height: 1 Hz	m	Solid Earth Tide
pole_tide_01	time_01	geocentric tide height: 1 Hz	m	Geocentric Polar Tide
wind_speed_mod_u_01	time_01	U component of the model wind vector: 1 Hz	m/s	U-component of the wind vector
wind_speed_mod_v_01	time_01	V component of the model wind vector: 1 Hz	m/s	V-component of the wind vector
surf_type_01	time_01	surface type: 1 Hz	FLAG	Surface type flag
flag_cor_status_01	time_01	correction status flags: 1 Hz	FLAG	Correction status flags
flag_cor_err_01	time_01	correction error flags: 1 Hz	FLAG	Correction error flags

Table 3.1.4-1 – 1-Hz Corrections Variables

3.1.5 **20-Hz Waveforms**

20-Hz Waveform				
Variable Name	**Dimension**	**long_name**	**units**	**EE Field**
pwr_waveform_20_ku	time_20_ku, ns_20_ku	waveform samples (scaled): 20 Hz	count	20-Hz Scaled Power Echo Waveform [128]
echo_scale_pwr_20_hr_ku	time_20_hr_ku	echo scale power (a power of 2) from HR data	count	/
pwr_waveform_20_hr_ku	time_20_hr_ku, ns_20_hr_ku	l1b power waveform scaled 0-65535 from HR data	count	/
echo_scale_20_ku	time_20_ku	echo scale factor: 20 Hz	count	20-Hz Echo Scale Factor
echo_scale_ 20_hr_ku	time_20_hr_ku	echo scale factor : 20 Hz from HR data	count	/
echo_numval_20_ku	time_20_ku	number of echoes averaged: 20 Hz	count	20-Hz Number of echoes averaged
echo_numval_20_hr_ku	time_20_hr_ku	number of echoes averaged: 20 Hz from HR data	count	/

20-Hz Waveform				
Variable Name	**Dimension**	**long_name**	**units**	**EE Field**
flag_echo_20_hr_ku	time_20_hr_ku	flags for errors or information about L1b 20Hz power waveform from HR data	FLAG	/
flag_trk_cycle_20_ku	time_20_ku	tracking cycle report: 20 Hz	FLAG	20-Hz Flags
flag_trk_cycle_20_hr_ku	time_20_hr_ku	tracking cycle report (as extracted from the L0): 20 Hz from HR data	FLAG	/
dop_angle_start_20_hr_ku	time_20_hr_ku	doppler angle start from HR data	rad	/
dop_angle_stop_20_hr_ku	time_20_hr_ku	doppler angle stop from HR data	rad	/
look_angle_start_20_hr_ku	time_20_hr_ku	look angle start from HR data	rad	/
look_angle_stop_20_hr_ku	time_20_hr_ku	look angle stop from HR data	rad	/
stack_number_after_weighting_20_hr_ku	time_20_hr_ku	number of contributing beams in the stack after weighting from HR data	count	/
stack_number_before_weighting_20_hr_ku	time_20_hr_ku	number of contributing beams in the stack before weighting from HR data	count	/
coherence_waveform_20_hr_ku	time_20_hr_ku	l1b coherence waveform from HR data	count	/

20-Hz Waveform				
Variable Name	**Dimension**	**long_name**	**units**	**EE Field**
stack_std_20_hr_ku	time_20_hr_ku	Gaussian power fitting: std wrt beam number from HR data	count	/
stack_centre_20_hr_ku	time_20_hr_ku	gaussian power fitting: center wrt beam number from HR data	count	/
stack_scaled_amplitude_20_hr_ku	time_20_hr_ku	gaussian power fitting: amplitude from HR data	dB	/
stack_skewness_20_hr_ku	time_20_hr_ku	gaussian power fitting: skewness wrt beam number from HR data	count	/
stack_kurtosis_20_hr_ku	time_20_hr_ku	gaussian power fitting: kurtosis wrt beam number from HR data	count	/
stack_std_angle_20_hr_ku	time_20_hr_ku	gaussian power fitting: std wrt boresight angle from HR data	rad	/
stack_centre_angle_20_hr_ku	time_20_hr_ku	gaussian power fitting: center wrt boresight angle from HR data	rad	/

Table 3.1.5-1 – 20-Hz Waveforms Variables

3.2 L1B PRODUCT FORMAT SPECIFICATION – GLOBAL ATTRIBUTES

The global attributes contains general information about the product and are listed in this section.

The classification of each attribute is adopted for the sake of clarity and to trace each attribute back to the EE Header field where the attribute comes from.

In any real product the attributes are not grouped but simply listed inside the CONFORM product.

Product Identification Information		
Attribute Name	**Description**	**Values**
product_name	Product File Name	any string
processing_stage	Processing stage code identifier.	RPRO = Reprocessing OFFL = Routine Operation NRT_ = Near Real Time TEST = Test LTA_ = Long Term Archive
reference_document	Reference DFCB Document describing the product	any string
acquisition_station	Acquisition station	Kiruna
mission	Mission	
processing_centre	Processing center	

Data Processing Information		
Attribute Name	**Description**	**Values**
creation_time	Processing Time (Product Generation Time)	
sensing_start	Sensing start	
sensing_stop	Sensing stop	
software_version	Processor Name and software version number	

Orbit Information		
Attribute Name	**Description**	**Values**
phase	Phase Code (set to X if not used)	
cycle_number	Cycle Number	
rel_orbit_number	Relative Orbit Number at sensing start time	
abs_orbit_number	Absolute Orbit Number at sensing start time	
state_vector_time	UTC state vector time	
delta_ut1	Universal Time Correction: DUT1 = UT1 – UTC	
x_position	X position in Earth Fixed Reference If not used set to +0000000.000	
y_position	Y position in Earth Fixed Reference If not used set to +0000000.000	

Orbit Information		
Attribute Name	**Description**	**Values**
z_position	Z position in Earth Fixed Reference If not used set to +0000000.000	
x_velocity	X velocity in Earth Fixed Reference If not used set to +0000.000000	
y_velocity	Y velocity in Earth Fixed Reference If not used set to +0000.000000	
z_velocity	Z velocity in Earth Fixed Reference If not used set to +0000.000000	
vector_source	Source of Orbit State Vector Record	fos_predicted doris_navigator doris_precise fos_restituted doris_preliminary

Leap Second Information		
Attribute Name	**Description**	**Values**
leap_utc	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	

Leap Second Information		
Attribute Name	**Description**	**Values**
	CFI EXPLORER_ORBIT library (see [EXPL_ORB-SUM] for details), otherwise it is not set. It corresponds to the time after the Leap Second occurrence (i.e. midnight of the day after the leap second)	
leap_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 not set	
leap_err	This field is always not set considering that CRYOSAT products have true UTC times	

Product Confidence Data Information		
Attribute Name	**Description**	**Values**
product_err	Product Error Flag	1 errors have been reported in the Product 0 no errors

Product Time Information		
Attribute Name	**Description**	**Values**
first_record_time	TAI of the first record in the Main MDS of this product	
last_record_time	TAI of the last record in the Main MDS of this product	

Product Orbit Information		
Attribute Name	**Description**	**Values**
abs_orbit_start	Absolute Orbit Number at sensing start time.	
rel_time_asc_node_start	Relative time since crossing ascending node time relative to start time of data sensing.	
abs_orbit_stop	Absolute Orbit Number at sensing stop time.	
rel_time_asc_node_stop	Relative time since crossing ascending node time relative to stop time of data sensing.	
equator_cross_time	Time of equator crossing at the ascending node relative to the sensing start time.	
equator_cross_long	Longitude of equator crossing at the ascending node relative to the sensing start time (positive East, 0 = Greenwich) referred to WGS84.	
ascending_flag	Orbit Orientation at the sensing start time	A=Ascending D=Descending

Product Location Information		
Attribute Name	**Description**	**Values**
first_record_lat	WGS84 latitude of the first record in the Main MDS (positive north)	

Product Location Information		
Attribute Name	**Description**	**Values**
first_record_lon	WGS84 longitude of the first record in the Main MDS (positive East, 0 = Greenwich)	
last_record_lat	WGS84 latitude of the last record in the Main MDS (positive north	
last_record_lon	WGS84 longitude of the last record in the Main MDS (positive East, 0 = Greenwich)	

SIRAL Level 0 Quality information		
Attribute Name	**Description**	**Values**
l0_proc_flag	Processing errors significance flag	1 errors (percentage of errors greater than threshold) 0 no errors
l0_processing_quality	Percentage of quality checks successfully passed during ISP processing	max allowed +10000
l0_proc_thresh	Minimum acceptable percentage of quality threshold that must be passed during ISP processing	max allowed +10000
l0_gaps_flag	Flag to indicate gaps in input data	1 gaps 0 no gaps
l0_gaps_num	Number of gaps detected during ISP processing	

SIRAL Instrument Configuration		
Attribute Name	**Description**	**Values**
instr_id	Instrument_Identifier	A = SIRAL Nominal B = SIRAL Redundant
sir_op_mode	SIRAL Operative Mode	lrm sar sarin
sir_configuration	SIRAL Rx Configuration	rx_1 rx_2 both unknown

Level 1 Surface Statistics		
Attribute Name	**Description**	**Values**
open_ocean_percent	Percentage of output L1B records detected on open ocean or semi-enclosed seas	
close_sea_percent	Percentage of output L1B records detected on close seas or lakes	
continent_ice_percent	Percentage of output L1B records detected on continental ice	
land_percent	Percentage of output L1B records detected on land	

SIRAL Level 1 Processing information		
Attribute Name	**Description**	**Values**
l1b_prod_status	Complete/Incomplete Product Completion Flag (0 or 1). 1 if the product has a duration shorter than the input Level 0	
l1b_proc_flag	Processing errors significance flag 1 errors (percentage of errors greater than threshold) 0 no errors	
l1b_proc_flag_hr	HR Processing errors significance flag 1 errors (percentage of errors greater than threshold) 0 no errors	
l1b_processing_quality	Percentage of quality checks successfully passed during Level 1B processing (max allowed +10000)	
l1b_processing_quality_hr	Percentage of quality checks successfully passed during Level 1B HR processing (max allowed +10000)	
l1b_proc_thresh	Minimum acceptable percentage of quality threshold that must be passed during Level 1B processing (max allowed +10000)	
l1b_proc_thresh_hr	Minimum acceptable percentage of quality threshold that must be passed during Level 1B HR processing (max allowed +10000)	

Reference DSD		
Attribute Name	**Description**	**Values**
xref_siral_l0	SIRAL L0 file name(s)	
xref_siral_l0_hr	SIRAL L0 file name(s) for HR processing	
xref_uso	USO file name	
xref_uso_hr	USO file name for HR processing	
xref_orbit	Orbit file name(s)	
xref_orbit_hr	Orbit file name(s) for HR processing	
xref_siral_characterisation	SIRAL IPFDB file name	
xref_siral_characterisation_hr	SIRAL IPFDB file name for HR processing	
xref_meteo	Meteo file name(s)	
xref_pole_location	Pole location file name	
xref_gim	GIM file name(s)	
xref_mog2d	MOG2D file name(s)	
xref_cal1	L1B CAL1 file name	
xref_cal1_hr	L1B CAL1 file name for HR processing	
xref_cal2	L1B CAL2 file name	
xref_cal2_hr	L1B CAL2 file name for HR processing	
xref_constants	Constants File	
xref_earth_tide	Cartwright File	
xref_long_period_tide	FES File	

Reference DSD		
Attribute Name	**Description**	**Values**
xref_mean_pressure	Mean Pressure File for Meteo Correction generated by using either analysis or forecast data	
xref_ocean_tide_sol1	Sol1 File for Ocean Tide	
xref_ocean_tide_sol2	Sol2 File for Ocean Tide	
xref_pconf	Processor Configuration Parameters File	
xref_orbit_scenario	Orbit scenario file name	
xref_surf_pressure	Surface Pressure File for Meteo Correction generated by using either analysis or forecast data	
xref_surf_type	Surface Type Map File	
xref_tidal_load_sol1	Solution 1 File for Tidal Loading	
xref_tidal_load_sol2	Solution 2 File for Tidal Loading	
xref_u_wind	U Wind component File for Meteo Correction generated by using either analysis or forecast data	
xref_v_wind	V Wind component File for Meteo Correction generated by using either analysis or forecast data	
xref_wet_trop	Wet Troposphere File for Meteo Correction generated by using either analysis or forecast data	
xref_star_tracker_0	Star Tracker Level 0 File	
xref_star_tracker_attcop	Star Tracker Level 1b File	

3.3 TABLE OF REFERENCE DSD VS L1B PROCESSORS

		PROCESSORS								
		L1b								
		NOP LRM	NOP SAR	NOP SRN	IOP LRM	IOP SAR	IOP SRN	GOP LRM	GOP SAR	GOP SRN
Input Data File	**File Type**									
xref_siral_l0/ xref_siral_l0_hr	SIR1LRM_0_ SIR2LRM_0_	M			M			M		
	SIR1SAR_0_ SIR2SAR_0_		M			M			M	
	SIR1SIN_0_ SIR2SIN_0_			M			M			M
	SIR1TKSA0_ SIR2TKSA0_		M			M			M	
	SIR1TKSI0_ SIR2TKSI0_			M			M			M
xref_pconf	None	M	M	M	M	M	M	M	M	M
xref_siral_characterisation/ xref_siral_characterisation_hr	AUX_IPFDBA AUX_IPFDBB	M	M	M	M	M	M	M	M	M
xref_orbit_scenario	MPL_ORBREF	M	M	M	M	M	M	M	M	M
xref_orbit/xref_orbit_hr	DOR_NAV_0	M	M	M						
	AUX_ORBDOP				M	M	M			
	AUX_ORBDOR							M	M	M
	MPL_ORBPRE	M	M	M	M	M	M	M	M	M
xref_uso	DOR_USO_0_	M	M	M	M	M	M	M	M	M
xref_surf_pressure	AUX_SURFPS				M	M	M	M	M	M
	AUXISURFPS	O	O	O						
	AUX_SEAMPS				M	M	M	M	M	M

		PROCESSORS								
		L1b								
		NOP LRM	NOP SAR	NOP SRN	IOP LRM	IOP SAR	IOP SRN	GOP LRM	GOP SAR	GOP SRN
xref_mean_pressure	AUXISEAMPS	O	O	O						
xref_wet_trop	AUX_WETTRP				M	M	M	M	M	M
	AUXIWETTRP	O	O	O						
xref_u_wind	AUX_U_WIND				M	M	M	M	M	M
	AUXIU_WIND	O	O	O						
xref_v_wind	AUX_V_WIND				M	M	M	M	M	M
	AUXIV_WIND	O	O	O						
xref_meteo	AUX_ALTGRD	M	M	M	M	M	M	M	M	M
xref_mog2d	AUX_MOG_2D							M	M	M
	AUXIMOG_2D	O	O	O	O	O	O			
xref_pole_location	AUX_POLLOC	M	M	M	M	M	M	M	M	M
xref_gim	AUX_IONGIM				M	M	M	M	M	M
	AUXIIONGIM	O	O	O						
xref_cal1/xref_cal1_hr	SIR1LRC11B SIR2LRC11B	M			M			M		
	SIR1SAC11B SIR2SAC11B		M	M		M	M		M	M
	SIR_SIC11B			M			M			M
xref_cal2/xref_cal2_hr	SIR1SAC21B SIR2SAC21B	M	M		M	M		M	M	
	SIR1SIC21B			M			M			M

		PROCESSORS								
		L1b								
		NOP LRM	NOP SAR	NOP SRN	IOP LRM	IOP SAR	IOP SRN	GOP LRM	GOP SAR	GOP SRN
	SIR2SIC21B									
xref_star_tracker_0	STR_		O	O						
xref_star_tracker_attcop	STR_ATTCOP					M	M		M	M
xref_constants	None	M	M	M	M	M	M	M	M	M
xref_earth_tide	None	M	M	M	M	M	M	M	M	M
xref_ocean_tide_sol1	None	M	M	M	M	M	M	M	M	M
xref_ocean_tide_sol2	None	M	M	M	M	M	M	M	M	M
xref_long_period_tide	None	M	M	M	M	M	M	M	M	M
xref_surf_type	None	M	M	M	M	M	M	M	M	M
xref_tidal_load_sol1	None	M	M	M	M	M	M	M	M	M
xref_tidal_load_sol2	None	M	M	M	M	M	M	M	M	M

3.4 L1B PRODUCT FORMAT SPECIFICATION –CDL DUMP

3.4.1 agc_01_ku(time_01)

```
 short agc_01_ku(time_01) ;
       agc_01_ku:_FillValue = -32768s;
       agc_01_ku:long_name = "corrected AGC: 1 Hz" ;
       agc_01_ku:units = "dB" ;
       agc_01_ku:add_offset = 0. ;
       agc_01_ku:scale_factor = 0.01 ;
       agc_01_ku:coordinates = "lon_01 lat_01" ;
       agc_01_ku:comment = "AGC corrected for instrumental errors [agc_cor_01]"
;
```

3.4.2 agc_20 _ku(time_20_ku)

```
 short agc_20_ku(time_20_ku) ;
       agc_20_ku:_FillValue = -32768s;
       agc_20_ku:long_name = "corrected AGC: 20 Hz" ;
       agc_20_ku:units = "dB" ;
       agc_20_ku:add_offset = 0. ;
       agc_20_ku:scale_factor = 0.01 ;
       agc_20_ku:coordinates = "lon_20_ku lat_20_ku" ;
       agc_20_ku:comment = "AGC corrected for instrumental errors [agc_cor_01]"
;
```

3.4.3 agc_ch1_20_hr_ku(time_20_hr_ku)

```
int agc_ch1_20_hr_ku(time_20_hr_ku) ;
    agc_ch1_20_hr_ku:_FillValue = -2147483648;
    agc_ch1_20_hr_ku:units = "dB" ;
    agc_ch1_20_hr_ku:long_name = "agc gain applied on rx channel 1 HR. Gain
                                 calibration corrections are applied" ;
    agc_ch1_20_hr_ku:comment = "Calibrated AGC gain applied on Rx channel 1.
                                 This is the sum of AGC stages 1 and 2 plus
                                 the corresponding corrections given in the
                                 variable instr_cor_gain_tx_rx_20_ku." ;
    agc_ch1_20_hr_ku:add_offset = 0.0 ;
    agc_ch1_20_hr_ku:scale_factor = 0.01 ;
```

3.4.4 agc_ch2_20_hr_ku(time_20_hr_ku)

```
int agc_ch2_20_hr_ku(time_20_hr_ku) ;
    agc_ch2_20_hr_ku:_FillValue = -2147483648 ;
    agc_ch2_20_hr_ku:units = "dB" ;
    agc_ch2_20_hr_ku:long_name = "agc gain applied on rx channel 2 HR. gain
                                 calibration corrections are applied" ;
    agc_ch2_20_hr_ku:comment = "Calibrated AGC gain applied on Rx channel 2.
This is the sum of AGC stages 1 and 2 plus the corresponding corrections given
in the variable instr_cor_gain_rx_20_ku." ;
    agc_ch2_20_hr_ku:add_offset = 0.0 ;
    agc_ch2_20_hr_ku:scale_factor = 0.01 ;
```

3.4.5 agc_cor_01(time_01)

```
short agc_cor_01(time_01) ;
    agc_cor_01:_FillValue = -32768s;
    agc_cor_01:long_name = "correction for instrumental errors on AGC: 1 Hz"
;
    agc_cor_01:units = "dB" ;
    agc_cor_01:add_offset = 0. ;
    agc_cor_01:scale_factor = 0.01 ;
    agc_cor_01:coordinates = "lon_01 lat_01" ;
    agc_cor_01:comment = "AGC correction determined from the values provided
in the IPF data base." ;
```

3.4.6 alt_01(time_01)

```
int alt_01(time_01) ;
    alt_01:_FillValue =-2147483648;
    alt_01:long_name = " center of mass altitude of the satellite: 1 Hz" ;
    alt_01:units = "m" ;
    alt_01:standard_name = "height_above_reference_ellipsoid" ;
    alt_01:scale_factor = 0.001 ;
    alt_01:coordinates = "lon_01 lat_01" ;
    alt_01:comment = "Altitude of satellite center of mass above the reference
ellipsoid." ;
```

3.4.7 alt_20_hr_ku(time_20_hr_ku)

```
int alt_20_hr_ku(time_20_hr_ku) ;
    alt_20_hr_ku:_FillValue = -2147483648 ;
    alt_20_hr_ku:units = "m" ;
    alt_20_hr_ku:long_name = "altitude of CoM above reference ellipsoid
[WGS84]: 20 Hz from HR data" ;
    alt_20_hr_ku:standard_name = "height_above_reference_ellipsoid" ;
    alt_20_hr_ku:comment = "Altitude of the Satellite CoM above reference
                      ellipsoid [WGS84]." ;
    alt_20_hr_ku:add_offset = 0.0 ;
    alt_20_hr_ku:scale_factor = 0.001 ;
```

3.4.8 alt_20_ku(time_20_ku)

```
int alt_20_ku(time_20_ku) ;
    alt_20_ku:_FillValue = -2147483648;
    alt_20_ku:long_name = Altitude of satellite center of mass above the
reference ellipsoid." ;
    alt_20_ku:units = "m" ;
    alt_20_ku:standard_name = "height_above_reference_ellipsoid" ;
    alt_20_ku:scale_factor = 0.001 ;
    alt_20_ku:coordinates = "lon_20_ku lat_20_ku" ;
    alt_20_ku:comment = "Altitude of satellite center of mass above the
reference ellipsoid." ;
```

3.4.9 beam_dir_vec_20_hr_ku(time_20_hr_ku,space_3d)

```
int  beam_dir_vec_20_hr_ku(time_20_hr_ku, space_3d) ;
    beam_dir_vec_20_hr_ku:_FillValue = -2147483648 ;
    beam_dir_vec_20_hr_ku:units = "m" ;
    beam_dir_vec_20_hr_ku:long_name = "real beam direction vector in crf" ;
    beam_dir_vec_20_hr_ku:comment = "Real beam direction vector described in
                      the CryoSat Reference Frame, components: [1] x, [2]
                      y, [3] z." ;
    beam_dir_vec_20_hr_ku:add_offset = 0.0 ;
    beam_dir_vec_20_hr_ku:scale_factor = 1.e-06 ;
```

3.4.10 cog_cor_01(time_01)

```
short cog_cor_01(time_01) ;
    cog_cor_01:_FillValue = -32768s;
    cog_cor_01:long_name = "distance antenna-CoMOG correction on altimeter
range: 1 Hz" ;
    cog_cor_01:units = "m" ;
    cog_cor_01:add_offset = 0. ;
    cog_cor_01:scale_factor = 0.001 ;
    cog_cor_01:coordinates = "lon_01 lat_01" ;
    cog_cor_01:comment = "Distance antenna-CoMOG determined from the value
provided in the IPF data base." ;
```

3.4.11 coherence_waveform_20_hr_ku(time_20_hr_ku, ns_20_hr_ku)

```
short coherence_waveform_20_hr_ku(time_20_hr_ku, ns_20_hr_ku) ;
    coherence_waveform_20_hr_ku:_FillValue = -32768s ;
    coherence_waveform_20_hr_ku:units = "count" ;
    coherence_waveform_20_hr_ku:long_name = "l1b coherence waveform from HR
data " ;
    coherence_waveform_20_hr_ku:comment = "The L1b 20Hz coherence waveform is
                        a fully-calibrated, high resolution, multilooked
                        coherence computed from the complex echoes on the
                        two receiving channels (SARin only)." ;
    coherence_waveform_20_hr_ku:add_offset = 0.0 ;
    coherence_waveform_20_hr_ku:scale_factor = 0.001 ;
```

3.4.12 cor2_applied_20_ku(time_20_ku)

```
  int cor2_applied_20_ku(time_20_ku) ;
    cor2_applied_20_ku:_FillValue = -2147483648;
    cor2_applied_20_ku:long_name = "range height rate initial word (3.05 ps):
 20 Hz" ;
    cor2_applied_20_ku:units = "count" ;
    cor2_applied_20_ku:coordinates = "lon_20_ku lat_20_ku" ;
    cor2_applied_20_ku:comment = "COR2 is the on-board tracker height rate
 over the radar cycle, forwarded from telemetry." ;
```

3.4.13 cor2_applied_20_hr_ku(time_20_hr_ku)

```
int cor2_applied_20_hr_ku(time_20_hr_ku) ;
    cor2_applied_20_hr_ku:_FillValue = -2147483648 ;
    cor2_applied_20_hr_ku:units = "seconds/rc" ;
    cor2_applied_20_hr_ku:long_name = " range height rate initial word: 20 Hz
" ;
    cor2_applied_20_hr_ku:comment = "COR2 is the on-board tracker height rate
                        over the radar cycle, forwarded from telemetry." ;
    cor2_applied_20_hr_ku:add_offset = 0.0 ;
    cor2_applied_20_hr_ku:scale_factor = 3.05e-12 ;
```

3.4.14 dop_angle_start_20_hr_ku(time_20_hr_ku)

```
int dop_angle_start_20_hr_ku(time_20_hr_ku) ;
    dop_angle_start_20_hr_ku:_FillValue = -2147483648 ;
    dop_angle_start_20_hr_ku:units = "rad" ;
    dop_angle_start_20_hr_ku:long_name = "doppler angle start from HR data"
;
    dop_angle_start_20_hr_ku:add_offset = 0.0 ;
    dop_angle_start_20_hr_ku:scale_factor = 1.e-07 ;
    dop_angle_start_20_hr_ku:commment = "Value of Doppler Angle for the first
                        single look echo in the stack. It is the angle
                        between: (a) perpendicular to the velocity vector,
                        (b) direction satellite - surface location. The
```

```
Doppler angle depends on velocity vector and on
geometry." ;
```

3.4.15 dop_angle_stop_20_hr_ku(time_20_hr_ku)

```
int dop_angle_stop_20_hr_ku(time_20_hr_ku) ;
    dop_angle_stop_20_hr_ku:_FillValue = -2147483648 ;
    dop_angle_stop_20_hr_ku:units = "rad" ;
    dop_angle_stop_20_hr_ku:long_name = "doppler angle stop from HR data" ;
    dop_angle_stop_20_hr_ku:add_offset = 0.0;
    dop_angle_stop_20_hr_ku:scale_factor = 1.e-07 ;
    dop_angle_stop_20_hr_ku:commment = "Value of Doppler Angle for the last
                                        single look echo in the stack. It is the angle
                                        between: (a) perpendicular to the velocity vector,
                                        (b) direction satellite - surface location. The
                                        Doppler angle depends on velocity vector and on
                                        geometry." ;
```

3.4.16 dop_cor_01_ku(time_01)

```
  short dop_cor_01_ku(time_01) ;
        dop_cor_01_ku:_FillValue = -32768s;
        dop_cor_01_ku:long_name = "doppler correction on the altimeter range: 1
Hz" ;
        dop_cor_01_ku:units = "m" ;
        dop_cor_01_ku:add_offset = 0. ;
        dop_cor_01_ku:scale_factor = 0.001 ;
        dop_cor_01_ku:coordinates = "lon_01 lat_01" ;
        dop_cor_01_ku:comment = "This is the Doppler range correction due to the
satellite altitude rate. It is computed from the component of the satellite
velocity in the nadir direction." ;
```

3.4.17 dop_cor_20_hr_ku(time_20_hr_ku)

```
int  dop_cor_20_hr_ku(time_20_hr_ku) ;
    dop_cor_20_hr_ku:_FillValue = -2147483648 ;
    dop_cor_20_hr_ku:units = "m" ;
    dop_cor_20_hr_ku:long_name = "doppler correction on altimeter range: 20
Hz from HR data" ;
    dop_cor_20_hr_ku:commment = "This is the Doppler range correction due to
                                the satellite altitude rate. It is computed for the
                                component of satellite velocity in the nadir
                                direction. Correction applied to L1B LRM waveforms
                                only." ;
    dop_cor_20_hr_ku:add_offset = 0.0 ;
    dop_cor_20_hr_ku:scale_factor = 0.001 ;
```

3.4.18 dop_cor_20_ku(time_20_ku)

```
  short dop_cor_20_ku(time_20_ku) ;
        dop_cor_20_ku:_FillValue = -32768s;
        dop_cor_20_ku:long_name = "doppler correction on the altimeter range: 20
Hz" ;
        dop_cor_20_ku:units = "m" ;
        dop_cor_20_ku:add_offset = 0. ;
        dop_cor_20_ku:scale_factor = 0.001 ;
        dop_cor_20_ku:coordinates = "lon_20_ku lat_20_ku" ;
        dop_cor_20_ku:comment = " This is the Doppler range correction due to the satelitte
altitude rate. It is computed from the component of the satellite velocity in the nadir direction." ;
```

3.4.19 echo_numval_20_hr_ku(time_20_hr_ku)

```
    short echo_numval_20_hr_ku(time_20_hr_ku) ;
        echo_numval_20_hr_ku:_FillValue = -32768s ;
        echo_numval_20_hr_ku:units = "count" ;
        echo_numval_20_hr_ku:long_name = "number of echoes averaged: 20 Hz from
  HR data" ;
        echo_numval_20_hr_ku:add_offset = 0s ;
        echo_numval_20_hr_ku:scale_factor = 1s ;
        echo_numval_20_hr_ku:commment = "For LRM is the number of echoes averaged
                                        to compute the corresponding L1B 20Hz power waveform.
                                        For SAR/SARin is the number of single look echoes in
                                        the Surface Sample Stack that have been multilooked
                                        to compute the corresponding L1B 20Hz power waveform
                                        This variable only include one receiveing channel
                                        however, In SARIn, single looks from both channels
                                        are averaged in order to reduce the SNR.." ;
```

3.4.20 echo_numval_20_ku(time_20_ku)

```
  short echo_numval_20_ku(time_20_ku) ;
        echo_numval_20_ku:_FillValue = -32768s;
        echo_numval_20_ku:long_name = "number of echoes averaged: 20 Hz" ;
        echo_numval_20_ku:units = "count" ;
        echo_numval_20_ku:coordinates = "lon_20_ku lat_20_ku" ;
        echo_numval_20_ku:comment = "Number of individual echoes averaged to
compute the corresponding 20 Hz power waveform [pwr_waveform_20_ku]." ;
```

3.4.21 echo_scale_20_ku(time_20_ku)

```
  short echo_scale_20_ku(time_20_ku) ;
        echo_scale_20_ku:long_name = "echo scale factor: 20 Hz" ;
        echo_scale_20_ku:units = "count" ;
        echo_scale_20_ku:add_offset = 32768. ;
        echo_scale_20_ku:scale_factor = 1. ;
        echo_scale_20_ku:coordinates = "lon_20_ku lat_20_ku" ;
        echo_scale_20_ku:comment = "The 20 Hz power waveform scaling factor,
computed in order to best fit each waveform within 2 bytes." ;
```

3.4.22 echo_scale_20_hr_ku(time_20_hr_ku)

```
int  echo_scale_20_hr_ku(time_20_hr_ku) ;
           echo_scale_20_hr_ku:_FillValue = -2147483648;
           echo_scale_20_hr_ku:units = "count" ;
           echo_scale_20_hr_ku:long_name = "echo scale factor: 20 Hz from HR
           data " ;
           echo_scale_20_hr_ku:add_offset = 0.0 ;
           echo_scale_20_hr_ku:scale_factor = 1.e-09;
           echo_scale_20_hr_ku:comment = "The 20Hz power waveform scaling
                               factor, computed in order to best fit each
                               waveform within 2 bytes. The scaling, needed to
                               convert the L1B 1Hz average power waveform into
                               Watt, is applied as follows:
                               pwr_waveform_20_ku(time_20_ku,ns_20_ku)
                               *echo_scale_factor_20_ku(time_20_ku)*2^echo_s
                               cale_pwr_20_ku(time_20_ku)." ;
```

3.4.23 echo_scale_pwr_20_hr_ku(time_20_hr_ku)

```
int echo_scale_pwr_20_hr_ku(time_20_hr_ku) ;
    echo_scale_pwr_20_hr_ku:_FillValue = -2147483648 ;
    echo_scale_pwr_20_hr_ku:units = "count" ;
    echo_scale_pwr_20_hr_ku:long_name = "echo scale power (a power of 2) from
                                         HR data" ;
    echo_scale_pwr_20_hr_ku:add_offset = 0 ;
    echo_scale_pwr_20_hr_ku:scale_factor = 1 ;
    echo_scale_pwr_20_hr_ku:commment = "The 20Hz power waveform power scaling
                               factor, computed in order to best fit each
                               waveform within 2 bytes. The scaling, needed to
                               convert the L1B 1Hz average power waveform into
                               Watt, is applied as follows:
                               pwr_waveform_20_ku(time_20_ku,ns_20_ku)
                               *echo_scale_factor_20_ku(time_20_ku)*2^echo_s
                               cale_pwr_20_ku(time_20_ku)." ;
```

3.4.24 flag_cor_status_01(time_01)

```
 int flag_cor_status_01(time_01) ;
        flag_cor_status_01:_FillValue = -1 ;
        flag_cor_status_01:long_name = "correction status flag: 1 Hz" ;
        flag_cor_status_01:flag_masks = 2048, 1024, 512, 256, 128, 64, 32, 16, 8,
4, 2, 1 ;
        flag_cor_status_01:flag_meanings = "model_dry_called model_wet_called
inv_bar_called hf_fluctuations_called iono_gim_called iono_model_called
ocean_tide_called ocean_tide_equil_called load_tide_called solid_earth_called
pole_tide_called surface_type_called" ;
        flag_cor_status_01:comment = "Correction status flag- showing which
correction algorithms have been called." ;
        flag_cor_status_01:coordinates = "lon_01 lat_01" ;
```

3.4.25 **flag_cor_err_01(time_01)**

```
 int flag_cor_err_01(time_01) ;
        flag_cor_err_01:_FillValue = -1 ;
        flag_cor_err_01:long_name = "correction error flag: 1 Hz" ;
        flag_cor_err_01:flag_masks = 2048, 1024, 512, 256, 128, 64, 32, 16, 8, 4,
2, 1 ;
        flag_cor_err_01:flag_meanings    =    "model_dry_error    model_wet_error
inv_bar_error     hf_fluctuations_error     iono_gim_error     iono_model_error
ocean_tide_equil_error    long_tide_error    load_tide_error    solid_earth_error
pole_tide_error surface_type_error" ;
        flag_cor_err_01:comment = "Correction error flag- showing if a correction
algorithm returned an error when called." ;
        flag_cor_err_01:coordinates = "lon_01 lat_01" ;
```

3.4.26 **flag_echo_20_hr_ku(time_20_hr_ku)**

```
    short flag_echo_20_hr_ku(time_20_hr_ku) ;
        flag_echo_20_hr_ku:_FillValue = -1s;
        flag_echo_20_hr_ku:long_name = "flags for errors or information about L1b
                              20Hz power waveform from HR data" ;
        flag_echo_20_hr_ku:flag_masks  =  -32768s,  16384s,  8192s,  4096s,  2048s,
                                 1024s, 512s, 256s;
        flag_echo_20_hr_ku:flag_meanings         =         "approx_beam_steering
                                        exact_beam_steering
                                        doppler_weighting_computed
                                        doppler_weighting_applied
                                        multi_look_incomplete
                                        beam_angle_steering_error
                                        anti_aliased_power_echoes
                                        auto_beam_steering" ;
        flag_echo_20_hr_ku:commment = "Flags for errors or information about L1b
                           20Hz power waveform." ;
```

3.4.27 flag_instr_conf_rx_bwdt_20_ku(time_20_ku)

```
byte flag_instr_conf_rx_bwdt_20_ku(time_20_ku) ;
        flag_instr_conf_rx_bwdt_20_ku:_FillValue = -128b ;
        flag_instr_conf_rx_bwdt_20_ku:long_name = "instrument configuration flag - bandwidth: 20 Hz" ;
        flag_instr_conf_rx_bwdt_20_ku:flag_values = 0b, 1b, 2b ;
        flag_instr_conf_rx_bwdt_20_ku:flag_meanings = "unknown 320_mhz 40_mhz" ;
        flag_instr_conf_rx_bwdt_20_ku:coordinates = "lon_20_ku lat_20_ku" ;
        flag_instr_conf_rx_bwdt_20_ku:comment = "This flag contains the instrument acquisition band." ;
```

3.4.28 flag_instr_conf_rx_bwdt_20_hr_ku(time_20_hr_ku)

```
byte flag_instr_conf_rx_bwdt_20_hr_ku(time_20_hr_ku) ;
    flag_instr_conf_rx_bwdt_20_hr_ku:_FillValue = -128b;
    flag_instr_conf_rx_bwdt_20_hr_ku:long_name = "instrument configuration flag - bandwidth: 20 Hz from HR data" ;
    flag_instr_conf_rx_bwdt_20_hr_ku:flag_values = 0b, 1b, 2b ;
    flag_instr_conf_rx_bwdt_20_hr_ku:flag_meanings = "unknown 320_mhz 40_mhz" ;
    flag_instr_conf_rx_bwdt_20_hr_ku:commment = "This flag contains the instrument acquisition band." ;
```

3.4.29 flag_instr_conf_rx_flags_20_ku(time_20_ku)

```
int flag_instr_conf_rx_flags_20_ku(time_20_ku) ;
        flag_instr_conf_rx_flags_20_ku:_FillValue = -2147483648 ;
        flag_instr_conf_rx_flags_20_ku:long_name = "instrument configuration flag - flags: 20 Hz" ;
        flag_instr_conf_rx_flags_20_ku:flag_masks = -128b, 64b, 32b, 16b, 8b, 4b, 2b, 1b ;
        flag_instr_conf_rx_flags_20_ku:flag_meanings = "siral_redundant external_cal open_loop loss_of_echo real_time_error echo_saturation rx_band_attenuated cycle_report_error" ;
        flag_instr_conf_rx_flags_20_ku:coordinates = "lon_20_ku lat_20_ku" ;
        flag_instr_conf_rx_flags_20_ku:comment = "This flag contains the status of the instrument acquisition." ;
```

3.4.30 **flag_instr_conf_rx_flags_20_hr_ku(time_20_hr_ku)**

```
byte flag_instr_conf_rx_flags_20_hr_ku(time_20_hr_ku) ;
    flag_instr_conf_rx_flags_20_hr_ku:long_name = "instrument configuration
                                              flag - flags: 20 Hz from HR
                                              data" ;
    flag_instr_conf_rx_flags_20_hr_ku:flag_masks = -128b, 64b, 32b, 16b, 8b,
                                            4b, 2b, 1b ;
    flag_instr_conf_rx_flags_20_hr_ku:flag_meanings = "siral_redundant
                                            external_cal open_loop
                                            loss_of_echo real_time_error
                                            echo_saturation
                                            rx_band_attenuated
                                            cycle_report_error" ;
    flag_instr_conf_rx_flags_20_hr_ku:commment = "This flag contains the
                               status of the instrument tracking." ;
```

3.4.31 **flag_instr_conf_rx_in_use_20_ku(time_20_ku)**

```
byte flag_instr_conf_rx_in_use_20_ku(time_20_ku) ;
        flag_instr_conf_rx_in_use_20_ku:_FillValue = -128b ;
        flag_instr_conf_rx_in_use_20_ku:long_name = "instrument configuration
flag - rx chain in use: 20 Hz" ;
        flag_instr_conf_rx_in_use_20_ku:flag_values = 0b, 1b, 2b, 3b ;
        flag_instr_conf_rx_in_use_20_ku:flag_meanings = "unknown rx1 rx2 both" ;
        flag_instr_conf_rx_in_use_20_ku:coordinates = "lon_20_ku lat_20_ku" ;
        flag_instr_conf_rx_in_use_20_ku:comment = "This flag contains the
instrument channel in use." ;
```

3.4.32 **flag_instr_conf_rx_in_use_20_hr_ku(time_20_hr_ku)**

```
byte flag_instr_conf_rx_in_use_20_hr_ku(time_20_hr_ku) ;
    flag_instr_conf_rx_in_use_20_hr_ku:_FillValue = -128b ;
    flag_instr_conf_rx_in_use_20_hr_ku:long_name = "instrument configuration
                                             flag- rx chain in use: 20 Hz
                                             from HR data" ;
    flag_instr_conf_rx_in_use_20_hr_ku:flag_values = 0b, 1b, 2b, 3b ;
    flag_instr_conf_rx_in_use_20_hr_ku:flag_meanings = "unknown rx1 rx2
 both";
    flag_instr_conf_rx_in_use_20_hr_ku:commment = "This flag contains the
                               instrument chain in use." ;
```

3.4.33 flag_instr_conf_rx_str_in_use_20_hr_ku(time_20_hr_ku)

```
byte flag_instr_conf_rx_str_in_use_20_hr_ku(time_20_hr_ku) ;
    flag_instr_conf_rx_str_in_use_20_hr_ku:_FillValue = -128b ;
    flag_instr_conf_rx_str_in_use_20_hr_ku:long_name = "instrument configuration flags: star tracker used: 20 Hz from HR data " ;
    flag_instr_conf_rx_str_in_use_20_hr_ku:flag_values = 0b, 1b, 2b, 3b, 4b ;
    flag_instr_conf_rx_str_in_use_20_hr_ku:flag_meanings = "no_str_tracker tracker_1 tracker_2 tracker_3 attref_file" ;
    flag_instr_conf_rx_str_in_use_20_hr_ku:comment = "Star tracker identification flag showing the source of the platform pointing. 0: No Star Tracker data used. 1: Data from Star Tracker 1 used. 2: Data from Star Tracker 2 used. 3: Data from Star Tracker 3 used. 4: Data from the Star Tracker selected on board by AOCS used." ;
```

3.4.34 flag_instr_conf_rx_trk_mode_20_ku(time_20_ku)

```
byte flag_instr_conf_rx_trk_mode_20_ku(time_20_ku) ;
        flag_instr_conf_rx_trk_mode_20_ku:_FillValue = -128b ;
        flag_instr_conf_rx_trk_mode_20_ku:long_name = "instrument configuration
flag - tracking mode: 20 Hz" ;
        flag_instr_conf_rx_trk_mode_20_ku:flag_values = 0b, 1b, 2b, 3b ;
        flag_instr_conf_rx_trk_mode_20_ku:flag_meanings = "unknown lrm sar sarin"
;
        flag_instr_conf_rx_trk_mode_20_ku:coordinates = "lon_20_ku lat_20_ku" ;
        flag_instr_conf_rx_trk_mode_20_ku:comment = "Tracking Mode." ;
```

3.4.35 flag_instr_conf_rx_trk_mode_20_hr_ku(time_20_hr_ku)

```
byte flag_instr_conf_rx_trk_mode_20_hr_ku(time_20_hr_ku) ;
    flag_instr_conf_rx_trk_mode_20_hr_ku:_FillValue = -128b ;
    flag_instr_conf_rx_trk_mode_20_hr_ku:long_name      =      "instrument
                                           configuration flag - tracking
                                           mode : 20 Hz from HR data" ;
    flag_instr_conf_rx_trk_mode_20_hr_ku:flag_values = 0b, 1b, 2b, 3b ;
    flag_instr_conf_rx_trk_mode_20_hr_ku:flag_meanings  =  "unknown  lrm  sar
                                          sarin" ;
    flag_instr_conf_rx_trk_mode_20_hr_ku:comment = "Tracking Mode." ;
```

3.4.36 flag_instr_mode_att_ctrl_20_hr_ku(time_20_hr_ku)

```
byte flag_instr_mode_att_ctrl_20_hr_ku (time_20_hr_ku) ;
    flag_instr_mode_att_ctrl_20_hr_ku:_FillValue = -128b ;
    flag_instr_mode_att_ctrl_20_hr_ku:long_name   =   "  mode   id   -platform
                                       attitude control flag: 20 Hz from
                                       HR data " ;
    flag_instr_mode_att_ctrl_20_hr_ku:flag_values = 0b, 1b, 2b ;
    flag_instr_mode_att_ctrl_20_hr_ku:flag_meanings       =       "unknown
                                       local_normal_pointing
                                       yaw_steering";
    flag_instr_mode_att_ctrl_20_hr_ku:comment  =  "Platform  attitude  control
                                       mode." ;
```

3.4.37 flag_instr_mode_flags_20_hr_ku(time_20_hr_ku)

```
byte flag_instr_mode_flags_20_hr_ku(time_20_hr_ku) ;
    flag_instr_mode_flags_20_hr_ku:_FillValue = -128b ;
    flag_instr_mode_flags_20_hr_ku:long_name = "mode id - identifies the
                                        siral instrument measurement
                                        mode from HR data" ;
    flag_instr_mode_flags_20_hr_ku:flag_masks = 2b, 1b ;
    flag_instr_mode_flags_20_hr_ku:flag_meanings = "sarin_degraded_case
                                             cal4_packet_detection";
    flag_instr_mode_flags_20_hr_ku:comment = "Instrument mode derived from
                                        configuration bits in L0." ;
```

3.4.38 flag_instr_op_mode_20_hr_ku(time_20_hr_ku)

```
byte flag_instr_op_mode_20_hr_ku(time_20_hr_ku) ;
    flag_instr_op_mode_20_hr_ku:_FillValue = -128b ;
    flag_instr_op_mode_20_hr_ku:long_name = "mode id - operative mode : 20 Hz
                                    from HR data" ;
    flag_instr_op_mode_20_hr_ku:flag_values = "1b, 2b, 3b" ;
    flag_instr_op_mode_20_hr_ku:flag_meanings = "lrm sar sarin" ;
flag_instr_op_mode_20_hr_ku:comment = "Mode ID - Identifies the SIRAL
instrument measurement mode." ;
```

3.4.39 flag_instr_op_mode _20_ku(time_20_ku)

```
byte flag_instr_op_mode_20_ku(time_20_ku) ;
    flag_instr_op_mode_20_ku:_FillValue = -128b;
    flag_instr_op_mode_20_ku:long_name = "mode id - operative mode: 20 Hz" ;
    flag_instr_op_mode_20_ku:flag_values = 1b, 2b, 3b ;
    flag_instr_op_mode_20_ku:flag_meanings = "lrm sar sarin" ;
    flag_instr_op_mode_20_ku:coordinates = "lon_20_ku lat_20_ku" ;
    flag_instr_op_mode_20_ku:comment = " Mode ID - Identifies the SIRAL
instrument measurement mode." ;
```

3.4.40 flag_mcd_20_ku(time_20_ku)

```
int flag_mcd_20_ku(time_20_ku) ;
        flag_mcd_20_ku:long_name = "measurement confidence data: 20 Hz" ;
        flag_mcd_20_ku:flag_masks = -2147483648, 1073741824, 536870912, 268435456, 134217728, 67108864, 33554432, 16777216, 8388608, 4194304, 2097152, 1048576, 524288, 262144, 131072, 65536, 32768, 16384, 8192, 4096, 2048, 128, 64, 32, 16, 8, 1;
        flag_mcd_20_ku:flag_meanings = "block_degraded blank_block datation_degraded orbit_prop_error orbit_file_change orbit_gap echo_saturated other_echo_error sarin_rx1_error sarin_rx2_error window_delay_error agc_error cal1_missing cal1_default doris_uso_missing ccal1_default trk_echo_error echo_rx1_error echo_rx2_error npm_error azimuth_cal_missing phase_pert_cor_missing cal2_missing cal2_default power_scale_error attitude_cor_missing phase_pert_cor_default";
        flag_mcd_20_ku:coordinates = "lon_20_ku lat_20_ku" ;
        flag_mcd_20_ku:comment = "Measurement confidence flags. Generally the MCD flags indicate problems when set. If the whole MCD is 0 then no problems or non-nominal conditions were detected. Serious errors are indicated by setting bit 31 (SS bit 0), in which case the block must not be processed. Other error settings can be regarded as warnings." ;
```

3.4.41 flag_mcd_20_hr_ku(time_20_hr_ku)

```
    int flag_mcd_20_hr_ku(time_20_hr_ku) ;
        flag_mcd_20_hr_ku:_FillValue = -1 ;
        flag_mcd_20_hr_ku:long_name = "measurement confidence data: 20 Hz  from HR data" ;
        flag_mcd_20_hr_ku:flag_masks = -2147483648, 1073741824, 536870912,
                              268435456, 134217728, 67108864, 33554432,
                              16777216, 8388608, 4194304, 2097152,
                              1048576, 524288, 262144, 131072, 65536,
                              32768, 16384, 8192, 4096, 2048, 128, 64, 32,
                              16, 8, 1 ;
        flag_mcd_20_hr_ku:flag_meanings = "block_degraded blank_block
                              datation_degraded orbit_prop_error
                              orbit_file_change orbit_gap echo_saturated
                              other_echo_error sarin_rx1_error
                              sarin_rx2_error window_delay_error
                              agc_error cal1_missing cal1_default
                              doris_uso_missing ccal1_default
                              trk_echo_error echo_rx1_error
                              echo_rx2_error npm_error cal1_pwr_corr_type
                              phase_pert_cor_missing cal2_missing
                              cal2_default power_scale_error
                              attitude_cor_missing
                              phase_pert_cor_default" ;
        flag_mcd_20_hr_ku:comment = " Measurement confidence flags. Generally the
                          MCD flags indicate problems when set. If the
                          whole MCD is 0 then no problems or non-nominal
                          conditions were detected. Serious errors are
                          indicated by setting the most-significant bit
                          i.e. block_degraded, in which case the block
                          must not be processed. Other error settings can
                          be regarded as warnings.." ;
```

3.4.42 flag_trk_cycle_20_ku(time_20_ku)

```
 short flag_trk_cycle_20_ku(time_20_ku) ;
        flag_trk_cycle_20_ku:_FillValue =  -32768;
        flag_trk_cycle_20_ku:long_name = "tracking cycle report: 20 Hz" ;
        flag_trk_cycle_20_ku:flag_values = 0b, 1b, 2b, 3b, 7b;
        flag_trk_cycle_20_ku:flag_meanings = "no_errors loss_of_echo
run_time_error echo_saturation_error unknown_error" ;
        flag_trk_cycle_20_ku:coordinates = "lon_20_ku lat_20_ku" ;
        flag_trk_cycle_20_ku:comment = "Tracking cycle report forwarded from
telemetry." ;
```

3.4.43 flag_trk_cycle_20_hr_ku(time_20_hr_ku)

```
 short flag_trk_cycle_20_hr_ku(time_20_hr_ku) ;
     flag_trk_cycle_20_hr_ku:long_name = " tracking cycle report: 20 Hz from
                              HR data" ;
     flag_trk_cycle_20_hr_ku:_FillValue =  -32768 ;
     flag_trk_cycle_20_hr_ku: flag_values = 0s, 1s, 2s, 3s, 7s ;
     flag_trk_cycle_20_hr_ku:flag_meanings = "no_errors loss_of_echo
                         run_time_error echo_saturation_error
                         unknown_error" ;
     flag_trk_cycle_20_hr_ku:commment = "Flags for errors or information about
                           L1b 20Hz power waveform for LRM/FDM case." ;
```

3.4.44 h0_applied_20_ku(time_20_ku)

```
 int h0_applied_20_ ku(time_20_ku) ;
        h0_applied_20_ku:_FillValue = -2147483648;
        h0_applied_20_ku:long_name = "range height initial word (12.5/256 ns): 20
Hz" ;
        h0_applied_20_ku:units = "count" ;
        h0_applied_20_ku:coordinates = "lon_20_ku lat_20_ku" ;
        h0_applied_20_ku:comment = "The H0 (initial altitude instruction)
forwarded from telemetry." ;
```

3.4.45 h0_applied_20_hr_ku(time_20_hr_ku)

```
 int h0_applied_20_hr_ku(time_20_hr_ku) ;
     h0_applied_20_hr_ku:_FillValue = -2147483648 ;
     h0_applied_20_hr_ku:units = "seconds" ;
     h0_applied_20_hr_ku:long_name = " range height initial word: 20 Hz from
HR data" ;
     h0_applied_20_hr_ku:add_offset = 0. ;
     h0_applied_20_hr_ku:scale_factor = 4.88e-11 ;
     h0_applied_20_hr_ku:comment = "The H0 (initial altitude instruction)
                forwarded from telemetry." ;
```

3.4.46 **h0_fai_word_20_ku(time_20_ku)**

```
 int h0_fai_word_20_ku(time_20_ku) ;
        h0_fai_word_20_ku:_FillValue = -2147483648;
        h0_fai_word_20_ku:long_name = "fine range word (12.5/256 ns): 20 Hz" ;
        h0_fai_word_20_ku:units = "count" ;
        h0_fai_word_20_ku:coordinates = "lon_20_ku lat_20_ku" ;
        h0_fai_word_20_ku:comment = "This is the Fine Altitude Instruction (FAI),
forwarded from telemetry." ;
```

3.4.47 **h0_fai_word_20_hr_ku(time_20_hr_ku)**

```
   int  h0_fai_word_20_hr_ku(time_20_hr_ku) ;
        h0_fai_word_20_hr_ku:_FillValue = -2147483648 ;
        h0_fai_word_20_hr_ku:units = "seconds" ;
        h0_fai_word_20_hr_ku:long_name = " fine range word : 20 Hz from HR data"
;
        h0_fai_word_20_hr_ku:add_offset = 0. ;
        h0_fai_word_20_hr_ku:scale_factor = 4.88e-11 ;
        h0_fai_word_20_hr_ku:comment = "This is the Fine Altitude Instruction
                  (FAI), computed from H0 and COR2." ;
```

3.4.48 **h0_lai_word_20_ku(time_20_ku)**

```
 int h0_lai_word_20_ku(time_20_ku) ;
        h0_lai_word_20_ku:_FillValue = -2147483648;
        h0_lai_word_20_ku:long_name = "coarse range word (12.5 ns): 20 Hz" ;
        h0_lai_word_20_ku:units = "count" ;
        h0_lai_word_20_ku:coordinates = "lon_20_ku lat_20_ku" ;
        h0_lai_word_20_ku:comment = "This is the Coarse Altitude Instruction
(LAI), forwarded from telemetry ." ;
```

3.4.49 **h0_lai_word_20_hr_ku(time_20_hr_ku)**

```
   int h0_lai_word_20_hr_ku(time_20_hr_ku) ;
        h0_lai_word_20_hr_ku:_FillValue = -2147483648 ;
        h0_lai_word_20_hr_ku:units = "seconds" ;
        h0_lai_word_20_hr_ku:long_name = "coarse range word: 20 Hz from HR data"
;
        h0_lai_word_20_hr_ku:add_offset = 0. ;
        h0_lai_word_20_hr_ku:scale_factor = 1.25e-08 ;
        h0_lai_word_20_hr_ku:comment = "This is the Coarse Altitude Instruction
                  (LAI), computed from H0 and COR2." ;
```

3.4.50 **hf_fluct_cor_01(time_01)**

```
  short hf_fluct_cor_01(time_01) ;
          hf_fluct_cor_01:_FillValue = -32768s;
          hf_fluct_cor_01:long_name = "high frequency fluctuations of the sea
surface topography: 1 Hz" ;
          hf_fluct_cor_01:units = "m" ;
          hf_fluct_cor_01:standard_name =
"sea_surface_height_correction_due_to_air_pressure_and_wind_at_high_frequency" ;
          hf_fluct_cor_01:add_offset = 0. ;
          hf_fluct_cor_01:scale_factor = 0.001 ;
          hf_fluct_cor_01:coordinates = "lon_01 lat_01" ;
          hf_fluct_cor_01:comment = "High frequency fluctuations of the sea surface
topography due to high frequency air pressure and wind effects. Also known as DAC
(Dynamical Atmospheric Correction). Provided as a correction to the inverted
barometer correction [inv_bar_cor_01]." ;
          hf_fluct_cor_01:source = "2.1.0" ;
          hf_fluct_cor_01:institution = "LEGOS/CLS/CNES" ;
```

3.4.51 **ind_first_meas_20hz_01(time_01)**

```
  int ind_first_meas_20hz_01(time_01) ;
          ind_first_meas_20hz_01:_FillValue = - 2147483648;
          ind_first_meas_20hz_01:long_name = "index of the first 20Hz measurement:
1 Hz" ;
          ind_first_meas_20hz_01:units = "count" ;
          ind_first_meas_20hz_01:comment = "Index of the first 20Hz measurement of
the 1Hz packet." ;
```

3.4.52 **ind_meas_1hz_20_ku(time_20_ku)**

```
  short ind_meas_1hz_20_ku(time_20_ku) ;
          ind_meas_1hz_20_ku:_FillValue = -32768s;
          ind_meas_1hz_20_ku:long_name = "index of the 1Hz measurement: 20 Hz" ;
          ind_meas_1hz_20_ku:units = "count" ;
          ind_meas_1hz_20_ku:comment = "Index of the 1Hz measurement to which
belongs the 20Hz measurement." ;
```

3.4.53 **instr_cor_gain_rx_20_hr_ku(time_20_hr_ku)**

```
     int instr_cor_gain_rx_20_hr_ku(time_20_hr_ku) ;
          instr_cor_gain_rx_20_hr_ku:_FillValue = -2147483648 ;
          instr_cor_gain_rx_20_hr_ku:units = "dB" ;
          instr_cor_gain_rx_20_hr_ku:long_name = "instrument gain correction (rx
                                          only chain) from HR data" ;
          instr_cor_gain_rx_20_hr_ku:add_offset = 0. ;
          instr_cor_gain_rx_20_hr_ku:scale_factor = 0.01 ;
          instr_cor_gain_rx_20_hr_ku:comment = "Instrument Gain Correction (Rx only
                        chain) - It includes the power variation from CAL1 and the
                        AGC calibration values." ;
```

3.4.54 **instr_cor_gain_tx_rx_20_hr_ku(time_20_hr_ku)**

```
int instr_cor_gain_tx_rx_20_hr_ku(time_20_hr_ku) ;
    instr_cor_gain_tx_rx_20_hr_ku:_FillValue = -2147483648 ;
    instr_cor_gain_tx_rx_20_hr_ku:units = "dB" ;
    instr_cor_gain_tx_rx_20_hr_ku:long_name = "instrument gain correction
                                      (tx-rx chain) from HR data" ;
    instr_cor_gain_tx_rx_20_hr_ku:add_offset = 0. ;
    instr_cor_gain_tx_rx_20_hr_ku:scale_factor = 0.01 ;
    instr_cor_gain_tx_rx_20_hr_ku:comment = "Instrument Gain Correction (Tx-
               Rx chain) - It includes the power variation from CAL1 and the
               AGC calibration values." ;
```

3.4.55 instr_cor_range_rx_20_hr_ku(time_20_hr_ku)

```
int instr_cor_range_rx_20_hr_ku(time_20_hr_ku) ;
    instr_cor_range_rx_20_hr_ku:_FillValue = -2147483648 ;
    instr_cor_range_rx_20_hr_ku:units = "m" ;
    instr_cor_range_rx_20_hr_ku:long_name = "2-way instrument range
                                       correction (rx only chain) from HR
                                       data" ;
    instr_cor_range_rx_20_hr_ku:add_offset = 0. ;
    instr_cor_range_rx_20_hr_ku:scale_factor = 0.001 ;
    instr_cor_range_rx_20_hr_ku:comment = "2-way instrument Range Correction
               (Rx only chain) - It includes (a) the internal path delay from
               CAL1, (b) the external group delay from ground
               characterisation and (c) the vertical component of the COM -
               Antenna distance." ;
```

3.4.56 instr_cor_range_tx_rx_20_hr_ku(time_20_hr_ku)

```
int instr_cor_range_tx_rx_20_hr_ku(time_20_hr_ku) ;
    instr_cor_range_tx_rx_20_hr_ku:_FillValue = -2147483648 ;
    instr_cor_range_tx_rx_20_hr_ku:units = "m" ;
    instr_cor_range_tx_rx_20_hr_ku:long_name = "2-way instrument range
                                        correction (tx-rx chain) from HR
                                        data" ;
    instr_cor_range_tx_rx_20_hr_ku:add_offset = 0. ;
    instr_cor_range_tx_rx_20_hr_ku:scale_factor = 0.001 ;
    instr_cor_range_tx_rx_20_hr_ku:comment = "2-way instrument Range
            Correction (Tx-Rx chain). It includes (a) the internal path
            delay from CAL1, (b) the external group delay from ground
            characterisation and (c) the vertical component of the COM -
            Antenna distance." ;
```

3.4.57 instr_ext_ph_cor_20_hr_ku(time_20_hr_ku)

```
int instr_ext_ph_cor_20_hr_ku(time_20_hr_ku) ;
    instr_ext_ph_cor_20_hr_ku:_FillValue = -2147483648 ;
    instr_ext_ph_cor_20_hr_ku:units = "rad" ;
    instr_ext_ph_cor_20_hr_ku:long_name = "external phase correction taken
                                from the ipfdb file from HR data" ;
    instr_ext_ph_cor_20_hr_ku:add_offset = 0. ;
    instr_ext_ph_cor_20_hr_ku:scale_factor = 1.e-06 ;
    instr_ext_ph_cor_20_hr_ku:comment = "External phase correction taken from
                                the IPFDB file (SARin only) to be added
                                to the internal phase correction term. The
                                external phase correction is the
                                temperature-averaged component of
                                external inter-channel phase difference
                                derived from phase difference sensitive
                                antenna subsystem, waveguides and
                                instrument waveguide switches. The
                                external phase correction doesn't contain
                                internal instrument effects of
                                calibration coupler and duplexer which
                                are included in the internal phase
                                difference correction." ;
```

3.4.58 instr_int_ph_cor_20_hr_ku(time_20_hr_ku)

```
int instr_int_ph_cor_20_hr_ku(time_20_hr_ku) ;
    instr_int_ph_cor_20_hr_ku:_FillValue = -2147483648 ;
    instr_int_ph_cor_20_hr_ku:units = "rad" ;
    instr_int_ph_cor_20_hr_ku:long_name = "internal phase correction computed
                                from the cal-4 from HR data" ;
    instr_int_ph_cor_20_hr_ku:add_offset = 0. ;
    instr_int_ph_cor_20_hr_ku:scale_factor = 1.e-06 ;
    instr_int_ph_cor_20_hr_ku:comment = "Internal phase correction computed
                                from the latest available CAL-4 packet.
                                Applied in L1b SARin products only). " ;
```

3.4.59 **int_path_cor_01(time_01)**

```
  short int_path_cor_01(time_01) ;
        int_path_cor_01:_FillValue = -32768s ;
        int_path_cor_01:long_name = "internal path correction on the altimeter
range: 1 Hz" ;
        int_path_cor_01:units = "m" ;
        int_path_cor_01:add_offset = 0. ;
        int_path_cor_01:scale_factor = 0.001 ;
        int_path_cor_01:coordinates = "lon_01 lat_01" ;
        int_path_cor_01:comment = "Internal calibration correction on the
altimeter range" ;
```

3.4.60 **inter_base_vec_20_hr_ku(time_20_hr_ku,space_3d)**

```
    int inter_base_vec_20_hr_ku(time_20_hr_ku, space_3d) ;
        inter_base_vec_20_hr_ku:_FillValue = -2147483648 ;
        inter_base_vec_20_hr_ku:units = "m" ;
        inter_base_vec_20_hr_ku:long_name = "interferometric baseline direction
                                     vector in crf from HR data" ;
        inter_base_vec_20_hr_ku:add_offset = 0. ;
        inter_base_vec_20_hr_ku:scale_factor = 1.e-06 ;
        inter_base_vec_20_hr_ku:comment = " Direction vector from Tx-Rx antenna
                                 reference point to Rx only antenna
                                 reference point defined in the CryoSat
                                 Reference Frame, components: [1] x, [2]
                                 y, [3] z." ;
```

3.4.61 **internal_cor_sig0_01(time_01)**

```
  short internal_cor_sig0_01(time_01) ;
        internal_cor_sig0_01:_FillValue = -32768s ;
        internal_cor_sig0_01:long_name = "internal calibration correction on the
backscatter coefficient: 1 Hz" ;
        internal_cor_sig0_01:units = "dB" ;
        internal_cor_sig0_01:add_offset = 0. ;
        internal_cor_sig0_01:scale_factor = 0.01 ;
        internal_cor_sig0_01:coordinates = "lon_01 lat_01" ;
        internal_cor_sig0_01:comment = "Internal calibration correction applied
to the backscatter coefficient." ;
```

3.4.62 inv_bar_cor_01(time_01)

```
 short inv_bar_cor_01(time_01) ;
        inv_bar_cor_01:_FillValue = -32768s;
        inv_bar_cor_01:long_name = "inverted barometer height correction: 1 Hz"
;
        inv_bar_cor_01:units = "m" ;
        inv_bar_cor_01:standard_name                                          =
"sea_surface_height_correction_due_to_air_pressure_at_low_frequency" ;
        inv_bar_cor_01:add_offset = 0. ;
        inv_bar_cor_01:scale_factor = 0.001 ;
        inv_bar_cor_01:coordinates = "lon_01 lat_01" ;
        inv_bar_cor_01:comment = "Computed at the altimeter time-tag [time_01]
from the interpolation of 2 meteorological fields that surround the altimeter
time-tag. To be added to range measurement together with the high frequency
fluctuation [hf_fluct_cor_01] to correct for the depression of the ocean surface
caused by the local barometric pressure." ;
        inv_bar_cor_01:source = "European Center for Medium Range Weather
Forecasting" ;
        inv_bar_cor_01:institution = "ECMWF" ;
```

3.4.63 iono_cor_gim_01(time_01)

```
 short iono_cor_gim_01(time_01) ;
        iono_cor_gim_01:_FillValue = -32768s;
        iono_cor_gim_01:long_name = "GIM ionospheric correction: 1 Hz" ;
        iono_cor_gim_01:units = "m" ;
        iono_cor_gim_01:standard_name                                         =
"altimeter_range_correction_due_to_ionosphere" ;
        iono_cor_gim_01:add_offset = 0. ;
        iono_cor_gim_01:scale_factor = 0.001 ;
        iono_cor_gim_01:coordinates = "lon_01 lat_01" ;
        iono_cor_gim_01:comment = To be added to range measurement to correct for
the delay to the Radar pulse caused by free electrons in the ionosphere. Computed
from GPS ionospheric data." ;
        iono_cor_gim_01:source = "GIM" ;
        iono_cor_gim_01:institution = "NASA/JPL" ;
```

3.4.64 lat_01(time_01)

```
 int lat_01(time_01) ;
        lat_01:long_name = "latitude: 1 Hz" ;
        lat_01:_FillValue =-2147483648;
        lat_01:units = "degrees_north" ;
        lat_01:standard_name = "latitude" ;
        lat_01:add_offset = 0. ;
        lat_01:scale_factor = 1.e-07 ;
        lat_01:comment = "Positive latitude is North latitude, negative latitude
is South latitude" ;
```

3.4.65 **lat_20_ku(time_20_ku)**

```
 int lat_20_ku(time_20_ku) ;
        lat_20_ku:long_name = "latitude: 20 Hz" ;
        lat_20_ku:_FillValue =-2147483648 ;
        lat_20_ku:units = "degrees_north" ;
        lat_20_ku:standard_name = "latitude" ;
        lat_20_ku:add_offset = 0. ;
        lat_20_ku:scale_factor = 1.e-07 ;
        lat_20_ku:comment = "Positive latitude is North latitude, negative
latitude is South latitude" ;
```

3.4.66 **lat_20_hr_ku(time_20_hr_ku)**

```
   int lat_20_hr_ku(time_20_hr_ku) ;
        lat_20_hr_ku:units = "degrees_north" ;
        lat_20_hr_ku:_FillValue = -2147483648 ;
        lat_20_hr_ku:long_name = " latitude: 20 Hz from HR data" ;
        lat_20_hr_ku:standard_name = "latitude" ;
        lat_20_hr_ku:scale_factor = 1.e-07 ;
        lat_20_hr_ku:add_offset = 0. ;
        lat_20_hr_ku:comment = "Latitude of measurement [-90,+90]. Positive
                               latitude is North latitude, negative latitude is
                               South latitude. Note the scale factor." ;
```

3.4.67 **load_tide_sol1_01(time_01)**

```
 short load_tide_sol1_01(time_01) ;
        load_tide_sol1_01:_FillValue = -32768s;
        load_tide_sol1_01:long_name = "load tide height for geocentric ocean tide
(solution 1): 1 Hz" ;
        load_tide_sol1_01:units = "m" ;
        load_tide_sol1_01:add_offset = 0. ;
        load_tide_sol1_01:scale_factor = 0.001 ;
        load_tide_sol1_01:coordinates = "lon_01 lat_01" ;
        load_tide_sol1_01:comment = "This value has already been added to the
corresponding ocean tide height value recorded in the product
[ocean_tide_sol1_01]." ;
        load_tide_sol1_01:source = "GOT4.10" ;
        load_tide_sol1_01:institution = "GSFC" ;
```

3.4.68 load_tide_sol2_01(time_01)

```
 short load_tide_sol2_01(time_01) ;
        load_tide_sol2_01:_FillValue = -32768s;
        load_tide_sol2_01:long_name = "load tide height for geocentric ocean tide (solution 2): 1 Hz" ;
        load_tide_sol2_01:units = "m" ;
        load_tide_sol2_01:add_offset = 0. ;
        load_tide_sol2_01:scale_factor = 0.001 ;
        load_tide_sol2_01:coordinates = "lon_01 lat_01" ;
        load_tide_sol2_01:comment = "This value contains the total load tide height (short-period and long-period) for the geocentric ocean tide (solution 2). To get only the pure ocean tide height (solution 2), do: [ocean_tide_sol2_01] + [ocean_tide_non_eq_01] - [load_tide_sol2_01]. This value has already been added to the corresponding ocean tide height value recorded in the product [ocean_tide_sol2_01]." ;
        load_tide_sol2_01:source = "FES2014b" ;
        load_tide_sol2_01:institution = "LEGOS/CNES" ;
```

3.4.69 lon_01(time_01)

```
 int lon_01(time_01) ;
        lon_01:_FillValue =-2147483648;
        lon_01:long_name = "longitude: 1 Hz" ;
        lon_01:units = "degrees_east" ;
        lon_01:standard_name = "longitude" ;
        lon_01:add_offset = 0. ;
        lon_01:scale_factor = 1.e-07 ;
        lon_01:comment = "East longitude relative to Greenwhich meridian" ;
```

3.4.70 lon_20_ku(time_20_ku)

```
 int lon_20_ku(time_20_ku) ;
        lon_20_ku:_FillValue = -2147483648;
        lon_20_ku:long_name = "longitude: 20 Hz" ;
        lon_20_ku:units = "degrees_east" ;
        lon_20_ku:standard_name = "longitude" ;
        lon_20_ku:add_offset = 0. ;
        lon_20_ku:scale_factor = 1.e-07 ;
        lon_20_ku:comment = "East longitude relative to Greenwhich meridian" ;
```

3.4.71 lon_20_hr_ku(time_20_hr_ku)

```
   int lon_20_hr_ku (time_20_hr_ku) ;
        lon_20_hr_ku:units = "degrees_east" ;
        lon_20_hr_ku:_FillValue = -2147483648 ;
        lon_20_hr_ku:long_name = " longitude: 20 Hz from HR data" ;
        lon_20_hr_ku:standard_name = "longitude" ;
        lon_20_hr_ku:scale_factor = 1.e-07 ;
        lon_20_hr_ku:add_offset = 0. ;
        lon_20_hr_ku:comment = "Longitude of measurement [-180,+180]. Positive at
                               East. East longitude relative to Greenwich
                               meridian. Note the scale factor." ;
```

3.4.72 **look_angle_start_20_hr_ku(time_20_hr_ku)**

```
int look_angle_start_20_hr_ku(time_20_hr_ku) ;
    look_angle_start_20_hr_ku:_FillValue = -2147483648 ;
    look_angle_start_20_hr_ku:units = "rad" ;
    look_angle_start_20_hr_ku:long_name = "look angle start from HR data" ;
    look_angle_start_20_hr_ku:add_offset = 0. ;
    look_angle_start_20_hr_ku:scale_factor = 1.e-07 ;
    look_angle_start_20_hr_ku:commment = "Value of Look Angle for the first
             single look echo in the stack. It is the angle between: (a)
             perpendicular from the satellite CoM to the surface, (b)
             direction satellite - surface location. The look angle depends
             purely on geometry.";
```

3.4.73 **look_angle_stop_20_hr_ku(time_20_hr_ku)**

```
int look_angle_stop_20_hr_ku(time_20_hr_ku) ;
    look_angle_stop_20_hr_ku:_FillValue = -2147483648 ;
    look_angle_stop_20_hr_ku:units = "rad" ;
    look_angle_stop_20_hr_ku:long_name = " look angle stop from HR data " ;
    look_angle_stop_20_hr_ku:add_offset = 0. ;
    look_angle_stop_20_hr_ku:scale_factor = 1.e-07 ;
    look_angle_stop_20_hr_ku:commment = "Value of Look Angle for the last
              single look echo in the stack.  It is the angle between: (a)
              perpendicular from the satellite CoM to the surface, (b)
              direction satellite - surface location. The look angle depends
              purely on geometry." ;
```

3.4.74 **mod_dry_tropo_cor_01(time_01)**

```
  short mod_dry_tropo_cor_01(time_01) ;
        mod_dry_tropo_cor_01:_FillValue = 32768s;
        mod_dry_tropo_cor_01:long_name = "model dry tropospheric correction: 1
Hz" ;
        mod_dry_tropo_cor_01:units = "m" ;
        mod_dry_tropo_cor_01:standard_name                                   =
"altimeter_range_correction_due_to_dry_troposphere" ;
        mod_dry_tropo_cor_01:add_offset = 0. ;
        mod_dry_tropo_cor_01:scale_factor = 0.001 ;
        mod_dry_tropo_cor_01:coordinates = "lon_01 lat_01" ;
        mod_dry_tropo_cor_01:comment = "Computed at the altimeter time-tag
[time_01] from the interpolation of 2 meteorological fields that surround the
altimeter time-tag. To be added to range measurement to correct for the
propagation delay to the radar pulse, caused by the dry-gas component of the
Earth's atmosphere." ;
        mod_dry_tropo_cor_01:source = "European Center for Medium Range Weather
Forecasting" ;
        mod_dry_tropo_cor_01:institution = "ECMWF" ;
```

3.4.75 mod_wet_tropo_cor_01(time_01)

```
short mod_wet_tropo_cor_01(time_01) ;
        mod_wet_tropo_cor_01:_FillValue = -32768s;
        mod_wet_tropo_cor_01:long_name = "model wet tropospheric correction: 1 Hz" ;
        mod_wet_tropo_cor_01:units = "m" ;
        mod_wet_tropo_cor_01:standard_name = "altimeter_range_correction_due_to_wet_troposphere" ;
        mod_wet_tropo_cor_01:add_offset = 0. ;
        mod_wet_tropo_cor_01:scale_factor = 0.001 ;
        mod_wet_tropo_cor_01:coordinates = "lon_01 lat_01" ;
        mod_wet_tropo_cor_01:comment = "Computed at the altimeter time-tag [time_01] from the interpolation of 2 meteorological fields that surround the altimeter time-tag. To be added to range measurement to correct for the propagation delay to the radar pulse, caused by the H20 component of the Earth's atmosphere." ;
        mod_wet_tropo_cor_01:source = "European Center for Medium Range Weather Forecasting" ;
        mod_wet_tropo_cor_01:institution = "ECMWF" ;
```

3.4.76 noise_power_20_ku(time_20_ku)

```
int noise_power_20_ku(time_20_ku) ;
        noise_power_20_ku:_FillValue = -2147483648 ;
        noise_power_20_ku:long_name = "noise power measurement: 20 Hz" ;
        noise_power_20_ku:units = "count" ;
        noise_power_20_ku:coordinates = "lon_20_ku lat_20_ku" ;
        noise_power_20_ku:comment = "Noise power measurement from telemetry." ;
```

3.4.77 noise_power_20_hr_ku(time_20_hr_ku)

```
int noise_power_20_hr_ku(time_20_hr_ku) ;
    noise_power_20_hr_ku:_FillValue = -2147483648 ;
    noise_power_20_hr_ku:units = "dB" ;
    noise_power_20_hr_ku:long_name = "noise power measurement: 20 Hz from HR data" ;
    noise_power_20_hr_ku:add_offset = 0.0 ;
    noise_power_20_hr_ku:scale_factor = 0.01 ;
    noise_power_20_hr_ku:commment = "Noise power measurement. In SAR/SARin it
            is estimated on the L1b 20Hz multilooked power waveform. In LRM
            it is converted from telemetry units and scaled according to
            the proper AGC value.." ;
```

3.4.78 ns_20_ku(ns_20_ku)

```
short ns_20_ku(ns_20_ku) ;
        ns_20_ku:long_name = "number of samples in the waveforms" ;
        ns_20_ku:units = "count" ;
        ns_20_ku:comment = "Set to be compliant with CF convention." ;
```

3.4.79 num_meas_20hz_01(time_01)

```
short num_meas_20hz_01(time_01) ;
        num_meas_20hz_01:long_name = "number of 20Hz measurements: 1 Hz" ;
        num_meas_20hz_01:units = "count" ;
        num_meas_20hz_01:_FillValue = -32768s;
        num_meas_20hz_01:comment = "Number of 20Hz measurements used to derive
the 1Hz measurement." ;
```

3.4.80 ocean_tide_eq_01(time_01)

```
short ocean_tide_eq_01(time_01) ;
        ocean_tide_eq_01:_FillValue = -32768s;
        ocean_tide_eq_01:long_name = "equilibrium long-period ocean tide height:
1 Hz" ;
        ocean_tide_eq_01:units = "m" ;
        ocean_tide_eq_01:standard_name =
"sea_surface_height_amplitude_due_to_equilibrium_ocean_tide" ;
        ocean_tide_eq_01:add_offset = 0. ;
        ocean_tide_eq_01:scale_factor = 0.001 ;
        ocean_tide_eq_01:coordinates = "lon_01 lat_01" ;
        ocean_tide_eq_01:comment = "This value has already been added to the two
geocentric ocean tide height values recorded in the product [ocean_tide_sol1_01]
and [ocean_tide_sol2_01]. The permanent tide (zero frequency) is not included in
this parameter because it is included in the geoid and mean sea surface." ;
        ocean_tide_eq_01:source = "Cartwright and Edden [1973] Corrected tables
of tidal harmonics - J. Geophys. J. R. Astr. Soc., 33, 253-264." ;
```

3.4.81 ocean_tide_non_eq_01(time_01)

```
 short ocean_tide_non_eq_01(time_01) ;
        ocean_tide_non_eq_01:_FillValue = -32768s;
        ocean_tide_non_eq_01:long_name = "non-equilibrium long-period ocean tide
height: 1 Hz" ;
        ocean_tide_non_eq_01:units = "m" ;
        ocean_tide_non_eq_01:standard_name                                     =
"sea_surface_height_amplitude_due_to_non_equilibrium_ocean_tide" ;
        ocean_tide_non_eq_01:add_offset = 0. ;
        ocean_tide_non_eq_01:scale_factor = 0.001 ;
        ocean_tide_non_eq_01:coordinates = "lon_01 lat_01" ;
        ocean_tide_non_eq_01:comment  =  "This  parameter  is  computed  as  a
correction to the parameter ocean_tide_eq_01. It contains the long-period ocean
tide  and  the  long  period  load  tide  components.  This  value  can  be  added  to
[ocean_tide_eq_01]  (or  [ocean_tide_sol1_01],  [ocean_tide_sol2_01])  so  that  the
resulting value models the total non equilibrium ocean tide height." ;
 ocean_tide_non_eq_01:source = "FES2014b" ;
        ocean_tide_non_eq_01:institution = "LEGOS/CNES" ;
```

3.4.82 ocean_tide_sol1_01(time_01)

```
 int ocean_tide_sol1_01(time_01) ;
        ocean_tide_sol1_01:_FillValue = 2147483648;
        ocean_tide_sol1_01:long_name = "geocentric ocean tide height (solution
1): 1 Hz" ;
        ocean_tide_sol1_01:units = "m" ;
        ocean_tide_sol1_01:standard_name                                       =
"sea_surface_height_amplitude_due_to_geocentric_ocean_tide" ;
        ocean_tide_sol1_01:add_offset = 0. ;
        ocean_tide_sol1_01:scale_factor = 0.001 ;
        ocean_tide_sol1_01:coordinates = "lon_01 lat_01" ;
        ocean_tide_sol1_01:comment  =  "Solution  1  corresponds  to  GOT  model.
Includes  the  corresponding  loading  tide  [ocean_tide_sol1_01]  and  equilibrium
long-period  ocean  tide  height  [ocean_tide_eq_01].  The  permanent  tide  (zero
frequency) is not included in this parameter because it is included in the geoid
and mean sea surface." ;          ocean_tide_sol1_01:source = "GOT4.10" ;
        ocean_tide_sol1_01:institution = "GSFC" ;
```

3.4.83 ocean_tide_sol2_01(time_01)

```
 int ocean_tide_sol2_01(time_01) ;
        ocean_tide_sol2_01:_FillValue = -2147483648;
        ocean_tide_sol2_01:long_name = "geocentric ocean tide height (solution
2): 1 Hz" ;
        ocean_tide_sol2_01:units = "m" ;
        ocean_tide_sol2_01:standard_name                                     =
"sea_surface_height_amplitude_due_to_geocentric_ocean_tide" ;
        ocean_tide_sol2_01:add_offset = 0. ;
        ocean_tide_sol2_01:scale_factor = 0.001 ;
        ocean_tide_sol2_01:coordinates = "lon_01 lat_01" ;
        ocean_tide_sol2_01:comment  =  "Solution  2  corresponds  to  FES  model.
Includes   the   corresponding   short-period   part   of   the   loading   tide
[ocean_tide_sol2_01]    and    equilibrium    long-period    ocean    tide    height
[ocean_tide_eq_01]. The permanent tide (zero frequency) is not included in this
parameter because it is included in the geoid [geoid_01] and mean sea surface
([mean_sea_surf_01], [mean_sea_surf_02])." ;         ocean_tide_sol2_01:source
= "FES2014b" ;
        ocean_tide_sol2_01:institution = "LEGOS/CNES" ;
```

3.4.84 off_nadir_pitch_angle_str_20_hr_ku(time_20_hr_ku)

```
int off_nadir_pitch_angle_str_20_hr_ku(time_20_hr_ku) ;
    off_nadir_pitch_angle_str_20_hr_ku:_FillValue = -2147483648 ;
    off_nadir_pitch_angle_str_20_hr_ku:units = "degrees" ;
    off_nadir_pitch_angle_str_20_hr_ku:long_name = " off nadir pitch angle
                                    derived from star tracker data: 20 Hz
                                    from HR data ";
    off_nadir_pitch_angle_str_20_hr_ku:comment = "Pitch angle with respect to
                          the nadir pointing, measured by the STRs and post-
                          processed by ground facility." ;
    off_nadir_pitch_angle_str_20_hr_ku:add_offset = 0.0 ;
    off_nadir_pitch_angle_str_20_hr_ku:scale_factor = 1.e-07;
```

3.4.85 **off_nadir_roll_angle_str_20_hr_ku(time_20_hr_ku)**

```
int off_nadir_roll_angle_str_20_hr_ku(time_20_hr_ku) ;
    off_nadir_roll_angle_str_20_hr_ku:_FillValue = -2147483648 ;
    off_nadir_roll_angle_str_20_hr_ku:units = "degrees" ;
    off_nadir_roll_angle_str_20_hr_ku:long_name = " off nadir roll angle
                                     derived from star tracker data: 20 Hz
                                     from HR data" ;
    off_nadir_roll_angle_str_20_hr_ku:comment = "Roll angle with respect to
                          the nadir pointing, measured by the STRs and post-
                          processed by ground facility." ;
    off_nadir_roll_angle_str_20_hr_ku:add_offset = 0.0 ;
    off_nadir_roll_angle_str_20_hr_ku:scale_factor = 1.e-07 ;
```

3.4.86 **off_nadir_yaw_angle_str_20_hr_ku(time_20_hr_ku)**

```
int off_nadir_yaw_angle_str_20_hr_ku(time_20_hr_ku) ;
    off_nadir_yaw_angle_str_20_hr_ku:_FillValue = -2147483648 ;
    off_nadir_yaw_angle_str_20_hr_ku:units = "degrees" ;
    off_nadir_yaw_angle_str_20_hr_ku:long_name = "off nadir yaw angle derived
                                     from star tracker data: 20 Hz " ;
    off_nadir_yaw_angle_str_20_hr_ku:comment = "Yaw angle with respect to the
                          nadir pointing, measured by the STRs and post-
                          processed by ground facility." ;
    off_nadir_yaw_angle_str_20_hr_ku:add_offset = 0.0 ;
    off_nadir_yaw_angle_str_20_hr_ku:scale_factor = 1.e-07 ;
```

3.4.87 orb_alt_rate_01(time_01)

```
 short orb_alt_rate_01(time_01) ;
        orb_alt_rate_01:_FillValue = -32768s;
        orb_alt_rate_01:long_name = " centre of mass altitude rate: 1 Hz" ;
 orb_alt_rate_01:units = "m/s" ;
        orb_alt_rate_01:add_offset = 0. ;
        orb_alt_rate_01:scale_factor = 0.001 ;
        orb_alt_rate_01:coordinates = "lon_01 lat_01" ;
               orb_alt_rate_01:comment  =  "Instantaneous  altitude  rate  at  the
Centre of Mass with respect to the reference ellipsoid." ;
```

3.4.88 orb_alt_rate_20_ku(time_20_ku)

```
 short orb_alt_rate_20_ku(time_20_ku) ;
        orb_alt_rate_20_ku:_FillValue = -32768s;
        orb_alt_rate_20_ku:long_name = " centre of mass altitude rate with respect
to the reference ellipsoid [WGS84] : 20 Hz" ;         orb_alt_rate_20_ku:units
= "m/s" ;
        orb_alt_rate_20_ku:add_offset = 0. ;
        orb_alt_rate_20_ku:scale_factor = 0.001 ;
        orb_alt_rate_20_ku:coordinates = "lon_20_ku lat_20_ku" ;
        orb_alt_rate_20_ku:comment = "Instantaneous altitude rate at the Centre
of Mass with respect to the reference ellipsoid." ;
```

3.4.89 orb_alt_rate_20_hr_ku(time_20_hr_ku)

```
    int orb_alt_rate_20_hr_ku(time_20_hr_ku) ;
        orb_alt_rate_20_hr_ku:_FillValue = -2147483648 ;
        orb_alt_rate_20_hr_ku:units = "m/s" ;
        orb_alt_rate_20_hr_ku:long_name  =  "centre  of  mass  altitude  rate  with
                                  respect  to  the  reference  ellipsoid
                                  [WGS84] : 20 Hz from HR data" ;
        orb_alt_rate_20_hr_ku:add_offset = 0. ;
        orb_alt_rate_20_hr_ku:scale_factor = 0.001 ;
        orb_alt_rate_20_hr_ku:comment  =  "Instantaneous  altitude  rate  at  the
                     Centre  of  Mass  with  respect  to  the  reference  ellipsoid
                     [WGS84]." ;
```

3.4.90 ph_diff_waveform_20_hr_ku(time_20_hr_ku, ns_20_hr_ku)

```
int ph_diff_waveform_20_hr_ku(time_20_hr_ku, ns_20_hr_ku) ;
    ph_diff_waveform_20_hr_ku:_FillValue = -2147483648 ;
    ph_diff_waveform_20_hr_ku:units = "rad" ;
    ph_diff_waveform_20_hr_ku:long_name = "l1b Phase Difference waveform" ;
    ph_diff_waveform_20_hr_ku:add_offset = 0. ;
    ph_diff_waveform_20_hr_ku:scale_factor = 1.e-06 ;
    ph_diff_waveform_20_hr_ku:commment = "The L1b 20Hz phase difference
                                          waveform is a fully-
                                          calibrated, high resolution,
                                          multilooked phase difference
                                          computed from the complex
                                          echoes on the two receiving
                                          channels (SARIn only)." ;
```

3.4.91 ph_slope_cor_20_hr_ku(time_20_hr_ku)

```
int ph_slope_cor_20_hr_ku(time_20_hr_ku) ;
    ph_slope_cor_20_hr_ku:_FillValue = -2147483648 ;
    ph_slope_cor_20_hr_ku:units = "rad" ;
    ph_slope_cor_20_hr_ku:long_name = "phase slope correction from HR data"
;
    ph_slope_cor_20_hr_ku:add_offset = 0. ;
    ph_slope_cor_20_hr_ku:scale_factor = 1.e-06 ;
    ph_slope_cor_20_hr_ku:comment = "Differential group delay phase
             difference slope correction across the whole bandwidth
             (SARin only). It is composed by fixed contributions from
             IPFDB and by variable contributions covering differences
             between the CAL-1 and CAL-4 paths. Applied in L1B SARin
             products." ;
```

3.4.92 pole_tide_01(time_01)

```
 short pole_tide_01(time_01) ;
        pole_tide_01:_FillValue = -32768s;
        pole_tide_01:long_name = "geocentric tide height: 1 Hz" ;
        pole_tide_01:units = "m" ;
        pole_tide_01:standard_name                                    =
"sea_surface_height_amplitude_due_to_pole_tide" ;
        pole_tide_01:add_offset = 0. ;
        pole_tide_01:scale_factor = 0.001 ;
        pole_tide_01:coordinates = "lon_01 lat_01" ;
        pole_tide_01:source = "Wahr [1985] Deformation of the Earth induced by
polar motion - J. Geophys. Res. (Solid Earth), 90, 9363-9368." ;
        pole_tide_01:institution = "IERS/CNES" ;
```

3.4.93 **pwr_waveform_20_ku(time_20_ku)**

```
short pwr_waveform_20_ku(time_20_ku,ns_20_ku) ;
      pwr_waveform_20_ku:long_name = "waveform samples (scaled): 20 Hz" ;
      pwr_waveform_20_ku:units = "count" ;
      pwr_waveform_20_ku:add_offset = 32768. ;
      pwr_waveform_20_ku:scale_factor = 1. ;
            pwr_waveform_20_ku:comment = "LRM mode: echo forwarded from telemetry. SAR mode: echo retrieved by on-ground pseudo-LRM processing. The echo is corrected from on-board FFT filtering effected, accounting for CAL2 gain profile range window (CAL2). Scaled power echo waveform = real power echo * echo scale factor (echo_scale_factor_20).The echo is corrected for the intermediate frequency filter effect." ;
```

3.4.94 **pwr_waveform_20_hr_ku(time_20_hr_ku, ns_20_hr_ku)**

```
ushort pwr_waveform_20_hr_ku(time_20_hr_ku, ns_20_hr_ku) ;
      pwr_waveform_20_hr_ku:units = "count" ;
      pwr_waveform_20_hr_ku:long_name = "l1b power waveform scaled 0-65535 from HR data" ;
      pwr_waveform_20_hr_ku:add_offset = 0us ;
      pwr_waveform_20_hr_ku:scale_factor = 1us ;
      pwr_waveform_20_hr_ku:commment = "The L1b 20Hz power waveform is a fully-calibrated waveform. For LRM it is a low resolution pulse limited waveform. For SAR/SARin it is a high resolution multilooked waveform. Units are counts scaled to fit in the range 0-65535." ;
```

3.4.95 rec_count_20_ku(time_20_ku)

```
 int rec_count_20_ku(time_20_ku) ;
        rec_count_20_ku:_FillValue = -2147483648;
        rec_count_20_ku:long_name = "record counter: 20 Hz" ;
        rec_count_20_ku:units = "count" ;
        rec_count_20_ku:comment = "Record counter - progressive counter
incremented by 1 for each data block." ;
```

3.4.96 rec_count_20_hr_ku(time_20_hr_ku)

```
int rec_count_20_hr_ku(time_20_hr_ku) ;
    rec_count_20_hr_ku:units = "count" ;
    rec_count_20_hr_ku:long_name = "record counter: 20 Hz from HR data" ;
    rec_count_20_hr_ku:comment = "Record counter - progressive counter
                                  incremented by 1 for each record.
                                  Surface Sample counter for SAR/SARin
                                  L1B products." ;
```

3.4.97 sat_vel_vec_20_hr_ku(time_20_hr_ku,space_3d)

```
int sat_vel_vec_20_hr_ku(time_20_hr_ku, space_3d) ;
    sat_vel_vec_20_hr_ku:_FillValue = -2147483648 ;
    sat_vel_vec_20_hr_ku:units = "m/s" ;
    sat_vel_vec_20_hr_ku:long_name = "velocity vector in itrf" ;
    sat_vel_vec_20_hr_ku:add_offset = 0. ;
    sat_vel_vec_20_hr_ku:scale_factor = 0.001 ;
    sat_vel_vec_20_hr_ku:comment = "Satellite velocity vector in
                                  International Terrestrial Reference
                                  Frame in the International Earth Fixed
                                  System. The 3 components are given
                                  according to the'space_3d' dimension:
                                  [1] x, [2] y, [3] z.";
```

3.4.98 scale_factor_20_ku(time_20_ku)

```
 int scale_factor_20_ku(time_20_ku) ;
        scale_factor_20_ku:_FillValue = -2147483648 ;
        scale_factor_20_ku:long_name = "scaling factor for backscatter
coefficient evaluation: 20 Hz" ;
        scale_factor_20_ku:units = "dB" ;
        scale_factor_20_ku:add_offset = 0. ;
        scale_factor_20_ku:scale_factor = 0.01 ;
        scale_factor_20_ku:coordinates = "lon_20_ku lat_20_ku" ;
        scale_factor_20_ku:comment = "This scaling factor represents the
backscatter coefficient for a waveform amplitude equal to 1. It is corrected for
AGC instrumental errors [agc_cor_01] and internal calibration
[internal_cor_sig0_01]" ;
```

3.4.99 seq_count_20_ku(time_20_ku)

```
int seq_count_20_ku(time_20_ku) ;
        seq_count_20_ku:_FillValue = -2147483648 ;
        seq_count_20_ku:long_name = "source sequence counter: 20 Hz" ;
 seq_count_20_ku:units = "count" ;
        seq_count_20_ku:comment = "Source Sequence Counter read from the L0 echo
telemetry packet.";
```

3.4.100 seq_count_20_hr_ku(time_20_hr_ku)

```
short seq_count_20_hr_ku(time_20_hr_ku) ;
    seq_count_20_hr_ku:units = "count" ;
    seq_count_20_hr_ku:long_name = " sequence counter: 20 Hz from HR data" ;
    seq_count_20_hr_ku:add_offset = 0s ;
    seq_count_20_hr_ku:scale_factor = 1s ;
    seq_count_20_hr_ku:comment = "Source Sequence Counter read from the L0
                                 echo telemetry packet." ;
```

3.4.101 solid_earth_tide_01(time_01)

```
 short solid_earth_tide_01(time_01) ;
        solid_earth_tide_01:_FillValue = -32768s;
        solid_earth_tide_01:long_name = "solid earth tide height: 1 Hz" ;
        solid_earth_tide_01:units = "m" ;
        solid_earth_tide_01:standard_name                                      =
"sea_surface_height_amplitude_due_to_earth_tide" ;
        solid_earth_tide_01:add_offset = 0. ;
        solid_earth_tide_01:scale_factor = 0.001 ;
              solid_earth_tide_01:comment = "Solid earth tide - to be added to
the range to remove the effect of local tidal distortion in the Earth\'s crust."
;       solid_earth_tide_01:source = "Cartwright and Edden [1973] Corrected
tables of tidal harmonics - J. Geophys. J. R. Astr. Soc., 33, 253-264." ;
```

3.4.102 stack_centre_20_hr_ku(time_20_hr_ku)

```
short stack_centre_20_hr_ku(time_20_hr_ku) ;
    stack_centre_20_hr_ku:units = "count" ;
    stack_centre_20_hr_ku:_FillValue = -32768s ;
    stack_centre_20_hr_ku:long_name = "gaussian power fitting: center wrt
                              beam number" ;
    stack_centre_20_hr_ku:add_offset = 0. ;
    stack_centre_20_hr_ku:scale_factor = 0.01 ;
    stack_centre_20_hr_ku:commment = "Position of the centre of Gaussian that
                             fits the range integrated power of the
                             single look echoes within a stack. Stack
                             centre as function of stack beam number."
                             ;
```

3.4.103 stack_centre_angle_20_hr_ku(time_20_hr_ku)

```
short stack_centre_angle_20_hr_ku(time_20_hr_ku) ;
    stack_centre_angle_20_hr_ku:_FillValue = -32768s ;
    stack_centre_angle_20_hr_ku:units = "rad" ;
    stack_centre_angle_20_hr_ku:long_name = "gaussian power fitting: center
                                             wrt boresight angle from HR data
                                             " ;
    stack_centre_angle_20_hr_ku:add_offset = 0. ;
    stack_centre_angle_20_hr_ku:scale_factor = 1.e-06 ;
    stack_centre_angle_20_hr_ku:commment = "Position of the centre of
                                         Gaussian that fits the range
                                         integrated power of the single look
                                         echoes within a stack. Centre as
                                         function of the boresight angle,
                                         that is the angle between: (a)
                                         antenna boresight direction, (b)
                                         direction satellite - surface
                                         location. The pointing angle depends
                                         on geometry and attitude (roll and
                                         pitch)." ;
```

3.4.104 stack_kurtosis_20_hr_ku(time_20_hr_ku)

```
short stack_kurtosis_20_hr_ku(time_20_hr_ku) ;
    stack_kurtosis_20_hr_ku:_FillValue = -999s ;
    stack_kurtosis_20_hr_ku:units = "count" ;
    stack_kurtosis_20_hr_ku:long_name = "gaussian power fitting: kurtosis wrt
                                       beam number from HR data " ;
    stack_kurtosis_20_hr_ku:add_offset = 0. ;
    stack_kurtosis_20_hr_ku:scale_factor = 0.01 ;
    stack_kurtosis_20_hr_ku:commment = "4th central moment computed on the
                                      range integrated power of the single
                                      look echoes within a stack. Kurtosis as
                                      function of stack beam number.";
```

3.4.105 stack_number_after_weighting_20_hr_ku(time_20_hr_ku)

```
short stack_number_after_weighting_20_hr_ku(time_20_hr_ku) ;
    stack_number_after_weighting_20_hr_ku:_FillValue = -32768s ;
    stack_number_after_weighting_20_hr_ku:units = "count" ;
    stack_number_after_weighting_20_hr_ku:long_name = "number of
                                  contributing beams in the stack after
                                  weighting from HR data " ;
    stack_number_after_weighting_20_hr_ku:add_offset = 0s ;
    stack_number_after_weighting_20_hr_ku:scale_factor = 1s ;
    stack_number_after_weighting_20_hr_ku:commment = "Number of contributing
                                  beams in the stack after weighting:
                                  number of single look echoes in the stack
                                  after the Surface Sample Stack weighting
                                  is applied." ;
```

3.4.106 stack_number_before_weighting_20_hr_ku(time_20_hr_ku)

```
short stack_number_before_weighting_20_hr_ku(time_20_hr_ku) ;
    stack_number_before_weighting_20_hr_ku:_FillValue = -32768s ;
    stack_number_before_weighting_20_hr_ku:units = "count" ;
    stack_number_before_weighting_20_hr_ku:long_name = "number of
                                     contributing beams in the stack before
                                     weighting from HR data " ;
    stack_number_before_weighting_20_hr_ku:add_offset = 0s ;
    stack_number_before_weighting_20_hr_ku:scale_factor = 1s ;
    stack_number_before_weighting_20_hr_ku:commment = "Number of
                                       contributing beams in the stack
                                       before weighting: number of single
                                       look echoes in the stack before the
                                       Surface Sample Stack weighting is
                                       applied." ;
```

3.4.107 stack_scaled_amplitude_20_hr_ku(time_20_hr_ku)

```
short stack_scaled_amplitude_20_hr_ku(time_20_hr_ku) ;
    stack_scaled_amplitude_20_hr_ku:_FillValue = -32768s ;
    stack_scaled_amplitude_20_hr_ku:units = "dB" ;
    stack_scaled_amplitude_20_hr_ku:long_name = "gaussian power fitting:
                                               amplitude from HR data " ;
    stack_scaled_amplitude_20_hr_ku:add_offset = 0. ;
    stack_scaled_amplitude_20_hr_ku:scale_factor = 0.01 ;
    stack_scaled_amplitude_20_hr_ku:commment = "Amplitude of Gaussian that
                                     fits the range integrated power of the
                                     single look echoes within a stack." ;
```

3.4.108 stack_skewness_20_hr_ku(time_20_hr_ku)

```
short stack_skewness_20_hr_ku(time_20_hr_ku) ;
    stack_skewness_20_hr_ku:_FillValue = -999s ;
    stack_skewness_20_hr_ku:units = "count" ;
    stack_skewness_20_hr_ku:long_name = "gaussian power fitting: skewness wrt
                                     beam number from HR data " ;
    stack_skewness_20_hr_ku:add_offset = 0.0 ;
    stack_skewness_20_hr_ku:scale_factor = 0.01 ;
    stack_skewness_20_hr_ku:commment = "3rd central moment computed on the
                                      range integrated power of the single
                                      look echoes within a stack. Skewness
                                      as function of stack beam number." ;
```

3.4.109 stack_std_20_hr_ku(time_20_hr_ku)

```
short stack_std_20_hr_ku(time_20_hr_ku) ;
    stack_std_20_hr_ku:units = "count" ;
    stack_std_20_hr_ku:_FillValue = -32768s ;
    stack_std_20_hr_ku:long_name = "Gaussian power fitting: std wrt beam
                                 number from HR data " ;
    stack_std_20_hr_ku:add_offset = 0. ;
    stack_std_20_hr_ku:scale_factor = 0.01 ;
    stack_std_20_hr_ku:commment = "Standard deviation of Gaussian that fits
                             the range integrated power of the single look
                             echoes within a stack. Standard deviation as
                             function of stack beam number." ;
```

3.4.110 stack_std_angle_20_hr_ku(time_20_hr_ku)

```
short stack_std_angle_20_hr_ku(time_20_hr_ku) ;
    stack_std_angle_20_hr_ku:_FillValue = -32768s ;
    stack_std_angle_20_hr_ku:units = "rad" ;
    stack_std_angle_20_hr_ku:long_name = "gaussian power fitting: std wrt
                                       boresight angle from HR data " ;
    stack_std_angle_20_hr_ku:add_offset = 0. ;
    stack_std_angle_20_hr_ku:scale_factor = 1.e-06 ;
    stack_std_angle_20_hr_ku:commment = "Standard deviation of Gaussian that
                        fits the range integrated power of the single look
                        echoes within a stack. Standard deviation as
                        function of the boresight angle, that is the angle
                        between: (a) antenna boresight direction, (b)
                        direction satellite - surface location. The
                        boresight angle depends on geometry and attitude
                        (roll and pitch)." ;
```

3.4.111 surf_type_01(time_01)

```
 byte surf_type_01(time_01) ;
       surf_type_01:_FillValue = -128b ;
       surf_type_01:long_name = "surface type: 1 Hz" ;
       surf_type_01:flag_values = 0b, 1b, 2b, 3b ;
       surf_type_01:flag_meanings = "ocean_or_semi_enclosed_sea
enclosed_sea_or_lake continental_ice land" ;
       surf_type_01:coordinates = "lon_01 lat_01" ;
       surf_type_01:source = "terrainbase 1.0" ;
       surf_type_01:institution = "NOAA National Geophysical Data Center,
Boulder, Colorado." ;
       surf_type_01:comment = "Computed using the TERRAINBASE model: 0= open
oceans or semi-enclosed seas; 1= enclosed seas or lakes; 2= continental ice; 3=
land. See Row, L.W., and D.A. Hastings, 1994. TerrainBase Worldwide Digital
Terrain Data on CD-ROM, Release 1.0." ;
```

3.4.112 time_01(time_01)

```
double time_01(time_01) ;
      time_01:long_name = "UTC: 1 Hz" ;
      time_01:units = "seconds since 2000-01-01 00:00:00.0" ;
      time_01:standard_name = "time" ;
      time_01:calendar = "gregorian" ;
      time_01:tai_utc_difference = 34.;
```

3.4.113 time_20_ku(time_20_ku)

```
double time_20_ku(time_20_ku) ;
      time_20_ku:long_name = "UTC: 20 Hz" ;
      time_20_ku:units = "seconds since 2000-01-01 00:00:00.0" ;
      time_20_ku:standard_name = "time" ;
      time_20_ku:calendar = "gregorian" ;
      time_20_ku:tai_utc_difference = 34.;
```

3.4.114 time_20_hr_ku(time_20_hr_ku)

```
double time_20_hr_ku(time_20_hr_ku) ;
    time_20_hr_ku:units = "seconds since 2000-01-01 00:00:00.0" ;
    time_20_hr_ku:long_name = " TAI: 20Hz" ;
    time_20_hr_ku:standard_name = "time" ;
    time_20_hr_ku:calendar = "gregorian" ;
    time_20_hr_ku:comment = "Time in TAI: it contains the seconds since 1 Jan
                          2000. Time refers to the instant the L1B 20Hz
                          power waveform  touches the surface." ;
```

3.4.115 tot_gain_ch1_20_hr_ku(time_20_hr_ku)

```
int tot_gain_ch1_20_hr_ku(time_20_hr_ku) ;
    tot_gain_ch1_20_hr_ku:_FillValue = -2147483648 ;
    tot_gain_ch1_20_hr_ku:units = "dB" ;
    tot_gain_ch1_20_hr_ku:long_name = "total fixed gain on channel 1 HR" ;
    tot_gain_ch1_20_hr_ku:add_offset = 0. ;
    tot_gain_ch1_20_hr_ku:scale_factor = 0.01 ;
    tot_gain_ch1_20_hr_ku:comment = "Total Fixed Gain On Channel 1 - total
                                   fixed instrument gain applied on chain 1, this
                                   is the gain applied by the RF unit. Applied
                                   in L1B." ;
```

3.4.116 tot_gain_ch2_20_hr_ku(time_20_hr_ku)

```
int  tot_gain_ch2_20_hr_ku(time_20_hr_ku) ;
    tot_gain_ch2_20_hr_ku:_FillValue = -2147483648 ;
    tot_gain_ch2_20_hr_ku:units = "dB" ;
    tot_gain_ch2_20_hr_ku:long_name = "total fixed gain on channel 2 HR" ;
    tot_gain_ch2_20_hr_ku:add_offset = 0. ;
    tot_gain_ch2_20_hr_ku:scale_factor = 0.01 ;
    tot_gain_ch2_20_hr_ku:comment = "Total Fixed Gain On Channel 2 - total
                                   fixed instrument gain applied on chain 2, this
                                   is the gain applied by the RF unit. Applied
                                   in L1B." ;
```

3.4.117 tracker_range_20_ku(time_20_ku)

```
  int tracker_range_20_ku(time_20_ku) ;
        tracker_range_20_ku:_FillValue = -2147483648;
        tracker_range_20_ku:long_name = "corrected tracker range: 20 Hz" ;
        tracker_range_20_ku:units = "m" ;
        tracker_range_20_ku:scale_factor = 0.001 ;
        tracker_range_20_ku:coordinates = "lon_20_ku lat_20_ku" ;
        tracker_range_20_ku:comment = "Tracker range corrected for USO frequency
drift [uso_cor_20_ku], internal path correction [int_path_cor_01] and Doppler
correction [dop_cor_20_ku]." ;
```

3.4.118 transmit_pwr_20_hr_ku(time_20_hr_ku)

```
    int  transmit_pwr_20_hr_ku(time_20_hr_ku) ;
        transmit_pwr_20_hr_ku:_FillValue = -2147483648 ;
        transmit_pwr_20_hr_ku:units = "Watt" ;
        transmit_pwr_20_hr_ku:long_name = "transmitted power from HR data" ;
        transmit_pwr_20_hr_ku:add_offset = 0. ;
        transmit_pwr_20_hr_ku:scale_factor = 1.e-06 ;
        transmit_pwr_20_hr_ku:comment = "The altimeter transmit power." ;
```

3.4.119 uso_cor_01_ku(time_01)

```
  short uso_cor_01_ku(time_01) ;
        uso_cor_01_ku:_FillValue = -32768s;
        uso_cor_01_ku:long_name = "uso correction on the altimeter range (2-way):
1 Hz" ;
        uso_cor_01_ku:units = "m" ;
        uso_cor_01_ku:add_offset = 0. ;
        uso_cor_01_ku:scale_factor = 0.001 ;
        uso_cor_01_ku:coordinates = "lon_01 lat_01" ;
        uso_cor_01_ku:comment = "Correction of the USO frequency drift on the
altimeter range" ;
```

3.4.120 uso_cor_20_ku(time_20_ku)

```
  short uso_cor_20_ku(time_20_ku) ;
        uso_cor_20_ku:_FillValue = -32768s;
               uso_cor_20_ku:long_name = "uso correction on the altimeter range
(2-way): 20 Hz" ;           uso_cor_20_ku:units = "m" ;
        uso_cor_20_ku:add_offset = 0. ;
        uso_cor_20_ku:scale_factor = 0.001 ;
        uso_cor_20_ku:coordinates = "lon_20_ku lat_20_ku" ;
        uso_cor_20_ku:comment = "Correction of the USO frequency drift on the
altimeter range" ;
```

3.4.121 uso_cor_20_hr_ku(time_20_hr_ku)

```
int  uso_cor_20_hr_ku(time_20_hr_ku) ;
        uso_cor_20_hr_ku:_FillValue = 2147483647 ;
        uso_cor_20_hr_ku:long_name = "uso correction on the altimeter range (2-way): 20 Hz from HR data" ;
        uso_cor_20_hr_ku:add_offset = 0. ;
        uso_cor_20_hr_ku:scale_factor = 1.e-15 ;
        uso_cor_20_hr_ku:comment = "USO correction factor defined as the ratio between the nominal and the modelled value. This correction accounts for the different between the nominal frequency provided in the IPFDB and the modelled frequency deviation provided by the DORIS USO drift file. Correction to be applied by the user." ;
```

3.4.122 wind_speed_mod_u_01(time_01)

```
short wind_speed_mod_u_01(time_01) ;
        wind_speed_mod_u_01:_FillValue = -32768s;
        wind_speed_mod_u_01:long_name = "U component of the model wind vector: 1 Hz" ;
        wind_speed_mod_u_01:units = "m/s" ;
        wind_speed_mod_u_01:standard_name = "wind_speed" ;
        wind_speed_mod_u_01:add_offset = 0. ;
        wind_speed_mod_u_01:scale_factor = 0.001 ;
        wind_speed_mod_u_01:coordinates = "lon_01 lat_01" ;
        wind_speed_mod_u_01:comment = "computed at the altimeter time-tag [time_01] from the interpolation of 2 meteorological fields that surround the altimeter time-tag." ;        wind_speed_mod_u_01:source = "European Center for Medium Range Weather Forecasting" ;
        wind_speed_mod_u_01:institution = "ECMWF" ;
```

3.4.123 wind_speed_mod_v_01(time_01)

```
short wind_speed_mod_v_01(time_01) ;
        wind_speed_mod_v_01:_FillValue = -32768s;
        wind_speed_mod_v_01:long_name = "V component of the model wind vector: 1 Hz" ;
        wind_speed_mod_v_01:units = "m/s" ;
        wind_speed_mod_v_01:standard_name = "wind_speed" ;
        wind_speed_mod_v_01:add_offset = 0. ;
        wind_speed_mod_v_01:scale_factor = 0.001 ;
        wind_speed_mod_v_01:coordinates = "lon_01 lat_01" ;
        wind_speed_mod_v_01:comment = "Computed at the altimeter time-tag [time_01] from the interpolation of 2 meteorological fields that surround the altimeter time-tag." ;        wind_speed_mod_v_01:source = "European Center for Medium Range Weather Forecasting" ;
        wind_speed_mod_v_01:institution = "ECMWF" ;
```

3.4.124 **window_del_20_hr_ku(time_20_hr_ku)**

```
int64 window_del_20_hr_ku(time_20_hr_ku) ;
    window_del_20_hr_ku:_FillValue = -9223372036854775808L ;
    window_del_20_hr_ku:units = "seconds" ;
    window_del_20_hr_ku:long_name = "calibrated window delay (2way) " ;
    window_del_20_hr_ku:add_offset = 0.0 ;
    window_del_20_hr_ku:scale_factor = 1.e-12 ;
    window_del_20_hr_ku:comment = "Calibrated 2-way window delay: distance
              from CoM to middle range window (at sample ns/2 from 0).  It
              includes all the range corrections given in the variable
              instr_cor_range. This is a 2-way time and 2-way corrections are
              applied " ;
```

4 L2 PRODUCT FORMAT SPECIFICATION

4.1 L2 PRODUCT FORMAT SPECIFICATION –LIST OF VARIABLES

The contents of the CryoSat ocean products can be logically grouped in:

1. 1-Hz Time and Orbit
2. 1-Hz PLRM Time and Orbit
3. 1-Hz Range Measurements
4. 1-Hz PLRM Range Measurements
5. 1-Hz Range Corrections
6. 1-Hz PLRM Range Corrections
7. 1-Hz SWH and Backscatter
8. 1-Hz PLRM SWH and Backscatter
9. 1-Hz SWH and Backscatter Correction
10. 1-Hz PLRM SWH and Backscatter Correction
11. 1 Hz- Geophysical Figures

This logical classification could be implemented in the NetCDF 4.0 model by means of a specific structure called **group**, however this feature is not used in the CryoSat products in order to assure the back compatibility with previous versions of the NetCDF models.

Nevertheless the logic behind this grouping is kept in the definition of the products and the remaining of this section will follow this hierarchy for the format specification.

4.1.1 20-Hz - Time and Orbit

20Hz-Time and Orbit				
Variable Name	**Dimension**	**long_name**	**units**	**EE Field**
time_01	time_01	UTC: 1 Hz	seconds since 2000-01-01 00:00:00.0	Data Record Time (MDSR Time Stamp)
time_1hz_20_ku	time_20_ku	UTC: 20 Hz ku band	seconds since 2000-01-01 00:00:00.0	
time_20_ku	time_20_ku	UTC: 20 Hz ku band	seconds since 2000-01-	

20Hz-Time and Orbit				
Variable Name	**Dimension**	**long_name**	**units**	**EE Field**
			01 00:00:00.0	
ind_first_meas_20hz_01	time_01	index of the first 20Hz measurement: 1 Hz	count	
num_meas_20hz_01	time_01	number of 20Hz measurement: 1 Hz	count	
ind_meas_1hz_20_ku	time_20_ku	index of the 1Hz measurement: 20 Hz ku band	count	
seq_count_01	time_01	sequence count: 1 Hz	count	Source Sequence Counter
lat_01	time_01	latitude: 1 Hz	degrees_north	Latitude of measurement
lat_20_ku	time_20_ku	latitude: 20 Hz ku band	degrees_north	Latitude of measurement
lon_01	time_01	longitude: 1 Hz	degrees_east	Longitude of measurement

20Hz-Time and Orbit				
Variable Name	**Dimension**	**long_name**	**units**	**EE Field**
lon_20_ku	time_20_ku	longitude: 20 Hz ku band	degrees_east	Longitude of measurement
alt_01	time_01	center of mass altitude of the satellite: 1 Hz	m	Altitude of CoM above reference ellipsoid
alt_20_ku	time_20_ku	center of mass altitude of the satellite: 20 Hz ku band	m	Altitude of CoM above reference ellipsoid
orb_alt_rate_01	time_01	center of mass altitude rate: 1 Hz	m/s	Instantaneous altitude rate derived from orbit Satellite velocity vector
peakiness_01_ku	time_01	peakiness: 1 Hz Ku band	count	Peakiness
peakiness_20_ku	time_20_ku	peakiness: 20 Hz ku band	count	Peakiness
mqe_ocean_20_ku	time_20_ku	mean quadratic error between waveform and model / 'ocean' retracking: 20 Hz ku band	count	20 Hz MQE

20Hz-Time and Orbit				
Variable Name	**Dimension**	**long_name**	**units**	**EE Field**
retracking_ocean_qual_20_ku	time_20_ku	quality flag for the 'ocean' retracking: 20 Hz ku band	FLAG	Ocean retracking quality
flag_instr_op_mode_01	time_01	Instrument mode id – operative mode: 1 Hz	FLAG	
flag_instr_op_mode_20_ku	time_20_ku	instrument mode id - operative mode: 20 Hz	FLAG	
flag_mcd_20_ku	time_20_ku	measurement confidence data: 20 Hz ku band	FLAG	MCD
off_nadir_roll_angle_str_20_ku	time_20_ku	off nadir roll angle derived from star tracker data: 20 Hz	degrees	/
off_nadir_pitch_angle_str_20_ku	time_20_ku	off nadir pitch angle derived from star tracker data: 20 Hz	degrees	/
off_nadir_yaw_angle_str_20_ku	time_20_ku	off nadir yaw angle derived from star tracker data: 20 Hz	degrees	/

4.1.2 20-Hz – PLRM Time and Orbit (only filled for SAR/SARin operating modes)

20-Hz – PLRM Time and Orbit				
Variable Name	**Dimension**	**long_name**	**units**	**EE Field**
time_1hz_20_plrm_ku	time_20_plrm_ku	UTC: 20 Hz PLRM ku band	seconds since 2000-01-01 00:00:00.0	
time_20_plrm_ku	time_20_plrm_ku	UTC: 20 Hz PLRM ku band	s	/
ind_first_meas_20hz_01_plrm_ku	time_01	index of the first 20Hz PLRM measurement: 1 Hz	count	
num_meas_20hz_01_plrm_ku	time_01	number of 20Hz PLRM measurement: 1 Hz	count	

20-Hz – PLRM Time and Orbit				
Variable Name	**Dimension**	**long_name**	**units**	**EE Field**
ind_meas_1hz_20_plrm_ku	time_20_plrm_ku	index of the 1Hz measurement: 20 Hz PLRM ku band	count	
lat_20_plrm_ku	time_20_plrm_ku	latitude: 20 Hz PLRM ku band	degrees_north	/
lon_20_plrm_ku	time_20_plrm_ku	longitude: 20 Hz PLRM ku band	degrees_east	/
alt_20_plrm_ku	time_20_plrm_ku	center of mass altitude of the satellite: 20 Hz PLRM ku band	m	/
peakiness_01_plrm_ku	time_01	peakiness: 1 Hz PLRM ku band	count	/
peakiness_20_plrm_ku	time_20_plrm_ku	peakiness: 20 Hz PLRM ku band	count	/
mqe_ocean_20_plrm_ku	time_20_plrm_ku	mean quadratic error between waveform and model 'ocean' retracking: 20 Hz PLRM ku band	count	/
retracking_ocean_qual_20_plrm_ku	time_20_plrm_ku	quality flag for ocean retracking: 20 Hz PLRM ku band	FLAG	/

20-Hz – PLRM Time and Orbit				
Variable Name	**Dimension**	**long_name**	**units**	**EE Field**
flag_instr_op_mode_20_plrm_ku	time_20_ku	instrument mode id - operative mode: 20 Hz PLRM ku band	FLAG	

4.1.3 **20-Hz - Range Measurements**

20Hz- Range Measurements				
Variable Name	**Dimension**	**long_name**	**units**	**EE Field**
range_ocean_01_ku	time_01	corrected 'ocean' altimeter range: 1 Hz ku band	m	Ocean range to ocean surface
range_ocean_20_ku	time_20_ku	corrected 'ocean' altimeter range: 20 Hz ku band	m	20 Hz ocean range
range_ocean_rms_01_ku	time_01	RMS of the 'ocean' altimeter range: 1 Hz ku band	m	Standard deviation of 20 Hz ocean range
range_ocean_numval_01_ku	time_01	number of valid points used to compute the 'ocean' altimeter range: 1 Hz ku band	count	Number of 20 Hz valid points for ocean range
range_ocean_qual_20_ku	time_20_ku	quality flag for the 'ocean' altimeter range: 20 Hz ku band	FLAG	Ocean range averaging status flags
range_ocog_01_ku	time_01	corrected 'ocog' altimeter range: 1 Hz ku band	m	Ice range to ocean surface
range_ocog_20_ku	time_20_ku	corrected 'ocog' altimeter range: 20 Hz ku band	m	20 Hz Ice range

20Hz- Range Measurements				
Variable Name	**Dimension**	**long_name**	**units**	**EE Field**
range_ocog_rms_01_ku	time_01	RMS of the 'ocog' altimeter range: 1 Hz ku band	m	Standard deviation of 20 Hz Ice range
range_ocog_numval_01_ku	time_01	number of valid points used to compute the 'ocog' altimeter range: 1 Hz ku band	count	Number of 20 Hz valid points for Ice range
range_ocog_qual_20_ku	time_20_ku	quality flag for the 'ocog' altimeter range: 20 Hz ku band	FLAG	Ice range averaging status flags

4.1.4 20-Hz – PLRM Range Measurements (only filled for SAR/SARin operating modes)

20-Hz – PLRM Range Measurements				
Variable Name	**Dimension**	**long_name**	**units**	**EE Field**
range_ocean_01_plrm_ku	time_01	corrected 'ocean' altimeter range: 1 Hz	m	/
range_ocean_20_plrm_ku	time_20_plrm_ku	corrected 'ocean' altimeter range: 20 Hz	m	/
range_ocean_rms_01_plrm_ku	time_01	RMS of the 'ocean' altimeter range: 1 Hz	m	/
range_ocean_numval_01_plrm_ku	time_01	number of valid points used to compute the 'ocean' altimeter range: 1 Hz	count	/
range_ocean_qual_20_plrm_ku	time_20_plrm_ku	quality flag for the 'ocean' altimeter range: 20 Hz PLRM ku band	FLAG	/
range_ocog_01_plrm_ku	time_01	corrected 'ocog' altimeter range: 1 Hz	m	/
range_ocog_20_plrm_ku	time_20_plrm_ku	corrected 'ocog' altimeter range: 20 Hz	m	/
range_ocog_rms_01_plrm_ku	time_01	RMS of the 'ocog' altimeter range: 1 Hz	m	/
range_ocog_numval_01_plrm_ku	time_01	number of valid points used to compute the 'ocog' altimeter range: 1 Hz	count	/
range_ocog_qual_20_plrm_ku	time_20_plrm_ku	quality flag for the \'ocog\' altimeter range: 20 Hz ku band	FLAG	/

4.1.5 **1-Hz - Range Corrections**

1-Hz - Range Corrections				
Variable Name	**Dimension**	**long_name**	**units**	**EE Field**
dop_cor_01_ku	time_01	doppler correction on the altimeter range: 1 Hz	m	Doppler correction
uso_cor_01_ku	time_01	uso correction on the altimeter range (2-way): 1 Hz	m	USO correction
cog_cor_01	time_01	distance antenna-CoM correction on altimeter range: 1 Hz	m	Distance antenna - CoM
int_path_cor_01	time_01	internal path correction on the altimeter range: 1 Hz	m	Range internal calibration correction
mod_instr_cor_range_01_ku	time_01	modeled instrumental correction on the altimeter range: 1 Hz ku band	m	Ocean range modeled instrumental correction
mod_dry_tropo_cor_01	time_01	model dry tropospheric correction: 1 Hz	m	Dry Tropospheric Correction
mod_wet_tropo_cor_01	time_01	model wet tropospheric correction: 1 Hz	m	Wet Tropospheric Correction
gpd_wet_tropo_cor_01	time_01	GPD+ wet tropospheric correction: 1 Hz	m	

1-Hz - Range Corrections				
Variable Name	**Dimension**	**long_name**	**units**	**EE Field**
gpd_wet_tropo_cor_qual_01	time_01	GPD+ wet tropospheric correction quality flag: 1Hz	FLAG	
inv_bar_cor_01	time_01	inverted barometer height correction: 1 Hz	m	Inverse Barometric Correction
hf_fluct_cor_01	time_01	high frequency fluctuations of the sea surface topography: 1 Hz	m	Dynamic Atmospheric Correction
iono_cor_gim_01	time_01	GIM ionospheric correction: 1 Hz	m	GIM Ionospheric Correction
sea_state_bias_01_ku	time_01	sea state bias correction: 1 Hz ku band	m	

4.1.6 **1-Hz – PLRM Range Corrections (only filled for SAR/SARin operation modes)**

1-Hz – PLRM Range Corrections				
Variable Name	**Dimension**	**long_name**	**units**	**EE Field**
mod_instr_cor_range_01_plrm_ku	time_01	modeled instrumental correction on the altimeter range: 1 Hz PLRM ku band	m	/
sea_state_bias_01_plrm_ku	time_01	sea state bias correction: 1 Hz PLRM ku band	m	/

4.1.7 **20-Hz - SWH and Backscatter**

20Hz- SWH and Backscatter				
Variable Name	**Dimension**	**long_name**	**units**	**EE Field**
square_swh_ocean_01_ku	time_01	corrected 'ocean' square of the significant waveheight: 1 Hz ku band	m^2	Square of Significant Wave Height
swh_ocean_01_ku	time_01	corrected 'ocean' significant waveheight: 1 Hz ku band	m	Significant Wave Height

20Hz- SWH and Backscatter				
Variable Name	**Dimension**	**long_name**	**units**	**EE Field**
swh_ocean_20_ku	time_20_ku	corrected 'ocean' significant waveheight: 20 Hz	m	20 Hz SWH
swh_ocean_rms_01_ku	time_01	RMS of the 'ocean' significant waveheight: 1 Hz ku band	m	Standard deviation of 20 Hz SWH
swh_ocean_numval_01_ku	time_01	number of valid points used to compute the 'ocean' significant waveheight: 1 Hz ku band	count	Number of 20 Hz valid points for SWH
swh_ocean_qual_20_ku	time_20_ku	quality flag for the 'ocean' significant waveheight: 20 Hz ku band	FLAG	SWH averaging status flags
sig0_ocean_01_ku	time_01	corrected 'ocean' backscatter coefficient: 1 Hz ku band	dB	Corrected ocean backscatter coefficient
sig0_ocean_20_ku	time_20_ku	corrected 'ocean' backscatter coefficient: 20 Hz ku band	dB	20-Hz ocean backscatter coefficient
sig0_ocean_rms_01_ku	time_01	RMS of the 'ocean' backscatter coefficient: 1 Hz ku band	dB	Standard deviation of 20 Hz ocean backscatter coefficient

20Hz- SWH and Backscatter				
Variable Name	**Dimension**	**long_name**	**units**	**EE Field**
sig0_ocean_numval_01_ku	time_01	number of valid points used to compute the 'ocean' backscatter coefficient: 1 Hz ku band	count	Number of 20 Hz valid points for ocean backscatter coefficient
sig0_ocean_qual_20_ku	time_20_ku	quality flag for the 'ocean' backscatter coefficient: 20 Hz ku band	FLAG	Ocean backscatter averaging status flags
sig0_ocog_01_ku	time_01	corrected 'ocog' backscatter coefficient: 1 Hz ku band	dB	Corrected Ice backscatter coefficient
sig0_ocog_20_ku	time_20_ku	corrected 'ocog' backscatter coefficient: 20 Hz ku band	dB	20-Hz Ice backscatter coefficient [0..19]
sig0_ocog_rms_01_ku	time_01	RMS of the 'ocog' backscatter coefficient: 1 Hz ku band	dB	Standard deviation of 20 Hz Ice backscatter coefficient
sig0_ocog_numval_01_ku	time_01	number of valid points used to compute the 'ocog' backscatter coefficient: 1 Hz ku band	count	Number of 20 Hz valid points for Ice backscatter coefficient
sig0_ocog_qual_20_ku	time_20_ku	quality flag for the 'ocog' backscatter coefficient: 1 Hz ku band	FLAG	Ice backscatter coefficient averaging status flags

20Hz- SWH and Backscatter				
Variable Name	**Dimension**	**long_name**	**units**	**EE Field**
off_nadir_angle_wf_ocean_01_ku	time_01	square of the off nadir angle derived from waveforms: 1 Hz ku band	degrees^2	Off nadir angle of the satellite from waveforms
agc_01_ku	time_01	corrected AGC: 1 Hz ku band	dB	Corrected AGC
scale_factor_20_ku	time_20_ku	scaling factor for backscatter coefficient evaluation: 20 Hz ku band	dB	Scaling factors for backscatter coefficient evaluation

4.1.8 20-Hz – PLRM SWH and Backscatter (only filled for SAR/SARin operating modes)

20-Hz – PLRM SWH and Backscatter				
Variable Name	**Dimension**	**long_name**	**units**	**EE Field**
square_swh_ocean_01_plrm_ku	time_01	corrected 'ocean' square of the significant waveheight: 1 Hz PLRM ku band	m^2	/
swh_ocean_01_plrm_ku	time_01	corrected 'ocean' significant waveheight: 1 Hz PLRM ku band	m	/
swh_ocean_20_plrm_ku	time_20_plrm_ku	corrected 'ocean' significant waveheight: 20 Hz PLRM ku band	m	/
swh_ocean_rms_01_plrm_ku	time_01	RMS of the 'ocean' significant waveheight: 1 Hz PLRM ku band	m	/
swh_ocean_numval_01_plrm_ku	time_01	number of valid points used to compute the 'ocean' significant waveheight: 1 Hz PLRM ku band	count	/
swh_ocean_qual_20_plrm_ku	time_20_plrm_ku	quality flag for the 'ocean' significant waveheight: 20 Hz PLRM ku band	FLAG	/

20-Hz – PLRM SWH and Backscatter				
Variable Name	**Dimension**	**long_name**	**units**	**EE Field**
sig0_ocean_01_plrm_ku	time_01	corrected 'ocean' backscatter coefficient: 1 Hz PLRM ku band	dB	/
sig0_ocean_20_plrm_ku	time_20_plrm_ku	corrected 'ocean' backscatter coefficient: 20 Hz PLRM ku band	dB	/
sig0_ocean_rms_01_plrm_ku	time_01	RMS of the 'ocean' backscatter coefficient: 1 Hz PLRM ku band	dB	/
sig0_ocean_numval_01_plrm_ku	time_01	number of valid points used to compute the 'ocean' backscatter coefficient: 1 Hz PLRM ku band	count	/
sig0_ocean_qual_20_plrm_ku	time_20_plrm_ku	quality flag for the 'ocean' backscatter coefficient: 20 Hz PLRM ku band	FLAG	/
sig0_ocog_01_plrm_ku	time_01	corrected 'ocog' backscatter coefficient: 1 Hz PLRM ku band	dB	/
sig0_ocog_20_plrm_ku	time_20_plrm_ku	corrected 'ocog' backscatter coefficient: 20 Hz PLRM ku band	dB	/

20-Hz – PLRM SWH and Backscatter				
Variable Name	**Dimension**	**long_name**	**units**	**EE Field**
sig0_ocog_rms_01_plrm_ku	time_01	RMS of the 'ocog' backscatter coefficient: 1 Hz PLRM ku band	dB	/
sig0_ocog_numval_01_plrm_ku	time_01	number of valid points used to compute the 'ocog' backscatter coefficient: 1 Hz PLRM ku band	count	/
sig0_ocog_qual_20_plrm_ku	time_20_plrm_ku	quality flag for the 'ocog' backscatter coefficient: 20 Hz PLRM ku band	FLAG	/
off_nadir_angle_wf_ocean_01_plrm_ku	time_01	square of the off nadir angle derived from waveforms: 1 Hz PLRM ku band	degrees^ 2	/
scale_factor_20_plrm_ku	time_20_plrm_ku	scaling factor for backscatter coefficient evaluation: 20 Hz PLRM ku band	dB	/

4.1.9 1-Hz SWH and Backscatter Correction

1-Hz - SWH and Backscatter Correction				
Variable Name	**Dimension**	**long_name**	**units**	**EE Field**
mod_instr_cor_swh_01_ku	time_01	modeled instrumental correction on the swh: 1 Hz ku band	m	SWH modeled instrumental correction (Ocean table)
agc_cor_01	time_01	correction for instrumental errors on AGC: 1 Hz	dB	AGC correction
internal_cor_sig0_01	time_01	internal calibration correction on the backscatter coefficient: 1 Hz	dB	Sigma0 internal calibration correction
mod_instr_cor_sig0_01_ku	time_01	modeled instrumental correction on the sig0: 1 Hz ku band	dB	Backscatter coefficient modeled instrumental correction (Ocean table)
atm_cor_sig0_01	time_01	atmospheric attenuation correction on the backscatter coefficient: 1 Hz	dB	Atmospheric attenuation

4.1.10 1-Hz PLRM SWH and Backscatter Correction (only filled for SAR/SARin operating modes)

1-Hz – PLRM SWH and Backscatter Correction				
Variable Name	**Dimension**	***long_name***	**units**	**EE Field**
mod_instr_cor_swh_01_plrm_ku	time_01	modeled instrumental correction on the swh: 1 Hz PLRM ku band	m	/
mod_instr_cor_sig0_01_plrm_ku	time_01	modeled instrumental correction on the sig0: 1 Hz PLRM ku band	m	/

4.1.11 1-Hz - Geophysical Figures

1-Hz - Geophysical Figures				
Variable Name	**Dimension**	**long_name**	**units**	**EE Field**
mean_sea_surf_sol1_01	time_01	mean sea surface height (solution 1) above reference ellipsoid: 1 Hz	m	Mean Sea Surface height (Solution 1)
mean_sea_surf_sol2_01	time_01	mean sea surface height (solution 2) above reference ellipsoid: 1 Hz	m	Mean Sea Surface height (Solution 2)
geoid_01	time_01	geoid height: 1 Hz	m	Geoid height

1-Hz - Geophysical Figures				
Variable Name	**Dimension**	**long_name**	**units**	**EE Field**
odle_01	time_01	ocean depth/land elevation: 1 Hz	m	Ocean Depth / Land Elevation
mean_dyn_topo_sol1_01	time_01	mean_dyn_topo_sol1_01(time_01) mean dynamic topography above geoid solution 1: 1 Hz	m	Mean Dynamic Topography height
mean_dyn_topo_sol2_01	time_01	mean_dyn_topo_sol2_01(time_01) mean dynamic topography above geoid solution 2: 1 Hz	m	/
ocean_tide_sol1_01	time_01	geocentric ocean tide height (solution 1): 1 Hz	m	Total geocentric ocean tide height (Solution 1 : GOT)
ocean_tide_sol2_01	time_01	geocentric ocean tide height (solution 2): 1 Hz	m	Total geocentric ocean tide height (Solution 2 : FES)
ocean_tide_eq_01	time_01	equilibrium long-period ocean tide height: 1 Hz	m	Long Period Tide Height

1-Hz - Geophysical Figures				
Variable Name	**Dimension**	**long_name**	**units**	**EE Field**
ocean_tide_non_eq_01	time_01	non-equilibrium long-period ocean tide height: 1 Hz	m	Non eq. long period ocean tide height
load_tide_sol1_01	time_01	load tide height for geocentric ocean tide (solution 1): 1 Hz	m	Ocean Loading Tide (Solution 1 : GOT)
load_tide_sol2_01	time_01	load tide height for geocentric ocean tide (solution 2): 1 Hz	m	Ocean Loading Tide (Solution 2 : FES)
solid_earth_tide_01	time_01	solid earth tide height: 1 Hz	m	Solid Earth Tide
pole_tide_01	time_01	geocentric tide height: 1 Hz	m	Geocentric Polar Tide
wind_speed_alt_01_ku	time_01	altimeter wind speed: 1 Hz ku band	m/s	Altimeter wind speed
wind_speed_mod_u_01	time_01	U component of the model wind vector: 1 Hz	m/s	U-component of the model wind vector
wind_speed_mod_v_01	time_01	V component of the model wind vector: 1 Hz	m/s	V-component of the model wind vector
surf_type_01	time_01	surface type: 1 Hz	FLAG	Surface type flag

4.1.12 1-Hz – PLRM Geophysical Figures (only filled for SAR/SARin operating modes)

1 Hz- Geophysical Figures PLRM				
Variable Name	**Dimension**	**long_name**	**units**	**EE Field**
wind_speed_alt_01_plrm_ku	time_01	altimeter wind speed: 1 Hz PLRM ku band	m/s	/

4.1.13 20-Hz - SSHA

20-Hz - SSHA				
Variable Name	**Dimension**	**long_name**	**units**	**EE Field**
ssha_01_ku	time_01	sea surface height anomaly: 1 Hz ku band	m	/
ssha_20_ku	time_20_ku	sea surface height anomaly: 20 Hz ku band	m	/
qual_ssha_01_ku	time_01	sea surface height anomaly quality flag: 1 Hz ku band	FLAG	/
qual_ssha_20_ku	time_20_ku	sea surface height anomaly quality flag: 20 Hz ku band	FLAG	/

4.1.14 **20-Hz – PLRM SSHA (only filled for SAR/SARin operating modes)**

20-Hz – PLRM SSHA				
Variable Name	**Dimension**	**long_name**	**units**	**EE Field**
ssha_01_plrm_ku	time_01	sea surface height anomaly: 1 Hz PLRM ku band	m	/
ssha_20_plrm_ku	time_20_plrm_ku	sea surface height anomaly: 20 Hz PLRM ku band	m	/
qual_ssha_01_plrm_ku	time_01	sea surface height anomaly quality flag: 1 Hz PLRM ku band	FLAG	/
qual_ssha_20_plrm_ku	time_20_plrm_ku	sea surface height anomaly quality flag: 20 Hz PLRM ku band	FLAG	/

4.2 L2 PRODUCT FORMAT SPECIFICATION – GLOBAL ATTRIBUTES

The global attributes contains general information about the product and are listed in this section.

The classification of each attribute is adopted for the sake of clarity and to trace each attribute back to the EE Header field where the attribute comes from.

In any real product the attributes are not grouped but simply listed inside the CONFORM product.

Product Identification Information		
Attribute Name	**Description**	**Values**
product_name	Product File Name	any string
processing_stage	Processing stage code identifier.	RPRO = Reprocessing OFFL = Routine Operation NRT_ = Near Real Time TEST = Test LTA_ = Long Term Archive
reference_document	Reference DFCB Document describing the product	any string
acquisition_station	Acquisition Station	any string
mission	Mission name	CryoSat
processing_centre	Processing Facility	PDS

Data Processing Information		
Attribute Name	**Description**	**Values**
creation_time	Processing Time (Product Generation Time)	
sensing_start	sensing start time	
sensing_stop	sensing stop time	
software_version	Processor Name and software version number	

Orbit Information		
Attribute Name	**Description**	**Values**
phase	Phase Code (set to X if not used)	
cycle_number	Cycle Number (set to +000 if not used)	
rel_orbit_number	Relative Orbit Number at sensing start time (set to +00000 if not used)	
abs_orbit_number	Absolute Orbit Number at sensing start time (set to +00000 if not used)	
state_vector_time	UTC state vector time	
delta_ut1	Universal Time Correction: DUT1 = UT1 – UTC	
x_position	X position in Earth Fixed Reference If not used set to +0000000.000	
y_position	Y position in Earth Fixed Reference	

Orbit Information		
Attribute Name	**Description**	**Values**
	If not used set to +0000000.000	
z_position	Z position in Earth Fixed Reference If not used set to +0000000.000	
x_velocity	X velocity in Earth Fixed Reference If not used set to +0000.000000	
y_velocity	Y velocity in Earth Fixed Reference If not used set to +0000.000000	
z_velocity	Z velocity in Earth Fixed Reference If not used set to +0000.000000	
vector_source	Source of Orbit State Vector Record	fos predicted doris_navigator doris_precise fos_restituted doris_preliminary

Leap Second Information		
Attribute Name	**Description**	**Values**
leap_utc	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 not set. It corresponds to the time after the Leap Second occurrence (i.e. midnight of the day after the leap second)	
leap_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 not set	
leap_err	This field is always not set considering that CRYOSAT products have true UTC times	

Product Confidence Data Information		
Attribute Name	**Description**	**Values**
product_err	Product Error Flag	1 errors have been reported in the Product 0 no errors

Product Time Information		
Attribute Name	**Description**	**Values**
first_meas_time	TAI of the first record in the Main MDS of this product	
last_meas_time	TAI of the last record in the Main MDS of this product	

Product Orbit Information		
Attribute Name	**Description**	**Values**
abs_orbit_start	Absolute Orbit Number at sensing start time.	
rel_time_asc_node_start	Relative time since crossing ascending node time relative to start time of data sensing.	
abs_orbit_stop	Absolute Orbit Number at sensing stop time.	
rel_time_asc_node_stop	Relative time since crossing ascending node time relative to stop time of data sensing.	
equator_cross_time	Time of equator crossing at the ascending node relative to the sensing start time.	
equator_cross_long	Longitude of equator crossing at the ascending node relative to the sensing start time (positive East, 0 = Greenwich) referred to WGS84.	
ascending_flag	Orbit Orientation at the sensing start time	A=Ascending D=Descending

Product Location Information		
Attribute Name	**Description**	**Values**
first_meas_lat	WGS84 latitude of the first record in the Main MDS (positive north)	
first_meas_lon	WGS84 longitude of the first record in the Main MDS (positive East, 0 = Greenwich)	
last_meas_lat	WGS84 latitude of the last record in the Main MDS (positive north	
last_meas_lon	WGS84 longitude of the last record in the Main MDS (positive East, 0 = Greenwich)	

SIRAL Instrument Configuration		
Attribute Name	**Description**	**Values**
instr_id	Instrument_Identifier	A = SIRAL Nominal B = SIRAL Redundnant
sir_op_mode	SIRAL Operative Mode	lrm sar sarin
sir_configuration	SIRAL Rx Configuration	rx_1 rx_2 both unknown

Level 1 Surface Statistics		
Attribute Name	**Description**	**Values**
open_ocean_percent	Percentage of records detected on open ocean or semi-enclosed seas	
close_sea_percent	Percentage of records detected on close seas or lakes	
continent_ice_percent	Percentage of records detected on continental ice	
land_percent	Percentage of records detected on land	

Operative mode Statistics		
Attribute Name	**Description**	**Values**
lrm_mode_percent	Percentage of input L1B records detected in LRM mode	
sar_mode_percent	Percentage of input L1B records detected in SAR mode	
sarin_mode_percent	Percentage of input L1B records detected in SARin mode	

SIRAL Level 1 Processing information		
Attribute Name	**Description**	**Values**
l1b_prod_status	Complete/Incomplete Product Completion Flag (0 or 1). 1 if the product has a duration shorter than the input Level 0	
l1b_proc_flag	Processing errors significance flag 1 errors (percentage of errors greater than threshold)	

SIRAL Level 1 Processing information		
Attribute Name	**Description**	**Values**
	0 no errors	
l1b_processing_quality	Percentage of quality checks successfully passed during Level 1B processing (max allowed +10000)	
l1b_proc_thresh	Minimum acceptable percentage of quality threshold that must be passed during Level 1B processing (max allowed +10000)	

SIRAL Level 2 Processing information		
Attribute Name	**Description**	**Values**
L2_prod_status	Complete/Incomplete Product Completion Flag (0 or 1). 1 if the product has a duration shorter than the input Level 0	
l2_proc_flag	Processing errors significance flag 1 errors (percentage of errors greater than threshold) 0 no errors	
l2_processing_quality	Percentage of quality checks successfully passed during Level 2 processing (max allowed +10000)	
l2_proc_thresh	Minimum acceptable percentage of quality threshold that must be passed during Level 2 processing (max allowed +10000)	

SIRAL Level 2 Processing information		
Attribute Name	**Description**	**Values**
Reference DSD		
Attribute Name	**Description**	**Values**
xref_siral_l0	SIRAL L0 file name(s)	
xref_siral_l1b	SIRAL L1b file name(s)	
xref_uso	USO file name	
xref_orbit	Orbit file nam(s)	
xref_siral_characterisation	SIRAL IPFDB file name	
xref_meteo	Meteo file name(s)	
xref_pole_location	Pole location file name	
xref_gim	GIM file name(s)	
xref_mog2d	MOG2D file name(s)	
xref_cal1	L1B CAL1 file name	
xref_cal2	L1B CAL2 file name	
xref_constants	Constants File	
xref_earth_tide	Cartwright File	
xref_long_period_tide	FES File	
xref_mean_pressure	Mean Pressure File for Meteo Correction generated by using either analysis or forecast data	
xref_ocean_tide_sol1	Sol1 File for Ocean Tide	
xref_ocean_tide_sol2	Sol2 File for Ocean Tide	
xref_pconf	Processor Configuration Parameters File	
xref_orbit_scenario	Orbit scenario file name	
xref_surf_pressure	Surface Pressure File for Meteo Correction generated by using either analysis or forecast data	

SIRAL Level 2 Processing information		
Attribute Name	**Description**	**Values**
xref_surf_type	Surface Type Map File	
xref_tidal_load_sol1	Solution 1 File for Tidal Loading	
xref_tidal_load_sol2	Solution 2 File for Tidal Loading	
xref_u_wind	U Wind component File for Meteo Correction generated by using either analysis or forecast data	
xref_v_wind	V Wind component File for Meteo Correction generated by using either analysis or forecast data	
xref_wet_trop	Wet Troposphere File for Meteo Correction generated by using either analysis or forecast data	
xref_geoid	Geoid File	
xref_mean_surface_sol1	Sol1 Mean Surface File	
xref_mean_surface_sol2	Sol2 Mean Surface File	
xref_mtd_sol1	Sol1 Mtd File	
xref_mtd_sol2	Sol2 Mtd File	
xref_sea_state_bias	Sea State Bias File	
xref_odle	Ocean Depth/Land Elevation File	
xref_gpd_wtc	GPD+ - Wet tropospheric correction FIle	

4.3 TABLE OF REFERENCE DSD VS L2 PROCESSORS

		PROCESSORS								
		L2								
		NOP LRM	NOP SAR	NOP SRN	IOP LRM	IOP SAR	IOP SRN	GOP LRM	GOP SAR	GOP SRN
Input Data File	**File Type**									
xref_siral_l1b	SIR_NOPM1B	M								
	SIR_NOPR1B		M							
	SIR_NOPN1B			M						
	SIR_IOPM1B				M					
	SIR_IOPR1B					M				
	SIR_IOPN1B						M			
	SIR_GOPM1B							M		
	SIR_GOPR1B								M	
	SIR_GOPN1B									M
xref_pconf	None	M	M	M	M	M	M	M	M	M
xref_siral_characterisation	AUX_IPFDBA AUX_IPFDBB	M	M	M	M	M	M	M	M	M
xref_orbit_scenario	MPL_ORBREF	M	M	M	M	M	M	M	M	M
xref_orbit	DOR_NAV_0	M	M	M						
	AUX_ORBDOP				M	M	M			
	AUX_ORBDOR							M	M	M
	MPL_ORBPRE	M	M	M	M	M	M	M	M	M
xref_gpd_wtc	AUX_GPDWTC							M	M	M
xref_geoid	None	M	M	M	M	M	M	M	M	M
xref_mtd_sol1	None	M	M	M	M	M	M	M	M	M
xref_mtd_sol2	None	M	M	M	M	M	M	M	M	M
xref_odle	None	M	M	M	M	M	M	M	M	M

		PROCESSORS								
		L2								
		NOP LRM	NOP SAR	NOP SRN	IOP LRM	IOP SAR	IOP SRN	GOP LRM	GOP SAR	GOP SRN
xref_sea_state_bias	None	M	M	M	M	M	M	M	M	M

		PROCESSORS	
		Pole-to-Pole	
		IOP	**GOP**
xref_siral_l2	SIR_IOPM2_	M	
	SIR_IOPR2_	M	
	SIR_IOPN2_	M	
	SIR_GOPM2_		M
	SIR_GOPR2_		M
	SIR_GOPN2_		M
xref_orbit	AUX_ORBDOR		M
	AUX_ORBDOP	M	
	MPL_ORBPRE	M	M
	MPL_ORBREF	M	M
xref_siral_characterisation	AUX_IPFDBA AUX_IPFDBB	M	M

4.4 L2 PRODUCT FORMAT SPECIFICATION – CDL DUMP

4.4.1 agc_01_ku(time_01)

```
        short agc_01_ku(time_01) ;
                agc_01_ku:_FillValue = -32768s;
                agc_01_ku:long_name = "corrected AGC: 1 Hz ku band" ;
                agc_01_ku:units = "dB" ;
                agc_01_ku:add_offset = 0. ;
                agc_01_ku:scale_factor = 0.01 ;
                agc_01_ku:coordinates = "lon_01 lat_01" ;
                agc_01_ku:comment = "AGC corrected for instrumental errors [agc_cor_01]"
;
```

4.4.2 agc_cor_01 (time_01)

```
        short agc_cor_01 (time_01) ;
                agc_cor_01:_FillValue = -32768s;
                agc_cor_01:long_name = "correction for instrumental errors on AGC: 1 Hz
ku band" ;
                agc_cor_01:units = "dB" ;
                agc_cor_01:add_offset = 0. ;
                agc_cor_01:scale_factor = 0.01 ;
                agc_cor_01:coordinates = "lon_01 lat_01" ;
                agc_cor_01:comment = "AGC correction determined from the values provided
in the IPF data base." ;
```

4.4.3 alt_01(time_01)

```
        int alt_01(time_01) ;
                alt_01:_FillValue = -2147483648;
                alt_01:long_name = "altitude of CoM above reference ellipsoid [WGS84]: 1
Hz" ;
                alt_01:units = "m" ;
                alt_01:standard_name = "height_above_reference_ellipsoid" ;
                alt_01:scale_factor = 0.001 ;
                alt_01:coordinates = "lon_01 lat_01" ;
                alt_01:comment = "Altitude of satellite center of mass above the reference
ellipsoid." ;
```

4.4.4 alt_20_ku(time_20_ku)

```
        int alt_20_ku(time_20_ku) ;
                alt_20_ku:_FillValue = -2147483648;
                alt_20_ku:long_name = altitude of CoM above reference ellipsoid [WGS84]:
20 Hz ku band" ;
                alt_20_ku:units = "m" ;
                alt_20_ku:standard_name = "height_above_reference_ellipsoid" ;
                alt_20_ku:scale_factor = 0.001 ;
                alt_20_ku:coordinates = "lon_20_ku lat_20_ku" ;
                alt_20_ku:comment = "Altitude of satellite center of mass above the
reference ellipsoid." ;
```

4.4.5 alt_20_plrm_ku(time_20_plrm_ku)

```
int alt_20_plrm_ku(time_20_plrm_ku) ;
        alt_20_plrm_ku:_FillValue = -2147483648;
alt_20_plrm_ku:long_name = "center of mass altitude of the satellite: 20 Hz PLRM
ku band" ;           alt_20_plrm_ku:units = "m" ;
        alt_20_plrm_ku:standard_name = "height_above_reference_ellipsoid" ;
        alt_20_plrm_ku:scale_factor = 0.001 ;
        alt_20_plrm_ku:coordinates = "lon_20_plrm_ku lat_20_plrm_ku" ;
alt_20_plrm_ku:comment = " Not provided in LRM mode. Altitude of satellite center
of mass above the reference ellipsoid." ;atm_cor_sig0_01(time_01)
short atm_cor_sig0_01(time_01) ;
        atm_cor_sig0_01:_FillValue = -32768s;
        atm_cor_sig0_01:long_name = "atmospheric attenuation correction on the
backscatter coefficient: 1 Hz" ;
        atm_cor_sig0_01:units = "dB" ;
        atm_cor_sig0_01:add_offset = 0. ;
        atm_cor_sig0_01:scale_factor = 0.01 ;
        atm_cor_sig0_01:coordinates = "lon_01 lat_01" ;
        atm_cor_sig0_01:comment = "Computed from model wet tropospheric
correction [mod_wet_tropo_cor_01]" ;
```

4.4.6 cog_cor_01(time_01)

```
short cog_cor_01(time_01) ;
        cog_cor_01:_FillValue = -32768s;
                cog_cor_01:long_name = "distance antenna-CoM correction on
altimeter range: 1 Hz" ;           cog_cor_01:units = "m" ;
        cog_cor_01:add_offset = 0. ;
        cog_cor_01:scale_factor = 0.001 ;
        cog_cor_01:coordinates = "lon_01 lat_01" ;
        cog_cor_01:comment = "Distance antenna-CoM determined from the value
provided in the IPF data base." ;
```

4.4.7 dop_cor_01_ku(time_01)

```
short dop_cor_01_ku(time_01) ;
        dop_cor_01_ku:_FillValue = -32768s;
        dop_cor_01_ku:long_name = "doppler correction on the altimeter range: 1
Hz" ;
        dop_cor_01_ku:units = "m" ;
        dop_cor_01_ku:add_offset = 0. ;
        dop_cor_01_ku:scale_factor = 0.001 ;
        dop_cor_01_ku:coordinates = "lon_01 lat_01" ;
        dop_cor_01_ku:comment = "This is the Doppler range correction due to the
satellite altitude rate. It is computed from the component of the satellite velocity
in the nadir direction." ;
```

4.4.8 flag_instr_op_mode_01(time_01)

```
byte flag_instr_op_mode_01(time_01_ku) ;
        flag_instr_op_mode_01:_FillValue = -128b;
        flag_instr_op_mode_01:long_name = "mode id - operative mode: 1 Hz" ;
flag_instr_op_mode_01:flag_values = 1b, 2b, 3b ;
        flag_instr_op_mode_01:flag_meanings = "lrm sar sarin" ;
        flag_instr_op_mode_01:coordinates = "lon_01 lat_01" ;
        flag_instr_op_mode_01:comment = "Mode ID - Identifies the SIRAL
instrument measurement mode." ;
```

4.4.9 flag_instr_op_mode_20_ku(time_20_ku)

```
byte flag_instr_op_mode_20_ku(time_20_ku) ;
        flag_instr_op_mode_20_ku:_FillValue = -128b ;
        flag_instr_op_mode_20_ku:comment = "Mode ID - Identifies the SIRAL
instrument measurement mode." ;
        flag_instr_op_mode_20_ku:coordinates = "lon_20_ku lat_20_ku" ;
        flag_instr_op_mode_20_ku:flag_meanings = "lrm sar sarin" ;
        flag_instr_op_mode_20_ku:flag_values = 1b, 2b, 3b ;
        flag_instr_op_mode_20_ku:long_name = "mode id - operative mode: 20 Hz" ;
```

4.4.10 flag_instr_op_mode_20_plrm_ku(time_20_plrm_ku)

```
byte flag_instr_op_mode_20_plrm_ku (time_20_plrm_ku) ;
        flag_instr_op_mode_20_plrm_ku:_FillValue = -128b;
        flag_instr_op_mode_20_plrm_ku:long_name = "mode id - operative mode: 20
Hz PLRM ku band" ;
        flag_instr_op_mode_20_plrm_ku:flag_values = 1b, 2b, 3b ;
        flag_instr_op_mode_20_plrm_ku:flag_meanings = "lrm sar sarin" ;
        flag_instr_op_mode_20_plrm_ku:coordinates = "lon_20_ku_plrm
lat_20_ku_plrm" ;
        flag_instr_op_mode_20_plrm_ku:comment = "Not provided in LRM mode. Mode
ID - Identifies the SIRAL instrument measurement mode." ;
```

4.4.11 flag_mcd_20_ku(time_20_ku)

```
int flag_mcd_20_ku(time_20_ku) ;
        flag_mcd_20_ku:_FillValue = -1 ;
        flag_mcd_20_ku:long_name = "measurement confidence data: 20 Hz" ;
        flag_mcd_20_ku:flag_masks = -2147483648, 1073741824, 536870912,
268435456, 134217728, 67108864, 33554432, 16777216, 8388608, 4194304, 2097152, 1048576,
524288, 262144, 131072, 65536, 32768, 16384, 8192, 4096, 2048, 128, 64, 32, 16, 8, 1;
        flag_mcd_20_ku:flag_meanings = "block_degraded blank_block
datation_degraded orbit_prop_error orbit_file_change orbit_gap echo_saturated
other_echo_error sarin_rx1_error sarin_rx2_error window_delay_error agc_error
cal1_missing cal1_default doris_uso_missing ccal1_default trk_echo_error
echo_rx1_error echo_rx2_error npm_error azimuth_cal_missing phase_pert_cor_missing
cal2_missing cal2_default power_scale_error attitude_cor_missing
phase_pert_cor_default";
        flag_mcd_20_ku:coordinates = "lon_20_ku lat_20_ku" ;
        flag_mcd_20_ku:comment = "Measurement confidence flags. Generally the MCD
flags indicate problems when set. If the whole MCD is 0 then no problems or non-nominal
conditions were detected. Serious errors are indicated by setting bit 31 (SS bit 0),
in which case the block must not be processed. Other error settings can be regarded as
warnings." ;
```

4.4.12 **geoid_01(time_01)**

```
int geoid_01(time_01) ;
        geoid_01:_FillValue = -2147483648;
        geoid_01:long_name = "geoid height: 1 Hz" ;
        geoid_01:units = "m" ;
        geoid_01:standard_name = "geoid_height_above_reference_ellipsoid" ;
        geoid_01:add_offset = 0. ;
        geoid_01:scale_factor = 0.001 ;
        geoid_01:coordinates = "lon_01 lat_01" ;
        geoid_01:comment = "Computed from the geoid model with a correction to refer the value to the mean tide system i.e. includes the permanent tide (zero frequency)" ;
        geoid_01:source = "EGM2008" ;
        geoid_01:institution = "GSFC" ;
```

4.4.13 **gpd_wet_tropo_cor_01(time_01)**

```
short gpd_wet_tropo_cor_01(time_01) ;
        gpd_wet_tropo_cor_01:_FillValue = -32768s ;
        gpd_wet_tropo_cor_01:long_name = "GPD+ wet tropospheric correction: 1 Hz" ;
        gpd_wet_tropo_cor_01:units = "m" ;
        gpd_wet_tropo_cor_01:standard_name = "altimeter_range_correction_due_to_wet_troposphere" ;
        gpd_wet_tropo_cor_01:add_offset = 0. ;
        gpd_wet_tropo_cor_01:scale_factor = 0.001 ;
        gpd_wet_tropo_cor_01:coordinates = "lon_01 lat_01" ;
        gpd_wet_tropo_cor_01:comment = "Computed at the altimeter time-tag [time_01] through OA space-time analysis using the GPD+ algorithm, by combining all available observations. The correction has been calibrated with respect to the SSM/I and SSM/IS imaging radiometers. A wet tropospheric correction must be added (negative value) to the instrument range to correct this range measurement for wet tropospheric range delays of the radar pulse. This correction is valid over ocean surfaces only.";
        gpd_wet_tropo_cor_01:institution = "UPorto" ;
```

4.4.14 **gpd_wet_tropo_cor_qual_01(time_01)**

```
byte gpd_wet_tropo_cor_qual_01(time_01) ;
        gpd_wet_tropo_cor_qual_01:_FillValue = -128b ;
        gpd_wet_tropo_cor_qual_01:long_name = "GPD+ wet tropospheric correction quality flag: 1Hz" ;
        gpd_wet_tropo_cor_qual_01:flag_values = 0b, 1b, 2b ;
        gpd_wet_tropo_cor_qual_01:flag_meanings = "from_obs invalid from_model" ;
        gpd_wet_tropo_cor_qual_01:coordinates = "lon_01 lat_01" ;
```

4.4.15 **hf_fluct_cor_01(time_01)**

```
short hf_fluct_cor_01(time_01) ;
        hf_fluct_cor_01:_FillValue = -32768s;
        hf_fluct_cor_01:long_name = "high frequency fluctuations of the sea surface topography: 1 Hz" ;
        hf_fluct_cor_01:units = "m" ;
        hf_fluct_cor_01:standard_name = "sea_surface_height_correction_due_to_air_pressure_and_wind_at_high_frequency" ;
        hf_fluct_cor_01:add_offset = 0. ;
        hf_fluct_cor_01:scale_factor = 0.001 ;
        hf_fluct_cor_01:coordinates = "lon_01 lat_01" ;
        hf_fluct_cor_01:comment = "High frequency fluctuations of the sea surface topography due to high frequency air pressure and wind effects. Also known as DAC (Dynamical Atmospheric Correction). Provided as a correction to the inverted barometer correction [inv_bar_cor_01]." ;
        hf_fluct_cor_01:source = "2.1.0" ;
        hf_fluct_cor_01:institution = "LEGOS/CLS/CNES" ;
```

4.4.16 ind_first_meas_20hz_01(time_01)

```
	int ind_first_meas_20hz_01(time_01) ;
		ind_first_meas_20hz_01:long_name = "index of the first 20Hz measurement: 1 Hz" ;
		ind_first_meas_20hz_01:units = "count" ;
		ind_first_meas_20hz_01:_FillValue = - 2147483648;
		ind_first_meas_20hz_01:comment = "Index of the first 20Hz measurement of the 1Hz packet." ;
```

4.4.17 ind_first_meas_20hz_01_plrm_ku(time_01)

```
	short ind_first_meas_20hz_01_plrm_ku(time_01) ;
		ind_first_meas_20hz_01_plrm_ku:long_name = "index of the first 20Hz PLRM measurement: 1 Hz" ;
		ind_first_meas_20hz_01_plrm_ku:units = "count" ;
		ind_first_meas_20hz_01_plrm_ku:_FillValue = -32768s;
		ind_first_meas_20hz_01_plrm_ku:comment = "Set to FillValue in LRM mode. Index of the first 20Hz PLRM measurement of the 1Hz packet." ;
```

4.4.18 ind_meas_1hz_20_ku(time_20_ku)

```
	short ind_meas_1hz_20_ku(time_20_ku) ;
		ind_meas_1hz_20_ku:long_name = "index of the 1Hz measurement: 20 Hz ku band" ;
		ind_meas_1hz_20_ku:units = "count" ;
		ind_meas_1hz_20_ku:_FillValue = -32768s;
		ind_meas_1hz_20_ku:comment = "Index of the 1Hz measurement to which belongs the 20Hz measurement." ;
```

4.4.19 ind_meas_1hz_20_plrm_ku(time_20_plrm_ku)

```
	short ind_meas_1hz_20_plrm_ku(time_20_plrm_ku) ;
		ind_meas_1hz_20_plrm_ku:long_name = "index of the 1Hz measurement: 20 Hz PLRM ku band" ;
		ind_meas_1hz_20_plrm_ku:units = "count" ;
		ind_meas_1hz_20_plrm_ku:_FillValue = -32768s;
		ind_meas_1hz_20_plrm_ku:comment = " Not provided in LRM mode. Index of the 1Hz measurement to which belongs the 20Hz PLRM measurement." ;
```

4.4.20 int_path_cor_01(time_01)

```
	short int_path_cor_01(time_01) ;
		int_path_cor_01:_FillValue = -32768s;
		int_path_cor_01:long_name = "internal path correction on the altimeter range: 1 Hz" ;
		int_path_cor_01:units = "m" ;
		int_path_cor_01:add_offset = 0. ;
		int_path_cor_01:scale_factor = 0.001 ;
		int_path_cor_01:coordinates = "lon_01 lat_01" ;
		int_path_cor_01:comment = "Internal calibration correction on the altimeter range" ;
```

4.4.21 internal_cor_sig0_01 (time_01)

```
short internal_cor_sig0_01(time_01) ;
        internal_cor_sig0_01:_FillValue = -32768s ;
        internal_cor_sig0_01:long_name = "internal calibration correction on the backscatter coefficient: 1 Hz" ;
        internal_cor_sig0_01:units = "dB" ;
        internal_cor_sig0_01:add_offset = 0. ;
        internal_cor_sig0_01:scale_factor = 0.01 ;
        internal_cor_sig0_01:coordinates = "lon_01 lat_01" ;
        internal_cor_sig0_01:comment = "Internal calibration correction applied to the backscatter coefficient." ;
```

4.4.22 inv_bar_cor_01(time_01)

```
short inv_bar_cor_01(time_01) ;
        inv_bar_cor_01:_FillValue = -32768s;
        inv_bar_cor_01:long_name = "inverted barometer height correction: 1 Hz" ;
        inv_bar_cor_01:units = "m" ;
        inv_bar_cor_01:standard_name = "sea_surface_height_correction_due_to_air_pressure_at_low_frequency" ;
        inv_bar_cor_01:add_offset = 0. ;
        inv_bar_cor_01:scale_factor = 0.001 ;
        inv_bar_cor_01:coordinates = "lon_01 lat_01" ;
        inv_bar_cor_01:comment = "Computed at the altimeter time-tag [time_01] from the interpolation of 2 meteorological fields that surround the altimeter time-tag. To be added to range measurement together with the high frequency fluctuation [hf_fluct_cor_01] to correct for the depression of the ocean surface caused by the local barometric pressure." ; inv_bar_cor_01:source = "European Center for Medium Range Weather Forecasting" ;
        inv_bar_cor_01:institution = "ECMWF" ;
```

4.4.23 iono_cor_gim_01(time_01)

```
short iono_cor_gim_01(time_01) ;
        iono_cor_gim_01:_FillValue = -32768s;
        iono_cor_gim_01:long_name = "GIM ionospheric correction: 1 Hz" ;
        iono_cor_gim_01:units = "m" ;
        iono_cor_gim_01:standard_name = "altimeter_range_correction_due_to_ionosphere" ;
        iono_cor_gim_01:add_offset = 0. ;
        iono_cor_gim_01:scale_factor = 0.001 ;
        iono_cor_gim_01:coordinates = "lon_01 lat_01" ;
        iono_cor_gim_01:comment = "To be added to range measurement to correct for the delay to the Radar pulse caused by free electrons in the ionosphere. Computed from GPS ionospheric data." ;
        iono_cor_gim_01:source = "GIM" ;
        iono_cor_gim_01:institution = "NASA/JPL" ;
```

4.4.24 lat_01(time_01)

```
int lat_01(time_01) ;
        lat_01:long_name = "latitude: 1 Hz" ;
        lat_01:_FillValue = -2147483648;
        lat_01:units = "degrees_north" ;
        lat_01:standard_name = "latitude" ;
        lat_01:add_offset = 0. ;
        lat_01:scale_factor = 1.e-07 ;
        lat_01:comment = "Positive latitude is North latitude, negative latitude is South latitude" ;
```

4.4.25 lat_20_ku(time_20_ku)

```
int lat_20_ku(time_20_ku) ;
        lat_20_ku:long_name = "latitude: 20 Hz ku band" ;
        lat_20_ku:_FillValue = -2147483648;
        lat_20_ku:units = "degrees_north" ;
        lat_20_ku:standard_name = "latitude" ;
        lat_20_ku:add_offset = 0. ;
        lat_20_ku:scale_factor = 1.e-07 ;
        lat_20_ku:comment = "Positive latitude is North latitude, negative latitude is South latitude" ;
```

4.4.26 lat_20_plrm_ku(time_20_plrm_ku)

```
int lat_20_plrm_ku(time_20_plrm_ku) ;
        lat_20_plrm_ku:long_name = "latitude: 20 Hz PLRM ku band" ;
        lat_20_plrm_ku:_FillValue = -2147483648;
        lat_20_plrm_ku:units = "degrees_north" ;
        lat_20_plrm_ku:standard_name = "latitude" ;
        lat_20_plrm_ku:add_offset = 0. ;
        lat_20_plrm_ku:scale_factor = 1.e-07 ;
        lat_20_plrm_ku:comment = " Not provided in LRM mode. Positive latitude is North latitude, negative latitude is South latitude" ;
```

4.4.27 load_tide_sol1_01(time_01)

```
short load_tide_sol1_01(time_01) ;
        load_tide_sol1_01:_FillValue = -32768s;
        load_tide_sol1_01:long_name = "load tide height for geocentric ocean tide (solution 1): 1 Hz" ;
        load_tide_sol1_01:units = "m" ;
        load_tide_sol1_01:add_offset = 0. ;
        load_tide_sol1_01:scale_factor = 0.001 ;
        load_tide_sol1_01:coordinates = "lon_01 lat_01" ;
        load_tide_sol1_01:comment = "This value has already been added to the corresponding ocean tide height value recorded in the product [ocean_tide_sol1_01]." ;
        load_tide_sol1_01:source = "GOT4.10" ;
        load_tide_sol1_01:institution = "GSFC" ;
```

4.4.28 load_tide_sol2_01(time_01)

```
short load_tide_sol2_01(time_01) ;
        load_tide_sol2_01:_FillValue = -32768s;
        load_tide_sol2_01:long_name = "load tide height for geocentric ocean tide (solution 2): 1 Hz" ;
        load_tide_sol2_01:units = "m" ;
        load_tide_sol2_01:add_offset = 0. ;
        load_tide_sol2_01:scale_factor = 0.001 ;
        load_tide_sol2_01:coordinates = "lon_01 lat_01" ;
        load_tide_sol2_01:comment = "This value contains the total load tide height (short-period and long-period) for the geocentric ocean tide (solution 2). To get only the pure ocean tide height (solution 2), do: [ocean_tide_sol2_01] + [ocean_tide_non_eq_01] - [load_tide_sol2_01]. This value has already been added to the corresponding ocean tide height value recorded in the product [ocean_tide_sol2_01]." ;
        load_tide_sol2_01:source = "FES2014b" ;
        load_tide_sol2_01:institution = "LEGOS/CNES" ;
```

4.4.29 lon_01(time_01)

```
int lon_01(time_01) ;
        lon_01:long_name = "longitude: 1 Hz" ;
        lon_01:_FillValue = -2147483648;
        lon_01:units = "degrees_east" ;
        lon_01:standard_name = "longitude" ;
        lon_01:add_offset = 0. ;
        lon_01:scale_factor = 1.e-07 ;
        lon_01:comment = "East longitude relative to Greenwhich meridian" ;
```

4.4.30 lon_20_ku(time_20_ku)

```
int lon_20_ku(time_20_ku) ;
        lon_20_ku:long_name = "longitude: 20 Hz ku band" ;
        lon_20_ku:_FillValue = -2147483648;
        lon_20_ku:units = "degrees_east" ;
        lon_20_ku:standard_name = "longitude" ;
        lon_20_ku:add_offset = 0. ;
        lon_20_ku:scale_factor = 1.e-07 ;
        lon_20_ku:comment = "East longitude relative to Greenwhich meridian" ;
```

4.4.31 lon_20_plrm_ku(time_20_plrm_ku)

```
int lon_20_plrm_ku(time_20_plrm_ku) ;
        lon_20_plrm_ku:long_name = "longitude: 20 Hz PLRM ku band" ;
        lon_20_plrm_ku:_FillValue = -2147483648;
        lon_20_plrm_ku:units = "degrees_east" ;
        lon_20_plrm_ku:standard_name = "longitude" ;
        lon_20_plrm_ku:add_offset = 0. ;
        lon_20_plrm_ku:scale_factor = 1.e-07 ;
        lon_20_plrm_ku:comment = " Not provided in LRM mode. East longitude relative to Greenwhich meridian" ;
```

4.4.32 mean_dyn_topo_sol1_01(time_01)

```
	int mean_dyn_topo_sol1_01(time_01) ;
		mean_dyn_topo_sol1_01:_FillValue = -2147483648;
		mean_dyn_topo_sol1_01:long_name = "mean dynamic topography (solution 1) 
above geoid: 1 Hz" ;
		mean_dyn_topo_sol1_01:units = "m" ;
		mean_dyn_topo_sol1_01:add_offset = 0. ;
		mean_dyn_topo_sol1_01:scale_factor = 0.001 ;
		mean_dyn_topo_sol1_01:coordinates = "lon_01 lat_01" ;
		mean_dyn_topo_sol1_01:source = "CNES/CLS 13" ;
		mean_dyn_topo_sol1_01:institution = "CNES/CLS" ;
```

4.4.33 mean_dyn_topo_sol2_01(time_01)

```
	int mean_dyn_topo_sol2_01(time_01) ;
		mean_dyn_topo_sol2_01:_FillValue = -2147483648;
		mean_dyn_topo_sol2_01:long_name = "mean dynamic topography (solution 2) 
above geoid: 1 Hz" ;
		mean_dyn_topo_sol2_01:units = "m" ;
		mean_dyn_topo_sol2_01:add_offset = 0. ;
		mean_dyn_topo_sol2_01:scale_factor = 0.001 ;
		mean_dyn_topo_sol2_01:coordinates = "lon_01 lat_01" ;
		mean_dyn_topo_sol2_01:source = "DTU13" ;
		mean_dyn_topo_sol2_01:institution = "DNSC" ;
```

4.4.34 mean_sea_surf_sol1_01(time_01)

```
	int mean_sea_surf_sol1_01(time_01) ;
		mean_sea_surf_sol1_01:_FillValue = -2147483648;
		mean_sea_surf_sol1_01:long_name = "mean sea surface height (solution 1) 
above reference ellipsoid: 1 Hz" ;
		mean_sea_surf_sol1_01:units = "m" ;
		mean_sea_surf_sol1_01:add_offset = 0. ;
		mean_sea_surf_sol1_01:scale_factor = 0.001 ;
		mean_sea_surf_sol1_01:coordinates = "lon_01 lat_01" ;
		mean_sea_surf_sol1_01:source = "CNES-CLS-15" ;
		mean_sea_surf_sol1_01:institution = "CNES/CLS" ;
```

4.4.35 mean_sea_surf_sol2_01(time_01)

```
	int mean_sea_surf_sol2_01(time_01) ;
		mean_sea_surf_sol2_01:_FillValue = -2147483648;
		mean_sea_surf_sol2_01:long_name = "mean sea surface height (solution 2) 
above reference ellipsoid: 1 Hz" ;
		mean_sea_surf_sol2_01:units = "m" ;
		mean_sea_surf_sol2_01:add_offset = 0. ;
		mean_sea_surf_sol2_01:scale_factor = 0.001 ;
		mean_sea_surf_sol2_01:coordinates = "lon_01 lat_01" ;
		mean_sea_surf_sol2_01:source = "DTU13" ;
		mean_sea_surf_sol2_01:institution = "DNSC" ;
```

4.4.36 mod_dry_tropo_cor_01(time_01)

```
short mod_dry_tropo_cor_01(time_01) ;
        mod_dry_tropo_cor_01:_FillValue = -32768s;
        mod_dry_tropo_cor_01:long_name = "model dry tropospheric correction: 1 Hz" ;
        mod_dry_tropo_cor_01:units = "m" ;
        mod_dry_tropo_cor_01:standard_name = "altimeter_range_correction_due_to_dry_troposphere" ;
        mod_dry_tropo_cor_01:add_offset = 0. ;
        mod_dry_tropo_cor_01:scale_factor = 0.001 ;
        mod_dry_tropo_cor_01:coordinates = "lon_01 lat_01" ;
        mod_dry_tropo_cor_01:comment = "Computed at the altimeter time-tag [time_01] from the interpolation of 2 meteorological fields that surround the altimeter time-tag. To be added to range measurement to correct for the propagation delay to the radar pulse, caused by the dry-gas component of the Earth's atmosphere." ;
        mod_dry_tropo_cor_01:source = "European Center for Medium Range Weather Forecasting" ;
        mod_dry_tropo_cor_01:institution = "ECMWF" ;
```

4.4.37 mod_instr_cor_range_01_ku(time_01)

```
short mod_instr_cor_range_01_ku(time_01) ;
        mod_instr_cor_range_01_ku:_FillValue = -32768s;
        mod_instr_cor_range_01_ku:long_name = "modeled instrumental correction on the altimeter range: 1 Hz ku band" ;
        mod_instr_cor_range_01_ku:units = "m" ;
        mod_instr_cor_range_01_ku:add_offset = 0. ;
        mod_instr_cor_range_01_ku:scale_factor = 0.001 ;
        mod_instr_cor_range_01_ku:coordinates = "lon_01 lat_01" ;
        mod_instr_cor_range_01_ku:source = "Cryosat-2 2015" ;
        mod_instr_cor_range_01_ku:institution = "CLS" ;
        mod_instr_cor_range_01_ku:comment = "Issued from instrumental look-up tables correcting geophysical estimates from the approximation of the instrument impulse response in the estimation step." ;
```

4.4.38 mod_instr_cor_range_01_plrm_ku(time_01)

```
short mod_instr_cor_range_01_plrm_ku(time_01) ;
        mod_instr_cor_range_01_plrm_ku:_FillValue = -32768s;
        mod_instr_cor_range_01_plrm_ku:long_name = "modeled instrumental correction on the altimeter range: 1 Hz PLRM ku band" ;
        mod_instr_cor_range_01_plrm_ku:units = "m" ;
        mod_instr_cor_range_01_plrm_ku:add_offset = 0. ;
        mod_instr_cor_range_01_plrm_ku:scale_factor = 0.001 ;
        mod_instr_cor_range_01_plrm_ku:coordinates = "lon_01 lat_01" ;
        mod_instr_cor_range_01_plrm_ku:source = "Cryosat-2 2015" ;
        mod_instr_cor_range_01_plrm_ku:institution = "CLS" ;
        mod_instr_cor_range_01_plrm_ku:comment = "Set to FillValue in LRM mode. Issued from instrumental look-up tables correcting geophysical estimates from the approximation of the instrument impulse response in the estimation step." ;
```

4.4.39 mod_instr_cor_sig0_01_ku(time_01)

```
short mod_instr_cor_sig0_01_ku(time_01) ;
        mod_instr_cor_sig0_01_ku:_FillValue = -32768s;
        mod_instr_cor_sig0_01_ku:long_name = "modeled instrumental correction on
the sig0: 1 Hz ku band" ;
        mod_instr_cor_sig0_01_ku:units = "dB" ;
        mod_instr_cor_sig0_01_ku:add_offset = 0. ;
        mod_instr_cor_sig0_01_ku:scale_factor = 0.01 ;
        mod_instr_cor_sig0_01_ku:coordinates = "lon_01 lat_01" ;
        mod_instr_cor_sig0_01_ku:source = "Cryosat-2 2015" ;
        mod_instr_cor_sig0_01_ku:institution = "CLS" ;
        mod_instr_cor_sig0_01_ku:comment = "Issued from instrumental look-up
tables correcting geophysical estimates from the approximation of the instrument
impulse response in the estimation step." ;
```

4.4.40 mod_instr_cor_sig0_01_plrm_ku(time_01)

```
short mod_instr_cor_sig0_01_plrm_ku(time_01) ;
        mod_instr_cor_sig0_01_plrm_ku:_FillValue = -32768s;
        mod_instr_cor_sig0_01_plrm_ku:long_name = "modeled instrumental
correction on the sig0: 1 Hz PLRM ku band" ;
        mod_instr_cor_sig0_01_plrm_ku:units = "dB" ;
        mod_instr_cor_sig0_01_plrm_ku:add_offset = 0. ;
        mod_instr_cor_sig0_01_plrm_ku:scale_factor = 0.01 ;
        mod_instr_cor_sig0_01_plrm_ku:coordinates = "lon_01 lat_01" ;
        mod_instr_cor_sig0_01_plrm_ku:source = "Cryosat-2 2015" ;
        mod_instr_cor_sig0_01_plrm_ku:institution = "CLS" ;
    mod_instr_cor_sig0_01_plrm_ku:comment = "Set to FillValue in LRM mode. Issued
from instrumental look-up tables correcting geophysical estimates from the
approximation of the instrument impulse response in the estimation step." ;
```

4.4.41 mod_instr_cor_swh_01_ku(time_01)

```
short mod_instr_cor_swh_01_ku(time_01) ;
        mod_instr_cor_swh_01_ku:_FillValue = -32768s;
        mod_instr_cor_swh_01_ku:long_name = "modeled instrumental correction on
the swh: 1 Hz ku band" ;
        mod_instr_cor_swh_01_ku:units = "m" ;
        mod_instr_cor_swh_01_ku:add_offset = 0. ;
        mod_instr_cor_swh_01_ku:scale_factor = 0.001 ;
        mod_instr_cor_swh_01_ku:coordinates = "lon_01 lat_01" ;
        mod_instr_cor_swh_01_ku:source = "Cryosat-2 2015" ;
        mod_instr_cor_swh_01_ku:institution = "CLS" ;
        mod_instr_cor_swh_01_ku:comment = "Issued from instrumental look-up
tables correcting geophysical estimates from the approximation of the instrument
impulse response in the estimation step." ;
```

4.4.42 mod_instr_cor_swh_01_plrm_ku(time_01)

```
short mod_instr_cor_swh_01_plrm_ku(time_01) ;
        mod_instr_cor_swh_01_plrm_ku:_FillValue = -32768s;
        mod_instr_cor_swh_01_plrm_ku:long_name = "modeled instrumental correction on the swh: 1 Hz PLRM ku band" ;
        mod_instr_cor_swh_01_plrm_ku:units = "m" ;
        mod_instr_cor_swh_01_plrm_ku:add_offset = 0. ;
        mod_instr_cor_swh_01_plrm_ku:scale_factor = 0.001 ;
        mod_instr_cor_swh_01_plrm_ku:coordinates = "lon_01 lat_01" ;
        mod_instr_cor_swh_01_plrm_ku:source = "Cryosat-2 2015" ;
                mod_instr_cor_swh_01_plrm_ku:comment = "Set to FillValue in LRM mode. Issued from instrumental look-up tables correcting geophysical estimates from the approximation of the instrument impulse response in the estimation step." ;
```

4.4.43 mod_wet_tropo_cor_01(time_01)

```
short mod_wet_tropo_cor_01(time_01) ;
        mod_wet_tropo_cor_01:_FillValue = -32768s;
        mod_wet_tropo_cor_01:long_name = "model wet tropospheric correction: 1 Hz" ;
        mod_wet_tropo_cor_01:units = "m" ;
        mod_wet_tropo_cor_01:standard_name = "altimeter_range_correction_due_to_wet_troposphere" ;
        mod_wet_tropo_cor_01:add_offset = 0. ;
        mod_wet_tropo_cor_01:scale_factor = 0.001 ;
        mod_wet_tropo_cor_01:coordinates = "lon_01 lat_01" ;
        mod_wet_tropo_cor_01:comment = "Computed at the altimeter time-tag [time_01] from the interpolation of 2 meteorological fields that surround the altimeter time-tag. To be added to range measurement to correct for the propagation delay to the radar pulse, caused by the H20 component of the Earth's atmosphere." ;
        mod_wet_tropo_cor_01:source = "European Center for Medium Range Weather Forecasting" ;
        mod_wet_tropo_cor_01:institution = "ECMWF" ;
```

4.4.44 mqe_ocean_20_ku(time_20_ku)

```
int mqe_ocean_20_ku(time_20_ku) ;
        mqe_ocean_20_ku:_FillValue = -2147483648;
        mqe_ocean_20_ku:long_name = "mean quadratic error between waveform and model / \'ocean\' retracking: 20 Hz ku band" ;
        mqe_ocean_20_ku:units = "count" ;
        mqe_ocean_20_ku:add_offset = 0. ;
        mqe_ocean_20_ku:scale_factor = 1.e-05 ;
        mqe_ocean_20_ku:coordinates = "lon_20_ku lat_20_ku" ;
        mqe_ocean_20_ku:source = "LRM: MLE4 retracking, SAR: SAMOSA v2.3 retracking." ;
```

4.4.45 mqe_ocean_20_plrm_ku(time_20_plrm_ku)

```
int mqe_ocean_20_plrm_ku(time_20_plrm_ku) ;
        mqe_ocean_20_plrm_ku:_FillValue = -2147483648;
        mqe_ocean_20_plrm_ku:long_name = "mean quadratic error between waveform and model / \'ocean\' retracking: 20 Hz PLRM ku band" ;
        mqe_ocean_20_plrm_ku:units = "count" ;
        mqe_ocean_20_plrm_ku:add_offset = 0. ;
        mqe_ocean_20_plrm_ku:scale_factor = 1.e-05 ;
        mqe_ocean_20_plrm_ku:coordinates = "lon_20_plrm_ku lat_20_plrm_ku" ;
        mqe_ocean_20_plrm_ku:source = "MLE4 retracking" ;
        mqe_ocean_20_plrm_ku:comment = " Not provided in LRM mode. Set to FillValue in LRM mode." ;
```

4.4.46 num_meas_20hz_01(time_01)

```
short num_meas_20hz_01(time_01) ;
        num_meas_20hz_01:long_name = "number of 20Hz measurements: 1 Hz" ;
        num_meas_20hz_01:units = "count" ;
        num_meas_20hz_01:_FillValue = -32768s;
        num_meas_20hz_01:comment = "Number of 20Hz measurements used to derive the 1Hz measurement." ;
```

4.4.47 num_meas_20hz_01_plrm_ku(time_01)

```
short num_meas_20hz_01_plrm_ku (time_01) ;
        num_meas_20hz_01_plrm_ku:long_name = "number of 20Hz PLRM measurements: 1 Hz" ;
        num_meas_20hz_01_plrm_ku:units = "count" ;
        num_meas_20hz_01_plrm_ku:_FillValue = -32768s;
            num_meas_20hz_01_plrm_ku:comment = "Set to FillValue in LRM mode. Number of 20Hz PLRM measurements used to derive the 1Hz measurement." ;
```

4.4.48 ocean_tide_eq_01(time_01)

```
short ocean_tide_eq_01(time_01) ;
        ocean_tide_eq_01:_FillValue = -32768s;
        ocean_tide_eq_01:long_name = "equilibrium long-period ocean tide height: 1 Hz" ;
        ocean_tide_eq_01:units = "m" ;
        ocean_tide_eq_01:standard_name = "sea_surface_height_amplitude_due_to_equilibrium_ocean_tide" ;
        ocean_tide_eq_01:add_offset = 0. ;
        ocean_tide_eq_01:scale_factor = 0.001 ;
        ocean_tide_eq_01:coordinates = "lon_01 lat_01" ;
            ocean_tide_eq_01:comment = " This value has already been added to the two geocentric ocean tide height values recorded in the product ([ocean_tide_sol1_01] and [ocean_tide_sol2_01]). The permanent tide (zero frequency) is not included in this parameter because it is included in the geoid [geoid_01] and mean sea surface ([mean_sea_surf_sol1_01], [mean_sea_surf_sol2_01])." ;" ;
        ocean_tide_eq_01:source = "Cartwright and Edden [1973] Corrected tables of tidal harmonics - J. Geophys. J. R. Astr. Soc., 33, 253-264." ;
```

4.4.49 ocean_tide_non_eq_01(time_01)

```
short ocean_tide_non_eq_01(time_01) ;
        ocean_tide_non_eq_01:_FillValue = -32768s;
        ocean_tide_non_eq_01:long_name = "non-equilibrium long-period ocean tide height: 1 Hz" ;
        ocean_tide_non_eq_01:units = "m" ;
        ocean_tide_non_eq_01:standard_name = "sea_surface_height_amplitude_due_to_non_equilibrium_ocean_tide" ;
        ocean_tide_non_eq_01:add_offset = 0. ;
        ocean_tide_non_eq_01:scale_factor = 0.001 ;
                ocean_tide_non_eq_01:comment = "This parameter is computed as a correction to the parameter ocean_tide_eq_01. It contains the long-period ocean tide and the long period load tide components. This value can be added to [ocean_tide_eq_01] (or [ocean_tide_sol1_01], [ocean_tide_sol2_01]) so that the resulting value models the total non equilibrium ocean tide height." ;        ocean_tide_non_eq_01:source = "FES2014b" ;
        ocean_tide_non_eq_01:institution = "LEGOS/CNES" ;
```

4.4.50 ocean_tide_sol1_01(time_01)

```
int ocean_tide_sol1_01(time_01) ;
        ocean_tide_sol1_01:_FillValue = -2147483648;
        ocean_tide_sol1_01:long_name = "geocentric ocean tide height (solution 1): 1 Hz" ;
        ocean_tide_sol1_01:units = "m" ;
        ocean_tide_sol1_01:standard_name = "sea_surface_height_amplitude_due_to_geocentric_ocean_tide" ;
        ocean_tide_sol1_01:add_offset = 0. ;
        ocean_tide_sol1_01:scale_factor = 0.001 ;
        ocean_tide_sol1_01:coordinates = "lon_01 lat_01" ;
                ocean_tide_sol1_01:comment = " Solution 1 corresponds to GOT model. Includes the corresponding loading tide [ocean_tide_sol1_01] and equilibrium long-period ocean tide height [ocean_tide_eq_01]. The permanent tide (zero frequency) is not included in this parameter because it is included in the geoid [geoid_01] and mean sea surface ([mean_sea_surf_sol1_01], [mean_sea_surf_sol2_01])." ;" ;
        ocean_tide_sol1_01:source = "GOT4.10" ;
        ocean_tide_sol1_01:institution = "GSFC" ;
```

4.4.51 ocean_tide_sol2_01(time_01)

```
int ocean_tide_sol2_01(time_01) ;
        ocean_tide_sol2_01:_FillValue = -2147483648;
        ocean_tide_sol2_01:long_name = "geocentric ocean tide height (solution 2): 1 Hz" ;
        ocean_tide_sol2_01:units = "m" ;
        ocean_tide_sol2_01:standard_name = "sea_surface_height_amplitude_due_to_geocentric_ocean_tide" ;
        ocean_tide_sol2_01:add_offset = 0. ;
        ocean_tide_sol2_01:scale_factor = 0.001 ;
        ocean_tide_sol2_01:coordinates = "lon_01 lat_01" ;
                ocean_tide_sol2_01:comment = " Solution 2 corresponds to FES model. Includes the corresponding short-period part of the loading tide [ocean_tide_sol2_01] and equilibrium long-period ocean tide height [ocean_tide_eq_01]. The permanent tide (zero frequency) is not included in this parameter because it is included in the geoid [geoid_01] and mean sea surface ([mean_sea_surf_sol1_01], [mean_sea_surf_sol2_01])." ;
        ocean_tide_sol2_01:source = "FES2014b" ;
        ocean_tide_sol2_01:institution = "LEGOS/CNES" ;
```

4.4.52 odle_01(time_01)

```
int odle_01(time_01) ;
        odle_01:_FillValue = -2147483648;
        odle_01:long_name = "ocean depth/land elevation: 1 Hz" ;
        odle_01:units = "m" ;
        odle_01:add_offset = 0. ;
        odle_01:scale_factor = 0.001 ;
        odle_01:coordinates = "lon_01 lat_01" ;
        odle_01:source = "ACE-2" ;
        odle_01:institution = "ESA" ;
```

4.4.53 off_nadir_angle_wf_ocean_01_ku(time_01)

```
short off_nadir_angle_wf_ocean_01_ku(time_01) ;
        off_nadir_angle_wf_ocean_01_ku:_FillValue = -32768s;
        off_nadir_angle_wf_ocean_01_ku:long_name = "square of the off nadir angle
derived from waveforms: 1 Hz ku band" ;
        off_nadir_angle_wf_ocean_01_ku:units = "degrees^2" ;
        off_nadir_angle_wf_ocean_01_ku:add_offset = 0. ;
        off_nadir_angle_wf_ocean_01_ku:scale_factor = 0.0001 ;
        off_nadir_angle_wf_ocean_01_ku:coordinates = "lon_01 lat_01" ;
        off_nadir_angle_wf_ocean_01_ku:source = "MLE4 retracking" ;
        off_nadir_angle_wf_ocean_01_ku:comment = "Set to FillValue in SAR mode"
;
```

4.4.54 off_nadir_angle_wf_ocean_01_plrm_ku(time_01)

```
short off_nadir_angle_wf_ocean_01_plrm_ku(time_01) ;
        off_nadir_angle_wf_ocean_01_plrm_ku:_FillValue = -32768s;
        off_nadir_angle_wf_ocean_01_plrm_ku:long_name = "square of the off nadir
angle derived from waveforms: 1 Hz PLRM ku band" ;
        off_nadir_angle_wf_ocean_01_plrm_ku:units = "degrees^2" ;
        off_nadir_angle_wf_ocean_01_plrm_ku:add_offset = 0. ;
        off_nadir_angle_wf_ocean_01_plrm_ku:scale_factor = 0.0001 ;
        off_nadir_angle_wf_ocean_01_plrm_ku:coordinates = "lon_01 lat_01" ;
        off_nadir_angle_wf_ocean_01_plrm_ku:source = "MLE4 retracking" ;
        off_nadir_angle_wf_ocean_01_plrm_ku:comment = "Set to FillValue in LRM
mode." ;
```

4.4.55 off_nadir_pitch_angle_str_20_ku(time_20_ku)

```
int off_nadir_pitch_angle_str_20_ku(time_20_ku) ;
        off_nadir_pitch_angle_str_20_ku:_FillValue = -2147483648;
        off_nadir_pitch_angle_str_20_ku:long_name = "off nadir pitch angle
    derived from star tracker data: 20 Hz" ;
        off_nadir_pitch_angle_str_20_ku:units = "degrees" ;
        off_nadir_pitch_angle_str_20_ku:comment = "Set to FillValue in LRM mode."
        off_nadir_pitch_angle_str_20_ku:add_offset = 0. ;
        off_nadir_pitch_angle_str_20_ku:scale_factor = 1.e-07 ;
        off_nadir_pitch_angle_str_20_ku:coordinates = "lon_20_ku lat_20_ku" ;
```

4.4.56 off_nadir_roll_angle_str_20_ku(time_20_ku)

```
 int off_nadir_roll_angle_str_20_ku(time_20_ku) ;
        off_nadir_roll_angle_str_20_ku:_FillValue = -2147483648;
        off_nadir_roll_angle_str_20_ku:long_name = "off nadir roll angle derived
from star tracker data: 20 Hz" ;
        off_nadir_roll_angle_str_20_ku:units = "degrees" ;
        off_nadir_roll_angle_str_20_ku:comment = "Set to FillValue in LRM mode."
        off_nadir_roll_angle_str_20_ku:add_offset = 0. ;
        off_nadir_roll_angle_str_20_ku:scale_factor = 1.e-07 ;
        off_nadir_roll_angle_str_20_ku:coordinates = "lon_20_ku lat_20_ku" ;
```

4.4.57 off_nadir_yaw_angle_str_20_ku(time_20_ku)

```
 int off_nadir_yaw_angle_str_20_ku(time_20_ku) ;
        off_nadir_yaw_angle_str_20_ku:_FillValue = -2147483648;
        off_nadir_yaw_angle_str_20_ku:long_name = "off nadir yaw angle derived
from star tracker data: 20 Hz" ;
        off_nadir_yaw_angle_str_20_ku:units = "degrees" ;
        off_nadir_yaw_angle_str_20_ku:comment = "Set to FillValue in LRM mode."
;       off_nadir_yaw_angle_str_20_ku:add_offset = 0. ;
        off_nadir_yaw_angle_str_20_ku:scale_factor = 1.e-07 ;
        off_nadir_yaw_angle_str_20_ku:coordinates = "lon_20_ku lat_20_ku" ;
```

4.4.58 orb_alt_rate_01(time_01)

```
 short orb_alt_rate_01(time_01) ;
        orb_alt_rate_01:_FillValue = -32768s;
            orb_alt_rate_01:comment = "Instantaneous altitude rate at the
Centre of Mass with respect to the reference ellipsoid." ;
        orb_alt_rate_01:long_name = "centre of mass altitude rate with respect to
the reference ellipsoid [WGS84]: 1 Hz" ;
        orb_alt_rate_01:units = "m/s" ;
        orb_alt_rate_01:add_offset = 0. ;
        orb_alt_rate_01:scale_factor = 0.001 ;
        orb_alt_rate_01:coordinates = "lon_01 lat_01" ;
```

4.4.59 peakiness_01_ku(time_01)

```
 int peakiness_01_ku(time_01) ;
        peakiness_01_ku:_FillValue = -2147483648;
        peakiness_01_ku:long_name = "peakiness: 1 Hz Ku band" ;
        peakiness_01_ku:units = "count" ;
        peakiness_01_ku:add_offset = 0. ;
        peakiness_01_ku:scale_factor = 0.001 ;
        peakiness_01_ku:coordinates = "lon_01 lat_01" ;
        peakiness_01_ku:comment = "This is the ratio of the maximum power in the
waveform to the average of the waveform power to the right hand side of the expected
waveform leading edge location." ;
```

4.4.60 **peakiness_01_plrm_ku(time_01)**

```
int peakiness_01_plrm_ku(time_01) ;
        peakiness_01_plrm_ku:_FillValue = -2147483648;
        peakiness_01_plrm_ku:long_name = "peakiness: 1 Hz PLRM ku band" ;
        peakiness_01_plrm_ku:units = "count" ;
        peakiness_01_plrm_ku:add_offset = 0. ;
        peakiness_01_plrm_ku:scale_factor = 0.001 ;
        peakiness_01_plrm_ku:coordinates = "lon_01 lat_01" ;
        peakiness_01_plrm_ku:comment = "Set to FillValue in LRM mode. This is the
ratio of the maximum power in the waveform to the average of the waveform power to the
right hand side of the expected waveform leading edge location." ;
```

4.4.61 **peakiness_20_ku(time_20_ku)**

```
int peakiness_20_ku(time_20_ku) ;
        peakiness_20_ku:_FillValue = -2147483648;
        peakiness_20_ku:long_name = "peakiness: 20 Hz ku band" ;
        peakiness_20_ku:units = "count" ;
        peakiness_20_ku:add_offset = 0. ;
        peakiness_20_ku:scale_factor = 0.001 ;
        peakiness_20_ku:coordinates = "lon_20_ku lat_20_ku" ;
        peakiness_20_ku:comment = "This is the ratio of the maximum power in the
waveform to the average of the waveform power to the right hand side of the expected
waveform leading edge location." ;
```

4.4.62 **peakiness_20_plrm_ku(time_20_plrm_ku)**

```
int peakiness_20_plrm_ku(time_20_plrm_ku) ;
        peakiness_20_plrm_ku:_FillValue = -2147483648;
        peakiness_20_plrm_ku:long_name = "peakiness: 20 Hz PLRM ku band" ;
        peakiness_20_plrm_ku:units = "count" ;
        peakiness_20_plrm_ku:add_offset = 0. ;
        peakiness_20_plrm_ku:scale_factor = 0.001 ;
        peakiness_20_plrm_ku:coordinates = "lon_20_plrm_ku lat_20_plrm_ku" ;
        peakiness_20_plrm_ku:comment = " Not provided in LRM mode. This is the
ratio of the maximum power in the waveform to the average of the waveform power to the
right hand side of the expected waveform leading edge location." ;" ;
```

4.4.63 **pole_tide_01(time_01)**

```
short pole_tide_01(time_01) ;
        pole_tide_01:_FillValue = -32768s;
        pole_tide_01:long_name = "geocentric tide height: 1 Hz" ;
        pole_tide_01:units = "m" ;
        pole_tide_01:standard_name                                    =
"sea_surface_height_amplitude_due_to_pole_tide" ;
        pole_tide_01:add_offset = 0. ;
        pole_tide_01:scale_factor = 0.001 ;
        pole_tide_01:coordinates = "lon_01 lat_01" ;
        pole_tide_01:source = "Wahr [1985] Deformation of the Earth induced by
polar motion - J. Geophys. Res. (Solid Earth), 90, 9363-9368." ;
        pole_tide_01:institution = "IERS/CNES" ;
```

4.4.64 qual_ssha_01_ku(time_01)

```
byte qual_ssha_01_ku(time_01) ;
        qual_ssha_01_ku:_FillValue = -128b ;
        qual_ssha_01_ku:long_name = "sea surface height anomaly quality flag: 1 Hz ku band" ;
        qual_ssha_01_ku:flag_values = 0b, 1b ;
        qual_ssha_01_ku:flag_meanings = "good bad" ;
        qual_ssha_01_ku:coordinates = "lon_01 lat_01" ;
        qual_ssha_01_ku:source = "LRM: MLE4 retracking, SAR: SAMOSA v2.3 retracking." ;
```

4.4.65 qual_ssha_01_plrm_ku(time_01)

```
byte qual_ssha_01_plrm_ku(time_01) ;
        qual_ssha_01_plrm_ku:_FillValue = -128b ;
        qual_ssha_01_plrm_ku:long_name = "sea surface height anomaly quality flag: 1 Hz PLRM ku band" ;
        qual_ssha_01_plrm_ku:flag_values = 0b, 1b ;
        qual_ssha_01_plrm_ku:flag_meanings = "good bad" ;
        qual_ssha_01_plrm_ku:coordinates = "lon_01 lat_01" ;
        qual_ssha_01_plrm_ku:source = "MLE4 retracking" ;
        qual_ssha_01_plrm_ku:comment = "Set to FillValue in LRM mode." ;
```

4.4.66 qual_ssha_20_ku(time_20_ku)

```
byte qual_ssha_20_ku(time_20_ku20_ku) ;
        qual_ssha_20_ku:_FillValue = -128b ;
        qual_ssha_20_ku:long_name = "sea surface height anomaly quality flag: 20 Hz ku band" ;
        qual_ssha_20_ku:flag_values = 0b, 1b ;
        qual_ssha_20_ku:flag_meanings = "good bad" ;
        qual_ssha_20_ku:coordinates = "lon_20_ku lat_20_ku" ;
        qual_ssha_20_ku:source = "LRM: MLE4 retracking, SAR: SAMOSA v2.3 retracking." ;
```

4.4.67 qual_ssha_20_plrm_ku(time_20_plrm_ku)

```
byte qual_ssha_20_plrm_ku(time_20_plrm_ku) ;
        qual_ssha_20_plrm_ku:_FillValue = -128b ;
        qual_ssha_20_plrm_ku:long_name = "sea surface height anomaly quality flag: 20 Hz PLRM ku band" ;
        qual_ssha_20_plrm_ku:flag_values = 0b, 1b ;
        qual_ssha_20_plrm_ku:flag_meanings = "good bad" ;
        qual_ssha_20_plrm_ku:coordinates = "lon_20_plrm_ku lat_20_plrm_ku";
        qual_ssha_20_plrm_ku:source = "MLE4 retracking" ;
        qual_ssha_20_plrm_ku:comment = "Not provided in LRM mode." ;
```

4.4.68 range_ocean_01_ku(time_01)

```
int range_ocean_01_ku(time_01) ;
        range_ocean_01_ku:_FillValue = -2147483648;
        range_ocean_01_ku:long_name = "corrected \'ocean\' altimeter range: 1 Hz ku band" ;
        range_ocean_01_ku:units = "m" ;
        range_ocean_01_ku:scale_factor = 0.001 ;
        range_ocean_01_ku:coordinates = "lon_01 lat_01" ;
        range_ocean_01_ku:comment = "Instrumental corrections included: USO drift correction [uso_cor_01_ku], internal path correction [int_path_cor_01], distance antenna-CoM [cog_cor_01], Doppler correction [dop_cor_01_ku], modeled instrumental errors correction [mod_instr_cor_range_01_ku] and system bias" ;
        range_ocean_01_ku:source = "LRM: MLE4 retracking, SAR: SAMOSA v2.3 retracking" ;
```

4.4.69 range_ocean_01_plrm_ku(time_01)

```
int range_ocean_01_plrm_ku(time_01) ;
        range_ocean_01_plrm_ku:_FillValue = -2147483648;
        range_ocean_01_plrm_ku:long_name = "corrected \'ocean\' altimeter range: 1 Hz PLRM ku band" ;
        range_ocean_01_plrm_ku:units = "m" ;
        range_ocean_01_plrm_ku:scale_factor = 0.001 ;
        range_ocean_01_plrm_ku:coordinates = "lon_01 lat_01" ;
            range_ocean_01_plrm_ku:comment = "Set to FillValue in LRM mode. Instrumental corrections included: USO drift correction [uso_cor_01_ku], internal path correction [int_path_cor_01], distance antenna-CoM [cog_cor_01], Doppler correction [dop_cor_01_ku], modeled instrumental errors correction [mod_instr_cor_range_01_plrm_ku] and system bias" ;
        range_ocean_01_plrm_ku:source = "MLE4 retracking" ;
```

4.4.70 range_ocean_20_ku(time_20_ku)

```
int range_ocean_20_ku(time_20_ku) ;
        range_ocean_20_ku:_FillValue = -2147483648;
        range_ocean_20_ku:long_name = "corrected \'ocean\' altimeter range: 20 Hz ku band" ;
        range_ocean_20_ku:units = "m" ;
        range_ocean_20_ku:scale_factor = 0.001 ;
        range_ocean_20_ku:coordinates = "lon_20_ku lat_20_ku" ;

        range_ocean_20_ku:comment = "Instrumental corrections included: USO drift correction [uso_cor_01_ku], internal path correction [int_path_cor_01], distance antenna-CoM [cog_cor_01], Doppler correction [dop_cor_01_ku], modeled instrumental errors correction [mod_instr_cor_range_01_ku] and system bias" ;
        range_ocean_20_ku:source = "LRM: MLE4 retracking, SAR: SAMOSA v2.3 retracking" ;
```

4.4.71 range_ocean_20_plrm_ku(time_20_plrm_ku)

```
int range_ocean_20_plrm_ku(time_20_plrm_ku) ;
        range_ocean_20_plrm_ku:_FillValue = -2147483648;
        range_ocean_20_plrm_ku:long_name = "corrected \'ocean\' altimeter range: 20 Hz PLRM ku band" ;
        range_ocean_20_plrm_ku:units = "m" ;
        range_ocean_20_plrm_ku:scale_factor = 0.001 ;
        range_ocean_20_plrm_ku:coordinates = "lon_20_plrm_ku lat_20_plrm_ku" ;
        range_ocean_20_plrm_ku:comment = "Not provided in LRM mode. Instrumental corrections included: USO drift correction [uso_cor_01_ku], internal path correction [int_path_cor_01], distance antenna-CoM [cog_cor_01], Doppler correction [dop_cor_01_ku], modeled instrumental errors correction [mod_instr_cor_range_01_plrm_ku] and system bias" ;
        range_ocean_20_plrm_ku:source = "MLE4 retracking" ;
```

4.4.72 range_ocean_numval_01_ku(time_01)

```
byte range_ocean_numval_01_ku(time_01) ;
        range_ocean_numval_01_ku:_FillValue = -128b ;
        range_ocean_numval_01_ku:long_name = "number of valid points used to compute the \'ocean\' altimeter range: 1 Hz ku band" ;
        range_ocean_numval_01_ku:units = "count" ;
        range_ocean_numval_01_ku:coordinates = "lon_01 lat_01" ;
        range_ocean_numval_01_ku:source = "LRM: MLE4 retracking, SAR: SAMOSA v2.3 retracking" ;
```

4.4.73 range_ocean_numval_01_plrm_ku(time_01)

```
byte range_ocean_numval_01_plrm_ku(time_01) ;
        range_ocean_numval_01_plrm_ku:_FillValue = -128b ;
        range_ocean_numval_01_plrm_ku:long_name = "number of valid points used to compute the \'ocean\' altimeter range: 1 Hz PLRM ku band" ;
        range_ocean_numval_01_plrm_ku:units = "count" ;
        range_ocean_numval_01_plrm_ku:coordinates = "lon_01 lat_01" ;
        range_ocean_numval_01_plrm_ku:source = "MLE4 retracking" ;
        range_ocean_numval_01_plrm_ku:comment = "Set to FillValue in LRM mode."
    ;
```

4.4.74 range_ocean_qual_20_ku(time_20_ku)

```
byte range_ocean_qual_20_ku(time_20_ku) ;
        range_ocean_qual_20_ku:_FillValue = -128b ;
        range_ocean_qual_20_ku:long_name = "quality flag for the \'ocean\' altimeter range: 20 Hz ku band" ;
        range_ocean_qual_20_ku:flag_values = 0b, 1b ;
        range_ocean_qual_20_ku:flag_meanings = "yes no" ;
        range_ocean_qual_20_ku:coordinates = "lon_20_ku lat_20_ku" ;
        range_ocean_qual_20_ku:comment = "Flag indicating the use or not of the 20-Hz estimate of the ocean retracking in the computation of 1Hz estimate" ;
        range_ocean_qual_20_ku:source = "LRM: MLE4 retracking, SAR: SAMOSA v2.3 retracking" ;
```

4.4.75 range_ocean_qual_20_plrm_ku(time_20_plrm_ku)

```
byte range_ocean_qual_20_plrm_ku(time_20_plrm_ku) ;
        range_ocean_qual_20_plrm_ku:_FillValue = -128b ;
        range_ocean_qual_20_plrm_ku:long_name = "quality flag for the \'ocean\' altimeter range: 20 Hz PLRM ku band" ;
        range_ocean_qual_20_plrm_ku:flag_values = 0b, 1b ;
        range_ocean_qual_20_plrm_ku:flag_meanings = "yes no" ;
        range_ocean_qual_20_plrm_ku:coordinates = "lon_20_plrm_ku lat_20_plrm_ku" ;
        range_ocean_qual_20_plrm_ku:comment = "Not provided in LRM mode. Flag indicating the use or not of the 20-Hz estimate of the ocean retracking in the computation of 1Hz estimate" ;
        range_ocean_qual_20_plrm_ku:source = "MLE4 retracking" ;
```

4.4.76 range_ocean_rms_01_ku(time_01)

```
short range_ocean_rms_01_ku(time_01) ;
        range_ocean_rms_01_ku:_FillValue = -32768s ;
        range_ocean_rms_01_ku:long_name = "RMS of the \'ocean\' altimeter range: 1 Hz ku band" ;
        range_ocean_rms_01_ku:units = "m" ;
        range_ocean_rms_01_ku:add_offset = 0. ;
        range_ocean_rms_01_ku:scale_factor = 0.001 ;
        range_ocean_rms_01_ku:coordinates = "lon_01 lat_01" ;
        range_ocean_rms_01_ku:comment = "Compression of high rate elements is preceded by a detection of outliers. Only valid high-rate values are used to compute this element" ;
    range_ocean_rms_01_ku:source = "LRM: MLE4 retracking, SAR: SAMOSA v2.3 retracking" ;
```

4.4.77 range_ocean_rms_01_plrm_ku(time_01)

```
short range_ocean_rms_01_plrm_ku(time_01) ;
        range_ocean_rms_01_plrm_ku:_FillValue = -32768s;
        range_ocean_rms_01_plrm_ku:long_name = "RMS of the \'ocean\' altimeter range: 1 Hz PLRM ku band" ;
        range_ocean_rms_01_plrm_ku:units = "m" ;
        range_ocean_rms_01_plrm_ku:add_offset = 0. ;
        range_ocean_rms_01_plrm_ku:scale_factor = 0.001 ;
        range_ocean_rms_01_plrm_ku:coordinates = "lon_01 lat_01" ;
        range_ocean_rms_01_plrm_ku:comment = "Set to FillValue in LRM mode. Compression of high rate elements is preceded by a detection of outliers. Only valid high-rate values are used to compute this element" ;
        range_ocean_rms_01_plrm_ku:source = "MLE4 retracking" ;
```

4.4.78 **range_ocog_01_ku(time_01)**

```
	int range_ocog_01_ku(time_01) ;
		range_ocog_01_ku:_FillValue = -2147483648;
		range_ocog_01_ku:long_name = "corrected \'ocog\' altimeter range: 1 Hz ku band" ;
		range_ocog_01_ku:units = "m" ;
		range_ocog_01_ku:scale_factor = 0.001 ;
		range_ocog_01_ku:coordinates = "lon_01 lat_01" ;
			range_ocog_01_ku:comment = " Set to FillValue in SAR mode. Instrumental corrections included: USO drift correction [uso_cor_01_ku], internal path correction [int_path_cor_01], distance antenna-CoM [cog_cor_01]" ;" ;
		range_ocog_01_ku:source = "OCOG retracking" ;
```

4.4.79 **range_ocog_01_plrm_ku(time_01)**

```
	int range_ocog_01_plrm_ku(time_01) ;
		range_ocog_01_plrm_ku:_FillValue = -2147483648;
		range_ocog_01_plrm_ku:long_name = "corrected \'ocog\' altimeter range: 1 Hz PLRM ku band" ;
		range_ocog_01_plrm_ku:units = "m" ;
		range_ocog_01_plrm_ku:scale_factor = 0.001 ;
		range_ocog_01_plrm_ku:coordinates = "lon_01 lat_01" ;
			range_ocog_01_plrm_ku:comment = "Set to FillValue in LRM mode. Instrumental corrections included: USO drift correction [uso_cor_01_ku], internal path correction [int_path_cor_01], distance antenna-CoM [cog_cor_01]" ;
		range_ocog_01_plrm_ku:source = "OCOG retracking" ;
```

4.4.80 **range_ocog_20_ku(time_20_ku)**

```
	int range_ocog_20_ku(time_20_ku) ;
		range_ocog_20_ku:_FillValue = -2147483648;
		range_ocog_20_ku:long_name = "corrected \'ocog\' altimeter range: 20 Hz ku band" ;
		range_ocog_20_ku:units = "m" ;
		range_ocog_20_ku:scale_factor = 0.001 ;
		range_ocog_20_ku:comment = " Set to FillValue in SAR mode. Instrumental corrections included: USO drift correction [uso_cor_01_ku], internal path correction [int_path_cor_01], distance antenna-CoM [cog_cor_01]" ;" ;
	range_ocog_20_ku:source = "OCOG retracking" ;
```

4.4.81 **range_ocog_20_plrm_ku(time_20_plrm_ku)**

```
	int range_ocog_20_plrm_ku(time_20_plrm_ku) ;
		range_ocog_20_plrm_ku:_FillValue = -2147483648;
		range_ocog_20_plrm_ku:long_name = "corrected \'ocog\' altimeter range: 20 Hz PLRM ku band" ;
		range_ocog_20_plrm_ku:units = "m" ;
		range_ocog_20_plrm_ku:scale_factor = 0.001 ;
		range_ocog_20_plrm_ku:coordinates = "lon_20_plrm_ku lat_20_plrm_ku" ;
		range_ocog_20_plrm_ku:comment = "Not provided in LRM mode. Instrumental corrections included: USO drift correction [uso_cor_01_ku], internal path correction [int_path_cor_01], distance antenna-CoM [cog_cor_01]" ;
		range_ocog_20_plrm_ku:source = "OCOG retracking" ;
```

4.4.82 range_ocog_numval_01_ku(time_01)

```
byte range_ocog_numval_01_ku(time_01) ;
        range_ocog_numval_01_ku:_FillValue = -128b;
        range_ocog_numval_01_ku:long_name = "number of valid points used to compute the \'ocog\' altimeter range: 1 Hz ku band" ;
        range_ocog_numval_01_ku:comment = "Set to FillValue in SAR mode." ;
range_ocog_numval_01_ku:units = "count" ;
        range_ocog_numval_01_ku:coordinates = "lon_01 lat_01" ;
        range_ocog_numval_01_ku:source = "OCOG retracking" ;
```

4.4.83 range_ocog_numval_01_plrm_ku(time_01)

```
byte range_ocog_numval_01_plrm_ku(time_01) ;
        range_ocog_numval_01_plrm_ku:_FillValue = -128b;
        range_ocog_numval_01_plrm_ku:long_name = "number of valid points used to compute the \'ocog\' altimeter range: 1 Hz PLRM ku band" ;
        range_ocog_numval_01_plrm_ku:units = "count" ;
        range_ocog_numval_01_plrm_ku:coordinates = "lon_01 lat_01" ;
        range_ocog_numval_01_plrm_ku:comment = "Set to FillValue in LRM mode." ;
        range_ocog_numval_01_plrm_ku:source = "OCOG retracking" ;
```

4.4.84 range_ocog_qual_20_ku(time_20_ku)

```
byte range_ocog_qual_20_ku(time_20_ku) ;
        range_ocog_qual_20_ku:_FillValue = -128b  ;
        range_ocog_qual_20_ku:long_name = "quality flag for the \'ocog\' altimeter range: 20 Hz ku band" ;
        range_ocog_qual_20_ku:flag_values = 0b, 1b ;
        range_ocog_qual_20_ku:flag_meanings = "yes no" ;
        range_ocog_qual_20_ku:coordinates = "lon_20_ku lat_20_ku" ;
        range_ocog_qual_20_ku:comment = " Set to FillValue in SAR mode. Flag indicating the use or not of the 20-Hz estimate of the ocean retracking in the computation of 1Hz estimate" ;
        range_ocog_qual_20_ku:source = "OCOG retracking" ;
```

4.4.85 range_ocog_qual_20_plrm_ku(time_20_plrm_ku)

```
byte range_ocog_qual_20_plrm_ku(time_20_plrm_ku) ;
        range_ocog_qual_20_plrm_ku:_FillValue = -128b;
        range_ocog_qual_20_plrm_ku:long_name = "quality flag for the \'ocog\' altimeter range: 20 Hz PLRM ku band" ;
        range_ocog_qual_20_plrm_ku:flag_values = 0b, 1b ;
        range_ocog_qual_20_plrm_ku:flag_meanings = "yes no" ;
        range_ocog_qual_20_plrm_ku:coordinates = "lon_20_plrm_ku lat_20_plrm_ku" ;
                range_ocog_qual_20_plrm_ku:comment = "Not provided in LRM mode. Flag indicating the use or not of the 20-Hz estimate of the ocean retracking in the computation of 1Hz estimate" ;         range_ocog_qual_20_plrm_ku:source = "OCOG retracking" ;
```

4.4.86 range_ocog_rms_01_ku(time_01)

```
	short range_ocog_rms_01_ku(time_01) ;
		range_ocog_rms_01_ku:_FillValue = -32768s;
		range_ocog_rms_01_ku:long_name = "RMS of the \'ocog\' altimeter range: 1 Hz ku band" ;
		range_ocog_rms_01_ku:units = "m" ;
		range_ocog_rms_01_ku:add_offset = 0. ;
		range_ocog_rms_01_ku:scale_factor = 0.001 ;
		range_ocog_rms_01_ku:coordinates = "lon_01 lat_01" ;
		range_ocog_rms_01_ku:comment = " Set to FillValue in SAR mode. Compression of high rate elements is preceded by a detection of outliers. Only valid high-rate values are used to compute this element" ;
		range_ocog_rms_01_ku:source = "OCOG retracking" ;
```

4.4.87 range_ocog_rms_01_plrm_ku(time_01)

```
	short range_ocog_rms_01_plrm_ku(time_01) ;
		range_ocog_rms_01_plrm_ku:_FillValue = -32768s;
		range_ocog_rms_01_plrm_ku:long_name = "RMS of the \'ocog\' altimeter range: 1 Hz PLRM ku band" ;
		range_ocog_rms_01_plrm_ku:units = "m" ;
		range_ocog_rms_01_plrm_ku:add_offset = 0. ;
		range_ocog_rms_01_plrm_ku:scale_factor = 0.001 ;
		range_ocog_rms_01_plrm_ku:coordinates = "lon_01 lat_01" ;
		range_ocog_rms_01_plrm_ku:comment = "Set to FillValue in LRM mode. Compression of high rate elements is preceded by a detection of outliers. Only valid high-rate values are used to compute this element" ;
		range_ocog_rms_01_plrm_ku:source = "OCOG retracking" ;
```

4.4.88 retracking_ocean_qual_20_ku(time_20_ku)

```
	byte retracking_ocean_qual_20_ku(time_20_ku) ;
		retracking_ocean_qual_20_ku:_FillValue = -128b;
		retracking_ocean_qual_20_ku:long_name = "\'ocean\' retracking quality flag: 20 Hz ku band" ;
		retracking_ocean_qual_20_ku:flag_values = 0b, 1b ;
		retracking_ocean_qual_20_ku:flag_meanings = "yes no" ;
		retracking_ocean_qual_20_ku:coordinates = "lon_20_ku lat_20_ku" ;
		retracking_ocean_qual_20_ku:comment = "Flag indicating the use or not of the 20-Hz estimate of the ocean retracking in the computation of 1Hz estimate" ;
		retracking_ocean_qual_20_ku:source = "LRM: MLE4 retracking, SAR: SAMOSA v2.3 retracking." ;
```

4.4.89 retracking_ocean_qual_20_plrm_ku(time_20_plrm_ku)

```
byte retracking_ocean_qual_20_plrm_ku(time_20_plrm_ku) ;
        retracking_ocean_qual_20_plrm_ku:_FillValue = -128b ;
        retracking_ocean_qual_20_plrm_ku:long_name = "\'ocean\' retracking quality flag: 20 Hz PLRM ku band" ;
        retracking_ocean_qual_20_plrm_ku:flag_values = 0b, 1b ;
        retracking_ocean_qual_20_plrm_ku:flag_meanings = "yes no" ;
        retracking_ocean_qual_20_plrm_ku:coordinates = "lon_20_plrm_ku lat_20_plrm_ku" ;
        retracking_ocean_qual_20_plrm_ku:comment = "Not provided in LRM mode. Flag indicating the use or not of the 20-Hz estimate of the ocean retracking in the computation of 1Hz estimate" ;
        retracking_ocean_qual_20_plrm_ku:source = "MLE4 retracking" ;
```

4.4.90 scale_factor_20_ku(time_20_ku)

```
int scale_factor_20_ku(time_20_ku) ;
        scale_factor_20_ku:_FillValue = -2147483648;
        scale_factor_20_ku:long_name = "scaling factor for backscatter coefficient evaluation: 20 Hz ku band" ;
        scale_factor_20_ku:units = "dB" ;
        scale_factor_20_ku:add_offset = 0. ;
        scale_factor_20_ku:scale_factor = 0.01 ;
        scale_factor_20_ku:coordinates = "lon_20_ku lat_20_ku" ;
        scale_factor_20_ku:comment = "This scaling factor represents the backscatter coefficient for a waveform amplitude equal to 1. It is corrected for AGC instrumental errors [agc_cor_01] and internal calibration [internal_cor_sig0_01]" ;
```

4.4.91 scale_factor_20_plrm_ku(time_20_plrm_ku)

```
int scale_factor_20_plrm_ku(time_20_plrm_ku) ;
        scale_factor_20_plrm_ku:_FillValue = -2147483648 ;
        scale_factor_20_plrm_ku:long_name = "scaling factor for backscatter coefficient evaluation: 20 Hz PLRM ku band" ;
        scale_factor_20_plrm_ku:units = "dB" ;
        scale_factor_20_plrm_ku:add_offset = 0. ;
        scale_factor_20_plrm_ku:scale_factor = 0.01 ;
        scale_factor_20_plrm_ku:coordinates = "lon_20_plrm_ku lat_20_plrm_ku" ;
        scale_factor_20_plrm_ku:comment = "Not provided in LRM mode. This scaling factor represents the backscatter coefficient for a waveform amplitude equal to 1. It is corrected for AGC instrumental errors [agc_cor_01] and internal calibration [internal_cor_sig0_01]" ;
```

4.4.92 **sea_state_bias_01_ku(time_01)**

```
short sea_state_bias_01_ku(time_01) ;
        sea_state_bias_01_ku:_FillValue = -32768s;
        sea_state_bias_01_ku:long_name = "sea state bias correction: 1 Hz ku band" ;
        sea_state_bias_01_ku:units = "m" ;
        sea_state_bias_01_ku:standard_name = "sea_surface_height_bias_due_to_sea_surface_roughness" ;
        sea_state_bias_01_ku:add_offset = 0. ;
        sea_state_bias_01_ku:scale_factor = 0.001 ;
        sea_state_bias_01_ku:coordinates = "lon_01 lat_01" ;
        sea_state_bias_01_ku:comment = "A sea state bias correction must be added (negative value) to the instrument range to correct this range measurement for sea state delays of the radar pulse." ;
        sea_state_bias_01_ku:source = "NTran 2015 empirical solution fitted on Cryosat GOP Baseline-B data" ;
        sea_state_bias_01_ku:institution = "ESA/CLS" ;
```

4.4.93 **sea_state_bias_01_plrm_ku(time_01)**

```
short sea_state_bias_01_plrm_ku(time_01) ;
        sea_state_bias_01_plrm_ku:_FillValue = -32768s;
        sea_state_bias_01_plrm_ku:long_name = "sea state bias correction: 1 Hz PLRM ku band" ;
        sea_state_bias_01_plrm_ku:units = "m" ;
        sea_state_bias_01_plrm_ku:standard_name = "sea_surface_height_bias_due_to_sea_surface_roughness" ;
        sea_state_bias_01_plrm_ku:add_offset = 0. ;
        sea_state_bias_01_plrm_ku:scale_factor = 0.001 ;
        sea_state_bias_01_plrm_ku:coordinates = "lon_01 lat_01" ;
        sea_state_bias_01_plrm_ku:comment = "Set to FillValue in LRM mode. A sea state bias correction must be added (negative value) to the instrument range to correct this range measurement for sea state delays of the radar pulse." ;
        sea_state_bias_01_plrm_ku:source = "NTran 2015 empirical solution fitted on Cryosat GOP Baseline-B data" ;
        sea_state_bias_01_plrm_ku:institution = "ESA/CLS" ;
```

4.4.94 **seq_count_01(time_01)**

```
int seq_count_01(time_01) ;
        seq_count_01:_FillValue = -2147483648;
                seq_count_01:long_name = "sequence counter: 1 Hz" ;
        seq_count_01:units = "count" ;
        seq_count_01:comment = "Record counter from the L1b product." ;
```

4.4.95 sig0_ocean_01_ku(time_01)

```
short sig0_ocean_01_ku(time_01) ;
        sig0_ocean_01_ku:_FillValue = -32768s;
        sig0_ocean_01_ku:long_name = "corrected \'ocean\' backscatter coefficient: 1 Hz ku band" ;
        sig0_ocean_01_ku:units = "dB" ;
        sig0_ocean_01_ku:standard_name = "surface_backwards_scattering_coefficient_of_radar_wave" ;
        sig0_ocean_01_ku:add_offset = 0. ;
        sig0_ocean_01_ku:scale_factor = 0.01 ;
        sig0_ocean_01_ku:coordinates = "lon_01 lat_01" ;
        sig0_ocean_01_ku:comment = "Instrumental corrections included: AGC instrumental errors correction [agc_cor_01], internal calibration correction [internal_cor_sig0_01], modeled instrumental errors correction [mod_instr_cor_sig0_01_ku], atmospheric attenuation correction [atm_cor_sig0_01] and system bias" ;
        sig0_ocean_01_ku:source = "LRM: MLE4 retracking, SAR: SAMOSA v2.3 retracking" ;
```

4.4.96 sig0_ocean_01_plrm_ku(time_01)

```
short sig0_ocean_01_plrm_ku(time_01) ;
        sig0_ocean_01_plrm_ku:_FillValue = -32768s ;
        sig0_ocean_01_plrm_ku:long_name = "corrected \'ocean\' backscatter coefficient: 1 Hz PLRM ku band" ;
        sig0_ocean_01_plrm_ku:units = "dB" ;
        sig0_ocean_01_plrm_ku:standard_name = "surface_backwards_scattering_coefficient_of_radar_wave" ;
        sig0_ocean_01_plrm_ku:add_offset = 0. ;
        sig0_ocean_01_plrm_ku:scale_factor = 0.01 ;
        sig0_ocean_01_plrm_ku:coordinates = "lon_01 lat_01" ;
        sig0_ocean_01_plrm_ku:comment = "Set to FillValue in LRM mode. Instrumental corrections included: AGC instrumental errors correction [agc_cor_01], internal calibration correction [internal_cor_sig0_01], modeled instrumental errors correction [mod_instr_cor_sig0_01_plrm_ku], atmospheric attenuation correction [atm_cor_sig0_01] and system bias" ;
        sig0_ocean_01_plrm_ku:source = "MLE4 retracking" ;
```

4.4.97 sig0_ocean_20_ku(time_20_ku)

```
short sig0_ocean_20_ku(time_20_ku) ;
        sig0_ocean_20_ku:_FillValue = -32768s;
        sig0_ocean_20_ku:long_name = "corrected \'ocean\' backscatter coefficient: 20 Hz ku band" ;
        sig0_ocean_20_ku:units = "dB" ;
        sig0_ocean_20_ku:standard_name = "surface_backwards_scattering_coefficient_of_radar_wave" ;
        sig0_ocean_20_ku:add_offset = 0. ;
        sig0_ocean_20_ku:scale_factor = 0.01 ;
        sig0_ocean_20_ku:coordinates = "lon_20_ku lat_20_ku" ;
        sig0_ocean_20_ku:comment = "Instrumental corrections included: AGC instrumental errors correction [agc_cor_01], internal calibration correction [internal_cor_sig0_01], atmospheric attenuation correction [atm_cor_sig0_01] and system bias" ;
        sig0_ocean_20_ku:source = "LRM: MLE4 retracking, SAR: SAMOSA v2.3 retracking" ;
```

4.4.98 sig0_ocean_20_plrm_ku(time_20_plrm_ku)

```
short sig0_ocean_20_plrm_ku(time_20_plrm_ku) ;
        sig0_ocean_20_plrm_ku:_FillValue = -32768s;
        sig0_ocean_20_plrm_ku:long_name = "corrected \'ocean\' backscatter coefficient: 20 Hz PLRM ku band" ;
        sig0_ocean_20_plrm_ku:units = "dB" ;
        sig0_ocean_20_plrm_ku:standard_name = "surface_backwards_scattering_coefficient_of_radar_wave" ;
        sig0_ocean_20_plrm_ku:add_offset = 0. ;
        sig0_ocean_20_plrm_ku:scale_factor = 0.01 ;
        sig0_ocean_20_plrm_ku:coordinates = "lon_20_plrm_ku lat_20_plrm_ku" ;
        sig0_ocean_20_plrm_ku:comment = "Not provided in LRM mode. Instrumental corrections included: AGC instrumental errors correction [agc_cor_01], internal calibration correction [internal_cor_sig0_01], atmospheric attenuation correction [atm_cor_sig0_01] and system bias" ;
        sig0_ocean_20_plrm_ku:source = "MLE4 retracking" ;
```

4.4.99 sig0_ocean_numval_01_ku(time_01)

```
byte sig0_ocean_numval_01_ku(time_01) ;
        sig0_ocean_numval_01_ku:_FillValue = -128b;
        sig0_ocean_numval_01_ku:long_name = "number of valid points used to compute the \'ocean\' backscatter coefficient: 1 Hz ku band" ;
        sig0_ocean_numval_01_ku:units = "count" ;
        sig0_ocean_numval_01_ku:coordinates = "lon_01 lat_01" ;
        sig0_ocean_numval_01_ku:source = "LRM: MLE4 retracking, SAR: SAMOSA v2.3 retracking" ;
```

4.4.100 sig0_ocean_numval_01_plrm_ku(time_01)

```
byte sig0_ocean_numval_01_plrm_ku(time_01) ;
        sig0_ocean_numval_01_plrm_ku:_FillValue = -128b;
        sig0_ocean_numval_01_plrm_ku:long_name = "number of valid points used to compute the \'ocean\' backscatter coefficient: 1 Hz PLRM ku band" ;
        sig0_ocean_numval_01_plrm_ku:units = "count" ;
        sig0_ocean_numval_01_plrm_ku:coordinates = "lon_01 lat_01" ;
        sig0_ocean_numval_01_plrm_ku:comment = "Set to FillValue in LRM mode." ;
        sig0_ocean_numval_01_plrm_ku:source = "MLE4 retracking" ;
```

4.4.101 sig0_ocean_qual_20_ku(time_20_ku)

```
byte sig0_ocean_qual_20_ku(time_20_ku) ;
        sig0_ocean_qual_20_ku:_FillValue = -128b;
        sig0_ocean_qual_20_ku:long_name = "quality flag for the \'ocean\' backscatter coefficient: 20 Hz ku band" ;
        sig0_ocean_qual_20_ku:flag_values = 0b, 1b ;
        sig0_ocean_qual_20_ku:flag_meanings = "yes no" ;
        sig0_ocean_qual_20_ku:coordinates = "lon_20_ku lat_20_ku" ;
        sig0_ocean_qual_20_ku:comment = "Flag indicating the use or not of the 20-Hz estimate of the ocean retracking in the computation of 1Hz estimate" ;
        sig0_ocean_qual_20_ku:source = "LRM: MLE4 retracking, SAR: SAMOSA v2.3 retracking" ;
```

4.4.102 sig0_ocean_qual_20_plrm_ku(time_20_plrm_ku)

```
byte sig0_ocean_qual_20_plrm_ku(time_20_plrm_ku) ;
        sig0_ocean_qual_20_plrm_ku:_FillValue = -128b ;
        sig0_ocean_qual_20_plrm_ku:long_name = "quality flag for the \'ocean\' backscatter coefficient: 20 Hz PLRM ku band" ;
        sig0_ocean_qual_20_plrm_ku:flag_values = 0b, 1b ;
        sig0_ocean_qual_20_plrm_ku:flag_meanings = "yes no" ;
        sig0_ocean_qual_20_plrm_ku:coordinates = "lon_20_plrm_ku lat_20_plrm_ku" ;
        sig0_ocean_qual_20_plrm_ku:comment = "Not provided in LRM mode. Flag indicating the use or not of the 20-Hz estimate of the \'ocean\' retracking in the computation of 1Hz estimate" ;
        sig0_ocean_qual_20_plrm_ku:source = "MLE4 retracking" ;
```

4.4.103 sig0_ocean_rms_01_ku(time_01)

```
short sig0_ocean_rms_01_ku(time_01) ;
        sig0_ocean_rms_01_ku:_FillValue = -32768s;
        sig0_ocean_rms_01_ku:long_name = "RMS of the \'ocean\' backscatter coefficient: 1 Hz ku band" ;
        sig0_ocean_rms_01_ku:units = "dB" ;
        sig0_ocean_rms_01_ku:add_offset = 0. ;
        sig0_ocean_rms_01_ku:scale_factor = 0.01 ;
        sig0_ocean_rms_01_ku:coordinates = "lon_01 lat_01" ;
        sig0_ocean_rms_01_ku:comment = "Compression of high rate elements is preceded by a detection of outliers. Only valid high-rate values are used to compute this element" ;
        sig0_ocean_rms_01_ku:source = "LRM: MLE4 retracking, SAR: SAMOSA v2.3 retracking" ;
```

4.4.104 sig0_ocean_rms_01_plrm_ku(time_01)

```
short sig0_ocean_rms_01_plrm_ku(time_01) ;
        sig0_ocean_rms_01_plrm_ku:_FillValue = -32768s;
        sig0_ocean_rms_01_plrm_ku:long_name = "RMS of the \'ocean\' backscatter coefficient: 1 Hz PLRM ku band" ;
        sig0_ocean_rms_01_plrm_ku:units = "dB" ;
        sig0_ocean_rms_01_plrm_ku:add_offset = 0. ;
        sig0_ocean_rms_01_plrm_ku:scale_factor = 0.01 ;
        sig0_ocean_rms_01_plrm_ku:coordinates = "lon_01 lat_01" ;
        sig0_ocean_rms_01_plrm_ku:comment = "Set to FillValue in LRM mode. Compression of high rate elements is preceded by a detection of outliers. Only valid high-rate values are used to compute this element" ;
        sig0_ocean_rms_01_plrm_ku:source = "MLE4 retracking" ;
```

4.4.105 sig0_ocog_01_ku(time_01)

```
short sig0_ocog_01_ku(time_01) ;
        sig0_ocog_01_ku:_FillValue = -32768s;
        sig0_ocog_01_ku:long_name = "corrected \'ocog\' backscatter coefficient: 1 Hz ku band" ;
        sig0_ocog_01_ku:units = "dB" ;
        sig0_ocog_01_ku:standard_name = "surface_backwards_scattering_coefficient_of_radar_wave" ;
        sig0_ocog_01_ku:add_offset = 0. ;
        sig0_ocog_01_ku:scale_factor = 0.01 ;
        sig0_ocog_01_ku:coordinates = "lon_01 lat_01" ;
        sig0_ocog_01_ku:comment = " Set to FillValue in SAR mode. Instrumental corrections included: AGC instrumental errors correction [agc_cor_01] and internal calibration correction [internal_cor_sig0_01]" ;
        sig0_ocog_01_ku:source = "OCOG retracking" ;
```

4.4.106 sig0_ocog_01_plrm_ku(time_01)

```
short sig0_ocog_01_plrm_ku(time_01) ;
        sig0_ocog_01_plrm_ku:_FillValue = -32768s;
        sig0_ocog_01_plrm_ku:long_name_plrm_ku = "corrected \'ocog\' backscatter coefficient: 1 Hz PLRM ku band" ;
        sig0_ocog_01_plrm_ku:units = "dB" ;
        sig0_ocog_01_plrm_ku:standard_name = "surface_backwards_scattering_coefficient_of_radar_wave" ;
        sig0_ocog_01_plrm_ku:add_offset = 0. ;
        sig0_ocog_01_plrm_ku:scale_factor = 0.01 ;
        sig0_ocog_01_plrm_ku:coordinates = "lon_01 lat_01" ;
        sig0_ocog_01_plrm_ku:comment = "Set to FillValue in LRM mode. Instrumental corrections included: AGC instrumental errors correction [agc_cor_01] and internal calibration correction [internal_cor_sig0_01]" ;
        sig0_ocog_01_plrm_ku:source = "OCOG retracking" ;
```

4.4.107 sig0_ocog_20_ku(time_20_ku)

```
short sig0_ocog_20_ku(time_20_ku) ;
        sig0_ocog_20_ku:_FillValue = -32768s;
        sig0_ocog_20_ku:long_name = "corrected \'ocog\' backscatter coefficient: 20 Hz ku band" ;
        sig0_ocog_20_ku:units = "dB" ;
        sig0_ocog_20_ku:standard_name = "surface_backwards_scattering_coefficient_of_radar_wave" ;
        sig0_ocog_20_ku:add_offset = 0. ;
        sig0_ocog_20_ku:scale_factor = 0.01 ;
        sig0_ocog_20_ku:coordinates = "lon_20_ku lat_20_ku" ;
        sig0_ocog_20_ku:comment = " Set to FillValue in SAR mode. Instrumental corrections included: AGC instrumental errors correction [agc_cor_01] and internal calibration correction [internal_cor_sig0_01]" ;
        sig0_ocog_20_ku:source = "OCOG retracking" ;
```

4.4.108 sig0_ocog_20_plrm_ku(time_20_plrm_ku)

```
short sig0_ocog_20_plrm_ku(time_20_plrm_ku) ;
        sig0_ocog_20_plrm_ku:_FillValue = -32768s;
        sig0_ocog_20_plrm_ku:long_name = "corrected \'ocog\' backscatter coefficient: 20 Hz PLRM ku band" ;
        sig0_ocog_20_plrm_ku:units = "dB" ;
        sig0_ocog_20_plrm_ku:standard_name = "surface_backwards_scattering_coefficient_of_radar_wave" ;
        sig0_ocog_20_plrm_ku:add_offset = 0. ;
        sig0_ocog_20_plrm_ku:scale_factor = 0.01 ;
        sig0_ocog_20_plrm_ku:coordinates = "lon_20_plrm_ku lat_20_plrm_ku" ;
        sig0_ocog_20_plrm_ku:comment = "Not provided in LRM mode. Instrumental corrections included: AGC instrumental errors correction [agc_cor_01] and internal calibration correction [internal_cor_sig0_01]" ;
        sig0_ocog_20_plrm_ku:source = "OCOG retracking" ;
```

4.4.109 sig0_ocog_numval_01_ku(time_01)

```
byte sig0_ocog_numval_01_ku(time_01) ;
        sig0_ocog_numval_01_ku:_FillValue = -128b;
        sig0_ocog_numval_01_ku:long_name = "number of valid points used to compute the \'ocog\' backscatter coefficient: 1 Hz ku band" ;
        sig0_ocog_numval_01_ku:units = "count" ;
        sig0_ocog_numval_01_ku:coordinates = "lon_01 lat_01" ;
        sig0_ocog_numval_01_ku:source = "OCOG retracking" ;
        sig0_ocog_numval_01_ku:comment = "Set to FillValue in SAR mode." ;
```

4.4.110 sig0_ocog_numval_01_plrm_ku(time_01)

```
byte sig0_ocog_numval_01_plrm_ku(time_01) ;
        sig0_ocog_numval_01_plrm_ku:_FillValue = -128b;
        sig0_ocog_numval_01_plrm_ku:long_name = "number of valid points used to compute the \'ocog\' backscatter coefficient: 1 Hz PLRM ku band" ;
        sig0_ocog_numval_01_plrm_ku:units = "count" ;
        sig0_ocog_numval_01_plrm_ku:coordinates = "lon_01 lat_01" ;
        sig0_ocog_numval_01_plrm_ku:comment = "Set to FillValue in LRM mode." ;
        sig0_ocog_numval_01_plrm_ku:source = "OCOG retracking" ;
```

4.4.111 sig0_ocog_qual_20_ku(time_20_ku)

```
byte sig0_ocog_qual_20_ku(time_20_ku) ;
        sig0_ocog_qual_20_ku:_FillValue = -128b;
        sig0_ocog_qual_20_ku:long_name = "quality flag for the \'ocog\' backscatter coefficient: 20 Hz ku band" ;
        sig0_ocog_qual_20_ku:flag_values = 0b, 1b ;
        sig0_ocog_qual_20_ku:flag_meanings = "yes no" ;
        sig0_ocog_qual_20_ku:coordinates = "lon_20_ku lat_20_ku" ;
        sig0_ocog_qual_20_ku:comment = " Set to FillValue in SAR mode. Flag indicating the use or not of the 20-Hz estimate of the \'ocog\' retracking in the computation of 1Hz estimate" ;
        sig0_ocog_qual_20_ku:source = "OCOG retracking" ;
```

4.4.112 sig0_ocog_qual_20_plrm_ku(time_20_plrm_ku)

```
byte sig0_ocog_qual_20_plrm_ku(time_20_plrm_ku) ;
        sig0_ocog_qual_20_plrm_ku:_FillValue = -128b ;
        sig0_ocog_qual_20_plrm_ku:long_name = "quality flag for the \'ocog\' backscatter coefficient: 20 Hz PLRM ku band" ;
        sig0_ocog_qual_20_plrm_ku:flag_values = 0b, 1b ;
        sig0_ocog_qual_20_plrm_ku:flag_meanings = "yes no" ;
        sig0_ocog_qual_20_plrm_ku:coordinates = "lon_20_plrm_ku lat_20_plrm_ku" ;
        sig0_ocog_qual_20_plrm_ku:comment = "Not provided in LRM mode. Flag indicating the use or not of the 20-Hz estimate of the \'ocog\' retracking in the computation of 1Hz estimate" ;
        sig0_ocog_qual_20_plrm_ku:source = "OCOG retracking" ;
```

4.4.113 sig0_ocog_rms_01_ku(time_01)

```
short sig0_ocog_rms_01_ku(time_01) ;
        sig0_ocog_rms_01_ku:_FillValue = -32768s;
        sig0_ocog_rms_01_ku:long_name = "RMS of the \'ocog\' backscatter coefficient: 1 Hz ku band" ;
        sig0_ocog_rms_01_ku:units = "dB" ;
        sig0_ocog_rms_01_ku:add_offset = 0. ;
        sig0_ocog_rms_01_ku:scale_factor = 0.01 ;
        sig0_ocog_rms_01_ku:coordinates = "lon_01 lat_01" ;
        sig0_ocog_rms_01_ku:comment = "Set to FillValue in SAR mode. Compression of high rate elements is preceded by a detection of outliers. Only valid high-rate values are used to compute this element" ;
        sig0_ocog_rms_01_ku:source = "OCOG retracking" ;
```

4.4.114 sig0_ocog_rms_01_plrm_ku(time_01)

```
short sig0_ocog_rms_01_plrm_ku(time_01) ;
        sig0_ocog_rms_01_plrm_ku:_FillValue = -32768s;
        sig0_ocog_rms_01_plrm_ku:long_name = "RMS of the \'ocog\' backscatter coefficient: 1 Hz PLRM ku band" ;
        sig0_ocog_rms_01_plrm_ku:units = "dB" ;
        sig0_ocog_rms_01_plrm_ku:add_offset = 0. ;
        sig0_ocog_rms_01_plrm_ku:scale_factor = 0.01 ;
        sig0_ocog_rms_01_plrm_ku:coordinates = "lon_01 lat_01" ;
        sig0_ocog_rms_01_plrm_ku:comment = "Set to FillValue in LRM mode. Compression of high rate elements is preceded by a detection of outliers. Only valid high-rate values are used to compute this element" ;
        sig0_ocog_rms_01_plrm_ku:source = "OCOG retracking" ;
```

4.4.115 solid_earth_tide_01(time_01)

```
short solid_earth_tide_01(time_01) ;
        solid_earth_tide_01:_FillValue = -32768s;
        solid_earth_tide_01:long_name = "solid earth tide height: 1 Hz" ;
        solid_earth_tide_01:units = "m" ;
        solid_earth_tide_01:standard_name = "sea_surface_height_amplitude_due_to_earth_tide" ;
        solid_earth_tide_01:add_offset = 0. ;
        solid_earth_tide_01:scale_factor = 0.001 ;
        solid_earth_tide_01:coordinates = "lon_01 lat_01" ;
        solid_earth_tide_01:comment = "Solid earth tide - to be added to the range to remove the effect of local tidal distortion in the Earth's crust." ;
        solid_earth_tide_01:source = "Cartwright and Edden [1973] Corrected tables of tidal harmonics - J. Geophys. J. R. Astr. Soc., 33, 253-264." ;
```

4.4.116 square_swh_ocean_01_ku(time_01)

```
int square_swh_ocean_01_ku(time_01) ;
        square_swh_ocean_01_ku:_FillValue = -2147483648;
        square_swh_ocean_01_ku:long_name = "corrected \'ocean\' square of the significant waveheight: 1 Hz ku band" ;
        square_swh_ocean_01_ku:units = "m^2" ;
        square_swh_ocean_01_ku:add_offset = 0. ;
        square_swh_ocean_01_ku:scale_factor = 1.e-06 ;
        square_swh_ocean_01_ku:coordinates = "lon_01 lat_01" ;
        square_swh_ocean_01_ku:comment = "The modeled instrumental errors correction [mod_instr_cor_swh_01_ku] and the system bias are not included" ;
        square_swh_ocean_01_ku:source = "LRM: MLE4 retracking, SAR: SAMOSA v2.3 retracking" ;
```

4.4.117 square_swh_ocean_01_plrm_ku(time_01)

```
int square_swh_ocean_01_plrm_ku(time_01) ;
        square_swh_ocean_01_plrm_ku:_FillValue = -2147483648;
        square_swh_ocean_01_plrm_ku:long_name = "corrected \'ocean\' square of the significant waveheight: 1 Hz PLRM ku band" ;
        square_swh_ocean_01_plrm_ku:units = "m^2" ;
        square_swh_ocean_01_plrm_ku:add_offset = 0. ;
        square_swh_ocean_01_plrm_ku:scale_factor = 1.e-06 ;
        square_swh_ocean_01_plrm_ku:coordinates = "lon_01 lat_01" ;
        square_swh_ocean_01_plrm_ku:comment = "Set to FillValue in LRM mode. The modeled instrumental errors correction [mod_instr_cor_swh_01_plrm_ku] and the system bias are not included" ;
        square_swh_ocean_01_plrm_ku:source = "MLE4 retracking" ;
```

4.4.118 ssha_01_ku(time_01)

```
short ssha_01_ku(time_01) ;
        ssha_01_ku:_FillValue = -32768s;
        ssha_01_ku:long_name = "sea surface height anomaly: 1 Hz ku band" ;
        ssha_01_ku:units = "m" ;
        ssha_01_ku:standard_name = "sea_surface_height_above_sea_level" ;
        ssha_01_ku:add_offset = 0. ;
        ssha_01_ku:scale_factor = 0.001 ;
        ssha_01_ku:coordinates = "lon_01 lat_01" ;

        ssha_01_ku:comment = "altitude of satellite [alt_01] - ku band corrected ocean altimeter range [range_ocean_01_ku] - gim ionospheric correction [iono_cor_gim_01] - model dry tropospheric correction [mod_dry_tropo_cor_01] - wet tropospheric correction ([mod_wet_tropo_cor_01] for NOP/IOP products, [gpd_wet_tropo_cor_01] for GOP off line products)- sea state bias correction in Ku band [sea_state_bias_01_ku] - solid earth tide height [solid_earth_tide_01] - geocentric ocean tide height solution 1 [ocean_tide_sol1_01] - geocentric pole tide height [pole_tide_01] - inverted barometer height correction [inv_bar_cor_01] - high frequency fluctuations of the sea surface topography ([hf_fluct_cor_01] for IOP/GOP off line products only) - mean sea surface solution 1 [mean_sea_surf_sol1_01]" ;
        ssha_01_ku:source = "LRM: MLE4 retracking, SAR: SAMOSA v2.3 retracking." ;
```

4.4.119 ssha_01_plrm_ku(time_01)

```
short ssha_01_plrm_ku(time_01) ;
        ssha_01_plrm_ku:_FillValue = -32768s;
        ssha_01_plrm_ku:long_name = "sea surface height anomaly: 1 Hz PLRM ku band" ;
        ssha_01_plrm_ku:units = "m" ;
        ssha_01_plrm_ku:standard_name = "sea_surface_height_above_sea_level" ;
        ssha_01_plrm_ku:add_offset = 0. ;
        ssha_01_plrm_ku:scale_factor = 0.001 ;
        ssha_01_plrm_ku:comment = "Set to FillValue in LRM mode. Altitude of satellite [alt_01] - PLRM ku band corrected ocean altimeter range [range_ocean_01_plrm_ku] - gim ionospheric correction [iono_cor_gim_01] - model dry tropospheric correction [mod_dry_tropo_cor_01] - wet tropospheric correction ([mod_wet_tropo_cor_01] for NOP/IOP products, [gpd_wet_tropo_cor_01] for GOP off line products) - sea state bias correction in PLRM Ku band [sea_state_bias_01_plrm_ku] - solid earth tide height [solid_earth_tide_01] - geocentric ocean tide height solution 1 [ocean_tide_sol1_01] - geocentric pole tide height [pole_tide_01] - inverted barometer height correction [inv_bar_cor_01] - high frequency fluctuations of the sea surface topography ([hf_fluct_cor_01] for IOP/GOP off line products only) - mean sea surface solution 1 [mean_sea_surf_sol1_01]" ;
        ssha_01_plrm_ku:source = "MLE4 retracking" ;
```

4.4.120 ssha_20_ku(time_20_ku)

```
short ssha_20_ku(time_20_ku) ;
        ssha_20_ku:_FillValue = -32768s;
        ssha_20_ku:long_name = "sea surface height anomaly: 20 Hz ku band" ;
        ssha_20_ku:units = "m " ;
        ssha_20_ku:standard_name = "sea_surface_height_above_sea_level" ;
        ssha_20_ku:add_offset = 0. ;
        ssha_20_ku:scale_factor = 0.001 ;

        ssha_20_ku:comment = "altitude of satellite [alt_20_ku] - ku band corrected ocean altimeter range [range_ocean_20_ku] - gim ionospheric correction [iono_cor_gim_01] - model dry tropospheric correction [mod_dry_tropo_cor_01] - wet tropospheric correction ([mod_wet_tropo_cor_01] for NOP/IOP products, [gpd_wet_tropo_cor_01] for GOP off line products) - sea state bias correction in Ku band [sea_state_bias_01_ku] - solid earth tide height [solid_earth_tide_01] - geocentric ocean tide height solution 1 [ocean_tide_sol1_01] - geocentric pole tide height [pole_tide_01] - inverted barometer height correction [inv_bar_cor_01] - high frequency fluctuations of the sea surface topography ([hf_fluct_cor_01] for IOP/GOP off line products only) - mean sea surface solution 1 [mean_sea_surf_sol1_01]" ;
        ssha_20_ku:source = "LRM: MLE4 retracking, SAR: SAMOSA v2.3 retracking." ;
```

4.4.121 ssha_20_plrm_ku(time_20_plrm_ku)

```
short ssha_20_plrm_ku(time_20_plrm_ku) ;
        ssha_20_plrm_ku:_FillValue = -32768s;
        ssha_20_plrm_ku:long_name = "sea surface height anomaly: 20 Hz PLRM ku band" ;
        ssha_20_plrm_ku:units = "m/s" ;
        ssha_20_plrm_ku:standard_name = "sea_surface_height_above_sea_level" ;
        ssha_20_plrm_ku:add_offset = 0. ;
        ssha_20_plrm_ku:scale_factor = 0.001 ;
        ssha_20_plrm_ku:comment = "Not provided in LRM mode. Altitude of satellite [alt_20_plrm_ku] - PLRM ku band corrected ocean altimeter range [range_ocean_20_plrm_ku] - gim ionospheric correction [iono_cor_gim_01] - model dry tropospheric correction [mod_dry_tropo_cor_01] - wet tropospheric correction ([mod_wet_tropo_cor_01] for NOP/IOP products, [gpd_wet_tropo_cor_01] for GOP off line products) - sea state bias correction in PLRM Ku band [sea_state_bias_01_plrm_ku] - solid earth tide height [solid_earth_tide_01] - geocentric ocean tide height solution 1 [ocean_tide_sol1_01] - geocentric pole tide height [pole_tide_01] - inverted barometer height correction [inv_bar_cor_01] - high frequency fluctuations of the sea surface topography ([hf_fluct_cor_01] for IOP/GOP off line products only) - mean sea surface solution 1 [mean_sea_surf_sol1_01]" ;
        ssha_20_plrm_ku:source = "MLE4 retracking" ;
```

4.4.122 surf_type_01(time_01)

```
byte surf_type_01(time_01) ;
        surf_type_01:_FillValue = -128b;
        surf_type_01:long_name = "surface type: 1 Hz" ;
        surf_type_01:flag_values = 0b, 1b, 2b, 3b ;
        surf_type_01:flag_meanings = "ocean_or_semi_enclosed_sea enclosed_sea_or_lake continental_ice land" ;
        surf_type_01:coordinates = "lon_01 lat_01" ;
        surf_type_01:source = "terrainbase 1.0" ;
        surf_type_01:institution = "NOAA National Geophysical Data Center, Boulder, Colorado." ;
        surf_type_01:comment = "Computed using the TERRAINBASE model: 0= open oceans or semi-enclosed seas; 1= enclosed seas or lakes; 2= continental ice; 3= land. See Row, L.W., and D.A. Hastings, 1994. TerrainBase Worldwide Digital Terrain Data on CD-ROM, Release 1.0." ;
```

4.4.123 swh_ocean_01_ku(time_01)

```
short swh_ocean_01_ku(time_01) ;
        swh_ocean_01_ku:_FillValue = -32768s;
        swh_ocean_01_ku:long_name = "corrected \'ocean\' significant waveheight: 1 Hz ku band" ;
        swh_ocean_01_ku:units = "m" ;
        swh_ocean_01_ku:standard_name = "sea_surface_wave_significant_height" ;
        swh_ocean_01_ku:add_offset = 0. ;
        swh_ocean_01_ku:scale_factor = 0.001 ;
        swh_ocean_01_ku:coordinates = "lon_01 lat_01" ;
                swh_ocean_01_ku:comment = "Instrumental corrections included: modeled instrumental errors correction [mod_instr_cor_swh_01_ku] and system bias." ;
```

4.4.124 swh_ocean_01_plrm_ku(time_01)

```
short swh_ocean_01_plrm_ku(time_01) ;
        swh_ocean_01_plrm_ku:_FillValue = -32768s;
        swh_ocean_01_plrm_ku:long_name = "corrected \'ocean\' significant waveheight: 1 Hz PLRM ku band" ;
        swh_ocean_01_plrm_ku:units = "m" ;
        swh_ocean_01_plrm_ku:standard_name = "sea_surface_wave_significant_height" ;
        swh_ocean_01_plrm_ku:add_offset = 0. ;
        swh_ocean_01_plrm_ku:scale_factor = 0.001 ;
        swh_ocean_01_plrm_ku:coordinates = "lon_01 lat_01" ;
        swh_ocean_01_plrm_ku:comment = "Set to FillValue in LRM mode. Instrumental corrections included: modeled instrumental errors correction [mod_instr_cor_swh_01_plrm_ku] and system bias." ;
        swh_ocean_01_plrm_ku:source = "MLE4 retracking" ;
```

4.4.125 swh_ocean_20_ku(time_20_ku)

```
short swh_ocean_20_ku(time_20_ku) ;
        swh_ocean_20_ku:_FillValue = -32768s;
        swh_ocean_20_ku:long_name = "corrected \'ocean\' significant waveheight: 20 Hz ku band" ;
        swh_ocean_20_ku:units = "m" ;
        swh_ocean_20_ku:standard_name = "sea_surface_wave_significant_height" ;
        swh_ocean_20_ku:add_offset = 0. ;
        swh_ocean_20_ku:scale_factor = 0.001 ;
        swh_ocean_20_ku:coordinates = "lon_20_ku lat_20_ku" ;
        swh_ocean_20_ku:comment = "Instrumental corrections included: modeled instrumental errors correction [mod_instr_cor_swh_01_ku] and system bias." ;
        swh_ocean_20_ku:source = "LRM: MLE4 retracking, SAR: SAMOSA v2.3 retracking";
```

4.4.126 swh_ocean_20_plrm_ku(time_20_plrm_ku)

```
short swh_ocean_20_plrm_ku(time_20_plrm_ku) ;
        swh_ocean_20_plrm_ku:_FillValue = -32768s;
        swh_ocean_20_plrm_ku:long_name = "corrected \'ocean\' significant waveheight: 20 Hz PLRM ku band" ;
        swh_ocean_20_plrm_ku:units = "m" ;
        swh_ocean_20_plrm_ku:standard_name = "sea_surface_wave_significant_height" ;
        swh_ocean_20_plrm_ku:add_offset = 0. ;
        swh_ocean_20_plrm_ku:scale_factor = 0.001 ;
        swh_ocean_20_plrm_ku:coordinates = "lon_20_plrm_ku lat_20_plrm_ku" ;
        swh_ocean_20_plrm_ku:comment = "Not provided in LRM mode. Instrumental corrections included: modeled instrumental errors correction [mod_instr_cor_swh_01_plrm_ku] and system bias." ;
        swh_ocean_20_plrm_ku:source = "MLE4 retracking" ;
```

4.4.127 swh_ocean_numval_01_ku(time_01)

```
byte swh_ocean_numval_01_ku(time_01) ;
        swh_ocean_numval_01_ku:_FillValue = -128b;
        swh_ocean_numval_01_ku:long_name = "number of valid points used to compute the \'ocean\' significant waveheight: 1 Hz ku band" ;
        swh_ocean_numval_01_ku:units = "count" ;
        swh_ocean_numval_01_ku:coordinates = "lon_01 lat_01" ;
        swh_ocean_numval_01_ku:source = "LRM: MLE4 retracking, SAR: SAMOSA v2.3 retracking";
```

4.4.128 swh_ocean_numval_01_plrm_ku(time_01)

```
byte swh_ocean_numval_01_plrm_ku(time_01) ;
        swh_ocean_numval_01_plrm_ku:_FillValue = -128b;
        swh_ocean_numval_01_plrm_ku:long_name = "number of valid points used to compute the \'ocean\' significant waveheight: 1 Hz PLRM ku band" ;
        swh_ocean_numval_01_plrm_ku:units = "count" ;
        swh_ocean_numval_01_plrm_ku:coordinates = "lon_01 lat_01" ;
        swh_ocean_numval_01_plrm_ku:comment = "Set to FillValue in LRM mode." ;
        swh_ocean_numval_01_plrm_ku:source = "MLE4 retracking" ;
```

4.4.129 swh_ocean_qual_20_ku(time_20_plrm_ku)

```
byte swh_ocean_qual_20_ku(time_20_ku) ;
    swh_ocean_qual_20_ku:_FillValue = -128b;
    swh_ocean_qual_20_ku:long_name = "quality flag for the \'ocean\'
significant waveheight: 20 Hz ku band" ;
    swh_ocean_qual_20_ku:flag_values = 0b, 1b ;
    swh_ocean_qual_20_ku:flag_meanings = "yes no" ;
    swh_ocean_qual_20_ku:coordinates = "lon_20_ku lat_20_ku" ;
    swh_ocean_qual_20_ku:comment = "Flag indicating the use or not of the 20-
Hz estimate of the ocean retracking in the computation of 1Hz estimate" ;
    swh_ocean_qual_20_ku:source = "LRM: MLE4 retracking, SAR: SAMOSA v2.3
retracking";
```

4.4.130 swh_ocean_qual_20_plrm_ku(time_20_plrm_ku)

```
byte swh_ocean_qual_20_plrm_ku(time_20_plrm_ku) ;
    swh_ocean_qual_20_plrm_ku:_FillValue = -128b;
    swh_ocean_qual_20_plrm_ku:long_name = "quality flag for the \'ocean\'
significant waveheight: 20 Hz PLRM ku band" ;
    swh_ocean_qual_20_plrm_ku:flag_values = 0b, 1b ;
    swh_ocean_qual_20_plrm_ku:flag_meanings = "yes no" ;
    swh_ocean_qual_20_plrm_ku:coordinates = "lon_20_plrm_ku lat_20_plrm_ku"
;
        swh_ocean_qual_20_plrm_ku:comment = "Not provided in LRM mode. Flag
indicating the use or not of the 20-Hz estimate of the \'ocean\' retracking in the
computation of 1Hz estimate" ;
    swh_ocean_qual_20_plrm_ku:source = "MLE4 retracking" ;
```

4.4.131 swh_ocean_rms_01_ku(time_01)

```
short swh_ocean_rms_01_ku(time_01) ;
    swh_ocean_rms_01_ku:_FillValue = -32768s;
    swh_ocean_rms_01_ku:long_name = "RMS of the \'ocean\' significant
waveheight: 1 Hz ku band" ;
    swh_ocean_rms_01_ku:units = "m" ;
    swh_ocean_rms_01_ku:add_offset = 0. ;
    swh_ocean_rms_01_ku:scale_factor = 0.001 ;
    swh_ocean_rms_01_ku:coordinates = "lon_01 lat_01" ;
    swh_ocean_rms_01_ku:comment = "Compression of high rate elements is
preceded by a detection of outliers. Only valid high-rate values are used to compute
this element" ;
    swh_ocean_rms_01_ku:source = "LRM: MLE4 retracking, SAR: SAMOSA v2.3
retracking";
```

4.4.132 swh_ocean_rms_01_plrm_ku(time_01)

```
short swh_ocean_rms_01_plrm_ku(time_01) ;
        swh_ocean_rms_01_plrm_ku:_FillValue = -32768s;
        swh_ocean_rms_01_plrm_ku:long_name = "RMS of the \'ocean\' significant waveheight: 1 Hz PLRM ku band" ;
        swh_ocean_rms_01_plrm_ku:units = "m" ;
        swh_ocean_rms_01_plrm_ku:add_offset = 0. ;
        swh_ocean_rms_01_plrm_ku:scale_factor = 0.001 ;
        swh_ocean_rms_01_plrm_ku:coordinates = "lon_01 lat_01" ;
        swh_ocean_rms_01_plrm_ku:comment = "Set to FillValue in LRM mode. Compression of high rate elements is preceded by a detection of outliers. Only valid high-rate values are used to compute this element" ;
        swh_ocean_rms_01_plrm_ku:source = "MLE4 retracking" ;
```

4.4.133 time_01(time_01)

```
double time_01(time_01) ;
        time_01:long_name = "UTC: 1 Hz" ;
        time_01:units = "seconds since 2000-01-01 00:00:00.0" ;
        time_01:standard_name = "time" ;
        time_01:calendar = "gregorian" ;
                time_01:tai_utc_difference = 34. ;
```

4.4.134 time_1hz_20_ku(time_20_ku)

```
double time_1hz_20_ku(time_20_ku) ;
        time_1hz_20_ku:long_name = "UTC: 20 Hz ku band" ;
        time_1hz_20_ku:units = "seconds since 2000-01-01 00:00:00.0" ;
        time_1hz_20_ku:standard_name = "time" ;
        time_1hz_20_ku:calendar = "gregorian" ;
        time_1hz_20_ku:tai_utc_difference = < TAI UTC difference >;
        time_1hz_20_ku:comment = "UTC time of the 1 Hz measurement to which belongs the 20Hz measurement";
```

4.4.135 time_1hz_20_plrm_ku(time_20_ku)

```
double time_1hz_20_plrm_ku(time_20_ku) ;
        time_1hz_20_ plrm_ku:long_name = "UTC: 20 Hz PLRM ku band" ;
        time_1hz_20_ plrm_ku:units = "seconds since 2000-01-01 00:00:00.0" ;
        time_1hz_20_ plrm_ku:standard_name = "time" ;
        time_1hz_20_ plrm_ku:calendar = "gregorian" ;
        time_1hz_20_ plrm_ku:tai_utc_difference = < TAI UTC difference >;
        time_1hz_20_ plrm_ku:comment = "Not provided in LRM mode. UTC time of the 1 Hz measurement to which belongs the 20Hz measurement";
```

4.4.136 time_20_ku(time_20_ku)

```
double time_20_ku(time_20_ku) ;
        time_20_ku:long_name = "UTC: 20 Hz ku band" ;
        time_20_ku:units = "seconds since 2000-01-01 00:00:00.0" ;
        time_20_ku:standard_name = "time" ;
        time_20_ku:calendar = "gregorian" ;
```

```
            time_20_ku:tai_utc_difference = 0. ;
```

4.4.137 time_20_plrm_ku(time_20_plrm_ku)

```
double time_20_plrm_ku(time_20_plrm_ku) ;
            time_20_plrm_ku:long_name = "UTC: 20 Hz PLRM ku band" ;
            time_20_plrm_ku:units = "seconds since 2000-01-01 00:00:00.0" ;
            time_20_plrm_ku:standard_name = "time" ;
            time_20_plrm_ku:calendar = "gregorian" ;
            time_20_plrm_ku:tai_utc_difference = 34. ;
            time_20_plrm_ku:comment = "Not provided in LRM mode" ;
```

4.4.138 uso_cor_01_ku(time_01)

```
      short uso_cor_01_ku(time_01) ;
            uso_cor_01_ku:long_name = "uso correction on the altimeter range (2-way):
1 Hz" ;
            uso_cor_01_ku:units = "m" ;
            uso_cor_01_ku:add_offset = 0. ;
            uso_cor_01_ku:scale_factor = 0.001 ;
            uso_cor_01_ku:coordinates = "lon_01 lat_01" ;
            uso_cor_01_ku:comment = "Correction of the USO frequency drift on the
altimeter range" ;
```

4.4.139 wind_speed_alt_01_ku(time_01)

```
      short wind_speed_alt_01_ku(time_01) ;
            wind_speed_alt_01_ku:_FillValue = -32768s;
            wind_speed_alt_01_ku:long_name = "altimeter wind speed: 1 Hz ku band" ;
            wind_speed_alt_01_ku:units = "m/s" ;
            wind_speed_alt_01_ku:standard_name = "wind_speed" ;
            wind_speed_alt_01_ku:add_offset = 0. ;
            wind_speed_alt_01_ku:scale_factor = 0.001 ;
            wind_speed_alt_01_ku:coordinates = "lon_01 lat_01" ;
            wind_speed_alt_01_ku:comment = "Should not be used over land" ;
            wind_speed_alt_01_ku:source = "Abdalla [2007]" ;
            wind_speed_alt_01_ku:institution = "ECMWF" ;
```

4.4.140 wind_speed_alt_01_plrm_ku(time_01)

```
      short wind_speed_alt_01_plrm_ku(time_01) ;
            wind_speed_alt_01_plrm_ku:_FillValue = -32768s;
            wind_speed_alt_01_plrm_ku:long_name = "altimeter wind speed: 1 Hz PLRM ku
band" ;
            wind_speed_alt_01_plrm_ku:units = "m/s" ;
            wind_speed_alt_01_plrm_ku:standard_name = "wind_speed" ;
            wind_speed_alt_01_plrm_ku:add_offset = 0. ;
            wind_speed_alt_01_plrm_ku:scale_factor = 0.001 ;
            wind_speed_alt_01_plrm_ku:coordinates = "lon_01 lat_01" ;
            wind_speed_alt_01_plrm_ku:comment = "Set to FillValue in LRM mode. Should
not be used over land" ;
            wind_speed_alt_01_plrm_ku:source = "Abdalla [2007]" ;
            wind_speed_alt_01_plrm_ku:institution = "ECMWF" ;
```

4.4.141 wind_speed_mod_u_01(time_01)

```
short wind_speed_mod_u_01(time_01) ;
        wind_speed_mod_u_01:_FillValue = -32768s;
        wind_speed_mod_u_01:long_name = "U component of the model wind vector: 1 Hz" ;
        wind_speed_mod_u_01:units = "m/s" ;
        wind_speed_mod_u_01:standard_name = "wind_speed" ;
        wind_speed_mod_u_01:add_offset = 0. ;
        wind_speed_mod_u_01:scale_factor = 0.001 ;
        wind_speed_mod_u_01:coordinates = "lon_01 lat_01" ;
        wind_speed_mod_u_01:comment = "Computed at the altimeter time-tag [time_01] from the interpolation of 2 meteorological fields that surround the altimeter time-tag." ;
        wind_speed_mod_u_01:source = "European Center for Medium Range Weather Forecasting" ;
        wind_speed_mod_u_01:institution = "ECMWF" ;
```

4.4.142 wind_speed_mod_v_01(time_01)

```
short wind_speed_mod_v_01(time_01) ;
        wind_speed_mod_v_01:_FillValue = -32768s;
        wind_speed_mod_v_01:long_name = "V component of the model wind vector: 1 Hz" ;
        wind_speed_mod_v_01:units = "m/s" ;
        wind_speed_mod_v_01:standard_name = "wind_speed" ;
        wind_speed_mod_v_01:add_offset = 0. ;
        wind_speed_mod_v_01:scale_factor = 0.001 ;
        wind_speed_mod_v_01:coordinates = "lon_01 lat_01" ;
        wind_speed_mod_v_01:comment = "Computed at the altimeter time-tag [time_01] from the interpolation of 2 meteorological fields that surround the altimeter time-tag." ;
        wind_speed_mod_v_01:source = "European Center for Medium Range Weather Forecasting" ;
        wind_speed_mod_v_01:institution = "ECMWF" ;
```

5 CRYOSAT POLE TO POLE OCEAN PRODUCTS

The Pole-to-Pole products are multi-mode L2 products with a half-orbit coverage (from one pole to the other).

There are two types of P2P products:

- IOP P2P : in these products all the LRM, SAR and SARin L2 IOP products covering half an orbit (from pole to pole) are concatenated inside a single product with file type: SIR_IOP__2.
- GOP P2P: in these products all the LRM, SAR and SARin L2 GOP products covering half an orbit (from pole to pole) are concatenated inside a single product with file type: SIR_GOP__2.

No additional processing is performed in these processors and this means that:

- The geophysical contents of each portion of the P2P products are exactly the same as the contents of the single products covering that portion.
- In the transition between two modes inside the P2P products the continuity of the counters is not assured and it is up to the user to properly reconstruct the correct sequence by using the variable mode

Appendix A: Variables to Products Mapping

The table below shows in which product each variable defined in section 3 and 4 can be found.

Variables to Products Mapping		
Variable Name	**L1b**	**L2**
agc_01_ku	x	x
agc_20_ku	x	
agc_ch1_20_hr_ku	x	
agc_ch2_20_hr_ku	x	
agc_cor_01	x	x
alt_01	x	x
alt_20_ku	x	x
alt_20_hr_ku	x	
alt_20_plrm_ku		x
atm_cor_sig0_01		x
beam_dir_vec_20_hr_ku	x	
cog_cor_01	x	x
coherence_waveform_20_hr_ku	x	
cor2_applied_20_ku	x	
cor2_applied_20_hr_ku	x	
dop_angle_start_20_hr_ku	x	
dop_angle_stop_20_hr_ku	x	
dop_cor_01_ku	x	x
dop_cor_20_ku	x	
dop_cor_20_hr_ku	x	
echo_numval_20_ku	x	
echo_numval_20_hr_ku	x	
echo_scale_20_ ku	x	
echo_scale_ _20_hr_ku	x	
echo_scale_pwr_20_hr_ku	x	
flag_cor_err_01	x	
flag_cor_status_01	x	
flag_echo_20_hr_ku	x	
flag_instr_conf_rx_bwdt_20_ku	x	
flag_instr_conf_rx_bwdt_20_hr_ku	x	

Variables to Products Mapping		
Variable Name	L1b	L2
flag_instr_conf_rx_flags_20_ku	x	
flag_instr_conf_rx_flags_20_hr_ku	x	
flag_instr_conf_rx_in_use_20_ku	x	
flag_instr_conf_rx_in_use_20_hr_ku	x	
flag_instr_conf_rx_str_in_use_20_hr_ku	x	
flag_instr_conf_rx_trk_mode_20_ku	x	
flag_instr_conf_rx_trk_mode_20_hr_ku	x	
flag_instr_mode_att_ctrl_20_hr_ku	x	
flag_instr_mode_flags_20_hr_ku	x	
flag_instr_op_mode_20_plrm_ku		x
flag_instr_op_mode_01		x
flag_instr_ _op_mode_20_hr_ku	x	
flag_instr_op_mode_20_ku	x	x
flag_mcd_20_ku	x	x
flag_mcd_20_hr_ku	x	
flag_trk_cycle_20_ku	x	
flag_trk_cycle_20_hr_ku	x	
geoid_01		x
gpd_wet_tropo_cor_01		x
gpd_wet_tropo_cor_qual_01		x
h0_applied_20_ku	x	
h0_applied_20_hr_ku	x	
h0_fai_word_20_ku	x	
h0_fai_word_20_hr_ku	x	
h0_lai_word_20_ku	x	
h0_lai_word_20_hr_ku	x	
hf_fluct_cor_01	x	x
ind_first_meas_20hz_01	x	x
ind_first_meas_20hz_01_plrm_ku		x
ind_meas_1hz_20_ku	x	x
ind_meas_1hz_20_plrm_ku		x
instr_cor_gain_rx_20_hr_ku	x	
instr_cor_gain_tx_rx_20_hr_ku	x	
instr_cor_range_rx_20_hr_ku	x	
instr_cor_range_tx_rx_20_hr_ku	x	
instr_ext_ph_cor_20_hr_ku	x	

Variables to Products Mapping		
Variable Name	L1b	L2
instr_int_ph_cor_20_hr_ku	x	
int_path_cor_01	x	x
inter_base_vec_20_hr_ku	x	
internal_cor_sig0_01	x	x
inv_bar_cor_01	x	x
iono_cor_gim_01	x	x
lat_01	x	x
lat_20_ku	x	x
lat_20_ hr_ku	x	
lat_20_ plrm_ku		x
load_tide_sol1_01	x	x
load_tide_sol2_01	x	x
lon_01	x	x
lon_20_ku	x	x
lon_20_ hr_ku	x	
lon_20_ plrm_ku		x
look_angle_start_20_hr_ku	x	
look_angle_stop_20_hr_ku	x	
mean_dyn_topo_sol1_01		x
mean_dyn_topo_sol2_01		x
mean_sea_surf_sol1_01		x
mean_sea_surf_sol2_01		x
mod_dry_tropo_cor_01	x	x
mod_instr_cor_range_01_ku		x
mod_instr_cor_range_01_plrm_ku		x
mod_instr_cor_sig0_01_ku		x
mod_instr_cor_sig0_01_plrm_ku		x
mod_instr_cor_swh_01_ku		x
mod_instr_cor_swh_01_plrm_ku		x
mod_wet_tropo_cor_01	x	x
mqe_ocean_20_ku		x
mqe_ocean_20_plrm_ku		x
noise_power_20_ku	x	
noise_power_20_hr_ku	x	
ns_20_ku	x	
num_meas_20hz_01	x	x
num_meas_20hz_01_plrm_ku		x
ocean_tide_eq_01	x	x

Variables to Products Mapping		
Variable Name	L1b	L2
ocean_tide_non_eq_01	x	x
ocean_tide_sol1_01	x	x
ocean_tide_sol2_01	x	x
odle_01		x
off_nadir_angle_wf_ocean_01_ku		x
off_nadir_angle_wf_ocean_01_plrm_ku		x
off_nadir_pitch_angle_str_20_ku		x
off_nadir_pitch_angle_str_20_hr_ku	x	
off_nadir_roll_angle_str_20_ku		x
off_nadir_roll_angle_str_20_hr_ku	x	
off_nadir_yaw_angle_str_20_ku		x
off_nadir_yaw_angle_str_20_hr_ku	x	
orb_alt_rate_01	x	x
orb_alt_rate_20_ku	x	
orb_alt_rate_20_hr_ku	x	
peakiness_01_ku		x
peakiness_01_plrm_ku		x
peakiness_20_ku		x
peakiness_20_plrm_ku		x
ph_diff_waveform_20_hr_ku	x	
ph_slope_cor_20_hr_ku	x	
pole_tide_01	x	x
pwr_waveform_20_ku	x	
pwr_waveform_20_hr_ku	x	
qual_ssha_01_ku		x
qual_ssha_01_plrm_ku		x
qual_ssha_20_ku		x
qual_ssha_20_plrm_ku		x
range_ocean_01_ku		x
range_ocean_01_plrm_ku		x
range_ocean_20_ku		x
range_ocean_20_plrm_ku		x
range_ocean_numval_01_ku		x
range_ocean_numval_01_plrm_ku		x
range_ocean_qual_20__ku		x
range_ocean_qual_20_plrm_ku		x
range_ocean_rms_01_ku		x
range_ocean_rms_01_plrm_ku		x

Variables to Products Mapping		
Variable Name	L1b	L2
range_ocog_01_ku		x
range_ocog_01_plrm_ku		x
range_ocog_20_ku		x
range_ocog_20_plrm_ku		x
range_ocog_numval_01		x
range_ocog_numval_01_plrm_ku		x
range_ocog_qual_20_ku		x
range_ocog_qual_20_plrm_ku(time_20_plrm_ku)		x
range_ocog_rms_01		x
range_ocog_rms_01_plrm_ku		x
rec_count_20_ku	x	
rec_count_20_hr_ku	x	
retracking_ocean_qual_20_ku		x
retracking_ocean_qual_20_plrm_ku		x
sat_vel_vec_20_hr_ku	x	
scale_factor_20_ku	x	x
scale_factor_20_plrm_ku		x
sea_state_bias_01_ku		x
sea_state_bias_01_plrm_ku		x
seq_count_01		x
seq_count_20_ku	x	
seq_count_20_hr_ku	x	
sig0_ocean_01_ku		x
sig0_ocean_01_plrm_ku		x
sig0_ocean_20_ku		x
sig0_ocean_20_plrm_ku		x
sig0_ocean_numval_01_ku		x
sig0_ocean_numval_01_plrm_ku		x
sig0_ocean_qual_20_ku		x
sig0_ocean_qual_20_plrm_ku		x
sig0_ocean_rms_01_ku		x
sig0_ocean_rms_01_plrm_ku		x
sig0_ocog_01_ku		x
sig0_ocog_01_plrm_ku		x
sig0_ocog_20_ku		x
sig0_ocog_20_plrm_ku		x
sig0_ocog_numval_01_ku(		x
sig0_ocog_numval_01_plrm_ku		x

Variables to Products Mapping		
Variable Name	L1b	L2
sig0_ocog_qual_20_ku		x
sig0_ocog_qual_20_plrm_ku		x
sig0_ocog_rms_01_ku		x
sig0_ocog_rms_01_plrm_ku		x
solid_earth_tide_01	x	x
square_swh_ocean_01_ku		x
square_swh_ocean_01_plrm_ku		x
ssha_01_ku		x
ssha_01_plrm_ku		x
stack_centre_20_hr_ku	x	
stack_centre_angle_20_hr_ku	x	
stack_kurtosis_20_hr_ku	x	
stack_number_after_weighting_20_hr_ku	x	
stack_number_before_weighting_20_hr_ku	x	
stack_scaled_amplitude_20_hr_ku	x	
stack_skewness_20_hr_ku	x	
stack_std_20_hr_ku	x	
stack_std_angle_20_hr_ku	x	
surf_type_01	x	x
swh_ocean_01_ku		x
swh_ocean_01_plrm_ku		x
swh_ocean_20_ku		x
swh_ocean_20_plrm_ku		x
swh_ocean_numval_01_k		x
swh_ocean_numval_01_plrm_ku		x
swh_ocean_qual_20_ku		x
swh_ocean_qual_20_plrm_ku		x
swh_ocean_rms_01_ku		x
swh_ocean_rms_01_plrm_ku		x
time_01	x	x
time_20_ku	x	x
time_20_hr_ku	x	
time_20_plrm_ku		x
tot_gain_ch1_20_hr_ku	x	
tot_gain_ch2_20_hr_ku	x	
tracker_range_20_ku	x	
transmit_pwr_20_hr_ku	x	
uso_cor_01_ku	x	x

Variables to Products Mapping		
Variable Name	**L1b**	**L2**
uso_cor_20_ku	**x**	
uso_cor_20_hr_ku	**x**	
wind_speed_alt_01_ku		**x**
wind_speed_alt_01_plrm_ku		**x**
wind_speed_mod_u_01	**x**	**x**
wind_speed_mod_v_01	**x**	**x**
window_del_20_hr_ku	**x**	

Appendix B: Default Setting of the Attribute: _FillValue

By design, each variable of the CONFORM products has got a _FillValue attribute, which contains the default value of that variable, i.e. the value the variable holds when its content hasn't been changed by the CryoSat processor.

The only exceptions to this rule are the variables that use the whole validity range of their types and these are:

Variables with no _FillValue			
name	**type**	**units**	**comment**
echo_scale_20_ku(time_20_ku)	short	count	Echo scale factor
seq_count_20_hr_ku(time_20_hr_ku)	short	count	Source Sequence Counter read from the L0 echo telemetry packet
pwr_waveform_20_ku(time_20_ku, ns_20_ku)	short	count	L1b 20Hz power waveform
pwr_waveform_20_hr_ku(time_20_hr_ku, ns_20_hr_ku)	ushort	count	L1b 20Hz power waveform
rec_count_20_hr_ku(time_20_hr_ku)	int	count	Record counter - progressive counter incremented by 1 for each data block.
flag_mcd_20_ku(time_20_ku)	int	/	

For the above variables, the _FillValue is missing but it is possible to figure out whether the variables are meaningful or not by checking the status of some flags.

In particular, as to the counters (i.e. rec_count_20_hr_ku and seq_count_20_hr_ku) there is no way to know whether they are meaningful so the only case when their contents shouldn't be used (as any other variables) is when the whole block containing the counters are flagged as invalid (i.e. the following bitfields are set in flag_mcd_20_ku: `block_degraded blank_block datation_`)

Likewise specific bitfields in the same flag are devoted to flag the validity or the errors in the waveforms.

For all the remaining variables (with a few exceptions, see later) the default _FillValue for each type is as follows:

_FillValue Specific Settings	
variable type	**_FillValue**
byte	-128b
int	-2147483648
short	-32768s

The above convention is not used in the following cases:

_FillValue Default Settings

Variable Name	Variable Type	_FillValue	Note
flag_cor_error_01(time_cor_01)	int	-1	
flag_cor_status_01(time_cor_01)	int	-1	
flag_instr_conf_rx_flags_20_hr_ku(time_20_hr_ku)	int	-1	
flag_mcd_20_hr_ku(time_20_hr_ku)	int	-1	

Appendix C: Timestamps Data Type

All the timestamps used in the CONFORM products represent the number of seconds since 1/1/2000 in double precision.
In this appendix it is shown that the current choice allows the represent timestamps with a precision of 1 microsecond till January 2034.

As the timestamps are typically added to or subtracted from each other, in order to preserve the precision of these operations down to the microsecond, we need to keep the exact representation of the number till the 10^{-7}, whose binary representation is around 2^{-23}, i.e. 23 bits are needed to represent the decimal part of the timestamps with a precision till 0,1 microseconds
The IEEE 754 standard representation for double precision type reserves 54 bits for the representation of the mantissa (53 bits plus 1 implicitly set), which means that the number of bits left to be used to represent the integer part of the number of seconds is : 53-23 = 30 bits, which means that we have at disposal 2^{30} -1 = 1,073,741,823 sec, i.e. 34 years.

Accordingly, the current representation allows to represent and manage timestamps in the CONFORM without issues in arithmetic operations till January 2034, a date compatible with the mission lifetime.

Appendix D: EE to NetCDF migration

The purpose of this section is to give the CryoSat users some insight into the criteria adopted to implement the migration from EE to CONFORM hoping that this can ease the analysis of the products in the new format.

The logic driving the migration is that this operation has to be implemented in two steps:

1. A version of the IPF1 software has to be released that generates baseline C CONFROM products. This IPF1 version as well as the baseline C CONFORM products are hidden versions, i.e. the software is not installed in the operational platform and the products are not distributed but to a selected groups of users to receive their feedback and suggestions for improvements.
2. The first official version of the IPF1 CONFORM software has to be the baseline D that has to generate CONFORM products containing some evolution from baseline C.

Accordingly the contents of this section are applicable to the step one only, i.e. they explain how the baseline C CONFORM products have been designed.

As of baseline D, the format will evolve without any relation to the EE format.

The Earth Explorer CryoSat Product consists of two files (figure 6-1):

- The XML Header File
- The Product File.

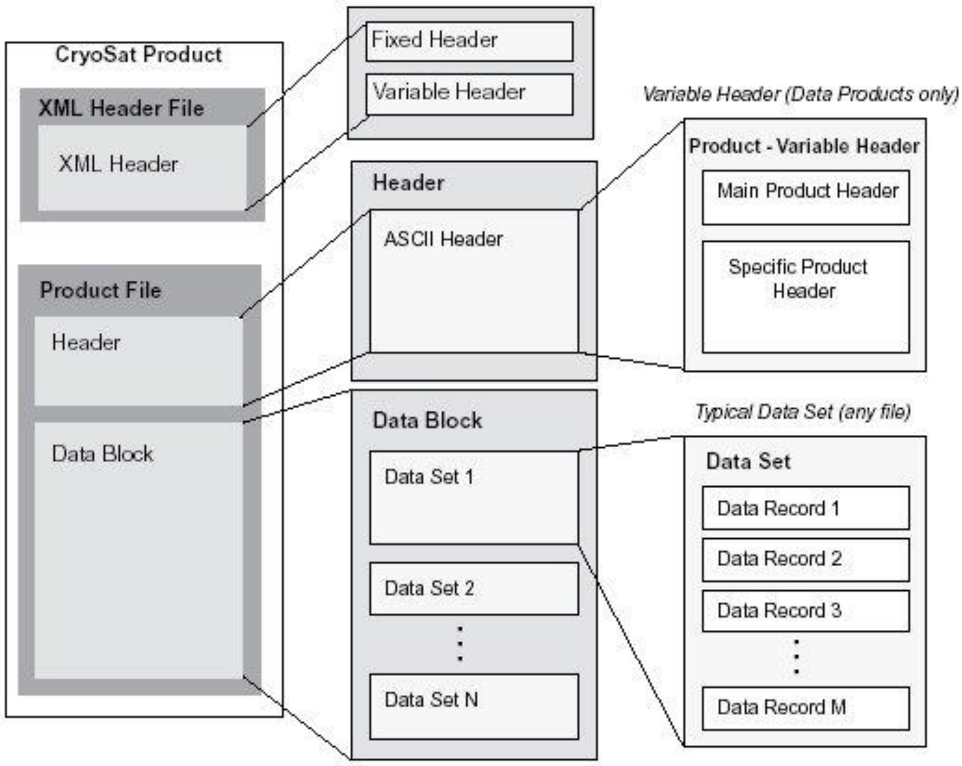

Figure 6-1: EE Product Structure

The CONFORM products consists of one file that contains the same information as the EE Product File whilst the XML Header File doesn't exist anymore in CONFORM and will no longer referred to in this section.

The EE Product File is defined taking the ENVISAT level-0 products as template and consists of:

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

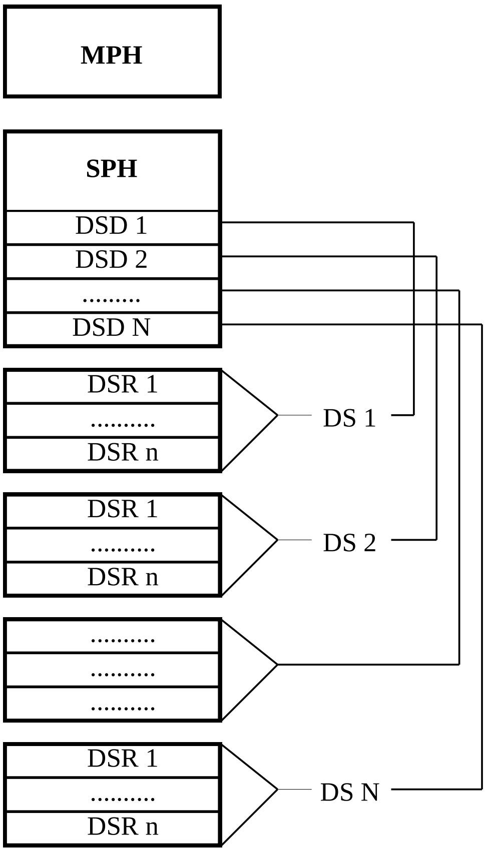

Figure 6-2: EE Product File Structure

The MPH and SPH blocks are ASCII whereas the Data Sets are completely binary and each of them contains one or more Data Set Records.
All the EE CryoSat Products that have migrated to the NetCDF format contain one DS.

The general rules driving the migration are:

- The contents of the MPH and SPH have to be converted into NetCDF global attributes

- each DS fields has been converted into a NetCDF variable
- Grouping within the product is only logical (i.e. the group feature of the NetCDF 4.0 is not used but the rationale is kept in the variable naming)
- Three time dimensions are used:
    - One time stamp for each 1Hz measurement.
    - One time stamp for each 20Hz measurement.
    - One time stamp to tag the time when the correction is applied.
- 20 Hz measurements are linked to the corresponding 1 Hz measurement by means of one index.
- _FillValue attribute is always filled with limited exceptions.
- Coding of binary flags:
    - For flags coded in a single bit the same convention as S6 GPP is used
    - For flags coded on more than one bit, a variable is created

END OF DOCUMENT