



Instrument Processing Facility L2

Cryosat Ice netCDF L2 PFS

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CRYOSAT Ground Segment

Instrument Processing Facility L2

CryoSat Ice netCDF L2 Product Format Specification

[PFS-I-L2]

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		<p style="text-align: right;"><i>Instrument Processing Facility L2</i> <i>Cryosat Ice netCDF L2 PFS</i></p> <p>Doc. No.: C2-RS-ACS-ESL-5265 Issue: 2.1draft Date: 14/07/2021 Page: 3</p>
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Document Change Record

Issue/Rev.	Class (R=Review /A=Approval)	Date	Reason for Change	Changed Pages/Paragraphs
1.0draft	R	02/05/2016	First Issue	All
1.0 draft 2		26/07/2016	Response to comments	All
1.0	R	29/07/2016	First Official Release	All
1.1	R	04/10/2016	Implementation of ESA's comments	<p>Appendices B (list of default values of _FillValue attribute for each variable type) and D (timestamp granularity) added</p> <p>Because of the previous change, section 1.2 has been modified and appendix B has become now D.</p> <p>Variable names harmonisation with ocean products and S3, S6 variables. The following sections have changed:</p>

Issue/Rev.	Class (R=Review /A=Approval)	Date	Reason for Change	Changed Pages/Paragraphs
				<p>section 3, 4 and appendix A.</p> <p>Unused variables types removed from section 2.3.1</p> <p>FDM format added. The following sections have changed: section 2.1, 3 and appendix A</p>
1.2	R	10/10/2016	Alignment with implementation	<p>Explanation how to link 20Hz records to 1-Hz ones added in section 3</p> <p>hf_fluct_cor_01 -> hf_fluct_total_cor_01. The following sections have been modified: 3.1, 3.2, 3.3.13, 3.3.14 and 4.1</p> <p>mean_sea_surface_ice_01 -> mean_sea_surf_sea_ice_01. The following sections have been modified: 3.1, 3.2, 3.3.22, 3.3.26, 4.1, 4.2.38, 4.2.46, 4.2.58, 4.2.62 and 4.2.124</p> <p>noise_pwr -> noise_power. The following sections have been modified: 4.1 and 4.2.61</p>
1.3	R	27/01/2017	<p>Comment fields of the variables : lat_poca_20_ku and lon_poca_20_ku have been updated</p> <p>Minor typos have been corrected in the CDL dumps</p>	<p>Section 3.3.27 and section 3.3.30</p> <p>Section 3 and section 4</p>
1.4	R	24/03/2017	The netCDF dump of the following L2 variables has been updated to align the document to the code:	<p>Section 3.3.7</p> <p>Section 3.3.22</p> <p>Section 3.3.29</p> <p>Section 3.3.33</p> <p>Section 3.3.43</p> <p>Section 3.3.55</p>

Issue/Rev.	Class (R=Review /A=Approval)	Date	Reason for Change	Changed Pages/Paragraphs
			ssh_interp_rms_20_ku time_20_ku The netCDF dump of the following L2I variables has been updated to align the document to the code: flag_instr_conf_rx_bwd_t_20_ku flag_instr_conf_rx_trk_mode_20_ku flag_quality_20_ku lat_poca_20_ku retracker_output_13_20_ku ssh_interp_rms_20_ku Typo errors corrected Variables "comment" reviewed	Section 3.3.75 Section 3.3.82 Section 4.2.17 Section 4.2.21 Section 4.2.27 Section 4.2.51 Section 4.2.91 Section 4.2.128 Section 4.2.18, 4.2.56, 4.2.57, 4.2.65, 4.2.134, 4.2.135 Section 3.3.7, 3.3.22->3.3.30, 3.3.32, 3.3.33, 3.3.35, 3.3.36, 3.3.42 -> 3.3.44, 3.3.53, 3.3.72, 3.3.83, 4.2.20, 4.2.38 -> 4.2.42, 4.2.45 -> 4.2.55, 4.2.59-> 4.2.63, 4.2.70, 4.2.73, 4.2.74, 4.2.122, 4.2.131, 4.2.132, 4.2.144 and 4.2.145
1.5	R	06/06/2017	sea_state_bias_01 -> sea_state_bias_01_ku flag_instr_conf_rx_str_in_use_01: _FillValue corrected wind_speed_alt_01:units corrected flag_cor_err_20_ku: CDL corrected flag_cor_status_20_ku: CDL corrected	Sections 3.1 and 3.3.58 Section 3.3.7 Section 3.3.84 Section 4.2.12 Section 4.2.13
1.6	R	21/06/2018	Global Attributes nomenclature aligned to COP Processor specification	Section 5

Issue/Rev.	Class (R=Review /A=Approval)	Date	Reason for Change	Changed Pages/Paragraphs
			L2 and L2I cdl dump aligned to baseline D product content	Section 3 and Section 4
2.0	R	23/12/2020	Issue for BaselineE VO1.0	<p>Section 3.3.17: freeboard_20_ku comment updated</p> <p>Section 3.3.19 height_1_20_ku updated</p> <p>Section 3.3.22 height_sea_ice_floe_20_ku comment updated</p> <p>Section 3.3.51 range_2_20_ku comment updated</p> <p>Section 3.3.52 range_3_20_ku comment updated</p> <p>Section 3.3.78 snow_depth_01 comment updated</p> <p>Section 3.3.79 variable snow_depth_cor_20_ku introduced</p> <p>Section 4.4.11 flag_cor_err_20_ku flag_mask and flag_meaning updated</p> <p>Section 4.4.12 flag_cor_status_20_ku flag_mask and flag_meanings updated</p> <p>Section 4.2.30 flag_sea_ice_type_20_ku introduced</p> <p>Section 4.2.33: freeboard_20_ku comment updated</p> <p>Section 4.2.35 height_1_20_ku comment updated</p> <p>Section 4.2.16 height_sea_ice_floe_20_ku comment updated</p> <p>Section 4.2.75 range_2_20_ku comment updated</p>

Issue/Rev.	Class (R=Review /A=Approval)	Date	Reason for Change	Changed Pages/Paragraphs
				<p>Section 4.2.76 range_3_20_ku comment updated</p> <p>Section 4.2.124 snow_depth_20_ku comment updated</p> <p>Section 4.2.125 snow_depth_cor_20_ku added</p> <p>Section 5 xref_sea_ice_north and xref_sea_ice_south added</p>
2.1draft	R	16/07/2021	Finale Baseline E Release	<p>freeboard_20_ku variable renamed in radar_freeboard_20_ku in both L2 and L2I cdl</p> <p>Comments updated for the following variables: height_1_20_ku height_sea_ice_floe_20_ku snow_depth_cor_20_ku</p> <p>Section 4.3 and 4.4 added: CRYO-IDE_355</p>

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1 INTRODUCTION

This document specifies the netCDF format of the Level 2 products generated by the CryoSat ice processing chains. This specification is called CONFORM: CryoSat Netcdf FORMat.

1.1 PURPOSE AND SCOPE

The purpose of the document is to specify the netCDF product structure and content of the Level-2 products generated by the CryoSat ice processing.

Since the beginning of the mission (2010), all CryoSat products had been generated in Earth Explorer 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 L2 production:

The first product baseline available in netCDF for all users was Baseline D. The FDM Processing chain was decommissioned in 2019 so all the references to FDM chain still available in the current document can be ignored.

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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 IPF2 ice production as well as a short introduction to the netCDF.
Section 3 - Level-2 Format Description	This section contains the specification of the L2 ice CONFORM products in terms of variable list and variable CDL dumps.
Section 4 - Level-2I Format Description	This section contains the specification of the L2i ice CONFORM products in terms of variable list and variable CDL dumps.
Section 5 – Level 2 and Level 2I Global Attributes	This section specifies the global attributes used for L2 and L2I products
Section 6- CryoSat Level-2 Conform Products	Here is the list of the L2 CONFORM ice products
Appendix A – Variables to Products Mapping	This section provides a variable name list ordered alphabetically and showing for each variable which product types it can be found in
Appendix B: Default Setting of the Attribute: _FillValue	This section lists the _FillValues for each variable type.
Appendix C: Timestamps Data Type	This section describes 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
IPF1 Detailed Processing Model Issue 4.2, April 2015	CS-TN-ACS-GS-5105	[IPF1-DPM]
Level 0 Products Specification Format Issue 3.1, November 2007	CS-ID-ACS-GS-0119	[L0-FMT]
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]

1.4 ACRONYMS AND ABBREVIATIONS

ACS	Advanced Computer Systems S.p.A.
AGC	Automatic Gain Control
AIR	Azimuth Impulse Response
AISP	Annotated Instrument Source Packet
APID	Application Process Identifier
BER	Bit Error Rate
BLOB	Binary Large Object
CADU	Channel Access Data Unit
CAL	Calibration
CCSDS	Consultative Committee for Space Data Systems
COG	Centre Of Gravity
CVCDU	Coded Virtual Channel Data Unit
DEM	Digital Elevation Model
DSR	Data Set Record
EO	Earth Observation
ESA	European Space Agency
FOS	Flight Operations Segment
FDO	Fast delivery Ocean
G/S	Ground Segment
HK/TM	Housekeeping/Telemetry data
ID	Identifier Digits or Document
I/O	Input/Output
IPF	Instrument Processing Facility
ISP	Instrument Source Packet
L1B	Level 1B
LRM	Low Rate Mode
MDS	Measurement Data Set
MJD	Modified Julian Day
MON	Monitoring
MPH	Main Product Header
MQE	Mean Quadratic Error
PDS	Payload Data System
PSLR	Peak to Side Lobe Ratio
PSS-05	ESA Software Engineering Standard
RC	Radar Cycle
RIR	Range Impulse Response
SAR	Synthetic Aperture Radar mode
SHA	Surfae Height Anomaly
SIN	Synthetic Interferometric mode
SIRAL	Synthetic Interferometric Radar Altimeter
SOW	Statement Of Work
SPH	Specific Product Header
SSHA	Sea-surface Height Anomaly
TAI	International Atomic Time Reference
TBC	To Be Confirmed
TBD	To Be Defined
TT&C	Tracking, Telemetry and Command
U10	Windspeed at 10m altitude, as calculated by the altimeter
UTC	Universal Time Co-ordinates
VCDU	Virtual Channel Data Unit
WGS84	World Geodetic System 1984

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2 GENERAL OVERVIEW

2.1 OVERVIEW OF THE IPF2 ICE PRODUCTION

The Level-2 products are derived from the CryoSat L1B products generated by the IPF1 and relevant to the science modes, that are LRM, SAR and SIN (nominal and degraded).

A common layout (i.e. independent from the SIRAL operative mode) is defined for all the Level 2 products.

A L2 product is generated soon after a L1B product is available thus resembling still a data driven approach. This implies that following this first generation step there will be L2 products still separated by modes (specifically LRM, SAR, SIN) defined over the same time window of the input L1B.

The L2 data is the main output from the L2 processors and consists of a compact product designed to minimise the data volume distributed to users. However, for all modes, another L2 data set is available, called 'In-depth L2' and is identified with an 'I' in the filetype: SIR_XXXI2X. This dataset contains many more parameters and flags and is therefore much larger. This detailed product is also required as the input to the second pass of the L2 SAR processing chain where the sea-surface height anomaly is interpolated to the location of all measurements identified as sea ice, to allow the computation of freeboard.

The L2I products are sometimes referred to as the Intermediate products. This is an old terminology coming from the early phases of the CryoSat project and shouldn't be used anymore.

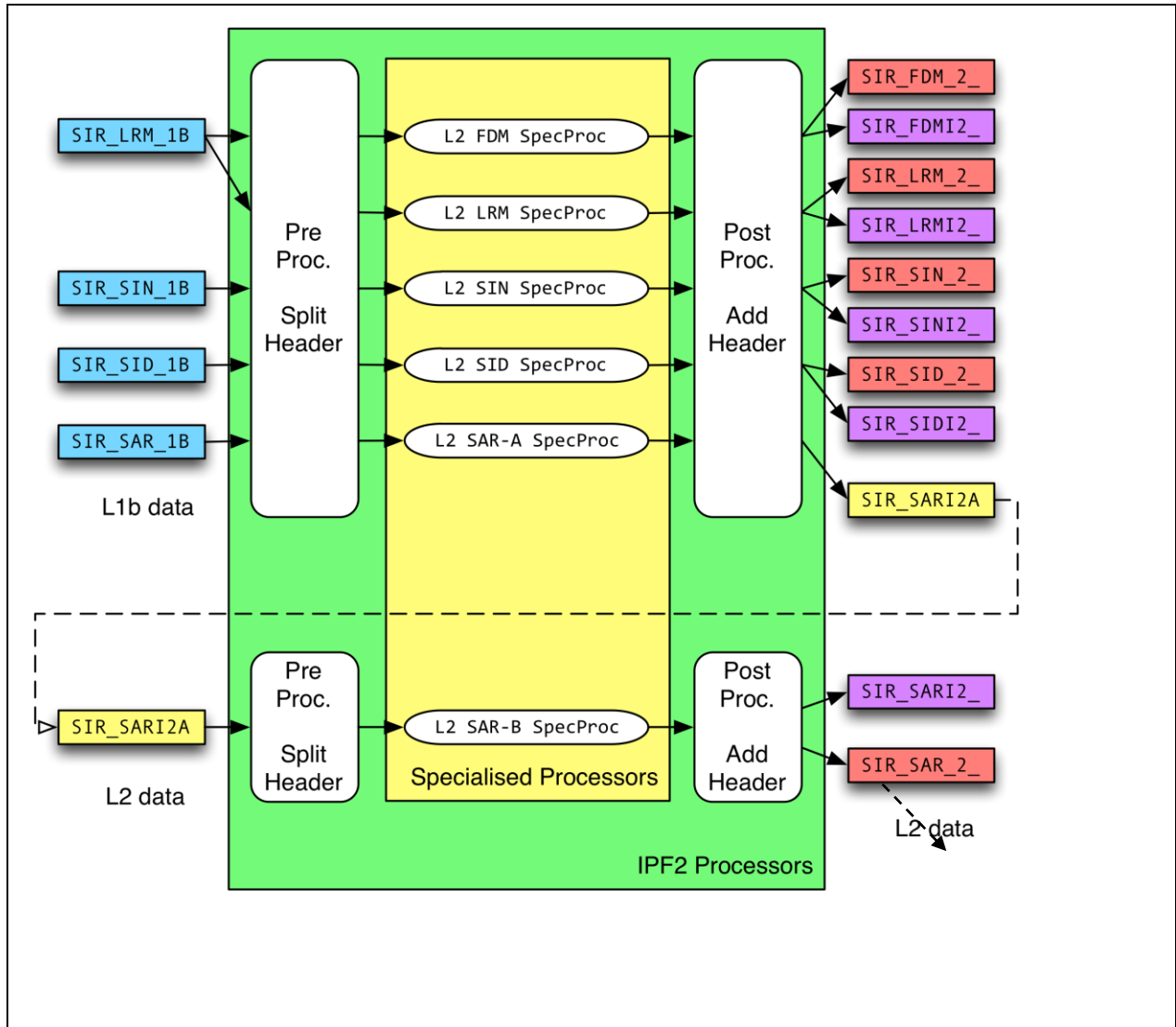


Figure 2-1 Level-2 (Step 1) Product Generation

In the second step of the processing, a global L2 product is generated from the L2 mode dependent products collected over an entire orbit, specifically from an ascending node (ANX) to the next one (ANX to ANX). This second step most likely does not imply any specific processing, but simply a concatenation of files in chronological order. L2 products from the first step, in fact, regardless of their SIRAL mode dependence, have binary records with the same layout.

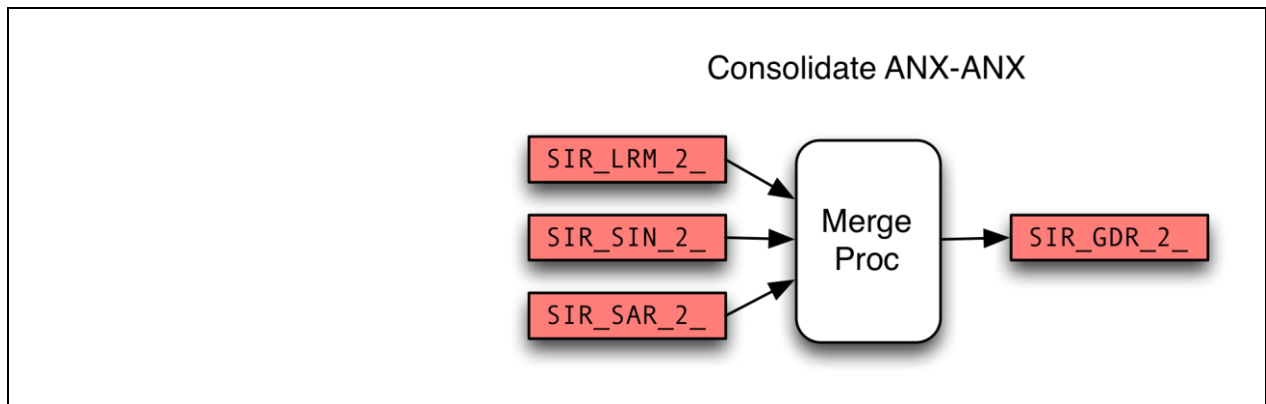


Figure 2-2 Level-2 (Step 2) ANX to ANX Consolidation

CRYOSAT LEVEL 2 CONFORM PRODUCTS

The following table provides the Product Identification for each product generated by the IPF2.

File Type	Description
SIR_LRM_2_	L2 Product from Low Resolution Mode Processing
SIR_SIN_2_	L2 Product from SAR Interferometric Processing
SIR_SID_2_	L2 Product from SIN Degraded Processing
SIR_SAR_2_	L2 Product from SAR Processing
SIR_GDR_2_	L2 Consolidated Product
SIR_LRMI2_	In-depth L2 Product from LRM Processing
SIR_SINI2_	In-depth L2 Product from SIN Processing
SIR_SIDI2_	In-depth L2 Product from SIN Degraded Process.
SIR_SARI2_	In-depth L2 Product from SAR Processing

Table 5-1: Level 2 products list

		<p style="text-align: right;"><i>Instrument Processing Facility L2</i> <i>Cryosat Ice netCDF L2 PFS</i></p> <p>Doc. No.: <i>C2-RS-ACS-ESL-5265</i> Issue: <i>2.1draft</i> Date: <i>14/07/2021</i> Page: <i>25</i></p>
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2.3 CONFORM PRODUCT FILE NAMES

The file names abide to the following conventions (the variable parts are in italics):

MM_CCCC_XXXXXXXXXX_yyyymmdd_hhmmss_YYYYMMDD_HHMMSS__bvvv.nc

MM = CS (Mission Identifier)

CCCC = file class which can be: OFFL (Off Line Processing/Systematic)
NRT_ (Near Real Time)
RPRO (Reprocessing)
TEST (Testing)
LTA_ (Long Term Archive)

XXXXXXXXXX = The file type. For the Level-2 products, this is defined in table 5.1.

yyymmdd_hhmmss = Validity start time corresponds to the input Level 1 UTC start time

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

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

vvv is the version number of the file

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2.4 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 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 a 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 was present in the EE header (see [PROD-FMT])

2.5 NETCDF PRIMITIVES

The following **dimensions** are used in the CryoSat ice Level 2 CONFORM products:

Dimensions					
Name	Description	Size	Units	Type	Limited/Unlimited
time_20	Timestamps of 20 Hz waveforms in the L1B product file (L1B only)	Number of 20 Hz waveforms in the product file	seconds since 2000-01-01 00:00:00.0	double	Limited
time_cor_01	Time of the first record in every block of 20 records input	Number of 1 Hz blocks in the input L1b file	seconds since 2000-01-01 00:00:00.0	double	Limited
space_3d	3 dimensions of space (x,y,z)	3	---	short	limited

The following **variables** are used in the CryoSat ice Level 2 CONFORM products:

Variables	
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)

The following **attributes** are used in the CryoSat ice Level 2 CONFORM products:

Attributes	
Name	Description
calendar	Reference time calendar
comment	Miscellaneous information about the data or the methods used to produce it. Variables in the L2/L2i products are cross-referenced like this: [variable_name]
coordinates	Identified auxiliary coordinates variables
_FillValue	A value used to represent missing or undefined data add_offset If present, this number is to be added to the date
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 <i>flag_meanings</i> .
flag_mask	Provide a list of number of independent Boolean conditions using bit field notation. Use in conjunction with <i>flag_meanings</i> .
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
add_offset	According to the netCDF standard, the value in the specified unit is computed as: $value_unit = (value_product * scale_factor) + add_offset$. If present, the data are to be multiplied by this factor after the data are read by an application.
scale_factor	
source	Data source (model features, or observation)
standard_name	A long descriptive name for the variable taken from a controlled vocabulary of variable names (when applicable)
units	The units of the variables data values. This attributes value should be a valid units string.

3 LEVEL-2 PRODUCT FORMAT DESCRIPTION

This section lists the variable names used in the CONFORM product alongside the corresponding EE variables.

The general rule used to implement the migration is to one-to-one map EE variables to netCDF ones although this is not always possible: Appendix D describes this strategy in detail.

Another difference to the EE format to highlight is that the CryoSat netCDF products don't contain the blank records that were needed in the EE format to keep the binary structure consistent.

This means that there are no longer exactly 20 x 20 Hz records for every 1Hz record and therefore the only way to associate 1Hz to 20 Hz quantities is by means of the time stamps: the record whose 20 Hz time stamp holds the same as the 1Hz time stamp is the first record in a group of up to 20 x 20 Hz records.

3.1 LIST OF L2 LRM/SAR/SARIN/GDR VARIABLES

L2 Product			
Variable Name (dim1,...,dim N) <i>long_name</i>	units	Standard_name	EE Field
time_cor_01(time_cor_01) <i>time (sec. since 2000-01-01)</i>	s	time	Data Record Time (MDSR Time Stamp)
time_20_ku(time_20_ku) <i>time (sec. since 2000-01-01)</i>	s	time	
flag_cor_err_01(time_cor_01) <i>correction error flags</i>	m		Correction error flags
flag_instr_mode_op_20_ku (time_20_ku) <i>measurement mode</i>			Measurement Mode
flag_instr_conf_rx_str_in_use_01(time_cor_01) <i>star tracker id</i>			Star Tracker ID
lat_01(time_cor_01)	degrees_n	latitude	Latitude of Orbit in

L2 Product			
Variable Name (dim1,...,dim N) <i>long_name</i>	units	Standard_name	EE Field
<i>latitude</i>	orth		WGS84
lon_01(time_cor_01) <i>longitude</i>	degrees_east	longitude	Latitude of Orbit in WGS84
alt_01(time_cor_01) <i>altitude of center of mass above reference ellipsoid</i>	m	height_above_reference_ellipsoid	Altitude of COG above reference ellipsoid
off_nadir_roll_angle_str_01(time_cor_01) <i>antenna bench roll angle corresponding to the mdsr time stamp</i>	deg		Antenna Bench Roll Angle
off_nadir_pitch_angle_str_01(time_cor_01) <i>antenna bench pitch angle corresponding to the mdsr time stamp</i>	deg		Antenna Bench Pitch Angle
off_nadir_yaw_angle_str_01(time_cor_01) <i>antenna bench yaw angle corresponding to the mdsr time stamp</i>	deg		Antenna Bench Yaw Angle
num_valid_01(time_cor_01) <i>number of valid measurements</i>	count		Number of valid Measurements in this record
mod_dry_tropo_cor_01(time_cor_01) <i>dry tropospheric correction</i>	m	altimeter_range_correction_due_to_dry_troposphere	Dry Tropospheric Correction
mod_wet_tropo_cor_01(time_cor_01) <i>wet tropospheric correction</i>	m	altimeter_range_correction_due_to_wet_troposphere	Wet Tropospheric Correction
inv_bar_cor_01(time_cor_01) <i>inverse barometric correction</i>	m	sea_surface_height_correction_due_to_air_pressure_at_low_frequency	Inverse Barometric Correction

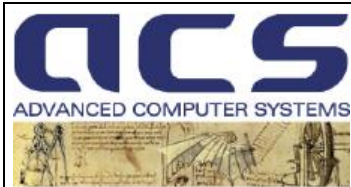
L2 Product			
Variable Name (dim1,...,dim N) <i>long_name</i>	units	Standard_name	EE Field
hf_fluct_total_cor_01(time_cor_01) <i>dynamic atmospheric correction</i>	m	sea_surface_height_correction_due_to_air_pressure_and_wind_at_high_frequency	Dynamic Atmospheric Correction
iono_cor_01(time_cor_01) <i>model ionospheric correction</i>	m	altimeter_range_correction_due_to_ionosphere	Model Ionospheric Correction
iono_cor_gim_01(time_cor_01) <i>gim ionospheric correction</i>	m	altimeter_range_correction_due_to_ionosphere	GIM Ionospheric Correction
sea_state_bias_01_ku(time_cor_01) <i>sea state bias correction</i>	m	sea_surface_height_bias_due_to_sea_surface_roughness	Sea State Bias (EM Bias)
ocean_tide_01(time_cor_01) <i>elastic ocean tide</i>	m		Elastic Ocean Tide
ocean_tide_eq_01(time_cor_01) <i>long period ocean tide</i>	m	sea_surface_height_amplitude_due_to_equilibrium_ocean_tide	Long Period Ocean Tide
load_tide_01(time_cor_01) <i>ocean loading tide</i>	m		Ocean Loading Tide
solid_earth_tide_01(time_cor_01) <i>solid earth tide</i>	m	sea_surface_height_amplitude_due_to_earth_tide	Solid Earth Tide
pole_tide_01(time_cor_01) <i>geocentric polar tide</i>	m	sea_surface_height_amplitude_due	Geocentric Polar Tide

L2 Product			
Variable Name (dim1,...,dim N) <i>long_name</i>	units	Standard_name	EE Field
		_to_pole_tide	
surf_type_20_ku (time_20_ku) <i>surface type from mask</i>			Surface type flag
mean_sea_surf_sea_ice_01(time_cor_01) <i>mean sea surface height</i>	m	sea_surface_height_above_reference_ellipsoid	MSS / Geoid from model
geoid_01(time_cor_01) <i>geoid height</i>	m	geoid_height_above_reference_ellipsoid	MSS / Geoid from model
odle_01 (time_cor_01) <i>ocean depth/land elevation</i>	m		Ocean Depth / Land Elevation from model
sea_ice_concentration_01 (time_cor_01) <i>sea ice area fraction</i>	percent	sea_ice_area_fraction	Ice Concentration
snow_depth_01 (time_cor_01) <i>snow depth</i>	m	surface_snow_thickness	Snow Depth
snow_density_01(time_cor_01) <i>snow density</i>	kgm ⁻³	snow_density	Snow Density
swh_ocean_ku_01 (time_cor_01) <i>1 Hz averaged significant waveheight</i>	m	sea_surface_wave_significant_height	Significant Wave Height
wind_speed_alt_01(time_cor_01) <i>1 Hz averaged wind speed</i>	ms ⁻¹	wind_speed	Wind Speed
lat_poca_20_ku (time_20_ku) <i>20 Hz latitude of the estimated echo location (POCA)</i>	degrees_north	latitude	Latitude of measurement
lon_poca_20_ku (time_20_ku)	degrees_ea	longitude	Longitude of

L2 Product			
Variable Name (dim1,...,dim N) <i>long_name</i>	units	Standard_name	EE Field
<i>20 Hz longitude of the estimated echo location (POCA)</i>	st		measurement
height_1_20_ku (time_20_ku) <i>20 Hz surface height (retracker 1)</i>	m	height_above_ref erence_ellipsoid	Height of surface w.r.t. reference ellipsoid (retracker 1)
height_2_20_ku (time_20_ku) <i>20 Hz surface height (retracker 2)</i>	m	height_above_ref erence_ellipsoid	Height of surface w.r.t. reference ellipsoid (retracker 2)
height_3_20_ku (time_20_ku) <i>20 Hz surface height (retracker 3)</i>	m	height_above_ref erence_ellipsoid	Height of surface w.r.t. reference ellipsoid (retracker 3)
height_sea_ice_floe_20_ku(time_20_ku) <i>surface height (sea-ice floe retracker)</i>	m	height_above_ref erence_ellipsoid	
height_sea_ice_lead_20_ku(time_20_ku) <i>surface height (sea-ice floe retracker)</i>	m	height_above_ref erence_ellipsoid	
sig0_1_20_ku (time_20_ku) <i>20 Hz backscatter coefficient (retracker 1)</i>	dB	surface_backward s_scattering_coeff icient_of_radar_w ave	Backscatter (sigma- zero) (retracker 1)
sig0_2_20_ku (time_20_ku) <i>20 Hz backscatter coefficient (retracker 2)</i>	dB	surface_backward s_scattering_coeff icient_of_radar_w ave	Backscatter (sigma- zero) (retracker 2)

L2 Product			
Variable Name (dim1,...,dim N) <i>long_name</i>	units	Standard_name	EE Field
sig0_3_20_ku (time_20_ku) <i>20 Hz backscatter coefficient (retracker 3)</i>	dB	surface_backward_s_scattering_coefficient_of_radar_wave	Backscatter (sigma-zero) (retracker 3)
radar_freeboard_20_ku (time_20_ku) <i>sea-ice freeboard</i>	m	sea_ice_freeboard	Freeboard
ssha_interp_20_ku (time_20_ku) <i>interpolated sea-surface height anomaly</i>	m		Interpolated sea surface height anomaly
ssha_interp_numval_20_ku (time_20_ku) <i>number of ssha interpolation points</i>	count		Number of interpolated records for SSHA
ssha_interp_rms_20_ku (time_20_ku) <i>ssha interpolation error</i>	m		SSHA interpolation quality
peakiness_20_ku (time_20_ku) <i>20 Hz waveform peakiness</i>			Peakiness
echo_avg_numval_20_ku (time_20_ku) <i>count of echoes or beams averaged</i>	count		Number of echoes or beams averaged
flag_prod_status_20_ku (time_20_ku) <i>quality flag</i>			Quality flags
flag_cor_err_01_ku (time_cor_01) <i>correction error flag</i>			Correction error flags
flag_cor_applied_20_ku (time_20_ku) <i>corrections application flag</i>			Correction application flags
retracker_1_quality_20_ku (time_20_ku) <i>quality metric (retracker 1)</i>			Retracker 1 quality value

L2 Product			
Variable Name (dim1,...,dim N) <i>long_name</i>	units	Standard_name	EE Field
retracker_2_quality_20_ku (time_20_ku) <i>quality metric (retracker 1)</i>			Retracker 2 quality value
retracker_3_quality_20_ku (time_20_ku) <i>quality metric (retracker 1)</i>			Retracker 3 quality value
ind_first_meas_20hz_01(time_cor_01) <i>index of the first 20Hz measurement: 1 Hz</i>	count		
ind_meas_1hz_20_ku(time_20_ku) <i>index of the 1Hz measurement: 20 Hz ku band</i>	count		
range_1_20_ku(time_20_ku) <i>range to surface (retracker 1)</i>	m	altimeter_range	
range_2_20_ku(time_20_ku) <i>range to surface (retracker 2)</i>	m	altimeter_range	
range_3_20_ku(time_20_ku) <i>range to surface (retracker 3)</i>	m	altimeter_range	



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3.2

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3.3 L2 CDL DUMP

3.3.1 alt_01(time_cor_01)

```
int alt_01(time_cor_01);
    alt_01:units = "m";
    alt_01:FillValue = -2147483648;
    alt_01:long_name = "Altitude of CoM above reference ellipsoid";
    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 CoM above reference ellipsoid
(WGS84).";
```

3.3.2 echo_avg_numval_20_ku(time_20_ku)

```
short echo_avg_numval_20_ku(time_20_ku);
    echo_avg_numval_20_ku:units = "count";
    echo_avg_numval_20_ku:FillValue = -32768s;
    echo_avg_numval_20_ku:long_name = "count of echoes or beams averaged";
    echo_avg_numval_20_ku:coordinates = "lon_poca_20_ku lat_poca_20_ku";
    echo_avg_numval_20_ku:comment = "In LRM mode this is the number of
echoes which have been averaged to make one measurement (normally). In SAR and
SARin mode this is the number of Doppler beams which have been stacked to
derive each measurement.";
```

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3.3.3 flag_cor_applied_20_ku(time_20_ku)

Note: refer to section 5 for the flag meaning definition

```

int flag_cor_applied_20_ku(time_20_ku);
flag_cor_applied_20_ku:_FillValue = -2147483648 ;
flag_cor_applied_20_ku:long_name = "corrections application flag";
    flag_cor_applied_20_ku:coordinates = "lon_poca_20_ku lat_poca_20_ku";
    flag_cor_applied_20_ku:flag_masks = 1, 2, 4, 8, 16, 32, 64, 128, 256,
512, 1024, 2048, 4096, 8192, 16384, 32768, 65536, 131072, 262144, 524288,
1048576, 2097152, 4194304, 8388608, 16777216, 33554432, 67108864, 134217728,
268435456, 536870912;
    flag_cor_applied_20_ku:flag_meanings = "correction_failure
    ssb_applied
    sarin_bad_velocity
    sarin_out_of_range
    sarin_bad_baseline
    lrm_slope_model_invalid
    sarin_ice_bias_applied
    sarin_ocean_bias_applied
    sar_ice_bias_applied
    sar_ocean_bias_applied
    lrm_ice_bias_applied
    lrm_ocean_bias_applied
    lrm_retracker_applied
    sarin_retracker_applied
    sar_retracker_applied
    window_offset_applied
    slope_doppler_applied
    pole_tide_applied
    solid_earth_applied
    load_tide_applied
    ocean_tide_equil_applied
    ocean_tide_applied
    iono_model_applied
    iono_gim_applied
    hf_fluctuations_applied
    inv_bar_applied
    model_wet_applied
    model_dry_applied
    doppler_applied
    internal_cal_applied";
    flag_cor_applied_20_ku:comment = "This flag indicates which corrections
were applied in the computation of the height values in this record. The intent
of this is to allow the user to remove applied corrections and substitute their
own.";

```

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3.3.4 flag_cor_err_01(time_cor_01)

Note: refer to section 5 for the flag meaning definition

```
int flag_cor_err_01(time_cor_01);
    flag_cor_err_01: FillValue = -2147483648;
    flag_cor_err_01: long_name = "corrections error flags";
    flag_cor_err_01: coordinates = "lon_01 lat_01";
    flag_cor_err_01: flag_masks = 1, 2, 4, 8, 16, 32, 64, 128, 256, 512, 1024,
                                2048, 4096, 8192, 16384, 32768, 65536,
                                131072, 262144, 524288, 1048576, 2097152,
                                4194304;
    flag_cor_err_01: flag_meanings = "surface_type_error pole_tide_error
                                     solid_earth_error load_tide_error
                                     ocean_tide_equil_error ocean_tide_error
                                     iono_model_error iono_gim_error
                                     hf_fluctuations_error inv_bar_error
                                     model_wet_error model_dry_error
                                     ssb_model_error slope_model_error
                                     dem_error odle_error geoid_error
                                     mss_error snow_density_error
                                     snow_depth_error ice_conc_error
                                     swh_error wind_error";
    flag_cor_err_01: comment = "Correction error flag. This flag shows whether
the correction models returned an error.";
```

3.3.5 flag_instr_conf_rx_str_in_use_01(time_cor_01)

Note: refer to section 5 for the flag meaning definition

```
byte flag_instr_conf_rx_str_in_use_01(time_cor_01);
    flag_instr_conf_rx_str_in_use_01: FillValue = -128b;
    flag_instr_conf_rx_str_in_use_01: long_name = "star tracker id";
    flag_instr_conf_rx_str_in_use_01: flag_values = 0b, 1b, 2b, 3b, 4b;
    flag_instr_conf_rx_str_in_use_01: flag_meanings = "no_star_tracker
                                                    tracker_1 tracker_2
                                                    tracker_3 attref_file";
    flag_instr_conf_rx_str_in_use_01: coordinates = "lon_01 lat_01";
    flag_instr_conf_rx_str_in_use_01: 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.";
```

3.3.6 flag_instr_mode_op_20_ku(time_20_ku)

Note: refer to section 5 for the flag meaning definition

```
byte flag_instr_mode_op_20_ku(time_20_ku);  
    flag_instr_mode_op_20_ku: FillValue = -128b;  
    flag_instr_mode_op_20_ku: long_name = "measurement mode";  
    flag_instr_mode_op_20_ku: flag_values = 1b, 2b, 3b;  
    flag_instr_mode_op_20_ku: flag_meanings = "lrm sar sarin ";  
    flag_instr_mode_op_20_ku: coordinates = "lon_poca_20_ku lat_poca_20_ku";  
    flag_instr_mode_op_20_ku: comment = "Instrument measurement mode derived  
from configuration bits in L0.";
```




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3.3.7 flag_prod_status_20_ku(time_20_ku)

Note: refer to section 5 for the flag meaning definition

```

int flag_prod_status_20_ku(time_20_ku) ;
    flag_prod_status_20_ku: FillValue = -2147483648 ;
    flag_prod_status_20_ku:long_name = "quality flag" ;
    flag_prod_status_20_ku:coordinates = "lon_poca_20_ku lat_poca_20_ku" ;
    flag_prod_status_20_ku:flag_masks = 1, 2, 4, 8, 16, 32, 64, 128, 256,
512, 1024, 2048, 4096, 8192, 16384, 32768, 65536, 131072, 262144, 524288,
1048576, 2097152, 4194304, 8388608, 16777216, 33554432, 67108864, 134217728,
268435456 ;
    flag_prod_status_20_ku:flag_meanings = "calibration_warning
sarin_bad_velocity          sarin_out_of_range          sarin_bad_baseline
lrm_slope_model_invalid    delta_time_error    mispointing_error
surface_model_unavailable   sarin_side_redundant sarin_rx_2_error
sarin_rx_1_error           sarin_height_ambiguous surf_type_class_undefined
surf_type_class_sea_ice    surf_type_class_lead  surf_type_class_ocean
freeboard_error peakiness_error  ssha_interp_error  sig0_3_error  sig0_2_error
sig0_1_error height_3_error height_2_error height_1_error orbit_discontinuity
orbit_error block_degraded height_sea_ice_error" ;
    flag_prod_status_20_ku:comment = "Flags indicating the quality of the
20Hz measurement parameters. The surface type discriminated by the SAR chain is
also packed within this flag. An error flag for height or backscatter when the
corresponding field is not set to FillValue means that the result should
typically be rejected, but could be of use for certain specialised users who
prefer degraded data to no data." ;

```



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3.3.8 radar_freeboard_20_ku(time_20_ku)

```
short radar_freeboard_20_ku(time_20_ku) ;
    radar_freeboard_20_ku:FillValue = -32768s ;
    radar_freeboard_20_ku:comment = "Radar freeboard. Computed as
[radar_freeboard_20_ku] = [height_1_20_ku] - [ssha_interp_20_ku]. Estimates of
snow depth [snow_depth_20_ku] and density [snow_density_20_ku] are provided for
the convenience of the product user. A correction for pulse delay due to snow
depth is provided in [snow_depth_cor_20_ku] but is not applied. Note that
freeboard can be a small negative value due to the effect of random noise (in
both the height estimation and the interpolation of the sea surface) on small
freeboard values. Unused in LRM mode." ;
    radar_freeboard_20_ku:coordinates = "lon_poca_20_ku lat_poca_20_ku" ;
    radar_freeboard_20_ku:long_name = "radar freeboard" ;
    radar_freeboard_20_ku:scale_factor = 0.001 ;
    radar_freeboard_20_ku:units = "m" ;
```

3.3.9 geoid_01(time_cor_01)

```
int geoid_01(time_cor_01);
    geoid_01:units = "m";
    geoid_01:FillValue = -2147483648;
    geoid_01:long_name = "geoid height";
    geoid_01:standard_name = "geoid_height_above_reference_ellipsoid";
    geoid_01:scale_factor = 0.001;
    geoid_01:coordinates = "lon_01 lat_01";
    geoid_01:source = "EGM96";
    geoid_01:institution = "NASA GSFC and NIMA ";
    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), and referenced to WGS84. See Lemoine, F. G., S. C. Kenyon, J. K.
Factor, R.G. Trimmer, N. K. Pavlis, D. S. Chinn, C. M. Cox, S. M. Klosko, S. B.
Luthcke, M. H. Torrence, Y. M. Wang, R. G. Williamson, E. C. Pavlis, R. H. Rapp
and T. R. Olson (1998). The Development of the Joint NASA GSFC and the National
Imagery and Mapping Agency (NIMA) Geopotential Model EGM96. NASA/TP-1998-
206861, July 1998.";
```

3.3.10 height_1_20_ku(time_20_ku)

```
int height_1_20_ku (time_20_ku);
    height_1_20_ku:units = "m";
    height_1_20_ku:FillValue = -2147483648;
    height_1_20_ku:long_name = "surface height (retracker 1)";
    height_1_20_ku:standard_name = "height_above_reference_ellipsoid";
    height_1_20_ku:scale_factor = 0.001;
    height_1_20_ku:coordinates = "lon_poca_20_ku lat_poca_20_ku ";
    height_1_20_ku:comment = "Measured height of the surface above the
reference ellipsoid (WGS84) at the coordinate location [lon_poca_20_ku]
[lat_poca_20_ku]. All instrumental [instr_cor_range_rx_20_ku] and appropriate
geophysical corrections included (see [flag_cor_applied_20_ku] for the set of
corrections applied), and system bias. Corrected for surface slope via a slope
model in LRM and SARin degraded mode. Corrected for surface slope via phase
information in SARin mode. Contains the Ocean CFI retracker result in LRM mode,
```



the UCL sea-ice retracker results in SAR mode (different method for specular and diffuse echoes), and the UCL margins retracker in SARin mode. ";

3.3.11 height_2_20_ku(time_20_ku)

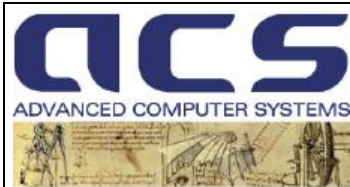
```
int height_2_20_ku(time_20_ku);
    height_2_20_ku:units = "m";
    height_2_20_ku:FillValue = -2147483648;
    height_2_20_ku:long_name = "surface height (retracker 2)";
    height_2_20_ku:standard_name = "height_above_reference_ellipsoid";
    height_2_20_ku:scale_factor = 0.001;
    height_2_20_ku:coordinates = "lon_poca_20_ku lat_poca_20_ku";
    height_2_20_ku:comment = "Measured height of the surface above the
reference ellipsoid (WGS84) at the coordinate location [lon_poca_20_ku]
[lat_poca_20_ku]. All instrumental [instr_cor_range_rx_20_ku] and appropriate
geophysical corrections included (see [flag_cor_applied_20_ku] for the set of
corrections applied), and system bias. Corrected for surface slope via a slope
model in LRM. Not currently used in SAR and SARin modes. Contains the UCL land-
ice retracker in LRM mode.";
```

3.3.12 height_3_20_ku(time_20_ku)

```
int height_3_20_ku(time_20_ku);
    height_3_20_ku:units = "m";
    height_3_20_ku:FillValue = -2147483648;
    height_3_20_ku:long_name = "surface height (retracker 3)";
    height_3_20_ku:standard_name = "height_above_reference_ellipsoid";
    height_3_20_ku:scale_factor = 0.001;
    height_3_20_ku:coordinates = "lon_poca_20_ku lat_poca_20_ku";
    height_3_20_ku:comment = "Measured height of the surface above the
reference ellipsoid (WGS84) at the coordinate location [lon_poca_20_ku]
[lat_poca_20_ku]. All instrumental [instr_cor_range_rx_20_ku] and appropriate
geophysical corrections included (see [flag_cor_applied_20_ku] for the set of
corrections applied), and system bias. Corrected for surface slope via a slope
model in LRM. Not currently used in SAR and SARin modes. Contains the OCOG
retracker in LRM mode.";
```

3.3.13 height_sea_ice_floe_20_ku(time_20_ku)

```
int height_sea_ice_floe_20_ku(time_20_ku) ;
    height_sea_ice_floe_20_ku:units = "m" ;
    height_sea_ice_floe_20_ku:FillValue = -2147483648 ;
    height_sea_ice_floe_20_ku:long_name = "surface height (sea-ice floe
retracker)" ;
    height_sea_ice_floe_20_ku:standard_name =
"height_above_reference_ellipsoid" ;
    height_sea_ice_floe_20_ku:scale_factor = 0.001 ;
    height_sea_ice_floe_20_ku:coordinates = "lon_poca_20_ku lat_poca_20_ku"
;
    height_sea_ice_floe_20_ku:comment = "Measured height of the surface
above the reference ellipsoid (WGS84) at the coordinate location
[lon_poca_20_ku] [lat_poca_20_ku]. All instrumental [instr_cor_range_rx_20_ku]
and appropriate geophysical corrections included (see [flag_cor_applied_20_ku]
for the set of corrections applied), and system bias. Only filled if the sea-
ice floe retracker ran. This retracker is run over all surfaces not
discriminated as a sea-ice lead, not just over sea-ice floes" ;
```



3.3.14 height_sea_ice_lead_20_ku (time_20_ku)

```
int height_sea_ice_lead_20_ku(time_20_ku) ;
    height_sea_ice_lead_20_ku:units = "m" ;
    height_sea_ice_lead_20_ku:FillValue = -2147483648 ;
    height_sea_ice_lead_20_ku:long_name = "surface height (sea-ice floe
retracker)" ;
    height_sea_ice_lead_20_ku:standard_name =
"height_above_reference_ellipsoid" ;
    height_sea_ice_lead_20_ku:scale_factor = 0.001 ;
    height_sea_ice_lead_20_ku:coordinates = "lon_poca_20_ku lat_poca_20_ku"
;
    height_sea_ice_lead_20_ku:comment = "Measured height of the surface
above the reference ellipsoid (WGS84) at the coordinate location
[lon_poca_20_ku] [lat_poca_20_ku]. All instrumental [instr_cor_range_rx_20_ku]
and appropriate geophysical corrections included (see [flag_cor_applied_20_ku]
for the set of corrections applied), and system bias. Only filled if the sea-
ice lead retracker ran." ;
```

3.3.15 hf_fluct_total_cor_01(time_cor_01)

```
short hf_fluct_total_cor_01(time_cor_01);
    hf_fluct_total_cor_01:units = "m";
    hf_fluct_total_cor_01:FillValue = -32768s;
    hf_fluct_total_cor_01:long_name = "dynamic atmospheric correction";
    hf_fluct_total_cor_01:standard_name =
"sea_surface_height_correction_due_to_air_pressure_and_wind_at_high_frequency";
    hf_fluct_total_cor_01:scale_factor = 0.001;
    hf_fluct_total_cor_01:coordinates = "lon_01 lat_01";
    hf_fluct_total_cor_01:source = "MOG2D 2.1.0";
    hf_fluct_total_cor_01:institution = "LEGOS/CLS/CNES";
    hf_fluct_total_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). This 1-
way correction is computed at the altimeter [time_cor_01] time-tag from the
interpolation of 2 meteorological fields that surround the altimeter time-tag.
The inverse barometric correction [inv_bar_cor_01] is included in this
field. This correction has been accounted for during the computation of height
(see [flag_cor_applied_20_ku] to determine if it was applied) in order to
account for both the depression of the ocean surface caused by the local
barometric pressure and the high-frequency effects caused by wind forcing.
This correction is an alternative to [inv_bar_cor_01] and therefore only one
should be used." ;
```

3.3.16 ind_first_meas_20hz_01 (time_cor_01)

```
int ind_first_meas_20hz_01(time_cor_01) ;
    ind_first_meas_20hz_01:FillValue = -2147483648 ;
    ind_first_meas_20hz_01:comment = "Index of the first 20Hz measurement
of the 1Hz packet." ;
    ind_first_meas_20hz_01:long_name = "index of the first 20Hz
measurement: 1 Hz" ;
    ind_first_meas_20hz_01:units = "count" ;
```

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3.3.17 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:comment = "Index of the 1Hz measurement to which
belongs the 20Hz measurement." ;
    ind_meas_1hz_20_ku:long_name = "index of the 1Hz measurement: 20 Hz ku
band" ;
    ind_meas_1hz_20_ku:units = "count" ;
```

3.3.18 inv_bar_cor_01(time_cor_01)

```
short inv_bar_cor_01(time_cor_01);
    inv_bar_cor_01:units = "m";
    inv_bar_cor_01: FillValue = -32768s;
    inv_bar_cor_01:long_name = "inverse barometric correction";
    inv_bar_cor_01:standard_name =
"sea_surface_height_correction_due_to_air_pressure_at_low_frequency";
    inv_bar_cor_01:scale_factor = 0.001;
    inv_bar_cor_01:coordinates = "lon_01 lat_01";
    inv_bar_cor_01:source = "European Center for Medium Range Weather
Forecasting ";
    inv_bar_cor_01:institution = "ECMWF";
    inv_bar_cor_01:comment = "Inverse barometric correction. This 1-way
correction is computed at the altimeter [time_cor_01] time-tag from the
interpolation of 2 meteorological fields that surround the altimeter time-tag.
This correction has been accounted for during the computation of height (see
[flag_cor_applied_20_ku] to determine if it was applied) in order to correct
this range measurement for the depression of the ocean surface caused by the
local barometric pressure. This correction is an alternative to
[hf_fluct_total_cor_01] and only one should be used.";
```

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3.3.19 iono_cor_01(time_cor_01)

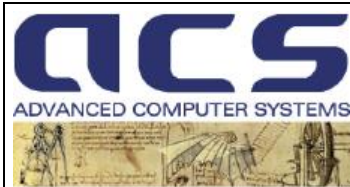
```
short iono_cor_01(time_cor_01);
    iono_cor_01:units = "m";
    iono_cor_01:FillValue = -32768s;
    iono_cor_01:long_name = "model ionospheric correction";
    iono_cor_01:standard_name =
"altimeter_range_correction_due_to_ionosphere";
    iono_cor_01:scale_factor = 0.001;
    iono_cor_01:coordinates = "lon_01 lat_01";
    iono_cor_01:source = "Bent";
    iono_cor_01:institution = "Bent";
    iono_cor_01:comment = "Model ionospheric correction. This 1-way
correction has been accounted for during the computation of height (see
[flag_cor_applied_20_ku] to determine if it was applied) in order to correct
this range measurement for ionospheric range delays of the radar pulse. This
correction is an alternative to [iono_cor_gim_01_ku] and only one should be
used. See S. K. Llewellyn, R. B. Bent, A. S. C. I. H. B. FL, U. S. N. T. I.
Service, Space and Missile Systems Organization (U.S.), Documentation and
Description of the Bent Ionospheric Model. U.S. Department of Commerce,
National Technical Information Service, 1973.";
```

3.3.20 iono_cor_gim_01(time_cor_01)

```
short iono_cor_gim_01(time_cor_01);
    iono_cor_gim_01:units = "m";
    iono_cor_gim_01:FillValue = -32768s;
    iono_cor_gim_01:long_name = "GIM ionospheric correction";
    iono_cor_gim_01:standard_name =
"altimeter_range_correction_due_to_ionosphere";
    iono_cor_gim_01:scale_factor = 0.001;
    iono_cor_gim_01:coordinates = "lon_01 lat_01";
    iono_cor_gim_01:source = "GIM";
    iono_cor_gim_01:institution = "NASA/JPL";
    iono_cor_gim_01:comment = "GIM ionospheric correction. This correction
has been accounted for during the computation of height (see
[flag_cor_applied_20_ku] to determine if it was applied) in order to correct
this range measurement for ionospheric range delays of the radar pulse. This
correction is an alternative to [iono_cor_01_ku] and only one should be used."
;
```

3.3.21 lat_01(time_cor_01)

```
int lat_01(time_cor_01);
    lat_01:units = "degrees_north";
    lat_01:FillValue = -2147483648;
    lat_01:long_name = "latitude";
    lat_01:standard_name = "latitude";
    lat_01:scale_factor = 1.e-07;
    lat_01:comment = "Latitude of nadir location [-90,+90]. Positive
latitude is North latitude, negative latitude is South latitude. Note the scale
factor.";
    lat_01:coordinates = "lon_01 lat_01";
```

3.3.22 lat_poca_20_ku(time_20_ku)

```
int lat_poca_20_ku(time_20_ku);
    lat_poca_20_ku:units = "degrees_north";
    lat_poca_20_ku:FillValue = -2147483648;
    lat_poca_20_ku:long_name = "latitude of the estimated echo location
(POCA)";
    lat_poca_20_ku:standard_name = "latitude";
    lat_poca_20_ku:scale_factor = 1.e-07;
    lat_poca_20_ku:comment = "Latitude of estimated echo location (point of
closest approach) [-90,+90]. Positive latitude is North latitude, negative
latitude is South latitude. Note the scale factor. Set to the nadir location if
uncorrected, so it always available to use as a plotting coordinate.";
    lat_poca_20_ku:coordinates = "lon_poca_20_ku lat_poca_20_ku";
```

3.3.23 load_tide_01(time_cor_01)

```
short load_tide_01(time_cor_01);
    load_tide_01:units = "m";
    load_tide_01:FillValue = -32768;
    load_tide_01:long_name = "ocean loading tide height";
    load_tide_01:scale_factor = 0.001;
    load_tide_01:source = "FES2004";
    load_tide_01:institution = "LEGOS/CNES";
    load_tide_01:coordinates = "lon_01 lat_01";
    load_tide_01:comment = "Ocean loading tide. This 1-way correction has
been accounted for during the computation of height (see
[flag_cor_applied_20_ku] to determine if it was applied) to remove the effect
of local tidal distortion to the Earth's crust, caused by increasing weight of
ocean as local water tide rises.";
```

3.3.24 lon_01(time_cor_01)

```
int lon_01(time_cor_01);
    lon_01:units = "degrees_east";
    lon_01:FillValue = -2147483648;
    lon_01:long_name = "longitude";
    lon_01:standard_name = "longitude";
    lon_01:scale_factor = 1.e-07;
    lon_01:comment = "Longitude of the nadir location [-180,+180]. East
longitude relative to Greenwich meridian. Note the scale factor.";
    lon_01:coordinates = "lon_01 lat_01";
```

3.3.25 lon_poca_20_ku(time_20_ku)

```
int lon_poca_20_ku(time_20_ku);
    lon_poca_20_ku:units = "degrees_east";
    lon_poca_20_ku:FillValue = -2147483648;
    lon_poca_20_ku:long_name = "longitude of the estimated echo location
(POCA)";
    lon_poca_20_ku:standard_name = "longitude";
    lon_poca_20_ku:scale_factor = 1.e-07;
    lon_poca_20_ku:comment = "Longitude of estimated echo location (point
of closest approach) [-180,+180]. East longitude relative to Greenwich meridian.
```

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Note the scale factor. Set to the nadir location if uncorrected, so it always available to use as a plotting coordinate.";

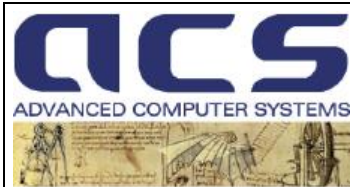
```
lon_poca_20_ku:coordinates = "lon_poca_20_ku lat_poca_20_ku";
```

3.3.26 mean_sea_surf_sea_ice_01(time_cor_01)

```
int mean_sea_surf_sea_ice_01(time_cor_01);
    mean_sea_surf_sea_ice_01:units = "m";
    mean_sea_surf_sea_ice_01:FillValue = -2147483648;
    mean_sea_surf_sea_ice_01:long_name = "mean sea surface height";
    mean_sea_surf_sea_ice_01:standard_name =
"sea_surface_height_above_reference_ellipsoid";
    mean_sea_surf_sea_ice_01:source = "UCL13";
    mean_sea_surf_sea_ice_01:institution = "UCL";
    mean_sea_surf_sea_ice_01:scale_factor = 0.001;
    mean_sea_surf_sea_ice_01:coordinates = "lon_01 lat_01";
    mean_sea_surf_sea_ice_01:comment = "Mean sea-surface model, referenced
to the WGS84 ellipsoid. This model has been optimised for use in computing the
surface height anomaly of the polar oceans to derive sea-ice freeboard. The
model is a merge of the CLS2011 mean sea-surface and CryoSat data from high
latitudes.";
```

3.3.27 mod_dry_tropo_cor_01(time_cor_01)

```
short mod_dry_tropo_cor_01(time_cor_01);
    mod_dry_tropo_cor_01:units = "m";
    mod_dry_tropo_cor_01:FillValue = -32768s;
    mod_dry_tropo_cor_01:long_name = "dry tropospheric correction";
    mod_dry_tropo_cor_01:standard_name =
"altimeter_range_correction_due_to_dry_troposphere";
    mod_dry_tropo_cor_01:scale_factor = 0.001;
    mod_dry_tropo_cor_01:coordinates = "lon_01 lat_01";
    mod_dry_tropo_cor_01:source = "European Center for Medium Range Weather
Forecasting ";
    mod_dry_tropo_cor_01:institution = "ECMWF";
    mod_dry_tropo_cor_01:comment = "Model dry tropospheric correction. This
1-way correction is computed at the [time_cor_01] altimeter time-tag from the
interpolation of 2 meteorological fields that surround the altimeter time-tag.
This correction has been accounted for during the computation of height (see
[flag_cor_applied_20_ku] to determine if it was applied) in order to correct
for the propagation delay to the radar pulse, caused by the dry-gas component
of the Earth's atmosphere.";
```



3.3.28 mod_wet_tropo_cor_01(time_cor_01)

```
short mod_wet_tropo_cor_01(time_cor_01);
  mod_wet_tropo_cor_01:units = "m";
  mod_wet_tropo_cor_01:FillValue = -32768s;
  mod_wet_tropo_cor_01:long_name = "wet tropospheric correction";
  mod_wet_tropo_cor_01:standard_name =
"altimeter_range_correction_due_to_wet_troposphere";
  mod_wet_tropo_cor_01:scale_factor = 0.001;
  mod_wet_tropo_cor_01:coordinates = "lon_01 lat_01";
  mod_wet_tropo_cor_01:source = "European Center for Medium Range Weather
Forecasting ";
  mod_wet_tropo_cor_01:institution = "ECMWF";
  mod_wet_tropo_cor_01:comment = "Model Wet Tropospheric Correction. This
1-way correction is computed at the time_cor_01 altimeter time-tag from the
interpolation of 2 meteorological fields that surround the altimeter time-tag.
This correction has been accounted for during the computation of height (see
[flag_cor_applied_20_ku] to determine if it was applied) in order to correct
for the propagation delay to the radar pulse, caused by the H~2~O component of
the Earth's atmosphere.";
```

3.3.29 num_valid_01(time_cor_01)

```
byte num_valid_01(time_cor_01);
  num_valid_01:FillValue = 128b;
  num_valid_01:units = "count";
  num_valid_01:long_name = "number of valid measurements";
  num_valid_01:coordinates = "lon_01 lat_01";
  num_valid_01:comment = "Count of the number of records in the meas_ind
dimension that are valid.";
```

3.3.30 ocean_tide_01(time_cor_01)

```
short ocean_tide_01(time_cor_01);
  ocean_tide_01:units = "m";
  ocean_tide_01:FillValue = -32768s;
  ocean_tide_01:long_name = "elastic ocean tide height";
  ocean_tide_01:scale_factor = 0.001;
  ocean_tide_01:coordinates = "lon_01 lat_01";
  ocean_tide_01:source = "FES2004 ";
  ocean_tide_01:institution = "LEGOS/CNES";
  ocean_tide_01:comment = "Ocean tide. This 1-way correction has been
accounted for during the computation of height (see [flag_cor_applied_20_ku]
to determine if it was applied) to remove the effect of local tide and adjust
the measurement to the mean sea surface. This is the pure ocean tide, not
including the corresponding loading tide [load_tide_01] or the 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_sea_ice_01]." ;
```

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3.3.31 ocean_tide_eq_01(time_cor_01)

```
short ocean_tide_eq_01(time_cor_01);
    ocean_tide_eq_01:units = "m";
    ocean_tide_eq_01: FillValue = -32768s;
    ocean_tide_eq_01:long_name = "long-period ocean tide height";
    ocean_tide_eq_01:standard_name =
"sea_surface_height_amplitude_due_to_equilibrium_ocean_tide";
    ocean_tide_eq_01:scale_factor = 0.001;
    ocean_tide_eq_01:coordinates = "lon_01 lat_01";
    ocean_tide_eq_01:source = "FES2004 ";
    ocean_tide_eq_01:institution = "LEGOS/CNES";
    ocean_tide_eq_01:comment = "Equilibrium ocean tide. This correction has
been accounted for during the computation of height (see
[flag_cor_applied_20_ku] to determine if it was applied) to remove the effect
of the oceanic response to the single tidal forcing." ;
```

3.3.32 odle_01(time_cor_01)

```
int odle_01 (time_cor_01);
    odle_01:units = "m";
    odle_01: FillValue = -2147483648;
    odle_01:long_name = "ocean depth/land elevation";
    odle_01:scale_factor = 0.001;
    odle_01:coordinates = "lon_01 lat_01";
    odle_01:source = "MACCESS ";
    odle_01:institution = "ESA/ESRIN";
    odle_01:comment = "Ocean depth and land elevation model. The model is a
merge of ACE land elevation data and Smith and Sandwell ocean bathymetry. See
P. A. M. Berry, R. A. Pinnock, R. D. Hilton, and C. P. D. Johnson, ACE: a new
GDEM incorporating satellite altimeter derived heights,\tESA Pub. SP-461, 9pp,
2000 and W. H. F Smith, and D. T. Sandwell, Global seafloor topography from
satellite altimetry and ship depth soundings, Science, v. 277, p. 1957-1962,
26 Sept., 1997." ;
```

3.3.33 off_nadir_angle_str_01(time_cor_01)

```
int off_nadir_angle_str_01(time_cor_01);
    off_nadir_angle_str_01:units = "deg";
    off_nadir_angle_str_01: FillValue = -2147483648;
    off_nadir_angle_str_01:long_name = "platform off-nadir angle";
    off_nadir_angle_str_01:scale_factor = 0.0001;
    off_nadir_angle_str_01:coordinates = "lon_01 lat_01";
    off_nadir_angle_str_01:comment = "The off-nadir angle from platform
star tracker data." ;
```

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3.3.34 off_nadir_pitch_angle_str_01(time_cor_01)

```
int off_nadir_pitch_angle_str_01(time_cor_01);
    off_nadir_pitch_angle_str_01: FillValue = -2147483648;
    off_nadir_pitch_angle_str_01:units = "degrees";
    off_nadir_pitch_angle_str_01:long_name = "antenna bench pitch angle";
    off_nadir_pitch_angle_str_01:scale_factor = 1.e-07;
    off_nadir_pitch_angle_str_01:coordinates = "lon_01 lat_01";
    off_nadir_pitch_angle_str_01:comment = "Pitch angle with respect to the
nadir pointing, measured by the STRs and post-processed by ground facility.";
```

3.3.35 off_nadir_roll_angle_str_01(time_cor_01)

```
int off_nadir_roll_angle_str_01(time_cor_01);
    off_nadir_roll_angle_str_01: FillValue = -2147483648;
    off_nadir_roll_angle_str_01:units = "degrees";
    off_nadir_roll_angle_str_01:long_name = "antenna bench roll angle";
    off_nadir_roll_angle_str_01:scale_factor = 1.e-07;
    off_nadir_roll_angle_str_01:coordinates = "lon_01 lat_01";
    off_nadir_roll_angle_str_01:comment = "Roll angle with respect to the
nadir pointing, measured by the STRs and post-processed by ground facility.";
```

3.3.36 off_nadir_yaw_angle_str_01(time_cor_01)

```
int off_nadir_yaw_angle_str_01(time_cor_01);
    off_nadir_yaw_angle_str_01: FillValue = -2147483648;
    off_nadir_yaw_angle_str_01:units = "degrees";
    off_nadir_yaw_angle_str_01:long_name = "antenna bench yaw angle";
    off_nadir_yaw_angle_str_01:scale_factor = 1.e-07;
    off_nadir_yaw_angle_str_01:coordinates = "lon_01 lat_01";
    off_nadir_yaw_angle_str_01:comment = "Yaw angle with respect to the
nadir pointing, measured by the STRs and post-processed by ground facility.";
```

3.3.37 orb_alt_rate_01(time_cor_01)

```
int orb_alt_rate_01(time_cor_01);
    orb_alt_rate_01:units = "m/s";
    orb_alt_rate_01: FillValue = -2147483648;
    orb_alt_rate_01:long_name = "CoM altitude rate with respect to the
reference ellipsoid";
    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 of the satellite
CoM with respect to the reference ellipsoid.";
```

3.3.38 peakiness_20_ku(time_20_ku)

```
int peakiness_20_ku(time_20_ku);
    peakiness_20_ku: FillValue = -2147483648;
    peakiness_20_ku:long_name = "waveform peakiness";
    peakiness_20_ku:scale_factor = 0.01;
    peakiness_20_ku:coordinates = "lon_poca_20_ku lat_poca_20_ku";
    peakiness_20_ku:comment = "Waveform peakiness. Note that this will
require different interpretation for SAR and SARin echoes which do not have the
typical pulse-limited echo shape. For LRM and SARin, the traditional ENVISAT
derivation is used. 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. For SAR mode, waveform bins with no power are
excluded from the average to account for the specular nature of some waveforms.
";
```

3.3.39 pole_tide_01(time_cor_01)

```
short pole_tide_01(time_cor_01);
    pole_tide_01:units = "m";
    pole_tide_01: FillValue = -32768s;
    pole_tide_01:long_name = "geocentric pole tide height";
    pole_tide_01:standard_name = "sea_surface_height_amplitude_due_to_pole_tide";
    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"
    pole_tide_01:comment = "Geocentric polar tide.This 1-way correction has
been accounted for during the computation of height (see
[flag_cor_applied_20_ku] to determine if it was applied) to remove a long-
period distortion of the Earth's crust. Although called a 'tide' this is in
fact caused by variations in centrifugal force as the Earth's rotational axis
moves its geographic location." ;
```

3.3.40 range_1_20_ku(time_20_ku)

```
int range_1_20_ku(time_20_ku) ;
    range_1_20_ku:units = "m" ;
    range_1_20_ku: FillValue = -2147483648 ;
    range_1_20_ku:long_name = "range to surface (retracker 1)" ;
    range_1_20_ku:standard_name = "altimeter_range" ;
    range_1_20_ku:scale_factor = 0.001 ;
    range_1_20_ku:coordinates = "lon_poca_20_ku lat_poca_20_ku" ;
    range_1_20_ku:comment = "Measured range from the satellite CoM to the
surface at the coordinate location [lon_poca_20_ku] [lat_poca_20_ku]. All
instrumental corrections applied. Contains the Ocean CFI retracker result in
LRM mode, the UCL sea-ice retracker results in SAR mode (different method for
specular and diffuse echoes), and the UCL margins retracker in SARin mode. Does
not include geophysical corrections." ;
```

3.3.41 range_2_20_ku(time_20_ku)

```
int range_2_20_ku(time_20_ku) ;
```



```
range_2_20_ku:units = "m" ;  
range_2_20_ku:FillValue = -2147483648 ;  
range_2_20_ku:long_name = "range to surface (retracker 2)" ;  
range_2_20_ku:standard_name = "altimeter_range" ;  
range_2_20_ku:scale_factor = 0.001 ;  
range_2_20_ku:coordinates = "lon_poca_20_ku lat_poca_20_ku" ;  
range_2_20_ku:comment = "Measured range from the satellite CoM to the  
surface at the coordinate location [lon_poca_20_ku] [lat_poca_20_ku]. All  
instrumental corrections applied. Not currently used in SAR and SARin modes.  
Contains the UCL land-ice retracker in LRM mode. Does not include geophysical  
corrections." ;
```

3.3.42 range_3_20_ku(time_20_ku)

```
int range_3_20_ku(time_20_ku) ;  
range_3_20_ku:units = "m" ;  
range_3_20_ku:FillValue = -2147483648 ;  
range_3_20_ku:long_name = "range to surface (retracker 3)" ;  
range_3_20_ku:standard_name = "altimeter_range" ;  
range_3_20_ku:scale_factor = 0.001 ;  
range_3_20_ku:coordinates = "lon_poca_20_ku lat_poca_20_ku" ;  
range_3_20_ku:comment = "Measured range from the satellite CoM to the  
surface at the coordinate location [lon_poca_20_ku] [lat_poca_20_ku]. All  
instrumental corrections applied. Not currently used in SAR and SARin modes.  
Contains the OCOG retracker in LRM mode. Does not include geophysical  
corrections." ;
```

3.3.43 range_ocean_01_ku(time_cor_01)

```
int range_ocean_01_ku(time_cor_01);  
range_ocean_01_ku:units = "m";  
range_ocean_01_ku:FillValue = -2147483648;  
range_ocean_01_ku:long_name = "averaged \'ocean\' altimeter range";  
range_ocean_01_ku:scale_factor = 0.001;  
range_ocean_01_ku:coordinates = "lon_01 lat_01";  
range_ocean_01_ku:comment = "Ocean retracking. Instrumental corrections  
included : USO drift correction, internal path correction, distance antenna-  
COG, Doppler correction, instrumental errors correction and system bias. This  
value is averaged from the valid 20 hz measurements to the 1 hz location given  
as the coordinates.";
```

3.3.44 range_ocean_20_ku(time_20_ku)

```
int range_ocean_20_ku(time_20_ku);  
range_ocean_20_ku:units = "m";  
range_ocean_20_ku:FillValue = -2147483648;  
range_ocean_20_ku:long_name = "\'ocean\' altimeter range";  
range_ocean_20_ku:scale_factor = 0.001;  
range_ocean_20_ku:coordinates = "lon_20_ku lat_20_ku";  
range_ocean_20_ku:comment = "Ocean retracking. Instrumental corrections  
included : USO drift correction, internal path correction, distance antenna-  
COG, Doppler correction, instrumental errors correction and system bias.";
```

3.3.45 range_ocean_numval_01_ku(time_cor_01)

```
byte range_ocean_numval_01_ku(time_cor_01);
```



```

range_ocean_numval_01_ku:units = "count";
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";
range_ocean_numval_01_ku:coordinates = "lon_01 lat_01";
range_ocean_numval_01_ku:comment = "ocean retracking. Number of
measurements used to compute averaged value.";

```

3.3.46 range_ocean_rms_01_ku(time_cor_01)

```

int range_ocean_rms_01_ku(time_cor_01);
range_ocean_rms_01_ku:units = "m";
range_ocean_rms_01_ku: FillValue = -2147483648;
range_ocean_rms_01_ku:long_name = "RMS of the \'ocean\' altimeter
range";
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 = "ocean retracking. Range error
estimate. Compression of high rate elements is preceded by a detection of
outliers. Only valid high-rate values are used to compute this element.";

```

3.3.47 range_ocog_01_ku(time_cor_01)

```

int range_ocog_01_ku(time_cor_01);
range_ocog_01_ku:units = "m";
range_ocog_01_ku: FillValue = -2147483648;
range_ocog_01_ku:long_name = "averaged \'ocog\' altimeter range";
range_ocog_01_ku:scale_factor = 0.001;
range_ocog_01_ku:coordinates = "lon_01 lat_01";
range_ocog_01_ku:comment = "ocog retracking. Instrumental corrections
included : USO drift correction, internal path correction, distance antenna-
COG, Doppler correction, instrumental errors correction and system bias. This
value is averaged from the valid 20 hz measurements to the 1 hz location given
as the coordinates.";

```

3.3.48 range_ocog_20_ku(time_20_ku)

```

int range_ocog_20_ku(time_20_ku);
range_ocog_20_ku:units = "m";
range_ocog_20_ku: FillValue = -2147483648;
range_ocog_20_ku:long_name = "\'ocog\' altimeter range";
range_ocog_20_ku:scale_factor = 0.001;
range_ocog_20_ku:coordinates = "lon_20_ku lat_20_ku";
range_ocog_20_ku:comment = "ocog retracking. Instrumental corrections
included : USO drift correction, internal path correction, distance antenna-
COG, Doppler correction, instrumental errors correction and system bias.";

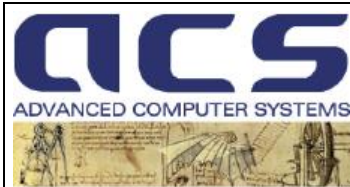
```

3.3.49 range_ocog_numval_01_ku(time_cor_01)

```

byte range_ocog_numval_01_ku(time_cor_01);
range_ocog_numval_01_ku:units = "count";
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";
range_ocog_numval_01_ku:coordinates = "lon_01 lat_01";

```

range_ocog_numval_01_ku:comment = "ocog retracking. Number of measurements used to compute averaged value.";

3.3.50 range_ocog_rms_01_ku(time_cor_01)

```
int range_ocog_rms_01_ku(time_cor_01);
range_ocog_rms_01_ku:units = "m";
range_ocog_rms_01_ku:FillValue = -2147483648;
range_ocog_rms_01_ku:long_name = "RMS of the \'ocog\' altimeter range";
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 = "ocog retracking. Range error estimate.
Compression of high rate elements is preceded by a detection of outliers. Only
valid high-rate values are used to compute this element.";
```

3.3.51 rec_count_20_ku(time_20_ku)

```
int rec_count_20_ku(time_20_ku);
rec_count_20_ku:units = "count";
rec_count_20_ku:long_name = "sample counter";
rec_count_20_ku:comment = "Record counter - progressive counter
incremented by 1 for each record. Surface Sample counter for SAR/SARin L1B products.
See [seq_count_20_ku] for LRM.";
```

		<p style="text-align: center;"><i>Instrument Processing Facility L2 Cryosat Ice netCDF L2 PFS</i></p> <p>Doc. No.: C2-RS-ACS-ESL-5265 Issue: 2.1draft Date: 14/07/2021 Page: 58</p>
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3.3.52 retracker_1_quality_20_ku(time_20_ku)

```
int retracker_1_quality_20_ku (time_20_ku);
    retracker_1_quality_20_ku: FillValue = -2147483648;
    retracker_1_quality_20_ku:long_name = "quality metric (retracker 1)";
    retracker_1_quality_20_ku:coordinates = "lon_poca_20_ku
lat_poca_20_ku";
    retracker_1_quality_20_ku:comment = "The quality metric (chi^2 of
fitted model) computed by the Ocean CFI retracker in LRM mode, the UCL sea-ice
retracker in SAR mode (over leads only) and the UCL margins retracker in SARin
mode.";
```

3.3.53 retracker_2_quality_20_ku(time_20_ku)

```
int retracker_2_quality_20_ku (time_20_ku);
    retracker_2_quality_20_ku: FillValue = -2147483648;
    retracker_2_quality_20_ku:long_name = "quality metric (retracker 2)";
    retracker_2_quality_20_ku:coordinates = "lon_poca_20_ku
lat_poca_20_ku";
    retracker_2_quality_20_ku:comment = "The quality metric (chi^2 of
fitted model) computed by the UCL land-ice retracker in LRM mode. Unused in SAR
and SARin modes.";
```

3.3.54 retracker_3_quality_20_ku(time_20_ku)

```
int retracker_3_quality_20_ku (time_20_ku);
    retracker_3_quality_20_ku: FillValue = -2147483648;
    retracker_3_quality_20_ku:long_name = "quality metric (retracker 3)";
    retracker_3_quality_20_ku:coordinates = "lon_poca_20_ku lat_poca_20_ku
";
    retracker_3_quality_20_ku:comment = "Unused in LRM, SAR, and SARin
modes.";
```

3.3.55 sea_ice_concentration_01(time_cor_01)

```
short sea_ice_concentration_01 (time_cor_01);
    sea_ice_concentration_01:units = "percent";
    sea_ice_concentration_01: FillValue = -32768s;
    sea_ice_concentration_01:long_name = "sea ice area fraction";
    sea_ice_concentration_01:standard_name = "sea_ice_area_fraction";
    sea_ice_concentration_01:source = "UCL";
    sea_ice_concentration_01:institution = "UCL";
    sea_ice_concentration_01:scale_factor = 1.;
    sea_ice_concentration_01:coordinates = "lon_01 lat_01";
    sea_ice_concentration_01:comment = "Sea ice concentration derived from
NSIDC SSM/I data. Unused in LRM mode.";
```

		<p style="text-align: right;"><i>Instrument Processing Facility L2</i> <i>Cryosat Ice netCDF L2 PFS</i></p> <p>Doc. No.: C2-RS-ACS-ESL-5265 Issue: 2.1draft Date: 14/07/2021 Page: 59</p>
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3.3.56 sea_state_bias_01_ku(time_cor_01)

```
short sea_state_bias_01_ku(time_cor_01);
  sea_state_bias_01_ku:units = "m";
  sea_state_bias_01_ku:FillValue = -32768s;
  sea_state_bias_01_ku:long_name = "sea state bias correction";
  sea_state_bias_01_ku:standard_name =
"sea_surface_height_bias_due_to_sea_surface_roughness";
  sea_state_bias_01_ku:source = "Labroue2007";
  sea_state_bias_01_ku:institution = "CLS";
  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 = "This sea-state bias has been corrected
for (if indicated by [flag_cor_applied_20_ku]) in the height estimates over
open-ocean in LRM mode. Not used in SAR/SARin modes.";
```

3.3.57 sig0_1_20_ku(time_20_ku)

```
short sig0_1_20_ku(time_20_ku);
  sig0_1_20_ku:units = "dB";
  sig0_1_20_ku:FillValue = -32768s;
  sig0_1_20_ku:long_name = "backscatter coefficient (retracker 1)";
  sig0_1_20_ku:standard_name =
"surface_backwards_scattering_coefficient_of_radar_wave";
  sig0_1_20_ku:scale_factor = 0.01;
  sig0_1_20_ku:coordinates = "lon_poca_20_ku lat_poca_20_ku ";
  sig0_1_20_ku:comment = "The measured backscatter from the surface,
corrected for instrument effects [instr_cor_gain_rx_20_ku], and including a
system bias that calibrates the results against previous missions. The
backscatter is computed from the amplitude of the waveform in Watts, as
measured by the Ocean CFI retracker in LRM mode. The measured power is used to
solve the radar equation to recover the value for backscatter. For SAR and
SARin mode, the power waveform is first convolved with a function to produce an
LRM-like waveform, that is then retracked with OCOG to produce the amplitude
estimate.";
```

3.3.58 sig0_2_20_ku(time_20_ku)

```
short sig0_2_20_ku (time_20_ku);
  sig0_2_20_ku:units = "dB";
  sig0_2_20_ku:FillValue = -32768s;
  sig0_2_20_ku:long_name = "backscatter coefficient (retracker 2)";
  sig0_2_20_ku:standard_name =
"surface_backwards_scattering_coefficient_of_radar_wave";
  sig0_2_20_ku:scale_factor = 0.01;
  sig0_2_20_ku:coordinates = "lon_poca_20_ku lat_poca_20_ku ";
  sig0_2_20_ku:comment = "The measured backscatter from the surface,
corrected for instrument effects [instr_cor_gain_rx_20_ku], and including a
system bias that calibrates the results against previous missions. The
backscatter is computed from the amplitude of the waveform in Watts, as
measured by the UCL land-ice retracker. The measured power is used to solve the
radar equation to recover the value for backscatter. Not currently used in SAR
and SARin modes.";
```

3.3.59 sig0_3_20_ku(time_20_ku)

```

short sig0_3_20_ku (time_20_ku);
    sig0_3_20_ku:units = "dB";
    sig0_3_20_ku:FillValue = -32768s;
    sig0_3_20_ku:long_name = "backscatter coefficient (retracker 3)";
    sig0_3_20_ku:standard_name =
"surface_backwards_scattering_coefficient_of_radar_wave";
    sig0_3_20_ku:scale_factor = 0.01;
    sig0_3_20_ku:coordinates = "lon_poca_20_ku lat_poca_20_ku ";
    sig0_3_20_ku:comment = "The measured backscatter from the surface,
corrected for instrument effects [instr_cor_gain_rx_20_ku], and including a
system bias that calibrates the results against previous missions. The
backscatter is computed from the amplitude of the waveform in Watts, as
measured by the OCOG retracker. The measured power is used to solve the radar
equation to recover the value for backscatter. Not currently used in SAR and
SARin modes.";

```

3.3.60 sig0_ocean_01_ku(time_cor_01)

```

short sig0_ocean_01_ku(time_cor_01);
    sig0_ocean_01_ku:units = "dB";
    sig0_ocean_01_ku:FillValue = -32768s;
    sig0_ocean_01_ku:long_name = "averaged \'ocean\' backscatter
coefficient";
    sig0_ocean_01_ku:standard_name =
"surface_backwards_scattering_coefficient_of_radar_wave";
    sig0_ocean_01_ku:scale_factor = 0.001;
    sig0_ocean_01_ku:coordinates = "lon_01 lat_01";
    sig0_ocean_01_ku:comment = "Ocean retracking. Instrumental corrections
included : AGC instrumental errors correction and internal calibration
correction. This value is averaged from the valid 20 hz measurements to the 1
hz location given as the coordinates.";

```

3.3.61 sig0_ocean_20_ku(time_20_ku)

```

short sig0_ocean_20_ku(time_20_ku);
    sig0_ocean_20_ku:units = "dB";
    sig0_ocean_20_ku:FillValue = -32768s;
    sig0_ocean_20_ku:long_name = "\'ocean\' backscatter coefficient";
    sig0_ocean_20_ku:standard_name =
"surface_backwards_scattering_coefficient_of_radar_wave";
    sig0_ocean_20_ku:scale_factor = 0.001;
    sig0_ocean_20_ku:coordinates = "lon_20_ku lat_20_ku";
    sig0_ocean_20_ku:comment = "Ocean retracking. Instrumental corrections
included : AGC instrumental errors correction and internal calibration
correction.";

```



3.3.62 sig0_ocean_numval_01_ku(time_cor_01)

```
byte sig0_ocean_numval_01_ku(time_cor_01);
    sig0_ocean_numval_01_ku:units = "count";
    sig0_ocean_numval_01_ku: FillValue = -128b;
    sig0_ocean_numval_01_ku:long_name = "number of valid points used to
compute the \'ocean\' backscatter average";
    sig0_ocean_numval_01_ku:scale_factor = 0.001;
    sig0_ocean_numval_01_ku:coordinates = "lon_01 lat_01";
    sig0_ocean_numval_01_ku:comment = "Number of measurements used to
compute averaged value.";
```

3.3.63 sig0_ocean_rms_01_ku(time_cor_01)

```
int sig0_ocean_rms_01_ku(time_cor_01);
    sig0_ocean_rms_01_ku:units = "dB";
    sig0_ocean_rms_01_ku: FillValue = -2147483648;
    sig0_ocean_rms_01_ku:long_name = "RMS of the averaged \'ocean\'
backscatter coefficient";
    sig0_ocean_rms_01_ku:scale_factor = 0.001;
    sig0_ocean_rms_01_ku:coordinates = "lon_01 lat_01";
    sig0_ocean_rms_01_ku:comment = "Ocean retracking. Error estimate of
averaged backscatter coefficient.";
```

3.3.64 sig0_ocog_01_ku(time_cor_01)

```
short sig0_ocog_01_ku(time_cor_01);
    sig0_ocog_01_ku:units = "dB";
    sig0_ocog_01_ku: FillValue = -32768s;
    sig0_ocog_01_ku:long_name = "averaged \'ocog\' backscatter
coefficient";
    sig0_ocog_01_ku:standard_name =
"surface_backwards_scattering_coefficient_of_radar_wave";
    sig0_ocog_01_ku:scale_factor = 0.001;
    sig0_ocog_01_ku:coordinates = "lon_01 lat_01";
    sig0_ocog_01_ku:comment = "ocog retracking. Instrumental corrections
included : AGC instrumental errors correction and internal calibration
correction. This value is averaged from the valid 20 hz measurements to the 1
hz location given as the coordinates.";
```

3.3.65 sig0_ocog_20_ku(time_20_ku)

```
short sig0_ocog_20_ku(time_20_ku);
    sig0_ocog_20_ku:units = "dB";
    sig0_ocog_20_ku: FillValue = -32768s;
    sig0_ocog_20_ku:long_name = "\'ocog\' backscatter coefficient";
    sig0_ocog_20_ku:standard_name =
"surface_backwards_scattering_coefficient_of_radar_wave";
    sig0_ocog_20_ku:scale_factor = 0.001;
    sig0_ocog_20_ku:coordinates = "lon_20_ku lat_20_ku";
    sig0_ocog_20_ku:comment = "ocog retracking. Instrumental corrections
included : AGC instrumental errors correction and internal calibration
correction.";
```

3.3.66 sig0_ocog_numval_01_ku(time_cor_01)

```
byte sig0_ocog_numval_01_ku(time_cor_01);
    sig0_ocog_numval_01_ku:units = "count";
    sig0_ocog_numval_01_ku: FillValue = -128b;
    sig0_ocog_numval_01_ku:long_name = "number of valid points used to
compute the \'ocog\' backscatter average";
    sig0_ocog_numval_01_ku:scale_factor = 0.001;
    sig0_ocog_numval_01_ku:coordinates = "lon_01 lat_01";
    sig0_ocog_numval_01_ku:comment = "Number of measurements used to
compute averaged value.";
```

3.3.67 sig0_ocog_rms_01_ku(time_cor_01)

```
int sig0_ocog_rms_01_ku(time_cor_01);
    sig0_ocog_rms_01_ku:units = "dB";
    sig0_ocog_rms_01_ku: FillValue = -2147483648;
    sig0_ocog_rms_01_ku:long_name = "RMS of the averaged \'ocog\'
backscatter coefficient";
    sig0_ocog_rms_01_ku:scale_factor = 0.001;
    sig0_ocog_rms_01_ku:coordinates = "lon_01 lat_01";
    sig0_ocog_rms_01_ku:comment = "ocog retracking. Error estimate of
averaged backscatter coefficient.";
```

3.3.68 snow_density_01(time_cor_01)

```
short snow_density_01(time_cor_01);
    snow_density_01:units = "kg/m^3";
    snow_density_01: FillValue = -32768s;
    snow_density_01:long_name = "snow density";
    snow_density_01:standard_name = "snow_density";
    snow_density_01:source = "UCL";
    snow_density_01:institution = "UCL";
    snow_density_01:scale_factor = 1.0;
    snow_density_01:coordinates = "lon_01 lat_01";
    snow_density_01:comment = "Snow density. Currently set to a fixed
average value for all records. The intention is to replace this with a model in
future. Unused in LRM mode.";
```

3.3.69 snow_depth_01(time_cor_01)

```
short snow_depth_01(time_cor_01);
    snow_depth_01:units = "m";
    snow_depth_01: FillValue = -32768s;
    snow_depth_01:long_name = "snow depth";
    snow_depth_01:standard_name = "surface_snow_thickness";
    snow_depth_01:source = "Warren";
    snow_depth_01:institution = "UCL";
    snow_depth_01:scale_factor = 0.001;
    snow_depth_01:coordinates = "lon_01 lat_01";
    snow_depth_01:comment = " Snow depth from Modified Warren climatology.
Unused in LRM mode. See S. G. Warren, I. G. Rigor, and N. Untersteiner, Snow
depth on Arctic sea ice.,1999. ";
```

3.3.70 snow_depth_cor_20_ku(time_cor_20_ku)

```
short snow_depth_cor_20_ku(time_20_ku) ;
    snow_depth_cor_20_ku:FillValue = -32768s ;
    snow_depth_cor_20_ku:comment = "Snow depth correction. This one-way
correction corrects for the propagation delay caused by snow present on top of
sea ice. To apply, add to range or subtract from height or freeboard. The
correction in m is directly proportional to snow depth (-0.25 x snow_depth)."
```

3.3.71 solid_earth_tide_01(time_cor_01)

```
short solid_earth_tide_01(time_cor_01);
    solid_earth_tide_01:units = "m";
    solid_earth_tide_01:FillValue = -32768s;
    solid_earth_tide_01:long_name = "solid earth tide height";
    solid_earth_tide_01:standard_name =
"sea_surface_height_amplitude_due_to_earth_tide";
    solid_earth_tide_01:scale_factor = 0.001;
    solid_earth_tide_01:coordinates = "lon_01 lat_01";
    solid_earth_tide_01:source = "Cartwright and Edden [1973] Corrected
tables of tidal harmonics - J. Geophys. J. R. Astr. Soc., 33, 253-264";
    solid_earth_tide_01:comment = "Solid earth tide. This 1-way correction
has been accounted for during the computation of height (see
[flag_cor_applied_20_ku] to determine if it was applied) to remove the effect
of local tidal distortion to the Earth's crust, in particular by the sun and
moon.";
```

3.3.72 ssha_interp_20_ku(time_20_ku)

```
short ssha_interp_20_ku (time_20);
    ssha_interp_20_ku:units = "m";
    ssha_interp_20_ku:FillValue = -32768s;
    ssha_interp_20_ku:long_name = "interpolated sea-surface height
anomaly";
    ssha_interp_20_ku:scale_factor = 0.001;
    ssha_interp_20_ku:coordinates = "lon_poca_20_ku lat_poca_20_ku ";
    ssha_interp_20_ku:comment = "Sea-surface height anomaly computed using
sea-surface height interpolated to the current location. Unused in LRM mode.";
```

3.3.73 ssha_interp_numval_20(time_20_ku)

```
short ssha_interp_numval_20_ku(time_20_ku);
    ssha_interp_numval_20_ku:units = "count";
    ssha_interp_numval_20_ku:FillValue = -32768s;
    ssha_interp_numval_20_ku:long_name = "number of ssha interpolation
points";
    ssha_interp_numval_20_ku:coordinates = "lon_poca_20_ku lat_poca_20_ku";
    ssha_interp_numval_20_ku:comment = "Number of SSHA points used in the
interpolation of [ssha_interp_20] at this location. Unused in LRM mode.";
```




3.3.74 ssha_interp_rms_20_ku(time_20_ku)

```
short ssha_interp_rms_20_ku(time_20_ku);
    ssha_interp_rms_20_ku:units = "m";
    ssha_interp_rms_20_ku:FillValue = -32768s;
    ssha_interp_rms_20_ku:long_name = "ssha interpolation error";
    ssha_interp_rms_20_ku:scale_factor = 0.001;
    ssha_interp_rms_20_ku:coordinates = "lon_poca_20_ku lat_poca_20_ku";
    ssha_interp_rms_20_ku:comment = "Estimated error in
[ssha_interp_20_ku]. Unused in LRM mode." ;
```

3.3.75 surf_type_20_ku(time_20_ku)

```
byte surf_type_20_ku(time_20_ku);
    surf_type_20_ku:FillValue = -128b;
    surf_type_20_ku:long_name = "surface type from mask";
    surf_type_20_ku:flag_values = 0b, 1b, 2b, 3b;
    surf_type_20_ku:flag_meanings = "ocean lake_enclosed_sea ice land";
    surf_type_20_ku:coordinates = "lon_poca_20_ku lat_poca_20_ku";
    surf_type_20_ku:source = "TERRAINBASE 1.0";
    surf_type_20_ku:institution = "NOAA National Geophysical Data Center,
Boulder, Colorado.";
    surf_type_20_ku:comment = "A surface type mask for the surface type at
the nadir location. 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. NOAA National Geophysical Data Center, Boulder,
Colorado.";
```

3.3.76 swh_ocean_01_ku(time_cor_01)

```
short swh_ocean_01_ku (time_cor_01);
    swh_ocean_01_ku:units = "m";
    swh_ocean_01_ku:FillValue = -32768s;
    swh_ocean_01_ku:long_name = "1 Hz averaged significant waveheight";
    swh_ocean_01_ku:standard_name = "sea_surface_significant_wave_height";
    swh_ocean_01_ku:scale_factor = 0.001;
    swh_ocean_01_ku:coordinates = "lon_01 lat_01";
    swh_ocean_01_ku:comment = "Computed directly from sigma c as computed
by the Ocean CFI retracker in LRM mode only. No bias correction to cross-
calibrate with previous missions applied. Unused in SAR and SARin modes.";
```

3.3.77 swh_ocean_numval_01_ku(time_cor_01)

```
byte swh_ocean_numval_01_ku(time_cor_01);
    swh_ocean_numval_01_ku:units = "count";
    swh_ocean_numval_01_ku:FillValue = -128b;
    swh_ocean_numval_01_ku:long_name = "number of valid points used to
compute the significant waveheight average";
    swh_ocean_numval_01_ku:coordinates = "lon_01 lat_01";
    swh_ocean_numval_01_ku:comment = "Number of measurements used to
compute averaged value.";
```

3.3.78 swh_ocean_rms_01_ku(time_cor_01)



```
int swh_ocean_rms_01_ku(time_cor_01);
    swh_ocean_rms_01_ku:units = "m";
    swh_ocean_rms_01_ku:FillValue = -2147483648;
    swh_ocean_rms_01_ku:long_name = "RMS of the averaged \'ocean\'
significant waveheight";
    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 = "Ocean retracking significant waveheight
error estimate. Compression of high rate elements is preceded by a detection of
outliers. Only valid high-rate values are used to compute this element";
```

3.3.79 swh_sq_ocean_01_ku(time_cor_01)

```
int swh_sq_ocean_01_ku(time_cor_01);
    swh_sq_ocean_01_ku:units = "m^2";
    swh_sq_ocean_01_ku:FillValue = -2147483648;
    swh_sq_ocean_01_ku:long_name = "averaged \'ocean\' significant
waveheight squared";
    swh_sq_ocean_01_ku:scale_factor = 0.001;
    swh_sq_ocean_01_ku:coordinates = "lon_01 lat_01";
    swh_sq_ocean_01_ku:comment = "1Hz average of significant waveheight
squared from the ocean retracker. This value is averaged from the valid 20 hz
measurements to the 1 hz location given as the coordinates.";
```

3.3.80 time_20_ku(time_20_ku)

```
double time_20_ku (time_20_ku);
    time_20_ku:units = "seconds since 2000-01-01 00:00:00.0";
    time_20_ku:long_name = "TAI time (sec. since 2000-01-01)";
    time_20_ku:standard_name = "time";
    time_20_ku:calendar = "gregorian";
    time_20_ku:comment = "TAI time counted in seconds since 2000-01-01
00:00:00.";
```

3.3.81 time_cor_01(time_cor_01)

```
double time_cor_01(time_cor_01);
    time_cor_01:units = "seconds since 2000-01-01 00:00:00.0";
    time_cor_01:long_name = "TAI time (sec. since 2000-01-01)";
    time_cor_01:standard_name = "time";
    time_cor_01:calendar = "gregorian";
    time_cor_01:comment = "TAI Time counted in seconds since 2000-01-01
00:00:00. Time refers to the instant which the corrections are referred to. ";
```

3.3.82 wind_speed_alt_01_ku(time_cor_01)

```
short wind_speed_alt_01_ku(time_cor_01);
    wind_speed_alt_01_ku:units = "m/s";
    wind_speed_alt_01_ku:FillValue = -32768s;
    wind_speed_alt_01_ku:long_name = "1 Hz averaged altimeter wind speed" ;
    wind_speed_alt_01_ku:standard_name = "wind_speed";
    wind_speed_alt_01_ku:scale_factor = 0.01;
    wind_speed_alt_01_ku:coordinates = "lon_01 lat_01";
    time_cor_01:comment = "TAI time counted in seconds since 2000-01-01
00:00:00. Time refers to the instant which the corrections are referred to.\t"
;
```

3.3.83 wind_speed_mod_u_01(time_cor_01)

```
short wind_speed_mod_u_01(time_cor_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: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 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";
```

3.3.84 wind_speed_mod_v_01(time_cor_01)

```
short wind_speed_mod_v_01(time_cor_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: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 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";
```

4 LEVEL-2I FORMAT DESCRIPTION

4.1 LIST L2I OF VARIABLES

L2i Variables			
Variable Name (dim1,...,dim N) <i>long_name</i>	units	Standard_name	EE Field
time_cor_01(time_cor_01) <i>time (sec. since 2000-01-01)</i>	s	time	Data Record Time (MDSR Time Stamp)
time_20_ku (time_20_ku) <i>time (sec. since 2000-01-01)</i>	s	time	
space_3d(space_3d) <i>space dimension</i>	count		
uso_cor_20_ku (time_20_ku) USO correction factor			USO correction
uso_cor_applied_20_ku(time_20_ku) uso correction (1-way range)	m		
flag_instr_mode_op_20_ku (time_20_ku) <i>mode id - identifies the siral instrument measurement mode</i>			Mode ID (instrument mode information)
flag_instr_mode_att_ctrl_20_ku (time_20_ku) <i>mode id - identifies the siral instrument measurement mode</i>			Mode ID (instrument mode information)
flag_instr_mode_flags_20_ku (time_20_ku) <i>mode id</i>			Mode ID (instrument mode information)
seq_count_20_ku (time_20_ku) <i>source sequence counter</i>			Source Sequence Counter (from

L2i Variables			
Variable Name (dim1,...,dim N) <i>long_name</i>	units	Standard_name	EE Field
			telemetry)
flag_instr_conf_rx_in_use_20_ku (time_20_ku) <i>reception chain in use</i>			Instrument Config (including loop status)
flag_instr_conf_rx_bwdt_20_ku (time_20_ku) <i>instrument bandwidth</i>			Instrument Config (including loop status)
flag_instr_conf_rx_trk_mode_20_ku (time_20_ku) <i>instrument tracking mode</i>			Instrument Config (including loop status)
flag_instr_conf_rx_flags_20_ku (time_20_ku) <i>instrument configuration flags</i>			Instrument Config (including loop status)
rec_count_20_ku (time_20_ku)	count		Surface Sample Counter (record counter)
lat_poca_20_ku (time_20_ku) <i>latitude of the estimated echo location</i>	degrees	latitude	Latitude of measurement in WGS84
lon_poca_20_ku (time_20_ku) <i>longitude of the estimated echo location</i>	degrees	longitude	Longitude of measurement in WGS84
alt_20_ku (time_20_ku) <i>altitude of satellite</i>	m	height_above_ref erence_ellipsoid	Altitude of COG above reference ellipsoid (interpolated value)

L2i Variables			
Variable Name (dim1,...,dim N) <i>long_name</i>	units	Standard_name	EE Field
orb_alt_rate_20_ku (time_20_ku) <i>orbital altitude rate</i>	m/s		Instantaneous altitude rate derived from orbit
sat_vel_vec_20_ku (time_20_ku,space_3d) <i>satellite velocity vector</i>	m/s		Satellite velocity vector[3] (in IERF)
beam_dir_vec_20_ku (time_20_ku,space_3d) <i>real beam vector</i>	m		Real beam direction vector[3] (in CRF)
inter_base_vec_20_ku (time_20_ku,space_3d) <i>interferometer baseline vector</i>	m		Interferometer baseline vector[3] (in CRF)
flag_instr_conf_rx_str_in_use_20_ku (time_20_ku) <i>star tracker id</i>			Star Tracker ID
off_nadir_roll_angle_str_20_ku (time_20_ku) <i>antenna bench roll angle</i>	degrees		Spacecraft Roll
off_nadir_pitch_angle_str_20_ku (time_20_ku) <i>antenna bench pitch angle</i>	degrees		Spacecraft Pitch
off_nadir_yaw_angle_str_20_ku (time_20_ku)	degrees		Spacecraft Yaw

L2i Variables			
Variable Name (dim1,...,dim N) <i>long_name</i>	units	Standard_name	EE Field
<i>antenna bench yaw angle</i>			
flag_mcd_20_ku (time_20_ku) <i>quality flag</i>			Measurement Confidence Data
height_1_20_ku (time_20_ku) <i>altimeter height (retracker 1)</i>	m	height_above_ref erence_ellipsoid	Height of surface w.r.t. ellipsoid (retracker 1)
height_2_20_ku (time_20_ku) <i>altimeter height (retracker 2)</i>	m	height_above_ref erence_ellipsoid	Height of surface w.r.t. ellipsoid (retracker 2)
height_3_20_ku (time_20_ku) <i>altimeter height (retracker 3)</i>	m	height_above_ref erence_ellipsoid	Height of surface w.r.t. ellipsoid (retracker 3)
height_sea_ice_floe_20_ku(time_20_ku) <i>surface height (sea-ice floe retracker)</i>	m	height_above_ref erence_ellipsoid	
height_sea_ice_lead_20_ku(time_20_ku) <i>surface height (sea-ice floe retracker)</i>	m	height_above_ref erence_ellipsoid	
sig0_1_20_ku (time_20_ku) <i>backscatter coefficient (retracker 1)</i>	dB	surface_backward s_scattering_coeff icient_of_radar_w ave	Sigma-0 (retracker 1)
sig0_2_20_ku (time_20_ku) <i>backscatter coefficient (retracker 2)</i>	dB	surface_backward s_scattering_coeff icient_of_radar_w ave	Sigma-0 (retracker 2)
sig0_3_20_ku (time_20_ku)	dB	surface_backward	Sigma-0 (retracker 3)

L2i Variables			
Variable Name (dim1,...,dim N) <i>long_name</i>	units	Standard_name	EE Field
<i>backscatter coefficient (retracker 3)</i>		s_scattering_coefficient_of_radar_wave	
swh_ocean_20_ku (time_20_ku) <i>significant waveheight</i>	m	sea_surface_wave_significant_height	Significant Wave Height
wind_speed_alt_20_ku (time_20_ku) <i>wind speed</i>	m/s	wind_speed	Wind Speed
peakiness_20_ku (time_20_ku) <i>peakiness of waveforms</i>			Peakiness
retracker_1_cor_20_ku (time_20_ku) <i>correction to range (retracker 1)</i>	m		Retracker range correction (retracker 1)
retracker_2_cor_20_ku (time_20_ku) <i>correction to range (retracker 2)</i>	m		Retracker range correction (retracker 2)
retracker_3_cor_20_ku (time_20_ku) <i>correction to range (retracker 3)</i>	m		Retracker range correction (retracker 3)
retracker_1_quality_20_ku (time_20_ku) <i>quality metric (retracker 1)</i>			Retracker 1 quality metric
retracker_2_quality_20_ku (time_20_ku) <i>quality metric (retracker 2)</i>			Retracker 2 quality metric
retracker_3_quality_20_ku (time_20_ku) <i>quality metric (retracker 3)</i>			Retracker 3 quality metric
retracker_output_3_20_ku (time_20_ku) <i>retracker output 3</i>			Retracker output 3

L2i Variables			
Variable Name (dim1,...,dim N) <i>long_name</i>	units	Standard_name	EE Field
retracker_output_4_20_ku (time_20_ku) <i>retracker output 4</i>			Retracker output 4
retracker_output_5_20_ku (time_20_ku) <i>retracker output 5</i>			Retracker output 5
retracker_output_6_20_ku (time_20_ku) <i>retracker output 6</i>			Retracker output 6
retracker_output_7_20_ku (time_20_ku) <i>retracker output 7</i>			Retracker output 7
retracker_output_8_20_ku (time_20_ku) <i>retracker output 8</i>			Retracker output 8
retracker_output_9_20_ku (time_20_ku) <i>retracker output 9</i>			Retracker output 3
retracker_output_10_20_ku (time_20_ku) <i>retracker output 10</i>			Retracker output 9
retracker_output_11_20_ku (time_20_ku) <i>retracker output 11</i>			Retracker output 10
retracker_output_12_20_ku (time_20_ku) <i>retracker output 12</i>			Retracker output 11
retracker_output_13_20_ku (time_20_ku) <i>retracker output 13</i>			Retracker output 12
retracker_output_14_20_ku (time_20_ku)			Retracker output 13

L2i Variables			
Variable Name (dim1,...,dim N) <i>long_name</i>	units	Standard_name	EE Field
<i>retracker output 14</i>			
retracker_output_15_20_ku (time_20_ku) <i>retracker output 15</i>			Retracker output 14
retracker_output_16_20_ku (time_20_ku) <i>retracker output 16</i>			Retracker output 15
retracker_output_17_20_ku (time_20_ku) <i>retracker output 17</i>			Retracker output 16
retracker_output_18_20_ku (time_20_ku) <i>retracker output 18</i>			Retracker output 17
retracker_output_19_20_ku (time_20_ku) <i>retracker output 19</i>			Retracker output 18
retracker_output_20_20_ku (time_20_ku) <i>retracker output 20</i>			Retracker output 19
retracker_output_21_20_ku (time_20_ku) <i>retracker output 21</i>			Retracker output 20
retracker_output_22_20_ku (time_20_ku) <i>retracker output 22</i>			Retracker output 22
retracker_output_23_20_ku (time_20_ku)			Retracker output 23

L2i Variables			
Variable Name (dim1,...,dim N) <i>long_name</i>	units	Standard_name	EE Field
<i>retracker output 23</i>			
across_track_angle_20_ku (time_20_ku) <i>across track angle</i>	radian		X-Track Angle (interferometric angle computed at Retrack point)
across_track_angle_cor_20_ku (time_20_ku) <i>across track angle correction</i>	radian		X-Track Angle Correction
coherence_20_ku (time_20_ku) <i>coherence</i>			Coherence (at Retrack point)
freeboard_20_ku (time_20_ku) <i>sea-ice freeboard</i>	m	sea_ice_freeboard	Freeboard
ssha_20_ku (time_20_ku) <i>sea-surface height anomaly</i>	m		Surface Height Anomaly
ssha_interp_20_ku (time_20_ku) interpolated sea-surface height anomaly	m		Interpolated Sea Surface Height Anomaly
ssha_interp_rms_20_ku (time_20_ku) <i>SSHA interpolation error</i>	m		Interpolation error for Ocean Height
ssha_interp_numval_fwd_20_ku (time_20_ku) <i>number of forward SSHA interpolation points</i>	count		Number of interpolation points used forward
ssha_interp_numval_back_20_ku (time_20_ku)	count		Number of interpolation points

L2i Variables			
Variable Name (dim1,...,dim N) <i>long_name</i>	units	Standard_name	EE Field
<i>number of backward SSHA interpolation points</i>			used backward
ssh_interp_time_fwd_20_ku (time_20_ku) <i>forward timespan of SSHA interpolation points</i>	s		Radius of interpolation -forward (in time)
ssh_interp_time_back_20_ku (time_20_ku) <i>backward timespan of SSHA interpolation points</i>	s		Radius of interpolation -backward (in time)
flag_ssh_interp_20_ku (time_20_ku) <i>SSHA interpolation error flag</i>			Interpolation error flag
flag_quality_20_ku (time_20_ku) <i>quality flag</i>			Measurement Quality Flags
flag_retracker_20_ku (time_20_ku) <i>retracker flag</i>			Retracker Flags
flag_height_20_ku (time_20_ku) <i>height status flag</i>			Height Status Flags
flag_freeboard_20_ku (time_20_ku) <i>freeboard flag</i>			SAR Freeboard Status Flags
sea_ice_concentration_20_ku (time_20_ku) <i>sea ice area fraction</i>	percent	sea_ice_area_fra ction	Ice concentration parameter

L2i Variables			
Variable Name (dim1,...,dim N) <i>long_name</i>	units	Standard_name	EE Field
snow_depth_20_ku (time_20_ku) <i>snow depth</i>	m	surface_snow_thickness	Snow Depth
snow_density_20_ku (time_20_ku) <i>snow density</i>	kg/m ³	snow_density	Snow Density
flag_surf_type_class_20_ku (time_20_ku) <i>discriminated surface type</i>			Discriminator result (enumerated type)
sarin_output_1_20_ku (time_20_ku) sarin discriminator output 1			SIN Discriminator Parameter 1=total power
sarin_output_2_20_ku (time_20_ku) sarin discriminator output 2			SIN Discriminator Parameter 2=max power
sarin_output_3_20_ku (time_20_ku) sarin discriminator output 3			SIN Discriminator Parameter 3=mean - sl 4 4 power
sarin_output_4_20_ku (time_20_ku) sarin discriminator output 4			SIN Discriminator 4=bin of max power
sarin_output_5_20_ku (time_20_ku) sarin discriminator output 5			SIN Discriminator 5=bin of half max power

L2i Variables			
Variable Name (dim1,...,dim N) <i>long_name</i>	units	Standard_name	EE Field
sarin_output_6_20_ku (time_20_ku) sarin discriminator output 6			SIN Discriminator 6=max Coherence
sarin_output_7_20_ku (time_20_ku) sarin discriminator output 7			SIN Discriminator 7=bin of max Coherence
sarin_output_8_20_ku (time_20_ku) sarin discriminator output 8			SIN Discriminator 8=first power bin
sarin_output_9_20_ku (time_20_ku) sarin discriminator output 9			SIN Discriminator 9=last power bin
sarin_output_10_20_ku (time_20_ku) sarin discriminator output 10			SIN Discriminator 10 - reserved
flag_disc_stat_20_ku (time_20_ku) <i>discrimination status flag</i>			Discriminator status flag
offset_attitude_20_ku (time_20_ku) <i>echo azimuth</i>	radian		Slope model correction attitude
offset_azimuth_20_ku (time_20_ku) <i>echo attitude</i>	radian		Slope model correction azimuth
slope_dop_cor_20_ku (time_20_ku) <i>Slope Doppler correction to altimeter</i>	m		Slope Doppler

L2i Variables			
Variable Name (dim1,...,dim N)	units	Standard_name	EE Field
<i>long_name</i>			
<i>range</i>			Correction
lat_20_ku (time_20_ku) <i>latitude</i>	degrees	latitude	Uncorrected Latitude
lon_20_ku (time_20_ku) <i>longitude</i>	degrees	longitude	Uncorrected Longitude
flag_sarin_ambiguity_warning_20_ku (time_20_ku) <i>ambiguity warning flag</i>			Ambiguity indicator
mean_sea_surface_sea_ice_20_ku (time_20_ku) <i>mean sea surface height above reference ellipsoid</i>	m	sea_surface_height_above_reference_ellipsoid	MSS from model
geoid_20_ku (time_20_ku) <i>geoid height</i>	m	geoid_height_above_reference_ellipsoid	Geoid from model
odle_20_ku(time_20_ku) ocean depth/land elevation	m		Ocean Depth / Land Elevation from model
dem_height_20_ku(time_20_ku) <i>height of DEM</i>	m		DEM elevation (interpolated)
dem_identifier_20_ku (time_20_ku) <i>ID of DEM</i>			DEM identifier (used in SIN mode)

L2i Variables			
Variable Name (dim1,...,dim N) <i>long_name</i>	units	Standard_name	EE Field
mod_dry_tropo_cor_01(time_cor_01) <i>dry tropospheric correction</i>	m	altimeter_range_c orrection_due_to_ dry_troposphere	Dry Tropospheric Correction
mod_wet_tropo_cor_01(time_cor_01) <i>wet tropospheric correction</i>	m	altimeter_range_c orrection_due_to_ wet_troposphere	Wet Tropospheric Correction
inv_bar_cor_01(time_cor_01) <i>inverse barometric correction</i>	m	<u>sea surface heig ht correction due to air pressure at low frequency</u>	Inverse Barometric Correction
hf_fluct_total_cor_01(time_cor_01) <i>dynamic atmosphere correction</i>	m	sea_surface_heig ht_correction_due _to_air_pressure_ and_wind_at_high _frequency	Dynamic Atmospheric Correction (DAC from Mog2D)
ind_first_meas_20hz_01(time_cor_01) <i>index of the first 20Hz measurement: 1 Hz</i>	count		
ind_meas_1hz_20_ku(time_20_ku) <i>index of the 1Hz measurement: 20 Hz ku band</i>	count		
iono_cor_gim_01(time_cor_01) <i>GIM ionospheric correction</i>	m	altimeter_range_c orrection_due_to_ ionosphere	GIM Ionospheric Correction
iono_cor_01(time_cor_01)	m	altimeter_range_c orrection_due_to_	Model Ionospheric

L2i Variables			
Variable Name (dim1,...,dim N) <i>long_name</i>	units	Standard_name	EE Field
<i>model ionospheric correction</i>		ionosphere	Correction
ocean_tide_01(time_cor_01) <i>elastic ocean tide</i>	m		Elastic Ocean Tide
ocean_tide_eq_01(time_cor_01) <i>long-period ocean tide</i>	m	sea_surface_height_amplitude_due_to_equilibrium_ocean_tide	Long Period Ocean Tide
load_tide_01(time_cor_01) <i>ocean loading tide</i>	m		Ocean Loading Tide
solid_earth_tide_01(time_cor_01) <i>solid earth tide</i>	m	sea_surface_height_amplitude_due_to_earth_tide	Solid Earth Tide
pole_tide_01(time_cor_01) <i>geocentric pole tide</i>	m	sea_surface_height_amplitude_due_to_pole_tide	Geocentric Polar Tide
range_1_20_ku(time_20_ku) <i>range to surface (retracker 1)</i>	m	altimeter_range	
range_2_20_ku(time_20_ku) <i>range to surface (retracker 2)</i>	m	altimeter_range	
range_3_20_ku(time_20_ku) <i>range to surface (retracker 3)</i>	m	altimeter_range	
surf_type_20_ku (time_20_ku) <i>surface type from mask</i>			Surface type flag
flag_cor_status_20_ku (time_20_ku) <i>corrections status flags</i>			Correction status flags

L2i Variables			
Variable Name (dim1,...,dim N) <i>long_name</i>	units	Standard_name	EE Field
flag_cor_err_20_ku (time_20_ku) <i>corrections error flags</i>			Correction error flags
sea_state_bias_20_ku (time_20_ku) <i>sea state bias correction</i>	m		Sea State Bias (EM Bias)
dop_cor_20_ku (time_20_ku) <i>Doppler correction to altimeter range</i>	m		Doppler range correction (inc slope)
instr_cor_range_tx_rx_20_ku (time_20_ku) <i>range calibration correction TxRx chain</i>	m		Instrument Range Correction, t-r antenna
instr_cor_range_rx_20_ku (time_20_ku) <i>range calibration correction Rx chain</i>	m		Instrument Range Correction, r only mm antenna
instr_corr_gain_tx_rx_20_ku (time_20_ku) <i>gain calibration correction TxRx chain</i>	dB		Instrument Sigma-0 correction, t-r antenna
instr_cor_gain_rx_20_ku (time_20_ku) <i>gain calibration correction Rx chain</i>	dB		Instrument Sigma-0 correction, r only antenna
instr_int_ph_cor_20_ku (time_20_ku) <i>internal phase calibration correction TxRx chain</i>	radian		Internal Phase Correction
instr_ext_ph_cor_20_ku (time_20_ku)	radian		External Phase

L2i Variables			
Variable Name (dim1,...,dim N) <i>long_name</i>	units	Standard_name	EE Field
<i>external phase correction TxRx chain</i>			Correction
ph_slope_cor_20_ku (time_20_ku) <i>phase slope TxRx chain</i>	radian		Phase Slope Correction
noise_power_20_ku (time_20_ku) <i>noise floor</i>	dB		Noise power measurement
dop_angle_start_20_ku(time_20_ku) <i>doppler angle start</i> <i>(FillValue in LRM case)</i>	rad		
dop_angle_stop_20_ku(time_20_ku) <i>doppler angle stop</i> <i>(FillValue in LRM case)</i>	rad		
look_angle_start_20_ku(time_20_ku) <i>look angle start</i> <i>(FillValue in LRM case)</i>	rad		
look_angle_stop_20_ku(time_20_ku) <i>look angle stop</i> <i>(FillValue in LRM case)</i>	rad		
stack_std_20_ku (time_20_ku) <i>Gaussian power fitting: std wrt beam number</i> <i>(FillValue in LRM case)</i>	count		Beam behaviour parameter
stack_centre_20_ku (time_20_ku) <i>gaussian power fitting: center wrt beam number</i>	count		

L2i Variables			
Variable Name (dim1,...,dim N) <i>long_name</i>	units	Standard_name	EE Field
<i>(FillValue in LRM case)</i>			
stack_scaled_amplitude_20_ku(time_20_ku) <i>gaussian power fitting: amplitude</i> <i>(FillValue in LRM case)</i>	dB		
Stack_skewness_20_ku(time_20_ku) <i>gaussian power fitting: skewness wrt beam number</i> <i>(FillValue in LRM case)</i>	count		
stack_kurtosis_20_ku(time_20_ku) <i>gaussian power fitting: kurtosis wrt beam number</i> <i>(FillValue in LRM case)</i>	count		
stack_std_angle_20_ku(time_20_ku) <i>gaussian power fitting: std wrt boresight angle</i> <i>(FillValue in LRM case)</i>	rad		
stack_centre_angle_20_ku(time_20_ku) <i>gaussian power fitting: center wrt boresight angle number</i> <i>(FillValue in LRM case)</i>	rad		
stack_centre_look_angle_20_ku(time_20_ku) <i>gaussian power fitting: center wrt look angle</i>	rad		
stack_gaussian_fitting_residuals_20_ku(time_20_ku)	dbW		

L2i Variables			
Variable Name (dim1,...,dim N) <i>long_name</i>	units	Standard_name	EE Field
<i>gaussian power fitting: residuals fitting</i>			
stack_number_after_weighting_20_ku(time_20_ku) <i>number of contributing beams in the stack after weighting</i> <i>(FillValue in LRM case)</i>	count		Beam behaviour parameter
stack_number_before_weighting_20_ku(time_20_ku) <i>number of contributing beams in the stack after weighting</i> <i>(FillValue in LRM case)</i>	count		Beam behaviour parameter
stack_peakiness_20_ku(time_20_ku) <i>gaussian power fitting: peakiness wrt beam number</i>	count		

4.2 L2I CDL DUMP

4.2.1 across_track_angle_20_ku(time_20_ku)

```
int across_track_angle_20_ku (time_20_ku);
    across_track_angle_20_ku:units = "rad";
    across_track_angle_20_ku:FillValue = -2147483648;
    across_track_angle_20_ku:long_name = "across track angle";
    across_track_angle_20_ku:scale_factor = 1e-6;
    across_track_angle_20_ku:coordinates = "lon_20_ku lat_20_ku ";
    across_track_angle_20_ku:comment = "The across track angle between the
nadir vector and the vector from the satellite to the point of closest approach
computed from the phase measurement in SARin mode. Unused in LRM and SAR modes.
";
```

4.2.2 across_track_angle_cor_20_ku(time_20_ku)

```
int across_track_angle_cor_20_ku(time_20_ku);
    across_track_angle_cor_20_ku:units = "rad";
    across_track_angle_cor_20_ku:FillValue = -2147483648;
    across_track_angle_cor_20_ku:long_name = "across track angle
correction";
    across_track_angle_cor_20_ku:scale_factor = 1e-6;
    across_track_angle_cor_20_ku:coordinates = "lon_20_ku lat_20_ku ";
    across_track_angle_cor_20_ku:comment = "The applied to the across track
angle between the nadir vector and the vector from the satellite to the point
of closest approach computed from the phase measurement in SARin mode. Unused
in LRM and SAR modes.";
```

4.2.3 alt_20_ku(time_20_ku)

```
int alt_20_ku (time_20_ku);
    alt_20_ku:units = "m";
    alt_20_ku:FillValue = -2147483648;
    alt_20_ku:long_name = "altitude of CoM satellite above reference
ellipsoid ";
    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 CoM above reference
ellipsoid (WGS84).";
```

		<p style="text-align: right;"><i>Instrument Processing Facility L2</i> <i>Cryosat Ice netCDF L2 PFS</i></p> <p>Doc. No.: <i>C2-RS-ACS-ESL-5265</i> Issue: <i>2.1draft</i> Date: <i>14/07/2021</i> Page: <i>86</i></p>
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4.2.4 beam_dir_vec_20_ku(time_20_ku,space_3d)

```
int beam_dir_vec_20_ku (time_20_ku,space_3d_ku);
    beam_dir_vec_20_ku:units = "m";
    beam_dir_vec_20_ku:FillValue = -2147483648;
    beam_dir_vec_20_ku:long_name = "real beam direction vector in crf";
    beam_dir_vec_20_ku:scale_factor = 1.0e-6;
    beam_dir_vec_20_ku:coordinates = "lon_20_ku lat_20_ku ";
    beam_dir_vec_20_ku:comment = "Real beam direction vector described in
the CryoSat Reference Frame. The 3 components are given according to
the'space_3d' dimension: [1] x, [2] y, [3] z.";
```

4.2.5 coherence_20_ku(time_20_ku)

```
int coherence_20_ku(time_20_ku);
    coherence_20_ku:FillValue = -2147483648;
    coherence_20_ku:long_name = "coherence";
    coherence_20_ku:scale_factor = 0.001;
    coherence_20_ku:coordinates = "lon_20_ku lat_20_ku ";
    coherence_20_ku:comment = "The coherence of the SARin echoes at the
retracking point. This is sampled from the coherence waveforms in the L1b
product. The coherence waveform is a fully-calibrated, high resolution,
multilooked coherence computed from the complex echoes on the two receiving
channels.Unused in LRM and SAR modes.";
```

4.2.6 dem_height_20_ku(time_20_ku)

```
int dem_height_20_ku(time_20_ku);
    dem_height_20_ku:units = "m";
    dem_height_20_ku:FillValue = -2147483648;
    dem_height_20_ku:long_name = "height of DEM";
    dem_height_20_ku:scale_factor = 0.001;
    dem_height_20_ku:coordinates = "lon_poca_20_ku lat_poca_20_ku";
    dem_height_20_ku:source = "Bamber and GIMP";
    dem_height_20_ku:institution = "UCL";
    dem_height_20_ku:comment = "Height value extracted from DEM used for
SARin ambiguity check. Unused in LRM and SAR modes. See Bamber, Jonathan L.,
Jose Luis Gomez-Dans, and Jennifer A. Griggs. 2009. Antarctic 1 km Digital
Elevation Model (DEM) from Combined ERS-1 Radar and ICESat Laser Satellite
Altimetry. Boulder, Colorado USA: National Snow and Ice Data Center and Howat
I.M., A. Negrete and B.E. Smith, 2014, The Greenland Ice Mapping Project (GIMP)
land classification and surface elevation datasets, The Cryosphere, 8, 1509-
1518, doi:10.5194/tc-8-1509-2014.";
```

4.2.7 dem_identfier_20_ku(time_20_ku)

```
byte dem_identfier_20_ku (time_20_ku);
    dem_identfier_20_ku:FillValue = -128b;
    dem_identfier_20_ku:long_name = "ID of DEM";
    dem_identfier_20_ku:coordinates = "lon_poca_20_ku lat_poca_20_ku";
    dem_identfier_20_ku:comment = "ID of the DEM interpolated to supply
the value present in [dem_height_20_ku]. Unused in LRM and SAR modes.";
```

4.2.8 dop_angle_start_20_ku(time_20_ku)

```
int dop_angle_start_20_ku(time_20_ku);
    dop_angle_start_20_ku:units = "rad";
    dop_angle_start_20_ku:FillValue = -2147483648;
    dop_angle_start_20_ku:long_name = "doppler angle start";
    dop_angle_start_20_ku:scale_factor = 1.e-07;
    dop_angle_start_20_ku:add_offset = 0.;
    dop_angle_start_20_ku:comment = "Value of Doppler Angle for the
first single look echo in the stack. It is the angle between: perpendicular to
the velocity vector and the direction satellite - surface location. The Doppler
angle depends on velocity vector and on geometry."
```

4.2.9 ;dop_angle_stop_20_ku(time_20_ku)

```
int dop_angle_stop_20_ku(time_20_ku);
    dop_angle_stop_20_ku:units = "rad";
    dop_angle_stop_20_ku:FillValue = -2147483648;
    dop_angle_stop_20_ku:long_name = "doppler angle stop";
    dop_angle_stop_20_ku:scale_factor = 1.e-07;
    dop_angle_stop_20_ku:add_offset = 0.;
    dop_angle_stop_20_ku:comment = "Value of Doppler Angle for the last
single look echo in the stack. It is the angle between: perpendicular to the
velocity vector and the direction satellite - surface location. The Doppler
angle depends on velocity vector and on geometry." ;
```

4.2.10 dop_cor_20_ku(time_20_ku)

```
int dop_cor_20_ku(time_20_ku);
    dop_cor_20_ku:units = "m";
    dop_cor_20_ku:FillValue = -2147483648;
    dop_cor_20_ku:long_name = "doppler range correction ";
    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 satellite altitude rate. It is computed for the component of satellite
velocity in the nadir direction. Correction applied to the window delay during
the L1 processing, therefore height estimates at L2 include this correction.";
```

4.2.11 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:comment = "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
includes only one receiving channel however, in SARin, single looks from both
channels are averaged in order to reduce the SNR." ;
    echo_numval_20_ku:coordinates = "lon_20_ku lat_20_ku" ;
    echo_numval_20_ku:long_name = "count of echoes or beams averaged" ;
```



```
echo_numval_20_ku:units = "count" ;
```

4.2.12 flag_cor_err_20_ku(time_20_ku)

```
int flag_cor_err_20_ku(time_20_ku);
  flag_cor_err_20_ku:_FillValue = -2147483648;
  flag_cor_err_20_ku:long_name = "corrections error flags";
  flag_cor_err_20_ku:coordinates = "lon_20_ku lat_20_ku";
  flag_cor_err_20_ku:flag_masks = 1, 2, 4, 8, 16, 32, 64, 128, 256, 512, 1024,
2048, 4096, 8192, 16384, 32768, 65536, 131072, 262144, 524288, 1048576, 2097152;
  flag_cor_err_20_ku:flag_meanings = "surface_type_error
pole_tide_error solid_earth_error load_tide_error ocean_tide_equil_error
ocean_tide_error iono_model_error iono_gim_error hf_fluctuations_error
inv_bar_error model_wet_error model_dry_error ssb_model_error slope_model_error
dem_error odle_error geoid_error mss_error snow_density_error snow_depth_error
ice_conc_error ice_type_error" ;
  flag_cor_err_20_ku:comment = "Correction error flag. This flag shows,
for corrections algorithms that have been called only (see
[flag_cor_status_20_ku]), whether the correction models returned an error.";
```

4.2.13 flag_cor_status_20_ku(time_20_ku)

```
int flag_cor_status_20_ku(time_20_ku);
  flag_cor_status_20_ku:_FillValue = -2147483648;
  flag_cor_status_20_ku:long_name = "corrections status flags";
  flag_cor_status_20_ku:coordinates = "lon_20_ku lat_20_ku";
  flag_cor_status_20_ku:flag_masks = 1, 2, 4, 8, 16, 32, 64, 128, 256, 512, 1024,
2048, 4096, 8192, 16384, 32768, 65536, 131072, 262144, 524288, 1048576, 2097152;
  flag_cor_status_20_ku:flag_meanings = "surface_type_called
pole_tide_called solid_earth_called load_tide_called ocean_tide_equil_called
ocean_tide_called iono_model_called iono_gim_called hf_fluctuations_called
inv_bar_called model_wet_called model_dry_called ssb_model_called
slope_model_called dem_called odle_called geoid_called mss_called
snow_density_called snow_depth_called ice_conc_called ice_type_called" ;
  flag_cor_status_20_ku:comment = "Correction status flag. This flag shows which
correction algorithms have been called. This is used to determine which
auxiliary datasets should be listed as reference datasets.";
```

4.2.14 flag_disc_stat_20_ku (time_20_ku)

```
int flag_disc_stat_20_ku(time_20_ku);
  flag_disc_stat_20_ku:_FillValue = -2147483648;
  flag_disc_stat_20_ku:long_name = "discrimination status flag";
  flag_disc_stat_20_ku:coordinates = "lon_20_ku lat_20_ku";
  flag_disc_stat_20_ku:flag_masks = 1, 2, 4, 8, 16, 32, 64, 128, 256,
512, 1024, 2048, 4096, 8192, 16384, 32768,
65536;
  flag_disc_stat_20_ku:flag_meanings = "multiple_match no_match
sar_wf_too_wide sar_snr_low
sar_unreliable_ice_conc
sar_unavailable_ice_conc
sar_bad_bb sar_low_power
sar_low_pk sar_high_pk
sin_high_pk sin_low_power
sin_low_pk sin_high_noise
```



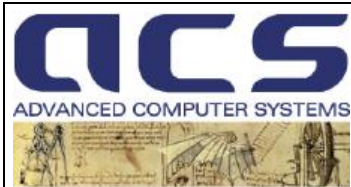

```
sin_bad_le sin_low_var  
discrimination_fail";  
flag_disc_stat_20_ku:comment = "Discriminator status flags. These flags  
are raised to provide low-level detail on why individual waveforms were  
rejected for processing. Unused in LRM mode."  
_;
```

4.2.15 flag_freeboard_20_ku(time_20_ku)

```
int flag_freeboard_20_ku (time_20_ku);  
flag_freeboard_20_ku:FillValue = -2147483648;  
flag_freeboard_20_ku:long_name = "freeboard flag";  
flag_freeboard_20_ku:coordinates = "lon_20_ku lat_20_ku ";  
flag_freeboard_20_ku:flag_masks = 1, 2, 4, 8 ;  
flag_freeboard_20_ku:flag_meanings = "in_south in_north unreliable  
unavailable";  
flag_freeboard_20_ku:comment = "SAR freeboard status flags indicate  
availability and reliability of the freeboard measurement. The measurement is  
unavailable if any step in the processing fails. The measurement is unreliable  
if extapolation has to be used to determine the sea-surface height anomaly.  
Unused in LRM mode.";
```

4.2.16 flag_height_20_ku(time_20_ku)

```
int flag_height_20_ku (time_20_ku);  
flag_height_20_ku:FillValue = -2147483648;  
flag_height_20_ku:long_name = "height status flag";  
flag_height_20_ku:coordinates = "lon_20_ku lat_20_ku";  
flag_height_20_ku:flag_masks = 1, 2, 4, 8, 16, 32, 64, 128, 256, 512,  
1024, 2048, 4096, 8192, 16384, 32768, 65536, 131072, 262144, 524288, 1048576,  
2097152, 4194304, 8388608, 16777216, 33554432, 67108864, 134217728, 268435456,  
536870912;  
flag_height_20_ku:flag_meanings = "correction_failure  
ssb_applied  
sarin_bad_velocity  
sarin_out_of_range  
sarin_bad_baseline  
lrm_slope_model_invalid  
lrm_slope_model_applied  
sarin_ice_bias_applied  
sarin_ocean_bias_applied  
sar_ice_bias_applied  
sar_ocean_bias_applied  
lrm_ice_bias_applied  
lrm_ocean_bias_applied  
lrm_retracker_applied  
sarin_retracker_applied  
sar_retracker_applied  
window_offset_applied  
slope_doppler_applied  
pole_tide_applied  
solid_earth_applied  
load_tide_applied  
ocean_tide_equil_applied  
ocean_tide_applied  
iono_model_applied  
iono_gim_applied  
hf_fluctuations_applied  
inv_bar_applied
```



```
        model_wet_applied
        model_dry_applied
        doppler_applied
        internal_cal_applied";"
    flag_height_20_ku:comment = "Height status flags show which corrections have
    been applied to the height fields [height_1_20_ku] [height_2_20_ku]
    [height_3_20_ku]. Flags which are mode dependent incorporate the name of the
    mode to which they apply.";
```

4.2.17 height_sea_ice_floe_20_ku (time_20_ku)

```
int height_sea_ice_floe_20_ku(time_20_ku) ;
    height_sea_ice_floe_20_ku:units = "m" ;
    height_sea_ice_floe_20_ku: FillValue = -2147483648 ;
    height_sea_ice_floe_20_ku:long_name = "surface height (sea-ice floe
retracker)" ;
    height_sea_ice_floe_20_ku:standard_name =
"height_above_reference_ellipsoid" ;
    height_sea_ice_floe_20_ku:scale_factor = 0.001 ;
    height_sea_ice_floe_20_ku:coordinates = "lon_poca_20_ku lat_poca_20_ku"
;
    height_sea_ice_floe_20_ku:comment = "Measured height of the surface
above the reference ellipsoid (WGS84) at the coordinate location
[lon_poca_20_ku] [lat_poca_20_ku]. All instrumental [instr_cor_range_rx_20_ku]
and appropriate geophysical corrections included (see [flag_cor_applied_20_ku]
for the set of corrections applied), and system bias. Only filled if the sea-
ice floe retracker ran. This retracker is run over all surfaces not
discriminated as a sea-ice lead, not just over sea-ice floes. In SAR mode over
sea ice floes, includes a correction for pulse delay due to snow
[snow_depth_cor_20_ku]. " ;
```

4.2.18 height_sea_ice_lead_20_ku (time_20_ku)

```
int height_sea_ice_lead_20_ku(time_20_ku) ;
    height_sea_ice_lead_20_ku: FillValue = -2147483648 ;
    height_sea_ice_lead_20_ku:comment = "Measured height of the surface
above the reference ellipsoid (WGS84) at the coordinate location
[lon_poca_20_ku] [lat_poca_20_ku]. All instrumental [instr_cor_range_rx_20_ku]
and appropriate geophysical corrections included (see [flag_cor_applied_20_ku]
for the set of corrections applied), and system bias. Only filled if the sea-
ice lead retracker ran." ;
    height_sea_ice_lead_20_ku:coordinates = "lon_poca_20_ku lat_poca_20_ku"
;
    height_sea_ice_lead_20_ku:long_name = "surface height (sea-ice floe
retracker)" ;
    height_sea_ice_lead_20_ku:scale_factor = 0.001 ;
    height_sea_ice_lead_20_ku:standard_name =
"height_above_reference_ellipsoid" ;
    height_sea_ice_lead_20_ku:units = "m" ;
```

4.2.19 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 acquisition
band";
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:comment = "This flag contains the
instrument acquisition band of the SIRAL instrument.";

```

4.2.20 flag_instr_conf_rx_flags_20(time_20_ku)

```

byte flag_instr_conf_rx_flags_20_ku (time_20_ku);
flag_instr_conf_rx_flags_20_ku:long_name = "instrument configuration
flag";
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:comment = "This flag contains the status
of the SIRAL instrument acquisition.";
byte flag_instr_conf_rx_flags_20_ku(time_20_ku);
flag_instr_conf_rx_flags_20_ku:long_name = "instrument configuration
flags.";

```

4.2.21 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 receive channel
";
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:comment = "This flag contains the
instrument receive channel in use in the SIRAL instrument.";

```

4.2.22 flag_instr_conf_rx_str_in_use_20_ku(time_20_ku)

```

byte flag_instr_conf_rx_str_in_use_20_ku(time_20_ku);
flag_instr_conf_rx_str_in_use_20_ku: FillValue = -128b;
flag_instr_conf_rx_str_in_use_20_ku:long_name = "star tracker id";
flag_instr_conf_rx_str_in_use_20_ku:flag_values = 0b, 1b, 2b, 3b, 4b;
flag_instr_conf_rx_str_in_use_20_ku:flag_meanings = "no_star_tracker
tracker_1 tracker_2 tracker_3 attref_file";
flag_instr_conf_rx_str_in_use_20_ku:coordinates = "lon_20_ku
lat_20_ku";
flag_instr_conf_rx_str_in_use_20_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.";

```

4.2.23 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";
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:comment = "This flag indicates the
tracking mode of the SIRAL instrument.";

```

4.2.24 flag_instr_mode_att_ctrl_20_ku(time_20_ku)

```

byte flag_instr_mode_att_ctrl_20_ku(time_20_ku);
    flag_instr_mode_att_ctrl_20_ku: FillValue = -128b;
    flag_instr_mode_att_ctrl_20_ku:long_name = "platform attitude control
mode ";
    flag_instr_mode_att_ctrl_20_ku:flag_values = 0b, 1b, 2b;
    flag_instr_mode_att_ctrl_20_ku:flag_meanings = "unknown
local_normal_pointing_yaw_steering";
    flag_instr_mode_att_ctrl_20_ku:coordinates = "lon_20_ku lat_20_ku";
    flag_instr_mode_att_ctrl_20_ku:comment = "Platform attitude control
mode from instrument configuration bits in L0.";

```

4.2.25 flag_instr_mode_flags_20_ku (time_20_ku)

```

byte flag_instr_mode_flags_20_ku(time_20_ku);
    flag_instr_mode_flags_20_ku: FillValue = -128b;
flag_instr_mode_flags_20_ku:long_name = "SARin sub-mode flags ";
    flag_instr_mode_flags_20_ku:coordinates = "lon_20_ku lat_20_ku";
    flag_instr_mode_flags_20_ku:flag_masks = 2b, 1b;
    flag_instr_mode_flags_20_ku:flag_meanings = "SARIN_degraded_case
CAL4_packet_detection ";
    flag_instr_mode_flags_20_ku:comment = "Flags related to sub-modes of
SARin mode from instrument configuration bits in L0.";

```

4.2.26 flag_instr_mode_op_20_ku(time_20_ku)

```

byte flag_instr_mode_op_20_ku(time_20_ku);
    flag_instr_mode_op_20_ku: FillValue = -128b;
    flag_instr_mode_op_20_ku:long_name = "measurement mode";
    flag_instr_mode_op_20_ku:flag_values = 1b, 2b, 3b;
    flag_instr_mode_op_20_ku:flag_meanings = "lrm sar sarin";
    flag_instr_mode_op_20_ku:coordinates = "lon_20_ku lat_20_ku";
    flag_instr_mode_op_20_ku:comment = "Instrument measurement mode derived
from configuration bits in L0.";

```



4.2.27 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 flags";
flag_mcd_20_ku: coordinates = "lon_20_ku lat_20_ku";
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
call_missing call_default
doris_uso_missing ccall_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: 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.";
```

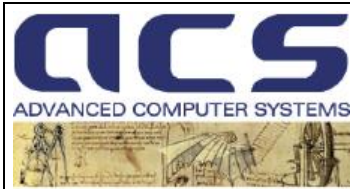
		<p style="text-align: right;"><i>Instrument Processing Facility L2</i> <i>Cryosat Ice netCDF L2 PFS</i></p> <p>Doc. No.: <i>C2-RS-ACS-ESL-5265</i> Issue: <i>2.1draft</i> Date: <i>14/07/2021</i> Page: <i>94</i></p>
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4.2.28 flag_quality_20_ku(time_20_ku)

```
int flag_quality_20_ku (time_20_ku);
    flag_quality_20_ku: FillValue = -2147483648;
    flag_quality_20_ku:long_name = "quality flag";
    flag_quality_20_ku:coordinates = "lon_20_ku lat_20_ku ";
    flag_quality_20_ku:flag_masks = 1, 2, 4, 8, 16, 32, 64, 128, 256, 512,
1024, 2048, 4096;
    flag_quality_20_ku:flag_meanings = "swh_error
    alt_wind_error
    maths_error
    coherence_error
    xtrack_angle_error
    echo_shape_error
    peakiness_error
    sig0_3_error
    sig0_2_error
    sig0_1_error
    height_3_error
    height_2_error
    height_1_error";
    flag_quality_20_ku:comment = "Indicates whether any of the measured
values are in error.";
```

4.2.29 flag_retracker_20_ku(time_20_ku)

```
int flag_retracker_20_ku(time_20_ku) ;
    flag_retracker_20_ku: FillValue = -2147483648 ;
    flag_retracker_20_ku:long_name = "retracker flag" ;
    flag_retracker_20_ku:coordinates = "lon_20_ku lat_20_ku" ;
    flag_retracker_20_ku:flag_masks = 1, 2, 4, 8, 16, 32, 64, 128, 256,
512, 1024, 2048, 4096, 8192, 16384, 32768, 65536, 131072 ;
    flag_retracker_20_ku:flag_meanings = "retracker_3_fail retracker_2_fail
retracker_1_fail poor_phase_fit poor_power_fit fdm_ocog_fail fit_failed
sarin_low_coherence sarin_interp_fail abnormal_bb_param out_of_range
bad_leading_edge low_variance high_noise high_peakiness low_peakiness low_power
sea_ice_retracker_fail" ;
    flag_retracker_20_ku:comment = "Retracker flags indicate errors from
the retracker algorithms, and waveform quality checking results, in each mode.
Mode specific flags incorporate the name of the mode." ;
```



4.2.30 flag_sarin_ambiguity_warning_20_ku(time_20_ku)

```
byte flag_sarin_ambiguity_warning_20_ku (time_20_ku);
    flag_sarin_ambiguity_warning_20_ku: FillValue = -128b;
    flag_sarin_ambiguity_warning_20_ku:long_name = "ambiguity warning
flag";
    flag_sarin_ambiguity_warning_20_ku:flag_values = 0b, 1b, 2b;
    flag_sarin_ambiguity_warning_20_ku:flag_meanings = "no_warning warning
not_checked";
    flag_sarin_ambiguity_warning_20_ku:coordinates = "lon_20_ku lat_20_ku
";
    flag_sarin_ambiguity_warning_20_ku:comment = "Flag indicating if the
height measurement may be affected by positional ambiguity due to phase
wrapping. Used in SARin, Unused in LRM and SAR modes.";
```

4.2.31 flag_sea_ice_type_20_ku(time_20_ku)

```
byte flag_sea_ice_type_20_ku(time_20_ku) ;
    flag_sea_ice_type_20_ku: FillValue = -128b ;
    flag_sea_ice_type_20_ku:comment = "Flag indicating sea ice type. Unused
in LRM mode." ;
    flag_sea_ice_type_20_ku:coordinates = "lon_20_ku lat_20_ku" ;
    flag_sea_ice_type_20_ku:flag_masks = 1b, 2b, 3b, 4b ;
    flag_sea_ice_type_20_ku:flag_meanings = "open_water first_year_ice
multi_year_ice ambiguous" ;
    flag_sea_ice_type_20_ku:institution = "EUMETSAT OSI SAF" ;
    flag_sea_ice_type_20_ku:long_name = "sea ice type flag" ;
    flag_sea_ice_type_20_ku:source = "OSI SAF Sea Ice Edge and Type
Product" ;
```

4.2.32 flag_ssha_interp_20_ku(time_20_ku)

```
byte flag_ssha_interp_20_ku(time_20_ku);
    flag_ssha_interp_20_ku: FillValue = -128b;
    flag_ssha_interp_20_ku:long_name = "SSHA interpolation error flag";
    flag_ssha_interp_20_ku:coordinates = "lon_20_ku lat_20_ku";
    flag_ssha_interp_20_ku:flag_masks = 1b, 2b, 3b;
    flag_ssha_interp_20_ku:flag_meanings = "no_values extrapolation
unreliable";
    flag_ssha_interp_20_ku:comment = "Flag indicating if an error occurred
during interpolation, due to a lack of values to interpolate. SSHA and freeboard
results will be unreliable. Unused in LRM mode.";
```

4.2.33 flag_surf_type_class_20_ku(time_20_ku)

```
short flag_surf_type_class_20_ku(time_20_ku) ;
    flag_surf_type_class_20_ku: FillValue = -32768s ;
    flag_surf_type_class_20_ku:long_name = "discriminated surface type" ;
    flag_surf_type_class_20_ku:flag_mask = 1s, 2s, 4s, 8s, 16s, 32s, 64s,
128s, 256s ;
    flag_surf_type_class_20_ku:flag_meanings = "lrm_undefined lrm_ocean
lrm_land_ice_sarin_undefined sarin_valid sar_undefined sar_ocean sar_sea_ice
sar_lead" ;
    flag_surf_type_class_20_ku:coordinates = "lon_20_ku lat_20_ku" ;
```




flag_surf_type_class_20_ku:comment = "Flag indicating the surface type determined by analysis of the waveform and aux values. Unused in LRM mode. Over ocean in SARin mode, the SAR discriminator for sea-ice is used." ;

4.2.34 freeboard_20_ku(time_20_ku)

```
int radar_freeboard_20_ku(time_20_ku) ;
  radar_freeboard_20_ku:FillValue = -2147483648 ;
  radar_freeboard_20_ku:comment = "Radar freeboard. Computed as
[radar_freeboard_20_ku] = [height_1_20_ku] - [ssha_interp_20_ku]. Estimates of
snow depth [snow_depth_20_ku] and density [snow_density_20_ku] are provided for
the convenience of the product user. A correction for pulse delay due to snow
depth is provided in [snow_depth_cor_20_ku] but is not applied. Note that
freeboard can be a small negative value due to the effect of random noise (in
both the height estimation and the interpolation of the sea surface) on small
freeboard values. Unused in LRM mode." ;
  radar_freeboard_20_ku:coordinates = "lon_20_ku lat_20_ku" ;
  radar_freeboard_20_ku:long_name = "radar freeboard" ;
  radar_freeboard_20_ku:scale_factor = 0.001 ;
  radar_freeboard_20_ku:units = "m" ;
```

4.2.35 geoid_20_ku(time_20_ku)

```
int geoid_20_ku (time_20_ku);
  geoid_20_ku:units = "m";
  geoid_20_ku:FillValue = -2147483648;
  geoid_20_ku:long_name = "geoid height";
  geoid_20_ku:standard_name = "geoid_height_above_reference_ellipsoid";
  geoid_20_ku:scale_factor = 0.001;
  geoid_20_ku:coordinates = "lon_20_ku lat_20_ku";
  geoid_20_ku:source = "EGM96";
  geoid_20_ku:institution = "NASA GSFC and NIMA";
  geoid_20_ku: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), and referenced to WGS84. See Lemoine, F. G., S. C. Kenyon, J.
K. Factor, R.G. Trimmer, N. K. Pavlis, D. S. Chinn, C. M. Cox, S. M. Klosko, S.
B. Luthcke, M. H. Torrence, Y. M. Wang, R. G. Williamson, E. C. Pavlis, R. H.
Rapp and T. R. Olson (1998). The Development of the Joint NASA GSFC and the
National Imagery and Mapping Agency (NIMA) Geopotential Model EGM96. NASA/TP-
1998-206861, July 1998.";
```

4.2.36 height_1_20_ku(time_20_ku)

```
int height_1_20_ku(time_20_ku);
  height_1_20_ku:units = "m";
  height_1_20_ku:FillValue = -2147483648;
  height_1_20_ku:long_name = "surface height (retracker 1)";
  height_1_20_ku:standard_name = "height_above_reference_ellipsoid";
  height_1_20_ku:scale_factor = 0.001;
  height_1_20_ku:coordinates = "lon_poca_20_ku lat_poca_20_ku ";
  height_1_20_ku:comment = "Measured height of the surface above the
reference ellipsoid (WGS84) at the coordinate location [lon_poca_20_ku]
[lat_poca_20_ku]. All instrumental [instr_cor_range_rx_20_ku] and appropriate
geophysical corrections included (see [flag_height_20_ku] for the set of
corrections applied), and system bias. Corrected for surface slope via a slope
model in LRM and SARin degraded mode. Corrected for surface slope via phase
information in SARin mode. Contains the Ocean CFI retracker result in LRM mode,
```


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the UCL sea-ice retracker results in SAR mode (different method for specular and diffuse echoes), and the UCL margins retracker in SARin mode. In SAR mode over sea ice floes, includes a correction for pulse delay due to snow [snow_depth_cor_20_ku]. ";

4.2.37 height_2_20_ku(time_20_ku)

```
int height_2_20_ku (time_20_ku);
    height_2_20_ku:units = "m";
    height_2_20_ku: FillValue = -2147483648;
    height_2_20_ku:long_name = "surface height (retracker 2)";
    height_2_20_ku:standard_name = "height_above_reference_ellipsoid";
    height_2_20_ku:scale_factor = 0.001;
    height_2_20_ku:coordinates = "lon_poca_20_ku lat_poca_20_ku ";
    height_2_20_ku:comment = "Measured height of the surface above the
reference ellipsoid (WGS84) at the coordinate location [lon_poca_20_ku]
[lat_poca_20_ku]. All instrumental [instr_cor_range_rx_20_ku] and appropriate
geophysical corrections included (see [flag_height_20_ku] for the set of
corrections applied), and system bias. Corrected for surface slope via a slope
model in LRM. Not currently used in SAR and SARin modes. Contains the UCL land-
ice retracker in LRM mode.";
```

4.2.38 height_3_20_ku(time_20_ku)

```
int height_3_20_ku (time_20_ku);
    height_3_20_ku:units = "m";
    height_3_20_ku: FillValue = -2147483648;
    height_3_20_ku:long_name = "surface height (retracker 3)";
    height_3_20_ku:standard_name = "height_above_reference_ellipsoid";
    height_3_20_ku:scale_factor = 0.001;
    height_3_20_ku:coordinates = "lon_poca_20_ku lat_poca_20_ku ";
    height_3_20_ku:comment = "Measured height of the surface above the
reference ellipsoid (WGS84) at the coordinate location [lon_poca_20_ku]
[lat_poca_20_ku]. All instrumental [instr_cor_range_rx_20_ku] and appropriate
geophysical corrections included (see [flag_height_20_ku] for the set of
corrections applied), and system bias. Corrected for surface slope via a slope
model in LRM. Not currently used in SAR and SARin modes. Contains the OCOG
retracker in LRM mode.";
```

4.2.39 hf_fluct_total_cor_01(time_cor_01)

```
int hf_fluct_total_cor_01(time_cor_01) ;
    hf_fluct_total_cor_01: FillValue = -2147483648 ;
    hf_fluct_total_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). This 1-way correction is
computed at the altimeter [time_cor_01] time-tag from the interpolation of 2
meteorological fields that surround the altimeter time-tag. The inverse
barometric correction [inv_bar_cor_01] is included in this field. This
correction has been accounted for during the computation of height (see
[flag_height_20_ku] to determine if it was applied) in order to account for
both the depression of the ocean surface caused by the local barometric
pressure and the high-frequency effects caused by wind forcing. This correction
is an alternative to [inv_bar_cor_01] and therefore only one should be used." ;
    hf_fluct_total_cor_01:coordinates = "lon_01 lat_01" ;
    hf_fluct_total_cor_01:institution = "LEGOS/CLS/CNES" ;
    hf_fluct_total_cor_01:long_name = "dynamic atmosphere correction" ;
    hf_fluct_total_cor_01:scale_factor = 0.001 ;
```

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```

hf_fluct_total_cor_01:source = "MOG2D 2.1.0" ;
hf_fluct_total_cor_01:standard_name =
"sea_surface_height_correction_due_to_air_pressure_and_wind_at_high_frequency"
;
hf_fluct_total_cor_01:units = "m" ;

```

4.2.40 ind_first_meas_20hz_01 (time_cor_01)

```

int ind_first_meas_20hz_01(time_cor_01) ;
ind_first_meas_20hz_01:FillValue = -2147483648 ;
ind_first_meas_20hz_01:comment = "Index of the first 20Hz measurement
of the 1Hz packet." ;
ind_first_meas_20hz_01:long_name = "index of the first 20Hz
measurement: 1 Hz" ;
ind_first_meas_20hz_01:units = "count" ;

```

4.2.41 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:comment = "Index of the 1Hz measurement to which
belongs the 20Hz measurement." ;
ind_meas_1hz_20_ku:long_name = "index of the 1Hz measurement: 20 Hz ku
band" ;
ind_meas_1hz_20_ku:units = "count" ;

```

4.2.42 instr_cor_gain_rx_20_ku(time_20_ku)

```

int instr_cor_gain_rx_20_ku(time_20_ku);
instr_cor_gain_rx_20_ku:FillValue = -2147483648;
instr_cor_gain_rx_20_ku:units = "dB";
instr_cor_gain_rx_20_ku:long_name = "instrument gain correction (rx
only chain)";
instr_cor_gain_rx_20_ku:add_offset = 0.;
instr_cor_gain_rx_20_ku:scale_factor = 0.01;
instr_cor_gain_rx_20_ku:coordinates = "lon_20_ku lat_20_ku";
instr_cor_gain_rx_20_ku:comment = "Instrument Gain Correction (Rx only
chain). It includes the power variation from CAL1 and the AGC calibration
values. ";

```

4.2.43 instr_cor_gain_tx_rx_20_ku(time_20_ku)

```

int instr_cor_gain_tx_rx_20_ku (time_20_ku);
instr_cor_gain_tx_rx_20_ku:units = "dB";
instr_cor_gain_tx_rx_20_ku:FillValue = -2147483648;
instr_cor_gain_tx_rx_20_ku:long_name = "instrument gain correction (tx-
rx chain)";
instr_cor_gain_tx_rx_20_ku:add_offset = 0.;
instr_cor_gain_tx_rx_20_ku:scale_factor = 0.01;
instr_cor_gain_tx_rx_20_ku:coordinates = "lon_20_ku lat_20_ku ";
instr_cor_gain_tx_rx_20_ku:comment = "Instrument Gain Correction (Tx-Rx
chain) It includes the power variation from CAL1 and the AGC calibration
values.";

```



4.2.44 instr_cor_range_rx_20_ku(time_20_ku)

```
int instr_cor_range_rx_20_ku (time_20_ku);
    instr_cor_range_rx_20_ku:units = "m";
    instr_cor_range_rx_20_ku: FillValue = -2147483648;
    instr_cor_range_rx_20_ku:long_name = "instrument range correction (rx
only chain)";
    instr_cor_range_rx_20_ku:add_offset = 0.;
    instr_cor_range_rx_20_ku:scale_factor = 0.001;
    instr_cor_range_rx_20_ku:coordinates = "lon_20_ku lat_20_ku ";
    instr_cor_range_rx_20_ku:comment = "2-way Instrument Range
Correction (Rx only chain). It includes: the internal path delay from CAL1, the
external group delay from ground characterisation, and the vertical component
of CoOM - Antenna distance." ;
```

4.2.45 instr_cor_range_tx_rx_20_ku(time_20_ku)

```
int instr_cor_range_tx_rx_20_ku (time_20_ku);
    instr_cor_range_tx_rx_20_ku:units = "m";
    instr_cor_range_tx_rx_20_ku: FillValue = -2147483648;
    instr_cor_range_tx_rx_20_ku:long_name = "instrument range correction
(tx-rx chain)";
    instr_cor_range_tx_rx_20_ku:add_offset = 0.;
    instr_cor_range_tx_rx_20_ku:scale_factor = 0.001;
    instr_cor_range_tx_rx_20_ku:coordinates = "lon_20_ku lat_20_ku";
    instr_cor_range_tx_rx_20_ku:comment = "Instrument Range Correction (Tx-
Rx chain). Calibration correction to range on channel 1 applied at L1B. It
includes the internal path delay from CAL1, the external group delay from
ground characterisation and the CoM - Antenna distance.";
```

4.2.46 instr_ext_ph_cor_20_ku(time_20_ku)

```
int instr_ext_ph_cor_20_ku (time_20_ku);
    instr_ext_ph_cor_20_ku:units = "rad";
    instr_ext_ph_cor_20_ku: FillValue = -2147483648;
    instr_ext_ph_cor_20_ku:long_name = "external phase correction taken
from the ipfdb file ";
    instr_ext_ph_cor_20_ku:add_offset = 0.;
    instr_ext_ph_cor_20_ku:scale_factor = 1.e-06;
    instr_ext_ph_cor_20_ku:coordinates = "lon_20_ku lat_20_ku";
    instr_ext_ph_cor_20_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.";
```

4.2.47 instr_int_ph_cor_20_ku(time_20_ku)

```
int instr_int_ph_cor_20_ku (time_20_ku);
    instr_int_ph_cor_20_ku:units = "rad";
    instr_int_ph_cor_20_ku: FillValue = -2147483648;
    instr_int_ph_cor_20_ku:long_name = "internal phase correction computed
from the cal-4";
    instr_int_ph_cor_20_ku:add_offset = 0.;
    instr_int_ph_cor_20_ku:scale_factor = 1.e-06;
```

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```
instr_int_ph_cor_20_ku:coordinates = "lon_20_ku lat_20_ku ";
instr_int_ph_cor_20_ku:comment = "Internal phase correction computed
from the CAL-4 packets during the azimuth impulse response amplitude (SARIN
only). It is set from the latest available CAL-4 packet.";
```

4.2.48 inter_base_vec_20_ku(time_20_ku,space_3d)

```
int inter_base_vec_20_ku (time_20_ku,space_3d);
inter_base_vec_20_ku:units = "m";
inter_base_vec_20_ku:FillValue = -2147483648;
inter_base_vec_20_ku:long_name = "interferometer baseline direction
vector in crf ";
inter_base_vec_20_ku:scale_factor = 1.0e-6;
inter_base_vec_20_ku:coordinates = "lon_20_ku lat_20_ku ";
inter_base_vec_20_ku:comment = "Interferometer baseline direction
vector. This is the direction vector from Tx-Rx antenna reference point to Rx
only antenna reference point described in the CryoSat Reference Frame. The 3
components are given according to the'space_3d' dimension: [1] x, [2] y, [3]
z.";
```

4.2.49 inv_bar_cor_01(time_cor_01)

```
int inv_bar_cor_01(time_cor_01);
inv_bar_cor_01:units = "m";
inv_bar_cor_01:FillValue = -2147483648;
inv_bar_cor_01:long_name = "inverse barometric correction";
inv_bar_cor_01:standard_name =
"sea_surface_height_correction_due_to_air_pressure_at_low_frequency";
inv_bar_cor_01:scale_factor = 0.001;
inv_bar_cor_01:coordinates = "lon_01 lat_01";
inv_bar_cor_01:source = "European Center for Medium Range Weather
Forecasting";
inv_bar_cor_01:institution = "ECMWF";
inv_bar_cor_01:comment = "Inverse barometric correction. This 1-way
correction is computed at the altimeter [time_cor_01] time-tag from the
interpolation of 2 meteorological fields that surround the altimeter time-tag.
This correction has been accounted for during the computation of height (see
[flag_height_20_ku] to determine if it was applied) in order to correct this
range measurement for the depression of the ocean surface caused by the local
barometric pressure. This correction is an alternative to
[hf_fluct_total_cor_01] and only one should be used.";
```

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4.2.50 iono_cor_01(time_cor_01)

```
int iono_cor_01(time_cor_01);
    iono_cor_01:units = "m";
    iono_cor_01:FillValue = -2147483648;
    iono_cor_01:long_name = "model ionospheric correction";
    iono_cor_01:standard_name =
"altimeter_range_correction_due_to_ionosphere";
    iono_cor_01:scale_factor = 0.001;
    iono_cor_01:coordinates = "lon_01 lat_01";
    iono_cor_01:source = "Bent";
    iono_cor_01:institution = "Bent";
    iono_cor_01:comment = "Model ionospheric correction. This 1-way
correction has been accounted for during the computation of height (see
[flag_height_20_ku] to determine if it was applied) in order to correct this
range measurement for ionospheric range delays of the radar pulse. This
correction is an alternative to [iono_cor_gim_01_ku] and only one should be
used. See S. K. Llewellyn, R. B. Bent, A. S. C. I. H. B. FL, U. S. N. T. I.
Service, Space and Missile Systems Organization (U.S.), Documentation and
Description of the Bent Ionospheric Model. U.S. Department of Commerce,
National Technical Information Service, 1973.";
```

4.2.51 iono_cor_gim_01(time_cor_01)

```
int iono_cor_gim_01(time_cor_01);
    iono_cor_gim_01:units = "m";
    iono_cor_gim_01:FillValue = -2147483648;
    iono_cor_gim_01:long_name = "GIM ionospheric correction";
    iono_cor_gim_01:standard_name =
"altimeter_range_correction_due_to_ionosphere";
    iono_cor_gim_01:scale_factor = 0.001;
    iono_cor_gim_01:coordinates = "lon_01 lat_01";
    iono_cor_gim_01:source = "GIM";
    iono_cor_gim_01:institution = "NASA/JPL";
    iono_cor_gim_01:comment = "GIM ionospheric correction. This 1-way
correction has been accounted for during the computation of height (see
[flag_height_20_ku] to determine if it was applied) in order to correct this
range measurement for ionospheric range delays of the radar pulse. This
correction is an alternative to [iono_cor_01_ku] and only one should be used.";
```

4.2.52 lat_20_ku(time_20_ku)

```
int lat_20_ku(time_20_ku);
    lat_20_ku:units = "degrees_north";
    lat_20_ku:FillValue = -2147483648;
    lat_20_ku:long_name = "20 Hz latitude";
    lat_20_ku:standard_name = "latitude";
    lat_20_ku:scale_factor = 1.e-07;
    lat_20_ku:comment = "Latitude of nadir location [-90,+90]. Positive
latitude is North latitude, negative latitude is South latitude. Note the scale
factor.";
```

4.2.53 lat_poca_20_ku(time_20_ku)

```
int lat_poca_20_ku (time_20_ku);
```

```

lat_poca_20_ku:units = "degrees_north";
lat_poca_20_ku:_FillValue = -2147483648;
lat_poca_20_ku:long_name = "latitude of the estimated echo location
(POCA)";
lat_poca_20_ku:standard_name = "latitude";
lat_poca_20_ku:scale_factor = 1.e-07;
lat_poca_20_ku:comment = "Latitude of estimated echo location (point of
closest approach) [-90,+90]. Positive latitude is North latitude, negative
latitude is South latitude. Note the scale factor. Set to lat_20_ku if the echo
offset is not estimated, so it always available to use as a plotting
coordinate. In SAR mode, this value will be the uncorrected nadir location. In
LRM/SARin, it may change from nadir due to slope correction or
interferometry.";

```

4.2.54 load_tide_01(time_cor_01)

```

int load_tide_01(time_cor_01);
load_tide_01:units = "m";
load_tide_01:_FillValue = -2147483648;
load_tide_01:long_name = "ocean loading tide height";
load_tide_01:scale_factor = 0.001;
load_tide_01:coordinates = "lon_01 lat_01";
load_tide_01:source = "FES2004";
load_tide_01:institution = "LEGOS/CNES";
load_tide_01:comment = "Ocean loading tide. This 1-way correction has
been accounted for during the computation of height (see [flag_height_20_ku] to
determine if it was applied) to remove the effect of local tidal distortion to
the Earth's crust, caused by increasing weight of ocean as local water tide
rises.";

```

4.2.55 lon_20_ku(time_20_ku)

```

int lon_20_ku (time_20_ku);
lon_20_ku:units = "degrees_east";
lon_20_ku:_FillValue = -2147483648;
lon_20_ku:long_name = "20 Hz longitude";
lon_20_ku:standard_name = "longitude";
lon_20_ku:scale_factor = 1.e-07;
lon_20_ku:comment = "Longitude of nadir location [-180,+180]. East
longitude relative to Greenwich meridian. Note the scale factor.";

```

4.2.56 lon_poca_20_ku(time_20_ku)

```

int lon_poca_20_ku(time_20_ku);
lon_poca_20_ku:units = "degrees_east";
lon_poca_20_ku:_FillValue = -2147483648;
lon_poca_20_ku:long_name = "longitude of the estimated echo location
(POCA)";
lon_poca_20_ku:standard_name = "longitude";
lon_poca_20_ku:scale_factor = 1.e-07;
lon_poca_20_ku:comment = "Longitude of estimated echo location (point
of closest approach) [-180,+180]. East longitude relative to Greenwich
meridian. Note the scale factor. Set to lon_20_ku if the echo offset is not
estimated, so it is always available for using as a plotting coordinate. In SAR
mode, this value will be the uncorrected nadir location. In LRM/SARin, it may
change from nadir due to slope correction or interferometry.";

```

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4.2.57 look_angle_start_20_ku(time_20_ku)

```
int look_angle_start_20_ku(time_20_ku);
    look_angle_start_20_ku:units = "rad";
    look_angle_start_20_ku:FillValue = -2147483648;
    look_angle_start_20_ku:long_name = "look angle start";
    look_angle_start_20_ku:scale_factor = 1.e-07;
    look_angle_start_20_ku:add_offset = 0.;
    look_angle_start_20_ku:comment = "look angle start";
        look_angle_start_20_ku:comment = "Value of Look Angle for
the first single look echo in the stack. It is the angle between: (a) nadir
direction from the satellite CoM to the surface, (b) direction satellite -
surface location. The look angle depends purely on geometry." ;
```

4.2.58 look_angle_stop_20_ku(time_20_ku)

```
int look_angle_stop_20_ku(time_20_ku);
    look_angle_stop_20_ku:units = "rad";
    look_angle_stop_20_ku:FillValue = -2147483648;
    look_angle_stop_20_ku:long_name = "data look angle stop";
    look_angle_stop_20_ku:add_offset = 0.;
    look_angle_stop_20_ku:scale_factor = 1.e-07;
    look_angle_stop_20_ku:comment = "data look angle stop";
    look_angle_stop_20_ku:comment = "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.";
```

4.2.59 mean_sea_surf_sea_ice_20_ku(time_20_ku)

```
int mean_sea_surf_sea_ice_20_ku(time_20_ku);
    mean_sea_surf_sea_ice_20_ku:units = "m";
    mean_sea_surf_sea_ice_20_ku:FillValue = -2147483648;
    mean_sea_surf_sea_ice_20_ku:long_name = "mean sea surface height above
reference ellipsoid";
    mean_sea_surf_sea_ice_20_ku:standard_name =
"sea_surface_height_above_reference_ellipsoid";
    mean_sea_surf_sea_ice_20_ku:source = "UCL13";
    mean_sea_surf_sea_ice_20_ku:institution = "UCL";
    mean_sea_surf_sea_ice_20_ku:scale_factor = 0.001;
    mean_sea_surf_sea_ice_20_ku:coordinates = "lon_20_ku lat_20_ku ";
    mean_sea_surf_sea_ice_20_ku:comment = "Mean sea-surface model,
referenced to the WGS84 ellipsoid. This model has been optimised for use in
computing the surface height anomaly of the polar oceans to derive sea-ice
freeboard. The model is a merge of the CLS2011 mean sea-surface and CryoSat
data from high latitudes.";
```


4.2.60 mod_dry_tropo_cor_01(time_cor_01)

```
int mod_dry_tropo_cor_01(time_cor_01);
    mod_dry_tropo_cor_01:units = "m";
    mod_dry_tropo_cor_01:FillValue = -2147483648;
    mod_dry_tropo_cor_01:long_name = "dry tropospheric correction";
    mod_dry_tropo_cor_01:standard_name =
"altimeter_range_correction_due_to_dry_troposphere";
    mod_dry_tropo_cor_01:scale_factor = 0.001;
    mod_dry_tropo_cor_01:coordinates = "lon_01 lat_01";
    mod_dry_tropo_cor_01:source = "European Center for Medium Range Weather
Forecasting";
    mod_dry_tropo_cor_01:institution = "ECMWF";
    mod_dry_tropo_cor_01:comment = "Model dry tropospheric correction. This
1-way correction is computed at the [time_cor_01] altimeter time-tag from the
interpolation of 2 meteorological fields that surround the altimeter time-tag.
This correction has been accounted for during the computation of height (see
[flag_height_20_ku] to determine if it was applied) in order to correct for the
propagation delay to the radar pulse, caused by the dry-gas component of the
Earth\'s atmosphere." ;
```

4.2.61 mod_wet_tropo_cor_01(time_cor_01)

```
int mod_wet_tropo_cor_01(time_cor_01);
    mod_wet_tropo_cor_01:units = "m";
    mod_wet_tropo_cor_01:FillValue = -2147483648;
    mod_wet_tropo_cor_01:long_name = "wet tropospheric correction";
    mod_wet_tropo_cor_01:standard_name =
"altimeter_range_correction_due_to_wet_troposphere";
    mod_wet_tropo_cor_01:scale_factor = 0.001;
    mod_wet_tropo_cor_01:coordinates = "lon_01 lat_01";
    mod_wet_tropo_cor_01:source = "European Center for Medium Range Weather
Forecasting";
    mod_wet_tropo_cor_01:institution = "ECMWF";
    mod_wet_tropo_cor_01:comment = "Wet Tropospheric Correction. This 1-way
correction is computed at the time_cor_01 altimeter time-tag from the
interpolation of 2 meteorological fields that surround the altimeter time-tag.
This correction has been accounted for during the computation of height (see
[flag_height_20_ku] to determine if it was applied) in order to correct for the
propagation delay to the radar pulse, caused by the H~2~O component of the
Earth\'s atmosphere.";
```


4.2.62 noise_power_20_ku(time_20_ku)

```
int noise_power_20_ku(time_20_ku);
    noise_power_20_ku:units = "dB";
    noise_power_20_ku:FillValue = -2147483648;
    noise_power_20_ku:long_name = "noise power measurement";
    noise_power_20_ku:scale_factor = 0.01;
    noise_power_20_ku:coordinates = "lon_20_ku lat_20_ku";
    noise_power_20_ku:comment = "Noise power measurement to be the noise
floor of measurement echoes. 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. This field is set to the default
value equal to -9999.99 when the telemetry contains zero. ";
```

4.2.63 ocean_tide_01(time_cor_01)

```
int ocean_tide_01(time_cor_01);
    ocean_tide_01:units = "m";
    ocean_tide_01:FillValue = -2147483648;
    ocean_tide_01:long_name = "elastic ocean tide height";
    ocean_tide_01:scale_factor = 0.001;
    ocean_tide_01:coordinates = "lon_01 lat_01";
    ocean_tide_01:source = "FES2004";
    ocean_tide_01:institution = "LEGOS/CNES";
    ocean_tide_01:comment = "Ocean tide. This 1-way correction has been
accounted for during the computation of height (see [flag_height_20_ku] to
determine if it was applied) to remove the effect of local tide and adjust the
measurement to the mean sea surface. This is the pure ocean tide, not including
the corresponding loading tide [load_tide_01] or the 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_sea_ice_01].";
```

4.2.64 ocean_tide_eq_01(time_cor_01)

```
int ocean_tide_eq_01(time_cor_01);
    ocean_tide_eq_01:units = "m";
    ocean_tide_eq_01:FillValue = -2147483648;
    ocean_tide_eq_01:long_name = "long-period ocean tide height";
    ocean_tide_eq_01:standard_name =
"sea_surface_height_amplitude_due_to_equilibrium_ocean_tide";
    ocean_tide_eq_01:scale_factor = 0.001;
    ocean_tide_eq_01:coordinates = "lon_01 lat_01";
    ocean_tide_eq_01:source = "FES2004";
    ocean_tide_eq_01:institution = "LEGOS/CNES";
    ocean_tide_eq_01:comment = "Equilibrium ocean tide. This 1-way
correction has been accounted for during the computation of height (see
[flag_height_20_ku] to determine if it was applied) to remove the effect of the
oceanic response to the single tidal forcing.";
```

4.2.65 odle_20_ku(time_20_ku)

```
int odle_20_ku (time_20_ku);
    odle_20_ku:units = "m";
    odle_20_ku:_FillValue = -2147483648;
    odle_20_ku:long_name = "ocean depth/land elevation";
    odle_20_ku:scale_factor = 0.001;
    odle_20_ku:coordinates = "lon_20_ku lat_20_ku";
    odle_20_ku:source = "MACCESS";
    odle_20_ku:institution = "ESA ESRIN";
    odle_20_ku:comment = "Ocean depth and land elevation model. The model
is a merge of ACE land elevation data and Smith and Sandwell ocean bathymetry.
See P. A. M. Berry, R. A. Pinnock, R. D. Hilton, and C. P. D. Johnson, ACE: a
new GDEM incorporating satellite altimeter derived heights, ESA Pub. SP-461,
9pp, 2000 and W. H. F Smith, and D. T. Sandwell, Global seafloor topography
from satellite altimetry and ship depth soundings, Science, v. 277, p. 1957-
1962, 26 Sept., 1997.";
```

4.2.66 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:units = "degrees";
off_nadir_pitch_angle_str_20_ku:long_name = "antenna bench pitch
angle";
    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";
    off_nadir_pitch_angle_str_20_ku:comment = "Pitch angle with respect to
the nadir pointing, measured by the STRs and post-processed by ground
facility.";
```

4.2.67 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:units = "degrees";
    off_nadir_roll_angle_str_20_ku:long_name = "antenna bench roll angle";
    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";
    off_nadir_roll_angle_str_20_ku:comment = "Roll angle with respect to
the nadir pointing, measured by the STRs and post-processed by ground
facility.";
```

4.2.68 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:units = "degrees";
off_nadir_yaw_angle_str_20_ku:long_name = "antenna bench yaw angle";
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";
off_nadir_yaw_angle_str_20_ku:comment = "Yaw angle with respect to the
nadir pointing, measured by the STRs and post-processed by ground facility";
int off_nadir_roll_angle_str_01(time_cor_01);
```

4.2.69 offset_attitude_20_ku(time_20_ku)

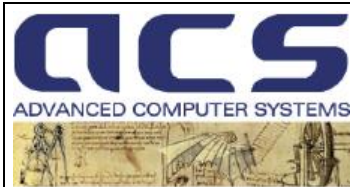
```
int offset_attitude_20_ku(time_20_ku);
offset_attitude_20_ku:units = "rad";
offset_attitude_20_ku:FillValue = -2147483648;
offset_attitude_20_ku:long_name = "20 Hz Ku band echo attitude";
offset_attitude_20_ku:scale_factor = 1.e-06;
offset_attitude_20_ku:coordinates = "lon_20_ku lat_20_ku ";
offset_attitude_20_ku:comment = "The attitude angle between the nadir
vector and the echo point vector. Unused in SAR and SARin modes.";
```

4.2.70 offset_azimuth_20_ku(time_20_ku)

```
int offset_azimuth_20_ku (time_20_ku);
offset_azimuth_20_ku:units = "rad";
offset_azimuth_20_ku:FillValue = -2147483648;
offset_azimuth_20_ku:long_name = "echo azimuth";
offset_azimuth_20_ku:scale_factor = 1.e-06;
offset_azimuth_20_ku:coordinates = "lon_20_ku lat_20_ku ";
offset_azimuth_20_ku:comment = "The azimuth angle between the north
vector and the echo point vector. Unused in SAR and SARin modes.";
```

4.2.71 orb_alt_rate_20_ku(time_20_ku)

```
int orb_alt_rate_20_ku (time_20_ku);
orb_alt_rate_20_ku:units = "m/s";
orb_alt_rate_20_ku:FillValue = -2147483648;
orb_alt_rate_20_ku:long_name = "CoM altitude rate with respect to the
reference ellipsoid ";
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 of the
satellite CoM with respect to the reference ellipsoid (WGS84).";
```



4.2.72 peakiness_20_ku(time_20_ku)

```
int peakiness_20_ku(time_20_ku);
    peakiness_20_ku: FillValue = -2147483648;
    peakiness_20_ku: long_name = "waveform peakiness ";
    peakiness_20_ku: scale_factor = 0.01;
    peakiness_20_ku: coordinates = "lon_20_ku lat_20_ku";
    peakiness_20_ku: comment = "Waveform peakiness. Note that this will
require different interpretation for SAR and SARin echoes which do not have the
typical pulse-limited echo shape. For LRM and SARin, the traditional ENVISAT
derivation is used. 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. For SAR mode, waveform bins with no power are
excluded from the average to account for the specular nature of some
waveforms.";
```

4.2.73 ph_slope_cor_20_ku(time_20_ku)

```
int ph_slope_cor_20_ku(time_20_ku);
    ph_slope_cor_20_ku: units = "rad";
    ph_slope_cor_20_ku: FillValue = -2147483648;
    ph_slope_cor_20_ku: long_name = "phase slope correction";
    ph_slope_cor_20_ku: scale_factor = 1.0e-6;
    ph_slope_cor_20_ku: coordinates = "lon_20_ku lat_20_ku";
    ph_slope_cor_20_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.";
```

4.2.74 pole_tide_01(time_cor_01)

```
int pole_tide_01(time_cor_01);
    pole_tide_01: units = "m";
    pole_tide_01: FillValue = -2147483648;
    pole_tide_01: long_name = "geocentric pole tide height";
    pole_tide_01: standard_name = "sea_surface_height_amplitude_due_to_pole_tide";
    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";
    pole_tide_01: comment = "Geocentric polar tide. This 1-way correction
has been accounted for during the computation of height (see
[flag_height_20_ku] to determine if it was applied) to remove a long-period
distortion of the Earth's crust. Although called a 'tide' this is in fact
caused by variations in centrifugal force as the Earth's rotational axis moves
its geographic location.";
```

4.2.75 range_1_20_ku(time_20_ku)

```
int range_1_20_ku(time_20_ku) ;
    range_1_20_ku:units = "m" ;
    range_1_20_ku: FillValue = -2147483648 ;
    range_1_20_ku:long_name = "range to surface (retracker 1)" ;
    range_1_20_ku:standard_name = "altimeter_range" ;
    range_1_20_ku:scale_factor = 0.001 ;
    range_1_20_ku:coordinates = "lon_poca_20_ku lat_poca_20_ku" ;
    range_1_20_ku:comment = "Measured range from the satellite CoM to the
surface at the coordinate location [lon_poca_20_ku] [lat_poca_20_ku]. All
instrumental [instr_cor_range_rx_20_ku] [uso_cor_applied_20_ku] corrections
applied. Contains the Ocean CFI retracker result in LRM mode, the UCL sea-ice
retracker results in SAR mode (different method for specular and diffuse
echoes), and the UCL margins retracker in SARin mode. Does not include
geophysical corrections." ;
```

4.2.76 range_2_20_ku(time_20_ku)

```
int range_2_20_ku(time_20_ku) ;
    range_2_20_ku: FillValue = -2147483648 ;
    range_2_20_ku:comment = "Measured range from the satellite CoM to the
surface at the coordinate location [lon_poca_20_ku] [lat_poca_20_ku]. All
instrumental [instr_cor_range_rx_20_ku] [uso_cor_applied_20_ku] corrections
applied. Not currently used in SAR and SARin modes. Contains the UCL land-ice
retracker in LRM mode. Does not include geophysical corrections. " ;
    range_2_20_ku:coordinates = "lon_poca_20_ku lat_poca_20_ku" ;
    range_2_20_ku:long_name = "range to surface (retracker 2)" ;
    range_2_20_ku:scale_factor = 0.001 ;
    range_2_20_ku:standard_name = "altimeter_range" ;
    range_2_20_ku:units = "m" ;
```

4.2.77 range_3_20_ku(time_20_ku)

```
int range_3_20_ku(time_20_ku) ;
    range_3_20_ku:units = "m" ;
    range_3_20_ku: FillValue = -2147483648 ;
    range_3_20_ku:long_name = "range to surface (retracker 3)" ;
    range_3_20_ku:standard_name = "altimeter_range" ;
    range_3_20_ku:scale_factor = 0.001 ;
    range_3_20_ku:coordinates = "lon_poca_20_ku lat_poca_20_ku" ;
    range_3_20_ku:comment = "Measured range from the satellite CoM to the
surface at the coordinate location [lon_poca_20_ku] [lat_poca_20_ku]. All
instrumental [instr_cor_range_rx_20_ku] [uso_cor_applied_20_ku] corrections
applied. Not currently used in SAR and SARin modes. Contains the OCOG retracker
in LRM mode. Does not include geophysical corrections. " ;
```

4.2.78 rec_count_20_ku(time_20_ku)

```
int rec_count_20_ku (time_20_ku);
    rec_count_20_ku:units = "count";
    rec_count_20_ku:long_name = "sample counter";
```



```
rec_count_20_ku:comment = "Record counter - progressive counter  
incremented by 1 for each record . Surface Sample counter for SAR/SARin L1B  
products. See [seq_count_20_ku] for LRM.";
```

4.2.79 retracker_1_cor_20_ku(time_20_ku)

```
int retracker_1_cor_20_ku(time_20_ku);  
retracker_1_cor_20_ku:units = "m";  
retracker_1_cor_20_ku:FillValue = -2147483648;  
retracker_1_cor_20_ku:long_name = "correction to range (retracker 1)";  
retracker_1_cor_20_ku:scale_factor = 0.001;  
retracker_1_cor_20_ku:coordinates = "lon_poca_20_ku lat_poca_20_ku";  
retracker_1_cor_20_ku:comment = "The correction to range computed by  
the retracker and used in the computation of height.";
```

4.2.80 retracker_1_quality_20_ku(time_20_ku)

```
int retracker_1_quality_20_ku(time_20_ku);  
retracker_1_quality_20_ku:FillValue = -2147483648;  
retracker_1_quality_20_ku:long_name = "quality metric (retracker 1)";  
retracker_1_quality_20_ku:coordinates = "lon_poca_20_ku  
lat_poca_20_ku";  
retracker_1_quality_20_ku:comment = "The quality metric (chi^2 of  
fitted model) computed by the Ocean CFI retracker in LRM mode, the UCL sea-ice  
retracker in SAR mode (over leads only) and the UCL margins retracker in SARin  
mode.";
```

4.2.81 retracker_2_cor_20_ku(time_20_ku)

```
int retracker_2_cor_20_ku(time_20_ku);  
retracker_2_cor_20_ku:units = "m";  
retracker_2_cor_20_ku:FillValue = -2147483648;  
retracker_2_cor_20_ku:long_name = "correction to range (retracker 2)";  
retracker_2_cor_20_ku:scale_factor = 0.001;  
retracker_2_cor_20_ku:coordinates = "lon_poca_20_ku lat_poca_20_ku";  
retracker_2_cor_20_ku:comment = "The correction to range computed by  
the retracker and used in the computation of height. Not currently used in SAR  
and SARin modes.";
```

4.2.82 retracker_2_quality_20_ku(time_20_ku)

```
int retracker_2_quality_20_ku(time_20_ku);  
retracker_2_quality_20_ku:FillValue = -2147483648;  
retracker_2_quality_20_ku:long_name = "quality metric (retracker 2)";  
retracker_2_quality_20_ku:coordinates = "lon_poca_20_ku  
lat_poca_20_ku";  
retracker_2_quality_20_ku:comment = "The quality metric (chi^2 of  
fitted model) computed by the UCL land-ice retracker in LRM mode. Unused in SAR  
and SARin modes.";
```

4.2.83 retracker_3_cor_20_ku(time_20_ku)

```
int retracker_3_cor_20_ku(time_20_ku);  
retracker_3_cor_20_ku:units = "m";  
retracker_3_cor_20_ku:FillValue = -2147483648;  
retracker_3_cor_20_ku:long_name = "correction to range (retracker 3)";
```

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```

retracker_3_cor_20_ku:scale_factor = 0.001;
retracker_3_cor_20_ku:coordinates = "lon_poca_20_ku lat_poca_20_ku";
retracker_3_cor_20_ku:comment = "The correction to range computed by
the retracker and used in the computation of height. Not currently used in SAR
and SARin modes.";

```

4.2.84 retracker_3_quality_20_ku(time_20_ku)

```

int retracker_3_quality_20_ku(time_20_ku);
retracker_3_quality_20_ku: FillValue = -2147483648;
retracker_3_quality_20_ku:long_name = "quality metric (retracker 3)";
retracker_3_quality_20_ku:coordinates = "lon_poca_20_ku
lat_poca_20_ku";
retracker_3_quality_20_ku:comment = "Unused in LRM, SAR, and SARin
modes.";

```

4.2.85 retracker_output_3_20_ku(time_20_ku)

```

int retracker_output_3_20_ku(time_20_ku);
retracker_output_3_20_ku: FillValue = -2147483648;
retracker_output_3_20_ku:long_name = "retracker output 3";
retracker_output_3_20_ku:coordinates = "lon_poca_20_ku lat_poca_20_ku";
retracker_output_3_20_ku:comment = "Amplitude fitted by retracker 1
[scaled Watts].";

```

4.2.86 retracker_output_4_20_ku (time_20_ku)

```

int retracker_output_4_20_ku(time_20_ku);
retracker_output_4_20_ku: FillValue = -2147483648;
retracker_output_4_20_ku:long_name = "retracker output 4";
retracker_output_4_20_ku:coordinates = "lon_poca_20_ku lat_poca_20_ku";
retracker_output_4_20_ku:comment = "The meaning and units of this field
vary by mode. LRM: retracker 1 leading edge width [milli-bins]. SAR: unused.
SARin: retracker 1 waveform width [milli-bins].";

```

4.2.87 retracker_output_5_20_ku(time_20_ku)

```

int retracker_output_5_20_ku(time_20_ku);
retracker_output_5_20_ku: FillValue = -2147483648;
retracker_output_5_20_ku:long_name = "retracker output 5";
retracker_output_5_20_ku:coordinates = "lon_poca_20_ku lat_poca_20_ku";
retracker_output_5_20_ku:comment = "Currently unused in any mode. ";

```




4.2.88 retracker_output_6_20_ku(time_20_ku)

```
int retracker_output_6_20_ku(time_20_ku);
    retracker_output_6_20_ku: FillValue = -2147483648;
    retracker_output_6_20_ku:long_name = "retracker output 6";
    retracker_output_6_20_ku:coordinates = "lon_poca_20_ku lat_poca_20_ku";
    retracker_output_6_20_ku:comment = "The meaning and units of this field
vary by mode. LRM: retracker 1 noise estimate [counts]. SAR: unused. SARin:
chi^2 of phase fit from retracker 1 [scaled 1e6].";
```

4.2.89 retracker_output_7_20_ku(time_20_ku)

```
int retracker_output_7_20_ku(time_20_ku);
    retracker_output_7_20_ku: FillValue = -2147483648;
    retracker_output_7_20_ku:long_name = "retracker output 7";
    retracker_output_7_20_ku:coordinates = "lon_poca_20_ku lat_poca_20_ku";
    retracker_output_7_20_ku:comment = "The meaning and units of this field
vary by mode. LRM: unused. SAR: retracker 1 fit parameter sigma for leads
[scaled 1e6]. SARin: phase from retracker 1 [micro-radians].";
```

4.2.90 retracker_output_8_20_ku(time_20_ku)

```
int retracker_output_8_20_ku(time_20_ku);
    retracker_output_8_20_ku: FillValue = -2147483648;
    retracker_output_8_20_ku:long_name = "retracker output 8";
    retracker_output_8_20_ku:coordinates = "lon_poca_20_ku lat_poca_20_ku";
    retracker_output_8_20_ku:comment = "The meaning and units of this field
vary by mode. LRM: unused. SAR: retracker 1 exponential fit parameter for leads
[scaled 1e6]. SARin: phase slope from tracker 1 [micro-radians/bin].";
```

4.2.91 retracker_output_9_20_ku(time_20_ku)

```
int retracker_output_9_20_ku(time_20_ku);
    retracker_output_9_20_ku: FillValue = -2147483648;
    retracker_output_9_20_ku:long_name = "retracker output 9";
    retracker_output_9_20_ku:coordinates = "lon_poca_20_ku lat_poca_20_ku";
    retracker_output_9_20_ku:comment = "The meaning and units of this field
vary by mode. LRM: unused. SAR: unused. SARin: leading edge slope from
retracker 1 [scaled 1e3].";
```

4.2.92 retracker_output_10_20_ku(time_20_ku)

```
int retracker_output_10_20_ku(time_20_ku);
    retracker_output_10_20_ku: FillValue = -2147483648;
    retracker_output_10_20_ku:long_name = "retracker output 10";
    retracker_output_10_20_ku:coordinates = "lon_poca_20_ku
lat_poca_20_ku";
    retracker_output_10_20_ku:comment = "OCOG position [milli-bins].";
```

4.2.93 retracker_output_11_20_ku(time_20_ku)

```
int retracker_output_11_20_ku(time_20_ku);
```


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```

retracker_output_11_20_ku: FillValue = -2147483648;
retracker_output_11_20_ku:long_name = "retracker output 11";
retracker_output_11_20_ku:coordinates = "lon_poca_20_ku
lat_poca_20_ku";
retracker_output_11_20_ku:comment = "OCOG amplitude [scaled Watts].";

```

4.2.94 retracker_output_12_20_ku(time_20_ku)

```

int retracker_output_12_20_ku(time_20_ku);
retracker_output_12_20_ku: FillValue = -2147483648;
retracker_output_12_20_ku:long_name = "retracker output 12";
retracker_output_12_20_ku:coordinates = "lon_poca_20_ku
lat_poca_20_ku";
retracker_output_12_20_ku:comment = "OCOG width [milli-bins].";

```

4.2.95 retracker_output_13_20_ku(time_20_ku)

```

int retracker_output_13_20_ku(time_20_ku);
retracker_output_13_20_ku: FillValue = -2147483648;
retracker_output_13_20_ku:long_name = "retracker output 13";
retracker_output_13_20_ku:coordinates = "lon_poca_20_ku
lat_poca_20_ku";
retracker_output_13_20_ku:comment = "Window delay converted to range
[mm].";

```

4.2.96 retracker_output_14_20_ku(time_20_ku)

```

int retracker_output_14_20_ku(time_20_ku);
retracker_output_14_20_ku: FillValue = -2147483648;
retracker_output_14_20_ku:long_name = "retracker output 14";
retracker_output_14_20_ku:coordinates = "lon_poca_20_ku
lat_poca_20_ku";
retracker_output_14_20_ku:comment = "The meaning and units of this
field vary by mode. LRM: unused. SAR: unused. SARin: Tail slope from retracker
1 [1e18W/bin^0.5].";

```

4.2.97 retracker_output_15_20_ku(time_20_ku)

```

int retracker_output_15_20_ku(time_20_ku);
retracker_output_15_20_ku: FillValue = -2147483648;
retracker_output_15_20_ku:long_name = "retracker output 15";
retracker_output_15_20_ku:coordinates = "lon_poca_20_ku
lat_poca_20_ku";
retracker_output_15_20_ku:comment = "The meaning and units of this
field vary by mode. LRM: unused. SAR: unused. SARin: Tail decay from retracker
1 [1e6/bin].";

```

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4.2.98 retracker_output_16_20_ku(time_20_ku)

```
int retracker_output_16_20_ku(time_20_ku);
    retracker_output_16_20_ku: FillValue = -2147483648;
    retracker_output_16_20_ku:long_name = "retracker output 16";
    retracker_output_16_20_ku:coordinates = "lon_poca_20_ku
lat_poca_20_ku";
    retracker_output_16_20_ku:comment = "Reserved for retracker 2.";
```

4.2.99 retracker_output_17_20_ku(time_20_ku)

```
int retracker_output_17_20_ku(time_20_ku);
    retracker_output_17_20_ku: FillValue = -2147483648;
    retracker_output_17_20_ku:long_name = "retracker output 17";
    retracker_output_17_20_ku:coordinates = "lon_poca_20_ku
lat_poca_20_ku";
    retracker_output_17_20_ku:comment = "Reserved for retracker 2.";
```

4.2.100 retracker_output_18_20_ku(time_20_ku)

```
int retracker_output_18_20_ku(time_20_ku);
    retracker_output_18_20_ku: FillValue = -2147483648;
    retracker_output_18_20_ku:long_name = "retracker output 18";
    retracker_output_18_20_ku:coordinates = "lon_poca_20_ku
lat_poca_20_ku";
    retracker_output_18_20_ku:comment = "Reserved for retracker 2.";
```

4.2.101 retracker_output_19_20_ku(time_20_ku)

```
int retracker_output_19_20_ku(time_20_ku);
    retracker_output_19_20_ku: FillValue = -2147483648;
    retracker_output_19_20_ku:long_name = "retracker output 19";
    retracker_output_19_20_ku:coordinates = "lon_poca_20_ku
lat_poca_20_ku";
    retracker_output_19_20_ku:comment = "Reserved for retracker 2.";
```

4.2.102 retracker_output_20_20_ku(time_20_ku)

```
int retracker_output_20_20_ku(time_20_ku);
    retracker_output_20_20_ku: FillValue = -2147483648;
    retracker_output_20_20_ku:long_name = "retracker output 20";
    retracker_output_20_20_ku:coordinates = "lon_poca_20_ku
lat_poca_20_ku";
    retracker_output_20_20_ku:comment = "The meaning and units of this
field vary by mode. LRM: OCOG amplitude [counts]. SAR: reserved for retracker
3. SARin: reserved for retracker 3.";
```

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4.2.103 retracker_output_21_20_ku(time_20_ku)

```
int retracker_output_21_20_ku(time_20_ku);
    retracker_output_21_20_ku: FillValue = -2147483648;
    retracker_output_21_20_ku:long_name = "retracker output 21";
    retracker_output_21_20_ku:coordinates = "lon_poca_20_ku
lat_poca_20_ku";
    retracker_output_21_20_ku:comment = "The meaning and units of this
field vary by mode. LRM: 25% OCOG range correction [mm]. SAR: reserved for
retracker 3. SARin: reserved for retracker 3.";
```

4.2.104 retracker_output_22_20_ku(time_20_ku)

```
int retracker_output_22_20_ku(time_20_ku);
    retracker_output_22_20_ku: FillValue = -2147483648;
    retracker_output_22_20_ku:long_name = "retracker output 22";
    retracker_output_22_20_ku:coordinates = "lon_poca_20_ku
lat_poca_20_ku";
    retracker_output_22_20_ku:comment = "Reserved for retracker 3.";
```

4.2.105 retracker_output_23_20_ku(time_20_ku)

```
int retracker_output_23_20_ku(time_20_ku);
    retracker_output_23_20_ku: FillValue = -2147483648;
    retracker_output_23_20_ku:long_name = "retracker output 23";
    retracker_output_23_20_ku:coordinates = "lon_poca_20_ku
lat_poca_20_ku";
    retracker_output_23_20_ku:comment = "Reserved for retracker 3.";
```

4.2.106 sarin_output_1_20_ku(time_20_ku)

```
int sarin_output_1_20_ku(time_20_ku);
    sarin_output_1_20_ku: FillValue = -2147483648;
    sarin_output_1_20_ku:long_name = "sarin discriminator output 1";
    sarin_output_1_20_ku:coordinates = "lon_poca_20_ku lat_poca_20_ku ";
    sarin_output_1_20_ku:comment = "Total power in waveform. Unused in LRM
and SAR modes.";
```

4.2.107 sarin_output_2_20_ku(time_20_ku)

```
int sarin_output_2_20_ku (time_20_ku);
    sarin_output_2_20_ku: FillValue = -2147483648;
    sarin_output_2_20_ku:long_name = "sarin discriminator output 2";
    sarin_output_2_20_ku:coordinates = "lon_poca_20_ku lat_poca_20_ku ";
    sarin_output_2_20_ku:comment = "Maximum power in waveform. Unused in
LRM and SAR modes.";
```

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4.2.108 sarin_output_3_20_ku(time_20_ku)

```
int sarin_output_3_20_ku (time_20_ku);
    sarin_output_3_20_ku: FillValue = -2147483648;
    sarin_output_3_20_ku:long_name = "sarin discriminator output 3";
    sarin_output_3_20_ku:coordinates = "lon_poca_20_ku lat_poca_20_ku ";
    sarin_output_3_20_ku:comment = "Mean power of waveform. Unused in LRM
and SAR modes.";
```

4.2.109 sarin_output_4_20_ku(time_20_ku)

```
int sarin_output_4_20_ku (time_20_ku);
    sarin_output_4_20_ku: FillValue = -2147483648;
    sarin_output_4_20_ku:long_name = "sarin discriminator output 4";
    sarin_output_4_20_ku:coordinates = "lon_poca_20_ku lat_poca_20_ku ";
    sarin_output_4_20_ku:comment = "Bin of maximum power. Unused in LRM and
SAR modes.";
```

4.2.110 sarin_output_5_20_ku(time_20_ku)

```
int sarin_output_5_20_ku (time_20_ku);
    sarin_output_5_20_ku: FillValue = -2147483648;
    sarin_output_5_20_ku:long_name = "sarin discriminator output 5";
    sarin_output_5_20_ku:coordinates = "lon_poca_20_ku lat_poca_20_ku ";
    sarin_output_5_20_ku:comment = "Bin of half maximum power. Unused in
LRM and SAR modes.";
```

4.2.111 sarin_output_6_20_ku(time_20_ku)

```
int sarin_output_6_20_ku (time_20_ku);
    sarin_output_6_20_ku: FillValue = -2147483648;
    sarin_output_6_20_ku:long_name = "sarin discriminator output 6";
    sarin_output_6_20_ku:coordinates = "lon_poca_20_ku lat_poca_20_ku ";
    sarin_output_6_20_ku:comment = "Maximum coherence. Unused in LRM and
SAR modes.";
```

4.2.112 sarin_output_7_20_ku(time_20_ku)

```
int sarin_output_7_20_ku (time_20_ku);
    sarin_output_7_20_ku: FillValue = -2147483648;
    sarin_output_7_20_ku:long_name = "sarin discriminator output 7";
    sarin_output_7_20_ku:coordinates = "lon_poca_20_ku lat_poca_20_ku ";
    sarin_output_7_20_ku:comment = "Bin of maximum coherence. Unused in LRM
and SAR modes.";
```

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4.2.113 sarin_output_8_20_ku(time_20_ku)

```
int sarin_output_8_20_ku (time_20_ku);
    sarin_output_8_20_ku: FillValue = -2147483648;
    sarin_output_8_20_ku:long_name = "sarin discriminator output 8";
    sarin_output_8_20_ku:coordinates = "lon_poca_20_ku lat_poca_20_ku ";
    sarin_output_8_20_ku:comment = "First power bin. Unused in LRM and SAR
modes.";
```

4.2.114 sarin_output_9_20_ku(time_20_ku)

```
int sarin_output_9_20_ku (time_20_ku);
    sarin_output_9_20_ku: FillValue = -2147483648;
    sarin_output_9_20_ku:long_name = "sarin discriminator output 9";
    sarin_output_9_20_ku:coordinates = "lon_poca_20_ku lat_poca_20_ku ";
    sarin_output_9_20_ku:comment = "Last power bin. Unused in LRM and SAR
modes.";
```

4.2.115 sarin_output_10_20_ku(time_20_ku)

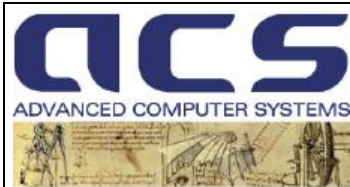
```
int sarin_output_10_20_ku (time_20_ku);
    sarin_output_10_20_ku: FillValue = -2147483648;
    sarin_output_10_20_ku:long_name = "sarin discriminator output 10";
    sarin_output_10_20_ku:coordinates = "lon_poca_20_ku lat_poca_20_ku ";
    sarin_output_10_20_ku:scale_factor = 0.01 ;
    sarin_output_10_20_ku:comment = "Sea-ice peakiness value. Unused in LRM and
SAR modes." ;
```

4.2.116 sat_vel_vec_20_ku(time_20_ku,space_3d)

```
int sat_vel_vec_20_ku (time_20_ku,space_3d);
    sat_vel_vec_20_ku:units = "m/s";
    sat_vel_vec_20_ku: FillValue = -2147483648;
    sat_vel_vec_20_ku:long_name = "satellite velocity vector in itrfr ";
    sat_vel_vec_20_ku:scale_factor = 0.001;
    sat_vel_vec_20_ku:coordinates = "lon_20_ku lat_20_ku ";
    sat_vel_vec_20_ku:comment = "Satellite velocity vector, described in
the International Terrestrial Reference Frame in the International Earth Fixed
System. This is not a unit vector as the velocity magnitude is also required.
The 3 components are given according to the'space_3d' dimension: [1] x, [2] y,
[3] z.";
```

4.2.117 sea_ice_concentration_20_ku(time_20_ku)

```
int sea_ice_concentration_20_ku (time_20_ku);
    sea_ice_concentration_20_ku:units = "percent";
    sea_ice_concentration_20_ku: FillValue = -2147483648;
    sea_ice_concentration_20_ku:long_name = "sea ice area fraction";
    sea_ice_concentration_20_ku:standard_name = "sea_ice_area_fraction";
    sea_ice_concentration_20_ku:source = "UCL";
    sea_ice_concentration_20_ku:institution = "UCL";
    sea_ice_concentration_20_ku:scale_factor = 0.1;
    sea_ice_concentration_20_ku:coordinates = "lon_20_ku lat_20_ku";
```



```
sea_ice_concentration_20_ku:comment = "Sea ice concentration derived  
from NSIDC SSM/I data. Unused in LRM mode.";
```

4.2.118 sea_state_bias_20_ku(time_20_ku)

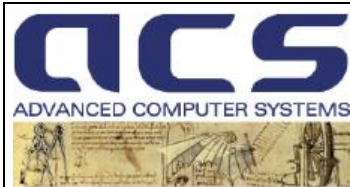
```
short sea_state_bias_20_ku(time_20_ku);  
sea_state_bias_20_ku:units = "m";  
sea_state_bias_20_ku:FillValue = -32768s;  
sea_state_bias_20_ku:long_name = "sea state bias correction";  
sea_state_bias_20_ku:standard_name =  
"sea_surface_height_bias_due_to_sea_surface_roughness";  
sea_state_bias_20_ku:source = "Labroue2007";  
sea_state_bias_20_ku:institution = "CLS/ESA ";  
sea_state_bias_20_ku:scale_factor = 0.001;  
sea_state_bias_20_ku:coordinates = "lon_20_ku lat_20_ku";  
sea_state_bias_20_ku:comment = "This sea-state bias has been corrected  
for (if indicated by [flag_cor_applied_20_ku]) in the height estimates over  
open-ocean in LRM mode. Not used in SAR/SARin modes.";
```

4.2.119 seq_count_20_ku(time_20_ku)

```
short seq_count_20_ku(time_20_ku);  
seq_count_20_ku:units = "count";  
seq_count_20_ku:long_name = "source sequence counter";  
seq_count_20_ku:add_offset = 0;  
seq_count_20_ku:scale_factor = 1;  
seq_count_20_ku:comment = "Source Sequence Counter read from the L0  
echo telemetry packet (LRM only). See [rec_count_20_ku] for SAR/SARin.";
```

4.2.120 sig0_1_20_ku(time_20_ku)

```
int sig0_1_20_ku(time_20_ku);  
sig0_1_20_ku:units = "dB";  
sig0_1_20_ku:FillValue = -2147483648;  
sig0_1_20_ku:long_name = "backscatter coefficient (retracker 1)";  
sig0_1_20_ku:standard_name =  
"surface_backwards_scattering_coefficient_of_radar_wave";  
sig0_1_20_ku:scale_factor = 0.01;  
sig0_1_20_ku:coordinates = "lon_poca_20_ku lat_poca_20_ku ";  
sig0_1_20_ku:comment = "The measured backscatter from the surface,  
corrected for instrument effects [instr_cor_gain_rx_20_ku], and including a  
system bias that calibrates the results against previous missions. The  
backscatter is computed from the amplitude of the waveform in Watts, as  
measured by the Ocean CFI retracker in LRM mode. The measured power is used  
to solve the radar equation to recover the value for backscatter. For SAR and  
SARin mode, the power waveform is first convolved with a function to produce an  
LRM-like waveform, that is then retracked with OCOG to produce the amplitude  
estimate.";
```



4.2.121 sig0_2_20_ku(time_20_ku)

```
int sig0_2_20_ku (time_20_ku);
    sig0_2_20_ku:units = "dB";
    sig0_2_20_ku:FillValue = -2147483648;
    sig0_2_20_ku:long_name = "backscatter coefficient (retracker 2)";
    sig0_2_20_ku:standard_name =
"surface_backwards_scattering_coefficient_of_radar_wave";
    sig0_2_20_ku:scale_factor = 0.01;
    sig0_2_20_ku:coordinates = "lon_poca_20_ku lat_poca_20_ku";
    sig0_2_20_ku:comment = "The measured backscatter from the surface,
corrected for instrument effects [instr_cor_gain_rx_20_ku], and including a
system bias that calibrates the results against previous missions. The
backscatter is computed from the amplitude of the waveform in Watts, as
measured by the UCL land-ice retracker. The measured power is used to solve the
radar equation to recover the value for backscatter. Not currently used in SAR
and SARin modes.";
```

4.2.122 sig0_3_20_ku(time_20_ku)

```
int sig0_3_20_ku (time_20_ku);
    sig0_3_20_ku:units = "dB";
    sig0_3_20_ku:FillValue = -2147483648;
    sig0_3_20_ku:long_name = "backscatter coefficient (retracker 3)";
    sig0_3_20_ku:standard_name =
"surface_backwards_scattering_coefficient_of_radar_wave";
    sig0_3_20_ku:scale_factor = 0.01;
    sig0_3_20_ku:coordinates = "lon_poca_20_ku lat_poca_20_ku ";
    sig0_3_20_ku:comment = "The measured backscatter from the surface,
corrected for instrument effects [instr_cor_gain_rx_20_ku], and including a
system bias that calibrates the results against previous missions. The
backscatter is computed from the amplitude of the waveform in Watts, as
measured by the OCOG retracker. The measured power is used to solve the radar
equation to recover the value for backscatter. Not currently used in SAR and
SARin modes.";
```

4.2.123 slope_dop_cor_20_ku(time_20_ku)

```
short slope_dop_cor_20_ku (time_20_ku);
    slope_dop_cor_20_ku:units = "m";
    slope_dop_cor_20_ku:FillValue = -32768s;
    slope_dop_cor_20_ku:long_name = "Slope Doppler correction to altimeter
range";
    slope_dop_cor_20_ku:scale_factor = 0.001;
    slope_dop_cor_20_ku:coordinates = "lon_20_ku lat_20_ku ";
    slope_dop_cor_20_ku:comment = "This value has replaced the use of
dop_cor_20 in the range used to compute the height values. This is done to
correct for the effect of sloping terrain. Unused in SAR and SARin modes.";
```


4.2.124 snow_density_20_ku(time_20_ku)

```
int snow_density_20_ku (time_20_ku);
    snow_density_20_ku:units = "kg/m^3";
    snow_density_20_ku: FillValue = -2147483648;
    snow_density_20_ku:long_name = "snow density";
    snow_density_20_ku:standard_name = "snow_density";
    snow_density_20_ku:source = "UCL";
    snow_density_20_ku:institution = "UCL";
    snow_density_20_ku:scale_factor = 1.0;
    snow_density_20_ku:coordinates = "lon_20_ku lat_20_ku ";
    snow_density_20_ku:comment = "Snow density. Currently set to a fixed
average value for all records. The intention is to replace this with a model in
future. Unused in LRM mode.";
```

4.2.125 snow_depth_20_ku(time_20_ku)

```
int snow_depth_20_ku (time_20_ku);
    snow_depth_20_ku:units = "m";
    snow_depth_20_ku: FillValue = -2147483648;
    snow_depth_20_ku:long_name = "snow depth";
    snow_depth_20_ku:standard_name = "surface_snow_thickness";
    snow_depth_20_ku:source = "Warren";
    snow_depth_20_ku:institution = "UCL";
    snow_depth_20_ku:scale_factor = 0.001;
    snow_depth_20_ku:coordinates = "lon_20_ku lat_20_ku";
    snow_depth_20_ku:comment = " Snow depth from Modified Warren
climatology. Unused in LRM mode. S. G. Warren, I. G. Rigor, and N.
Untersteiner, Snow depth on Arctic sea ice., 1999. ";
```

4.2.126 snow_depth_cor_20_ku(time_20_ku)

```
int snow_depth_cor_20_ku(time_20_ku) ;
    snow_depth_cor_20_ku: FillValue = -2147483648 ;
    snow_depth_cor_20_ku:comment = "Snow depth correction. This one-way
correction corrects for the propagation delay caused by snow present on top of
sea ice. To apply, add to range or subtract from height or freeboard. The
correction in m is directly proportional to snow depth (-0.25 x
snow_depth_20_ku)." ;;
    snow_depth_cor_20_ku:coordinates = "lon_20_ku lat_20_ku" ;
    snow_depth_cor_20_ku:long_name = "snow depth correction" ;
    snow_depth_cor_20_ku:scale_factor = 0.001 ;
    snow_depth_cor_20_ku:units = "m" ;
```

4.2.127 solid_earth_tide_01(time_cor_01)

```
int solid_earth_tide_01(time_cor_01);
    solid_earth_tide_01:units = "m";
    solid_earth_tide_01: FillValue = -2147483648;
    solid_earth_tide_01:long_name = "solid earth tide height";
    solid_earth_tide_01:standard_name = "sea_surface_height_amplitude_due_to_earth_tide";
    solid_earth_tide_01:scale_factor = 0.001;
    solid_earth_tide_01:coordinates = "lon_01 lat_01";
```


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```

solid_earth_tide_01:source = "Cartwright and Edden [1973] Corrected
tables of tidal harmonics - J. Geophys. J. R. Astr. Soc., 33, 253-264.";
solid_earth_tide_01:comment = "Solid earth tide. This 1-way correction
has been accounted for during the computation of height (see
[flag_height_20_ku] to determine if it was applied) to remove the effect of
local tidal distortion to the Earth's crust, in particular by the sun and
moon.";

```

4.2.128 space_3d(space_3d)

```

short space_3d(space_3d);
space_3d:units = "count";
space_3d:long_name = "space dimension";
space_3d:comment = "Set to be compliant with the CF convention. Counts
0..2.";

```

4.2.129 ssha_20_ku(time_20_ku)

```

int ssha_20_ku(time_20_ku);
ssha_20_ku:units = "m";
ssha_20_ku:FillValue = -2147483648;
ssha_20_ku:long_name = "sea-surface height anomaly";
ssha_20_ku:scale_factor = 0.001;
ssha_20_ku:coordinates = "lon_20_ku lat_20_ku ";
ssha_20_ku:comment = "Sea-surface height anomaly. Computed as
[ssha_20_ku] = [height_1_20_ku] - [mean_sea_surf_sea_ice_20_ku].Unused in LRM
mode." ;

```

4.2.130 ssha_interp_20_ku(time_20_ku)

```

int ssha_interp_20_ku(time_20_ku);
ssha_interp_20_ku:units = "m";
ssha_interp_20_ku:FillValue = -2147483648;
ssha_interp_20_ku:long_name = "interpolated sea-surface height
anomaly";
ssha_interp_20_ku:scale_factor = 0.001;
ssha_interp_20_ku:coordinates = "lon_20_ku lat_20_ku ";
ssha_interp_20_ku:comment = "Sea-surface height anomaly computed using
sea-surface height anomaly [ssha_20_ku] interpolated to the current location.
Unused in LRM mode.";

```

4.2.131 ssha_interp_numval_back_20_ku(time_20_ku)

```

int ssha_interp_numval_back_20_ku (time_20_ku);
ssha_interp_numval_back_20_ku:units = "count";
ssha_interp_numval_back_20_ku:FillValue = -2147483648;
ssha_interp_numval_back_20_ku:long_name = "number of backward SSHA
interpolation points";
ssha_interp_numval_back_20_ku:coordinates = "lon_20_ku lat_20_ku ";
ssha_interp_numval_back_20_ku:comment = "Number of backward (behind
nadir) SSHA points used in the interpolation of SSHA at this location. Unused
in LRM mode.";

```

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4.2.132 ssha_interp_numval_fwd_20_ku(time_20_ku)

```
int ssha_interp_numval_fwd_20_ku (time_20_ku);
    ssha_interp_numval_fwd_20_ku:units = "count";
    ssha_interp_numval_fwd_20_ku: FillValue = -2147483648;
    ssha_interp_numval_fwd_20_ku:long_name = "number of forward SSHA
interpolation points";
    ssha_interp_numval_fwd_20_ku:coordinates = "lon_20_ku lat_20_ku ";
    ssha_interp_numval_fwd_20_ku:comment = "Number of forward (ahead of
nadir)SSHA points used in the interpolation of SSHA at this location. Unused in
LRM mode.";
```

4.2.133 ssha_interp_rms_20_ku(time_20_ku)

```
int ssha_interp_rms_20_ku (time_20_ku);
    ssha_interp_rms_20_ku:units = "m";
    ssha_interp_rms_20_ku: FillValue = -2147483648;
    ssha_interp_rms_20_ku:long_name = "ssha interpolation error";
    ssha_interp_rms_20_ku:scale_factor = 0.001;
    ssha_interp_rms_20_ku:coordinates = "lon_20_ku lat_20_ku ";
    ssha_interp_rms_20_ku:comment = "Estimated error in
[ssha_interp_20_ku]. Unused in LRM mode.";
```

4.2.134 ssha_interp_time_back_20_ku(time_20_ku)

```
int ssha_interp_time_back_20_ku (time_20_ku);
    ssha_interp_time_back_20_ku:units = "s";
    ssha_interp_time_back_20_ku: FillValue = -2147483648;
    ssha_interp_time_back_20_ku:long_name = "backward timespan of SSHA
interpolation points";
    ssha_interp_time_back_20_ku:scale_factor = 0.001;
    ssha_interp_time_back_20_ku:coordinates = "lon_20_ku lat_20_ku ";
    ssha_interp_time_back_20_ku:comment = "Delta in time between this
record and the most backward (smallest time) SSHA point used in the
interpolation of SSHA at this location. Unused in LRM mode.";
```

4.2.135 ssha_interp_time_fwd_20_ku(time_20_ku)

```
int ssha_interp_time_fwd_20_ku (time_20_ku);
    ssha_interp_time_fwd_20_ku:units = "s";
    ssha_interp_time_fwd_20_ku: FillValue = -2147483648;
    ssha_interp_time_fwd_20_ku:long_name = "forward timespan of SSHA
interpolation points";
    ssha_interp_time_fwd_20_ku:scale_factor = 0.001;
    ssha_interp_time_fwd_20_ku:coordinates = "lon_20_ku lat_20_ku ";
    ssha_interp_time_fwd_20_ku:comment = "Delta in time between this record
and the most forward (largest time) SSHA point used in the interpolation of
SSHA at this location. Unused at LRM mode.";
```

4.2.136 stack_centre_20_ku(time_20_ku)

```
short stack_centre_20_ku(time_20_ku);
    stack_centre_20_ku:units = "count";
    stack_centre_20_ku:FillValue = -32768s;
    stack_centre_20_ku:long_name = "gaussian power fitting: center wrt beam
number";
    stack_centre_20_ku:scale_factor = 0.01;
    stack_centre_20_ku:add_offset = 0.;
    stack_centre_20_ku:comment = "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.";
```

4.2.137 stack_centre_angle_20_ku(time_20_ku)

```
short stack_centre_angle_20_ku(time_20_ku);
    stack_centre_angle_20_ku:units = "rad";
    stack_centre_angle_20_ku:FillValue = -32768s;
    stack_centre_angle_20_ku:long_name = "gaussian power fitting: center
wrt boresight angle number";
    stack_centre_angle_20_ku:scale_factor = 1.e-06;
    stack_centre_angle_20_ku:add_offset = 0.;
    stack_centre_angle_20_ku:comment = "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)";
```

4.2.138 stack_centre_look_angle_20_ku(time_20_ku)

```
short stack_centre_look_angle_20_ku(time_20_ku) ;
    stack_centre_look_angle_20_ku:FillValue = -32768s ;
    stack_centre_look_angle_20_ku:add_offset = 0. ;
    stack_centre_look_angle_20_ku:comment = "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 look angle, that is the angle between: (a)
nadir direction from the satellite CoM to the surface, (b) direction satellite
- surface location. Read \'Pitch Estimation for CryoSat by Analysis of Stacks
of Single-Look Echoes\' - M. Scagliola, M. Fornari and N. Tagliani - IEEE
Geoscience and Remote Sensing Letters, vol. 12, no. 7, pp. 1561-1565, July
2015. doi: 10.1109/LGRS.2015.2413135" ;
    stack_centre_look_angle_20_ku:long_name = "gaussian power fitting:
center wrt look angle" ;
    stack_centre_look_angle_20_ku:scale_factor = 1.e-06 ;
    stack_centre_look_angle_20_ku:units = "rad" ;
```

4.2.139 stack_gaussian_fitting_residuals_20_ku (time_20_ku)

```
short stack_gaussian_fitting_residuals_20_ku(time_20_ku) ;
    stack_gaussian_fitting_residuals_20_ku:FillValue = -32768s ;
    stack_gaussian_fitting_residuals_20_ku:add_offset = 0. ;
```

```

stack_gaussian_fitting_residuals_20_ku:comment = "Residuals of Gaussian
that fits the range integrated power of the single look echoes within a stack.
It is the root mean squared error between the Gaussian fitting and the range
integrated power of the single look echoes within a stack." ;
stack_gaussian_fitting_residuals_20_ku:long_name = "gaussian power
fitting: residuals fitting" ;
stack_gaussian_fitting_residuals_20_ku:scale_factor = 0.01 ;
stack_gaussian_fitting_residuals_20_ku:units = "dbW" ;

```

4.2.140 stack_kurtosis_20_ku(time_20_ku)

```

short stack_kurtosis_20_ku(time_20_ku);
stack_kurtosis_20_ku:units = "count";
stack_kurtosis_20_ku:FillValue = -999s;
stack_kurtosis_20_ku:long_name = "gaussian power fitting: kurtosis wrt
beam number";
stack_kurtosis_20_ku:scale_factor = 0.01;
stack_kurtosis_20_ku:add_offset = 0.;
stack_kurtosis_20_ku:comment = "4th central moment computed on the
range integrated power of the single look echoes within a stack. Kurtosis as
function of stack beam number.";

```

4.2.141 stack_number_after_weighting_20_ku(time_20_ku)

```

short stack_number_after_weighting_20_ku(time_20_ku);
stack_number_after_weighting_20_ku:units = "count";
stack_number_after_weighting_20_ku:FillValue = -32768s;
stack_number_after_weighting_20_ku:long_name = "number of contributing
beams in the stack after weighting";
stack_number_after_weighting_20_ku:add_offset = 0s;
stack_number_after_weighting_20_ku:scale_factor = 1s;
stack_number_after_weighting_20_ku:comment = "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." ;

```

4.2.142 stack_number_before_weighting_20_ku(time_20_ku)

```

short stack_number_before_weighting_20_ku(time_20_ku);
stack_number_before_weighting_20_ku:units = "count";
stack_number_before_weighting_20_ku:FillValue = -32768s;
stack_number_before_weighting_20_ku:long_name = "number of contributing
beams in the stack before weighting";
stack_number_before_weighting_20_ku:add_offset = 0s;
stack_number_before_weighting_20_ku:scale_factor = 1s;
stack_number_before_weighting_20_ku:comment = "number of contributing
beams in the stack before weighting: number of single look echoes in the stack
before that the Surface Sample Stack weighting is applied." ;

```

4.2.143 stack_peakiness_20_ku(time_20_ku)

```

short stack_peakiness_20_ku(time_20_ku) ;
stack_peakiness_20_ku:FillValue = -32768s ;
stack_peakiness_20_ku:add_offset = 0. ;
stack_peakiness_20_ku:comment = "Peakiness of the range integrated
power of the single look echoes within a stack." ;
stack_peakiness_20_ku:long_name = "gaussian power fitting: peakiness
wrt beam number" ;

```

```
stack_peakiness_20_ku:scale_factor = 0.01 ;  
stack_peakiness_20_ku:units = "count" ;
```

4.2.144 stack_scaled_amplitude_20_ku(time_20_ku)

```
short stack_scaled_amplitude_20_ku(time_20_ku);  
stack_scaled_amplitude_20_ku:units = "dB";  
stack_scaled_amplitude_20_ku:FillValue = -32768s;  
stack_scaled_amplitude_20_ku:long_name = "gaussian power fitting:  
amplitude";  
stack_scaled_amplitude_20_ku:scale_factor = 0.01;  
stack_scaled_amplitude_20_ku:add_offset = 0.;  
stack_scaled_amplitude_20_ku:comment = "Amplitude of Gaussian that fits  
the range integrated power of the single look echoes within a stack.";
```

4.2.145 stack_skewness_20_ku(time_20_ku)

```
short stack_skewness_20_ku(time_20_ku);  
stack_skewness_20_ku:units = "count";  
stack_skewness_20_ku:FillValue = -999s;  
stack_skewness_20_ku:long_name = "gaussian power fitting: skewness wrt  
beam number";  
stack_skewness_20_ku:scale_factor = 0.01;  
stack_skewness_20_ku:add_offset = 0.;  
stack_skewness_20_ku:comment = "3rd central moment computed on the  
range integrated power of the single look echoes within a stack.Skewness as  
function of stack beam number.";
```

4.2.146 stack_std_20_ku(time_20_ku)

```
short stack_std_20_ku(time_20_ku);  
stack_std_20_ku:units = "count";  
stack_std_20_ku:FillValue = -32768s;  
stack_std_20_ku:long_name = "Gaussian power fitting: std wrt beam  
number";  
stack_std_20_ku:scale_factor = 0.01;  
stack_std_20_ku:add_offset = 0.;  
stack_std_20_ku:comment = "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.";
```

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4.2.147 stack_std_angle_20_ku(time_20_ku)

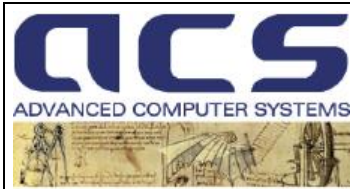
```
short stack_std_angle_20_ku(time_20_ku);
    stack_std_angle_20_ku:units = "rad";
    stack_std_angle_20_ku:FillValue = -32768s;
    stack_std_angle_20_ku:long_name = "gaussian power fitting: std wrt
boresight angle";
    stack_std_angle_20_ku:scale_factor = 1.e-06;
    stack_std_angle_20_ku:add_offset = 0.;
    stack_std_angle_20_ku:comment = "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 pointing angle depends on geometry and attitude (roll and
pitch)";
```

4.2.148 surf_type_20_ku(time_20_ku)

```
byte surf_type_20_ku(time_20_ku) ;
    surf_type_20_ku:FillValue = -128b ;
    surf_type_20_ku:comment = "A surface type mask for the surface type at
the nadir location. 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. NOAA National Geophysical Data Center, Boulder,
Colorado." ;
    surf_type_20_ku:coordinates = "lon_20_ku lat_20_ku" ;
    surf_type_20_ku:flag_meanings = "ocean lake enclosed_sea ice land" ;
    surf_type_20_ku:flag_values = 0b, 1b, 2b, 3b ;
    surf_type_20_ku:institution = "NOAA National Geophysical Data Center,
Boulder, Colorado." ;
    surf_type_20_ku:long_name = "surface type from mask" ;
    surf_type_20_ku:source = "TERRAINBASE 1.0" ;
```

4.2.149 swh_ocean_20_ku(time_20_ku)

```
short swh_ocean_20_ku(time_20_ku);
    swh_ocean_20_ku:units = "m";
    swh_ocean_20_ku:FillValue = -32768s;
    swh_ocean_20_ku:long_name = "significant waveheight";
    swh_ocean_20_ku:standard_name = "sea_surface_wave_significant_height";
    swh_ocean_20_ku:scale_factor = 0.001;
    swh_ocean_20_ku:coordinates = "lon_20_ku lat_20_ku";
    swh_ocean_20_ku:comment = "Computed directly from sigma c as computed
by the Ocean CFI retracker in LRM mode only. No bias correction to cross-
calibrate with previous missions applied. Not currently used in SAR and SARin
modes.";
```



4.2.150 time_20_ku(time_20_ku)

```
double time_20_ku(time_20_ku);
    time_20_ku:units = "seconds since 2000-01-01 00:00:00.0";
    time_20_ku:long_name = "TAI time (sec. since 2000-01-01)";
    time_20_ku:standard_name = "time";
    time_20_ku:calendar = "gregorian";
    time_20_ku:comment = "TAI time counted in seconds since 2000-01-01
00:00:00.";
```

4.2.151 time_cor_01(time_cor_01)

```
double time_cor_01(time_cor_01);
    time_cor_01:units = "seconds since 2000-01-01 00:00:00.0";
    time_cor_01:long_name = "TAI time (sec. since 2000-01-01)";
    time_cor_01:standard_name = "time";
    time_cor_01:calendar = "gregorian";
    time_cor_01:comment = "TAI time counted in seconds since 2000-01-01
00:00:00. Time refers to the instant which the corrections are referred to. ";
```

4.2.152 uso_cor_20_ku(time_20_ku)

```
int uso_cor_20_ku (time_20_ku);
    uso_cor_20_ku:_FillValue = -2147483648;
    uso_cor_20_ku:units = "seconds";
    uso_cor_20_ku:long_name = "uso correction (2-way)";
    uso_cor_20_ku:add_offset = 0;
    uso_cor_20_ku:scale_factor = 1.e-12 ;          uso_cor_20_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. ";
```

4.2.153 uso_cor_applied_20_ku(time_20_ku)

```
int uso_cor_applied_20_ku(time_20_ku) ;
    uso_cor_applied_20_ku:_FillValue = -2147483648 ;
    uso_cor_applied_20_ku:comment = "USO correction to range as applied in
the L1 processing. This value is included in the range and height estimates.
This value is [uso_cor_20_ku] converted from 2-way time to 1-way range." ;
    uso_cor_applied_20_ku:long_name = "uso correction (1-way range)" ;
    uso_cor_applied_20_ku:scale_factor = 0.001 ;
    uso_cor_applied_20_ku:units = "m" ;
```


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4.2.154 wind_speed_alt_20_ku(time_20_ku)

```

short wind_speed_alt_20_ku(time_20_ku);
  wind_speed_alt_20_ku:units = "m/s";
  wind_speed_alt_20_ku:FillValue = -32768;
  wind_speed_alt_20_ku:long_name = "altimeter wind speed";
  wind_speed_alt_20_ku:standard_name = "wind_speed";
  wind_speed_alt_20_ku:scale_factor = 0.01;
  wind_speed_alt_20_ku:coordinates = "lon_20_ku lat_20_ku";
  wind_speed_alt_20_ku:comment = "Computed directly from backscatter via
a CFI call using the Chelton model for ENVISAT. No bias correction to cross-
calibrate with previous missions applied. Not currently used in SAR and SARin
modes.";

```


5 FLAG MEANING TABLES

5.1 FLAG MEANING TABLES L2

5.1.1 flag_cor_applied_20_ku

ID	Flag Name	Flag Mask	Description	Setting
1.	correction_failure	1	Master Failure Flag (one or more corrections not applied)	0 = no, 1 = yes
2.	ssb_applied	2	Sea State Bias Applied	0 = no, 1 = yes
3.	sarin_bad_velocity	4	SARIn Bad Velocity Flag	0 = no, 1 = yes
4.	sarin_out_of_range	8	SARIn Out of Range Flag	0 = no, 1 = yes
5.	sarin_bad_baseline	16	SARIn Baseline Error Flag	0 = no, 1 = yes
6.	lrm_slope_model_invalid	32	LRM Slope Model Data Valid (flag indicates whether the slope model data is valid for this location. The flag is only set if the location is covered by a slope model and the slope model data is not flagged as bad.	0 = no, 1 = yes
7.	sarin_ice_bias_applied	64	SARIn Ice Bias Applied	0 = no, 1 = yes
8.	sarin_ocean_bias_applied	128	SARIn Ocean Bias Applied	0 = no, 1 = yes
9.	sar_ice_bias_applied	256	SAR Ice Bias Applied	0 = no, 1 = yes
10.	sar_ocean_bias_applied	512	SAR Ocean Bias Applied	0 = no, 1 = yes
11.	lrm_ice_bias_applied	1024	LRM Ice Bias Applied	0 = no, 1 = yes
12.	lrm_ocean_bias_applied	2048	LRM Ocean Bias Applied	0 = no, 1 = yes
13.	lrm_retracker_applied	4096	LRM Retracker Applied	0 = no, 1 = yes
14.	sarin_retracker_applied	8192	SARIn Retracker Applied	0 = no, 1 = yes
15.	sar_retracker_applied	16384	SAR Retracker Applied	0 = no, 1 = yes
16.	window_offset_applied	32768	Mode-specific Window Offset Correction Applied	0 = no, 1 = yes
17.	slope_doppler_applied	65536	Slope Doppler Correction Applied	0 = no, 1 = yes
18.	pole_tide_applied	131072	Geocentric Polar Tide Correction Applied	0 = no, 1 = yes
19.	solid_earth_applied	262144	Solid Earth Tide Correction Applied	0 = no, 1 = yes
20.	load_tide_applied	524288	Ocean Loading Tide Correction	0 = no, 1 = yes

			Applied	
21.	ocean_tide_equil_applied	1048576	Equilibrium Ocean Tide Correction Applied	0 = no, 1 = yes
22.	ocean_tide_applied	2097152	Ocean Tide Correction Applied	0 = no, 1 = yes
23.	iono_model_applied	4194304	Model Ionospheric Correction Applied	0 = no, 1 = yes
24.	iono_gim_applied	8388608	GIM Ionospheric Correction Applied	0 = no, 1 = yes
25.	hf_fluctuations_applied	16777216	High Frequency Variability Dynamic Atmospheric Correction Applied	0 = no, 1 = yes
26.	inv_bar_applied	33554432	Inverse Barometric Correction Applied	0 = no, 1 = yes
27.	model_wet_applied	67108864	Wet Tropospheric Correction Applied	0 = no, 1 = yes
28.	model_dry_applied	134217728	Dry Tropospheric Correction Applied	0 = no, 1 = yes
29.	doppler_applied	268435456	Doppler Correction Applied	0 = no, 1 = yes
30.	internal_cal_applied	536870912	Internal Calibration Correction Applied	0 = no, 1 = yes

5.1.2 flag_cor_err_01

ID	Flag Name	Flag Mask	Description	Setting
1.	surface_type_error	1	Surface Type Flag Error	0 = OK, 1 = error
2.	pole_tide_error	2	Geocentric Polar Tide Error	0 = OK, 1 = error
3.	solid_earth_error	4	Solid Earth Tide Error	0 = OK, 1 = error
4.	load_tide_error	8	Ocean Loading Tide Error	0 = OK, 1 = error
5.	ocean_tide_equil_error	16	Equilibrium Ocean Tide Error	0 = OK, 1 = error
6.	ocean_tide_error	32	Ocean Tide Error	0 = OK, 1 = error
7.	iono_model_error	64	Model Ionospheric Correction Error	0 = OK, 1 = error
8.	iono_gim_error	128	GIM Ionospheric Correction Error	0 = OK, 1 = error
9.	hf_fluctuations_error	256	High Frequency Variability Dynamic Atmospheric Correction Error	0 = OK, 1 = error
10.	inv_bar_error	512	Inverse Barometric Correction Error	0 = OK, 1 = error
11.	model_wet_error	1024	Wet Tropospheric Correction Error	0 = OK, 1 = error
12.	model_dry_error	2048	Dry Tropospheric Correction Error	0 = OK, 1 = error
13.	ssb_model_error	4096	Sea State Bias Model Error	0 = OK, 1 = error

14.	slope_model_error	8192	Slope Model Error	0 = OK, 1 = error
15.	dem_error	16384	DEM Model Error	0 = OK, 1 = error
16.	odle_error	32768	ODLE Model Error	0 = OK, 1 = error
17.	geoid_error	65536	Geoid Model Error	0 = OK, 1 = error
18.	mss_error	131072	MSS Model Error	0 = OK, 1 = error
19.	snow_density_error	262144	Snow Density Error	0 = OK, 1 = error
20.	snow_depth_error	524288	Snow Depth Error	0 = OK, 1 = error
21.	ice_conc_error	1048576	Ice Concentration Error	0 = OK, 1 = error
22.	swh_error	2097152	SWH Error	0 = OK, 1 = error
23.	wind_error	4194304	Wind Model Error	0 = OK, 1 = error

5.1.3 flag_instr_conf_rx_str_in_use_01

ID	Flag Name	Description	Setting
1.	no_star_tracker	No Star Tracker data used	0
2.	tracker_1	Data from Star Tracker 1 used	1
3.	tracker_2	Data from Star Tracker 2 used	2
4.	tracker_3	Data from Star Tracker 3 used	3
5.	attref_file	Data from the Star Tracker selected on board by AOCS used	4

5.1.4 flag_instr_mode_op_20_ku

ID	Flag Name	Setting
1.	lrm	1
2.	sar	2
3.	sarin	3

5.1.5 flag_mcd_20_ku

ID	Flag Name	Flag Mask	Description	Setting
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1.	block_degraded	- 2147483648	Block Degraded. Set if the block is degraded and should not be processed	0 = OK 1 = Degraded
2.	blank_block	1073741824	Blank Block. Set if a blank block has been inserted for record padding	0 = OK 1 = Blank Block
3.	datation_degraded	536870912	Datation Degraded. Set if the datation is degraded.	0 = OK 1 = Datation degraded
4.	orbit_prop_error	268435456	Orbit Propagation Error. Set if an error has been returned by the CFI or independent check.	0 = OK 1 = Error
5.	orbit_file_change	134217728	Orbit File Change. Set if the orbit file has changed with respect to the previous record.	0 = OK 1 = Orbit file change
6.	orbit_gap	67108864	Orbit Discontinuity. Set if there is a discontinuity/ gap in the orbit coverage.	0 = OK 1 = Orbit gap
7.	echo_saturated	33554432	Echo Saturation. From the echo saturation flag from the telemetry.	0 = OK 1 = Saturated
8.	other_echo_error	16777216	Other Echo Error. Set if either the tracking echo, echo Rx1 error or echo Rx2 error bits are set to 1.	0 = OK 1 = Echo Error
9.	sarin_rx1_error	8388608	SARIn Receive Chain 1 (Rx1) Error. Set if the Rx1 chain is degraded or missing.	0 = OK 1 = Degraded/ missing
10.	sarin_rx2_error	4194304	SARIn Receive Chain 2 (Rx2) Error. Set if the Rx2 chain is degraded or missing.	0 = OK 1 = Degraded/ missing
11.	window_delay_error	2097152	Window Delay Error. Set if the window delay value is out of range or if there is a computation error	0 = OK (value in range) 1 = value out of range
12.	agc_error	1048576	AGC Error. Set if the AGC value is out of range or if there is a computation error.	0 = OK (value in range) 1 = value out of range
13.	cal1_missing	524288	CAL1 Correction Missing. Set if the CAL1 correction has not been applied.	0 = correction applied 1 = correction not applied
14.	cal1_default	262144	CAL1 from Default. Set if the CAL1 correction has been taken from the IPFDB (default) instead of the CAL1 product (preferred).	0 = correction from CAL1 product 1 = correction from IPFDB
15.	doris_uso_missing	131072	DORIS USO Correction Missing. Set if the DORIS USO correction factor is not available.	0 = USO Correction available 1 = USO Correction not available
16.	ccal1_default	65536	CCAL1 from Default. Set if the Complex	0 = correction from

			CAL1 correction has been taken from the IPFDB (default) instead of the CCAL1 product (preferred).	CCAL1 product 1 = correction from IPFDB
17.	trk_echo_error	32768	Tracking Echo Error. Set if the tracking echo is degraded.	0 = OK 1 = degraded/ empty tracking echo
18.	echo_rx1_error	16384	Receive Chain 1 (Rx1) Error. Set if the Rx1 chain raw echo is degraded or missing.	0 = OK 1 = degraded/ empty raw echo
19.	echo_rx2_error	8192	Receive Chain 1 (Rx2) Error. Set if the Rx2 chain raw echo is degraded or missing.	0 = OK 1 = degraded/ empty raw echo
20.	npm_error	4096	Noise Power Measurement Error. Set if the NPM is degraded, out of range, or there is a computation error.	0 = OK 1 = value out of range
21.	azimuth_cal_missing	2048	Azimuth Calibration Missing. Set if the azimuth calibration is missing.	0 = OK 1 = missing
22.	phase_pert_cor_missing	128	Phase Perturbation Correction Missing. Set of the phase perturbation correction has not been applied.	0 = applied 1 = not applied
23.	cal2_missing	64	CAL2 Correction Missing. Set if the CAL2 correction has not been applied.	0 = correction applied 1 = correction not applied
24.	cal2_default	32	CAL2 from Default. Set if the CAL2 correction has been taken from the IPFDB (default) instead of the CAL2 product (preferred).	0 = correction from CAL2 product 1 = correction from IPF DB
25.	power_scale_error	16	Power Scaling Error. Set if there is an error in the power scaling of the echo (L1B waveform is null). Only used in L1B LRM.	0 = OK 1 = Error
26.	attitude_cor_missing	8	Attitude Correction Missing. Set if the attitude correction has not been applied.	0 = correction applied 1 = correction not applied
27.	phase_pert_cor_default	1	Phase Perturbation Correction from Default. Set if the phase perturbation correction has been taken from the IPFDB (default) instead of the Complex CAL1 (preferred). Only applicable to SARIn.	0 = correction from CCAL1 1 = correction from IPFDB

5.1.6 flag_ocean_quality_01_ku

ID	Flag Name	Flag Mask	Setting
1.	record_0_ok	1	0 = ok, 1 = nok



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ID	Flag Name	Flag Mask	Setting
2.	record_1_ok	2	0 = ok, 1 = nok
3.	record_2_ok	4	0 = ok, 1 = nok
4.	record_3_ok	8	0 = ok, 1 = nok
5.	record_4_ok	16	0 = ok, 1 = nok
6.	record_5_ok	32	0 = ok, 1 = nok
7.	record_6_ok	64	0 = ok, 1 = nok
8.	record_7_ok	128	0 = ok, 1 = nok
9.	record_8_ok	256	0 = ok, 1 = nok
10.	record_9_ok	512	0 = ok, 1 = nok
11.	record_10_ok	1024	0 = ok, 1 = nok
12.	record_11_ok	2048	0 = ok, 1 = nok
13.	record_12_ok	4096	0 = ok, 1 = nok
14.	record_13_ok	8192	0 = ok, 1 = nok
15.	record_14_ok	16384	0 = ok, 1 = nok
16.	record_15_ok	32768	0 = ok, 1 = nok
17.	record_16_ok	65536	0 = ok, 1 = nok
18.	record_17_ok	131072	0 = ok, 1 = nok
19.	record_18_ok	262144	0 = ok, 1 = nok
20.	record_19_ok	524288	0 = ok, 1 = nok

5.1.7 flag_prod_status_20_ku

ID	Flag Name	Flag Mask	Description	Setting
1.	calibration_warning	1	Calibration Warning.	0 = ok, 1 = nok
2.	sarin_bad_velocity	2	SARIn Bad Velocity.	0 = ok, 1 = nok
3.	sarin_out_of_range	4	SARIn Out of Range.	0 = ok, 1 = nok
4.	sarin_bad_baseline	8	SARIn Bad Baseline.	0 = ok, 1 = nok
5.	lrm_slope_model_invalid	16	LRM Slope Model Invalid	0 = ok, 1 = nok
6.	delta_time_error	32	Delta Time Error.	0 = ok, 1 = nok

ID	Flag Name	Flag Mask	Description	Setting
7.	mispointing_error	64	Mispointing Error.	0 = ok, 1 = nok
8.	surface_model_unavailable	128	Surface Model Unavailable.	0 = ok, 1 = nok
9.	sarin_side_redundant	256	SARIn Redundancy.	0 = ok, 1 = nok
10.	sarin_rx_2_error	512	SARIn Receive Chain 2 (Rx2) Error.	0 = ok, 1 = nok
11.	sarin_rx_1_error	1024	SARIn Receive Chain 1 (Rx1) Error.	0 = ok, 1 = nok
12.	sarin_height_ambiguous	2048	SARIn Ambiguity Error.	0 = ok, 1 = nok
13.	surf_type_class_undefined	4096	Surface Type: Undefined.	0 = ok, 1 = nok
14.	surf_type_class_sea_ice	8192	Surface Type: Sea Ice.	0 = ok, 1 = nok
15.	surf_type_class_lead	16384	Surface Type: Lead.	0 = ok, 1 = nok
16.	surf_type_class_ocean	32768	Surface Type: Ocean.	0 = ok, 1 = nok
17.	freeboard_error	65536	Freeboard Error.	0 = ok, 1 = nok
18.	peakiness_error	131072	Peakiness Error.	0 = ok, 1 = nok
19.	ssha_interp_error	262144	SSHA Interpolation Error.	0 = ok, 1 = nok
20.	sig0_3_error	524288	Sigma0 Error Retracker 3.	0 = ok, 1 = nok
21.	sig0_2_error	1048576	Sigma0 Error Retracker 2.	0 = ok, 1 = nok
22.	sig0_1_error	2097152	Sigma0 Error Retracker 1.	0 = ok, 1 = nok
23.	height_3_error	4194304	Height Error Retracker 3.	0 = ok, 1 = nok
24.	height_2_error	8388608	Height Error Retracker 2.	0 = ok, 1 = nok
25.	height_1_error	16777216	Height Error Retracker 1.	0 = ok, 1 = nok
26.	orbit_discontinuity	33554432	Orbit Discontinuity.	0 = ok, 1 = nok
27.	orbit_error	67108864	Orbit Error.	0 = ok, 1 = nok
28.	block_degraded	134217728	Block Degraded.	0 = ok, 1 = nok
29.	height_sea_ice_error	268435456	Sea Ice Height Error.	0 = ok, 1 = nok

5.1.8 flag_range_ocean_01_ku

ID	Flag Name	Flag Mask	Setting
1.	record_0_ok	1	0 = ok, 1 = nok
2.	record_1_ok	2	0 = ok, 1 = nok
3.	record_2_ok	4	0 = ok, 1 = nok
4.	record_3_ok	8	0 = ok, 1 = nok

ID	Flag Name	Flag Mask	Setting
5.	record_4_ok	16	0 = ok, 1 = nok
6.	record_5_ok	32	0 = ok, 1 = nok
7.	record_6_ok	64	0 = ok, 1 = nok
8.	record_7_ok	128	0 = ok, 1 = nok
9.	record_8_ok	256	0 = ok, 1 = nok
10.	record_9_ok	512	0 = ok, 1 = nok
11.	record_10_ok	1024	0 = ok, 1 = nok
12.	record_11_ok	2048	0 = ok, 1 = nok
13.	record_12_ok	4096	0 = ok, 1 = nok
14.	record_13_ok	8192	0 = ok, 1 = nok
15.	record_14_ok	16384	0 = ok, 1 = nok
16.	record_15_ok	32768	0 = ok, 1 = nok
17.	record_16_ok	65536	0 = ok, 1 = nok
18.	record_17_ok	131072	0 = ok, 1 = nok
19.	record_18_ok	262144	0 = ok, 1 = nok
20.	record_19_ok	524288	0 = ok, 1 = nok
21.	regression_fail	1048576	0 = ok, 1 = nok

5.1.9 flag_sig0_ocean_01_ku

ID	Flag Name	Flag Mask	Setting
1.	record_0_ok	1	0 = ok, 1 = nok
2.	record_1_ok	2	0 = ok, 1 = nok
3.	record_2_ok	4	0 = ok, 1 = nok
4.	record_3_ok	8	0 = ok, 1 = nok
5.	record_4_ok	16	0 = ok, 1 = nok
6.	record_5_ok	32	0 = ok, 1 = nok
7.	record_6_ok	64	0 = ok, 1 = nok
8.	record_7_ok	128	0 = ok, 1 = nok
9.	record_8_ok	256	0 = ok, 1 = nok

ID	Flag Name	Flag Mask	Setting
10.	record_9_ok	512	0 = ok, 1 = nok
11.	record_10_ok	1024	0 = ok, 1 = nok
12.	record_11_ok	2048	0 = ok, 1 = nok
13.	record_12_ok	4096	0 = ok, 1 = nok
14.	record_13_ok	8192	0 = ok, 1 = nok
15.	record_14_ok	16384	0 = ok, 1 = nok
16.	record_15_ok	32768	0 = ok, 1 = nok
17.	record_16_ok	65536	0 = ok, 1 = nok
18.	record_17_ok	131072	0 = ok, 1 = nok
19.	record_18_ok	262144	0 = ok, 1 = nok
20.	record_19_ok	524288	0 = ok, 1 = nok
21.	regression_fail	1048576	0 = ok, 1 = nok

5.1.10 flag_sig0_ocog_01_ku

ID	Flag Name	Flag Mask	Setting
1.	record_0_ok	1	0 = ok, 1 = nok
2.	record_1_ok	2	0 = ok, 1 = nok
3.	record_2_ok	4	0 = ok, 1 = nok
4.	record_3_ok	8	0 = ok, 1 = nok
5.	record_4_ok	16	0 = ok, 1 = nok
6.	record_5_ok	32	0 = ok, 1 = nok
7.	record_6_ok	64	0 = ok, 1 = nok
8.	record_7_ok	128	0 = ok, 1 = nok
9.	record_8_ok	256	0 = ok, 1 = nok
10.	record_9_ok	512	0 = ok, 1 = nok
11.	record_10_ok	1024	0 = ok, 1 = nok
12.	record_11_ok	2048	0 = ok, 1 = nok
13.	record_12_ok	4096	0 = ok, 1 = nok
14.	record_13_ok	8192	0 = ok, 1 = nok
15.	record_14_ok	16384	0 = ok, 1 = nok

ID	Flag Name	Flag Mask	Setting
16.	record_15_ok	32768	0 = ok, 1 = nok
17.	record_16_ok	65536	0 = ok, 1 = nok
18.	record_17_ok	131072	0 = ok, 1 = nok
19.	record_18_ok	262144	0 = ok, 1 = nok
20.	record_19_ok	524288	0 = ok, 1 = nok
21.	regression_fail	1048576	0 = ok, 1 = nok

5.1.11 flag_surf_type_01

ID	Flag Name	Description	Setting
1.	ocean	open oceans or semi-enclosed seas	0
2.	lake_enclosed_sea	enclosed seas or lakes	1
3.	ice	continental ice	2
4.	land	land	3

5.1.12 flag_swh_ocean_01_ku

ID	Flag Name	Flag Mask	Setting
1.	record_0_ok	1	0 = ok, 1 = nok
2.	record_1_ok	2	0 = ok, 1 = nok
3.	record_2_ok	4	0 = ok, 1 = nok
4.	record_3_ok	8	0 = ok, 1 = nok
5.	record_4_ok	16	0 = ok, 1 = nok
6.	record_5_ok	32	0 = ok, 1 = nok
7.	record_6_ok	64	0 = ok, 1 = nok
8.	record_7_ok	128	0 = ok, 1 = nok
9.	record_8_ok	256	0 = ok, 1 = nok
10.	record_9_ok	512	0 = ok, 1 = nok
11.	record_10_ok	1024	0 = ok, 1 = nok
12.	record_11_ok	2048	0 = ok, 1 = nok
13.	record_12_ok	4096	0 = ok, 1 = nok

ID	Flag Name	Flag Mask	Setting
14.	record_13_ok	8192	0 = ok, 1 = nok
15.	record_14_ok	16384	0 = ok, 1 = nok
16.	record_15_ok	32768	0 = ok, 1 = nok
17.	record_16_ok	65536	0 = ok, 1 = nok
18.	record_17_ok	131072	0 = ok, 1 = nok
19.	record_18_ok	262144	0 = ok, 1 = nok
20.	record_19_ok	524288	0 = ok, 1 = nok
21.	regression_fail	1048576	0 = ok, 1 = nok

5.2 FLAG MEANING TABLES L2I

5.2.1 flag_cor_err_20_ku

ID	Flag Name	Flag Mask	Description	Setting
1.	surface_type_error	1	Surface Type Flag Error	0 = OK, 1 = error
2.	pole_tide_error	2	Geocentric Polar Tide Error	0 = OK, 1 = error
3.	solid_earth_error	4	Solid Earth Tide Error	0 = OK, 1 = error
4.	load_tide_error	8	Ocean Loading Tide Error	0 = OK, 1 = error
5.	ocean_tide_equil_error	16	Equilibrium Ocean Tide Error	0 = OK, 1 = error
6.	ocean_tide_error	32	Ocean Tide Error	0 = OK, 1 = error
7.	iono_model_error	64	Model Ionospheric Correction Error	0 = OK, 1 = error
8.	iono_gim_error	128	GIM Ionospheric Correction Error	0 = OK, 1 = error
9.	hf_fluctuations_error	256	High Frequency Variability Dynamic Atmospheric Correction Error	0 = OK, 1 = error
10.	inv_bar_error	512	Inverse Barometric Correction Error	0 = OK, 1 = error
11.	model_wet_error	1024	Wet Tropospheric Correction Error	0 = OK, 1 = error
12.	model_dry_error	2048	Dry Tropospheric Correction Error	0 = OK, 1 = error
13.	ssb_model_error	4096	Sea State Bias Model Error	0 = OK, 1 = error
14.	slope_model_error	8192	Slope Model Error	0 = OK, 1 = error
15.	dem_error	16384	DEM Model Error	0 = OK, 1 = error
16.	odle_error	32768	ODLE Model Error	0 = OK, 1 = error

17.	geoid_error	65536	Geoid Model Error	0 = OK, 1 = error
18.	mss_error	131072	MSS Model Error	0 = OK, 1 = error
19.	snow_density_error	262144	Snow Density Error	0 = OK, 1 = error
20.	snow_depth_error	524288	Snow Depth Error	0 = OK, 1 = error
21.	ice_conc_error	1048576	Ice Concentration Error	0 = OK, 1 = error
22.	ice_type_error	2097152	Ice Type Error	0 = OK, 1 = error
23.	swh_error wind_error	2097152	SWH Error	0 = OK, 1 = error

5.2.2 flag_cor_status_20_ku

ID	Flag Name	Flag Mask	Description	Setting
1.	surface_type_called	1	Surface Type Flag Error	0 = no, 1 = yes
2.	pole_tide_called	2	Geocentric Polar Tide Error	0 = no, 1 = yes
3.	solid_earth_called	4	Solid Earth Tide Error	0 = no, 1 = yes
4.	load_tide_called	8	Ocean Loading Tide Error	0 = no, 1 = yes
5.	ocean_tide_equil_called	16	Equilibrium Ocean Tide Error	0 = no, 1 = yes
6.	ocean_tide_called	32	Ocean Tide Error	0 = no, 1 = yes
7.	iono_model_called	64	Model Ionospheric Correction Error	0 = no, 1 = yes
8.	iono_gim_called	128	GIM Ionospheric Correction Error	0 = no, 1 = yes
9.	hf_fluctuations_called	256	High Frequency Variability Dynamic Atmospheric Correction Error	0 = no, 1 = yes
10.	inv_bar_called	512	Inverse Barometric Correction Error	0 = no, 1 = yes
11.	model_wet_called	1024	Wet Tropospheric Correction Error	0 = no, 1 = yes
12.	model_dry_called	2048	Dry Tropospheric Correction Error	0 = no, 1 = yes
13.	ssb_model_called	4096	Sea State Bias Model Error	0 = no, 1 = yes
14.	slope_model_called	8192	Slope Model Error	0 = no, 1 = yes
15.	dem_called	16384	DEM Model Error	0 = no, 1 = yes
16.	odle_called	32768	ODLE Model Error	0 = no, 1 = yes
17.	geoid_called	65536	Geoid Model Error	0 = no, 1 = yes
18.	mss_called	131072	MSS Model Error	0 = no, 1 = yes
19.	snow_density_called	262144	Snow Density Error	0 = no, 1 = yes

20.	snow_depth_called	524288	Snow Depth Error	0 = no, 1 = yes
21.	ice_conc_called	1048576	Ice Concentration Error	0 = no, 1 = yes
22.	ice_type_called	2097152	Ice Type Error	0 = no, 1 = yes

5.2.3 flag_disc_stat_20_ku

ID	Flag Name	Flag Mask	Description	Setting
1.	multiple_match	1	Multiple match flag.	0 = no, 1 = yes
2.	no_match	2	No match flag.	0 = no, 1 = yes
3.	sar_wf_too_wide	4	SAR waveform is too wide.	0 = no, 1 = yes
4.	sar_snr_low	8	SAR signal to noise ratio is too low.	0 = no, 1 = yes
5.	sar_unreliable_ice_conc	16	SAR ice concentration is unreliable.	0 = no, 1 = yes
6.	sar_unavailable_ice_conc	32	SAR ice concentration is unavailable.	0 = no, 1 = yes
7.	sar_bad_bb	64	SAR abnormal beam behaviour parameters.	0 = no, 1 = yes
8.	sar_low_power	128	SAR low or zero power flag.	0 = no, 1 = yes
9.	sar_low_pk	256	SAR low peakiness flag.	0 = no, 1 = yes
10.	sar_high_pk	512	SAR high peakiness flag.	0 = no, 1 = yes
11.	sin_high_pk	1024	SAR high peakiness flag.	0 = no, 1 = yes
12.	sin_low_power	2048	SIN low power flag.	0 = no, 1 = yes
13.	sin_low_pk	4096	SARIn low peakiness flag.	0 = no, 1 = yes
14.	sin_high_noise	8192	SARIn high noise flag.	0 = no, 1 = yes
15.	sin_bad_le	16384	SARIn bad leading edge flag.	0 = no, 1 = yes
16.	sin_low_var	32768	SARIn low variance flag.	0 = no, 1 = yes
17.	discrimination_fail	65536	Overall Discrimination Failure.	0 = no, 1 = yes

5.2.4 flag_freeboard_20_ku

ID	Flag Name	Flag Mask	Setting
1.	in_south	1	0 = no, 1 = yes
2.	in_north	2	0 = no, 1 = yes
3.	unreliable	4	0 = no, 1 = yes

		<p style="text-align: right;"><i>Instrument Processing Facility L2</i> <i>Cryosat Ice netCDF L2 PFS</i></p> <p>Doc. No.: C2-RS-ACS-ESL-5265 Issue: 2.1draft Date: 14/07/2021 Page: 142</p>
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4.	unavailable	8	0 = no, 1 = yes
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5.2.5 flag_height_20_ku

ID	Flag Name	Flag Mask	Description	Setting
1.	correction_failure	1	Master Failure Flag (one or more corrections not applied)	0 = no, 1 = yes
2.	ssb_applied	2	Sea State Bias Applied	0 = no, 1 = yes
3.	sarin_bad_velocit	4	SARIn Bad Velocity Flag	0 = no, 1 = yes
4.	sarin_out_of_range	8	SARIn Out of Range Flag	0 = no, 1 = yes
5.	sarin_bad_baseline	16	SARIn Baseline Error Flag	0 = no, 1 = yes
6.	lrm_slope_model_invalid	32	LRM Slope Model Data Valid (flag indicates whether the slope model data is valid for this location. The flag is only set if the location is covered by a slope model and the slope model data is not flagged as bad.	0 = no, 1 = yes
7.	sarin_ice_bias_applied	64	SARIn Ice Bias Applied	0 = no, 1 = yes
8.	sarin_ocean_bias_applied	128	SARIn Ocean Bias Applied	0 = no, 1 = yes
9.	sar_ice_bias_applied	256	SAR Ice Bias Applied	0 = no, 1 = yes
10.	sar_ocean_bias_applied	512	SAR Ocean Bias Applied	0 = no, 1 = yes
11.	lrm_ice_bias_applied	1024	LRM Ice Bias Applied	0 = no, 1 = yes
12.	lrm_ocean_bias_applied	2048	LRM Ocean Bias Applied	0 = no, 1 = yes
13.	lrm_retracker_applied	4096	LRM Retracker Applied	0 = no, 1 = yes
14.	sarin_retracker_applied	8192	SARIn Retracker Applied	0 = no, 1 = yes
15.	sar_retracker_applied	16384	SAR Retracker Applied	0 = no, 1 = yes
16.	window_offset_applied	32768	Mode-specific Window Offset Correction Applied	0 = no, 1 = yes
17.	slope_doppler_applied	65536	Slope Doppler Correction Applied	0 = no, 1 = yes
18.	pole_tide_applied	131072	Geocentric Polar Tide Correction Applied	0 = no, 1 = yes
19.	solid_earth_applied	262144	Solid Earth Tide Correction Applied	0 = no, 1 = yes
20.	load_tide_applied	524288	Ocean Loading Tide Correction Applied	0 = no, 1 = yes
21.	ocean_tide_equil_applied	1048576	Equilibrium Ocean Tide Correction Applied	0 = no, 1 = yes
22.	ocean_tide_applied	2097152	Ocean Tide Correction Applied	0 = no, 1 = yes

23.	iono_model_applied	4194304	Model Ionospheric Correction Applied	0 = no, 1 = yes
24.	iono_gim_applied	8388608	GIM Ionospheric Correction Applied	0 = no, 1 = yes
25.	hf_fluctuations_applied	16777216	High Frequency Variability Dynamic Atmospheric Correction Applied	0 = no, 1 = yes
26.	inv_bar_applied	33554432	Inverse Barometric Correction Applied	0 = no, 1 = yes
27.	model_wet_applied	67108864	Wet Tropospheric Correction Applied	0 = no, 1 = yes
28.	model_dry_applied	134217728	Dry Tropospheric Correction Applied	0 = no, 1 = yes
29.	doppler_applied	268435456	Doppler Correction Applied	0 = no, 1 = yes
30.	internal_cal_applied	536870912	Internal Calibration Correction Applied	0 = no, 1 = yes

5.2.6 flag_instr_conf_rx_bwdt_20_ku

ID	Flag Name	Setting
1.	Unknown	0
2.	320_MHz	1
3.	40_MHz	2

5.2.7 flag_instr_conf_rx_flags_20

ID	Flag Name	Flag Mask	Description	Setting
1.	siral_redundant	-128b	SIRAL Redundancy.	0=no, 1=yes
2.	external_cal	64b	External Calibration.	0=no, 1=yes
3.	open_loop	32b	Loop Status	0=closed loop, 1=open loop
4.	loss_of_echo	16b	Loss of Echo.	0=no, 1=yes
5.	real_time_error	8b	Real-Time Computation Error.	0=no, 1=yes
6.	echo_saturation	4b	Echo Saturation Error.	0=no, 1=yes
7.	rx_band_attenuated	2b	Reception Band Attenuation.	0=no, 1=yes
8.	cycle_report_error	1b	Cycle Report Error.	0=no, 1=yes

5.2.8 flag_instr_conf_rx_in_use_20_ku

ID	Flag Name	Description	Setting
1.	unknown	Unknown.	0
2.	Rx1	Receive channel 1	1
3.	Rx2	Receive channel 1	2
4.	Both	Both receive channels	3

5.2.9 flag_instr_conf_rx_str_in_use_20_ku

ID	Flag Name	Description	Setting
1.	no_star_tracker	No Star Tracker data used	0
2.	tracker_1	Data from Star Tracker 1 used	1
3.	tracker_2	Data from Star Tracker 2 used	2
4.	tracker_3	Data from Star Tracker 3 used	3
5.	attref_file	Data from the Star Tracker selected on board by AOCS used	4

5.2.10 flag_instr_conf_rx_trk_mode_20_ku

ID	Flag Name	Setting
1.	Unknown	0
2.	LRM	1
3.	SAR	2
4.	SARIN	3

5.2.11 flag_instr_mode_att_ctrl_20_ku

ID	Flag Name	Setting
1.	Unknown	0
2.	local_normal	1
3.	pointing yaw_steering	2

5.2.12 flag_instr_mode_flags_20_ku

ID	Flag Name	Flag Mask	Setting
1.	SARIN_degraded_case	2b	0=no, 1=yes
2.	CAL4_packet_detection	1b	0=no, 1=yes

5.2.13 flag_instr_mode_op_20_ku

ID	Flag Name	Setting
1.	lrm	1
2.	sar	2
3.	sarin	3

5.2.14 flag_mcd_20_ku

ID	Flag Name	Flag Mask	Description	Setting
1.	block_degraded	- 2147483648	Block Degraded. Set if the block is degraded and should not be processed	0 = OK 1 = Degraded
2.	blank_block	1073741824	Blank Block. Set if a blank block has been inserted for record padding	0 = OK 1 = Blank Block
3.	datation_degraded	536870912	Datation Degraded. Set if the datation is degraded.	0 = OK 1 = Datation Degraded
4.	orbit_prop_error	268435456	Orbit Propagation Error. Set if an error has been returned by the CFI or independent check.	0 = OK 1 = Error
5.	orbit_file_change	134217728	Orbit File Change. Set if the orbit file has changed with respect to the previous record.	0 = OK 1 = Orbit file change
6.	orbit_gap	67108864	Orbit Discontinuity. Set if there is a discontinuity/ gap in the orbit coverage.	0 = OK 1 = Orbit gap
7.	echo_saturated	33554432	Echo Saturation. From the echo saturation flag from the telemetry.	0 = OK 1 = Saturated
8.	other_echo_error	16777216	Other Echo Error. Set if either the tracking echo, echo Rx1 error or	0 = OK 1 = Echo Error

ID	Flag Name	Flag Mask	Description	Setting
			echo Rx2 error bits are set to 1.	
9.	sarin_rx1_error	8388608	SARIn Receive Chain 1 (Rx1) Error. Set if the Rx1 chain is degraded or missing.	0 = OK 1 = Degraded /missing
10.	sarin_rx2_error	4194304	SARIn Receive Chain 2 (Rx2) Error. Set if the Rx2 chain is degraded or missing.	0 = OK 1 = Degraded /missing
11.	window_delay_error	2097152	Window Delay Error. Set if the window delay value is out of range or if there is a computation error	0 = OK (value in range) 1 = value out of range
12.	agc_error	1048576	AGC Error. Set if the AGC value is out of range or if there is a computation error.	0 = OK (value is in range) 1 = value out of range
13.	cal1_missing	524288	CAL1 Correction Missing. Set if the CAL1 correction has not been applied.	0 = correction applied 1 = correction not applied
14.	cal1_default	262144	CAL1 from Default. Set if the CAL1 correction has been taken from the IPFDB (default) instead of the CAL1 product (preferred).	0 = correction from CAL1 product 1 = correction from IPFDB
15.	doris_uso_missing	131072	DORIS USO Correction Missing. Set of the DORIS USO correction factor is not available.	0 = USO Correction available 1 = USO Correction not available
16.	ccal1_default	65536	CCAL1 from Default. Set if the Complex CAL1 correction has been taken from the IPFDB (default) instead of the CCAL1 product (preferred).	0 = correction from CCAL1 product 1 = correction from IPFDB
17.	trk_echo_error	32768	Tracking Echo Error. Set if the tracking echo is degraded.	0 = OK 1 = Degraded/ empty tracking echo
18.	echo_rx1_error	16384	Receive Chain 1 (Rx1) Error. Set if the Rx1 chain raw echo is degraded or missing.	0 = OK 1 = Degraded/ empty raw echo
19.	echo_rx2_error	8192	Receive Chain 1 (Rx2) Error. Set if the Rx2 chain raw echo is degraded or missing.	0 = OK 1 = Degraded/ empty raw echo
20.	npm_error	4096	Noise Power Measurement Error. Set if the NPM is degraded, out of range, or there is a computation error.	0 = OK 1 = value out of range
21.	azimuth_cal_missing	2048	Azimuth Calibration Missing. Set if the azimuth calibration is missing.	0 = OK 1= missing
22.	phase_pert_cor_missing	128	Phase Perturbation Correction Missing. Set of the phase perturbation correction has not been applied.	0 = applied 1 = not applied

ID	Flag Name	Flag Mask	Description	Setting
23.	cal2_missing	64	CAL2 Correction Missing. Set if the CAL2 correction has not been applied.	0 = correction applied 1 = correction not applied
24.	cal2_default	32	CAL2 from Default. Set if the CAL2 correction has been taken from the IPFDB (default) instead of the CAL2 product (preferred).	0 = correction from CAL2 product 1 = correction from IPFDB
25.	power_scale_error	16	Power Scaling Error. Set if there is an error in the power scaling of the echo (L1B waveform is null). Only used in L1B LRM.	0 = OK 1 = Error
26.	attitude_cor_missing	8	Attitude Correction Missing. Set if the attitude correction has not been applied.	0 = correction applied 1 = correction not applied
27.	phase_pert_cor_default	1	Phase Perturbation Correction from Default. Set if the phase perturbation correction has been taken from the IPFDB (default) instead of the Complex CAL1 (preferred). Only applicable to SARIn.	0 = correction from CCAL1 1 = correction from IPFDB

5.2.15 flag_quality_20_ku

ID	Flag Name	Flag Mask	Description	Setting
1.	swh_error	1	Significant Wave Height Calculation Error.	0=ok, 1=error
2.	alt_wind_error	2	Altimeter Wind Calculation Error.	0=ok, 1=error
3.	maths_error	4	Arithmetic Error.	0=ok, 1=error
4.	coherence_error	8	Coherence Error.	0=ok, 1=error
5.	xtrack_angle_error	16	Across-track Angle Error.	0=ok, 1=error
6.	echo_shape_error	32	Echo Shape Error.	0=ok, 1=error
7.	peakiness_error	64	Peakiness Error.	0=ok, 1=error
8.	sig0_3_error	128	Sigma0 Error Retracker 3.	0=ok, 1=error
9.	sig0_2_error	256	Sigma0 Error Retracker 2.	0=ok, 1=error
10.	sig0_1_error	512	Sigma0 Error Retracker 1.	0=ok, 1=error
11.	height_3_error	1024	Height Error Retracker 3.	0=ok, 1=error
12.	height_2_error	2048	Height Error Retracker 2.	0=ok, 1=error
13.	height_1_error	4096	Height Error Retracker 1.	0=ok, 1=error

5.2.16 flag_retracker_20_ku

ID	Flag Name	Flag Mask	Description	Setting
1.	retracker_3_fail	1	Retracker 1 Failure.	0=ok, 1=nok
2.	retracker_2_fail	2	Retracker 2 Failure.	0=ok, 1=nok
3.	retracker_1_fail	4	Retracker 3 Failure.	0=ok, 1=nok
4.	poor_phase_fit	8	Poor Phase Fit. Set if the chi squared is above the threshold. Only applicable to SARIn mode.	0=ok, 1=nok
5.	poor_power_fit	16	Poor Power Fit. Set if the chi squared is above the threshold.	0=ok, 1=nok
6.	fdm_ocog_fail	32	FDM OCOG Failure.	0=ok, 1=nok
7.	fit_failed	64	Fit Failed.	0=ok, 1=nok
8.	sarin_low_coherence	128	SARIn Low Coherence Flag.	0=ok, 1=nok
9.	sarin_interp_fail	256	SARIn Retracker Interpolation Failure.	0=ok, 1=nok
10.	abnormal_bb_param	512	Abnormal Beam Behaviour Parameters.	0=ok, 1=nok
11.	out_of_range	1024	Out of Range.	0=ok, 1=nok
12.	bad_leading_edge	2048	Bad Leading Edge Flag.	0=ok, 1=nok
13.	low_variance	4096	Low Variance Flag. Set if the variance is below the threshold.	0=ok, 1=nok
14.	high_noise	8192	High Noise Flag. Set if the noise is above the threshold.	0=ok, 1=nok
15.	high_peakiness	16384	High Peakiness Flag. Set if the peakiness is above the threshold.	0=ok, 1=nok
16.	low_peakiness	32768	Low Peakiness Flag. Set if the peakiness is below the threshold.	0=ok, 1=nok
17.	low_power	65536	Low Power Flag. Set for low or zero power in the waveform.	0=ok, 1=nok
18.	sea_ice_retracker_fail	131072	Sea Ice Retracker Failure.	0=ok, 1=nok

5.2.17 flag_sarin_ambiguity_warning_20_ku

ID	Flag Name	Setting
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1.	no_warning	0
2.	warning	1
3.	not_checked	2

5.2.18 flag_sea_ice_type_20_ku

ID	Flag Name	Setting
1.	open_water	1
2.	first_year_ice	2
3.	multi_year_ice	3
4.	ambiguous	4

5.2.19 flag_sshinterp_20_ku

ID	Flag Name	Setting
1.	no_values	1
2.	extrapolation	2
3.	unreliable	3

5.2.20 flag_surf_type_class_20_ku

ID	Flag Name	Flag Mask	Description	Setting
1.	lrm_undefined	1s	LRM Undefined.	0=no, 1=yes
2.	lrm_ocean	2s	LRM Ocean.	0=no, 1=yes
3.	lrm_land_ice	4s	LRM Land Ice.	0=no, 1=yes
4.	sarin_undefined	8s	SARIn Undefined.	0=no, 1=yes
5.	sarin_valid	16s	SARIn Valid.	0=no, 1=yes
6.	sar_undefined	32s	SARIn Undefined.	0=no, 1=yes
7.	sar_ocean	64s	SAR Ocean.	0=no, 1=yes
8.	sar_sea_ice	128s	SAR Sea Ice.	0=no, 1=yes

		<p style="text-align: right;"><i>Instrument Processing Facility L2</i> <i>Cryosat Ice netCDF L2 PFS</i></p> <p>Doc. No.: C2-RS-ACS-ESL-5265 Issue: 2.1draft Date: 14/07/2021 Page: 150</p>
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9.	sar_lead	256s	SAR Lead.	0=no, 1=yes
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6 LEVEL 2 AND LEVEL 2I GLOBAL ATTRIBUTES

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

Each attribute is described here for the sake of clarity and to provide traceability back to the corresponding EE Header field where the attribute comes from.

In reality 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
doi	Digital Orbit Identifier	any string
acquisition_station	Acquisition Station	any string
mission	Mission Name	Cryosat
processing_centre	Procassing 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 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



Orbit Information		
Attribute Name	Description	Values
		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_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)	
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 Instrument Configuration		
Attribute Name	Description	Values



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 TX_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) 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)	



Reference DSD		
Attribute Name	Description	Values
xref_cal1	L1B CAL1 file	
xref_cal2	L1B CAL2 file	
xref_cal1_sarin	L1B Complex CAL1 SARin file	
xref_constants	Geophysical Constants File	
xref_dem	DEM File	
xref_dip_map	Bent Modified Dip Map File used for Bent Ionospheric Correction	
xref_earth_tide	Earth Tide File (Cartwright & Edden 1973)	
xref_geoid	Geoid File	
xref_gim	Global Ionospheric Map generated by using either analysis or forecast data	
xref_iono_cor	Ionospheric Coefficients file used for Bent Model Ionospheric Correction	
xref_mean_pressure	Mean Pressure File for Meteo Correction generated by using either analysis or forecast data	
xref_meteo	Meteo Grid Definition File	
xref_mog2d	2D Gravity Wave model for Dynamic Atmospheric Correction (DAC) generated by using either analysis or forecast data	
xref_mss	Mean Sea Surface File	
xref_ocean_tide	Ocean Tide File	
xref_odle	Ocean Depth/Land Elevation File	
xref_orbit	Orbit File	
xref_orbit_scenario	Orbit Scenario File	
xref_pconf	Processor Configuration Parameters File	
xref_pole_location	Pole Tide File	
xref_s1_tide_amplitude	S1 tide grid of monthly mean of global amplitude	
xref_s1_tide_phase	S1 tide grid of monthly mean of global phase	
xref_s1s2_pressure_00h	Climatology Pressure Grids for each month at 00 h.	

Reference DSD		
Attribute Name	Description	Values
xref_s1s2_pressure_06h	Climatology Pressure Grids for each month at 06 h.	
xref_s1s2_pressure_12h	Climatology Pressure Grids for each month at 12 h.	
xref_s1s2_pressure_18h	Climatology Pressure Grids for each month at 18 h.	
xref_s2_tide_amplitude	S2 tide grid of monthly mean of global amplitude	
xref_s2_tide_phase	S2 tide grid of monthly mean of global phase	
xref_sai	Solar Activity Index File used for Bent Model Ionospheric Correction	
xref_sea_ice	Sea Ice Concentration File	Only applicable to SAR and SARIn over open ocean
xref_sea_ice_type_north	Sea Ice Type File (Northern Hemisphere)	Only applicable to SAR and SARIn over open ocean
xref_sea_ice_type_south	Sea Ice Type File (Southern Hemisphere)	Only applicable to SAR and SARIn over open ocean
xref_siral_characterisation	SIRAL IPFDB File	
xref_siral_l0	SIRAL L0 File(s)	
xref_siral_l1b	SIRAL L1B File(s)	
xref_siral_l2	SIRAL L2 File(s)	GDR only.
xref_slope_model	Surface Slope Model File	LRM only.
xref_snow_depth	Snow depth Climatology File	SAR and SARIn only.
xref_ssb	Sea State Bias File	Only applicable to LRM over open ocean.
xref_star_tracker_0	Star Tracker Level L0 File	NRT only.
xref_star_tracker_attref	Star Tracker ATTREF File	
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	Tidal Loading File	
xref_u_wind	U Wind component File for Meteo Correction generated by using either analysis or forecast data	
xref_uso	USO file name	
xref_v_wind	V Wind component File for Meteo Correction generated by using either analysis or forecast data	

Reference DSD		
Attribute Name	Description	Values
xref_wet_trop	Wet Troposphere File for Meteo Correction generated by using either analysis or forecast data	
xref_wind_model	Abdalla2007 Wind Model File	Only applicable to LRM over open ocean.

6.1 TABLE OF REFERENCE DSD VS L2/L2I PROCESSORS

Reference DSD (HDR file)	Reference Attribute (Netcdf file)	File Type	Processors			
			LRM	SAR	SRN	GDR
CALIBRATION_TYPE_1_FILE	xref_cal1	SIR1LRC11B	M			M
		SIR2LRC11B				
		SIR1SAC11B	M		M	
		SIR2SAC11B				
SIR_SIC11B			M	M		
SIR_COMPLEX_CAL1_SARIN	xref_cal1_sarin	SIR_SICC1B	?	?	M	M
CALIBRATION_TYPE_2_FILE	xref_cal2	SIR1SAC21B	M	M		M
		SIR2SAC21B				
		SIR1SIC21B			M	M
		SIR2SIC21B				
CONSTANTS_FILE	xref_constants	Geophysical_Constants	M	M	M	M
DEM_MODEL_FILE	xref_dem	AUX_DEMMSL			M	
MODIFIED_DIP_MAP_FILE	xref_dip_map	AUX_DIPMAP	M	M	M	M
EARTH_TIDE_FILE	xref_earth_tide	AUX_CARTWR	M	M	M	M
GEOID_FILE	xref_geoid	AUX_GEOID_	M	M	M	M
GPS_IONO_MAP	xref_gim	AUX_IONGIM	M	M	M	M

			Processors			
			LRM	SAR	SRN	GDR
IONO_COEFFICIENTS_FILE	xref_iono_cor	AUX_MICOEF	M	M	M	M
MEAN_PRESSURE_FILE	xref_mean_pressure	AUX_SEAMPS	M	M	M	M
METEO_GRID_DEF_FILE	xref_meteo	AUX_ALTGRD	M	M	M	M
AUX_MOG2D	xref_mog2d	AUX_MOG_2D	M	M	M	M
MEAN_SEA_SURFACE_FILE	xref_mss	AUX_MSSURF	M	M	M	M
OCEAN_TIDE_FILE	xref_ocean_tide	AUX_OCTIDE	M	M	M	M
ODLE_FILE	xref_odle	AUX_ODLE	M	M	M	M
ORBIT_FILE	xref_orbit	MPL_ORBPRES				
		AUX_ORBDOR	M	M	M	M
		AUX_ORBDOP				
SCENARIO_FILE	xref_orbit_scenario	MPL_ORBREF	M	M	M	M
PROC_CONFIG_PARAMS_FILE	xref_pconf	PCONF_IPF2	M	M	M	M
POLE_TIDE_FILE	xref_pole_location	AUX_POLLOC	M	M	M	M
S1_TIDE_AMPLITUDE_MAP	xref_s1_tide_amplitude	AUX_S1AMPL	M	M	M	M
S1_TIDE_PHASE_MAP	xref_s1_tide_phase	AUX_S1PHAS	M	M	M	M
S1S2_PRESSURE_00H_MAP	xref_s1s2_pressure_00h	AUX_PRSS00	M	M	M	M
S1S2_PRESSURE_06H_MAP	xref_s1s2_pressure_06h	AUX_PRSS06	M	M	M	M
S1S2_PRESSURE_12H_MAP	xref_s1s2_pressure_12h	AUX_PRSS12	M	M	M	M
S1S2_PRESSURE_18H_MAP	xref_s1s2_pressure_18h	AUX_PRSS18	M	M	M	M
S2_TIDE_AMPLITUDE_MAP	xref_s2_tide_amplitude	AUX_S1AMPL	M	M	M	M
S2_TIDE_PHASE_MAP	xref_s2_tide_phase	AUX_S2PHAS	M	M	M	M
SAI_FILE	xref_sai	AUX_SUNACT	M	M	M	M
SEA_ICE_CONCENTRATION_FILE	xref_sea_ice	AUX_SEA_IC		M	M	
NORTH_SEA_ICE_TYPE_FILE	xref_sea_ice_type_north	AUX_DSITNH		M	M	
SOUTH_SEA_ICE_TYPE_FILE	xref_sea_ice_type_south	AUX_DSITSH		M	M	

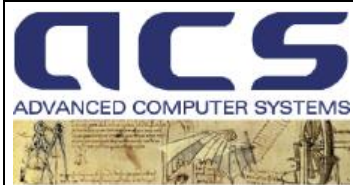
			Processors			
			LRM	SAR	SRN	GDR
IPF_RA_DATABASE_FILE	xref_siral_characterisation	AUX_IPFDBA AUX_IPFDBB	M	M	M	M
SIRAL_LEVEL_0_FILE	xref_siral_l0	SIR1SIN_0_ SIR2SIN_0_ SIR1TKSIO_ SIR2TKSIO_			M	M
		SIR1LRM_0_ SIR2LRM_0_	M			M
		SIR1SAR_0_ SIR2SAR_0_		M		M
SIR_L1B_LRM	xref_siral_l1b	SIR_LRM_1B	M			
SIR_L1B_SAR	xref_siral_l1b	SIR_SAR_1B		M		
SIR_L1B_SARIN	xref_siral_l1b	SIR_SIN_1B			M	
SIRAL_LEVEL_2_FILE	xref_siral_l2	SIR_LRM_2_ SIR_LRMI2_				M
		SIR_SAR_2_ SIR_SARI2_				M
		SIR_SIN_2_ SIR_SINI2_				M
SLOPE_MODEL_FILE	xref_slope_model	AUX_SLPMSL	M			M
SNOW_DEPTH_CLIMATE_FILE	xref_snow_depth	AUX_SDC_xx, xx=01,...,12		M	M	M
SEA_STATE_BIAS_FILE	xref_ssb	AUX_SSBIAS	M			M
STAR_TRACKER_ATTREF_FILE	xref_star_tracker_attref	STR_ATTREF	M	M	M	M
SURFACE_PRESSURE_FILE	xref_surf_pressure	AUX_SURFPS	M	M	M	M
SURFACE_TYPE_FILE	xref_surf_type	AUX_LS_MAP	M	M	M	M
TIDAL_LOADING_FILE	xref_tidal_load	AUX_TDLOAD	M	M	M	M



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			Processors			
			LRM	SAR	SRN	GDR
U_WIND_FILE	xref_u_wind	AUX_U_WIND	M	M	M	M
DORIS_USO_DRIFT_FILE	xref_uso	AUX_DORUSO	M	M	M	M
V_WIND_FILE	xref_v_wind	AUX_V_WIND	M	M	M	M
WET_TROPOSPHERE_FILE	xref_wet_trop	AUX_WETTRP	M	M	M	M
WIND_MODEL_FILE	xref_wind_model	AUX WDNCHE	M			



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Appendix A: Variables to Products

Variables to Products Mapping		
Variable Name	L2	L2I
across_track_angle_20_ku(time_20_ku);		X
across_track_angle_cor_20_ku(time_20_ku);		X
alt_01(time_cor_01);	X	
alt_20_ku(time_20_ku);		X
beam_dir_vec_20_ku(time_20_ku, space_3d_ku);		X
coherence_20_ku(time_20_ku);		X
dem_height_20_ku(time_20_ku);		X
dem_identifier_20_ku(time_20_ku);		X
dop_angle_start_20_ku(time_20_ku);		X
dop_angle_stop_20_ku(time_20_ku);		X
dop_cor_20_ku(time_20_ku);		X
echo_avg_numval_20_ku(time_20_ku);	X	X
flag_cor_applied_20_ku(time_20_ku);	X	
flag_cor_err_01(time_cor_01);	X	
flag_cor_err_20_ku(time_20_ku);		X
flag_cor_status_20_ku(time_20_ku);		X
flag_disc_stat_20_ku(time_20_ku);		X
flag_freeboard_20_ku(time_20_ku);		X
flag_height_20_ku(time_20_ku);		X
flag_instr_conf_rx_bwdt_20_ku(time_20_ku);		X
flag_instr_conf_rx_flags_20_ku(time_20_ku);		X
flag_instr_conf_rx_in_use_20_ku(time_20_ku);		X
flag_instr_conf_rx_str_in_use_01(time_cor_01);	X	X
flag_instr_conf_rx_trk_mode_20_ku(time_20_ku);		X
flag_instr_mode_att_ctrl_20_ku(time_20_ku);		X
flag_instr_mode_flags_20_ku(time_20_ku);		X
flag_instr_mode_op_20_ku(time_20_ku);	X	X
flag_mcd_20_ku(time_20_ku);		X
flag_prod_status_20_ku(time_20_ku);	X	
flag_quality_20_ku(time_20_ku);		X
flag_retracker_20_ku(time_20_ku);		X
flag_sarin_ambiguity_warning_20_ku(time_20_ku);		X
flag_sea_ice_type_20_ku		X

Variables to Products Mapping		
Variable Name	L2	L2I
flag_ssha_interp_20_ku(time_20_ku);		X
flag_surf_type_class_20_ku(time_20_ku);		X
radar_freeboard_20_ku(time_20_ku);	X	X
geoid_01(time_cor_01);	X	X
height_1_20_ku(time_20_ku);	X	X
height_2_20_ku(time_20_ku);	X	X
height_3_20_ku(time_20_ku);	X	X
hf_fluct_total_cor_01(time_cor_01);	X	X
instr_ph_cor_20_ku(time_20_ku);		X
instr_cor_gain_rx_20_ku(time_20_ku);		X
instr_cor_gain_tx_rx_20_ku(time_20_ku);		X
instr_cor_range_rx_20_ku(time_20_ku);		X
instr_cor_range_tx_rx_20_ku(time_20_ku);		X
instr_ext_ph_cor_20_ku(time_20_ku);		X
inter_base_vec_20_ku(time_20_ku, space_3d_ku);		X
inv_bar_cor_01(time_cor_01);	X	X
iono_cor_01(time_cor_01);	X	X
iono_cor_gim_01(time_cor_01);	X	X
lat_01(time_cor_01);	X	
lat_20_ku(time_20_ku);		X
lat_poca_20_ku(time_20_ku);	X	X
load_tide_01(time_cor_01);	X	X
lon_01(time_cor_01);	X	
lon_20_ku(time_20_ku);		X
lon_poca_20_ku(time_20_ku);	X	X
look_angle_start_20_ku(time_20_ku);		X
look_angle_stop_20_ku(time_20_ku);		X
mean_sea_surf_sea_ice_01(time_cor_01);	X	
mean_sea_surf_sea_ice_20_ku(time_20_ku);		X
mod_dry_tropo_cor_01(time_cor_01);	X	X
mod_wet_tropo_cor_01(time_cor_01);	X	X
noise_power_20_ku(time_20_ku);		X
num_valid_01(time_cor_01);	X	
ocean_tide_01(time_cor_01);	X	X
ocean_tide_eq_01(time_cor_01);	X	X
odle_01(time_cor_01);	X	
odle_20_ku(time_20_ku);		X
off_nadir_pitch_angle_str_01(time_cor_01);	X	X

Variables to Products Mapping		
Variable Name	L2	L2I
off_nadir_pitch_angle_str_20(time_20_ku)		X
off_nadir_roll_angle_str_01(time_cor_01);	X	
off_nadir_roll_angle_str_20_ku(time_20_ku)		X
off_nadir_yaw_angle_str_01(time_cor_01);	X	
off_nadir_yaw_angle_str_20_ku(time_20_ku)		X
offset_attitude_20_ku(time_20_ku);		X
offset_azimuth_20_ku(time_20_ku);		X
orb_alt_rate_20_ku(time_20_ku);		X
peakiness_20_ku(time_20_ku);	X	X
ph_slope_cor_20_ku(time_20_ku);		X
pole_tide_01(time_cor_01);	X	X
range_1_20_ku(time_20_ku)	X	X
range_2_20_ku(time_20_ku)	X	X
range_3_20_ku(time_20_ku)	X	X
rec_count_20_ku(time_20_ku);		X
retracker_1_cor_20_ku(time_20_ku);		X
retracker_1_quality_20_ku(time_20_ku);	X	X
retracker_2_cor_20_ku(time_20_ku);		X
retracker_2_quality_20_ku(time_20_ku);	X	X
retracker_3_cor_20_ku(time_20_ku);		X
retracker_3_quality_20_ku(time_20_ku);	X	X
retracker_output_10_20_ku(time_20_ku);		X
retracker_output_11_20_ku(time_20_ku);		X
retracker_output_12_20_ku(time_20_ku);		X
retracker_output_13_20_ku(time_20_ku);		X
retracker_output_14_20_ku(time_20_ku);		X
retracker_output_15_20_ku(time_20_ku);		X
retracker_output_16_20_ku(time_20_ku);		X
retracker_output_17_20_ku(time_20_ku);		X
retracker_output_18_20_ku(time_20_ku);		X
retracker_output_19_20_ku(time_20_ku);		X
retracker_output_20_20_ku(time_20_ku);		X
retracker_output_21_20_ku(time_20_ku);		X
retracker_output_22_20_ku(time_20_ku);		X
retracker_output_23_20_ku(time_20_ku);		X
retracker_output_3_20_ku(time_20_ku);		X

Variables to Products Mapping		
Variable Name	L2	L2I
retracker_output_4_20_ku(time_20_ku);		X
retracker_output_5_20_ku(time_20_ku);		X
retracker_output_6_20_ku(time_20_ku);		X
retracker_output_7_20_ku(time_20_ku);		X
retracker_output_8_20_ku(time_20_ku);		X
retracker_output_9_20_ku(time_20_ku);		X
sarin_output_1_20_ku(time_20_ku);		X
sarin_output_10_20_ku(time_20_ku);		X
sarin_output_2_20_ku(time_20_ku);		X
sarin_output_3_20_ku(time_20_ku);		X
sarin_output_4_20_ku(time_20_ku);		X
sarin_output_5_20_ku(time_20_ku);		X
sarin_output_6_20_ku(time_20_ku);		X
sarin_output_7_20_ku(time_20_ku);		X
sarin_output_8_20_ku(time_20_ku);		X
sarin_output_9_20_ku(time_20_ku);		X
sat_vel_vec_20_ku(time_20_ku, space_3d_ku);		X
sea_ice_concentration_01(time_cor_01);	X	
sea_ice_concentration_20_ku(time_20_ku);		X
sea_state_bias_01_ku(time_cor_01);	X	
sea_state_bias_20_ku(time_20_ku);		X
seq_count_20_ku(time_20_ku);		X
sig0_1_20_ku(time_20_ku);	X	X
sig0_2_20_ku(time_20_ku);	X	X
sig0_3_20_ku(time_20_ku);	X	X
slope_dop_cor_20_ku(time_20_ku);		X
snow_density_01(time_cor_01);	X	
snow_density_20_ku(time_20_ku);		X
snow_depth_01(time_cor_01);	X	
snow_depth_20_ku(time_20_ku);		X
solid_earth_tide_01(time_cor_01);	X	X
space_3d_ku(space_3d_ku);		X
ssha_20_ku(time_20_ku);		X
ssha_interp_20_ku(time_20_ku);	X	X
ssha_interp_numval_20_ku(time_20_ku);	X	
ssha_interp_numval_back_20_ku(time_20_ku);		X
ssha_interp_numval_fwd_20_ku(time_20_ku);		X
ssha_interp_rms_20_ku(time_20_ku);	X	X

Variables to Products Mapping		
Variable Name	L2	L2I
ssha_interp_time_back_20_ku(time_20_ku);		X
ssha_interp_time_fwd_20_ku(time_20_ku);		X
stack_centre_20_ku(time_20_ku);		X
stack_centre_angle_20_ku(time_20_ku);		X
stack_kurtosis_20_ku(time_20_ku);		X
stack_number_after_weighting_20_ku(time_20_ku);		X
stack_number_before_weighting_20_ku(time_20_ku);		X
stack_scaled_amplitude_20_ku(time_20_ku);		X
stack_skewness_20_ku(time_20_ku);		X
stack_std_20_ku(time_20_ku);		X
stack_std_angle_20_ku(time_20_ku);		X
surf_type(time_20_ku);		X
surf_type_20_ku(time_20_ku);	X	X
swh_ocean_ku_01(time_cor_01);	X	
swh_ocean_20_ku(time_20_ku);		X
time_20_ku(time_20_ku);	X	X
time_cor_01(time_cor_01);	X	X
uso_cor_20_ku(time_20_ku);		X
wind_speed_alt_01_ku(time_cor_01);	X	
wind_speed_alt_20_ku(time_20_ku);		X

Appendix B: Default Setting of the Attribute: `_FillValue`

By design, each variable of the CONFORM products has 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 processing.

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

Variables with no <code>_FillValue</code>			
name	type	units	comment
<code>rec_count_20_ku(time_20_ku)</code>	int	count	Record counter - progressive counter incremented by 1 for each data block.

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_ku` and `instr_seq_count_20_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_degraded`)

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:

<code>_FillValue</code> Specific Settings	
variable type	<code>_FillValue</code>
byte	-128b
int	-2147483648
int64	-9223372036854775808LL

short	-32768
ushort	32767US

The above convention is not used in the following cases:

_FillValue Default Settings			
Variable Name	Variable Type	_FillValue	Note
flag_cor_err_01(time_cor_01)	int	-2147483648	
flag_instr_conf_rx_bwdt_20_ku(time_20_ku)	int	-1	
flag_mcd_20_ku(time_20_ku)	int	-1	
stack_kurtosis_20_ku(time_20_ku)	short	-999	This is the default value used in the EE product
stack_skewness_20_ku(time_20_ku)	short	-999	This is the default value used in the EE product
uso_cor_20_ku(time_20_ku)	int	2147483647	It has been observed a negative drift in time of the uso correction, then choosing the max positive value as _FillValue seems to be the safest choice.

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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 timestamps to be represented 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 to 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 of 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 $2^{30} - 1 = 1,073,741,823$ seconds, i.e. 34 years.

Accordingly, the current representation allows us 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:

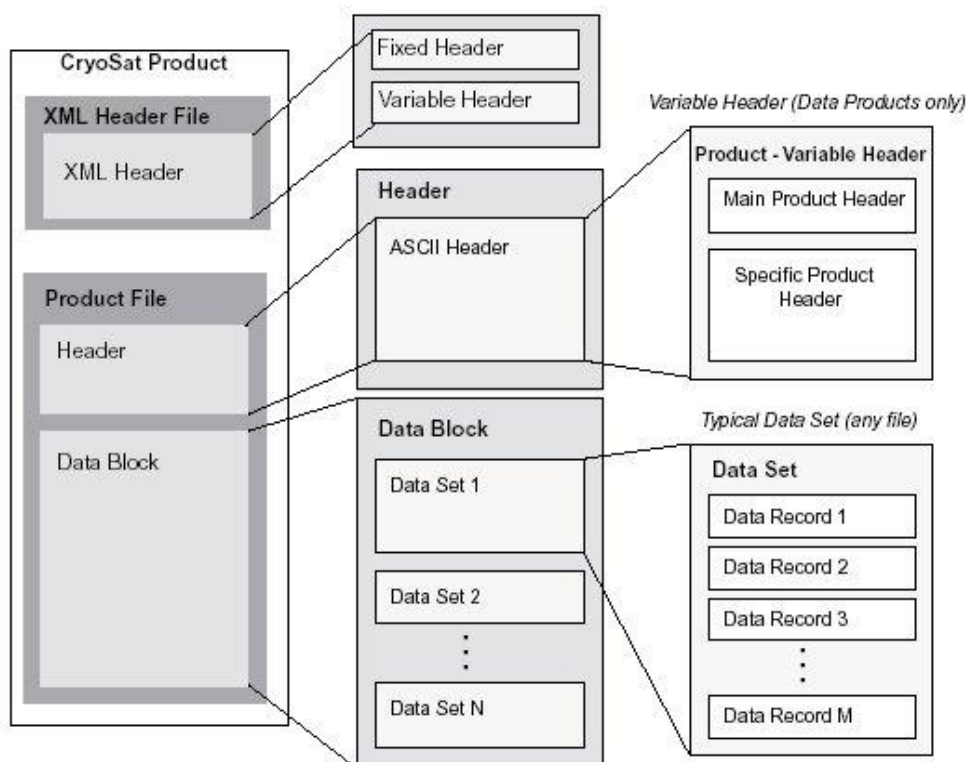
1. A version of the IPF2 software has to be released that generates baseline C CONFORM products. This IPF2 version as well as the baseline C CONFORM products are hidden versions, i.e. the software is not installed in the operational platform and the products are not distributed but to a selected groups of users to receive their feedback and suggestions for improvements.
2. The first official version of the IPF2 CONFORM software is 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.



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Figure 6-1: EE Product Structure

6.2 XML HEADER FILE

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

The XML Header file is composed by:

- a Fixed Header
- a Variable Header

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

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

6.2.1 Fixed Header (CryoSat Header)

The Standard Cryosat Header is completely ASCII and based on XML syntax and conventions proposed in [FMT-GUIDE].

The format and content of the Standard Cryosat Header is under ESA responsibility and it is specified in [FMT-GUIDE].

6.2.2 Variable Header (Product Header)

The Variable Header (hereafter called Product Header) for the Level-2 product is composed by:

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

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

Each header is completely ASCII and based on XML syntax and conventions proposed in the [FMT-GUIDE].

The following paragraphs describe the format and content of the XML MPH and XML SPH without overload of the XML format description.

6.2.2.1 XML Main Product Header (XML MPH)

Field #	Description	Units	Bytes	Format
	MPH	Tag		
	<i>Product Identification Info</i>			
#01	Product	Tag		
	Product File Name Note: the file name is without extension		62	See Section Error! Reference source not found. for legal filenames
#02	Proc_Stage_Code	Tag		
	Processing stage code identifier: RPRO = Reprocessing OFFL = Routine Operations NRT_ = Near Real Time TEST = Test LTA_ = Long Term Archive		4	4*uc
#03	Ref_Doc	Tag		
	Reference Document describing the product		23	CS-RS-ACS-ESL-5265
	<i>Data Processing Information</i>			
#04	Proc_Time	Tag		
	Processing Time (Product Generation Time)		30	UTC=yyyy-mm-ddThh:mm:ss.uuuuuu
#05	Software_Version	Tag		
	Processor Name and software version number		14	ProcessorName/VV.rr
	<i>Orbit Information</i>			
#06	Phase	Tag		
	Phase Code If not used set to X		1	uc
#07	Cycle	Tag		
	Cycle Number If not used set to +000		4	%+04d
#08	Rel_Orbit	Tag		
	Relative Orbit Number at sensing start time. If not used set to +00000		6	%+06d

Field #	Description	Units	Bytes	Format
#09	Abs_Orbit	Tag		
	Absolute Orbit Number at sensing start time. If not used set to +00000		6	%+06d
#10	State_Vector_Time	Tag		
	UTC state vector time		30	UTC=yyyy-mm-ddThh:mm:ss.uuuuuu
#11	Delta_UT1	Tag		
	DELTA_UT1 Universal Time Correction: DUT1 = UT1 – UTC If not used set to +.000000	S	8	%+08.6f
#12	X_Position	Tag		
	X position in Earth Fixed Reference If not used set to +0000000.000	M	12	%+012.3f
#13	Y_Position	Tag		
	Y position in Earth Fixed Reference If not used set to +0000000.000	M	12	%+012.3f
#14	Z_Position	Tag		
	Z position in Earth Fixed Reference If not used set to +0000000.000	M	12	%+012.3f
#15	X_Velocity	Tag		
	X velocity in Earth Fixed Reference If not used set to +0000.000000	m/s	12	%+012.6f
#16	Y_Velocity	Tag		
	Y velocity in Earth Fixed Reference If not used set to +0000.000000	m/s	12	%+012.6f
#17	Z_Velocity	Tag		
	Z velocity in Earth Fixed Reference If not used set to +0000.000000	m/s	12	%+012.6f
#18	State_Vector_Source	Tag		
	Source of Orbit State Vector Record FP = FOS predicted DN = DORIS Level 0 navigator DP = DORIS precise orbit FR= FOS Restituted DI = DORIS Preliminary		2	2*uc
	<i>Product Confidence Data Information</i>			

Field #	Description	Units	Bytes	Format
#19	Product_Err	Tag		
	Product Error Flag 1 errors have been reported in the Product 0 no errors		1	uc
	<i>Product Size Information</i>			
#20	Tot_Size	Tag		
	Total Size of the Data Product	bytes	21	%021d

Table 2.2.2.1-1: XML Main Product Header Description

6.2.2.2 XML Specific Product Header (XML SPH)

Field #	Description	Units	Bytes	FORMAT
	SPH	tag		
<i>Product description and identification</i>				
#1	SPH_Descriptor	tag		
	Name describing the Specific Product Header		28	<i>ProductID SPECIFIC HEADER</i> <i>ProductID</i> is the file type as specified in Error! Reference source not found.
<i>Product Time information</i>				
	Time_Information	tag		
#2	Start_Record_Time	tag		
	TAI of the first record in the main MDS of this product		30	TAI=yyyy-mm-ddThh:mm:ss.uuuuuu
#3	Stop_Record_Time	tag		
	TAI of the last record in the main MDS of this product		30	TAI=yyyy-mm-ddThh:mm:ss.uuuuuu
<i>Product Orbit information</i>				
	Orbit_Information	tag		
#4	ABS_Orbit_Start	tag		
	Absolute Orbit Number at sensing start time.		6	%06d
#5	Rel_Time_ASC_Node_Start	tag		
	Relative time since crossing ascending node time relative to start time of data sensing.	s	11	%011.6f
#6	ABS_Orbit_Stop	tag		

Field #	Description	Units	Bytes	FORMAT
	Absolute Orbit Number at sensing stop time.		6	%06d
#7	Rel_Time_ASC_Node_Stop	tag		
	Relative time since crossing ascending node time relative to stop time of data sensing.	s	11	%011.6f
#8	Equator_Cross_Time	tag		
	Time of equator crossing at the ascending node relative to the sensing start time.		30	UTC=yyyy-mm-ddThh:mm:ss.uuuuuu
#9	Equator_Cross_Long	tag		
	Longitude of equator crossing at the ascending node relative to the sensing start time (positive East, 0 = Greenwich) referred to WGS84.	10-6 deg	11	%+011d
#10	Ascending_Flag	tag		
	Orbit Orientation at the sensing start time A=Ascending D=Descending		1	uc
<i>Product Location Information</i>				
	Product_Location	tag		
#11	Start_Lat	tag		
	WGS84 latitude of the first record in the Main MDS (positive north)	10-6 deg	11	%+011d
#12	Start_Long	tag		
	WGS84 longitude of the first record in the Main MDS (positive East, 0 = Greenwich)	10-6 deg	11	%+011d
#13	Stop_Lat	tag		

Field #	Description	Units	Bytes	FORMAT
	WGS84 latitude of the last record in the Main MDS (positive north)	10-6 deg	11	%+011d
#14	Stop_Long	tag		
	WGS84 longitude of the last record in the Main MDS (positive East, 0 = Greenwich)	10-6 deg	11	%+011d
<i>SIRAL Level 1B Quality information</i>				
	Level_1_Confidence_Data	tag		
#15	L1_Proc_Flag	tag		
	Processing errors significance flag 1 errors (percentage of errors greater than threshold) 0 no errors		1	uc
#16	L1_Processing_Quality	tag		
	Percentage of quality checks successfully passed during the ISP processing (max allowed +10000)	10-2 %	6	%+06d
#17	L1_Proc_Thresh	tag		
	Minimum acceptable percentage of quality threshold that must be passed during ISP processing (max allowed +10000)	10-2 %	6	%+06d
#18	Num_L1_DSR_Processed	tag		
	Number of L1 Data Set Records analysed		11	%+011d
<i>SIRAL Instrument Configuration</i>				
	SIR_Instrument_Configuration	tag		
#19	Instrument_Identifier	tag	1	1*uc A (SIRAL Nominal) B (SIRAL Redundant)
<i>SIRAL Mode Statistics</i>				
	SIR_Mode_Statistics	tag		
#20	LRM_Mode_Percent	tag		
	Percentage of input Level-1B records detected in LRM mode	10-2 %	6	%+06d
#21	SAR_Mode_Percent	tag		
	Percentage of input Level-1B records detected in SAR mode	10-2 %	6	%+06d

Field #	Description	Units	Bytes	FORMAT
#22	SARIN_Mode_Percent	tag		
	Percentage of input Level-1B records detected in SIN mode	10-2 %	6	%+06d
#23	Other_Modes_Percent	tag		
	Percentage of input Level-1B records detected in other modes	10-2 %	6	%+06d
<i>SIRAL L1B Surface Statistics</i>				
	Surface_Statistics	tag		
#24	Open_Ocean_Percent	tag		
	Percentage of records detected on open ocean or semi-enclosed seas	10-2 %	6	%+06d
#25	Close_Sea_Percent	tag		
	Percentage of records detected on close seas or lakes	10-2 %	6	%+06d
#26	Continent_Ice_Percent	tag		
	Percentage of records detected on continental ice	10-2 %	6	%+06d
#27	Land_Percent	tag		
	Percentage of records detected on land	10-2 %	6	%+06d
<i>SIRAL Level 2 Processing information</i>				
	Level_2_Confidence_Data	tag		
#28	L2_Prod_Status	tag		
	Complete/Incomplete Product Completion Flag (0 or 1). 1 if the Product has a duration shorter than the input Level-0 input		1	uc
#29	L2_Proc_Flag	tag		
	Processing errors significance flag 1 errors (percentage of errors greater than threshold) 0 no errors		1	uc
#30	L2_Processing_Quality	tag		
	Percentage of quality checks successfully passed during Level-2 processing (max allowed +10000)	10-2 %	6	%+06d
#31	L2_Proc_Thresh	tag		

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

Table 2.2.2.2-1: XML Specific Product Header description

Main relevant content of XML Header File is reported in the Global Attribute section of the netcdf product, in any case the XML Header File Product will be generated for Legacy.

6.3 THE PRODUCT FILE: MIGRATION FROM EE TO NETCDF

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

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

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.

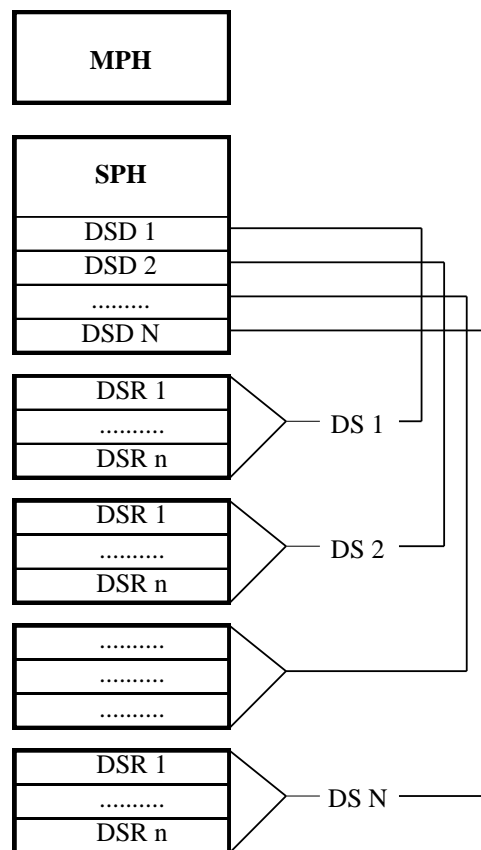


Figure 6-2: EE Product File Structure

All the EE CryoSat Products have been migrated to the netCDF format which contain one DS.

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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 1 Hz measurement.
 - One time stamp for each 20 Hz 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 will be created

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Appendix E: ncdump reference template

In annex to the current document, the reference template representative of the product netcdf metadata are included.

The folder includes the following templates:

- L2: Level 2 Compact cdl dump for the LRM/SAR/SARin mode
- L2I: Level 2 In Depth cdl dump for the LRM/SAR/SARin mode

END OF DOCUMENT