SALP

SALP Products Specification – SWOT Nadir Altimeter User Products

Prepared by :	F. BIGNALET-CAZALET	CNES	Bignalet-Cazalet Francois 2020.12.18 10:05:22 +01'00'
	S. URIEN	CLS	Signature numérique de Urien Stéphanie Date : 2020.12.18 12:12:33 +01'00'
	N. PICOT	CNES	Picot Nicolas Signature numérique de Picot Nicolas DN : c=FR, o=CNES, ou=0002 775665912, ou=Agents CNES, 2.5.4.45=#Picot@cnes.fr, cn=Picot Nicolas Date : 2020.12.18 13:51:00 +01'00'
Accepted by :			
Approved by :	N. PICOT	CNES	Picot Nicolas
	S. DESAI	NASA/JPL	Dec 23, 2020

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Application to	X	X						X	

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SUMMARY

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Summary : This document is aimed at defining the SWOT Nadir Altimeter User Products

DOCUMENT CHANGE RECORD

Issue	Update	Date	Modifications	Visa
1	0	19-Aug-19	Creation, based on Jason-3 applicable document and GDR-F ongoing evolutions. To ease the reading, GDR-F evolutions are identified by track changes	SC & NP
1	**1**	18-Dec-2020	SALP-FT-11902 : GDR-F standard batch 4 (groups and variable names) SALP-FT-11903 : GDR-F standard batch 5 (3D meteo, OSISAF and Rain Rate) SALP-FT-11904 : GDR-F standard batch 6 (radiometer, surface slope, angle of approach to coast, internal tide in SSHA) SALP-FT-12311 : GDR-F standard batch 7 Adaptive retracking and waveform classification SALP-FT-12340 : GDR-F standard batch 8 (L1 alti updates) SALP-FT-12436 : GDR-F standard batch 9 SALP-FT-12148 : GIM applicable to OGDR	FBC & SU

ABBREVIATIONS

Sigle	Definition
AD	Applicable Documents
AGC	Automatic Gain Control
AMR	Advanced Microwave Radiometer
CAL	Calibration
CDL	Common Data Language
CF-1.0	Climate and Forecast convention
CLS	Collecte Localisation Satellites
CNES	Centre National d'Etudes Spatiales
COG	Center Of Gravity
DAD	Dynamic Auxiliary Data
DORIS	Doppler Orbitography and Radiopositioning Integrated by Satellite
ECMWF	European Centre for Medium-Range Weather Forecasts
FFT	Fast Fourier Transform
GDR	Geophysical Data Record
GPS	Global Positioning System
IGDR	Interim Geophysical Data Record
LPF	Low Pass Filter
LTM	Long Term Monitoring
MDS	Measurement Data Set
N/A	Not Applicable
NRT	Near Real Time
OFL	Off Line
OGDR	Operational Geophysical Data Record
POD	Precise Orbit Determination
POE	Precise Orbit Ephemeris
POSEIDON-3C	SWOT altimeter
PTR	Point Target Response
RD	Reference Documents
RMS	Root Mean Square
SAD	Static Auxiliary Data
SALP	Service d'Altimétrie et Localisation Précise
SDR	Sensor Data Record
SGDR	Sensor Geophysical Data Record
SNR	Signal to Noise Ratio
SSALTO	Segment Sol ALTimétrie et Orbitographie
SSHA	Sea-Surface Height Anomaly
SWH	Significant WaveHeight
TBC	To Be Confirmed
TBD	To Be Defined
TEC	Total Electron Content
USO	Ultra Stable Oscillator
UTC	Universal Time Coordinate

APPLICABLE AND REFERENCE DOCUMENTS

Reference	Document title
JPL D-61923	AD 1 SWOT Science Requirements Document
SMM-DD-BA-24876-CN	AD 2 Bibli_Alti : SWOT Nadir altimeter Interfaces
SMM-ST-BA-24877-CN	AD 3 Bibli_Alti : SWOT Nadir altimeter Processing Steps
To be issued	RD 1 SWOT Nadir altimeter Products Handbook

TBC AND TBD LIST

TBC/TBD	Paragraph	Brief description

CONTENTS

1. INTRODUCTION

The aim of this document is to define the SWOT level2 altimeter products specifications. It is applicable to the development of the processing module (SPA, TM_NRT) and of the other tools developed by NASA, CNES or other partners (BUFR convertor, NRTAVS, …). The document RD 1 (SWOT Nadir Altimeter Products Handbook) gives the required information to users.

This document has been named according to the Jason-2 and Jason-3 missions (SSALTO Products Specifications – Volume 10 : Jason-2 User Products). Other products specification documents are available to describe experts products and orbitography products. Those additional documents are maintain by CNES SALP project and are names :

- SALP-ST-M-EA-10882-CN : SSALTO Products Specifications – Volume 4 : Positioning and orbitography external products
- SALP-ST-M-EA-10883-CN : Spécifications des produits SSALTO – Volume 5 : Altimeter expertise products
- SALP-ST-M-EA-10884-CN : SSALTO Products Specifications – Volume 6 : Mission orbitography and positioning expertise products
- SALP-ST-M-EA-10885-CN : Spécifications des produits SSALTO – Volume 7 : Produits d'expertise – Réseau de balises

According to requirements from AD 1, three different data products shall be produced and distributed to the users:

1. Operational Geophysical Data Record (**OGDR**) produced in near real time
2. Interim Geophysical Data Record (**IGDR**) produced in 1 to 1.5 days
3. Geophysical Data Record (**GDR**) produced in 90 days

The first one is a NRT product. The other two are OFL products.

In addition to the native NetCdf format which are described in this document, a 1Hz BUFR-formatted dataset from the OGDR family (OGDR-BUFR) for distribution via the World Meteorological Organization (WMO) Global Tele-communication System (GTS) and EUMETCast (TBC) is also generated. The BUFR format is described in RD 1.

Netcdf OGDR/IGDR/GDR products have the same information and format. The only difference is related to auxiliary data (orbit, meteo files, calibrations, …).

Taken into account Jason-2/3 heritage, products are splitted into several data sets :

1. One file close to current Jason-3 NRT-**SSHA,** limited to 1Hz sampling.
2. One file close to current Jason-3 I/**GDR**, containing 1Hz and 20Hz values.
3. One file close to current Jason-3 **SGDR**, containing 1Hz, 20Hz and waveforms values. This file is not generated in NRT.

The following table shows the data sets available for each kind of product.

		Data set		
		SSHA	**GDR**	**SGDR**
Products	OGDR	X	X	
	IGDR	X	X	X
	GDR	X	X	X

Table 1 – Data set availability per product

An overview of the file format used for the data sets is given in section 2. Then the data sets are described from section 3 to section 7.

2. SWOT NADIR ALTIMETER USER PRODUCTS OVERVIEW

2.1. NETCDF FORMAT AND CF CONVENTION

The netCDF data format has been chosen to store the different data sets (one file per data set). This format is extremely flexible, self describing and has been adopted as a de-facto standard for many operational oceanography systems. What's more, the files will follow the Climate and Forecast NetCDF conventions CF-1.7 because these conventions provide a practical standard for storing.

2.2. THE NETCDF DATA MODEL

A netCDF file contains dimensions, variables, and attributes, which all have both a name by which they are identified. These components can be used together to capture the meaning of data and relations among data fields in an array-oriented data set.

2.2.1. DIMENSIONS

A dimension may be used to represent a real physical dimension, for example, time, latitude, longitude, or height. A dimension might also be used to index other quantities (waveforms index for example). The following dimensions are used in the SWOT Nadir Altimeter product files:

			Data set		
Group	**Dimension name**	**Value**	**SSHA**	**GDR**	**SGDR**
data_01	**time**	Number of measurements in the file	Yes	Yes	Yes
data_20	**time**	Number of measurements in the file	No	Yes	Yes
/	**samples**	**104** (number of waveform samples)	No	No	Yes

Table 2 - Dimensions used in the SWOT Nadir Altimeter data sets

2.2.2. VARIABLES

Variables are used to store the bulk of the data in a netCDF file. 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.

A variable data type is one of a small set of netCDF types. In this document the variable types will be represented as follows:

Variable type	Description
char	Characters
byte	8-bit data signed
short	16-bit signed integer
int	32-bit signed integer
float	IEEE single precision floating point (32 bits)
double	IEEE double precision floating point (64 bits)

Table 3 - netCDF variable type

2.2.3. COORDINATE VARIABLES AND AUXILIARY COORDINATE VARIABLES

A variable with the same name as a dimension is called a coordinate variable. It typically defines a physical coordinate corresponding to that dimension. In accordance with the Climate and Forecast conventions, we must declare a coordinate variable for each dimension. What's more, missing values are not allowed in coordinate variables and they must be strictly monotonic.

An **auxiliary coordinate variable** is a netCDF variable that contains coordinates data but is not a coordinate variable as defined above. Unlike coordinate variables, there is no relationship between the name of an auxiliary coordinate variable and the name(s) of its dimension(s).

2.2.4. ATTRIBUTES

NetCDF attributes are used to store data about the data (ancillary data or metadata), similar in many ways to the information stored in data dictionaries and schema in conventional database systems. Most attributes provide information about a specific variable. These are identified by the name of that variable, together with the name of the attribute.

Some attributes provide information about the data set as a whole. They are called **global attributes** (similar to the header of the Jason-1 products).

The following table shows the variable attributes used in the SWOT Nadir Altimeter product. There are no mandatory attributes.

Attribute	Description
_FillValue	A value used to represent missing or undefined data
add_offset	If present, this number is to be added to the date after it is read by an application. If both *scale_factor* and *add_offset* attributes are present, the date are first scaled before the offset is added.
calendar	Reference time calendar
comment	Miscellaneous information about the data or the methods used to produce it
coordinates	Identified auxiliary coordinates variables.
flag_meanings	Use in conjunction with *flag_values* to provide descriptive words or phrase for each flag value.
flag_values	Provide a list of the flag values. Use in conjunction with *flag_meanings*.
institution	Institution which provides the data
leap_second	UTC time at which a leap second occurs

Attribute	Description
long_name	A descriptive name that indicates a variable's content. This name is not standardized.
quality_flag	Name of the variable(s) (quality flag) representing the quality of the current variable
scale_factor	If present, the date are to be multiplied by this factor after the data are read by an application. See also *add_offset* attribute.
source	Data source (model features, or observation)
standard_name	A standard name that references a description of a variables content in the standard name table.
tai_utc_difference	Difference between TAI and UTC reference time
units	Unit of a variable's content. The value of this attribute must be a string that can be recognized by the UNIDATA's Udunits package.
valid_max	Largest theoretical valid value of a variable (this is not the maximum of actual data).
valid_min	Smallest theoretical valid value of a variable (this is not the minimum of actual data).

Table 4 - Variable's attributes

2.3. THE COMMON DATA LANGUAGE

The Common Data Language (CDL) will be used to describe the content of a data set.

The CDL is textual notation that described the netCDF object and it is human readable. The netCDF utility **ncdump** converts netCDF objects binary to CDL text. The netCDF utility **ncgen** creates netCDF binary file from CDL text file.

A CDL description of a netCDF data set takes the form:

```
netCDF name {
      dimension: …
      variables: …
      data: …
}
```

where the name is used only as a default in constructing file names by the ncgen utility. The CDL description consists of three optional parts, introduced by the keywords dimensions variables and data. NetCDF dimension declarations appear after the dimensions keyword, netCDF variables and attributes are defined after the variables keyword and variable data assignments appears after the data keyword. CDL statement are terminated by a semicolon. Spaces, tabs and newlines can be used freely for readability. Comments in CDL follow the characters '//' on any line.

Example :

```
netcdf example {
 dimensions:                                          // dimensions name are declared first
  time = 2680;

  variables:

double time(time);
       time:long_name = "time in UTC";
       time:standard_name = “time”;
       time:calendar = “gregorian”;
       time:tai_utc_difference = < Value of TAI-UTC at time of first record >;
       time:leap_second = < UTC time of the leap second (YYYY-MM-DD hh:mm:ss) >;
       time: units = “seconds since 2000-01-01 00:00:00.0”;
       time: comment = ”Time of measurement in seconds in the UTC time scale since 1 Jan 2000 00:00:00
UTC. [tai_utc_difference] is the difference between TAI and UTC reference time (seconds) for the first
measurement of the data set. If a leap second occurs within the data set, the attribute [leap_second]
is set to the UTC time at which the leap second occurs.”;

double time_tai(time);
       time_tai:long_name = "time in TAI";
       time_tai:standard_name = “time”;
       time_tai:calendar = “gregorian”;
       time_tai: units = “seconds since 2000-01-01 00:00:00.0”;
       time_tai: comment = ”Time of measurement in seconds in the TAI time scale since 1 Jan 2000
00:00:00 TAI. This time scale contains no leap seconds. The difference (in seconds) with time in UTC
is given by the attribute [time:tai_utc_difference]”;

  int longitude(time);
    longitude:long_name = "longitude";
    longitude:standard_name = "longitude";
    longitude:units = "degrees_east";
    longitude:scale_factor = 1.0e-06;

byte rad_surface_type_flag(time);
       rad_surface_type_flag:_FillValue = 127b;
       rad_surface_type_flag:long_name = "radiometer surface type";
       rad_surface_type_flag:flag_meanings = "open_ocean near_coast land";
       rad_surface_type_flag:flag_values = 0b, 1b, 2b;
       rad_surface_type_flag:coordinates = "longitude latitude";
       rad_surface_type_flag:comment = "Named rad_surf_type in GDR-D standard. The radiometer
surface type flag is applicable to the radiometer wet troposphere path delays provided by
rad_wet_tropo_cor. A value of 0 indicates that open ocean processing is used to compute the path
delay, 1 indicates coastal processing is used, and 2 indicates the path delay is invalid due to land";

   int altitude(time);
    altitude:long_name = "1 Hz altitude of satellite";
    altitude:_FillValue = 2147483647;
    altitude:units = "m";
    altitude:add_offset = 1.30e+06;
    altitude:scale_factor = 1.00e-04;
    altitude:coordinates = "longitude latitude";
```

- time is a coordinate variable.
- rad_surface_type_flag is a flag fully described by the flag_meanings and flag_values attributes:

  rad_surface_type_flag = 0 -> open ocean surface
  rad_surface_type_flag = 1 -> near coast surface
  rad_surface_type_flag = 2 -> land surface

  If rad_surface_type_flag is not computed, it will take the value 127 (_FillValue attribute).

- alt is *packed*. The data are stored in 32-bit integers (long). The value of the altitude of the satellite can be recovered using:

alt = (alt_{long} * scale_factor) + add_offset

2.4. NAMING CONVENTION

Both MLE-3 and MLE-4 parameters are made available to all users of nominal and reduced datasets, as well as those using expert products. This leads to the following convention on the variables' names described in sections 4 to 7:

Altimeter parameters (e.g. Range, swh, sigma0, etc) and related geophysical parameters (e.g. Ionosphere correction, sea state bias correction, wind speed, etc) named without the "mle3" or "adaptive" extension are derived from MLE-4 retracking, while those with the "mle3" extension are derived from MLE-3 retracking and the those with the "adaptive" extension from Adaptive retracking.

Most users are advised to use the MLE-4 altimeter parameters for typical scientific applications. The MLE-3 Ku band parameters are provided for the convenience of specialized studies on the calibration and validation of the mission and impact of altimeter retracking.

2.5. FILE FORMAT

SWOT Nadir Altimeter Level 2 Product are NetCdF4/HDF5 files.

A NetCDF native compression is applied: nc_def_var_deflate

using :

- Shuffle = 0 (False)
- Deflate = 1 (True)
- deflate_level = 6

3. GLOBAL ATTRIBUTES

Global attributes are defined in the table below.

			Data set		
Attribute name	**Format**	**Description**	**SSHA**	**GDR**	**SGDR**
Conventions	String	netCDF convention followed. **"CF-1.7"**	X	X	X
title	String	The descriptive title for the data set (ex OGDR - Reduced dataset IGDR - Standard dataset GDR - Standard dataset GDR - Expertise dataset	X	X	X
institution	String	The name of the data producer (ex. CNES):	X	X	X
source	String	The method of production of original data (model vs observational): **"Processing Baseline F v1.0"**	X	X	X
history	String	Product creation date and time **(**YYYY-MM-DD HH:MM:SS : creation**)**	X	X	X
contact	String	A text giving the primary contact for information about the data set **"CNES aviso@altimetry.fr, JPL podaac@podaac.jpl.nasa.gov"**	X	X	X
references	String	The version of the altimetric library used to produce the data set (ex: L1 library=V3.1p1, L2 library=V3.0p1, Processing Pilot=V3-0p1p2p3):	X	X	X
processing_center	String	Name of the processing center (SALP)	X	X	X
reference_document	String	Name of the reference document describing the products **"SWOT Nadir Altimeter Products Handbook, SALP-MU-M-OP-xxxxx-CN"**, To be issued	X	X	X
mission_name	String	Name of the mission: "SWOT"	X	X	X
altimeter_sensor_name	String	Name of the altimeter sensor "Poseidon-3C"	X	X	X

			Data set		
Attribute name	**Format**	**Description**	**SSHA**	**GDR**	**SGDR**
radiometer_sensor_name	String	Name of the radiometer sensor **"AMR"**	X	X	X
doris_sensor_name	String	Name of the DORIS sensor "DGXX-S"	X	X	X
gpsr_sensor_name	String	Name of the GPSR sensor "**GPSP**"	X	X	X
cycle_number	long	Cycle number	X	X	X
absolute_rev_number	long	Absolute number of revolution	X	X	X
pass_number	long	Pass number in the cycle (relative pass number)	X	X	X
absolute_pass_number	long	Absolute pass number (since the beginning of the mission)	X	X	X
equator_time	String	UTC time of equator crossing (YYYY-MM-DD HH:MM:SS.mmmmmm)	X	X	X
equator_longitude	double	Longitude of equator crossing	X	X	X
first_meas_time	String	UTC Date of the first measurement of the data set (YYYY-MM-DD HH:MM:SS.mmmmmm)	X	X	X
last_meas_time	String	UTC Date of the last measurement of the data set (YYYY-MM-DD HH:MM:SS.mmmmmm)	X	X	X
xref_telemetry	String	Name of the telemetry files	X	X	X
xref_altimeter_characterisation	String	Name of the altimeter characterisation data file	X	X	X
xref_altimeter_ltm	String	Name of the files containing the Altimeter Long Term Monitoring (PTR and LPF data)	X	X	X
xref_radiometer_level2	String	Name of the file containing the level 2 radiometer product	X	X	X
xref_doris_uso	String	Name of the file containing the DORIS-derived USO frequency	X	X	X
xref_orbit_data	String	Name of the file containing the orbit ephemeris	X	X	X
xref_pf_data	String	Name of the file containing the platform data (mispointing, distance antenna-COG)	X	X	X
xref_pole_location	String	Name of the file containing the pole location data	X	X	X
xref_orf_data	String	Name of the Orbit Revolution File used to create the pass file	X	X	X
xref_meteorological_files	String	Name of the meteorological files used to create the pass file (including Altitude Gaussian grid)	X	X	X

			Data set		
Attribute name	**Format**	**Description**	**SSHA**	**GDR**	**SGDR**
xref_sst_data	String	Name of the file containing the sea surface temperature data (applicable to GDRs products only)	X	X	X
xref_wave_model_data	String	Name of the file(s) containing the wave model data (not applicable to OGDRs products)	X	X	X
xref_utc_tai_data	String	Name of the TAI/UTC leap second offset file used to manage the leap second	X	X	X
xref_gim_data	String	Name of the files containing the ionospheric correction	X	X	X
xref_mog2d_data	String	Name of the files containing the MOG2D correction	X	X	X
xref_polar_ice_data	String	Name of the files containing the ocean sea-ice concentration (not applicable to OGDRs products)	X	X	X
ellipsoid_axis	Double	Semi-major axis of the reference ellipsoid	X	X	X
ellipsoid_flattening	Double	Flattening coefficient of the reference ellipsoid	X	X	X

4. LEVEL 2 VARIABLE AVAILABILITY

The table below show the variables available for each type of data set (SSHA, GDR and SGDR).

Parameter name	dataset ssha							dataset gdr							dataset sgdr						
	/	data_01			data_20			/	data_01			data_20			/	data_01			data_20		
	/	/	ku	c	/	ku	c	/	/	ku	c	/	ku	c	/	/	ku	c	/	ku	c
time		x							x			x				x			x		
time_tai		x							x			x				x			x		
index_first_20hz_measurement									x							x					
index_1hz_measurement												x							x		
numtotal_20hz_measurement									x							x					
samples															x						
latitude		x							x			x				x			x		
longitude		x							x			x				x			x		
rad_side_1_surface_type_flag		x							x							x					
rad_side_2_surface_type_flag		x							x							x					
rad_side_1_distance_to_land									x							x					
rad_side_2_distance_to_land									x							x					
surface_classification_flag		x							x			x				x			x		
angle_of_approach_to_coast									x			x				x			x		
distance_to_coast									x			x				x			x		
alt_qual		x																			
rad_qual		x																			
geo_qual		x																			
range_ocean_compression_qual										x	x		x	x			x	x		x	x
range_ocean_mle3_compression_qual										x			x				x			x	
range_adaptive_compression_qual										x			x				x			x	
swh_ocean_compression_qual										x	x		x	x			x	x		x	x
swh_ocean_mle3_compression_qual										x			x				x			x	
swh_adaptive_compression_qual										x			x				x			x	
sig0_ocean_compression_qual										x	x		x	x			x	x		x	x
sig0_ocean_mle3_compression_qual										x			x				x			x	
sig0_adaptive_compression_qual										x			x				x			x	
off_nadir_angle_wf_ocean_compression_qual										x			x				x			x	
range_cor_ocean_net_instr_qual										x	x						x	x			
swh_cor_ocean_net_instr_qual										x	x						x	x			
sig0_cor_ocean_net_instr_qual										x	x						x	x			

rad_tb_187_qual								x						x						
rad_tb_238_qual								x						x						
rad_tb_340_qual								x						x						
rad_side_1_land_frac_187								x						x						
rad_side_2_land_frac_187								x						x						
rad_side_1_land_frac_238								x						x						
rad_side_2_land_frac_238								x						x						
rad_side_1_land_frac_340								x						x						
rad_side_2_land_frac_340								x						x						
alt_state_c_band_flag										x						x				
alt_state_band_seq_flag								x						x						
alt_state_band_status_flag									x	x					x	x				
alt_state_acq_mode_flag											x						x			
alt_state_track_trans_flag											x						x			
rad_state_oper_flag								x						x						
orb_state_diode_flag								x						x						
orb_state_rest_flag								x						x						
meteo_map_availability_flag		x						x						x						
wave_model_map_availability_flag								x						x						
sig0_cor_atm_source								x						x						
rain_flag		x						x						x						
rad_side_1_rain_flag		x						x						x						
rad_side_2_rain_flag		x						x						x						
ice_flag		x						x						x						
rad_side_1_sea_ice_flag		x						x						x						
rad_side_2_sea_ice_flag		x						x						x						
rad_wet_tropo_cor_interp_qual		x						x						x						
mean_sea_surface_cnescls_interp_qual								x						x						
mean_sea_surface_dtu_interp_qual								x						x						
mean_dynamic_topography_interp_qual								x						x						
ocean_tide_got_interp_qual								x						x						
ocean_tide_fes_interp_qual								x						x						
internal_tide_interp_qual								x						x						
meteo_zero_altitude_interp_qual								x						x						
meteo_measurement_altitude_interp_qual								x			x			x			x			
sea_ice_concentration_interp_qual								x						x						
wave_model_interp_qual								x						x						

ocog_qual														x							x	
ice2_qual														x	x						x	x
seaice_qual														x							x	
tfmra_qual														x							x	
iono_cor_alt_filtered_qual										x								x				
iono_cor_alt_filtered_mle3_qual										x								x				
iono_cor_alt_filtered_adaptive_qual										x								x				
altitude		x							x			x					x					
altitude_rate									x								x					
tracker_range_calibrated																					x	x
tracker_range_counter																				x		
tracker_range_rate_counter																				x		
range_ocean			x							x	x			x	x			x	x		x	x
range_ocean_mle3			x							x				x				x			x	
range_adaptive										x				x				x			x	
range_ocean_rms										x	x							x	x			
range_ocean_mle3_rms										x								x				
range_adaptive_rms										x								x				
range_ocean_numval										x	x							x	x			
range_ocean_mle3_numval										x								x				
range_adaptive_numval										x								x				
model_dry_tropo_cor_zero_altitude		x							x								x					
model_dry_tropo_cor_measurement_altitude									x			x					x			x		
model_wet_tropo_cor_zero_altitude									x								x					
model_wet_tropo_cor_measurement_altitude									x			x					x			x		
rad_wet_tropo_cor		x							x								x					
surface_slope_cor									x			x					x			x		
iono_cor_alt										x								x				
iono_cor_alt_mle3										x								x				
iono_cor_alt_adaptive										x												
iono_cor_alt_filtered			x							x								x				
iono_cor_alt_filtered_mle3			x							x								x				
iono_cor_alt_filtered_adaptive										x								x				
iono_cor_gim										x								x				
sea_state_bias			x							x	x							x	x			
sea_state_bias_mle3			x							x	x							x	x			
sea_state_bias_adaptive										x	x							x	x			

sea_state_bias_3d_mp2										x							x				
sea_state_bias_adaptive_3d_mp2										x							x				
range_cor_ocean_net_instr										x	x						x	x			
range_cor_ocean_mle3_net_instr										x							x				
range_cor_adaptive_net_instr										x							x				
range_cor_uso																x					
range_cor_internal_path																	x	x			
range_cor_ocean_model_instr																	x	x			
range_cor_ocean_mle3_model_instr																	x				
range_cor_doppler																	x	x			
range_cor_cog																x					
swh_ocean			x							x	x		x	x			x	x		x	x
swh_ocean_mle3			x							x			x				x			x	
swh_adaptive										x			x				x			x	
swh_ocean_rms										x	x						x	x			
swh_ocean_mle3_rms										x							x				
swh_adaptive_rms										x							x				
swh_ocean_numval										x	x						x	x			
swh_ocean_mle3_numval										x							x				
swh_adaptive_numval										x							x				
swh_cor_ocean_net_instr										x	x						x	x			
swh_cor_ocean_mle3_net_instr										x							x				
swh_cor_adaptive_net_instr										x							x				
swh_cor_ocean_model_instr																	x	x			
swh_cor_ocean_mle3_model_instr																	x				
sig0_ocean			x							x	x		x	x			x	x		x	x
sig0_ocean_mle3			x							x			x				x			x	
sig0_adaptive										x			x				x			x	
sig0_ocean_rms										x	x						x	x			
sig0_ocean_mle3_rms										x							x				
sig0_adaptive_rms										x							x				
sig0_ocean_numval										x	x						x	x			
sig0_ocean_mle3_numval										x							x				
sig0_adaptive_numval										x							x				
sig0_cor_atm										x	x						x	x			
sig0_cor_ocean_net_instr										x	x						x	x			
sig0_cor_ocean_mle3_net_instr										x							x				

sig0_cor_adaptive_net_instr										x							x				
sig0_cor_calibration																	x	x			
sig0_cor_ocean_model_instr																	x	x			
sig0_cor_ocean_mle3_model_instr																	x				
agc										x	x						x	x		x	x
agc_rms										x	x						x	x			
agc_numval										x	x						x	x			
sig0_scaling_factor																				x	x
agc_cor																				x	x
mean_sea_surface_cnescls		x							x							x					
mean_sea_surface_dtu									x							x					
x		x							x							x					
geoid									x							x					
depth_or_elevation		x							x							x					
inv_bar_cor		x							x							x					
dac		x							x							x					
ocean_tide_got									x							x					
ocean_tide_fes		x							x							x					
ocean_tide_eq									x							x					
ocean_tide_non_eq									x							x					
load_tide_got									x							x					
load_tide_fes									x							x					
solid_earth_tide		x							x							x					
pole_tide		x							x							x					
internal_tide		x							x							x					
wind_speed_mod_u									x							x					
wind_speed_mod_v									x							x					
wind_speed_alt		x							x							x					
wind_speed_alt_mle3		x							x							x					
wind_speed_alt_adaptive									x							x					
rad_wind_speed									x							x					
rad_water_vapor		x							x							x					
rad_cloud_liquid_water		x							x							x					
rain_rate									x							x					
sst									x							x					
mean_wave_period_t02									x							x					
mean_wave_direction									x							x					

sea_ice_concentration									x						x					
ssha			x							x						x				
ssha_mle3			x							x						x				
off_nadir_angle_wf_ocean										x			x			x			x	
off_nadir_angle_wf_ocean_rms										x						x				
off_nadir_angle_wf_ocean_numval										x						x				
rad_tmb_187									x						x					
rad_tmb_238									x						x					
rad_tmb_340									x						x					
rad_tb_187									x						x					
rad_tb_238									x						x					
rad_tb_340									x						x					
mqe_ocean													x	x					x	x
mqe_ocean_mle3													x						x	
mqe_adaptive													x							
mqe_ice2													x	x					x	x
peakiness													x	x					x	x
wvf_main_class			x							x			x				x		x	
wvf_main_class_score																			x	
wvf_second_class																			x	
wvf_second_class_score																			x	
rad_ta_187															x					
rad_ta_238															x					
rad_ta_340															x					
epoch_ocean																			x	x
epoch_ocean_mle3																			x	
epoch_adaptive																			x	
sigmac_ocean																			x	x
sigmac_ocean_mle3																			x	
amplitude_ocean																			x	x
amplitude_ocean_mle3																			x	
amplitude_adaptive																			x	
noise_floor_ocean																			x	x
noise_floor_adaptive																			x	
gamma_adaptive																			x	
convergence_criteria_adaptive																			x	
num_iterations_ocean													x	x					x	x

num_iterations_ocean_mle3														x								x		
num_iterations_adaptive														x								x		
range_ocog														x	x							x	x	
sig0_ocog														x	x							x	x	
epoch_ocog																						x	x	
amplitude_ocog																						x	x	
range_seaice														x								x		
sig0_seaice														x								x		
epoch_seaice																						x		
amplitude_seaice																						x		
range_ice2														x	x							x	x	
sig0_leading_edge_ice2														x	x							x	x	
sig0_ice2														x	x							x	x	
sigmal_ice2														x	x							x	x	
slope1_ice2														x	x							x	x	
slope2_ice2														x	x									
slope_ice2																						x		
epoch_ice2																						x	x	
amplitude_ice2																						x	x	
mean_amplitude_ice2																						x	x	
noise_floor_ice2																						x	x	
range_tfmra														x								x		
sig0_tfmra														x								x		
epoch_tfmra																						x		
amplitude_tfmra																						x		
power_waveform																						x	x	

5. SSHA DATA SET

```
netcdf ssha {
```

// 1-Hz data

```
group: data_01 {

 dimensions:
  time = < number of measurements >;

 variables:
```

// Time Tag

```
double time(time);
       time:long_name = "time in UTC";
       time:standard_name = "time";
       time:calendar = "gregorian";
       time:tai_utc_difference = < Value of TAI-UTC at time of first record >;
       time:leap_second = < UTC time of the leap second (YYYY-MM-DD hh:mm:ss) >;
       time:units = "seconds since 2000-01-01 00:00:00.0";
       time:comment = "Time of measurement in seconds in the UTC time scale since 1 Jan
2000 00:00:00 UTC. [tai_utc_difference] is the difference between TAI and UTC reference
time (seconds) for the first measurement of the data set. If a leap second occurs within
the data set, the attribute [leap_second] is set to the UTC time at which the leap second
occurs";

double time_tai(time);
       time_tai:_FillValue = 18446744073709551616.000000;
       time_tai:long_name = "time in TAI";
       time_tai:standard_name = "time";
       time_tai:calendar = "gregorian";
       time_tai:units = "seconds since 2000-01-01 00:00:00.0";
       time_tai:comment = "Time of measurement in seconds in the TAI time scale since 1
Jan 2000 00:00:00 TAI. This time scale contains no leap seconds. The difference (in
seconds) with time in UTC is given by the attribute [time:tai_utc_difference]";
```

// Location and surface type

```
int latitude(time);
       latitude:_FillValue = 2147483647;
       latitude:long_name = "latitude";
       latitude:standard_name = "latitude";
       latitude:units = "degrees_north";
       latitude:scale_factor = 1.00e-06;
       latitude:comment = "Positive latitude is North latitude, negative latitude is
South latitude. See SWOT Nadir Altimeter User Handbook. Associated quality flag is
orb_state_diode_flag for the OGDR products, orb_state_rest_flag for the IGDR and GDR
products";

int longitude(time);
       longitude:_FillValue = 2147483647;
       longitude:long_name = "longitude";
       longitude:standard_name = "longitude";
       longitude:units = "degrees_east";
       longitude:scale_factor = 1.00e-06;
```

```
      longitude:comment = "East longitude relative to Greenwich meridian. See SWOT Nadir
Altimeter User Handbook. Associated quality flag is orb_state_diode_flag for the OGDR
products, orb_state_rest_flag for the IGDR and GDR products";

byte surface_classification_flag(time);
      surface_classification_flag:_FillValue = 127b;
      surface_classification_flag:long_name = "surface classification";
      surface_classification_flag:flag_meanings = "open_ocean land continental_water
aquatic_vegetation continental_ice_snow floating_ice salted_basin";
      surface_classification_flag:flag_values = 0b, 1b, 2b, 3b, 4b, 5b, 6b;
      surface_classification_flag:coordinates = "longitude latitude";
      surface_classification_flag:comment = "Computed from a mask built with MODIS and
GlobCover data";

byte rad_side_1_surface_type_flag(time);
      rad_side_1_surface_type_flag:_FillValue = 127b;
      rad_side_1_surface_type_flag:long_name = "radiometer surface type from first
radiometer";
      rad_side_1_surface_type_flag:flag_meanings = "open_ocean near_coast land";
      rad_side_1_surface_type_flag:flag_values = 0b, 1b, 2b;
      rad_side_1_surface_type_flag:coordinates = "longitude latitude";

byte rad_side_2_surface_type_flag(time);
      rad_side_2_surface_type_flag:_FillValue = 127b;
      rad_side_2_surface_type_flag:long_name = "radiometer surface type from second
radiometer";
      rad_side_2_surface_type_flag:flag_meanings = "open_ocean near_coast land";
      rad_side_2_surface_type_flag:flag_values = 0b, 1b, 2b;
      rad_side_2_surface_type_flag:coordinates = "longitude latitude";
```

// Quality information

```
byte alt_qual(time);
      alt_qual:_FillValue = 127b;
      alt_qual:long_name = "altimeter quality flag";
      alt_qual:flag_meanings = "good bad";
      alt_qual:flag_values = 0b, 1b;
      alt_qual:coordinates = "longitude latitude";
      alt_qual:comment = "Compilation of all altimeter flags except altimeter echo
type : Set to default in the current issue";

byte rad_qual(time);
      rad_qual:_FillValue = 127b;
      rad_qual:long_name = "radiometer quality flag";
      rad_qual:flag_meanings = "good bad";
      rad_qual:flag_values = 0b, 1b;
      rad_qual:coordinates = "longitude latitude";
      rad_qual:comment = "Compilation of all radiometer flags except radiometer surface
type : Set to default in the current issue";

byte geo_qual(time);
      geo_qual:_FillValue = 127b;
      geo_qual:long_name = "geophysical quality flag";
      geo_qual:flag_meanings = "good bad";
      geo_qual:flag_values = 0b, 1b;
      geo_qual:coordinates = "longitude latitude";
      geo_qual:comment = "Check on validity of all geophysical fields : Set to default
in the current issue";

byte meteo_map_availability_flag(time);
```

```
      meteo_map_availability_flag:_FillValue = 127b;
      meteo_map_availability_flag:long_name = "ECMWF meteorological map availability";
      meteo_map_availability_flag:flag_meanings = "2_maps_nominal 2_maps_degraded
1_map_closest_used no_valid_map";
      meteo_map_availability_flag:flag_values = 0b, 1b, 2b, 3b;
      meteo_map_availability_flag:coordinates = "longitude latitude";
      meteo_map_availability_flag:comment = "Possible values are: 0 meaning '2 maps,
nominal' (six hours apart), 1 meaning '2 maps, degraded' (more than six hours apart), 2
meaning '1 map, closest map used', 3 meaning 'no valid map'";

byte rad_wet_tropo_cor_interp_qual(time);
      rad_wet_tropo_cor_interp_qual:_FillValue = 127b;
      rad_wet_tropo_cor_interp_qual:long_name = "radiometer wet tropospheric correction
interpolation quality flag";
      rad_wet_tropo_cor_interp_qual:flag_meanings = "good degraded bad";
      rad_wet_tropo_cor_interp_qual:flag_values = 0b, 1b, 2b;
      rad_wet_tropo_cor_interp_qual:coordinates = "longitude latitude";
      rad_wet_tropo_cor_interp_qual:comment = "See SWOT Nadir Altimeter User Handbook";

byte rain_flag(time);
      rain_flag:_FillValue = 127b;
      rain_flag:long_name = "rain flag";
      rain_flag:flag_meanings = "no_rain rain high_rain_probability_from_altimeter
high_probability_of_no_rain_from_altimeter ambiguous_situation_possibility_of_ice
evaluation_not_possible";
      rain_flag:flag_values = 0b, 1b, 2b, 3b, 4b, 5b;
      rain_flag:coordinates = "longitude latitude";
      rain_flag:comment = "See SWOT Nadir Altimeter User Handbook";

byte rad_side_1_rain_flag(time);
      rad_side_1_rain_flag:_FillValue = 127b;
      rad_side_1_rain_flag:long_name = "radiometer rain flag from first radiometer";
      rad_side_1_rain_flag:flag_meanings = "no_rain rain";
      rad_side_1_rain_flag:flag_values = 0b, 1b;
      rad_side_1_rain_flag:coordinates = "longitude latitude";
      rad_side_1_rain_flag:comment = "See SWOT Nadir Altimeter User Handbook";


byte rad_side_2_rain_flag(time);
      rad_side_2_rain_flag:_FillValue = 127b;
      rad_side_2_rain_flag:long_name = "radiometer rain flag from second radiometer";
      rad_side_2_rain_flag:flag_meanings = "no_rain rain";
      rad_side_2_rain_flag:flag_values = 0b, 1b;
      rad_side_2_rain_flag:coordinates = "longitude latitude";
      rad_side_2_rain_flag:comment = "See SWOT Nadir Altimeter User Handbook";


byte ice_flag(time);
      ice_flag:_FillValue = 127b;
      ice_flag:long_name = "ice flag";
      ice_flag:flag_meanings = "no_ice ice";
      ice_flag:flag_values = 0b, 1b;
      ice_flag:coordinates = "longitude latitude";
      ice_flag:comment = "See SWOT Nadir Altimeter User Handbook";


byte rad_side_1_sea_ice_flag(time);
      rad_side_1_sea_ice_flag:_FillValue = 127b;
      rad_side_1_sea_ice_flag:long_name = "radiometer sea-ice flag from first
radiometer";
      rad_side_1_sea_ice_flag:flag_meanings = "no_sea_ice sea_ice";
      rad_side_1_sea_ice_flag:flag_values = 0b, 1b;
      rad_side_1_sea_ice_flag:coordinates = "longitude latitude";
```

```
      rad_side_1_sea_ice_flag:comment = "See SWOT Nadir Altimeter User Handbook";
byte rad_side_2_sea_ice_flag(time);
      rad_side_2_sea_ice_flag:_FillValue = 127b;
      rad_side_2_sea_ice_flag:long_name = "radiometer sea-ice flag from second
radiometer";
      rad_side_2_sea_ice_flag:flag_meanings = "no_sea_ice sea_ice";
      rad_side_2_sea_ice_flag:flag_values = 0b, 1b;
      rad_side_2_sea_ice_flag:coordinates = "longitude latitude";
      rad_side_2_sea_ice_flag:comment = "See SWOT Nadir Altimeter User Handbook";
```

// Orbit

```
int altitude(time);
      altitude:_FillValue = 2147483647;
      altitude:long_name = "1 Hz altitude of satellite";
      altitude:standard_name = "height_above_reference_ellipsoid";
      altitude:units = "m";
      altitude:add_offset = 1.300000e+06;
      altitude:scale_factor = 1.00e-04;
      altitude:coordinates = "longitude latitude";
      altitude:comment = "Altitude of satellite above the reference ellipsoid.
Associated quality flag is orb_state_diode_flag for the OGDR products,
orb_state_rest_flag for the IGDR and GDR products";
```

// Altimeter range corrections

```
short model_dry_tropo_cor_zero_altitude (time);
      model_dry_tropo_cor_zero_altitude:_FillValue = 32767s;
      model_dry_tropo_cor_zero_altitude:long_name = "model dry tropospheric correction
at zero altitude";
      model_dry_tropo_cor_zero_altitude:standard_name =
"altimeter_range_correction_due_to_dry_troposphere";
      model_dry_tropo_cor_zero_altitude:source = "European Center for Medium Range
Weather Forecasting";
      model_dry_tropo_cor_zero_altitude:institution = "ECMWF";
      model_dry_tropo_cor_zero_altitude:units = "m";
      model_dry_tropo_cor_zero_altitude:scale_factor = 1.00e-04;
      model_dry_tropo_cor_zero_altitude:coordinates = "longitude latitude";
      model_dry_tropo_cor_zero_altitude:comment = "Computed at the altimeter time-tag
from the interpolation of 2 meteorological fields that surround the altimeter time-tag. A
dry tropospheric correction must be added (negative value) to the instrument range to
correct this range measurement for dry tropospheric range delays of the radar pulse. See
SWOT Nadir Altimeter User Handbook";

short rad_wet_tropo_cor(time);
      rad_wet_tropo_cor:_FillValue = 32767s;
      rad_wet_tropo_cor:long_name = "radiometer wet tropospheric correction";
      rad_wet_tropo_cor:standard_name =
"altimeter_range_correction_due_to_wet_troposphere";
      rad_wet_tropo_cor:source = "AMR";
      rad_wet_tropo_cor:institution = "NASA/JPL";
      rad_wet_tropo_cor:units = "m";
      rad_wet_tropo_cor:scale_factor = 1.00e-04;
      rad_wet_tropo_cor:coordinates = "longitude latitude";
      rad_wet_tropo_cor:comment = "A wet tropospheric correction must be added (negative
value) to the instrument range to correct this range measurement for wet tropospheric
range delays of the radar pulse";
```

// Geophysical parameters

```
int mean_sea_surface_cnescls(time);
       mean_sea_surface_cnescls:_FillValue = 2147483647;
       mean_sea_surface_cnescls:long_name = "mean sea surface height (CNES/CLS solution)
above reference ellipsoid";
       mean_sea_surface_cnescls:source = < mean_sea_surface_cnescls_source >;
       mean_sea_surface_cnescls:institution = < mean_sea_surface_cnescls_institution >;
       mean_sea_surface_cnescls:units = "m";
       mean_sea_surface_cnescls:scale_factor = 1.00e-04;
       mean_sea_surface_cnescls:coordinates = "longitude latitude";
       mean_sea_surface_cnescls:comment = "See SWOT Nadir Altimeter User Handbook";

int mean_dynamic_topography(time);
       mean_dynamic_topography:_FillValue = 2147483647;
       mean_dynamic_topography:long_name = "mean dynamic topography above geoid";
       mean_dynamic_topography:source = < mdt_source >;
       mean_dynamic_topography:institution = < mdt_institution >;
       mean_dynamic_topography:units = "m";
       mean_dynamic_topography:scale_factor = 1.00e-04;
       mean_dynamic_topography:coordinates = "longitude latitude";
       mean_dynamic_topography:comment = "See SWOT Nadir Altimeter User Handbook";

int depth_or_elevation(time);
       depth_or_elevation:_FillValue = 2147483647;
       depth_or_elevation:long_name = "ocean depth/land elevation";
       depth_or_elevation:source = < bathy_topo_source >;
       depth_or_elevation:institution = < bathy_topo_institution >;
       depth_or_elevation:units = "m";
       depth_or_elevation:coordinates = "longitude latitude";

short inv_bar_cor(time);
       inv_bar_cor:_FillValue = 32767s;
       inv_bar_cor:long_name = "inverted barometer height correction";
       inv_bar_cor:standard_name =
"sea_surface_height_correction_due_to_air_pressure_at_low_frequency";
       inv_bar_cor:source = "European Center for Medium Range Weather Forecasting";
       inv_bar_cor:institution = "ECMWF";
       inv_bar_cor:units = "m";
       inv_bar_cor:scale_factor = 1.00e-04;
       inv_bar_cor:coordinates = "longitude latitude";
       inv_bar_cor:comment = "Computed at the altimeter time-tag from the interpolation
of 2 meteorological fields that surround the altimeter time-tag. See SWOT Nadir Altimeter
User Handbook";

short dac(time);
       dac:_FillValue = 32767s;
       dac:long_name = "dynamic atmospheric correction";
       dac:institution = "LEGOS/CLS/CNES";
       dac:units = "m";
       dac:scale_factor = 1.00e-04;
       dac:coordinates = "longitude latitude";
       dac:comment = "Sum of the high frequency fluctuations correction and of the low
frequency inverted barometer correction (inv_bar_cor). See SWOT Nadir Altimeter User
Handbook";

int ocean_tide_fes(time);
       ocean_tide_fes:_FillValue = 2147483647;
       ocean_tide_fes:long_name = "geocentric ocean tide height (FES solution)";
```

```
      ocean_tide_fes:standard_name =
"sea_surface_height_amplitude_due_to_geocentric_ocean_tide";
      ocean_tide_fes:source = < ocean_tide_fes_source >;
      ocean_tide_fes:institution = < ocean_tide_fes_institution >;
      ocean_tide_fes:units = "m";
      ocean_tide_fes:scale_factor = 1.00e-04;
      ocean_tide_fes:coordinates = "longitude latitude";
      ocean_tide_fes:comment = "Includes the equilibrium long-period ocean tide height
and the short-period part of the corresponding loading tide. The permanent tide (zero
frequency) is not included in this parameter because it is included in the geoid and mean
sea surface (geoid, mean_sea_surface_cnescls). See SWOT Nadir Altimeter User Handbook";

short solid_earth_tide(time);
      solid_earth_tide:_FillValue = 32767s;
      solid_earth_tide:long_name = "solid earth tide height";
      solid_earth_tide:standard_name = "sea_surface_height_amplitude_due_to_earth_tide";
      solid_earth_tide:source = < solid_earth_tide_source >;
      solid_earth_tide:units = "m";
      solid_earth_tide:scale_factor = 1.00e-04;
      solid_earth_tide:coordinates = "longitude latitude";
      solid_earth_tide:comment = "Calculated using Cartwright and Tayler tables and
consisting of the second and third degree constituents. The permanent tide (zero
frequency) is not included. See SWOT Nadir Altimeter User Handbook";

short pole_tide(time);
      pole_tide:_FillValue = 32767s;
      pole_tide:long_name = "geocentric pole tide height";
      pole_tide:standard_name = "sea_surface_height_amplitude_due_to_pole_tide";
      pole_tide:source = < pole_tide_source >;
      pole_tide:units = "m";
      pole_tide:scale_factor = 1.00e-04;
      pole_tide:coordinates = "longitude latitude";
      pole_tide:comment = "See SWOT Nadir Altimeter User Handbook";

short internal_tide(time);
      internal_tide:_FillValue = 32767s;
      internal_tide:long_name = "internal tide height";
      internal_tide:source = < internal_tide_source >;
      internal_tide:units = "m";
      internal_tide:scale_factor = 1.00e-04;
      internal_tide:coordinates = "longitude latitude";
      internal_tide:comment = "See SWOT Nadir Altimeter User Handbook";
```

// Environmental parameters

```
short wind_speed_alt(time);
      wind_speed_alt:_FillValue = 32767s;
      wind_speed_alt:long_name = "altimeter wind speed";
      wind_speed_alt:standard_name = "wind_speed";
      wind_speed_alt:units = "m/s";
      wind_speed_alt:scale_factor = 1.00e-02;
      wind_speed_alt:coordinates = "longitude latitude";
      wind_speed_alt:comment = "Should not be used over land. See SWOT Nadir Altimeter
User Handbook. A calibration bias of +0.06 dB has been added to the Ku band backscatter
coefficient (/data_01/ku/sig0_ocean) before computing the wind speed";

short wind_speed_alt_mle3(time);
      wind_speed_alt_mle3:_FillValue = 32767s;
      wind_speed_alt_mle3:long_name = "altimeter wind speed (MLE3 retracking)";
```

```
        wind_speed_alt_mle3:standard_name = "wind_speed";
        wind_speed_alt_mle3:units = "m/s";
        wind_speed_alt_mle3:scale_factor = 1.00e-02;
        wind_speed_alt_mle3:coordinates = "longitude latitude";
        wind_speed_alt_mle3:comment = "Should not be used over land. See SWOT Nadir
Altimeter User Handbook. A calibration bias of +0.109 dB has been added to the Ku band
backscatter coefficient (/data_01/ku/sig0_ocean_mle3) before computing the wind speed";

short rad_water_vapor(time);
        rad_water_vapor:_FillValue = 32767s;
        rad_water_vapor:long_name = "radiometer water vapor content";
        rad_water_vapor:standard_name = "atmosphere_water_vapor_content";
        rad_water_vapor:source = "AMR";
        rad_water_vapor:institution = "NASA/JPL";
        rad_water_vapor:units = "kg/m^2";
        rad_water_vapor:scale_factor = 1.00e-01;
        rad_water_vapor:coordinates = "longitude latitude";
        rad_water_vapor:comment = "Should not be used over land";

short rad_cloud_liquid_water(time);
        rad_cloud_liquid_water:_FillValue = 32767s;
        rad_cloud_liquid_water:long_name = "radiometer liquid water content";
        rad_cloud_liquid_water:standard_name = "atmosphere_cloud_liquid_water_content";
        rad_cloud_liquid_water:source = "AMR";
        rad_cloud_liquid_water:institution = "NASA/JPL";
        rad_cloud_liquid_water:units = "kg/m^2";
        rad_cloud_liquid_water:scale_factor = 1.00e-02;
        rad_cloud_liquid_water:coordinates = "longitude latitude";
        rad_cloud_liquid_water:comment = "Should not be used over land";
```

// 1 Hz Ku band data

```
group: ku {

   variables:
```

// Altimeter range

```
int range_ocean(time);
        range_ocean:_FillValue = 2147483647;
        range_ocean:long_name = "1 Hz Ku band corrected altimeter range";
        range_ocean:standard_name = "altimeter_range";
        range_ocean:units = "m";
        range_ocean:add_offset = 1.300000e+06;
        range_ocean:scale_factor = 1.00e-04;
        range_ocean:coordinates = "/data_01/longitude /data_01/latitude";
        range_ocean:comment = "All instrumental corrections included, i.e. distance
antenna-COG (/data_01/range_cor_cog), USO drift correction (/data_01/range_cor_uso),
internal path correction (range_cor_internal_path), Doppler correction
(range_cor_doppler), modeled instrumental errors correction (range_cor_ocean_model_instr)
and system bias";

int range_ocean_mle3(time);
        range_ocean_mle3:_FillValue = 2147483647;
        range_ocean_mle3:long_name = "1 Hz Ku band corrected altimeter range (MLE3
retracking)";
        range_ocean_mle3:standard_name = "altimeter_range";
        range_ocean_mle3:units = "m";
```

```
      range_ocean_mle3:add_offset = 1.300000e+06;
      range_ocean_mle3:scale_factor = 1.00e-04;
      range_ocean_mle3:coordinates = "/data_01/longitude /data_01/latitude";
      range_ocean_mle3:comment = "All instrumental corrections included, i.e. distance
antenna-COG (/data_01/range_cor_cog), USO drift correction (/data_01/range_cor_uso),
internal path correction (range_cor_internal_path), Doppler correction
(range_cor_doppler), modeled instrumental errors correction
(range_cor_ocean_mle3_model_instr) and system bias";
```

// Altimeter range corrections

```
short iono_cor_alt_filtered(time);
      iono_cor_alt_filtered:_FillValue = 32767s;
      iono_cor_alt_filtered:long_name = "filtered altimeter ionospheric correction on Ku
band";
      iono_cor_alt_filtered:standard_name =
"altimeter_range_correction_due_to_ionosphere";
      iono_cor_alt_filtered:source = "Poseidon-3C";
      iono_cor_alt_filtered:institution = "CNES";
      iono_cor_alt_filtered:units = "m";
      iono_cor_alt_filtered:scale_factor = 1.00e-04;
      iono_cor_alt_filtered:coordinates = "/data_01/longitude /data_01/latitude";
      iono_cor_alt_filtered:comment = "An ionospheric correction must be added (negative
value) to the instrument range to correct this range measurement for ionospheric range
delays of the radar pulse. See SWOT Nadir Altimeter User Handbook";

short iono_cor_alt_filtered_mle3(time);
      iono_cor_alt_filtered_mle3:_FillValue = 32767s;
      iono_cor_alt_filtered_mle3:long_name = "filtered altimeter ionospheric correction
on Ku band (MLE3 retracking)";
      iono_cor_alt_filtered_mle3:standard_name =
"altimeter_range_correction_due_to_ionosphere";
      iono_cor_alt_filtered_mle3:source = "Poseidon-3C";
      iono_cor_alt_filtered_mle3:institution = "CNES";
      iono_cor_alt_filtered_mle3:units = "m";
      iono_cor_alt_filtered_mle3:scale_factor = 1.00e-04;
      iono_cor_alt_filtered_mle3:coordinates = "/data_01/longitude /data_01/latitude";
      iono_cor_alt_filtered_mle3:comment = "An ionospheric correction must be added
(negative value) to the instrument range to correct this range measurement for
ionospheric range delays of the radar pulse. See SWOT Nadir Altimeter User Handbook";

short sea_state_bias(time);
      sea_state_bias:_FillValue = 32767s;
      sea_state_bias:long_name = "sea state bias correction in Ku band";
      sea_state_bias:standard_name =
"sea_surface_height_bias_due_to_sea_surface_roughness";
      sea_state_bias:source = < ssb_source >;
      sea_state_bias:institution = < ssb_institution >;
      sea_state_bias:units = "m";
      sea_state_bias:scale_factor = 1.00e-04;
      sea_state_bias:coordinates = "/data_01/longitude /data_01/latitude";
      sea_state_bias:comment = "A sea state bias correction must be added (negative
value) to the instrument range to correct this range measurement for sea state delays of
the radar pulse. This element should not be used over land. See SWOT Nadir Altimeter User
Handbook";

short sea_state_bias_mle3(time);
      sea_state_bias_mle3:_FillValue = 32767s;
      sea_state_bias_mle3:long_name = "sea state bias correction in Ku band (MLE3
retracking)";
```

```
      sea_state_bias_mle3:standard_name =
"sea_surface_height_bias_due_to_sea_surface_roughness";
      sea_state_bias_mle3:source = < ssb_mle3_source >;
      sea_state_bias_mle3:institution = < ssb_mle3_institution >;
      sea_state_bias_mle3:units = "m";
      sea_state_bias_mle3:scale_factor = 1.00e-04;
      sea_state_bias_mle3:coordinates = "/data_01/longitude /data_01/latitude";
      sea_state_bias_mle3:comment = "A sea state bias correction must be added (negative
value) to the instrument range to correct this range measurement for sea state delays of
the radar pulse. This element should not be used over land. See SWOT Nadir Altimeter User
Handbook";
```

// Significant waveheight

```
short swh_ocean(time);
      swh_ocean:_FillValue = 32767s;
      swh_ocean:long_name = "Ku band corrected significant waveheight";
      swh_ocean:standard_name = "sea_surface_wave_significant_height";
      swh_ocean:units = "m";
      swh_ocean:scale_factor = 1.00e-03;
      swh_ocean:coordinates = "/data_01/longitude /data_01/latitude";
      swh_ocean:comment = "All instrumental corrections included, i.e. modeled
instrumental errors correction (swh_cor_ocean_model_instr) and system bias";

short swh_ocean_mle3(time);
      swh_ocean_mle3:_FillValue = 32767s;
      swh_ocean_mle3:long_name = "Ku band corrected significant waveheight (MLE3
retracking)";
      swh_ocean_mle3:standard_name = "sea_surface_wave_significant_height";
      swh_ocean_mle3:units = "m";
      swh_ocean_mle3:scale_factor = 1.00e-03;
      swh_ocean_mle3:coordinates = "/data_01/longitude /data_01/latitude";
      swh_ocean_mle3:comment = "All instrumental corrections included, i.e. modeled
instrumental errors correction (swh_cor_ocean_mle3_model_instr) and system bias";
```

// Backscatter coefficient

```
short sig0_ocean(time);
      sig0_ocean:_FillValue = 32767s;
      sig0_ocean:long_name = "Ku band corrected backscatter coefficient";
      sig0_ocean:standard_name =
"surface_backwards_scattering_coefficient_of_radar_wave";
      sig0_ocean:units = "dB";
      sig0_ocean:scale_factor = 1.00e-02;
      sig0_ocean:coordinates = "/data_01/longitude /data_01/latitude";
      sig0_ocean:comment = "All instrumental corrections included, excepted the system
bias, i.e. AGC instrumental errors correction, internal calibration correction
(sig0_cor_calibration), modeled instrumental errors correction
(sig0_cor_ocean_model_instr) and atmospheric attenuation (sig0_cor_atm)";

short sig0_ocean_mle3(time);
      sig0_ocean_mle3:_FillValue = 32767s;
      sig0_ocean_mle3:long_name = "Ku band corrected backscatter coefficient (MLE3
retracking)";
      sig0_ocean_mle3:standard_name =
"surface_backwards_scattering_coefficient_of_radar_wave";
      sig0_ocean_mle3:units = "dB";
      sig0_ocean_mle3:scale_factor = 1.00e-02;
      sig0_ocean_mle3:coordinates = "/data_01/longitude /data_01/latitude";
```

```
      sig0_ocean_mle3:comment = "All instrumental corrections included, excepted the
system bias, i.e. AGC instrumental errors correction, internal calibration correction
(sig0_cor_calibration), modeled instrumental errors correction
(sig0_cor_ocean_mle3_model_instr) and atmospheric attenuation (sig0_cor_atm)";
```

// Waveforms characteristics

```
byte wvf_main_class(time);
      wvf_main_class:_FillValue = 127b;
      wvf_main_class:long_name = "1 Hz Ku band waveform main class";
      wvf_main_class:flag_meanings = "brown_ocean peaky noise strong_peak
brown_peak_trailing_edge brown_peak_leading_edge brown_flat_trailing_eadge peak_end trash
brown_noise two_leading_edges shifted_brown brown_noise_leading_edge
linear_positive_slope linear_negative_slope";
      wvf_main_class:flag_values = 1b, 2b, 3b, 4b, 5b, 6b, 7b, 8b, 9b, 10b, 11b, 12b,
13b, 15b, 18b;
      wvf_main_class:coordinates = "/data_01/longitude /data_01/latitude";
      wvf_main_class:comment = "Waveform classification : main class selected by
classification neural network trained on shape features of the waveforms";
```

// Sea Surface height

```
short ssha(time);
      ssha:_FillValue = 32767s;
      ssha:long_name = "sea surface height anomaly";
      ssha:standard_name = "sea_surface_height_above_sea_level";
      ssha:source = "Poseidon-3C";
      ssha:institution = "CNES";
      ssha:units = "m";
      ssha:scale_factor = 1.00e-03;
      ssha:coordinates = "/data_01/longitude /data_01/latitude";
      ssha:comment = "= altitude of satellite (/data_01/altitude) - Ku band corrected
altimeter range (range_ocean) - filtered altimeter ionospheric correction on Ku band
(iono_cor_alt_filtered) - model dry tropospheric correction
(/data_01/model_dry_tropo_cor_zero_altitude) - radiometer wet tropospheric correction
(/data_01/rad_wet_tropo_cor) - sea state bias correction in Ku band (sea_state_bias) -
solid earth tide height (/data_01/solid_earth_tide) - geocentric ocean tide height from
FES solution (/data_01/ocean_tide_fes) - non-equilibrium long-period ocean tide height
(/data_01/ocean_tide_non_eq) - geocentric pole tide height (/data_01/pole_tide) -
internal tide (/data_01/internal_tide) - dynamic atmospheric correction (/data_01/dac) -
mean sea surface from CNES/CLS solution (/data_01/mean_sea_surface_cnescls). Set to
default if the waveform classification (wvf_main_class) is not set to 1 = brown ocean, 12
= shifted brown, 13 = brown noise leading edge or 15 = linear positive_slope, or if the
radiometer wet tropospheric interpolation quality flag
(/data_01/rad_wet_tropo_cor_interp_qual) is set to 2 = fail";

short ssha_mle3(time);
      ssha_mle3:_FillValue = 32767s;
      ssha_mle3:long_name = "sea surface height anomaly (MLE3 retracking)";
      ssha_mle3:standard_name = "sea_surface_height_above_sea_level";
      ssha_mle3:source = "Poseidon-3C";
      ssha_mle3:institution = "CNES";
      ssha_mle3:units = "m";
      ssha_mle3:scale_factor = 1.00e-03;
      ssha_mle3:coordinates = "/data_01/longitude /data_01/latitude";
      ssha_mle3:comment = "= altitude of satellite (/data_01/altitude) - Ku band
corrected altimeter range (range_ocean_mle3) - filtered altimeter ionospheric correction
on Ku band (iono_cor_alt_filtered_mle3) - model dry tropospheric correction
(/data_01/model_dry_tropo_cor_zero_altitude) - radiometer wet tropospheric correction
```

(/data_01/rad_wet_tropo_cor) - sea state bias correction in Ku band (sea_state_bias_mle3) - solid earth tide height (/data_01/solid_earth_tide) - geocentric ocean tide height from FES solution (/data_01/ocean_tide_fes) - non-equilibrium long-period ocean tide height (/data_01/ocean_tide_non_eq) - geocentric pole tide height (/data_01/pole_tide) - internal tide (/data_01/internal_tide) - dynamic atmospheric correction (/data_01/dac) - mean sea surface from CNES/CLS solution (/data_01/mean_sea_surface_cnescls). Set to default if the waveform classification (wvf_main_class) is not set to 1 = brown ocean, 12 = shifted brown, 13 = brown noise leading edge or 15 = linear positive_slope, or if the radiometer wet tropospheric interpolation quality flag (/data_01/rad_wet_tropo_cor_interp_qual) is set to 2 = fail";

} // group: ku

} // group: data_01

}

6. GDR DATA SET

```
netcdf gdr {
```

// 1-Hz data

```
group: data_01 {

 dimensions:
  time = < number of measurements >;

  variables:
```

// Time Tag

```
double time(time);
       time:long_name = "time in UTC";
       time:standard_name = "time";
       time:calendar = "gregorian";
       time:tai_utc_difference = < Value of TAI-UTC at time of first record >;
       time:leap_second = < UTC time of the leap second (YYYY-MM-DD hh:mm:ss) >;
       time:units = "seconds since 2000-01-01 00:00:00.0";
       time:comment = "Time of measurement in seconds in the UTC time scale since 1 Jan
2000 00:00:00 UTC. [tai_utc_difference] is the difference between TAI and UTC reference
time (seconds) for the first measurement of the data set. If a leap second occurs within
the data set, the attribute [leap_second] is set to the UTC time at which the leap second
occurs";

double time_tai(time);
       time_tai:_FillValue = 18446744073709551616.000000;
       time_tai:long_name = "time in TAI";
       time_tai:standard_name = "time";
       time_tai:calendar = "gregorian";
       time_tai:units = "seconds since 2000-01-01 00:00:00.0";
       time_tai:comment = "Time of measurement in seconds in the TAI time scale since 1
Jan 2000 00:00:00 TAI. This time scale contains no leap seconds. The difference (in
seconds) with time in UTC is given by the attribute [time:tai_utc_difference]";

int index_first_20hz_measurement(time);
       index_first_20hz_measurement:_FillValue = 2147483647;
       index_first_20hz_measurement:long_name = "record counter of the first associated
20 Hz measurement";
       index_first_20hz_measurement:coordinates = "longitude latitude";
       index_first_20hz_measurement:comment = "Record counter of the first 20 Hz
elementary measurement used to derive the 1 Hz measurement. The total number of 20 Hz
measurements associated to 1 Hz time is given by numtotal_20hz_measurement";

byte numtotal_20hz_measurement(time);
       numtotal_20hz_measurement:_FillValue = 127b;
       numtotal_20hz_measurement:long_name = "total number of 20 Hz measurements
associated to the 1 Hz measurement";
       numtotal_20hz_measurement:coordinates = "longitude latitude";
       numtotal_20hz_measurement:comment = "Total number of 20 Hz measurements associated
to the 1 Hz measurement";
```

// Location and surface type

int latitude(time);
latitude:_FillValue = 2147483647;
latitude:long_name = "latitude";
latitude:standard_name = "latitude";
latitude:units = "degrees_north";
latitude:scale_factor = 1.00e-06;
latitude:quality_flag = "orb_state_rest_flag or orb_state_diode_flag";
latitude:comment = "Positive latitude is North latitude, negative latitude is South latitude. See SWOT Nadir Altimeter User Handbook. Associated quality flag is orb_state_diode_flag for the OGDR products, orb_state_rest_flag for the IGDR and GDR products";

int longitude(time);
longitude:_FillValue = 2147483647;
longitude:long_name = "longitude";
longitude:standard_name = "longitude";
longitude:units = "degrees_east";
longitude:scale_factor = 1.00e-06;
longitude:quality_flag = "orb_state_rest_flag or orb_state_diode_flag";
longitude:comment = "East longitude relative to Greenwich meridian. See SWOT Nadir Altimeter User Handbook. Associated quality flag is orb_state_diode_flag for the OGDR products, orb_state_rest_flag for the IGDR and GDR products";

byte rad_side_1_surface_type_flag(time);
rad_side_1_surface_type_flag:_FillValue = 127b;
rad_side_1_surface_type_flag:long_name = "radiometer surface type from first radiometer";
rad_side_1_surface_type_flag:flag_meanings = "open_ocean near_coast land";
rad_side_1_surface_type_flag:flag_values = 0b, 1b, 2b;
rad_side_1_surface_type_flag:coordinates = "longitude latitude";

byte rad_side_2_surface_type_flag(time);
rad_side_2_surface_type_flag:_FillValue = 127b;
rad_side_2_surface_type_flag:long_name = "radiometer surface type from second radiometer";
rad_side_2_surface_type_flag:flag_meanings = "open_ocean near_coast land";
rad_side_2_surface_type_flag:flag_values = 0b, 1b, 2b;
rad_side_2_surface_type_flag:coordinates = "longitude latitude";

int rad_side_1_distance_to_land(time);
rad_side_1_distance_to_land:_FillValue = 2147483647;
rad_side_1_distance_to_land:long_name = "radiometer radial distance to land from first radiometer";
rad_side_1_distance_to_land:units = "m";
rad_side_1_distance_to_land:coordinates = "longitude latitude";
rad_side_1_distance_to_land:comment = "Shortest distance between nadir sub-satellite point and land";

int rad_side_2_distance_to_land(time);
rad_side_2_distance_to_land:_FillValue = 2147483647;
rad_side_2_distance_to_land:long_name = "radiometer radial distance to land from second radiometer";
rad_side_2_distance_to_land:units = "m";
rad_side_2_distance_to_land:coordinates = "longitude latitude";
rad_side_2_distance_to_land:comment = "Shortest distance between nadir sub-satellite point and land";

byte surface_classification_flag(time);
surface_classification_flag:_FillValue = 127b;
surface_classification_flag:long_name = "surface classification";

```
      surface_classification_flag:flag_meanings = "open_ocean land continental_water
aquatic_vegetation continental_ice_snow floating_ice salted_basin";
      surface_classification_flag:flag_values = 0b, 1b, 2b, 3b, 4b, 5b, 6b;
      surface_classification_flag:coordinates = "longitude latitude";
      surface_classification_flag:comment = "Computed from a mask built with MODIS and
GlobCover data";

short angle_of_approach_to_coast(time);
      angle_of_approach_to_coast:_FillValue = 32767s;
      angle_of_approach_to_coast:long_name = "angle of approach to the coast";
      angle_of_approach_to_coast:units = "degrees";
      angle_of_approach_to_coast:scale_factor = 1.00e-02;
      angle_of_approach_to_coast:coordinates = "longitude latitude";
      angle_of_approach_to_coast:comment = "Angle of approach to the closest coast. 0 is
parallel to the coast with the land on the right. Positive values indicate the satellite
is approaching the land. Negative values indicate the satellite is leaving the land.
Values close to +/-180 degrees have the land on the left";

int distance_to_coast(time);
      distance_to_coast:_FillValue = 2147483647;
      distance_to_coast:long_name = "distance to the coast";
      distance_to_coast:units = "m";
      distance_to_coast:coordinates = "longitude latitude";
```

// Quality information and sensor status

// Quality flags for 1 Hz radiometer data

```
byte rad_tb_187_qual(time);
      rad_tb_187_qual:_FillValue = 127b;
      rad_tb_187_qual:long_name = "quality flag for 1 Hz radiometer data: 18.7 GHz
brightness temperature";
      rad_tb_187_qual:flag_meanings = "good bad";
      rad_tb_187_qual:flag_values = 0b, 1b;
      rad_tb_187_qual:coordinates = "longitude latitude";

byte rad_tb_238_qual(time);
      rad_tb_238_qual:_FillValue = 127b;
      rad_tb_238_qual:long_name = "quality flag for 1 Hz radiometer data: 23.8 GHz
brightness temperature";
      rad_tb_238_qual:flag_meanings = "good bad";
      rad_tb_238_qual:flag_values = 0b, 1b;
      rad_tb_238_qual:coordinates = "longitude latitude";

byte rad_tb_340_qual(time);
      rad_tb_340_qual:_FillValue = 127b;
      rad_tb_340_qual:long_name = "quality flag for 1 Hz radiometer data: 34 GHz
brightness temperature";
      rad_tb_340_qual:flag_meanings = "good bad";
      rad_tb_340_qual:flag_values = 0b, 1b;
      rad_tb_340_qual:coordinates = "longitude latitude";

short rad_side_1_land_frac_187(time);
      rad_side_1_land_frac_187:_FillValue = 32767s;
      rad_side_1_land_frac_187:long_name = "radiometer 18.7 GHz antenna gain weighted
land fraction in main beam from first radiometer";
      rad_side_1_land_frac_187:units = "1";
      rad_side_1_land_frac_187:scale_factor = 1.00e-02;
      rad_side_1_land_frac_187:coordinates = "longitude latitude";
      rad_side_1_land_frac_187:comment = "ratio between 0 and 1";
```

```
short rad_side_2_land_frac_187(time);
       rad_side_2_land_frac_187:_FillValue = 32767s;
       rad_side_2_land_frac_187:long_name = "radiometer 18.7 GHz antenna gain weighted
land fraction in main beam from second radiometer";
       rad_side_2_land_frac_187:units = "1";
       rad_side_2_land_frac_187:scale_factor = 1.00e-02;
       rad_side_2_land_frac_187:coordinates = "longitude latitude";
       rad_side_2_land_frac_187:comment = "ratio between 0 and 1";

short rad_side_1_land_frac_238(time);
       rad_side_1_land_frac_238:_FillValue = 32767s;
       rad_side_1_land_frac_238:long_name = "radiometer 23.8 GHz antenna gain weighted
land fraction in main beam from first radiometer";
       rad_side_1_land_frac_238:units = "1";
       rad_side_1_land_frac_238:scale_factor = 1.00e-02;
       rad_side_1_land_frac_238:coordinates = "longitude latitude";
       rad_side_1_land_frac_238:comment = "ratio between 0 and 1";

short rad_side_2_land_frac_238(time);
       rad_side_2_land_frac_238:_FillValue = 32767s;
       rad_side_2_land_frac_238:long_name = "radiometer 23.8 GHz antenna gain weighted
land fraction in main beam from second radiometer";
       rad_side_2_land_frac_238:units = "1";
       rad_side_2_land_frac_238:scale_factor = 1.00e-02;
       rad_side_2_land_frac_238:coordinates = "longitude latitude";
       rad_side_2_land_frac_238:comment = "ratio between 0 and 1";

short rad_side_1_land_frac_340(time);
       rad_side_1_land_frac_340:_FillValue = 32767s;
       rad_side_1_land_frac_340:long_name = "radiometer 34 GHz antenna gain weighted land
fraction in main beam from first radiometer";
       rad_side_1_land_frac_340:units = "1";
       rad_side_1_land_frac_340:scale_factor = 1.00e-02;
       rad_side_1_land_frac_340:coordinates = "longitude latitude";
       rad_side_1_land_frac_340:comment = "ratio between 0 and 1";

short rad_side_2_land_frac_340(time);
       rad_side_2_land_frac_340:_FillValue = 32767s;
       rad_side_2_land_frac_340:long_name = "radiometer 34 GHz antenna gain weighted land
fraction in main beam from second radiometer";
       rad_side_2_land_frac_340:units = "1";
       rad_side_2_land_frac_340:scale_factor = 1.00e-02;
       rad_side_2_land_frac_340:coordinates = "longitude latitude";
       rad_side_2_land_frac_340:comment = "ratio between 0 and 1";


       // Altimeter state flags
byte alt_state_band_seq_flag(time);
       alt_state_band_seq_flag:_FillValue = 127b;
       alt_state_band_seq_flag:long_name = "altimeter state flag: Ku/C band sequencing";
       alt_state_band_seq_flag:flag_meanings = "3Ku_1C_3Ku 2Ku_1C_2Ku";
       alt_state_band_seq_flag:flag_values = 0b, 1b;
       alt_state_band_seq_flag:coordinates = "longitude latitude";


       // Orbit state flags

byte orb_state_diode_flag(time);
       orb_state_diode_flag:_FillValue = 127b;
       orb_state_diode_flag:long_name = "orbit state flag: OGDR products";
```

```
      orb_state_diode_flag:flag_meanings = "From good quality (0) to bad quality (9)";
      orb_state_diode_flag:flag_values = 0b, 1b, 2b, 3b, 4b, 5b, 6b, 7b, 8b, 9b;
      orb_state_diode_flag:coordinates = "longitude latitude";
      orb_state_diode_flag:comment = "0 = Accurate orbit (0 - 5 cm radial), 1 = Good orbit
(5 - 10 cm radial), 2 = Moderate orbit (10 - 15 cm radial), 4-8 = Potentially degraded
orbit (> 15 cm radial), 9 = Degraded orbit (e.g., as during maneuver)";

byte orb_state_rest_flag(time);
      orb_state_rest_flag:_FillValue = 127b;
      orb_state_rest_flag:long_name = "orbit state flag: restituted orbit";
      orb_state_rest_flag:flag_meanings = "op_maneuver op_adjusted op_extrapolated
pre_adjusted pre_maneuver pre_interpolated_gap pre_extrapolated_L1 pre_extrapolated_L1S2
pre_extrapolated_S2 DIODE";
      orb_state_rest_flag:flag_values = 0b, 1b, 2b, 3b, 4b, 5b, 6b, 7b, 8b, 9b;
      orb_state_rest_flag:coordinates = "longitude latitude";
      orb_state_rest_flag:comment = "0 characterizes a mission operations orbit that is
computed during a maneuver period, 1 stands for an adjusted mission operations orbit, 2
stands for an extrapolated mission operations orbit, 3 stands for an adjusted
(preliminary/precise) orbit, 4 indicates that the (preliminary/precise) orbit is estimated
during a maneuver period, 5 indicates that the (preliminary/precise) orbit is interpolated
over a tracking data gap, 6 means that the (preliminary/precise) orbit is extrapolated for
a duration less than 1 day, 7 means that the (preliminary/precise) orbit is extrapolated
for a duration that ranges from 1 day to 2 days, 8 means that the (preliminary/precise)
orbit is extrapolated for a duration larger than 2 days, or that the orbit is extrapolated
just after a maneuver, 9 stands for the DORIS DIODE navigator orbit. The nominal value is
3";

      // Geophysical flags

byte meteo_map_availability_flag(time);
      meteo_map_availability_flag:_FillValue = 127b;
      meteo_map_availability_flag:long_name = "ECMWF meteorological map availability";
      meteo_map_availability_flag:flag_meanings = "2_maps_nominal 2_maps_degraded
1_map_closest_used no_valid_map";
      meteo_map_availability_flag:flag_values = 0b, 1b, 2b, 3b;
      meteo_map_availability_flag:coordinates = "longitude latitude";
      meteo_map_availability_flag:comment = "Possible values are: 0 meaning '2 maps,
nominal' (six hours apart), 1 meaning '2 maps, degraded' (more than six hours apart), 2
meaning '1 map, closest map used', 3 meaning 'no valid map'";

byte wave_model_map_availability_flag(time);
      wave_model_map_availability_flag:_FillValue = 127b;
      wave_model_map_availability_flag:long_name = "wave model map availability";
      wave_model_map_availability_flag:flag_meanings = "2_maps_nominal 2_maps_degraded
1_map_closest_used no_valid_map";
      wave_model_map_availability_flag:flag_values = 0b, 1b, 2b, 3b;
      wave_model_map_availability_flag:coordinates = "longitude latitude";
      wave_model_map_availability_flag:comment = "Possible values are: 0 meaning '2
maps, nominal' (three hours apart), 1 meaning '2 maps, degraded' (more than three hours
apart), 2 meaning '1 map, closest map used', 3 meaning 'no valid map'";

byte sig0_cor_atm_source(time);
      sig0_cor_atm_source:_FillValue = 127b;
      sig0_cor_atm_source:long_name = "data source for atmospheric attenuation
computation";
      sig0_cor_atm_source:flag_meanings = "radiometer meteo_model";
      sig0_cor_atm_source:flag_values = 0b, 1b;
      sig0_cor_atm_source:coordinates = "longitude latitude";
```

```
      sig0_cor_atm_source:comment = "Flag indicating whether the radiometer data or the
climatological values from meteorological model (ECMWF backup solution) have been used to
compute the atmospheric sigma0 correction";

byte rain_flag(time);
      rain_flag:_FillValue = 127b;
      rain_flag:long_name = "rain flag";
      rain_flag:flag_meanings = "no_rain rain high_rain_probability_from_altimeter
high_probability_of_no_rain_from_altimeter ambiguous_situation_possibility_of_ice
evaluation_not_possible";
      rain_flag:flag_values = 0b, 1b, 2b, 3b, 4b, 5b;
      rain_flag:coordinates = "longitude latitude";
      rain_flag:comment = "See SWOT Nadir Altimeter User Handbook";

byte rad_side_1_rain_flag(time);
      rad_side_1_rain_flag:_FillValue = 127b;
      rad_side_1_rain_flag:long_name = "radiometer rain flag from first radiometer";
      rad_side_1_rain_flag:flag_meanings = "no_rain rain";
      rad_side_1_rain_flag:flag_values = 0b, 1b;
      rad_side_1_rain_flag:coordinates = "longitude latitude";
      rad_side_1_rain_flag:comment = "See SWOT Nadir Altimeter User Handbook";

byte rad_side_2_rain_flag(time);
      rad_side_2_rain_flag:_FillValue = 127b;
      rad_side_2_rain_flag:long_name = "radiometer rain flag from second radiometer";
      rad_side_2_rain_flag:flag_meanings = "no_rain rain";
      rad_side_2_rain_flag:flag_values = 0b, 1b;
      rad_side_2_rain_flag:coordinates = "longitude latitude";
      rad_side_2_rain_flag:comment = "See SWOT Nadir Altimeter User Handbook";

byte ice_flag(time);
      ice_flag:_FillValue = 127b;
      ice_flag:long_name = "ice flag";
      ice_flag:flag_meanings = "no_ice ice";
      ice_flag:flag_values = 0b, 1b;
      ice_flag:coordinates = "longitude latitude";
      ice_flag:comment = "See SWOT Nadir Altimeter User Handbook";

byte rad_side_1_sea_ice_flag(time);
      rad_side_1_sea_ice_flag:_FillValue = 127b;
      rad_side_1_sea_ice_flag:long_name = "radiometer sea-ice flag from first
radiometer";
      rad_side_1_sea_ice_flag:flag_meanings = "no_sea_ice sea_ice";
      rad_side_1_sea_ice_flag:flag_values = 0b, 1b;
      rad_side_1_sea_ice_flag:coordinates = "longitude latitude";
      rad_side_1_sea_ice_flag:comment = "See SWOT Nadir Altimeter User Handbook";

byte rad_side_2_sea_ice_flag(time);
      rad_side_2_sea_ice_flag:_FillValue = 127b;
      rad_side_2_sea_ice_flag:long_name = "radiometer sea-ice flag from second
radiometer";
      rad_side_2_sea_ice_flag:flag_meanings = "no_sea_ice sea_ice";
      rad_side_2_sea_ice_flag:flag_values = 0b, 1b;
      rad_side_2_sea_ice_flag:coordinates = "longitude latitude";
      rad_side_2_sea_ice_flag:comment = "See SWOT Nadir Altimeter User Handbook";

      // Quality flags for interpolation

byte rad_wet_tropo_cor_interp_qual(time);
      rad_wet_tropo_cor_interp_qual:_FillValue = 127b;
```

```
      rad_wet_tropo_cor_interp_qual:long_name = "radiometer wet tropospheric correction
interpolation qualiy flag";
      rad_wet_tropo_cor_interp_qual:flag_meanings = "good degraded fail";
      rad_wet_tropo_cor_interp_qual:flag_values = 0b, 1b, 2b;
      rad_wet_tropo_cor_interp_qual:coordinates = "longitude latitude";
      rad_wet_tropo_cor_interp_qual:comment = "See SWOT Nadir Altimeter User Handbook";

byte mean_sea_surface_cnescls_interp_qual(time);
      mean_sea_surface_cnescls_interp_qual:_FillValue = 127b;
      mean_sea_surface_cnescls_interp_qual:long_name = "mean sea surface interpolation
flag (CNES/CLS solution)";
      mean_sea_surface_cnescls_interp_qual:flag_meanings = "good bad";
      mean_sea_surface_cnescls_interp_qual:flag_values = 0b, 1b;
      mean_sea_surface_cnescls_interp_qual:coordinates = "longitude latitude";

byte mean_sea_surface_dtu_interp_qual(time);
      mean_sea_surface_dtu_interp_qual:_FillValue = 127b;
      mean_sea_surface_dtu_interp_qual:long_name = "mean sea surface interpolation flag
(DTU solution)";
      mean_sea_surface_dtu_interp_qual:flag_meanings = "good bad";
      mean_sea_surface_dtu_interp_qual:flag_values = 0b, 1b;
      mean_sea_surface_dtu_interp_qual:coordinates = "longitude latitude";

byte mean_dynamic_topography_interp_qual(time);
      mean_dynamic_topography_interp_qual:_FillValue = 127b;
      mean_dynamic_topography_interp_qual:long_name = "MDT interpolation flag";
      mean_dynamic_topography_interp_qual:flag_meanings = "good bad";
      mean_dynamic_topography_interp_qual:flag_values = 0b, 1b;
      mean_dynamic_topography_interp_qual:coordinates = "longitude latitude";

byte ocean_tide_got_interp_qual(time);
      ocean_tide_got_interp_qual:_FillValue = 127b;
      ocean_tide_got_interp_qual:long_name = "ocean tide interpolation flag (GOT
solution)";
      ocean_tide_got_interp_qual:flag_meanings = "good bad extrapolation";
      ocean_tide_got_interp_qual:flag_values = 0b, 1b, 2b;
      ocean_tide_got_interp_qual:coordinates = "longitude latitude";
      ocean_tide_got_interp_qual:comment = "0 = 4 points over ocean; 1 = less than 4
points; 2 = extrapolated points";

byte ocean_tide_fes_interp_qual(time);
      ocean_tide_fes_interp_qual:_FillValue = 127b;
      ocean_tide_fes_interp_qual:long_name = "ocean tide interpolation flag (FES
solution)";
      ocean_tide_fes_interp_qual:flag_meanings = "good bad extrapolation";
      ocean_tide_fes_interp_qual:flag_values = 0b, 1b, 2b;
      ocean_tide_fes_interp_qual:coordinates = "longitude latitude";
      ocean_tide_fes_interp_qual:comment = "0 = 4 points over ocean; 1 = less than 4
points; 2 = extrapolated points";

byte internal_tide_interp_qual(time);
      internal_tide_interp_qual:_FillValue = 127b;
      internal_tide_interp_qual:long_name = "internal tide interpolation flag";
      internal_tide_interp_qual:flag_meanings = "good bad";
      internal_tide_interp_qual:flag_values = 0b, 1b;
      internal_tide_interp_qual:coordinates = "longitude latitude";
      internal_tide_interp_qual:comment = "0 = 4 points over ocean; 1 = less than 4
points";

byte meteo_zero_altitude_interp_qual(time);
      meteo_zero_altitude_interp_qual:_FillValue = 127b;
```

```
      meteo_zero_altitude_interp_qual:long_name = "meteorological data at zero altitude
interpolation flag";
      meteo_zero_altitude_interp_qual:flag_meanings = "good bad";
      meteo_zero_altitude_interp_qual:flag_values = 0b, 1b;
      meteo_zero_altitude_interp_qual:coordinates = "longitude latitude";
      meteo_zero_altitude_interp_qual:comment = "0 = interpolation from 4 points; 1 =
interpolation from less than 4 points";

byte meteo_measurement_altitude_interp_qual(time);
      meteo_measurement_altitude_interp_qual:_FillValue = 127b;
      meteo_measurement_altitude_interp_qual:long_name = "meteorological data at
measurement altitude interpolation flag";
      meteo_measurement_altitude_interp_qual:flag_meanings = "good bad";
      meteo_measurement_altitude_interp_qual:flag_values = 0b, 1b;
      meteo_measurement_altitude_interp_qual:coordinates = "longitude latitude";
      meteo_measurement_altitude_interp_qual:comment = "0 = interpolation from 4 points;
1 = interpolation from less than 4 points";

byte sea_ice_concentration_interp_qual(time);
      sea_ice_concentration_interp_qual:_FillValue = 127b;
      sea_ice_concentration_interp_qual:long_name = "sea ice concentration data
interpolation flag";
      sea_ice_concentration_interp_qual:flag_meanings = "good bad";
      sea_ice_concentration_interp_qual:flag_values = 0b, 1b;
      sea_ice_concentration_interp_qual:coordinates = "longitude latitude";
      sea_ice_concentration_interp_qual:comment = "0 = interpolation from 4 points; 1 =
interpolation from less than 4 points";

byte wave_model_interp_qual(time);
      wave_model_interp_qual:_FillValue = 127b;
      wave_model_interp_qual:long_name = "wave model data interpolation flag";
      wave_model_interp_qual:flag_meanings = "good bad";
      wave_model_interp_qual:flag_values = 0b, 1b;
      wave_model_interp_qual:coordinates = "longitude latitude";
      wave_model_interp_qual:comment = "0 = interpolation from 4 points; 1 =
interpolation from less than 4 points";
```

// Orbit

```
int altitude(time);
      altitude:_FillValue = 2147483647;
      altitude:long_name = "1 Hz altitude of satellite";
      altitude:standard_name = "height_above_reference_ellipsoid";
      altitude:units = "m";
      altitude:add_offset = 1.300000e+06;
      altitude:scale_factor = 1.00e-04;
      altitude:coordinates = "longitude latitude";
      altitude:quality_flag = "orb_state_rest_flag or orb_state_diode_flag";
      altitude:comment = "Altitude of satellite above the reference ellipsoid.
Associated quality flag is orb_state_diode_flag for the OGDR products,
orb_state_rest_flag for the IGDR and GDR products";

short altitude_rate(time);
      altitude_rate:_FillValue = 32767s;
      altitude_rate:long_name = "1 Hz orbital altitude rate";
      altitude_rate:units = "m/s";
      altitude_rate:scale_factor = 1.00e-02;
      altitude_rate:coordinates = "longitude latitude";
      altitude_rate:comment = "The reference surface for the orbital altitude rate is
the combined mean_sea_surface_cnescls/geoid surface. It is used to compute the Doppler
```

correction on the altimeter range (/data_01/ku/range_cor_doppler, /data_01/c/range_cor_doppler)";

// Altimeter range corrections

short model_dry_tropo_cor_zero_altitude(time);
model_dry_tropo_cor_zero_altitude:_FillValue = 32767s;
model_dry_tropo_cor_zero_altitude:long_name = "model dry tropospheric correction at zero altitude";
model_dry_tropo_cor_zero_altitude:standard_name = "altimeter_range_correction_due_to_dry_troposphere";
model_dry_tropo_cor_zero_altitude:source = "European Center for Medium Range Weather Forecasting";
model_dry_tropo_cor_zero_altitude:institution = "ECMWF";
model_dry_tropo_cor_zero_altitude:units = "m";
model_dry_tropo_cor_zero_altitude:scale_factor = 1.00e-04;
model_dry_tropo_cor_zero_altitude:coordinates = "longitude latitude";
model_dry_tropo_cor_zero_altitude:quality_flag = "meteo_zero_altitude_interp_qual";
model_dry_tropo_cor_zero_altitude:comment = "Computed at the altimeter time-tag from the interpolation of 2 meteorological fields that surround the altimeter time-tag. A dry tropospheric correction must be added (negative value) to the instrument range to correct this range measurement for dry tropospheric range delays of the radar pulse. See SWOT Nadir Altimeter User Handbook";

short model_dry_tropo_cor_measurement_altitude(time);
model_dry_tropo_cor_measurement_altitude:_FillValue = 32767s;
model_dry_tropo_cor_measurement_altitude:long_name = "model dry tropospheric correction at measurement altitude";
model_dry_tropo_cor_measurement_altitude:standard_name = "altimeter_range_correction_due_to_dry_troposphere";
model_dry_tropo_cor_measurement_altitude:source = "European Center for Medium Range Weather Forecasting";
model_dry_tropo_cor_measurement_altitude:institution = "ECMWF";
model_dry_tropo_cor_measurement_altitude:units = "m";
model_dry_tropo_cor_measurement_altitude:scale_factor = 1.00e-04;
model_dry_tropo_cor_measurement_altitude:coordinates = "longitude latitude";
model_dry_tropo_cor_measurement_altitude:quality_flag = "meteo_measurement_altitude_interp_qual";
model_dry_tropo_cor_measurement_altitude:comment = "Computed from 3d meteorological fields at measurement altitude, at the altimeter time-tag from the interpolation of 2 meteorological fields that surround the altimeter time-tag. A dry tropospheric correction must be added (negative value) to the instrument range to correct this range measurement for dry tropospheric range delays of the radar pulse. See SWOT Nadir Altimeter User Handbook";

short model_wet_tropo_cor_zero_altitude(time);
model_wet_tropo_cor_zero_altitude:_FillValue = 32767s;
model_wet_tropo_cor_zero_altitude:long_name = "model wet tropospheric correction at zero altitude";
model_wet_tropo_cor_zero_altitude:standard_name = "altimeter_range_correction_due_to_wet_troposphere";
model_wet_tropo_cor_zero_altitude:source = "European Center for Medium Range Weather Forecasting";
model_wet_tropo_cor_zero_altitude:institution = "ECMWF";
model_wet_tropo_cor_zero_altitude:units = "m";
model_wet_tropo_cor_zero_altitude:scale_factor = 1.00e-04;
model_wet_tropo_cor_zero_altitude:coordinates = "longitude latitude";
model_wet_tropo_cor_zero_altitude:quality_flag = "meteo_zero_altitude_interp_qual";

model_wet_tropo_cor_zero_altitude:comment = "Computed at the altimeter time-tag from the interpolation of 2 meteorological fields that surround the altimeter time-tag. A wet tropospheric correction must be added (negative value) to the instrument range to correct this range measurement for wet tropospheric range delays of the radar pulse. See SWOT Nadir Altimeter User Handbook";

short model_wet_tropo_cor_measurement_altitude(time);
model_wet_tropo_cor_measurement_altitude:_FillValue = 32767s;
model_wet_tropo_cor_measurement_altitude:long_name = "model wet tropospheric correction at measurement altitude";
model_wet_tropo_cor_measurement_altitude:standard_name = "altimeter_range_correction_due_to_wet_troposphere";
model_wet_tropo_cor_measurement_altitude:source = "European Center for Medium Range Weather Forecasting";
model_wet_tropo_cor_measurement_altitude:institution = "ECMWF";
model_wet_tropo_cor_measurement_altitude:units = "m";
model_wet_tropo_cor_measurement_altitude:scale_factor = 1.00e-04;
model_wet_tropo_cor_measurement_altitude:coordinates = "longitude latitude";
model_wet_tropo_cor_measurement_altitude:quality_flag = "meteo_measurement_altitude_interp_qual";
model_wet_tropo_cor_measurement_altitude:comment = "Computed from 3d meteorological fields at measurement altitude, at the altimeter time-tag from the interpolation of 2 meteorological fields that surround the altimeter time-tag. A wet tropospheric correction must be added (negative value) to the instrument range to correct this range measurement for wet tropospheric range delays of the radar pulse. See SWOT Nadir Altimeter User Handbook";

short rad_wet_tropo_cor(time);
rad_wet_tropo_cor:_FillValue = 32767s;
rad_wet_tropo_cor:long_name = "radiometer wet tropospheric correction";
rad_wet_tropo_cor:standard_name = "altimeter_range_correction_due_to_wet_troposphere";
rad_wet_tropo_cor:source = "AMR";
rad_wet_tropo_cor:institution = "NASA/JPL";
rad_wet_tropo_cor:units = "m";
rad_wet_tropo_cor:scale_factor = 1.00e-04;
rad_wet_tropo_cor:coordinates = "longitude latitude";
rad_wet_tropo_cor:quality_flag = "rad_wet_tropo_cor_interp_qual";
rad_wet_tropo_cor:comment = "A wet tropospheric correction must be added (negative value) to the instrument range to correct this range measurement for wet tropospheric range delays of the radar pulse";

int surface_slope_cor(time);
surface_slope_cor:_FillValue = 2147483647;
surface_slope_cor:long_name = "surface slope correction";
surface_slope_cor:source = < surface_slope_cor_source >;
surface_slope_cor:units = "m";
surface_slope_cor:scale_factor = 1.00e-04;
surface_slope_cor:coordinates = "longitude latitude";
surface_slope_cor:comment = "The surface slope correction shall not be used with the mean sea surface (mean_sea_surface_cnescls or mean_sea_surface_dtu) provided in the product. See SWOT Nadir Altimeter User Handbook";

// Brightness temperatures

int rad_tmb_187(time);
rad_tmb_187:_FillValue = 2147483647;
rad_tmb_187:long_name = "18.7 GHz main beam brightness temperature";
rad_tmb_187:standard_name = "surface_brightness_temperature";
rad_tmb_187:units = "K";

```
       rad_tmb_187:scale_factor = 1.00e-02;
       rad_tmb_187:coordinates = "longitude latitude";
       rad_tmb_187:quality_flag = "rad_tb_187_qual";
       rad_tmb_187:comment = "Brightness temperatures are unsmoothed (along-track
averaging has not been performed on the brightness temperatures)";

int rad_tmb_238(time);
       rad_tmb_238:_FillValue = 2147483647;
       rad_tmb_238:long_name = "23.8 GHz main beam brightness temperature";
       rad_tmb_238:standard_name = "surface_brightness_temperature";
       rad_tmb_238:units = "K";
       rad_tmb_238:scale_factor = 1.00e-02;
       rad_tmb_238:coordinates = "longitude latitude";
       rad_tmb_238:quality_flag = "rad_tb_238_qual";
       rad_tmb_238:comment = "Brightness temperatures are unsmoothed (along-track
averaging has not been performed on the brightness temperatures)";

int rad_tmb_340(time);
       rad_tmb_340:_FillValue = 2147483647;
       rad_tmb_340:long_name = "34 GHz main beam brightness temperature";
       rad_tmb_340:standard_name = "surface_brightness_temperature";
       rad_tmb_340:units = "K";
       rad_tmb_340:scale_factor = 1.00e-02;
       rad_tmb_340:coordinates = "longitude latitude";
       rad_tmb_340:quality_flag = "rad_tb_340_qual";
       rad_tmb_340:comment = "Brightness temperatures are unsmoothed (along-track
averaging has not been performed on the brightness temperatures)";

int rad_tb_187(time);
       rad_tb_187:_FillValue = 2147483647;
       rad_tb_187:long_name = "18.7 GHz main beam smoothed brightness temperature";
       rad_tb_187:standard_name = "surface_brightness_temperature";
       rad_tb_187:units = "K";
       rad_tb_187:scale_factor = 1.00e-02;
       rad_tb_187:coordinates = "longitude latitude";
       rad_tb_187:quality_flag = "rad_tb_187_qual";
       rad_tb_187:comment = "Brightness temperatures are along-track averaged";

int rad_tb_238(time);
       rad_tb_238:_FillValue = 2147483647;
       rad_tb_238:long_name = "23.8 GHz main beam smoothed brightness temperature";
       rad_tb_238:standard_name = "surface_brightness_temperature";
       rad_tb_238:units = "K";
       rad_tb_238:scale_factor = 1.00e-02;
       rad_tb_238:coordinates = "longitude latitude";
       rad_tb_238:quality_flag = "rad_tb_238_qual";
       rad_tb_238:comment = "Brightness temperatures are along-track averaged";

int rad_tb_340(time);
       rad_tb_340:_FillValue = 2147483647;
       rad_tb_340:long_name = "34 GHz main beam smoothed brightness temperature";
       rad_tb_340:standard_name = "surface_brightness_temperature";
       rad_tb_340:units = "K";
       rad_tb_340:scale_factor = 1.00e-02;
       rad_tb_340:coordinates = "longitude latitude";
       rad_tb_340:quality_flag = "rad_tb_340_qual";
       rad_tb_340:comment = "Brightness temperatures are along-track averaged";
```

// Geophysical parameters

```
int mean_sea_surface_cnescls(time);
       mean_sea_surface_cnescls:_FillValue = 2147483647;
       mean_sea_surface_cnescls:long_name = "mean sea surface height (CNES/CLS solution)
above reference ellipsoid";
       mean_sea_surface_cnescls:source = < mean_sea_surface_cnescls_source >;
       mean_sea_surface_cnescls:institution = < mean_sea_surface_cnescls_institution >;
       mean_sea_surface_cnescls:units = "m";
       mean_sea_surface_cnescls:scale_factor = 1.00e-04;
       mean_sea_surface_cnescls:coordinates = "longitude latitude";
       mean_sea_surface_cnescls:quality_flag = "mean_sea_surface_cnescls_interp_qual";
       mean_sea_surface_cnescls:comment = "See SWOT Nadir Altimeter User Handbook";

int mean_sea_surface_dtu(time);
       mean_sea_surface_dtu:_FillValue = 2147483647;
       mean_sea_surface_dtu:long_name = "mean sea surface height (DTU solution) above
reference ellipsoid";
       mean_sea_surface_dtu:source = < mean_sea_surface_dtu_source >;
       mean_sea_surface_dtu:institution = < mean_sea_surface_dtu_institution >;
       mean_sea_surface_dtu:units = "m";
       mean_sea_surface_dtu:scale_factor = 1.00e-04;
       mean_sea_surface_dtu:coordinates = "longitude latitude";
       mean_sea_surface_dtu:quality_flag = "mean_sea_surface_dtu_interp_qual";
       mean_sea_surface_dtu:comment = "See SWOT Nadir Altimeter User Handbook";

int mean_dynamic_topography(time);
       mean_dynamic_topography:_FillValue = 2147483647;
       mean_dynamic_topography:long_name = "mean dynamic topography above geoid";
       mean_dynamic_topography:source = < mdt_source >;
       mean_dynamic_topography:institution = < mdt_institution >;
       mean_dynamic_topography:units = "m";
       mean_dynamic_topography:scale_factor = 1.00e-04;
       mean_dynamic_topography:coordinates = "longitude latitude";
       mean_dynamic_topography:quality_flag = "mean_dynamic_topography_interp_qual";
       mean_dynamic_topography:comment = "See SWOT Nadir Altimeter User Handbook";

int geoid(time);
       geoid:_FillValue = 2147483647;
       geoid:long_name = "geoid height";
       geoid:standard_name = "geoid_height_above_reference_ellipsoid";
       geoid:source = < geoid_source >;
       geoid:institution = < geoid_institution >;
       geoid:units = "m";
       geoid:scale_factor = 1.00e-04;
       geoid:coordinates = "longitude latitude";
       geoid: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). See SWOT
Nadir Altimeter User Handbook";

int depth_or_elevation(time);
       depth_or_elevation:_FillValue = 2147483647;
       depth_or_elevation:long_name = "ocean depth/land elevation";
       depth_or_elevation:source = < bathy_topo_source >;
       depth_or_elevation:institution = < bathy_topo_institution >;
       depth_or_elevation:units = "m";
       depth_or_elevation:coordinates = "longitude latitude";

short inv_bar_cor(time);
       inv_bar_cor:_FillValue = 32767s;
       inv_bar_cor:long_name = "inverted barometer height correction";
       inv_bar_cor:standard_name =
"sea_surface_height_correction_due_to_air_pressure_at_low_frequency";
```

```
      inv_bar_cor:source = "European Center for Medium Range Weather Forecasting";
      inv_bar_cor:institution = "ECMWF";
      inv_bar_cor:units = "m";
      inv_bar_cor:scale_factor = 1.00e-04;
      inv_bar_cor:coordinates = "longitude latitude";
      inv_bar_cor:quality_flag = "meteo_zero_altitude_interp_qual";
      inv_bar_cor:comment = "Computed at the altimeter time-tag from the interpolation
of 2 meteorological fields that surround the altimeter time-tag. See SWOT Nadir Altimeter
User Handbook";

short dac(time);
      dac:_FillValue = 32767s;
      dac:long_name = "dynamic atmospheric correction";
      dac:institution = "LEGOS/CLS/CNES";
      dac:units = "m";
      dac:scale_factor = 1.00e-04;
      dac:coordinates = "longitude latitude";
      dac:comment = "Sum of the high frequency fluctuations correction and of the low
frequency inverted barometer correction (inv_bar_cor). See SWOT Nadir Altimeter User
Handbook";

int ocean_tide_got(time);
      ocean_tide_got:_FillValue = 2147483647;
      ocean_tide_got:long_name = "geocentric ocean tide height (GOT solution)";
      ocean_tide_got:standard_name =
"sea_surface_height_amplitude_due_to_geocentric_ocean_tide";
      ocean_tide_got:source = < ocean_tide_got_source >;
      ocean_tide_got:institution = < ocean_tide_got_institution >;
      ocean_tide_got:units = "m";
      ocean_tide_got:scale_factor = 1.00e-04;
      ocean_tide_got:coordinates = "longitude latitude";
      ocean_tide_got:quality_flag = "ocean_tide_got_interp_qual";
      ocean_tide_got:comment = "Includes the corresponding loading tide (load_tide_got)
and equilibrium long-period ocean tide height (ocean_tide_eq). The permanent tide (zero
frequency) is not included in this parameter because it is included in the geoid and mean
sea surface (geoid, mean_sea_surface_cnescls). See SWOT Nadir Altimeter User Handbook";

int ocean_tide_fes(time);
      ocean_tide_fes:_FillValue = 2147483647;
      ocean_tide_fes:long_name = "geocentric ocean tide height (FES solution)";
      ocean_tide_fes:standard_name =
"sea_surface_height_amplitude_due_to_geocentric_ocean_tide";
      ocean_tide_fes:source = < ocean_tide_fes_source >;
      ocean_tide_fes:institution = < ocean_tide_fes_institution >;
      ocean_tide_fes:units = "m";
      ocean_tide_fes:scale_factor = 1.00e-04;
      ocean_tide_fes:coordinates = "longitude latitude";
      ocean_tide_fes:quality_flag = "ocean_tide_fes_interp_qual";
      ocean_tide_fes:comment = "Includes the equilibrium long-period ocean tide height
(ocean_tide_eq) and the short-period part of the corresponding loading tide
(load_tide_fes). The permanent tide (zero frequency) is not included in this parameter
because it is included in the geoid and mean sea surface (geoid,
mean_sea_surface_cnescls). See SWOT Nadir Altimeter User Handbook";

short ocean_tide_eq(time);
      ocean_tide_eq:_FillValue = 32767s;
      ocean_tide_eq:long_name = "equilibrium long-period ocean tide height";
      ocean_tide_eq:standard_name =
"sea_surface_height_amplitude_due_to_equilibrium_ocean_tide";
      ocean_tide_eq:source = < ocean_tide_eq_source >;
      ocean_tide_eq:units = "m";
```

ocean_tide_eq:scale_factor = 1.00e-04;
ocean_tide_eq:coordinates = "longitude latitude";
ocean_tide_eq:comment = "This value has already been added to the two geocentric ocean tide height values recorded in the product (ocean_tide_got and ocean_tide_fes). The permanent tide (zero frequency) is not included in this parameter because it is included in the geoid and mean sea surface (geoid, mean_sea_surface_cnescls). See SWOT Nadir Altimeter User Handbook";

short ocean_tide_non_eq(time);
ocean_tide_non_eq:_FillValue = 32767s;
ocean_tide_non_eq:long_name = "non-equilibrium long-period ocean tide height";
ocean_tide_non_eq:standard_name = "sea_surface_height_amplitude_due_to_non_equilibrium_ocean_tide";
ocean_tide_non_eq:source = < ocean_tide_neq_source >;
ocean_tide_non_eq:institution = < ocean_tide_neq_institution >;
ocean_tide_non_eq:units = "m";
ocean_tide_non_eq:scale_factor = 1.00e-04;
ocean_tide_non_eq:coordinates = "longitude latitude";
ocean_tide_non_eq:comment = "This parameter is computed as a correction to the parameter ocean_tide_eq; it contains the long-period ocean tide and the long-period load tide components. This value can be added to ocean_tide_eq (or ocean_tide_got, ocean_tide_fes) so that the resulting value models the total non equilibrium ocean tide height. See SWOT Nadir Altimeter User Handbook";

short load_tide_got(time);
load_tide_got:_FillValue = 32767s;
load_tide_got:long_name = "load tide height for geocentric ocean tide (GOT solution)";
load_tide_got:source = < tidal_loading_got_source >;
load_tide_got:institution = < tidal_loading_got_institution >;
load_tide_got:units = "m";
load_tide_got:scale_factor = 1.00e-04;
load_tide_got:coordinates = "longitude latitude";
load_tide_got:comment = "This value has already been added to the corresponding ocean tide height value recorded in the product (ocean_tide_got). See SWOT Nadir Altimeter User Handbook";

short load_tide_fes(time);
load_tide_fes:_FillValue = 32767s;
load_tide_fes:long_name = "load tide height for geocentric ocean tide (FES solution)";
load_tide_fes:source = < tidal_loading_fes_source >;
load_tide_fes:institution = < tidal_loading_fes_institution >;
load_tide_fes:units = "m";
load_tide_fes:scale_factor = 1.00e-04;
load_tide_fes:coordinates = "longitude latitude";
load_tide_fes:comment = "This value contains the total load tide height (short-period and long-period) for the geocentric ocean tide (FES solution). To get only the ocean tide height (FES solution), do: ocean_tide_fes + ocean_tide_non_eq - load_tide_fes. See SWOT Nadir Altimeter User Handbook";

short solid_earth_tide(time);
solid_earth_tide:_FillValue = 32767s;
solid_earth_tide:long_name = "solid earth tide height";
solid_earth_tide:standard_name = "sea_surface_height_amplitude_due_to_earth_tide";
solid_earth_tide:source = < solid_earth_tide_source >;
solid_earth_tide:units = "m";
solid_earth_tide:scale_factor = 1.00e-04;
solid_earth_tide:coordinates = "longitude latitude";

```
      solid_earth_tide:comment = "Calculated using Cartwright and Tayler tables and
consisting of the second and third degree constituents. The permanent tide (zero
frequency) is not included. See SWOT Nadir Altimeter User Handbook";

short pole_tide(time);
      pole_tide:_FillValue = 32767s;
      pole_tide:long_name = "geocentric pole tide height";
      pole_tide:standard_name = "sea_surface_height_amplitude_due_to_pole_tide";
      pole_tide:source = < pole_tide_source >;
      pole_tide:units = "m";
      pole_tide:scale_factor = 1.00e-04;
      pole_tide:coordinates = "longitude latitude";
      pole_tide:comment = "See SWOT Nadir Altimeter User Handbook";

short internal_tide(time);
      internal_tide:_FillValue = 32767s;
      internal_tide:long_name = "internal tide height";
      internal_tide:source = < internal_tide_source >;
      internal_tide:units = "m";
      internal_tide:scale_factor = 1.00e-04;
      internal_tide:coordinates = "longitude latitude";
      internal_tide:quality_flag = "internal_tide_interp_qual";
      internal_tide:comment = "See SWOT Nadir Altimeter User Handbook";
```

// Environmental parameters

```
short wind_speed_mod_u(time);
      wind_speed_mod_u:_FillValue = 32767s;
      wind_speed_mod_u:long_name = "U component of the model wind vector";
      wind_speed_mod_u:standard_name = "wind_speed";
      wind_speed_mod_u:source = "European Center for Medium Range Weather Forecasting";
      wind_speed_mod_u:institution = "ECMWF";
      wind_speed_mod_u:units = "m/s";
      wind_speed_mod_u:scale_factor = 1.00e-02;
      wind_speed_mod_u:coordinates = "longitude latitude";
      wind_speed_mod_u:quality_flag = "meteo_zero_altitude_interp_qual and
meteo_map_availability_flag";
      wind_speed_mod_u:comment = "Computed at the altimeter time-tag from the
interpolation of 2 meteorological fields that surround the altimeter time-tag. See SWOT
Nadir Altimeter User Handbook";

short wind_speed_mod_v(time);
      wind_speed_mod_v:_FillValue = 32767s;
      wind_speed_mod_v:long_name = "V component of the model wind vector";
      wind_speed_mod_v:standard_name = "wind_speed";
      wind_speed_mod_v:source = "European Center for Medium Range Weather Forecasting";
      wind_speed_mod_v:institution = "ECMWF";
      wind_speed_mod_v:units = "m/s";
      wind_speed_mod_v:scale_factor = 1.00e-02;
      wind_speed_mod_v:coordinates = "longitude latitude";
      wind_speed_mod_v:quality_flag = "meteo_zero_altitude_interp_qual and
meteo_map_availability_flag";
      wind_speed_mod_v:comment = "Computed at the altimeter time-tag from the
interpolation of 2 meteorological fields that surround the altimeter time-tag. See SWOT
Nadir Altimeter User Handbook";

short wind_speed_alt(time);
      wind_speed_alt:_FillValue = 32767s;
      wind_speed_alt:long_name = "altimeter wind speed";
      wind_speed_alt:standard_name = "wind_speed";
```

```
      wind_speed_alt:units = "m/s";
      wind_speed_alt:scale_factor = 1.00e-02;
      wind_speed_alt:coordinates = "longitude latitude";
      wind_speed_alt:comment = "Should not be used over land. See SWOT Nadir Altimeter
User Handbook. A calibration bias of +0.06 dB has been added to the Ku band backscatter
coefficient (/data_01/ku/sig0_ocean) before computing the wind speed";

short wind_speed_alt_mle3(time);
      wind_speed_alt_mle3:_FillValue = 32767s;
      wind_speed_alt_mle3:long_name = "altimeter wind speed (MLE3 retracking)";
      wind_speed_alt_mle3:standard_name = "wind_speed";
      wind_speed_alt_mle3:units = "m/s";
      wind_speed_alt_mle3:scale_factor = 1.00e-02;
      wind_speed_alt_mle3:coordinates = "longitude latitude";
      wind_speed_alt_mle3:comment = "Should not be used over land. See SWOT Nadir
Altimeter User Handbook. A calibration bias of +0.109 dB has been added to the Ku band
backscatter coefficient (/data_01/ku/sig0_ocean_mle3) before computing the wind speed";

short wind_speed_alt_adaptive(time);
      wind_speed_alt_adaptive:_FillValue = 32767s;
      wind_speed_alt_adaptive:long_name = "altimeter wind speed (adaptive retracking)";
      wind_speed_alt_adaptive:standard_name = "wind_speed";
      wind_speed_alt_adaptive:units = "m/s";
      wind_speed_alt_adaptive:scale_factor = 1.00e-02;
      wind_speed_alt_adaptive:coordinates = "longitude latitude";
      wind_speed_alt_adaptive:comment = "Should not be used over land. See SWOT Nadir
Altimeter User Handbook. A calibration bias of +0.08 dB has been added to the Ku band
backscatter coefficient (/data_01/ku/sig0_adaptive) before computing the wind speed";

short rad_wind_speed(time);
      rad_wind_speed:_FillValue = 32767s;
      rad_wind_speed:long_name = "radiometer wind speed";
      rad_wind_speed:standard_name = "wind_speed";
      rad_wind_speed:source = "AMR";
      rad_wind_speed:institution = "NASA/JPL";
      rad_wind_speed:units = "m/s";
      rad_wind_speed:scale_factor = 1.00e-02;
      rad_wind_speed:coordinates = "longitude latitude";
      rad_wind_speed:comment = "Should not be used over land. See SWOT Nadir Altimeter
User Handbook";

short rad_water_vapor(time);
      rad_water_vapor:_FillValue = 32767s;
      rad_water_vapor:long_name = "radiometer water vapor content";
      rad_water_vapor:standard_name = "atmosphere_water_vapor_content";
      rad_water_vapor:source = "AMR";
      rad_water_vapor:institution = "NASA/JPL";
      rad_water_vapor:units = "kg/m^2";
      rad_water_vapor:scale_factor = 1.00e-01;
      rad_water_vapor:coordinates = "longitude latitude";
      rad_water_vapor:comment = "Should not be used over land";

short rad_cloud_liquid_water(time);
      rad_cloud_liquid_water:_FillValue = 32767s;
      rad_cloud_liquid_water:long_name = "radiometer liquid water content";
      rad_cloud_liquid_water:standard_name = "atmosphere_cloud_liquid_water_content";
      rad_cloud_liquid_water:source = "AMR";
      rad_cloud_liquid_water:institution = "NASA/JPL";
      rad_cloud_liquid_water:units = "kg/m^2";
      rad_cloud_liquid_water:scale_factor = 1.00e-02;
      rad_cloud_liquid_water:coordinates = "longitude latitude";
```

```
        rad_cloud_liquid_water:comment = "Should not be used over land";

short rain_rate(time);
        rain_rate:_FillValue = 32767s;
        rain_rate:long_name = "model rain rate";
        rain_rate:source = "European Center for Medium Range Weather Forecasting";
        rain_rate:institution = "ECMWF";
        rain_rate:units = "mm/h";
        rain_rate:scale_factor = 1.00e-02;
        rain_rate:coordinates = "longitude latitude";
        rain_rate:comment = "See SWOT Nadir Altimeter User Handbook";

short sst(time);
        sst:_FillValue = 32767s;
        sst:long_name = "sea surface temperature";
        sst:standard_name = "sea_surface_temperature";
        sst:source = < sst_source >;
        sst:institution = < sst_institution >;
        sst:units = "K";
        sst:scale_factor = 1.00e-02;
        sst:coordinates = "longitude latitude";

short mean_wave_period_t02(time);
        mean_wave_period_t02:_FillValue = 32767s;
        mean_wave_period_t02:long_name = "t02 mean wave period";
        mean_wave_period_t02:standard_name =
"sea_surface_wind_wave_mean_period_from_variance_spectral_density_second_frequency_moment
";
        mean_wave_period_t02:source = < wave_model_source >;
        mean_wave_period_t02:institution = < wave_model_institution >;
        mean_wave_period_t02:units = "s";
        mean_wave_period_t02:scale_factor = 1.00e-02;
        mean_wave_period_t02:coordinates = "longitude latitude";
        mean_wave_period_t02:quality_flag = "wave_model_interp_qual and
wave_model_map_availability_flag";

int mean_wave_direction(time);
        mean_wave_direction:_FillValue = 2147483647;
        mean_wave_direction:long_name = "mean direction of the sea surface wave";
        mean_wave_direction:standard_name = "sea_surface_wave_from_direction";
        mean_wave_direction:source = < wave_model_source >;
        mean_wave_direction:institution = < wave_model_institution >;
        mean_wave_direction:units = "degrees";
        mean_wave_direction:scale_factor = 1.00e-02;
        mean_wave_direction:coordinates = "longitude latitude";
        mean_wave_direction:quality_flag = "wave_model_interp_qual and
wave_model_map_availability_flag";

short sea_ice_concentration(time);
        sea_ice_concentration:_FillValue = 32767s;
        sea_ice_concentration:long_name = "sea ice concentration";
        sea_ice_concentration:standard_name = "sea_ice_area_fraction";
        sea_ice_concentration:source = < sea ice concentration source >;
        sea_ice_concentration:institution = < sea ice concentration institution >;
        sea_ice_concentration:units = "1";
        sea_ice_concentration:scale_factor = 1.00e-02;
        sea_ice_concentration:coordinates = "longitude latitude";
        sea_ice_concentration:quality_flag = "sea_ice_concentration_interp_qual";
        sea_ice_concentration:comment = "percentage between 0 and 100";
```

// 1-Hz Ku band data

```
group: ku {

  variables:
```

// Quality information and sensor status

```
        // Altimeter state flags
byte alt_state_band_status_flag(time);
       alt_state_band_status_flag:_FillValue = 127b;
       alt_state_band_status_flag:long_name = "altimeter state flag: Ku band status";
       alt_state_band_status_flag:flag_meanings = "On Off";
       alt_state_band_status_flag:flag_values = 0b, 1b;
       alt_state_band_status_flag:coordinates = "/data_01/longitude /data_01/latitude";


        // Quality flags for 1Hz altimeter data
byte range_ocean_compression_qual(time);
       range_ocean_compression_qual:_FillValue = 127b;
       range_ocean_compression_qual:long_name = "quality flag for 1 Hz altimeter data: Ku
band range";
       range_ocean_compression_qual:flag_meanings = "good bad";
       range_ocean_compression_qual:flag_values = 0b, 1b;
       range_ocean_compression_qual:coordinates = "/data_01/longitude /data_01/latitude";

byte range_ocean_mle3_compression_qual(time);
       range_ocean_mle3_compression_qual:_FillValue = 127b;
       range_ocean_mle3_compression_qual:long_name = "quality flag for 1 Hz altimeter
data: Ku band range (MLE3 retracking)";
       range_ocean_mle3_compression_qual:flag_meanings = "good bad";
       range_ocean_mle3_compression_qual:flag_values = 0b, 1b;
       range_ocean_mle3_compression_qual:coordinates = "/data_01/longitude
/data_01/latitude";

byte range_adaptive_compression_qual(time);
       range_adaptive_compression_qual:_FillValue = 127b;
       range_adaptive_compression_qual:long_name = "quality flag for 1 Hz altimeter data:
Ku band range (adaptive retracking)";
       range_adaptive_compression_qual:flag_meanings = "good bad";
       range_adaptive_compression_qual:flag_values = 0b, 1b;
       range_adaptive_compression_qual:coordinates = "/data_01/longitude
/data_01/latitude";

byte swh_ocean_compression_qual(time);
       swh_ocean_compression_qual:_FillValue = 127b;
       swh_ocean_compression_qual:long_name = "quality flag for 1 Hz altimeter data: Ku
band SWH";
       swh_ocean_compression_qual:flag_meanings = "good bad";
       swh_ocean_compression_qual:flag_values = 0b, 1b;
       swh_ocean_compression_qual:coordinates = "/data_01/longitude /data_01/latitude";

byte swh_ocean_mle3_compression_qual(time);
       swh_ocean_mle3_compression_qual:_FillValue = 127b;
       swh_ocean_mle3_compression_qual:long_name = "quality flag for 1 Hz altimeter data:
Ku band SWH (MLE3 retracking)";
       swh_ocean_mle3_compression_qual:flag_meanings = "good bad";
       swh_ocean_mle3_compression_qual:flag_values = 0b, 1b;
```

```
      swh_ocean_mle3_compression_qual:coordinates = "/data_01/longitude
/data_01/latitude";

byte swh_adaptive_compression_qual(time);
      swh_adaptive_compression_qual:_FillValue = 127b;
      swh_adaptive_compression_qual:long_name = "quality flag for 1 Hz altimeter data:
Ku band SWH (adaptive retracking)";
      swh_adaptive_compression_qual:flag_meanings = "good bad";
      swh_adaptive_compression_qual:flag_values = 0b, 1b;
      swh_adaptive_compression_qual:coordinates = "/data_01/longitude
/data_01/latitude";

byte sig0_ocean_compression_qual(time);
      sig0_ocean_compression_qual:_FillValue = 127b;
      sig0_ocean_compression_qual:long_name = "quality flag for 1 Hz altimeter data: Ku
band backscatter coefficient";
      sig0_ocean_compression_qual:flag_meanings = "good bad";
      sig0_ocean_compression_qual:flag_values = 0b, 1b;
      sig0_ocean_compression_qual:coordinates = "/data_01/longitude /data_01/latitude";

byte sig0_ocean_mle3_compression_qual(time);
      sig0_ocean_mle3_compression_qual:_FillValue = 127b;
      sig0_ocean_mle3_compression_qual:long_name = "quality flag for 1 Hz altimeter
data: Ku band backscatter coefficient (MLE3 retracking)";
      sig0_ocean_mle3_compression_qual:flag_meanings = "good bad";
      sig0_ocean_mle3_compression_qual:flag_values = 0b, 1b;
      sig0_ocean_mle3_compression_qual:coordinates = "/data_01/longitude
/data_01/latitude";

byte sig0_adaptive_compression_qual(time);
      sig0_adaptive_compression_qual:_FillValue = 127b;
      sig0_adaptive_compression_qual:long_name = "quality flag for 1 Hz altimeter data:
Ku band backscatter coefficient (adaptive retracking)";
      sig0_adaptive_compression_qual:flag_meanings = "good bad";
      sig0_adaptive_compression_qual:flag_values = 0b, 1b;
      sig0_adaptive_compression_qual:coordinates = "/data_01/longitude
/data_01/latitude";

byte off_nadir_angle_wf_ocean_compression_qual(time);
      off_nadir_angle_wf_ocean_compression_qual:_FillValue = 127b;
      off_nadir_angle_wf_ocean_compression_qual:long_name = "quality flag for 1 Hz
altimeter data: off nadir angle from Ku band";
      off_nadir_angle_wf_ocean_compression_qual:flag_meanings = "good bad";
      off_nadir_angle_wf_ocean_compression_qual:flag_values = 0b, 1b;
      off_nadir_angle_wf_ocean_compression_qual:coordinates = "/data_01/longitude
/data_01/latitude";
```

// Quality flags for 1 Hz altimeter instrumental corrections

```
byte range_cor_ocean_net_instr_qual(time);
      range_cor_ocean_net_instr_qual:_FillValue = 127b;
      range_cor_ocean_net_instr_qual:long_name = "quality flag for 1 Hz instrumental
correction: Ku band range";
      range_cor_ocean_net_instr_qual:flag_meanings = "good bad";
      range_cor_ocean_net_instr_qual:flag_values = 0b, 1b;
      range_cor_ocean_net_instr_qual:coordinates = "/data_01/longitude
/data_01/latitude";
      range_cor_ocean_net_instr_qual:comment = "Threshold control of
range_cor_ocean_net_instr";
```

```
byte swh_cor_ocean_net_instr_qual(time);
       swh_cor_ocean_net_instr_qual:_FillValue = 127b;
       swh_cor_ocean_net_instr_qual:long_name = "quality flag for 1 Hz instrumental
correction: Ku band SWH";
       swh_cor_ocean_net_instr_qual:flag_meanings = "good bad";
       swh_cor_ocean_net_instr_qual:flag_values = 0b, 1b;
       swh_cor_ocean_net_instr_qual:coordinates = "/data_01/longitude /data_01/latitude";
       swh_cor_ocean_net_instr_qual:comment = "Threshold control of
swh_cor_ocean_net_instr";

byte sig0_cor_ocean_net_instr_qual(time);
       sig0_cor_ocean_net_instr_qual:_FillValue = 127b;
       sig0_cor_ocean_net_instr_qual:long_name = "quality flag for 1 Hz instrumental
correction: Ku band backscatter coefficient";
       sig0_cor_ocean_net_instr_qual:flag_meanings = "good bad";
       sig0_cor_ocean_net_instr_qual:flag_values = 0b, 1b;
       sig0_cor_ocean_net_instr_qual:coordinates = "/data_01/longitude
/data_01/latitude";
       sig0_cor_ocean_net_instr_qual:comment = "Threshold control of
sig0_cor_ocean_net_instr";

       // Quality flags for interpolation

byte iono_cor_alt_filtered_qual(time);
       iono_cor_alt_filtered_qual:_FillValue = 127b;
       iono_cor_alt_filtered_qual:long_name = "filtered altimeter ionospheric correction
quality flag";
       iono_cor_alt_filtered_qual:flag_meanings = "filtered interpolated bad";
       iono_cor_alt_filtered_qual:flag_values = 0b, 1b, 2b;
       iono_cor_alt_filtered_qual:coordinates = "/data_01/longitude /data_01/latitude";

byte iono_cor_alt_filtered_mle3_qual(time);
       iono_cor_alt_filtered_mle3_qual:_FillValue = 127b;
       iono_cor_alt_filtered_mle3_qual:long_name = "filtered altimeter ionospheric
correction quality flag (MLE3 retracking)";
       iono_cor_alt_filtered_mle3_qual:flag_meanings = "filtered interpolated bad";
       iono_cor_alt_filtered_mle3_qual:flag_values = 0b, 1b, 2b;
       iono_cor_alt_filtered_mle3_qual:coordinates = "/data_01/longitude
/data_01/latitude";

byte iono_cor_alt_filtered_adaptive_qual(time);
       iono_cor_alt_filtered_adaptive_qual:_FillValue = 127b;
       iono_cor_alt_filtered_adaptive_qual:long_name = "filtered altimeter ionospheric
correction quality flag (adaptive retracking)";
       iono_cor_alt_filtered_adaptive_qual:flag_meanings = "filtered interpolated bad";
       iono_cor_alt_filtered_adaptive_qual:flag_values = 0b, 1b, 2b;
       iono_cor_alt_filtered_adaptive_qual:coordinates = "/data_01/longitude
/data_01/latitude";
```

// Altimeter range

```
int range_ocean(time);
       range_ocean:_FillValue = 2147483647;
       range_ocean:long_name = "1 Hz Ku band corrected altimeter range";
       range_ocean:standard_name = "altimeter_range";
       range_ocean:units = "m";
       range_ocean:add_offset = 1.300000e+06;
       range_ocean:scale_factor = 1.00e-04;
```

```
      range_ocean:coordinates = "/data_01/longitude /data_01/latitude";
      range_ocean:quality_flag = "range_ocean_compression_qual";
      range_ocean:comment = "All instrumental corrections included, i.e. distance
antenna-COG (/data_01/range_cor_cog), USO drift correction (/data_01/range_cor_uso),
internal path correction (range_cor_internal_path), Doppler correction
(range_cor_doppler), modeled instrumental errors correction (range_cor_ocean_model_instr)
and system bias";

short range_ocean_rms(time);
      range_ocean_rms:_FillValue = 32767s;
      range_ocean_rms:long_name = "RMS of the Ku band range";
      range_ocean_rms:units = "m";
      range_ocean_rms:scale_factor = 1.00e-04;
      range_ocean_rms:coordinates = "/data_01/longitude /data_01/latitude";
      range_ocean_rms:comment = "Compression of Ku band high rate elements is preceded
by a detection of outliers. Only valid high-rate values are used to compute this
element";

byte range_ocean_numval(time);
      range_ocean_numval:_FillValue = 127b;
      range_ocean_numval:long_name = "number of valid points for Ku band range";
      range_ocean_numval:units = "count";
      range_ocean_numval:coordinates = "/data_01/longitude /data_01/latitude";
      range_ocean_numval:valid_min = 0b;
      range_ocean_numval:valid_max = 20b;
```

// Altimeter range – ocean-2 (MLE3)

```
int range_ocean_mle3(time);
      range_ocean_mle3:_FillValue = 2147483647;
      range_ocean_mle3:long_name = "1 Hz Ku band corrected altimeter range (MLE3
retracking)";
      range_ocean_mle3:standard_name = "altimeter_range";
      range_ocean_mle3:units = "m";
      range_ocean_mle3:add_offset = 1.300000e+06;
      range_ocean_mle3:scale_factor = 1.00e-04;
      range_ocean_mle3:coordinates = "/data_01/longitude /data_01/latitude";
      range_ocean_mle3:quality_flag = "range_ocean_mle3_compression_qual";
      range_ocean_mle3:comment = "All instrumental corrections included, i.e. distance
antenna-COG (/data_01/range_cor_cog), USO drift correction (/data_01/range_cor_uso),
internal path correction (range_cor_internal_path), Doppler correction
(range_cor_doppler), modeled instrumental errors correction
(range_cor_ocean_mle3_model_instr) and system bias";

short range_ocean_mle3_rms(time);
      range_ocean_mle3_rms:_FillValue = 32767s;
      range_ocean_mle3_rms:long_name = "RMS of the Ku band range (MLE3 retracking)";
      range_ocean_mle3_rms:units = "m";
      range_ocean_mle3_rms:scale_factor = 1.00e-04;
      range_ocean_mle3_rms:coordinates = "/data_01/longitude /data_01/latitude";
      range_ocean_mle3_rms:comment = "Compression of Ku band high rate elements is
preceded by a detection of outliers. Only valid high-rate values are used to compute this
element";

byte range_ocean_mle3_numval(time);
      range_ocean_mle3_numval:_FillValue = 127b;
      range_ocean_mle3_numval:long_name = "number of valid points for Ku band range
(MLE3 retracking)";
      range_ocean_mle3_numval:units = "count";
      range_ocean_mle3_numval:coordinates = "/data_01/longitude /data_01/latitude";
```

```
      range_ocean_mle3_numval:valid_min = 0b;
      range_ocean_mle3_numval:valid_max = 20b;
```

// Altimeter range – adaptive

```
int range_adaptive(time);
      range_adaptive:_FillValue = 2147483647;
      range_adaptive:long_name = "1 Hz Ku band corrected altimeter range (adaptive
retracking)";
      range_adaptive:standard_name = "altimeter_range";
      range_adaptive:units = "m";
      range_adaptive:add_offset = 1.300000e+06;
      range_adaptive:scale_factor = 1.00e-04;
      range_adaptive:coordinates = "/data_01/longitude /data_01/latitude";
      range_adaptive:quality_flag = "range_adaptive_compression_qual";
      range_adaptive:comment = "All instrumental corrections included, i.e. distance
antenna-COG (/data_01/range_cor_cog), USO drift correction (/data_01/range_cor_uso),
internal path correction (range_cor_internal_path), Doppler correction
(range_cor_doppler) and system bias";

short range_adaptive_rms(time);
      range_adaptive_rms:_FillValue = 32767s;
      range_adaptive_rms:long_name = "RMS of the Ku band range (adaptive retracking)";
      range_adaptive_rms:units = "m";
      range_adaptive_rms:scale_factor = 1.00e-04;
      range_adaptive_rms:coordinates = "/data_01/longitude /data_01/latitude";
      range_adaptive_rms:comment = "Compression of Ku band high rate elements is
preceded by a detection of outliers. Only valid high-rate values are used to compute this
element";

byte range_adaptive_numval(time);
      range_adaptive_numval:_FillValue = 127b;
      range_adaptive_numval:long_name = "number of valid points for Ku band range
(adaptive retracking)";
      range_adaptive_numval:units = "count";
      range_adaptive_numval:coordinates = "/data_01/longitude /data_01/latitude";
      range_adaptive_numval:valid_min = 0b;
      range_adaptive_numval:valid_max = 20b;
```

// Altimeter range corrections

```
int range_cor_ocean_net_instr(time);
      range_cor_ocean_net_instr:_FillValue = 2147483647;
      range_cor_ocean_net_instr:long_name = "net instrumental correction on the Ku band
range";
      range_cor_ocean_net_instr:units = "m";
      range_cor_ocean_net_instr:scale_factor = 1.00e-04;
      range_cor_ocean_net_instr:coordinates = "/data_01/longitude /data_01/latitude";
      range_cor_ocean_net_instr:quality_flag = "range_cor_ocean_net_instr_qual";
      range_cor_ocean_net_instr:comment = "Sum of distance antenna-COG
(/data_01/range_cor_cog), USO drift correction (/data_01/range_cor_uso), internal path
correction (range_cor_internal_path), Doppler correction (range_cor_doppler), modeled
instrumental errors correction (range_cor_ocean_model_instr) and system bias";

int range_cor_ocean_mle3_net_instr(time);
      range_cor_ocean_mle3_net_instr:_FillValue = 2147483647;
      range_cor_ocean_mle3_net_instr:long_name = "net instrumental correction on the Ku
band range (MLE3 retracking)";
```

```
      range_cor_ocean_mle3_net_instr:units = "m";
      range_cor_ocean_mle3_net_instr:scale_factor = 1.00e-04;
      range_cor_ocean_mle3_net_instr:coordinates = "/data_01/longitude
/data_01/latitude";
      range_cor_ocean_mle3_net_instr:comment = "Sum of distance antenna-COG
(/data_01/range_cor_cog), USO drift correction (/data_01/range_cor_uso), internal path
correction (range_cor_internal_path), Doppler correction (range_cor_doppler), modeled
instrumental errors correction (range_cor_ocean_mle3_model_instr) and system bias";

int range_cor_adaptive_net_instr(time);
      range_cor_adaptive_net_instr:_FillValue = 2147483647;
      range_cor_adaptive_net_instr:long_name = "net instrumental correction on the Ku
band range (adaptive retracking)";
      range_cor_adaptive_net_instr:units = "m";
      range_cor_adaptive_net_instr:scale_factor = 1.00e-04;
      range_cor_adaptive_net_instr:coordinates = "/data_01/longitude /data_01/latitude";
      range_cor_adaptive_net_instr:comment = "Sum of distance antenna-COG
(/data_01/range_cor_cog), USO drift correction (/data_01/range_cor_uso), internal path
correction (range_cor_internal_path), Doppler correction (range_cor_doppler) and system
bias";

short iono_cor_alt(time);
      iono_cor_alt:_FillValue = 32767s;
      iono_cor_alt:long_name = "altimeter ionospheric correction on Ku band";
      iono_cor_alt:standard_name = "altimeter_range_correction_due_to_ionosphere";
      iono_cor_alt:source = "Poseidon-3C";
      iono_cor_alt:institution = "CNES";
      iono_cor_alt:units = "m";
      iono_cor_alt:scale_factor = 1.00e-04;
      iono_cor_alt:coordinates = "/data_01/longitude /data_01/latitude";
      iono_cor_alt:comment = "An ionospheric correction must be added (negative value)
to the instrument range to correct this range measurement for ionospheric range delays of
the radar pulse. See SWOT Nadir Altimeter User Handbook";

short iono_cor_alt_mle3(time);
      iono_cor_alt_mle3:_FillValue = 32767s;
      iono_cor_alt_mle3:long_name = "altimeter ionospheric correction on Ku band (MLE3
retracking)";
      iono_cor_alt_mle3:standard_name = "altimeter_range_correction_due_to_ionosphere";
      iono_cor_alt_mle3:source = "Poseidon-3C";
      iono_cor_alt_mle3:institution = "CNES";
      iono_cor_alt_mle3:units = "m";
      iono_cor_alt_mle3:scale_factor = 1.00e-04;
      iono_cor_alt_mle3:coordinates = "/data_01/longitude /data_01/latitude";
      iono_cor_alt_mle3:comment = "An ionospheric correction must be added (negative
value) to the instrument range to correct this range measurement for ionospheric range
delays of the radar pulse. See SWOT Nadir Altimeter User Handbook";

short iono_cor_alt_adaptive(time);
      iono_cor_alt_adaptive:_FillValue = 32767s;
      iono_cor_alt_adaptive:long_name = "altimeter ionospheric correction on Ku band
(adaptive retracking)";
      iono_cor_alt_adaptive:standard_name =
"altimeter_range_correction_due_to_ionosphere";
      iono_cor_alt_adaptive:source = "Poseidon-3C";
      iono_cor_alt_adaptive:institution = "CNES";
      iono_cor_alt_adaptive:units = "m";
      iono_cor_alt_adaptive:scale_factor = 1.00e-04;
      iono_cor_alt_adaptive:coordinates = "/data_01/longitude /data_01/latitude";
```

iono_cor_alt_adaptive:comment = "An ionospheric correction must be added (negative value) to the instrument range to correct this range measurement for ionospheric range delays of the radar pulse. See SWOT Nadir Altimeter User Handbook";

short iono_cor_alt_filtered(time);
iono_cor_alt_filtered:_FillValue = 32767s;
iono_cor_alt_filtered:long_name = "filtered altimeter ionospheric correction on Ku band";
iono_cor_alt_filtered:standard_name = "altimeter_range_correction_due_to_ionosphere";
iono_cor_alt_filtered:source = "Poseidon-3C";
iono_cor_alt_filtered:institution = "CNES";
iono_cor_alt_filtered:units = "m";
iono_cor_alt_filtered:scale_factor = 1.00e-04;
iono_cor_alt_filtered:coordinates = "/data_01/longitude /data_01/latitude";
iono_cor_alt_filtered:quality_flag = "iono_cor_alt_filtered_qual";
iono_cor_alt_filtered:comment = "An ionospheric correction must be added (negative value) to the instrument range to correct this range measurement for ionospheric range delays of the radar pulse. See SWOT Nadir Altimeter User Handbook";

short iono_cor_alt_filtered_mle3(time);
iono_cor_alt_filtered_mle3:_FillValue = 32767s;
iono_cor_alt_filtered_mle3:long_name = "filtered altimeter ionospheric correction on Ku band (MLE3 retracking)";
iono_cor_alt_filtered_mle3:standard_name = "altimeter_range_correction_due_to_ionosphere";
iono_cor_alt_filtered_mle3:source = "Poseidon-3C";
iono_cor_alt_filtered_mle3:institution = "CNES";
iono_cor_alt_filtered_mle3:units = "m";
iono_cor_alt_filtered_mle3:scale_factor = 1.00e-04;
iono_cor_alt_filtered_mle3:coordinates = "/data_01/longitude /data_01/latitude";
iono_cor_alt_filtered_mle3:quality_flag = "iono_cor_alt_filtered_mle3_qual";
iono_cor_alt_filtered_mle3:comment = "An ionospheric correction must be added (negative value) to the instrument range to correct this range measurement for ionospheric range delays of the radar pulse. See SWOT Nadir Altimeter User Handbook";

short iono_cor_alt_filtered_adaptive(time);
iono_cor_alt_filtered_adaptive:_FillValue = 32767s;
iono_cor_alt_filtered_adaptive:long_name = "filtered altimeter ionospheric correction on Ku band (adaptive retracking)";
iono_cor_alt_filtered_adaptive:standard_name = "altimeter_range_correction_due_to_ionosphere";
iono_cor_alt_filtered_adaptive:source = "Poseidon-3C";
iono_cor_alt_filtered_adaptive:institution = "CNES";
iono_cor_alt_filtered_adaptive:units = "m";
iono_cor_alt_filtered_adaptive:scale_factor = 1.00e-04;
iono_cor_alt_filtered_adaptive:coordinates = "/data_01/longitude /data_01/latitude";
iono_cor_alt_filtered_adaptive:quality_flag = "iono_cor_alt_filtered_adaptive_qual";
iono_cor_alt_filtered_adaptive:comment = "An ionospheric correction must be added (negative value) to the instrument range to correct this range measurement for ionospheric range delays of the radar pulse. See SWOT Nadir Altimeter User Handbook";

short iono_cor_gim(time);
iono_cor_gim:_FillValue = 32767s;
iono_cor_gim:long_name = "GIM ionospheric correction on Ku band";
iono_cor_gim:standard_name = "altimeter_range_correction_due_to_ionosphere";
iono_cor_gim:institution = "NASA/JPL";
iono_cor_gim:units = "m";
iono_cor_gim:scale_factor = 1.00e-04;

```
      iono_cor_gim:coordinates = "/data_01/longitude /data_01/latitude";
      iono_cor_gim:comment = "An ionospheric correction must be added (negative value)
to the instrument range to correct this range measurement for ionospheric range delays of
the radar pulse. See SWOT Nadir Altimeter User Handbook";

short sea_state_bias(time);
      sea_state_bias:_FillValue = 32767s;
      sea_state_bias:long_name = "sea state bias correction in Ku band";
      sea_state_bias:standard_name =
"sea_surface_height_bias_due_to_sea_surface_roughness";
      sea_state_bias:source = < ssb_source >;
      sea_state_bias:institution = < ssb_institution >;
      sea_state_bias:units = "m";
      sea_state_bias:scale_factor = 1.00e-04;
      sea_state_bias:coordinates = "/data_01/longitude /data_01/latitude";
      sea_state_bias:comment = "A sea state bias correction must be added (negative
value) to the instrument range to correct this range measurement for sea state delays of
the radar pulse. This element should not be used over land. See SWOT Nadir Altimeter User
Handbook";

short sea_state_bias_mle3(time);
      sea_state_bias_mle3:_FillValue = 32767s;
      sea_state_bias_mle3:long_name = "sea state bias correction in Ku band (MLE3
retracking)";
      sea_state_bias_mle3:standard_name =
"sea_surface_height_bias_due_to_sea_surface_roughness";
      sea_state_bias_mle3:source = < ssb_mle3_source >;
      sea_state_bias_mle3:institution = < ssb_mle3_institution >;
      sea_state_bias_mle3:units = "m";
      sea_state_bias_mle3:scale_factor = 1.00e-04;
      sea_state_bias_mle3:coordinates = "/data_01/longitude /data_01/latitude";
      sea_state_bias_mle3:comment = "A sea state bias correction must be added (negative
value) to the instrument range to correct this range measurement for sea state delays of
the radar pulse. This element should not be used over land. See SWOT Nadir Altimeter User
Handbook";

short sea_state_bias_adaptive(time);
      sea_state_bias_adaptive:_FillValue = 32767s;
      sea_state_bias_adaptive:long_name = "sea state bias correction in Ku band
(adaptive retracking)";
      sea_state_bias_adaptive:standard_name =
"sea_surface_height_bias_due_to_sea_surface_roughness";
      sea_state_bias_adaptive:source = < ssb_adaptive_source >;
      sea_state_bias_adaptive:institution = < ssb_adaptive_institution >;
      sea_state_bias_adaptive:units = "m";
      sea_state_bias_adaptive:scale_factor = 1.00e-04;
      sea_state_bias_adaptive:coordinates = "/data_01/longitude /data_01/latitude";
      sea_state_bias_adaptive:comment = "A sea state bias correction must be added
(negative value) to the instrument range to correct this range measurement for sea state
delays of the radar pulse. This element should not be used over land. See SWOT Nadir
Altimeter User Handbook";

short sea_state_bias_3d_mp2(time);
      sea_state_bias_3d_mp2:_FillValue = 32767s;
      sea_state_bias_3d_mp2:long_name = "sea state bias correction in Ku band computed
from 3d model";
      sea_state_bias_3d_mp2:standard_name =
"sea_surface_height_bias_due_to_sea_surface_roughness";
      sea_state_bias_3d_mp2:source = < ssb_3d_source >;
      sea_state_bias_3d_mp2:institution = < ssb_3d_institution >;
      sea_state_bias_3d_mp2:units = "m";
```

```
      sea_state_bias_3d_mp2:scale_factor = 1.00e-04;
      sea_state_bias_3d_mp2:coordinates = "/data_01/longitude /data_01/latitude";
      sea_state_bias_3d_mp2:quality_flag = "wave_model_interp_qual and
wave_model_map_availability_flag";
      sea_state_bias_3d_mp2:comment = "Sea state bias computed from 3D model with mean
wave period (T02) as third input. A sea state bias correction must be added (negative
value) to the instrument range to correct this range measurement for sea state delays of
the radar pulse. This element should not be used over land. See SWOT Nadir Altimeter User
Handbook";

short sea_state_bias_adaptive_3d_mp2(time);
      sea_state_bias_adaptive_3d_mp2:_FillValue = 32767s;
      sea_state_bias_adaptive_3d_mp2:long_name = "sea state bias correction in Ku band
computed from 3d model";
      sea_state_bias_adaptive_3d_mp2:standard_name =
"sea_surface_height_bias_due_to_sea_surface_roughness";
      sea_state_bias_adaptive_3d_mp2:source = < ssb_adaptive_3d_source >;
      sea_state_bias_adaptive_3d_mp2:institution = < ssb_adaptive_3d_institution >;
      sea_state_bias_adaptive_3d_mp2:units = "m";
      sea_state_bias_adaptive_3d_mp2:scale_factor = 1.00e-04;
      sea_state_bias_adaptive_3d_mp2:coordinates = "/data_01/longitude
/data_01/latitude";
      sea_state_bias_adaptive_3d_mp2:quality_flag = "wave_model_interp_qual and
wave_model_map_availability_flag";
      sea_state_bias_adaptive_3d_mp2:comment = "Sea state bias computed from 3D model
with mean wave period (T02) as third input. A sea state bias correction must be added
(negative value) to the instrument range to correct this range measurement for sea state
delays of the radar pulse. This element should not be used over land. See SWOT Nadir
Altimeter User Handbook";
```

// Significant waveheight

```
short swh_ocean(time);
      swh_ocean:_FillValue = 32767s;
      swh_ocean:long_name = "Ku band corrected significant waveheight";
      swh_ocean:standard_name = "sea_surface_wave_significant_height";
      swh_ocean:units = "m";
      swh_ocean:scale_factor = 1.00e-03;
      swh_ocean:coordinates = "/data_01/longitude /data_01/latitude";
      swh_ocean:quality_flag = "swh_ocean_compression_qual";
      swh_ocean:comment = "All instrumental corrections included, i.e. modeled
instrumental errors correction (swh_cor_ocean_model_instr) and system bias";

short swh_ocean_rms(time);
      swh_ocean_rms:_FillValue = 32767s;
      swh_ocean_rms:long_name = "RMS of the Ku band significant waveheight";
      swh_ocean_rms:units = "m";
      swh_ocean_rms:scale_factor = 1.00e-03;
      swh_ocean_rms:coordinates = "/data_01/longitude /data_01/latitude";
      swh_ocean_rms:comment = "Compression of Ku band high rate elements is preceded by
a detection of outliers. Only valid high-rate values are used to compute this element";

byte swh_ocean_numval(time);
      swh_ocean_numval:_FillValue = 127b;
      swh_ocean_numval:long_name = "number of valid points used to compute Ku band
significant waveheight";
      swh_ocean_numval:units = "count";
      swh_ocean_numval:coordinates = "/data_01/longitude /data_01/latitude";
      swh_ocean_numval:valid_min = 0b;
      swh_ocean_numval:valid_max = 20b;
```

// Significant waveheight – ocean-2 (MLE3)

```
short swh_ocean_mle3(time);
       swh_ocean_mle3:_FillValue = 32767s;
       swh_ocean_mle3:long_name = "Ku band corrected significant waveheight (MLE3
retracking)";
       swh_ocean_mle3:standard_name = "sea_surface_wave_significant_height";
       swh_ocean_mle3:units = "m";
       swh_ocean_mle3:scale_factor = 1.00e-03;
       swh_ocean_mle3:coordinates = "/data_01/longitude /data_01/latitude";
       swh_ocean_mle3:quality_flag = "swh_ocean_mle3_compression_qual";
       swh_ocean_mle3:comment = "All instrumental corrections included, i.e. modeled
instrumental errors correction (swh_cor_ocean_mle3_model_instr) and system bias";

short swh_ocean_mle3_rms(time);
       swh_ocean_mle3_rms:_FillValue = 32767s;
       swh_ocean_mle3_rms:long_name = "RMS of the Ku band significant waveheight (MLE3
retracking)";
       swh_ocean_mle3_rms:units = "m";
       swh_ocean_mle3_rms:scale_factor = 1.00e-03;
       swh_ocean_mle3_rms:coordinates = "/data_01/longitude /data_01/latitude";
       swh_ocean_mle3_rms:comment = "Compression of Ku band high rate elements is
preceded by a detection of outliers. Only valid high-rate values are used to compute this
element";

byte swh_ocean_mle3_numval(time);
       swh_ocean_mle3_numval:_FillValue = 127b;
       swh_ocean_mle3_numval:long_name = "number of valid points used to compute Ku band
significant waveheight (MLE3 retracking)";
       swh_ocean_mle3_numval:units = "count";
       swh_ocean_mle3_numval:coordinates = "/data_01/longitude /data_01/latitude";
       swh_ocean_mle3_numval:valid_min = 0b;
       swh_ocean_mle3_numval:valid_max = 20b;
```

// Significant waveheight – adaptive

```
short swh_adaptive(time);
       swh_adaptive:_FillValue = 32767s;
       swh_adaptive:long_name = "Ku band corrected significant waveheight (adaptive
retracking)";
       swh_adaptive:standard_name = "sea_surface_wave_significant_height";
       swh_adaptive:units = "m";
       swh_adaptive:scale_factor = 1.00e-03;
       swh_adaptive:coordinates = "/data_01/longitude /data_01/latitude";
       swh_adaptive:quality_flag = "swh_adaptive_compression_qual";

short swh_adaptive_rms(time);
       swh_adaptive_rms:_FillValue = 32767s;
       swh_adaptive_rms:long_name = "RMS of the Ku band significant waveheight (adaptive
retracking)";
       swh_adaptive_rms:units = "m";
       swh_adaptive_rms:scale_factor = 1.00e-03;
       swh_adaptive_rms:coordinates = "/data_01/longitude /data_01/latitude";
       swh_adaptive_rms:comment = "Compression of Ku band high rate elements is preceded
by a detection of outliers. Only valid high-rate values are used to compute this
element";
```

```
byte swh_adaptive_numval(time);
       swh_adaptive_numval:_FillValue = 127b;
       swh_adaptive_numval:long_name = "number of valid points used to compute Ku band
significant waveheight (adaptive retracking)";
       swh_adaptive_numval:units = "count";
       swh_adaptive_numval:coordinates = "/data_01/longitude /data_01/latitude";
       swh_adaptive_numval:valid_min = 0b;
       swh_adaptive_numval:valid_max = 20b;
       swh_adaptive_numval:comment = "Compression of Ku band high rate elements is
preceded by a detection of outliers. Only valid high-rate values are used to compute this
element";
```

// Significant waveheight corrections

```
short swh_cor_ocean_net_instr(time);
       swh_cor_ocean_net_instr:_FillValue = 32767s;
       swh_cor_ocean_net_instr:long_name = "net instrumental correction on Ku band
significant waveheight";
       swh_cor_ocean_net_instr:units = "m";
       swh_cor_ocean_net_instr:scale_factor = 1.00e-03;
       swh_cor_ocean_net_instr:coordinates = "/data_01/longitude /data_01/latitude";
       swh_cor_ocean_net_instr:quality_flag = "swh_cor_ocean_net_instr_qual";
       swh_cor_ocean_net_instr:comment = "Sum of modeled instrumental errors correction
(swh_cor_ocean_model_instr) and system bias";

short swh_cor_ocean_mle3_net_instr(time);
       swh_cor_ocean_mle3_net_instr:_FillValue = 32767s;
       swh_cor_ocean_mle3_net_instr:long_name = "net instrumental correction on Ku band
significant waveheight (MLE3 retracking)";
       swh_cor_ocean_mle3_net_instr:units = "m";
       swh_cor_ocean_mle3_net_instr:scale_factor = 1.00e-03;
       swh_cor_ocean_mle3_net_instr:coordinates = "/data_01/longitude /data_01/latitude";
       swh_cor_ocean_mle3_net_instr:comment = "Sum of modeled instrumental errors
correction (swh_cor_ocean_mle3_model_instr) and system bias";

short swh_cor_adaptive_net_instr(time);
       swh_cor_adaptive_net_instr:_FillValue = 32767s;
       swh_cor_adaptive_net_instr:long_name = "net instrumental correction on Ku band
significant waveheight (adaptive retracking)";
       swh_cor_adaptive_net_instr:units = "m";
       swh_cor_adaptive_net_instr:scale_factor = 1.00e-03;
       swh_cor_adaptive_net_instr:coordinates = "/data_01/longitude /data_01/latitude";
       swh_cor_adaptive_net_instr:comment = "Set to zero";
```

// Backscatter coefficient

```
short sig0_ocean(time);
       sig0_ocean:_FillValue = 32767s;
       sig0_ocean:long_name = "Ku band corrected backscatter coefficient";
       sig0_ocean:standard_name =
"surface_backwards_scattering_coefficient_of_radar_wave";
       sig0_ocean:units = "dB";
       sig0_ocean:scale_factor = 1.00e-02;
       sig0_ocean:coordinates = "/data_01/longitude /data_01/latitude";
       sig0_ocean:quality_flag = "sig0_ocean_compression_qual";
       sig0_ocean:comment = "All instrumental corrections included, excepted the system
bias, i.e. AGC instrumental errors correction, internal calibration correction
```

```
(sig0_cor_calibration), modeled instrumental errors correction
(sig0_cor_ocean_model_instr) and atmospheric attenuation (sig0_cor_atm)";

short sig0_ocean_rms(time);
       sig0_ocean_rms:_FillValue = 32767s;
       sig0_ocean_rms:long_name = "RMS of the Ku band backscatter coefficient";
       sig0_ocean_rms:units = "dB";
       sig0_ocean_rms:scale_factor = 1.00e-02;
       sig0_ocean_rms:coordinates = "/data_01/longitude /data_01/latitude";
       sig0_ocean_rms:comment = "Compression of Ku band high rate elements is preceded by
a detection of outliers. Only valid high-rate values are used to compute this element";

byte sig0_ocean_numval(time);
       sig0_ocean_numval:_FillValue = 127b;
       sig0_ocean_numval:long_name = "number of valid points used to compute Ku band
backscatter coefficient";
       sig0_ocean_numval:units = "count";
       sig0_ocean_numval:coordinates = "/data_01/longitude /data_01/latitude";
       sig0_ocean_numval:valid_min = 0b;
       sig0_ocean_numval:valid_max = 20b;
```

// Backscatter coefficient – ocean-2 (MLE3)

```
short sig0_ocean_mle3(time);
       sig0_ocean_mle3:_FillValue = 32767s;
       sig0_ocean_mle3:long_name = "Ku band corrected backscatter coefficient (MLE3
retracking)";
       sig0_ocean_mle3:standard_name =
"surface_backwards_scattering_coefficient_of_radar_wave";
       sig0_ocean_mle3:units = "dB";
       sig0_ocean_mle3:scale_factor = 1.00e-02;
       sig0_ocean_mle3:coordinates = "/data_01/longitude /data_01/latitude";
       sig0_ocean_mle3:quality_flag = "sig0_ocean_mle3_compression_qual";
       sig0_ocean_mle3:comment = "All instrumental corrections included, excepted the
system bias, i.e. AGC instrumental errors correction, internal calibration correction
(sig0_cor_calibration), modeled instrumental errors correction
(sig0_cor_ocean_mle3_model_instr) and atmospheric attenuation (sig0_cor_atm)";

short sig0_ocean_mle3_rms(time);
       sig0_ocean_mle3_rms:_FillValue = 32767s;
       sig0_ocean_mle3_rms:long_name = "RMS of the Ku band backscatter coefficient (MLE3
retracking)";
       sig0_ocean_mle3_rms:units = "dB";
       sig0_ocean_mle3_rms:scale_factor = 1.00e-02;
       sig0_ocean_mle3_rms:coordinates = "/data_01/longitude /data_01/latitude";
       sig0_ocean_mle3_rms:comment = "Compression of Ku band high rate elements is
preceded by a detection of outliers. Only valid high-rate values are used to compute this
element";

byte sig0_ocean_mle3_numval(time);
       sig0_ocean_mle3_numval:_FillValue = 127b;
       sig0_ocean_mle3_numval:long_name = "number of valid points used to compute Ku band
backscatter coefficient (MLE3 retracking)";
       sig0_ocean_mle3_numval:units = "count";
       sig0_ocean_mle3_numval:coordinates = "/data_01/longitude /data_01/latitude";
       sig0_ocean_mle3_numval:valid_min = 0b;
       sig0_ocean_mle3_numval:valid_max = 20b;
```

// Backscatter coefficient – adaptive

```
short sig0_adaptive(time);
       sig0_adaptive:_FillValue = 32767s;
       sig0_adaptive:long_name = "Ku band corrected backscatter coefficient (adaptive
retracking)";
       sig0_adaptive:standard_name =
"surface_backwards_scattering_coefficient_of_radar_wave";
       sig0_adaptive:units = "dB";
       sig0_adaptive:scale_factor = 1.00e-02;
       sig0_adaptive:coordinates = "/data_01/longitude /data_01/latitude";
       sig0_adaptive:quality_flag = "sig0_adaptive_compression_qual";
       sig0_adaptive:comment = "All instrumental corrections included, excepted the
system bias, i.e. AGC instrumental errors correction, internal calibration correction
(sig0_cor_calibration) and atmospheric attenuation (sig0_cor_atm)";

short sig0_adaptive_rms(time);
       sig0_adaptive_rms:_FillValue = 32767s;
       sig0_adaptive_rms:long_name = "RMS of the Ku band backscatter coefficient
(adaptive retracking)";
       sig0_adaptive_rms:units = "dB";
       sig0_adaptive_rms:scale_factor = 1.00e-02;
       sig0_adaptive_rms:coordinates = "/data_01/longitude /data_01/latitude";
       sig0_adaptive_rms:comment = "Compression of Ku band high rate elements is preceded
by a detection of outliers. Only valid high-rate values are used to compute this
element";

byte sig0_adaptive_numval(time);
       sig0_adaptive_numval:_FillValue = 127b;
       sig0_adaptive_numval:units = "count";
       sig0_adaptive_numval:long_name = "number of valid points used to compute Ku band
backscatter coefficient (adaptive retracking)";
       sig0_adaptive_numval:coordinates = "/data_01/longitude /data_01/latitude";
       sig0_adaptive_numval:valid_min = 0b;
       sig0_adaptive_numval:valid_max = 20b;
```

// Tracker AGC

```
short agc(time);
       agc:_FillValue = 32767s;
       agc:long_name = "Ku band corrected AGC";
       agc:units = "dB";
       agc:scale_factor = 1.00e-02;
       agc:coordinates = "/data_01/longitude /data_01/latitude";
       agc:comment = "AGC is corrected for instrumental errors due to the imperfections
of the on-board attenuators";

short agc_rms(time);
       agc_rms:_FillValue = 32767s;
       agc_rms:long_name = "RMS of the Ku band AGC";
       agc_rms:units = "dB";
       agc_rms:scale_factor = 1.00e-02;
       agc_rms:coordinates = "/data_01/longitude /data_01/latitude";
       agc_rms:comment = "Compression of Ku band high rate elements is preceded by a
detection of outliers. Only valid high-rate values are used to compute this element";

byte agc_numval(time);
       agc_numval:_FillValue = 127b;
       agc_numval:long_name = "number of valid points used to compute Ku band AGC";
       agc_numval:units = "count";
       agc_numval:coordinates = "/data_01/longitude /data_01/latitude";
```

```
      agc_numval:valid_min = 0b;
      agc_numval:valid_max = 20b;
```

// Backscatter coefficient corrections

```
short sig0_cor_ocean_net_instr(time);
      sig0_cor_ocean_net_instr:_FillValue = 32767s;
      sig0_cor_ocean_net_instr:long_name = "net instrumental correction on Ku band
backscatter coefficient";
      sig0_cor_ocean_net_instr:units = "dB";
      sig0_cor_ocean_net_instr:scale_factor = 1.00e-02;
      sig0_cor_ocean_net_instr:coordinates = "/data_01/longitude /data_01/latitude";
      sig0_cor_ocean_net_instr:quality_flag = "sig0_cor_ocean_net_instr_qual";
      sig0_cor_ocean_net_instr:comment = "Sum of AGC instrumental errors correction,
internal calibration correction (sig0_cor_calibration) and modeled instrumental errors
correction (sig0_cor_ocean_model_instr) - system bias not included";

short sig0_cor_ocean_mle3_net_instr(time);
      sig0_cor_ocean_mle3_net_instr:_FillValue = 32767s;
      sig0_cor_ocean_mle3_net_instr:long_name = "net instrumental correction on Ku band
backscatter coefficient (MLE3 retracking)";
      sig0_cor_ocean_mle3_net_instr:units = "dB";
      sig0_cor_ocean_mle3_net_instr:scale_factor = 1.00e-02;
      sig0_cor_ocean_mle3_net_instr:coordinates = "/data_01/longitude
/data_01/latitude";
      sig0_cor_ocean_mle3_net_instr:comment = "Sum of AGC instrumental errors
correction, internal calibration correction (sig0_cor_calibration) and modeled
instrumental errors correction (sig0_cor_ocean_mle3_model_instr) - system bias not
included";

short sig0_cor_adaptive_net_instr(time);
      sig0_cor_adaptive_net_instr:_FillValue = 32767s;
      sig0_cor_adaptive_net_instr:long_name = "net instrumental correction on Ku band
backscatter coefficient (adaptive retracking)";
      sig0_cor_adaptive_net_instr:units = "dB";
      sig0_cor_adaptive_net_instr:scale_factor = 1.00e-02;
      sig0_cor_adaptive_net_instr:coordinates = "/data_01/longitude /data_01/latitude";
      sig0_cor_adaptive_net_instr:comment = "Sum of AGC instrumental errors correction,
internal calibration correction (sig0_cor_calibration) - system bias not included";

short sig0_cor_atm(time);
      sig0_cor_atm:_FillValue = 32767s;
      sig0_cor_atm:long_name = "atmospheric attenuation correction on Ku band
backscatter coefficient";
      sig0_cor_atm:units = "dB";
      sig0_cor_atm:scale_factor = 1.00e-02;
      sig0_cor_atm:coordinates = "/data_01/longitude /data_01/latitude";
      sig0_cor_atm:comment = "Based either on the radiometer (if available) or
atmospheric model (otherwise). The flag sig0_cor_atm_source indicates whether the
atmospheric model has been used";
```

// Off nadir angle

```
short off_nadir_angle_wf_ocean(time);
      off_nadir_angle_wf_ocean:_FillValue = 32767s;
      off_nadir_angle_wf_ocean:long_name = "square of the off nadir angle computed from
Ku band waveforms";
      off_nadir_angle_wf_ocean:units = "degrees^2";
```

```
      off_nadir_angle_wf_ocean:scale_factor = 1.00e-04;
      off_nadir_angle_wf_ocean:coordinates = "/data_01/longitude /data_01/latitude";
      off_nadir_angle_wf_ocean:quality_flag =
"off_nadir_angle_wf_ocean_compression_qual";

short off_nadir_angle_wf_ocean_rms(time);
      off_nadir_angle_wf_ocean_rms:_FillValue = 32767s;
      off_nadir_angle_wf_ocean_rms:long_name = "RMS of the square of the off nadir angle
computed from Ku band waveforms";
      off_nadir_angle_wf_ocean_rms:units = "degrees^2";
      off_nadir_angle_wf_ocean_rms:scale_factor = 1.00e-04;
      off_nadir_angle_wf_ocean_rms:coordinates = "/data_01/longitude /data_01/latitude";
      off_nadir_angle_wf_ocean_rms:comment = "Compression of high rate elements is
preceded by a detection of outliers. Only valid high-rate values are used to compute this
element";

byte off_nadir_angle_wf_ocean_numval(time);
      off_nadir_angle_wf_ocean_numval:_FillValue = 127b;
      off_nadir_angle_wf_ocean_numval:long_name = "number of valid points for square of
the off nadir angle computed from Ku band waveforms";
      off_nadir_angle_wf_ocean_numval:units = "count";
      off_nadir_angle_wf_ocean_numval:coordinates = "/data_01/longitude
/data_01/latitude";
      off_nadir_angle_wf_ocean_numval:valid_min = 0b;
      off_nadir_angle_wf_ocean_numval:valid_max = 20b;
```

// Waveforms characteristics

```
byte wvf_main_class(time);
      wvf_main_class:_FillValue = 127b;
      wvf_main_class:long_name = "1 Hz Ku band waveform main class";
      wvf_main_class:flag_meanings = "brown_ocean peaky noise strong_peak
brown_peak_trailing_edge brown_peak_leading_edge brown_flat_trailing_eadge peak_end trash
brown_noise two_leading_edges shifted_brown brown_noise_leading_edge
linear_positive_slope linear_negative_slope";
      wvf_main_class:flag_values = 1b, 2b, 3b, 4b, 5b, 6b, 7b, 8b, 9b, 10b, 11b, 12b,
13b, 15b, 18b;
      wvf_main_class:coordinates = "/data_01/longitude /data_01/latitude";
      wvf_main_class:comment = "Waveform classification : main class selected by
classification neural network trained on shape features of the waveforms";
```

// Sea Surface height

```
short ssha(time);
      ssha:_FillValue = 32767s;
      ssha:long_name = "sea surface height anomaly";
      ssha:standard_name = "sea_surface_height_above_sea_level";
      ssha:source = "Poseidon-3C";
      ssha:institution = "CNES";
      ssha:units = "m";
      ssha:scale_factor = 1.00e-03;
      ssha:coordinates = "/data_01/longitude /data_01/latitude";
      ssha:comment = "= altitude of satellite (/data_01/altitude) - Ku band corrected
altimeter range (range_ocean) - filtered altimeter ionospheric correction on Ku band
(iono_cor_alt_filtered) - model dry tropospheric correction
(/data_01/model_dry_tropo_cor_zero_altitude) - radiometer wet tropospheric correction
(/data_01/rad_wet_tropo_cor) - sea state bias correction in Ku band (sea_state_bias) -
solid earth tide height (/data_01/solid_earth_tide) - geocentric ocean tide height from
```

FES solution (/data_01/ocean_tide_fes) - non-equilibrium long-period ocean tide height (/data_01/ocean_tide_non_eq) - geocentric pole tide height (/data_01/pole_tide) - internal tide (/data_01/internal_tide) - dynamic atmospheric correction (/data_01/dac) - mean sea surface from CNES/CLS solution (/data_01/mean_sea_surface_cnescls). Set to default if the waveform classification (wvf_main_class) is not set to 1 = brown ocean, 12 = shifted brown, 13 = brown noise leading edge or 15 = linear positive_slope, or if the radiometer wet tropospheric interpolation quality flag (/data_01/rad_wet_tropo_cor_interp_qual) is set to 2 = fail";

short ssha_mle3(time);
ssha_mle3:_FillValue = 32767s;
ssha_mle3:long_name = "sea surface height anomaly (MLE3 retracking)";
ssha_mle3:standard_name = "sea_surface_height_above_sea_level";
ssha_mle3:source = "Poseidon-3C";
ssha_mle3:institution = "CNES";
ssha_mle3:units = "m";
ssha_mle3:scale_factor = 1.00e-03;
ssha_mle3:coordinates = "/data_01/longitude /data_01/latitude";
ssha_mle3:comment = "= altitude of satellite (/data_01/altitude) - Ku band corrected altimeter range (range_ocean_mle3) - filtered altimeter ionospheric correction on Ku band (iono_cor_alt_filtered_mle3) - model dry tropospheric correction (/data_01/model_dry_tropo_cor_zero_altitude) - radiometer wet tropospheric correction (/data_01/rad_wet_tropo_cor) - sea state bias correction in Ku band (sea_state_bias_mle3) - solid earth tide height (/data_01/solid_earth_tide) - geocentric ocean tide height from FES solution (/data_01/ocean_tide_fes) - non-equilibrium long-period ocean tide height (/data_01/ocean_tide_non_eq) - geocentric pole tide height (/data_01/pole_tide) - internal tide (/data_01/internal_tide) - dynamic atmospheric correction (/data_01/dac) - mean sea surface from CNES/CLS solution (/data_01/mean_sea_surface_cnescls). Set to default if the waveform classification (wvf_main_class) is not set to 1 = brown ocean, 12 = shifted brown, 13 = brown noise leading edge or 15 = linear positive_slope, or if the radiometer wet tropospheric interpolation quality flag (/data_01/rad_wet_tropo_cor_interp_qual) is set to 2 = fail";

} // group: ku

// 1-Hz C band data

group: c {

variables:

// Quality information and sensor status

// Altimeter state flags

byte alt_state_c_band_flag(time);
alt_state_c_band_flag:_FillValue = 127b;
alt_state_c_band_flag:long_name = "altimeter state flag: C bandwidth used";
alt_state_c_band_flag:flag_meanings = "320MHz 100MHz";
alt_state_c_band_flag:flag_values = 0b, 1b;
alt_state_c_band_flag:coordinates = "/data_01/longitude /data_01/latitude";

byte alt_state_band_status_flag(time);
alt_state_band_status_flag:_FillValue = 127b;
alt_state_band_status_flag:long_name = "altimeter state flag: C band status";
alt_state_band_status_flag:flag_meanings = "On Off";
alt_state_band_status_flag:flag_values = 0b, 1b;
alt_state_band_status_flag:coordinates = "/data_01/longitude /data_01/latitude";

```
// Quality flags for 1Hz altimeter data

byte range_ocean_compression_qual(time);
       range_ocean_compression_qual:_FillValue = 127b;
       range_ocean_compression_qual:long_name = "quality flag for 1 Hz altimeter data: C
band range";
       range_ocean_compression_qual:flag_meanings = "good bad";
       range_ocean_compression_qual:flag_values = 0b, 1b;
       range_ocean_compression_qual:coordinates = "/data_01/longitude /data_01/latitude";

byte swh_ocean_compression_qual(time);
       swh_ocean_compression_qual:_FillValue = 127b;
       swh_ocean_compression_qual:long_name = "quality flag for 1 Hz altimeter data: C
band SWH";
       swh_ocean_compression_qual:flag_meanings = "good bad";
       swh_ocean_compression_qual:flag_values = 0b, 1b;
       swh_ocean_compression_qual:coordinates = "/data_01/longitude /data_01/latitude";

byte sig0_ocean_compression_qual(time);
       sig0_ocean_compression_qual:_FillValue = 127b;
       sig0_ocean_compression_qual:long_name = "quality flag for 1 Hz altimeter data: C
band backscatter coefficient";
       sig0_ocean_compression_qual:flag_meanings = "good bad";
       sig0_ocean_compression_qual:flag_values = 0b, 1b;
       sig0_ocean_compression_qual:coordinates = "/data_01/longitude /data_01/latitude";

// Quality flags for 1 Hz altimeter instrumental corrections
byte range_cor_ocean_net_instr_qual(time);
       range_cor_ocean_net_instr_qual:_FillValue = 127b;
       range_cor_ocean_net_instr_qual:long_name = "quality flag for 1 Hz instrumental
correction: C band range";
       range_cor_ocean_net_instr_qual:flag_meanings = "good bad";
       range_cor_ocean_net_instr_qual:flag_values = 0b, 1b;
       range_cor_ocean_net_instr_qual:coordinates = "/data_01/longitude
/data_01/latitude";
       range_cor_ocean_net_instr_qual:comment = "Threshold control of
range_cor_ocean_net_instr";

byte swh_cor_ocean_net_instr_qual(time);
       swh_cor_ocean_net_instr_qual:_FillValue = 127b;
       swh_cor_ocean_net_instr_qual:long_name = "quality flag for 1 Hz instrumental
correction: C band SWH";
       swh_cor_ocean_net_instr_qual:flag_meanings = "good bad";
       swh_cor_ocean_net_instr_qual:flag_values = 0b, 1b;
       swh_cor_ocean_net_instr_qual:coordinates = "/data_01/longitude /data_01/latitude";
       swh_cor_ocean_net_instr_qual:comment = "Threshold control of
swh_cor_ocean_net_instr";

byte sig0_cor_ocean_net_instr_qual(time);
       sig0_cor_ocean_net_instr_qual:_FillValue = 127b;
       sig0_cor_ocean_net_instr_qual:long_name = "quality flag for 1 Hz instrumental
correction: C band backscatter coefficient";
       sig0_cor_ocean_net_instr_qual:flag_meanings = "good bad";
       sig0_cor_ocean_net_instr_qual:flag_values = 0b, 1b;
       sig0_cor_ocean_net_instr_qual:coordinates = "/data_01/longitude
/data_01/latitude";
       sig0_cor_ocean_net_instr_qual:comment = "Threshold control of
sig0_cor_ocean_net_instr";
```

// Altimeter range

```
int range_ocean(time);
       range_ocean:_FillValue = 2147483647;
       range_ocean:long_name = "1 Hz C band corrected altimeter range";
       range_ocean:standard_name = "altimeter_range";
       range_ocean:units = "m";
       range_ocean:add_offset = 1.300000e+06;
       range_ocean:scale_factor = 1.00e-04;
       range_ocean:coordinates = "/data_01/longitude /data_01/latitude";
       range_ocean:quality_flag = "range_ocean_compression_qual";
       range_ocean:comment = "All instrumental corrections included, i.e. distance
antenna-COG (/data_01/range_cor_cog), USO drift correction (/data_01/range_cor_uso),
internal path correction (range_cor_internal_path), Doppler correction
(range_cor_doppler), modeled instrumental errors correction (range_cor_ocean_model_instr)
and system bias";

short range_ocean_rms(time);
       range_ocean_rms:_FillValue = 32767s;
       range_ocean_rms:long_name = "RMS of the C band range";
       range_ocean_rms:units = "m";
       range_ocean_rms:scale_factor = 1.00e-04;
       range_ocean_rms:coordinates = "/data_01/longitude /data_01/latitude";
       range_ocean_rms:comment = "Compression of C band high rate elements is preceded by
a detection of outliers. Only valid high-rate values are used to compute this element";

byte range_ocean_numval(time);
       range_ocean_numval:_FillValue = 127b;
       range_ocean_numval:long_name = "number of valid points for C band range";
       range_ocean_numval:units = "count";
       range_ocean_numval:coordinates = "/data_01/longitude /data_01/latitude";
       range_ocean_numval:valid_min = 0b;
       range_ocean_numval:valid_max = 20b;
```

// Altimeter range corrections

```
int range_cor_ocean_net_instr(time);
       range_cor_ocean_net_instr:_FillValue = 2147483647;
       range_cor_ocean_net_instr:long_name = "net instrumental correction on the C band
range";
       range_cor_ocean_net_instr:units = "m";
       range_cor_ocean_net_instr:scale_factor = 1.00e-04;
       range_cor_ocean_net_instr:coordinates = "/data_01/longitude /data_01/latitude";
       range_cor_ocean_net_instr:quality_flag = "range_cor_ocean_net_instr_qual";
       range_cor_ocean_net_instr:comment = "Sum of distance antenna-COG
(/data_01/range_cor_cog), USO drift correction (/data_01/range_cor_uso), internal path
correction (range_cor_internal_path), Doppler correction (range_cor_doppler), modeled
instrumental errors correction (range_cor_ocean_model_instr) and system bias";

short sea_state_bias(time);
       sea_state_bias:_FillValue = 32767s;
       sea_state_bias:long_name = "sea state bias correction in C band";
       sea_state_bias:standard_name =
"sea_surface_height_bias_due_to_sea_surface_roughness";
       sea_state_bias:source = < ssb_source >;
       sea_state_bias:institution = < ssb_institution >;
       sea_state_bias:units = "m";
       sea_state_bias:scale_factor = 1.00e-04;
       sea_state_bias:coordinates = "/data_01/longitude /data_01/latitude";
```

```
      sea_state_bias:comment = "A sea state bias correction must be added (negative
value) to the instrument range to correct this range measurement for sea state delays of
the radar pulse. This element should not be used over land. See SWOT Nadir Altimeter User
Handbook";

short sea_state_bias_mle3(time);
      sea_state_bias_mle3:_FillValue = 32767s;
      sea_state_bias_mle3:long_name = "sea state bias correction in C band (MLE3
retracking)";
      sea_state_bias_mle3:standard_name =
"sea_surface_height_bias_due_to_sea_surface_roughness";
      sea_state_bias_mle3:source = < ssb_mle3_source >;
      sea_state_bias_mle3:institution = < ssb_mle3_institution >;
      sea_state_bias_mle3:units = "m";
      sea_state_bias_mle3:scale_factor = 1.00e-04;
      sea_state_bias_mle3:coordinates = "/data_01/longitude /data_01/latitude";
      sea_state_bias_mle3:comment = "A sea state bias correction must be added (negative
value) to the instrument range to correct this range measurement for sea state delays of
the radar pulse. This element should not be used over land. See SWOT Nadir Altimeter User
Handbook";

short sea_state_bias_adaptive(time);
      sea_state_bias_adaptive:_FillValue = 32767s;
      sea_state_bias_adaptive:long_name = "sea state bias correction in C band (adaptive
retracking)";
      sea_state_bias_adaptive:standard_name =
"sea_surface_height_bias_due_to_sea_surface_roughness";
      sea_state_bias_adaptive:source = < ssb_adaptive_source >;
      sea_state_bias_adaptive:institution = < ssb_adaptive_institution >;
      sea_state_bias_adaptive:units = "m";
      sea_state_bias_adaptive:scale_factor = 1.00e-04;
      sea_state_bias_adaptive:coordinates = "/data_01/longitude /data_01/latitude";
      sea_state_bias_adaptive:comment = "A sea state bias correction must be added
(negative value) to the instrument range to correct this range measurement for sea state
delays of the radar pulse. This element should not be used over land. See SWOT Nadir
Altimeter User Handbook";
```

// Significant waveheight

```
short swh_ocean(time);
      swh_ocean:_FillValue = 32767s;
      swh_ocean:long_name = "C band corrected significant waveheight";
      swh_ocean:standard_name = "sea_surface_wave_significant_height";
      swh_ocean:units = "m";
      swh_ocean:scale_factor = 1.00e-03;
      swh_ocean:coordinates = "/data_01/longitude /data_01/latitude";
      swh_ocean:quality_flag = "swh_ocean_compression_qual";
      swh_ocean:comment = "All instrumental corrections included, i.e. modeled
instrumental errors correction (swh_cor_ocean_model_instr) and system bias";

short swh_ocean_rms(time);
      swh_ocean_rms:_FillValue = 32767s;
      swh_ocean_rms:long_name = "RMS of the C band significant waveheight";
      swh_ocean_rms:units = "m";
      swh_ocean_rms:scale_factor = 1.00e-03;
      swh_ocean_rms:coordinates = "/data_01/longitude /data_01/latitude";
      swh_ocean_rms:comment = "Compression of C band high rate elements is preceded by a
detection of outliers. Only valid high-rate values are used to compute this element";

byte swh_ocean_numval(time);
```

```
       swh_ocean_numval:_FillValue = 127b;
       swh_ocean_numval:long_name = "number of valid points used to compute C band
significant waveheight";
       swh_ocean_numval:units = "count";
       swh_ocean_numval:coordinates = "/data_01/longitude /data_01/latitude";
       swh_ocean_numval:valid_min = 0b;
       swh_ocean_numval:valid_max = 20b;
```

// Significant waveheight corrections

```
short swh_cor_ocean_net_instr(time);
       swh_cor_ocean_net_instr:_FillValue = 32767s;
       swh_cor_ocean_net_instr:long_name = "net instrumental correction on C band
significant waveheight";
       swh_cor_ocean_net_instr:units = "m";
       swh_cor_ocean_net_instr:scale_factor = 1.00e-03;
       swh_cor_ocean_net_instr:coordinates = "/data_01/longitude /data_01/latitude";
       swh_cor_ocean_net_instr:quality_flag = "swh_cor_ocean_net_instr_qual";
       swh_cor_ocean_net_instr:comment = "Sum of modeled instrumental errors correction
(swh_cor_ocean_model_instr) and system bias";
```

// Backscatter coefficient

```
short sig0_ocean(time);
       sig0_ocean:_FillValue = 32767s;
       sig0_ocean:long_name = "C band corrected backscatter coefficient";
       sig0_ocean:standard_name =
"surface_backwards_scattering_coefficient_of_radar_wave";
       sig0_ocean:units = "dB";
       sig0_ocean:scale_factor = 1.00e-02;
       sig0_ocean:coordinates = "/data_01/longitude /data_01/latitude";
       sig0_ocean:quality_flag = "sig0_ocean_compression_qual";
       sig0_ocean:comment = "All instrumental corrections included, excepted the system
bias, i.e. AGC instrumental errors correction, internal calibration correction
(sig0_cor_calibration), modeled instrumental errors correction
(sig0_cor_ocean_model_instr) and atmospheric attenuation (sig0_cor_atm)";

short sig0_ocean_rms(time);
       sig0_ocean_rms:_FillValue = 32767s;
       sig0_ocean_rms:long_name = "RMS of the C band backscatter coefficient";
       sig0_ocean_rms:units = "dB";
       sig0_ocean_rms:scale_factor = 1.00e-02;
       sig0_ocean_rms:coordinates = "/data_01/longitude /data_01/latitude";
       sig0_ocean_rms:comment = "Compression of C band high rate elements is preceded by
a detection of outliers. Only valid high-rate values are used to compute this element";

byte sig0_ocean_numval(time);
       sig0_ocean_numval:_FillValue = 127b;
       sig0_ocean_numval:long_name = "number of valid points used to compute C band
backscatter coefficient";
       sig0_ocean_numval:units = "count";
       sig0_ocean_numval:coordinates = "/data_01/longitude /data_01/latitude";
       sig0_ocean_numval:valid_min = 0b;
       sig0_ocean_numval:valid_max = 20b;
```

// Tracker AGC

```
short agc(time);
       agc:_FillValue = 32767s;
       agc:long_name = "C band corrected AGC";
       agc:units = "dB";
       agc:scale_factor = 1.00e-02;
       agc:coordinates = "/data_01/longitude /data_01/latitude";
       agc:comment = "AGC is corrected for instrumental errors due to the imperfections
of the on-board attenuators";

short agc_rms(time);
       agc_rms:_FillValue = 32767s;
       agc_rms:long_name = "RMS of the C band AGC";
       agc_rms:units = "dB";
       agc_rms:scale_factor = 1.00e-02;
       agc_rms:coordinates = "/data_01/longitude /data_01/latitude";
       agc_rms:comment = "Compression of C band high rate elements is preceded by a
detection of outliers. Only valid high-rate values are used to compute this element";

byte agc_numval(time);
       agc_numval:_FillValue = 127b;
       agc_numval:long_name = "number of valid points used to compute C band AGC";
       agc_numval:units = "count";
       agc_numval:coordinates = "/data_01/longitude /data_01/latitude";
       agc_numval:valid_min = 0b;
       agc_numval:valid_max = 20b;
```

// Backscatter coefficient corrections

```
short sig0_cor_ocean_net_instr(time);
       sig0_cor_ocean_net_instr:_FillValue = 32767s;
       sig0_cor_ocean_net_instr:long_name = "net instrumental correction on C band
backscatter coefficient";
       sig0_cor_ocean_net_instr:units = "dB";
       sig0_cor_ocean_net_instr:scale_factor = 1.00e-02;
       sig0_cor_ocean_net_instr:coordinates = "/data_01/longitude /data_01/latitude";
       sig0_cor_ocean_net_instr:quality_flag = "sig0_cor_ocean_net_instr_qual";
       sig0_cor_ocean_net_instr:comment = "Sum of AGC instrumental errors correction,
internal calibration correction (sig0_cor_calibration) and modeled instrumental errors
correction (sig0_cor_ocean_model_instr) - system bias not included";

short sig0_cor_atm(time);
       sig0_cor_atm:_FillValue = 32767s;
       sig0_cor_atm:long_name = "atmospheric attenuation correction on C band backscatter
coefficient";
       sig0_cor_atm:units = "dB";
       sig0_cor_atm:scale_factor = 1.00e-02;
       sig0_cor_atm:coordinates = "/data_01/longitude /data_01/latitude";
       sig0_cor_atm:comment = "Based either on the radiometer (if available) or
atmospheric model (otherwise). The flag sig0_cor_atm_source indicates whether the
atmospheric model has been used";

} // group: c

} // group: data_01
```

// 20-Hz data

```
group: data_20 {
```

```
  dimensions:
    time = < number of measurements >;

  variables:
```

// Time Tag

```
double time(time);
       time:long_name = "time 20 Hz in UTC";
       time:standard_name = "time";
       time:calendar = "gregorian";
       time:tai_utc_difference = < Value of TAI-UTC at time of first record >;
       time:leap_second = < UTC time of the leap second (YYYY-MM-DD hh:mm:ss) >;
       time:units = "seconds since 2000-01-01 00:00:00.0";
       time:comment = "Time of measurement in seconds in the UTC time scale since 1 Jan
2000 00:00:00 UTC. [tai_utc_difference] is the difference between TAI and UTC reference
time (seconds) for the first measurement of the data set. If a leap second occurs within
the data set, the attribute [leap_second] is set to the UTC time at which the leap second
occurs";

double time_tai(time);
       time_tai:_FillValue = 18446744073709551616.000000;
       time_tai:long_name = "time 20 Hz in TAI";
       time_tai:standard_name = "time";
       time_tai:calendar = "gregorian";
       time_tai:units = "seconds since 2000-01-01 00:00:00.0";
       time_tai:comment = "Time of measurement in seconds in the TAI time scale since 1
Jan 2000 00:00:00 TAI. This time scale contains no leap seconds. The difference (in
seconds) with time in UTC is given by the attribute [time:tai_utc_difference]";

int index_1hz_measurement(time);
       index_1hz_measurement:_FillValue = 2147483647;
       index_1hz_measurement:long_name = "record counter of the associated 1 Hz
measurement";
       index_1hz_measurement:coordinates = "longitude latitude";
       index_1hz_measurement:comment = "Record counter of the averaged 1 Hz measurement
associated to the 20 Hz elementary measurement";
```

// Location and surface type

```
int latitude(time);
       latitude:_FillValue = 2147483647;
       latitude:long_name = "20 Hz latitude";
       latitude:standard_name = "latitude";
       latitude:units = "degrees_north";
       latitude:scale_factor = 1.00e-06;
       latitude:comment = "Positive latitude is North latitude, negative latitude is
South latitude. See SWOT Nadir Altimeter User Handbook";

int longitude(time);
       longitude:_FillValue = 2147483647;
       longitude:long_name = "20 Hz longitude";
       longitude:standard_name = "longitude";
       longitude:units = "degrees_east";
       longitude:scale_factor = 1.00e-06;
       longitude:comment = "East longitude relative to Greenwich meridian. See SWOT Nadir
Altimeter User Handbook";
```

```
byte surface_classification_flag(time);
       surface_classification_flag:_FillValue = 127b;
       surface_classification_flag:long_name = "20 Hz surface classification";
       surface_classification_flag:flag_meanings = "open_ocean land continental_water
aquatic_vegetation continental_ice_snow floating_ice salted_basin";
       surface_classification_flag:flag_values = 0b, 1b, 2b, 3b, 4b, 5b, 6b;
       surface_classification_flag:coordinates = "longitude latitude";
       surface_classification_flag:comment = "Computed from a mask built with MODIS and
GlobCover data";

short angle_of_approach_to_coast(time);
       angle_of_approach_to_coast:_FillValue = 32767s;
       angle_of_approach_to_coast:long_name = "20 Hz angle of approach to the coast";
       angle_of_approach_to_coast:units = "degrees";
       angle_of_approach_to_coast:scale_factor = 1.00e-02;
       angle_of_approach_to_coast:coordinates = "longitude latitude";
       angle_of_approach_to_coast:comment = "Angle of approach to the closest coast. 0 is
parallel to the coast with the land on the right. Positive values indicate the satellite
is approaching the land. Negative values indicate the satellite is leaving the land.
Values close to +/-180 degrees have the land on the left";

int distance_to_coast(time);
       distance_to_coast:_FillValue = 2147483647;
       distance_to_coast:long_name = "20 Hz distance to the coast";
       distance_to_coast:units = "m";
       distance_to_coast:coordinates = "longitude latitude";
```

// Quality information and sensor status

// Altimeter state flags

```
byte alt_state_acq_mode_flag(time);
       alt_state_acq_mode_flag:_FillValue = 127b;
       alt_state_acq_mode_flag:long_name = "20 Hz altimeter state flag: operational
acquisition mode";
       alt_state_acq_mode_flag:flag_meanings = "autonomous_acq/track
autonomous_DIODEacq/track DIODE+DEM/track";
       alt_state_acq_mode_flag:flag_values = 8b, 9b, 10b;
       alt_state_acq_mode_flag:coordinates = "longitude latitude";
       alt_state_acq_mode_flag:comment = "8 = autonomous acquisition / tracking, 9 =
autonomous DIODE acquisition / tracking, 10 = DIODE + Digital Elevation Model tracking";

byte alt_state_track_trans_flag(time);
       alt_state_track_trans_flag:_FillValue = 127b;
       alt_state_track_trans_flag:long_name = "20 Hz altimeter state flag: tracking
automatic transition";
       alt_state_track_trans_flag:flag_meanings = "authorized inhibited";
       alt_state_track_trans_flag:flag_values = 0b, 1b;
       alt_state_track_trans_flag:coordinates = "longitude latitude";
```

// Quality flags for interpolation

```
byte meteo_measurement_altitude_interp_qual(time);
       meteo_measurement_altitude_interp_qual:_FillValue = 127b;
       meteo_measurement_altitude_interp_qual:long_name = "20 Hz meteorological data at
measurement altitude interpolation flag";
       meteo_measurement_altitude_interp_qual:flag_meanings = "good bad";
       meteo_measurement_altitude_interp_qual:flag_values = 0b, 1b;
       meteo_measurement_altitude_interp_qual:coordinates = "longitude latitude";
       meteo_measurement_altitude_interp_qual:comment = "0 = interpolation from 4 points;
1 = interpolation from less than 4 points";
```

// Orbit

```
int altitude(time);
       altitude:_FillValue = 2147483647;
       altitude:long_name = "20 Hz altitude of satellite";
       altitude:standard_name = "height_above_reference_ellipsoid";
       altitude:units = "m";
       altitude:add_offset = 1.300000e+06;
       altitude:scale_factor = 1.00e-04;
       altitude:coordinates = "longitude latitude";
       altitude:comment = "Altitude of satellite above the reference ellipsoid";
```

// Altimeter range corrections

```
short model_dry_tropo_cor_measurement_altitude(time);
       model_dry_tropo_cor_measurement_altitude:_FillValue = 32767s;
       model_dry_tropo_cor_measurement_altitude:long_name = "20 Hz model dry tropospheric
correction at measurement altitude";
       model_dry_tropo_cor_measurement_altitude:standard_name =
"altimeter_range_correction_due_to_dry_troposphere";
       model_dry_tropo_cor_measurement_altitude:source = "European Center for Medium
Range Weather Forecasting";
       model_dry_tropo_cor_measurement_altitude:institution = "ECMWF";
       model_dry_tropo_cor_measurement_altitude:units = "m";
       model_dry_tropo_cor_measurement_altitude:scale_factor = 1.00e-04;
       model_dry_tropo_cor_measurement_altitude:coordinates = "longitude latitude";
       model_dry_tropo_cor_measurement_altitude:quality_flag =
"meteo_measurement_altitude_interp_qual";
       model_dry_tropo_cor_measurement_altitude:comment = "Computed from 3d
meteorological fields at measurement altitude, at the altimeter time-tag from the
interpolation of 2 meteorological fields that surround the altimeter time-tag. A dry
tropospheric correction must be added (negative value) to the instrument range to correct
this range measurement for dry tropospheric range delays of the radar pulse. See SWOT
Nadir Altimeter User Handbook";

short model_wet_tropo_cor_measurement_altitude(time);
       model_wet_tropo_cor_measurement_altitude:_FillValue = 32767s;
       model_wet_tropo_cor_measurement_altitude:long_name = "20 Hz model wet tropospheric
correction at measurement altitude";
       model_wet_tropo_cor_measurement_altitude:standard_name =
"altimeter_range_correction_due_to_wet_troposphere";
       model_wet_tropo_cor_measurement_altitude:source = "European Center for Medium
Range Weather Forecasting";
       model_wet_tropo_cor_measurement_altitude:institution = "ECMWF";
       model_wet_tropo_cor_measurement_altitude:units = "m";
       model_wet_tropo_cor_measurement_altitude:scale_factor = 1.00e-04;
       model_wet_tropo_cor_measurement_altitude:coordinates = "longitude latitude";
       model_wet_tropo_cor_measurement_altitude:quality_flag =
"meteo_measurement_altitude_interp_qual";
       model_wet_tropo_cor_measurement_altitude:comment = "Computed from 3d
meteorological fields at measurement altitude, at the altimeter time-tag from the
interpolation of 2 meteorological fields that surround the altimeter time-tag. A wet
tropospheric correction must be added (negative value) to the instrument range to correct
this range measurement for wet tropospheric range delays of the radar pulse. See SWOT
Nadir Altimeter User Handbook";

int surface_slope_cor(time);
       surface_slope_cor:_FillValue = 2147483647;
       surface_slope_cor:long_name = "surface slope correction";
```

```
      surface_slope_cor:source = < surface_slope_cor_source >;
      surface_slope_cor:units = "m";
      surface_slope_cor:scale_factor = 1.00e-04;
      surface_slope_cor:coordinates = "longitude latitude";
      surface_slope_cor:comment = "The surface slope correction shall not be used with
the mean sea surface (mean_sea_surface_cnescls or mean_sea_surface_dtu) provided in the
product. See SWOT Nadir Altimeter User Handbook";
```

// 20-Hz Ku band data

```
group: ku {

  variables:
```

// Altimeter range

```
int range_ocean(time);
      range_ocean:_FillValue = 2147483647;
      range_ocean:long_name = "20 Hz Ku band corrected altimeter range";
      range_ocean:standard_name = "altimeter_range";
      range_ocean:units = "m";
      range_ocean:add_offset = 1.300000e+06;
      range_ocean:scale_factor = 1.00e-04;
      range_ocean:coordinates = "/data_20/longitude /data_20/latitude";
      range_ocean:comment = "All instrumental corrections included, i.e. distance
antenna-COG (/data_01/range_cor_cog), USO drift correction (/data_01/range_cor_uso),
internal path correction (/data_01/ku/range_cor_internal_path), Doppler correction
(/data_01/ku/range_cor_doppler), modeled instrumental errors correction
(/data_01/ku/range_cor_ocean_model_instr) and system bias";

byte range_ocean_compression_qual(time);
      range_ocean_compression_qual:_FillValue = 127b;
      range_ocean_compression_qual:long_name = "20 Hz flag for utilization in the
computation of 1 Hz Ku band range";
      range_ocean_compression_qual:flag_meanings = "yes no";
      range_ocean_compression_qual:flag_values = 0b, 1b;
      range_ocean_compression_qual:coordinates = "/data_20/longitude /data_20/latitude";
      range_ocean_compression_qual:comment = "Map of valid points used to compute the 1
Hz Ku band altimeter range";
```

// Altimeter range – ocean-2 (MLE3)

```
int range_ocean_mle3(time);
      range_ocean_mle3:_FillValue = 2147483647;
      range_ocean_mle3:long_name = "20 Hz Ku band corrected altimeter range (MLE3
retracking)";
      range_ocean_mle3:standard_name = "altimeter_range";
      range_ocean_mle3:units = "m";
      range_ocean_mle3:add_offset = 1.300000e+06;
      range_ocean_mle3:scale_factor = 1.00e-04;
      range_ocean_mle3:coordinates = "/data_20/longitude /data_20/latitude";
      range_ocean_mle3:comment = "All instrumental corrections included, i.e. distance
antenna-COG (/data_01/range_cor_cog), USO drift correction (/data_01/range_cor_uso),
internal path correction (/data_01/ku/range_cor_internal_path), Doppler correction
(/data_01/ku/range_cor_doppler), modeled instrumental errors correction
(/data_01/ku/range_cor_ocean_mle3_model_instr) and system bias";
```

```
byte range_ocean_mle3_compression_qual(time);
       range_ocean_mle3_compression_qual:_FillValue = 127b;
       range_ocean_mle3_compression_qual:long_name = "20 Hz flag for utilization in the
computation of 1 Hz Ku band range (MLE3 retracking)";
       range_ocean_mle3_compression_qual:flag_meanings = "yes no";
       range_ocean_mle3_compression_qual:flag_values = 0b, 1b;
       range_ocean_mle3_compression_qual:coordinates = "/data_20/longitude
/data_20/latitude";
       range_ocean_mle3_compression_qual:comment = "Map of valid points used to compute
the 1 Hz Ku band altimeter range";
```

// Altimeter range – adaptive

```
int range_adaptive(time);
       range_adaptive:_FillValue = 2147483647;
       range_adaptive:long_name = "20 Hz Ku band corrected altimeter range (adaptive
retracking)";
       range_adaptive:standard_name = "altimeter_range";
       range_adaptive:units = "m";
       range_adaptive:add_offset = 1.300000e+06;
       range_adaptive:scale_factor = 1.00e-04;
       range_adaptive:coordinates = "/data_20/longitude /data_20/latitude";
       range_adaptive:comment = "All instrumental corrections included, i.e. distance
antenna-COG (/data_01/range_cor_cog), USO drift correction (/data_01/range_cor_uso),
internal path correction (/data_01/ku/range_cor_internal_path), Doppler correction
(/data_01/ku/range_cor_doppler) and system bias";

byte range_adaptive_compression_qual(time);
       range_adaptive_compression_qual:_FillValue = 127b;
       range_adaptive_compression_qual:long_name = "20 Hz flag for utilization in the
computation of 1 Hz Ku band range (adaptive retracking)";
       range_adaptive_compression_qual:flag_meanings = "yes no";
       range_adaptive_compression_qual:flag_values = 0b, 1b;
       range_adaptive_compression_qual:coordinates = "/data_20/longitude
/data_20/latitude";
       range_adaptive_compression_qual:comment = "Map of valid points used to compute the
1 Hz Ku band altimeter range";
```

// Significant waveheight

```
short swh_ocean(time);
       swh_ocean:_FillValue = 32767s;
       swh_ocean:long_name = "20 Hz Ku band corrected significant waveheight";
       swh_ocean:standard_name = "sea_surface_wave_significant_height";
       swh_ocean:units = "m";
       swh_ocean:scale_factor = 1.00e-03;
       swh_ocean:coordinates = "/data_20/longitude /data_20/latitude";
       swh_ocean:comment = "All instrumental corrections included, i.e. modeled
instrumental errors correction (/data_01/ku/swh_cor_ocean_model_instr) and system bias";

byte swh_ocean_compression_qual(time);
       swh_ocean_compression_qual:_FillValue = 127b;
       swh_ocean_compression_qual:long_name = "20 Hz flag for utilization in the
computation of 1 Hz Ku band significant waveheight";
       swh_ocean_compression_qual:flag_meanings = "yes no";
       swh_ocean_compression_qual:flag_values = 0b, 1b;
       swh_ocean_compression_qual:coordinates = "/data_20/longitude /data_20/latitude";
```

```
      swh_ocean_compression_qual:comment = "Map of valid points used to compute the 1 Hz
Ku band significant waveheight";
```

// Significant waveheight – ocean-2 (MLE3)

```
short swh_ocean_mle3(time);
      swh_ocean_mle3:_FillValue = 32767s;
      swh_ocean_mle3:long_name = "20 Hz Ku band corrected significant waveheight (MLE3
retracking)";
      swh_ocean_mle3:standard_name = "sea_surface_wave_significant_height";
      swh_ocean_mle3:units = "m";
      swh_ocean_mle3:scale_factor = 1.00e-03;
      swh_ocean_mle3:coordinates = "/data_20/longitude /data_20/latitude";
      swh_ocean_mle3:comment = "All instrumental corrections included, i.e. modeled
instrumental errors correction (/data_01/ku/swh_cor_ocean_mle3_model_instr) and system
bias";

byte swh_ocean_mle3_compression_qual(time);
      swh_ocean_mle3_compression_qual:_FillValue = 127b;
      swh_ocean_mle3_compression_qual:long_name = "20 Hz flag for utilization in the
computation of 1 Hz Ku band significant waveheight (MLE3 retracking)";
      swh_ocean_mle3_compression_qual:flag_meanings = "yes no";
      swh_ocean_mle3_compression_qual:flag_values = 0b, 1b;
      swh_ocean_mle3_compression_qual:coordinates = "/data_20/longitude
/data_20/latitude";
      swh_ocean_mle3_compression_qual:comment = "Map of valid points used to compute the
1 Hz Ku band significant waveheight";
```

// Significant waveheight – adaptive

```
short swh_adaptive(time);
      swh_adaptive:_FillValue = 32767s;
      swh_adaptive:long_name = "20 Hz Ku band corrected significant waveheight (adaptive
retracking)";
      swh_adaptive:standard_name = "sea_surface_wave_significant_height";
      swh_adaptive:units = "m";
      swh_adaptive:scale_factor = 1.00e-03;
      swh_adaptive:coordinates = "/data_20/longitude /data_20/latitude";
      swh_adaptive:comment = "No correction applied";

byte swh_adaptive_compression_qual(time);
      swh_adaptive_compression_qual:_FillValue = 127b;
      swh_adaptive_compression_qual:long_name = "20 Hz flag for utilization in the
computation of 1 Hz Ku band significant waveheight (adaptive retracking)";
      swh_adaptive_compression_qual:flag_meanings = "yes no";
      swh_adaptive_compression_qual:flag_values = 0b, 1b;
      swh_adaptive_compression_qual:coordinates = "/data_20/longitude
/data_20/latitude";
      swh_adaptive_compression_qual:comment = "Map of valid points used to compute the 1
Hz Ku band significant waveheight";
```

// Backscatter coefficient

```
short sig0_ocean(time);
      sig0_ocean:_FillValue = 32767s;
      sig0_ocean:long_name = "20 Hz Ku band corrected backscatter coefficient";
```

```
      sig0_ocean:standard_name =
"surface_backwards_scattering_coefficient_of_radar_wave";
      sig0_ocean:units = "dB";
      sig0_ocean:scale_factor = 1.00e-02;
      sig0_ocean:coordinates = "/data_20/longitude /data_20/latitude";
      sig0_ocean:comment = "All instrumental corrections included, excepted the system
bias, i.e. AGC instrumental errors correction, internal calibration correction
(/data_01/ku/sig0_cor_calibration), modeled instrumental errors correction
(/data_01/ku/sig0_cor_ocean_model_instr) and atmospheric attenuation (sig0_cor_atm)";

byte sig0_ocean_compression_qual(time);
      sig0_ocean_compression_qual:_FillValue = 127b;
      sig0_ocean_compression_qual:long_name = "20 Hz flag for utilization in the
computation of 1 Hz Ku band backscatter coefficient";
      sig0_ocean_compression_qual:flag_meanings = "yes no";
      sig0_ocean_compression_qual:flag_values = 0b, 1b;
      sig0_ocean_compression_qual:coordinates = "/data_20/longitude /data_20/latitude";
      sig0_ocean_compression_qual:comment = "Map of valid points used to compute the 1
Hz Ku band backscatter coefficient";
```

// Backscatter coefficient – ocean-2 (MLE3)

```
short sig0_ocean_mle3(time);
      sig0_ocean_mle3:_FillValue = 32767s;
      sig0_ocean_mle3:long_name = "20 Hz Ku band corrected backscatter coefficient (MLE3
retracking)";
      sig0_ocean_mle3:standard_name =
"surface_backwards_scattering_coefficient_of_radar_wave";
      sig0_ocean_mle3:units = "dB";
      sig0_ocean_mle3:scale_factor = 1.00e-02;
      sig0_ocean_mle3:coordinates = "/data_20/longitude /data_20/latitude";
      sig0_ocean_mle3:comment = "All instrumental corrections included, excepted the
system bias, i.e. AGC instrumental errors correction, internal calibration correction
(/data_01/ku/sig0_cor_calibration), modeled instrumental errors correction
(/data_01/ku/sig0_cor_ocean_mle3_model_instr) and atmospheric attenuation
(sig0_cor_atm)";

byte sig0_ocean_mle3_compression_qual(time);
      sig0_ocean_mle3_compression_qual:_FillValue = 127b;
      sig0_ocean_mle3_compression_qual:long_name = "20 Hz flag for utilization in the
computation of 1 Hz Ku band backscatter coefficient (MLE3 retracking)";
      sig0_ocean_mle3_compression_qual:flag_meanings = "yes no";
      sig0_ocean_mle3_compression_qual:flag_values = 0b, 1b;
      sig0_ocean_mle3_compression_qual:coordinates = "/data_20/longitude
/data_20/latitude";
      sig0_ocean_mle3_compression_qual:comment = "Map of valid points used to compute
the 1 Hz Ku band backscatter coefficient";
```

// Backscatter coefficient – adaptive

```
short sig0_adaptive(time);
      sig0_adaptive:_FillValue = 32767s;
      sig0_adaptive:long_name = "20 Hz Ku band corrected backscatter coefficient
(adaptive retracking)";
      sig0_adaptive:standard_name =
"surface_backwards_scattering_coefficient_of_radar_wave";
      sig0_adaptive:units = "dB";
      sig0_adaptive:scale_factor = 1.00e-02;
```

```
      sig0_adaptive:coordinates = "/data_20/longitude /data_20/latitude";
      sig0_adaptive:comment = "All instrumental corrections included, excepted the
system bias, i.e. AGC instrumental errors correction, internal calibration correction
(/data_01/ku/sig0_cor_calibration) and atmospheric attenuation (sig0_cor_atm)";

byte sig0_adaptive_compression_qual(time);
      sig0_adaptive_compression_qual:_FillValue = 127b;
      sig0_adaptive_compression_qual:long_name = "20 Hz flag for utilization in the
computation of 1 Hz Ku band backscatter coefficient (adaptive retracking)";
      sig0_adaptive_compression_qual:flag_meanings = "yes no";
      sig0_adaptive_compression_qual:flag_values = 0b, 1b;
      sig0_adaptive_compression_qual:coordinates = "/data_20/longitude
/data_20/latitude";
      sig0_adaptive_compression_qual:comment = "Map of valid points used to compute the
1 Hz Ku band backscatter coefficient";
```

// Off nadir angle

```
short off_nadir_angle_wf_ocean(time);
      off_nadir_angle_wf_ocean:_FillValue = 32767s;
      off_nadir_angle_wf_ocean:long_name = "20 Hz square of the off nadir angle computed
from Ku band waveforms";
      off_nadir_angle_wf_ocean:units = "degrees^2";
      off_nadir_angle_wf_ocean:scale_factor = 1.00e-04;
      off_nadir_angle_wf_ocean:coordinates = "/data_20/longitude /data_20/latitude";

byte off_nadir_angle_wf_ocean_compression_qual(time);
      off_nadir_angle_wf_ocean_compression_qual:_FillValue = 127b;
      off_nadir_angle_wf_ocean_compression_qual:long_name = "20 Hz flag for utilization
in the computation of 1 Hz square of the off nadir angle computed from Ku band
waveforms";
      off_nadir_angle_wf_ocean_compression_qual:flag_meanings = "yes no";
      off_nadir_angle_wf_ocean_compression_qual:flag_values = 0b, 1b;
      off_nadir_angle_wf_ocean_compression_qual:coordinates = "/data_20/longitude
/data_20/latitude";
      off_nadir_angle_wf_ocean_compression_qual:comment = "Map of valid points used to
compute the 1 Hz square of the off nadir angle computed from Ku band waveforms";
```

// Ocean retracking outputs

```
byte num_iterations_ocean(time);
      num_iterations_ocean:_FillValue = 127b;
      num_iterations_ocean:long_name = "20 Hz number of iterations of the ocean
retracking in Ku band";
      num_iterations_ocean:units = "count";
      num_iterations_ocean:coordinates = "/data_20/longitude /data_20/latitude";

byte num_iterations_ocean_mle3(time);
      num_iterations_ocean_mle3:_FillValue = 127b;
      num_iterations_ocean_mle3:long_name = "20 Hz number of iterations of the ocean
retracking in Ku band (MLE3 retracking)";
      num_iterations_ocean_mle3:units = "count";
      num_iterations_ocean_mle3:coordinates = "/data_20/longitude /data_20/latitude";

short num_iterations_adaptive(time);
      num_iterations_adaptive:_FillValue = 32767s;
      num_iterations_adaptive:long_name = "20 Hz number of iterations of the adaptive
retracking in Ku band";
```

```
      num_iterations_adaptive:units = "count";
      num_iterations_adaptive:coordinates = "/data_20/longitude /data_20/latitude";
```

// OCOG retracking

```
int range_ocog(time);
      range_ocog:_FillValue = 2147483647;
      range_ocog:long_name = "20 Hz Ku band altimeter range (OCOG retracking)";
      range_ocog:standard_name = "altimeter_range";
      range_ocog:units = "m";
      range_ocog:add_offset = 1.300000e+06;
      range_ocog:scale_factor = 1.00e-04;
      range_ocog:coordinates = "/data_20/longitude /data_20/latitude";
      range_ocog:comment = "Distance antenna-COG (/data_01/range_cor_cog), USO drift
correction (/data_01/range_cor_uso), internal path correction
(/data_01/ku/range_cor_internal_path), Doppler correction (/data_01/ku/range_cor_doppler)
and system bias included";

short sig0_ocog(time);
      sig0_ocog:_FillValue = 32767s;
      sig0_ocog:long_name = "20 Hz Ku band backscatter coefficient (OCOG retracking)";
      sig0_ocog:standard_name =
"surface_backwards_scattering_coefficient_of_radar_wave";
      sig0_ocog:units = "dB";
      sig0_ocog:scale_factor = 1.00e-02;
      sig0_ocog:coordinates = "/data_20/longitude /data_20/latitude";
      sig0_ocog:comment = "AGC instrumental errors correction and internal calibration
correction (/data_01/ku/sig0_cor_calibration) included";

byte ocog_qual(time);
      ocog_qual:_FillValue = 127b;
      ocog_qual:long_name = "20 Hz Ku band OCOG retracking quality flag";
      ocog_qual:flag_meanings = "good bad";
      ocog_qual:flag_values = 0b, 1b;
      ocog_qual:coordinates = "/data_20/longitude /data_20/latitude";
      ocog_qual:comment = "OCOG retracking quality flag";
```

//Sea-Ice retracking

```
int range_seaice(time);
      range_seaice:_FillValue = 2147483647;
      range_seaice:long_name = "20 Hz Ku band altimeter range (sea-ice retracking)";
      range_seaice:standard_name = "altimeter_range";
      range_seaice:units = "m";
      range_seaice:add_offset = 1.300000e+06;
      range_seaice:scale_factor = 1.00e-04;
      range_seaice:coordinates = "/data_20/longitude /data_20/latitude";
      range_seaice:comment = "Distance antenna-COG (/data_01/range_cor_cog), USO drift
correction (/data_01/range_cor_uso), internal path correction
(/data_01/ku/range_cor_internal_path), Doppler correction (/data_01/ku/range_cor_doppler)
and system bias included";

short sig0_seaice(time);
      sig0_seaice:_FillValue = 32767s;
      sig0_seaice:long_name = "20 Hz Ku band backscatter coefficient (sea-ice
retracking)";
      sig0_seaice:standard_name =
"surface_backwards_scattering_coefficient_of_radar_wave";
```

```
       sig0_seaice:units = "dB";
       sig0_seaice:scale_factor = 1.00e-02;
       sig0_seaice:coordinates = "/data_20/longitude /data_20/latitude";
       sig0_seaice:comment = "AGC instrumental errors correction and internal calibration
correction (/data_01/ku/sig0_cor_calibration) included";

byte seaice_qual(time);
       seaice_qual:_FillValue = 127b;
       seaice_qual:long_name = "20 Hz Ku band sea-ice retracking quality flag";
       seaice_qual:flag_meanings = "good bad";
       seaice_qual:flag_values = 0b, 1b;
       seaice_qual:coordinates = "/data_20/longitude /data_20/latitude";
       seaice_qual:comment = "sea-ice retracking quality flag";
```

// Ice-2 retracking

```
int range_ice2(time);
       range_ice2:_FillValue = 2147483647;
       range_ice2:long_name = "20 Hz Ku band altimeter range (ice-2 retracking)";
       range_ice2:standard_name = "altimeter_range";
       range_ice2:units = "m";
       range_ice2:add_offset = 1.300000e+06;
       range_ice2:scale_factor = 1.00e-04;
       range_ice2:coordinates = "/data_20/longitude /data_20/latitude";
       range_ice2:comment = "Distance antenna-COG (/data_01/range_cor_cog), USO drift
correction (/data_01/range_cor_uso), internal path correction
(/data_01/ku/range_cor_internal_path), Doppler correction (/data_01/ku/range_cor_doppler)
and system bias included";

short sig0_leading_edge_ice2(time);
       sig0_leading_edge_ice2:_FillValue = 32767s;
       sig0_leading_edge_ice2:long_name = "20 Hz Ku band leading edge backscatter
coefficient (ice-2 retracking)";
       sig0_leading_edge_ice2:standard_name =
"surface_backwards_scattering_coefficient_of_radar_wave";
       sig0_leading_edge_ice2:units = "dB";
       sig0_leading_edge_ice2:scale_factor = 1.00e-02;
       sig0_leading_edge_ice2:coordinates = "/data_20/longitude /data_20/latitude";
       sig0_leading_edge_ice2:comment = "AGC instrumental errors correction and internal
calibration correction (/data_01/ku/sig0_cor_calibration) included";

short sig0_ice2(time);
       sig0_ice2:_FillValue = 32767s;
       sig0_ice2:long_name = "20 Hz Ku band backscatter coefficient (ice-2 retracking)";
       sig0_ice2:standard_name =
"surface_backwards_scattering_coefficient_of_radar_wave";
       sig0_ice2:units = "dB";
       sig0_ice2:scale_factor = 1.00e-02;
       sig0_ice2:coordinates = "/data_20/longitude /data_20/latitude";
       sig0_ice2:comment = "AGC instrumental errors correction and internal calibration
correction (/data_01/ku/sig0_cor_calibration) included";

short sigmal_ice2(time);
       sigmal_ice2:_FillValue = 32767s;
       sigmal_ice2:long_name = "20 Hz width of the Ku band leading edge (ice-2
retracking)";
       sigmal_ice2:units = "m";
       sigmal_ice2:scale_factor = 1.00e-3;
       sigmal_ice2:coordinates = "/data_20/longitude /data_20/latitude";
```

```
      sigmal_ice2:comment = "The width of the leading edge corresponds to the so-called
composite sigma (SigmaL)";

int slope1_ice2(time);
      slope1_ice2:_FillValue = 2147483647;
      slope1_ice2:long_name = "20 Hz slope of the first part of the logarithm of the Ku
band trailing edge (ice-2 retracking)";
      slope1_ice2:units = "s-1";
      slope1_ice2:coordinates = "/data_20/longitude /data_20/latitude";

int slope2_ice2(time);
      slope2_ice2:_FillValue = 2147483647;
      slope2_ice2:long_name = "20 Hz slope of the second part of the logarithm of the Ku
band trailing edge (ice-2 retracking)";
      slope2_ice2:units = "s-1";
      slope2_ice2:coordinates = "/data_20/longitude /data_20/latitude";

int mqe_ice2(time);
      mqe_ice2:_FillValue = 2147483647;
      mqe_ice2:long_name = "20 Hz Ku band MQE (ice-2 retracking)";
      mqe_ice2:units = "1";
      mqe_ice2:scale_factor = 1.00e-05;
      mqe_ice2:coordinates = "/data_20/longitude /data_20/latitude";
      mqe_ice2:comment = "Mean Quadratic Error between the waveforms samples and the
corresponding model samples built from the ice-2 retracking outputs";

byte ice2_qual(time);
      ice2_qual:_FillValue = 127b;
      ice2_qual:long_name = "20 Hz Ku band ice-2 retracking quality flag";
      ice2_qual:flag_values = 0b, 1b;
      ice2_qual:flag_meanings = "good bad";
      ice2_qual:coordinates = "/data_20/longitude /data_20/latitude";
      ice2_qual:comment = "ice-2 retracking quality flag";
```

//TFMRA retracking

```
int range_tfmra(time);
      range_tfmra:_FillValue = 2147483647;
      range_tfmra:long_name = "20 Hz Ku band altimeter range (TFMRA retracking)";
      range_tfmra:standard_name = "altimeter_range";
      range_tfmra:units = "m";
      range_tfmra:add_offset = 1.300000e+06;
      range_tfmra:scale_factor = 1.00e-04;
      range_tfmra:coordinates = "/data_20/longitude /data_20/latitude";
      range_tfmra:comment = "Distance antenna-COG (/data_01/range_cor_cog), USO drift
correction (/data_01/range_cor_uso), internal path correction
(/data_01/ku/range_cor_internal_path), Doppler correction (/data_01/ku/range_cor_doppler)
and system bias included";

short sig0_tfmra(time);
      sig0_tfmra:_FillValue = 32767s;
      sig0_tfmra:long_name = "20 Hz Ku band backscatter coefficient (TFMRA retracking)";
      sig0_tfmra:standard_name =
"surface_backwards_scattering_coefficient_of_radar_wave";
      sig0_tfmra:units = "dB";
      sig0_tfmra:scale_factor = 1.00e-02;
      sig0_tfmra:coordinates = "/data_20/longitude /data_20/latitude";
      sig0_tfmra:comment = "AGC instrumental errors correction and internal calibration
correction (/data_01/ku/sig0_cor_calibration) included";
```

```
byte tfmra_qual(time);
       tfmra_qual:_FillValue = 127b;
       tfmra_qual:long_name = "20 Hz Ku band TFMRA retracking quality flag";
       tfmra_qual:flag_meanings = "good bad";
       tfmra_qual:flag_values = 0b, 1b;
       tfmra_qual:coordinates = "/data_20/longitude /data_20/latitude";
       tfmra_qual:comment = "TFMRA retracking quality flag";
```

// Waveforms characteristics

```
short mqe_ocean(time);
       mqe_ocean:_FillValue = 32767s;
       mqe_ocean:long_name = "20 Hz Ku band MQE (ocean retracking)";
       mqe_ocean:units = "1";
       mqe_ocean:scale_factor = 1.00e-04;
       mqe_ocean:coordinates = "/data_20/longitude /data_20/latitude";
       mqe_ocean:comment = "Mean Quadratic Error between the waveforms samples and the
corresponding model samples built from the ocean retracking outputs";

short mqe_ocean_mle3(time);
       mqe_ocean_mle3:_FillValue = 32767s;
       mqe_ocean_mle3:long_name = "20 Hz Ku band MQE (MLE3 retracking)";
       mqe_ocean_mle3:units = "1";
       mqe_ocean_mle3:scale_factor = 1.00e-04;
       mqe_ocean_mle3:coordinates = "/data_20/longitude /data_20/latitude";
       mqe_ocean_mle3:comment = "Mean Quadratic Error between the waveforms samples and
the corresponding model samples built from the MLE3 retracking outputs";

short mqe_adaptive(time);
       mqe_adaptive:_FillValue = 32767s;
       mqe_adaptive:long_name = "20 Hz Ku band MQE (adaptive retracking)";
       mqe_adaptive:units = "1";
       mqe_adaptive:scale_factor = 1.00e-04;
       mqe_adaptive:coordinates = "/data_20/longitude /data_20/latitude";
       mqe_adaptive:comment = "Mean Quadratic Error between the waveforms samples and the
corresponding model samples built from the adaptive retracking outputs";

int peakiness(time);
       peakiness:_FillValue = 2147483647;
       peakiness:long_name = "20 Hz peakiness on Ku band waveforms";
       peakiness:units = "1";
       peakiness:scale_factor = 1.00e-03;
       peakiness:coordinates = "/data_20/longitude /data_20/latitude";

byte wvf_main_class(time);
       wvf_main_class:_FillValue = 127b;
       wvf_main_class:long_name = "20 Hz Ku band waveform main class";
       wvf_main_class:flag_meanings = "brown_ocean peaky noise strong_peak
brown_peak_trailing_edge brown_peak_leading_edge brown_flat_trailing_eadge peak_end trash
brown_noise two_leading_edges shifted_brown brown_noise_leading_edge
linear_positive_slope linear_negative_slope";
       wvf_main_class:flag_values = 1b, 2b, 3b, 4b, 5b, 6b, 7b, 8b, 9b, 10b, 11b, 12b,
13b, 15b, 18b;
       wvf_main_class:coordinates = "/data_20/longitude /data_20/latitude";
       wvf_main_class:comment = "Waveform classification : main class selected by
classification neural network trained on shape features of the waveforms";

} // group: ku
```

// 20-Hz C band data

```
group: c {
  variables:
```

// Altimeter range

```
int range_ocean(time);
       range_ocean:_FillValue = 2147483647;
       range_ocean:long_name = "20 Hz C band corrected altimeter range";
       range_ocean:standard_name = "altimeter_range";
       range_ocean:units = "m";
       range_ocean:add_offset = 1.300000e+06;
       range_ocean:scale_factor = 1.00e-04;
       range_ocean:coordinates = "/data_20/longitude /data_20/latitude";
       range_ocean:comment = "All instrumental corrections included, i.e. distance
antenna-COG (/data_01/range_cor_cog), USO drift correction (/data_01/range_cor_uso),
internal path correction (/data_01/c/range_cor_internal_path), Doppler correction
(/data_01/c/range_cor_doppler), modeled instrumental errors correction
(/data_01/c/range_cor_ocean_model_instr) and system bias";

byte range_ocean_compression_qual(time);
       range_ocean_compression_qual:_FillValue = 127b;
       range_ocean_compression_qual:long_name = "20 Hz flag for utilization in the
computation of 1 Hz C band range";
       range_ocean_compression_qual:flag_meanings = "yes no";
       range_ocean_compression_qual:flag_values = 0b, 1b;
       range_ocean_compression_qual:coordinates = "/data_20/longitude /data_20/latitude";
       range_ocean_compression_qual:comment = "Map of valid points used to compute the 1
Hz C band altimeter range";
```

// Significant waveheight

```
short swh_ocean(time);
       swh_ocean:_FillValue = 32767s;
       swh_ocean:long_name = "20 Hz C band corrected significant waveheight";
       swh_ocean:standard_name = "sea_surface_wave_significant_height";
       swh_ocean:units = "m";
       swh_ocean:scale_factor = 1.00e-03;
       swh_ocean:coordinates = "/data_20/longitude /data_20/latitude";
       swh_ocean:comment = "All instrumental corrections included, i.e. modeled
instrumental errors correction (/data_01/c/swh_cor_ocean_model_instr) and system bias";

byte swh_ocean_compression_qual(time);
       swh_ocean_compression_qual:_FillValue = 127b;
       swh_ocean_compression_qual:long_name = "20 Hz flag for utilization in the
computation of 1 Hz C band significant waveheight";
       swh_ocean_compression_qual:flag_meanings = "yes no";
       swh_ocean_compression_qual:flag_values = 0b, 1b;
       swh_ocean_compression_qual:coordinates = "/data_20/longitude /data_20/latitude";
       swh_ocean_compression_qual:comment = "Map of valid points used to compute the 1 Hz
C band significant waveheight";
```

// Backscatter coefficient

```
short sig0_ocean(time);
       sig0_ocean:_FillValue = 32767s;
       sig0_ocean:long_name = "20 Hz C band corrected backscatter coefficient";
       sig0_ocean:standard_name =
"surface_backwards_scattering_coefficient_of_radar_wave";
       sig0_ocean:units = "dB";
       sig0_ocean:scale_factor = 1.00e-02;
       sig0_ocean:coordinates = "/data_20/longitude /data_20/latitude";
       sig0_ocean:comment = "All instrumental corrections included, excepted the system
bias, i.e. AGC instrumental errors correction, internal calibration correction
(/data_01/c/sig0_cor_calibration), modeled instrumental errors correction
(/data_01/c/sig0_cor_ocean_model_instr) and atmospheric attenuation (sig0_cor_atm)";

byte sig0_ocean_compression_qual(time);
       sig0_ocean_compression_qual:_FillValue = 127b;
       sig0_ocean_compression_qual:long_name = "20 Hz flag for utilization in the
computation of 1 Hz C band backscatter coefficient";
       sig0_ocean_compression_qual:flag_meanings = "yes no";
       sig0_ocean_compression_qual:flag_values = 0b, 1b;
       sig0_ocean_compression_qual:coordinates = "/data_20/longitude /data_20/latitude";
       sig0_ocean_compression_qual:comment = "Map of valid points used to compute the 1
Hz C band backscatter coefficient";
```

// Ocean retracking outputs

```
byte num_iterations_ocean(time);
       num_iterations_ocean:_FillValue = 127b;
       num_iterations_ocean:long_name = "20 Hz number of iterations of the ocean
retracking in C band";
       num_iterations_ocean:units = "count";
       num_iterations_ocean:coordinates = "/data_20/longitude /data_20/latitude";
```

// OCOG retracking

```
int range_ocog(time);
       range_ocog:_FillValue = 2147483647;
       range_ocog:long_name = "20 Hz C band altimeter range (OCOG retracking)";
       range_ocog:standard_name = "altimeter_range";
       range_ocog:units = "m";
       range_ocog:add_offset = 1.300000e+06;
       range_ocog:scale_factor = 1.00e-04;
       range_ocog:coordinates = "/data_20/longitude /data_20/latitude";
       range_ocog:comment = "Distance antenna-COG (/data_01/range_cor_cog), USO drift
correction (/data_01/range_cor_uso), internal path correction
(/data_01/c/range_cor_internal_path), Doppler correction (/data_01/c/range_cor_doppler)
and system bias included";

short sig0_ocog(time);
       sig0_ocog:_FillValue = 32767s;
       sig0_ocog:long_name = "20 Hz C band backscatter coefficient (OCOG retracking)";
       sig0_ocog:standard_name =
"surface_backwards_scattering_coefficient_of_radar_wave";
       sig0_ocog:units = "dB";
       sig0_ocog:scale_factor = 1.00e-02;
       sig0_ocog:coordinates = "/data_20/longitude /data_20/latitude";
       sig0_ocog:comment = "AGC instrumental errors correction and internal calibration
correction (/data_01/c/sig0_cor_calibration) included";
```

// Ice-2 retracking

```
int range_ice2(time);
       range_ice2:_FillValue = 2147483647;
       range_ice2:long_name = "20 Hz C band altimeter range (ice-2 retracking)";
       range_ice2:standard_name = "altimeter_range";
       range_ice2:units = "m";
       range_ice2:add_offset = 1.300000e+06;
       range_ice2:scale_factor = 1.00e-04;
       range_ice2:coordinates = "/data_20/longitude /data_20/latitude";
       range_ice2:comment = "Distance antenna-COG (/data_01/range_cor_cog), USO drift
correction (/data_01/range_cor_uso), internal path correction
(/data_01/c/range_cor_internal_path), Doppler correction (/data_01/c/range_cor_doppler)
and system bias included";

short sig0_leading_edge_ice2(time);
       sig0_leading_edge_ice2:_FillValue = 32767s;
       sig0_leading_edge_ice2:long_name = "20 Hz C band leading edge backscatter
coefficient (ice-2 retracking)";
       sig0_leading_edge_ice2:standard_name =
"surface_backwards_scattering_coefficient_of_radar_wave";
       sig0_leading_edge_ice2:units = "dB";
       sig0_leading_edge_ice2:scale_factor = 1.00e-02;
       sig0_leading_edge_ice2:coordinates = "/data_20/longitude /data_20/latitude";
       sig0_leading_edge_ice2:comment = "AGC instrumental errors correction and internal
calibration correction (/data_01/c/sig0_cor_calibration) included";

short sig0_ice2(time);
       sig0_ice2:_FillValue = 32767s;
       sig0_ice2:long_name = "20 Hz C band backscatter coefficient (ice-2 retracking)";
       sig0_ice2:standard_name =
"surface_backwards_scattering_coefficient_of_radar_wave";
       sig0_ice2:units = "dB";
       sig0_ice2:scale_factor = 1.00e-02;
       sig0_ice2:coordinates = "/data_20/longitude /data_20/latitude";
       sig0_ice2:comment = "AGC instrumental errors correction and internal calibration
correction (/data_01/c/sig0_cor_calibration) included";

short sigmal_ice2(time);
       sigmal_ice2:_FillValue = 32767s;
       sigmal_ice2:long_name = "20 Hz width of the C band leading edge (ice-2
retracking)";
       sigmal_ice2:units = "m";
       sigmal_ice2:scale_factor = 1.00e-3;
       sigmal_ice2:coordinates = "/data_20/longitude /data_20/latitude";
       sigmal_ice2:comment = "The width of the leading edge corresponds to the so-called
composite sigma (SigmaL)";

int slope1_ice2(time);
       slope1_ice2:_FillValue = 2147483647;
       slope1_ice2:long_name = "20 Hz slope of the first part of the logarithm of the C
band trailing edge (ice-2 retracking)";
       slope1_ice2:units = "s-1";
       slope1_ice2:coordinates = "/data_20/longitude /data_20/latitude";

int slope2_ice2(time);
       slope2_ice2:_FillValue = 2147483647;
       slope2_ice2:long_name = "20 Hz slope of the second part of the logarithm of the C
band trailing edge (ice-2 retracking)";
       slope2_ice2:units = "s-1";
```

```
        slope2_ice2:coordinates = "/data_20/longitude /data_20/latitude";

int mqe_ice2(time);
        mqe_ice2:_FillValue = 2147483647;
        mqe_ice2:long_name = "20 Hz C band MQE (ice-2 retracking)";
        mqe_ice2:units = "1";
        mqe_ice2:scale_factor = 1.00e-05;
        mqe_ice2:coordinates = "/data_20/longitude /data_20/latitude";
        mqe_ice2:comment = "Mean Quadratic Error between the waveforms samples and the
corresponding model samples built from the ice-2 retracking outputs";

byte ice2_qual(time);
        ice2_qual:_FillValue = 127b;
        ice2_qual:long_name = "20 Hz C band ice-2 retracking quality flag";
        ice2_qual:flag_meanings = "good bad";
        ice2_qual:flag_values = 0b, 1b;
        ice2_qual:coordinates = "/data_20/longitude /data_20/latitude";
        ice2_qual:comment = "ice-2 retracking quality flag";
```

// Waveforms characteristics

```
short mqe_ocean(time);
        mqe_ocean:_FillValue = 32767s;
        mqe_ocean:long_name = "20 Hz C band MQE (ocean retracking)";
        mqe_ocean:units = "1";
        mqe_ocean:scale_factor = 1.00e-04;
        mqe_ocean:coordinates = "/data_20/longitude /data_20/latitude";
        mqe_ocean:comment = "Mean Quadratic Error between the waveforms samples and the
corresponding model samples built from the ocean retracking outputs";

int peakiness(time);
        peakiness:_FillValue = 2147483647;
        peakiness:long_name = "20 Hz peakiness on C band waveforms";
        peakiness:units = "1";
        peakiness:scale_factor = 1.00e-03;
        peakiness:coordinates = "/data_20/longitude /data_20/latitude";

} // group: c

} // group: data_20

}
```

7. SGDR DATA SET

All the variables described for the GDR data set are available in SGDR. Below are given the data available only in the SGDR data set.

```
netcdf sgdr {

 dimensions:

   samples = 104;

  variables:

byte samples(samples);
       samples:long_name = "waveform index";
       samples:units = "count";
       samples:comment = "Set to be compliant with the CF-1.7 convention";
```

// 1-Hz data

```
group: data_01 {

  dimensions:

    time = < number of measurements >;

  variables:
```

// Cf. GDR product 1-Hz data

…/… [cf. section 6]

// Altimeter range corrections

```
int range_cor_uso(time);
       range_cor_uso:_FillValue = 2147483647;
       range_cor_uso:long_name = "USO frequency correction on altimeter range";
       range_cor_uso:units = "m";
       range_cor_uso:scale_factor = 1.00e-04;
       range_cor_uso:comment = "Correction of the USO frequency drift on the altimeter
range";

short range_cor_cog(time);
       range_cor_cog:_FillValue = 32767s;
       range_cor_cog:long_name = "Distance antenna-COG correction on altimeter range";
       range_cor_cog:units = "m";
       range_cor_cog:scale_factor = 1.00e-04;
```

// Radiometer parameters

```
short rad_ta_187(time);
       rad_ta_187:_FillValue = 32767s;
       rad_ta_187:long_name = "18.7 GHz antenna temperature";
       rad_ta_187:units = "K";
```

```
      rad_ta_187:scale_factor = 1.00e-02;
      rad_ta_187:coordinates = "longitude latitude";

short rad_ta_238(time);
      rad_ta_238:_FillValue = 32767s;
      rad_ta_238:long_name = "23.8 GHz antenna temperature";
      rad_ta_238:units = "K";
      rad_ta_238:scale_factor = 1.00e-02;
      rad_ta_238:coordinates = "longitude latitude";

short rad_ta_340(time);
      rad_ta_340:_FillValue = 32767s;
      rad_ta_340:long_name = "34 GHz antenna temperature";
      rad_ta_340:units = "K";
      rad_ta_340:scale_factor = 1.00e-02;
      rad_ta_340:coordinates = "longitude latitude";
```

// 1-Hz Ku band data

```
group: ku {

  variables:
```

// Cf. GDR product 1-Hz Ku band data

…/… [cf. section 6]

// Altimeter range corrections

```
int range_cor_internal_path(time);
      range_cor_internal_path:_FillValue = 2147483647;
      range_cor_internal_path:long_name = "Ku band internal path delay correction on
altimeter range";
      range_cor_internal_path:units = "m";
      range_cor_internal_path:scale_factor = 1.00e-04;
      range_cor_internal_path:comment = "Internal calibration correction on the Ku band
altimeter range";

short range_cor_ocean_model_instr(time);
      range_cor_ocean_model_instr:_FillValue = 32767s;
      range_cor_ocean_model_instr:long_name = "Ku band modeled instrumental correction
on altimeter range";
      range_cor_ocean_model_instr:units = "m";
      range_cor_ocean_model_instr:scale_factor = 1.00e-04;

short range_cor_ocean_mle3_model_instr(time);
      range_cor_ocean_mle3_model_instr:_FillValue = 32767s;
      range_cor_ocean_mle3_model_instr:long_name = "Ku band modeled instrumental
correction on altimeter range (MLE3 retracking)";
      range_cor_ocean_mle3_model_instr:units = "m";
      range_cor_ocean_mle3_model_instr:scale_factor = 1.00e-04;

short range_cor_doppler(time);
      range_cor_doppler:_FillValue = 32767s;
      range_cor_doppler:long_name = "Ku band Doppler correction on altimeter range";
      range_cor_doppler:units = "m";
      range_cor_doppler:scale_factor = 1.00e-04;
```

// Significant waveheight corrections

```
short swh_cor_ocean_model_instr(time);
       swh_cor_ocean_model_instr:_FillValue = 32767s;
       swh_cor_ocean_model_instr:long_name = "Ku band modeled instrumental correction on
significant waveheight";
       swh_cor_ocean_model_instr:units = "m";
       swh_cor_ocean_model_instr:scale_factor = 1.00e-03;

short swh_cor_ocean_mle3_model_instr(time);
       swh_cor_ocean_mle3_model_instr:_FillValue = 32767s;
       swh_cor_ocean_mle3_model_instr:long_name = "Ku band modeled instrumental
correction on significant waveheight (MLE3 retracking)";
       swh_cor_ocean_mle3_model_instr:units = "m";
       swh_cor_ocean_mle3_model_instr:scale_factor = 1.00e-03;
```

// Backscatter coefficient corrections

```
short sig0_cor_calibration(time);
       sig0_cor_calibration:_FillValue = 32767s;
       sig0_cor_calibration:long_name = "Ku band internal calibration correction on
backscatter coefficient";
       sig0_cor_calibration:units = "dB";
       sig0_cor_calibration:scale_factor = 1.00e-02;

short sig0_cor_ocean_model_instr(time);
       sig0_cor_ocean_model_instr:_FillValue = 32767s;
       sig0_cor_ocean_model_instr:long_name = "Ku band modeled instrumental correction on
backscatter coefficient";
       sig0_cor_ocean_model_instr:units = "dB";
       sig0_cor_ocean_model_instr:scale_factor = 1.00e-02;

short sig0_cor_ocean_mle3_model_instr(time);
       sig0_cor_ocean_mle3_model_instr:_FillValue = 32767s;
       sig0_cor_ocean_mle3_model_instr:long_name = "Ku band modeled instrumental
correction on backscatter coefficient (MLE3 retracking)";
       sig0_cor_ocean_mle3_model_instr:units = "dB";
       sig0_cor_ocean_mle3_model_instr:scale_factor = 1.00e-02;


} // group: ku
```

// 1-Hz C band data

```
group: c {
  variables:
```

// Cf. GDR product 1-Hz C band data

…/… [cf. section 6]

// Altimeter range corrections

```
int range_cor_internal_path(time);
```

```
      range_cor_internal_path:_FillValue = 2147483647;
      range_cor_internal_path:long_name = "C band internal path delay correction on
altimeter range";
      range_cor_internal_path:units = "m";
      range_cor_internal_path:scale_factor = 1.00e-04;
      range_cor_internal_path:comment = "Internal calibration correction on the C band
altimeter range";

short range_cor_ocean_model_instr(time);
      range_cor_ocean_model_instr:_FillValue = 32767s;
      range_cor_ocean_model_instr:long_name = "C band modeled instrumental correction on
altimeter range";
      range_cor_ocean_model_instr:units = "m";
      range_cor_ocean_model_instr:scale_factor = 1.00e-04;

short range_cor_doppler(time);
      range_cor_doppler:_FillValue = 32767s;
      range_cor_doppler:long_name = "C band Doppler correction on altimeter range";
      range_cor_doppler:units = "m";
      range_cor_doppler:scale_factor = 1.00e-04;
```

// Significant waveheight corrections

```
short swh_cor_ocean_model_instr(time);
      swh_cor_ocean_model_instr:_FillValue = 32767s;
      swh_cor_ocean_model_instr:long_name = "C band modeled instrumental correction on
significant waveheight";
      swh_cor_ocean_model_instr:units = "m";
      swh_cor_ocean_model_instr:scale_factor = 1.00e-03;
```

// Backscatter coefficient corrections

```
short sig0_cor_calibration(time);
      sig0_cor_calibration:_FillValue = 32767s;
      sig0_cor_calibration:long_name = "C band internal calibration correction on
backscatter coefficient";
      sig0_cor_calibration:units = "dB";
      sig0_cor_calibration:scale_factor = 1.00e-02;

short sig0_cor_ocean_model_instr(time);
      sig0_cor_ocean_model_instr:_FillValue = 32767s;
      sig0_cor_ocean_model_instr:long_name = "C band modeled instrumental on backscatter
coefficient";
      sig0_cor_ocean_model_instr:units = "dB";
      sig0_cor_ocean_model_instr:scale_factor = 1.00e-02;


} // group: c

} // group: data_01
```

// 20-Hz data

```
group: data_20 {

  dimensions:
```

```
    time = < number of measurements >;

  variables:
```

// Cf. GDR product 20-Hz data

…/… [cf. section 6]

// Tracker range

```
int tracker_range_counter(time);
       tracker_range_counter:_FillValue = 2147483647;
       tracker_range_counter:long_name = "20 Hz tracker range counter [3.125/64 ns]";
       tracker_range_counter:units = "count";
       tracker_range_counter:add_offset = 2147483648.;
       tracker_range_counter:coordinates = "longitude latitude";
       tracker_range_counter:comment = "Tracker range counter with a resolution of
3.125/64 ns";

short tracker_range_rate_counter(time);
       tracker_range_rate_counter:_FillValue = 32767s;
       tracker_range_rate_counter:long_name = "20 Hz tracker range rate counter
[3.125/1024 ns]";
       tracker_range_rate_counter:units = "count";
       tracker_range_rate_counter:coordinates = "longitude latitude";
       tracker_range_rate_counter:comment = "Tracker range rate counter with a resolution
of 3.125/1024 ns";
```

// 20-Hz Ku band data

```
group: ku {

  variables:
```

// Cf. GDR product 20-Hz Ku band data

…/… [cf. section 6]

// Tracker range

```
int tracker_range_calibrated(time);
       tracker_range_calibrated:_FillValue = 2147483647;
       tracker_range_calibrated:long_name = "20 Hz Ku band corrected tracker range";
       tracker_range_calibrated:standard_name = "altimeter_range";
       tracker_range_calibrated:units = "m";
       tracker_range_calibrated:add_offset = 1.300000e+06;
       tracker_range_calibrated:scale_factor = 1.00e-04;
       tracker_range_calibrated:coordinates = "/data_20/longitude /data_20/latitude";
       tracker_range_calibrated:comment = "Ku band operating tracker (’Diode+DEM’ or
’Median’ or ’Split-Gate’ tracker). This includes the Distance antenna-COG
(/data_01/range_cor_cog), USO drift correction (/data_01/range_cor_uso) and internal path
correction (/data_01/ku/range_cor_internal_path). But not the Doppler correction
(/data_01/ku/range_cor_doppler), modeled instrumental errors correction
(/data_01/ku/range_cor_ocean_model_instr) and system bias";
```

```
int tracker_range_diode(time);
       tracker_range_diode:_FillValue = 2147483647;
       tracker_range_diode:long_name = "20 Hz Ku band tracker range from Diode+DEM";
       tracker_range_diode:standard_name = "altimeter_range";
       tracker_range_diode:units = "m";
       tracker_range_diode:add_offset = 1.300000e+06;
       tracker_range_diode:scale_factor = 1.00e-04;
       tracker_range_diode:coordinates = "/data_20/longitude /data_20/latitude";
```

// Tracker AGC

```
short agc(time);
       agc:_FillValue = 32767s;
       agc:long_name = "20 Hz Ku band corrected AGC";
       agc:units = "dB";
       agc:scale_factor = 1.00e-02;
       agc:coordinates = "/data_20/longitude /data_20/latitude";
       agc:comment = "AGC is corrected for instrumental errors due to the imperfections
of the on-board attenuators";

short agc_cor(time);
       agc_cor:_FillValue = 32767s;
       agc_cor:long_name = "20 Hz Ku band AGC correction";
       agc_cor:units = "dB";
       agc_cor:scale_factor = 1.00e-02;
       agc_cor:coordinates = "/data_20/longitude /data_20/latitude";
       agc_cor:comment = "Comes from AGC static characterization, and added to on-board
AGC to obtain applied AGC";
```

// Scaling factors for Sigma0 evaluation

```
int sig0_scaling_factor(time);
       sig0_scaling_factor:_FillValue = 2147483647;
       sig0_scaling_factor:long_name = "Scaling factor for Ku band backscatter
coefficient";
       sig0_scaling_factor:units = "dB";
       sig0_scaling_factor:scale_factor = 1.00e-02;
       sig0_scaling_factor:coordinates = "/data_20/longitude /data_20/latitude";
       sig0_scaling_factor:comment = "This scaling factor represents the backscatter
coefficient for a Ku band waveform amplitude equal to 1. It is a raw value accounting for
AGC 20 Hz correction and internal calibration correction. All other correction are not
applied (ie atmospheric attenuation, modeled instrumental errors correction and system
bias)";
```

// Ocean retracking outputs

// Ocean-3 (MLE4) outputs

```
int epoch_ocean(time);
       epoch_ocean:_FillValue = 2147483647;
       epoch_ocean:long_name = "Ku band epoch (ocean retracking)";
       epoch_ocean:units = "s";
       epoch_ocean:scale_factor = 1.00e-15;
       epoch_ocean:coordinates = "/data_20/longitude /data_20/latitude";

int sigmac_ocean(time);
       sigmac_ocean:_FillValue = 2147483647;
       sigmac_ocean:long_name = "Ku band width of the leading edge (ocean retracking)";
```

```
       sigmac_ocean:units = "s";
       sigmac_ocean:scale_factor = 1.00e-15;
       sigmac_ocean:coordinates = "/data_20/longitude /data_20/latitude";
       sigmac_ocean:comment = "The width of the leading edge corresponds to the so-called
composite sigma (SigmaC)";

int amplitude_ocean(time);
       amplitude_ocean:_FillValue = 2147483647;
       amplitude_ocean:long_name = "Ku band amplitude (ocean retracking) [FFT power
unit]";
       amplitude_ocean:units = "count";
       amplitude_ocean:scale_factor = 1.00e-04;
       amplitude_ocean:coordinates = "/data_20/longitude /data_20/latitude";

int noise_floor_ocean(time);
       noise_floor_ocean:_FillValue = 2147483647;
       noise_floor_ocean:long_name = "Ku band thermal noise (ocean retracking) [FFT power
unit]";
       noise_floor_ocean:units = "count";
       noise_floor_ocean:scale_factor = 1.00e-06;
       noise_floor_ocean:coordinates = "/data_20/longitude /data_20/latitude";
```

// Ocean-2 (MLE3) outputs

```
int epoch_ocean_mle3(time);
       epoch_ocean_mle3:_FillValue = 2147483647;
       epoch_ocean_mle3:long_name = "Ku band epoch (MLE3 retracking)";
       epoch_ocean_mle3:units = "s";
       epoch_ocean_mle3:scale_factor = 1.00e-15;
       epoch_ocean_mle3:coordinates = "/data_20/longitude /data_20/latitude";

int sigmac_ocean_mle3(time);
       sigmac_ocean_mle3:_FillValue = 2147483647;
       sigmac_ocean_mle3:long_name = "Ku band width of the leading edge (MLE3
retracking)";
       sigmac_ocean_mle3:units = "s";
       sigmac_ocean_mle3:scale_factor = 1.00e-15;
       sigmac_ocean_mle3:coordinates = "/data_20/longitude /data_20/latitude";
       sigmac_ocean_mle3:comment = "The width of the leading edge corresponds to the so-
called composite sigma (SigmaC)";

int amplitude_ocean_mle3(time);
       amplitude_ocean_mle3:_FillValue = 2147483647;
       amplitude_ocean_mle3:long_name = "Ku band amplitude (MLE3 retracking) [FFT power
unit]";
       amplitude_ocean_mle3:units = "count";
       amplitude_ocean_mle3:scale_factor = 1.00e-04;
       amplitude_ocean_mle3:coordinates = "/data_20/longitude /data_20/latitude";
```

// Adaptive retracking outputs

```
int epoch_adaptive(time);
       epoch_adaptive:_FillValue = 2147483647;
       epoch_adaptive:long_name = "Ku band epoch (adaptive retracking)";
       epoch_adaptive:units = "s";
       epoch_adaptive:scale_factor = 1.00e-15;
       epoch_adaptive:coordinates = "/data_20/longitude /data_20/latitude";
```

```
int amplitude_adaptive(time);
       amplitude_adaptive:_FillValue = 2147483647;
       amplitude_adaptive:long_name = "Ku band amplitude (adaptive retracking) [FFT power
unit]";
       amplitude_adaptive:units = "count";
       amplitude_adaptive:scale_factor = 1.00e-04;
       amplitude_adaptive:coordinates = "/data_20/longitude /data_20/latitude";

int noise_floor_adaptive(time);
       noise_floor_adaptive:_FillValue = 2147483647;
       noise_floor_adaptive:long_name = "Ku band thermal noise (adaptive retracking) [FFT
power unit]";
       noise_floor_adaptive:units = "count";
       noise_floor_adaptive:scale_factor = 1.00e-06;
       noise_floor_adaptive:coordinates = "/data_20/longitude /data_20/latitude";

int gamma_adaptive(time);
       gamma_adaptive:_FillValue = 2147483647;
       gamma_adaptive:long_name = "Ku band gamma (adaptive retracking)";
       gamma_adaptive:units = "count";
       gamma_adaptive:scale_factor = 1.00e-06;
       gamma_adaptive:coordinates = "/data_20/longitude /data_20/latitude";

int convergence_criteria_adaptive(time);
       convergence_criteria_adaptive:_FillValue = 2147483647;
       convergence_criteria_adaptive:long_name = "Ku band convergence criteria (adaptive
retracking)";
       convergence_criteria_adaptive:units = "count";
       convergence_criteria_adaptive:scale_factor = 1.00e-02;
       convergence_criteria_adaptive:coordinates = "/data_20/longitude
/data_20/latitude";
```

// OCOG retracking outputs

```
int epoch_ocog(time);
       epoch_ocog:_FillValue = 2147483647;
       epoch_ocog:long_name = "Ku band epoch (OCOG retracking)";
       epoch_ocog:units = "s";
       epoch_ocog:scale_factor = 1.00e-15;
       epoch_ocog:coordinates = "/data_20/longitude /data_20/latitude";

int amplitude_ocog(time);
       amplitude_ocog:_FillValue = 2147483647;
       amplitude_ocog:long_name = "Ku band amplitude (OCOG retracking) [FFT power unit]";
       amplitude_ocog:units = "count";
       amplitude_ocog:scale_factor = 1.00e-04;
       amplitude_ocog:coordinates = "/data_20/longitude /data_20/latitude";
```

//Sea-Ice retracking outputs

```
int epoch_seaice(time);
       epoch_seaice:_FillValue = 2147483647;
       epoch_seaice:long_name = "Ku band epoch (sea-ice retracking)";
       epoch_seaice:units = "s";
       epoch_seaice:scale_factor = 1.00e-15;
       epoch_seaice:coordinates = "/data_20/longitude /data_20/latitude";

int amplitude_seaice(time);
```

```
       amplitude_seaice:_FillValue = 2147483647;
       amplitude_seaice:long_name = "Ku band amplitude (sea-ice retracking) [FFT power
unit]";
       amplitude_seaice:units = "count";
       amplitude_seaice:scale_factor = 1.00e-04;
       amplitude_seaice:coordinates = "/data_20/longitude /data_20/latitude";
```

// Ice-2 retracking outputs

```
int epoch_ice2(time);
       epoch_ice2:_FillValue = 2147483647;
       epoch_ice2:long_name = "Ku band epoch (ice-2 retracking)";
       epoch_ice2:units = "s";
       epoch_ice2:scale_factor = 1.00e-15;
       epoch_ice2:coordinates = "/data_20/longitude /data_20/latitude";

int amplitude_ice2(time);
       amplitude_ice2:_FillValue = 2147483647;
       amplitude_ice2:long_name = "Ku band amplitude (ice-2 retracking) [FFT power
unit]";
       amplitude_ice2:units = "count";
       amplitude_ice2:scale_factor = 1.00e-04;
       amplitude_ice2:coordinates = "/data_20/longitude /data_20/latitude";

int mean_amplitude_ice2(time);
       mean_amplitude_ice2:_FillValue = 2147483647;
       mean_amplitude_ice2:long_name = "Ku band mean amplitude (ice-2 retracking) [FFT
power unit]";
       mean_amplitude_ice2:units = "count";
       mean_amplitude_ice2:scale_factor = 1.00e-04;
       mean_amplitude_ice2:coordinates = "/data_20/longitude /data_20/latitude";

int noise_floor_ice2(time);
       noise_floor_ice2:_FillValue = 2147483647;
       noise_floor_ice2:long_name = "Ku band thermal noise (ice-2 retracking) [FFT power
unit]";
       noise_floor_ice2:units = "count";
       noise_floor_ice2:scale_factor = 1.00e-06;
       noise_floor_ice2:coordinates = "/data_20/longitude /data_20/latitude";

int slope_ice2(time);
       slope_ice2:_FillValue = 2147483647;
       slope_ice2:long_name = "20 Hz Ku band slope of the logarithm of the trailing edge
for mispointing (ice-2 retracking)";
       slope_ice2:units = "s-1";
       slope_ice2:coordinates = "/data_20/longitude /data_20/latitude";
```

//TFMRA retracking outputs

```
int epoch_tfmra(time);
       epoch_tfmra:_FillValue = 2147483647;
       epoch_tfmra:long_name = "Ku band epoch (TFMRA retracking)";
       epoch_tfmra:units = "s";
       epoch_tfmra:scale_factor = 1.00e-15;
       epoch_tfmra:coordinates = "/data_20/longitude /data_20/latitude";

int amplitude_tfmra(time);
       amplitude_tfmra:_FillValue = 2147483647;
```

```
      amplitude_tfmra:long_name = "Ku band amplitude (TFMRA retracking) [FFT power
unit]";
      amplitude_tfmra:units = "count";
      amplitude_tfmra:scale_factor = 1.00e-04;
      amplitude_tfmra:coordinates = "/data_20/longitude /data_20/latitude";
```

// Waveforms characteristics

```
short wvf_main_class_score(time);
      wvf_main_class_score:_FillValue = 32767s;
      wvf_main_class_score:long_name = "20 Hz Ku band waveform main class probability";
      wvf_main_class_score:scale_factor = 1.00e-02;
      wvf_main_class_score:coordinates = "/data_20/longitude /data_20/latitude";
      wvf_main_class_score:comment = "Waveform classification : probability associated
to the main class (between 0 and 100, 100=strongest probability)";

byte wvf_second_class(time);
      wvf_second_class:_FillValue = 127b;
      wvf_second_class:long_name = "20 Hz Ku band waveform second class";
      wvf_second_class:flag_meanings = "brown_ocean peaky noise strong_peak
brown_peak_trailing_edge brown_peak_leading_edge brown_flat_trailing_eadge peak_end trash
brown_noise two_leading_edges shifted_brown brown_noise_leading_edge
linear_positive_slope linear_negative_slope";
      wvf_second_class:flag_values = 1b, 2b, 3b, 4b, 5b, 6b, 7b, 8b, 9b, 10b, 11b, 12b,
13b, 15b, 18b;
      wvf_second_class:coordinates = "/data_20/longitude /data_20/latitude";
      wvf_second_class:comment = "Waveform classification : second class selected by
classification neural network trained on shape features of the waveforms";

short wvf_second_class_score(time);
      wvf_second_class_score:_FillValue = 32767s;
      wvf_second_class_score:long_name = "20 Hz Ku band waveform second class
probability";
      wvf_second_class_score:scale_factor = 1.00e-02;
      wvf_second_class_score:coordinates = "/data_20/longitude /data_20/latitude";
      wvf_second_class_score:comment = "Waveform classification : probability associated
to the second class (between 0 and 100, 100=strongest probability)";
```

// Waveforms

```
int power_waveform(time,samples);
      power_waveform:_FillValue = 2147483647;
      power_waveform:long_name = "Ku band waveform samples";
      power_waveform:units = "count";
      power_waveform:scale_factor = 1.00e-03;
      power_waveform:comment = "Waveforms are corrected for the Low Pass Filter
effects";

} // group: ku
```

// 20-Hz C band data

```
group: c {

  variables:
```

// Cf. GDR product 20-Hz C band data

…/… [cf. section 6]

// Tracker range

```
int tracker_range_calibrated(time);
       tracker_range_calibrated:_FillValue = 2147483647;
       tracker_range_calibrated:long_name = "20 Hz C band corrected tracker range";
       tracker_range_calibrated:standard_name = "altimeter_range";
       tracker_range_calibrated:units = "m";
       tracker_range_calibrated:add_offset = 1.300000e+06;
       tracker_range_calibrated:scale_factor = 1.00e-04;
       tracker_range_calibrated:coordinates = "/data_20/longitude /data_20/latitude";
       tracker_range_calibrated:comment = "C band operating tracker. This includes the
Distance antenna-COG (/data_01/range_cor_cog), USO drift correction
(/data_01/range_cor_uso) and internal path correction
(/data_01/c/range_cor_internal_path). But not the Doppler correction
(/data_01/c/range_cor_doppler), modeled instrumental errors correction
(/data_01/c/range_cor_ocean_model_instr) and system bias";
```

// Tracker AGC

```
short agc(time);
       agc:_FillValue = 32767s;
       agc:long_name = "20 Hz C band corrected AGC";
       agc:units = "dB";
       agc:scale_factor = 1.00e-02;
       agc:coordinates = "/data_20/longitude /data_20/latitude";
       agc:comment = "AGC is corrected for instrumental errors due to the imperfections
of the on-board attenuators";

short agc_cor(time);
       agc_cor:_FillValue = 32767s;
       agc_cor:long_name = "20 Hz C band AGC correction";
       agc_cor:units = "dB";
       agc_cor:scale_factor = 1.00e-02;
       agc_cor:coordinates = "/data_20/longitude /data_20/latitude";
       agc_cor:comment = "Comes from AGC static characterization, and added to on-board
AGC to obtain applied AGC";
```

// Scaling factors for Sigma0 evaluation

```
int sig0_scaling_factor(time);
       sig0_scaling_factor:_FillValue = 2147483647;
       sig0_scaling_factor:long_name = "Scaling factor for C band backscatter
coefficient";
       sig0_scaling_factor:units = "dB";
       sig0_scaling_factor:scale_factor = 1.00e-02;
       sig0_scaling_factor:coordinates = "/data_20/longitude /data_20/latitude";
       sig0_scaling_factor:comment = "This scaling factor represents the backscatter
coefficient for a C band waveform amplitude equal to 1. It is a raw value accounting for
AGC 20 Hz correction and internal calibration correction. All other correction are not
applied (ie atmospheric attenuation, modeled instrumental errors correction and system
bias)";
```

// Ocean retracking outputs

// Ocean-3 (MLE4) outputs

```
int epoch_ocean(time);
       epoch_ocean:_FillValue = 2147483647;
       epoch_ocean:long_name = "C band epoch (ocean retracking)";
       epoch_ocean:units = "s";
       epoch_ocean:scale_factor = 1.00e-15;
       epoch_ocean:coordinates = "/data_20/longitude /data_20/latitude";

int sigmac_ocean(time);
       sigmac_ocean:_FillValue = 2147483647;
       sigmac_ocean:long_name = "C band width of the leading edge (ocean retracking)";
       sigmac_ocean:units = "s";
       sigmac_ocean:scale_factor = 1.00e-15;
       sigmac_ocean:coordinates = "/data_20/longitude /data_20/latitude";
       sigmac_ocean:comment = "The width of the leading edge corresponds to the so-called
composite sigma (SigmaC)";

int amplitude_ocean(time);
       amplitude_ocean:_FillValue = 2147483647;
       amplitude_ocean:long_name = "C band amplitude (ocean retracking) [FFT power
unit]";
       amplitude_ocean:units = "count";
       amplitude_ocean:scale_factor = 1.00e-04;
       amplitude_ocean:coordinates = "/data_20/longitude /data_20/latitude";

int noise_floor_ocean(time);
       noise_floor_ocean:_FillValue = 2147483647;
       noise_floor_ocean:long_name = "C band thermal noise (ocean retracking) [FFT power
unit]";
       noise_floor_ocean:units = "count";
       noise_floor_ocean:scale_factor = 1.00e-06;
       noise_floor_ocean:coordinates = "/data_20/longitude /data_20/latitude";
```

// OCOG retracking outputs

```
int epoch_ocog(time);
       epoch_ocog:_FillValue = 2147483647;
       epoch_ocog:long_name = "C band epoch (OCOG retracking)";
       epoch_ocog:units = "s";
       epoch_ocog:scale_factor = 1.00e-15;
       epoch_ocog:coordinates = "/data_20/longitude /data_20/latitude";

int amplitude_ocog(time);
       amplitude_ocog:_FillValue = 2147483647;
       amplitude_ocog:long_name = "C band amplitude (OCOG retracking) [FFT power unit]";
       amplitude_ocog:units = "count";
       amplitude_ocog:scale_factor = 1.00e-04;
       amplitude_ocog:coordinates = "/data_20/longitude /data_20/latitude";
```

// Ice-2 retracking outputs

```
int epoch_ice2(time);
       epoch_ice2:_FillValue = 2147483647;
       epoch_ice2:long_name = "C band epoch (ice-2 retracking)";
       epoch_ice2:units = "s";
```

```
        epoch_ice2:scale_factor = 1.00e-15;
        epoch_ice2:coordinates = "/data_20/longitude /data_20/latitude";

int amplitude_ice2(time);
        amplitude_ice2:_FillValue = 2147483647;
        amplitude_ice2:long_name = "C band amplitude (ice-2 retracking) [FFT power unit]";
        amplitude_ice2:units = "count";
        amplitude_ice2:scale_factor = 1.00e-04;
        amplitude_ice2:coordinates = "/data_20/longitude /data_20/latitude";

int mean_amplitude_ice2(time);
        mean_amplitude_ice2:_FillValue = 2147483647;
        mean_amplitude_ice2:long_name = "C band mean amplitude (ice-2 retracking) [FFT
power unit]";
        mean_amplitude_ice2:units = "count";
        mean_amplitude_ice2:scale_factor = 1.00e-04;
        mean_amplitude_ice2:coordinates = "/data_20/longitude /data_20/latitude";

int noise_floor_ice2(time);
        noise_floor_ice2:_FillValue = 2147483647;
        noise_floor_ice2:long_name = "C band thermal noise (ice-2 retracking) [FFT power
unit]";
        noise_floor_ice2:units = "count";
        noise_floor_ice2:scale_factor = 1.00e-06;
        noise_floor_ice2:coordinates = "/data_20/longitude /data_20/latitude";
```

// Waveforms

```
int power_waveform(time,samples);
        power_waveform:_FillValue = 2147483647;
        power_waveform:long_name = "C band waveform samples";
        power_waveform:units = "count";
        power_waveform:scale_factor = 1.00e-03;
        power_waveform:comment = "Waveforms are corrected for the Low Pass Filter
effects";

} // group: c

} // group: data_20

}
```

DIFFUSION CNES

Nom	Sigle
VADON Hélène	DNO/OT/AR
COUDERC Véronique	DSO/OT/SWO
BIGNALET-CAZALET François	DNO/OT/OC
GUINLE Thierry	DNO/OT/OC
PICOT Nicolas	DSO/OT/AL
COUSTANCE Sophie	DNO/OT/AR
GARCIA Charlotte	DNO/OT/AR

DIFFUSION JPL/NASA

Nom	Email
DESAI Shailen	Shailen.*D.D*esai@jpl.nasa.gov

DIFFUSION CLS

Nom	email
DUMONT Jean-Paul	*jdumont@groupcls.com*
URIEN Stéphanie	*surien@groupcls.com*