SALP

SALP Products Specification – Volume 1 : Jason-2 User Products

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SUMMARY

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Key words : Jason-2 User Products	
Summary : This document is aimed at defining the Jason-2 User Products	

DOCUMENT CHANGE RECORD

Issue	Update	Date	Modifications	Visa
1	**0**	**28-06-07**	**Creation**	
1	**1**	**18-09-07**	• Accounting for SMM-DM-BA3-GO-22928-CM (Evolution of global attrinutes - adding of MDT model (“mdt_model ») - and evolution of GDR data set - adding of an MDT interpolation flag (“interp_flag_mdt”)) • Corrections (Modification of “number_of_iterations _Ku” and “number_of_iterations_C”)	
1	**2**	**09-11-07**	• Comments relative to brightness temperatures • Accounting for a new DAD and for four new SAD for AMR data processing • Adding of state flags (altimeter acquisition mode and radiometer operating)	

2	**0**	**31-03-08**	• Modification of the "altimeter acquisition mode" flag (20-Hz instead of 1-Hz) • Update of global attributes: – Removal of some attributes – Adding of references to AD 3 • Update of variables definition: – Adding of comments (mainly issued from Jason-1 Handbook), adding reference to the name of variables – Adding of variables attributes: "quality_flag", "time_calendar", "source", "institution", "tai_utc_difference", "leap_second" – Adding of standard names – Reformulation of some names of variables (consistency between the various names) and use of lowercase only in the names of variables – Update of some long-names – Adding of references to AD 3	

2	**1**	**13-05-08**	• Global attributes: – Adding of first_meas_time and last_meas_time – Renaming of the attributes corresponding to the referencement of dynamic input files (xref_...) – Removal of the attributes corresponding to the referencement of static input files – Adding of two attibutes to reference the ellipsoïd (semi-major axis and flattening coefficient) • Data sets: – Removal of quality_flag attibutes for SSHA parameters – Modification of comment attributes for SSHA alt_quality_flag, rad_quality_flag and ecmwf_meteo_map_avail – Update of standard names (range, dry and tropo. corrections, iono. correction, sea state bias, significant waveheight, backscatter coefficient, inverted barometer, HF fluctuations of the SSH, geocentric ocean tide, equilibrium ocean tide, non equilibrium ocean tide, solid earth tide, pole tide, altitude) – Removal of standard names (bathymetry, ssha, mss, mean_topography, load_tide) – Update of long names (mss, mean_topography) • Minor corrections (typo)	
2	**2**	**19-Jun-08**	• Minor corrections provided by EUMETSAT and NOAA, only on header part. (**SALP-DM- M-522-CN)**	**N. Picot**
2	**3**	**27-Nov-08**	• Evolutions to account for project, PIs and Eumetsat feedbacks. **(SALP-DM- M-549-CN)**	**N. Picot**

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-3	Jason-2 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
TP3-J0-STB-116-CNES	AD 1 Jason-2 Operational Service Specification
SMM-DD-BA-EA-32179-CLS	AD 2 Bibli_Alti : Jason-2 Interfaces
SMM-ST-BA-EA-32178-CLS	AD 3 Bibli_Alti : Jason-2 Processing Steps
SALP-MU-M-OP-15815-CN	RD 1 OSTM/Jason-2 Products Handbook

TBC AND TBD LIST

TBC/TBD	Paragraph	Brief description

CONTENTS

1. INTRODUCTION

The aim of this document is to define the Jason-2 level2 altimeter products specifications. It is applicable to the development of the processing module (SPA, TM_NRT) and of the other tools developed by 4 partners (BUFR convertor, NRTAVS, …) but is not to be delivered to external users. The document RD 1 (OSTM/Jason-2 Products Handbook) gives the required information to users.

This document has been named according to the Jason-1 mission (SSALTO Products Specifications – Volume 1 : JASON-1 User Products : SALP -ST-M-EA-10879-CN DA162). 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 60 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 is also generated. The BUFR format is described in RD 1.

Netcdf .OGDR/IGDR/GDR products will have the same information and format. The only difference will be related to auxiliary data (orbit, meteo files, calibrations, …) and a possible simplify version of the ground retracking algorithms applied to OGDR due to the NRT constraint.

Taken into account Jason-1 heritage, products will be split into several data sets :

1. One file close to current Jason-1 NRT-**SSHA,** limited to 1Hz sampling.
2. One file close to current Jason-1 I/**GDR**, containing 1Hz and 20Hz values.
3. One file close to current Jason-1 **SGDR**, containing 1Hz, 20hz and waveforms values. This file will not be 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 6.

2. JASON-2 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-1.1 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 Jason-2 product files:

		Data set		
Dimension name	**Value**	**SSHA**	**GDR**	**SGDR**
time	Number of measurements in the file	Yes	Yes	Yes
meas_ind	**20** (number of elementary measurements)	Yes	Yes	Yes
wvf_ind	**104** (number of waveform samples)	No	No	Yes

Table 2 - Dimensions used in the Jason-2 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 represent 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 Jason-2 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

Attribute	Description
	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
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);                                     // variable <type> <name>(<dimension>)
        time:long_name = "time";                           // variable attributes
        time:units = "seconds since 2000-01-01 00:00:00.0";

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

    byte alt_echo_type(time);
        alt_echo_type:long_name = "altimeter echo type";
        alt_echo_type:_FillValue = 127b;
        alt_echo_type:flag_values = 0b, 1b ;
        alt_echo_type:flag_meanings = "ocean_like non_ocean_like";
        alt_echo_type:coordinates = "lon lat";

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

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

  alt_echo_type = 0 -> ocean like echo
  alt_echo_type = 1 -> non ocean like echo

  If alt_echo_type is not computed, it will take the value 127 (_FillValue attribute).
- alt_time is *packed*. The data are stored in 32-bit integers (long). The value of the altitude of the satellite can be recovered using:

$$alt = (alt_{long} * scale\_factor) + add\_offset$$

3. GLOBAL ATTRIBUTES

Global attributes are defined in the table below.

[xxx] refers to the name of the parameter defined in AD 3 (in "Step G1 command file" or "Golbal attributes of production user products" sections) and AD 3 ("Global attributes to be computed" section in processing step G1).

			Data set		
Attribute name	**Format**	**Description**	**SSHA**	**GDR**	**SGDR**
Conventions	String	netCDF convention followed. This attribute should be set to **"CF-1.1"** to indicate that the file is compliant with the Climate and Forecast netCDF convention.	X	X	X

title	String	A descriptive title for the data set, built as follows:
		[PO_PROD] – [Title_x], leading to
		`OGDR - Reduced dataset`
		`OGDR - Standard dataset`
		
		`IGDR - Reduced dataset`
		`IGDR - Standard dataset`
		`IGDR - Expertise dataset`
		
		`GDR - Reduced dataset`
		`GDR - Standard dataset`
		`GDR - Expertise dataset`
			X	X	X

institution	String	The name of the data producer (ex. CNES EUMETSAT or NOAA): **[GA_INSTITUTION]**	X	X	X
source	String	The method of production of original data (model vs observational): **"radar altimeter"**	X	X	X
history	String	**Date** and **[product_create_time]**	X	X	X
contact	String	A text giving the primary contact for information about the data set (ex. CNES aviso@cls.fr, EUMETSAT ops@eumetsat.int, NOAA ESPCOperations@noaa.gov) : **[contact]**	X	X	X

references	String	The version of the altimetric library used to produce the data set (ex: Level1 library = v3.1, Level2 Library = v2.3p1, Processing Pilot = v2.3): **[references]**	X	X	X
processing_center	String	Name of the processing center (SALP, EUMPC or ESPC): **[GA_PROC_CENTRE]**	X	X	X
reference_document	String	Name of the reference document describing the products (ex. OSTM/Jason-2 Products Handbook, SALP-MU-M-OP-15815-CN) **[reference_document]**	X	X	X
mission_name	String	Name of the mission (ex. "Jason-2"): **[mission_name]**	X	X	X
altimeter_sensor_name	String	Name of the altimeter sensor (ex. "Poseidon-3"): **[altimeter_sensor_name]**	X	X	X
radiometer_sensor_name	String	Name of the radiometer sensor (ex. "AMR"): **[radiometer_sensor_name]**	X	X	X
doris_sensor_name	String	Name of the DORIS sensor **[doris_sensor_name]**	X	X	X
acq_station_name	String	Identification of the acquisition station (JTCCS for CNES, EUMET-USG for EUMETSAT, NOAACDAS for NOAA): **[GA_ACQ_STATION]**	X	X	X
cycle_number	long	Cycle number: **[GA_CYCLE_NB]**	X	X	X
absolute_rev_number	long	Absolute number of revolution: **[GA_ABS_REV_NB]**	X	X	X
pass_number	long	Pass number in the cycle (relative pass number): **[GA_PASS_NB]**	X	X	X
absolute_pass_number	long	Absolute pass number (since the beginning of the mission): **[GA_ABS_PASS_NB]**	X	X	X
equator_time	String	UTC time of equator crossing (YYYY-MM-DD HH:MM:SS.mmmmmm): **[GA_EQ_TIME]**	X	X	X
equator_longitude	double	Longitude of equator crossing: **[GA_EQ_LON]**	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_input_frame	String	Name of the input frame (only for OGDRs products): **[GA_FRAME]**	X	X	
xref_altimeter_level1	String	Name of the altimeter level 1.0 product: **[GA_ALT_L1]**	X	X	X
xref_radiometer_level1	String	Name of the radiometer level 1.0 product: **[GA_RAD_L1]**	X	X	X
xref_altimeter_chacterisation	String	Name of the altimeter characterisation data file: **[IF_CHAR_ALT]**	X	X	X
xref_altimeter_ltm	String	Name of the altimeter Long Term Monitoring data file: **[GA_LTM]**	X	X	X
xref_radiometer_temp	String	Name of the file containing the antenna temperature coefficients: **[GA_TEMP]**	X	X	X
xref_doris_uso	String	Name of the file containing the DORIS-derived USO frequency: **[GA_USO]**	X	X	X
xref_orbit_data	String	Name of the file containing the orbit ephemeris: **[GA_ORB]**		X	X
xref_pf_data	String	Name of the file containing the platform data (mispointing, distance antenna-COG): **[GA_PLA]**	X	X	X
xref_pole_location	String	Name of the file containing the pole location data: **[GA_POL]**	X	X	X
xref_orf_data	String	Name of the Orbit Revolution File used to create the pass file: **[GA_ORF]**		X	X
xref_meteorological_files	String	Name of the meteorological files used to create the pass file: **[GA_METEO]**	X	X	X
ellipsoid_axis	String	Semi-major axis of the reference ellipsoid **[ellipsoid_sm_axis]**	X	X	X
ellipsoid_flattening	String	Flattening coeffcient of the reference ellipsoid **[ellipsoid _flattening]**	X	X	X

4. SSHA DATA SET

```
netcdf ssha {
  dimensions:
    time = < number of measurements >;

  variables:
```

// Time Tag

```
    double time(time);
       time:long_name = "time (sec. since 2000-01-01)";
       time:standard_name = "time";
       time:units = "seconds since 2000-01-01 00:00:00.0";
       time:calendar = "gregorian";
       time:tai_utc_difference = [GA_TAI_UTC_DIF];
       time:leap_second = [GA_LEAP_TIME];
       time:comment = " "tai_utc_difference" is the difference between TAI and UTC
reference time (seconds) for the first measurement of the data set. "leap_second" is the
UTC time at which a leap second occurs in the data set, if any. After this UTC time, the
tai_utc_difference is increased by 1 second. "
```

// Location and surface type

```
    int lat(time);
       lat:long_name = "latitude";
       lat:standard_name = "latitude";
       lat:units = "degrees_north";
       lat:scale_factor = 1.00e-06;
       lat:comment = "Positive latitude is North latitude, negative latitude is South
latitude. See Jason-2 User Handbook";

    int lon(time);
       lon:long_name = "longitude";
       lon:standard_name = "longitude";
       lon:units = "degrees_east";
       lon:scale_factor = 1.00e-06;
       lon:comment = "East longitude relative to Greenwich meridian. See Jason-2 User
Handbook";

    byte alt_echo_type(time);
       alt_echo_type:long_name = "altimeter echo type";
       alt_echo_type:_FillValue = 127b;
       alt_echo_type:flag_values = 0b, 1b;
       alt_echo_type:flag_meanings = "ocean_like non_ocean_like";
       alt_echo_type:coordinates = "lon lat";
       alt_echo_type:comment = "The altimeter echo type is determined by testing the rms
of the high rate range measurements against a threshold as well as the number of valid
high rate range measurements against a minimum value";

    byte rad_surf_type(time);
       rad_surf_type:long_name = "radiometer surface type";
       rad_surf_type:_FillValue = 127b;
       rad_surf_type:flag_values = 0b, 1b;
       rad_surf_type:flag_meanings = "ocean land";
       rad_surf_type:coordinates = "lon lat";
```

// Quality information

```
    byte alt_quality_flag(time);
       alt_quality_flag:long_name = "altimeter quality flag";
       alt_quality_flag:_FillValue = 127b;
       alt_quality_flag:flag_values = 0b, 1b;
       alt_quality_flag:flag_meanings = "Good Bad";
       alt_quality_flag:coordinates = "lon lat";
       alt_quality_flag:comment = "Compilation of all altimeter flags except altimeter
echo type : Set to default in the current issue";

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

   byte geophysical_quality_flag(time);
       geophysical_quality_flag:long_name = "geophysical quality flag";
       geophysical_quality_flag:_FillValue = 127b;
       geophysical_quality_flag:flag_values = 0b, 1b;
       geophysical_quality_flag:flag_meanings = "Good Bad";
       geophysical_quality_flag:coordinates = "lon lat";
       geophysical_quality_flag:comment = "Check on validity of all geophysical fields :
Set to default in the current issue";

    byte ecmwf_meteo_map_avail(time);
       ecmwf_meteo_map_avail:long_name = "ECMWF meteorological map availability";
       ecmwf_meteo_map_avail:_FillValue = 127b;
       ecmwf_meteo_map_avail:flag_values = 0b, 1b, 2b, 3b ;
       ecmwf_meteo_map_avail:flag_meanings = "2_maps_nominal 2_maps_degraded
1_map_extrapolated no_map";
       ecmwf_meteo_map_avail:coordinates = "lon lat";
       ecmwf_meteo_map_avail: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, extrapolation used", 3 meaning "no map". Given the latest definition of the
meteorological field processing algorithms, this flag will always be set to 0.";

    byte rain_flag(time);
       rain_flag:long_name = "rain flag";
       rain_flag:_FillValue = 127b;
       rain_flag:flag_values = 0b, 1b;
       rain_flag:flag_meanings = "no_rain rain";
       rain_flag:coordinates = "lon lat";
       rain_flag:comment = "See Jason-2 User Handbook";
```

// Orbit

```
    int alt(time);
       alt:long_name = "1 Hz altitude of satellite";
       alt: standard _name = "height_above_reference_ellipsoid";
       alt:_FillValue = 2147483647;
       alt:units = "m";
       alt:add_offset = 1.300000e+06;
       alt:scale_factor = 1.00e-04;
       alt:coordinates = "lon lat";
       alt:comment = "Altitude of satellite above the reference ellipsoid";
```

// Altimeter range

```
    int range_ku(time);
       range_ku:long_name = "1 Hz Ku band corrected altimeter range";
       range_ku:standard_name = "altimeter_range";
       range_ku:_FillValue = 2147483647;
       range_ku:units = "m";
       range_ku:add_offset = 1.300000e+06;
       range_ku:scale_factor = 1.00e-04;
       range_ku:coordinates = "lon lat";
       range_ku:comment = "All instrumental corrections included, i.e. distance antenna-
COG (cog_corr), USO drift correction (uso_corr), internal path correction
(internal_path_delay_corr_ku), Doppler correction (doppler_corr_ku), modeled instrumental
errors correction (modeled_instr_corr_range_ku) and system bias";
```

// Altimeter range corrections

```
    short model_dry_tropo_corr(time);
       model_dry_tropo_corr:long_name = "model dry tropospheric correction";
       model_dry_tropo_corr:standard_name =
"altimeter_range_correction_due_to_dry_troposphere";
       model_dry_tropo_corr:source = [mto_fields_source];
       model_dry_tropo_corr:institution = [mto_fields_institution];
       model_dry_tropo_corr:_FillValue = 32767s;
       model_dry_tropo_corr:units = "m";
       model_dry_tropo_corr:scale_factor = 1.00e-04;
       model_dry_tropo_corr:coordinates = "lon lat";
       model_dry_tropo_corr: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 Jason-2
User Handbook";

    short rad_wet_tropo_corr(time);
       rad_wet_tropo_corr:long_name = "radiometer wet tropospheric correction";
       rad_wet_tropo_corr:standard_name =
"altimeter_range_correction_due_to_wet_troposphere";
       rad_wet_tropo_corr:source = [radiometer_sensor_name];
       rad_wet_tropo_corr:institution = [radiometer_sensor_institution];
       rad_wet_tropo_corr:_FillValue = 32767s;
       rad_wet_tropo_corr:units = "m";
       rad_wet_tropo_corr:scale_factor = 1.00e-04;
       rad_wet_tropo_corr:coordinates = "lon lat";
       rad_wet_tropo_corr: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";

    short iono_corr_alt_ku(time);
       iono_corr_alt_ku:long_name = "altimeter ionospheric correction on Ku band";
       iono_corr_alt_ku:standard_name = "altimeter_range_correction_due_to_ionosphere";
       iono_corr_alt_ku:source = [altimeter_sensor_name];
       iono_corr_alt_ku:institution = [altimeter_sensor_institution];
       iono_corr_alt_ku:_FillValue = 32767s;
       iono_corr_alt_ku:units = "m";
       iono_corr_alt_ku:scale_factor = 1.00e-04;
       iono_corr_alt_ku:coordinates = "lon lat";
       iono_corr_alt_ku: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 Jason-2 User Handbook";

    short sea_state_bias_ku(time);
       sea_state_bias_ku:long_name = "sea state bias correction in Ku band";
       sea_state_bias_ku:standard_name =
"sea_surface_height_bias_due_to_sea_surface_roughness";
       sea_state_bias_ku:source = [altimeter_ssb_source];
```

```
      sea_state_bias_ku:institution = [altimeter_ssb_institution];
      sea_state_bias_ku:_FillValue = 32767s;
      sea_state_bias_ku:units = "m";
      sea_state_bias_ku:scale_factor = 1.00e-04;
      sea_state_bias_ku:coordinates = "lon lat";
      sea_state_bias_ku:comment = "A sea state bias correction must be added (negative
value) to the instrument range to correct this range measurement for sea state delays of
the radar pulse. This element should not be used over land. See Jason-2 User Handbook";
```

// Significant waveheight

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

// Backscatter coefficient

```
   short sig0_ku(time);
      sig0_ku:long_name = "Ku band corrected backscatter coefficient ";
      sig0_ku:standard_name = "surface_backwards_scattering_coefficient_of_radar_wave";
      sig0_ku:_FillValue = 32767s;
      sig0_ku:units = "dB";
      sig0_ku:scale_factor = 1.00e-02;
      sig0_ku:coordinates = "lon lat";
      sig0_ku:comment = "All instrumental corrections included, excepted the system
bias, i.e. AGC instrumental errors correction, internal calibration correction
(internal_corr_sig0_ku), modeled instrumental errors correction
(modeled_instr_corr_sig0_ku) and atmospheric attenuation (atmos_corr_sig0_ku). See Jason-
2 User Handbook"
```

// Geophysical parameters

```
   int mean_sea_surface(time);
      mean_sea_surface:long_name = "mean sea surface height above reference ellipsoid ";
      mean_sea_surface:source = [mean_sea_surface_source];
      mean_sea_surface:institution = [mean_sea_surface_institution];
      mean_sea_surface:_FillValue = 2147483647;
      mean_sea_surface:units = "m";
      mean_sea_surface:scale_factor = 1.00e-04;
      mean_sea_surface:coordinates = "lon lat";
      mean_sea_surface:comment = "See Jason-2 User Handbook";

   int mean_topography(time);
      mean_topography:long_name = "mean dynamic topography above geoid ";
      mean_topography:source = [mdt_source];
      mean_topography:institution = [mdt_institution];
      mean_topography:_FillValue = 2147483647;
      mean_topography:units = "m";
      mean_topography:scale_factor = 1.00e-04;
      mean_topography:coordinates = "lon lat";
      mean_topography:comment = "See Jason-2 User Handbook";

   int bathymetry(time);
      bathymetry:long_name = "ocean depth/land elevation";
      bathymetry:source = [bathy_topo_source];
      bathymetry:institution = [bathy_topo_institution];
      bathymetry:_FillValue = 2147483647;
```

```
      bathymetry:units = "m";
      bathymetry:coordinates = "lon lat";

    short inv_bar_corr(time);
      inv_bar_corr:long_name = "inverted barometer height correction";
      inv_bar_corr:standard_name =
"sea_surface_height_correction_due_to_air_pressure_at_low_frequency";
      inv_bar_corr:source = [mto_fields_source];
      inv_bar_corr:institution = [mto_fields_institution];
      inv_bar_corr:_FillValue = 32767s;
      inv_bar_corr:units = "m";
      inv_bar_corr:scale_factor = 1.00e-04;
      inv_bar_corr:coordinates = "lon lat";
      inv_bar_corr:comment = "Computed at the altimeter time-tag from the interpolation
of 2 meteorological fields that surround the altimeter time-tag. See Jason-2 User
Handbook";

    short hf_fluctuations_corr(time);
      hf_fluctuations_corr:long_name = "high frequency fluctuations of the sea surface
topography";
      hf_fluctuations_corr:standard_name =
"sea_surface_height_correction_due_to_air_pressure_and_wind_at_high_frequency";
      hf_fluctuations_corr:source = [GA_MOG2D_VER];
      hf_fluctuations_corr:institution = [mog2d_institution];
      hf_fluctuations_corr:_FillValue = 32767s;
      hf_fluctuations_corr:units = "m";
      hf_fluctuations_corr:scale_factor = 1.00e-04;
      hf_fluctuations_corr:coordinates = "lon lat";
      hf_fluctuations_corr:comment = "Provided as a correction to the inverted barometer
correction (inv_bar_corr)";

    int ocean_tide_sol1(time);
      ocean_tide_sol1:long_name = "geocentric ocean tide height (solution 1)";
      ocean_tide_sol1:standard_name =
"sea_surface_height_amplitude_due_to_geocentric_ocean_tide";
      ocean_tide_sol1:source = [ocean_tide_sol1_source];
      ocean_tide_sol1:institution = [ocean_tide_sol1_institution];
      ocean_tide_sol1:_FillValue = 2147483647;
      ocean_tide_sol1:units = "m";
      ocean_tide_sol1:scale_factor = 1.00e-04;
      ocean_tide_sol1:coordinates = "lon lat";
      ocean_tide_sol1:comment = "Solution 1 corresponds to GOT00.2 model. Includes the
corresponding loading tide (load_tide_sol1) and equilibrium long-period ocean tide height
(ocean_tide_equil). 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). See
Jason-2 User Handbook ";

    short solid_earth_tide(time);
      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:institution = [solid_earth_tide_institution];
      solid_earth_tide:_FillValue = 32767s;
      solid_earth_tide:units = "m";
      solid_earth_tide:scale_factor = 1.00e-04;
      solid_earth_tide:coordinates = "lon lat";
      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 Jason-2 User Handbook";

    short pole_tide(time);
      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:institution = [pole_tide_institution];
```

```
      pole_tide:_FillValue = 32767s;
      pole_tide:units = "m";
      pole_tide:scale_factor = 1.00e-04;
      pole_tide:coordinates = "lon lat";
      pole_tide:comment = "See Jason-2 User Handbook";
```

// Environmental parameters

```
    short wind_speed_alt(time);
      wind_speed_alt:long_name = "altimeter wind speed";
      wind_speed_alt:standard_name = "wind_speed";
      wind_speed_alt:_FillValue = 32767s;
      wind_speed_alt:units = "m/s";
      wind_speed_alt:scale_factor = 1.00e-02;
      wind_speed_alt:coordinates = "lon lat";
      wind_speed_alt:comment = "Should not be used over land. See Jason-2 User
Handbook";

    short rad_water_vapor(time);
      rad_water_vapor:long_name = "radiometer water vapor content";
      rad_water_vapor:standard_name = "atmosphere_water_vapor_content";
      rad_water_vapor:source = [radiometer_sensor_name];
      rad_water_vapor:institution = [radiometer_sensor_institution];
      rad_water_vapor:_FillValue = 32767s;
      rad_water_vapor:units = " kg/m^2";
      rad_water_vapor:scale_factor = 1.00e-01;
      rad_water_vapor:coordinates = "lon lat";
      rad_water_vapor:comment = "Should not be used over land";

    short rad_liquid_water(time);
      rad_liquid_water:long_name = "radiometer liquid water content";
      rad_liquid_water:standard_name = "atmosphere_cloud_liquid_water_content";
      rad_liquid_water:source = [radiometer_sensor_name];
      rad_liquid_water:institution = [radiometer_sensor_institution];
      rad_liquid_water:_FillValue = 32767s;
      rad_liquid_water:units = "kg/m^2";
      rad_liquid_water:scale_factor = 1.00e-02;
      rad_liquid_water:coordinates = "lon lat";
      rad_liquid_water:comment = "Should not be used over land";
```

// Sea Surface height

```
    short ssha(time);
      ssha:long_name = "sea surface height anomaly";
      ssha:standard_name = "sea_surface_height_above_sea_level";
      ssha:source = [altimeter_sensor_name];
      ssha:institution = [altimeter_sensor_institution];
      ssha:_FillValue = 32767s;
      ssha:units = "m";
      ssha:scale_factor = 1.00e-03;
      ssha:coordinates = "lon lat";
      ssha:comment = "= altitude of satellite (alt) - Ku band corrected altimeter range
(range_ku) - altimeter ionospheric correction on Ku band (iono_cor_alt_ku) - model dry
tropospheric correction (model_dry_tropo_corr) - radiometer wet tropospheric correction
(rad_wet_tropo_corr) - sea state bias correction in Ku band (sea_state_bias_ku) - solid
earth tide height (solid_earth_tide) - geocentric ocean tide height solution 1
(ocean_tide_sol1) - geocentric pole tide height (pole_tide) - inverted barometer height
correction (inv_bar_corr) - high frequency fluctuations of the sea surface topography
(hf_fluctuations_corr for I/GDR off line products only) - mean sea surface";

}
```

5. GDR DATA SET

```
netcdf gdr {
  dimensions:
    time = < number of measurements >;
    meas_ind = 20;

  variables:
```

// Time Tag

```
double time(time);
       time:long_name = «time (sec. since 2000-01-01)»;
       time:standard_name = "time";
       time:units = "seconds since 2000-01-01 00:00:00.0";
       time:calendar = "gregorian";
       time:tai_utc_difference = [GA_TAI_UTC_DIF];
       time:leap_second = [GA_LEAP_TIME];
       time:comment = " "tai_utc_difference" is the difference between TAI and UTC
reference time (seconds) for the first measurement of the data set. "leap_second" is the
UTC time at which a leap second occurs in the data set, if any. After this UTC time, the
tai_utc_difference is increased by 1 second. "

byte meas_ind(meas_ind);
       meas_ind:long_name = "elementary measurement index";
       meas_ind:units = "count";
        meas_ind:comment = "Set to be compliant with the CF-1.1 convention";

double time_20hz(time,meas_ind);
       time_20hz:long_name = "time 20 Hz (sec. since 2000-01-01)";";
       time_20hz:standard_name = "time";
       time_20hz:_FillValue = 18446744073709551616.000000;
       time_20hz:units = "seconds since 2000-01-01 00:00:00.0";
       time_20hz:calendar = "gregorian";
       time:tai_utc_difference = [GA_TAI_UTC_DIF];
       time:leap_second = [GA_LEAP_TIME];
       time:comment = " "tai_utc_difference" is the difference between TAI and UTC
reference time (seconds) for the first measurement of the data set. "leap_second" is the
UTC time at which a leap second occurs in the data set, if any. After this UTC time, the
tai_utc_difference is increased by 1 second. "
```

// Location and surface type

```
int lat(time);
       lat:long_name = "latitude";
       lat:standard_name = "latitude";
       lat:units = "degrees_north";
       lat:scale_factor = 1.00e-06;
       lat:quality_flag = "orb_state_flag_rest";
       lat:comment = "Positive latitude is North latitude, negative latitude is South
latitude. See Jason-2 User Handbook";

int lon(time);
       lon:long_name = "longitude";
       lon:standard_name = "longitude";
       lon:units = "degrees_east";
       lon:scale_factor = 1.00e-06;
       lon:quality_flag = "orb_state_flag_rest";
```

```
      lon:comment = "East longitude relative to Greenwich meridian. See Jason-2 User
Handbook";

int lon_20hz(time,meas_ind);
      lon_20hz:long_name = "20 Hz longitude";
      lon_20hz:standard_name = "longitude";
      lon_20hz:_FillValue = 2147483647;
      lon_20hz:units = "degrees_east";
      lon_20hz:scale_factor = 1.00e-06;
      lon_20hz:comment = "East longitude relative to Greenwich meridian. See Jason-2
User Handbook";

int lat_20hz(time,meas_ind);
      lat_20hz:long_name = "20 Hz latitude";
      lat_20hz:standard_name = "latitude";
      lat_20hz:_FillValue = 2147483647;
      lat_20hz:units = "degrees_north";
      lat_20hz:scale_factor = 1.00e-06;
      lat_20hz:comment = "Positive latitude is North latitude, negative latitude is
South latitude. See Jason-2 User Handbook";

byte surface_type(time);
      surface_type:long_name = "surface type";
      surface_type:_FillValue = 127b;
      surface_type:flag_values = 0b, 1b, 2b, 3b ;
      surface_type:flag_meanings = "ocean lake_enclosed_sea ice land";
      surface_type:coordinates = "lon lat";
      surface_type:comment = "Computed using a DTM2000 file: 0 = open oceans or semi-
enclosed seas; 1 = enclosed seas or lakes; 2 = continental ice; 3 = land. See Jason-2
User Handbook";

byte alt_echo_type(time);
      alt_echo_type:long_name = "altimeter echo type";
      alt_echo_type:_FillValue = 127b;
      alt_echo_type:flag_values = 0b, 1b;
      alt_echo_type:flag_meanings = "ocean_like non_ocean_like";
      alt_echo_type:coordinates = "lon lat";
      alt_echo_type:comment = "The altimeter echo type is determined by testing the rms
of the high rate range measurements against a threshold as well as the number of valid
high rate range measurements against a minimum value";

byte rad_surf_type(time);
      rad_surf_type:long_name = "radiometer surface type";
      rad_surf_type:_FillValue = 127b;
      rad_surf_type:flag_values = 0b, 1b;
      rad_surf_type:flag_meanings = "ocean land";
      rad_surf_type:coordinates = "lon lat";
```

// Quality information and sensor status

// Quality flags for 1Hz altimeter data

```
byte qual_alt_1hz_range_ku(time);
      qual_alt_1hz_range_ku:long_name = "quality flag for 1 Hz altimeter data: Ku band
range";
      qual_alt_1hz_range_ku:_FillValue = 127b;
      qual_alt_1hz_range_ku:flag_values = 0b, 1b;
      qual_alt_1hz_range_ku:flag_meanings = "Good   Bad";
      qual_alt_1hz_range_ku:coordinates = "lon lat";

byte qual_alt_1hz_range_c(time);
      qual_alt_1hz_range_c:long_name = "quality flag for 1 Hz altimeter data: C band
range";
      qual_alt_1hz_range_c:_FillValue = 127b;
```

```
        qual_alt_1hz_range_c:flag_values = 0b, 1b;
        qual_alt_1hz_range_c:flag_meanings = "Good   Bad";
        qual_alt_1hz_range_c:coordinates = "lon lat";

byte qual_alt_1hz_swh_ku(time);
        qual_alt_1hz_swh_ku:long_name = "quality flag for 1 Hz altimeter data: Ku band
SWH";
        qual_alt_1hz_swh_ku:_FillValue = 127b;
        qual_alt_1hz_swh_ku:flag_values = 0b, 1b;
        qual_alt_1hz_swh_ku:flag_meanings = "Good   Bad";
        qual_alt_1hz_swh_ku:coordinates = "lon lat";

byte qual_alt_1hz_swh_c(time);
        qual_alt_1hz_swh_c:long_name = "quality flag for 1 Hz altimeter data: C band SWH";
        qual_alt_1hz_swh_c:_FillValue = 127b;
        qual_alt_1hz_swh_c:flag_values = 0b, 1b;
        qual_alt_1hz_swh_c:flag_meanings = "Good   Bad";
        qual_alt_1hz_swh_c:coordinates = "lon lat";

byte qual_alt_1hz_sig0_ku(time);
        qual_alt_1hz_sig0_ku:long_name = "quality flag for 1 Hz altimeter data: Ku band
backscatter coefficient";
        qual_alt_1hz_sig0_ku:_FillValue = 127b;
        qual_alt_1hz_sig0_ku:flag_values = 0b, 1b;
        qual_alt_1hz_sig0_ku:flag_meanings = "Good   Bad";
        qual_alt_1hz_sig0_ku:coordinates = "lon lat";

byte qual_alt_1hz_sig0_c(time);
        qual_alt_1hz_sig0_c:long_name = "quality flag for 1 Hz altimeter data: C band
backscatter coefficient";
        qual_alt_1hz_sig0_c:_FillValue = 127b;
        qual_alt_1hz_sig0_c:flag_values = 0b, 1b;
        qual_alt_1hz_sig0_c:flag_meanings = "Good   Bad";
        qual_alt_1hz_sig0_c:coordinates = "lon lat";

byte qual_alt_1hz_off_nadir_angle_wf_ku(time);
        qual_alt_1hz_off_nadir_angle_wf_ku:long_name = "quality flag for 1 Hz altimeter
        data: off nadir angle from Ku band";
        qual_alt_1hz_off_nadir_angle_wf_ku:_FillValue = 127b;
        qual_alt_1hz_off_nadir_angle_wf_ku:flag_values = 0b, 1b;
        qual_alt_1hz_off_nadir_angle_wf_ku:flag_meanings = "Good   Bad";
        qual_alt_1hz_off_nadir_angle_wf_ku:coordinates = "lon lat";

byte qual_alt_1hz_off_nadir_angle_pf(time);
        qual_alt_1hz_off_nadir_angle_pf:long_name = "quality flag for 1 Hz altimeter data:
off nadir angle from platform";
        qual_alt_1hz_off_nadir_angle_pf:_FillValue = 127b;
        qual_alt_1hz_off_nadir_angle_pf:flag_values = 0b, 1b;
        qual_alt_1hz_off_nadir_angle_pf:flag_meanings = "Good   Bad";
        qual_alt_1hz_off_nadir_angle_pf:coordinates = "lon lat";

        // Quality flags for 1 Hz altimeter instrumental corrections

byte qual_inst_corr_1hz_range_ku(time);
        qual_inst_corr_1hz_range_ku:long_name = "quality flag for 1 Hz instrumental
correction: Ku band range";
        qual_inst_corr_1hz_range_ku:_FillValue = 127b;
        qual_inst_corr_1hz_range_ku:flag_values = 0b, 1b;
        qual_inst_corr_1hz_range_ku:flag_meanings = "Good   Bad";
        qual_inst_corr_1hz_range_ku:coordinates = "lon lat";

byte qual_inst_corr_1hz_range_c(time);
```

```
      qual_inst_corr_1hz_range_c:long_name = "quality flag for 1 Hz instrumental
correction: C band range";
      qual_inst_corr_1hz_range_c:_FillValue = 127b;
      qual_inst_corr_1hz_range_c:flag_values = 0b, 1b;
      qual_inst_corr_1hz_range_c:flag_meanings = "Good   Bad";
      qual_inst_corr_1hz_range_c:coordinates = "lon lat";

byte qual_inst_corr_1hz_swh_ku(time);
      qual_inst_corr_1hz_swh_ku:long_name = "quality flag for 1 Hz instrumental
correction: Ku band SWH";
      qual_inst_corr_1hz_swh_ku:_FillValue = 127b;
      qual_inst_corr_1hz_swh_ku:flag_values = 0b, 1b;
      qual_inst_corr_1hz_swh_ku:flag_meanings = "Good   Bad";
      qual_inst_corr_1hz_swh_ku:coordinates = "lon lat";

byte qual_inst_corr_1hz_swh_c(time);
      qual_inst_corr_1hz_swh_c:long_name = "quality flag for 1 Hz instrumental
correction: C band SWH";
      qual_inst_corr_1hz_swh_c:_FillValue = 127b;
      qual_inst_corr_1hz_swh_c:flag_values = 0b, 1b;
      qual_inst_corr_1hz_swh_c:flag_meanings = "Good   Bad";
      qual_inst_corr_1hz_swh_c:coordinates = "lon lat";

byte qual_inst_corr_1hz_sig0_ku(time);
      qual_inst_corr_1hz_sig0_ku:long_name = "quality flag for 1 Hz instrumental
correction: Ku band backscatter coefficient";
      qual_inst_corr_1hz_sig0_ku:_FillValue = 127b;
      qual_inst_corr_1hz_sig0_ku:flag_values = 0b, 1b;
      qual_inst_corr_1hz_sig0_ku:flag_meanings = "Good   Bad";
      qual_inst_corr_1hz_sig0_ku:coordinates = "lon lat";

byte qual_inst_corr_1hz_sig0_c(time);
      qual_inst_corr_1hz_sig0_c:long_name = "quality flag for 1 Hz instrumental
correction: C band backscatter coefficient";
      qual_inst_corr_1hz_sig0_c:_FillValue = 127b;
      qual_inst_corr_1hz_sig0_c:flag_values = 0b, 1b;
      qual_inst_corr_1hz_sig0_c:flag_meanings = "Good   Bad";
      qual_inst_corr_1hz_sig0_c:coordinates = "lon lat";

      // Quality flags for 1 Hz radiometer data

byte qual_rad_1hz_tb187(time);
      qual_rad_1hz_tb187:long_name = "quality flag for 1 Hz radiometer data: 18.7 GHz
brightness temperature";
      qual_rad_1hz_tb187:_FillValue = 127b;
      qual_rad_1hz_tb187:flag_values = 0b, 1b;
      qual_rad_1hz_tb187:flag_meanings = "Good   Bad";
      qual_rad_1hz_tb187:coordinates = "lon lat";

byte qual_rad_1hz_tb238(time);
      qual_rad_1hz_tb238:long_name = "quality flag for 1 Hz radiometer data: 23.8 GHz
brightness temperature";
      qual_rad_1hz_tb238:_FillValue = 127b;
      qual_rad_1hz_tb238:flag_values = 0b, 1b;
      qual_rad_1hz_tb238:flag_meanings = "Good   Bad";
      qual_rad_1hz_tb238:coordinates = "lon lat";

byte qual_rad_1hz_tb340(time);
      qual_rad_1hz_tb340:long_name = "quality flag for 1 Hz radiometer data: 34 GHz
brightness temperature";
      qual_rad_1hz_tb340:_FillValue = 127b;
      qual_rad_1hz_tb340:flag_values = 0b, 1b;
      qual_rad_1hz_tb340:flag_meanings = "Good   Bad";
```

```
        qual_rad_1hz_tb340:coordinates = "lon lat";

        // Altimeter state flags

byte alt_state_flag_oper(time);
        alt_state_flag_oper:long_name = "altimeter state flag: altimeter operating";
        alt_state_flag_oper:_FillValue = 127b;
        alt_state_flag_oper:flag_values = 0b, 1b;
        alt_state_flag_oper:flag_meanings = "SideA   SideB";
        alt_state_flag_oper:coordinates = "lon lat";
        alt_state_flag_oper:comment = "Side A = nominal; Side B = redondancy";

byte alt_state_flag_c_band(time);
        alt_state_flag_c_band:long_name = "altimeter state flag: C bandwidth used";
        alt_state_flag_c_band:_FillValue = 127b;
        alt_state_flag_c_band:flag_values = 0b, 1b;
        alt_state_flag_c_band:flag_meanings = "320MHz 100MHz";
        alt_state_flag_c_band:coordinates = "lon lat";

byte alt_state_flag_band_seq(time);
        alt_state_flag_band_seq:long_name = "altimeter state flag: Ku/C band sequencing";
        alt_state_flag_band_seq:_FillValue = 127b;
        alt_state_flag_band_seq:flag_values = 0b, 1b;
        alt_state_flag_band_seq:flag_meanings = "3Ku_1C_3Ku 2Ku_1C_2Ku";
        alt_state_flag_band_seq:coordinates = "lon lat";

byte alt_state_flag_ku_band_status(time);
        alt_state_flag_ku_band_status:long_name = "altimeter state flag: Ku band status";
        alt_state_flag_ku_band_status:_FillValue = 127b;
        alt_state_flag_ku_band_status:flag_values = 0b, 1b;
        alt_state_flag_ku_band_status:flag_meanings = "On Off";
        alt_state_flag_ku_band_status:coordinates = "lon lat";

byte alt_state_flag_c_band_status(time);
        alt_state_flag_c_band_status:long_name = "altimeter state flag: C band status";
        alt_state_flag_c_band_status:_FillValue = 127b;
        alt_state_flag_c_band_status:flag_values = 0b, 1b;
        alt_state_flag_c_band_status:flag_meanings = "On Off";
        alt_state_flag_c_band_status:coordinates = "lon lat";

byte alt_state_flag_acq_mode_20hz (time,meas_ind);
        alt_state_flag_acq_mode_20hz:long_name = "20 Hz altimeter state flag: acquisition
mode";
        alt_state_flag_acq_mode_20hz:_FillValue = 127b;
        alt_state_flag_acq_mode_20hz:flag_values = 0b, 1b, 2b;
        alt_state_flag_acq_mode_20hz:flag_meanings = «autonomous_acq/track
autonomous_DIODEacq/track DIODE+DEM/track ";
        alt_state_flag_acq_mode_20hz:coordinates = "lon_20Hz lat_20Hz";
        alt_state_flag_acq_mode_20hz:comment = "0 = autonomous acquisition / tracking, 1 =
autonomous DIODE acquisition / tracking, 2 = DIODE + Digital Elevation Model tracking";

byte alt_state_flag_tracking_mode_20hz(time,meas_ind);
        alt_state_flag_tracking_mode_20hz:long_name = "20 Hz altimeter state flag:
tracking mode";
        alt_state_flag_tracking_mode_20hz:_FillValue = 127b;
        alt_state_flag_tracking_mode_20hz:flag_values = 0b, 1b;
        alt_state_flag_tracking_mode_20hz:flag_meanings = «split-gate_tracking
median_tracking";
        alt_state_flag_tracking_mode_20hz:coordinates = "lon_20Hz lat_20Hz";
        alt_state_flag_tracking_mode_20hz:comment = "0 = split-gate tracking, 1 = median
tracking";

        // Radiometer state flag
```

```
byte rad_state_flag_oper(time);
       rad_state_flag_oper:long_name = "radiometer state flag: radiometer operating";
       rad_state_flag_oper:_FillValue = 127b;
       rad_state_flag_oper:flag_values = 0b, 1b;
       rad_state_flag_oper:flag_meanings = "SideA   SideB";
       rad_state_flag_oper:coordinates = "lon lat";
       rad_state_flag_oper:comment = "Side A = nominal; Side B = redondancy";
```

// Orbit state flags

```
byte orb_state_flag_diode(time);
       orb_state_flag_diode:long_name = "orbit state flag:  DIODE on board software";
       orb_state_flag_diode:_FillValue = 127b;
       orb_state_flag_diode:flag_values = 0b, 1b, 2b, 3b, 4b, 5b, 6b, 7b, 8b, 9b ;
       orb_state_flag_diode:flag_meanings = "E<0,30> E<30,60> E<60,90> E<90,120>
E<120,150> E<150,180> E<180,210> E<210,240> E<240,270> E>270";
       orb_state_flag_diode:coordinates = "lon lat";
       orb_state_flag_diode:comment = "E= Three dimensional error estimate of the
navigator orbit range (cm)";

byte orb_state_flag_rest(time);
       orb_state_flag_rest:long_name = «orbit state flag: restituted orbit";
       orb_state_flag_rest:_FillValue = 127b;
       orb_state_flag_rest:flag_values = 0b, 1b,  2b, 3b, 4b, 5b, 6b, 7b, 8b, 9b ;
       orb_state_flag_rest: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_flag_rest:coordinates = "lon lat";
orb_state_flag_rest: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 ecmwf_meteo_map_avail(time);
       ecmwf_meteo_map_avail:long_name = "ECMWF meteorological map availability";
       ecmwf_meteo_map_avail:_FillValue = 127b;
       ecmwf_meteo_map_avail:flag_values = 0b, 1b, 2b, 3b ;
       ecmwf_meteo_map_avail:flag_meanings = "2_maps_nominal 2_maps_degraded
1_map_extropolated no_map";
       ecmwf_meteo_map_avail:coordinates = "lon lat";
       ecmwf_meteo_map_avail: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, extrapolation used", 3 meaning "no map". Given the latest definition of the
meteorological field processing algorithms, this flag will always be set to 0.";

byte rain_flag(time);
       rain_flag:long_name = "rain flag";
       rain_flag:_FillValue = 127b;
       rain_flag:flag_values = 0b, 1b;
       rain_flag:flag_meanings = "no_rain rain";
       rain_flag:coordinates = "lon lat";
       rain_flag:comment = "See Jason-2 User Handbook";
```

```
byte ice_flag(time);
       ice_flag:long_name = "ice flag";
       ice_flag:_FillValue = 127b;
       ice_flag:flag_values = 0b, 1b;
       ice_flag:flag_meanings = "no_ice ice";
       ice_flag:coordinates = "lon lat";
       ice_flag:comment = «See Jason-2 User Handbook ";
```

// Quality flags for interpolation

```
byte interp_flag_tb(time);
       interp_flag_tb:long_name = "radiometer brightness temperatures interpolation
flag";
       interp_flag_tb:_FillValue = 127b;
       interp_flag_tb:flag_values = 0b, 1b, 2b, 3b;
       interp_flag_tb:flag_meanings = "good interpolation_with_gap extrapolation fail";
       interp_flag_tb:coordinates = "lon lat";
       interp_flag_tb:comment = "Possible values are: 0 = interpolation without gap
between AMR data, 1 = interpolation with gap between AMR data, 2 = extrapolation of AMR
data, 3 = failure of extrapolation and interpolation";

byte interp_flag_mean_sea_surface(time);
       interp_flag_mean_sea_surface:long_name = "mean_sea_surface interpolation flag";
       interp_flag_mean_sea_surface:_FillValue = 127b;
       interp_flag_mean_sea_surface:flag_values = 0b, 1b;
       interp_flag_mean_sea_surface:flag_meanings = "Good Bad";
       interp_flag_mean_sea_surface:coordinates = "lon lat";

byte interp_flag_mdt(time);
       interp_flag_mdt:long_name = "MDT interpolation flag";
       interp_flag_mdt:_FillValue = 127b;
       interp_flag_mdt:flag_values = 0b, 1b;
       interp_flag_mdt:flag_meanings = "Good Bad";
       interp_flag_mdt:coordinates = "lon lat";

byte interp_flag_ocean_tide_sol1(time);
       interp_flag_ocean_tide_sol1:long_name = "ocean tide solution 1 interpolation
flag";
       interp_flag_ocean_tide_sol1:_FillValue = 127b;
       interp_flag_ocean_tide_sol1:flag_values = 0b, 1b;
       interp_flag_ocean_tide_sol1:flag_meanings = "Good Bad";
       interp_flag_ocean_tide_sol1:coordinates = "lon lat";
       interp_flag_ocean_tide_sol1:comment = "0 = 4 points over ocean; 1 = less than 4
points";

byte interp_flag_ocean_tide_sol2(time);
       interp_flag_ocean_tide_sol2:long_name = "ocean tide solution 2 interpolation
flag";
       interp_flag_ocean_tide_sol2:_FillValue = 127b;
       interp_flag_ocean_tide_sol2:flag_values = 0b, 1b;
       interp_flag_ocean_tide_sol2:flag_meanings = "Good Bad";
       interp_flag_ocean_tide_sol2:coordinates = "lon lat";
       interp_flag_ocean_tide_sol2:comment = "0 = 4 points over ocean; 1 = less than 4
points";

byte interp_flag_meteo(time);
       interp_flag_meteo   :long_name = "meteorological data interpolation flag";
       interp_flag_meteo   :_FillValue = 127b;
       interp_flag_meteo   :flag_values = 0b, 1b;
       interp_flag_meteo   :flag_meanings = "Good Bad";
       interp_flag_meteo   :coordinates = "lon lat";
```

// Orbit

```
int alt(time);
       alt:long_name = "1 Hz altitude of satellite";
       alt: standard_name = "height_above_reference_ellipsoid";
       alt:_FillValue = 2147483647;
       alt:units = "m";
       alt:add_offset = 1.300000e+06;
       alt:scale_factor = 1.00e-04;
       alt:coordinates = "lon lat";
       alt:quality_flag = "orb_state_flag_rest";
       alt:comment = "Altitude of satellite above the reference ellipsoid";

int alt_20hz(time,meas_ind);
       alt_20hz:long_name = "20 Hz altitude of satellite";
       alt_20hz: standard_name = "height_above_reference_ellipsoid";
       alt_20hz:_FillValue = 2147483647;
       alt_20hz:units = "m";
       alt_20hz:add_offset = 1.300000e+06;
       alt_20hz:scale_factor = 1.00e-04;
       alt_20hz:coordinates = "lon_20Hz lat_20Hz";
       alt:comment = "Altitude of satellite above the reference ellipsoid";

short orb_alt_rate(time);
       orb_alt_rate:long_name = "1 Hz orbital altitude rate";
       orb_alt_rate:_FillValue = 32767s;
       orb_alt_rate:units = "m/s";
       orb_alt_rate:scale_factor = 1.00e-02;
       orb_alt_rate:coordinates = "lon lat";
       orb_alt_rate:comment = "The reference surface for the orbital altitude rate is the
combined mean_sea_surface/geoid surface. It is used to compute the Doppler correction on
the altimeter range (doppler_corr_ku, doppler_corr_c)";
```

// Altimeter range

```
int range_ku(time);
       range_ku:long_name = "1 Hz Ku band corrected altimeter range";
       range_ku:standard_name = "altimeter_range”;
range_ku:_FillValue = 2147483647;
       range_ku:units = "m";
       range_ku:add_offset = 1.300000e+06;
       range_ku:scale_factor = 1.00e-04;
       range_ku:coordinates = "lon lat";
       range_ku:quality_flag = "qual_alt_1hz_range_ku";
       range_ku:comment = "All instrumental corrections included, i.e. distance antenna-
COG (cog_corr), USO drift correction (uso_corr), internal path correction
(internal_path_delay_corr_ku), Doppler correction (doppler_corr_ku), modeled instrumental
errors correction (modeled_instr_corr_range_ku) and system bias";

int range_20hz_ku(time,meas_ind);
       range_20hz_ku:long_name = "20 Hz Ku band corrected altimeter range";
       range_20hz_ku:standard_name = "altimeter_range”;
       range_20hz_ku:_FillValue = 2147483647;
       range_20hz_ku:units = "m";
       range_20hz_ku:add_offset = 1.300000e+06;
       range_20hz_ku:scale_factor = 1.00e-04;
       range_20hz_ku:coordinates = "lon_20Hz lat_20Hz";
       range_20hz_ku:comment = "All instrumental corrections included, i.e. distance
antenna-COG (cog_corr), USO drift correction (uso_corr), internal path correction
(internal_path_delay_corr_ku), Doppler correction (doppler_corr_ku), modeled instrumental
errors correction (modeled_instr_corr_range_ku) and system bias";
```

```
int range_c(time);
       range_c:long_name = "1 Hz C band corrected altimeter range";
       range_c:standard_name = "altimeter_range";
       range_c:_FillValue = 2147483647;
       range_c:units = "m";
       range_c:add_offset = 1.300000e+06;
       range_c:scale_factor = 1.00e-04;
       range_c:coordinates = "lon lat";
       range_c:quality_flag = "qual_alt_1hz_range_c";
       range_c:comment = "All instrumental corrections included, i.e. distance antenna-
       COG (cog_corr), USO drift correction (uso_corr), internal path correction
       (internal_path_delay_corr_c), Doppler correction (doppler_corr_c), modeled
       instrumental errors correction (modeled_instr_corr_range_c) and system bias";

int range_20hz_c(time,meas_ind);
       range_20hz_c:long_name = "20 Hz C band corrected altimeter range";
       range_20hz_c:standard_name = "altimeter_range";
       range_20hz_c:_FillValue = 2147483647;
       range_20hz_c:units = "m";
       range_20hz_c:add_offset = 1.300000e+06;
       range_20hz_c:scale_factor = 1.00e-04;
       range_20hz_c:coordinates = "lon_20Hz lat_20Hz";
       range_20hz_c:comment = "All instrumental corrections included, i.e. distance
antenna-COG (cog_corr), USO drift correction (uso_corr), internal path correction
(internal_path_delay_corr_c), Doppler correction (doppler_corr_c), modeled instrumental
errors correction (modeled_instr_corr_range_c) and system bias";

byte range_used_20hz_ku(time,meas_ind);
       range_used_20hz_ku:long_name = "20 Hz flag for utilization in the computation of
1Hz Ku band range";
       range_used_20hz_ku:_FillValue = 127b;
       range_used_20hz_ku:flag_values = 0b, 1b;
       range_used_20hz_ku:flag_meanings = "Yes No";
       range_used_20hz_ku:coordinates = "lon_20Hz lat_20Hz";
       range_used_20hz_ku:comment = "Map of valid points used to compute the 1-Hz Ku-band
altimeter range";

byte range_used_20hz_c(time,meas_ind);
       range_used_20hz_c:long_name = "20 Hz flag for utilization in the computation of
1Hz C band range";
       range_used_20hz_c:_FillValue = 127b;
       range_used_20hz_c:flag_values = 0b, 1b;
       range_used_20hz_c:flag_meanings = "Yes No";
       range_used_20hz_c:coordinates = "lon_20Hz lat_20Hz";
       range_used_20hz_c:comment = "Map of valid points used to compute the 1-Hz C-band
altimeter range";

short range_rms_ku(time);
       range_rms_ku:long_name = "RMS of the Ku band range";
       range_rms_ku:_FillValue = 32767s;
       range_rms_ku:units = "m";
       range_rms_ku:scale_factor = 1.00e-04;
       range_rms_ku:coordinates = "lon lat";
       range_rms_ku: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";

short range_rms_c(time);
       range_rms_c:long_name = "RMS of the C band range";
       range_rms_c:_FillValue = 32767s;
       range_rms_c:units = "m";
       range_rms_c:scale_factor = 1.00e-04;
       range_rms_c:coordinates = "lon lat";
       range_rms_c: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_numval_ku(time);
       range_numval_ku:long_name = "number of valid points for Ku band range";
       range_numval_ku:_FillValue = 127b;
       range_numval_ku:units = "count";
       range_numval_ku:coordinates = "lon lat";
       range_numval_ku:valid_min = 0b;
       range_numval_ku:valid_max = 20b;

byte range_numval_c(time);
       range_numval_c:long_name = "number of valid points for C band range";
       range_numval_c:_FillValue = 127b;
       range_numval_c:units = "count";
       range_numval_c:coordinates = "lon lat";
       range_numval_c:valid_min = 0b;
       range_numval_c:valid_max = 20b;
```

// Ocean retracking outputs

```
byte number_of_iterations_ku(time,meas_ind);
       number_of_iterations_ku:long_name = "20 Hz number of iterations of the ocean
retracking in Ku band";
       number_of_iterations_ku:_FillValue = 127b;
       number_of_iterations_ku:units = "count";
       number_of_iterations_ku:coordinates = "lon_20Hz lat_20Hz";

byte number_of_iterations_c(time,meas_ind);
       number_of_iterations_c:long_name = "20 Hz number of iterations of the ocean
retracking in C band";
       number_of_iterations_c:_FillValue = 127b;
       number_of_iterations_c:units = "count";
       number_of_iterations_c:coordinates = "lon_20Hz lat_20Hz";
```

// Altimeter range corrections

```
int net_instr_corr_range_ku(time);
       net_instr_corr_range_ku:long_name = "net instrumental correction on the Ku band
range";
       net_instr_corr_range_ku:_FillValue = 2147483647;
       net_instr_corr_range_ku:units = "m";
       net_instr_corr_range_ku:scale_factor = 1.00e-04;
       net_instr_corr_range_ku:coordinates = "lon lat";
       net_instr_corr_range_ku:quality_flag = "qual_inst_corr_1hz_range_ku";
       net_instr_corr_range_ku:comment = "Sum of distance antenna-COG (cog_corr), USO
drift correction (uso_corr), internal path correction (internal_path_delay_corr_ku),
Doppler correction (doppler_corr_ku), modeled instrumental errors correction
(modeled_instr_corr_range_ku) and system bias";

int net_instr_corr_range_c(time);
       net_instr_corr_range_c:long_name = "net instrumental correction on the C band
range";
       net_instr_corr_range_c:_FillValue = 2147483647;
       net_instr_corr_range_c:units = "m";
       net_instr_corr_range_c:scale_factor = 1.00e-04;
       net_instr_corr_range_c:coordinates = "lon lat";
       net_instr_corr_range_c:quality_flag = "qual_inst_corr_1hz_range_c";
       net_instr_corr_range_c:comment = "Sum of distance antenna-COG (cog_corr), USO
drift correction (uso_corr), internal path correction (internal_path_delay_corr_c),
Doppler correction (doppler_corr_c), modeled instrumental errors correction
(modeled_instr_corr_range_c) and system bias";

short model_dry_tropo_corr(time);
```

model_dry_tropo_corr:long_name = "model dry tropospheric correction";
model_dry_tropo_corr:standard_name = "altimeter_range_correction_due_to_dry_troposphere";
model_dry_tropo_corr:source = [mto_fields_source];
model_dry_tropo_corr:institution = [mto_fields_institution];
model_dry_tropo_corr:_FillValue = 32767s;
model_dry_tropo_corr:units = "m";
model_dry_tropo_corr:scale_factor = 1.00e-04;
model_dry_tropo_corr:coordinates = "lon lat";
model_dry_tropo_corr:quality_flag = "interp_flag_meteo";
model_dry_tropo_corr: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 Jason-2 User Handbook";

short model_wet_tropo_corr(time);
model_wet_tropo_corr:long_name = "model wet tropospheric correction";
model_wet_tropo_corr:standard_name = "altimeter_range_correction_due_to_wet_troposphere";
model_wet_tropo_corr:source = [mto_fields_source];
model_wet_tropo_corr:institution = [mto_fields_institution];
model_wet_tropo_corr:_FillValue = 32767s;
model_wet_tropo_corr:units = "m";
model_wet_tropo_corr:scale_factor = 1.00e-04;
model_wet_tropo_corr:coordinates = "lon lat";
model_wet_tropo_corr:quality_flag = "interp_flag_meteo";
model_wet_tropo_corr: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 Jason-2 User Handbook";

short rad_wet_tropo_corr(time);
rad_wet_tropo_corr:long_name = "radiometer wet tropospheric correction";
rad_wet_tropo_corr:standard_name = "altimeter_range_correction_due_to_wet_troposphere";
rad_wet_tropo_corr:source = [radiometer_sensor_name];
rad_wet_tropo_corr:institution = [radiometer_sensor_institution];
rad_wet_tropo_corr:_FillValue = 32767s;
rad_wet_tropo_corr:units = "m";
rad_wet_tropo_corr:scale_factor = 1.00e-04;
rad_wet_tropo_corr:coordinates = "lon lat";
rad_wet_tropo_corr:quality_flag = "qual_rad_1hz_tb187 and qual_rad_1hz_tb238 and qual_rad_1hz_tb340 and interp_flag_tb";
rad_wet_tropo_corr: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";

short iono_corr_alt_ku(time);
iono_corr_alt_ku:long_name = "altimeter ionospheric correction on Ku band";
iono_corr_alt_ku:standard_name = "altimeter_range_correction_due_to_ionosphere";
iono_corr_alt_ku:source = [altimeter_sensor_name];
iono_corr_alt_ku:institution = [altimeter_sensor_institution];
iono_corr_alt_ku:_FillValue = 32767s;
iono_corr_alt_ku:units = "m";
iono_corr_alt_ku:scale_factor = 1.00e-04;
iono_corr_alt_ku:coordinates = "lon lat";
iono_corr_alt_ku: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 Jason-2 User Handbook";

short iono_corr_gim_ku(time);
iono_corr_gim_ku:long_name = "GIM ionospheric correction on Ku band";
iono_corr_gim_ku:standard_name = "altimeter_range_correction_due_to_ionosphere";

```
        iono_corr_gim_ku:source = [GA_GIM_VER];
        iono_corr_gim_ku:institution = [GIM_institution];
        iono_corr_gim_ku:_FillValue = 32767s;
        iono_corr_gim_ku:units = "m";
        iono_corr_gim_ku:scale_factor = 1.00e-04;
        iono_corr_gim_ku:coordinates = "lon lat";
        iono_corr_gim_ku: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 Jason-2 User Handbook";

short sea_state_bias_ku(time);
        sea_state_bias_ku:long_name = "sea state bias correction in Ku band";
        sea_state_bias_ku:standard_name =
"sea_surface_height_bias_due_to_sea_surface_roughness";
        sea_state_bias_ku:source = [altimeter_ssb_source];
        sea_state_bias_ku:institution = [altimeter_ssb_institution];
        sea_state_bias_ku:_FillValue = 32767s;
        sea_state_bias_ku:units = "m";
        sea_state_bias_ku:scale_factor = 1.00e-04;
        sea_state_bias_ku:coordinates = "lon lat";
        sea_state_bias_ku:comment = "A sea state bias correction must be added (negative
value) to the instrument range to correct this range measurement for sea state delays of
the radar pulse. This element should not be used over land. See Jason-2 User Handbook";

short sea_state_bias_c(time);
        sea_state_bias_c:long_name = "sea state bias correction in C band";
        sea_state_bias_c:standard_name =
"sea_surface_height_bias_due_to_sea_surface_roughness";
        sea_state_bias_c:source = [altimeter_ssb_source];
        sea_state_bias_c:institution = [altimeter_ssb_institution];
        sea_state_bias_c:_FillValue = 32767s;
        sea_state_bias_c:units = "m";
        sea_state_bias_c:scale_factor = 1.00e-04;
        sea_state_bias_c:coordinates = "lon lat";
        sea_state_bias_c: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 Jason-2 User Handbook";
```

// Significant waveheight

```
short swh_ku(time);
        swh_ku:long_name = "Ku band corrected significant waveheight";
        swh_ku:standard_name = "sea_surface_wave_significant_height";
        swh_ku:_FillValue = 32767s;
        swh_ku:units = "m";
        swh_ku:scale_factor = 1.00e-03;
        swh_ku:coordinates = "lon lat";
        swh_ku:quality_flag = "qual_alt_1hz_swh_ku";
        swh_ku:comment = "All instrumental corrections included, i.e. modeled instrumental
errors correction (modeled_instr_corr_swh_ku) and system bias";

short swh_20hz_ku(time,meas_ind);
        swh_20hz_ku:long_name = "20 Hz Ku band corrected significant waveheight";
        swh_20hz_ku:standard_name = "sea_surface_wave_significant_height";
        swh_20hz_ku:_FillValue = 32767s;
        swh_20hz_ku:units = "m";
        swh_20hz_ku:scale_factor = 1.00e-03;
        swh_20hz_ku:coordinates = "lon_20Hz lat_20Hz";
        swh_20hz_ku:comment = "All instrumental corrections included, i.e. modeled
instrumental errors correction (modeled_instr_corr_swh_ku) and system bias";

short swh_c(time);
        swh_c:long_name = "C band corrected significant waveheight";
```

```
        swh_c:standard_name = "sea_surface_wave_significant_height";
        swh_c:_FillValue = 32767s;
        swh_c:units = "m";
        swh_c:scale_factor = 1.00e-03;
        swh_c:coordinates = "lon lat";
        swh_c:quality_flag = "qual_alt_1hz_swh_c";
        swh_c:comment = "All instrumental corrections included, i.e. modeled instrumental
errors correction (modeled_instr_corr_swh_c) and system bias";

short swh_20hz_c(time,meas_ind);
        swh_20hz_c:long_name = "20 Hz C band corrected significant waveheight";
        swh_20hz_c:standard_name = "sea_surface_wave_significant_height";
        swh_20hz_c:_FillValue = 32767s;
        swh_20hz_c:units = "m";
        swh_20hz_c:scale_factor = 1.00e-03;
        swh_20hz_c:coordinates = "lon_20Hz lat_20Hz";
        swh_20hz_c:comment = "All instrumental corrections included, i.e. modeled
instrumental errors correction (modeled_instr_corr_swh_c) and system bias";

byte swh_used_20hz_ku(time,meas_ind);
        swh_used_20hz_ku:long_name = "20 Hz flag for utilization in the computation of 1Hz
Ku band significant waveheight";
        swh_used_20hz_ku:_FillValue = 127b;
        swh_used_20hz_ku:flag_values = 0b, 1b;
        swh_used_20hz_ku:flag_meanings = "Yes No";
        swh_used_20hz_ku:coordinates = "lon_20Hz lat_20Hz";
        swh_used_20hz_ku:comment = "Map of valid points used to compute the 1-Hz Ku-band
significant waveheight";

byte swh_used_20hz_c(time,meas_ind);
        swh_used_20hz_c:long_name = "20 Hz flag for utilization in the computation of 1Hz
C band significant waveheight";
        swh_used_20hz_c:_FillValue = 127b;
        swh_used_20hz_c:flag_values = 0b, 1b;
        swh_used_20hz_c:flag_meanings = "Yes No";
        swh_used_20hz_c:coordinates = "lon_20Hz lat_20Hz";
        swh_used_20hz_c:comment = "Map of valid points used to compute the 1-Hz C-band
significant waveheight";

short swh_rms_ku(time);
        swh_rms_ku:long_name = "RMS of the Ku band significant waveheight";
        swh_rms_ku:_FillValue = 32767s;
        swh_rms_ku:units = "m";
        swh_rms_ku:scale_factor = 1.00e-03;
        swh_rms_ku:coordinates = "lon lat";
        swh_rms_ku: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";

short swh_rms_c(time);
        swh_rms_c:long_name = "RMS of the C band significant waveheight";
        swh_rms_c:_FillValue = 32767s;
        swh_rms_c:units = "m";
        swh_rms_c:scale_factor = 1.00e-03;
        swh_rms_c:coordinates = "lon lat";
        swh_rms_c: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_numval_ku(time);
        swh_numval_ku:long_name = "number of valid points used to compute Ku significant
waveheight";
        swh_numval_ku:_FillValue = 127b;
        swh_numval_ku:units = "count";
        swh_numval_ku:coordinates = "lon lat";
        swh_numval_ku:valid_min = 0b;
        swh_numval_ku:valid_max = 20b;
```

```
byte swh_numval_c(time);
       swh_numval_c:long_name = "number of valid points used to compute C significant
waveheight";
       swh_numval_c:_FillValue = 127b;
       swh_numval_c:units = "count";
       swh_numval_c:coordinates = "lon lat";
       swh_numval_c:valid_min = 0b;
       swh_numval_c:valid_max = 20b;
```

// Significant waveheight corrections

```
short net_instr_corr_swh_ku(time);
       net_instr_corr_swh_ku:long_name = "net instrumental correction on Ku band
significant waveheight";
       net_instr_corr_swh_ku:_FillValue = 32767s;
       net_instr_corr_swh_ku:units = "m";
       net_instr_corr_swh_ku:scale_factor = 1.00e-03;
       net_instr_corr_swh_ku:coordinates = "lon lat";
       net_instr_corr_swh_ku:quality_flag = "qual_inst_corr_1hz_swh_ku";
       net_instr_corr_swh_ku:comment = "Sum of modeled instrumental errors correction
(modeled_instr_corr_swh_ku) and system bias";

short net_instr_corr_swh_c(time);
       net_instr_corr_swh_c:long_name = "net instrumental correction on C band
significant waveheight";
       net_instr_corr_swh_c:_FillValue = 32767s;
       net_instr_corr_swh_c:units = "m";
       net_instr_corr_swh_c:scale_factor = 1.00e-03;
       net_instr_corr_swh_c:coordinates = "lon lat";
       net_instr_corr_swh_c:quality_flag = "qual_inst_corr_1hz_swh_c";
       net_instr_corr_swh_c:comment = "Sum of modeled instrumental errors correction
(modeled_instr_corr_swh_c) and system bias";
```

// Backscatter coefficient

```
short sig0_ku(time);
       sig0_ku:long_name = "Ku band corrected backscatter coefficient ";
       sig0_ku:standard_name = "surface_backwards_scattering_coefficient_of_radar_wave";
       sig0_ku:_FillValue = 32767s;
       sig0_ku:units = "dB";
       sig0_ku:scale_factor = 1.00e-02;
       sig0_ku:coordinates = "lon lat";
       sig0_ku:quality_flag = "qual_alt_1hz_sig0_ku";
       sig0_ku:comment = "All instrumental corrections included, excepted the system
bias, i.e. AGC instrumental errors correction, internal calibration correction
(internal_corr_sig0_ku), modeled instrumental errors correction
(modeled_instr_corr_sig0_ku) and atmospheric attenuation (atmos_corr_sig0_ku)";

short sig0_20hz_ku(time,meas_ind);
       sig0_20hz_ku:long_name = "20 Hz Ku band corrected backscatter coefficient ";
       sig0_20hz_ku:standard_name =
"surface_backwards_scattering_coefficient_of_radar_wave";
       sig0_20hz_ku:_FillValue = 32767s;
       sig0_20hz_ku:units = "dB";
       sig0_20hz_ku:scale_factor = 1.00e-02;
       sig0_20hz_ku:coordinates = "lon_20Hz lat_20Hz";
       sig0_20hz_ku:comment = "All instrumental corrections included, excepted the system
bias, i.e. AGC instrumental errors correction, internal calibration correction
(internal_corr_sig0_ku), modeled instrumental errors correction
(modeled_instr_corr_sig0_ku) and atmospheric attenuation (atmos_corr_sig0_ku)";
```

```
short sig0_c(time);
       sig0_c:long_name = "C band corrected backscatter coefficient ";
       sig0_c:standard_name = "surface_backwards_scattering_coefficient_of_radar_wave";
       sig0_c:_FillValue = 32767s;
       sig0_c:units = "dB";
       sig0_c:scale_factor = 1.00e-02;
       sig0_c:coordinates = "lon lat";
       sig0_c:quality_flag = "qual_alt_1hz_sig0_c";
       sig0_c:comment = "All instrumental corrections included, excepted the system bias,
i.e. AGC instrumental errors correction, internal calibration correction
(internal_corr_sig0_c), modeled instrumental errors correction
(modeled_instr_corr_sig0_c) and atmospheric attenuation (atmos_corr_sig0_c)";

short sig0_20hz_c(time,meas_ind);
       sig0_20hz_c:long_name = "20 Hz C band corrected backscatter coefficient ";
       sig0_20hz_c:standard_name =
"surface_backwards_scattering_coefficient_of_radar_wave";
       sig0_20hz_c:_FillValue = 32767s;
       sig0_20hz_c:units = "dB";
       sig0_20hz_c:scale_factor = 1.00e-02;
       sig0_20hz_c:coordinates = "lon_20Hz lat_20Hz";
       sig0_20hz_c:comment = "All instrumental corrections included, excepted the system
bias, i.e. AGC instrumental errors correction, internal calibration correction
(internal_corr_sig0_c), modeled instrumental errors correction
(modeled_instr_corr_sig0_c) and atmospheric attenuation (atmos_corr_sig0_c)";

byte sig0_used_20hz_ku(time,meas_ind);
       sig0_used_20hz_ku:long_name = "20 Hz flag for utilization in the computation of
1Hz Ku band backscatter coefficient";
       sig0_used_20hz_ku:_FillValue = 127b;
       sig0_used_20hz_ku:flag_values = 0b, 1b;
       sig0_used_20hz_ku:flag_meanings = "Yes No";
       sig0_used_20hz_ku:coordinates = "lon_20Hz lat_20Hz";
       sig0_used_20hz_ku:comment = "Map of valid points used to compute the 1-Hz Ku-band
backscatter coefficient ";

byte sig0_used_20hz_c(time,meas_ind);
       sig0_used_20hz_c:long_name = "20 Hz flag for utilization in the computation of 1Hz
C band backscatter coefficient";
       sig0_used_20hz_c:_FillValue = 127b;
       sig0_used_20hz_c:flag_values = 0b, 1b;
       sig0_used_20hz_c:flag_meanings = "Yes No";
       sig0_used_20hz_c:coordinates = "lon_20Hz lat_20Hz";
       sig0_used_20hz_c:comment = "Map of valid points used to compute the 1-Hz C-band
backscatter coefficient ";

short sig0_rms_ku(time);
       sig0_rms_ku:long_name = "RMS of the Ku band backscatter coefficient ";
       sig0_rms_ku:_FillValue = 32767s;
       sig0_rms_ku:units = "dB";
       sig0_rms_ku:scale_factor = 1.00e-02;
       sig0_rms_ku:coordinates = "lon lat";
       sig0_rms_ku: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";

short sig0_rms_c(time);
       sig0_rms_c:long_name = "RMS of the C band backscatter coefficient ";
       sig0_rms_c:_FillValue = 32767s;
       sig0_rms_c:units = "dB";
       sig0_rms_c:scale_factor = 1.00e-02;
       sig0_rms_c:coordinates = "lon lat";
       sig0_rms_c: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_numval_ku(time);
```

```
        sig0_numval_ku:long_name = "number of valid points used to compute Ku backscatter
coefficient";
        sig0_numval_ku:_FillValue = 127b;
        sig0_numval_ku:units = "count";
        sig0_numval_ku:coordinates = "lon lat";
        sig0_numval_ku:valid_min = 0b;
        sig0_numval_ku:valid_max = 20b;

byte sig0_numval_c(time);
        sig0_numval_c:long_name = "number of valid points used to compute C backscatter
coefficient";
        sig0_numval_c:_FillValue = 127b;
        sig0_numval_c:units = "count";
        sig0_numval_c:coordinates = "lon lat";
        sig0_numval_c:valid_min = 0b;
        sig0_numval_c:valid_max = 20b;
```

// Tracker AGC

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

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

short agc_rms_ku(time);
        agc_rms_ku:long_name = "RMS of the Ku band AGC ";
        agc_rms_ku:_FillValue = 32767s;
        agc_rms_ku:units = "dB";
        agc_rms_ku:scale_factor = 1.00e-02;
        agc_rms_ku:coordinates = "lon lat";
        sig0_rms_ku: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";

short agc_rms_c(time);
        agc_rms_c:long_name = "RMS of the C band AGC ";
        agc_rms_c:_FillValue = 32767s;
        agc_rms_c:units = "dB";
        agc_rms_c:scale_factor = 1.00e-02;
        agc_rms_c:coordinates = "lon lat";
        sig0_rms_c: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_ku(time);
        agc_numval_ku:long_name = "number of valid points used to compute Ku band AGC";
        agc_numval_ku:_FillValue = 127b;
        agc_numval_ku:units = "count";
        agc_numval_ku:coordinates = "lon lat";
        agc_numval_ku:valid_min = 0b;
        agc_numval_ku:valid_max = 20b;
```

```
byte agc_numval_c(time);
       agc_numval_c:long_name = "number of valid points used to compute C band AGC";
       agc_numval_c:_FillValue = 127b;
       agc_numval_c:units = "count";
       agc_numval_c:coordinates = "lon lat";
       agc_numval_c:valid_min = 0b;
       agc_numval_c:valid_max = 20b;
```

// Backscatter coefficient corrections

```
short net_instr_corr_sig0_ku(time);
       net_instr_corr_sig0_ku:long_name = "net instrumental correction on Ku backscatter
coefficient ";
       net_instr_corr_sig0_ku:_FillValue = 32767s;
       net_instr_corr_sig0_ku:units = "dB";
       net_instr_corr_sig0_ku:scale_factor = 1.00e-02;
       net_instr_corr_sig0_ku:coordinates = "lon lat";
       net_instr_corr_sig0_ku:quality_flag = "qual_inst_corr_1hz_sig0_ku";
       net_instr_corr_sig0_ku:comment = "Sum of AGC instrumental errors correction,
internal calibration correction (internal_corr_sig0_ku) and modeled instrumental errors
correction (modeled_instr_corr_sig0_ku) - system bias not included";

short net_instr_corr_sig0_c(time);
       net_instr_corr_sig0_c:long_name = "net instrumental correction on C backscatter
coefficient ";
       net_instr_corr_sig0_c:_FillValue = 32767s;
       net_instr_corr_sig0_c:units = "dB";
       net_instr_corr_sig0_c:scale_factor = 1.00e-02;
       net_instr_corr_sig0_c:coordinates = "lon lat";
       net_instr_corr_sig0_c:quality_flag = "qual_inst_corr_1hz_sig0_c";
       net_instr_corr_sig0_c:comment = «Sum of AGC instrumental errors correction,
internal calibration correction (internal_corr_sig0_c) and modeled instrumental errors
correction (modeled_instr_corr_sig0_c) - system bias not included";

byte atmos_corr_sig0_ku(time);
       atmos_corr_sig0_ku:long_name = "atmospheric attenuation correction on Ku band
backscatter coefficient ";
       atmos_corr_sig0_ku:_FillValue = 127b;
       atmos_corr_sig0_ku:units = "dB";
       atmos_corr_sig0_ku:scale_factor = 1.00e-02;
       atmos_corr_sig0_ku:coordinates = "lon lat";

byte atmos_corr_sig0_c(time);
       atmos_corr_sig0_c:long_name = "atmospheric attenuation correction on C band
backscatter coefficient ";
       atmos_corr_sig0_c:_FillValue = 127b;
       atmos_corr_sig0_c:units = "dB";
       atmos_corr_sig0_c:scale_factor = 1.00e-02;
       atmos_corr_sig0_c:coordinates = "lon lat";
```

// Off nadir angle

```
short off_nadir_angle_wf_ku(time);
       off_nadir_angle_wf_ku:long_name = "square of the off nadir angle computed from Ku
waveforms";
       off_nadir_angle_wf_ku:_FillValue = 32767s;
       off_nadir_angle_wf_ku:units = "degrees^2";
       off_nadir_angle_wf_ku:scale_factor = 1.00e-04;
       off_nadir_angle_wf_ku:coordinates = "lon lat";
       off_nadir_angle_wf_ku:quality_flag = "qual_alt_1hz_off_nadir_angle_wf_ku";
```

```
short off_nadir_angle_wf_20hz_ku(time,meas_ind);
       off_nadir_angle_wf_20hz_ku:long_name = "20 Hz square of the off nadir angle
computed from Ku waveforms";
       off_nadir_angle_wf_20hz_ku:_FillValue = 32767s;
       off_nadir_angle_wf_20hz_ku:units = "degrees^2";
       off_nadir_angle_wf_20hz_ku:scale_factor = 1.00e-04;
       off_nadir_angle_wf_20hz_ku:coordinates = "lon_20Hz lat_20Hz";

short off_nadir_angle_pf(time);
       off_nadir_angle_pf:long_name = "square of the off nadir angle computed from
platform data";
       off_nadir_angle_pf:_FillValue = 32767s;
       off_nadir_angle_pf:units = "degrees^2";
       off_nadir_angle_pf:scale_factor = 1.00e-04;
       off_nadir_angle_pf:coordinates = "lon lat";
       off_nadir_angle_pf:quality_flag = «qual_alt_1hz_off_nadir_angle_pf";
```

// Brightness temperatures

```
short tb_187(time);
       tb_187:long_name = "18.7 GHz main beam brightness temperature";
       tb_187:standard_name = "surface_brightness_temperature";
       tb_187:_FillValue = 32767s;
       tb_187:units = "K";
       tb_187:scale_factor = 1.00e-02;
       tb_187:coordinates = "lon lat";
       tb_187:quality_flag = "qual_rad_1hz_tb187";
       tb_187:comment = "Brightness temperatures are unsmoothed (along-track averaging
has not been performed on the brightness temperatures)";

short tb_238(time);
       tb_238:long_name = "23.8 GHz main beam brightness temperature";
       tb_238:standard_name = "surface_brightness_temperature";
       tb_238:_FillValue = 32767s;
       tb_238:units = "K";
       tb_238:scale_factor = 1.00e-02;
       tb_238:coordinates = "lon lat";
       tb_238:quality_flag = «qual_rad_1hz_tb238";
       tb_238:comment = «Brightness temperatures are unsmoothed (along-track averaging
has not been performed on the brightness temperatures)";

short tb_340(time);
       tb_340:long_name = "34 GHz main beam brightness temperature";
       tb_340:standard_name = "surface_brightness_temperature";
       tb_340:_FillValue = 32767s;
       tb_340:units = "K";
       tb_340:scale_factor = 1.00e-02;
       tb_340:coordinates = "lon lat";
       tb_340:quality_flag = «qual_rad_1hz_tb340";
       tb_340:comment = «Brightness temperatures are unsmoothed (along-track averaging
has not been performed on the brightness temperatures)";
```

// Geophysical parameters

```
int mean_sea_surface(time);
       mean_sea_surface:long_name = "mean sea surface height above reference ellipsoid";
       mean_sea_surface:source = [mean_sea_surface_source];
       mean_sea_surface:institution = [mean_sea_surface_institution];
       mean_sea_surface:_FillValue = 2147483647;
       mean_sea_surface:units = "m";
       mean_sea_surface:scale_factor = 1.00e-04;
```

```
        mean_sea_surface:coordinates = "lon lat";
        mean_sea_surface:quality_flag = "interp_flag_mean_sea_surface";
        mean_sea_surface:comment = "See Jason-2 User Handbook";

int mean_topography(time);
        mean_topography:long_name = "mean dynamic topography above geoid ";
        mean_topography:source = [mdt_source];
        mean_topography:institution = [mdt_institution];
        mean_topography:_FillValue = 2147483647;
        mean_topography:units = "m";
        mean_topography:scale_factor = 1.00e-04;
        mean_topography:coordinates = "lon lat";
        mean_topography:quality_flag = "interp_flag_mdt";
        mean_topography:comment = "See Jason-2 User Handbook";

int geoid(time);
        geoid:long_name = "geoid height";
        geoid:standard_name = "geoid_height_above_reference_ellipsoid";
        geoid:source = [geoid_source];
        geoid:institution = [geoid_institution];
        geoid:_FillValue = 2147483647;
        geoid:units = "m";
        geoid:scale_factor = 1.00e-04;
        geoid:coordinates = "lon lat";
        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
Jason-2 User Handbook";

int bathymetry(time);
        bathymetry:long_name = "ocean depth/land elevation";
        bathymetry:source = [bathy_topo_source];
        bathymetry:institution = [bathy_topo_institution];
        bathymetry:_FillValue = 2147483647;
        bathymetry:units = "m";
        bathymetry:coordinates = "lon lat";

short inv_bar_corr(time);
        inv_bar_corr:long_name = "inverted barometer height correction";
        inv_bar_corr:standard_name =
"sea_surface_height_correction_due_to_air_pressure_at_low_frequency";
        inv_bar_corr:source = [mto_fields_source];
        inv_bar_corr:institution = [mto_fields_institution];
        inv_bar_corr:_FillValue = 32767s;
        inv_bar_corr:units = "m";
        inv_bar_corr:scale_factor = 1.00e-04;
        inv_bar_corr:coordinates = "lon lat";
        inv_bar_corr:quality_flag = "interp_flag_meteo";
        inv_bar_corr:comment = "Computed at the altimeter time-tag from the interpolation
of 2 meteorological fields that surround the altimeter time-tag. See Jason-2 User
Handbook";

short hf_fluctuations_corr(time);
        hf_fluctuations_corr:long_name = "high frequency fluctuations of the sea surface
topography";
        hf_fluctuations_corr:standard_name =
"sea_surface_height_correction_due_to_air_pressure_and_wind_at_high_frequency";
        hf_fluctuations_corr:source = [GA_MOG2D_VER];
        hf_fluctuations_corr:institution = [mog2d_institution];
        hf_fluctuations_corr:_FillValue = 32767s;
        hf_fluctuations_corr:units = "m";
        hf_fluctuations_corr:scale_factor = 1.00e-04;
        hf_fluctuations_corr:coordinates = "lon lat";
        hf_fluctuations_corr:comment = "Provided as a correction to the inverted barometer
correction (inv_bar_corr)";
```

int ocean_tide_sol1(time);
ocean_tide_sol1:long_name = "geocentric ocean tide height (solution 1)";
ocean_tide_sol1:standard_name = "sea_surface_height_amplitude_due_to_geocentric_ocean_tide";
ocean_tide_sol1:source = [ocean_tide_sol1_source];
ocean_tide_sol1:institution = [ocean_tide_sol1_institution];
ocean_tide_sol1:_FillValue = 2147483647;
ocean_tide_sol1:units = "m";
ocean_tide_sol1:scale_factor = 1.00e-04;
ocean_tide_sol1:coordinates = "lon lat";
ocean_tide_sol1:quality_flag = "interp_flag_ocean_tide_sol1";
ocean_tide_sol1:comment = "Solution 1 corresponds to GOT00.2 model. Includes the corresponding loading tide (load_tide_sol1) and equilibrium long-period ocean tide height (ocean_tide_equil). 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). See Jason-2 User Handbook ";

int ocean_tide_sol2(time);
ocean_tide_sol2:long_name = "geocentric ocean tide height (solution 2)";
ocean_tide_sol2:standard_name = "sea_surface_height_amplitude_due_to_geocentric_ocean_tide";
ocean_tide_sol2:source = [ocean_tide_sol2_source];
ocean_tide_sol2:institution = [ocean_tide_sol2_institution];
ocean_tide_sol2:_FillValue = 2147483647;
ocean_tide_sol2:units = "m";
ocean_tide_sol2:scale_factor = 1.00e-04;
ocean_tide_sol2:coordinates = "lon lat";
ocean_tide_sol2:quality_flag = «interp_flag_ocean_tide_sol2";
ocean_tide_sol2:comment = "Solution 2 corresponds to FES2004 model. Includes the corresponding loading tide (load_tide_sol2) and equilibrium long-period ocean tide height (ocean_tide_equil). 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). See Jason-2 User Handbook ";

short ocean_tide_equil(time);
ocean_tide_equil:long_name = "equilibrium long-period ocean tide height";
ocean_tide_equil:standard_name = "sea_surface_height_amplitude_due_to_equilibrium_ocean_tide";
ocean_tide_equil:source = [ocean_tide_eq_source];
ocean_tide_equil:institution = [ocean_tide_eq_institution];
ocean_tide_equil:_FillValue = 32767s;
ocean_tide_equil:units = "m";
ocean_tide_equil:scale_factor = 1.00e-04;
ocean_tide_equil:coordinates = "lon lat";
ocean_tide_equil:comment = "This value has already been added to the two geocentric ocean tide height values recorded in the product (ocean_tide_sol1 and ocean_tide_sol2). 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). See Jason-2 User Handbook";

short ocean_tide_non_equil(time);
ocean_tide_non_equil:long_name = "non-equilibrium long-period ocean tide height";
ocean_tide_non_equil:standard_name = "sea_surface_height_amplitude_due_to_non_equilibrium_ocean_tide";
ocean_tide_non_equil:source = [ocean_tide_neq_source];
ocean_tide_non_equil:institution = [ocean_tide_neq_institution];
ocean_tide_non_equil:_FillValue = 32767s;
ocean_tide_non_equil:units = "m";
ocean_tide_non_equil:scale_factor = 1.00e-04;
ocean_tide_non_equil:coordinates = "lon lat";
ocean_tide_non_equil:comment = "This parameter is computed as a correction to the parameter ocean_tide_equil. This value can be added to ocean_tide_equil (or ocean_tide_sol1, ocean_tide_sol2) so that the resulting value models the total non equilibrium ocean tide height. See Jason-2 User Handbook";

```
short load_tide_sol1(time);
       load_tide_sol1:long_name = "load tide height for geocentric ocean tide (solution
1)";
       load_tide_sol1:source = [tidal_loading_sol1_source];
       load_tide_sol1:institution = [tidal_loading_sol1_institution];
       load_tide_sol1:_FillValue = 32767s;
       load_tide_sol1:units = "m";
       load_tide_sol1:scale_factor = 1.00e-04;
       load_tide_sol1:coordinates = "lon lat";
       load_tide_sol1:comment = "This value has already been added to the corresponding
ocean tide height value recorded in the product (ocean_tide_sol1). See Jason-2 User
Handbook";

short load_tide_sol2(time);
       load_tide_sol2:long_name = "load tide height for geocentric ocean tide (solution
2)";
       load_tide_sol2:source = [tidal_loading_sol2_source];
       load_tide_sol2:institution = [tidal_loading_sol2_institution];
       load_tide_sol2:_FillValue = 32767s;
       load_tide_sol2:units = "m";
       load_tide_sol2:scale_factor = 1.00e-04;
       load_tide_sol2:coordinates = "lon lat";
       load_tide_sol2:comment = "This value has already been added to the corresponding
ocean tide height value recorded in the product (ocean_tide_sol2). See Jason-2 User
Handbook";

short solid_earth_tide(time);
       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::institution = [solid_earth_tide_institution];
       solid_earth_tide:_FillValue = 32767s;
       solid_earth_tide:units = "m";
       solid_earth_tide:scale_factor = 1.00e-04;
       solid_earth_tide:coordinates = "lon lat";
       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 Jason-2 User Handbook";

short pole_tide(time);
       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:institution = [pole_tide_institution];
       pole_tide:_FillValue = 32767s;
       pole_tide:units = "m";
       pole_tide:scale_factor = 1.00e-04;
       pole_tide:coordinates = "lon lat";
       pole_tide:comment = "See Jason-2 User Handbook";
```

// Environmental parameters

```
short wind_speed_model_u(time);
       wind_speed_model_u:long_name = "U component of the model wind vector";
       wind_speed_model_u:standard_name = "wind_speed";
       wind_speed_model_u:source = [mto_fields_source];
       wind_speed_model_u:institution = [mto_fields_institution];
       wind_speed_model_u:_FillValue = 32767s;
       wind_speed_model_u:units = "m/s";
       wind_speed_model_u:scale_factor = 1.00e-02;
       wind_speed_model_u:coordinates = "lon lat";
       wind_speed_model_u:quality_flag = "interp_flag_meteo and ecmwf_meteo_map_avail";
```

wind_speed_model_u:comment = "Computed at the altimeter time-tag from the interpolation of 2 meteorological fields that surround the altimeter time-tag. See Jason-2 User Handbook";

short wind_speed_model_v(time);
wind_speed_model_v:long_name = "V component of the model wind vector";
wind_speed_model_v:standard_name = "wind_speed»;
wind_speed_model_v:source = [mto_fields_source];
wind_speed_model_vu:institution = [mto_fields_institution];
wind_speed_model_v:_FillValue = 32767s;
wind_speed_model_v:units = "m/s";
wind_speed_model_v:scale_factor = 1.00e-02;
wind_speed_model_v:coordinates = "lon lat";
wind_speed_model_v:quality_flag = "interp_flag_meteo and ecmwf_meteo_map_avail";
wind_speed_model_v:comment = "Computed at the altimeter time-tag from the interpolation of 2 meteorological fields that surround the altimeter time-tag. See Jason-2 User Handbook";

short wind_speed_alt(time);
wind_speed_alt:long_name = "altimeter wind speed";
wind_speed_alt:standard_name = "wind_speed";
wind_speed_alt:_FillValue = 32767s;
wind_speed_alt:units = "m/s";
wind_speed_alt:scale_factor = 1.00e-02;
wind_speed_alt:coordinates = "lon lat";
wind_speed_alt:comment = "Should not be used over land. See Jason-2 User Handbook";

short wind_speed_rad(time);
wind_speed_rad:long_name = "radiometer wind speed";
wind_speed_rad:standard_name = "wind_speed";
wind_speed_rad:source = [radiometer_sensor_name];
wind_speed_rad:institution = [radiometer_sensor_institution];
wind_speed_rad:_FillValue = 32767s;
wind_speed_rad:units = "m/s";
wind_speed_rad:scale_factor = 1.00e-02;
wind_speed_rad:coordinates = "lon lat";
wind_speed_rad:comment = "Should not be used over land. See Jason-2 User Handbook"

short rad_water_vapor(time);
rad_water_vapor:long_name = "radiometer water vapor content";
rad_water_vapor:standard_name = "atmosphere_water_vapor_content";
rad_water_vapor:source = [radiometer_sensor_name];
rad_water_vapor:institution = [radiometer_sensor_institution];
rad_water_vapor:_FillValue = 32767s;
rad_water_vapor:units = "kg/m^2";
rad_water_vapor:scale_factor = 1.00e-01;
rad_water_vapor:coordinates = "lon lat";
rad_water_vapor:quality_flag = "qual_rad_1hz_tb187 and qual_rad_1hz_tb238 and qual_rad_1hz_tb340 and interp_flag_tb";
rad_water_vapor:comment = "Should not be used over land";

short rad_liquid_water(time);
rad_liquid_water:long_name = "radiometer liquid water content";
rad_liquid_water:standard_name = "atmosphere_cloud_liquid_water_content";
rad_liquid_water:source = [radiometer_sensor_name];
rad_liquid_water:institution = [radiometer_sensor_institution];
rad_liquid_water:_FillValue = 32767s;
rad_liquid_water:units = "kg/m^2";
rad_liquid_water:scale_factor = 1.00e-02;
rad_liquid_water:coordinates = "lon lat";
rad_liquid water:quality_flag = "qual_rad_1hz_tb187 and qual_rad_1hz_tb238 and qual_rad_1hz_tb340 and interp_flag_tb";
rad_liquid water:comment = "Should not be used over land";

// Ice retracking

```
int ice_range_20hz_ku(time,meas_ind);
       ice_range_20hz_ku:long_name = "20 Hz Ku band altimeter range (ice retracking)";
       ice_range_20hz_ku:standard_name = "altimeter_range”;
       ice_range_20hz_ku:_FillValue = 2147483647;
       ice_range_20hz_ku:units = "m";
       ice_range_20hz_ku:add_offset = 1.300000e+06;
       ice_range_20hz_ku:scale_factor = 1.00e-04;
       ice_range_20hz_ku:coordinates = "lon_20Hz lat_20Hz";
       ice_range_20hz_ku:comment = "Distance antenna-COG (cog_corr), USO drift correction
(uso_corr) and internal path correction (internal_path_delay_corr_ku) included";

int ice_range_20hz_c(time,meas_ind);
       ice_range_20hz_c:long_name = "20 Hz C band altimeter range (ice retracking)";
       icz_range_20hz_c:standard_name = "altimeter_range”;
       ice_range_20hz_c:_FillValue = 2147483647;
       ice_range_20hz_c:units = "m";
       ice_range_20hz_c:add_offset = 1.300000e+06;
       ice_range_20hz_c:scale_factor = 1.00e-04;
       ice_range_20hz_c:coordinates = "lon_20Hz lat_20Hz";
       ice_range_20hz_c:comment = "Distance antenna-COG (cog_corr), USO drift correction
(uso_corr) and internal path correction (internal_path_delay_corr_c) included";

short ice_sig0_20hz_ku(time,meas_ind);
       ice_sig0_20hz_ku:long_name = "20 Hz Ku band backscatter coefficient (ice
retracking) ";
       ice_sig0_20hz_ku:standard_name =
"surface_backwards_scattering_coefficient_of_radar_wave";
       ice_sig0_20hz_ku:_FillValue = 32767s;
       ice_sig0_20hz_ku:units = "dB";
       ice_sig0_20hz_ku:scale_factor = 1.00e-02;
       ice_sig0_20hz_ku:coordinates = "lon_20Hz lat_20Hz";
       ice_sig0_20hz_ku:comment = "AGC instrumental errors correction and internal
calibration correction (internal_corr_sig0_ku) included";

short ice_sig0_20hz_c(time,meas_ind);
       ice_sig0_20hz_c:long_name = "20 Hz C band backscatter coefficient (ice retracking)
";
       ice_sig0_20hz_c:standard_name =
"surface_backwards_scattering_coefficient_of_radar_wave";
       ice_sig0_20hz_c:_FillValue = 32767s;
       ice_sig0_20hz_c:units = "dB";
       ice_sig0_20hz_c:scale_factor = 1.00e-02;
       ice_sig0_20hz_c:coordinates = "lon_20Hz lat_20Hz";
       ice_sig0_20hz_c:comment = «AGC instrumental errors correction and internal
calibration correction (internal_corr_sig0_c) included";
```

// Ice retracking outputs

```
byte ice_qual_flag_20hz_ku(time,meas_ind);
       ice_qual_flag_20hz_ku:long_name = "20 Hz Ku band ice retracking quality flag";
       ice_qual_flag_20hz_ku:_FillValue = 127b;
       ice_qual_flag_20hz_ku:flag_values = 0b, 1b;
       ice_qual_flag_20hz_ku:flag_meanings = "Good Bad";
       ice_qual_flag_20hz_ku:coordinates = "lon_20hz lat_20hz" ;
       ice_qual_flag_20hz_ku:comment = "ice retracking quality flag ";
```

// Waveforms characteristics

```
short mqe_20hz_ku(time,meas_ind);
       mqe_20hz_ku:long_name = "20 Hz Ku band MQE (ocean retracking)";
       mqe_20hz_ku:_FillValue = 32767s;
       mqe_20hz_ku:units = "count";
       mqe_20hz_ku:scale_factor = 1.00e-04;
       mqe_20hz_ku:coordinates = "lon_20Hz lat_20Hz";
       mqe_20hz_ku:comment = "Mean Quadratic Error between the waveforms samples and the
corresponding model samples built from the ocean retracking outputs";

short mqe_20hz_c(time,meas_ind);
       mqe_20hz_c:long_name = "20 Hz C band MQE (ocean retracking)";
       mqe_20hz_c:_FillValue = 32767s;
       mqe_20hz_c:units = "count";
       mqe_20hz_c:scale_factor = 1.00e-04;
       mqe_20hz_c:coordinates = "lon_20Hz lat_20Hz";
       mqe_20hz_c:comment = "Mean Quadratic Error between the waveforms samples and the
corresponding model samples built from the ocean retracking outputs";

short peakiness_20hz_ku(time,meas_ind);
       peakiness_20hz_ku:long_name = "20 Hz peakiness on Ku band waveforms";
       peakiness_20hz_ku:_FillValue = 32767s;
       peakiness_20hz_ku:units = "count";
       peakiness_20hz_ku:scale_factor = 1.00e-03;
       peakiness_20hz_ku:coordinates = "lon_20Hz lat_20Hz";

short peakiness_20hz_c(time,meas_ind);
       peakiness_20hz_c:long_name = "20 Hz peakiness on C band waveforms";
       peakiness_20hz_c:_FillValue = 32767s;
       peakiness_20hz_c:units = "count";
       peakiness_20hz_c:scale_factor = 1.00e-03;
       peakiness_20hz_c:coordinates = "lon_20Hz lat_20Hz";
}
```

// Sea Surface height

```
    short ssha(time);
       ssha:long_name = "sea surface height anomaly";
       ssha:standard_name = "sea_surface_height_above_sea_level";
       ssha:source = [altimeter_sensor_name];
       ssha:institution = [altimeter_sensor_institution];
       ssha:_FillValue = 32767s;
       ssha:units = "m";
       ssha:scale_factor = 1.00e-03;
       ssha:coordinates = "lon lat";
       ssha:comment = "= altitude of satellite (alt) - Ku band corrected altimeter range
(range_ku) - altimeter ionospheric correction on Ku band (iono_cor_alt_ku) - model dry
tropospheric correction (model_dry_tropo_corr) - radiometer wet tropospheric correction
(rad_wet_tropo_corr) - sea state bias correction in Ku band (sea_state_bias_ku) - solid
earth tide height (solid_earth_tide) - geocentric ocean tide height solution 1
(ocean_tide_sol1) - geocentric pole tide height (pole_tide) - inverted barometer height
correction (inv_bar_corr) - high frequency fluctuations of the sea surface topography
(hf_fluctuations_corr for I/GDR off line products only) - mean sea surface";

}
```

6. 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:
time = < number of measurements >;
meas_ind = 20;
wvf_ind = 104;

  variables:
```

// Time Tag

```
double time(time);
       time:long_name = "time (sec. since 2000-01-01)";
       time:standard_name = "time";
       time:units = "seconds since 2000-01-01 00:00:00.0";
       time:calendar = "gregorian";
       time:tai_utc_difference = [GA_TAI_UTC_DIF];
       time:leap_second = [GA_LEAP_TIME];
       time:comment = " "tai_utc_difference" is the difference between TAI and UTC
reference time (seconds) for the first measurement of the data set. "leap_second" is the
UTC time at which a leap second occurs in the data set, if any. After this UTC time, the
tai_utc_difference is increased by 1 second. "

byte meas_ind(meas_ind);
       meas_ind:long_name = "elementary measurement index";
       meas_ind:units = "count";
        meas_ind:comment = "Set to be compliant with the CF-1.1 convention";

byte wvf_ind(wvf_ind);
       wvf_ind:long_name = "waveform index";
       wvf_ind:units = "count";
       wvf_ind:comment = "Set to be compliant with the CF-1.0 convention";

double time_20hz(time,meas_ind);
       time_20hz:long_name = "time 20 Hz (sec. since 2000-01-01)";
       time_20hz:standard_name = "time";
       time_20hz:_FillValue = 18446744073709551616.000000;
       time_20hz:units = "seconds since 2000-01-01 00:00:00.0";
       time_20hz:calendar = "gregorian";
       time:tai_utc_difference = [GA_TAI_UTC_DIF];
       time:leap_second = [GA_LEAP_TIME];
       time:comment = " "tai_utc_difference" is the difference between TAI and UTC
reference time (seconds) for the first measurement of the data set. "leap_second" is the
UTC time at which a leap second occurs in the data set, if any. After this UTC time, the
tai_utc_difference is increased by 1 second. "
```

// Cf. GDR product

…/… [cf. section 5]

// Tracker range

```
int tracker_20hz_ku(time,meas_ind);
       tracker_20hz_ku:long_name = "20 Hz Ku band corrected tracker range";
       tracker_20hz_ku:standard_name = "altimeter_range";
       tracker_20hz_ku:_FillValue = 2147483647;
       tracker_20hz_ku:units = "m";
       tracker_20hz_ku:add_offset = 1.300000e+06;
       tracker_20hz_ku:scale_factor = 1.00e-04;
       tracker_20hz_ku:coordinates = "lon_20Hz lat_20Hz";
       tracker_20hz_ku:comment = "Ku-band operating tracker ("Diode+DEM" or "Median" or
"Slide Gate" tracker). All instrumental corrections included, i.e. distance antenna-COG
(cog_corr), USO drift correction (uso_corr), internal path correction
(internal_path_delay_corr_ku), Doppler correction (doppler_corr_ku), modeled instrumental
errors correction (modeled_instr_corr_range_ku) and system bias";

int tracker_diode_20hz_ku(time,meas_ind);
       tracker_diode_20hz_ku:long_name = "20 Hz tracker range counter from Diode+DEM";
       tracker_diode_20hz_ku:standard_name = "altimeter_range";
       tracker_diode_20hz_ku:_FillValue = 2147483647;
       tracker_diode_20hz_ku:units = "m";
       tracker_diode_20hz_ku:add_offset = 1.300000e+06;
       tracker_diode_20hz_ku:scale_factor = 1.00e-04;
       tracker_diode_20hz_ku:coordinates = "lon_20Hz lat_20Hz";

int tracker_20hz_c(time,meas_ind);
       tracker_20hz_c:long_name = "20 Hz C band corrected tracker range";
       tracker_20hz_c:standard_name = "altimeter_range";
       tracker_20hz_c:_FillValue = 2147483647;
       tracker_20hz_c:units = "m";
       tracker_20hz_c:add_offset = 1.300000e+06;
       tracker_20hz_c:scale_factor = 1.00e-04;
       tracker_20hz_c:coordinates = "lon_20Hz lat_20Hz";
       tracker_20hz_c:comment = «C-band operating tracker. All instrumental corrections
included, i.e. distance antenna-COG (cog_corr), USO drift correction (uso_corr), internal
path correction (internal_path_delay_corr_c), Doppler correction (doppler_corr_c),
modeled instrumental errors correction (modeled_instr_corr_range_c) and system bias ";
```

// Altimeter range corrections

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

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

int internal_path_delay_corr_c(time);
       internal_path_delay_corr_c:long_name = "C band internal path delay correction on
altimeter range";
       internal_path_delay_corr_c:_FillValue = 2147483647;
       internal_path_delay_corr_c:units = "m";
       internal_path_delay_corr_c:scale_factor = 1.00e-04;
```

```
      internal_path_delay_corr_c:comment = "Internal calibration correction on the C-
band altimeter range;

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

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

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

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

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

// Significant waveheight corrections

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

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

// Backscatter coefficient corrections

```
short internal_corr_sig0_ku(time);
      internal_corr_sig0_ku:long_name = "Ku band internal calibration correction on
backscatter coefficient ";
      internal_corr_sig0_ku:_FillValue = 32767s;
      internal_corr_sig0_ku:units = "dB";
      internal_corr_sig0_ku:scale_factor = 1.00e-02;

short internal_corr_sig0_c(time);
```

```
      internal_corr_sig0_c:long_name = "C band internal calibration correction on
backscatter coefficient ";
      internal_corr_sig0_c:_FillValue = 32767s;
      internal_corr_sig0_c:units = "dB";
      internal_corr_sig0_c:scale_factor = 1.00e-02;

short modeled_instr_corr_sig0_ku(time);
      modeled_instr_corr_sig0_ku:long_name = "Ku band modeled instrumental correction on
backscatter coefficient ";
      modeled_instr_corr_sig0_ku:_FillValue = 32767s;
      modeled_instr_corr_sig0_ku:units = "dB";
      modeled_instr_corr_sig0_ku:scale_factor = 1.00e-02;

short modeled_instr_corr_sig0_c(time);
      modeled_instr_corr_sig0_c:long_name = "C band modeled instrumental on backscatter
coefficient ";
      modeled_instr_corr_sig0_c:_FillValue = 32767s;
      modeled_instr_corr_sig0_c:units = "dB";
      modeled_instr_corr_sig0_c:scale_factor = 1.00e-02;
```

// Scaling factors for Sigma0 evaluation

```
int scaling_factor_20hz_ku(time,meas_ind);
      scaling_factor_20hz_ku:long_name = "Scaling factor for Ku band backscatter
coefficient ";
      scaling_factor_20hz_ku:_FillValue = 2147483647;
      scaling_factor_20hz_ku:units = "dB";
      scaling_factor_20hz_ku:scale_factor = 1.00e-02;
      scaling_factor_20hz_ku:coordinates = "lon_20Hz lat_20Hz";
      scaling_factor_20hz_ku:comment = "This scaling factor represents the backscatter
coefficient for a Ku-band waveform amplitude equal to 1. It accounts for all the
parameters of the radar equation excepted the amplitude of the waveform. It is a raw
value accounting for atmospheric attenuation (atmos_corr_sig0_ku) only. AGC instrumental
errors correction, internal calibration correction, modeled instrumental errors
correction and system bias are not included";

int scaling_factor_20hz_c(time,meas_ind);
      scaling_factor_20hz_c:long_name = "Scaling factor for C band backscatter
coefficient ";
      scaling_factor_20hz_c:_FillValue = 2147483647;
      scaling_factor_20hz_c:units = "dB";
      scaling_factor_20hz_c:scale_factor = 1.00e-02;
      scaling_factor_20hz_c:coordinates = "lon_20Hz lat_20Hz";
      scaling_factor_20hz_c:comment = "This scaling factor represents the backscatter
coefficient for a C-band waveform amplitude equal to 1. It accounts for all the
parameters of the radar equation excepted the amplitude of the waveform. It is a raw
value accounting for atmospheric attenuation (atmos_corr_sig0_c) only. AGC instrumental
errors correction, internal calibration correction, modeled instrumental errors
correction and system bias not included";
```

// Ocean retracking outputs

```
int epoch_20hz_ku(time,meas_ind);
      epoch_20hz_ku:long_name = "Ku band epoch (ocean retracking)";
      epoch_20hz_ku:_FillValue = 2147483647;
      epoch_20hz_ku:units = "s";
      epoch_20hz_ku:scale_factor = 1.00e-15;
      epoch_20hz_ku:coordinates = "lon_20Hz lat_20Hz";

int width_leading_edge_20hz_ku(time,meas_ind);
```

```
      width_leading_edge_20hz_ku:long_name = "Ku band width of the leading edge (ocean
retracking)";
      width_leading_edge_20hz_ku:_FillValue = 2147483647;
      width_leading_edge_20hz_ku:units = "s";
      width_leading_edge_20hz_ku:scale_factor = 1.00e-15;
      width_leading_edge_20hz_ku:coordinates = "lon_20Hz lat_20Hz";
      width_leading_edge_20hz_ku:comment = "The width of the leading edge corresponds to
the so-called composite sigma (SigmaC)";

int amplitude_20hz_ku(time,meas_ind);
      amplitude_20hz_ku:long_name = "Ku band amplitude (ocean retracking) [FFT power
unit]";
      amplitude_20hz_ku:_FillValue = 2147483647;
      amplitude_20hz_ku:units = "count";
      amplitude_20hz_ku:scale_factor = 1.00e-06;
      amplitude_20hz_ku:coordinates = "lon_20Hz lat_20Hz";

int thermal_noise_20hz_ku(time,meas_ind);
      thermal_noise_20hz_ku:long_name = "Ku band thermal noise (ocean retracking) [FFT
power unit]";
      thermal_noise_20hz_ku:_FillValue = 2147483647;
      thermal_noise_20hz_ku:units = "count";
      thermal_noise_20hz_ku:scale_factor = 1.00e-06;
      thermal_noise_20hz_ku:coordinates = "lon_20Hz lat_20Hz";

int epoch_20hz_c(time,meas_ind);
      epoch_20hz_c:long_name = "C band epoch (ocean retracking)";
      epoch_20hz_c:_FillValue = 2147483647;
      epoch_20hz_c:units = "s";
      epoch_20hz_c:scale_factor = 1.00e-15;
      epoch_20hz_c:coordinates = "lon_20Hz lat_20Hz";

int width_leading_edge_20hz_c(time,meas_ind);
      width_leading_edge_20hz_c:long_name = "C band width of the leading edge (ocean
retracking)";
      width_leading_edge_20hz_c:_FillValue = 2147483647;
      width_leading_edge_20hz_c:units = "s";
      width_leading_edge_20hz_c:scale_factor = 1.00e-15;
      width_leading_edge_20hz_c:coordinates = "lon_20Hz lat_20Hz";
      width_leading_edge_20hz_c:comment = "The width of the leading edge corresponds to
the so-called composite sigma (SigmaC)";

int amplitude_20hz_c(time,meas_ind);
      amplitude_20hz_c:long_name = "C band amplitude (ocean retracking) [FFT power
unit]";
      amplitude_20hz_c:_FillValue = 2147483647;
      amplitude_20hz_c:units = "count";
      amplitude_20hz_c:scale_factor = 1.00e-06;
      amplitude_20hz_c:coordinates = "lon_20Hz lat_20Hz";

int thermal_noise_20hz_c(time,meas_ind);
      thermal_noise_20hz_c:long_name = "C band thermal noise (ocean retracking) [FFT
power unit]";
      thermal_noise_20hz_c:_FillValue = 2147483647;
      thermal_noise_20hz_c:units = "count";
      thermal_noise_20hz_c:scale_factor = 1.00e-06;
      thermal_noise_20hz_c:coordinates = "lon_20Hz lat_20Hz";
```

// Waveforms

```
short waveforms_20hz_ku(time,meas_ind,wvf_ind);
      waveforms_20hz_ku:long_name = "Ku band waveform samples";
      waveforms_20hz_ku:_FillValue = 32767s;
```

```
        waveforms_20hz_ku:units = "count";
        waveforms_20hz_ku:comment = "Waveforms are not corrected for the Low Pass Filter
effects";

short waveforms_20hz_c(time,meas_ind,wvf_ind);
        waveforms_20hz_c:long_name = "C band waveform samples";
        waveforms_20hz_c:_FillValue = 32767s;
        waveforms_20hz_c:units = "count";
        waveforms_20hz_c:comment = "Waveforms are not corrected for the Low Pass Filter
effects";

}
```

DIFFUSION

INTERNAL:

BOY François	DCT/PS/CMI		
CHERMAIN Dominique	DCT/PS/CMI		
MENOT Frédéric	DCT/PS/CMI		
LAMBIN Juliette	DCT/SI/IM		
LOMBARD Alix	DCT/SI/IM		
GUINLE Thierry	DCT/ME/OT		
BRONNER Emilie	DCT/ME/OT		
PERBOS Jacqueline	DCT/PO/AL		
PICOT Nicolas	DCT/PO/AL		

EXTERNAL:

M. DESTOUESSE	CLS/DT		
J.P. DUMONT	CLS/DOS		
G. DIBARBOURE	CLS/DOS		
M. ABLAIN	CLS/DOS		
J. LILLIBRIDGE	NOAA (John.Lillibridge@noaa.gov)		
H. BONEKAMP	EumetSat (hans.bonekamp@eumetsat.int)		
J. FIGA	EumetSat (julia.figa@eumetsat.int)		
S. DESAI	NASA/JPL (Shailen.D.Desai@jpl.nasa.gov)		