EUMETSAT

ASCAT Level 2 Soil Moisture: Product Format Specification

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Document Change Record

Issue / Revision	*Date*	*DCN. No*	*Changed Pages / Paragraphs*
v1	20 Nov 2007		First formal release.
v2	14 Apr 2008		General clean-up of the document structure. Addition of a VEADR-SMC to capture the name of the auxiliary data file configuration used in the processing. Correction of the size of the records as described in Annex 2.
v3	21 Aug 2009	ECP_AB_ECP_428	New fields added in order to replace L1b dissemination and enable single-pass BUFR generation (without L1b involvement). Details in Excel Annex (App. B, formerly Annex 2). Also general editorial corrections and updates to standardise document layout, including moving annex of record descriptions into separate Excel document.
v3A	9 Nov 2009		Deleted unwanted row in Table 8.
V3B	19 Nov 2009	ODT_DCR_155	Corrected subclass ID for VIADR-VER from 6 to 7. Added specific mention of SPHR, GEADR & GIADR (which are not present in product). See Annex for other updates.
	23 Feb 2011	ODT_DCR_235	Annex: Field description updates (see Annex for full details).
V4	10 Nov 2014		Aligned contents of the Level 1B product version 12.0 throughout the whole document. Also updated annex. Specifically, change of MDR record names as for Level 1B.
V4A	27 April 2015		Corrected VIADR-VER to properly align with L1B 12.0 version (changes to Annex only).

Table of Contents

Table of Tables

1 INTRODUCTION

1.1 Purpose and Scope

This document is the Advanced Scatterometer (ASCAT) Level 2 Soil Moisture Product Format Specification.

The generic product format specification used by this document is defined in the EPS Generic Product Format Specification [AD 1].

The current version of this document describes the ASCAT Level 2 Soil Moisture Product Format Version 12.0. This format version has been issued in order to ensure alignment with the corresponding evolution in the corresponding Level 1B MDR records, as well as to do a clean-up of auxiliary data records and other minor pending issues.

1.2 Document Structure

The document is organised in the following sections, including the introduction:

- Section 1 describes the scope of the document
- Section 2 contains the format detail description, including structure and record description
- Section 3 details the occurrence rates of the various records within the Level 2 Soil Moisture product
- Section 4 provides a version control history for the different records defined
- 5 summarises the meaning of Boolean, enumerated and bit-string field values
- 6 links to detailed tables describing the record formats

1.3 Applicable Documents

No.	*Document Title*	*EUMETSAT Reference*
AD 1	EPS Generic Product Format Specification	EPS/GGS/SPE/96167

1.4 Reference Documents

None.

2 FORMAT OF THE LEVEL 2 SOIL MOISTURE PRODUCTS

2.1 Overview

The product format for both ASCAT Level 2 SM products is based on the generic product format as described in [AD 1].

There are two ASCAT Level 2 Soil Moisture (SM) products:

- Level 2 SM 12.5 km
- Level 2 SM 25 km

ASCAT Level 2 SM 12.5 and 25 km data correspond to re-sampled (spatially averaged) σ_0 values, on a 12.5 and 25 km orbit swath grid, respectively. The product is organised as successive lines of nodes along track, referenced to by the orbit time that corresponds to that line of nodes.

The ASCAT Level 2 SM 12.5 km product is also more generally known by its product type, i.e., *SMR* and the 25 km product by its product type, i.e., *SMO*.

2.2 Generic Record Header Fields

All generic record header fields of the instrument/level specific records defined in this document shall have an INSTRUMENT_GROUP value of ASCAT [AD 1].

The next sections detail the instrument- and level-specific additions required for ASCAT Level 2 SM products. Currently, there are no Secondary Product Header Records (SPHR), Global External Auxiliary Data Records (GEADR) or Global Internal Auxiliary Data Records (GIADR) in the products, though some may be added in the future.

2.3 Variable External Auxiliary Data Records

The following subclasses of VEADR are present for ASCAT Level 2 SM products.

Subclass	*Description*	*Subclass ID*
VEADR-SMC	σ_0 bias correction file	7
VEADR-CURV	Parameters database file	8
VEADR-CURV-NOISE	Parameters database file	9
VEADR-DRY	Parameters database file	10
VEADR-DRY-NOISE	Parameters database file	11
VEADR-MS-MEAN	Parameters database file	12
VEADR-NONSCAT	Parameters database file	13
VEADR-SLOP	Parameters database file	14
VEADR-SLOP-NOISE	Parameters database file	15
VEADR-WET	Parameters database file	16
VEADR-WET-NOISE	Parameters database file	17

Table 1: VEADR subclasses for ASCAT Level 2 SM Products

2.4 Variable Internal Auxiliary Data Records

The following subclasses of VIADR are present for ASCAT Level 1B Products.

Subclass	*Description*	*Subclass ID*
VIADR-VER	Processor and auxiliary file versions used	7

Table 2: VIADR subclasses for ASCAT Level 1B Products

2.5 Measurement Data Records

2.5.1 Record subclasses

The following subclasses of MDR are present for ASCAT Level 2 SM products.

Subclass	*Description*	*Subclass ID*
MDR-2-SM-250	Only used in SMR products	4
MDR-2-SM-12	Only used in SMO products	5

Table 3: MDR subclasses for ASCAT Level 2 SM Products

The contents and format of MDR-2-SM-250 and MDR-2-SM-125 are detailed in 0 to this document.

2.5.2 Level 2 SM 25 km and 50 km Products

The Level 2 SM 12.5 km and 25 km product data are organised as follows:

- by lines of nodes along the swath
- by nodes across the swath
- by σ_0 /soil moisture within a node

Each MDR contains data of these four types, defining fields of three different dimensions. Associated data of the same dimensions, related for example to geometry or quality flags, are also included in the MDR. The position of the nodes in these products does not correspond to the original measuring footprint. The data are a result of spatial re-sampling; hence the geographical location of each node is defined in that process.

Along the swath, lines of nodes are generated with a fixed time interval, which corresponds to a distance in kilometres of approximately 12.5 km or 25 km. The exact spacing between lines depends on the orbit height, which varies slightly around the orbit and between orbits.

Across the swath, lines of nodes are generated on a fixed distance in kilometres of 12.5 km or 25 km. This results in 82 nodes (41 per swath) for the 12.5 km product and 42 nodes (21 per swath) for the 25 km product. Every line of nodes contains data from both swaths, ordered from left swath to right swath and from left to right within the swaths, if one moves in the direction of the instrument.

ASCAT Level 2 SM products contain the Level 1B date used in their generation. In particular, this includes the σ_0 values. The number of σ_0 values in an ASCAT Level 1B product node is three, as the name *triplet* indicates. For each node, only one value of soil moisture is generated.

3 OCCURENCE INFORMATION

3.1 Level 2-SM 12.5 km

Record	*Occurrence*
MPHR	Once per product
VEADR-SMC, -CURV, -CURV-NOISE, -DRY, -DRY-NOISE, -MS-MEAN, -NONSCAT, -SLOP, -SLOP-NOISE, -WET, -WET-NOISE	Occurs at least once. Re-occurs each time the applicability of the information changes within the product.
VIADR-VER	Occurs at least once. Re-occurs each time the applicability of the information changes within the product.
MDR-2-SM-25KM	Once per every 12.5 km grid line of nodes

Table 4: Occurrence information for Level 2-SM 1.25 km records.

3.2 Level 2-SM 25 km

Record	*Occurrence*
MPHR	Once per product
VEADR-SMC, -CURV, -CURV-NOISE, -DRY, -DRY-NOISE, -MS-MEAN, -NONSCAT, -SLOP, -SLOP-NOISE, -WET, -WET-NOISE	Occurs at least once. Re-occurs each time the applicability of the information changes within the product
VIADR-VER	Occurs at least once. Re-occurs each time the applicability of the information changes within the product.
MDR-2-SM-50KM	Once per every 25 km grid line of nodes

Table 5: Occurrence information for Level 2-SM 25 km records

4 RECORD FORMAT VERSION CONTROL

This section provides version numbers for the records defined within this document.

Record Subclass	*Format Version Number*	*Issue Defined*
MDR-2-SM-250	2	V4
MDR-2-SM-125	2	V4
VIADR-VER	1	V4
VEADR-SMC	0	V2
VEADR-CURV	0	V3
VEADR-CURV-NOISE	0	V3
VEADR-DRY	0	V3
VEADR-DRY-NOISE	0	V3
VEADR-MS-MEAN	0	V3
VEADR-NONSCAT	0	V3
VEADR-SLOP	0	V3
VEADR-SLOP-NOISE	0	V3
VEADR-WET	0	V3
VEADR-WET-NOISE	0	V3

Table 6: Record Format Version Numbers

The product format version summarising the latest baseline corresponds to 12.0. This number is reflected in the following MPHR fields of all ASCAT Level 1 SM products:

- PRODUCT_MAJOR_VERSION = 12
- PRODUCT_MINOR_VERSION = 00

APPENDIX A: MEANING OF VALUES IN BOOLEAN, ENUMERATED AND BIT-STRING FIELDS

Record	*Field*	*value = 0*	*value = 1*
MDR-2-SM-250 / 125	DEGRADED_INST_MDR	Nominal	Degraded
MDR-2-SM-250 / 125	DEGRADED_PROC_MDR	Nominal	Degraded
MDR-2-SM-250 / 125	SWATH_INDICATOR	Left Swath	Right Swath
MDR-2-SM-250 / 125	F_KP	Kp estimate at nominal quality	Kp estimate at non-nominal quality

Table 7: Meaning of boolean field values

Record	*Field*	*Meaning*
MDR-2-SM-250 / 125	F_USABLE	0 = GOOD 1 = USABLE 2 = NON-USABLE

Table 8: Meaning of enumerated field values

The 8-bit string CORRECTION_FLAGS, associated with a node, contains flags related to corrections applied to the data during the processing.

Bit	*Values*
1	Soil Moisture between -20% and 0%
2	Soil Moisture between 100% and 120%
3	Correction of wet backscatter reference applied
4	Correction of dry backscatter reference applied
5	Correction of volume scattering in sand applied
6-8	Reserved
All 8 bits set means correction flags not available.	

Table 9: Description of CORRECTION_FLAGS

The 16-bit string PROCESSING_FLAGS, associated with a node, contains flags related to the reason why the soil moisture value could not be carried out.

Bit	***Values***
1	Not meaningful soil measurement due to the following: a) less than 3 valid neighbours in the parameter neighbourhood for Hamming windowing exist, or b) the number of invalid neighbours is larger than the number of valid neighbours.
2	Sensitivity to soil moisture less than or equal to 2 dB.
3	Azimuthal noise greater than or equal to 1 dB.
4	Backscatter Fore-Aft beam out of range: [dB]
5	Slope Mid-Fore beam out of range, i.e. larger than 6 times the noise of the slope.
6	Slope Mid-Aft beam out of range, i.e. larger than 6 times the noise of the slope.
7	Surface soil moisture below –20%.
8	Surface soil moisture above 120%.
9-16	Reserved
All 16 bits set means processing flags not available.	

Table 10: Description of PROCESSING_FLAGS

APPENDIX B: DETAILED SPECIFICATION OF ASCAT LEVEL 2 SOIL MOISTURE DATA RECORDS

In the annex that follows, detailed format specifications for all the Measurement Data Records in ASCAT SM Level 2 products are included:

- VIADR-VER
- MDR-2-SM-250
- MDR-2-SM-125

The Annex is also available as a separate spreadsheet. The EUMETSAT document reference number is as follows:

(8 0 2 36 (36 63(

Doc Ref: EUM/OPS-EPS/SPE/09/0323
ASCAT_Level_2_Soil_Moisture_Product_Format_Specification_-_Annex[1].xls
Worksheet: VERSION

This Document	
Title	ASCAT LEVEL 2 SOIL MOISTURE PRODUCT FORMAT SPECIFICATION TABLES
Reference Number	EPS/OPS-EPS/SPE/09/0323

Change Record	
Version 1 Date 16/05/2007	Issued a first version of ASCAT L2 SOIL MOISTURE PFS TABLES
Version 2 Date 09/04/2008	Issued a second version of ASCAT L2 SOIL MOISTURE PFS TABLES (modified)
Version 3 Date 21/08/2009	**ECP_AB_ECP_428**
	Added records: VIADR-VER MDR-2-SM 25KM/50KM: added new fields: F_F, F_V, F_OA, F_SA, F_TEL, F_EXT_FIL, ATMOSPHERIC_HEIGHT, ATMOSPHERIC_LOSS, DEGRADED_INST_MDR, DEGRADED_PROC_MDR
Version 3A Date 09/11/2009	No changes to annex.
Version 3B Date 23/02/2011	**Typos:**
	Field names in both MDR records: SOIL_MOISTURE_SENS**E**TIVITY (--> **I**), IN**NU**DATION_OR_WETLAND (--> **UN**).
	Descriptions in MDR records for several fields: 'atmo**w**phere', 'use**d** of synthetic data', 'atti**cut**e', 'tele**mt**ry', 'in**nu**dation'.
	ODT_DCR_235
	All MDR records: Added Description note on azimuth angle range for those fields including azimuth angle. This is because some fields use the standard 0...360 degree range, while others use -180...+180.

Version 4 Date 15/11/2014	Updates of VIADR-VER to include a reference to the calibration version (XCL)
	Change of MDR record names
	Update of MDR records to reflect changes isn the Level 1B product contents (in green are the new fields, in blue are the deleted fields)

Version 4A Date 27/04/2015	Corrected VIADR-VER to align wtih L1b - as per processing code

FIELD	DESCRIPTION	SF	UNITS	DIM1	DIM2	DIM3	TYPE	TYPE SIZE	FIELD SIZE	OFFSET
RECORD_HEADER	Generic Record Header			1	1	1	REC_HEAD	20	20	0
PROCESSOR_VERSION1	L1 PPF major release number	n/a	n/a	1	1	1	enumerated	1	1	20
PROCESSOR_VERSION2	L1 PPF release number	n/a	n/a	1	1	1	enumerated	1	1	21
PROCESSOR_VERSION3	L1 PPF patch number	n/a	n/a	1	1	1	enumerated	1	1	22
PRC_VERSION1	ASCA_PRC_xx_ Major Version	n/a	n/a	1	1	1	enumerated	1	1	23
PRC_VERSION2	ASCA_PRC_xx_ Minor Version	n/a	n/a	1	1	1	enumerated	1	1	24
INS_VERSION1	ASCA_INS_xx_ Major Version	n/a	n/a	1	1	1	enumerated	1	1	25
INS_VERSION2	ASCA_INS_xx_ Minor Version	n/a	n/a	1	1	1	enumerated	1	1	26
NTB_VERSION1	ASCA_NTB_xx_ Major Version	n/a	n/a	1	1	1	enumerated	1	1	27
NTB_VERSION2	ASCA_NTB_xx_ Minor Version	n/a	n/a	1	1	1	enumerated	1	1	28
XCL_VERSION1	ASCA_XCL_xx_ Major Version	n/a	n/a	1	1	1	enumerated	1	1	29
XCL_VERSION2	ASCA_XCL_xx_ Minor Version	n/a	n/a	1	1	1	enumerated	1	1	30
SOMO_PROCESSOR_VERSION1	SOMO L2 PPF major release number	n/a	n/a	1	1	1	enumerated	1	1	31
SOMO_PROCESSOR_VERSION2	SOMO L2 PPF release number	n/a	n/a	1	1	1	enumerated	1	1	32
SOMO_PROCESSOR_VERSION3	SOMO L2 PPF patch number	n/a	n/a	1	1	1	enumerated	1	1	33
SMC_VERSION1	ASCA_SMC_xx_ Major Version	n/a	n/a	1	1	1	enumerated	1	1	34
SMC_VERSION2	ASCA_SMC_xx_ Minor Version	n/a	n/a	1	1	1	enumerated	1	1	35
CURV-VERSION	ASCA_SOMO_curv.tar Version	n/a	n/a	1	1	1	enumerated	1	1	36
CURV-NOISE-VERSION	ASCA_SOMO_curv_noise.tar Version	n/a	n/a	1	1	1	enumerated	1	1	37
DRY-VERSION	ASCA_SOMO_dry.tar Version	n/a	n/a	1	1	1	enumerated	1	1	38
DRY-NOISE-VERSION	ASCA_SOMO_dry_noise.tar Version	n/a	n/a	1	1	1	enumerated	1	1	39
MS-MEAN-VERSION	ASCA_SOMO_ms_mean.tar Version	n/a	n/a	1	1	1	enumerated	1	1	40
NONSCAT-VERSION	ASCA_SOMO_nonscat.tar Version	n/a	n/a	1	1	1	enumerated	1	1	41
SLOP-VERSION	ASCA_SOMO_slop.tar Version	n/a	n/a	1	1	1	enumerated	1	1	42
SLOP-NOISE-VERSION	ASCA_SOMO_slop_noise.tar Version	n/a	n/a	1	1	1	enumerated	1	1	43
WET-VERSION	ASCA_SOMO_wet.tar Version	n/a	n/a	1	1	1	enumerated	1	1	44
WET-NOISE-VERSION	ASCA_SOMO_noise.tar Version	n/a	n/a	1	1	1	enumerated	1	1	45
TOTAL SIZE										46

FIELD	DESCRIPTION	SF	UNITS	DIM1	DIM2	DIM3	TYPE	TYPE SIZE	FIELD SIZE	OFFSET
RECORD_HEADER	Generic Record Header			1	1	1	REC_HEAD	20	20	0
Quality of MDR has been degraded from nominal due to a processing degradation.										
DEGRADED_INST_MDR	Quality of MDR has been degraded from nominal due to an instrument degradation.	n/a	n/a	1	1	1	boolean	1	1	20
DEGRADED_PROC_MDR	Quality of MDR has been degraded from nominal due to a processing degradation.	n/a	n/a	1	1	1	boolean	1	1	21
SWATH GRID LINE and associated data										
UTC_LINE_NODES	UTC time of line of nodes	n/a	UTC	1	1	1	short cds time	6	6	22
ABS_LINE_NUMBER	Absolute (unique) counter for the line of nodes (from format version 12.0 onwards only)	n/a	count	1	1	1	integer4	4	4	28
SAT_TRACK_AZI	Azimuth angle bearing (range: 0 to 360) of nadir track velocity	2	deg	1	1	1	u-integer2	2	2	32
AS_DES_PASS	Ascending/descending pass indicator	n/a	n/a	1	1	1	boolean	1	1	34
NODE and associated data										
NODE_NUM	Node number as used in the PGF (ref AD-2]), i.e., (10 to -10) for the left swath in the left-to-right order, (-10 to 10) for the right swath in the left-to-right order, 0 corresponding to the mid swath position in both swaths.	0	count	42	1	1	integer2	2	84	deleted
SWATH INDICATOR	Swath (0=LEFT, 1=RIGHT)	n/a	n/a	42	1	1	boolean	1	42	35
LATITUDE	Latitude (-90 to 90 deg)	6	deg	42	1	1	integer4	4	168	77
LONGITUDE	Longitude (0 to 360 deg)	6	deg	42	1	1	integer4	4	168	245
ATMOSPHERIC_HEIGHT	Height of atmosphere used	3	km	42	1	1	u-integer2	#REF!	#REF!	Deleted
ATMOSPHERIC_LOSS	Atmospheric loss per unit length of atmosphere	10	dB/km	42	1	1	u-integer4	#REF!	#REF!	Deleted
TRIPLET and associated data										
SIGMA0_TRIP	Sigma0 triplet, re-sampled to swath grid, for 3 beams (fore, mid, aft)	6	dB	3	42	1	integer4	4	504	413
KP	Kp for re-sampled sigma0 tripplet. Values between 0 and 1	4	n/a	3	42	1	u-integer2	2	252	917
INC_ANGLE_TRIP	Incidence angle for re-sampled sigma0 tripplet.	2	deg	3	42	1	u-integer2	2	252	1169

AZI_ANGLE_TRIP	Incidence angle for re-sampled sigma0 tripplet. Values range from -180 to +180, where minus is west and plus is east.	2	deg	3	42	1	integer2	2	252	1421
NUM_VAL_TRIP	Number of full resolution sigma0 values contributing to the re-sampled sigma0 tripplet.	0	count	3	42	1	u-integer4	4	504	1673
F_KP	Flag related to the quality of the Kp estimate (0=NOMINAL, 1=NON-NOMINAL)	n/a	n/a	3	42	1	boolean	1	126	2177
F_USABLE	Flag related to the usability of the sigma0 tripplet (0=GOOD, 1=USABLE, 2=NOT USABLE)	n/a	n/a	3	42	1	enumerated	1	126	2303
F_F	Flag related to non-nominal amount of input raw data to calculate echo corrections (value between 0 and 1 shows the fraction of original samples affected)	3	n/a	3	42	1	u-integer2	2	252	2429
F_V	Flag related to non enough amount of input raw data to calculate echo corrections (value between 0 and 1 shows the fraction of original samples affected)	3	n/a	3	42	1	u-integer2	2	252	2681
F_OA	Flag related to lack of accuracy of orbit/atticute knowledge (value between 0 and 1 shows the fraction of original samples affected)	3	n/a	3	42	1	u-integer2	2	252	2933
F_SA	Flag related to solar array reflection contamination (value between 0 and 1 shows the fraction of original samples affected)	3	n/a	3	42	1	u-integer2	2	252	3185
F_TEL	Flag related to non-nominal telemetry check results (value between 0 and 1 shows the fraction of original samples affected)	3	n/a	3	42	1	u-integer2	2	252	3437
F_EXT_FIL	Flag related to the presence of extrapolated reference functions in the generation of averaged value (ref. Ad-2) (value between 0 and 1)	3	n/a	3	42	1	u-integer2	2	252	Deleted

F_REF	Flag related to non-nominal raw echo correction reference functions (value between 0 and 1 shows the fraction of original samples affected)	3	n/a	3	42	1	u-integer2	2	252	3689
F_LAND	Flag related to presence of land in the re-sampled sigma0 tripllet (value between 0 and 1 shows the fraction of original samples affected)	3	n/a	3	42	1	u-integer2	2	252	3941
SOIL MOISTURE COMPONENT										
WARP_NRT_VERSION	WARP-NRT version number	0	n/a	1	1	1	u-integer2	2	2	4193
PARAM_DB_VERSION	Parameters database version	0	n/a	1	1	1	u-integer2	2	2	4195
SOIL_MOISTURE	Soil Moisture (0 to 100%)	2	%	42	1	1	u-integer2	2	84	4197
SOIL_MOISTURE_ERROR	Estimated Soil Moisture Error %	2	%	42	1	1	u-integer2	2	84	4281
SIGMA40	Extrapolated Sigma0 backscatter at 40 degrees incidence angle	6	dB	42	1	1	integer4	4	168	4365
SIGMA40_ERROR	Estimated Error in Extrapolated Sigma Zero backscatter at 40 degrees incidence angle	6	dB	42	1	1	integer4	4	168	4533
SLOPE40	Slope at 40 degrees incidence angle	6	dB	42	1	1	integer4	4	168	4701
SLOPE40_ERROR	Estimated error in the slope at 40 degrees incidence angle	6	dB	42	1	1	integer4	4	168	4869
SOIL_MOISTURE_SENSITIVITY	Soil Moisture sensitivity	6	dB	42	1	1	u-integer4	4	168	5037
DRY_BACKSCATTER	Dry backscatter	6	dB	42	1	1	integer4	4	168	5205
WET_BACKSCATTER	Wet backscatter	6	dB	42	1	1	integer4	4	168	5373
MEAN_SURF_SOIL_MOISTURE	Mean surface soil moisture (0 to 100%)	2	%	42	1	1	u-integer2	2	84	5541
RAINFALL_FLAG	Rainfall contamination flag (0 to 100, zero meaning no rain contamination, 100 meaning full rain contamination)	0	n/a	42	1	1	u-byte	1	42	5625
CORRECTION_FLAGS	Correction flags	0	n/a	42	1	1	u-byte	1	42	5667
PROCESSING_FLAGS	Processing flags	0	n/a	42	1	1	u-integer2	2	84	5709
AGGREGATED_QUALITY_FLAG	Aggregated quality flag. Equal to the maximum value of fields 36,37,38 & 39	0	n/a	42	1	1	u-byte	1	42	5793
SNOW_COVER_PROBABILITY	Flag indicating probability of presence of snow cover	0	n/a	42	1	1	u-byte	1	42	5835
FROZEN_SOIL_PROBABILITY	Flag indicating probability of frozen soil	0	n/a	42	1	1	u-byte	1	42	5877

INUNDATION_OR_WETLAND	Flag indicating the fraction of inundation and wetland areas. Zero means no inundation or wetland areas present	0	n/a	42	1	1	u-byte	1	42	5919
TOPOGRAPHICAL_COMPLEXITY	Flag indicating the topographical complexity (equal to the normalised standard deviation of the elevation). Zero values mean flat, higher values mean complex topography	0	n/a	42	1	1	u-byte	1	42	5961
SIZE OF THE RECORD										6003

FIELD	DESCRIPTION	SF	UNITS	DIM1	DIM2	DIM3	TYPE	TYPE SIZE	FIELD SIZE	OFFSET
RECORD_HEADER	Generic Record Header			1	1	1	REC_HEAD	20	20	0
Quality of MDR has been degraded from nominal due to a processing degradation.										
DEGRADED_INST_MDR	Quality of MDR has been degraded from nominal due to an instrument degradation.	n/a	n/a	1	1	1	boolean	1	1	20
DEGRADED_PROC_MDR	Quality of MDR has been degraded from nominal due to a processing degradation.	n/a	n/a	1	1	1	boolean	1	1	21
SWATH GRID LINE and associated data										
UTC_LINE_NODES	UTC time of line of nodes	n/a	UTC	1	1	1	short cds time	6	6	22
ABS_LINE_NUMBER	Absolute (unique) counter for the line of nodes (from format version 12.0 onwards only)	n/a	count	1	1	1	integer4	4	4	28
SAT_TRACK_AZI	Azimuth angle bearing (range: 0 to 360) of	2	deg	1	1	1	u-integer2	2	2	32
AS_DES_PASS	Ascending/descending pass indicator	n/a	n/a	1	1	1	boolean	1	1	34
NODE and associated data										
NODE_NUM	Node number as used in the PGF (ref AD-2]), i.e., (10 to -10) for the left swath in the left-to-right order, (-10 to 10) for the right swath in the left-to-right order, 0 corresponding to the mid swath position in both swaths.	0	count	82	1	1	integer2	2	164	deleted
SWATH INDICATOR	Swath (0=LEFT, 1=RIGHT)	n/a	n/a	82	1	1	boolean	1	82	35
LATITUDE	Latitude (-90 to 90 deg)	6	deg	82	1	1	integer4	4	328	117
LONGITUDE	Longitude (0 to 360 deg)	6	deg	82	1	1	integer4	4	328	445
ATMOSPHERIC_HEIGHT	Height of atmosphere used	3	km	82	1	1	u-integer2	2	164	Deleted
ATMOSPHERIC_LOSS	Atmospheric loss per unit length of atmosphere	10	dB/km	82	1	1	u-integer4	4	328	Deleted
TRIPLET and associated data										
SIGMA0_TRIP	Sigma0 triplet, re-sampled to swath grid, for 3 beams (fore, mid, aft)	6	dB	3	82	1	integer4	4	984	773

KP	Kp for re-sampled sigma0 tripplet. Values between 0 and 1	4	n/a	3	82	1	u-integer2	2	492	1757
INC_ANGLE_TRIP	Incidence angle for re-sampled sigma0 tripplet.	2	deg	3	82	1	u-integer2	2	492	2249
AZI_ANGLE_TRIP	Incidence angle for re-sampled sigma0 tripplet. Values range from -180 to +180, where minus is west and plus is east.	2	deg	3	82	1	integer2	2	492	2741
NUM_VAL_TRIP	Number of full resolution sigma0 values contributing to the re-sampled sigma0 tripplet.	0	count	3	82	1	u-integer4	4	984	3233
F_KP	Flag related to the quality of the Kp estimate (0=NOMINAL, 1=NON-NOMINAL)	n/a	n/a	3	82	1	boolean	1	246	4217
F_USABLE	Flag related to the usability of the sigma0 tripplet (0=GOOD, 1=USABLE, 2=NOT USABLE)	n/a	n/a	3	82	1	enumerated	1	246	4463
F_F	Flag related to non-nominal amount of input raw data to calculate echo corrections (value between 0 and 1 shows the fraction of original samples affected)	3	n/a	3	82	1	u-integer2	2	492	4709
F_V	Flag related to non enough amount of input raw data to calculate echo corrections (value between 0 and 1 shows the fraction of original samples affected)	3	n/a	3	82	1	u-integer2	2	492	5201
F_OA	Flag related to lack of accuracy of orbit/atticute knowledge (value between 0 and 1 shows the fraction of original samples affected)	3	n/a	3	82	1	u-integer2	2	492	5693
F_SA	Flag related to solar array reflection contamination (value between 0 and 1 shows the fraction of original samples affected)	3	n/a	3	82	1	u-integer2	2	492	6185

F_TEL	Flag related to non-nominal telemetry check results (value between 0 and 1 shows the fraction of original samples affected)	3	n/a	3	82	1	u-integer2	2	492	6677
F_EXT_FIL	Flag related to the presence of extrapolated reference functions in the generation of averaged value (ref. Ad-2) (value between 0 and 1)	3	n/a	3	82	1	u-integer2	2	492	Deleted
F_REF	Flag related to non-nominal raw echo correction reference functions (value between 0 and 1 shows the fraction of original samples affected)	3	n/a	3	82	1	u-integer2	2	492	7169
F_LAND	Flag related to presence of land in the re-sampled sigma0 tripllet (value between 0 and 1 shows the fraction of original samples affected)	3	n/a	3	82	1	u-integer2	2	492	7661
SOIL MOISTURE COMPONENT										
WARP_NRT_VERSION	WARP-NRT version number	0	n/a	1	1	1	u-integer2	2	2	8153
PARAM_DB_VERSION	Parameters database version	0	n/a	1	1	1	u-integer2	2	2	8155
SOIL_MOISTURE	Soil Moisture (0 to 100%)	2	%	82	1	1	u-integer2	2	164	8157
SOIL_MOISTURE_ERROR	Estimated Soil Moisture Error %	2	%	82	1	1	u-integer2	2	164	8321
SIGMA40	Extrapolated Sigma0 backscatter at 40 degrees incidence angle	6	dB	82	1	1	integer4	4	328	8485
SIGMA40_ERROR	Estimated Error in Extrapolated Sigma Zero backscatter at 40 degrees incidence angle	6	dB	82	1	1	integer4	4	328	8813
SLOPE40	Slope at 40 degrees incidence angle	6	dB	82	1	1	integer4	4	328	9141
SLOPE40_ERROR	Estimated error in the slope at 40 degrees incidence angle	6	dB	82	1	1	integer4	4	328	9469
SOIL_MOISTURE_SENSITIVITY	Soil Moisture sensitivity	6	dB	82	1	1	u-integer4	4	328	9797
DRY_BACKSCATTER	Dry backscatter	6	dB	82	1	1	integer4	4	328	10125
WET_BACKSCATTER	Wet backscatter	6	dB	82	1	1	integer4	4	328	10453
MEAN_SURF_SOIL_MOISTURE	Mean surface soil moisture (0 to 100%)	2	%	82	1	1	u-integer2	2	164	10781

RAINFALL_FLAG	Rainfall contamination flag (0 to 100, zero meaning no rain contamination, 100 meaning full rain contamination)	0	n/a	82	1	1	u-byte	1	82	10945
CORRECTION_FLAGS	Correction flags	0	n/a	82	1	1	u-byte	1	82	11027
PROCESSING_FLAGS	Processing flags	0	n/a	82	1	1	u-integer2	2	164	11109
AGGREGATED_QUALITY_FLAG	Aggregated quality flag. Equal to the maximum value of fields 36,37,38 & 39	0	n/a	82	1	1	u-byte	1	82	11273
SNOW_COVER_PROBABILITY	Flag indicating probability of presence of snow cover	0	n/a	82	1	1	u-byte	1	82	11355
FROZEN_SOIL_PROBABILITY	Flag indicating probability of frozen soil	0	n/a	82	1	1	u-byte	1	82	11437
INUNDATION_OR_WETLAND	Flag indicating the fraction of inundation and wetland areas. Zero means no inundation or wetland areas present	0	n/a	82	1	1	u-byte	1	82	11519
TOPOGRAPHICAL_COMPLEXITY	Flag indicating the topographical complexity (equal to the normalised standard deviation of the elevation). Zero values mean flat, higher values mean complex topography	0	n/a	82	1	1	u-byte	1	82	11601
SIZE OF THE RECORD										11683

Field Type	Size in Bytes
bitst(16)	2
bitst(24)	3
bitst(32)	4
bitst(48)	6
bitst(64)	8
bitst(8)	1
boolean	1
byte	1
char(1)	1
char(100)	100
char(2)	2
char(3)	3
char(4)	4
char(40)	40
char(88)	88
e-char(1)	1
e-char(2)	2
e-char(3)	3
enumerated	1
general time	15
integer2	2
integer4	4
integer8	8
long cds time	8
REC_HEAD	20
short cds time	6
u-byte	1
u-integer2	2
u-integer4	4
u-integer8	8