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ASPS Product Format

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Added the NetCDF version		Added section 2.4

TABLE OF CONTENTS

1 INTRODUCTION

1.1 Purpose of the Document

The document describes the format of the product generated by the ASPS facility in the framework of the Scatterometer mission reprocessing.

1.2 Reference

The following documents are as reference:

[R-1] ERS Ground Station Products definition ER-IS-EPO-GS-0201
[R-2] NetCDF-ASPS Scatterometer data file format - SCI-SPE-14-0010-03

1.3 Acronyms, Abbreviations

ASPS	Advanced Scatterometer Processing System
CMOD-4	C-band Model 4
CMOD-5	C-band Model 5
DSR	Data Set Record
EGH	Extracted General Headers
ERS	European Remote Sensing Satellite
ESA	European Space Agency
EWIC	Extracted Wind Calibration data
FMA	Fore Mid Aft
LUT	Look-Up Tables
MPH	Main Product Header
MSC	Modified Successive Corrections algorithm for wind direction ambiguity removal
SPH	Specific Product Header
UWI	User Wind data
WSP	WindScatterometer Processor developed by RMA
YSM	Yaw Steering Mode
ZGM	Zero Gyro Mode

2 ASPS PRODUCTS OVERVIEW

An overview of the ASPS output products is shown in Table 1.

Table1
ASPS Products Overview

Product Name	**Description**	**Size [Mb]**
ASPS Level 1.5	• Intermediate processing parameters • Instrument monitoring parameters • Averaged values for instrument long loop monitoring and processing monitoring	0.5 MB
ASPS Level 2.0	• Nominal resolution sigma nought • High resolution sigma nought • Sea/Land Flag • Refined spatial filter • Rank 1-4 Wind Vector • Ambiguity removed Wind Vector • Ice Flag • Averaged values for QC	Nominal resolution: 2.7 MB High resolution: 11.5 MB
UWI	• Nominal resolution sigma nought • Ambiguity removed Wind Vector • Sea/Land flag	1.5 M
NetCDF Level 2.0	• Nominal resolution sigma nought • High resolution sigma nought • Sea/Land Flag • Refined spatial filter • Rank 1-4 Wind Vector • Ambiguity removed Wind Vector • Ice Flag • Averaged values for QC	Nominal resolution: 2.7 MB High resolution: 12 MB

2.1 ASPS Level 1.5 Products

2.1.1 DESCRIPTION

This product includes the intermediate outputs of the new Wind Scatterometer Processor (WSP). Intermediate outputs are used for instrument and processing monitoring.
The product is time scale organized. Each data set record contains information on one FMA sequence.

2.1.2 SATELLITE SOURCE

AMI in Wind only, wind wave mode

2.1.3 ORIGINATING SUBSYSTEM

ASPS

2.1.4 THROUGHPUT

One product per orbit.

2.1.5 FORMAT

One product includes:

- Main Product Header. (See Table C on Appendix)
- Specific Product Header (See Table 2)
- Product Data Set Records (See Table 3)

The number of DSR is variable depending on the availability of AMI in wind only or wind wave mode throughout an orbit.
According to Table C on Appendix the total number of DSR is stored in field 9 of MPH. The size of each DSR is stored in field 10 of MPH

2.1.6 MEDIA

The product is not distributed.

2.1.7 COMMENT ON PRODUCT

Product quality is monitored on DSR level. Averaged (over the entire product) information for trend analysis is stored on SPH level.

2.1.8 CONFIDENCE

Quality flags are associated to the following parameters:

- Doppler Compensation
- Doppler Frequency shift
- Yaw error angle
- Internal Calibration
- Noise Power
- Arcing
- Frame checksum

2.1.9 PRODUCT SIZE

The product size is roughly 0.5 MB.

The size of MPH is: 176 bytes;
The size of SPH is: 100 bytes;
The size of one DSR is: 85 bytes.

It is foreseen to have 1 DSR roughly every 1 second therefore the maximum size of the product is:

176 + 100 + (85 * 6000 roughly) => roughly 0.5 MB

Table 2
ASPS Level 1.5 Specific Product Header format

Field	Bytes	Type	Description	Units
1	2	B	Bit 1 Summary PCD factor 0: processing according to full specification 1: result to be viewed with limitation. One of the bit (2-10) listed below is not zero. Bit 2 Doppler Compensation CoG flag 0: Compensation OK 1: any beam outside the supplied range Bit 3 Doppler Compensation "StD" flag 0: Compensation OK 1: any beam outside the supplied range Bit 4 Doppler Frequency Shift flag 0: Frequency shift OK 1: any beam outside the supplied range Bit 5 Yaw angle flag 0: Yaw angle OK 1: yaw angle outside the supplied range Bit 6 Noise Power flag 0: all beams OK 1: any beam above or equal the defined threshold Bit 7 Internal Calibration flag 0: all beams OK 1: any beam above or equal the defined threshold Bit 8 Arcing flag 0: all beams OK 1: at least 1 arcing occurred for any beam above	

			or equal the defined threshold Bit 9 Frame checksum flag set 0: all beams OK 1: any beam above or equal the defined threshold Bit 10-11 Spectrum fit methods: 0: CoG 1: Gaussian 2: Sinc 3: Spare Bit 12 - 16 Spare	
2	4	I4	Absolute Orbit Number	
3	2	I2	Averaged (all DSR) CoG of received spectrum (fore) after on ground Doppler Compensation	1 Hz
4	2	I2	Averaged (all DSR) "Standard deviation" of received spectrum (fore) after on ground Doppler Compensation	1 Hz
5	2	I2	Averaged (all DSR) CoG of received spectrum (mid) after on ground Doppler Compensation	1 Hz
6	2	I2	Averaged (all DSR) "Standard deviation" of received spectrum (mid) after on ground Doppler Compensation	1 Hz
7	2	I2	Averaged (all DSR) CoG of received spectrum (aft) after on ground Doppler Compensation	1 Hz
8	2	I2	Averaged (all DSR) "Standard deviation" of received spectrum (aft) after on ground Doppler Compensation	1 Hz
9	2	I2	Averaged (all DSR) Doppler frequency shift (fore) of received spectrum	1 Hz
10	2	I2	Averaged (all DSR) Doppler frequency shift (mid) of received spectrum	1 Hz
11	2	I2	Averaged (all DSR) Doppler frequency shift (aft) of received spectrum	1 Hz
12	2	I2	Averaged (all DSR) Yaw error angle	10^{-3} deg
13	2	I2	Averaged (all DSR) Yaw error angle (only fore)	10^{-3} deg
14	2	I2	Averaged (all DSR) Yaw error angle (only mid)	10^{-3} deg
15	2	I2	Averaged (all DSR) Yaw error angle (only aft)	10^{-3} deg
16	4	I4	Averaged (all DSR) I Noise Power (fore)	10^{-3} ADC units
17	4	I4	Averaged (all DSR) Q Noise Power (fore)	10^{-3} ADC units
18	4	I4	Averaged (all DSR) I Noise Power (mid)	10^{-3} ADC units

19	4	I4	Averaged (all DSR) Q Noise Power (mid)	10^{-3} ADC units
20	4	I4	Averaged (all DSR) I Noise Power (aft)	10^{-3} ADC units
21	4	I4	Averaged (all DSR) Q Noise Power (aft)	10^{-3} ADC units
22	4	I4	Averaged (all DSR) Internal Calibration Level (fore)	10^{-3} ADC units
23	4	I4	Averaged (all DSR) Internal Calibration Level (mid)	10^{-3} ADC units
24	4	I4	Averaged (all DSR) Internal Calibration Level (aft)	10^{-3} ADC units
27	2	I2	Total number of DSR with frame checksum error flag set	
28	2	I2	Total Number of DSR with arcing flag set	
29	2	I2	Total number of DSR with Noise Power flag set (mid)	
30	2	I2	Total number of DSR with Internal Calibration flag set	
31	2	I2	Total number of DSR with Doppler Compensation CoG flag set	
32	2	I2	Total number of DSR with Doppler Compensation "standard deviation" flag set	
33	2	I2	Total number of DSR with Doppler Shift flag set	
34	2	I2	Total number of DSR with Yaw angle flag set	
35	4	I4	WSP Configuration file version number	
36	4	I4	Spare	
37	4	I4	Spare	
38	4	I4	Spare	

Table 3
ASPS Level 1.5 Data Set Record

Field	Bytes	Type	Description	Units
1	4	I4	Data Record number, starting with 1	
2	2	B	DSR Confidence Data -1 Bit 1 Summary PCD factor 0: processing according to full specification 1: result to be viewed with limitation. Summary PCD-1 set OR Summary PCD-2 set (see field 3). Bit 2 Summary PCD-1 0: processing according to full specification 1: result to be viewed with limitation. One of the PCD listed below is not zero. Bit 3 Doppler Compensation CoG flag (Fore) 0: Compensation OK 1: Compensation out of the defined interval Bit 4 Doppler Compensation StDev flag (Fore) 0: Compensation OK 1: Compensation out of the defined interval Bit 5 Doppler Compensation CoG flag (Mid) 0: Compensation OK 1: Compensation out of the defined interval Bit 6 Doppler Compensation StDev flag (Mid) 0: Compensation OK 1: Compensation out of the defined interval	

			Bit 7 Doppler Compensation CoG flag (Aft) 0: Compensation OK 1: Compensation out of the defined interval Bit 8 Doppler Compensation StDev flag (Aft) 0: Compensation OK 1: Compensation out of the defined interval Bit 9 Doppler frequency Shift (Fore) 0: Frequency shift OK 1: Frequency shift out of the defined interval Bit 10 Doppler frequency Shift (Mid) 0: Frequency shift OK 1: Frequency shift out of the defined interval Bit 11 Doppler frequency Shift (Aft) 0: Frequency shift OK 1: Frequency shift out of the defined interval Bit 12 Yaw error angle flag 0: Yaw error angle OK 1: Yaw error out of the defined interval Bit 13 Internal Calibration flag 0: all beams OK 1: any beam above or equal the defined threshold Bit 14 Arcing flag Fore beam 0: No arcing detected on Fore beam 1: at least 1 arcing detected on Fore beam	

			Bit 15 Arcing flag Mid beam 0: No arcing detected on Mid beam 1: at least 1 arcing detected on Mid beam Bit 16 Arcing flag Aft beam 0: No arcing detected on Aft beam 1: at least 1 arcing detected on Aft beam	
3	1	B	DSR Confidence Data -2 Bit 1 Summary PCD-2 0: processing according to full specification 1: result to be viewed with limitation. One of the PCD listed below is not zero. Bit 2 Frame checksum flag 0: all beams OK 1: any beam above or equal the defined threshold Bit 3 Noise Power flag Fore I 0: all beams OK 1: noise power above or equal the defined threshold Bit 4 Noise Power flag Fore Q 0: all beams OK 1: noise power above or equal the defined threshold Bit 5 Noise Power flag Mid I 0: all beams OK 1: noise power above or equal the defined threshold	

			Bit 6 Noise Power flag Mid Q 0: all beams OK 1: noise power above or equal the defined threshold Bit 7 Noise Power flag Aft I 0: all beams OK 1: noise power above or equal the defined threshold Bit 8 Noise Power flag Aft Q 0: all beams OK 1: noise power above or equal the defined threshold	
3	2	I2	Mid beam acquisition time since ascending node crossing	200 ms
4	4	I4	Satellite Track Heading w.r.t. North, turning clockwise at time of mid beam source packet	10^{-3} deg
5	4	I4	Geodetic Latitude of Sub-Satellite point at acquisition time. A negative latitude denote South Latitude and a positive value denotes North Latitude	10^{-3} deg
6	4	I4	East Longitude of Sub-Satellite point at acquisition time. 0-360 deg from Greenwich to East	10^{-3} deg
7	2	I2	Fore beam estimated Yaw angle	10^{-3} deg
8	2	I2	Mid beam estimated Yaw angle	10^{-3} deg
9	2	I2	Aft beam estimated Yaw angle	10^{-3} deg
10	2	I2	Estimated Yaw angle (averaged along track)	10^{-3} deg
11	2	I2	Fore beam Center of gravity of received power spectrum after Doppler Compensation	1 Hz
12	2	I2	Fore beam "Standard Deviation" of received power spectrum after Doppler Compensation	1 Hz
13	2	I2	Mid beam Center of gravity of received power spectrum after Doppler Compensation	1 Hz
14	2	I2	Mid beam " Standard Deviation" of received power spectrum after Doppler Compensation	1 Hz
15	2	I2	Aft beam Center of gravity of received power spectrum after Doppler Compensation	1 Hz
16	2	I2	Aft beam "Standard Deviation" of received power spectrum after Doppler Compensation	1 Hz

17	2	I2	Fore Beam Doppler frequency shift of received echo (Estimated with the method given in SPH field 1 bit 9-10)	1 Hz
18	2	I2	Mid Beam Doppler frequency shift of received echo (Estimated with the method given in SPH field 1 bit 9-10)	1 Hz
19	2	I2	Aft Beam Doppler frequency shift of received echo (Estimated with the method given in SPH field 1 bit 11-12)	1 Hz
20	4	I4	I Mean Noise Power (fore)	10^{-3} ADC units
21	4	I4	Q Mean Noise Power (fore)	10^{-3} ADC units
22	4	I4	I Mean Noise Power (mid)	10^{-3} ADC units
23	4	I4	Q Mean Noise Power (mid)	10^{-3} ADC units
24	4	I4	I Mean Noise Power (aft)	10^{-3} ADC units
25	4	I4	Q Mean Noise Power (aft)	10^{-3} ADC units
26	4	I4	Internal Calibration Level (fore)	10^{-3} ADC units
27	4	I4	Internal Calibration Level (mid)	10^{-3} ADC units
28	4	I4	Internal Calibration Level (aft)	10^{-3} ADC units

2.2 ASPS Level 2.0 Products

2.2.1 DESCRIPTION

It includes the sigma nought triplets and the retrieved wind field (up to 4 solutions for each node) refer to a height of 10m. Ambiguity removed winds are also provided by using MSC algorithm.
The product corresponds to one orbit (from ascending node to ascending node). Each data set record contains across track (500 Km) sigma noughts and wind field. The product sampling is 25 Km across track and 25 Km along track.
The product contains also specific fields to take into account for future scientific upgrades (e.g. Ice flag, spatial filter).

2.2.2 SATELLITE SOURCE

AMI in Wind only, wind wave mode

2.2.3 ORIGINATING SUBSYSTEM

ASPS

2.2.4 THROUGHPUT

One product per orbit.

2.2.5 FORMAT

One product includes:

- Main Product Header. (See Table C on Appendix)
- Specific Product Header (See Table 4)
- Product Data Set Records (See Table 5):
    - Data Set Records Header
    - Nodes structure

The number of DSR is variable depending on the availability of AMI in wind only or wind wave mode throughout an orbit.
According to Table C on Appendix the total number of DSR is stored in field 9 of MPH. The size of each DSR is stored in field 10 of MPH.

2.2.6 MEDIA

The product is distributed to all users through the ESA Earth Online Data Access (https://earth.esa.int/web/guest/data-access).

2.2.7 COMMENT ON PRODUCT

Averaged quality information are stored in the SPH.

2.2.8 CONFIDENCE

Quality flags are associated to each node and the following pcd are available:

- Radiometric accuracy (Kp)
- Doppler frequency shift
- Doppler Compensation
- Yaw error angle
- Internal Calibration
- Noise Power
- Arcing
- Frame checksum flag
- Distance from the C-BAND MODEL
- Low/high wind speed
- Selected solution (ambiguity removal)
- Wind seep bias
- Wind direction bias

2.2.9 PRODUCT SIZE

The size of product is about 2.7 MB in nominal resolution and 11.5 MB in high resolution.

The size of MPH is: 176 bytes;
The size of SPH is: 239 bytes;
The size of one DSR is: 32 + N*93 bytes
where:
N = 19 (nominal resolution) or
N = 41 (high resolution to cover the same area of the nominal resolution product)

It is foreseen to have 1 DSR roughly every 4 seconds in nominal resolution and every 2 seconds in high resolution. The maximum size of the product is:
176 + 239 + (32+19*93)*1500 roughly 2.7 MB
or
176 + 239 + (32+41*93)*3000 roughly 11.5 MB

Table 4
ASPS Level 2.0 Specific Product Header format

Field	Bytes	Type	Description	Units
1	1	B	Product Description Product Type Bit 1 : 0 ASPS : 1 ASPS scientific upgrade Product Resolution Bit 2 : 0 Nominal resolution (50Km) : 1 High resolution Wind Field Ambiguity removal applied Bit 3 : 0 No ambiguity removal : 1 ambiguity removal applied Spatial Filter Methods: Bit 4-5 : 0 Hamming window : 1 Spare (for Scientific upgrades) : 2 Spare (for Scientific upgrades) : 3 Spare (for Scientific upgrades) Wind Retrieval Settings Bit 6 : C-band Model Distance used 0: Euclidian 1: Maximum Likelihood Distance Bit 7 0: Fast wind retrieval 1: Precise wind retrieval Bit 8 : Spare	
2	4	I4	Absolute Orbit Number	
3	2	IU	Number of nodes with 3 valid sigma noughts	
4	2	IU	Number of nodes with 2 valid sigma noughts	
5	2	IU	Number of nodes with 1 valid sigma nought	
6	2	IU	Total number of nodes with Land Flag	
7	2	IU	Total number of nodes with Ice Flag (Valid only for scientific upgrades)	
8	2	IU	Total number of nodes with arcing flag set	

9	2	IU	Total number of nodes with Kp flag set	
10	2	IU	Total Number of nodes with frame checksum error flag set	
11	2	IU	Total number of nodes with Noise Power flag set	
12	2	IU	Total number of nodes with Internal Calibration flag set	
13	2	IU	Total number of nodes with Doppler Compensation CoG flag set	
14	2	IU	Total number of nodes with Doppler Compensation "standard deviation" flag set	
15	2	IU	Total number of nodes with Doppler Shift flag set	
16	2	IU	Total number of nodes with Yaw angle flag set	
17	2	IU	Total number of wind nodes	
18	2	IU	Total number of low wind nodes	
19	2	IU	Total number of high wind nodes	
20	2	IU	Total number of nodes with distance from C-BAND Model flag set	
21	2	IU	Total number of nodes with wind speed bias flag set	
22	2	IU	Total number of nodes with wind direction bias flag set	
23	2	I2	Mean Wind Speed Bias (set to 32767 if no meteorological forecast had been used in the processing)	10^{-3} m/s
24	2	I2	Wind speed standard deviation (set to 32767 if no meteorological forecast had been used in the processing)	10^{-3} m/s
25	2	I2	Mean Wind Direction Bias (set to 32767 if no meteorological forecast had been used in the processing)	10^{-2} deg
26 – 66	164	I4	Mean Distance from C-BAND Model node 1 to 41 (For nominal resolution Field 44-66 are blank)	10^{-3}
67	2	I2	WSP Version	
68	2	I2	WSP Configuration file version number	
69	2	I2	Meteo Table ID If Meteo Table is PALU: table type 83 - forecast F18 generated at 12 UTC If Meteo Table is ERA-40 or OPAN: table type 00 - analysis centered at 00 UTC	
70	2	I2	Meteo Table ID If Meteo Table is PALU: table type 84 - forecast F24 generated at 12 UTC	

			If Meteo Table is ERA-40 or OPAN: table type 06 - analysis centered at 06 UTC	
71	2	I2	Meteo Table ID If Meteo Table is PALU: table type 85 - forecast F18 generated at 00 UTC If Meteo Table is ERA-40 or OPAN: table type 12 - analysis centered at 12 UTC	
72	2	I2	Meteo Table ID If Meteo Table is PALU: table type 86 - forecast F24 generated at 00 UTC If Meteo Table is ERA-40 or OPAN: table type 18 - analysis centered at 18 UTC	
73	4	I4	Type of meteo table used in the processing: 0: No Meteo Table used 1: Operational Forecast (PALU) 2: ERA-40 reanalysis 3: Operational analysis (OPAN)	
74	4	I4	Spare	
75	4	I4	Spare	

Table 5
ASPS Level 2.0 Data Set Record (nominal or high resolution)

DSRHDR (Data Set Record Header)				
Field	Bytes	Type	Description	Units
1	4	I4	Data Record number, starting with 1	Count
2	24	A	Mid beam acquisition time (UTC) node 10 (or node 21 for High Resolution) dd-mmm-yy hh:mm:ss.ddd	
3	4	I4	Subsatellite Track Heading w.r. to North, turning clockwise at time of node 10 (or node 21 for high resolution)	10^{-3} deg
NODE				
1	4	I4	Geodetic latitude of Node 1. A negative value denotes South latitude and a positive value denotes North latitude	10^{-3} deg
2	4	I4	East Longitude of Node 1 (i.e. 0 -360° from Greenwich to east)	10^{-3} deg
3	2	I2	Fore beam acquisition time Node 1 since ascending node crossing.	200 ms
4	2	I2	Mid beam acquisition time Node 1 since ascending node crossing.	200 ms
5	2	I2	Aft beam acquisition time Node 1 since ascending node crossing.	200 ms
6	4	I4	Sigma nought Node 1 fore beam	10^{-7} dB
7	2	I2	Incidence angle Node 1 fore beam	0.1 deg
8	2	I2	Look angle Node 1 fore beam	0.1 deg
9	2	IU	Kp Node 1 forebeam	10^{-3} %
10	2	I2	Number of samples used for Node 1 forebeam (Negative values means wind wave mode)	
10	4	I4	Sigma nought Node 1 midbeam	10^{-7} dB
12	2	I2	Incidence angle Node 1 midbeam	0.1 deg
13	2	I2	Look angle Node 1 midbeam	0.1 deg
14	2	IU	Kp Node 1 midbeam	10^{-3} %
15	2	I2	Number of samples used for Node 1 midbeam (Negative values means wind wave mode)	
16	4	I4	Sigma nought Node 1 aftbeam	10^{-7} dB
17	2	I2	Incidence angle Node 1 aftbeam	0.1 deg

18	2	I2	Look angle Node 1 aftbeam	0.1 deg
19	2	IU	Kp Node 1 aftbeam	10^{-3} %
20	2	I2	Number of samples used for Node 1 aftbeam (Negative values means wind wave mode)	
21	2	I2	Wind Speed Node 1 - Rank1	0.01 m/s
22	2	I2	Wind Direction Node 1 - Rank1	0.1 deg
23	4	I4	Distance from the C-BAND Geophysical Model Function Node 1 Rank1	10^{-3}
24	2	I2	Wind Speed Node 1 - Rank2	0.01 m/s
25	2	I2	Wind Direction Node 1 - Rank2	0.1 deg
26	4	I4	Distance from the C-BAND Geophysical Model Function Node 1 Rank2	10^{-3}
27	2	I2	Wind Speed Node 1 - Rank3	0.01 m/s
28	2	I2	Wind Direction Node 1 - Rank3	0.1 deg
29	4	I4	Distance from the C-BAND Geophysical Model Function Node 1 Rank3	10^{-3}
30	2	I2	Wind Speed Node 1 - Rank4	0.01 m/s
31	2	I2	Wind Direction Node 1 - Rank4	0.1 deg
32	4	I4	Distance from the C-BAND Geophysical Model Function Node 1 Rank4	10^{-3}
33	2	I2	Wind Speed bias (ambiguity removed solution)	0.01 m/s
34	2	I2	Sea Ice Probability	10^{-2}
35	2	I2	Wind Direction bias (Ambiguity removed solution)	0.1 deg
36	2	B	Node Confidence Data -1 Bit 1 Summary PCD factor 0: processing according to full specification 1: result to be viewed with limitation. Summary PCD-1 set OR Summary PCD-2 set (see field 37). Bit 2 Summary PCD-1 0: processing according to full specification 1: result to be viewed with limitation. One of the PCD listed below is not zero.	N/A

			Bit 3 Fore beam flag 0: beam OK 1: no Fore beam calculation Bit 4 Mid beam flag 0: beam OK 1: no Mid beam calculation Bit 5 Aft beam flag 0: beam OK 1: no Aft beam calculation Bit 6 Doppler Compensation CoG flag (Fore) 0: Compensation OK 1: Compensation out of the defined interval Bit 7 Doppler Compensation StDev flag (Fore) 0: Compensation OK 1: Compensation out of the defined interval Bit 8 Doppler Compensation CoG flag (Mid) 0: Compensation OK 1: Compensation out of the defined interval Bit 9 Doppler Compensation StDev flag (Mid) 0: Compensation OK 1: Compensation out of the defined interval Bit 10 Doppler Compensation CoG flag (Aft) 0: Compensation OK 1: Compensation out of the defined interval Bit 11 Doppler Compensation StDev flag (Aft) 0: Compensation OK	

			1: Compensation out of the defined interval Bit 12 Doppler frequency Shift (Fore) 0: Frequency shift OK 1: Frequency shift out of the defined interval Bit 13 Doppler frequency Shift (Mid) 0: Frequency shift OK 1: Frequency shift out of the defined interval Bit 14 Doppler frequency Shift (Aft) 0: Frequency shift OK 1: Frequency shift out of the defined interval Bit 15 Yaw error angle flag 0: Yaw error angle OK 1: Yaw error out of the defined interval Bit 16 Frame checksum flag 0: all beams OK 1: any beam above or equal the defined threshold	
37	2	B	Node Confidence Data -2 Bit 1 Summary PCD-2 factor 0: processing according to full specification 1: result to be viewed with limitation. One of the PCD listed below is not set to zero. (valid only for bit 2 -14) Bit 2 Spare Bit 3 Internal Calibration flag 0: all beams OK 1: any beam above or below	N/A

			the defined thresholds Bit 4 Arcing flag Fore beam 0: No arcing detected on Fore beam 1: at least 1 arcing detected on Fore beam Bit 5 Arcing flag Mid beam 0: No arcing detected on Mid beam 1: at least 1 arcing detected on Mid beam Bit 6 Arcing flag Aft beam 0: No arcing detected on Aft beam 1: at least 1arcing detected on Fore beam Bit 7 Noise Power flag 0: all beams OK 1: any beam above or equal the defined threshold Bit 8 Limit of Kp value 0: all beams below supplied threshold 1: any beam above or below the defined thresholds Bit 9 Distance from C-Band Model Flag 0: Distance of the Rank1 solution is less than or equal to a threshold 1: Distance of the Rank1 solution is greater than a threshold Bit 10 Wind Speed bias (selected solution) flag 0: less than or equal to a threshold 1: above a threshold Bit 11 Wind direction bias (selected solution) flag	

			0: less than or equal to a threshold 1: above a threshold Bit 12 Low wind flag 0: wind speed above a threshold 1: wind speed less or equal a threshold Bit 13 High wind flag 0: wind speed less or equal a threshold 1: wind speed above a threshold Bit 14 Spare Bit 15-16 Ambiguity removal flag (bit 15 less significant) 0: Selected rank1 1: Selected rank2 2: Selected rank3 3: Selected rank4	
38	1	B	Geophysical PCD Bit 1 Land-Sea Flag 0: Sea 1: Land Bit 2 Ice flag (only for scientific upgrades) 0: No ice 1: Ice Bit 3 - 8 Spare	
39 - 724 OR 40 - 1560	93	Node	From node 2 to 19 (as Fields 1 - 38) OR From node 2 to 41 (as Fields 1 - 38) for high resolution product	N/A

2.3 ASPS UWI Products

2.3.1 DESCRIPTION

To maintain the compatibility with the actual ERS ground segment one additional output from ASPS shall be the UWI product. UWI shall be generated from Level 1.5 and Level 2.0 data. One orbit is from ascending node to ascending node.

2.3.2 SATELLITE SOURCE

AMI in Wind only, wind wave mode

2.3.3 ORIGINATING SUBSYSTEM

ASPS

2.3.4 THROUGHPUT

Roughly 85 products per orbit.

2.3.5 FORMAT

One product includes:

- Main Product Header (see Table C on Appendix)
- Specific Product Header (see Table 6)
- Product Data Set Records (see Table 7)

The number of DSR is 361

2.3.6 MEDIA

The product is distributed to Category-1 Users.

2.3.7 COMMENT ON PRODUCT

See table C for MPH product description.
The definition of some fields in the UWI product generated by ASPS has been changed. In particular:

- The definition of the CoG of averaged power spectrum (for 3 antennae) has been changed as CoG of averaged power spectrum at the central node of the product;
- The Frame synchronizer flag is also set in case corrupted calibration pulse or noise data was detected and replaced with default value.
- The definition of the counter of corrupted or missing source packets has been changed as number of samples used to compute the node.

2.3.8 PRODUCT SIZE

The product size is roughly 1.5 MB

The size of MPH is: 176 bytes;
The size of SPH is: 294 bytes;
The size of one DSR is: 361 * 46 bytes

It is foreseen to have 85 products per orbit.
The maximum size of the product is:
(176 + 294 + (361 * 46))*85 => roughly 1.5 MB

Table 6
UWI Specific Product Header format

Field	Bytes	Type	Description	Units
1	2	B	Product Confidence Data for Processing bit 1 & 2: Processing equipment status 0: equipment working 1: some problems with equipment 2: equipment failed during product generation bit 3: Spare bit 4: I/Q Imbalance Flag 0: all beams better than MMCC/EECF-defined threshold 1: any beam above or equal to MMCC/EECF-defined threshold bit 5: Internal Calibration level flag 0: all beams within MMCC/EECF-defined level window 1: any beam out of MMCC/EECF-defined level window bit 6: Blank Product Flag 0: data available 1 no data available bit 7: Doppler Compensation: Center of Gravity flag 0: all beams below MMCC/EECF defined threshold 1: any beam above or equal to MMCC/EECF-defined threshold bit 8: Doppler Compensation: Standard Deviation flag 0: all beams below MMCC/EECF defined interval 1: any beam outside MMCC/EECF-defined interval bit 9 & 10: Type of Meteo Table used in the processing: 0: No Meteo Table used 1: Operational Forecast (PALU) 2: ERA-40 reanalysis 3: Operational analysis (OPAN) bit 11 - 16: Spare	N/A
2	4	I4	Geodetic latitude of Product Center; A negative value denotes South latitude, and a positive value denotes North latitude.	10^{-3} deg
3	4	I4	East longitude (i.e. 0-360º) from Greenwich to East)	10^{-3} deg
4	4	I4	Subsatellite Track Heading w.r. to North, turning clockwise 0at time of product center	10^{-3} deg
5	2	I2	Mean distance between two successive along track nodes at product center	meter
6	2	I2	Center of Gravity of averaged power spectrum (forebeam)	2.344 Hz
7	2	I2	''Standard Deviation'' of averaged power spectrum (forebeam)	2.344 Hz
8	2	I2	Center of Gravity of averaged power spectrum (midbeam)	2.344 Hz
9	2	I2	''Standard Deviation'' of averaged power spectrum (midbeam)	2.344 Hz
10	2	I2	Center of Gravity of averaged power spectrum (aftbeam)	2.344 Hz

11	2	I2	''Standard Deviation'' of averaged power spectrum (aftbeam)	2.344 Hz
12	4	I4	I Mean Noise Power, forebeam	10^{-3} ADC units
13	4	I4	Q Mean Noise Power, forebeam	10^{-3} ADC units
14	4	I4	I Mean Noise Power, midbeam	10^{-3} ADC units
15	4	I4	Q Mean Noise Power, midbeam	10^{-3} ADC units
16	4	I4	I Mean Noise Power, aftbeam	10^{-3} ADC units
17	4	I4	Q Mean Noise Power, aftbeam	10^{-3} ADC units
18	4	I4	Internal Calibration level monitoring factor, forebeam	10^{-3} ADC units
19	4	I4	Internal Calibration level monitoring factor, midbeam	10^{-3} ADC units
20	4	I4	Internal Calibration level monitoring factor, aftbeam	10^{-3} ADC units
21	2	B	Mode of operation - set by the first midbeam source packet contributing to spatial filtering for the first node (near swath) in the center row of a product. bit 1 and 2: 0: wind mode 1: wind/wave mode 2: no data found to identify mode bit 3 - 16: Spare	N/A
22-71	82	I2	Parameter Table ID. Details as follows:	N/A
22	2	I2	Global threshold Parameter Table ID	N/A
23	2	I2	Static parameter Parameter Table ID	N/A
24	2	I2	Dynamic parameter Parameter Table ID	N/A
25	2	I2	F Rb(n) Parameter Table ID	N/A
26	2	I2	Torbit,ref,D Parameter Table ID	N/A
27	2	I2	*F Parameter Table ID	N/A
28	2	I2	*M Parameter Table ID	N/A
29	2	I2	*A Parameter Table ID	N/A
30	2	I2	F Tb(n) Parameter Table ID	N/A
31	2	I2	CADC,b(n) Parameter Table ID	N/A

32	2	I2	Torbit,ref,N Parameter Table ID	N/A
33	2	I2	FN,F Parameter Table ID	N/A
34	2	I2	FN,M Parameter Table ID	N/A
35	2	I2	FN,F Parameter Table ID	N/A
36	2	I2	*N,b(j,k) Parameter Table ID	N/A
37	2	I2	*N,b(j,k) Parameter Table ID	N/A
38	2	I2	Meff,b(j,k) Parameter Table ID	N/A
39	2	I2	N(j,k) Parameter Table ID	N/A
40	2	I2	Wind extraction software configuration Table ID	N/A
41	2	I2	LAb(ir,ic) Parameter Table ID	N/A
42	2	I2	LZb(ir,ic) Parameter Table ID	N/A
43	2	I2	LNb Parameter Table ID	N/A
44	2	I2	MAb Parameter Table ID	N/A
45	2	I2	MSb Parameter Table ID	N/A
46	2	I2	NAF(*,ic) fore Parameter Table ID	N/A
47	2	I2	NAM(*,ic) mid Parameter Table ID	N/A
48	2	I2	NAA(*,ic) aft Parameter Table ID	N/A
49	2	I2	NSF(*,ic) fore Parameter Table ID	N/A
50	2	I2	NSM(*,ic) mid Parameter Table ID	N/A
51	2	I2	NSA(*,ic) aft Parameter Table ID	N/A
52	2	I2	NNF(*,ic) fore Parameter Table ID	N/A
53	2	I2	NNM(*,ic) mid Parameter Table ID	N/A
54	2	I2	NNA(*,ic) aft Parameter Table ID	N/A
55	2	I2	lref Parameter Table ID	N/A
56	2	I2	aF(* ,ic) fore Parameter Table ID	N/A
57	2	I2	aM(* ,ic) mid Parameter Table ID	N/A
58	2	I2	aA(* ,ic) aft Parameter Table ID	N/A
59	2	I2	avF(k,ir,ic) fore Param. Table ID	N/A
60	2	I2	avM(k,ir,ic) mid Parameter Table ID	N/A
61	2	I2	avA(k,ir,ic) aft Parameter Table ID	N/A
62	2	I2	ib Parameter Table ID	N/A
63	2	I2	WSP Version number	N/A
64	2	I2	WSP configuration files identification number	N/A
65	2	I2	Meteo Table ID	N/A

			If Meteo Table is PALU: table type 83 - forecast F18 generated at 12 UTC If Meteo Table is ERA-40 or OPAN: table type 00 -analysis centered at 00 UTC	
66	2	I2	Meteo Table ID If Meteo Table is PALU: table type 84 - forecast F24 generated at 12 UTC If Meteo Table is ERA-40 or OPAN: table type 06 -analysis centered at 06 UTC	N/A
67	2	I2	Meteo Table ID If Meteo Table is PALU: table type 85 - forecast F18 generated at 00 UTC If Meteo Table is ERA-40 or OPAN: table type 12 -analysis centered at 12 UTC	N/A
68	2	I2	Meteo Table ID If Meteo Table is PALU: table type 86 - forecast F24 generated at 00 UTC If Meteo Table is ERA-40 or OPAN: table type 18 -analysis centered at 18 UTC	N/A
69	2	I2	Spare	N/A
70	2	I2	Spare	N/A
71	2	I2	Spare	N/A

Table 7
UWI Data Set Header

Field	Bytes	Type	Description	Units
1	4	I4	Data record number, starting with 1.	Count
2	4	I4	Geodetic latitude of Node. A negative value denotes South latitude, and a positive value denotes North latitude.	10^{-3} deg
3	4	I4	East longitude (i.e. 0-360* from Greenwich to east)	10^{-3} deg
4	4	I4	σ^o of forebeam	10^{-7} dB
5	2	I2	Incidence Angle for forebeam	0.1 deg
6	2	I2	Look Angle of forebeam clock- wise w.r.t. North at grid point	0.1 deg
7	1	I1	Kp Value of forebeam, set to 255 if the calculation is not possible	‰
8	1	I1	Number of samples used to compute the node (Values from -128 to 127; Negative values means wind wave mode)	8
9	4	I4	σ^o of midbeam	10^{-7} dB
10	2	I2	Incidence Angle of midbeam	0.1 deg
11	2	I2	Look Angle of midbeam clock- wise w.r.t. North at grid point	0.1 deg
12	1	I1	Kp Value of midbeam, set to 255 if the calculation is not possible.	‰
13	1	I1	Number of samples used to compute the node (Values from -128 to 127; Negative values means wind wave mode)	8
14	4	I4	σ^o of aftbeam	10^{-7} dB
15	2	I2	Incidence Angle of aftbeam	0.1 deg
16	2	I2	Look Angle of aftbeam clock- wise w.r.t. North at grid point.	0.1 deg
17	1	I1	Kp Value of aftbeam, set to 255 if the calculation is not possible.	‰
18	1	I1	Number of samples used to compute the node (Values from -128 to 127; Negative values means wind wave mode)	8
19	1	I1	Wind speed (set to 255 if wind extraction is not possible)	0.2 m/s
20	1	I1	Wind direction with respect to North turning clockwise at grid point (set to 255 if wind extraction is not possible)	2 deg.
21	2	B	Product Confidence Data bit 1 Summary PCD factor 0: processing of cell according to full specification 1: result to be viewed with limitation, i.e. one of the PCD flags listed below is not 0 (except bits 11-13). bit 2 Forebeam Flag 0: beam OK	N/A

			1: no forebeam calculation bit 3 Midbeam Flag 0: beam OK 1: no midbeam calculation bit 4 Aftbeam Flag 0: beam OK 1: no aftbeam calculation bit 5 Forebeam Arcing Flag 0: no arcing detected on forebeam 1: arcing detected on forebeam bit 6 Midbeam Arcing Flag 0: no arcing detected on midbeam 1: arcing detected on midbeam bit 7 Aftbeam Arcing Flag 0: no arcing detected on aftbeam 1: arcing detected on aftbeam bit 8 Limit of Kp value 0: all beams below MMCC/EECF-supplied threshold 1: any beam above or equal to MMCC/EECF-supplied threshold bit 9 Land-Sea Flag 0: Sea 1: Land bit 10 Ambiguity removal flag 0: Ambiguity removal performed 1: No ambiguity removal performed or ambiguity removal not successful: rank-1 solution selected. bit 11-12 Ambiguity Removal Method . 0: ambiguity removed autonomously 1: use of meteorological tables after failure of autonomous ambiguity removal 2: ambiguity removed using meteorological data only 3: no ambiguity removal attempted bit 13 Maximum likelihood distance flag . 0: Maximum Likelihood Distance M of the rank 1 solution is less than or equal to a threshold	

			1: Maximum Likelihood Distance M of the rank 1 solution (i.e. solution of minimum residual) is greater than a threshold. bit 14 Frame Checksum Flag 0: Checksum correct 1: Checksum error detected, noise and calibration replaced with default bit 15 Yaw angle computation flag 0: Yaw angle computed 1: Yaw angle not computed due to degraded satellite attitude bit 16 Yaw angle error flag 0: Yaw angle OK 1: Yaw angle outside nominal range [±3 degree]	

2.4 NetCDF level 2.0 products

2.4.1 DESCRIPTION

The level 2.0 products are also distributed in Net CDF standard format.
As for the ASPS 2.0 products, it includes the sigma nought triplets and the retrieved wind field (up to 4 solutions for each node) refer to a height of 10m. Ambiguity removed winds are also provided by using MSC algorithm.
The product corresponds to one orbit (from ascending node to ascending node). Each data set record contains across track (500 Km) sigma noughts and wind field.

2.4.2 SATELLITE SOURCE

AMI in Wind only, wind wave mode

2.4.3 ORIGINATING SUBSYSTEM

ASPS2NetCDF converter.

2.4.4 THROUGHPUT

One product per orbit.

2.4.5 FORMAT

ASPS2 NetCDF file contains information organized in the following standard NetCDF data structures: *dimensions*, *variables* and global *attributes*, as defined in Tables 8, 9 and 10 respectively.

2.4.6 MEDIA

The product is distributed to all users through the ESA Earth Online Data Access (https://earth.esa.int/web/guest/data-access).

2.4.7 COMMENT ON PRODUCT

Averaged quality information is stored in the global common attributes.

2.4.8 CONFIDENCE

Quality flags are associated to each node and the following flags are available:

- Radiometric accuracy (Kp)
- Doppler frequency shift
- Doppler Compensation
- Yaw error angle
- Internal Calibration
- Noise Power
- Arcing
- Frame checksum flag
- Distance from the C-BAND MODEL
- Low/high wind speed
- Selected solution (ambiguity removal)
- Wind seep bias
- Wind direction bias

2.4.9 PRODUCT SIZE

The size of product is about 2.8 MB in nominal resolution and 12 MB in high resolution.

Table 8
Definition of Dimension in ASPS 2 NetCDF product

		Product Type	
Dimension name	**Value**	**H resolution**	**N resolution**
numrows	Number of row	3209	1605
numcells	Number of cell	41	19
numbeams	Number of beams	3	3
numwindsol	Number of wind speed solutions	4	4
vector	Satellite State Vector dimensions	3	3
time	Time dimension	1	1
clockd	Satellite binary clock dimension	2	2
softd	Step length of binary clock dimension	4	4

Table 9
Definition of Variables in ASPS 2 NetCDF product (green color indicates that the standard name is actually CF-compliant, while the red color indicates that the standard name is not)

mean_cmod_dist	Mean distance between the measured sigma0 triplet and the wind model		int	numcells
units	Unit name	1		
cell_method	lon: mean lat: mean			
valid_min	Minimum value	0; // int		
valid_max	Maximum value	100000; // int		
scale_factor	The data must be multiplied by this factor after reading	0.001f; // float		
_FillValue	Default value for unused or not computed elements	0; // int		
Comment	Mean distance between the sigma0 triplets and the C-band model			

time	Time at which the central measurement was performed		double	numrows
Standard_name	time			
units	Unit name	seconds since 1950-01-01 00:00:00 UTC		
valid_min	Minimum value	0.0f; // float		
scale_factor	The data must be multiplied by this factor after reading	1.0; // double		
_FillValue	Default value for unused or not computed elements	0.0; // double		
Comment	UTC time of line of nodes			

timeacquisition	Time at which the measurement was performed		short	numbeams, numrows, numcells
units	Unit name	seconds since ascending node crossing time		
valid_min	Minimum value	0.0f; // float		
scale_factor	The data must be multiplied by this factor after reading	5.0; // double		
_FillValue	Default value for unused or not computed elements	0S		
Comment	Seconds since ascending node crossing time			

head	Subsatellite track heading of the node in the middle of the swath		double	numrows
Standard_name	platform_course			

units	Unit name	degrees		
scale_factor	The data must be multiplied by this factor after reading	1000.0; // double		
_FillValue	Default value for unused or not computed elements	0.0; // double		

lon	Longitude of the wind vector cell		int	numrows, numcells
Standard_name	longitude			
units	Unit name	degrees_east		
_CoordinateAxisType	Space or time coordinate	Lon		
valid_min	Minimum value	-180000; // int		
valid_max	Maximum value	180000; // int		
scale_factor	The data must be multiplied by this factor after reading	0.001f; // float		
Comment	Longitude (-180 to 180 deg)			

lat	Latitude of the wind vector cell		int	numrows, numcells
Standard_name	latitude			
units	Unit name	degrees_north		
_CoordinateAxisType	Space or time coordinate	Lat		
valid_min	Minimum value	-90000; // int		
valid_max	Maximum value	90000; // int		
scale_factor	The data must be multiplied by this factor after reading	0.001f; // float		
Comment	Latitude			

Sigma0	Sigma0 triplet resampled to swath grid		int	numbeams, numrows, numcells
Standard_name	surface_normalized_radar_cross_section			
units	Unit name	0.1 lg(re 1)		
cell_method	area: mean			
valid_min	Minimum value	-9999998; // int		
valid_max	Maximum value	9999999; // int		
definition	0: FORE, 1: MID, 2: AFT			
_CoordinateAxes		lat lon		
scale_factor	The data must be multiplied by this factor after reading	1.0E-7f; // float		
_FillValue	Default value for unused or not computed elements	-9999999; // int		

Comment	Smoothed to 12.5 km spatial resolution triplet (fore, mid, aft) sigma0 values (expressed in dB)			

wind_speed	Wind speed at the WVC		short	numwindsol, numrows, numcells
Standard_name	wind_speed			
units	Unit name	m s-1		
cell_method	area: point			
valid_min	Minimum value	0S; // short		
valid_max	Maximum value	6000S; // short		
_CoordinateAxes		lat lon		
scale_factor	The data must be multiplied by this factor after reading	0.01f; // float		
_FillValue	Default value for unused or not computed elements	0S; // short		
Comment	Sea surface wind speed at 10 m			

wind_dir	Wind direction at the WVC		short	numwindsol, numrows, numcells
Standard_name	wind_from_direction			
units	Unit name	degrees		
cell_method	area: point			
valid_min	Minimum value	0S; // short		
valid_max	Maximum value	3600S; // short		
_CoordinateAxes		lat lon		
scale_factor	The data must be multiplied by this factor after reading	0.1f; // float		
_FillValue	Default value for unused or not computed elements	0S; // short		
Comment	Sea surface wind direction at 10 m			

distance	Distance between the measured sigma0 triplet and the wind model		int	numwindsol, numrows, numcells
Standard_name	distance_to_model			
units	Unit name	1		
cell_method	area: point			
valid_min	Minimum value	0S; // short		

valid_max	Maximum value	100000; // int		
_CoordinateAxes		lat lon		
scale_factor	The data must be multiplied by this factor after reading	0.1f; // float		
_FillValue	Default value for unused or not computed elements	-1; // int		
Comment	Distance between the sigma0 triplet and the C-band model			

wind_speed_bias	Wind speed bias with respect to background wind		short	numrows, numcells
Standard_name	wind_speed_bias_from_background_wind			
units	Unit name	m s-1		
cell_method	area: point			
valid_min	Minimum value	0S; // short		
valid_max	Maximum value	6000S; // short		
_CoordinateAxes		lat lon		
scale_factor	The data must be multiplied by this factor after reading	0.01f; // float		
_FillValue	Default value for unused or not computed elements	0S; // short		

wind_speed_stddev	Wind speed bias with respect to background wind		short	numrows, numcells
Standard_name	wind_speed_bias_from_background_wind standard_error			
units	Unit name	m s-1		
cell_method	area: point			
valid_min	Minimum value	0S; // short		
valid_max	Maximum value	6000S; // short		
_CoordinateAxes		lat lon		
scale_factor	The data must be multiplied by this factor after reading	0.01f; // float		
_FillValue	Default value for unused or not computed elements	0S; // short		

wind_dir_bias	Wind direction bias from background wind		short	numrows, numcells
Standard_name	wind_direction_bias_from_background_wind			
units	Unit name	degrees		
cell_method	area: point			
valid_min	Minimum value	0S; // short		
valid_max	Maximum value	3600S; // short		
_CoordinateAxes		lat lon		

scale_factor	The data must be multiplied by this factor after reading	0.1f; // float		
_FillValue	Default value for unused or not computed elements	0S; // short		

qcflag_windspeed	Geophysical flags		byte	numrows, numcells
Standard_name	surface_normalized_radar_backscatter_coefficient status_flag			
units	Unit name	1		
valid_range	Validity range	0B, 2B; // byte		
flag_mask	Flag mask	1, 1, 2, 2; // int		
flag_value	Maximum value	0, 1, 0, 2; // int		
flag_meaning	Flag meaning	Node_is_over_sea Node_is_over_land Node_does_not_contain_sea_ice Node_contains_sea_ice		
_CoordinateAxes		lat lon		
_FillValue	Default value for unused or not computed elements	0B; // byte		
Comment	Geophysical information			

inc_angle_trip	Incidence angle		short	numbeams, numrows, numcells
Standard_name	angle_of_incidence			
units	Unit name	degrees		
cell_method	area: point			
valid_min	Minimum value	1800S; // short		
valid_max	Maximum value	5700S; // short		
_CoordinateAxes		lat lon		
scale_factor	The data must be multiplied by this factor after reading	0.1f; // float		
_FillValue	Default value for unused or not computed elements	0S; // short		
Comment	Incidence angle values			

azi_angle_trip	Beam azimuth angle		short	numbeams, numrows, numcells
Standard_name	sensor_azimuth_angle			
units	Unit name	degrees		
cell_method	area: point			
valid_min	Minimum value	-1800S; // short		
valid_max	Maximum value	1800S; // short		
_CoordinateAxes		lat lon		
scale_factor	The data must be multiplied by this factor after reading	0.1f; // float		
_FillValue	Default value for unused or not computed elements	0S; // short		
Comment	Azimuth angle values			

kp	Kp		short	numbeams, numrows, numcells
Standard_name	surface_normalized_radar_backscatter_coefficient standard_error			
units	Unit name	1		
cell_method	area: standard_deviation			
valid_min	Minimum value	0S; // short		
valid_max	Maximum value	1000S; // short		
_CoordinateAxes		lat lon		
scale_factor	The data must be multiplied by this factor after reading	0.001f; // float		
_FillValue	Default value for unused or not computed elements	0S; // short		
Comment	Kp values are equal to the standard deviation of the sigma0 normalized by the sigma0			

number_of_samples	Number of samples averaged		short	numbeams, numrows, numcells
Standard_name	number_of_samples			
units	Unit name	1		
cell_method	area: mean			
_CoordinateAxes		lat lon		
scale_factor	The data must be multiplied by this factor after reading	1S; // short		

_FillValue	Default value for unused or not computed elements	0S; // short		
Comment	Negative values means that the instrument is in wind-wave mode			

node_confidence_data1_sigma0	Node confidence data of the sigma0 triplet		int	numrows, numcells
Standard_name	surface_normalized_radar_backscatter_coefficient status_flag			
units	Unit name	1		
valid_range	Validity range	0, 65536; // int		
flag_mask	Flag mask	1, 1, 2, 2, 4, 4, 8, 8, 16, 16, 32, 32, 64, 64, 128, 128, 256, 256, 512, 512, 1024, 1024, 2048, 2048, 4096, 4096, 8192, 8192, 16384, 16384, 32768, 32768; // int		
flag_value	Maximum value	0, 1, 0, 2, 0, 4, 0, 8, 0, 16, 0, 32, 0, 64, 0, 128, 0, 256, 0, 512, 0, 1024, 0, 2048, 0, 4096, 0, 8192, 0, 16384, 0, 32768; // int		
flag_meaning	Flag meaning	Processing_according_to_full_specification Result_to_be_viewed_with_limitation Nominal_NCD1 Non_nominal_NCD1 For_beam_ok For_beam_not_computed Mid_beam_ok Mid_beam_not_computedAft_beam_ok Aft_beam_not_computed DopplerCompCOGfor_ok DopplerCompCOGfor_nok DopplerCompstdfor_ok DopplerCompstdfor_nok DopplerCompCOGmid_ok DopplerCompCOGmid_nok DopplerCompstdmid_ok DopplerCompstdmid_nok DopplerCompCOGaft_ok DopplerCompCOGaft_nok DopplerCompstdaft_ok DopplerCompstdaft_nok Dopplerfreqshiftfor_ok Dopplerfreqshiftfor_nok Dopplerfreqshiftmid_ok		

		Dopplerfreqshiftmid_nok Dopplerfreqshiftaft_ok Dopplerfreqshiftaft_nok Yaw_angle_ok Yaw_angle_nok frame_checksum_ok frame_checksum_nok		
_CoordinateAxes		lat lon		
_FillValue	Default value for unused or not computed elements	0; // int		
Comment	Usability of the sigma0 triplet (byte 1 of 2)			

node_confidence_data2_sigma0	Node confidence data of the sigma0 triplet		int	numrows, numcells
Standard_name	surface_normalized_radar_backscatter_coefficient status_flag			
units	Unit name	1		
valid_range	Validity range	0, 65536; // int		
flag_mask	Flag mask	1, 1, 4, 4, 8, 8, 16, 16, 32, 32, 64, 64, 256, 256, 512, 512, 1024, 1024, 2048, 2048, 4096, 4096, 49152, 49152, 49152, 49152; // int		
flag_value	Maximum value	0, 1, 0, 4, 0, 8, 0, 16, 0, 32, 0, 64, 0, 128, 0, 256, 0, 512, 0, 1024, 0, 2048, 0, 4096, 0, 16384, 32768, 49152; // int		
flag_meaning	Flag meaning	Nominal_NCD2 Non_nominal_NCD2 Internal_calibration_ok_for_all_beams Internal_calibration_ouside_confidence_interval_for_any_beam For_beam_not_arcing For_beam_arcing Mid_beam_not_arcing Mid_beam_arcing Aft_beam_not_arcing Aft_beam_arcing Nominal_noise_power Noise_power_outside_of_confidence_interval Nominal_Kp_value Kp_value_outside_of_confidence_interval Nominal_distance_to_cone Distance_to_cone_above_threshold Wind_speed_bias_nominal		

		Wind_speed_bias_above_threshold Wind_direction_bias_nominal Wind_direction_bias_above_threshold Wind_speed_above_low_threshod wind_speed_below_low_threshold Wind_speed_above_high_threshod wind_speed_below_high_threshold Ambiguity_removal_selected_rank_1_solution Ambiguity_removal_selected_rank_2_solution Ambiguity_removal_selected_rank_3_solution Ambiguity_removal_selected_rank_4_solution		
_CoordinateAxes		lat lon		
_FillValue	Default value for unused or not computed elements	0; // int		
Comment	Usability of the sigma0 triplet (byte 2 of 2)			

state_vector_position	State vector: satellite position at epoch		int	vector
units	Unit name	m		
scale_factor	The data must be multiplied by this factor after reading	0.01f; // float		

state_vector_velocity	State vector: satellite velocity at epoch		int	vector
units	Unit name	m s-1		
scale_factor	The data must be multiplied by this factor after reading	1.0E-5f; // float		

state_vector_time	State vector: satellite epoch		double	
units	Unit name	seconds since 1950-01-01 00:00:00 UTC		

utct	UTC time at subsatellite point		double	
units	Unit name	seconds since 1950-01-01 00:00:00 UTC		

reft	UTC reference time		double	
units	Unit name	seconds since 1950-01-01 00:00:00 UTC		
Comment	linked to clock and soft variables			

clock	Reference binary time of satellite clock		int	clockd
units	Unit name	1		
comment	linked to clock and soft variables			

soft	Step length of satellite clock		short	softd
units	Unit name	1		
comment	linked to clock and soft variables			

Table 10
Definition of Global Attributes in ASPS 2 NetCDF product

Attribute name	Description	Format
Title	Full name to identify the product	string
Title_short_name	Short product name	string
Conventions	netCDF convention	string
Institution	Specifies where the original data was produced	string
Source	Satellite/instrument	string
processing_station_id	Processing center	string
subsystem_that_generated_the_product	Subsystem that generated the product	string
threshold_table_version_number	Threshold table version number	string
contents	Product filename	string
product_type	Product type	string
spatial_resolution	Spatial resolution	string
wind_field_ambiguity_removal	Wind field ambiguity removal method	string
spatial_filter_method	Spatial filter method used	string
c_band_model_distance_used	C-band model distance used	string
wind_retrieval_method	Wind retrieval method used	string
processing_level	Processing level	string
start_date_time	Sensing start in DD-MMM-YYYY HH:MM:SS.ttt	string
stop_date_time	Sensing stop in DD-MMM-YYYY HH:MM:SS.ttt	int
history	Product origin	int
references	Web-based references that describe the data	int
creation_date_time	Creation time in DD MM HH MM SS YYYY	int
absolute_orbit_number	Absolute orbit number	double
number_of_nodes_with_3_valid_sigma_0	Number of nodes with 3 valid sigma 0	string
number_of_nodes_with_2_valid_sigma_0	Number of nodes with 2 valid sigma 0	int
number_of_nodes_with_1_valid_sigma_0	Number of nodes with 1 valid sigma 0	double
number_of_nodes_with_land_flag_set	Number of nodes with land flag set	string
number_of_nodes_with_ice_flag_set	Number of nodes with ice flag set	string
number_of_nodes_with_arcing_flag_set	Number of nodes with arcing flag set	byte
number_of_nodes_with_kp_flag_set	Number of nodes with Kp flag set	string
number_of_nodes_with_frame_checksum_flag_set	Number of nodes with frame checksum flag set	string
number_of_nodes_with_noise_power_flag_set	Number of nodes with noise power flag set	string
number_of_nodes_with_internal_calibration_flag_set	Number of nodes with internal calibration set	string
number_of_nodes_with_doppler_cog_flag_set	Number of nodes with Doppler cog flag set	string
number_of_nodes_with_doppler_std_flag_set	Number of nodes with Doppler std flag set	double
number_of_nodes_with_doppler_shift_flag_set	Number of nodes with Doppler shift flag set	double

number_of_nodes_with_yaw_angle_flag_set	Number of nodes with yaw angle flag set	double
number_of_nodes_with_high_wind	Number of nodes with high wind flag set	double
number_of_nodes_with_low_wind	Number of nodes with low wind flag set	byte
number_of_nodes_with_distance_to_wind_model_flag_set	Number of nodes with distance to wind model flag set	double
number_of_nodes_with_wind_speed_bias_flag_set	Number of nodes with wind speed bias flag set	byte
number_of_nodes_with_wind_direction_bias_flag_set	Number of nodes with wind direction bias flag set	byte
mean_wind_speed_bias	Mean wind speed bias	double
wind_speed_bias_std_dev	Wind speed bias standard deviation	double
mean_wind_direction_bias	Mean wind direction bias	double
Meteo_table_ID_1	Meteo table ID 1	double
Meteo_table_ID_2	Meteo table ID 2	double
Meteo_table_ID_3	Meteo table ID 3	double
Meteo_table_ID_4	Meteo table ID 4	double
Configuration_file_version_number	Configuration file version number	double

APPENDIX A

Table A: Data types in the ERS Ground station products

Data Type	Meaning
I1	1-byte unsigned integer
I2	2-byte integer in Linux format
I4	4-byte integer in Linux format
IU	Unassigned integer
A	ASCII
B	1 byte or bits (flags)
S	Special format, as defined in description field

Table B: Product types

Type	Product	
0	RATSR	ATSR-1 Extracted Calibration data
1	UI16	AMI Image 16-bit Fast delivery
2	UI8	AMI Image 8-bit Fast delivery
3	UIND	AMI Image Noise Statistics and Drift Calibration
4	UIC	AMI Image Chirp Replica
5	UWA	AMI Wave Fast delivery
6	UWAND	AMI Wave Noise Statistics and Drift Calibration
7	UWAC	AMI Wave Chirp Replica
8	UWI	AMI Wind Fast delivery
9	URA	Radar Altimeter Fast delivery
10	IWA	AMI Wave Intermediate Products
11	II16	AMI Image Intermediate Products
12	EIC	AMI Image Extracted Calibration
13	EWAC	AMI Wave Extracted Calibration
14	EWIC	AMI Wind Extracted Calibration data
15	ERAC	Radar Altimeter Extracted Calibration Data
16	EII	AMI Image Instrument Headers
17	EWAI	AMI Wave Instrument Headers

18	EWII	AMI Wind Instrument Headers
19	ERAI	Radar Altimeter Instrument Headers
20	EGH	General Headers
21	EEP	Ephemeris Data
22	TP	Text Product
23	UILR	User Image Low Resolution Image
30	VI	Verification Image
31	VIC	Verification Image Calibration
32	VWA	Verification Wave
33	VWAC	Verification Wave Calibration
34	EGOC	GOME Extracted Calibration data
35	EGOI	GOME Instrument Headers
36	EATI2	ATSR-2 Instrument Headers
37	EATI1	ATSR-1 Instrument Headers
38	EATC2	ATSR-2 Low rate Extracted Calibration data
39	EMWC	Microwave Sounder Extracted Calibration data
40	EICM	Multiple AMI Image Calibration Data
41	ASPS Level 1.5	AMI ASPS Level 1.5
42	ASPS Level 2.0	AMI ASPS Level 2.0

Table C: Main Product Header Detailed Description for all products

Field	Bytes	Type	Description
1	17	A/I	Product identifier (for ESA internal operational use only), i.e. a set of characters and integers which form a unique identifier. The set of 17 Bytes is defined as follows: Byte 1: Originator of logical schedule (for ESA internal use only) e.g.: I: MMCC/EECF, Immediate Command M: MMCC/EECF, Logical Schedule J: Local operator, Immediate Command K: Local operator, Logical Schedule Byte 2-5: Sequential Counter of Logical Schedule = orbit number Byte 6-9: Unique Identification, set to 0 Byte 10-13: Not used, set to 0 Byte 14-17: Sequential Number of Currently Generated Product, set to 0
2	1	I1	Type of Product, see Table B
3	1	I1	Spacecraft 1: ERS-1 2: ERS-2
4	24	A	UTC time of subsatellite point at beginning of product. Format in ASCII: DD-MMM-YYYY hh:mm:ss.ttt For example: 30-JAN-1987 14:30:27.123
5	1	I1	Station ID, where data was processed 1: Kiruna Station (KS) 2: Fucino Station (FS) 3: Gatineau Station (GS) 4: Maspalomas Station (MS) 5: EECF Station (ES) 6: Prince Albert Station (PS) 7 West Freugh (WF) 8 Mcmurdo (MM) 9 O'Higgins (TF) 10 Miami (MI) 11 Beijing (BE) 12 Hobart (HL) 13 Singapore (SG)

			14 Chetumal (CM) 15 Johannesburg (JO)
6	2	B	Product Confidence Data bit 1 PCD Summary Flag 0: product correctly generated 1: at least one of the remaining 15 bits of the PCD in the MPH is set. In particular the specific header flags are not read when this bit is set. bit 2 - 3 spare bit 4 - 5 Downlink Performance and X-Band acquisition chain. This value summarizes the PCD snapshots rel. to the products. 0: performance better than MMCC/EECF-supplied minimum threshold 1: performance equal to or worse than threshold 2: performance unknown bit 6 - 7 HDDT Summary. This value summarizes the PCD snapshots rel. to the product. 1: performance equal to or worse than threshold 2: performance unknown bit 8 - 9 Frame Synchronizer. This value summarizes the PCD snapshots rel. to the product. 0: performance better than MMCC/EECF-supplied minimum threshold 1: performance equal to or worse than threshold 2: performance unknown bit 10 - 11 FS to Processor I/F The LRDPF and SARFDP reads the status of the FS interface. 0: no parity error detected 1: at least one parity error detected 2: performance unknown bit 12 - 13 Checksum Analysis on LR Frames. The percentage of source packets, featuring a checksum error, and used in the actual product is compared to a MMCC/EECF given threshold. 0: lower than threshold 1: greater than threshold 2: performance unknown bit 14 - 15 Quality of Downlinked Formats and Source Packets. The RA product is based on using 80 consecutive source packets. The percentage of erroneous ones is determined and compared to a MMCC/EECF given threshold. 1: greater than threshold 2: performance unknown

			bit 16 Existence of Auxiliary Data. 0: auxiliary data and/or chirp correctly extracted 1: not all auxiliary data extracted
7	24	A	UTC time when MPH was generated; Format as in field 4.
8	4	I4	Size of Specific Product Header: Record in Bytes
9	4	I4	Number of Product Data Set Records
10	4	I4	Size of each Product Data Set Record in Bytes
11	1	B	Subsystem that generated the product. 2: LRDPF 3: VMP
12	1	B	OBRC flag used for SAR products only bit 1 - 2 0: not used 1: OGRC data 2: OBRC data
13	24	A	UTC reference time. Time relation used to convert from satellite to ground, used together with the next two fields.
14	4	I4	Reference binary time of satellite clock (32-bit unsigned integer)
15	4	I4	Step length of satellite clock in nanoseconds
16	8	I2	Processor software version used to generate product. Format as defined by MMCC/EECF. 8 bytes = 4 words of integer x 2
17	2	I2	Threshold table version number.
18	2	B	Spare
19	24	A	UTC time of ascending node state vector
20-25	24	6I4	Ascending node state vector in earth-fixed reference system
20	4	I4	State vector; X in 10-2 m
21	4	I4	State vector; Y in 10-2 m
22	4	I4	State vector; Z in 10-2 m
23	4	I4	State vector; X velocity in 10-5 m/s
24	4	I4	State vector; Y velocity in 10-5 m/s
25	4	I4	State vector; Z velocity in 10-5 m/s