esa DOCUMENT

document title/ titre du document

ENVISAT CYCLIC ALTIMETRIC REPORT

CYCLE 33 from 14-12-2004 to 17-01-2005

Quality Assessment Report

prepared by/*préparé par*	EOP-GOQ and PCF team
reference/*réference*	ENVI-GSOP-EOPG-03-0011
issue/*édition*	1
revision/*révision*	0
date of issue/*date d'édition*	29 March 2005
status/*état*	
Document type/*type de document*	Technical Note
Distribution/*distribution*	

European Space Agency
Agence spatiale européenne

TABLE OF CONTENTS

1 INTRODUCTION

This documents aims at reporting on the performances of the EnviSat Radar Altimeter, Microwave Radiometer and DORIS sensors, on the data quality of the corresponding Fast Delivery products as well as on the main events occurred during cycle 33.

This report covers the period from the 13th of December 2004 and the 17th of January 2005.

2 DISTRIBUTION LIST

This report is available in PDF format at the internet address
http://earth.esa.int/pcs/envisat/ra2/reports/pcs_cyclic/

3 ACRONYMS

AGC	Automatic Gain Control
DORIS	Doppler Orbitography and Radiopositioning Integrated by Satellite
DSR	Data Set Record
EPC	Electronic Power Converter
ERS	European Remote Sensing satellite
ESRIN	European Space Research Institute
ESOC	European Space Operations Centre
FD	Fast Delivery products
GS	Ground Segment
GTS	Global Telecommunication System
HTL	Height Tracking Loop
ICU	Instrument Control Unit
IECF	Instrument Engineering Calibration Facility
IF	Intermediate Frequency
IE	Individual Echoes
IPF	Instrument Processing Facility
LUT	Look Up Table
MCMD	MacroCommand
MPH	Main Product Header
MSS	Mean Sea Surface
MWR	MicroWave Radiometer
MPS	Mission Planning System
NRT	Near Real Time
OBT	On-Board Time
OCM	Orbit Control Mode/Manoeuvres
PCS	ERS Products Control Service
PCF	EnviSat Product Control Facility
PDHS-E	ESRIN Processing and Data Handling Station

PDHS-K	Kiruna Processing and Data Handling Station
PLSOL	Payload Switch-Off Line
PMC	Payload Main Computer
PSO	On-orbit Position
PTR	Point Target Response
RA-2	EnviSat Radar Altimeter bi-frequency
RSL	Resolution Selection Logic
SAD	Static Auxiliary Files
SBT	Satellite Binary Time
SEU	Single Event
SFCM	Stellar Fine Control Mode
SPH	Specific Product header
SPSA	Signal Processing Sub-Assembly
SYSM	Stellar Yaw Steering Mode
S/W	Software
TM	Telemetry
TRP	Transponder
TWT	Traveling Wave Tube
UTC	Coordinated Universal Time
YSM	Yaw Stellar Mode

4 REFERENCE DOCUMENTS

[R – 1a] F-PAC MONTHLY REPORT, SALP-RP-M-OP-15370-CN, December 2004
[R – 1b] F-PAC MONTHLY REPORT, SALP-RP-M-OP-15379-CN, January 2005
[R – 2] ENVISAT Microwave Radiometer Assessment Report Cycle 033, CLS.DOS/05.013, http://earth.esa.int/pcs/envisat/mwr/reports/
[R – 3] Envisat RA-2 IF Mask weird behavior: Investigation Report
[R – 4] Instrument Performance Evaluation and Analysis Summary, PO-TR-ALS-RA-0042
[R – 5] Instrument Corrections Applied on RA-2 Level 1b products, Paper presented at the ENVISAT Calibration Review in September 2002
[R – 6] ENVISAT Phase E Cal/Val Acquisition Plan, ENVI-SPPA-EOPG-TN-03-0008
[R – 7] RA-2 S-Band Anomaly Investigation, PO-TN-ESA-RA-1331, http://earth.esa.int/pcs/envisat/ra2/articles/
[R – 8] RA-2 Performance Results, Paper presented at the ENVISAT Calibration Review in September 2002
[R – 9a] ECMWF Report on ENVISAT RA- 2 for December 2004, Report on ENVISAT Radar Altimeter - 2 (RA- 2), Wind/ Wave Product with Height Information (RA2_ WWV_ 2P),
[R – 9b] ECMWF Report on ENVISAT RA- 2 for January 2005, Report on ENVISAT Radar Altimeter - 2 (RA- 2), Wind/ Wave Product with Height Information (RA2_ WWV_ 2P), http://earth.esa.int/pcs/envisat/ra2/reports/ecmwf/
[R – 10] Envisat GDR Quality Assessment Report, SALP-RP-P2-EX-21121-CLS015
[R – 11] Envisat RA-2 Range Instrumental correction: USO clock period variations and associated auxiliary file, ENVI-GSEG-EOPG-TN-03-0009

[R – 12] Defining a Rain flag for the Envisat altimeter, G. Quartly, study presented to the final CCVT plenary meeting, http://earth.esa.int/pcs/envisat/ra2/articles/
[R – 13] ENVISAT Weekly Mission Operations Reports # 132-135, ENVI-ESOC-OPS-RP-1011-TOS-OF
[R – 14] Envisat validation and cross calibration activities during the verification phase. Synthesis Report ESTEC contract No. 16243/02/NL/FF WP6, http://earth.esa.int/pcs/envisat/ra2/articles/
[R – 15] ENVISAT-1 Products Specifications - Vol. 14: RA-2 Products Specifications, PO-RS-MDA-GS-2009, Iss 3, Rev. K, 24/05/2004
[R – 16] Algorithm for Flag identification and waveforms reconstruction of RA-2 data affected by "S-Band anomaly", ENVI-GSEG-TN-04-0004, Issue 1.4

5 GENERAL QUALITY ASSESSMENT

5.1 Instruments status

The RA-2 instrument, during this cycle underwent one instrument anomalies as given in par. 6.1.

The two known causes of random on-board anomalies are still present. In particular we refer to the so-called S-Band anomaly and the IF mask weird behavior described respectively in [R – 7] and [R – 3]. Only the S-Band anomaly partially affects a low number of Envisat data products as given in par. 7.1.7.

MWR sensor assessment report: refer to [R – 2].

DORIS sensor assessment report: refer to [R – 1a] and [R-1b].

5.2 Cycle quality

The summary of the RA-2 data products availability for this cycle is given in Table 1 (one line per week)**Error! Reference source not found.**.

Start orbit	Stop orbit	Time [sec] instrum. Unavai-lability	Time [sec] L0 gaps	Time [sec] L1b gaps	Time [sec] L2 (FGD) gaps	% instrum. avail.	% L0 avail.	% L1b avail.	% L2 (FGD) avail.
14584	14684.2	1974.421	53982.985	54180.602	48646.909	99.673541	90.747766	90.715091	91.63006
14684.2	14784.4	41610.962	6603.93	6578.503	6603.037	93.119874	92.027953	92.032157	92.0281
14784.4	14884.6	2115.155	1094.187	1090.479	1103.441	99.650271	99.469354	99.469967	99.46782
14884.6	14984.8	2067.749	10019.045	13637.588	19364.751	99.658111	98.001525	97.403222	96.45627
14984.8	15085	2152.529	4253.253	4248.524	9324.16	99.644093	98.940846	98.941628	98.10241

Table 1: RA-2 L0, L1b and L2 FGD Data products availability summary for cycle 33

The summary of the MWR L0 data products availability for this cycle is given in Table 2 (one line per week).

Start orbit	Stop orbit	Time [sec] instrum. unavailability	Time [sec] L0 gaps	% instrum. avail.	% L0 avail.
14684.2	14784.4	0	5761	100	99.0475
14784.4	14884.6	0	216	100	99.9643
14884.6	14984.8	0	7752	100	98.7183
14984.8	15085	0	9289	100	98.4641
14684.2	14784.4	0	5761	100	99.0475

Table 2: MWR L0 Data products availability summary for cycle 33

The summary of the DORIS L0 data products availability for this cycle is given in Table 3 (one line per week).

Start orbit	Stop orbit	Time [sec] instrum. unavailability	Time [sec] L0 gaps	% instrum. avail.	% L0 avail.
14584	14684.2	0	87542	100	92.7627
14684.2	14784.4	0	15049	100	98.7559
14784.4	14884.6	0	5038	100	99.5835
14884.6	14984.8	0	21487	100	98.2236
14984.8	15085	0	11287	100	99.0669

Table 3: DORIS L0 Data products availability summary for cycle 33

5.3 Orbit quality

During cycle 33 the orbit was maintained within the +/- 1km to the reference ground track.

Three manoeuvres over the period:

On December 17th, 2004 (DOY 352) a one burn in-plane correction manoeuvre (SFCM) took place, in order to start a new ground track control cycle. The characteristics of this manoeuvre were:
Planned delta V size: 0.0096 m/s (towards flight direction)
Mid thrust time: 02:03:18 utc at PSO 131.69 degrees
Thrust duration: 5 seconds
Measured delta V: 0.0096 m/s (towards flight direction)

On January 6th, 2005 (DOY 006) an in-plane correction manoeuvre (SFCM) took place, in order to start a new ground track control cycle. The characteristics of this manoeuvre were:
Planned delta V size: 0.0150 m/s, increasing orbit semi major axis by approximately 30 metres
Mid thrust time: 00:10:00 utc at PSO 189.287 degrees

Thrust duration: 7 seconds
Measured delta V: 0.0147 m/s (towards flight direction).

On January 7th, 2005 (DOY 007) an orbit inclination correction manoeuvre took place. The characteristics of this manoeuvre were:
Planned delta V size: 1.9 m/s, increasing orbit inclination by approximately 0.015 degree
Mid thrust time: 05:31:33 utc at PSO 12.840 degrees
Thrust duration: 815.2 seconds
Measured delta V: 1.9151 m/s across track, 0.0034 along track (towards flight direction), 0.0478 m/s radial (towards downward vertical).

5.4 Ground Segment Processing Chain Status

5.4.1 IPF PROCESSING CHAIN

Current version of the IPF processing chain is V4.58, installed in both PDHS-E and PDHS-K on July the 16th 2004. This is equivalent to the previous version for what regards all the algorithms and auxiliary files, only a new parameter has been added in the SPH that is the pass number which, for NRT data is nominally set to 0. This was done in order to be compliant with the off-line products version that indeed includes the pass number.

Previous IPF version V4.57 was operational at the Envisat PDHS-K and PDHS-E since April 29th and 28th 2004 respectively.

5.4.2 F-PAC PROCESSING CHAIN

Current version of CMA is V6.3 operational since Apr. 29, 2004. Patches 1, 2, 3 and 4 have been installed until known with no impacts on ENVISAT products.

F-PAC CMA anomalies: anomalies are detailed in the F-PAC Monthly Report [R – 1a] and [R-1b].

5.4.3 AUXILIARY DATA FILE

Hereafter all the Auxiliary files used actually used by the IPF ground processing are listed:

```
RA2_CHD_AXVIEC20030402_094243_20030407_000000_20200101_000000
RA2_CON_AXVIEC20020606_164228_20020101_000000_20200101_000000
RA2_CST_AXVIEC20020621_135858_20020101_000000_20200101_000000
RA2_DIP_AXVIEC20020122_134206_20020101_000000_20200101_000000
RA2_GEO_AXVIEC20020314_093428_20020101_000000_20200101_000000
RA2_ICT_AXVIEC20031208_143628_20020101_000000_20200101_000000
RA2_IFA_AXVIEC20020313_174755_20020101_000000_20200101_000000
RA2_IFB_AXVIEC20020313_174959_20020101_000000_20200101_000000
RA2_IFF_AXVIEC20031208_151817_20030602_215929_20100101_000000
```

```
RA2_IOC_AXVIEC20020122_141121_20020101_000000_20200101_000000
RA2_MET_AXVIEC20020204_073357_20020101_000000_20200101_000000
RA2_MSS_AXVIEC20031208_145545_20020101_000000_20200101_000000
RA2_OT1_AXVIEC20040120_082051_20020101_000000_20200101_000000
RA2_OT2_AXVIEC20031208_150159_20020101_000000_20200101_000000
RA2_PLA_AXVIEC20040127_180142_20020101_000000_20200101_000000
RA2_SET_AXVIEC20020122_150917_20020101_000000_20200101_000000
RA2_SL1_AXVIEC20030131_100228_20020101_000000_20200101_000000
RA2_SL2_AXVIEC20030131_101757_20020101_000000_20200101_000000
RA2_SOI_AXVIEC20031208_150608_20020101_000000_20200101_000000
RA2_SSB_AXVIEC20031208_150749_20020101_000000_20200101_000000
RA2_TLD_AXVIEC20031208_151137_20020101_000000_20200101_000000
RA2_USO_AXVIEC20020122_162920_20020101_000000_20200101_000000
```

The RA2_POL_AX, the RA2_SOL_AX and the RA2_PLA_AX have been regularly updated every week without problems.

The RA-2 Auxiliary Data Files (ADF) are accessible from the Envisat Web pages under http://www.envisat.esa.int/services/auxiliary_data/ra2mwr/ .

5.4.4 PLANNED UPGRADES

Evolution of the IPF Level 1B and Level 2 processing chain is currently planned. The next IPF version release shall nominally contain the following:

1. USO instrumental correction within the RA-2 L1b processor.
2. New MWR Side Lobes correction algorithm within MWR L1b processor
3. Correction of the mispointing evaluation algorithm within the RA-2 L2 processor
4. Inclusion of the loading tide for the GOT2000.2 model.
5. Addition of the peakiness fields in Ku and S band to the RA-2 and MWR FD/I/MAR meteorological products
6. Inclusion of the square of the significant wave height in Ku and S band
7. Inclusion of an S-band anomaly flag, see [R – 16]
8. Upgrade of the Level 1B and Level 2 processing for DORIS NRT orbital information computation.

Evolutions 3, 5 and 6 shall be reflected too in the F-PAC CMA processing chain.

6 ENVISAT PAYLOAD STATUS

6.1 Altimeter Events

The Radar Altimeter 2, during cycle 33, was unavailable once in the following time frames:

Start: 27 Dec 2004 02:49:10:000 Orbit = 14772
Stop: 27 Dec 2004 13:494:30:000 Orbit =14779

cause: Ra-2 switched down to Reset/Wait, due to a suspected Memory Health Check anomaly

The Envisat Weekly Mission Operations Reports related to the cycle 33 do not make reference to the HSU1 fuse problem [R-13]. However this problem does not affect nominal operations since the RA-2 instrument is heated by the nearby hardware.

6.1.1 RA-2 INSTRUMENT PLANNING

The RA-2 instrument planning was performed as follows:

- IF Calibration Mode according the nominal operational acquisition scheme: 100 seconds of data twice per day over Himalayan region (ascending and descending passes).
- Preset Loop Output mode for GAVDOS Range transponders, located in Creta.
- Preset Loop Output acquisition over ESA transponders, located near Rome; for both ascending and descending passes. Due to the recent improvement in the transponders signal centering the PLO planning has been updated to the High Chirp Resolution for the ESA TRP overpasses, starting from orbit #14790.
- Individual Echoes background planning: the buffering of 20 Data Blocks of individual Echoes (1.114 sec.) transmitted every 160 Data Blocks starts after flying over Himalayan region (both ascending and descending passes) and prosecutes for half day.

Hereafter the map is reported showing the acquisition sites for both the Range and Sigma_0 transponders.

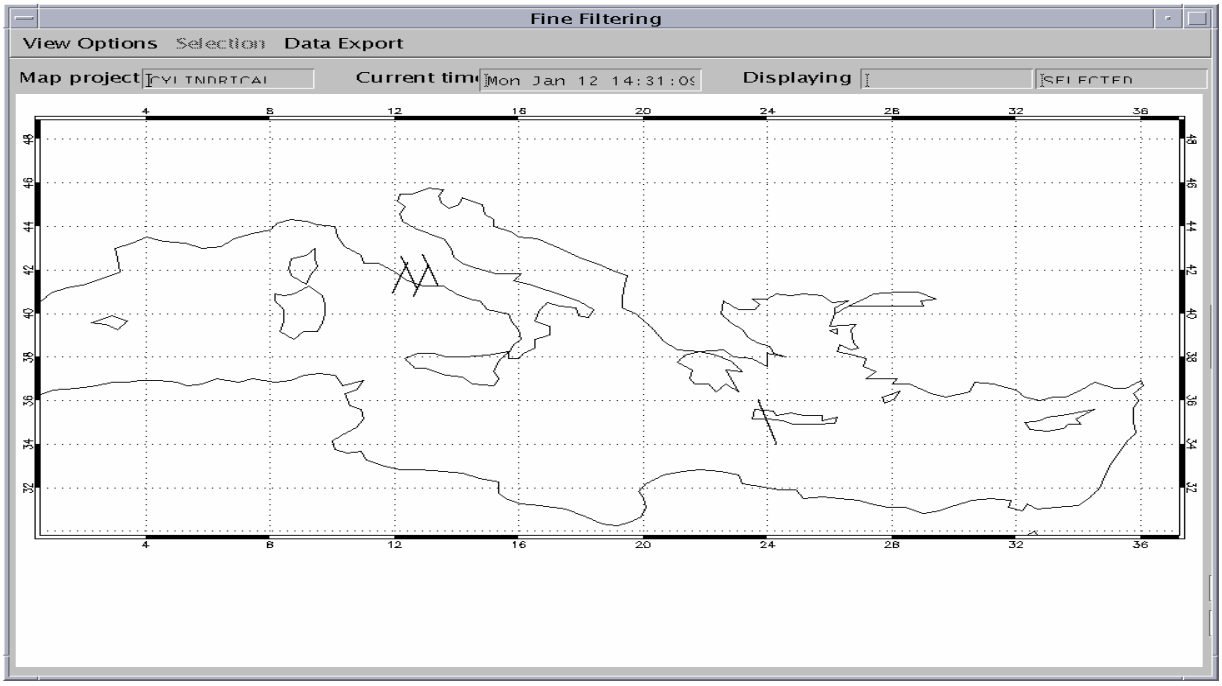

Figure 1: Transponder Acquisition sites for cycle 33

6.2 MWR Events

The MWR, during cycle 33 was never unavailable [R-13].

6.3 DORIS Events

The DORIS during cycle 33 was never unavailable [R-13].
Starting from June the 14th 2004 the DORIS USO was switched to the redundancy component and it is now working correctly.

7 INSTRUMENT PERFORMANCES

7.1 RA-2 Performances

7.1.1 IF FILTER MASK

In Figure 2 all valid IF masks retrieved by averaging the 100 seconds of data acquired daily during cycle 33 are plotted in the left panel. The on-ground measured IF mask (ref [R – 4]) is also plotted in that panel with a solid line. In the right panel the difference of each of the calculated IF masks with respect to the on-ground measured one is reported. During cycle 33 the number of valid IF masks has been of 21, representing about the 30% of the total available IF masks. Only valid IF masks are used to generate the final IF mask used in the Level 1B ground processing; the method

used for editing the data is based on the comparison between each of the single IF masks and the reference one (on-ground).

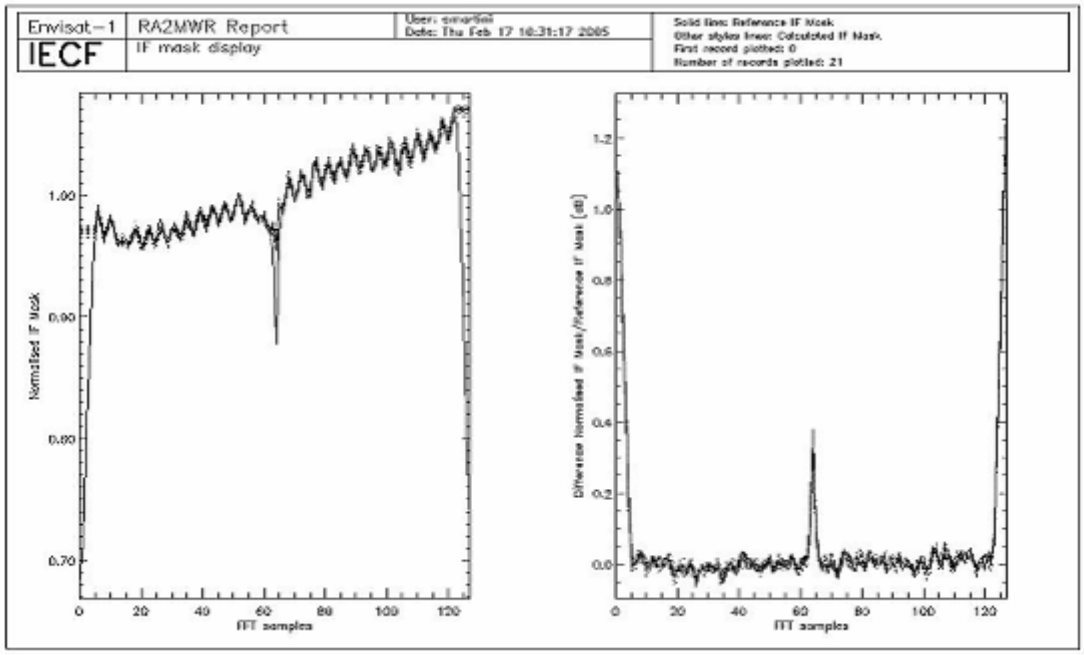

Figure 2: Valid IF masks retrieved daily during cycle 33 plotted together with the on-ground reference.

7.1.2 USO

In Figure the USO clock period trend retrieved for cycle 33 is reported. In order to make the variability visible, the difference of the actual USO clock period with respect to the nominal one has been plotted, in the upper panel. In the lower panel the Range error due to the USO clock variability has been reported taking a satellite altitude of 800 Km as a nominal value.

Currently the nominal USO clock period (12500 ps) is used within the processing, this means that the data are not corrected for the bias and the drift correlated to the actual USO clock period.

A particular investigation has been performed regarding the USO clock trend and the associated auxiliary file; this is described in [R – 11]. The conclusion can be summarized as follows: the precision of 1 ps available in the current USO auxiliary file is not enough to appreciate its trend and it is too rough for any altimetric application. A suitable resolution is considered to be of 10^{-6} ps. This problem will be corrected with the following upgrade of the IPF as described in par. 5.4.4.

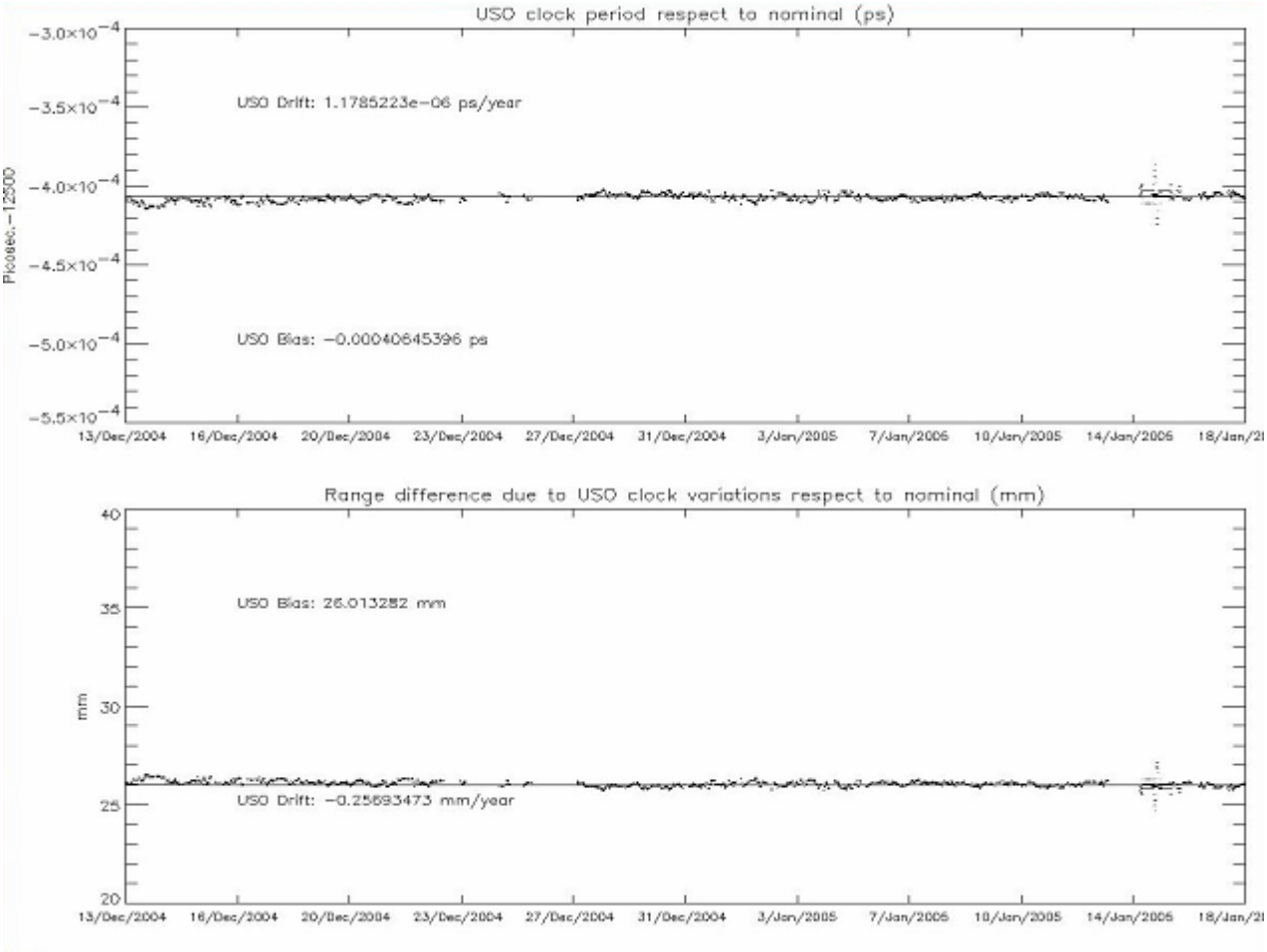

Figure 3: USO clock period for cycle 33

7.1.3 TRACKING CAPABILITY

In Figure 4 and Figure 5, the Chirp ID is plotted respectively for ascending and descending passes of cycle 33. The MDSRs acquired with 320MHz bandwidth are plotted in light gray (Chirp ID equal to 0), the ones acquired with 80MHz bandwidth are plotted in violet (Chirp ID equal to 1) and the ones acquired with the 20MH bandwidth are plotted in dark green (Chirp ID equal to 2).

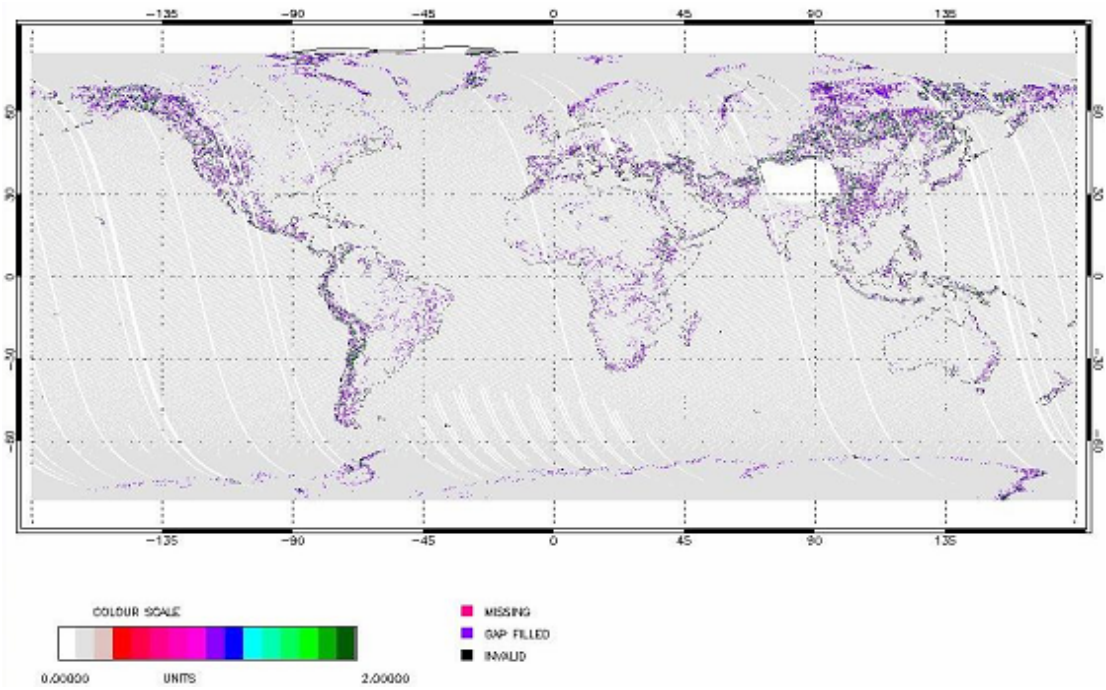

Figure 4: RA-2 Chirp ID for ascending passes during cycle 33

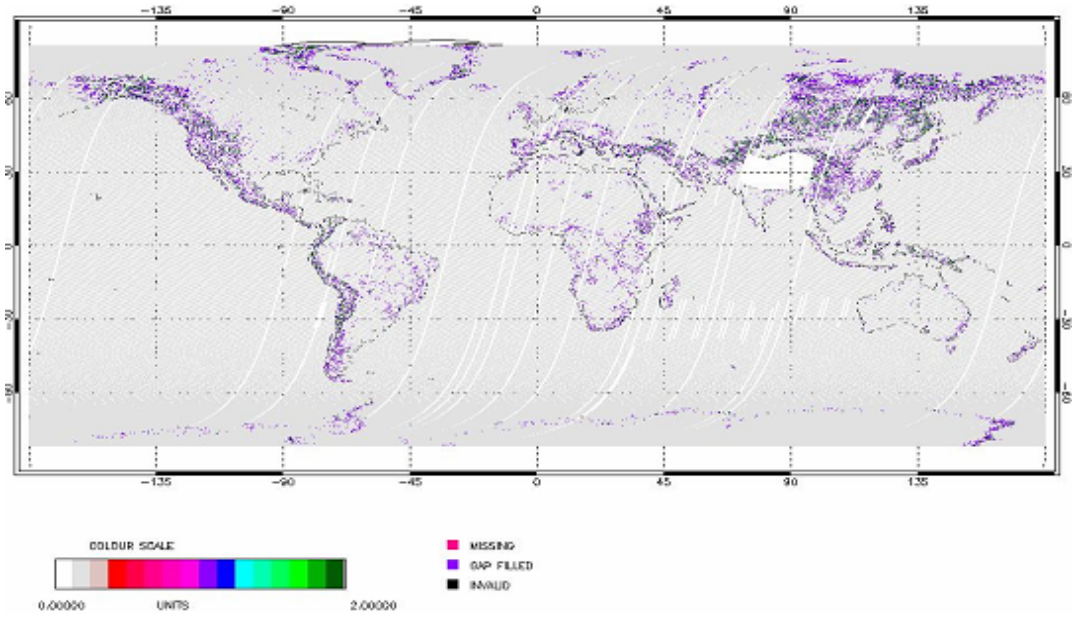

Figure 5: RA-2 Chirp ID for descending passes during cycle 33

The corresponding percentages of acquisition in the different resolutions subdivided by surface type are given in Table 4:

Surface type	320 MHz	80 MHz	20MHz
Open Ocean	99.9135 %	0.066 %	0.0197 %
Costal Water (ocean depth < 200 m)	97.16 %	2.26 %	0.57 %

Sea Ice	98.70 %	1.10 %	0.19 %
Ice Sheet	96.51 %	2.78 %	0.71 %
Land	81.68 %	12.92 %	5.39 %
All world	94.795 %	3.827 %	1.378 %

Table 4: RA-2 Tracking capability: Chirp ID percentages discriminated by surface type

The figures given for the RA-2 tracking performances during this cycle are very much in line with the ones recorded at the end of the Commissioning Phase and presented in [R – 8]. The slight differences are in part due to the different algorithms used to discriminate the surface types.
The objectives of the Commissioning Phase "RSL and Tracking optimization" are hereafter reported:
320MHz over Ocean > 99%
320 MHz within 15km of Land/Ocean boundary (Costal Water)
320 MHz over Sea Ice > 95%
320/80 MHz Fixed resolution at Ice Sheet Crossovers > 95%
320MHz over Ice Shelves > 95%

7.1.4 SIGMA0 TRANSPONDER

During cycle 33 only three of the four planned Sigma_0 Transponder acquisitions were performed. The one planned on December 16, 2004 in Fiuggi was not completed because of the hostile meteorological conditions (heavy rain). All of them were executed in High Resolution. The dates and times of the acquisitions are reported hereafter:

28-December-2004, Maccarese, at 09:03:26
04-January-2005, Rome at 20:27:30
13-January-2005, Valmontone, at 09:00:34

The processing of the data has been completed, including those acquired in Low resolution during the previous cycle. The results are reported in the following Table 5. The tropospheric corrections have not been computed yet.

Orbit	Date	Location/Rel. Track	Coordinates	Resolution	Not Corrected Backscattering Bias [dB]	Tropospheric Correction (one way) [dB]
14290	23-nov-04	Maccarese/208	41.8605, 12.2385	Low	1.43	0.103
14397	30-nov-04	Rome/315	41.8472, 12.4819	Low	1.11	0.071
14519	09-dic-04	Valmontone/437	41.7673, 12.9247	Low	1.26	0.116
14791	28-dic-04	Maccarese/208	41.8605, 12.2385	High	0.97	0.059
14898	04-gen-05	Rome/315	41.8472, 12.4819	High	0.95	0.054
15020	13-gen-05	Valmontone/437	41.7673, 12.9247	High	0.88	0.055

Table 5: Absolute backscattering calibration results obtained with Transponder measurements

As it is possible to notice from Table the values obtained at Low resolution are about 0.4 dB higher than the one obtained at High resolution, which is in agreement with the Commissioning Phase Transponder results. The reason of this behavior is at the moment under investigation.

7.1.5 DATATION

A significant part of an eventual error in the RA-2 products datation could be given by the not perfect synchronism between the Satellite Binary Time and the UTC Time due to a drift of the ICU clock period. A correlation between those two times is performed at every Kiruna orbit dump and then extrapolated for the four non-Kiruna orbits. In Figure 6 (upper panel) the differences between the extrapolated UTC values and the corresponding real UTC values measured at the next Kiruna dump, are reported. For the whole cycle, fifteen times they come over the 20 microseconds (absolute value) warning threshold; this reflects an increased variability of the deviations already observed during the last ten days of the previous cycle (cycle 32). In the lower panel the ICU clock step for the same period is shown and it is possible to notice that there is a certain degree of correspondence of the peak reported in the higher panel with the clock step value changes. This allows one to compensate for the extrapolation deviations and to go back to a nominal situation.

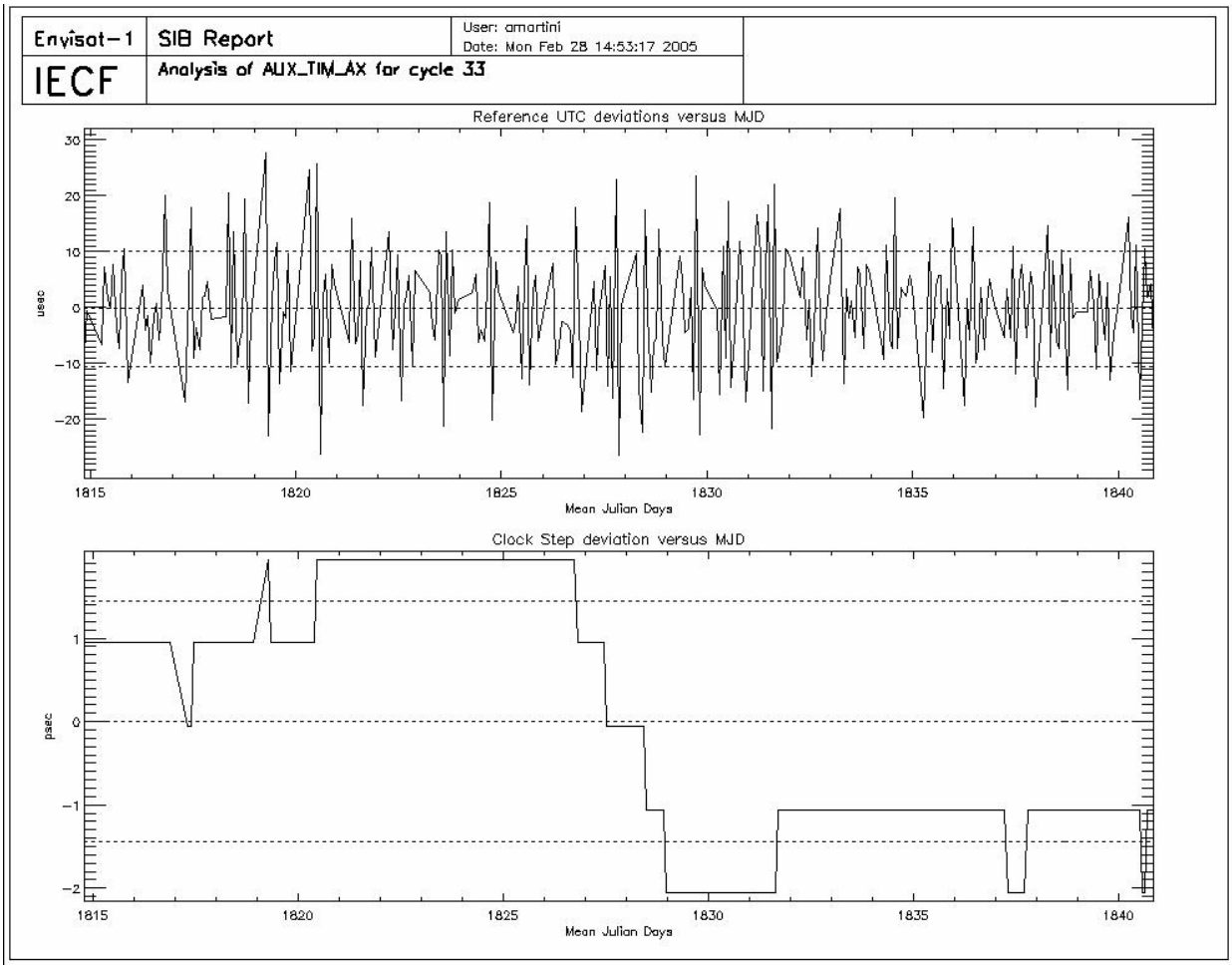

Figure 6: UTC deviations and ICU clock period for cycle 33

7.1.6 MISPOINTING

In Figure7 the trend of the mispointing squared (averaged every orbit) is reported in deg^2*10e-4

The average mispointing value, as extracted from the RA2_FGD_2P data products, is around 0.028 deg^2, is known to be higher than the one reported at platform level [R – 13]. This is due to a not perfect tuning of the algorithm currently used to retrieve the mispointing value from the RA-2 waveform data. An optimization of this algorithm shall be part of the next Level 2 processors upgrade, planned for mid-2005 (ref. 5.4.4).
In particular for this cycle one event of low mispointing values and two events of high mispointing values are visible in the plot. The low mispointing event is in correspondence with the occurred instrument anomaly on December 27th 2004, as reported in par. 6.1. The higher mispointing event occurred in the period 6-7 January, when some orbital manoeuvres have occurred.

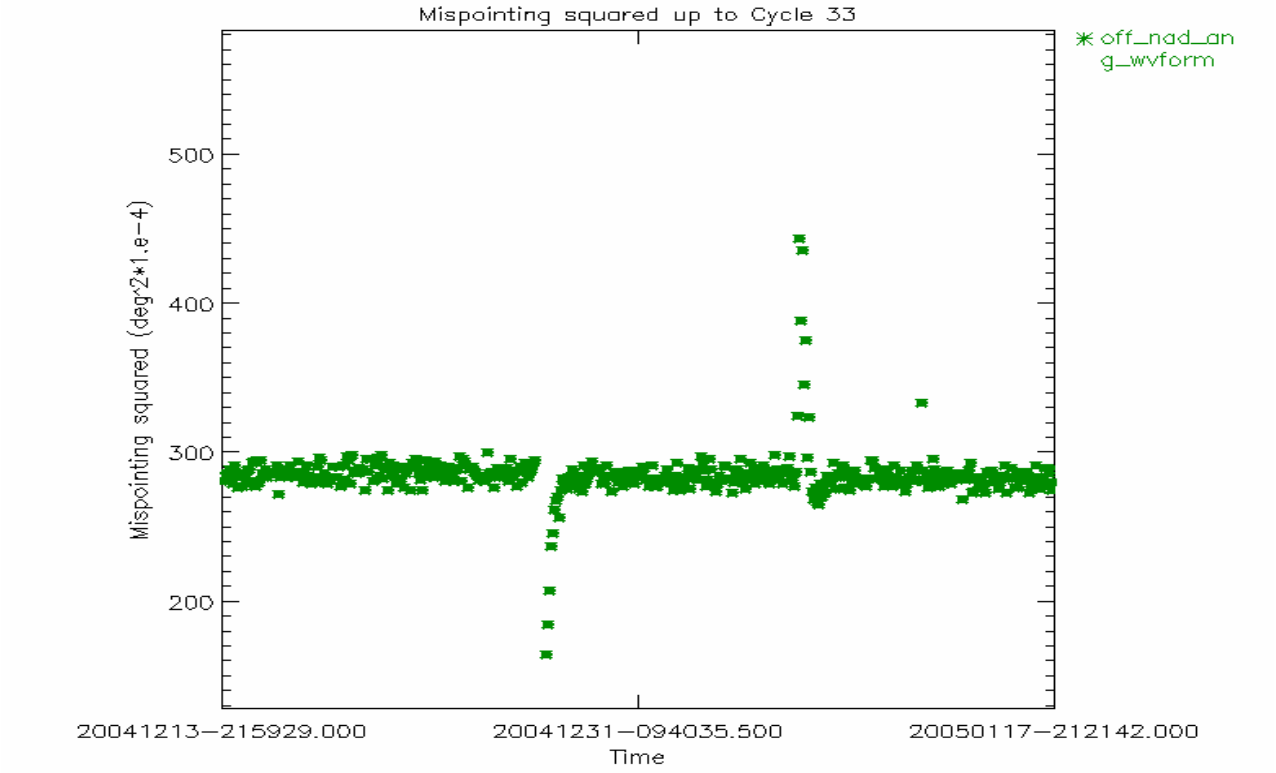

Figure 7: Smoothed mispointing squared trend for cycle 33 (deg^2*10^4)

7.1.7 S-BAND ANOMALY

The so-called "S-Band anomaly" affects the RA-2 data products quality. Hereafter, the table lists the products files affected by the S-band anomaly problem during cycle 33. This corresponds to a total percentage of about 2.2% of the acquired data.

Being the method used a statistical one working on ocean data, files containing less than 1000 seconds of data over ocean have not been considered. This choice is supported by the fact that the "S-Band anomaly" is associated to a particular instrumental behavior that cannot appear and disappear within a short time frame. (ref. [R – 7])

File name	Start date	Start time	Stop date	Stop time

RA2_FGD_2PNPDK20041218_130526_000058272033_00067_14650_2292.N1	18-dic-04	13:05:26.6	18-dic-04	14:42:33.9
RA2_FGD_2PNPDK20041218_144418_000050222033_00068_14651_2293.N1	18-dic-04	14:44:18.7	18-dic-04	16:08:00.5
RA2_FGD_2PNPDK20041220_084406_000058162033_00093_14676_2309.N1	20-dic-04	08:44:06.1	20-dic-04	10:21:02.3
RA2_FGD_2PNPDK20041220_102411_000057542033_00094_14677_2310.N1	20-dic-04	10:24:11.7	20-dic-04	12:00:05.4
RA2_FGD_2PNPDK20041220_120120_000058612033_00095_14678_2311.N1	20-dic-04	12:01:20.1	20-dic-04	13:39:00.8
RA2_FGD_2PNPDK20041220_134126_000050412033_00096_14679_2312.N1	20-dic-04	13:41:26.8	20-dic-04	15:05:27.6
RA2_FGD_2PNPDK20041221_112931_000060192033_00109_14692_2321.N1	21-dic-04	11:29:31.0	21-dic-04	13:09:49.9
RA2_FGD_2PNPDK20041221_130849_000060802033_00110_14693_2322.N1	21-dic-04	13:08:49.8	21-dic-04	14:50:10.0
RA2_FGD_2PNPDK20041221_144917_000050682033_00111_14694_2323.N1	21-dic-04	14:49:17.7	21-dic-04	16:13:45.2
RA2_FGD_2PNPDE20041223_023614_000049442033_00132_14715_2033.N1	23-dic-04	02:36:14.0	23-dic-04	03:58:37.9
RA2_FGD_2PNPDE20050103_033122_000049242033_00290_14873_2243.N1	03-gen-05	03:31:22.8	03-gen-05	04:53:26.6

Table 6: List of L2 FGD Files affected by S-Band anomaly during cycle 33

A valuable algorithm to detect the RA-2 DSRs affected by the S-Band anomaly within the L2 products can be found in [R- 12]. Note that the algorithm is only valid for data acquired over open-ocean.

7.1.8 IN-FLIGHT INTERNAL CALIBRATION

The RA-2 Range and Sigma0 measurements are corrected to take into account the internal path delay and attenuation, respectively. This is done by measuring those two variables in relation to the internal Point Target Response. The two correction factors are calculated during the L1b processing and directly applied. They are also continuously monitored and the results for cycle 33 (averaged per day) are reported in Figure 8 and Figure 9. It can be noticed that the time delay calibration factor shows a very stable behaviour while the Sigma0 one reports a small increasing trend of few hundreds of a dB over the cycle, in contrast with the behaviour showed on the previous cycle. Note that instability in the Sigma0 calibration factor seems to be correlated with time of RA-2 anomaly and orbital manoeuvre.

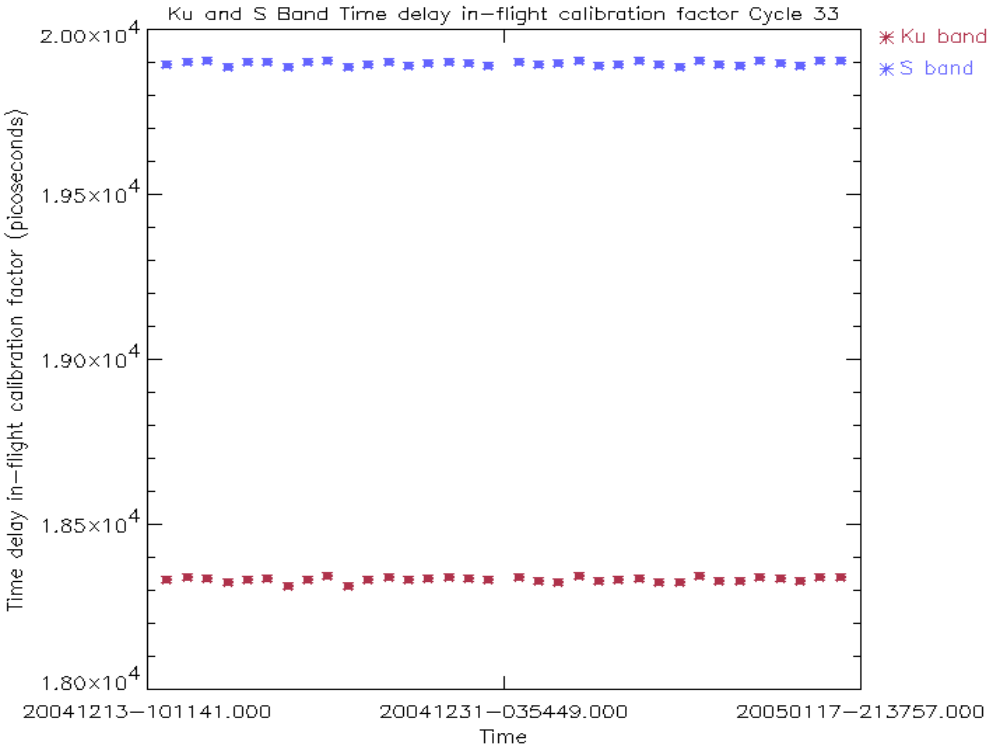

Figure 8: Ku and S Band in-flight time delay calibration factor for cycle 33

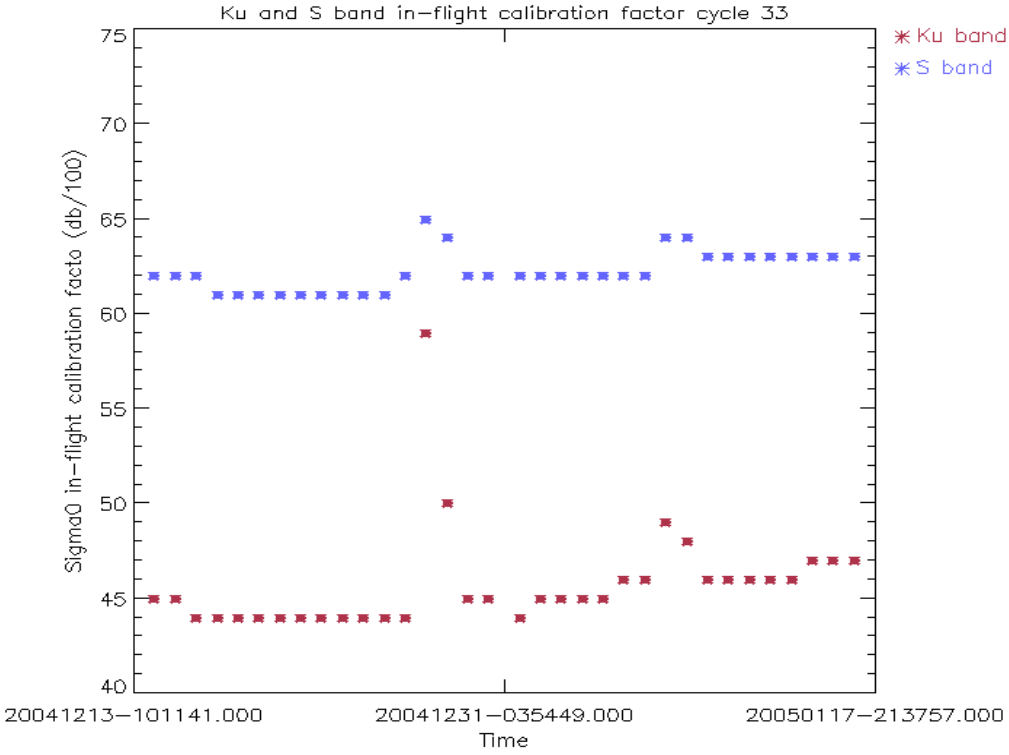

Figure 9: Ku and S Band in-flight Sigma0 calibration factor for cycle 33

7.2 MWR Performances

For MWR performances please refer to the Reference CLS Cyclic Report of the type of [R – 2].

7.3 DORIS Performances

For DORIS performances refer to the Reference F-PAC Monthly Report of the type of [R – 1a] and [R-1b].

8 PRODUCT PERFORMANCES

8.1 Availability of data

In Figure 10 and Table 7 the summary of unavailable RA-2 L0 products is given.
It is easy to notice that close to the Himalayan region two small gaps in the data are present. This is due to the daily instrument switch-offs (Heater 2 mode) performed to prevent the S-Band anomaly to last more than half a day when it occurs.

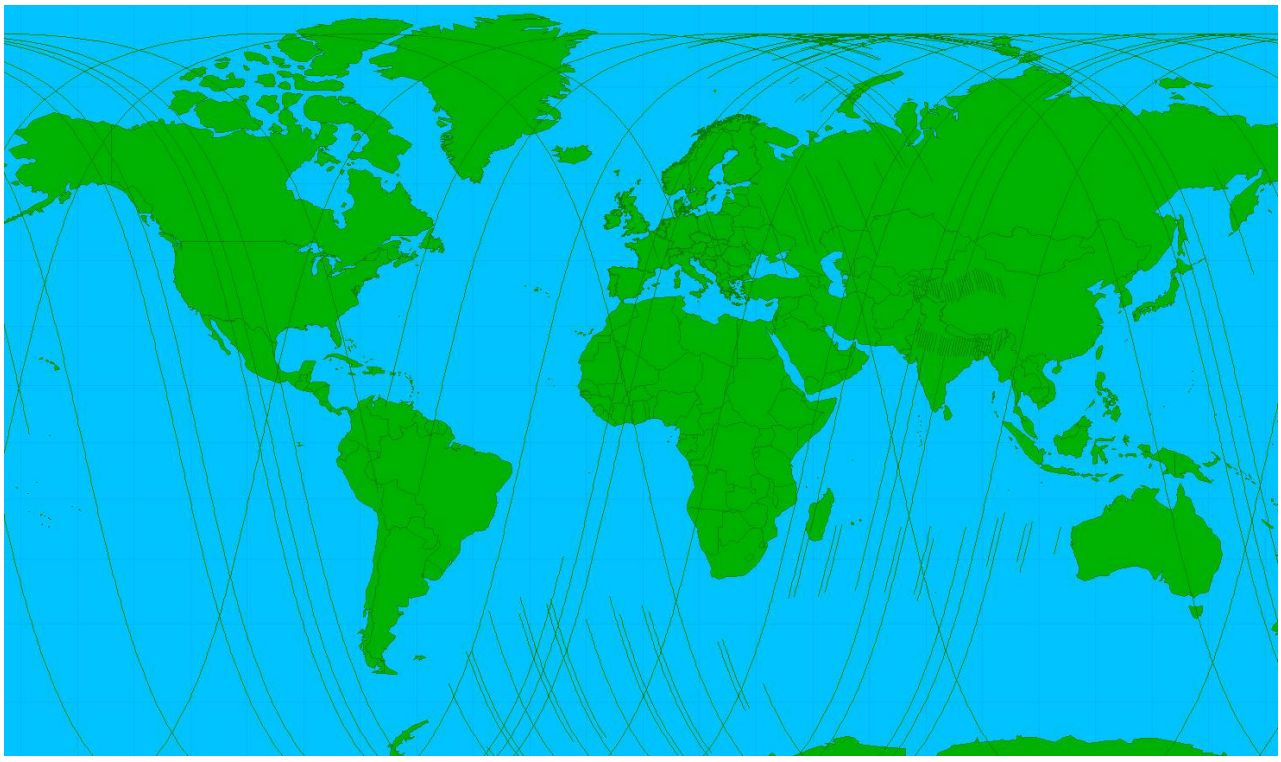

Figure 10: RA-2 L0 unavailable products for cycle 33

Start Date	Start Time	Stop Date	Stop Time	Duration (s)	Start Orbit	Stop Orbit	Reason
13-dic-04	04:15:34	13-dic-04	04:16:52	78	14573	14573	PDS_UNKNOWN_FAILURE
13-dic-04	15:28:01	13-dic-04	15:29:19	78	14580	14580	PDS_UNKNOWN_FAILURE
14-dic-04	05:23:53	14-dic-04	05:25:11	78	14588	14588	PDS_UNKNOWN_FAILURE
14-dic-04	16:43:18	14-dic-04	16:44:18	60	14595	14595	PDS_UNKNOWN_FAILURE
14-dic-04	18:19:50	14-dic-04	18:23:52	242	14596	14596	PDS_UNKNOWN_FAILURE
14-dic-04	20:00:22	14-dic-04	20:03:03	161	14597	14597	PDS_UNKNOWN_FAILURE
14-dic-04	21:10:27	14-dic-04	21:14:17	230	14597	14597	PDS_UNKNOWN_FAILURE
14-dic-04	22:47:03	14-dic-04	22:56:23	560	14598	14598	PDS_UNKNOWN_FAILURE
15-dic-04	02:04:25	15-dic-04	02:10:22	357	14600	14600	PDS_UNKNOWN_FAILURE
15-dic-04	03:25:08	15-dic-04	04:50:30	5122	14601	14602	PDS_UNKNOWN_FAILURE
15-dic-04	04:52:58	15-dic-04	06:52:10	7152	14602	14603	PDS_UNKNOWN_FAILURE
15-dic-04	11:17:20	15-dic-04	11:20:55	215	14606	14606	PDS_UNKNOWN_FAILURE
15-dic-04	12:57:48	15-dic-04	12:59:59	131	14607	14607	PDS_UNKNOWN_FAILURE
15-dic-04	14:36:52	15-dic-04	14:38:14	82	14608	14608	PDS_UNKNOWN_FAILURE
15-dic-04	16:04:37	15-dic-04	16:05:55	78	14609	14609	PDS_UNKNOWN_FAILURE
15-dic-04	16:12:25	15-dic-04	17:52:34	6009	14609	14610	PDS_UNKNOWN_FAILURE
15-dic-04	19:29:21	15-dic-04	19:30:34	73	14611	14611	PDS_UNKNOWN_FAILURE
15-dic-04	21:09:02	15-dic-04	21:11:24	142	14612	14612	PDS_UNKNOWN_FAILURE
15-dic-04	22:17:15	15-dic-04	22:24:57	462	14612	14612	PDS_UNKNOWN_FAILURE
15-dic-04	23:58:34	16-dic-04	00:06:18	464	14613	14613	PDS_UNKNOWN_FAILURE
15-dic-04	00:29:04	15-dic-04	00:38:06	542	14599	14599	PDS_UNKNOWN_FAILURE
16-dic-04	01:37:01	16-dic-04	01:43:44	403	14614	14614	PDS_UNKNOWN_FAILURE
16-dic-04	02:54:15	16-dic-04	02:57:45	210	14615	14615	PDS_UNKNOWN_FAILURE
16-dic-04	04:21:21	16-dic-04	04:22:39	78	14616	14616	PDS_UNKNOWN_FAILURE
16-dic-04	04:35:59	16-dic-04	04:40:14	255	14616	14616	PDS_UNKNOWN_FAILURE
16-dic-04	06:15:37	16-dic-04	06:20:16	279	14617	14617	PDS_UNKNOWN_FAILURE
16-dic-04	09:08:32	16-dic-04	09:09:43	71	14619	14619	PDS_UNKNOWN_FAILURE
16-dic-04	10:47:03	16-dic-04	10:48:28	85	14620	14620	PDS_UNKNOWN_FAILURE
16-dic-04	12:25:18	16-dic-04	12:27:23	125	14621	14621	PDS_UNKNOWN_FAILURE
16-dic-04	14:06:21	16-dic-04	14:07:16	55	14622	14622	PDS_UNKNOWN_FAILURE
16-dic-04	15:33:52	16-dic-04	15:35:10	78	14623	14623	PDS_UNKNOWN_FAILURE
16-dic-04	15:43:20	16-dic-04	15:45:07	107	14623	14623	PDS_UNKNOWN_FAILURE
16-dic-04	17:16:26	16-dic-04	17:21:45	319	14624	14624	PDS_UNKNOWN_FAILURE
16-dic-04	18:56:00	16-dic-04	19:00:38	278	14625	14625	PDS_UNKNOWN_FAILURE
16-dic-04	20:39:44	16-dic-04	23:33:26	10422	14626	14627	PDS_UNKNOWN_FAILURE
17-dic-04	01:04:42	17-dic-04	01:14:35	593	14628	14628	PDS_UNKNOWN_FAILURE
17-dic-04	02:22:57	17-dic-04	02:24:56	119	14629	14629	PDS_UNKNOWN_FAILURE
17-dic-04	04:03:34	17-dic-04	05:27:28	5034	14630	14631	PDS_UNKNOWN_FAILURE
17-dic-04	05:28:51	17-dic-04	05:48:32	1181	14631	14631	PDS_UNKNOWN_FAILURE
17-dic-04	08:37:31	17-dic-04	08:38:36	65	14633	14633	PDS_UNKNOWN_FAILURE
17-dic-04	10:15:49	17-dic-04	10:16:59	70	14634	14634	PDS_UNKNOWN_FAILURE
17-dic-04	11:53:41	17-dic-04	11:55:31	110	14635	14635	PDS_UNKNOWN_FAILURE
17-dic-04	13:35:34	17-dic-04	13:35:58	24	14636	14636	PDS_UNKNOWN_FAILURE
17-dic-04	15:13:02	17-dic-04	15:14:50	108	14637	14637	PDS_UNKNOWN_FAILURE

17-dic-04	16:42:04	17-dic-04	16:43:22	78	14638	14638	PDS_UNKNOWN_FAILURE
17-dic-04	18:26:04	17-dic-04	18:29:17	193	14639	14639	PDS_UNKNOWN_FAILURE
17-dic-04	20:05:48	17-dic-04	20:08:15	147	14640	14640	PDS_UNKNOWN_FAILURE
17-dic-04	21:16:04	17-dic-04	21:19:51	227	14640	14640	PDS_UNKNOWN_FAILURE
17-dic-04	22:53:18	17-dic-04	23:03:17	599	14641	14641	PDS_UNKNOWN_FAILURE
18-dic-04	00:35:45	18-dic-04	00:42:50	425	14642	14642	PDS_UNKNOWN_FAILURE
18-dic-04	02:12:20	18-dic-04	02:19:19	419	14643	14643	PDS_UNKNOWN_FAILURE
18-dic-04	03:31:19	18-dic-04	03:34:45	206	14644	14644	PDS_UNKNOWN_FAILURE
18-dic-04	04:58:36	18-dic-04	04:59:54	78	14645	14645	PDS_UNKNOWN_FAILURE
18-dic-04	05:12:34	18-dic-04	05:17:05	271	14645	14645	PDS_UNKNOWN_FAILURE
18-dic-04	06:52:54	18-dic-04	06:58:02	308	14646	14646	PDS_UNKNOWN_FAILURE
18-dic-04	09:46:01	18-dic-04	09:46:18	17	14648	14648	PDS_UNKNOWN_FAILURE
18-dic-04	11:23:49	18-dic-04	11:25:21	92	14649	14649	PDS_UNKNOWN_FAILURE
18-dic-04	13:02:27	18-dic-04	13:05:26	179	14650	14650	PDS_UNKNOWN_FAILURE
18-dic-04	14:42:32	18-dic-04	14:44:18	106	14651	14651	PDS_UNKNOWN_FAILURE
18-dic-04	16:10:19	18-dic-04	16:11:37	78	14652	14652	PDS_UNKNOWN_FAILURE
18-dic-04	16:18:02	18-dic-04	16:22:10	248	14652	14652	PDS_UNKNOWN_FAILURE
18-dic-04	17:55:03	18-dic-04	17:58:49	226	14653	14653	PDS_UNKNOWN_FAILURE
18-dic-04	19:34:32	18-dic-04	19:35:21	49	14654	14654	PDS_UNKNOWN_FAILURE
18-dic-04	20:39:11	18-dic-04	20:45:54	403	14654	14654	PDS_UNKNOWN_FAILURE
18-dic-04	22:21:26	18-dic-04	22:31:05	579	14655	14655	PDS_UNKNOWN_FAILURE
19-dic-04	00:03:31	19-dic-04	00:11:48	497	14656	14656	PDS_UNKNOWN_FAILURE
19-dic-04	01:42:11	19-dic-04	01:49:31	440	14657	14657	PDS_UNKNOWN_FAILURE
19-dic-04	03:00:07	19-dic-04	03:02:49	162	14658	14658	PDS_UNKNOWN_FAILURE
19-dic-04	04:23:52	19-dic-04	04:23:55	3	14659	14659	PDS_UNKNOWN_FAILURE
19-dic-04	04:27:05	19-dic-04	04:28:23	78	14659	14659	PDS_UNKNOWN_FAILURE
19-dic-04	04:40:54	19-dic-04	04:45:33	279	14659	14659	PDS_UNKNOWN_FAILURE
19-dic-04	06:21:26	19-dic-04	06:26:19	293	14660	14660	PDS_UNKNOWN_FAILURE
19-dic-04	09:15:09	19-dic-04	09:15:33	24	14662	14662	PDS_UNKNOWN_FAILURE
19-dic-04	10:50:48	19-dic-04	10:53:36	168	14663	14663	PDS_UNKNOWN_FAILURE
22-dic-04	04:32:50	22-dic-04	04:34:08	78	14702	14702	PDS_UNKNOWN_FAILURE
22-dic-04	15:45:02	22-dic-04	15:46:20	78	14709	14709	PDS_UNKNOWN_FAILURE
22-dic-04	15:51:32	22-dic-04	15:56:56	324	14709	14709	PDS_UNKNOWN_FAILURE
23-dic-04	04:00:52	23-dic-04	04:02:10	78	14716	14716	PDS_UNKNOWN_FAILURE
23-dic-04	12:03:49	23-dic-04	12:07:17	208	14721	14721	PDS_UNKNOWN_FAILURE
23-dic-04	15:13:13	23-dic-04	15:14:31	78	14723	14723	PDS_UNKNOWN_FAILURE
24-dic-04	05:09:50	24-dic-04	05:11:08	78	14731	14731	PDS_UNKNOWN_FAILURE
24-dic-04	16:22:08	24-dic-04	16:23:26	78	14738	14738	PDS_UNKNOWN_FAILURE
24-dic-04	05:07:37	24-dic-04	05:07:40	3	14731	14731	PDS_UNKNOWN_FAILURE
25-dic-04	04:38:35	25-dic-04	04:39:53	78	14745	14745	PDS_UNKNOWN_FAILURE
25-dic-04	15:47:49	25-dic-04	15:47:52	3	14752	14752	PDS_UNKNOWN_FAILURE
25-dic-04	15:50:38	25-dic-04	15:51:55	77	14752	14752	PDS_UNKNOWN_FAILURE
26-dic-04	04:06:44	26-dic-04	04:08:01	77	14759	14759	PDS_UNKNOWN_FAILURE
26-dic-04	11:05:15	26-dic-04	12:11:39	3984	14763	14764	PDS_UNKNOWN_FAILURE
26-dic-04	15:19:08	26-dic-04	15:20:25	77	14766	14766	PDS_UNKNOWN_FAILURE
27-dic-04	02:48:55	27-dic-04	02:49:10	15	14772	14772	PDS_UNKNOWN_FAILURE

27-dic-04	13:49:30	27-dic-04	13:50:36	66	14779	14779	PDS_UNKNOWN_FAILURE
27-dic-04	16:28:03	27-dic-04	16:29:20	77	14781	14781	PDS_UNKNOWN_FAILURE
27-dic-04	02:48:55	27-dic-04	02:49:10	15	14772	14772	PDS_UNKNOWN_FAILURE
27-dic-04	13:49:30	27-dic-04	13:50:36	66	14779	14779	PDS_UNKNOWN_FAILURE
27-dic-04	16:28:03	27-dic-04	16:29:20	77	14781	14781	PDS_UNKNOWN_FAILURE
27-dic-04	02:49:10	27-dic-04	05:13:16	8646	14772	14774	UNAV_RA2
27-dic-04	05:15:26	27-dic-04	13:49:30	30844	14774	14779	UNAV_RA2
27-dic-04	02:48:55	27-dic-04	02:49:10	15	14772	14772	PDS_UNKNOWN_FAILURE
27-dic-04	13:49:30	27-dic-04	13:50:36	66	14779	14779	PDS_UNKNOWN_FAILURE
27-dic-04	02:48:55	27-dic-04	02:49:10	15	14772	14772	PDS_UNKNOWN_FAILURE
27-dic-04	13:49:30	27-dic-04	13:50:36	66	14779	14779	PDS_UNKNOWN_FAILURE
27-dic-04	16:28:03	27-dic-04	16:29:20	77	14781	14781	PDS_UNKNOWN_FAILURE
28-dic-04	04:44:19	28-dic-04	04:45:37	78	14788	14788	PDS_UNKNOWN_FAILURE
28-dic-04	15:56:13	28-dic-04	15:57:31	78	14795	14795	PDS_UNKNOWN_FAILURE
28-dic-04	04:44:19	28-dic-04	04:45:37	78	14788	14788	PDS_UNKNOWN_FAILURE
28-dic-04	15:56:13	28-dic-04	15:57:31	78	14795	14795	PDS_UNKNOWN_FAILURE
28-dic-04	04:44:19	28-dic-04	04:45:37	78	14788	14788	PDS_UNKNOWN_FAILURE
28-dic-04	15:56:13	28-dic-04	15:57:31	78	14795	14795	PDS_UNKNOWN_FAILURE
29-dic-04	04:12:36	29-dic-04	04:13:53	77	14802	14802	PDS_UNKNOWN_FAILURE
29-dic-04	15:22:19	29-dic-04	15:22:21	2	14809	14809	PDS_UNKNOWN_FAILURE
29-dic-04	15:25:02	29-dic-04	15:26:20	78	14809	14809	PDS_UNKNOWN_FAILURE
29-dic-04	04:12:36	29-dic-04	04:13:53	77	14802	14802	PDS_UNKNOWN_FAILURE
29-dic-04	15:22:19	29-dic-04	15:22:21	2	14809	14809	PDS_UNKNOWN_FAILURE
29-dic-04	15:25:02	29-dic-04	15:26:20	78	14809	14809	PDS_UNKNOWN_FAILURE
29-dic-04	04:12:36	29-dic-04	04:13:53	77	14802	14802	PDS_UNKNOWN_FAILURE
29-dic-04	15:22:19	29-dic-04	15:22:21	2	14809	14809	PDS_UNKNOWN_FAILURE
29-dic-04	15:25:02	29-dic-04	15:26:20	78	14809	14809	PDS_UNKNOWN_FAILURE
30-dic-04	05:21:03	30-dic-04	05:22:21	78	14817	14817	PDS_UNKNOWN_FAILURE
30-dic-04	16:33:56	30-dic-04	16:35:14	78	14824	14824	PDS_UNKNOWN_FAILURE
30-dic-04	05:21:03	30-dic-04	05:22:21	78	14817	14817	PDS_UNKNOWN_FAILURE
30-dic-04	16:33:56	30-dic-04	16:35:14	78	14824	14824	PDS_UNKNOWN_FAILURE
30-dic-04	05:21:03	30-dic-04	05:22:21	78	14817	14817	PDS_UNKNOWN_FAILURE
30-dic-04	16:33:56	30-dic-04	16:35:14	78	14824	14824	PDS_UNKNOWN_FAILURE
31-dic-04	04:50:04	31-dic-04	04:51:22	78	14831	14831	PDS_UNKNOWN_FAILURE
31-dic-04	16:01:48	31-dic-04	16:03:05	77	14838	14838	PDS_UNKNOWN_FAILURE
31-dic-04	04:50:04	31-dic-04	04:51:22	78	14831	14831	PDS_UNKNOWN_FAILURE
31-dic-04	16:01:48	31-dic-04	16:03:05	77	14838	14838	PDS_UNKNOWN_FAILURE
31-dic-04	04:50:04	31-dic-04	04:51:22	78	14831	14831	PDS_UNKNOWN_FAILURE
31-dic-04	16:01:48	31-dic-04	16:03:05	77	14838	14838	PDS_UNKNOWN_FAILURE
01-gen-05	04:18:27	01-gen-05	04:19:44	77	14845	14845	PDS_UNKNOWN_FAILURE
01-gen-05	15:27:57	01-gen-05	15:27:59	2	14852	14852	PDS_UNKNOWN_FAILURE
01-gen-05	15:30:56	01-gen-05	15:32:14	78	14852	14852	PDS_UNKNOWN_FAILURE
01-gen-05	04:18:27	01-gen-05	04:19:44	77	14845	14845	PDS_UNKNOWN_FAILURE
01-gen-05	15:27:57	01-gen-05	15:27:59	2	14852	14852	PDS_UNKNOWN_FAILURE
01-gen-05	15:30:56	01-gen-05	15:32:14	78	14852	14852	PDS_UNKNOWN_FAILURE
01-gen-05	04:18:27	01-gen-05	04:19:44	77	14845	14845	PDS_UNKNOWN_FAILURE

01-gen-05	15:27:57	01-gen-05	15:27:59	2	14852	14852	PDS_UNKNOWN_FAILURE
01-gen-05	15:30:56	01-gen-05	15:32:14	78	14852	14852	PDS_UNKNOWN_FAILURE
02-gen-05	05:26:21	02-gen-05	05:27:39	78	14860	14860	PDS_UNKNOWN_FAILURE
02-gen-05	16:39:20	02-gen-05	16:40:38	78	14867	14867	PDS_UNKNOWN_FAILURE
02-gen-05	05:26:21	02-gen-05	05:27:39	78	14860	14860	PDS_UNKNOWN_FAILURE
02-gen-05	16:39:20	02-gen-05	16:40:38	78	14867	14867	PDS_UNKNOWN_FAILURE
02-gen-05	05:26:21	02-gen-05	05:27:39	78	14860	14860	PDS_UNKNOWN_FAILURE
02-gen-05	16:39:20	02-gen-05	16:40:38	78	14867	14867	PDS_UNKNOWN_FAILURE
03-gen-05	04:55:46	03-gen-05	04:57:04	78	14874	14874	PDS_UNKNOWN_FAILURE
03-gen-05	16:07:23	03-gen-05	16:08:40	77	14881	14881	PDS_UNKNOWN_FAILURE
04-gen-05	04:24:11	04-gen-05	04:25:29	78	14888	14888	PDS_UNKNOWN_FAILURE
04-gen-05	15:36:37	04-gen-05	15:37:55	78	14895	14895	PDS_UNKNOWN_FAILURE
04-gen-05	20:40:31	04-gen-05	20:40:48	17	14898	14898	PDS_UNKNOWN_FAILURE
05-gen-05	03:52:01	05-gen-05	03:53:19	78	14902	14902	PDS_UNKNOWN_FAILURE
05-gen-05	10:19:18	05-gen-05	11:59:01	5983	14906	14907	PDS_UNKNOWN_FAILURE
05-gen-05	16:44:44	05-gen-05	16:46:01	77	14910	14910	PDS_UNKNOWN_FAILURE
06-gen-05	05:01:22	06-gen-05	05:02:40	78	14917	14917	PDS_UNKNOWN_FAILURE
06-gen-05	16:13:14	06-gen-05	16:14:32	78	14924	14924	PDS_UNKNOWN_FAILURE
07-gen-05	04:29:56	07-gen-05	04:31:13	77	14931	14931	PDS_UNKNOWN_FAILURE
07-gen-05	08:49:43	07-gen-05	09:08:02	1099	14934	14934	PDS_UNKNOWN_FAILURE
07-gen-05	10:41:33	07-gen-05	10:47:35	362	14935	14935	PDS_UNKNOWN_FAILURE
07-gen-05	14:14:24	07-gen-05	14:38:40	1456	14937	14937	PDS_UNKNOWN_FAILURE
07-gen-05	15:39:13	07-gen-05	15:39:16	3	14938	14938	PDS_UNKNOWN_FAILURE
07-gen-05	15:42:13	07-gen-05	15:43:31	78	14938	14938	PDS_UNKNOWN_FAILURE
08-gen-05	03:55:51	08-gen-05	03:55:54	3	14945	14945	PDS_UNKNOWN_FAILURE
08-gen-05	03:57:54	08-gen-05	03:59:12	78	14945	14945	PDS_UNKNOWN_FAILURE
08-gen-05	15:10:14	08-gen-05	15:11:32	78	14952	14952	PDS_UNKNOWN_FAILURE
09-gen-05	05:04:47	09-gen-05	05:04:50	3	14960	14960	PDS_UNKNOWN_FAILURE
09-gen-05	05:07:00	09-gen-05	05:08:18	78	14960	14960	PDS_UNKNOWN_FAILURE
09-gen-05	16:19:10	09-gen-05	16:20:28	78	14967	14967	PDS_UNKNOWN_FAILURE
10-gen-05	04:35:42	10-gen-05	04:36:59	77	14974	14974	PDS_UNKNOWN_FAILURE
10-gen-05	15:44:55	10-gen-05	15:44:59	4	14981	14981	PDS_UNKNOWN_FAILURE
10-gen-05	15:47:49	10-gen-05	15:49:07	78	14981	14981	PDS_UNKNOWN_FAILURE
12-gen-05	05:10:25	12-gen-05	05:10:28	3	15003	15003	PDS_UNKNOWN_FAILURE
12-gen-05	05:12:38	12-gen-05	05:13:56	78	15003	15003	PDS_UNKNOWN_FAILURE
12-gen-05	16:25:05	12-gen-05	16:26:23	78	15010	15010	PDS_UNKNOWN_FAILURE
13-gen-05	04:41:27	13-gen-05	04:42:45	78	15017	15017	PDS_UNKNOWN_FAILURE
13-gen-05	15:50:41	13-gen-05	15:50:44	3	15024	15024	PDS_UNKNOWN_FAILURE
13-gen-05	15:53:25	13-gen-05	15:54:43	78	15024	15024	PDS_UNKNOWN_FAILURE
14-gen-05	04:09:40	14-gen-05	04:10:58	78	15031	15031	PDS_UNKNOWN_FAILURE
14-gen-05	15:22:05	14-gen-05	15:23:23	78	15038	15038	PDS_UNKNOWN_FAILURE
15-gen-05	05:18:16	15-gen-05	05:19:33	77	15046	15046	PDS_UNKNOWN_FAILURE
15-gen-05	16:31:01	15-gen-05	16:32:19	78	15053	15053	PDS_UNKNOWN_FAILURE
16-gen-05	04:47:13	16-gen-05	04:48:31	78	15060	15060	PDS_UNKNOWN_FAILURE
16-gen-05	15:59:02	16-gen-05	16:00:19	77	15067	15067	PDS_UNKNOWN_FAILURE

Table 7: List of gaps for RA-2 L0 products during cycle 33

In Figure 11 and Table 8 the summary of unavailable MWR L0 products is given.

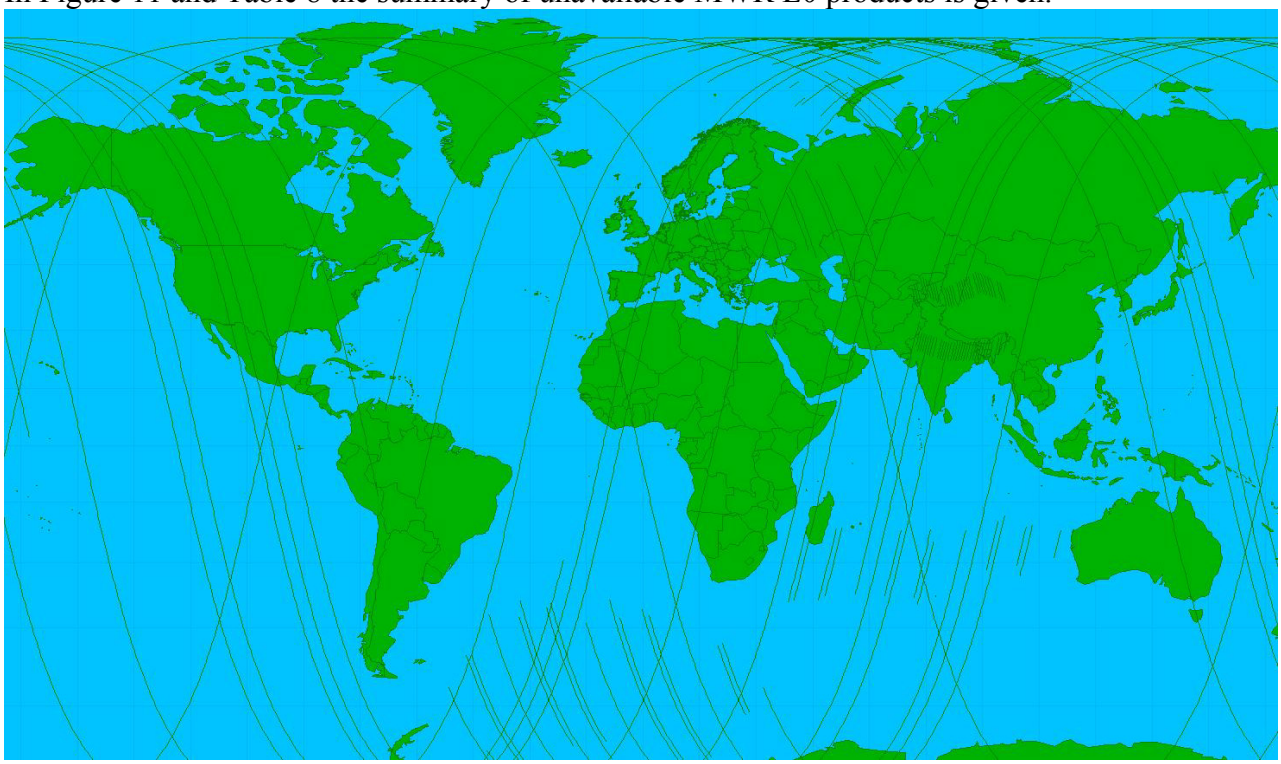

Figure 11: MWR L0 unavailable products for cycle 33

Start Date	Start Time	Stop Date	Stop Time	Duration (s)	Start Orbit	Stop Orbit	Reason
14-dic-04	02:19:17	14-dic-04	05:42:05	12168	14586	14588	PDS_UNKNOWN_FAILURE
14-dic-04	16:42:30	14-dic-04	16:44:06	96	14595	14595	PDS_UNKNOWN_FAILURE
15-dic-04	06:46:08	15-dic-04	06:52:08	360	14603	14603	PDS_UNKNOWN_FAILURE
15-dic-04	11:16:32	15-dic-04	11:20:32	240	14606	14606	PDS_UNKNOWN_FAILURE
15-dic-04	12:56:56	15-dic-04	12:59:44	168	14607	14607	PDS_UNKNOWN_FAILURE
15-dic-04	14:35:44	15-dic-04	14:38:08	144	14608	14608	PDS_UNKNOWN_FAILURE
15-dic-04	16:11:21	15-dic-04	16:14:33	192	14609	14609	PDS_UNKNOWN_FAILURE
15-dic-04	17:47:45	15-dic-04	17:52:33	288	14610	14610	PDS_UNKNOWN_FAILURE
15-dic-04	19:28:33	15-dic-04	19:30:33	120	14611	14611	PDS_UNKNOWN_FAILURE
15-dic-04	21:08:33	15-dic-04	21:11:21	168	14612	14612	PDS_UNKNOWN_FAILURE
15-dic-04	22:16:09	15-dic-04	22:24:57	528	14612	14612	PDS_UNKNOWN_FAILURE
15-dic-04	23:57:45	16-dic-04	00:06:09	504	14613	14613	PDS_UNKNOWN_FAILURE
14-dic-04	18:18:55	14-dic-04	18:23:43	288	14596	14596	PDS_UNKNOWN_FAILURE
16-dic-04	01:36:09	16-dic-04	01:43:21	432	14614	14614	PDS_UNKNOWN_FAILURE
16-dic-04	02:53:22	16-dic-04	02:57:46	264	14615	14615	PDS_UNKNOWN_FAILURE
16-dic-04	04:34:58	16-dic-04	06:20:10	6312	14616	14617	PDS_UNKNOWN_FAILURE
16-dic-04	09:07:46	16-dic-04	09:09:22	96	14619	14619	PDS_UNKNOWN_FAILURE
16-dic-04	10:46:10	16-dic-04	10:48:10	120	14620	14620	PDS_UNKNOWN_FAILURE
16-dic-04	12:24:10	16-dic-04	12:27:22	192	14621	14621	PDS_UNKNOWN_FAILURE
16-dic-04	14:05:47	16-dic-04	14:06:59	72	14622	14622	PDS_UNKNOWN_FAILURE
16-dic-04	15:42:11	16-dic-04	15:44:59	168	14623	14623	PDS_UNKNOWN_FAILURE

16-dic-04	17:15:23	16-dic-04	17:21:23	360	14624	14624	PDS_UNKNOWN_FAILURE
16-dic-04	18:54:59	16-dic-04	19:00:35	336	14625	14625	PDS_UNKNOWN_FAILURE
14-dic-04	19:59:19	14-dic-04	20:02:55	216	14597	14597	PDS_UNKNOWN_FAILURE
16-dic-04	21:48:11	16-dic-04	21:51:23	192	14626	14626	PDS_UNKNOWN_FAILURE
16-dic-04	23:23:24	16-dic-04	23:33:24	600	14627	14627	PDS_UNKNOWN_FAILURE
17-dic-04	01:03:48	17-dic-04	01:14:12	624	14628	14628	PDS_UNKNOWN_FAILURE
17-dic-04	02:21:48	17-dic-04	02:24:36	168	14629	14629	PDS_UNKNOWN_FAILURE
17-dic-04	04:02:36	17-dic-04	05:48:12	6336	14630	14631	PDS_UNKNOWN_FAILURE
17-dic-04	08:37:00	17-dic-04	08:38:36	96	14633	14633	PDS_UNKNOWN_FAILURE
17-dic-04	10:15:01	17-dic-04	10:16:37	96	14634	14634	PDS_UNKNOWN_FAILURE
17-dic-04	11:52:37	17-dic-04	11:55:25	168	14635	14635	PDS_UNKNOWN_FAILURE
17-dic-04	13:35:01	17-dic-04	13:35:49	48	14636	14636	PDS_UNKNOWN_FAILURE
17-dic-04	15:12:13	17-dic-04	15:14:37	144	14637	14637	PDS_UNKNOWN_FAILURE
14-dic-04	21:09:19	14-dic-04	21:14:07	288	14597	14597	PDS_UNKNOWN_FAILURE
17-dic-04	18:25:01	17-dic-04	18:29:01	240	14639	14639	PDS_UNKNOWN_FAILURE
17-dic-04	20:05:01	17-dic-04	20:08:13	192	14640	14640	PDS_UNKNOWN_FAILURE
17-dic-04	21:15:02	17-dic-04	21:19:50	288	14640	14640	PDS_UNKNOWN_FAILURE
17-dic-04	22:52:14	17-dic-04	23:03:02	648	14641	14641	PDS_UNKNOWN_FAILURE
18-dic-04	00:34:38	18-dic-04	00:42:38	480	14642	14642	PDS_UNKNOWN_FAILURE
18-dic-04	02:11:26	18-dic-04	02:19:02	456	14643	14643	PDS_UNKNOWN_FAILURE
18-dic-04	03:30:14	18-dic-04	03:34:38	264	14644	14644	PDS_UNKNOWN_FAILURE
18-dic-04	05:11:26	18-dic-04	05:17:02	336	14645	14645	PDS_UNKNOWN_FAILURE
18-dic-04	06:51:50	18-dic-04	06:57:50	360	14646	14646	PDS_UNKNOWN_FAILURE
18-dic-04	09:45:27	18-dic-04	09:46:15	48	14648	14648	PDS_UNKNOWN_FAILURE
14-dic-04	22:46:07	14-dic-04	22:56:07	600	14598	14598	PDS_UNKNOWN_FAILURE
18-dic-04	11:23:03	18-dic-04	11:25:03	120	14649	14649	PDS_UNKNOWN_FAILURE
18-dic-04	13:01:27	18-dic-04	13:05:03	216	14650	14650	PDS_UNKNOWN_FAILURE
18-dic-04	14:41:27	18-dic-04	14:44:15	168	14651	14651	PDS_UNKNOWN_FAILURE
18-dic-04	16:17:03	18-dic-04	16:21:51	288	14652	14652	PDS_UNKNOWN_FAILURE
18-dic-04	17:54:16	18-dic-04	17:58:40	264	14653	14653	PDS_UNKNOWN_FAILURE
18-dic-04	19:33:28	18-dic-04	19:35:04	96	14654	14654	PDS_UNKNOWN_FAILURE
18-dic-04	20:38:16	18-dic-04	20:45:52	456	14654	14654	PDS_UNKNOWN_FAILURE
18-dic-04	22:20:40	18-dic-04	22:31:04	624	14655	14655	PDS_UNKNOWN_FAILURE
19-dic-04	00:02:40	19-dic-04	00:11:28	528	14656	14656	PDS_UNKNOWN_FAILURE
19-dic-04	01:41:04	19-dic-04	01:49:28	504	14657	14657	PDS_UNKNOWN_FAILURE
15-dic-04	00:28:07	15-dic-04	00:37:43	576	14599	14599	PDS_UNKNOWN_FAILURE
19-dic-04	02:59:04	19-dic-04	03:02:40	216	14658	14658	PDS_UNKNOWN_FAILURE
19-dic-04	04:39:53	19-dic-04	04:45:29	336	14659	14659	PDS_UNKNOWN_FAILURE
19-dic-04	06:20:41	19-dic-04	06:26:17	336	14660	14660	PDS_UNKNOWN_FAILURE
19-dic-04	09:14:41	19-dic-04	09:15:29	48	14662	14662	PDS_UNKNOWN_FAILURE
19-dic-04	10:49:53	19-dic-04	10:53:29	216	14663	14663	PDS_UNKNOWN_FAILURE
19-dic-04	12:30:41	19-dic-04	12:33:53	192	14664	14664	PDS_UNKNOWN_FAILURE
19-dic-04	14:09:53	19-dic-04	14:12:17	144	14665	14665	PDS_UNKNOWN_FAILURE
19-dic-04	15:47:54	19-dic-04	15:50:42	168	14666	14666	PDS_UNKNOWN_FAILURE
15-dic-04	02:03:19	15-dic-04	02:10:07	408	14600	14600	PDS_UNKNOWN_FAILURE
15-dic-04	03:24:07	15-dic-04	03:28:31	264	14601	14601	PDS_UNKNOWN_FAILURE

15-dic-04	05:06:08	15-dic-04	05:11:20	312	14602	14602	PDS_UNKNOWN_FAILURE
22-dic-04	15:50:24	22-dic-04	15:56:48	384	14709	14709	PDS_UNKNOWN_FAILURE
23-dic-04	12:02:50	23-dic-04	12:07:14	264	14721	14721	PDS_UNKNOWN_FAILURE
26-dic-04	11:04:09	26-dic-04	12:11:21	4032	14763	14764	PDS_UNKNOWN_FAILURE
27-dic-04	13:49:30	27-dic-04	13:50:36	66	14779	14779	PDS_UNKNOWN_FAILURE
27-dic-04	16:28:03	27-dic-04	16:29:20	77	14781	14781	PDS_UNKNOWN_FAILURE
31-dic-04	16:03:05	31-dic-04	16:03:06	1	14838	14838	PDS_UNKNOWN_FAILURE
01-gen-05	04:18:27	01-gen-05	04:19:44	77	14845	14845	PDS_UNKNOWN_FAILURE
01-gen-05	15:30:56	01-gen-05	15:32:14	78	14852	14852	PDS_UNKNOWN_FAILURE
02-gen-05	05:26:21	02-gen-05	05:27:39	78	14860	14860	PDS_UNKNOWN_FAILURE
02-gen-05	16:39:20	02-gen-05	16:40:38	78	14867	14867	PDS_UNKNOWN_FAILURE
28-dic-04	04:44:19	28-dic-04	04:45:37	78	14788	14788	PDS_UNKNOWN_FAILURE
28-dic-04	15:56:13	28-dic-04	15:57:31	78	14795	14795	PDS_UNKNOWN_FAILURE
29-dic-04	04:12:36	29-dic-04	04:13:53	77	14802	14802	PDS_UNKNOWN_FAILURE
29-dic-04	15:25:02	29-dic-04	15:26:20	78	14809	14809	PDS_UNKNOWN_FAILURE
30-dic-04	05:21:03	30-dic-04	05:22:21	78	14817	14817	PDS_UNKNOWN_FAILURE
30-dic-04	16:33:56	30-dic-04	16:35:14	78	14824	14824	PDS_UNKNOWN_FAILURE
31-dic-04	04:50:04	31-dic-04	04:51:22	78	14831	14831	PDS_UNKNOWN_FAILURE
31-dic-04	16:01:48	31-dic-04	16:03:05	77	14838	14838	PDS_UNKNOWN_FAILURE
05-gen-05	10:18:31	05-gen-05	11:58:55	6024	14906	14907	PDS_UNKNOWN_FAILURE
07-gen-05	08:48:36	07-gen-05	09:08:12	1176	14933	14934	PDS_UNKNOWN_FAILURE
07-gen-05	10:40:36	07-gen-05	10:47:48	432	14935	14935	PDS_UNKNOWN_FAILURE
07-gen-05	14:13:24	07-gen-05	14:15:24	120	14937	14937	PDS_UNKNOWN_FAILURE
14-gen-05	21:40:52	14-gen-05	23:22:05	6073	15041	15042	PDS_UNKNOWN_FAILURE

Table 8: List of gaps for MWR L0 products during cycle 33

In Figure 12 and Table 9 the summary of unavailable RA-2 L1b products is given. Please note that in this case, only the gaps due to problems with the PDS are reported.

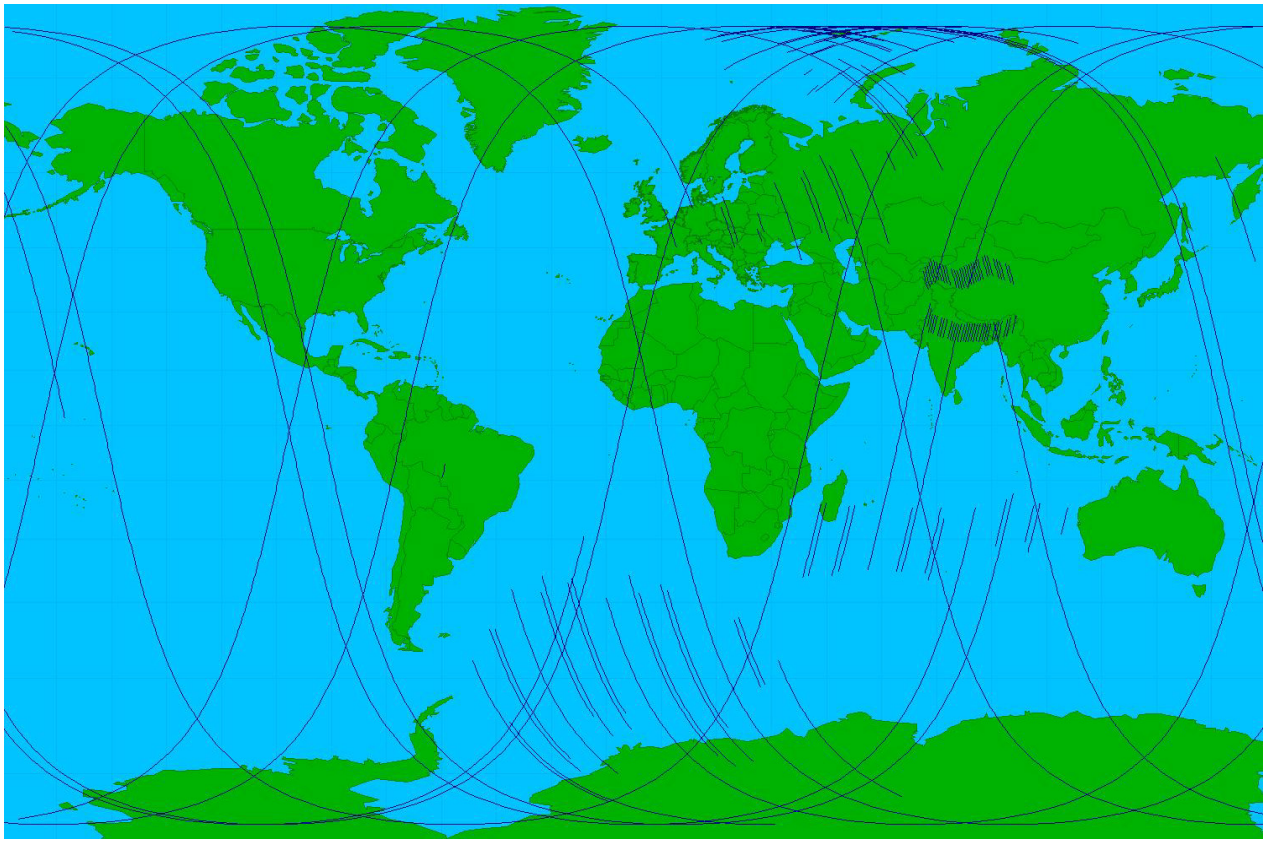

Figure 12: RA-2 L1b unavailable products for cycle 33

Start Date	Start Time	Stop Date	Stop Time	Duration (s)	Start Orbit	Stop Orbit	Reason
13-dic-04	04:15:34	13-dic-04	04:16:52	78	14573	14573	PDS_UNKNOWN_FAILURE
13-dic-04	15:28:01	13-dic-04	15:29:19	78	14580	14580	PDS_UNKNOWN_FAILURE
14-dic-04	22:47:05	14-dic-04	22:56:23	558	14598	14598	PDS_UNKNOWN_FAILURE
15-dic-04	00:29:05	15-dic-04	00:38:06	541	14599	14599	PDS_UNKNOWN_FAILURE
15-dic-04	02:04:26	15-dic-04	02:10:22	356	14600	14600	PDS_UNKNOWN_FAILURE
15-dic-04	03:25:09	15-dic-04	04:50:30	5121	14601	14602	PDS_UNKNOWN_FAILURE
15-dic-04	04:52:58	15-dic-04	05:11:20	1102	14602	14602	PDS_UNKNOWN_FAILURE
15-dic-04	06:47:02	15-dic-04	06:52:10	308	14603	14603	PDS_UNKNOWN_FAILURE
15-dic-04	11:17:21	15-dic-04	11:20:55	214	14606	14606	PDS_UNKNOWN_FAILURE
15-dic-04	12:57:49	15-dic-04	12:59:59	130	14607	14607	PDS_UNKNOWN_FAILURE
15-dic-04	14:36:53	15-dic-04	14:38:14	81	14608	14608	PDS_UNKNOWN_FAILURE
15-dic-04	16:04:37	15-dic-04	16:05:55	78	14609	14609	PDS_UNKNOWN_FAILURE
14-dic-04	05:23:53	14-dic-04	05:25:11	78	14588	14588	PDS_UNKNOWN_FAILURE
15-dic-04	16:12:26	15-dic-04	17:52:34	6008	14609	14610	PDS_UNKNOWN_FAILURE
15-dic-04	19:29:22	15-dic-04	19:30:34	72	14611	14611	PDS_UNKNOWN_FAILURE
15-dic-04	21:09:03	15-dic-04	21:11:24	141	14612	14612	PDS_UNKNOWN_FAILURE
15-dic-04	22:17:16	15-dic-04	22:24:57	461	14612	14612	PDS_UNKNOWN_FAILURE
15-dic-04	23:58:35	16-dic-04	00:06:18	463	14613	14613	PDS_UNKNOWN_FAILURE
16-dic-04	01:37:02	16-dic-04	01:43:44	402	14614	14614	PDS_UNKNOWN_FAILURE
16-dic-04	02:54:16	16-dic-04	02:57:45	209	14615	14615	PDS_UNKNOWN_FAILURE

16-dic-04	04:21:21	16-dic-04	04:22:39	78	14616	14616	PDS_UNKNOWN_FAILURE
16-dic-04	04:36:00	16-dic-04	04:40:14	254	14616	14616	PDS_UNKNOWN_FAILURE
16-dic-04	06:15:38	16-dic-04	06:20:16	278	14617	14617	PDS_UNKNOWN_FAILURE
14-dic-04	16:36:40	14-dic-04	16:37:58	78	14595	14595	PDS_UNKNOWN_FAILURE
16-dic-04	09:08:33	16-dic-04	09:09:43	70	14619	14619	PDS_UNKNOWN_FAILURE
16-dic-04	10:47:04	16-dic-04	10:48:28	84	14620	14620	PDS_UNKNOWN_FAILURE
16-dic-04	12:25:19	16-dic-04	12:27:23	124	14621	14621	PDS_UNKNOWN_FAILURE
16-dic-04	14:06:22	16-dic-04	14:07:16	54	14622	14622	PDS_UNKNOWN_FAILURE
16-dic-04	15:33:52	16-dic-04	15:35:10	78	14623	14623	PDS_UNKNOWN_FAILURE
16-dic-04	15:43:21	16-dic-04	15:45:07	106	14623	14623	PDS_UNKNOWN_FAILURE
16-dic-04	17:16:27	16-dic-04	17:21:45	318	14624	14624	PDS_UNKNOWN_FAILURE
16-dic-04	18:56:01	16-dic-04	19:00:38	277	14625	14625	PDS_UNKNOWN_FAILURE
16-dic-04	20:39:45	16-dic-04	23:33:26	10421	14626	14627	PDS_UNKNOWN_FAILURE
17-dic-04	01:04:43	17-dic-04	01:14:35	592	14628	14628	PDS_UNKNOWN_FAILURE
14-dic-04	16:43:19	14-dic-04	16:44:18	59	14595	14595	PDS_UNKNOWN_FAILURE
17-dic-04	02:22:58	17-dic-04	02:24:56	118	14629	14629	PDS_UNKNOWN_FAILURE
17-dic-04	04:03:35	17-dic-04	05:27:28	5033	14630	14631	PDS_UNKNOWN_FAILURE
17-dic-04	05:28:51	17-dic-04	05:48:32	1181	14631	14631	PDS_UNKNOWN_FAILURE
17-dic-04	06:57:46	17-dic-04	08:37:31	5985	14632	14633	PDS_UNKNOWN_FAILURE
17-dic-04	08:37:31	17-dic-04	08:38:36	65	14633	14633	PDS_UNKNOWN_FAILURE
17-dic-04	10:15:50	17-dic-04	10:16:59	69	14634	14634	PDS_UNKNOWN_FAILURE
17-dic-04	11:53:42	17-dic-04	11:55:31	109	14635	14635	PDS_UNKNOWN_FAILURE
17-dic-04	13:35:35	17-dic-04	13:35:58	23	14636	14636	PDS_UNKNOWN_FAILURE
17-dic-04	15:13:03	17-dic-04	15:14:50	107	14637	14637	PDS_UNKNOWN_FAILURE
17-dic-04	16:42:04	17-dic-04	16:43:22	78	14638	14638	PDS_UNKNOWN_FAILURE
14-dic-04	18:19:51	14-dic-04	18:23:52	241	14596	14596	PDS_UNKNOWN_FAILURE
17-dic-04	18:26:05	17-dic-04	18:29:17	192	14639	14639	PDS_UNKNOWN_FAILURE
17-dic-04	20:05:49	17-dic-04	20:08:15	146	14640	14640	PDS_UNKNOWN_FAILURE
17-dic-04	21:16:05	17-dic-04	21:19:51	226	14640	14640	PDS_UNKNOWN_FAILURE
17-dic-04	22:53:19	17-dic-04	23:03:17	598	14641	14641	PDS_UNKNOWN_FAILURE
18-dic-04	00:35:46	18-dic-04	00:42:50	424	14642	14642	PDS_UNKNOWN_FAILURE
18-dic-04	02:12:21	18-dic-04	02:19:19	418	14643	14643	PDS_UNKNOWN_FAILURE
18-dic-04	03:31:20	18-dic-04	03:34:45	205	14644	14644	PDS_UNKNOWN_FAILURE
18-dic-04	04:58:36	18-dic-04	04:59:54	78	14645	14645	PDS_UNKNOWN_FAILURE
18-dic-04	05:12:35	18-dic-04	05:17:05	270	14645	14645	PDS_UNKNOWN_FAILURE
18-dic-04	06:52:55	18-dic-04	06:58:02	307	14646	14646	PDS_UNKNOWN_FAILURE
14-dic-04	18:23:52	14-dic-04	18:23:53	1	14596	14596	PDS_UNKNOWN_FAILURE
18-dic-04	09:46:02	18-dic-04	09:46:18	16	14648	14648	PDS_UNKNOWN_FAILURE
18-dic-04	11:23:50	18-dic-04	11:25:21	91	14649	14649	PDS_UNKNOWN_FAILURE
18-dic-04	13:02:28	18-dic-04	13:05:26	178	14650	14650	PDS_UNKNOWN_FAILURE
18-dic-04	14:42:33	18-dic-04	14:44:18	105	14651	14651	PDS_UNKNOWN_FAILURE
18-dic-04	16:10:19	18-dic-04	16:11:37	78	14652	14652	PDS_UNKNOWN_FAILURE
18-dic-04	16:18:03	18-dic-04	16:22:10	247	14652	14652	PDS_UNKNOWN_FAILURE
18-dic-04	17:55:04	18-dic-04	17:58:49	225	14653	14653	PDS_UNKNOWN_FAILURE
18-dic-04	19:34:33	18-dic-04	19:35:21	48	14654	14654	PDS_UNKNOWN_FAILURE
18-dic-04	20:39:12	18-dic-04	20:45:54	402	14654	14654	PDS_UNKNOWN_FAILURE

18-dic-04	22:21:27	18-dic-04	22:31:05	578	14655	14655	PDS_UNKNOWN_FAILURE
14-dic-04	20:00:23	14-dic-04	20:03:03	160	14597	14597	PDS_UNKNOWN_FAILURE
19-dic-04	00:03:33	19-dic-04	00:11:48	495	14656	14656	PDS_UNKNOWN_FAILURE
19-dic-04	01:42:12	19-dic-04	01:49:31	439	14657	14657	PDS_UNKNOWN_FAILURE
19-dic-04	03:00:08	19-dic-04	03:02:49	161	14658	14658	PDS_UNKNOWN_FAILURE
19-dic-04	04:27:05	19-dic-04	04:28:23	78	14659	14659	PDS_UNKNOWN_FAILURE
19-dic-04	04:40:55	19-dic-04	04:45:33	278	14659	14659	PDS_UNKNOWN_FAILURE
19-dic-04	06:21:27	19-dic-04	06:26:19	292	14660	14660	PDS_UNKNOWN_FAILURE
19-dic-04	09:15:10	19-dic-04	09:15:33	23	14662	14662	PDS_UNKNOWN_FAILURE
19-dic-04	09:15:33	19-dic-04	09:15:38	5	14662	14662	PDS_UNKNOWN_FAILURE
19-dic-04	10:50:13	19-dic-04	10:50:48	35	14663	14663	PDS_UNKNOWN_FAILURE
19-dic-04	10:50:48	19-dic-04	10:53:36	168	14663	14663	PDS_UNKNOWN_FAILURE
14-dic-04	20:03:03	14-dic-04	20:03:04	1	14597	14597	PDS_UNKNOWN_FAILURE
19-dic-04	10:53:36	19-dic-04	10:53:37	1	14663	14663	PDS_UNKNOWN_FAILURE
19-dic-04	12:31:52	19-dic-04	12:34:12	140	14664	14664	PDS_UNKNOWN_FAILURE
19-dic-04	14:10:58	19-dic-04	14:12:37	99	14665	14665	PDS_UNKNOWN_FAILURE
14-dic-04	21:10:28	14-dic-04	21:14:17	229	14597	14597	PDS_UNKNOWN_FAILURE
24-dic-04	16:22:08	24-dic-04	16:23:26	78	14738	14738	PDS_UNKNOWN_FAILURE
25-dic-04	04:38:35	25-dic-04	04:39:53	78	14745	14745	PDS_UNKNOWN_FAILURE
25-dic-04	15:50:38	25-dic-04	15:51:55	77	14752	14752	PDS_UNKNOWN_FAILURE
26-dic-04	04:06:44	26-dic-04	04:08:01	77	14759	14759	PDS_UNKNOWN_FAILURE
26-dic-04	11:05:16	26-dic-04	12:11:39	3983	14763	14764	PDS_UNKNOWN_FAILURE
26-dic-04	15:19:08	26-dic-04	15:20:25	77	14766	14766	PDS_UNKNOWN_FAILURE
27-dic-04	13:49:30	27-dic-04	13:50:36	66	14779	14779	PDS_UNKNOWN_FAILURE
27-dic-04	16:28:03	27-dic-04	16:29:20	77	14781	14781	PDS_UNKNOWN_FAILURE
22-dic-04	04:32:50	22-dic-04	04:34:08	78	14702	14702	PDS_UNKNOWN_FAILURE
22-dic-04	15:45:02	22-dic-04	15:46:20	78	14709	14709	PDS_UNKNOWN_FAILURE
22-dic-04	15:51:33	22-dic-04	15:56:56	323	14709	14709	PDS_UNKNOWN_FAILURE
23-dic-04	04:00:52	23-dic-04	04:02:10	78	14716	14716	PDS_UNKNOWN_FAILURE
23-dic-04	12:03:50	23-dic-04	12:07:17	207	14721	14721	PDS_UNKNOWN_FAILURE
23-dic-04	15:13:13	23-dic-04	15:14:31	78	14723	14723	PDS_UNKNOWN_FAILURE
24-dic-04	05:09:50	24-dic-04	05:11:08	78	14731	14731	PDS_UNKNOWN_FAILURE
27-dic-04	13:49:30	27-dic-04	13:50:36	66	14779	14779	PDS_UNKNOWN_FAILURE
27-dic-04	16:28:03	27-dic-04	16:29:20	77	14781	14781	PDS_UNKNOWN_FAILURE
31-dic-04	16:03:05	31-dic-04	16:03:06	1	14838	14838	PDS_UNKNOWN_FAILURE
01-gen-05	04:18:27	01-gen-05	04:19:44	77	14845	14845	PDS_UNKNOWN_FAILURE
01-gen-05	15:30:56	01-gen-05	15:32:14	78	14852	14852	PDS_UNKNOWN_FAILURE
02-gen-05	05:26:21	02-gen-05	05:27:39	78	14860	14860	PDS_UNKNOWN_FAILURE
02-gen-05	16:39:20	02-gen-05	16:40:38	78	14867	14867	PDS_UNKNOWN_FAILURE
28-dic-04	04:44:19	28-dic-04	04:45:37	78	14788	14788	PDS_UNKNOWN_FAILURE
28-dic-04	15:56:13	28-dic-04	15:57:31	78	14795	14795	PDS_UNKNOWN_FAILURE
29-dic-04	04:12:36	29-dic-04	04:13:53	77	14802	14802	PDS_UNKNOWN_FAILURE
29-dic-04	15:25:02	29-dic-04	15:26:20	78	14809	14809	PDS_UNKNOWN_FAILURE
30-dic-04	05:21:03	30-dic-04	05:22:21	78	14817	14817	PDS_UNKNOWN_FAILURE
30-dic-04	16:33:56	30-dic-04	16:35:14	78	14824	14824	PDS_UNKNOWN_FAILURE
31-dic-04	04:50:04	31-dic-04	04:51:22	78	14831	14831	PDS_UNKNOWN_FAILURE

31-dic-04	16:01:48	31-dic-04	16:03:05	77	14838	14838	PDS_UNKNOWN_FAILURE
03-gen-05	04:55:46	03-gen-05	04:57:04	78	14874	14874	PDS_UNKNOWN_FAILURE
03-gen-05	16:07:23	03-gen-05	16:08:40	77	14881	14881	PDS_UNKNOWN_FAILURE
07-gen-05	04:29:56	07-gen-05	04:31:13	77	14931	14931	PDS_UNKNOWN_FAILURE
07-gen-05	08:49:44	07-gen-05	09:08:02	1098	14934	14934	PDS_UNKNOWN_FAILURE
07-gen-05	10:41:34	07-gen-05	10:47:35	361	14935	14935	PDS_UNKNOWN_FAILURE
07-gen-05	14:14:25	07-gen-05	14:38:40	1455	14937	14937	PDS_UNKNOWN_FAILURE
07-gen-05	14:38:40	07-gen-05	15:39:13	3633	14937	14938	PDS_UNKNOWN_FAILURE
07-gen-05	15:39:13	07-gen-05	15:39:16	3	14938	14938	PDS_UNKNOWN_FAILURE
07-gen-05	15:42:13	07-gen-05	15:43:31	78	14938	14938	PDS_UNKNOWN_FAILURE
08-gen-05	03:57:54	08-gen-05	03:59:12	78	14945	14945	PDS_UNKNOWN_FAILURE
08-gen-05	15:10:14	08-gen-05	15:11:32	78	14952	14952	PDS_UNKNOWN_FAILURE
09-gen-05	05:07:00	09-gen-05	05:08:18	78	14960	14960	PDS_UNKNOWN_FAILURE
04-gen-05	04:24:11	04-gen-05	04:25:29	78	14888	14888	PDS_UNKNOWN_FAILURE
09-gen-05	16:19:10	09-gen-05	16:20:28	78	14967	14967	PDS_UNKNOWN_FAILURE
10-gen-05	04:35:42	10-gen-05	04:36:59	77	14974	14974	PDS_UNKNOWN_FAILURE
10-gen-05	15:47:49	10-gen-05	15:49:07	78	14981	14981	PDS_UNKNOWN_FAILURE
04-gen-05	15:36:37	04-gen-05	15:37:55	78	14895	14895	PDS_UNKNOWN_FAILURE
04-gen-05	20:40:32	04-gen-05	20:40:48	16	14898	14898	PDS_UNKNOWN_FAILURE
05-gen-05	03:52:01	05-gen-05	03:53:19	78	14902	14902	PDS_UNKNOWN_FAILURE
05-gen-05	10:19:19	05-gen-05	11:59:01	5982	14906	14907	PDS_UNKNOWN_FAILURE
05-gen-05	16:44:44	05-gen-05	16:46:01	77	14910	14910	PDS_UNKNOWN_FAILURE
06-gen-05	05:01:22	06-gen-05	05:02:40	78	14917	14917	PDS_UNKNOWN_FAILURE
06-gen-05	16:13:14	06-gen-05	16:14:32	78	14924	14924	PDS_UNKNOWN_FAILURE
12-gen-05	05:12:38	12-gen-05	05:13:56	78	15003	15003	PDS_UNKNOWN_FAILURE
12-gen-05	16:25:05	12-gen-05	16:26:23	78	15010	15010	PDS_UNKNOWN_FAILURE
16-gen-05	15:59:02	16-gen-05	16:00:19	77	15067	15067	PDS_UNKNOWN_FAILURE
13-gen-05	04:41:27	13-gen-05	04:42:45	78	15017	15017	PDS_UNKNOWN_FAILURE
13-gen-05	15:50:42	13-gen-05	15:50:44	2	15024	15024	PDS_UNKNOWN_FAILURE
13-gen-05	15:53:25	13-gen-05	15:54:43	78	15024	15024	PDS_UNKNOWN_FAILURE
14-gen-05	04:09:40	14-gen-05	04:10:58	78	15031	15031	PDS_UNKNOWN_FAILURE
14-gen-05	15:22:05	14-gen-05	15:23:23	78	15038	15038	PDS_UNKNOWN_FAILURE
15-gen-05	05:18:16	15-gen-05	05:19:33	77	15046	15046	PDS_UNKNOWN_FAILURE
15-gen-05	16:31:01	15-gen-05	16:32:19	78	15053	15053	PDS_UNKNOWN_FAILURE
16-gen-05	04:47:13	16-gen-05	04:48:31	78	15060	15060	PDS_UNKNOWN_FAILURE

Table 9: List of gaps for RA-2 L1b products during cycle 33

8.2 RA-2 Altimeter Parameters

Hereafter a summary of the main Altimetric parameters performances is reported; these results have been obtained with the editing criteria mentioned in par. 8.3.

8.2.1 ALTIMETER RANGE

No current results for the time being. The monitoring of the RA-2 FD altimetric range shall be done once the NRT products shall be upgraded with the DORIS navigator NRT orbital information.

8.2.2 SIGNIFICANT WAVE HEIGHT

The histogram of the SWH, reported in Figure 13, shows a nominal behavior for this cycle. The trend goes on following the behavior shown in the previous cycle.
During cycle 33 a slightly increase of about 2.5-3 cm is observed for the peak of the Ku band histogram with respect to the previous cycle. Now the peaks of Ku and S bands SWH histograms are closer each other.
On July the 2nd the SWH value in the two bands seemed to drop of about 10 cm in average. After a more detailed analysis that drop can be now interpreted more like a smoother decrease which can be correlated to a seasonal variability as it could be observed during year 2003.
The high daily means (sometimes plotted outside the figure range) reported for the S-Band values are due to the so-called S-Band anomaly (ref. par.7.1.7).

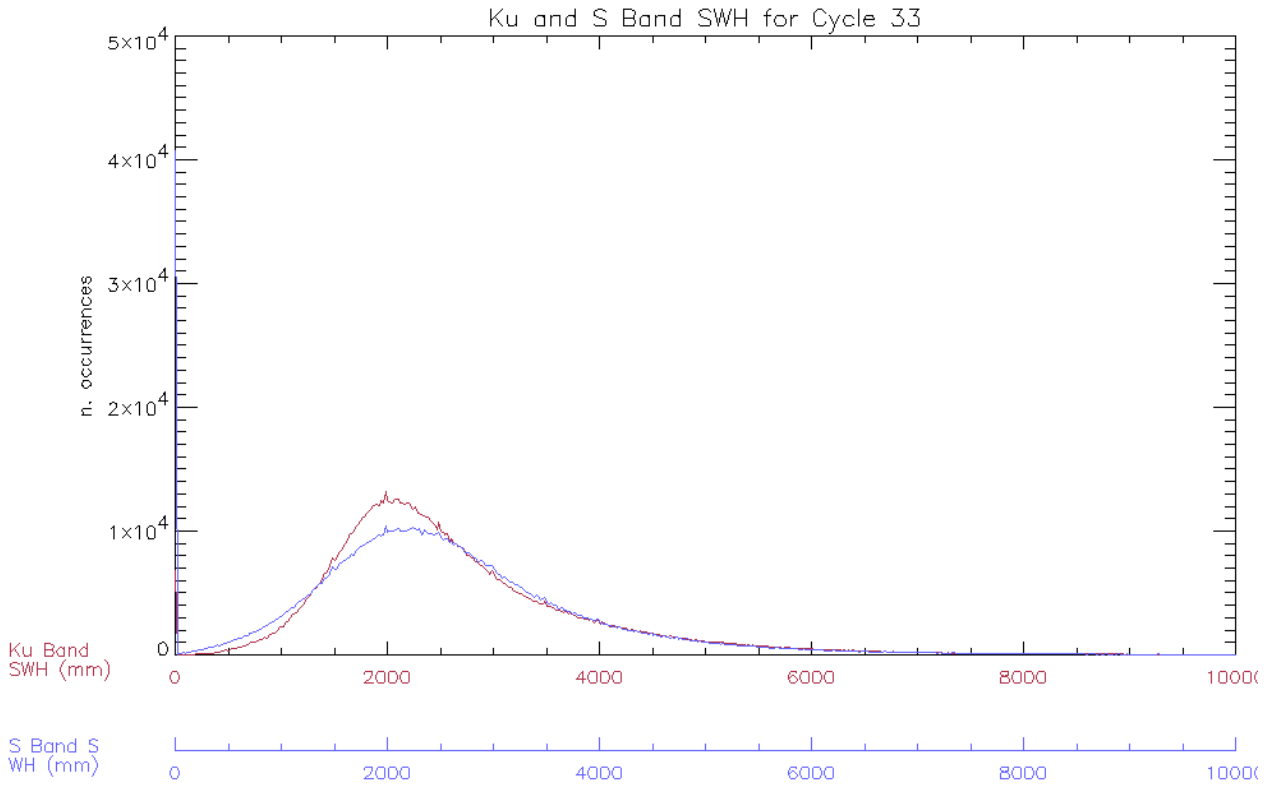

Figure 13: Histogram of Ku and S Band SWH for cycle 33 (mm)

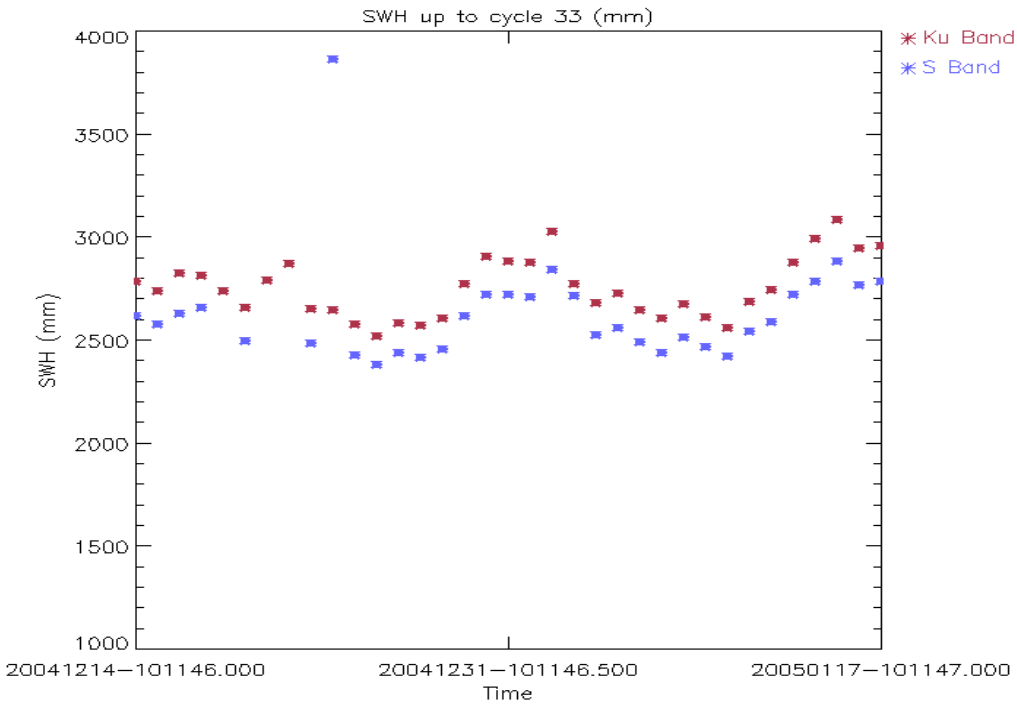

Figure 14: Ku and S SWH daily average for cycle 33 (mm)

8.2.3 BACKSCATTER COEFFICIENT – WIND SPEED

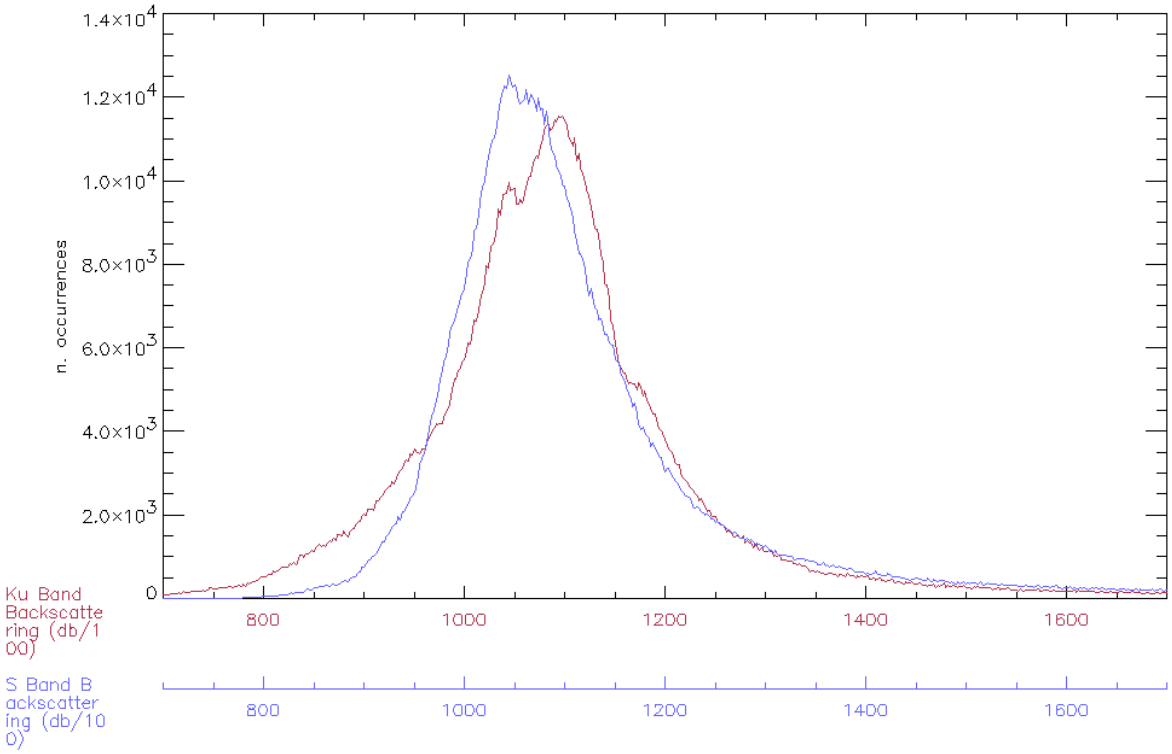

Figure 15: Histogram of Ku and S Band Backscattering Coefficient for cycle 33 (dB/100)

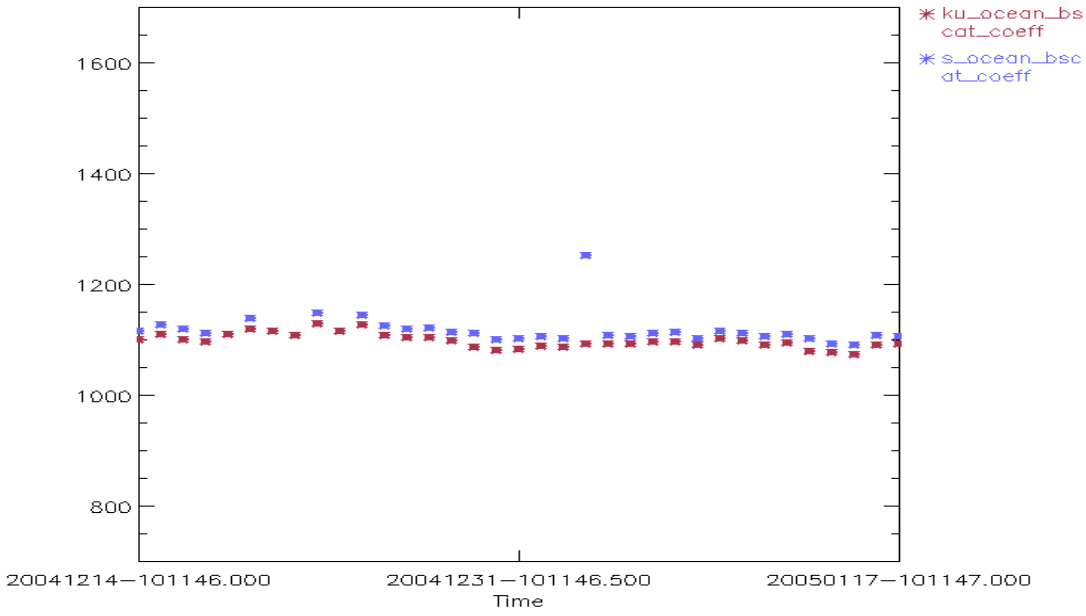

Figure 16: Ku and S Sigma_0 daily average for cycle 33 (dB/100)

The Sigma_0 histogram both in Ku and S Band shows secondary peaks. A small investigation on this problem, performed on the data of cycle 28, demonstrated that the backscattering distribution assumes a different behavior for different sea conditions. Indeed, for both bands, the majority of the data is concentrated on lower values for rough sea state (southern hemisphere, winter conditions) and on higher values for calm sea state (northern hemisphere, summer conditions).
An anomalous peak at about 12 dB for both Ku and S bands can be seen and shall be monitored in the next cycle.

The backscattering coefficient daily average trend shows, for both bands, a nominal behavior.
The high daily means (sometimes plotted outside the figure range) reported for the S-Band Sigma_0 are due to the so-called S-Band anomaly (ref. par. 7.1.7).

The histogram of Wind Speed computed for the Ku-band and the time behavior during cycle 33 are reported in Figure 17 and Figure 18. They are similar to the previous cycle.

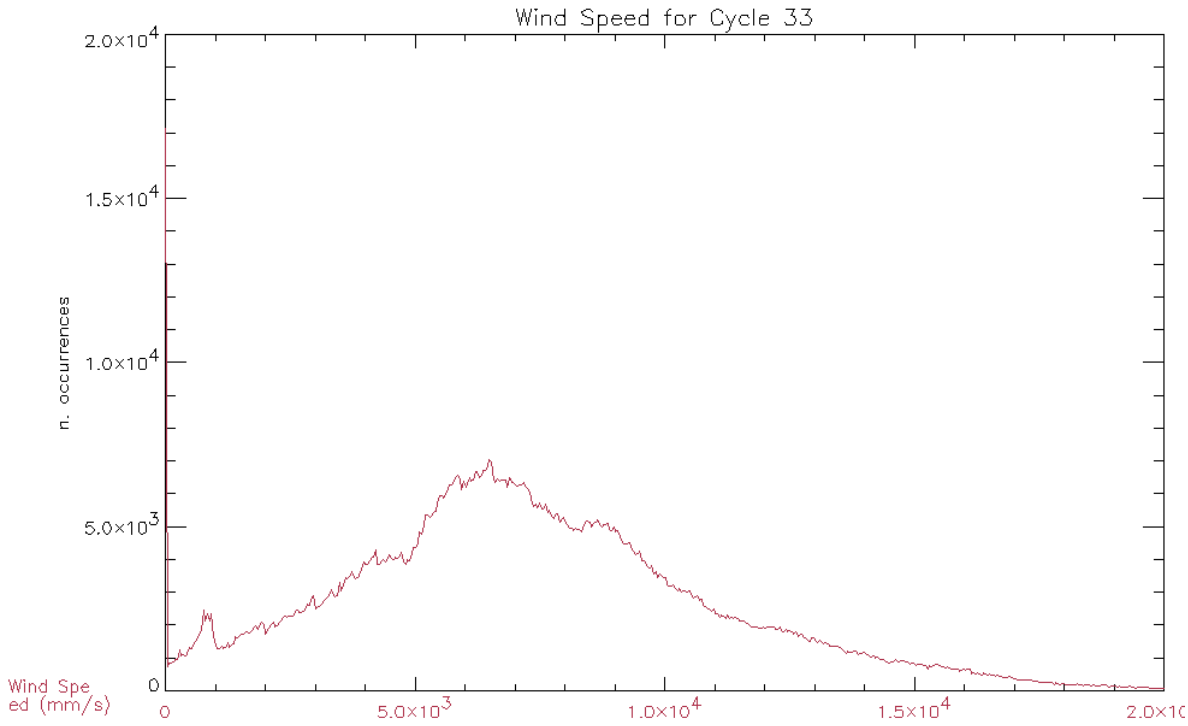

Figure 17: Histogram of Ku Wind Speed for cycle 33 (mm/s)

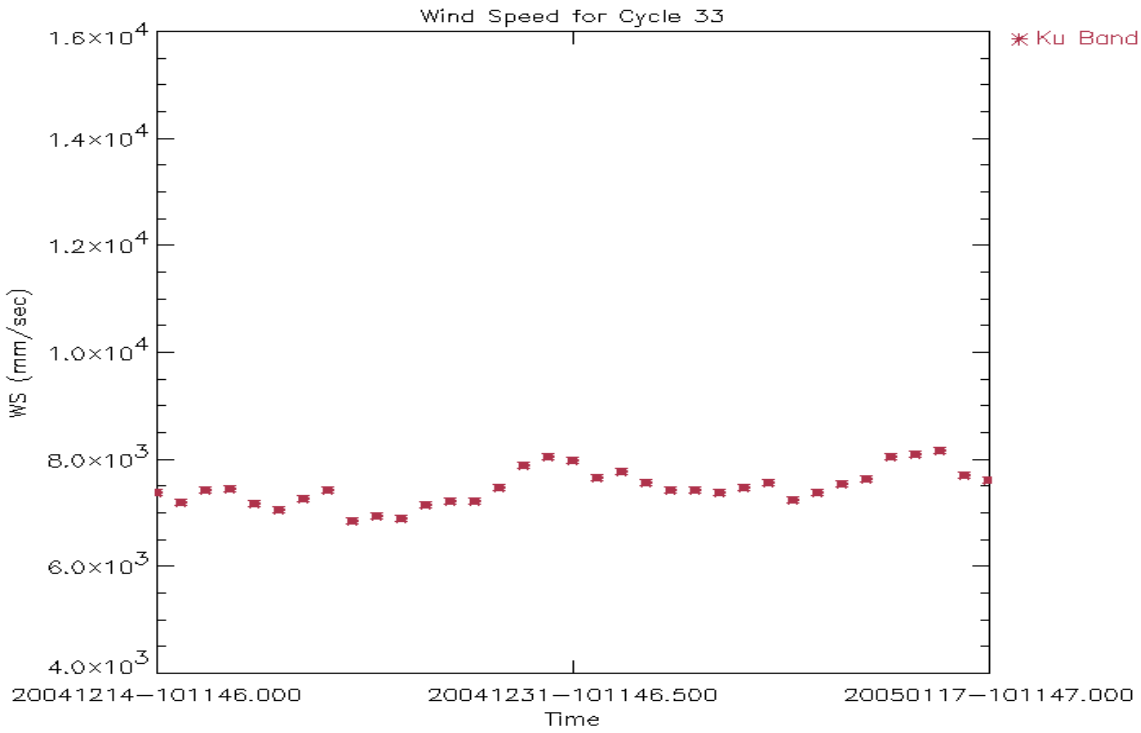

Figure 18: Ku Band Wind Speed daily average for cycle 33 (mm/s)

8.3 *Edited measurements*

In order to produce the statistics reported in 8.2 the following editing criteria have been used before using RA2_FGD products:

Parameter	Surface type	Zone	Range
Ku SWH	Open Ocean	All world	[0, 10] (m)
Ku Backscattering Coeff.	Open ocean	All world	[7, 17] (dBs)
Ku Wind Speed	Open ocean	All world	[0, 20] (m/s)

Table 10: Editing criteria for RA-2 parameters statistics

8.4 *Product disclaimer*

For the product disclaimers please refer to the following web link:
http://envisat.esa.int/dataproducts/availability/

8.5 Data handling recommendations

8.5.1 SEA-ICE FLAG

The following algorithm is proposed for the determination of a sea-ice flag, presently missing in the Level 2 Ra-2 and MWR data products. (See [R – 14]):

|Latitude *(lat: field#4 of L2 data)*| >50 deg

AND

The number of 20Hz valid data *(num_18hz_ku_ocean: field#23 of L2 data)* < 17

OR

|MWR Wet Tropospheric Correction *(mwr_wet_tropo_corr: field#42 of L2 data)*–ECMWF Wet Tropospheric Correction *(mod_wet_tropo_corr: field#41 of L2 data)*| > 10 cm

OR

Peakiness *(Ku_peak: field#139 of L2 data)* >2

8.5.2 OCEAN S-BAND ANOMALIES DETECTION

A valuable algorithm to detect the Level 2 DSR affected by the RA-2 S-Band anomaly is proposed in [R- 12]. Note that its validity is limited to the data acquired over open-ocean.

8.5.3 WARNING ON IPF 4.56 VERSION IDENTIFICATION FIELD

All RA-2 and MWR level 1B and NRT Level 2 products generated after November 26, 2003 report a software version as being 4.54 (available in MPH field 8).

Nevertheless those products have been generated with the IPF V4.56 operational since November 26, 2003. The first nominal generated product, using the new SW version, will be the one relevant to the absolute orbit number 9094.

The software version ID is correct since December 4, 2003.

8.5.4 S-BAND BACKSCATTERING COEFFICIENT

For the data processed with IPF version 4.56 on, the S-Band Backscattering coefficient has been demonstrated to be in average about 0.65 dBs higher than for the previous versions of the processor. This is due to the algorithm used for the retrieval of the AGC in S-Band, corrected in IPF version 4.56 to be more coherent with the real functioning of the instrument.

An average value of 0.65 dBs is suggested to be added to the old software versions S-Band Sigma0 in order to be in line with the new IPF V4.56 version.

8.5.5 USO RANGE CORRECTION

The actual data of cycle 33 have to be corrected to compensate for the Ultra Stable Oscillator drift shown in Figure 3. The measured Range shall be corrected considering a drift of –0.267 mm per year. Eventually it could also be corrected for the cyclic average given bias (26.013 mm) that has to be added to the measured value.

8.5.6 KU-BAND BACKSCATTERING COEFFICIENT CALIBRATION

The results of the Ku-Band Sigma0 absolute calibration performed with a transponder have been presented in par. 7.1.4. Those results are still not conclusive since some problems have still to be solved, in any case, in order to absolutely calibrate the backscattering coefficient given in the RA2 L2 products the following shall be used by the end user to get to the real Sigma0 measurement:

Sigma_0_true = Sigma_0_prod + **G_tx_rx_prod** - **G_tx_rx_real** - **Bias** [dB]

Where:
Bias: Bias retrieved from the Sigma0 Absolute Calibration
G_tx_rx_prod: Current effective Tx-Rx Gain value used in the operational ground processing chain (ADF file RA2_CHD_AX). The value nominally used since IPF V4.54 is (for configuration RFSS=A and HPA=A) is 170.70 dB
G_tx_rx_real: Pre-launch characterization value (configuration value RFSS=A and HPA=A is 167.46 dB)

8.5.7 ABNORMAL RA-2 RANGE BEHAVIOR AFTER ANOMALY RECOVERY

An un-expected behavior of the Envisat RA-2 sensor was observed in the period from 2004/09/27 at ~16:00 and ending on 2004/09/29 at ~12:00 AM. This directly happened after the recovery of a RA-2 on-board anomaly occurred on the 2004/09/26 at ~13:40. The altimetric range jumped by several meters w.r.t. the Mean Sea Surface; on the other hand everything came back to normal as from the 29th of September around noon. RA-2 data from the above period have to be considered with caution.

8.6 Wind & Wave quality assessment

Refer to the ECMWF report given in [R – 9a] and [R-9b].

9 LONG TERM MONITORING

9.1 RA-2 Instrument monitoring

9.1.1 IF FILTER MASK

IIn Figure 19 the evolution of the IF mask quality parameters evaluated as in [R – 4] is reported only for valid data. It can be observed that the difference with respect to the on-ground reference stays quite constant around 0.07 dBs. Three peaks are visible on the plot that correspond to the data acquired on September the 27th 2003 at 15:48, on October the 29th 2003 at 15:42 and on May the 10th 2004 at 15:45. The reason of this could be found in the instrument warming up considering that the IF Cal acquisition has been made, in all the cases, only a couple of hours after an anomaly recovery. The residual noise and the accuracy show a very constant behavior over the whole period. Despite the quite constant IF mask trend, a weird behavior had been observed during the validation of several newly created IF mask correction auxiliary files. After an investigation, it has been recently found out that the phenomenon was due to an error done by the operator while manually creating the auxiliary files.

During cycle 33 the IF Calibration Mode still shows the weird behavior described in [R – 3]. This problem, present since the beginning of the mission, is under investigation. The anomaly directly affects the number of valid RA-2 IF masks obtained per cycle, but does not refrain from the generation of the IF mask correction file, used in input to the Level 1B ground processing.

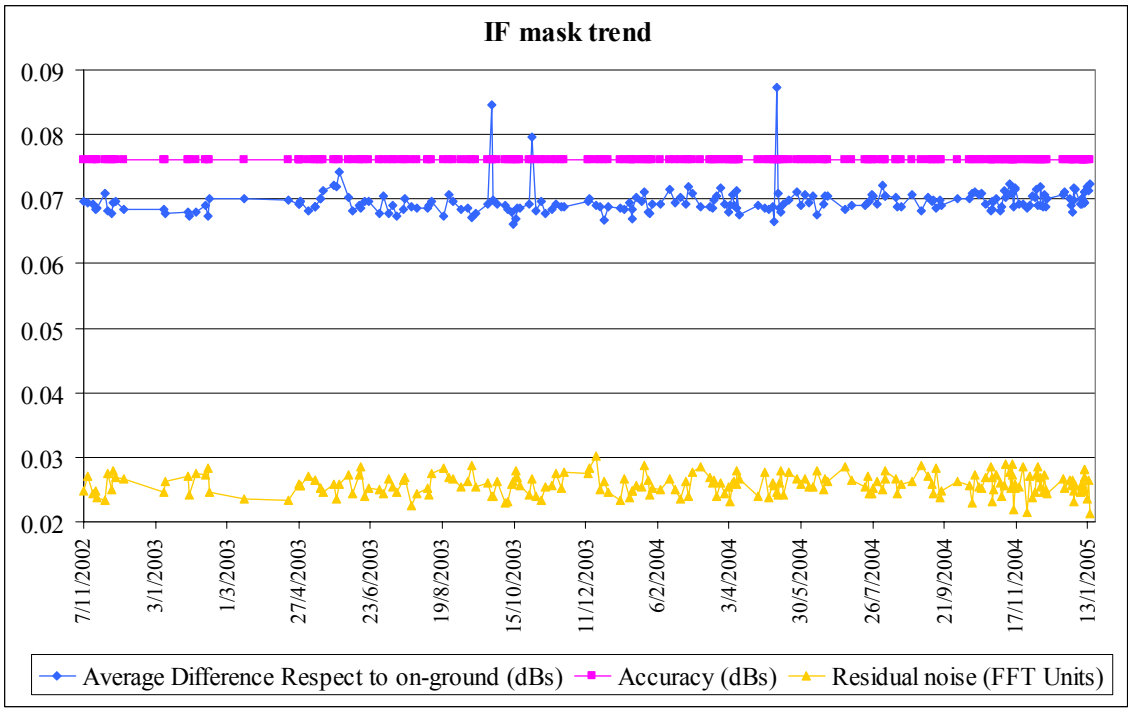

Figure 19: Evolution of the IF mask related parameters for valid IF masks retrieved up to cycle 33

9.1.2 USO

In Figure 20 the USO clock period trend retrieved until the end of cycle 33 is reported. In order to make the variability visible, the difference of the actual USO clock period with respect to the nominal one has been plotted, in the upper panel. In the lower panel the Range error due to the USO clock variability has been reported taking a satellite altitude of 800 Km as a nominal value.

Currently the nominal USO clock period (12500 ps) is used within the processing, this means that the data are not corrected for the bias and the drift correlated to the actual USO clock period. Those values, translated into altimetric range figures, are respectively of 31.46 mm and –4.72 mm/year as calculated with data covering the period 13 June 2003 to 18 January 2005 (the data covering the anomalous period between 2004/09/27 at ~16:00 and 2004/09/29 at ~12:00 AM have not been used to evaluate these figures). The given bias and drift have to be added to the original altimetric range.

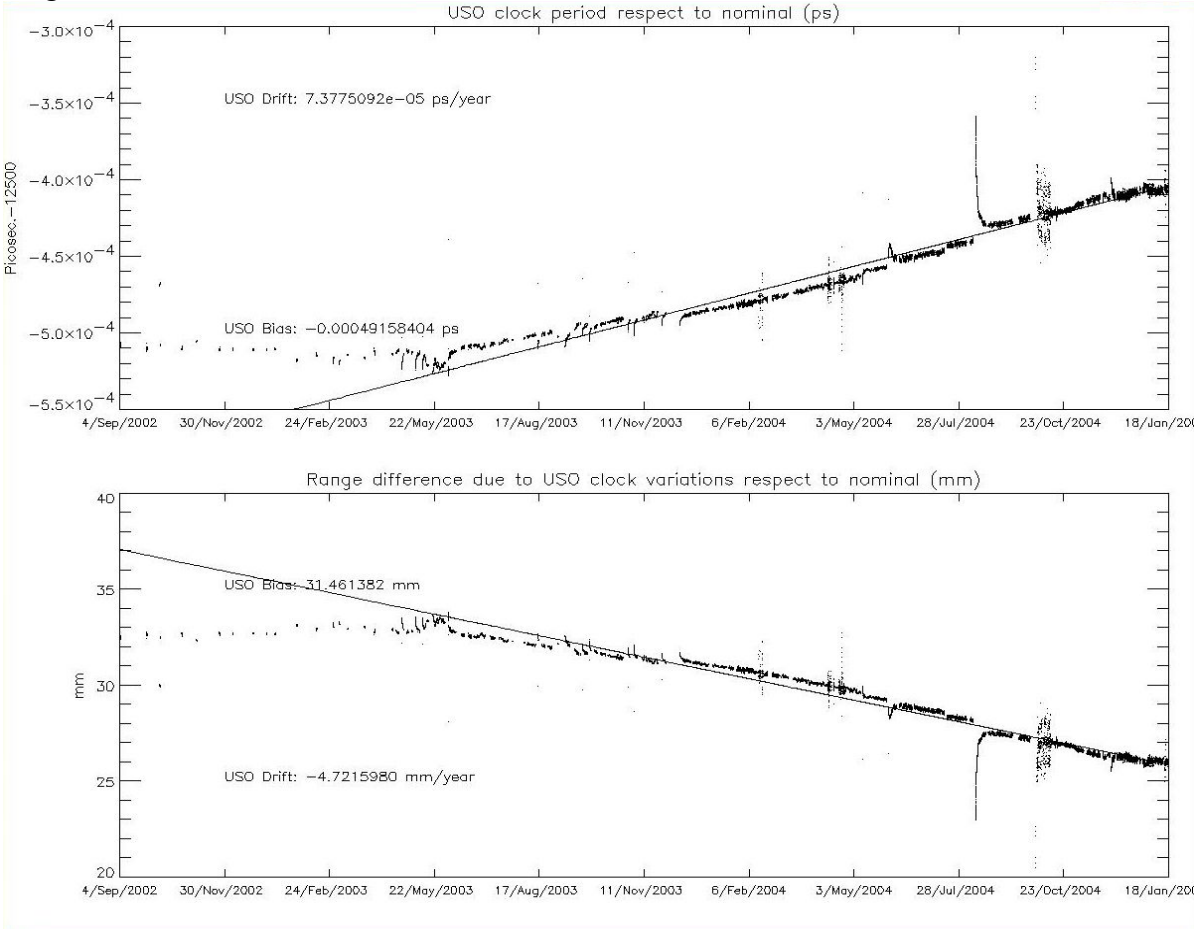

Figure 20: USO clock period until end of cycle 33

9.1.3 TRACKING CAPABILITY

In Figure 21, Figure 22 and Figure 23 the cyclic tracking percentages for the three RA-2 bandwidths are reported.

The worsening in performances noticeable for cycle 20 was due to the up-load of wrong on-board software parameters for the lasted for about three days.

In general, even if a tiny evolution can be observed, the tracking performances are well in line with the output figures and objectives of the Commissioning Phase as given in par. 7.1.3.

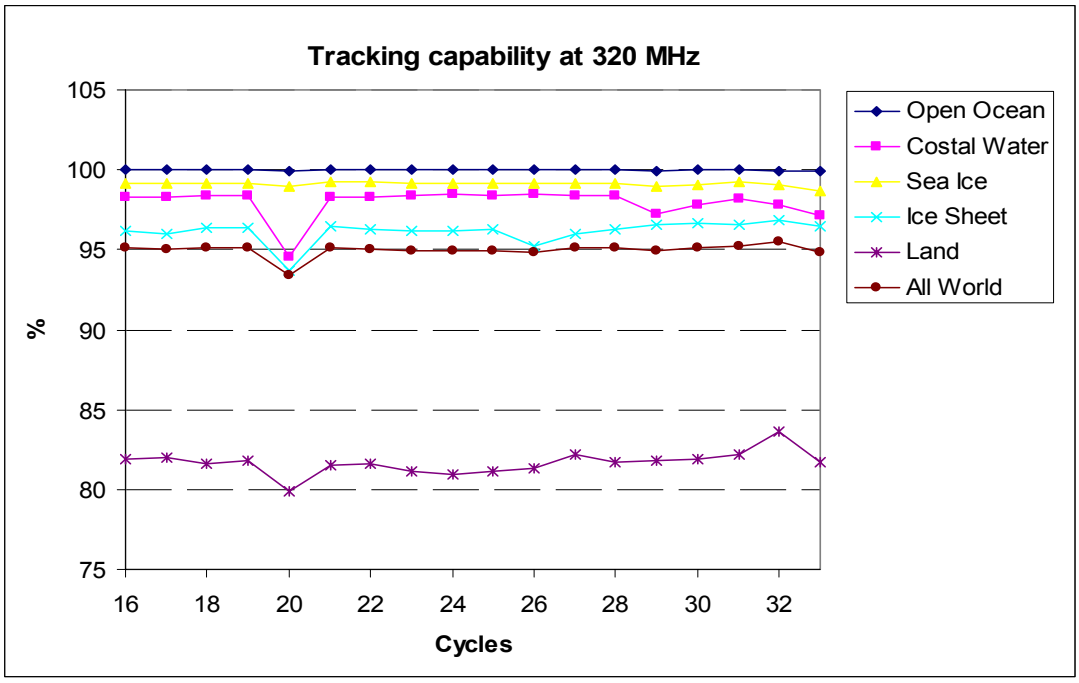

Figure 21: RA-2 Tracking percentage at 320MHz for different surfaces

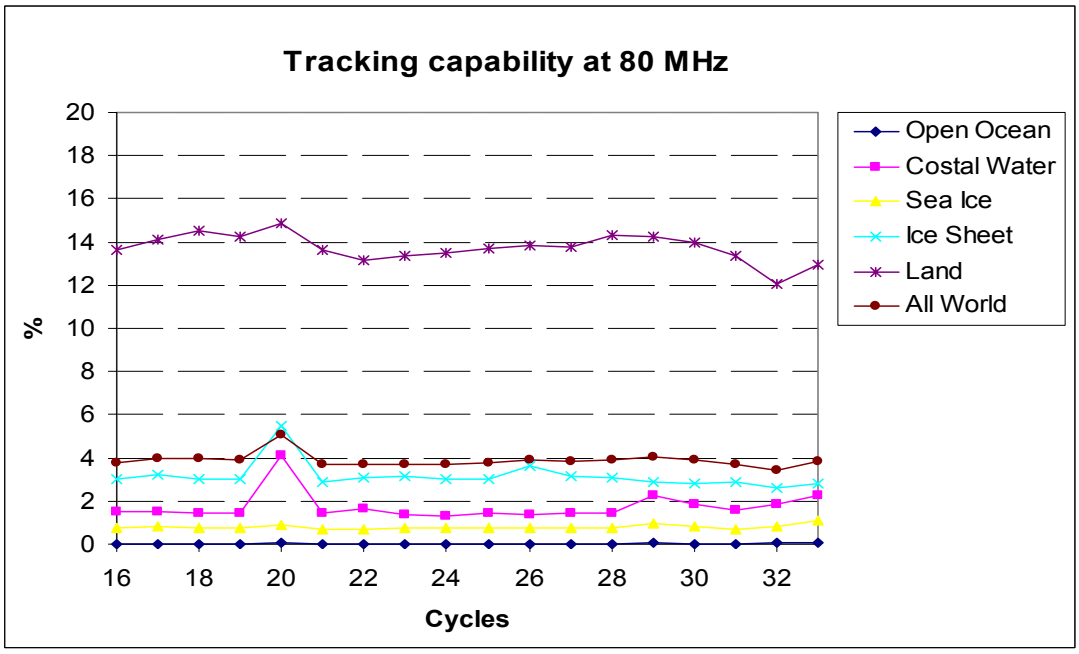

Figure 22: RA-2 Tracking percentage at 80MHz for different surfaces

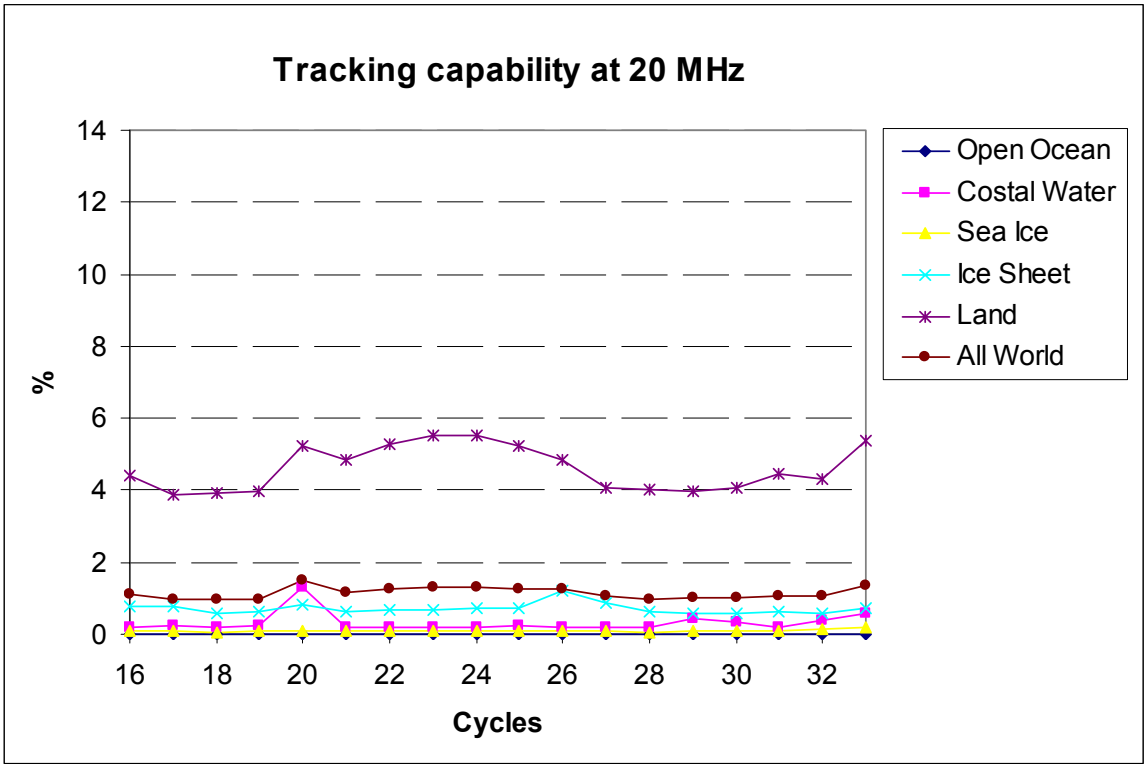

Figure 23: RA-2 Tracking percentage at 20MHz for different surfaces

9.1.4 DATATION

In Figure 24 (upper panel) the differences between the extrapolated UTC values and the corresponding real UTC values measured at the next Kiruna dump, are reported.
The plots are only related to the data collected up to cycle 32. The UTC deviation for the cycle 33 have been not added, see par. 7.1.5 for the datation of cycle 33.
Only few anomalous events can be observed at the beginning of the period (cycles 16/17) for which the difference rises above the 20 microseconds warning threshold. However, starting from cycles 22/23, the number of small differences (10 microseconds plus or minus) has increased a lot; this problem is currently under investigation. Furthermore during the last ten days of the current cycle, the variability of the deviations has increased reporting many peaks just under the 20 microseconds threshold; this phenomenon will also be part of the investigation.

In the lower panel the ICU clock step for the same period is shown where big variations are reported. This is however not a problem because the ICU clock period variations are included in the algorithm for the SBT/UTC correlation evaluation.

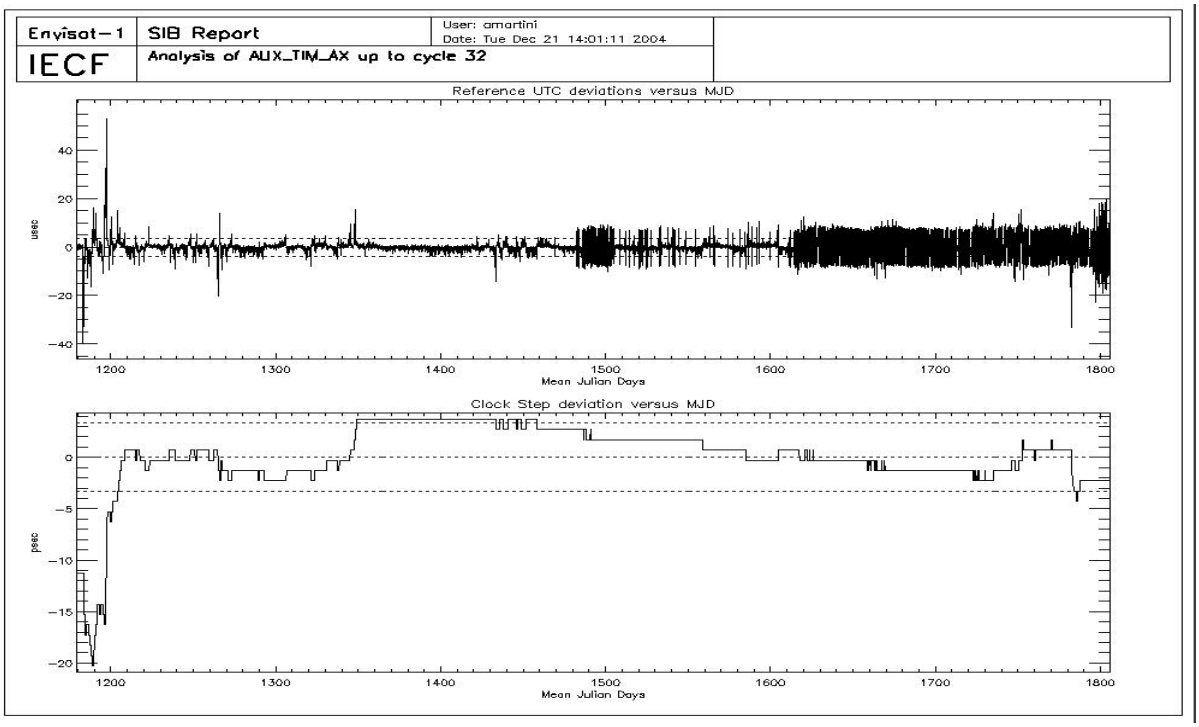

Figure 24: UTC deviations and ICU clock period up to cycle 32

9.1.5 MISPOINTING

In Figure 25 the overall mispointing squared trend (averaged over each orbit) is plotted for cycles 16 to 32. The jump occurred on November the 26th 2003 is correlated to the upload of IPF version 4.56; the abrupt decreasing of the mispointing squared value is due to the usage of a new RA2_IFF_AX IF mask auxiliary file. After the drop a very tiny increase of the mispointing squared could eventually be detectable. The most probable cause of this phenomenon could be a change in the Intermediate Frequency Filter slope due to ageing effects.

On the other hand, it can be noticed that the mispointing squared assumes lower values just after an instrument anomaly, showing an increasing trend until it reaches back a standard mispointing value. This particular behavior can be explained by the different shape that the over-ocean average waveform has before and after an anomalous event as visible in Figure 26. Observe, in particular, the disappearance of the small dip in the waveforms acquired after the anomaly. This problem will be solved with the introduction of an updated mispointing retrieval algorithm with the next version of the processing software as described in par. 5.4.4.

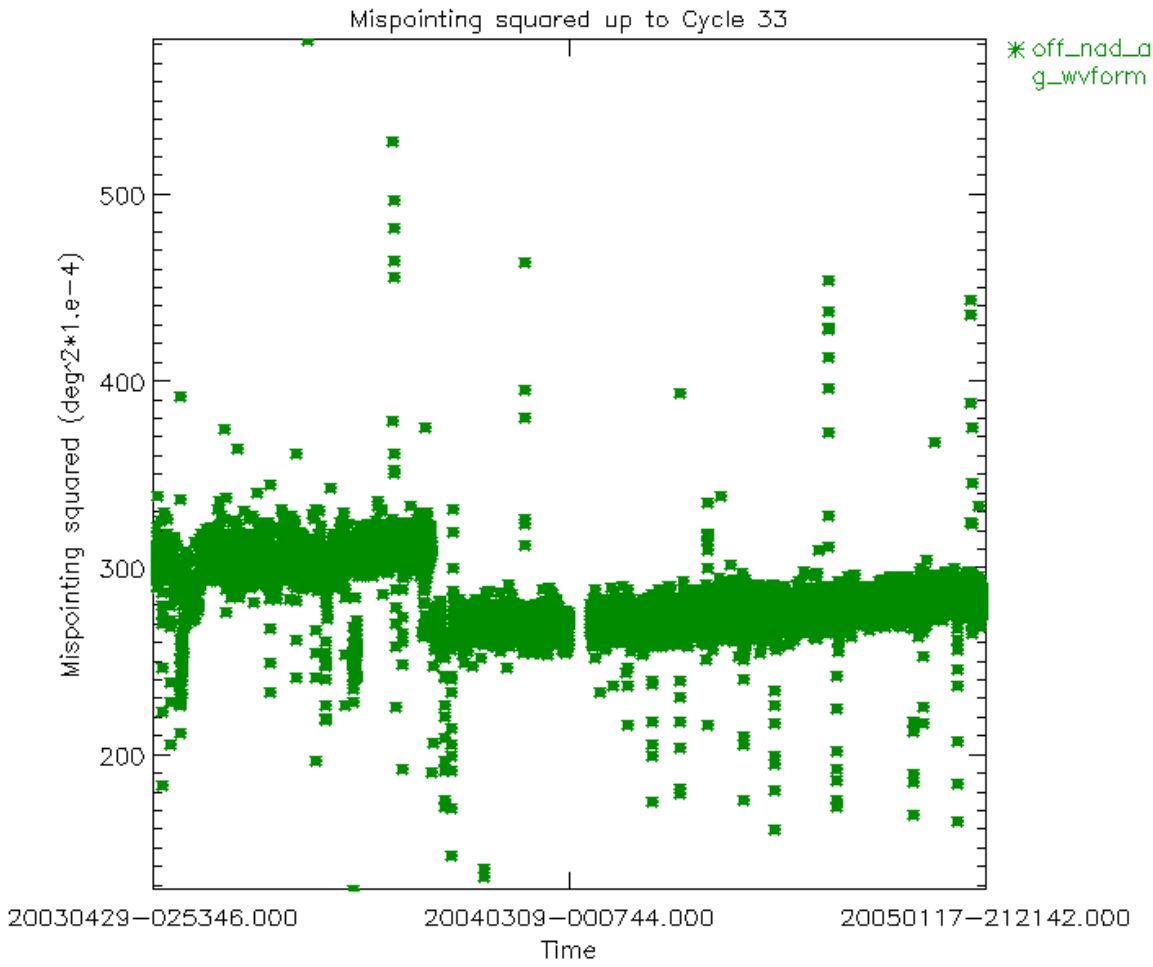

Figure 25: Smoothed mispointing squared trend until end of cycle 33 (deg^2*10e-4)

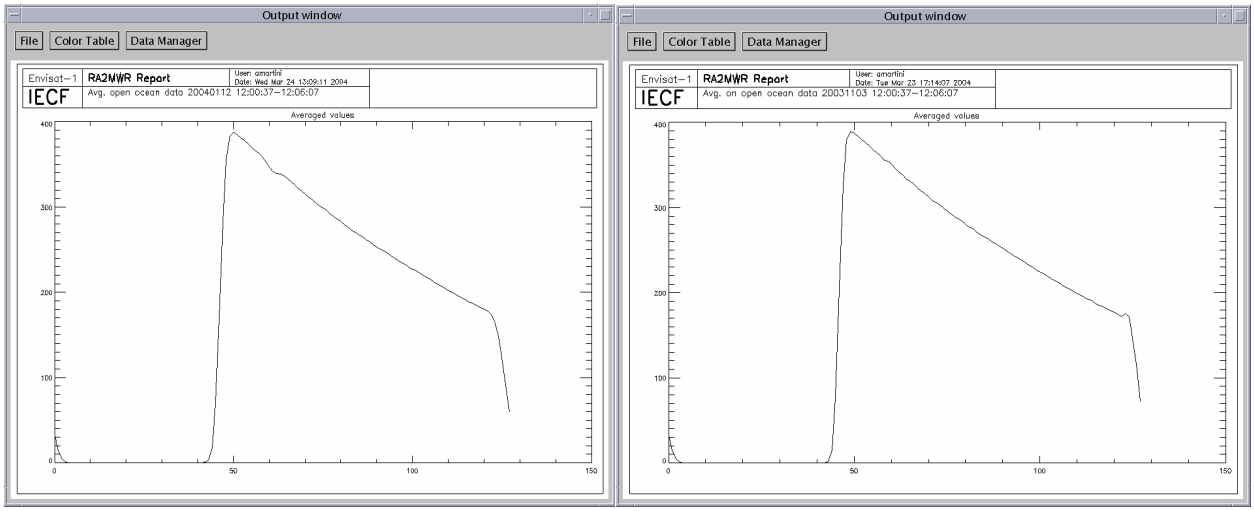

Figure 26: Open Ocean average waveforms before (left) and after an anomaly (right)

9.1.6 S-BAND ANOMALY

In Figure 27 the percentage of data per cycle that are affected by the so-called "S-Band" anomaly is reported. The figures are quite stable between 0% and 8.1%.
The relatively high value recorded for cycle 27 is due to the fact that on the day 1st of June, the S-band anomaly started at around 14:30 while the instrument didn't switch to mode Heater 2 when foreseen (at about 15:50). For this reason the S-Band anomaly continued for the next 24 hours until the next Heater 2 mode on June the 2nd.

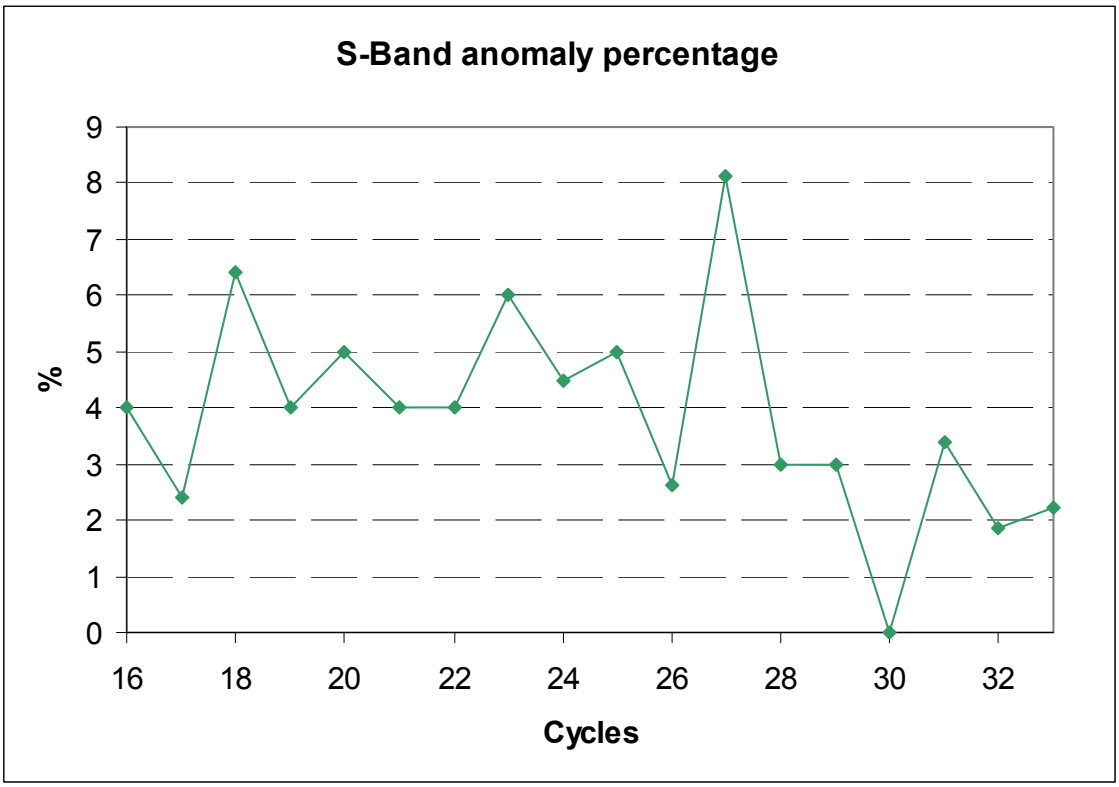

Figure 27: Percentage of data affected by the "S-Band Anomaly" for cycles 16-33

9.1.7 IN-FLIGHT INTERNAL CALIBRATION

Figure 28 and Figure 29 report Ku and S Band in-flight calibration factors for Time Delay and Sigma0 respectively, daily averaged. The Time Delay factor shows to be very stable for both the working frequencies, but the Ku band Sigma0 factor reveals a decrease of about 0.2 dBs over the period starting from cycle 16. This means that the overall internal gain has been continuously decreasing, having demonstrated that the transmitted power did not decrease during the same time span. Being the decreasing factor quite small this is not being considered a problem, for the moment, since the calibration factor is indeed introduced especially to correct for eventual instrumental changes. However a special eye is kept on the monitoring of this parameter.

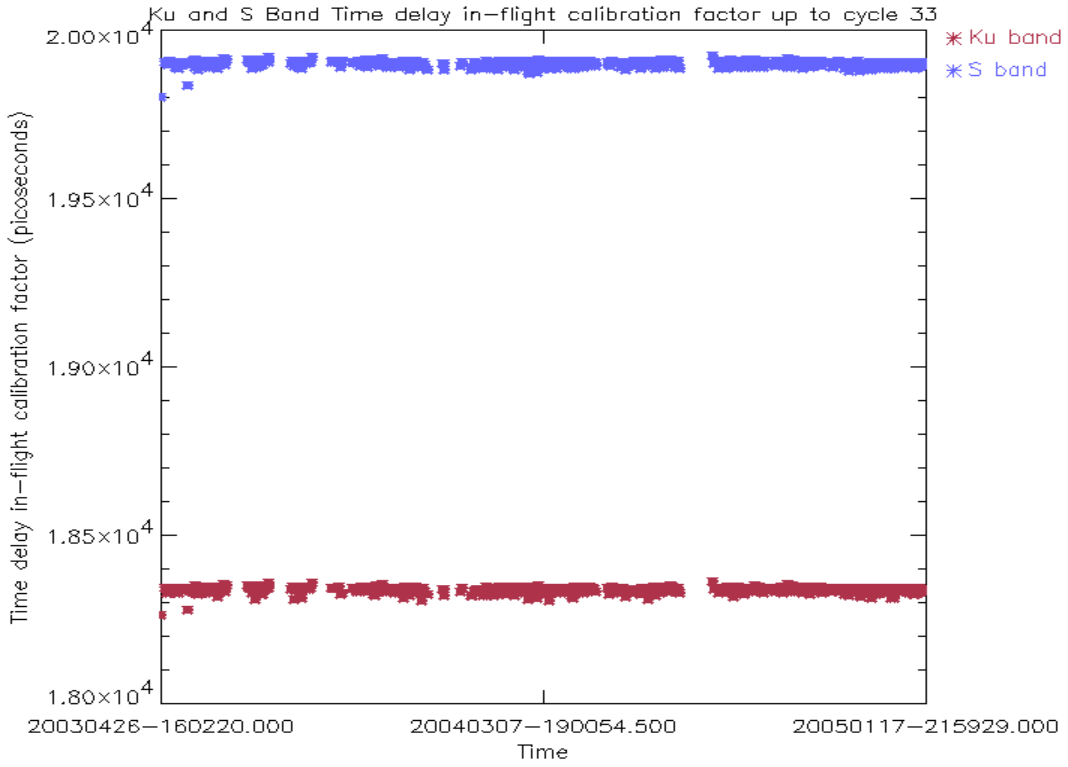

Figure 28: Ku and S Band in-flight time delay calibration factor up to cycle 33

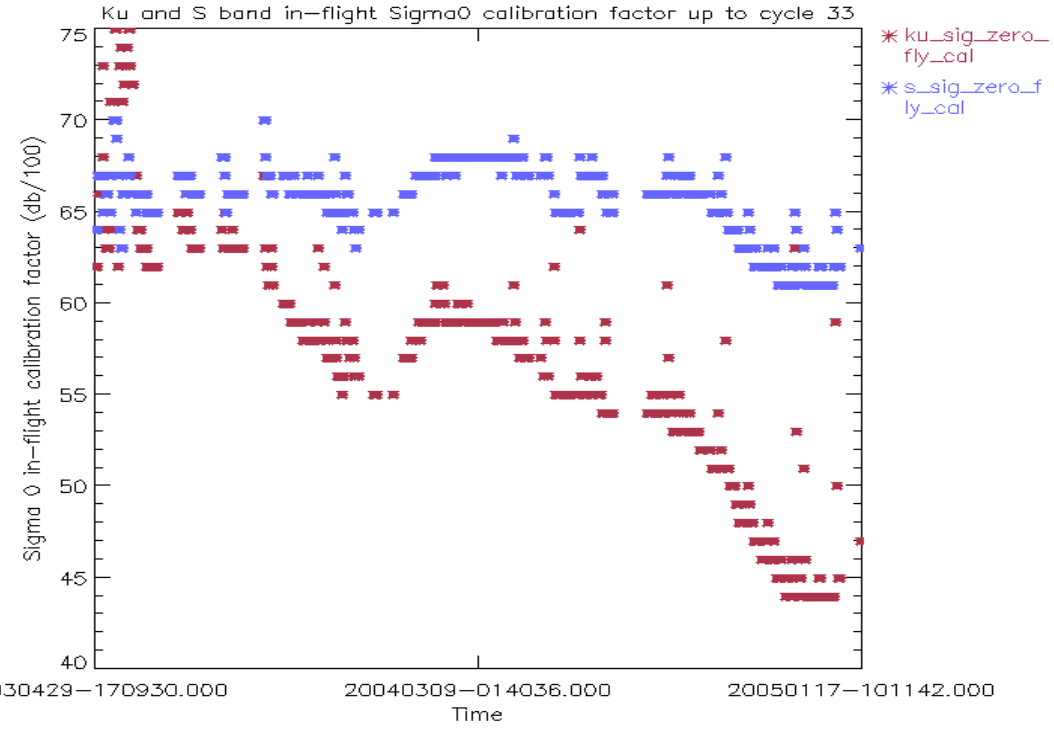

Figure 29: Ku and S Band in-flight Sigma0 calibration factor up to cycle 33

9.2 Products Monitoring

9.2.1 AVAILABILITY OF DATA

Hereafter the percentage of the different levels of products availability is reported for different cycles up to number 33. Considering as reference the instrument unavailability, it is possible to notice that in the last cycle the situation is slightly improved, with respect to the previous one, for all levels of products.

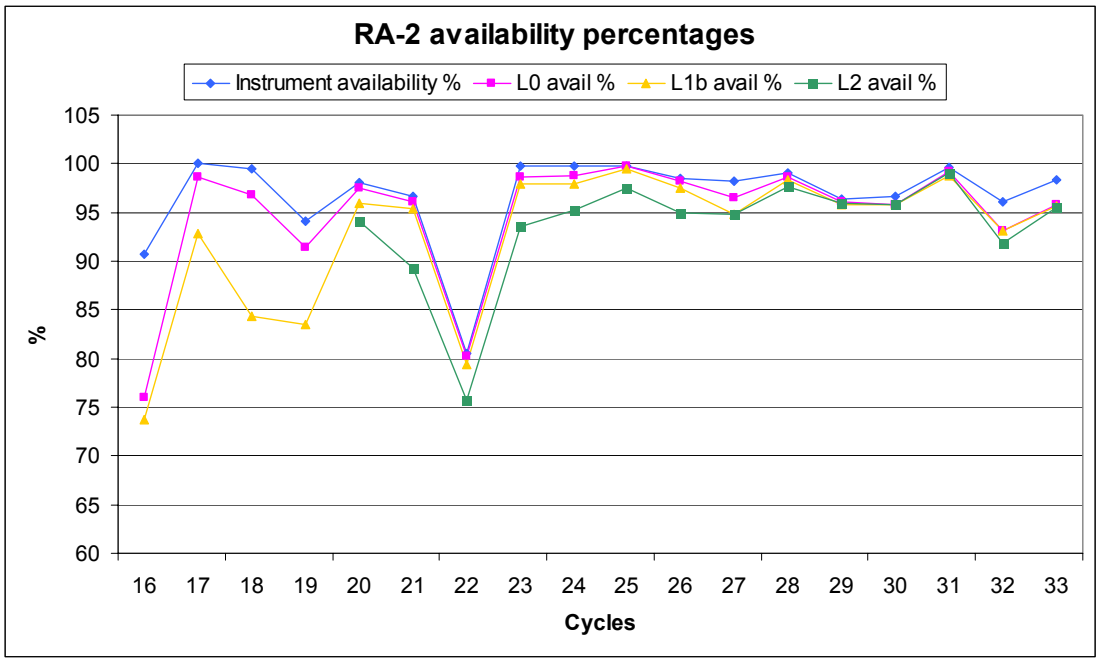

Figure 30: Percentage of Products unavailability up to cycle 33

9.2.2 RA-2 ALTIMETER PARAMETERS

Hereafter a summary of the main altimetric parameters performances is reported; these results have been obtained with the editing criteria mentioned in par. 8.3.

9.2.2.1 Altimeter range

No current results for the time being. The monitoring of the RA-2 FD altimetric range shall be done once the NRT products shall be upgraded with the DORIS navigator NRT orbital information.

9.2.2.2 Significant Wave Height

The SWH in both bands shows a small drop around the beginning of July 2004 which has been already mentioned in par 8.2.2. After a detailed analysis that drop can be now interpreted more like

a smoother decrease which can be correlated to a seasonal variability as it could be observed during the year 2003.

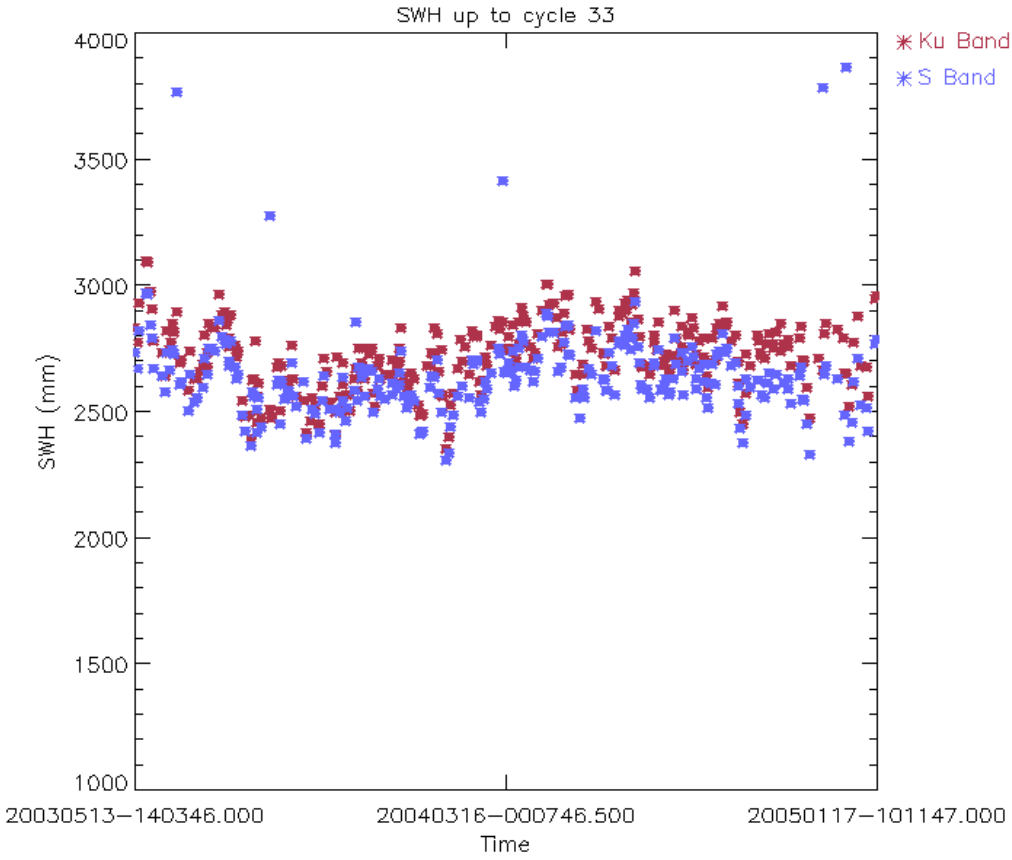

Figure 31: Ku and S SWH daily average up to cycle 33 (mm)

On the other hand, the S-Band SWH shows a drop on April the 9th 2003 corresponding to the operational up-load of IPF version 4.54; furthermore the high daily means reported (sometimes plotted outside the figure range) are due to the so-called S-Band anomaly (ref. par.7.1.7).

9.2.2.3 Backscatter coefficient – Wind Speed

The Ku-Band Sigma_0 trend, reported hereafter, is characterized by a jump of in average 3.24 dBs concomitant with the operational up-load of IPF version 4.54 occurred on the 9th of April 2003. To be said that this change is due to the upload of a new RA2_CHD_AX ADF file that artificially shifted the RA-2 real Sigma_0 in order to align it with ERS-2 Sigma_0 and make it coherent with the Witter and Chelton empirical wind model. A similar change in trend, but in the opposite direction, is also visible in the Wind Speed trend reported afterwards.
Beyond the huge jump occurred in April 2003, the S-Band Sigma_0 reports a smaller jump occurring on November the 26th 2003. Following the installation of the IPF processing chain V4.56, the average values of the RA-2 S-Band backscattering parameter, shows an increase of ~0.65 dBs, the new S-band sigma0 being higher with respect to the previous versions. See chapter 8.5.4.

When looking carefully a tiny increasing trend can be noticed that causes a change in the Ku-Band backscattering coefficient of about 0.2 dBs over the whole reported period. This could be due to the Ku-Band Sigma0 in-flight calibration factor behaviour which shows a decrease of 0.2 dBs over the same time frame. However, despite the jump, the same increasing trend can eventually be detected for the S-band backscattering coefficient while the S-Band Sigma0 in-flight calibration does not show a decreasing trend as the Ku-band one.

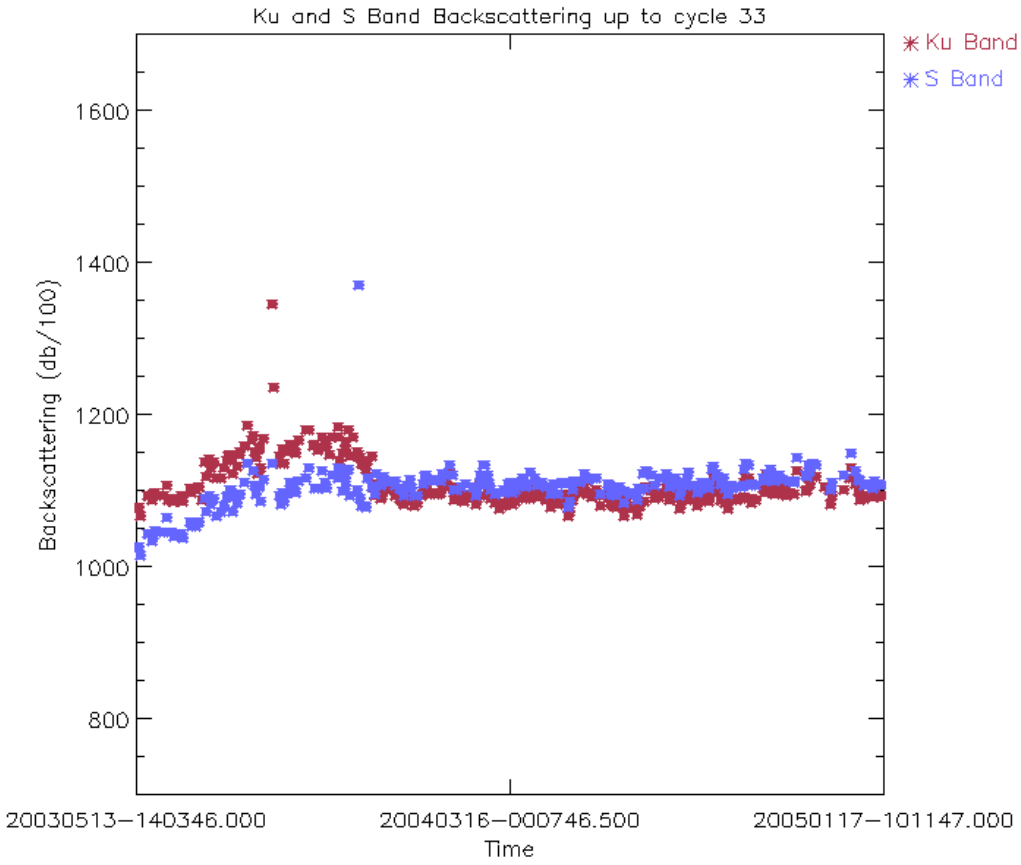

Figure 32: Ku and S band Backscattering daily averages up to cycle 33 (dB/100)

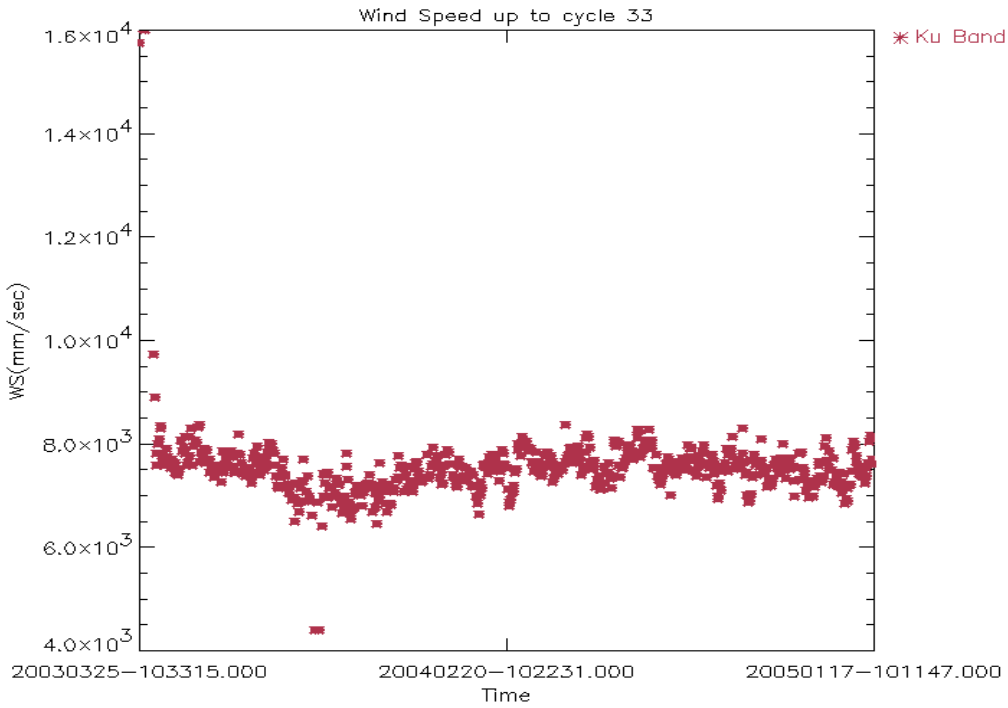

Figure 33: Wind Speed daily averages up to cycle 33 (mm/s)

10 PARTICULAR INVESTIGATIONS

During cycle 33 no special investigation has been performed.